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Table 4-1. Number of Benthic Invertebrate Community Samples: 2010
Tennessee Valley Authority Kingston, Tennessee

			Benthic Community Samples	
River	**Transect**	**Area**	**Collection Date**	**Number of Samples**
Emory	ERM 6.0	Reference	Dec/2010	10
	ERM 5.0	Site	Dec/2010	10
	ERM 4.1	Site	Dec/2010	10
	ERM 3.0	Site	Dec/2010	10
	ERM 2.6	Site	Jan/2011	10
	ERM 2.2	Site	Dec/2010	20
	ERM 1.0	Site	Dec/2010	20
Clinch	CRM 8.7	Reference	Dec/2010	10
	CRM 6.0	Reference	Dec/2010	20
	CRM 4.0	Site	Dec/2010	10
	CRM 3.0	Site	Dec/2010	10
	CRM 1.5	Site	Dec/2010	7
	CRM 0.5	Site	Dec/2010	10
Tennessee	TRM 573.9	Reference	Dec/2010	10
	TRM 566.3	Site	Dec/2010	10
	TRM 560.8	Site	Nov/2010	10

See Figure 4-1 for transect locations.
CRM = Clinch River mile.
ERM = Emory River mile.
TRM = Tennessee River mile.

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Table 4-2. Benthic Invertebrate Community Metric Expected Response to Perturbation
Tennessee Valley Authority Kingston, Tennessee

Benthic Metrics		Expected Response to Perturbation (USEPA 1999)	References
Abundance	Number of Organisms	Decrease	General: TVA (2011, 1992); Kerans and Karr (1994) Metals Specific: Burton et al. (2005); Maret et al. (2003); Clements et al. (2000, 1992); Poulton et al. (1995)
Diversity	Number of Taxa	Decrease	General: TVA (2011, 1994, 1992); TDEC (2011); USEPA (2006, 1999); Carriker (1999); Kerans and Karr (1994) Metals Specific: Burton et al. (2005); Maret et al. (2003); Clements et al. (2000, 1992); Carlisle and Clements (1999); Clements (1997); Kiffney and Clements (1996, 1994); Poulton et al. (1995)
	Number of EPT Taxa	Decrease	General: TVA (2011, 1994); TDEC (2011); USEPA (2006, 1999); Carriker (1999) Metals Specific: Maret et al. (2003); Clements et al. (2000); Clements (1997); Poulton et al. (1995)
	Shannon Diversity	Decrease	General: USEPA (2006); Krebs (1999) Metals Specific: Burton et al. (2005)
Tolerance	Tolerance Index	Increase	General: TDEC (2011); NCDENR (2011); USEPA (1999); Hilsenhoff (1998, 1987) Metals Specific: USEPA (2006); Wildhaber and Schmitt (1998)
	% 2 Dominant Taxa	Increase	General: TVA (2011); USEPA (2006, 1999); Carriker (1999); Kerans and Karr (1994); TVA (1994) Metals Specific: Mebane (2003); Poulton et al. (1995); Clements et al. (1992)
Composition	% Oligochaetes	Increase	General: TVA (2011); TDEC (2011 - % Oligochaete and % Chironomid combined); USEPA (2006, 1999); Carriker (1999); Kerans and Karr (1994); TVA 1994
	% Chironomids	Decrease	General: TDEC (2011 - % Oligochaete and % Chironomid combined); USEPA (2006, 1999); Carriker (1999); Kerans and Karr (1994); TVA (1994) Metals Specific: Clements et al. (2000)
Feeding	% Shredder	Decrease	General: Merritt et al. (2008); USEPA (1999) Metals Specific: Clements et al. (2000)
Habit	% Clinger	Decrease	General: TDEC (2011); Merritt et al. (2008). USEPA (1999)

% = Percent.
EPT = Ephemeroptera, Plecoptera, and Trichoptera.
NCDENR = North Carolina Department of Environment and Natural Resources.
TDEC = Tennessee Department of Environment and Conservation.
TVA = Tennessee Valley Authority.
USEPA = U.S. Environmental Protection Agency.

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Table 4-3. Mean Water Depth and Substrate Characterization
Tennessee Valley Authority Kingston, Tennessee

				Percent Substrate Characterization in Benthic Grab Samples									
					Grain Size					Organics			
River	Transect	Area	Water Depth (ft)	Ash (%)	Bedrock (%)	Gravel (%)	Sand (%)	Fines (%)	HP Clay (%)	Woody Debris (%)	Detritus (%)	Mollusk Shell (%)	Coal-Gravel (%)
Emory	ERM 6.0	Reference	30	0	0	3	37	43	0	2	16	0	0
	ERM 5.0	Site	29	31	0	0	25	0	19	0	10	0	16
	ERM 4.1	Site	19	0	0	1	10	48	5	0	33	0	1
	ERM 3.0	Site	10	14	0	0	9	34	19	0	25	0	0
	ERM 2.6	Site	13	26	0	2	2	49	0	0	19	0	0
	ERM 2.2	Site	14	18	0	3	0	43	14	0	23	0	0
	ERM 1.0	Site	10	18	0	1	15	58	0	0	9	0	0
Clinch	CRM 8.7	Reference	13	0	0	16	8	45	7	0	23	0	0
	CRM 6.0	Reference	17	0	0	17	4	31	1	0	37	11	0
	CRM 4.0	Site	13	11	0	8	0	63	0	0	18	0	0
	CRM 3.0	Site	23	32	0	0	2	58	0	0	6	1	0
	CRM 1.5	Site	31	8	41	6	0	39	0	0	5	1	0
	CRM 0.5	Site	20	5	0	1	0	66	0	0	28	1	0
Tennessee	TRM 573.9	Reference	26	0	0	8	14	73	0	0	4	1	0
	TRM 566.3	Site	40	16	0	8	13	48	8	0	7	0	0
	TRM 560.8	Site	34	0	0	4	5	88	0	0	2	0	0

Substrate composition of grab samples was characterized based on visual observations. Percentages may not add to 100 due to rounding.
% = Percent.
CRM = Clinch River mile.
ERM = Emory River mile.
ft = Feet.
TRM = Tennessee River mile.

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																															
Transect and Area	ERM 6.0 Reference										ERM 5.0 Site										ERM 4.1 Site											
Collection Date	Dec/2010										Dec/2010										Dec/2010											
Sample Location	ERM 6.0-01	ERM 6.0-02	ERM 6.0-03	ERM 6.0-04	ERM 6.0-05	ERM 6.0-06	ERM 6.0-07	ERM 6.0-08	ERM 6.0-09	ERM 6.0-10	ERM 5.0-01	ERM 5.0-02	ERM 5.0-03	ERM 5.0-04	ERM 5.0-05	ERM 5.0-06	ERM 5.0-07	ERM 5.0-08	ERM 5.0-09	ERM 5.0-10	ERM 4.1-01	ERM 4.1-02	ERM 4.1-03	ERM 4.1-04	ERM 4.1-05	ERM 4.1-06	ERM 4.1-07	ERM 4.1-08	ERM 4.1-09	ERM 4.1-10
Invertebrate Taxa	Number of Organisms																													
INSECTA																														
EPHEMEROPTERA																														
Baetidae																														
Caenis sp.																														
Hexagenia sp.									2	1		3	1						1		1	2	3	5	9	1				
Leptophlebiidae																														
Stenonema sp.																														
ODONATA																														
Coenagrionidae																														
Gomphidae																														
Gomphus sp.																														1
Didymops sp.																														
Macromia sp.																														
PLECOPTERA																														
Allocapnia sp.															1															
Taeniopteryx sp.						2																								1
MEGALOPTERA																														
Sialis sp.																														
TRICHOPTERA																														
Cheumatopsyche sp.																														
Hydropsychidae																														
Hydroptila sp.		1																												
Leptoceridae																														
Oecetis sp.																					2									
Triaenodes injustus													1																	1
Cyrnellus fraternus																														
Nyctiophylax sp.																														
Polycentropodidae																														
Polycentropus sp.																												1		3
COLEOPTERA																														
Curculionidae														1																
Dubiraphia sp.																											1			
Microcylloepus pusillus																														
Optioservus sp.																														
Promoresia elegans																												1		
Berosus sp.																														
DIPTERA																														
Ceratopogonidae		1										2									4	1	3	4	2					1
Chaoborus punctipennis	1	4		49	6	5	2	2	22	4		15	3	2	9		2	2	1		5	41	103	41	30	18	2	4	1	
Ptychoptera sp.																														
Tipulidae																														
Chironomidae																														
Ablabesmyia annulata												3		1							2	1	3	3	3					
Ablabesmyia mallochi																														
Ablabesmyia rhamphe gp.																														
Axarus sp.																												1		
Chaetocladius sp.																														
Chironomus sp.	3	5		41	5	4	2	7	17	18		22	4	1	6	3	2	1				56	103	106	123	67	15		2	
Cladopelma sp.																								1	2					2
Cladotanytarsus sp.																														1
Clinotanypus sp.															1															
Coelotanypus sp.																														
Conchapelopia sp.																														
Cricotopus sp.																														
Cryptochironomus sp.	1	1		1	2												2	1			3		1	5		3	1			4
Dicrotendipes lucifer																														
Dicrotendipes modestus																														
Dicrotendipes neomodestus		3			1								1								1						1		1	4
Dicrotendipes simpsoni																				7	1									4
Dicrotendipes sp.																														
Diplocladius cultriger																														
Endochironomus nigricans																														
Epoicocladius flavens																														
Epoicocladius sp.																														
Glyptotendipes sp.						3	1	1			5				2					48	8							3		2
Gymnometriocnemus sp.																														
Heterotrissocladius marcid																														
Heterotrissocladius sp.																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																															
Transect and Area	ERM 6.0 Reference										ERM 5.0 Site										ERM 4.1 Site											
Collection Date	Dec/2010										Dec/2010										Dec/2010											
Sample Location	ERM 6.0-01	ERM 6.0-02	ERM 6.0-03	ERM 6.0-04	ERM 6.0-05	ERM 6.0-06	ERM 6.0-07	ERM 6.0-08	ERM 6.0-09	ERM 6.0-10	ERM 5.0-01	ERM 5.0-02	ERM 5.0-03	ERM 5.0-04	ERM 5.0-05	ERM 5.0-06	ERM 5.0-07	ERM 5.0-08	ERM 5.0-09	ERM 5.0-10	ERM 4.1-01	ERM 4.1-02	ERM 4.1-03	ERM 4.1-04	ERM 4.1-05	ERM 4.1-06	ERM 4.1-07	ERM 4.1-08	ERM 4.1-09	ERM 4.1-10
INSECTA (continued)																														
Chironomidae (continued)																														
Hydrobaenus sp.																														
Kiefferulus sp.																														
Lipiniella sp.																														
Microchironomus sp.																														
Microtendipes pedellus gp.						1			1	2					2												1		3
Monodiamesa sp.																														
Nanocladius distinctus																														
Nilothauma sp.																														1
Orthocladius sp.																														
Pagastiella sp.																														
Parachironomus sp.																														
Paracladopelma sp.																														
Paracladopelma undine																														
Parakiefferiella sp.																														
Paralauterborniella nigroh																														
Parametriocnemus sp.															1															
Paratanytarsus sp.																														
Polypedilum halterale gp.	5									2							1					1	1			1		2		1
Polypedilum scalaenum																														
Potthastia longimana																														1
Procladius sp.		3								1		2									2	6	15	26	33	12	2	2		1
Psectrocladius sp.																														
Pseudochironomus sp.				1										1			2								1		1	7		
Pseudorthocladius sp.																														
Rheocricotopus robacki																														
Rheotanytarsus exiguus gp.		1									2					1		1						1		1		1		
Smittia sp.																									1					
Stenochironomus sp.																														
Stictochironomus caffrariu																														
Stictochironomus devinctus										1																				
Tanypus carinatus																														
Tanytarsus sp.													1							3	1									2
Tribelos fuscicornis																														
Tribelos jucundum		1		1												1											1	1		1
Tribelos sp.																														
ARACHNIDA																														
ACARIFORMES																														
Acariformes																														
Atractides sp.																														
Neumania sp.																														
Unionicola sp.																					13									
CRUSTACEA																														
AMPHIPODA																														
Crangonyx sp.																														
Gammarus sp.																														
ANNELIDA																														
OLIGOCHAETA																														
Enchytraeidae																												3		
Lumbricidae																												1		
Arcteonais lomondi																							1							
Dero digitata																														
Dero sp.																				2										
Haemonais waldvogeli																				1										
Naididae																				1								2		41
Nais cf. pardalis																														
Nais communis											1																			
Nais sp.																														3
Ripistes parasita																												1		
Slavina appendiculata											1																			5
Aulodrilus pigueti										1																				
Branchiura sowerbyi															1						2	1	1				3			1
Ilyodrilus templetoni																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																															
Transect and Area	ERM 6.0 Reference										ERM 5.0 Site										ERM 4.1 Site									
Collection Date	Dec/2010										Dec/2010										Dec/2010									
Sample Location	ERM 6.0-01	ERM 6.0-02	ERM 6.0-03	ERM 6.0-04	ERM 6.0-05	ERM 6.0-06	ERM 6.0-07	ERM 6.0-08	ERM 6.0-09	ERM 6.0-10	ERM 5.0-01	ERM 5.0-02	ERM 5.0-03	ERM 5.0-04	ERM 5.0-05	ERM 5.0-06	ERM 5.0-07	ERM 5.0-08	ERM 5.0-09	ERM 5.0-10	ERM 4.1-01	ERM 4.1-02	ERM 4.1-03	ERM 4.1-04	ERM 4.1-05	ERM 4.1-06	ERM 4.1-07	ERM 4.1-08	ERM 4.1-09	ERM 4.1-10
ANNELIDA (continued)																														
OLIGOCHAETA (continued)																														
Limnodrilus cervix						1			1						2										3	14	8			
Limnodrilus claparedianus					1																									
Limnodrilus hoffmeisteri				2		1																					3			
Limnodrilus sp.																														
Quistadrilus multisetosus									1																					
Tubificidae	4	1	1		1	4	2	2	3	3		13	1	2	9	1					11	1	9	28	31	79	41	5		6
Lumbriculidae																														
Lumbriculus sp.																														
HIRUDINEA																														
Actinobdella inequiannulat																														3
Actinobdella sp.																														
Helobdella elongata																														
Helobdella sp.																														
Helobdella stagnalis																														
NEMATODA																														
Nematoda			1																											
MOLLUSCA																														
GASTROPODA																														
Ferrissia rivularis																														
Amnicola limosa																														
Amnicola sp.																														
Hydrobiidae																														
Somatogyrus sp.																														
Pleurocera canaliculata																														
Pleurocera nobilis nodosa																														
Viviparus sp.																														
BIVALVIA																														
Obliquaria reflexa																														
Corbicula fluminea						2	1								1				1			2							2	5
Dreissena polymorpha																														
Musculium transversum																														
Pisidium compressum																														
Pisidium sp.																														
Sphaeriidae																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																														
Transect and Area	ERM 3.0 Site										ERM 2.6 Site										ERM 2.2 Site										
Collection Date	Dec/2010										Jan/2011										Dec/2010										
Sample Location	ERM 3.0-01	ERM 3.0-02	ERM 3.0-03	ERM 3.0-04	ERM 3.0-05	ERM 3.0-06	ERM 3.0-07	ERM 3.0-08	ERM 3.0-09	ERM 3.0-10	ERM 2.6-01	ERM 2.6-02	ERM 2.6-03	ERM 2.6-04	ERM 2.6-05	ERM 2.6-06	ERM 2.6-07	ERM 2.6-08	ERM 2.6-09	ERM 2.6-10	ERM 2.2-01	ERM 2.2-02	ERM 2.2-03	ERM 2.2-04	ERM 2.2-05	ERM 2.2-06	ERM 2.2-07	ERM 2.2-08	ERM 2.2-09	ERM 2.2-10
Invertebrate Taxa	Number of Organisms																														
INSECTA																															
EPHEMEROPTERA																															
Baetidae																															
Caenis sp.																				1											
Hexagenia sp.							5	3	3	1	7	4	2	5	3			2	13	1	9	23		13	11	30	4	3	3	
Leptophlebiidae																															
Stenonema sp.																															
ODONATA																															
Coenagrionidae																															
Gomphidae																											1				
Gomphus sp.																															
Didymops sp.																1															
Macromia sp.																															
PLECOPTERA																															
Allocapnia sp.																															
Taeniopteryx sp.																															
MEGALOPTERA																															
Sialis sp.																															
TRICHOPTERA																															
Cheumatopsyche sp.																															
Hydropsychidae		1																													
Hydroptila sp.																											1				
Leptoceridae																															
Oecetis sp.																							2								
Triaenodes injustus																															
Cyrnellus fraternus																															
Nyctiophylax sp.																															
Polycentropodidae																															
Polycentropus sp.																															
COLEOPTERA																															
Curculionidae																															
Dubiraphia sp.									1							1						1					1				
Microcylloepus pusillus				3																											
Optioservus sp.																															
Promoresia elegans																															
Berosus sp.				3																											
DIPTERA																															
Ceratopogonidae			4						1	5	2	3			2	1		1	1	3	2	5			2	1			2	
Chaoborus punctipennis		1	5		2		3	7	11	6	2	6	4	11	1	3	4	12	3	9	3	1		28	11	8	17	15	44	
Ptychoptera sp.																											1				
Tipulidae																											1				
Chironomidae																															
Ablabesmyia annulata	1			3			1	3	2	1		1	2	1	3	7		2	5		5	6	1	12	2	6	6	3	2	
Ablabesmyia mallochi																															
Ablabesmyia rhamphe gp.				3												3															
Axarus sp.		3			1		1						12	3	4						1	3			4	1	1			
Chaetocladius sp.																															
Chironomus sp.		2	5	5	8	2	75	36	28	20	3	11	48	104	127	33	6	7	3	18	2	11	1	32	84	80	91	13	8	
Cladopelma sp.			4																											
Cladotanytarsus sp.			1	5																										
Clinotanypus sp.			1																											
Coelotanypus sp.							11	8	7		12	4	11	13	9			1			2	5		16	1	4		1		
Conchapelopia sp.																															
Cricotopus sp.																															
Cryptochironomus sp.	5	3	23			12	8	3	7	7	5	4	9		3	1	5	1	3	14	6	8		6	4	6	3	6	1	
Dicrotendipes lucifer																															
Dicrotendipes modestus																															
Dicrotendipes neomodestus			4	3													1	1	1	6					2	1	1		1	
Dicrotendipes simpsoni			2	13	1											1														
Dicrotendipes sp.																															
Diplocladius cultriger																															
Endochironomus nigricans																															
Epoicocladius flavens																															
Epoicocladius sp.													1													2	1			
Glyptotendipes sp.				15							2		1			8		1					1							1
Gymnometriocnemus sp.																															
Heterotrissocladius marcid																															
Heterotrissocladius sp.			1																												

