

Division of Surface Water

Biological Assessment of the Great Miami River

Piqua Power Plant

Miami County, Ohio



November 20, 2009

Ted Strickland, Governor
Chris Korleski, Director

Biological Assessment

Great Miami River (Piqua Power Plant Property)

2009

Miami County, Ohio
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EXECUTIVE SUMMARY

Two miles of the Great Miami River were biologically assessed by the Ohio EPA during 2008. Based on the performance of the biological communities, 1.0 mile of the Great Miami River (free-flowing sections) was in full attainment of the designated Exceptional Warmwater Habitat (EWH) aquatic life use, and 1.0 mile (impounded section of river) was partially attaining the designated Warmwater Habitat (WWH) use (Table 1). The partial attainment was due to poor to fair macroinvertebrate communities in the impounded section of river. The impaired condition of the macroinvertebrate community within the dam pool was the result of a lack of flowing water and poor habitat conditions. In sampling throughout the state, the macroinvertebrate communities from dam pool sites are typically impaired and underperform the fish community. The impaired condition of the macroinvertebrate community in the dam pool was the result of poor macroinvertebrate habitat conditions caused by the presence of the dam and not the result of any potential contaminants associated with the Piqua power plant.

RECOMMENDATIONS

The aquatic life use designation of Warmwater Habitat in the impounded section of the Great Miami River in the Piqua area, and Exceptional Warmwater Habitat in the free-flowing segments has been confirmed in this study and previous Ohio EPA biological and water quality studies, and should be maintained. Within the Ohio Water Quality Standards, one EWH section of the Great Miami River occurs between RM 116.7 (SR 66) and RM 130.2 (Sidney water works dam). Sampling during this survey documented that the above noted EWH segment of the Great Miami River should be extended further downstream to RM 115.3. Physical habitat conditions, river pool depths, and recreational activity verified that the Primary Contact Recreation use is appropriate for the Great Miami River.

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Report preparation and analysis: David Altfater, Mike Gray

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INTRODUCTION

Biological and physical habitat quality was assessed in a 1.5 mile section of the Great Miami River during 2009. This study was undertaken to assess water resource conditions in the Great Miami upstream, adjacent, and downstream from the former City of Piqua Power Plant property. This water resource project was undertaken as a Voluntary Action Program technical assistance request.

Specific objectives of the evaluation were to:

- Assess biological conditions in the Great Miami River by evaluating fish and macroinvertebrate communities,
- Determine the aquatic life use attainment status of the Great Miami River with regard to the Warmwater Habitat (WWH) and Exceptional Warmwater Habitat (EWH) aquatic life use designations codified in the Ohio Water Quality Standards, and
- Perform the work to satisfy the requirements of VAP rule OAC 3745-300-09.

The Great Miami River is located in the Eastern Corn Belt Plains (ECBP) ecoregion. The Great Miami River is currently assigned the Warmwater Habitat aquatic life use designation for the impounded segment of river within the City of Piqua, and Exceptional Warmwater Habitat in the free-flowing sections.

Aquatic life use attainment conditions are presented in Table 1, and sampling locations are detailed in Table 2 and graphically presented in Figure 1.

Table 1. Aquatic life use attainment status for sampling locations in the Great Miami River, Piqua area, 2009. The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. River sites are located in the Eastern Corn Belt Plains (ECBP) ecoregion. In the Ohio Water Quality Standards, the Great Miami River in the study segment is designated Warmwater Habitat (WWH), Exceptional Warmwater Habitat (EWH) or EWH recommended (R). If biological impairment has occurred, the cause(s) and source(s) of the impairment are noted.

