

**Evaluation of the Fish Community in the Vicinity of
Kingston Fossil Plant, 2001-2010**

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Acronyms and Abbreviations

CRM	Clinch River Mile
ERM	Emory River Mile
KIF	Kingston Fossil Plant
QA	Quality Assurance
RFAI	Reservoir Fish Assemblage Index
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
VS	Vital Signs monitoring program

1. Introduction

Tennessee Valley Authority's Reservoir Fish Assemblage Index (RFAI) methodology has been used to assess the condition of the fish community in the vicinity of the Kingston Fossil Plant (KIF) since 2001 to satisfy NPDES permit renewal requirements. Fish community samples were taken once every two years from 2001 through 2007 at locations upstream (Clinch River Mile [CRM] 4.4) and downstream (CRM 1.5) of the KIF heated discharge. Following the ash release in December 2008, fish community sampling has been conducted annually at three locations, including the two sites sampled prior to the spill and at an additional site established at Emory River Mile (ERM) 2.5 to evaluate immediate near-field effects. This report presents the results of RFAI data collected from autumn 2001 through autumn 2010.

2. Study Area

The KIF facility is located on a peninsula at the confluence of the Emory and Clinch Rivers on Watts Bar Reservoir on the right descending bank. The Emory River borders the KIF ash cells to the east. The KIF cooling water intake is located at Emory River mile (ERM) 2.0. Heated water from KIF is discharged to the Clinch River, rather than to the Emory, at approximately Clinch River mile (CRM) 2.6.

The Emory River originates on the Cumberland Plateau and its inflows to Watts Bar Reservoir are not regulated (not controlled by an upstream flood storage dam or navigation structure), but the Watts Bar Reservoir summer pool extends upstream to above Harriman, Tennessee (ERM 11.0). Flows in the nearby Clinch River arm of Watts Bar Reservoir are dependent on flows from Melton Hill Dam.

The river surface elevation near KIF is controlled by Watts Bar Dam (Tennessee River Mile [TRM] 529.9) approximately 40 miles downstream of KIF. The summer pool elevation (May 15- October 31) for the Emory River at KIF is approximately 740 to 741 feet mean sea level (msl) and the winter pool elevation (December 1- March 31) is 735 to 737 feet msl. The Watts Bar annual spring reservoir fill period is April 1- May 14. Watts Bar's surface area varies between approximately 32,000 acres at minimum winter pool level to 39,000 acres at the normal maximum summer pool level. Watts Bar Reservoir extends 72 miles up the Tennessee River to Fort Loudoun Dam and 61 miles up the Tennessee and Clinch Rivers to Melton Hill Dam.

Watts Bar is a mainstream Tennessee River reservoir with an average annual discharge of about 27,000 cubic feet per second (cfs) at Watts Bar Dam. Most of the water entering Watts Bar Reservoir (86 percent) comes from outside the immediate drainage area. The Tennessee and Little Tennessee Rivers (i.e., average annual discharge from Fort Loudoun Dam, 18,200 cfs) account for approximately 67 percent of the flow into the reservoir. The Clinch River, with an annual average discharge from Melton Hill Dam of 5,000 cfs, accounts for about 19 percent of the flow into the reservoir. The remaining 14 percent is contributed by local inflows.

3. Methods

Field Procedures

Two existing sampling locations and one new sampling location were selected in Watts Bar Reservoir: ERM 2.5, CRM 4.4, and CRM 1.5. ERM 2.5 is the new site and is in the immediate area of the spill and subsequent dredging operation. This sample area ranges from approximately ERM 1.7 to ERM 4.5 (Figure 1). CRM 4.4 ranges from CRM 3.8 up to CRM 5.3 and up the Emory River to mile 0.7 (Figure 2). CRM 1.5 is the approximate center point for a sample area extending from CRM 0.0 to 2.4 (Figure 3).

Fish sampling methods included boat electrofishing and gill netting (Hubert, 1996; Reynolds, 1996). Electrofishing methodology consisted of fifteen electrofishing boat runs near the shoreline, each 300 meters long with duration of approximately 10 minutes. The total near-shore area sampled is approximately 4,500 meters (15,000 feet). Ten overnight experimental gill net sets were used at each area. Experimental gill nets are used as an additional gear type to collect fish from deeper habitats not effectively sampled by electrofishing. Each experimental gill net consists of five-6.1 meter panels for a total length of 30.5 meters (100.1 feet). The distinguishing characteristic of experimental gill nets is mesh size that varies between panels. For this application, each net has panels with mesh sizes of 2.5, 5.1, 7.6, 10.2, and 12.7 cm. Experimental gill nets are typically set perpendicular to river flow extending from near-shore toward the main channel of the reservoir.

Fish collected using these sampling methods were identified by species, counted, and examined for anomalies (such as disease, deformations, or hybridization).

Data Analysis

Community results were evaluated using a multi-metric scoring method (Reservoir Fish Assemblage Index or RFAI) developed by TVA in early 1990s as part of TVA's Valley-wide Reservoir Vital Signs Monitoring Program (Hickman and McDonough 1996).

The RFAI uses 12 fish community metrics from four general categories: Species Richness and Composition, Trophic Composition, Abundance, and Fish Health. Individual species can contribute to more than one metric. Together, these 12 metrics provide a balanced evaluation of fish community integrity. The individual metrics are shown below, grouped by category:

Species Richness and Composition

(1) Total number of indigenous species -- Greater numbers of species are considered representative of healthier aquatic ecosystems. As conditions degrade, numbers of species at an area decline. Non-indigenous (non-native) species are not included in this metric because they have the potential to reduce the quality of native fish communities through increased competition for resources, predation on native species, and degradation of water quality.

- (2) Number of centrarchid species** -- Sunfish species (excluding black basses) are invertivores and a high diversity of this group is indicative of reduced siltation and suitable sediment quality in littoral areas.
- (3) Number of benthic invertivore species** -- Due to the special dietary requirements of this species group and the limitations of their food source in degraded environments, numbers of benthic invertivore species increase with better environmental quality.
- (4) Number of intolerant species** -- This group is made up of species that are particularly intolerant of physical, chemical, and thermal habitat degradation. Higher numbers of intolerant species suggest the presence of fewer environmental stressors.
- (5) Percentage of tolerant individuals** (excluding Young-of-Year) -- This metric signifies poorer water quality with increasing proportions of individuals tolerant of degraded conditions.
- (6) Percentage dominance by one species** -- Ecological quality is considered reduced if one species inordinately dominates the resident fish community.
- (7) Percentage non-indigenous species** -- Based on the assumption that non-native species reduce the quality of resident fish communities.
- (8) Number of top carnivore species** -- Higher diversity of carnivores is indicative of the availability of diverse and plentiful forage species and the presence of suitable habitat.

Trophic Composition

- (9) Percent of individuals as top carnivores** -- A measure of the functional aspect of top carnivores which feed on major planktivore and insectivore populations.
- (10) Percentage of individuals as omnivores** -- Omnivores are less sensitive to environmental stresses due to their ability to vary their diets. As trophic links are disrupted due to degraded conditions, specialist species such as insectivores decline while opportunistic omnivorous species increase in relative abundance.

Abundance

- (11) Average number per run** -- (number of individuals) -- This metric is based upon the assumption that high quality fish assemblages support large numbers of individuals.

Fish Health

- (12) Percentage individuals with anomalies** -- Incidence of diseases, lesions, tumors, external parasites, deformities, blindness, and natural hybridization are noted for all fish measured, with higher incidence indicating less favorable environmental conditions.

Scoring categories are based on “expected” fish community characteristics in the absence of human-induced impacts other than impoundment of the reservoir. For this study, scoring criteria were developed from historical fish assemblage data representative of transition zones from upper mainstream Tennessee River reservoirs (Hickman and McDonough, 1996). Attained values for each of the 12 metrics were compared to the scoring criteria and assigned scores to represent relative degrees of degradation: least degraded (5); intermediate level of degradation (3); and most degraded (1). Scoring criteria for upper mainstem Tennessee River reservoirs are shown in Table 1.

If a metric was calculated as a percentage (e.g., “percent tolerant individuals”), the data from electrofishing and gill netting were scored separately and allotted half the total score for that individual metric. Individual metric scores for a sampling area (i.e., ERM 2.5) are summed to obtain the RFAI score for the area.

RFAI scores range from 12 to 60. Ecological health ratings (12-21 [“Very Poor”], 22-31 [“Poor”], 32-40 [“Fair”], 41-50 [“Good”], or 51-60 [“Excellent”]) are then applied to scores. As discussed in detail below, the average variation for RFAI scores in TVA reservoirs is 6 (\pm 3).

The RFAI results were used to determine if ash-related effects were evident in the fish community by comparison with historical scores for existing sites on the Clinch River, both of which may have had some impact from the spill. The Emory River site can also be compared to historical data from Clinch River sites, and now has two years of data to provide information about unique characteristics at that site. An inspection of individual RFAI metric results and species of fish used in each metric provides more insight into any observed changes and differences between monitoring locations.

4. Results

RFAI results including individual metric scores, contributing species, and overall RFAI scores for each sampling site for each sample year are listed in Tables 4-6. Metric scoring criteria are shown in Table 1. The total number of each species collected in electrofishing and gill netting samples combined is listed for each sampling site for each sample year in Table 3. The species collected, including trophic level, indigenous, and tolerance classifications, as well as catch per effort during electrofishing and gill netting at each sampling site for each sample year are listed in Appendix A (Tables A1-A14)

Reservoir Fish Assemblage Index (RFAI) Scores

Historical RFAI scores for CRM 4.4 and CRM 1.5 show the year-to-year variation for the period 2001 to 2010 (Table 2, Figure 4). RFAI scores for CRM 4.4 averaged 41.2 for this period, with a minimum of 36 (2007), a maximum of 45 (2001) and a range of 9. The average score for the CRM 1.5 was 39.8, with a minimum of 34 (2007), a maximum of 44 (2003), and a range of 10. CRM 1.5 had a slightly lower score than CRM 4.4 in four of the six sample years, but the scores at both sites exhibited very similar patterns through time. The average difference between the annual scores for each site was 2.0 points. The maximum difference between the scores at the two sites in a particular sampling year was 3 points (2001 and 2005), so the difference in scores between the two sites has not exceeded 6 points (defined as the acceptable range for similarity) in any sampling year.

The lowest score for CRM 4.4 and CRM 1.5 (38 and 36, respectively) was measured in 2007, which likely reflects the most severe drought in 122 years of record. RFAI scores at both sites increased by two points between 2007 and 2009, but scores remained below the respective long-term averages for each site and were the second lowest observed for each site. ERM 2.5 also was sampled in 2009 and it obtained the highest score (44) among the three sites that year. In

2010, RFAI scores of 44 and 42 were observed at the three stations, with Emory 2.5 again having the highest score, although these scores would be considered similar (not different) (Figure 4).

Species Richness and Composition

Diversity is addressed by the metrics in the Species Richness and Composition category. A total of 55 species have been collected in RFAI sampling in the vicinity of KIF since 2001, including 50 indigenous species and five non-indigenous species (Table 3). However, non-indigenous species –nor hybrids– are not included in the species RFAI richness metrics (metrics 1-4 and 8). Non-indigenous species included common carp, grass carp, yellow perch, inland silverside, and striped bass. They contributed three to five species to the total taxa count at each site each year (Table 3, Figures 5 and 6). Hybrid fish encountered were hybrid sunfish and hybrid black bass, as well as hybrid striped bass-white bass which are stocked by state fisheries agencies.

The “total number of indigenous species” (metric 1) collected at the three sites over the years has ranged from 25 to 35 (Table 3, Figure 6). Species richness at each site in 2009 and 2010 was similar to that observed prior to the spill, with the highest number (35) occurring at the immediate near-field site (ERM 2.5) and CRM 1.5 in 2010. The lowest number (25) was collected at CRM 1.5 in 2007.

Species richness scored the maximum points at ERM 2.5 in 2009 and 2010, with 32 and 35 species, respectively. Species richness also scored the maximum points at CRM 1.5 and CRM 4.4 each year sampled from 2001 through 2005 (30 to 34 species) and in 2010 (34 to 35 species). Moderate species richness was observed at the Clinch River sites in 2007 and 2009 (25 to 28 species). Because the number of indigenous species declined consecutively during 2005 and 2007, with 2007 yielding the lowest number to date, and due to the fact that ERM 2.5 had the expected number of species represented in both post spill samples, the moderate richness observed in the Clinch River in 2009 is not believed related to any adverse effects of the spill. Year-to-year variations in species richness resulted primarily from species which are not commonly collected each year. When these “incidental species” are collected, it is typically in low numbers (~1 to 3 individuals); “Incidental species” have long-term median catch rates of 0 to 1 (Table 3). Examples of “incidental species” are paddlefish, walleye, lake sturgeon, steelcolor shiner, and several species of redhorse. For instance, lake sturgeon were collected only in autumn 2010, with one each collected at CRM 1.5 and CRM 4.4. Of the 50 indigenous species collected since 2001, 14 species were collected in only one to three of the 14 RFAI samples.

Sites received the highest possible score for the “number of centrarchid species” (metric 2) each year except 2007. Only four species were collected at CRM 4.4 that year, resulting in a moderate score. Otherwise, six to eight centrarchid species were collected at each site each year. Of the eight centrarchid species, bluegill was the most common, followed by redear sunfish and longear sunfish. Less common were black and white crappie, redbreast sunfish, and warmouth; these four species were not collected at CRM 4.4 in 2007.

The “number of benthic invertivore species” (metric 3) collected at a site each sample year ranged from 2 to 7, with a total of 8 species collected since 2001. Spotted sucker and freshwater

drum were the most common, respectively, followed by golden redhorse and logperch. The moderate range for this metric is from 4 to 7 species; therefore, no site has received the highest possible score. The highest number was observed at CRM 4.4 in 2005 and lowest number was observed at CRM 1.5 in 2007. A total of six benthic invertivore species have been collected at ERM 2.5, with five species collected during each of the two surveys at this site. A total of eight species have been collected at CRM 4.4, with five species collected in four of the six sample years. Only one individual each of river redhorse and silver redhorse has been collected, and both occurred at CRM 4.4 in 2005, which accounted for the highest number of benthic invertivore species (7) observed at a site to date. In contrast, only three benthic invertivore species were collected at CRM 4.4 in 2009, resulting in the lowest score for this site. However, fewer benthic invertivore species were collected most years at CRM 1.5 than at other sites. The number of species contributing to this metric at CRM 1.5 has fluctuated between three and four each year except 2007, when only two species were collected. Northern hog suckers were collected only during two surveys: CRM 1.5 in 2005 (4 individuals) and ERM 2.5 in 2009 (one individual). Black redhorse were collected each year at ERM 2.5 and CRM 4.4, but in low numbers (1 to 3 individuals). No black redhorse have been collected at CRM 1.5.