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																														
Transect and Area	ERM 3.0 Site										ERM 2.6 Site										ERM 2.2 Site										
Collection Date	Dec/2010										Jan/2011										Dec/2010										
Sample Location	ERM 3.0-01	ERM 3.0-02	ERM 3.0-03	ERM 3.0-04	ERM 3.0-05	ERM 3.0-06	ERM 3.0-07	ERM 3.0-08	ERM 3.0-09	ERM 3.0-10	ERM 2.6-01	ERM 2.6-02	ERM 2.6-03	ERM 2.6-04	ERM 2.6-05	ERM 2.6-06	ERM 2.6-07	ERM 2.6-08	ERM 2.6-09	ERM 2.6-10	ERM 2.2-01	ERM 2.2-02	ERM 2.2-03	ERM 2.2-04	ERM 2.2-05	ERM 2.2-06	ERM 2.2-07	ERM 2.2-08	ERM 2.2-09	ERM 2.2-10
INSECTA (continued)																															
Chironomidae (continued)																															
Hydrobaenus sp.	1															3	3	1													
Kiefferulus sp.																															
Lipiniella sp.																															
Microchironomus sp.																															
Microtendipes pedellus gp.	2	1	1		2	2	1									1		1				1			1		3			2
Monodiamesa sp.																															
Nanocladius distinctus			1																												
Nilothauma sp.																															
Orthocladius sp.																															
Pagastiella sp.			9																						1						
Parachironomus sp.																															
Paracladopelma sp.			1																								2				
Paracladopelma undine																															
Parakiefferiella sp.				3																1											
Paralauterborniella nigroh																															
Parametriocnemus sp.																															
Paratanytarsus sp.																															
Polypedilum halterale gp.		14	15	3	9	13	1								7	29	3			54		2		1	10	4	8	2		
Polypedilum scalaenum																															
Potthastia longimana																															
Procladius sp.		1	5	13	1		16	62	40	19	5	9	20	13	45	4	9	1		12		9		7	36	30	44			
Psectrocladius sp.				3																											
Pseudochironomus sp.				5											2	1	1		1								2			1
Pseudorthocladius sp.																															
Rheocricotopus robacki																															
Rheotanytarsus exiguus gp.		1		3	1		1										4									1	1			
Smittia sp.				3																					1	2	5			
Stenochironomus sp.																											3			
Stictochironomus caffrariu																														
Stictochironomus devinctus																		1												
Tanypus carinatus																					1									
Tanytarsus sp.			6		1		9	3	2		1	2			9	1	1						1		1	2	2			
Tribelos fuscicornis																														
Tribelos jucundum				11												1												1		
Tribelos sp.																														
ARACHNIDA																															
ACARIFORMES																															
Acariformes																															
Atractides sp.																															
Neumania sp.																															
Unionicola sp.																					5	1	1				1			
CRUSTACEA																															
AMPHIPODA																															
Crangonyx sp.																1	1													
Gammarus sp.																															
ANNELIDA																															
OLIGOCHAETA																															
Enchytraeidae																	1											1		
Lumbricidae																														
Arcteonais lomondi																														
Dero digitata																														
Dero sp.																				1										
Haemonais waldvogeli																														
Naididae																	1			6										
Nais cf. pardalis																														
Nais communis																														
Nais sp.	1		4														1													
Ripistes parasita																														
Slavina appendiculata																														
Aulodrilus pigueti			1										3																	
Branchiura sowerbyi	1	6		25	3	2	1	3	10	8	3	6	13	6	5	2			3			3	1		7	9		2		
Ilyodrilus templetoni																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																															
Transect and Area	**ERM 3.0 Site**										**ERM 2.6 Site**										**ERM 2.2 Site**									
Collection Date	**Dec/2010**										**Jan/2011**										**Dec/2010**									
Sample Location	**ERM 3.0-01**	**ERM 3.0-02**	**ERM 3.0-03**	**ERM 3.0-04**	**ERM 3.0-05**	**ERM 3.0-06**	**ERM 3.0-07**	**ERM 3.0-08**	**ERM 3.0-09**	**ERM 3.0-10**	**ERM 2.6-01**	**ERM 2.6-02**	**ERM 2.6-03**	**ERM 2.6-04**	**ERM 2.6-05**	**ERM 2.6-06**	**ERM 2.6-07**	**ERM 2.6-08**	**ERM 2.6-09**	**ERM 2.6-10**	**ERM 2.2-01**	**ERM 2.2-02**	**ERM 2.2-03**	**ERM 2.2-04**	**ERM 2.2-05**	**ERM 2.2-06**	**ERM 2.2-07**	**ERM 2.2-08**	**ERM 2.2-09**	**ERM 2.2-10**
ANNELIDA (continued)																														
OLIGOCHAETA (continued)																														
Limnodrilus cervix					5							2	3	4																
Limnodrilus claparedianus				25	1											2	1	2									9			
Limnodrilus hoffmeisteri		3													19															
Limnodrilus sp.						1																								
Quistadrilus multisetosus																														
Tubificidae	5	48	3	279	22	21	89	10	13	2		1	54	25	167	11	2	4	8	3		1			153	79	168	1		
Lumbriculidae																														
Lumbriculus sp.																														
HIRUDINEA																														
Actinobdella inequiannulat													1		1		1													
Actinobdella sp.																														
Helobdella elongata																														
Helobdella sp.																														
Helobdella stagnalis																														
NEMATODA																														
Nematoda									1						1												3			
MOLLUSCA																														
GASTROPODA																														
Ferrissia rivularis																														
Amnicola limosa																														
Amnicola sp.																														
Hydrobiidae																														
Somatogyrus sp.																														
Pleurocera canaliculata																														
Pleurocera nobilis nodosa																														
Viviparus sp.																														
BIVALVIA																														
Obliquaria reflexa																														
Corbicula fluminea			1																								1			
Dreissena polymorpha																														
Musculium transversum								5	9	1	16	20	6								11	61								
Pisidium compressum																														
Pisidium sp.																														
Sphaeriidae																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																													
Transect and Area	ERM 2.2 Site										ERM 1.0 Site																			
Collection Date	Dec/2010										Dec/2010																			
Sample Location	ERM 2.2-11	ERM 2.2-12	ERM 2.2-13	ERM 2.2-14	ERM 2.2-15	ERM 2.2-16	ERM 2.2-17	ERM 2.2-18	ERM 2.2-19	ERM 2.2-20	ERM 1.0-01	ERM 1.0-02	ERM 1.0-03	ERM 1.0-04	ERM 1.0-05	ERM 1.0-06	ERM 1.0-07	ERM 1.0-08	ERM 1.0-09	ERM 1.0-10	ERM 1.0-11	ERM 1.0-12	ERM 1.0-13	ERM 1.0-14	ERM 1.0-15	ERM 1.0-16	ERM 1.0-17	ERM 1.0-18	ERM 1.0-19	ERM 1.0-20
Invertebrate Taxa	Number of Organisms																													
INSECTA																														
EPHEMEROPTERA																														
Baetidae																														
Caenis sp.																														
Hexagenia sp.	11	4	22	3	4	5	3			3	5	8	5	1	1				1	3	12	7	1						2	1
Leptophlebiidae																														
Stenonema sp.																								2						
ODONATA																														
Coenagrionidae																														
Gomphidae																														
Gomphus sp.																														
Didymops sp.																														
Macromia sp.																								1						
PLECOPTERA																														
Allocapnia sp.																														
Taeniopteryx sp.																														
MEGALOPTERA																														
Sialis sp.																														1
TRICHOPTERA																														
Cheumatopsyche sp.																			1											
Hydropsychidae																														
Hydroptila sp.																														
Leptoceridae																								1						
Oecetis sp.					2																									
Triaenodes injustus																														
Cyrnellus fraternus																													1	
Nyctiophylax sp.																			1											
Polycentropodidae																								1						
Polycentropus sp.																														
COLEOPTERA																														
Curculionidae																														
Dubiraphia sp.			1		1														1											
Microcylloepus pusillus																			1											
Optioservus sp.																														
Promoresia elegans																														
Berosus sp.																														
DIPTERA																														
Ceratopogonidae	1		3		1					2	1			1				1	1	2	3									
Chaoborus punctipennis	1	1	21	8	14	6	11	3	11	73	2	2	2	1	3			1	2	2	8	6		1			1	1	1	4
Ptychoptera sp.																														
Tipulidae																														
Chironomidae																														
Ablabesmyia annulata	3		14			2	2			2		1	4							2		8	1	13					1	
Ablabesmyia mallochi								4																						
Ablabesmyia rhamphe gp.																														
Axarus sp.	1	1		3	1	1	3										5	1												
Chaetocladius sp.																														
Chironomus sp.	4		28	44	70	26	35	3		12	3	5	41	41	9	2	6	56	55	13	6	39	32	22	4	1	10	42	29	9
Cladopelma sp.																			1											
Cladotanytarsus sp.																												1		
Clinotanypus sp.																														
Coelotanypus sp.	5		15	2	3		1			1	3	2	3	1					7	16	2							1	5	16
Conchapelopia sp.																														
Cricotopus sp.																								1						
Cryptochironomus sp.	4	4		2	2	1	3	4		1	8	2	5	8	5	1	6	2	5	4	7	8	6	1	4	8	9	7		3
Dicrotendipes lucifer																														
Dicrotendipes modestus																								2			1		1	
Dicrotendipes neomodestus					2		1							1					2		1							5		
Dicrotendipes simpsoni							1																							
Dicrotendipes sp.																								4						
Diplocladius cultriger					1																			2						
Endochironomus nigricans																														
Epoicocladius flavens																														
Epoicocladius sp.			1												1						2	2								
Glyptotendipes sp.						3					1						1							1						1
Gymnometriocnemus sp.																							1							
Heterotrissocladius marcid																								1						
Heterotrissocladius sp.																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																														
Transect and Area	ERM 2.2 Site										ERM 1.0 Site																				
Collection Date	Dec/2010										Dec/2010																				
Sample Location	ERM 2.2-11	ERM 2.2-12	ERM 2.2-13	ERM 2.2-14	ERM 2.2-15	ERM 2.2-16	ERM 2.2-17	ERM 2.2-18	ERM 2.2-19	ERM 2.2-20	ERM 1.0-01	ERM 1.0-02	ERM 1.0-03	ERM 1.0-04	ERM 1.0-05	ERM 1.0-06	ERM 1.0-07	ERM 1.0-08	ERM 1.0-09	ERM 1.0-10	ERM 1.0-11	ERM 1.0-12	ERM 1.0-13	ERM 1.0-14	ERM 1.0-15	ERM 1.0-16	ERM 1.0-17	ERM 1.0-18	ERM 1.0-19	ERM 1.0-20
INSECTA (continued)																															
Chironomidae (continued)																															
Hydrobaenus sp.								1																							
Kiefferulus sp.																															
Lipiniella sp.																															
Microchironomus sp.			1		4																										
Microtendipes pedellus gp.	1	2		1	1																			4				1			
Monodiamesa sp.																															
Nanocladius distinctus																															
Nilothauma sp.																			1												
Orthocladius sp.																															
Pagastiella sp.																															
Parachironomus sp.																															
Paracladopelma sp.					1																										
Paracladopelma undine																															
Parakiefferiella sp.																															
Paralauterborniella nigroh							1	1									1														
Parametriocnemus sp.						1																									
Paratanytarsus sp.					1			1																							
Polypedilum halterale gp.					14	5	23	3						1		1	77	5	2			1		1			11	11		
Polypedilum scalaenum																															
Potthastia longimana																															
Procladius sp.	5	4	7	31	79	37	18	2	1		1	1	5	7	1	3		1	26	4		7	1	8			1	4	11	
Psectrocladius sp.																															
Pseudochironomus sp.					5	1													3					1						
Pseudorthocladius sp.					1	1																									
Rheocricotopus robacki																								1							
Rheotanytarsus exiguus gp.								2																1							
Smittia sp.					1	1	1												1												
Stenochironomus sp.																			1												
Stictochironomus caffrariu																															
Stictochironomus devinctus																															
Tanypus carinatus																															
Tanytarsus sp.	4		1		8														1	1								3			
Tribelos fuscicornis																															
Tribelos jucundum							1	1							1		1														
Tribelos sp.																															
ARACHNIDA																															
ACARIFORMES																															
Acariformes																		1													
Atractides sp.																															
Neumania sp.																					4										
Unionicola sp.	2		1											1					1												2
CRUSTACEA																															
AMPHIPODA																															
Crangonyx sp.																															
Gammarus sp.																															
ANNELIDA																															
OLIGOCHAETA																															
Enchytraeidae																			4					5							
Lumbricidae																															
Arcteonais lomondi																						1									
Dero digitata						1																									
Dero sp.						1																									
Haemonais waldvogeli						2																									
Naididae								1																		1					
Nais cf. pardalis																															
Nais communis																															
Nais sp.																								5							
Ripistes parasita																															
Slavina appendiculata								1																5							
Aulodrilus pigueti			1	1																											
Branchiura sowerbyi	3		3	2		1	3	2			1	2	13	10	1	6	4	9	8		1	21	14		8	1		13	3	
Ilyodrilus templetoni																						1	9								

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	EMORY RIVER																														
Transect and Area	ERM 2.2 Site										ERM 1.0 Site																				
Collection Date	Dec/2010										Dec/2010																				
Sample Location	ERM 2.2-11	ERM 2.2-12	ERM 2.2-13	ERM 2.2-14	ERM 2.2-15	ERM 2.2-16	ERM 2.2-17	ERM 2.2-18	ERM 2.2-19	ERM 2.2-20	ERM 1.0-01	ERM 1.0-02	ERM 1.0-03	ERM 1.0-04	ERM 1.0-05	ERM 1.0-06	ERM 1.0-07	ERM 1.0-08	ERM 1.0-09	ERM 1.0-10	ERM 1.0-11	ERM 1.0-12	ERM 1.0-13	ERM 1.0-14	ERM 1.0-15	ERM 1.0-16	ERM 1.0-17	ERM 1.0-18	ERM 1.0-19	ERM 1.0-20
ANNELIDA (continued)																															
OLIGOCHAETA (continued)																															
Limnodrilus cervix					11								2	7					8			2	9				17		2		
Limnodrilus claparedianus								1																							
Limnodrilus hoffmeisteri													1												21				2		
Limnodrilus sp.					11		3					1														1			1		
Quistadrilus multisetosus																															
Tubificidae				11	88	3	61	6			3		11	11	4	8	53	15	64		2	14	48	36	64	10	94	153	17		
Lumbriculidae																															
Lumbriculus sp.						1																									
HIRUDINEA																															
Actinobdella inequiannulat																	1														
Actinobdella sp.																															
Helobdella elongata																															
Helobdella sp.																															
Helobdella stagnalis						1																									
NEMATODA																															
Nematoda					1		3																	1			3				
MOLLUSCA																															
GASTROPODA																															
Ferrissia rivularis																															
Amnicola limosa																															
Amnicola sp.																															
Hydrobiidae																										1					
Somatogyrus sp.																															
Pleurocera canaliculata																															
Pleurocera nobilis nodosa																															
Viviparus sp.																															
BIVALVIA																															
Obliquaria reflexa	1																														
Corbicula fluminea					1											1									1		3	1			
Dreissena polymorpha																											1				
Musculium transversum	28		20	4			1					8	2				2		1	2	6	23	5		15		5				2
Pisidium compressum																															
Pisidium sp.																	2										4				
Sphaeriidae																															