Sample Location River Mile	Aquatic Life Use Designation	Aquatic Life Attainment Status	IBI	MIwb	ICI	Stream ^a Habitat	Aquatic Life Use Impairment Cause/Source ^b
115.4	EWH-R	FULL	56	10.2	52	Excellent	
114.9	WWH	PARTIAL	55	9.1	16-Low Fair*	Fair	Impounded-low flow/ Low head dam
114.4	WWH	PARTIAL	41 ^{ns}	8.9	14-Low Fair*	Fair	Impounded-low flow/ Low head dam
114.0	EWH	FULL	54	10.3	46	Very Good	

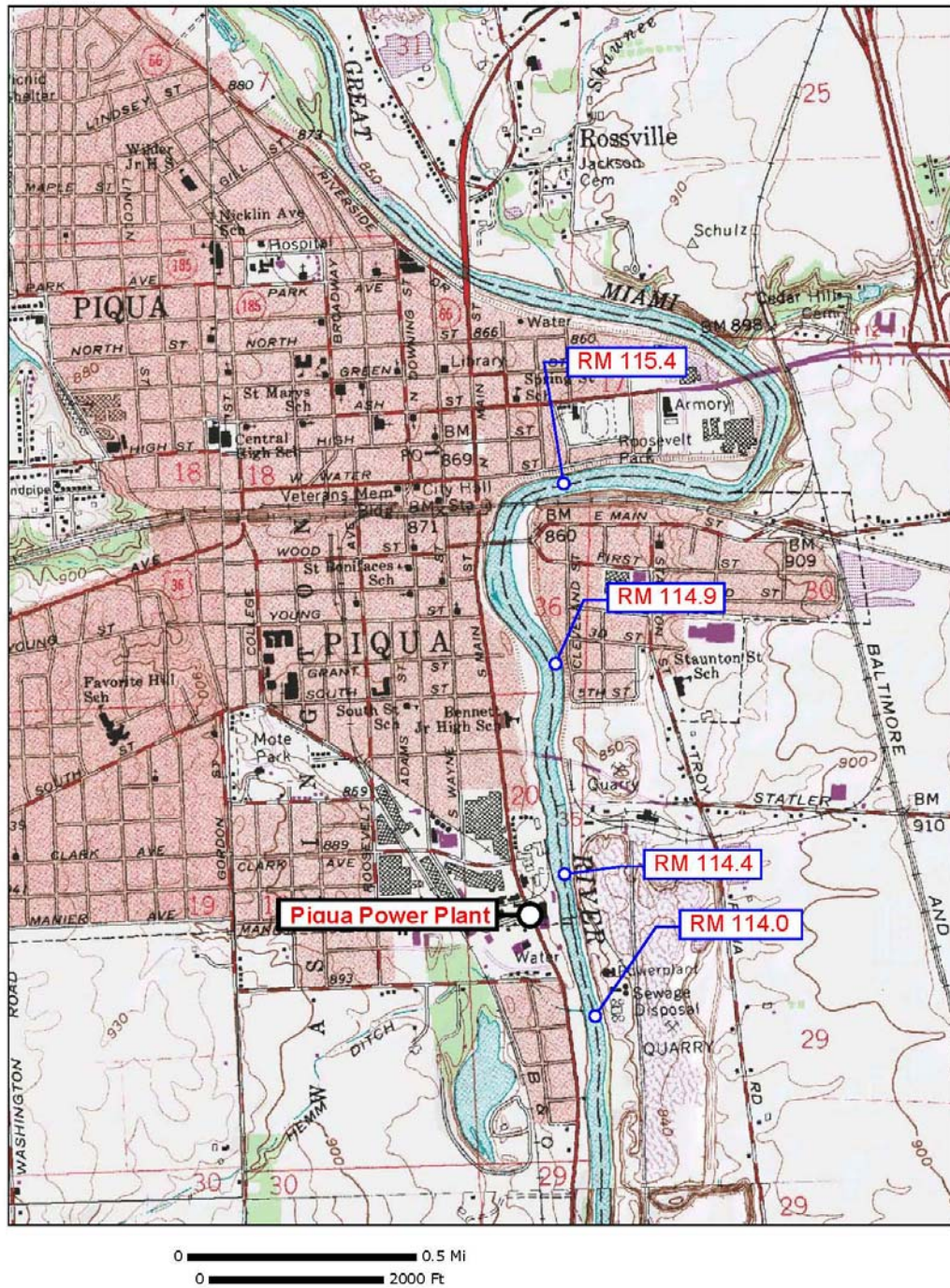
BIOCRITERIA		
INDEX - Site Type	WWH	EWH
IBI: Boat	42	48
MIwb: Boat	8.5	9.6
ICI	36	46

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
^{ns} Nonsignificant departure from biocriterion (≤ 4 IBI or ICI units, 0.5 MIwb units).
^a Narrative habitat evaluations are based on QHEI scores as follows: Excellent =75-100, Good = 60-74, Fair = 45-59, Poor = 30-44 and Very Poor <30.