“Number of intolerant species” (metric 4) (pollution-intolerant) usually scored the maximum points (5), with 5 to 7 species represented at each site each year. The one exception occurred at CRM 1.5 in 2007, when only three intolerant species (brook silverside, longear sunfish, and smallmouth bass) were collected. There was no discernable difference in the number of intolerant species collected during pre- and post-spill surveys. Overall, a total of 10 intolerant species have been collected near KIF. Brook silverside, longear sunfish, smallmouth bass, and spotted sucker were the most common. Four species (mooneye, northern hog sucker, river redhorse, and rock bass) were collected infrequently (in only one to three of the 14 total surveys) and with no consistency among sites or years. As previously stated, black redhorse were collected at ERM 2.5 and CRM 4.4 each survey, but in low numbers (1 to 3 individuals), and they were not collected at CRM 1.5.

“Percent tolerant individuals” (metric 5) in electrofishing samples has consistently scored the lowest number of possible points, with percentages ranging from about 66 to 84%. At each site, bluegill typically contributed most to this metric, followed by gizzard shad, and then largemouth bass and/or spotfin shiner. In gill netting samples, the scores for “percent tolerant individuals” were variable, with percentages ranging from about 7 to 38%, and gizzard shad typically contributing the highest percentages. “Percent tolerant individuals” in gill net samples received the highest possible score at ERM 2.5 and typically received a moderate score at other sites. There was no apparent pattern with respect to this metric in electrofishing samples or gill net samples that indicated an adverse effect of the spill.

“Percent dominance by one species” (metric 6) was fairly consistent for electrofishing samples, generally ranging from about 33 to 46%. However, scores fluctuated between moderate and low as the upper bounds of the moderate range is 40%. Bluegill typically was the dominant species in electrofishing samples at each site. Exceptions were CRM 4.4 in 2005 and ERM 2.5 in 2010, when gizzard shad were dominant (~36 and 41%, respectively). The gill netting samples typically received a moderate score, with percentages ranging from about 15 to 26%. One notable exception was the high composition (47.7%; 51 individuals) of channel catfish at ERM

2.5 in 2009, which resulted in a low score. Gizzard shad were often the dominant species in gill netting samples, but other species (e.g., skipjack herring, yellow bass, striped bass, and/or blue catfish,) were dominant in any given year.

The scores for “percent non-indigenous species” (metric 7) have been variable from year to year, receiving high, moderate, and low scores. The non-indigenous species collected in the vicinity of KIF included common carp, grass carp, yellow perch, inland silverside, and striped bass as well as hybrid striped bass-white bass. For electrofishing, the metric score was dependent largely upon the collection of inland silversides. The inland silverside is a relatively new species to Tennessee Valley reservoirs and their range and abundance has continued to increase, thereby resulting in lower scores for this metric at many sites throughout mainstream Tennessee River reservoirs. In gill net samples, although percentages of common carp, striped bass, and hybrid striped bass-white bass have contributed to this metric, the variations in scores from year to year were largely dependent on the number of striped bass collected.

“Number of top carnivore species” (metric 8) scored the maximum points at all sites all years. Typically, 10 to 12 top carnivore species were collected at a site each year. The one exception was the nine species collected at CRM 4.4 in 2007. Overall, a total of 14 top carnivore species have been collected near KIF since 2001. Largemouth bass were the most common species. Walleye and rock bass were the least common, followed by longnose gar. In the two combined sample years at ERM 2.5, 12 of the 14 species were collected. Longnose gar and rock bass were the two species not collected at this site. Interestingly, rock bass were not collected in RFAI sampling at KIF until 2009. Rock bass were collected at CRM 4.4 in 2009 (3 individuals) and CRM 1.5 in 2009 and 2010 (3 individuals each year).

Trophic Composition

“Percent top carnivores” (metric 9) ranged from about 3 to 12% in electrofishing samples, with largemouth bass contributing the highest percentages to this metric. Scores have fluctuated between high, moderate, and low, with no discernable difference between pre- and post-spill results. Percentages in gill net samples ranged from about 33 to 53% at CRM 4.4 and CRM 1.5 and from 22 to 52% at ERM 2.5. The species that contributed most in gill net samples at Clinch River sites typically were yellow bass and striped bass. However, skipjack also contributed considerably (~7 to 15%) at the Clinch River sites from 2001 through 2003. The species that contributed most at ERM 2.5 were spotted gar in 2009 and skipjack herring and yellow bass in 2010. While year-to-year difference in composition existed at each site, most appeared to be random changes that likely reflect sampling variability rather than related to any real change in the environment.

“Percent omnivores” (metric 10) scored in the high (good) to moderate range in electrofishing samples. The one exception was the low score for the electrofishing sample at ERM 2.5 in 2010. Gizzard shad accounted for about 41% of the total sample that year. This is consistent with other samples in that gizzard shad typically accounted for the highest percentages among the omnivores in both electrofishing and gill net samples at a site each year. However, an unusually high number (631) of gizzard shad was collected in electrofishing samples at ERM 2.5 in 2010 as compared to previous years and other sites (range 87-384, average 194). “Percent omnivores”

received the maximum possible score in electrofishing samples at ERM 2.5 in 2009 and at CRM 1.5 and CRM 4.4 in 2009 and 2010. “Percent omnivores” scored in the moderate range in gill net samples most years, but percentages often were near the upper end (46%) of the moderate range. Lower scores were observed at CRM 4.4 in 2003 (~52%) and CRM 1.5 (~48%) and ERM 2.5 (65.3%) in 2009. The highest composition of omnivores in gill net samples was largely due to the unusually high number (51 individuals) of channel catfish collected at ERM 2.5 in 2009. Gizzard shad usually accounted for the highest percentage in gill net samples, but other species also contributed considerably to the metric. Blue catfish generally contributed the second highest percentages, followed by channel catfish, common carp, and smallmouth buffalo, respectively.

Abundance

Abundance (“average number per run”) generally was low at each site. The number of fish collected per electrofishing run was higher at all sites in 2009 and 2010 than during pre-spill surveys, but still remained in the moderate to low range. The increases at CRM 1.5 and CRM 4.4 were due largely to higher numbers of bluegill and inland silverside (non-indigenous) both years, plus spotfin shiner, redear sunfish, and, to a lesser degree, largemouth bass in 2009. At ERM 2.5, the higher number of fish as compared to historical results from the Clinch River sites was mainly due to the higher than average numbers of spotfin shiner, largemouth bass, and bluegill (tolerant species) in 2009. In 2010, ERM 2.5 had considerable higher numbers of gizzard shad (tolerant) and inland silversides (non-indigenous). Gill net catch rates were within the range (~8 to 23 fish per net) observed during pre-spill surveys; the highest catch per effort occurred in 2001 and/or 2003.

Fish Health

The “percentage of individuals with anomalies” (metric 12) (i.e. visible lesions, bacterial and fungal infections, parasites, muscular and skeletal deformities, and hybridization) received the highest score possible in electrofishing samples each year except 2009. In 2009, this metric received a moderate score at each site with anomalies ranging from 2.8 to 4.3% as compared to 0.1 to 1.3% prior to the spill and 1.1 to 1.6% in 2010. The higher percentages of anomalies resulted largely from increased numbers of bluegill infected with common parasite(s) (i.e., trematodes in eyes) and, to a lesser degree, the number of largemouth bass with parasites. In gill netting samples, the percentages of fish with anomalies has ranged from 0 to 2.8% and were similar during pre-and post-spill surveys.

5. Summary of Results

RFAI Scores

- Over the six sample years, RFAI scores rated “Good” to “Fair”, with the lowest scores occurring at the Clinch River sites in 2007 and 2009, respectively.
- The number of indigenous species collected at the Clinch River sites in 2007 and 2009 was lower than in other sample years, which contributed to lower overall RFAI scores.

- The number of indigenous species collected at ERM 2.5 in 2009 and 2010 was similar to that observed prior to the spill, with the highest number (35) of species to date occurring at the immediate near-field site (ERM 2.5) and at CRM 1.5 in 2010.
- In 2009, the RFAI score at ERM 2.5 was six to eight points higher than the Clinch River sites, largely due to ERM 2.5 scoring higher in number of indigenous species, number of benthic invertivores, and percent non-native species.
- In 2010, RFAI scores for all sites rated “Good” and individual metric scores were very similar among sites.

Individual Metrics

- Species richness metrics (1-4 and 8) typically received the maximum number of points, indicating a “good” number of species were represented in samples. Exceptions were the moderate “number of indigenous species” collected at CRM 1.5 and CRM 4.4 in 2007 and 2009, and the moderate to low “number of benthic invertivores” collected at each site each sample year. Because the number of indigenous species declined consecutively at Clinch River sites from 2005 to 2007, with 2007 yielding the lowest number of indigenous species to date, the moderate richness observed in 2009 is not believed related to any adverse effects of the spill. Additionally, because results for benthic invertivores were similar in pre-spill and post-spill samples, there is no clear evidence of ash-related effects.
- “Percent tolerant individuals” and “percent dominance by one species” usually scored in the moderate to low range at all sites, with no apparent difference between pre- and post-spill samples attributable to ash-related effects. The low scores for “dominance” were largely due to the high percentage of bluegill and/or gizzard shad in most samples. Likewise, these species are considered tolerant of degraded water quality and contribute to the composition of tolerant individuals.
- “Percent non-indigenous species” have shown a trend of increasing percentages in electrofishing samples due mainly to an increase in the frequency and numbers of inland silversides collected. This species was first collected in Kentucky and Pickwick reservoirs in 1993 and has continued to spread throughout the Tennessee River system.
- Scores for trophic composition (“percent top carnivores” and “percent omnivores”) have fluctuated between high, moderate, and low. The principal difference between pre- and post-spill results was the improved score (lower composition) for “percent omnivores” in electrofishing samples at CRM 1.5 and CRM 4.4 in 2009 and 2010; a result of the higher overall number of fish collected those years.
- Fish abundance was low in electrofishing and gill netting samples at all sites each sample year. Fewer fish were collect at both Clinch River sites in 2007 than in other years. The number of fish in electrofishing samples was higher during post-spill surveys than during pre-spill surveys, but fish abundance continued to score low or at the low end of the

moderate range. Additionally, the higher than average number of fish collected at both sites in 2009 and 2010 was largely the result of increases in tolerant (bluegill, gizzard shad, largemouth bass, and/or spotfin shiner) species and inland silversides which are not indigenous.

- The principal difference in the percentage of fish with anomalies among years was the higher percentages (2.8 to 4.3%) in electrofishing samples in 2009. The majority of the increases were attributable to bluegill infected with common parasites, which also coincided with considerable increases in numbers of bluegill collected when compared to most previous years. It is possible that the ash spill event had a short-term impact on health of resident fish, especially in the immediate downstream areas, and thus resulted in increased concentrations of parasites during fall 2009. However, conditions abated by fall 2010 and no long-term impacts are anticipated.

6. Conclusion

Fish community results from 2009 and 2010 were compared to those of surveys conducted in the area prior to the spill and to criteria/expectations developed from historical fish assemblage data representative of transition zones in upper mainstream Tennessee River reservoirs. This comparison of results from multiple years of sampling provides strong evidence that the area near KIF continues to support species of fish in numbers and conditions typically observed in the area before the spill.

Some year-to-year and site-to-site variability in specific characteristics used to assess the fish assemblage was observed, but this is expected as a result of natural population cycles and movements of the species being measured (TWRC, 2006). Some variability also arises from the fact that nearly any practical measurement, lethal or non-lethal, of a biological community is a sample rather than a census of the entire population.

Though there is some indication that individual fish health may have been adversely influenced immediately after the ash spill as reflected by increased parasite loads, no long-term impacts are apparent. Overall RFAI results both at the spill site in the Emory River and downstream in the Clinch River reflect the lack of community-wide negative influences from the ash spill at KIF. TVA will continue to monitor resident fish communities at these three sites to determine if any latent effects become apparent.

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Tables

Table 1. Scoring criteria for forebay, transition, and inflow sections of upper mainstream reservoirs in the Tennessee River Valley. Upper mainstream reservoirs include Chickamauga, Fort Loudoun, Melton Hill, Nickajack, Tellico, and Watts Bar.

Metric	Gear	Scoring Criteria								
		Forebay			Transition			Inflow		
		1	3	5	1	3	5	1	3	5
1. Number of indigenous species	Combined	<14	14-27	>27	<15	15-29	>29	<14	14-27	>27
2. Number of Centrarchid species	Combined	<2	2-4	>4	<2	2-4	>4	<3	3-4	>4
3. Number of benthic invertivores species	Combined	<4	4-7	>7	<4	4-7	>7	<3	3-6	>6
4. Number of intolerant species	Combined	<2	2-4	>4	<2	2-4	>4	<2	2-4	>4
5. Percent tolerant individuals	Electrofishing	>62%	31-62%	<31%	>62%	31-62%	<31%	>58%	29-58%	<29%
	Gill netting	>28%	14-28%	<14%	>32%	16-32%	<16%			
6. Percent dominance by one species	Electrofishing	>50%	25-50%	<25%	>40%	20-40%	<20%	>46%	23-46%	<23%
	Gill netting	>29%	15-29%	<15%	>28%	14-28%	<14%			
7. Percent non-indigenous species	Electrofishing	>4%	2-4%	<2%	>6%	3-6%	<3%	>17%	8-17%	<8%
	Gill netting	>16%	8-16%	<8%	>9%	5-9%	<5%			
8. Number of top carnivore species	Combined	<4	4-7	>7	<4	4-7	>7	<3	3-6	>6
9. Percent top carnivores	Electrofishing	<5%	5-10%	>10%	<6%	6-11%	>11%	<11%	11-22%	>22%
	Gill netting	<25%	25-50%	>50%	<26%	26-52%	>52%			
10. Percent omnivores	Electrofishing	>49%	24-49%	<24%	>44%	22-44%	<22%	>55%	27-55%	<27%
	Gill netting	>34%	17-34%	<17%	>46%	23-46%	<23%			
11. Average number per run	Electrofishing	<121	121-241	>241	<105	105-210	>210	<51	51-102	>102
	Gill netting	<12	12-24	>24	<12	12-24	>24			
12. Percent anomalies	Electrofishing	>5%	2-5%	<2%	>5%	2-5%	<2%	>5%	2-5%	<2%
	Gill netting	>5%	2-5%	<2%	>5%	2-5%	<2%			

Table 2. Reservoir Fish Assemblage Index (RFAI) scores and long-term average scores for ERM 2.5, CRM 4.4, and CRM 1.5, 2001-2010.