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																														
Transect and Area	CRM 8.7 Reference										CRM 6.0 Reference																				
Collection Date	Dec/2010										Dec/2010																				
Sample Location	CRM 8.7-01	CRM 8.7-02	CRM 8.7-03	CRM 8.7-04	CRM 8.7-05	CRM 8.7-06	CRM 8.7-07	CRM 8.7-08	CRM 8.7-09	CRM 8.7-10	CRM 6.0-01	CRM 6.0-02	CRM 6.0-03	CRM 6.0-04	CRM 6.0-05	CRM 6.0-06	CRM 6.0-07	CRM 6.0-08	CRM 6.0-09	CRM 6.0-10	CRM 6.0-11	CRM 6.0-12	CRM 6.0-13	CRM 6.0-14	CRM 6.0-15	CRM 6.0-16	CRM 6.0-17	CRM 6.0-18	CRM 6.0-19	CRM 6.0-20
Invertebrate Taxa	**Number of Organisms**																														
INSECTA																															
EPHEMEROPTERA																															
Baetidae																															1
Caenis sp.								1									1														
Hexagenia sp.						11	1							1	20	26	3	2	5	2				15	3	12	11	2	1	6
Leptophlebiidae																															
Stenonema sp.																															
ODONATA																															
Coenagrionidae																	1														
Gomphidae																															
Gomphus sp.																	1														
Didymops sp.																															
Macromia sp.																															
PLECOPTERA																															
Allocapnia sp.																															
Taeniopteryx sp.																															
MEGALOPTERA																															
Sialis sp.																													1		
TRICHOPTERA																															
Cheumatopsyche sp.																															
Hydropsychidae																						1									
Hydroptila sp.			1																							1					
Leptoceridae																								1							
Oecetis sp.			1		1			1									2				1						2				
Triaenodes injustus																															
Cyrnellus fraternus																								1							
Nyctiophylax sp.																															
Polycentropodidae																															
Polycentropus sp.																															
COLEOPTERA																															
Curculionidae																															
Dubiraphia sp.																4															
Microcylloepus pusillus																															
Optioservus sp.																															
Promoresia elegans																															
Berosus sp.																															
DIPTERA																															
Ceratopogonidae		1	1				5	1	1								1		1				1	3		1	3	3	1	2
Chaoborus punctipennis													2		3				2					4	2					1
Ptychoptera sp.																															
Tipulidae																															
Chironomidae																															
Ablabesmyia annulata						5	2								2	9	2	1	3	2				3	1	6	7			
Ablabesmyia mallochi																		1										1		
Ablabesmyia rhamphe gp.																														1
Axarus sp.																															
Chaetocladius sp.																															
Chironomus sp.	1					13	34	14	44	25			3	13		31	13	10	25	12				17	6	31	31	12	8	9
Cladopelma sp.			1																											
Cladotanytarsus sp.								1						1		2	1		2	1		1				1	2	3		6
Clinotanypus sp.																															
Coelotanypus sp.			1			2	1								1	2	2	3	2					5		6		1		7
Conchapelopia sp.																															
Cricotopus sp.																															
Cryptochironomus sp.	1		2	1	2	2	4	2	7	2		2	4	2	1	7	2		3	6	1	2	1	2		2	6	3	2	11
Dicrotendipes lucifer																															
Dicrotendipes modestus																			2												
Dicrotendipes neomodestus				1		5	6	5	3	5	3	4	1	7	4	19	29	7	12	3	4	1	3		1	30	13	34	7	14
Dicrotendipes simpsoni	2																	3												
Dicrotendipes sp.																															
Diplocladius cultriger																															
Endochironomus nigricans																															
Epoicocladius flavens																															
Epoicocladius sp.						1										1									1		1			
Glyptotendipes sp.								1																						
Gymnometriocnemus sp.																														
Heterotrissocladius marcid																														
Heterotrissocladius sp.																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																													
Transect and Area	CRM 8.7 Reference										CRM 6.0 Reference																			
Collection Date	Dec/2010										Dec/2010																			
Sample Location	CRM 8.7-01	CRM 8.7-02	CRM 8.7-03	CRM 8.7-04	CRM 8.7-05	CRM 8.7-06	CRM 8.7-07	CRM 8.7-08	CRM 8.7-09	CRM 8.7-10	CRM 6.0-01	CRM 6.0-02	CRM 6.0-03	CRM 6.0-04	CRM 6.0-05	CRM 6.0-06	CRM 6.0-07	CRM 6.0-08	CRM 6.0-09	CRM 6.0-10	CRM 6.0-11	CRM 6.0-12	CRM 6.0-13	CRM 6.0-14	CRM 6.0-15	CRM 6.0-16	CRM 6.0-17	CRM 6.0-18	CRM 6.0-19	CRM 6.0-20
INSECTA (continued)																														
Chironomidae (continued)																														
Hydrobaenus sp.								1																						
Kiefferulus sp.																														1
Lipiniella sp.																														
Microchironomus sp.																														
Microtendipes pedellus gp.	45	10	2	1		6	8	2	1			4	2	1	1		2	1	3		1	1		1		8	1	4	1	1
Monodiamesa sp.																									1					
Nanocladius distinctus																														
Nilothauma sp.																														
Orthocladius sp.																														
Pagastiella sp.																														
Parachironomus sp.																1														
Paracladopelma sp.													1		1	2					1									
Paracladopelma undine																														
Parakiefferiella sp.																														
Paralauterborniella nigroh									1			1	3	4											1					1
Parametriocnemus sp.																														
Paratanytarsus sp.																	2							1				1		
Polypedilum halterale gp.		1	11		3	2	1	1	3	12		29	8	31	7	6	4	2	3	3		3		1	5	4	16	5	15	15
Polypedilum scalaenum																														
Potthastia longimana																														
Procladius sp.						32	7		3			3	24	7	22	43	64	21	18	6	1	1	1	26	9	45	56	36	20	18
Psectrocladius sp.																														
Pseudochironomus sp.	2		1				1	1								2	1	1	2	3						1	4		1	1
Pseudorthocladius sp.																														
Rheocricotopus robacki																														
Rheotanytarsus exiguus gp.																														
Smittia sp.																											1			
Stenochironomus sp.																														
Stictochironomus caffrariu																														
Stictochironomus devinctus																														
Tanypus carinatus																														
Tanytarsus sp.						1	1	3		1		1				3				1	1					1	2			2
Tribelos fuscicornis			1																											
Tribelos jucundum														1			2	3	2					2	2		1		5	
Tribelos sp.																														
ARACHNIDA																														
ACARIFORMES																														
Acariformes																														
Atractides sp.						2	1	1	2	1																		1		
Neumania sp.			1		1	2		2	3	2					1					3		1								4
Unionicola sp.																	1									1				
CRUSTACEA																														
AMPHIPODA																														
Crangonyx sp.							1																							
Gammarus sp.																								1				1		
ANNELIDA																														
OLIGOCHAETA																														
Enchytraeidae			6																											
Lumbricidae																											16			
Arcteonais lomondi							2									1														
Dero digitata							2										3													
Dero sp.																									1	2		7		3
Haemonais waldvogeli																														
Naididae			6													1	2	1									8		4	1
Nais cf. pardalis							1	9	5																					
Nais communis																														
Nais sp.								9																				7		
Ripistes parasita																														
Slavina appendiculata							1	1																					2	
Aulodrilus pigueti															2	2										1			1	
Branchiura sowerbyi	4	18	3		4	14	3		2	1		10	25	6	6	6	4	8	22	3	1	3	1	7	18	5	2	7	6	5
Ilyodrilus templetoni																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																													
Transect and Area	CRM 8.7 Reference										CRM 6.0 Reference																			
Collection Date	Dec/2010										Dec/2010																			
Sample Location	CRM 8.7-01	CRM 8.7-02	CRM 8.7-03	CRM 8.7-04	CRM 8.7-05	CRM 8.7-06	CRM 8.7-07	CRM 8.7-08	CRM 8.7-09	CRM 8.7-10	CRM 6.0-01	CRM 6.0-02	CRM 6.0-03	CRM 6.0-04	CRM 6.0-05	CRM 6.0-06	CRM 6.0-07	CRM 6.0-08	CRM 6.0-09	CRM 6.0-10	CRM 6.0-11	CRM 6.0-12	CRM 6.0-13	CRM 6.0-14	CRM 6.0-15	CRM 6.0-16	CRM 6.0-17	CRM 6.0-18	CRM 6.0-19	CRM 6.0-20
ANNELIDA (continued)																														
OLIGOCHAETA (continued)																														
Limnodrilus cervix	1				3			1		1			12			1		4	11	11		2				3		7	5	7
Limnodrilus claparedianus																							1							
Limnodrilus hoffmeisteri										1						1				1		1								2
Limnodrilus sp.																														1
Quistadrilus multisetosus																		2									24	13		
Tubificidae	4	73	101	12	61	79	24	26	102	35		89	88	111	21	24	22	30	78	16	6	27	16	48	23	27	112	94	26	29
Lumbriculidae																														
Lumbriculus sp.																														
HIRUDINEA																														
Actinobdella inequiannulat									1																					
Actinobdella sp.																									2					
Helobdella elongata																														
Helobdella sp.																														
Helobdella stagnalis						2			1			7		1			1	5			3		12	6	2	2	3	1		
NEMATODA																														
Nematoda																	1	1							1		5	1		2
MOLLUSCA																														
GASTROPODA																														
Ferrissia rivularis																												2		
Amnicola limosa	5	2			4			17	5	2		1			3							7		6			5	16		
Amnicola sp.			19																		1		5							6
Hydrobiidae																														
Somatogyrus sp.							1														1			1						
Pleurocera canaliculata								1																						
Pleurocera nobilis nodosa																														
Viviparus sp.																														
BIVALVIA																														
Obliquaria reflexa																														
Corbicula fluminea	2	4	13	1	1	2		1			1	3	4		2			1		1	10	9	5	16	4	5	1		1	
Dreissena polymorpha		1	2															1			7	2	138	2						
Musculium transversum																														
Pisidium compressum		1		2																		2		1				1	1	1
Pisidium sp.										1							1										7	7	5	
Sphaeriidae																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																										
Transect and Area	CRM 4.0 Site										CRM 3.0 Site										CRM 1.5 Site						
Collection Date	Dec/2010										Dec/2010										Dec/2010						
Sample Location	CRM 4.0-01	CRM 4.0-02	CRM 4.0-03	CRM 4.0-04	CRM 4.0-05	CRM 4.0-06	CRM 4.0-07	CRM 4.0-08	CRM 4.0-09	CRM 4.0-10	CRM 3.0-01	CRM 3.0-02	CRM 3.0-03	CRM 3.0-04	CRM 3.0-05	CRM 3.0-06	CRM 3.0-07	CRM 3.0-08	CRM 3.0-09	CRM 3.0-10	CRM 1.5-01	CRM 1.5-02	CRM 1.5-03	CRM 1.5-04	CRM 1.5-05	CRM 1.5-06	CRM 1.5-07
Invertebrate Taxa	Number of Organisms																										
INSECTA																											
EPHEMEROPTERA																											
Baetidae																											
Caenis sp.																											
Hexagenia sp.				5	35	27	24	17	2	3	29	7	15	5	7	7	10	29	16	22	13	43	11	7			
Leptophlebiidae										1																	
Stenonema sp.																											
ODONATA																											
Coenagrionidae																											
Gomphidae																											
Gomphus sp.																											
Didymops sp.																											
Macromia sp.																											
PLECOPTERA																											
Allocapnia sp.																											
Taeniopteryx sp.																											
MEGALOPTERA																											
Sialis sp.																											
TRICHOPTERA																											
Cheumatopsyche sp.									1																		
Hydropsychidae																											
Hydroptila sp.																											
Leptoceridae																											
Oecetis sp.	1		1	1											1			1									
Triaenodes injustus																											
Cyrnellus fraternus																											
Nyctiophylax sp.																											
Polycentropodidae																											
Polycentropus sp.																										1	
COLEOPTERA																											
Curculionidae																											
Dubiraphia sp.							1															1					
Microcylloepus pusillus														1													
Optioservus sp.																											
Promoresia elegans																											
Berosus sp.																											
DIPTERA																											
Ceratopogonidae				6			1	1		1	8	2	3					2		3	2	2	1	2			
Chaoborus punctipennis	1			3	1			1		1				2	1				3	6	2	3	5				
Ptychoptera sp.																											
Tipulidae																											
Chironomidae																											
Ablabesmyia annulata				4	11	13	7	11			8	1	4	2	3	1	4	3	5	4	3	15	4	3			
Ablabesmyia mallochi																											
Ablabesmyia rhamphe gp.									1																		
Axarus sp.																											
Chaetocladius sp.														1													
Chironomus sp.	2	1	2	20	1	1	4	7	41	24		1	1	17	31	42	3	5	20	3	32	11	30	17			
Cladopelma sp.																											
Cladotanytarsus sp.	6	5	1				1	1		1											1						
Clinotanypus sp.																											
Coelotanypus sp.					1	1	3		1	1	17	1		2	6	1	3	13	17	30	2	10	1	3			
Conchapelopia sp.	1																						1				
Cricotopus sp.																											
Cryptochironomus sp.	11	1	2			5	6	6	8	2	3	8	1	1	6	9	2	4	3	1	6	4	3	5		1	
Dicrotendipes lucifer	19	9	10	3	1		1	2	5	9		1		1	1			2	1	3	2	1	1				
Dicrotendipes modestus																											
Dicrotendipes neomodestus		3	5	1																							
Dicrotendipes simpsoni											4																
Dicrotendipes sp.																											
Diplocladius cultriger																											
Endochironomus nigricans										1																	
Epoicocladius flavens				1	1	1	4	2	1						2					1			3				
Epoicocladius sp.																											
Glyptotendipes sp.							1																		2		
Gymnometriocnemus sp.																											
Heterotrissocladius marcid																											
Heterotrissocladius sp.																											

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																										
Transect and Area	CRM 4.0 Site										CRM 3.0 Site										CRM 1.5 Site						
Collection Date	Dec/2010										Dec/2010										Dec/2010						
Sample Location	CRM 4.0-01	CRM 4.0-02	CRM 4.0-03	CRM 4.0-04	CRM 4.0-05	CRM 4.0-06	CRM 4.0-07	CRM 4.0-08	CRM 4.0-09	CRM 4.0-10	CRM 3.0-01	CRM 3.0-02	CRM 3.0-03	CRM 3.0-04	CRM 3.0-05	CRM 3.0-06	CRM 3.0-07	CRM 3.0-08	CRM 3.0-09	CRM 3.0-10	CRM 1.5-01	CRM 1.5-02	CRM 1.5-03	CRM 1.5-04	CRM 1.5-05	CRM 1.5-06	CRM 1.5-07
INSECTA (continued)																											
Chironomidae (continued)																											
Hydrobaenus sp.			1																								
Kiefferulus sp.																											
Lipiniella sp.																						1					
Microchironomus sp.																											
Microtendipes pedellus gp.			2			2	2	5	4	1					2												
Monodiamesa sp.																											
Nanocladius distinctus																											
Nilothauma sp.																											
Orthocladius sp.		1																									
Pagastiella sp.																											
Parachironomus sp.																											
Paracladopelma sp.																											
Paracladopelma undine			1																								
Parakiefferiella sp.	1																										
Paralauterborniella nigroh																											
Parametriocnemus sp.																											
Paratanytarsus sp.	1	1																									
Polypedilum halterale gp.	1			1		1		3	1	9									1								
Polypedilum scalaenum								1																			
Potthastia longimana																											
Procladius sp.				6	2	14	8	16	19	9	1	3		6	3	3	2	4	3	1	11	12	7	3		3	1
Psectrocladius sp.																											
Pseudochironomus sp.	1																										
Pseudorthocladius sp.				1																							
Rheocricotopus robacki																											
Rheotanytarsus exiguus gp.	1																										
Smittia sp.																											
Stenochironomus sp.									1																		
Stictochironomus caffrariu					1	2				1	6	2				1	1	1			2	1	1				
Stictochironomus devinctus																											
Tanypus carinatus																											
Tanytarsus sp.	2	1	1							1									1		1				1		
Tribelos fuscicornis																											
Tribelos jucundum																											
Tribelos sp.				1																							
ARACHNIDA																											
ACARIFORMES																											
Acariformes																											
Atractides sp.											1																
Neumania sp.																	1				2						
Unionicola sp.																		3	2								
CRUSTACEA																											
AMPHIPODA																											
Crangonyx sp.																											
Gammarus sp.																											
ANNELIDA																											
OLIGOCHAETA																											
Enchytraeidae				1																							
Lumbricidae																											
Arcteonais lomondi	3			2						5																	
Dero digitata										3																	
Dero sp.																											
Haemonais waldvogeli																											
Naididae	7			2		1																					
Nais cf. pardalis	12	1	3																								
Nais communis																											
Nais sp.	1	1																									
Ripistes parasita																											
Slavina appendiculata		3		1																							
Aulodrilus pigueti																											
Branchiura sowerbyi			1	3			2	5	2	7	1											3		2			
Ilyodrilus templetoni																											

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER																										
Transect and Area	CRM 4.0 Site										CRM 3.0 Site										CRM 1.5 Site						
Collection Date	Dec/2010										Dec/2010										Dec/2010						
Sample Location	CRM 4.0-01	CRM 4.0-02	CRM 4.0-03	CRM 4.0-04	CRM 4.0-05	CRM 4.0-06	CRM 4.0-07	CRM 4.0-08	CRM 4.0-09	CRM 4.0-10	CRM 3.0-01	CRM 3.0-02	CRM 3.0-03	CRM 3.0-04	CRM 3.0-05	CRM 3.0-06	CRM 3.0-07	CRM 3.0-08	CRM 3.0-09	CRM 3.0-10	CRM 1.5-01	CRM 1.5-02	CRM 1.5-03	CRM 1.5-04	CRM 1.5-05	CRM 1.5-06	CRM 1.5-07
ANNELIDA (continued)																											
OLIGOCHAETA (continued)																											
Limnodrilus cervix									5	5											2						
Limnodrilus claparedianus																											
Limnodrilus hoffmeisteri				1											1						2			1			
Limnodrilus sp.						1																					
Quistadrilus multisetosus																											
Tubificidae	13	3	3	25	2	16	29	14	92	39		4		18	43	16	2	6	2	3	45	11	4	20		1	
Lumbriculidae				2																							
Lumbriculus sp.																											
HIRUDINEA																											
Actinobdella inequiannulat		1																									
Actinobdella sp.																											
Helobdella elongata										1																	
Helobdella sp.																											
Helobdella stagnalis	3			1						1												1					3
NEMATODA																											
Nematoda																											
MOLLUSCA																											
GASTROPODA																											
Ferrissia rivularis																											
Amnicola limosa																											
Amnicola sp.																											
Hydrobiidae																											
Somatogyrus sp.																											
Pleurocera canaliculata									1											1							
Pleurocera nobilis nodosa									2																		
Viviparus sp.		3										1															
BIVALVIA																											
Obliquaria reflexa																											
Corbicula fluminea	1				3	1	3	1	4			1	1			2		1						1			2
Dreissena polymorpha		1		1																					8	1	1
Musculium transversum	2			1	24	42	13	3	1				34	8		7	16			3			2	1		1	
Pisidium compressum																											
Pisidium sp.																											
Sphaeriidae																			22								