Table 2. Sampling locations in Great Miami River, Piqua area, 2009. Type of sampling included fish community (F), and macroinvertebrate community (M).

Stream/ River Mile	Type of Sampling	Latitude	Longitude	Landmark
115.4	F,M	40.1474	84.2348	Free-flowing river, upstream Piqua City Linear Park
114.9	F,M	40.1422	84.2373	Impounded river, upstream Piqua Power Plant
114.4	F,M	40.1348	84.2364	Impounded river, adjacent Piqua Power Plant
114.0	F,M	40.1293	84.2350	Free-flowing river, downstream Piqua Power Plant & WWTP

Figure 1. Sampling locations in the Great Miami River, Piqua area, 2009.



METHODS

Biological field, data processing, and data analysis methods and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 2006b), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio Environmental Protection Agency 1987b, 1989a, 1989b, 2008a, 2008b), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989), and Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (Ohio EPA 2006a).

Determining Use Attainment

Use attainment status is a term describing the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). Assessing aquatic use attainment status involves a primary reliance on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-15). These are confined to ambient assessments and apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community. Three attainment status results are possible at each sampling location - full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria. Non-attainment means that none of the applicable indices meet the biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (Table 1) is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (*i.e.*, full, partial, or non-attainment), the Qualitative Habitat Evaluation Index (QHEI), and a sampling location description. Biological results were compared to WWH biocriteria. The Great Miami River is currently listed as a EWH (in the free-flowing sections) and WWH (in the Piqua impounded section) in the Ohio Water Quality Standards.

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995; Ohio EPA 2006a). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75 often typify habitat conditions which have the ability to support exceptional faunas.

Macroinvertebrate Community Assessment

Macroinvertebrates were collected from artificial substrates and from the natural habitats at the Great Miami River sites. The artificial substrate collection provided quantitative data and consisted of a composite sample of five modified Hester-Dendy multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample was also collected. This sampling effort consisted of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (*e.g.*, riffle, run, pool, margin). At the two macroinvertebrate sampling sites within a dam pool, two composite artificial substrate samples were used. One was placed in a wading accessible location near the shoreline in a manner consistent with OEPA historical sampling methods. The other was set on the bottom in mid-channel in water from 5-8 feet deep. Detailed discussion of macroinvertebrate field and laboratory procedures is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a, 2008b).

Fish Community

A total of 3,280 fish representing 38 species were collected from the Great Miami River in the Piqua area between July and September, 2009. Relative numbers and species collected per location are presented in Appendix Table 2 and IBI metrics are presented in Appendix Table 1. Sampling locations were evaluated using Warmwater Habitat or Exceptional Warmwater biocriteria. All four fish sampling locations evaluated during this study were achieving the applicable Warmwater Habitat or Exceptional Warmwater Habitat fish biocriterion. Three of the sites had very good to exceptional fish communities, and pollution intolerant species comprised 7 – 12% of the fish populations.

Table 4. Fish community summaries based on pulsed D.C. boat electrofishing sampling conducted by Ohio EPA in the Great Miami River, Piqua area, from July - September, 2009. Relative numbers are per 1.0 km. The applicable aquatic life use designation is WWH in the impounded section and EWH in the free-flowing section.