Site	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Long-term Average
ERM 2.5	---	---	---	---	---	---	---	---	44	44	44.0
CRM 4.4	45	---	42	---	44	---	36	---	38	42	41.2
CRM 1.5	42	---	44	---	41	---	34	---	36	42	39.8

RFAI scoring range for five rating categories: 12-21 (“Very Poor”), 22-31 (“Poor”), 32-40 (“Fair”), 41-50 (“Good”), or 51-60 (“Excellent”)

Table 3. Species collected, indigenous classification, and total fish combined for RFAI electrofishing and gill netting samples at CRM 1.5, CRM 4.4, and ERM 2.5, 2001-2010.

Common Name	Indigenous species	CRM 1.5						CRM 4.4						ERM 2.5	
		2001	2003	2005	2007	2009	2010	2001	2003	2005	2007	2009	2010	2009	2010
Paddlefish	X	1	1		1*		1						1		
Lake sturgeon	X						1						1		
Longnose gar	X		2	1	11		1		1		1				
Spotted gar	X	2	1	4	1	1	1		5				1	11	2
Skipjack herring	X	21	21	22			10	20	18	12			4		25
Gizzard shad	X	292	196	317	186	157	282	122	280	396	188	96	178	120	646
Threadfin shad	X	3	1	3		1	16	2	2		5	4		2	12
Mooneye	X		1	4					1						
Common carp		20	21	22	7	15	14	43	22	27	13	19	19	14	18
Largescale stoneroller	X						5								3
Golden shiner	X	9	5			3		1	9		1				
Emerald shiner	X	44	13					11		9					
Spotfin shiner	X	54	22	23	21	264	20	55	41	33	20	225	40	179	48
Striped shiner	X						3								
Steelcolor shiner	X			1								1			
Bluntnose minnow	X	2	5	3	1	28	68	2	2		2	103	10	41	19
Bullhead minnow	X										1			1	5
Northern hog sucker	X			4										1	
River carpsucker	X	1								1					
Quillback	X								1					1	2
Smallmouth buffalo	X	20	16	3	11	4	6	7	29	9	3	4	6	1	8
Black buffalo	X	3		2			2	3	3	3			2	2	3
Spotted sucker	X	14	11	18		15	11	17	64	73	15	15	16	19	28
Silver redhorse	X									1					
River redhorse	X									1					
Black redhorse	X							1	1	2	1	2	3	1	1
Golden redhorse	X		1		1	1	2	1	2	5	2		1	2	2
Blue catfish	X	32	15	14	7	17	17	35	26	6	13	21	11	13	16
Channel catfish	X	19	20	10	8	18	22	22	14	10	13	26	6	53	28
Flathead catfish	X	6	15	7	8	1	11	4	2	2	3	2	3	3	6
White bass	X	5	6	6	1	3	17	17	6	2	3	2	12	1	8
Yellow bass	X	19	22	14	5	5	32	38	32	9	8	28	5	1	22
Striped bass		14	9	18	8	3	11	2	18	10	9	4	22	1	5
Hybrid striped bass-white bass		2								1					
Redbreast sunfish	X	5	1	6	1	14	5	3				2	6	3	2
Green sunfish	X	11	4	36	16	43	35	4	3	14	1	25	49	9	43
Warmouth	X	2				3		1	3			3	3	7	7
Bluegill	X	540	365	330	364	970	704	483	298	288	305	539	764	514	330
Longear sunfish	X	12	16	52	106	197	71	10	25	13	40	112	31	38	6
Redear sunfish	X	59	51	40	47	52	107	74	50	67	35	73	89	132	56
Hybrid sunfish								1							
Rock bass	X					3	3					3			
Smallmouth bass	X	6	2	9	1	16	6	6	4	21	5	14	8	2	1
Spotted bass	X	25	8	14	1	8		19	18	12	4	4	1	7	7
Largemouth bass	X	98	37	28	21	101	57	86	64	83	27	96	79	153	120
Hybrid bass													1		
White crappie	X	8	2	2			4	1	1	3		2	3	2	4
Black crappie	X	12	1		2	2	4	5	2	3		3	3	3	13
Snubnose darter	X							1							
Yellow perch		3	3			2		5	2	1	1	1	4	5	4
Logperch	X	5	6	2			3	1	2	4	1		7		12
Sauger	X	4	4	8		14	5	9	4	6	5	12	5	1	4
Walleye	X				1						2		3		1
Freshwater drum	X	10	30	9	8	11	13	6	17	12	10	8	18	6	6
Brook silverside	X	17	34	5	11	20	21	14	44	18	14	40	13	56	29
Inland silverside				100	2	219	318			10	24	92	355		119
Chestnut lamprey	X						1						1		
Grass carp															1
Total Fish Collected	---	1,400	967	1,137	858	2,211	1,910	1,132	1,116	1,167	775	1,581	1,784	1,405	1,672
Total Species Richness	55	36	36	34	28	32	38	36	37	34	32	32	38	35	40
Number of Indigenous Species	50	33	33	31	25	28	35	34	34	30	28	28	34	32	35

*=Only young-of-year collected

Table 4. Individual metric scores, contributing species, and overall RFAI scores for CRM 1.5, autumn 2001-2010.

Clinch River Mile 1.5														
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010	
			Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score
1. Number of indigenous species	Combined	(Table 3)	33	5	33	5	31	5	25	3	28	3	35	5
2. Number of centrarchid species (less <i>Micropterus</i>)	Combined		8	5	7	5	6	5	6	5	7	5	7	5
		Black crappie	12		1		--		2		2		4	
		Bluegill	540		365		330		364		970		704	
		Green sunfish	11		4		36		16		43		35	
		Longear sunfish	12		16		52		106		197		71	
		Redbreast sunfish	5		1		6		1		14		5	
		Redear sunfish	59		51		40		47		52		107	
		Warmouth	2		--		--		--		3		--	
White crappie	8		2		2		--		--		4			
3. Number of benthic invertivore species	Combined		3	1	4	3	4	3	2	1	3	1	4	3
		Freshwater drum	10		30		9		8		11		13	
		Golden redhorse	--		1		--		1		1		2	
		Logperch	5		6		2		--		--		3	
		Northern hog sucker	--		--		4		--		--		--	
		Spotted sucker	14		11		18		--		15		11	
4. Number of intolerant species	Combined		5	5	6	5	7	5	3	3	5	5	6	5
		Brook silverside	17		34		5		11		20		21	
		Longear sunfish	12		16		52		106		197		71	
		Mooneye	--		1		4		--		--		--	
		Northern hog sucker	--		--		4		--		--		--	
		Rock bass	--		--		--		--		3		3	
		Skipjack herring	21		21		22		--		--		10	
		Smallmouth bass	6		2		21		1		23		8	
Spotted sucker	14		11		18		--		15		11			
5. Percent tolerant individuals	Electrofishing		83.4%	0.5	75.7%	0.5	74.8%	0.5	76.6%	0.5	74.1%	0.5	66.4%	0.5
		Bluegill	45.0%		43.8%		34.0%		46.1%		45.5%		40.5%	
		Bluntnose minnow	0.2%		0.6%		0.3%		0.1%		1.3%		3.9%	
		Common carp	1.6%		1.9%		1.8%		0.6%		0.6%		0.4%	
		Gizzard shad	21.6%		21.2%		29.4%		22.4%		6.9%		14.5%	
		Golden shiner	0.8%		0.6%		--		--		0.1%		--	
		Green sunfish	0.9%		0.5%		3.7%		2.0%		2.0%		2.0%	
		Largemouth bass	8.0%		4.1%		2.6%		2.6%		4.6%		3.2%	
		Redbreast sunfish	0.4%		0.1%		0.6%		0.1%		0.7%		0.3%	
		River carpsucker	0.1%		--		--		--		--		--	
		Spotfin shiner	4.6%		2.7%		2.4%		2.7%		12.4%		1.2%	
		Striped shiner	--		--		--		--		--		0.2%	
		White crappie	0.2%		0.2%		--		--		--		0.2%	
			Gill Netting		27.7%	1.5	24.5%	1.5	25.8%	1.5	37.7%	0.5	17.7%	1.5	23.7%	1.5
Bluegill	6.1%			2.8%		--		5.2%		--		0.6%		
Common carp	0.4%			3.5%		3.0%		2.6%		2.5%		4.0%		
Gizzard shad	16.9%			14.7%		19.2%		14.3%		12.7%		17.3%		
Largemouth bass	1.7%			2.1%		1.8%		1.3%		2.5%		0.6%		
Longnose gar	--			1.4%		0.6%		14.3%		--		0.6%		
White crappie	2.6%		--		1.2%		--		--		0.6%			
6. Percent dominance by one species	Electrofishing	Bluegill	45.0%	0.5	43.8%	0.5	34.0%	1.5	46.1%	0.5	45.5%	0.5	40.5%	0.5
	Gill Netting	Blue catfish	--		--		--		--		21.5%	1.5	--	
		Gizzard shad	16.9%	1.5	14.7%	1.5	19.2%	1.5	14.3%	1.5	--		--	
		Yellow bass	--		--		--		--			18.5%	1.5	

Table 4. (Continued)

Clinch River Mile 1.5															
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010		
			Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	
7. Percent non-indigenous species	Electrofishing		1.9%	2.5	2.3%	2.5	12.1%	0.5	0.9%	2.5	11.0%	0.5	18.8%	0.5	
		Common carp	1.6%		1.9%		1.8%		0.6%		0.6%		0.4%		
		Inland silverside	--		--		10.3%		0.3%		10.3%		18.3%		
		Striped bass	--		--		--		--		--		0.1%		
		Yellow perch	0.3%		0.4%		--		--		0.1%		--		
	Gill Netting			7.4%	1.5	9.8%	0.5	13.8%	0.5	13.0%	0.5	6.3%	1.5	9.8%	0.5
		Common carp	0.4%		3.5%		3.0%		2.6%		2.5%		4.0%		
		Hybrid striped-white bass	0.9%		--		--		--		--		--		
Striped bass	6.1%		6.3%		10.8%		10.4%		3.8%		5.8%				
8. Number of top carnivore species	Combined		11	5	12	5	11	5	10	5	10	5	12	5	
		Black crappie	12		1		--		2		2		4		
		Flathead catfish	6		15		7		8		1		11		
		Largemouth bass	98		37		32		21		125		69		
		Longnose gar	--		2		1		11		--		1		
		Rock bass	--		--		--		--		3		3		
		Sauger	4		4		8		--		14		5		
		Skipjack herring	21		21		22		--		--		10		
		Smallmouth bass	6		2		21		1		23		8		
		Spotted bass	25		8		14		1		8		--		
		Spotted gar	2		1		4		1		1		1		
		Walleye	--		--		--		1		--		--		
		White bass	5		6		6		1		3		17		
		White crappie	8		2		2		--		--		4		
		Yellow bass	19		22		14		5		5		32		
9. Percent top carnivores	Electrofishing		10.7%	1.5	6.4%	1.5	5.3%	0.5	3.0%	0.5	5.9%	1.5	5.0%	0.5	
		Black crappie	0.1%		0.1%		--		--		--		0.2%		
		Flathead catfish	0.2%		0.8%		0.3%		0.1%		--		0.2%		
		Hybrid bass	--		--		--		--		--		--		
		Largemouth bass	8.0%		4.1%		2.6%		2.6%		4.6%		3.2%		
		Rock bass	--		--		--		--		0.1%		0.1%		
		Skipjack herring	--		--		--		--		--		0.1%		
		Smallmouth bass	0.5%		0.2%		0.9%		0.1%		0.8%		0.3%		
		Spotted bass	1.5%		0.8%		1.2%		0.1%		0.4%		--		
		Spotted gar	0.2%		--		0.3%		0.1%		--		0.1%		
		Striped bass	--		--		--		--		--		0.1%		
		White bass	--		0.1%		--		--		0.0%		0.5%		
		White crappie	0.2%		0.2%		--		--		--		0.2%		
	Yellow bass	--		0.1%		--		--		--		--			
	Gill Netting			42.0%	1.5	52.5%	2.5	48.6%	1.5	46.8%	1.5	37.9%	1.5	44.6%	1.5
		Black crappie	4.8%		--		--		2.6%		2.5%		0.6%		
		Flathead catfish	1.7%		5.6%		2.4%		9.1%		1.3%		4.6%		
		Hybrid striped x white bass	0.9%		--		--		--		--		--		
		Largemouth bass	1.7%		2.1%		1.8%		1.3%		2.5%		0.6%		
		Longnose gar	--		1.4%		0.6%		14.3%		--		0.6%		
Rock bass		--		--		--		--		--		0.6%			
Sauger	1.7%		2.8%		4.8%		--		17.7%		2.9%				
Skipjack herring	9.1%		14.7%		13.2%		--		--		4.6%				
Spotted bass	3.0%		0.7%		1.2%		--		--		--				
Spotted gar	--		0.7%		0.6%		--		1.3%		--				
Striped bass	6.1%		6.3%		10.8%		10.4%		3.8%		5.8%				
Walleye	--		--		--		1.3%		--		--				
White bass	2.2%		3.5%		3.6%		1.3%		2.5%		5.2%				
White crappie	2.6%		--		1.2%		--		--		0.6%				
Yellow bass	8.2%		14.7%		8.4%		6.5%		6.3%		18.5%				

Table 4. (Continued)