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER										TENNESSEE RIVER																			
Transect and Area	CRM 0.5 Site										TRM 573.9 Reference										TRM 566.3 Site									
Collection Date	Dec/2010										Dec/2010										Dec/2010									
Sample Location	CRM 0.5-01	CRM 0.5-02	CRM 0.5-03	CRM 0.5-04	CRM 0.5-05	CRM 0.5-06	CRM 0.5-07	CRM 0.5-08	CRM 0.5-09	CRM 0.5-10	TRM 573.9-01	TRM 573.9-02	TRM 573.9-03	TRM 573.9-04	TRM 573.9-05	TRM 573.9-06	TRM 573.9-07	TRM 573.9-08	TRM 573.9-09	TRM 573.9-10	TRM 566.3-01	TRM 566.3-02	TRM 566.3-03	TRM 566.3-04	TRM 566.3-05	TRM 566.3-06	TRM 566.3-07	TRM 566.3-08	TRM 566.3-09	TRM 566.3-10
Invertebrate Taxa	Number of Organisms																													
INSECTA																														
EPHEMEROPTERA																														
Baetidae																														
Caenis sp.																														
Hexagenia sp.	41	26	9	1	17	11	13	12	16	22	30	34	10	6	11	2	60	39	28	5	24	34	6	29	3	3	4	16	6	9
Leptophlebiidae																														
Stenonema sp.																														
ODONATA																														
Coenagrionidae																														
Gomphidae																	1													
Gomphus sp.																														
Didymops sp.																														
Macromia sp.																														
PLECOPTERA																														
Allocapnia sp.																														
Taeniopteryx sp.																														
MEGALOPTERA																														
Sialis sp.						1																								
TRICHOPTERA																														
Cheumatopsyche sp.																														
Hydropsychidae																														
Hydroptila sp.																														
Leptoceridae																														
Oecetis sp.										2				1			1			2	1									
Triaenodes injustus																														
Cyrnellus fraternus															1															
Nyctiophylax sp.																														
Polycentropodidae																														
Polycentropus sp.						1																								
COLEOPTERA																														
Curculionidae																														
Dubiraphia sp.						1																								
Microcylloepus pusillus																														
Optioservus sp.																														
Promoresia elegans																														
Berosus sp.																														
DIPTERA																														
Ceratopogonidae	1	2	1		1												1	1		1									1	
Chaoborus punctipennis		1	2		2		1	1		4					1			1			3		2	1	2	5	1	1	2	1
Ptychoptera sp.																														
Tipulidae																														
Chironomidae																														
Ablabesmyia annulata	11	9	6		2	4	6	4	9	10	13	3	1		2	1	1	2	8		8	10	1	9	1	1	3	10		4
Ablabesmyia mallochi																														
Ablabesmyia rhamphe gp.																														
Axarus sp.																														
Chaetocladius sp.																														
Chironomus sp.	4		6		15	10	3	5	7	23	1		2	2	3	1	3	1	2		4	4	8	7	25	8	21	16	15	6
Cladopelma sp.																														
Cladotanytarsus sp.																						1								
Clinotanypus sp.																														
Coelotanypus sp.	12	1			3	4	2	6	3	9	10	21	11	17	8	1	30	10	20		24	13		7		4	9	5	6	5
Conchapelopia sp.																														
Cricotopus sp.																														
Cryptochironomus sp.		3	5		3	2	4	4	7	6	5	1		1	2	13	1	2	8	3	10	5	1		5	1	3	3	3	3
Dicrotendipes lucifer																														
Dicrotendipes modestus						5		1		3											1									
Dicrotendipes neomodestus								1	1									1												
Dicrotendipes simpsoni								1	1																					
Dicrotendipes sp.																														
Diplocladius cultriger																														
Endochironomus nigricans																														
Epoicocladius flavens																														
Epoicocladius sp.	1				2	1		1	2			1			3						1			1				1		
Glyptotendipes sp.					1												1			1			6							
Gymnometriocnemus sp.																														
Heterotrissocladius marcid																														
Heterotrissocladius sp.																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER										TENNESSEE RIVER																			
Transect and Area	CRM 0.5 Site										TRM 573.9 Reference										TRM 566.3 Site									
Collection Date	Dec/2010										Dec/2010										Dec/2010									
Sample Location	CRM 0.5-01	CRM 0.5-02	CRM 0.5-03	CRM 0.5-04	CRM 0.5-05	CRM 0.5-06	CRM 0.5-07	CRM 0.5-08	CRM 0.5-09	CRM 0.5-10	TRM 573.9-01	TRM 573.9-02	TRM 573.9-03	TRM 573.9-04	TRM 573.9-05	TRM 573.9-06	TRM 573.9-07	TRM 573.9-08	TRM 573.9-09	TRM 573.9-10	TRM 566.3-01	TRM 566.3-02	TRM 566.3-03	TRM 566.3-04	TRM 566.3-05	TRM 566.3-06	TRM 566.3-07	TRM 566.3-08	TRM 566.3-09	TRM 566.3-10
INSECTA (continued)																														
Chironomidae (continued)																														
Hydrobaenus sp.									1																					
Kiefferulus sp.																														
Lipiniella sp.																														
Microchironomus sp.					1		1		1																					
Microtendipes pedellus gp.																									1					1
Monodiamesa sp.																														
Nanocladius distinctus																														
Nilothauma sp.																														
Orthocladius sp.																														
Pagastiella sp.																														
Parachironomus sp.																														
Paracladopelma sp.																														1
Paracladopelma undine																														
Parakiefferiella sp.																														
Paralauterborniella nigroh																														
Parametriocnemus sp.																														
Paratanytarsus sp.																														
Polypedilum halterale gp.	1					1	1		1	5	1				1						1									
Polypedilum scalaenum																														
Potthastia longimana																														
Procladius sp.	5	4	2		15	6	4	16	9	3	4	2	5	12	4	2	10	2	13	6	5	7	8	13	3	20	4	4	6	7
Psectrocladius sp.																														
Pseudochironomus sp.																														
Pseudorthocladius sp.																														
Rheocricotopus robacki																														
Rheotanytarsus exiguus gp.																														
Smittia sp.																														
Stenochironomus sp.																														
Stictochironomus caffrariu		1							2																					
Stictochironomus devinctus																														
Tanypus carinatus																														
Tanytarsus sp.						1							1								1									
Tribelos fuscicornis																														
Tribelos jucundum																														
Tribelos sp.																														
ARACHNIDA																														
ACARIFORMES																														
Acariformes																														
Atractides sp.																					1									
Neumania sp.				1						1						1														
Unionicola sp.				1						1	2					2		1			2									
CRUSTACEA																														
AMPHIPODA																														
Crangonyx sp.																														
Gammarus sp.									1																					
ANNELIDA																														
OLIGOCHAETA																														
Enchytraeidae																														
Lumbricidae																														
Arcteonais lomondi																														
Dero digitata																														
Dero sp.																														
Haemonais waldvogeli																														
Naididae																														
Nais cf. pardalis																														
Nais communis																														
Nais sp.																														
Ripistes parasita																														
Slavina appendiculata																														
Aulodrilus pigueti														1																
Branchiura sowerbyi				1		1	3	3	5		1			1		1							2	1		1				
Ilyodrilus templetoni																														

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	CLINCH RIVER										TENNESSEE RIVER																			
Transect and Area	CRM 0.5 Site										TRM 573.9 Reference										TRM 566.3 Site									
Collection Date	Dec/2010										Dec/2010										Dec/2010									
Sample Location	CRM 0.5-01	CRM 0.5-02	CRM 0.5-03	CRM 0.5-04	CRM 0.5-05	CRM 0.5-06	CRM 0.5-07	CRM 0.5-08	CRM 0.5-09	CRM 0.5-10	TRM 573.9-01	TRM 573.9-02	TRM 573.9-03	TRM 573.9-04	TRM 573.9-05	TRM 573.9-06	TRM 573.9-07	TRM 573.9-08	TRM 573.9-09	TRM 573.9-10	TRM 566.3-01	TRM 566.3-02	TRM 566.3-03	TRM 566.3-04	TRM 566.3-05	TRM 566.3-06	TRM 566.3-07	TRM 566.3-08	TRM 566.3-09	TRM 566.3-10
ANNELIDA (continued)																														
OLIGOCHAETA (continued)																														
Limnodrilus cervix					5				1				1													2				
Limnodrilus claparedianus																														
Limnodrilus hoffmeisteri																									1		1	2		
Limnodrilus sp.																														
Quistadrilus multisetosus																														
Tubificidae				2	29	23	14	26	19	5	4	4	1	14	3	6	5		11	4	1	6	1	8	12	48	7	4	5	22
Lumbriculidae																														
Lumbriculus sp.																														
HIRUDINEA																														
Actinobdella inequiannulat																										1				
Actinobdella sp.																														
Helobdella elongata																														
Helobdella sp.																														
Helobdella stagnalis					4	1		2	3	5					1									3	1	19	8			1
NEMATODA																														
Nematoda			1						1																					
MOLLUSCA																														
GASTROPODA																														
Ferrissia rivularis																														
Amnicola limosa																														
Amnicola sp.																														
Hydrobiidae																														
Somatogyrus sp.																														
Pleurocera canaliculata																														
Pleurocera nobilis nodosa																														
Viviparus sp.																														
BIVALVIA																														
Obliquaria reflexa																														
Corbicula fluminea	4						3		2	1	2	1	1	1		1	7	2	4	6	2	3	9	2		2		3	2	
Dreissena polymorpha																														
Musculium transversum	2	5	15	7	4	8	7	7	11	44	34	36	28	8	90	2	111	178		2	19	26		18			1	24	3	
Pisidium compressum																														
Pisidium sp.																														
Sphaeriidae																			7											

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	TENNESSEE RIVER									
Transect and Area	TRM 560.8 Site									
Collection Date	Nov/2010									
Sample Location	TRM 560.8-01	TRM 560.8-02	TRM 560.8-03	TRM 560.8-04	TRM 560.8-05	TRM 560.8-06	TRM 560.8-07	TRM 560.8-08	TRM 560.8-09	TRM 560.8-10
Invertebrate Taxa	**Number of Organisms**									
INSECTA										
EPHEMEROPTERA										
Baetidae										
Caenis sp.										
Hexagenia sp.	5	2	2	2	2	2	1	7	10	2
Leptophlebiidae										
Stenonema sp.										
ODONATA										
Coenagrionidae										
Gomphidae										
Gomphus sp.										
Didymops sp.										
Macromia sp.										
PLECOPTERA										
Allocapnia sp.										
Taeniopteryx sp.										
MEGALOPTERA										
Sialis sp.										
TRICHOPTERA										
Cheumatopsyche sp.		1								
Hydropsychidae										
Hydroptila sp.										
Leptoceridae										
Oecetis sp.										4
Triaenodes injustus										
Cyrnellus fraternus										
Nyctiophylax sp.										
Polycentropodidae										
Polycentropus sp.										
COLEOPTERA										
Curculionidae										
Dubiraphia sp.										
Microcylloepus pusillus										
Optioservus sp.				1						
Promoresia elegans										
Berosus sp.										
DIPTERA										
Ceratopogonidae										
Chaoborus punctipennis	3	1	1	1	1	1	3		5	
Ptychoptera sp.										
Tipulidae										
Chironomidae										
Ablabesmyia annulata	5			4	1	5	2	7	2	1
Ablabesmyia mallochi										
Ablabesmyia rhamphe gp.										
Axarus sp.										
Chaetocladius sp.										
Chironomus sp.		6	2	5	7	11	5	4	1	1
Cladopelma sp.										
Cladotanytarsus sp.										
Clinotanypus sp.										
Coelotanypus sp.	21	27	27	23	14	12	25	11	18	2
Conchapelopia sp.										
Cricotopus sp.										
Cryptochironomus sp.										
Dicrotendipes lucifer										
Dicrotendipes modestus										
Dicrotendipes neomodestus										
Dicrotendipes simpsoni										
Dicrotendipes sp.										
Diplocladius cultriger										
Endochironomus nigricans										
Epoicocladius flavens										
Epoicocladius sp.										
Glyptotendipes sp.										
Gymnometriocnemus sp.										
Heterotrissocladius marcid										
Heterotrissocladius sp.										

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	TENNESSEE RIVER									
Transect and Area	TRM 560.8 Site									
Collection Date	Nov/2010									
Sample Location	TRM 560.8-01	TRM 560.8-02	TRM 560.8-03	TRM 560.8-04	TRM 560.8-05	TRM 560.8-06	TRM 560.8-07	TRM 560.8-08	TRM 560.8-09	TRM 560.8-10
INSECTA (continued)										
Chironomidae (continued)										
Hydrobaenus sp.										
Kiefferulus sp.										
Lipiniella sp.										
Microchironomus sp.										
Microtendipes pedellus gp.										
Monodiamesa sp.										
Nanocladius distinctus										
Nilothauma sp.										
Orthocladius sp.										
Pagastiella sp.										
Parachironomus sp.										
Paracladopelma sp.										
Paracladopelma undine										
Parakiefferiella sp.										
Paralauterborniella nigroh										
Parametriocnemus sp.										
Paratanytarsus sp.										
Polypedilum halterale gp.										
Polypedilum scalaenum										
Potthastia longimana										
Procladius sp.		1	1	2		2	2		2	2
Psectrocladius sp.										
Pseudochironomus sp.										
Pseudorthocladius sp.										
Rheocricotopus robacki										
Rheotanytarsus exiguus gp.										
Smittia sp.										
Stenochironomus sp.										
Stictochironomus caffrariu										
Stictochironomus devinctus										
Tanypus carinatus										
Tanytarsus sp.										
Tribelos fuscicornis										
Tribelos jucundum										
Tribelos sp.										
ARACHNIDA										
ACARIFORMES										
Acariformes										
Atractides sp.					1					
Neumania sp.										
Unionicola sp.										
CRUSTACEA										
AMPHIPODA										
Crangonyx sp.										
Gammarus sp.										
ANNELIDA										
OLIGOCHAETA										
Enchytraeidae										
Lumbricidae										
Arcteonais lomondi										
Dero digitata										
Dero sp.										
Haemonais waldvogeli										
Naididae										
Nais cf. pardalis										
Nais communis										
Nais sp.										
Ripistes parasita										
Slavina appendiculata										
Aulodrilus pigueti						2				
Branchiura sowerbyi					1					
Ilyodrilus templetoni										

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Table 4-4. Benthic Invertebrate Taxonomic Dataset
Tennessee Valley Authority **Kingston, Tennessee**

River	TENNESSEE RIVER									
Transect and Area	TRM 560.8 Site									
Collection Date	Nov/2010									
Sample Location	TRM 560.8-01	TRM 560.8-02	TRM 560.8-03	TRM 560.8-04	TRM 560.8-05	TRM 560.8-06	TRM 560.8-07	TRM 560.8-08	TRM 560.8-09	TRM 560.8-10
ANNELIDA (continued)										
OLIGOCHAETA (continued)										
Limnodrilus cervix										
Limnodrilus claparedianus										
Limnodrilus hoffmeisteri									3	
Limnodrilus sp.										
Quistadrilus multisetosus										
Tubificidae	1	1	1	4	4	3	2	1	3	9
Lumbriculidae										
Lumbriculus sp.										
HIRUDINEA										
Actinobdella inequiannulat										1
Actinobdella sp.										
Helobdella elongata										
Helobdella sp.										
Helobdella stagnalis										
NEMATODA										
Nematoda										2
MOLLUSCA										
GASTROPODA										
Ferrissia rivularis										
Amnicola limosa										
Amnicola sp.										
Hydrobiidae										
Somatogyrus sp.										
Pleurocera canaliculata										
Pleurocera nobilis nodosa										
Viviparus sp.										
BIVALVIA										
Obliquaria reflexa										
Corbicula fluminea			1						1	6
Dreissena polymorpha										
Musculium transversum	14	20	5	13	25	28	12	44	20	9
Pisidium compressum										3
Pisidium sp.										
Sphaeriidae										

CRM = Clinch River mile.
ERM = Emory River mile.
TRM = Tennessee River mile.

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Table 4-5. Mean Percent Benthic Invertebrate Abundance: 2010
Tennessee Valley Authority Kingston, Tennessee

	River	Emory							Clinch						Tennessee		
	Transect	ERM 6.0	ERM 5.0	ERM 4.1	ERM 3.0	ERM 2.6	ERM 2.2	ERM 1.0	CRM 8.7	CRM 6.0	CRM 4.0	CRM 3.0	CRM 1.5	CRM 0.5	TRM 573.9	TRM 566.3	TRM 560.8
	Area	Ref	Site	Site	Site	Site	Site	Site	Ref	Ref	Site	Site	Site	Site	Ref	Site	Site
Percent Abundance	Ephemeroptera (Mayfly)	1	2	2	1	3	6	3	1	4	11	20	18	22	20	17	6
	Odonata (Dragon/Damselfly)	--	--	0	--	0	0	0	--	0	--	--	--	--	0	--	--
	Plecoptera (Stonefly)	1	0	0	--	--	--	--	--	--	--	--	--	--	--	--	--
	Megaloptera (Alderfly)	--	--	--	--	--	--	0	--	0	--	--	--	0	--	--	--
	Trichoptera (Caddisfly)	0	0	1	0	--	0	0	0	0	0	0	0	0	0	0	1
	Coleoptera (Beetle)	--	0	0	0	0	0	0	--	1	2	0	0	1	--	--	0
	Diptera (Fly)	35	17	20	3	5	12	2	1	1	2	4	4	2	0	2	3
	Chironomid (Midge)	50	61	52	49	60	49	46	33	41	41	47	50	39	25	46	47
	Acariform (Mite)	--	--	1	--	--	0	0	2	0	--	1	0	1	1	0	0
	Amphipoda (Scud)	--	--	--	--	0	--	--	0	0	--	--	--	0	--	--	--
	Oligochaete (Aquatic Worm)	11	17	24	45	28	26	44	55	41	32	13	22	18	5	16	6
	Hirudinea (Leech)	--	--	0	--	0	0	0	0	2	1	--	1	2	0	4	0
	Nematoda (Roundworms)	0	--	--	0	0	0	0	--	0	--	--	--	0	--	--	0
	Gastropoda (Snail)	--	--	--	--	--	--	0	5	2	1	0	--	--	--	--	--
	Bivalvia (Mussel/Clam)	1	1	1	1	3	5	4	3	8	10	13	4	15	47	14	36

The tenth decimal place is not shown to enhance pattern recognition. Percentages may not add to 100 due to rounding.
-- = No taxa.
0 = Present but in small numbers (>0 to 0.5%).
CRM = Clinch River mile.
ERM = Emory River mile.
Ref = Reference.
TRM = Tennessee River mile.

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Table 4-6. Mean Benthic Invertebrate Community Metrics: 2010

Tennessee Valley Authority **Kingston, Tennessee**

		River:	Emory							Clinch						Tennessee		
		Transect	ERM 6.0	ERM 5.0	ERM 4.1	ERM 3.0	ERM 2.6	ERM 2.2	ERM 1.0	CRM 8.7	CRM 6.0	CRM 4.0	CRM 3.0	CRM 1.5	CRM 0.5	TRM 573.9	TRM 566.3	TRM 560.8
		Area	Ref	Site	Site	Site	Site	Site	Site	Ref	Ref	Site	Site	Site	Site	Ref	Site	Site
Benthic Metrics	Abundance	Number of Organisms	452	348	2140	2172	2137	2073	1570	1850	2477	1640	1207	981	1297	1835	1315	930
	Diversity	Number of Taxa	5.9	5.4	11.3	11.9	13.3	12.6	11.2	13.2	16.8	16.3	11.2	9.6	12.5	10.6	11.0	8.2
		Number of EPT Taxa	0.3	0.5	1.1	0.5	0.9	1.0	0.9	0.7	1.2	1.1	1.2	0.7	1.2	1.4	1.1	1.2
		Shannon Diversity	2.1	2.1	2.5	2.6	3.0	2.5	2.6	2.3	3.0	3.2	2.7	2.4	2.9	2.4	2.8	2.3
	Tolerance	Tolerance Index	8.1	7.8	8.0	7.5	7.6	7.5	7.7	7.1	7.3	6.9	6.8	7.2	6.6	6.2	7.3	6.8
		% 2 Dominant Taxa	69	64	64	61	53	60	61	69	54	50	60	62	51	63	50	67
	Composition	% Oligochaetes	19	13	26	38	20	14	36	54	38	29	12	15	17	9	16	7
		% Chironomids	48	56	47	55	58	50	49	33	42	45	46	43	36	33	49	48
	Feeding	% Filterer	4	11	5	6	8	11	4	14	12	11	15	22	19	38	14	35
		% Gatherer	54	45	62	56	51	41	66	70	60	66	52	41	50	29	50	20
		% Predator	29	27	26	30	31	42	25	8	20	18	32	34	29	32	35	44
		% Scraper	--	--	0	1	1	0	0	5	2	3	1	--	0	--	--	0
		% Shredder	8	17	4	8	9	4	4	3	5	2	0	3	1	1	1	--
		% Piercer	0	--	--	--	--	0	--	0	0	--	--	--	--	--	--	--
		% Parasite	5	--	3	0	0	2	1	0	0	0	1	--	1	1	0	1
	Habit	% Burrower	59	62	68	58	61	51	75	73	66	74	78	53	72	79	73	88
		% Climber	4	5	2	9	9	5	4	4	6	3	0	1	1	1	0	1
		% Swimmer	--	--	--	0	0	--	--	0	0	0	--	--	0	--	--	--
		% Clinger	2	7	2	3	1	4	1	15	8	4	1	16	1	0	0	0
		% Sprawler	34	27	28	30	29	41	20	8	20	20	21	30	26	20	27	11

The tenth decimal place is not shown to enhance pattern recognition. Percentages may not add to 100 due to rounding.
-- = No taxa.
% = Percent..
0 = Present but in small numbers (>0 to 0.5%).
EPT = Ephemeroptera, Plecoptera, and Trichoptera.
ERM = Emory River mile.
CRM = Clinch River mile.
Ref = Reference.
TRM = Tennessee River mile.