Stream River Mile	Sampling Method	Species (Mean)	Species (Total)	Relative Number	QHEI	Index of Biotic Integrity	Modified Index of Well-being	Narrative Evaluation
115.4	Boat	26.5	31	999	76.5	56	10.2	Exceptional
114.9	Boat	23.0	28	617	56.0	55	9.1	Very Good to Exceptional
114.4	Boat	20.5	25	495	57.0	41 ^{ns}	8.9	Marginally Good to Good
114.0	Boat	31.0	34	1169	74.0	54	10.3	Exceptional

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)		
INDEX - Site Type	WWH	EWH
IBI: Boat	42	48
MIwb: Boat	8.5	9.6

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

^{ns} Non-significant departure from ecoregion biocriterion (≤4 IBI units or 0.5 MIwb units).

Macroinvertebrate Community

The macroinvertebrate communities from the Great Miami were sampled in 2009 using quantitative (artificial substrate) and qualitative (natural substrate multi-habitat composite) sampling protocols. Results are summarized in Table 5. The ICI metrics with the associated scores, and the raw data are attached as Appendix Tables 3 and 4. The macroinvertebrate communities from the free flowing sites above and below the impounded dam pool attained the Exceptional Warmwater Habitat biocriterion. The macroinvertebrate communities from all sites within the impounded dam pool had ICI scores in the poor to low fair range and did not attain the Warmwater Habitat narrative criterion. The impaired condition of the macroinvertebrate community within the dam pool was the result of a lack of flowing water and poor habitat conditions. In sampling throughout the state, the macroinvertebrate communities from dam pool sites are typically impaired and underperform the fish community. The impaired condition of the macroinvertebrate community in the dam pool appeared to be the result of poor habitat conditions caused by the presence of the dam and not the result of any other issues associated with the Piqua power plant.

Table 5. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Great Miami River, Piqua area, 2009.

Stream/ River Mile	Density Number/ft ²	Total Taxa	Quantitative Taxa	Qualitative Taxa	Qualitative EPT ^a	ICI	Evaluation
<i>Great Miami River</i>							
115.4	2404	68	39	54	22	52	Exceptional
114.9A -Edge	2420	33	26	23	5	16-Low Fair*	Low Fair
114.9B - Mid	901	-	24	-	-	14-Low Fair*	Low Fair
114.4A - Edge	2709	34	26	16	3	14-Low Fair*	Low Fair
114.4B - Mid	1596	-	19	-	-	<u>10-Poor*</u>	Poor
114.0	3322	66	30	56	18	46	Exceptional

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)		
INDEX	WWH	EWH
ICI	36	46

^a EPT=total Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa richness, a measure of pollution sensitive organisms.

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

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APPENDICES – GREAT MIAMI RIVER, 2009

Appendix Table 1. Index of Biotic Integrity (IBI) scores and metrics for samples collected from the Great Miami River, Piqua, 2009.

River Mile	Type	Date	Drainage area (sq mi)	Number of				Percent of Individuals						DELTA anomalies	Rel.No. minus tolerants /(1.0 km)	Modified IBI	lwb
				Total species	Sunfish species	Sucker species	Intolerant species	Rnd-bodied suckers	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores				
Great Miami River - (14-001)																	
Year: 2009																	
115.40	A	08/19/2009	867	26(5)	4(5)	6(5)	5(5)	26(3)	55(5)	13(5)	13(5)	12(5)	75(5)	0.0(5)	1010(5)	58	10.4
115.40	A	09/22/2009	867	26(5)	6(5)	7(5)	4(5)	34(3)	50(5)	22(3)	22(3)	20(5)	57(5)	0.2(5)	654(5)	54	10.0
114.90	A	08/19/2009	867	23(5)	5(5)	5(3)	2(3)	43(5)	47(5)	18(3)	17(3)	24(5)	59(5)	0.0(5)	496(5)	52	9.0
114.90	A	09/22/2009	867	21(5)	4(5)	6(5)	3(3)	44(5)	48(5)	12(5)	12(5)	28(5)	60(5)	0.3(5)	548(5)	58	9.3
114.40	A	08/19/2009	868	19(3)	4(5)	6(5)	1(1)	32(3)	44(3)	29(1)	21(3)	12(5)	66(5)	0.9(3)	322(3)	40	8.5
114.40	A	09/22/2009	868	20(3)	5(5)	5(3)	2(3)	28(3)	38(3)	24(3)	23(3)	10(5)	66(5)	0.7(3)	410(3)	42	9.3
114.00	A	07/07/2009	873	30(5)	6(5)	6(5)	4(5)	31(3)	43(3)	11(5)	11(5)	15(5)	70(5)	0.5(5)	736(5)	56	10.3
114.00	A	08/11/2009	873	30(5)	5(5)	6(5)	4(5)	30(3)	39(3)	20(3)	20(3)	19(5)	59(5)	0.1(5)	1208(5)	52	10.3