Clinch River Mile 1.5															
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010		
			Obs	Score											
10. Percent omnivores	Electrofishing		<u>25.2%</u>	<u>1.5</u>	<u>27.2%</u>	<u>1.5</u>	<u>32.2%</u>	<u>1.5</u>	<u>24.2%</u>	<u>1.5</u>	<u>9.5%</u>	<u>2.5</u>	<u>20.1%</u>	<u>2.5</u>	
		Black buffalo	--		--		0.2%		--		--		0.1%		
		Bluntnose minnow	0.2%		0.6%		0.3%		0.1%		1.3%		3.9%		
		Channel catfish	0.2%		1.6%		0.5%		0.5%		0.5%		0.8%		
		Common carp	1.6%		1.9%		1.8%		0.6%		0.6%		0.4%		
		Gizzard shad	21.6%		21.2%		29.4%		22.4%		6.9%		14.5%		
		Golden shiner	0.8%		0.6%		--		--		0.1%		--		
		River carpsucker	0.1%		--		--		--		--		--		
		Smallmouth buffalo	0.7%		1.3%		--		0.6%		0.1%		0.2%		
	Striped shiner	--		--		--		--		--		0.2%			
	Gill Netting			<u>45.1%</u>	<u>1.5</u>	<u>37.1%</u>	<u>1.5</u>	<u>35.4%</u>	<u>1.5</u>	<u>39.0%</u>	<u>1.5</u>	<u>48.1%</u>	<u>0.5</u>	<u>37.5%</u>	<u>1.5</u>
		Black buffalo	1.3%		--		--		--		--		0.6%		
		Blue catfish	13.9%		10.5%		8.4%		9.1%		21.5%		9.8%		
		Channel catfish	7.4%		4.9%		3.0%		5.2%		8.9%		4.6%		
Common carp		0.4%		3.5%		3.0%		2.6%		2.5%		4.0%			
Gizzard shad		16.9%		14.7%		19.2%		14.3%		12.7%		17.3%			
Smallmouth buffalo	5.2%		3.5%		1.8%		7.8%		2.5%		1.2%				
11. Average number per run	Electrofishing		<u>77.9</u>	<u>0.5</u>	<u>54.9</u>	<u>0.5</u>	<u>64.7</u>	<u>0.5</u>	<u>52.1</u>	<u>0.5</u>	<u>142.1</u>	<u>1.5</u>	<u>115.8</u>	<u>1.5</u>	
	Gill Netting		<u>23.1</u>	<u>1.5</u>	<u>14.3</u>	<u>1.5</u>	<u>16.7</u>	<u>1.5</u>	<u>7.7</u>	<u>0.5</u>	<u>7.9</u>	<u>0.5</u>	<u>17.3</u>	<u>1.5</u>	
12. Percent anomalies	Electrofishing		<u>0.9</u>	<u>2.5</u>	<u>0.1</u>	<u>2.5</u>	<u>0.3</u>	<u>2.5</u>	<u>0.1</u>	<u>2.5</u>	<u>4.1</u>	<u>1.5</u>	<u>1.2</u>	<u>2.5</u>	
	Gill Netting		<u>0.4</u>	<u>2.5</u>	<u>0</u>	<u>2.5</u>	<u>1.8</u>	<u>2.5</u>	<u>0</u>	<u>2.5</u>	<u>2.5</u>	<u>1.5</u>	<u>0.6</u>	<u>2.5</u>	
RFAI Score				<u>42</u>		<u>44</u>		<u>41</u>		<u>34</u>		<u>36</u>		<u>42</u>	

Table 5. Individual metric scores, contributing species, and overall RFAI scores for CRM 4.4 autumn 2001-2010.

Clinch River Mile 4.4														
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010	
			Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score
1. Number of indigenous species	Combined	(Table 3)	33	5	34	5	30	5	28	3	28	3	34	5
2. Number of centrarchid species (less <i>Micropterus</i>)	Combined		8	5	7	5	6	5	4	3	8	5	8	5
		Black crappie	5		2		3		--		3		3	
		Bluegill	483		298		288		305		539		764	
		Green sunfish	4		3		14		1		25		49	
		Longear sunfish	10		25		13		40		112		31	
		Redbreast sunfish	3		--		--		--		2		6	
		Redear sunfish	74		50		67		35		73		89	
		Warmouth	1		3		--		--		3		3	
White crappie	1		1		3		--		2		3			
3. Number of benthic invertivore species	Combined		5	3	5	3	7	3	5	3	3	1	5	3
		Black redhorse	1		1		2		1		2		3	
		Freshwater drum	6		17		12		10		8		18	
		Golden redhorse	1		2		5		2		--		1	
		Logperch	1		2		4		1		--		7	
		River redhorse	--		--		1		--		--		--	
		Silver redhorse	--		--		1		--		--		--	
Spotted sucker	17		64		80		15		15		16			
4. Number of intolerant species	Combined		6	5	7	5	7	5	5	5	6	5	6	5
		Black redhorse	1		1		2		1		2		3	
		Brook silverside	14		44		18		14		40		13	
		Longear sunfish	10		25		13		40		112		31	
		Mooneye	--		1		--		--		--		--	
		River redhorse	--		--		1		--		--		--	
		Rock bass	--		--		--		--		3		--	
		Skipjack herring	20		18		12		--		--		4	
		Smallmouth bass	6		4		29		5		14		16	
Spotted sucker	17		64		80		15		15		16			
5. Percent tolerant individuals	Electrofishing		81.7%	0.5	72.2%	0.5	77.0%	0.5	77.7%	0.5	74.4%	0.5	67.2%	0.5
		Bluegill	52.2%		32.8%		27.0%		44.5%		36.4%		45.4%	
		Bluntnose minnow	0.2%		0.2%		--		0.3%		7.0%		0.6%	
		Common carp	3.8%		1.6%		1.9%		1.2%		1.0%		1.0%	
		Gizzard shad	9.5%		24.8%		36.1%		24.6%		6.4%		9.6%	
		Golden shiner	0.1%		1.0%		--		0.1%		--		--	
		Green sunfish	0.4%		0.3%		1.3%		0.1%		1.7%		2.9%	
		Largemouth bass	9.2%		6.9%		7.4%		4.0%		6.4%		4.7%	
		Redbreast sunfish	0.3%		--		--		--		0.1%		0.4%	
	Spotfin shiner	6.0%		4.6%		3.1%		2.9%		15.3%		2.4%		
	White crappie	--		--		0.2%		--		0.1%		0.2%		
	Gill Netting		22.6%	1.5	33.4%	0.5	22.9%	1.5	29.3%	1.5	10.4%	2.5	17.8%	1.5
		Bluegill	1.4%		1.4%		--		1.1%		1.9%		--	
		Common carp	3.8%		3.7%		6.4%		5.4%		3.8%		2.0%	
		Gizzard shad	16.4%		26.4%		11.0%		21.7%		1.9%		15.8%	
		Largemouth bass	0.5%		0.9%		3.7%		--		1.9%		--	
		Longnose gar	--		0.5%		--		1.1%		--		--	
River carpsucker		--		--		0.9%		--		--		--		
White crappie		0.5%		0.5%		0.9%		--		0.9%		--		
6. Percent dominance by one species	Electrofishing		52.2%	0.5	32.8%	1.5	36.1%	1.5	44.5%	0.5	36.4%	1.5	45.4%	0.5
		Bluegill	52.2%		32.8%		--		44.5%		36.4%		45.4%	
		Gizzard shad	--		--		36.1%		--		--		--	
	Gill Netting		16.9%	1.5	26.4%	1.5	11.0%	2.5	21.7%	1.5	25.5%	1.5	21.8%	1.5
		Blue catfish	--		--		--		--		--		--	
		Channel catfish	--		--		--		--		--		--	
		Gizzard shad	--		26.4%		11.0%		21.7%		--		--	
Striped bass	--		--		--		--		--		21.8%			
Yellow bass	16.9%		--		--		--		25.5%		--			

Table 5. (Continued)

Clinch River Mile 4.4															
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010		
			Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	Obs	Score	
7. Percent non-indigenous species	Electrofishing		4.3%	1.5	1.8%	2.5	2.9%	2.5	4.8%	1.5	7.3%	0.5	22.3%	0.5	
		Common carp	3.8%		1.6%		1.9%		1.2%		1.0%		1.0%		
		Inland silverside	--		--		0.9%		3.5%		6.2%		21.1%		
	Yellow perch	0.5%		0.2%		0.1%		0.1%		0.1%		0.2%			
	Gill Netting			4.7%	2.5	12.0%	0.5	16.5%	0.5	15.2%	0.5	7.6%	1.5	23.8%	0.5
		Common carp	3.8%		3.7%		6.4%		5.4%		3.8%		2.0%		
Hybrid striped-white bass		0.9%		8.3%		9.2%		9.8%		3.8%		21.8%			
8. Number of top carnivore species	Combined		10	5	12	5	10	5	9	5	10	5	12	5	
		Black crappie	5		2		3		--		3		3		
		Flathead catfish	4		2		2		3		2		3		
		Largemouth bass	86		64		97		27		106		90		
		Longnose gar	--		1		--		1		--		--		
		Rock bass	--		--		--		--		3		--		
		Sauger	9		4		6		5		12		5		
		Skipjack herring	20		18		12		--		--		4		
		Smallmouth bass	6		4		29		5		14		16		
		Spotted bass	19		18		12		4		7		2		
		Spotted gar	--		5		--		--		--		1		
		Walleye	--		--		--		2		--		3		
		White bass	17		6		2		3		2		12		
		White crappie	1		1		3		--		2		3		
Yellow bass	38		32		9		8		28		5				
9. Percent top carnivores	Electrofishing		12.2%	2.5	9.9%	1.5	11.1%	2.5	5.3%	0.5	8.1%	1.5	6.4%	1.5	
		Black crappie	0.2%		0.2%		0.3%		--		0.1%		0.2%		
		Flathead catfish	0.1%		0.1%		0.1%		0.1%		--		--		
		Hybrid bass	--		--		--		--		--		0.1%		
		Largemouth bass	9.2%		6.9%		7.4%		4.0%		6.4%		4.7%		
		Rock bass	--		--		--		--		0.2%		--		
		Skipjack herring	--		0.2%		--		--		--		--		
		Smallmouth bass	0.7%		0.4%		2.0%		0.7%		0.9%		0.5%		
		Spotted bass	1.6%		1.3%		1.0%		0.4%		0.3%		0.1%		
		Spotted gar	--		0.6%		--		--		--		0.1%		
		White bass	0.2%		--		--		--		--		0.5%		
	White crappie	--		--		0.2%		--		0.1%		0.2%			
	Yellow bass	0.2%		0.2%		0.1%		0.1%		0.1%		--			
	Gill Netting			44.1%	1.5	39.5%	1.5	42.1%	1.5	32.7%	1.5	49.1%	1.5	45.8%	1.5
		Black crappie	1.4%		--		--		--		1.9%		--		
		Flathead catfish	1.4%		0.5%		0.9%		2.2%		1.9%		3.0%		
		Hybrid striped-white bass	--		--		0.9%		--		--		--		
		Largemouth bass	0.5%		0.9%		3.7%		--		1.9%		--		
Longnose gar		--		0.5%		--		1.1%		--		--			
Sauger		4.2%		1.9%		5.5%		5.4%		11.3%		5.0%			
Skipjack herring	9.4%		7.4%		11.0%		--		--		4.0%				
Spotted bass	1.9%		2.8%		0.9%		1.1%		--		--				
Striped bass	0.9%		8.3%		9.2%		9.8%		3.8%		21.8%				
Walleye	--		--		--		2.2%		--		3.0%				
White bass	7.0%		2.8%		1.8%		3.3%		1.9%		4.0%				
White crappie	0.5%		0.5%		0.9%		--		0.9%		--				
Yellow bass	16.9%		13.9%		7.3%		7.6%		25.5%		5.0%				

Table 5. (Continued)

Clinch River Mile 4.4															
Metric	Gear	Common Name	2001		2003		2005		2007		2009		2010		
			Obs	Score											
10. Percent omnivores	Electrofishing		<u>15.3%</u>	<u>2.5</u>	<u>30.5%</u>	<u>1.5</u>	<u>39.1%</u>	<u>1.5</u>	<u>28.0%</u>	<u>1.5</u>	<u>15.6%</u>	<u>2.5</u>	<u>11.6%</u>	<u>2.5</u>	
		Black buffalo	0.1%		0.3%		0.3%		--				0.1%		
		Bluntnose minnow	0.2%		0.2%		--		0.3%		7.0%		0.6%		
		Channel catfish	0.8%		0.6%		0.5%		1.5%		1.0%		0.2%		
		Common carp	3.8%		1.6%		1.9%		1.2%		1.0%		1.0%		
		Gizzard shad	9.5%		24.8%		36.1%		24.6%		6.4%		9.6%		
		Golden shiner	0.1%		1.0%		--		0.1%		--		--		
		Smallmouth buffalo	0.8%		2.0%		0.3%		0.3%		0.2%		0.1%		
	Gill Netting			<u>44.5%</u>	<u>1.5</u>	<u>51.9%</u>	<u>0.5</u>	<u>33.9%</u>	<u>1.5</u>	<u>45.6%</u>	<u>1.5</u>	<u>36.8%</u>	<u>1.5</u>	<u>35.7%</u>	<u>1.5</u>
		Black buffalo	0.9%		--		--		--		--		--		
		Blue catfish	16.4%		12.0%		5.5%		14.1%		19.8%		10.9%		
		Channel catfish	7.0%		4.2%		4.6%		3.3%		10.4%		3.0%		
		Common carp	3.8%		3.7%		6.4%		5.4%		3.8%		2.0%		
		Gizzard shad	16.4%		26.4%		11.0%		21.7%		1.9%		15.8%		
		Quillback	--		0.5%		--		--		--		--		
River carpsucker		--		--		0.9%		--		--		--			
Smallmouth buffalo	--		5.1%		5.5%		1.1%		0.9%		4.0%				
11. Average number per run	Electrofishing		<u>61.3</u>	<u>0.5</u>	<u>60</u>	<u>0.5</u>	<u>71</u>	<u>0.5</u>	<u>45.5</u>	<u>0.5</u>	<u>98.3</u>	<u>0.5</u>	<u>112.2</u>	<u>1.5</u>	
	Gill Netting		<u>21.3</u>	<u>1.5</u>	<u>21.6</u>	<u>1.5</u>	<u>10.9</u>	<u>0.5</u>	<u>9.2</u>	<u>0.5</u>	<u>10.6</u>	<u>0.5</u>	<u>10.1</u>	<u>0.5</u>	
12. Percent anomalies	Electrofishing		<u>1.3</u>	<u>2.5</u>	<u>0.2</u>	<u>2.5</u>	<u>1.2</u>	<u>2.5</u>	<u>0.4</u>	<u>2.5</u>	<u>2.8</u>	<u>1.5</u>	<u>1.1</u>	<u>2.5</u>	
	Gill Netting		<u>2.3</u>	<u>1.5</u>	<u>0</u>	<u>2.5</u>	<u>2.8</u>	<u>1.5</u>	<u>0</u>	<u>2.5</u>	<u>2.8</u>	<u>1.5</u>	<u>0</u>	<u>2.5</u>	
RFAI Score				<u>45</u>		<u>42</u>		<u>44</u>		<u>36</u>		<u>38</u>		<u>42</u>	