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Table 4-7. Emory River ANOVA Results

Tennessee Valley Authority **Kingston, Tennessee**

Benthic Metrics	Kruskal-Wallis p-Value	Wilcoxon One-Sided p-Value Comparison to Reference					
		ERM 5.0	ERM 4.1	ERM 3.0	ERM 2.6	ERM 2.2	ERM 1.0
Number of Organisms	0.000	0.172	0.997	0.999	0.999	0.997	1.000
Number of Taxa	0.000	0.221	0.997	0.999	1.000	0.998	1.000
Number of EPT Taxa	0.037	0.706	0.989	0.801	0.987	0.998	0.971
Shannon Diversity	0.010	0.560	0.971	0.998	0.998	0.975	0.979
Tolerance Index	0.284	0.914	0.661	0.956	0.973	0.974	0.966
% 2 Dominant Taxa	0.482	0.689	0.689	0.786	0.935	0.864	0.849
% Oligochaetes	0.010	0.828	0.367	0.052	0.367	0.904	0.020
% Chironomids	0.834	0.752	0.395	0.740	0.864	0.526	0.474
% Shredder	0.814	0.724	0.391	0.579	0.593	0.365	0.229
% Clinger	0.344	0.710	0.549	0.815	0.282	0.619	0.238

Benthic Metrics	Means						
	Emory Ref	ERM 5.0	ERM 4.1	ERM 3.0	ERM 2.6	ERM 2.2	ERM 1.0
Number of Organisms	452	348	2140	2172	2137	2073	1570
Number of Taxa	5.90	5.40	11.30	11.90	13.30	12.55	11.15
Number of EPT Taxa	0.30	0.50	1.10	0.50	0.90	0.95	0.90
Shannon Diversity	2.05	2.06	2.47	2.61	2.96	2.51	2.57
Tolerance Index	8.10	7.80	8.00	7.50	7.60	7.50	7.70
% 2 Dominant Taxa	68.8	63.9	64.0	61.4	53.0	60.1	61.4
% Oligochaetes	18.8	13.5	26.4	37.8	19.8	14.1	35.9
% Chironomids	47.7	55.9	47.0	55.3	58.1	50.1	49.5
% Shredder	8.43	17.35	3.51	7.71	9.21	4.23	4.09
% Clinger	2.21	6.75	1.95	2.92	1.33	3.93	0.84
Number of Samples	10	10	10	10	10	20	20

= Shading indicates significance at $p \leq 0.10$.

% = Percent.

ANOVA = Analysis of Variance.

EPT = Ephemeroptera, Plecoptera, and Trichoptera.

ERM = Emory River mile.

Ref = Reference.

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Table 4-8. Emory River Linear Regression Results

Tennessee Valley Authority Kingston, Tennessee

Benthic Metrics	Intercept	Slope (% Ash)	Significance of % Ash (p-Value)	Comments
Number of Organisms[1]	43.866	-0.194	0.036	Metric significantly decreases with increasing ash.
Number of Taxa	13.106	-0.054	0.046	Metric significantly decreases with increasing ash.
Number of EPT taxa	0.745	0.002	0.505	No consistent relationship.
Shannon Diversity	2.595	-0.00248	0.3382	No consistent relationship.
Tolerance Index	7.534	0.004	0.200	No consistent relationship.
% 2 Dominant Taxa	59.815	0.019	0.767	No consistent relationship.
% Oligochaetes	26.986	-0.128	0.143	No consistent relationship.
% Chironomids	55.522	-0.141	0.125	Metric tends to decrease with increasing ash but not significantly.
% Shredder[1]	0.193	-0.00017	0.8656	No consistent relationship.
% Clinger[1]	0.119	-0.00088	0.1785	No consistent relationship.

[1] Data log transformed.

Shading indicates significance at $p \leq 0.10$.

% = Percent.

EPT = Ephemeroptera, Plecoptera, and Trichoptera.

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Table 4-9. Clinch River ANOVA Results

Tennessee Valley Authority **Kingston, Tennessee**

Benthic Metric	Kruskal-Wallis p-Value	Wilcoxon One-Sided p-Value Comparison to Reference			
		CRM 4.0	CRM 3.0	CRM 1.5	CRM 0.5
Number of Organisms	0.004	0.082	0.002	0.008	0.007
Number of Taxa	0.008	0.623	0.008	0.013	0.061
Number of EPT Taxa	0.468	0.693	0.838	0.256	0.838
Shannon Diversity	0.128	0.914	0.174	0.100	0.519
Tolerance Index	0.047	0.842	0.941	0.454	0.998
% 2 Dominant Taxa	0.190	0.913	0.287	0.255	0.882
% Oligochaetes	0.000	1.000	1.000	1.000	1.000
% Chironomids	0.409	0.787	0.885	0.706	0.525
% Shredder	0.000	0.018	0.000	0.009	0.005
% Clinger	0.000	0.078	0.000	0.224	0.000

Benthic Metric	Means				
	Clinch Ref	CRM 4.0	CRM 3.0	CRM 1.5	CRM 0.5
Number of Organisms	2268	1640	1207	981	1297
Number of Taxa	15.60	16.30	11.20	9.57	12.50
Number of EPT Taxa	1.00	1.10	1.20	0.71	1.20
Shannon Diversity	2.74	3.16	2.65	2.43	2.91
Tolerance Index	7.23	6.90	6.80	7.20	6.60
% 2 Dominant Taxa	59.0	49.7	60.2	61.9	50.9
% Oligochaetes	43.2	28.7	11.9	14.8	17.3
% Chironomids	39.0	44.6	45.6	43.0	35.6
% Shredder	4.47	1.57	0.10	2.60	0.95
% Clinger	10.56	3.62	0.78	16.12	0.61
Number of Samples	30	10	10	7	10

Shading indicates significance at $p \leq 0.10$.

% = Percent.
ANOVA = Analysis of Variance.
CRM = Clinch River mile.
EPT = Ephemeroptera, Plecoptera, and Trichoptera.
Ref = Reference.

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Table 4-10. Tennessee River ANOVA Results

Tennessee Valley Authority **Kingston, Tennessee**

Benthic Metric	Kruskal-Wallis p-Value	Wilcoxon One-Sided p-Value Comparison to Reference	
		TR 566.3	TR 560.8
Number of Organisms	0.106	0.236	0.038
Number of Taxa	0.002	0.577	0.002
Number of EPT Taxa	0.283	0.072	0.183
Shannon Diversity	0.007	0.992	0.236
Tolerance Index	0.011	0.004	0.019
% 2 Dominant Taxa	0.013	0.973	0.172
% Oligochaetes	0.223	0.106	0.688
% Chironomids	0.051	0.988	0.968
% Shredder	0.111	0.257	0.017
% Clinger	0.718	0.748	0.748

Benthic Metric	Means		
	Tenn Ref	TRM 566.3	TRM 560.8
Number of Organisms	1835	1315	930
Number of Taxa	10.60	11.00	8.20
Number of EPT Taxa	1.40	1.10	1.20
Shannon Diversity	2.39	2.85	2.27
Tolerance Index	6.20	7.30	6.80
% 2 Dominant Taxa	62.7	50.1	67.4
% Oligochaetes	8.7	15.7	6.6
% Chironomids	32.5	48.8	47.7
% Shredder	0.55	1.46	0.00
% Clinger	0.08	0.35	0.35
Number of Samples	10	10	10

Shading indicates significance at $p \leq 0.10$.

% = Percent.
ANOVA = Analysis of Variance.
EPT = Ephemeroptera, Plecoptera, and Trichoptera.
Ref = Reference.
TRM = Tennessee River mile.

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Table 4-11. Overall Summary of Toxicity Tests at 100% Site Sediment

Tennessee Valley Authority Kingston, Tennessee

Type of Test	Species	ERM 0.5	ERM 0.8	ERM 1.0	ERM 2.5	ERM 3.0	ERM 3.5	ERM 4.0	ERM 5.5
Long-term	*Ceriodaphnia dubia*	NS	NS	NS	NS	NS	NS	NS	NS
Screening 10-day	*Chironomus dilutus*	**G, B**	**G, B**	NS	**S, G, B**	**G, B**	**S, G, B**	**G, B**	**G, B**
	Hyalella azteca	**G**	NS	NS	**S, G, B**	**S, G, B**	**S, G, B**	**G, B**	**S, G, B**
Long-term	*Chironomus dilutus*	**G, B, E**	—	**G, B, E**	**S, G, B, E**	—	**G, B, E**	—	—
	Hyalella azteca	—	—	**G, B**	**S, G, B**	—	**S, G, B**	—	**G, B**

Type of Test	Species	CRM 0.0	CRM 1.5	CRM 2.0	CRM 2.5	CRM 3.0	CRM 3.5	CRM 4.0	CRM 4.5
Long-term	*Ceriodaphnia dubia*	NS	NS	NS	NS	NS	NS	NS	NS
Screening 10-day	*Chironomus dilutus*	NS	NS	**B**	NS	NS	NS	**G, B**	NS
	Hyalella azteca	NS	**G, B**	NS	**G**	NS	NS	NS	**G**
Long-term	*Chironomus dilutus*	—	**S, E**	NS	—	NS	—	NS	—
	Hyalella azteca	—	**G, B**	—	NS	NS	—	—	**G, B**

— = Not tested.
CRM = Clinch River mile.
ERM = Emory River mile.
NS = Not significant.
Bold = Significant differences relative to the reference for survival (S), growth (G), emergence (E) or biomass (B).

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Table 4-12. Results of 10-Day Screening Tests for Emory River Sediments
Tennessee Valley Authority Kingston, Tennessee

Endpoints for *Chironomus dilutus*	Control	Reference	ERM 0.5	ERM 0.8	ERM 1.0	ERM 2.5	ERM 3.0	ERM 3.5	ERM 4.0	ERM 5.5
% Survival	98	99	100	95	98	70	100	88	100	100
% Reduction - Survival	NA	NA	-1	4	1	29	-1	11	-1	-1
Growth (mg)	1.181	1.343	0.99	1.18	1.29	0.83	1.07	0.93	1.02	1.14
% Reduction- Growth	NA	NA	26	12	4	38	20	31	24	15
Biomass (mg)	1.152	1.326	0.99	1.10	1.26	0.56	1.07	0.80	1.02	1.14
% Reduction Biomass	NA	NA	25	17	5	58	19	40	23	14

Endpoints for *Hyalella azteca*	Control	Reference	ERM 0.5	ERM 0.8	ERM 1.0	ERM 2.5	ERM 3.0	ERM 3.5	ERM 4.0	ERM 5.5
% Survival	98	94	93	95	89	48	49	25	88	74
% Reduction - Survival	NA	NA	1	-1	5	49	48	73	7	21
Growth (mg)	0.121	0.118	0.10	0.12	0.12	0.07	0.10	0.08	0.10	0.08
% Reduction- Growth	NA	NA	14	2	-1	40	17	28	18	30
Biomass (mg)	0.118	0.109	0.10	0.11	0.11	0.03	0.05	0.02	0.09	0.06
% Reduction Biomass	NA	NA	13	0	1	71	56	81	22	44

Toxicity test method: EPA Methods 100.1 & 100.2, EPA 600/R-99/064.
% = Percent.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
Shaded cells indicate significance at $p \leq 0.05$.
ERM = Emory River mile.
mg = Milligrams.
NA = Not applicable.

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Table 4-13. Insect Larvae Emory River Sediment Dilutuion Series Endpoint Results

Tennessee Valley Authority **Kingston, Tennessee**

			10% Site Sediment				20% Site Sediment				40% Site Sediment			
	Control	**Reference**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**
Growth	1.252	1.338	1.50	1.35	1.30	1.34	1.11	1.15	1.28	1.14	1.12	1.06	1.23	1.30
% reduction Growth	NA	NA	-12	-1	3	0	17	14	5	15	16	21	8	3
Biomass	1.201	1.311	1.21	1.23	1.21	1.23	1.09	1.10	1.25	1.08	1.12	0.99	1.23	1.27
% reduction Biomass	NA	NA	8	6	8	6	17	16	5	18	14	25	6	3
20-day % Survival	96	98	85	92	93	94	98	96	98	96	100	94	100	98
% reduction Survival	NA	NA	13	6	5	4	0	2	0	2	-2	4	-2	0
PLC % Survival	88	77	76	75	80	88	69	64	75	81	64	68	72	74
% reduction PLC survival	NA	NA	1	3	-4	-13	11	18	3	-5	18	12	7	4
PLC Emergence	0.865	0.771	0.76	0.71	0.80	0.88	0.69	0.64	0.74	0.79	0.64	0.66	0.72	0.74
% reduction PLC emergence			1	8	-4	-13	11	18	4	-3	18	15	7	4

			60% Site Sediment				80% Site Sediment				100 % Site Sediment			
	Control	**Reference**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 0.5**
Growth	1.252	1.338	0.97	0.79	1.29	1.09	0.76	0.66	1.03	1.04	0.67	0.89	0.98	0.81
% reduction Growth	NA	NA	28	41	3	19	43	50	23	22	50	33	27	39
Biomass	1.201	1.311	0.86	0.75	1.14	1.05	0.63	0.56	1.01	1.02	0.61	0.42	0.90	0.75
% reduction Biomass	NA	NA	35	43	13	20	52	57	23	22	53	68	32	43
20-day % Survival	96	98	90	96	90	96	83	85	98	98	92	50	92	94
% reduction Survival	NA	NA	8	2	8	2	15	13	0	0	6	49	6	4
PLC % Survival	88	77	50	40	68	67	42	24	41	57	26	22	39	48
% reduction PLC survival	NA	NA	35	49	12	13	46	69	47	26	66	72	50	38
PLC Emergence	0.865	0.771	0.47	0.40	0.66	0.65	0.40	0.24	0.41	0.51	0.26	0.22	0.39	0.48
% reduction PLC emergence	NA	NA	39	49	15	16	49	69	47	34	66	72	50	38

Toxicity test method: EPA Methods 100.5 modified for test duration and endpoints for *Chironomus dilutus* and EPA 600/R/-99/064.

% = Percent.

Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.

Shaded cells indicate significance at $p \leq 0.05$.

ERM = Emory River mile.

mg = Milligrams.

NA = Not applicable.

PLC = Partial life cycle.

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Table 4-14. Amphipod Emory River Sediment Dilution Series Endpoint Results

Tennessee Valley Authority **Kingston, Tennessee**

			10% Site Sediment				20% Site Sediment				40% Site Sediment			
	Control	**Reference**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**
Growth (mg)	0.48839	0.39924	0.39	0.40	0.32	0.39	0.38	0.33	0.30	0.37	0.31	0.31	0.30	0.39
% reduction Growth	NA	NA	2	-1	20	2	4	18	26	7	22	23	25	3
Biomass (mg)	0.47613	0.37525	0.37	0.38	0.30	0.38	0.35	0.32	0.30	0.35	0.30	0.28	0.29	0.38
% reduction Biomass	NA	NA	1	-2	19	-2	7	16	21	7	19	25	23	-1
%Survival	98	95	95	95	95	98	91	96	100	95	98	90	98	99
% reduction Survival	NA	NA	0	0	0	-3	4	-1	-5	0	-3	5	-3	-4

			60% Site Sediment				80% Site Sediment				100 % Site Sediment			
	Control	**Reference**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**	**ERM 5.5**	**ERM 3.5**	**ERM 2.5**	**ERM 1.0**
Growth (mg)	0.48839	0.39924	0.30	0.23	0.25	0.34	0.32	0.23	0.25	0.31	0.28	0.26	0.31	0.29
% reduction Growth	NA	NA	24	43	37	14	20	42	37	23	29	35	22	27
Biomass (mg)	0.47613	0.37525	0.30	0.20	0.23	0.33	0.29	0.21	0.20	0.28	0.27	0.15	0.08	0.26
% reduction Biomass	NA	NA	21	47	40	11	23	43	46	27	29	60	78	31
%Survival	98	95	98	89	89	98	91	93	83	91	95	59	43	90
% reduction Survival	NA	NA	-3	7	7	-3	4	3	13	4	0	38	55	5

Toxicity test method: EPA Methods 100.1 modified for test duration and *Hyalella azteca* age at test start and EPA 600/R/-99/064.

% = Percent.

Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.

Shaded cells indicate significance at $p \leq 0.05$.

ERM - Emory River mile.

mg = Milligrams.

NA = Not applicable.

Toxicity test method: EPA Methods 100.5 modified for test duration and endpoints for *Chironomus dilutus* and EPA 600/R/-99/064.

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Table 4-15. Results of 10-Day Screening Tests for Clinch River Sediments

Tennessee Valley Authority **Kingston, Tennessee**

Endpoints for *Chironomus dilutus*	**Control**	**Reference**	**CRM 0.0**	**CRM 1.5**	**CRM 2.0**	**CRM 2.5**	**CRM 3.0**	**CRM 3.5**	**CRM 4.0**	**CRM 4.5**
% Survival	94	100	100	90	98	99	99	100	93	98
% Reduction - Survival	NA	NA	0	10	3	1	1	0	8	3
Growth (mg)	0.997	0.7789	0.817	0.887	0.678	0.717	0.905	0.819	0.567	0.766
% Reduction- Growth	NA	NA	-5	-14	13	8	-16	-5	27	2
Biomass (mg)	0.932	0.7789	0.817	0.77	0.66	0.71	0.89	0.82	0.51	0.75
% Reduction Biomass	NA	NA	-5	1	15	9	-15	-5	34	4

Endpoints for *Hyalella azteca*	**Control**	**Reference**	**CRM 0.0**	**CRM 1.5**	**CRM 2.0**	**CRM 2.5**	**CRM 3.0**	**CRM 3.5**	**CRM 4.0**	**CRM 4.5**
% Survival	97	95	100	99	100	100	96	99	88	100
% Reduction- Survival	NA	NA	-5	-4	-5	-5	-1	-4	8	-5
Growth (mg)	0.113	0.105	0.103	0.0809	0.089	0.086	0.090	0.094	0.092	0.086
% Reduction- Growth	NA	NA	2	23	15	19	14	10	13	19
Biomass (mg)	0.109	0.100	0.103	0.08	0.089	0.086	0.087	0.093	0.086	0.086
% Reduction Biomass	NA	NA	-3	20	11	14	13	7	14	15

Toxicity test method: EPA Methods 100.1 & 100.2, EPA 600/R-99/064.
% = Percent.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
Shaded cells indicate significance at $p \leq 0.05$.
CRM = Clinch River mile.
mg = Milligrams.
NA = Not applicable.