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

Appendix Table 2. Fish sampling results for the Great Miami River, Piqua area, 2009.

Species List

River Code: 14-001	Stream: Great Miami River	Sample Date: 2009
River Mile: 115.40	Location: upst. Piqua Power Plant, upst. RR	Date Range: 08/19/2009
Time Fished: 4145 sec	Drainage: 867.0 sq mi	Thru: 09/22/2009
Dist Fished: 1.00 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback	C	O	M	7	7.00	0.70	5.00	6.05	714.29
Black Redhorse	R	I	S I	57	57.00	5.71	11.65	14.08	204.32
Golden Redhorse	R	I	S M	136	136.00	13.61	22.94	27.75	168.70
Northern Hog Sucker	R	I	S M	84	84.00	8.41	11.13	13.46	132.48
White Sucker	W	O	S T	16	16.00	1.60	2.59	3.14	162.12
Spotted Sucker	R	I	S	2	2.00	0.20	0.04	0.05	19.00
Smallmouth Redhorse	R	I	S M	19	19.00	1.90	3.83	4.63	201.68
Common Carp	G	O	M T	3	3.00	0.30	7.10	8.59	2,366.67
River Chub	N	I	N I	4	4.00	0.40	0.37	0.44	91.50
Suckermouth Minnow	N	I	S	1	1.00	0.10	0.00	0.00	4.00
Silver Shiner	N	I	S I	27	27.00	2.70	0.20	0.24	7.41
Rosyface Shiner	N	I	S I	5	5.00	0.50	0.01	0.01	2.00
Scarlet Shiner	N	I	S M	3	3.00	0.30	0.01	0.01	2.33
Striped Shiner	N	I	S	109	109.00	10.91	0.72	0.87	6.61
Spotfin Shiner	N	I	M	106	106.00	10.61	0.38	0.46	3.57
Sand Shiner	N	I	M M	8	8.00	0.80	0.02	0.02	2.38
Bluntnose Minnow	N	O	C T	140	140.00	14.01	0.34	0.41	2.41
Central Stoneroller	N	H	N	3	3.00	0.30	0.14	0.17	48.00
Channel Catfish	F		C	1	1.00	0.10	2.15	2.60	2,150.00
White Crappie	S	I	C	1	1.00	0.10	0.08	0.10	81.00
Black Crappie	S	I	C	1	1.00	0.10	0.12	0.14	119.00
Rock Bass	S	C	C	34	34.00	3.40	3.16	3.82	92.99
Smallmouth Bass	F	C	C M	120	120.00	12.01	8.90	10.76	74.15
Green Sunfish	S	I	C T	8	8.00	0.80	0.41	0.50	51.75
Bluegill Sunfish	S	I	C P	5	5.00	0.50	0.07	0.09	14.60
Longear Sunfish	S	I	C M	30	30.00	3.00	0.77	0.94	25.80
Green Sf X Bluegill Sf				1	1.00	0.10	0.15	0.18	150.00
Yellow Perch			M	1	1.00	0.10	0.06	0.07	60.00
Blackside Darter	D	I	S	4	4.00	0.40	0.01	0.01	2.75
Logperch	D	I	S M	23	23.00	2.30	0.23	0.27	9.87
Greenside Darter	D	I	S M	19	19.00	1.90	0.07	0.08	3.53
Banded Darter	D	I	S I	21	21.00	2.10	0.04	0.04	1.76
<i>Mile Total</i>				999	999.00		82.69		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-001	Stream: Great Miami River	Sample Date: 2009
River Mile: 114.90	Location: upst. Piqua Power Plant	Date Range: 08/19/2009
Time Fished: 3837 sec	Drainage: 867.0 sq mi	Thru: 09/22/2009
Dist Fished: 1.00 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	4	4.00	0.65	0.20	0.18	49.50
Quillback	C	O	M	3	3.00	0.49	2.41	2.19	801.67
Black Redhorse	R	I	S I	40	40.00	6.48	10.39	9.45	259.67
Golden Redhorse	R	I	S M	199	199.00	32.25	60.91	55.41	306.05
Northern Hog Sucker	R	I	S M	24	24.00	3.89	2.94	2.67	122.40
White Sucker	W	O	S T	1	1.00	0.16	0.15	0.14	152.00
Spotted Sucker	R	I	S	2	2.00	0.32	0.19	0.17	95.00
Smallmouth Redhorse	R	I	S M	4	4.00	0.65	1.52	1.38	380.25
Common Carp	G	O	M T	3	3.00	0.49	13.97	12.71	4,655.00
Silver Shiner	N	I	S I	2	2.00	0.32	0.03	0.03	15.00
Striped Shiner	N	I	S	10	10.00	1.62	0.13	0.12	12.70
Spotfin Shiner	N	I	M	20	20.00	3.24	0.09	0.08	4.60
Sand Shiner	N	I	M M	5	5.00	0.81	0.01	0.01	1.40
Bluntnose Minnow	N	O	C T	77	77.00	12.48	0.14	0.13	1.79
Channel Catfish	F		C	1	1.00	0.16	0.11	0.10	110.00
Yellow Bullhead		I	C T	1	1.00	0.16	0.22	0.20	217.00
Brook Silverside		I	M M	1	1.00	0.16	0.00	0.00	2.00
White Crappie	S	I	C	1	1.00	0.16	0.05	0.05	52.00
Rock Bass	S	C	C	78	78.00	12.64	8.93	8.12	114.47
Smallmouth Bass	F	C	C M	79	79.00	12.80	6.36	5.79	80.53
Largemouth Bass	F	C	C	5	5.00	0.81	0.11	0.10	21.00
Green Sunfish	S	I	C T	13	13.00	2.11	0.45	0.41	34.74
Bluegill Sunfish	S	I	C P	3	3.00	0.49	0.09	0.08	29.33
Longear Sunfish	S	I	C M	31	31.00	5.02	0.46	0.41	14.71
Blackside Darter	D	I	S	1	1.00	0.16	0.00	0.00	4.00
Logperch	D	I	S M	5	5.00	0.81	0.08	0.07	15.00
Greenside Darter	D	I	S M	2	2.00	0.32	0.01	0.00	2.50
Banded Darter	D	I	S I	2	2.00	0.32	0.00	0.00	1.50
<i>Mile Total</i>				617	617.00		109.91		
<i>Number of Species</i>				28					
<i>Number of Hybrids</i>				0					