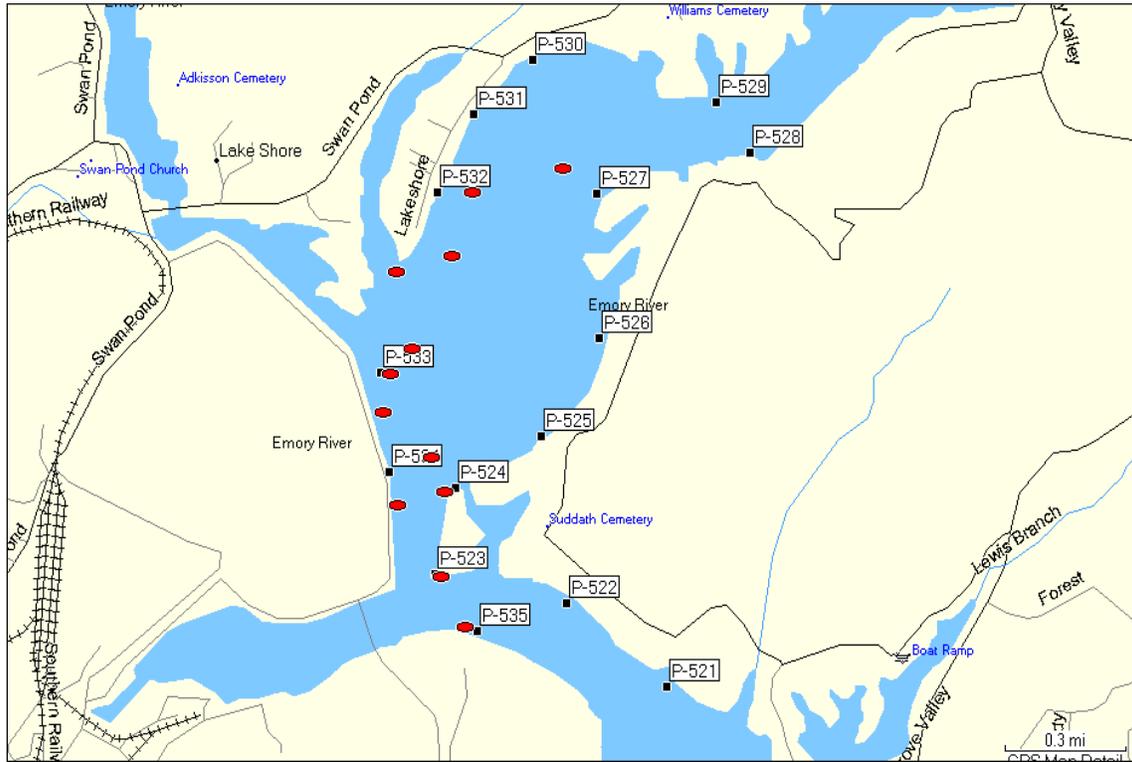
Table 6. Individual metric scores, contributing species, and overall RFAI scores for ERM 2.5, autumn 2009 and 2010.

Emory River Mile 2.5						
Metric	Gear	Common Name	2009		2010	
			Obs	Score	Obs	Score
1. Number of indigenous species	Combined	(Table 3)	32	5	35	5
2. Number of centrarchid species (less <i>Micropterus</i>)	Combined	Black crappie	3		13	
		Bluegill	515		330	
		Green sunfish	9		43	
		Longear sunfish	38		6	
		Redbreast sunfish	3		2	
		Redear sunfish	132		56	
		Warmouth	7		7	
		White crappie	2		4	
3. Number of benthic invertivore species	Combined	Black redhorse	1		1	
		Freshwater drum	6		6	
		Golden redhorse	2		2	
		Logperch	--		12	
		Northern hog sucker	1		--	
		Spotted sucker	19		28	
4. Number of intolerant species	Combined	Black redhorse	1		1	
		Brook silverside	56		29	
		Longear sunfish	38		6	
		Northern hog sucker	1		--	
		Skipjack herring	--		25	
		Smallmouth bass	2		1	
		Spotted sucker	19		28	
5. Percent tolerant individuals	Electrofishing		79.1%	0.5	78.5%	0.5
		Bluegill	39.5%		21.4%	
		Bluntnose minnow	3.2%		1.2%	
		Common carp	1.0%		1.0%	
		Gizzard shad	9.0%		41.1%	
		Green sunfish	0.7%		2.8%	
		Largemouth bass	11.7%		7.7%	
		Redbreast sunfish	0.2%		0.1%	
		Spotfin shiner	13.8%		3.1%	
		White crappie	--		0.1%	
	Gill Netting		7.4%	2.5	15.4%	2.5
		Bluegill	0.9%		0.7%	
		Common carp	0.9%		1.5%	
		Gizzard shad	2.8%		11.0%	
6. Percent dominance by one species	Electrofishing		39.5%	1.5	41.1%	0.5
		Bluegill	39.5%		--	
	Gizzard shad	--		41.1%		
Gill Netting		47.7%	0.5	18.4%	1.5	
	Channel catfish	47.7%		18.4%		
7. Percent non-indigenous species	Electrofishing		1.4%	2.5	9.2%	0.5
		Common carp	1.0%		1.0%	
		Grass carp	--		0.1%	
		Inland silverside	--		7.7%	
		Striped bass	--		0.1%	
	Yellow perch	0.4%		0.3%		
	Gill Netting		1.8%	2.5	4.4%	2.5
		Common carp	0.9%		1.5%	
		Striped bass	0.9%		2.9%	

Table 6. (Continued)

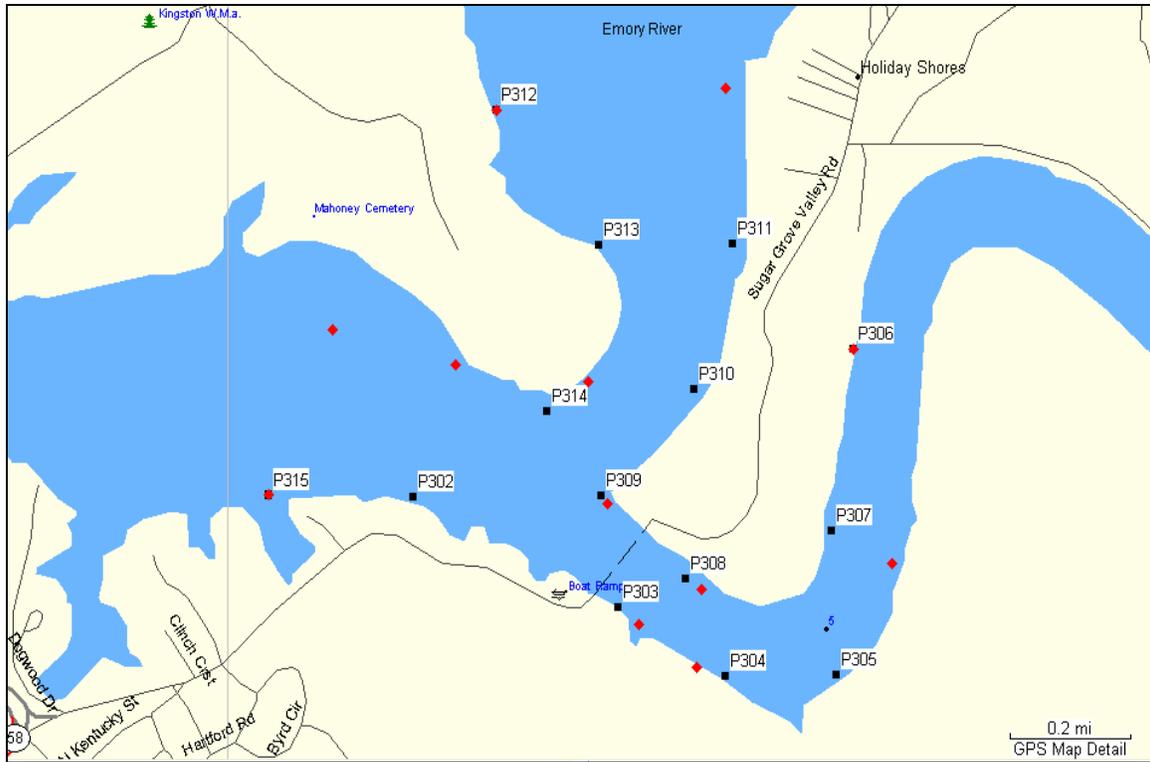
Emory River Mile 2.5						
Metric	Gear	Common Name	2009		2010	
			Obs	Score	Obs	Score
8. Number of top carnivore species	Combined		<u>10</u>	<u>5</u>	<u>12</u>	<u>5</u>
		Black crappie	3		13	
		Flathead catfish	3		6	
		Largemouth bass	180		125	
		Sauger	1		4	
		Skipjack herring	--		25	
		Smallmouth bass	2		1	
		Spotted bass	8		11	
		Spotted gar	11		2	
		Walleye	--		1	
		White bass	1		8	
		White crappie	2		4	
		Yellow bass	1		22	
9. Percent top carnivores	Electrofishing		<u>12.4%</u>	<u>2.5</u>	<u>9.7%</u>	<u>1.5</u>
		Black crappie	--		0.8%	
		Flathead catfish	--		0.2%	
		Largemouth bass	11.7%		7.7%	
		Smallmouth bass	0.2%		0.1%	
		Spotted bass	0.5%		0.4%	
		Spotted gar	--		0.1%	
		Striped bass	--		0.1%	
		White bass	--		0.1%	
		White crappie	--		0.1%	
		Yellow bass	--		0.1%	
		Gill Netting		<u>22.3%</u>	<u>0.5</u>	<u>51.9%</u>	2.5
	Black crappie		2.8%		0.7%	
	Flathead catfish		2.8%		2.2%	
	Largemouth bass		0.9%		0.7%	
	Sauger		0.9%		2.9%	
	Skipjack herring		--		18.4%	
	Spotted bass		--		0.7%	
	Spotted gar		10.3%		0.7%	
	Striped bass		0.9%		2.9%	
	Walleye		--		0.7%	
	White bass		0.9%		5.1%	
	White crappie		1.9%		1.5%	
	Yellow bass	0.9%		15.4%		
10. Percent omnivores	Electrofishing		<u>13.6%</u>	<u>2.5</u>	<u>44.4%</u>	<u>0.5</u>
		Black buffalo	0.1%		0.2%	
		Bluntnose minnow	3.2%		1.2%	
		Channel catfish	0.2%		0.7%	
		Common carp	1.0%		1.0%	
		Gizzard shad	9.0%		41.1%	
	Smallmouth buffalo	0.1%		0.2%		
	Gill Netting		<u>65.3%</u>	<u>0.5</u>	<u>42.7%</u>	<u>1.5</u>
		Black buffalo	0.9%		--	
		Blue catfish	12.1%		11.8%	
		Channel catfish	47.7%		13.2%	
		Common carp	0.9%		1.5%	
		Gizzard shad	2.8%		11.0%	
		Quillback	0.9%		1.5%	
Smallmouth buffalo		--		3.7%		
11. Average number per run	Electrofishing		<u>86.5</u>	<u>0.5</u>	<u>102.4</u>	<u>0.5</u>
	Gill Netting		<u>10.7</u>	<u>0.5</u>	<u>13.6</u>	<u>1.5</u>
12. Percent anomalies	Electrofishing		<u>4.3</u>	<u>1.5</u>	<u>1.6</u>	<u>2.5</u>
	Gill Netting		<u>0.9</u>	<u>2.5</u>	<u>0</u>	<u>2.5</u>
RFAI Score			<u>44</u>		<u>44</u>	

Figures



P-521	1 EF	N35 54.089	W84 29.510		P-536	1 XGN	N35 54.306	W84 30.112
P-522	2 EF	N35 54.253	W84 29.779		P-537	2 XGN	N35 54.471	W84 30.102
P-523	3 EF	N35 54.309	W84 30.127		P-538	3 XGN	N35 55.106	W84 29.788
P-524	4 EF	N35 54.480	W84 30.072		P-539	4 XGN	N35 55.061	W84 30.029
P-525	5 EF	N35 54.580	W84 29.846		P-540	5 XGN	N35 54.935	W84 30.083
P-526	6 EF	N35 54.774	W84 29.691		P-541	6 XGN	N35 54.904	W84 30.232
P-527	7 EF	N35 55.056	W84 29.697		P-542	7 XGN	N35 54.752	W84 30.189
P-528	8 EF	N35 55.139	W84 29.289		P-543	8 XGN	N35 54.703	W84 30.246
P-529	9 EF	N35 55.238	W84 29.378		P-544	9 XGN	N35 54.629	W84 30.266
P-530	10 EF	N35 55.319	W84 29.868		P-545	10 XGN	N35 54.540	W84 30.139
P-531	11 EF	N35 55.213	W84 30.024		P-546	11 XGN	N35 54.447	W84 30.229
P-532	12 EF	N35 55.060	W84 30.122		P-547	12 XGN	N35 54.206	W84 30.048
P-533	13 EF	N35 54.705	W84 30.273					
P-534	14 EF	N35 54.511	W84 30.249					
P-535	15 EF	N35 54.198	W84 30.015					

Figure 1. Reservoir Fish Assemblage Index (RFAI) electrofishing and gill netting locations at site ERM 2.5 on Watts Bar Reservoir.



P301	1EF	N35 53.234	W-84 30.006	P316	1XGN	N35 53.234	W-84 30.006
P302	2EF	N35 53.230	W-84 29.751	P317	2XGN	N35 53.060	W-84 29.349
P303	3EF	N35 53.083	W-84 29.386	P318	3XGN	N35 53.002	W-84 29.246
P304	4EF	N35 52.990	W-84 29.196	P319	4XGN	N35 53.142	W-84 28.901
P305	5EF	N35 52.992	W-84 28.999	P320	5XGN	N35 53.428	W-84 28.968
P306	6EF	N35 53.428	W-84 28.968	P321	6XGN	N35 53.107	W-84 29.238
P307	7EF	N35 53.184	W-84 29.008	P322	7XGN	N35 53.221	W-84 29.406
P308	8EF	N35 53.120	W-84 29.267	P323	8XGN	N35 53.777	W-84 29.195
P309	9EF	N35 53.232	W-84 29.415	P324	9XGN	N35 53.747	W-84 29.603
P310	10EF	N35 53.374	W-84 29.252	P325	10EXN	N35 53.385	W-84 29.440
P311	11EF	N35 53.569	W-84 29.182	P326	11EXN	N35 53.407	W-84 29.676
P312	12EF	N35 53.747	W-84 29.603	P327	12XGN	N35 53.453	W-84 29.894
P313	13EF	N35 53.566	W-84 29.420				
P314	14EF	N35 53.345	W-84 29.512				
P315	15EF	N35 53.232	W-84 30.006				

Figure 2. Reservoir Fish Assemblage Index (RFAI) electrofishing and gill netting locations at site CRM 4.4 on Watts Bar Reservoir.