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Table 4-16. Insect Larvae Clinch River Sediment Dilution Series Endpoint Results

Tennessee Valley Authority **Kingston, Tennessee**

			10% Site Sediment				20% Site Sediment				40% Site Sediment			
	Control	**Reference**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**
Growth (mg)	1.09	0.996	1.07	1.27	1.21	1.03	1.19	1.57	1.02	1.00	1.02	1.14	1.14	0.95
% reduction Growth	NA	NA	-7	-27	-22	-3	-20	-58	-2	0	-2	-14	-14	5
Biomass (mg)	0.94	0.9	1.07	0.92	1.10	1.03	1.13	1.05	1.02	0.93	0.93	1.01	1.11	0.91
% reduction Biomass	NA	NA	-5	-2	-22	-14	-26	-17	-13	-4	-4	-12	-23	-1
20-d % Survival	88	92	100	83	92	100	96	75	100	94	94	92	98	96
% reduction Survival	NA	NA	-9	9	0	-9	-4	18	-9	-2	-2	0	-7	-4
PLC % Survival	75	78	72	75	78	83	74	72	79	78	79	78	80	76
% reduction PLC survival	NA	NA	4	4	0	-7	8	8	-1	0	5	0	-3	3
PLC Emergence	0.75	0.781	0.69	0.71	0.75	0.78	0.72	0.67	0.79	0.72	0.77	0.72	0.79	0.75
% reduction PLC emergence	NA	NA	4	9	4	0	12	15	-1	8	8	8	-1	4

			60% Site Sediment				80% Site Sediment				100% Site Sediment			
	Control	**Reference**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**	**CRM 4.0**	**CRM 3.0**	**CRM 2.0**	**CRM 1.5**
Growth (mg)	1.09	0.996	1.17	1.27	1.07	0.94	1.28	1.13	1.20	1.10	1.06	1.32	1.21	1.18
% reduction Growth	NA	NA	-18	-28	-7	6	-29	-14	-21	-10	-6	-33	-21	-19
Biomass (mg)	0.94	0.9	1.12	1.10	1.02	0.90	1.28	1.05	1.17	1.02	0.97	1.29	1.06	1.10
% reduction Biomass	NA	NA	-25	-22	-13	0	-43	-17	-31	-13	-8	-44	-18	-22
20-d % Survival	88	92	96	88	96	96	100	94	98	94	94	98	90	94
% reduction Survival	NA	NA	-4	5	-4	-4	-9	-2	-7	-2	-2	-7	2	-2
PLC % Survival	75	78	73	73	77	78	74	74	75	68	60	76	74	53
% reduction PLC survival	NA	NA	7	7	1	0	5	5	4	13	23	3	5	32
PLC Emergence	0.75	0.781	0.73	0.70	0.70	0.73	0.72	0.73	0.73	0.62	0.60	0.73	0.74	0.53
% reduction PLC emergence	NA	NA	7	11	11	7	8	7	7	21	23	7	5	32

Toxicity test method: EPA Methods 100.5 modified for test duration and endpoints for *Chironomus dilutus* and EPA 600/R/-99/064.
% = Percent.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
Shaded cells indicate significance at $p \leq 0.05$.
CRM = Clinch River mile.
mg = Milligrams.
NA = Not applicable.
PLC = Partial life cycle.

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Table 4-17. Amphipod Clinch River Sediment Dilution Series Endpoint Results
Tennessee Valley Authority Kingston, Tennessee

			10% Site Sediment				20% Site Sediment				40% Site Sediment			
	Control	Reference	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5
Growth (mg)	0.42891	0.331	0.33	0.30	0.33	0.27	0.33	0.29	0.35	0.31	0.26	0.38	0.28	0.25
% reduction Growth	NA	NA	1	9	1	20	1	12	-6	7	21	-14	16	24
Biomass (mg)	0.40138	0.298	0.32	0.30	0.31	0.25	0.32	0.28	0.34	0.27	0.23	0.38	0.27	0.22
% reduction Biomass	NA	NA	-9	0	-6	15	-7	6	-13	9	23	-27	10	25
%Survival	94	91	99	99	96	95	98	98	96	89	88	100	96	90
% reduction Survival	NA	NA	-8	-8	-5	-4	-7	-7	-5	3	4	-10	-5	1

			60% Site Sediment				80% Site Sediment				100 % Site Sediment			
	Control	Reference	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5	CRM 4.5	CRM 3.0	CRM 2.5	CRM 1.5
Growth (mg)	0.42891	0.331	0.28	0.31	0.26	0.25	0.21	0.29	0.25	0.23	0.21	0.27	0.27	0.23
% reduction Growth	NA	NA	17	6	22	23	36	13	26	29	37	19	18	30
Biomass (mg)	0.40138	0.298	0.27	0.28	0.25	0.23	0.20	0.27	0.24	0.19	0.20	0.26	0.26	0.21
% reduction Biomass	NA	NA	8	6	17	23	34	11	19	35	32	12	14	31
%Survival	94	91	99	93	96	90	91	94	99	83	98	98	95	90
% reduction Survival	NA	NA	-8	-1	-5	1	0	-3	-8	10	-7	-7	-4	1

Toxicity test method: EPA Methods 100.1 modified for test duration and *H. azteca* age at test start and EPA 600/R/-99/064.
% = Percent.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
Shaded cells indicate significance at $p \leq 0.05$.
CRM = Clinch River mile.
mg = Milligrams.
NA = Not applicable.

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Table 4-18. Emory River Amphipod 28-Day and Insect Larvae Partial Life Cycle Test Results (in % Site Sediment)
Tennessee Valley Authority Kingston, Tennessee

	ERM 0.5			ERM 1.0			ERM 2.5			ERM 3.5		
C. dilutus	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**
20-d Survival	100	>100	>100	100	>100	>100	80	100	86.8	100	>100	>100
20-d Growth	60	80	83.2	60	80	90.3	10	20	43.9	40	60	46.9
20-d Biomass	80	100	82.8	60	80	84.9	10	20	40.5	40	60	49.9
PLC Survival	80	100	70.6	60	80	66.6	40	60	46	40	60	48.5
PLC Emergence	60	80	64.2	60	80	65.4	40	60	45.4	40	60	46.9

	ERM 1.0			ERM 2.5			ERM 3.5			ERM 5.5		
H. azteca	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**
Survival	100	>100	>100	80	100	84.9	80	100	91.9	100	>100	>100
Growth	60	80	88	<10	10	19.5	20	40	41.6	20	40	88.7
Biomass	60	80	77.1	<10	10	42.7	20	40	37.8	20	40	86

EPA Method 100.1 and 100.5 (modified for test duration, endpoints, test organism age) EPA 600/R-99/064.
IC_{25} = Percent of site sediment which resulted in 25% inhibition.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
d = Day.
ERM = Emory River mile.
LOEC = Lowest observed effects concentration.
NOEC = No observed effects concentration.
PLC = Partial life cycle.
% = Percent.

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Table 4-19. Clinch River Amphipod 28-Day and Insect Larvae Partial Life Cycle Test Results (in % Site Sediment)
Tennessee Valley Authority Kingston, Tennessee

	CRM 1.5			CRM 2.0			CRM 3.0			CRM 4.0		
C. dilutus	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**
20-d Survival	100	>100	>100	100	>100	>100	100	>100	>100	100	>100	>100
20-d Growth	100	>100	>100	100	>100	>100	100	>100	>100	100	>100	>100
20-d Biomass	100	>100	>100	100	>100	>100	100	>100	>100	100	>100	>100
PLC Survival	80	>100	89.8	100	>100	>100	100	>100	>100	100	>100	>100
PLC Emergence	80	>100	86.9	100	>100	>100	100	>100	>100	100	>100	>100

	CRM 1.5			CRM 2.5			CRM 3.0			CRM 4.5		
H. azteca	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**	**NOEC**	**LOEC**	**IC_{25}**
Survival	100	>100	>100	100	>100	>100	100	>100	>100	100	>100	>100
Growth	20	40	64.9	100	>100	>100	100	>100	>100	60	80	67.3
Biomass	20	40	62	100	>100	>100	100	>100	>100	60	80	65.7

EPA Method 100.1 and 100.5 (modified for test duration, endpoints, test organism age) EPA 600/R-99/064.
IC_{25} = Percent of site sediment which resulted in 25% inhibition.
Biomass = Dry weight (mg) of the surviving organisms divided by the initial number of organisms.
d = Day.
CRM = Clinch River mile.
LOEC = Lowest observed effects concentration.
NOEC = No observed effects concentration.
PLC = Partial life cycle.
% = Percent.

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Table 4-20. Pearson Correlations for Emory River and Clinch River 10-Day Screening Tests

Tennessee Valley Authority **Kingston, Tennessee**

Analytes	Ash	Chironomid Biomass	Chironomid Growth	Chironomid Survival	Hyalella Biomass	Hyalella Growth	Hyalella Survival
Ash	1	0.67637	0.56554	0.68706	0.64355	0.51261	0.64934
Aluminum	0.09228	-0.26595	**-0.436**	0.19333	-0.05191	0.26732	-0.25364
Arsenate speciation	0.81017	0.7373	0.60642	0.82835	0.75551	0.60531	0.75129
Arsenic	0.88727	0.56031	**0.44007**	0.68552	0.73166	0.57715	0.72093
Arsenic speciation	0.89858	0.66703	0.53174	0.80532	0.73634	0.62512	0.71603
Arsenite speciation	0.76251	**0.40677**	0.38795	0.30841	0.63989	0.38519	0.68658
Barium	0.83021	0.37782	0.21876	0.647	0.39413	**0.44478**	0.32562
Beryllium	0.79197	0.31224	0.17376	0.55344	**0.40878**	**0.42745**	0.34276
Boron	0.79273	**0.44628**	0.24645	0.80727	0.50448	0.55739	**0.42152**
Chromium	0.58615	0.21332	0.02043	0.58073	**0.45694**	0.51321	0.35839
Cobalt	0.00597	-0.29827	**-0.4294**	0.08083	-0.1424	0.13557	-0.2946
Copper	0.49475	0.13677	-0.09147	0.54202	0.27486	0.48427	0.09732
Inorganic Arsenic speciation	0.88781	0.68718	0.56276	0.77664	0.74875	0.57991	0.75828
Inorganic Mercury speciation	-0.28492	-0.35313	-0.50816	0.03098	-0.14779	0.19653	-0.36026
Inorganic Selenium speciation	0.72058	0.58302	0.49487	0.59812	0.85908	0.56678	0.89065
Iron	-0.02713	-0.41741	-0.5438	-0.01568	-0.28337	0.00299	-0.42294
Lead	-0.01563	-0.30457	-0.5031	0.22137	-0.01859	0.2731	-0.21744
Manganese	-0.39	-0.60492	-0.74655	-0.11717	-0.30624	-0.00674	-0.47788
Mercury	-0.3008	-0.37574	-0.53309	0.04069	-0.35986	-0.06423	-0.49556
Mercury speciation	-0.28527	-0.35403	-0.50898	0.03023	-0.14984	0.19463	-0.36198
Methyl mercury speciation	-0.16029	-0.3935	-0.35873	-0.33438	-0.69497	-0.73326	-0.53964
Nickel	**0.41984**	0.05282	-0.10346	0.38649	0.2423	0.3828	0.12464
Organic Arsenic speciation	0.69895	0.58228	0.55691	**0.4371**	0.85709	0.52191	0.91005
Organic Selenium speciation	0.49162	0.36425	0.35259	0.30577	-0.03337	0.07651	-0.03182
Selenate speciation	-0.43286	-0.60806	-0.65318	-0.27852	-0.52353	-0.2998	-0.58814
Selenite speciation	0.72058	0.58302	0.49487	0.59812	0.85908	0.56678	0.89065
Selenium	0.74589	0.33131	0.18553	0.51627	0.35218	0.24974	0.36683
Selenium speciation	0.88785	0.63528	0.57226	0.62127	0.51743	**0.42011**	0.53695
Strontium	0.91786	0.49939	0.38507	0.64555	0.48638	**0.40789**	0.48562
Vanadium	0.71076	0.25692	0.07442	0.6112	0.35173	**0.4643**	0.24412
Zinc	-0.36423	-0.45056	-0.57797	-0.09268	-0.29918	0.04333	-0.48494
AVS	-0.33406	-0.32158	-0.30599	-0.25901	-0.52517	-0.28481	-0.61748
SEM SUM	0.11136	-0.16477	-0.24935	0.00191	0.14212	0.09428	0.07949
SEM- AVS	0.22792	-0.07281	-0.16874	0.086	0.32291	0.1936	0.28554

Notes:

Sample size includes those 18 sediment samples used in the Emory and Clinch Rivers 10-day screening tests (except AVS/SEM has 17 samples).

Toxicity test endpoints included percent reduction from reference.

= Shading indicates significance at $p \leq 0.05$, a likely relationship.

AVS = Acid volatile sulfide.

SEM = Sequentially extracted metals.

Bold significant at $p < 0.10$.

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Table 4-21. Pearson Correlations for Emory River 10-Day Screening Tests

Tennessee Valley Authority **Kingston, Tennessee**

Analytes	Ash	Chironomid Biomass	Chironomid Growth	Chironomid Survival	Hyalella Biomass	Hyalella Growth	Hyalella Survival
Ash	1	0.747	**0.623**	0.755	**0.613**	0.500	**0.652**
Aluminum	0.471	0.554	0.528	0.423	0.315	0.425	0.233
Arsenate speciation	0.843	0.899	0.760	0.933	0.740	0.682	0.729
Arsenic	0.945	0.818	0.698	0.816	0.788	**0.623**	0.830
Arsenic speciation	0.921	0.875	0.732	0.916	0.753	0.687	0.750
Arsenite speciation	0.789	0.512	0.504	0.377	0.732	0.412	0.841
Barium	0.948	0.791	**0.656**	0.811	0.484	0.461	0.491
Beryllium	0.953	0.748	**0.629**	0.750	0.559	0.456	**0.590**
Boron	0.916	0.887	0.727	0.944	**0.638**	**0.621**	**0.627**
Chromium	0.810	0.816	0.721	0.744	0.715	**0.592**	0.753
Cobalt	-0.022	0.119	0.095	0.084	-0.188	0.009	-0.263
Copper	0.952	0.807	0.684	0.794	**0.610**	0.516	**0.640**
Inorganic Arsenic speciation	0.919	0.877	0.744	0.888	0.767	**0.638**	0.799
Inorganic Mercury speciation	-0.108	-0.123	-0.064	-0.178	0.161	0.372	0.003
Inorganic Selenium speciation	0.704	0.687	**0.627**	**0.636**	0.868	**0.609**	0.929
Iron	0.057	-0.014	-0.010	-0.080	-0.317	-0.181	-0.348
Lead	0.474	**0.660**	0.570	**0.643**	0.671	**0.615**	**0.642**
Manganese	-0.555	-0.574	-0.453	-0.648	-0.277	-0.139	-0.375
Mercury	0.256	-0.030	-0.080	0.012	-0.512	-0.443	-0.474
Mercury speciation	-0.110	-0.128	-0.070	-0.180	0.154	0.367	-0.003
Methyl mercury speciation	-0.283	-0.706	-0.799	-0.412	-0.883	-0.929	-0.744
Nickel	**0.601**	0.685	**0.591**	**0.627**	0.437	0.437	0.435
Organic Arsenic speciation	0.687	**0.605**	**0.583**	0.496	0.861	**0.597**	0.911
Organic Selenium speciation	0.496	0.426	0.325	0.476	-0.143	0.101	-0.214
Selenate speciation	-0.779	-0.644	-0.600	-0.542	-0.659	-0.525	-0.697
Selenite speciation	0.704	0.687	**0.627**	**0.636**	0.868	**0.609**	0.929
Selenium	0.866	0.580	0.457	**0.599**	0.348	0.164	0.448
Selenium speciation	0.932	0.813	0.674	0.847	0.528	0.499	0.541
Strontium	0.983	0.771	**0.633**	0.802	0.554	0.451	**0.596**
Vanadium	0.923	0.819	0.685	0.819	0.558	0.521	0.565
Zinc	-0.640	-0.346	-0.268	-0.425	-0.491	-0.245	-0.597
SEM SUM	0.160	0.001	0.088	-0.145	0.291	-0.084	0.485
SEM-AVS	0.336	0.100	0.164	-0.028	0.469	0.082	**0.658**

Note: Sample size includes those 9 sediment samples used in the Emory River 10-day screening tests (Except AVS/SEM has 8 samples).
Toxicity test endpoints included percent reduction from reference.
Shading indicates significance at $p \leq 0.05$, a likely relationship.

AVS = Acid volatile sulfide.
SEM = Sequentially extracted metals.
Bold significant at $p < 0.10$.