Species List

River Code: 14-001	Stream: Great Miami River	Sample Date: 2009
River Mile: 114.40	Location: adj. Piqua Power Plant	Date Range: 08/19/2009
Time Fished: 4171 sec	Drainage: 868.0 sq mi	Thru: 09/22/2009
Dist Fished: 1.00 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	2	2.00	0.40	0.07	0.10	32.50
Quillback	C	O	M	11	11.00	2.22	9.00	13.74	817.91
Black Redhorse	R	I	S I	18	18.00	3.64	2.48	3.78	137.50
Golden Redhorse	R	I	S M	109	109.00	22.02	26.07	39.83	239.19
Northern Hog Sucker	R	I	S M	4	4.00	0.81	0.35	0.54	88.25
White Sucker	W	O	S T	2	2.00	0.40	0.73	1.11	362.50
Spotted Sucker	R	I	S	14	14.00	2.83	2.43	3.72	173.72
Smallmouth Redhorse	R	I	S M	1	1.00	0.20	0.51	0.77	505.00
Common Carp	G	O	M T	5	5.00	1.01	16.88	25.78	3,375.00
Silver Shiner	N	I	S I	7	7.00	1.41	0.05	0.08	7.14
Striped Shiner	N	I	S	31	31.00	6.26	0.21	0.32	6.77
Spotfin Shiner	N	I	M	52	52.00	10.51	0.20	0.31	3.90
Bluntnose Minnow	N	O	C T	91	91.00	18.38	0.20	0.30	2.15
Channel Catfish	F		C	1	1.00	0.20	1.70	2.60	1,700.00
White Crappie	S	I	C	1	1.00	0.20	0.09	0.13	85.00
Rock Bass	S	C	C	5	5.00	1.01	0.35	0.54	70.60
Smallmouth Bass	F	C	C M	49	49.00	9.90	2.40	3.66	48.88
Largemouth Bass	F	C	C	1	1.00	0.20	0.02	0.02	15.00
Green Sunfish	S	I	C T	31	31.00	6.26	0.91	1.38	29.22
Bluegill Sunfish	S	I	C P	8	8.00	1.62	0.20	0.31	25.38
Longear Sunfish	S	I	C M	35	35.00	7.07	0.58	0.88	16.43
Blackside Darter	D	I	S	2	2.00	0.40	0.01	0.01	4.00
Logperch	D	I	S M	13	13.00	2.63	0.06	0.09	4.77
Johnny Darter	D	I	C	1	1.00	0.20	0.00	0.00	2.00
Greenside Darter	D	I	S M	1	1.00	0.20	0.00	0.00	3.00
	<i>Mile Total</i>			495	495.00		65.46		
	<i>Number of Species</i>			25					
	<i>Number of Hybrids</i>			0					

Species List

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River Code: 14-001	Stream: Great Miami River	Sample Date: 2009
River Mile: 114.00	Location: dst. Piqua dam	Date Range: 07/07/2009
Time Fished: 5448 sec	Drainage: 873.0 sq mi	Thru: 08/11/2009