P328	1EF	N35 51.739	W-84 31.824		P343	1XGN	N35 51.792	W-84 31.627
P329	2EF	N35 51.820	W-84 31.583		P344	2XGN	N35 51.938	W-84 31.412
P330	3EF	N35 52.032	W-84 31.318		P345	3XGN	N35 52.371	W-84 31.246
P331	4EF	N35 52.276	W-84 31.177		P346	4XGN	N35 52.887	W-84 31.765
P332	5EF	N35 52.434	W-84 31.292		P347	5XGN	N35 53.054	W-84 31.647
P333	6EF	N35 53.045	W-84 31.658		P348	6XGN	N35 53.208	W-84 31.537
P334	7EF	N35 53.208	W-84 31.537		P349	7XGN	N35 53.402	W-84 31.575
P335	8EF	N35 53.402	W-84 31.575		P350	8XGN	N35 53.018	W-84 31.914
P336	9EF	N35 53.172	W-84 31.769		P351	9XGN	N35 52.238	W-84 31.843
P337	10EF	N35 53.038	W-84 31.977		P352	10XGN	N35 52.661	W-84 31.888
P338	11EF	N35 52.804	W-84 31.947		P353	11XGN	N35 52.519	W-84 31.624
P339	12EF	N35 52.615	W-84 31.827		P354	12XGN	N35 52.103	W-84 31.634
P340	13EF	N35 52.467	W-84 31.553					
P341	14EF	N35 52.266	W-84 31.505					
P342	15EF	N35 52.064	W-84 31.710					

Figure 3. Reservoir Fish Assemblage Index (RFAI) electrofishing and gill netting locations at site CRM 1.5 on Watts Bar Reservoir.

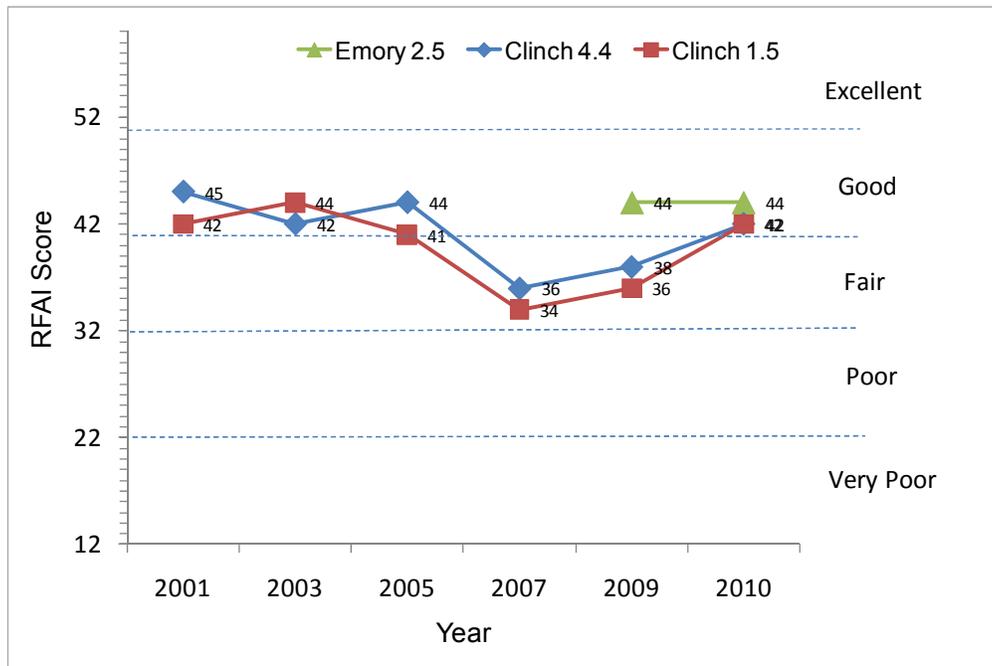


Figure 4. Reservoir Fish Assemblage Index (RFAI) ratings for fish community sampling results from autumn 2001 through autumn 2010.

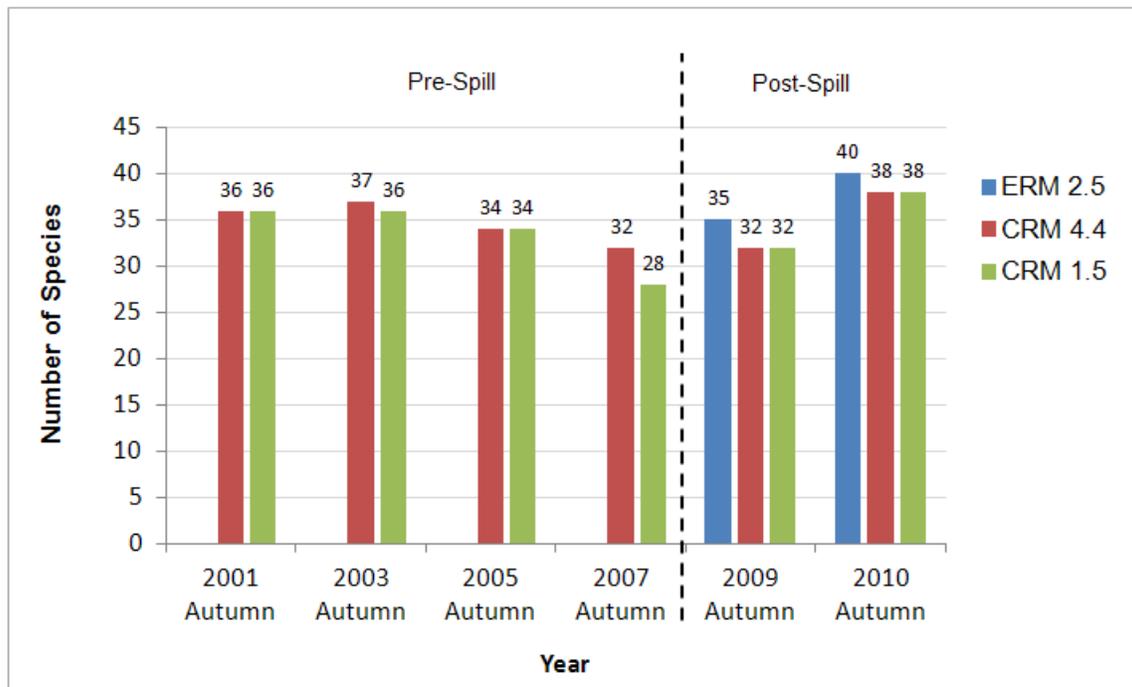


Figure 5. Total species richness, including indigenous and non-indigenous species, at ERM 2.5, CRM 4.4 and CRM 1.5 from 2001 through 2010.

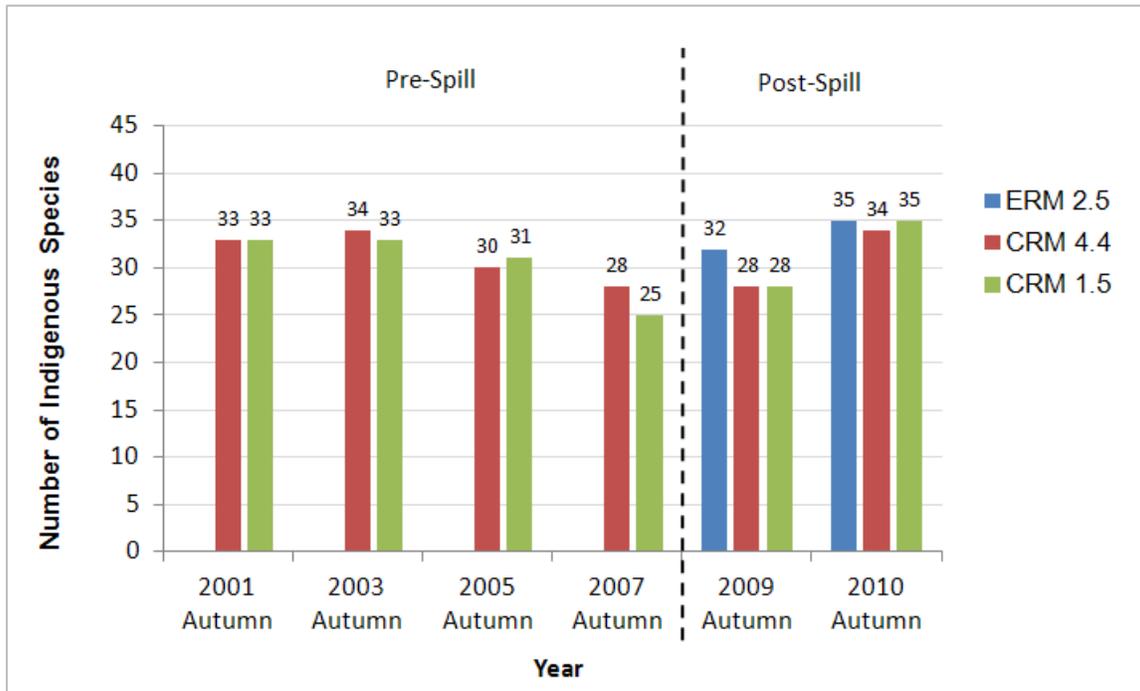


Figure 6. Number of indigenous species collect at ERM 2.5, CRM 4.4, and CRM 1.5 from 2001 through 2010.

Appendix A

Species collected, trophic level, indigenous, and tolerance classifications; and
catch per effort for RFAI electrofishing and gill netting samples at
CRM 1.5, CRM 4.4, and ERM 2.5,
2001- 2010

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Table A-1. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2001.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Paddlefish	<i>Polyodon spathula</i>	PK	.	X	.	.	.	.	0.10	1	1	0.1%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.13	0.69	2	0.00	.	2	0.1%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	2.10	21	21	1.5%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	16.87	87.85	253	3.90	39	292	20.9%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.07	0.35	1	0.20	2	3	0.2%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.27	6.60	19	0.10	1	20	1.4%
Golden shiner	<i>Notemigonus crysoleucas</i>	OM	.	X	TOL	0.60	3.13	9	.	.	9	0.6%
Emerald shiner	<i>Notropis atherinoides</i>	IN	.	X	.	2.93	15.28	44	.	.	44	3.1%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	3.60	18.75	54	.	.	54	3.9%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.13	0.69	2	.	.	2	0.1%
River carpsucker	<i>Carpionodes carpio</i>	OM	.	X	TOL	0.07	0.35	1	.	.	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.53	2.78	8	1.20	12	20	1.4%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	.	.	.	0.30	3	3	0.2%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.73	3.82	11	0.30	3	14	1.0%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	3.20	32	32	2.3%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.13	0.69	2	1.70	17	19	1.4%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.13	0.69	2	0.40	4	6	0.4%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.50	5	5	0.4%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	1.90	19	19	1.4%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	1.40	14	14	1.0%
Hybrid striped-white bass	<i>Hybrid Morone</i>	TC	.	.	.	.	.	.	0.20	2	2	0.1%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.33	1.74	5	.	.	5	0.4%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.73	3.82	11	.	.	11	0.8%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.13	0.69	2	.	.	2	0.1%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	35.07	182.64	526	1.40	14	540	38.6%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	0.73	3.82	11	0.10	1	12	0.9%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3.73	19.44	56	0.30	3	59	4.2%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.40	2.08	6	.	.	6	0.4%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	1.20	6.25	18	0.70	7	25	1.8%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	6.27	32.64	94	0.40	4	98	7.0%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.13	0.69	2	0.60	6	8	0.6%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.07	0.35	1	1.10	11	12	0.9%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.20	1.04	3	.	.	3	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.33	1.74	5	.	.	5	0.4%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.40	4	4	0.3%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.27	1.39	4	0.60	6	10	0.7%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	1.13	5.90	17	.	.	17	1.2%
Total						77.91	405.90	1,169	23.10	231	1,400	100.0%
Number of Samples						15			10			
Species Collected			8	33		28			24			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-2. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2003.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Paddlefish	<i>Polyodon spathula</i>	PK	.	X	.	.	.	.	*	*	0	0.0%
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	0.20	2	2	0.2%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	2.10	21	21	2.2%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	11.67	70.00	175	2.10	21	196	20.3%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.07	0.40	1	.	.	1	0.1%
Mooneye	<i>Hiodon tergisus</i>	IN	.	X	INT	.	.	.	0.10	1	1	0.1%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.07	6.40	16	0.50	5	21	2.2%
Golden shiner	<i>Notemigonus crysoleucas</i>	OM	.	X	TOL	0.33	2.00	5	.	.	5	0.5%
Emerald shiner	<i>Notropis atherinoides</i>	IN	.	X	.	0.87	5.20	13	.	.	13	1.3%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	1.47	8.80	22	.	.	22	2.3%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.33	2.00	5	.	.	5	0.5%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.73	4.40	11	0.50	5	16	1.7%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.60	3.60	9	0.20	2	11	1.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.07	0.40	1	.	.	1	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.50	15	15	1.6%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.87	5.20	13	0.70	7	20	2.1%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.47	2.80	7	0.80	8	15	1.6%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.07	0.40	1	0.50	5	6	0.6%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.07	0.40	1	2.10	21	22	2.3%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.90	9	9	0.9%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.07	0.40	1	.	.	1	0.1%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.27	1.60	4	.	.	4	0.4%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	24.07	144.40	361	0.40	4	365	37.7%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	1.07	6.40	16	.	.	16	1.7%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3.33	20.00	50	0.10	1	51	5.3%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.13	0.80	2	.	.	2	0.2%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.47	2.80	7	0.10	1	8	0.8%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	2.27	13.60	34	0.30	3	37	3.8%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.13	0.80	2	.	.	2	0.2%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.07	0.40	1	.	.	1	0.1%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.20	1.20	3	.	.	3	0.3%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.40	2.40	6	.	.	6	0.6%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.40	4	4	0.4%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	1.53	9.20	23	0.70	7	30	3.1%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	2.27	13.60	34	.	.	34	3.5%
Total						54.97	329.60	824	14.30	286	967	100.0%
Number Samples						15			10			
Species Collected			7	33		28			20			