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Table 4-22. Pearson Correlations for Emory River and Clinch River Long-Term Tests

Tennessee Valley Authority **Kingston, Tennessee**

Analytes	Ash[1]	C. dilutus IC_{25} 20-d Survival[2]	C. dilutus IC_{25} 20-d Growth[2]	C.dilutus IC_{25} 20-d Biomass[2]	C.dilutus IC_{25} Survival[2]	C.dilutus IC_{25} Emergence[2]	H. azteca IC_{25} Survival[2]	H. azteca IC_{25} Growth[2]	H. azteca IC_{25} Biomass[2]
Ash	1	-0.8182	-0.91742	-0.93401	-0.80785	-0.77238	-0.95415	-0.85314	-0.75775
Aluminum	0.09228	0.01359	0.31843	0.32567	0.34378	0.34693	0.30193	-0.00177	-0.00641
Arsenate speciation	0.81017	-0.89372	-0.91847	-0.93234	-0.79793	-0.76535	-0.99368	-0.88626	-0.73594
Arsenic	0.88727	-0.76146	-0.9511	-0.9558	-0.83362	-0.79263	-0.91393	-0.87213	-0.78456
Arsenic speciation	0.89858	-0.87757	-0.91979	-0.93608	-0.79834	-0.76	-0.97421	-0.86579	-0.72299
Arsenite speciation	0.76251	-0.25724	-0.81423	-0.78542	**-0.70573**	**-0.672**	-0.56298	-0.59269	**-0.65433**
Barium	0.83021	-0.93244	-0.76218	-0.79845	**-0.68804**	**-0.65702**	-0.83129	-0.74429	-0.5804
Beryllium	0.79197	-0.90371	-0.74123	-0.77386	**-0.64049**	-0.5951	-0.78965	-0.72582	-0.56954
Boron	0.79273	-0.92833	-0.80881	-0.82396	**-0.66695**	**-0.63185**	-0.89765	-0.87546	-0.71354
Chromium	0.58615	-0.37233	**-0.67346**	**-0.63799**	-0.54158	-0.51164	-0.61933	-0.7762	-0.80062
Cobalt	0.00597	0.13139	0.36757	0.35917	0.29778	0.29505	0.47834	0.28517	0.25452
Copper	0.49475	-0.32074	-0.13391	-0.12696	-0.09009	-0.08305	-0.24814	-0.47258	-0.44423
Inorganic Arsenic speciation	0.88781	-0.78397	-0.97122	-0.97409	-0.84771	-0.8126	-0.95768	-0.88515	-0.78715
Inorganic Mercury speciation	-0.28492	0.2246	0.44591	0.46429	0.42416	0.40356	0.4653	0.15575	0.10078
Inorganic Selenium speciation	0.72058	**-0.65296**	-0.90409	-0.88583	-0.72264	**-0.67569**	-0.93732	-0.87802	-0.81839
Iron	-0.02713	0.32726	0.60879	0.60061	0.51517	0.50384	0.57634	0.38643	0.33025
Lead	-0.01563	0.03171	0.25536	0.27425	0.30292	0.30654	0.26169	-0.05397	-0.07198
Manganese	-0.39	0.31012	0.53576	0.55228	0.50146	0.4815	0.56897	0.25544	0.18935
Mercury	-0.3008	0.27502	0.58323	0.601	0.59124	0.57558	0.39682	0.12369	0.08659
Mercury_speciation	-0.28527	0.22532	0.44742	0.46564	0.42512	0.40451	0.4664	0.15667	0.1015
Methyl mercury speciation	-0.16029	0.4747	0.66597	0.60692	0.38992	0.37504	0.54179	0.46941	0.32866
Nickel	**0.41984**	-0.27634	-0.38483	-0.37627	-0.3468	-0.32129	-0.38782	-0.52273	-0.53697
Organic Arsenic speciation	0.69895	-0.60832	-0.9557	-0.94687	-0.842	-0.8009	-0.88953	-0.82358	-0.79238
Organic Selenium speciation	0.49162	-0.53045	-0.41549	-0.4712	-0.50647	-0.51585	-0.53721	-0.35653	-0.2087
Selenate speciation	-0.43286	0.38844	0.85973	0.85018	0.85172	0.8581	0.59754	0.53303	0.52405
Selenite speciation	0.72058	**-0.65296**	-0.90409	-0.88583	-0.72264	**-0.67569**	-0.93732	-0.87802	-0.81839
Selenium	0.74589	**-0.69514**	-0.74141	-0.7772	-0.80277	-0.78226	**-0.6722**	-0.74228	-0.71831
Selenium speciation	0.88785	-0.75453	-0.83489	-0.86955	-0.79789	-0.76926	-0.83932	**-0.68496**	-0.57269
Strontium	0.91786	-0.859	-0.85281	-0.8791	-0.73991	**-0.69933**	-0.8834	-0.70732	-0.55724
Vanadium	0.71076	-0.82537	**-0.68621**	**-0.70292**	-0.56247	-0.51879	-0.74206	-0.77328	**-0.64566**
Zinc	-0.36423	0.32285	0.54639	0.55589	0.47678	0.45415	0.58404	0.32164	0.25542
AVS	-0.33406	0.94936	0.99257	0.99616	0.89839	0.86484	0.56465	0.39561	0.2928
SEM SUM	0.11136	0.38332	0.59531	0.61442	0.64635	0.64545	0.26952	0.05412	-0.01233
SEM AVS	0.22792	0.19469	0.4237	0.44443	0.50518	0.51261	0.13792	-0.07042	-0.11708

[1] Positive correlations translate to a stronger relationship to ash.

[2] Negative values translate to a greater effect on toxicity test endpoints.

Sample size for chemistry and ash correlations includes those 18 bulk sediment samples collected in the Emory River and Clinch River.

Sample size for toxicity test endpoint correlations includes those 10 sediment samples used in the Emory River and Clinch River long-term tests.

Toxicity test endpoints included IC_{25} in percent site sediment.

Shading indicates significance at $p \leq 0.05$, a likely relationship.

AVS = Acid volatile sulfide.

C. dilutus = *Chironomus dilutus.*

d = Day.

H. azteca = *Hyalella azteca.*

IC_{25} = Percent of site sediment which resulted in 25% inhibition.

SEM = Sequentially extracted metals.

Bold significant at $p < 0.10$.

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Table 4-23. Sequentially Extracted Metal Results for Select COPECs Collected in the Emory River

Tennessee Valley Authority Kingston, Tennessee

Locations	Analytes (mg/kg)	Arsenic	Barium	Copper	Selenium	Strontium	Vandium
Emory Reference	Total Metals	2.8	67.7	8.7	0.75	8	12.5
	Water Extractable Fraction	<0.0054	0.32	<0.0047	<0.014	0.13	<0.015
	Fraction extracted at pH 1.5	4.29%	53.80%	0.91%	8.80%	55.50%	1.28%
ERM 0.5	Total Metals	20.3	221	26.2	2.9	149	38.7
	Water Extractable Fraction	0.045	0.61	0.026	<0.014	0.54	0.035
	Fraction extracted at pH 1.5	3.00%	35.66%	1.08%	7.86%	18.21%	0.50%
ERM 0.8	Total Metals	28.3	218	30.6	3.4	152	44.2
	Water Extractable Fraction	0.028	0.53	<0.0048	<0.014	0.53	<0.015
	Fraction extracted at pH 1.5	4.12%	37.44%	0.91%	7.68%	17.39%	1.06%
ERM 1.0	Total Metals	26.8	226	31.6	3.4	159	46.6
	Water Extractable Fraction	0.037	0.59	0.018	<0.014	0.54	<0.014
	Fraction extracted at pH 1.5	4.11%	36.63%	0.88%	7.53%	16.57%	0.92%
ERM 2.5	Total Metals	56.1	313	40.3	4.2	265	60.8
	Water Extractable Fraction	0.41	0.41	0.021	0.072	1.1	0.3
	Fraction extracted at pH 1.5	11.07%	32.97%	3.60%	33.86%	16.68%	20.58%
ERM 3.0	Total Metals	45.4	220	35	3.1	172	51.2
	Water Extractable Fraction	0.11	0.59	0.029	<0.013	0.81	0.054
	Fraction extracted at pH 1.5	4.65%	34.36%	1.23%	11.74%	16.98%	1.08%
ERM 3.5	Total Metals	54.9	255	37.3	3.8	226	57
	Water Extractable Fraction	0.26	0.4	<0.0048	0.05	1.4	0.15
	Fraction extracted at pH 1.5	7.43%	33.29%	1.90%	17.89%	18.54%	14.70%
ERM 4.0	Total Metals	7.5	110	19.1	1.6	22.1	26.5
	Water Extractable Fraction	<0.0051	0.63	<0.0045	<0.013	0.4	<0.014
	Fraction extracted at pH 1.5	1.87%	54.39%	0.70%	7.50%	38.91%	0.57%
ERM 5.5	Total Metals	18.2	112	17.9	1.7	52.7	26.4
	Water Extractable Fraction	<0.0055	0.68	<0.0048	<0.014	0.78	<0.015
	Fraction extracted at pH 1.5	1.65%	50.34%	1.08%	5.06%	27.29%	0.13%

< = Result was less than or equal to the reporting limit.

% = Percent.

ERM = Emory River mile.

mg = Milligrams.

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Table 4-24. Sequentially Extracted Metal Results for Select COPECs Collected in the Clinch River
Tennessee Valley Authority Kingston, Tennessee

Locations	Analytes (mg/kg)	Arsenic	Barium	Copper	Selenium	Strontium	Vandium
Clinch Reference	Total Metals	42.2	48.8	7	0.49	7.6	10.2
	Water Extractable Fraction	0.048	0.16	0.011	—	0.2	—
	Fraction extracted at pH 1.5	1.19%	52.99%	2.10%	4.90%	63.03%	0.33%
CRM 0.0	Total Metals	32.6	272	36.3	3.2	155	49.9
	Water Extractable Fraction	0.083	0.89	0.12	—	1.1	0.073
	Fraction extracted at pH 1.5	1.72%	39.67%	2.59%	4.38%	23.35%	1.18%
CRM 1.5	Total Metals	15.7	198	58.3	2	56.9	41.4
	Water Extractable Fraction	0.015	0.43	0.086	—	0.5	0.037
	Fraction extracted at pH 1.5	1.20%	51.58%	3.60%	5.50%	36.56%	1.02%
CRM 2.0	Total Metals	22.9	230	40.8	2.7	143	42.9
	Water Extractable Fraction	0.054	0.67	0.11	—	0.61	0.082
	Fraction extracted at pH 1.5	1.45%	33.77%	2.99%	3.52%	16.23%	0.92%
CRM 2.5	Total Metals	25.9	205	36.5	2.6	121	39.4
	Water Extractable Fraction	0.046	0.59	0.086	—	0.57	0.066
	Fraction extracted at pH 1.5	1.32%	39.02%	3.00%	4.62%	19.64%	0.98%
CRM 3.0	Total Metals	29	258	31.5	3	3	46.1
	Water Extractable Fraction	0.078	0.93	0.079	—	—	0.075
	Fraction extracted at pH 1.5	1.94%	40.05%	2.25%	4.00%	4.00%	1.08%
CRM 3.5	Total Metals	27.7	261	41.4	3	3	50.6
	Water Extractable Fraction	0.084	1.2	0.15	—	—	0.13
	Fraction extracted at pH 1.5	2.14%	37.47%	3.07%	5.67%	5.67%	1.32%
CRM 4.0	Total Metals	22.6	232	36.7	3.1	3.1	44.8
	Water Extractable Fraction	0.042	0.76	0.076	—	—	0.072
	Fraction extracted at pH 1.5	1.89%	35.11%	2.50%	3.23%	3.23%	1.44%
CRM 4.5	Total Metals	22.6	270	42	3.8	3.8	55.1
	Water Extractable Fraction	0.042	0.67	0.07	—	—	0.08
	Fraction extracted at pH 1.5	1.89%	35.91%	1.76%	5.95%	5.95%	0.76%

— = Unreliable positive result, analyte may or may not be present and result was rejected.
< = Result was less than or equal to the reporting limit.
% = Percent.
CRM = Clinch River mile.
mg = Milligrams.

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Table 4-25. Emory River Snail Tissue ANOVAs

Tennessee Valley Authority **Kingston, Tennessee**

Analyte	Model p-Value	Dunnett One-Sided p-Value[1]			Emory River Study Area[2]	HOV
		Emory River Reach A	Emory River Reach B	Emory River Reach C		
Aluminum	0.003	0.045	0.023	0.001	0.001	0.040
Antimony	0.130	**0.075**	0.783	0.956	0.302	0.640
Arsenic	0.127	0.036	0.194	0.498	0.029	0.217
Barium	0.042	1.000	0.955	0.586	0.865	0.492
Beryllium	<.0001	1.000	1.000	1.000	1.000	0.197
Boron	0.034	1.000	0.962	0.564	0.870	0.085
Cadmium	0.387	0.219	0.179	0.410	0.044	0.391
Chromium	0.172	0.114	0.884	0.957	0.384	0.514
Cobalt	0.398	0.127	0.591	0.464	**0.093**	0.265
Copper	0.895	0.799	0.615	0.911	0.503	0.513
Lead	0.714	0.854	0.428	0.482	0.264	0.543
Manganese	0.835	0.781	0.963	0.800	0.647	0.462
Mercury*	0.003	1.000	1.000	1.000	1.000	0.365
Molybdenum	0.792	0.804	0.421	0.845	0.378	0.211
Nickel	0.668	0.362	0.846	0.493	0.242	0.401
Selenium	0.241	0.131	0.842	0.933	0.341	0.088
Silver	<.0001	1.000	1.000	0.999	0.999	0.072
Strontium	0.014	0.998	0.437	0.030	0.326	0.403
Thallium	<.0001	<.0001	<.0001	<.0001	<.0001	0.283
Vanadium	0.002	0.000	0.204	**0.079**	0.006	0.384
Zinc	0.007	0.008	0.957	0.025	**0.057**	0.093

[1] Tests whether reach is greater than reference.

[2] Tests whether entire study area is greater than reference.

ANOVA = Analysis of variance.

HOV = Homogeneity of Variance Test.

Shaded cells indicate significance at $p \leq 0.05$.

Bold values significant at $p < 0.10$.

* Significantly greater concentrations in reference area.

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Table 4-26. Clinch River Snail Tissue ANOVAs

Tennessee Valley Authority Kingston, Tennessee

Analyte	Model p-Value	Dunnett p-Value[1]		HOV	Clinch River Study Area[2]
		Clinch River Reach A	Clinch River Reach A		
Aluminum	0.400	0.163	0.302	0.144	**0.095**
Antimony	0.781	0.441	0.395	0.148	0.235
Arsenic	0.698	0.762	0.902	0.262	0.742
Barium	0.855	0.831	0.820	0.345	0.720
Beryllium*	<.0001	1.000	1.000	0.101	1.000
Boron	0.338	0.146	0.541	0.179	0.169
Cadmium	0.700	0.480	0.804	0.273	0.489
Chromium	0.856	0.526	0.743	0.125	0.468
Cobalt	0.497	0.218	0.312	0.160	0.117
Copper	0.576	0.822	0.934	0.440	0.814
Lead	0.185	0.491	0.972	0.234	0.702
Manganese	0.020	0.006	**0.052**	0.259	0.007
Mercury	0.035	0.992	0.998	0.430	0.994
Molybdenum	0.651	0.892	0.902	0.154	0.832
Nickel	0.538	0.233	0.513	0.119	0.196
Selenium	0.512	0.229	0.311	0.125	0.120
Silver	0.367	0.842	0.969	0.155	0.866
Strontium	0.898	0.800	0.805	0.264	0.686
Thallium	0.082	0.039	**0.053**	0.249	0.010
Vanadium	0.347	0.197	0.161	0.134	**0.066**
Zinc	0.628	0.515	0.281	0.159	0.218

[1] Tests whether reach is greater than reference.

[2] Tests whether the entire study area is greater than reference.

ANOVA = Analysis of variance.

HOV = Homogeneity of Variance Test.

Shaded cells indicate significance at $p \leq 0.05$.

Bold values significant at $p < 0.10$.

* Low detection skewed results.

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Table 4-27. Tennessee River Snail Tissue ANOVAs
Tennessee Valley Authority Kingston, Tennessee

Analyte	p-Value One-Sided t-Test
	Tennessee Reference[1]
Aluminum	0.425
Antimony	0.126
Arsenic	0.001
Barium	0.001
Boron	0.550
Cadmium	0.004
Chromium	0.004
Cobalt	0.377
Copper	0.296
Lead	0.577
Manganese	0.149
Mercury	0.001
Molybdenum	0.027
Nickel	0.020
Selenium	0.000
Silver	0.994
Strontium	0.126
Vanadium	0.005
Zinc	<.0001

[1] Tests whether the Tennessee River study area is greater than the Tennessee River reference area.
ANOVA = Analysis of variance.
Shaded cells indicate significance at $p \leq 0.05$.

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Table 4-28. Clinch River and Emory River Mayfly Adult ANOVAs

Tennessee Valley Authority Kingston, Tennessee

Analyte	p-Values for One-Sided Wilcoxon Rank Sum Tests					
	Clinch River Reference					
	Clinch River Reach A	Clinch River Reach B	Clinch River Combined	Emory River Reach A	Emory River Reach B	Emory River Combined
Aluminum	0.992	0.848	0.970	0.568	0.102	0.281
Arsenic	0.002	0.001	0.000	0.000	0.000	0.000
Barium	0.626	0.158	0.320	0.000	0.000	0.000
Boron	0.211	0.034	**0.051**	0.006	0.001	0.001
Cadmium	0.002	0.962	0.438	1.000	1.000	1.000
Chromium	0.998	0.998	1.000	0.988	1.000	0.999
Cobalt	0.003	0.683	0.164	0.408	0.999	0.945
Copper	0.977	0.987	0.994	1.000	0.999	1.000
Manganese	0.188	0.042	**0.054**	0.250	0.047	**0.100**
Mercury	0.998	0.999	1.000	1.000	1.000	1.000
Molybdenum	**0.054**	0.001	0.002	0.003	0.001	0.001
Selenium	0.003	0.001	0.000	0.000	0.000	0.000
Silver	0.998	0.999	1.000	1.000	1.000	1.000
Strontium	0.714	0.616	0.694	0.006	0.035	0.010
Vanadium	0.002	0.001	0.000	0.015	0.006	0.005
Zinc	0.468	0.020	**0.075**	0.011	0.151	0.035

Shaded cells indicate significance at $p \leq 0.05$.

ANOVA = Analysis of variance.

Bold values significant at $p < 0.10$.

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Table 4-29. Tennessee River Mayfly Adult ANOVAs
Tennessee Valley Authority Kingston, Tennessee

Analyte	p-values for One-sided Wilcoxon Rank Sum Tests		FOD
	Tennessee River Reference		
	Tennessee River Reach A	Tennessee River Reach B	
Aluminum	0.776	0.213	23%
Arsenic	0.922	0.868	100%
Barium	0.985	1.000	100%
Boron	0.958	1.000	75%
Cadmium	0.200	0.995	100%
Chromium	0.225	0.997	83%
Cobalt	0.846	0.830	100%
Copper	0.702	0.756	100%
Manganese	0.361	0.899	100%
Mercury	0.008	0.002	100%
Molybdenum	0.011	0.020	100%
Selenium	0.000	0.000	100%
Silver	0.998	1.000	94%
Strontium	0.732	0.855	100%
Vanadium	0.002	**0.074**	100%
Zinc	0.855	0.829	100%

Shaded cells indicate significance at $p \leq 0.05$.