Dist Fished: 1.00 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	3	3.00	0.26	0.32	0.24	106.67
Quillback	C	O	M	3	3.00	0.26	1.47	1.12	490.67
Black Redhorse	R	I	S I	77	77.00	6.59	17.20	13.06	223.38
Golden Redhorse	R	I	S M	194	194.00	16.60	46.31	35.17	238.72
Northern Hog Sucker	R	I	S M	57	57.00	4.88	4.15	3.15	72.83
Spotted Sucker	R	I	S	2	2.00	0.17	0.16	0.12	81.00
Smallmouth Redhorse	R	I	S M	22	22.00	1.88	4.45	3.38	202.27
Common Carp	G	O	M T	8	8.00	0.68	24.55	18.65	3,068.75
River Chub	N	I	N I	30	30.00	2.57	0.29	0.22	9.80
Suckermouth Minnow	N	I	S	2	2.00	0.17	0.00	0.00	2.00
Silver Shiner	N	I	S I	1	1.00	0.09	0.01	0.01	12.00
Rosyface Shiner	N	I	S I	4	4.00	0.34	0.01	0.01	2.25
Scarlet Shiner	N	I	S M	2	2.00	0.17	0.00	0.00	2.00
Striped Shiner	N	I	S	4	4.00	0.34	0.02	0.01	4.00
Spotfin Shiner	N	I	M	162	162.00	13.86	0.61	0.46	3.73
Sand Shiner	N	I	M M	18	18.00	1.54	0.03	0.02	1.39
Bluntnose Minnow	N	O	C T	184	184.00	15.74	0.41	0.31	2.21
Central Stoneroller	N	H	N	25	25.00	2.14	0.07	0.06	2.96
Channel Catfish	F		C	10	10.00	0.86	7.52	5.71	752.40
Brook Silverside		I	M M	1	1.00	0.09	0.00	0.00	3.00
Black Crappie	S	I	C	2	2.00	0.17	0.22	0.17	109.50
Rock Bass	S	C	C	50	50.00	4.28	5.28	4.01	105.58
Smallmouth Bass	F	C	C M	135	135.00	11.55	11.96	9.08	88.58
Largemouth Bass	F	C	C	12	12.00	1.03	0.44	0.33	36.33
Green Sunfish	S	I	C T	5	5.00	0.43	0.23	0.17	45.20
Bluegill Sunfish	S	I	C P	19	19.00	1.63	0.69	0.52	36.21
Orangespotted Sunfish	S	I	C	4	4.00	0.34	0.03	0.02	8.00
Longear Sunfish	S	I	C M	19	19.00	1.63	0.49	0.37	25.70
Yellow Perch			M	2	2.00	0.17	0.04	0.03	18.50
Blackside Darter	D	I	S	3	3.00	0.26	0.01	0.01	3.00
Logperch	D	I	S M	50	50.00	4.28	0.65	0.50	13.04
Greenside Darter	D	I	S M	19	19.00	1.63	0.10	0.08	5.47
Banded Darter	D	I	S I	27	27.00	2.31	0.05	0.03	1.67
Rainbow Darter	D	I	S M	7	7.00	0.60	0.02	0.02	3.14
Sauger X Walleye	E	P		6	6.00	0.51	3.87	2.94	645.17
<i>Mile Total</i>				1,169	1,169.00		131.66		
<i>Number of Species</i>				34					
<i>Number of Hybrids</i>				1					