*=Young of year only collected

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-3. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2005.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Total fish EF	Gill Netting	Total fish Gill Net	Total fish Combined	Percent of total fish
						Catch Rate Per Run	Catch Rate Per Hour		Catch Rate Per Net Night			
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	0.10	1	1	0.1%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.20	1.01	3	0.10	1	4	0.4%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	2.20	22	22	1.9%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	19.00	96.28	285	3.20	32	317	27.9%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.20	1.01	3	.	.	3	0.3%
Mooneye	<i>Hiodon tergisus</i>	IN	.	X	INT	.	.	.	0.40	4	4	0.4%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.13	5.74	17	0.50	5	22	1.9%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	1.53	7.77	23	.	.	23	2.0%
Steelcolor shiner	<i>Cyprinella whipplei</i>	IN	.	X	.	0.07	0.34	1	.	.	1	0.1%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.20	1.01	3	.	.	3	0.3%
Northern hog sucker	<i>Hypentelium nigricans</i>	BI	.	X	INT	0.20	1.01	3	0.10	1	4	0.4%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	.	.	.	0.30	3	3	0.3%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.13	0.68	2	.	.	2	0.2%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.60	3.04	9	0.90	9	18	1.6%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.40	14	14	1.2%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.33	1.69	5	0.50	5	10	0.9%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.20	1.01	3	0.40	4	7	0.6%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.60	6	6	0.5%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	1.40	14	14	1.2%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	1.80	18	18	1.6%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.40	2.03	6	.	.	6	0.5%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	2.40	12.16	36	.	.	36	3.2%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	22.00	111.49	330	.	.	330	29.0%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	3.47	17.57	52	.	.	52	4.6%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	2.40	12.16	36	0.40	4	40	3.5%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.60	3.04	9	.	.	9	0.8%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.80	4.05	12	0.20	2	14	1.2%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	1.67	8.45	25	0.30	3	28	2.5%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	.	.	.	0.20	2	2	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.13	0.68	2	.	.	2	0.2%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.80	8	8	0.7%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	.	.	.	0.90	9	9	0.8%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	0.33	1.69	5	.	.	5	0.4%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	6.67	33.78	100	.	.	100	8.8%
Total						64.66	327.69	970	16.70	167	1,137	100.0%
Number Samples						15			10			
Species Collected			6	31		23			21			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-4. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2007.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Total fish EF	Gill Netting	Total fish Gill Net	Total fish Combined	Percent of total fish
						Catch Rate Per Run	Catch Rate Per Hour		Catch Rate Per Net Night			
Paddlefish	<i>Polyodon spathula</i>	PK	.	X	.	.	.	.	0.10	1	1	0.1%
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	1.10	11	11	1.3%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.07	0.34	1	.	.	1	0.1%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	11.67	59.12	175	1.10	11	186	21.7%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.33	1.69	5	0.20	2	7	0.8%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	1.4	7.09	21	.	.	21	2.4%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.07	0.34	1	.	.	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.33	1.69	5	0.60	6	11	1.3%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	.	.	.	0.10	1	1	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	0.70	7	7	0.8%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.27	1.35	4	0.40	4	8	0.9%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.07	0.34	1	0.70	7	8	0.9%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	0.50	5	5	0.6%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.80	8	8	0.9%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.07	0.34	1	.	.	1	0.1%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	1.07	5.41	16	.	.	16	1.9%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	24	121.62	360	0.40	4	364	42.4%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	7.07	35.81	106	.	.	106	12.4%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3	15.2	45	0.20	2	47	5.5%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.07	0.34	1	.	.	1	0.1%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.07	0.34	1	.	.	1	0.1%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	1.33	6.76	20	0.10	1	21	2.4%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	.	.	.	0.20	2	2	0.2%
Walleye	<i>Stizostedion vitreum</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.33	1.69	5	0.30	3	8	0.9%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	0.73	3.72	11	.	.	11	1.3%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	0.13	0.68	2	.	.	2	0.2%
Total						52.08	263.87	781	7.70	77	858	100.0%
Number Samples						15			10			
Species Collected			6	25		19			18			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-5. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2009.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total Gill net fish		Total fish Combined
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	.	.	.	0.10	1	1	0.0%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	9.80	34.19	147	1.00	10	157	7.1%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.07	0.23	1	.	.	1	0.0%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.87	3.02	13	0.20	2	15	0.7%
Golden shiner	<i>Notemigonus crysoleucas</i>	OM	.	X	TOL	0.20	0.70	3	.	.	3	0.1%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	17.60	61.40	264	.	.	264	11.9%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	1.87	6.51	28	.	.	28	1.3%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.13	0.47	2	0.20	2	4	0.2%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.93	3.26	14	0.10	1	15	0.7%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.07	0.23	1	.	.	1	0.0%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.70	17	17	0.8%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.73	2.56	11	0.70	7	18	0.8%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	.	.	.	0.10	1	1	0.0%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.07	0.23	1	0.20	2	3	0.1%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	0.50	5	5	0.2%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.30	3	3	0.1%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.93	3.26	14	.	.	14	0.6%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	2.87	10.00	43	.	.	43	1.9%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.20	0.70	3	.	.	3	0.1%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	64.67	225.58	970	.	.	970	43.9%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	13.13	45.81	197	.	.	197	8.9%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3.27	11.40	49	0.30	3	52	2.4%
Rock bass	<i>Ambloplites rupestris</i>	TC	.	X	INT	0.20	0.70	3	.	.	3	0.1%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	1.07	3.72	16	.	.	16	0.7%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.53	1.86	8	.	.	8	0.4%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	6.60	23.02	99	0.20	2	101	4.6%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	.	.	.	0.20	2	2	0.1%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.13	0.47	2	.	.	2	0.1%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	1.40	14	14	0.6%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.27	0.93	4	0.70	7	11	0.5%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	1.33	4.65	20	.	.	20	0.9%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	14.60	50.93	219	.	.	219	9.9%
Total						142.14	495.83	2,132	7.90	79	2,211	
Number Samples						15			10			
Species Collected			7	28		25			16			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-6. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 1.5, autumn 2010.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Paddlefish	<i>Polyodon spathula</i>	PK	.	X	.	.	.	.	0.10	1	1	0.1%
Lake sturgeon	<i>Acipenser fulvescens</i>	IN	.	X	.	.	.	.	0.10	1	1	0.1%
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	0.10	1	1	0.1%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.07	0.25	1	.	.	1	0.1%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	0.13	0.51	2	0.80	8	10	0.5%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	16.80	63.96	252	3.00	30	282	14.8%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	.	.	.	1.60	16	16	0.8%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.47	1.78	7	0.70	7	14	0.7%
Largescale stoneroller	<i>Campostoma oligolepis</i>	HB	.	X	.	0.33	1.27	5	.	.	5	0.3%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	1.33	5.08	20	.	.	20	1.0%
Striped shiner	<i>Luxilus chrysocephalus</i>	OM	.	X	TOL	0.20	0.76	3	.	.	3	0.2%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	4.53	17.26	68	.	.	68	3.6%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.27	1.02	4	0.20	2	6	0.3%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.07	0.25	1	0.10	1	2	0.1%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.53	2.03	8	0.30	3	11	0.6%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.13	0.51	2	.	.	2	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.70	17	17	0.9%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.93	3.55	14	0.80	8	22	1.2%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.20	0.76	3	0.80	8	11	0.6%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.53	2.03	8	0.90	9	17	0.9%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	3.20	32	32	1.7%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	0.07	0.25	1	1.00	10	11	0.6%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.33	1.27	5	.	.	5	0.3%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	2.33	8.88	35	.	.	35	1.8%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	46.87	178.43	703	0.10	1	704	36.9%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	4.73	18.02	71	.	.	71	3.7%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	7.00	26.65	105	0.20	2	107	5.6%
Rock bass	<i>Ambloplites rupestris</i>	TC	.	X	INT	0.13	0.51	2	0.10	1	3	0.2%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.40	1.52	6	.	.	6	0.3%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	3.73	14.21	56	0.10	1	57	3.0%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.20	0.76	3	0.10	1	4	0.2%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.20	0.76	3	0.10	1	4	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.20	0.76	3	.	.	3	0.2%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.50	5	5	0.3%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.47	1.78	7	0.60	6	13	0.7%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	1.40	5.33	21	.	.	21	1.1%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	21.20	80.71	318	.	.	318	16.6%
Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	PS	.	X	.	.	.	.	0.10	1	1	0.1%
Total						115.78	440.86	1,737	17.30	173	1,910	100.0%
Number of Samples						15			10			
Species Collected			7	35		30			25		38	

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-7. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2001.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Total fish EF	Gill Netting		Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour		Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	2.00	20	20	1.8%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	5.80	27.27	87	3.50	35	122	10.8%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.13	0.63	2	.	.	2	0.2%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	2.33	10.97	35	0.80	8	43	3.8%
Golden shiner	<i>Notemigonus crysoleucas</i>	OM	.	X	TOL	0.07	0.31	1	.	.	1	0.1%
Emerald shiner	<i>Notropis atherinoides</i>	IN	.	X	.	0.73	3.45	11	.	.	11	1.0%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	3.67	17.24	55	.	.	55	4.9%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.13	0.63	2	.	.	2	0.2%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.47	2.19	7	.	.	7	0.6%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.07	0.31	1	0.20	2	3	0.3%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.53	2.51	8	0.90	9	17	1.5%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.07	0.31	1	.	.	1	0.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	.	.	.	0.10	1	1	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	3.50	35	35	3.1%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.47	2.19	7	1.50	15	22	1.9%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.07	0.31	1	0.30	3	4	0.4%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.13	0.63	2	1.50	15	17	1.5%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.13	0.63	2	3.60	36	38	3.4%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.20	2	2	0.2%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.20	0.94	3	.	.	3	0.3%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.27	1.25	4	.	.	4	0.4%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.07	0.31	1	.	.	1	0.1%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	32.00	150.47	480	0.30	3	483	42.7%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	0.67	3.13	10	.	.	10	0.9%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	4.53	21.32	68	0.60	6	74	6.5%
Hybrid sunfish	<i>Hybrid lepomis spp.</i>	IN	.	.	.	0.07	0.31	1	.	.	1	0.1%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.40	1.88	6	.	.	6	0.5%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	1.00	4.70	15	0.40	4	19	1.7%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	5.67	26.65	85	0.10	1	86	7.6%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	.	.	.	0.10	1	1	0.1%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.13	0.63	2	0.30	3	5	0.4%
Snubnose darter	<i>Etheostoma simoterum</i>	SP	.	X	.	0.07	0.31	1	.	.	1	0.1%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.33	1.57	5	.	.	5	0.4%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.07	0.31	1	.	.	1	0.1%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.90	9	9	0.8%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.07	0.31	1	0.50	5	6	0.5%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	0.93	4.39	14	.	.	14	1.2%
Total						61.28	288.06	919	21.3	213	1,132	100.0%
Number Samples						15			10			
Species Collected			8	33		31			20			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-8. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2003.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting				
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net	Total fish Combined	Percent of total fish
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	0.10	1	1	0.1%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.33	1.97	5	.	.	5	0.4%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	0.13	0.79	2	1.60	16	18	1.6%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	14.87	87.80	223	5.70	57	280	25.1%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.07	0.39	1	0.10	1	2	0.2%
Mooneye	<i>Hiodon tergisus</i>	IN	.	X	INT	.	.	.	0.10	1	1	0.1%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.93	5.51	14	0.80	8	22	2.0%
Golden shiner	<i>Notemigonus</i>	OM	.	X	TOL	0.60	3.54	9	.	.	9	0.8%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	2.73	16.14	41	.	.	41	3.7%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.13	0.79	2	.	.	2	0.2%
Quillback	<i>Carpionodes cyprinus</i>	OM	.	X	.	.	.	.	0.10	1	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	1.20	7.09	18	1.10	11	29	2.6%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.20	1.18	3	.	.	3	0.3%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	3.87	22.83	58	0.60	6	64	5.7%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	.	.	.	0.10	1	1	0.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.13	0.79	2	.	.	2	0.2%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	2.60	26	26	2.3%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.33	1.97	5	0.90	9	14	1.3%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.07	0.39	1	0.10	1	2	0.2%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.60	6	6	0.5%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.13	0.79	2	3.00	30	32	2.9%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	1.80	18	18	1.6%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.20	1.18	3	.	.	3	0.3%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.20	1.18	3	.	.	3	0.3%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	19.67	116.14	295	0.30	3	298	26.7%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	1.67	9.84	25	.	.	25	2.2%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3.20	18.90	48	0.20	2	50	4.5%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.27	1.57	4	.	.	4	0.4%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.80	4.72	12	0.60	6	18	1.6%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	4.13	24.41	62	0.20	2	64	5.7%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	.	.	.	0.10	1	1	0.1%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.13	0.79	2	.	.	2	0.2%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.13	0.79	2	.	.	2	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.13	0.79	2	.	.	2	0.2%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.40	4	4	0.4%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.80	4.72	12	0.50	5	17	1.5%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	2.93	17.32	44	.	.	44	3.9%
Total						59.98	354.32	900	21.6	216	1,116	100.0%
Number Samples						15			10			
Species Collected			7	34		28			23			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-9. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2005.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	1.20	12	12	1.0%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	25.60	130.17	384	1.20	12	396	33.9%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.33	6.78	20	0.70	7	27	2.3%
Emerald shiner	<i>Notropis atherinoides</i>	IN	.	X	.	0.60	3.05	9	.	.	9	0.8%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	2.20	11.19	33	.	.	33	2.8%
River carpsucker	<i>Carpionodes carpio</i>	OM	.	X	.	.	.	.	0.10	1	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.20	1.02	3	0.60	6	9	0.8%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.20	1.02	3	.	.	3	0.3%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	4.20	21.36	63	1.00	10	73	6.3%
Silver redhorse	<i>Moxostoma anisurum</i>	BI	.	X	.	0.07	0.34	1	.	.	1	0.1%
River redhorse	<i>Moxostoma carinatum</i>	BI	.	X	INT	.	.	.	0.10	1	1	0.1%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.13	0.68	2	.	.	2	0.2%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.07	0.34	1	0.40	4	5	0.4%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	0.60	6	6	0.5%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.33	1.69	5	0.50	5	10	0.9%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.07	0.34	1	0.10	1	2	0.2%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.20	2	2	0.2%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.07	0.34	1	0.80	8	9	0.8%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	1.00	10	10	0.9%
Hybrid striped-white bass	<i>Hybrid Morone</i>	TC	.	.	.	.	.	.	0.10	1	1	0.1%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.93	4.75	14	.	.	14	1.2%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	19.20	97.63	288	.	.	288	24.7%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	0.87	4.41	13	.	.	13	1.1%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	4.27	21.69	64	0.30	3	67	5.7%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	1.40	7.12	21	.	.	21	1.8%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.73	3.73	11	0.10	1	12	1.0%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	5.27	26.78	79	0.40	4	83	7.1%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.13	0.68	2	0.10	1	3	0.3%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.20	1.02	3	.	.	3	0.3%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.07	0.34	1	.	.	1	0.1%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.27	1.36	4	.	.	4	0.3%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.60	6	6	0.5%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.27	1.36	4	0.80	8	12	1.0%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	1.20	6.10	18	.	.	18	1.5%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	0.67	3.39	10	.	.	10	0.9%
Total						70.55	358.68	1,058	10.9	109	1,167	100.0%
Number Samples						15			10			
Species Collected			6	30		27			20			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-10. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2007.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Longnose gar	<i>Lepisosteus osseus</i>	TC	.	X	TOL	.	.	.	0.10	1	1	0.1%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	11.20	55.08	168	2.00	20	188	24.3%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.33	1.64	5	.	.	5	0.6%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.53	2.62	8	0.50	5	13	1.7%
Golden shiner	<i>Notemigonus crysoleucas</i>	OM	.	X	TOL	0.07	0.33	1	.	.	1	0.1%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	1.33	6.56	20	.	.	20	2.6%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.13	0.66	2	.	.	2	0.3%
Bullhead minnow	<i>Pimephales vigilax</i>	IN	.	X	.	0.07	0.33	1	.	.	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.13	0.66	2	0.10	1	3	0.4%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.53	2.62	8	0.70	7	15	1.9%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	.	.	.	0.10	1	1	0.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	.	.	.	0.20	2	2	0.3%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.30	13	13	1.7%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.67	3.28	10	0.30	3	13	1.7%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.07	0.33	1	0.20	2	3	0.4%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.30	3	3	0.4%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.07	0.33	1	0.70	7	8	1.0%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.90	9	9	1.2%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.07	0.33	1	.	.	1	0.1%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	20.27	99.67	304	0.10	1	305	39.4%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	2.67	13.11	40	.	.	40	5.2%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	2.20	10.82	33	0.20	2	35	4.5%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.33	1.64	5	.	.	5	0.6%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.20	0.98	3	0.10	1	4	0.5%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	1.80	8.85	27	.	.	27	3.5%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.07	0.33	1	.	.	1	0.1%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.07	0.33	1	.	.	1	0.1%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.50	5	5	0.6%
Walleye	<i>Stizostedion vitreum</i>	TC	.	X	.	.	.	.	0.20	2	2	0.3%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.20	0.98	3	0.70	7	10	1.3%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	0.93	4.59	14	.	.	14	1.8%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	1.60	7.87	24	.	.	24	3.1%
Total						45.54	223.94	683	9.20	92	775	100.0%
Number Samples						15			10			
Species Collected			4	28		24			19			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-11. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2009.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	6.27	23.38	94	0.20	2	96	6.1%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.27	1.00	4	.	.	4	0.3%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.00	3.73	15	0.40	4	19	1.2%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	15.00	55.97	225	.	.	225	14.2%
Steelcolor shiner	<i>Cyprinella whipplei</i>	IN	.	X	.	0.07	0.25	1	.	.	1	0.1%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	6.87	25.62	103	.	.	103	6.5%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.20	0.75	3	0.10	1	4	0.3%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.67	2.49	10	0.50	5	15	0.9%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.07	0.25	1	0.10	1	2	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	2.10	21	21	1.3%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	1.00	3.73	15	1.10	11	26	1.6%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	.	.	.	0.20	2	2	0.1%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.20	2	2	0.1%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.07	0.25	1	2.70	27	28	1.8%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.40	4	4	0.3%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.13	0.50	2	.	.	2	0.1%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	1.67	6.22	25	.	.	25	1.6%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.20	0.75	3	.	.	3	0.2%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	35.80	133.58	537	0.20	2	539	34.1%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	7.47	27.86	112	.	.	112	7.1%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	4.87	18.16	73	.	.	73	4.6%
Rock bass	<i>Ambloplites rupestris</i>	TC	.	X	INT	0.20	0.75	3	.	.	3	0.2%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.93	3.48	14	.	.	14	0.9%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.27	1.00	4	.	.	4	0.3%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	6.27	23.38	94	0.20	2	96	6.1%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.07	0.25	1	0.10	1	2	0.1%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.07	0.25	1	0.20	2	3	0.2%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.07	0.25	1	.	.	1	0.1%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	1.20	12	12	0.8%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.07	0.25	1	0.70	7	8	0.5%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	2.67	9.95	40	.	.	40	2.5%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	6.13	22.89	92	.	.	92	5.8%
Total						98.38	366.94	1,475	10.60	106	1,581	
Number Samples						15			10			
Species Collected			8	28		27			17			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-12. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at CRM 4.4, autumn 2010.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Paddlefish	<i>Polyodon spathula</i>	PK	.	X	.	.	.	.	0.1	1	1	0.1%
Lake sturgeon	<i>Acipenser fulvescens</i>	IN	.	X	.	.	.	.	0.1	1	1	0.1%
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.07	0.27	1	.	.	1	0.1%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	0.4	4	4	0.2%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	10.8	43.55	162	1.6	16	178	10.0%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.13	4.57	17	0.2	2	19	1.1%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	2.67	10.75	40	.	.	40	2.2%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	0.67	2.69	10	.	.	10	0.6%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.13	0.54	2	0.4	4	6	0.3%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.13	0.54	2	.	.	2	0.1%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	1	4.03	15	0.1	1	16	0.9%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.2	0.81	3	.	.	3	0.2%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.07	0.27	1	.	.	1	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.1	11	11	0.6%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.2	0.81	3	0.3	3	6	0.3%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	.	.	.	0.3	3	3	0.2%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.53	2.15	8	0.4	4	12	0.7%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	0.5	5	5	0.3%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	2.2	22	22	1.2%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.4	1.61	6	.	.	6	0.3%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	3.27	13.17	49	.	.	49	2.7%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.2	0.81	3	.	.	3	0.2%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	50.93	205.38	764	.	.	764	42.8%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	2.07	8.33	31	.	.	31	1.7%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	5.87	23.66	88	0.1	1	89	5.0%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.53	2.15	8	.	.	8	0.4%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.07	0.27	1	.	.	1	0.1%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	5.27	21.24	79	.	.	79	4.4%
Hybrid bass	<i>Hybrid micropterus sp.</i>	TC	.	.	.	0.07	0.27	1	.	.	1	0.1%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.2	0.81	3	.	.	3	0.2%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.2	0.81	3	.	.	3	0.2%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.27	1.08	4	.	.	4	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.47	1.88	7	.	.	7	0.4%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.5	5	5	0.3%
Walleye	<i>Stizostedion vitreum</i>	TC	.	X	.	.	.	.	0.3	3	3	0.2%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.2	0.81	3	1.5	15	18	1.0%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	0.87	3.49	13	.	.	13	0.7%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	23.67	95.43	355	.	.	355	19.9%
Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	PS	.	X	.	0.07	0.27	1	.	.	1	0.1%
Total						112.23	452.45	1,683	10.1	101	1,784	100.0%
Number of Samples						15			10			
Species Collected			8	34		30			17		39	