ANOVA = Analysis of variance.
FOD = Frequency of detection.
Bold values significant at $p < 0.10$.

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Table 4-30. Emory River Mayfly Nymph ANOVAs
Tennessee Valley Authority Kingston, Tennessee

Analyte	Dunnett One-Sided p-Value[1]			p-Value One-Sided t-Test[2]	HOV
	Emory River Reach A	Emory River Reach B	Emory River Reach C		
Aluminum	0.043	0.991	0.375	0.336	0.201
Antimony	<.0001	0.015	0.019	0.034	0.103
Arsenic	<.0001	0.002	0.001	0.011	0.149
Barium	<.0001	0.005	0.007	0.002	0.092
Beryllium*	**0.086**	0.535	0.043	0.045	0.068
Boron	0.126	0.946	0.116	0.209	0.145
Cadmium	0.982	0.811	1.000	0.912	0.407
Chromium	0.008	0.924	0.316	0.172	0.350
Cobalt	0.638	0.995	0.938	0.805	0.354
Copper	0.129	0.998	0.183	0.433	0.319
Lead	0.001	0.992	0.151	0.198	0.146
Manganese	0.241	0.901	0.668	0.363	0.139
Mercury	0.471	**0.087**	0.003	0.040	0.559
Molybdenum	<.0001	0.000	0.004	0.008	0.109
Nickel	0.014	0.972	0.239	0.215	0.314
Selenium	<.0001	<.0001	0.002	0.001	0.973
Silver	1.000	0.997	0.990	0.992	0.077
Strontium	<.0001	<.0001	0.000	0.000	0.147
Vanadium	0.001	0.580	**0.061**	**0.053**	0.188
Zinc	1.000	1.000	0.962	0.959	0.177

[1] Tests if reach is greater than reference.
[2] Tests if study area is greater than reference.
ANOVA = Analysis of variance.
HOV = Homogeneity of variance.
= Shaded cells indicate significance at $p \leq 0.05$.
Bold values significant at $p < 0.10$.
* Low frequency of detection (44%).

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Table 4-31. Clinch River Mayfly Nymph ANOVAs
Tennessee Valley Authority Kingston, Tennessee

Analyte	Dunnett p-Value[1]		p-Value One-Sided t-Test[2]	HOV
	Clinch River Reach A	Clinch River Reach B		
Aluminum	0.026	0.002	0.004	0.423
Antimony	0.012	0.001	0.002	0.217
Arsenic	**0.052**	0.016	0.007	0.149
Barium	0.001	0.000	0.000	0.143
Beryllium	0.694	0.168	0.248	0.439
Boron	0.823	0.926	0.805	0.519
Cadmium	0.902	0.736	0.726	0.203
Chromium	0.034	0.002	0.006	0.369
Cobalt	0.498	**0.098**	0.132	0.128
Copper	0.994	0.998	0.995	0.225
Lead	0.945	0.725	0.769	0.353
Manganese	0.024	0.007	0.003	0.278
Mercury	1.000	1.000	1.000	0.593
Molybdenum	0.001	0.003	0.000	0.099
Nickel	0.103	0.006	0.016	0.230
Selenium	<.0001	<.0001	<.0001	0.407
Silver	0.562	0.588	0.392	0.130
Strontium	0.003	0.001	0.000	0.867
Vanadium	0.005	0.001	0.001	0.479
Zinc	0.999	0.999	0.999	0.173

[1] Tests if reach is greater than reference.
[2] Tests if study area is greater than reference.
ANOVA = Analysis of variance.
HOV = Homogeneity of variance.
Shaded cells indicate significance at $p \leq 0.05$.
Bold values significant at $p < 0.10$.

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Table 4-32. Tennessee River Mayfly Nymph ANOVAs
Tennessee Valley Authority Kingston, Tennessee

Analyte	p-Value One-Sided t-Test
	Tennessee Reference[1]
Aluminum	0.946
Antimony	0.893
Arsenic	0.106
Barium	0.927
Boron	0.041
Cadmium	0.171
Chromium	0.912
Cobalt	0.639
Copper	**0.076**
Lead	0.992
Manganese	0.959
Mercury	0.188
Molybdenum	0.014
Nickel	0.872
Selenium	0.001
Silver	0.999
Strontium	**0.088**
Vanadium	0.915
Zinc	0.615

[1] Tests impacted Tennessee River reaches against Tennessee reference.
ANOVA = Analysis of variance.
Shaded cells indicate significane at $p < 0.05$.
Bold values significant at $p < 0.10$.

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Table 4-33. Emory River COPECs in Invertebrate Tissue Greater than Reference
Tennessee Valley Authority Kingston, Tennessee

Metals	Snails			Mayfly Adults		Mayfly Nymphs		
	Emory River Reach A	Emory River Reach B	Emory River Reach C	Emory River Reach A	Emory River Reach B	Emory River Reach A	Emory River Reach B	Emory River Reach C
Aluminum	X	X	X			X		
Antimony						X	X	X
Arsenic	X			X	X	X	X	X
Barium				X	X	X	X	X
Boron				X	X			
Chromium						X		
Lead						X		
Manganese					X			
Mercury								X
Molybdenum				X	X	X	X	X
Nickel						X		
Selenium				X	X	X	X	X
Strontium			X	X	X	X	X	X
Thallium	X	X	X					
Vanadium	X			X	X	X		
Zinc	X		X	X				

COPEC = Constituents of potential concern.

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Table 4-34. Clinch River COPECs in Invertebrate Tissue Greater than Reference

Tennessee Valley Authority Kingston, Tennessee

Metals	Snails		Mayfly Adults		Mayfly Nymphs	
	Clinch River Reach A	Clinch River Reach B	Clinch River Reach A	Clinch River Reach B	Clinch River Reach A	Clinch River Reach B
Aluminum					X	X
Antimony					X	X
Arsenic			X	X		X
Barium					X	X
Boron				X		
Cadmium			X			
Chromium					X	X
Cobalt			X			
Manganese	X			X	X	X
Molybdenum				X	X	X
Nickel						X
Selenium			X	X	X	X
Strontium					X	X
Thallium	X					
Vanadium			X	X	X	X
Zinc				X		

COPEC = Constituents of potential concern.

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Table 4-35. Tennessee River COPECs in Invertebrate Tissue Greater than Reference
Tennessee Valley Authority Kingston, Tennessee

Metals	Snails	Mayfly Adults	Mayfly Nymphs
Arsenic	X		
Barium	X		
Boron			X
Cadmium	X		
Mercury	X	X	
Molybdenum	X	X	X
Nickel	X		
Selenium	X	X	X
Vanadium	X	X	
Zinc	X		

*Reference is combined Tennessee/Clinch River reference
COPEC = Constituents of potential concern.

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Table 4-36. Critical Body Residue Data
Tennessee Valley Authority Kingston, Tennessee

Analyte	Mayflies (mg/kg ww)		Snails (mg/kg ww)	
	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	31	310	31	310
Antimony	NA	NA	NA	NA
Arsenic	0.0249	0.249	16	160
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	15.6	156	460	4600
Chromium	0.144	1.44	0.144	1.44
Cobalt	0.1061	1.061	0.1061	1.061
Copper	26	260	8	80
Lead	269	2690	68	680
Manganese	5.36	53.6	9.6	96
Mercury	2.7	27	8	16
Molybdenum	NA	NA	NA	NA
Nickel	0.115	1.15	79	575
Selenium	0.051	0.51	2.94	6.34
Silver	0.23	2.3	9.67	96.7
Strontium	NA	NA	NA	NA
Thallium	1.206	12.06	1.206	12.06
Vanadium	0.604	6.04	0.604	6.04
Zinc	382	3820	5	50

LOAEL = Lowest observed adverse effect level.
mg/kg ww = Milligrams per kilogram per wet weight.
NA = Not available.
NOAEL - No observed adverse effect level.

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Table 4-37. Hazard Quotients for Snails

Tennessee Valley Authority Kingston, Tennessee

Analyte	Emory River						Clinch River				Tennessee River	
	Reach A		Reach B		Reach C		Reach A		Reach B		Reach B	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Aluminum	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-
Arsenic	<1	<1	<1	<1	<1	<1	-	-	-	-	<1	<1
Cadmium	-	-	-	-	-	-	-	-	-	-	<1	<1
Chromium	-	-	-	-	-	-	-	-	-	-	2	<1
Manganese	-	-	-	-	-	-	13	1	9	<1	-	-
Mercury	-	-	-	-	-	-	-	-	-	-	<1	<1
Molybdenum	-	-	-	-	-	-	-	-	-	-	NA	NA
Nickel	-	-	-	-	-	-	-	-	-	-	<1	<1
Selenium	-	-	-	-	-	-	-	-	-	-	<1	<1
Strontium	NA	NA	NA	NA	NA	NA	-	-	-	-	-	-
Thallium	<1	<1	<1	<1	-	-	<1	<1	<1	<1	-	-
Vanadium	<1	<1	<1	<1	<1	<1	-	-	-	-	<1	<1
Zinc	12	1	6	<1	9	<1	-	-	-	-	6	<1

- = Not evaluated.
CBR = Critical body residue.
HQ = Hazard Quotient.
LOAEL = Lowest observed adverse effect level.
NA = No CBR available.
NOAEL = No observed adverse effect level.

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Table 4-38. Hazard Quotients for Mayfly Adults
Tennessee Valley Authority Kingston, Tennessee

Analyte	Emory River				Clinch River				Tennessee River			
	Reach A		Reach B		Reach A		Reach B		Reach A		Reach B	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Arsenic	2	<1	3	<1	2	<1	2	<1	-	-	-	-
Cobalt	-	-	-	-	2	<1	-	-	-	-	-	-
Barium	NA	NA	NA	NA	-	-	-	-	-	-	-	-
Boron	NA	NA	NA	NA	-	-	-	-	-	-	-	-
Manganese	<1	<1	<1	<1	-	-	<1	<1	-	-	-	-
Mercury	-	-	-	-	-	-	-	-	-	-	<1	<1
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	22	2	25	3	26	3	26	3	11	1	13	1
Strontium	NA	NA	NA	NA	-	-	-	-	-	-	-	-
Vanadium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	<1	<1	-	-	-	-	<1	<1	-	-	-	-

- = Not evaluated.
CBR = Critical body residue.
HQ = Hazard Quotient.
LOAEL = Lowest observed adverse effect level.
NOAEL = No observed adverse effect level.
NA = No CBR available.

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Table 4-39. Hazard Quotients for Mayfly Nymphs

Tennessee Valley Authority Kingston, Tennessee

Analyte	Emory River						Clinch River				Tennessee River	
	Reach A		Reach B		Reach C		Reach A		Reach B		Reach B	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Aluminum	14	1	-	-	-	-	6	<1	9	<1	-	-
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Arsenic	334	33	27	3	29	3	-	-	43	4	-	-
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Beryllium	NA	NA	NA	NA	NA	NA	-	-	-	-	-	-
Boron	-	-	-	-	-	-	-	-	-	-	NA	NA
Cadmium	-	-	-	-	-	-	-	-	-	-	<1	<1
Chromium	5	<1	-	-	-	-	2	<1	3	<1	-	-
Lead	<1	<1	-	-	-	-	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	8	<1	8	<1	-	-
Mercury	-	-	-	-	<1	<1	-	-	-	-	-	-
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	6	<1	-	-	-	-	-	-	4	<1	-	-
Selenium	34	3	23	2	16	2	29	3	33	3	15	2
Strontium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Vanadium	2	<1	-	-	-	-	<1	<1	1	<1	-	-

- = Not evaluated.
CBR = Critical body residue.
HQ = Hazard Quotient.
LOAEL = Lowest observed adverse effect level.
NA = No CBR available.
NOAEL = No observed adverse effect level.

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Table 4-40. Snail and Sediment Correlations

Tennessee Valley Authority **Kingston, Tennessee**

Analyte	Spearman Correlation Coefficient	p-Value	Frequency of Detection	
			Snail	Sediment
Aluminum	0.03	0.9572	100%	100%
Arsenic	0.89	0.0188	100%	93%
Barium	-0.94	0.0048	100%	100%
Manganese	-0.03	0.9572	100%	100%
Molybdenum	0.37	0.4685	100%	0%
Nickel	0.49	0.3287	100%	100%
Selenium	0.14	0.7872	100%	10%
Strontium	-0.14	0.7872	100%	87%
Thallium	0.43	0.3965	48%	4%
Vanadium	0.77	**0.0724**	100%	100%
Zinc	0.26	0.6228	100%	100%

% = Percent.

Shaded cells indicate significance at $p \leq 0.05$.

Bold values significant at $p < 0.10$.

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Table 4-41. Mayfly Adult and Sediment Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value	Frequency of Detection	
			Adult Mayfly	Sediment
Arsenic	0.93	0.001	100%	94%
Barium	0.05	0.911	100%	100%
Boron	-0.05	0.911	75%	77%
Cadmium	0.45	0.260	100%	0%
Chromium	-0.12	0.779	83%	100%
Cobalt	0.19	0.651	100%	100%
Manganese	0.36	0.385	100%	100%
Molybdenum	-0.14	0.736	100%	0%
Nickel	-0.62	0.102	3%	100%
Selenium	0.36	0.385	100%	33%
Strontium	0.80	0.104	100%	89%
Vanadium	0.33	0.420	100%	99%
Zinc	-0.19	0.651	100%	100%

Beryllium and thallium not detected in adults.
% = Percent.
Shaded cells indicate significance at $p \leq 0.05$.

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Table 4-42. Mayfly Adult and Ash Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value
Arsenic	0.898	0.002
Barium	0.455	0.257
Boron	0.623	**0.099**
Cadmium	-0.635	0.091
Chromium	-0.228	0.588
Cobalt	-0.743	0.035
Copper	-0.766	0.027
Manganese	-0.012	0.978
Mercury	0.036	0.933
Molybdenum	0.838	0.009
Selenium	0.958	0.000
Silver	-0.826	0.011
Strontium	0.407	0.317
Vanadium	0.683	**0.062**
Zinc	0.755	0.031

Shaded cells indicate significance at $p \leq 0.05$.

Bold values significant at $p < 0.10$.

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Table 4-43. Mayfly Nymph and Sediment Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value	Frequency of Detection	
			Nymph	Sediment
Aluminum	0.18	0.6368	100%	100%
Antimony	0.55	0.125	78%	12%
Arsenic	0.73	0.0246	100%	94%
Barium	0.18	0.6368	100%	100%
Beryllium	0.28	0.46	44%	76%
Boron	0.15	0.6989	93%	77%
Cadmium	0.20	0.6059	100%	0%
Chromium	0.32	0.4064	100%	100%
Lead	-0.07	0.8647	100%	100%
Manganese	0.22	0.5755	100%	100%
Mercury	0.63	**0.0671**	100%	64%
Molybdenum	0.27	0.4879	100%	0%
Nickel	0.03	0.9322	100%	100%
Selenium	0.55	0.125	100%	33%
Strontium	0.96	0.0005	100%	89%
Vanadium	0.25	0.5165	100%	99%

Thallium not detected in nymphs.
Shaded cells indicate significance at $p \leq 0.05$.
Bold values significant at $p < 0.10$.
% = Percent.

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Table 4-44. Mayfly Nymph and Ash Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value
Aluminum	0.08	0.828
Antimony	0.81	0.008
Arsenic	0.73	0.026
Barium	0.78	0.013
Beryllium	0.53	0.146
Boron	-0.17	0.662
Cadmium	-0.39	0.300
Chromium	0.24	0.539
Cobalt	0.08	0.828
Copper	-0.14	0.728
Lead	-0.19	0.631
Manganese	0.08	0.828
Mercury	0.17	0.663
Molybdenum	0.76	0.017
Nickel	0.24	0.539
Selenium	0.78	0.013
Silver	-0.29	0.452
Strontium	0.92	0.001
Thallium	0.58	0.104
Vanadium	0.46	0.215
Zinc	-0.76	0.018

Shaded cells indicate significance at $p \leq 0.05$.

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Table 4-45. Mayfly Nymph and Select Sediment Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value	Frequency of Detection	
			Nymph	Sediment
Aluminum	0.21	0.6103	100%	100%
Antimony	0.29	0.4927	75%	5%
Arsenic	0.81	0.0149	100%	100%
Barium	0.14	0.7358	100%	100%
Beryllium	0.19	0.6514	46%	82%
Boron	0.47	0.2433	92%	86%
Cadmium	0.07	0.8665	100%	0%
Chromium	0.38	0.3518	100%	100%
Lead	0.26	0.5309	100%	100%
Manganese	-0.07	0.8665	100%	100%
Mercury	0.26	0.5309	100%	82%
Molybdenum	0.14	0.7358	100%	0%
Nickel	0.40	0.3199	100%	100%
Selenium	0.52	0.1827	100%	50%
Strontium	0.89	0.0068	100%	95%
Vanadium	0.26	0.5309	100%	100%

Shaded cells indicate significance at $p \leq 0.05$.
Select sediment = Samples within 500 feet of mayfly nymph samples.
% = Percent.

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Table 4-46. Mayfly Nymph and Porewater Correlations
Tennessee Valley Authority Kingston, Tennessee

Analyte	Spearman Correlation Coefficient	p-Value	Frequency of Detection	
			Nymph	Porewater
Aluminum	0.33	0.463	100%	18%
Antimony	0.70	**0.077**	71%	59%
Arsenic	0.57	0.180	100%	100%
Barium	0.32	0.482	100%	100%
Boron	-0.25	0.589	90%	100%
Cobalt	0.39	0.383	100%	100%
Copper	-0.43	0.337	100%	100%
Lead	0.34	0.452	100%	53%
Manganese	-0.54	0.215	100%	100%
Molybdenum	0.64	0.119	100%	94%
Nickel	-0.14	0.760	100%	100%
Selenium	0.59	0.161	100%	47%
Strontium	0.61	0.148	100%	100%
Vanadium	0.59	0.159	100%	59%
Zinc	0.29	0.531	100%	94%

Beryllium, cadmium, mercury, silver, and thallium were non-detect in porewater.
Bold values significant at $p < 0.10$.
% = Percent.

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Table 4-47. Summary of Significant Relationships in Benthic Invertebrate Tissue
Tennessee Valley Authority Kingston, Tennessee

Analyte	Tissue/Sediment			Tissue/Ash		
	Snail	Adult	Nymph	Snail	Adult	Nymph
Antimony				NA		x
Arsenic	x	x	x	NA	x	x
Barium				NA		x
Molybdenum				NA	x	x
Selenium				NA	x	x
Strontium			x	NA		x
Zinc				NA	x	x

NA - Not available; snails not assessed against ash data because no ash samples are located in seasonally exposed sediment.