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-13. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at ERM 2.5, autumn 2009.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	.	.	.	1.10	11	11	0.8%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	7.80	25.22	117	0.30	3	120	8.5%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.13	0.43	2	.	.	2	0.1%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	0.87	2.80	13	0.10	1	14	1.0%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	11.93	38.58	179	.	.	179	12.7%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	2.73	8.84	41	.	.	41	2.9%
Bullhead minnow	<i>Pimephales vigilax</i>	IN	.	X	.	0.07	0.22	1	.	.	1	0.1%
Northern hog sucker	<i>Hypentelium nigricans</i>	BI	.	X	INT	0.07	0.22	1	.	.	1	0.1%
Quillback	<i>Carpionodes cyprinus</i>	OM	.	X	.	.	.	.	0.10	1	1	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.07	0.22	1	.	.	1	0.1%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.07	0.22	1	0.10	1	2	0.1%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	0.93	3.02	14	0.50	5	19	1.4%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.07	0.22	1	.	.	1	0.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	.	.	.	0.20	2	2	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.30	13	13	0.9%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.13	0.43	2	5.10	51	53	3.8%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	.	.	.	0.30	3	3	0.2%
White bass	<i>Morone chrysops</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	.	.	.	0.10	1	1	0.1%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.20	0.65	3	.	.	3	0.2%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	0.60	1.94	9	.	.	9	0.6%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.47	1.51	7	.	.	7	0.5%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	34.20	110.56	513	0.10	1	514	36.6%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	2.53	8.19	38	.	.	38	2.7%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	8.67	28.02	130	0.20	2	132	9.4%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.13	0.43	2	.	.	2	0.1%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.47	1.51	7	.	.	7	0.5%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	10.13	32.76	152	0.10	1	153	10.9%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	.	.	.	0.20	2	2	0.1%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	.	.	.	0.30	3	3	0.2%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.33	1.08	5	.	.	5	0.4%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.10	1	1	0.1%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.20	0.65	3	0.30	3	6	0.4%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	3.73	12.07	56	.	.	56	4.0%
Total						86.53	279.79	1,298	10.70	107	1,405	100.0%
Number of Samples						15			10			
Species Collected			8	32		24			20			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).

Table A-14. Species collected, trophic level, indigenous, and tolerance classifications; and catch per effort during electrofishing and gill netting at ERM 2.5, autumn 2010.

Common Name	Scientific name	Trophic level	Sunfish Species	Indigenous species	Pollution Tolerance	Electrofishing	Electrofishing	Gill Netting			Percent of total fish	
						Catch Rate Per Run	Catch Rate Per Hour	Total fish EF	Catch Rate Per Net Night	Total fish Gill Net		Total fish Combined
Spotted gar	<i>Lepisosteus oculatus</i>	TC	.	X	.	0.07	0.26	1	0.1	1	2	0.1%
Skipjack herring	<i>Alosa chrysochloris</i>	TC	.	X	INT	.	.	.	2.5	25	25	1.5%
Gizzard shad	<i>Dorosoma cepedianum</i>	OM	.	X	TOL	42.07	165.18	631	1.5	15	646	38.6%
Threadfin shad	<i>Dorosoma petenense</i>	PK	.	X	.	0.8	3.14	12	.	.	12	0.7%
Common carp	<i>Cyprinus carpio</i>	OM	.	.	TOL	1.07	4.19	16	0.2	2	18	1.1%
Largescale stoneroller	<i>Campostoma oligolepis</i>	HB	.	X	.	0.2	0.79	3	.	.	3	0.2%
Spotfin shiner	<i>Cyprinella spiloptera</i>	IN	.	X	TOL	3.2	12.57	48	.	.	48	2.9%
Bluntnose minnow	<i>Pimephales notatus</i>	OM	.	X	TOL	1.27	4.97	19	.	.	19	1.1%
Bullhead minnow	<i>Pimephales vigilax</i>	IN	.	X	.	0.33	1.31	5	.	.	5	0.3%
Quillback	<i>Carpionodes cyprinus</i>	OM	.	X	.	.	.	.	0.2	2	2	0.1%
Smallmouth buffalo	<i>Ictiobus bubalus</i>	OM	.	X	.	0.2	0.79	3	0.5	5	8	0.5%
Black buffalo	<i>Ictiobus niger</i>	OM	.	X	.	0.2	0.79	3	.	.	3	0.2%
Spotted sucker	<i>Minytrema melanops</i>	BI	.	X	INT	1.8	7.07	27	0.1	1	28	1.7%
Black redhorse	<i>Moxostoma duquesnei</i>	BI	.	X	INT	0.07	0.26	1	.	.	1	0.1%
Golden redhorse	<i>Moxostoma erythrurum</i>	BI	.	X	.	0.07	0.26	1	0.1	1	2	0.1%
Blue catfish	<i>Ictalurus furcatus</i>	OM	.	X	.	.	.	.	1.6	16	16	1.0%
Channel catfish	<i>Ictalurus punctatus</i>	OM	.	X	.	0.67	2.62	10	1.8	18	28	1.7%
Flathead catfish	<i>Pylodictis olivaris</i>	TC	.	X	.	0.2	0.79	3	0.3	3	6	0.4%
White bass	<i>Morone chrysops</i>	TC	.	X	.	0.07	0.26	1	0.7	7	8	0.5%
Yellow bass	<i>Morone mississippiensis</i>	TC	.	X	.	0.07	0.26	1	2.1	21	22	1.3%
Striped bass	<i>Morone saxatilis</i>	TC	.	.	.	0.07	0.26	1	0.4	4	5	0.3%
Redbreast sunfish	<i>Lepomis auritus</i>	IN	X	X	TOL	0.13	0.52	2	.	.	2	0.1%
Green sunfish	<i>Lepomis cyanellus</i>	IN	X	X	TOL	2.87	11.26	43	.	.	43	2.6%
Warmouth	<i>Lepomis gulosus</i>	IN	X	X	.	0.47	1.83	7	.	.	7	0.4%
Bluegill	<i>Lepomis macrochirus</i>	IN	X	X	TOL	21.93	86.13	329	0.1	1	330	19.7%
Longear sunfish	<i>Lepomis megalotis</i>	IN	X	X	INT	0.4	1.57	6	.	.	6	0.4%
Redear sunfish	<i>Lepomis microlophus</i>	IN	X	X	.	3.67	14.4	55	0.1	1	56	3.3%
Smallmouth bass	<i>Micropterus dolomieu</i>	TC	.	X	INT	0.07	0.26	1	.	.	1	0.1%
Spotted bass	<i>Micropterus punctulatus</i>	TC	.	X	.	0.4	1.57	6	0.1	1	7	0.4%
Largemouth bass	<i>Micropterus salmoides</i>	TC	.	X	TOL	7.93	31.15	119	0.1	1	120	7.2%
White crappie	<i>Pomoxis annularis</i>	TC	X	X	TOL	0.13	0.52	2	0.2	2	4	0.2%
Black crappie	<i>Pomoxis nigromaculatus</i>	TC	X	X	.	0.8	3.14	12	0.1	1	13	0.8%
Yellow perch	<i>Perca flavescens</i>	IN	.	.	.	0.27	1.05	4	.	.	4	0.2%
Logperch	<i>Percina caprodes</i>	BI	.	X	.	0.8	3.14	12	.	.	12	0.7%
Sauger	<i>Stizostedion canadense</i>	TC	.	X	.	.	.	.	0.4	4	4	0.2%
Walleye	<i>Stizostedion vitreum</i>	TC	.	X	.	.	.	.	0.1	1	1	0.1%
Freshwater drum	<i>Aplodinotus grunniens</i>	BI	.	X	.	0.2	0.79	3	0.3	3	6	0.4%
Brook silverside	<i>Labidesthes sicculus</i>	IN	.	X	INT	1.93	7.59	29	.	.	29	1.7%
Inland silverside	<i>Menidia beryllina</i>	IN	.	.	.	7.93	31.15	119	.	.	119	7.1%
Grass carp	<i>Ctenopharyngodon idella</i>	HB	.	.	.	0.07	0.26	1	.	.	1	0.1%
Total						102.43	402.1	1,536	13.6	136	1,672	100.0%
Number of Samples						15			10			
Species Collected			8	35		35			23			

Trophic: benthic invertivore (BI), insectivore (IN), omnivore (OM), parasitic (PS), planktivore (PK), top carnivore (TC); Tolerance: tolerant (TOL), intolerant (INT).