Appendix Table 3. Invertebrate Community Index (ICI) metrics and scores for sampling locations in the Great Miami River, Piqua area, 2009. Page A8

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco-region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddisflies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms			
Great Miami River (14-001)													
Year: 2009													
115.40	867.0	39(6)	9(6)	8(6)	12(4)	13.5(4)	30.0(4)	37.6(6)	18.6(4)	0.0(6)	22(6)	5	52
114.90 A	867.0	26(4)	3(2)	3(4)	8(2)	4.1(2)	0.8(0)	1.6(2)	93.1(0)	8.2(0)	5(0)	5	16
114.90 B	867.0	24(4)	4(2)	4(4)	7(2)	8.9(2)	4.6(0)	0.0(0)	86.5(0)	25.0(0)	5(0)	5	14
114.40 A	868.0	26(4)	4(2)	2(2)	7(2)	0.3(2)	0.1(0)	0.0(0)	99.5(0)	3.5(2)	3(0)	5	14
114.40 B	868.0	19(2)	4(2)	2(2)	3(0)	2.5(2)	2.0(0)	0.0(0)	95.5(0)	3.3(2)	3(0)	5	10
114.00	873.0	30(4)	8(6)	5(4)	10(4)	6.5(2)	33.5(6)	39.0(6)	20.8(4)	3.1(4)	18(6)	5	46

Appendix Table 4. Macroinvertebrate sampling results for the Great Miami River, Piqua area, 2009.

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Great Miami River

Collection Date: 09/30/2009 River Code: 14-001 RM: 115.40

upst. Piqua Power Plant, upst. RR

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	16	78120	<i>Labrundinia maculata</i>	+
01801	<i>Turbellaria</i>	1 +	78655	<i>Procladius (Holotanypus) sp</i>	+
03121	<i>Paludicella articulata</i>	+	78750	<i>Rheopelopia paramaculipennis</i>	197
03360	<i>Plumatella sp</i>	22 +	79085	<i>Telopelopia okoboji</i>	65
03451	<i>Urnatella gracilis</i>	1 +	80310	<i>Cardiocladius obscurus</i>	66 +
03600	<i>Oligochaeta</i>	+	80410	<i>Cricotopus (C.) sp</i>	+
04637	<i>Batracobdella phalera</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	393
06201	<i>Hyalella azteca</i>	+	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	590
11119	<i>Plauditus dubius or P. virilis</i>	118 +	81250	<i>Nanocladius (N.) minimus</i>	131 +
11130	<i>Baetis intercalaris</i>	137 +	81460	<i>Orthocladius (O.) sp</i>	+
11620	<i>Paracloeodes minutus</i>	+	82101	<i>Thienemanniella taurocapita</i>	96
12200	<i>Isonychia sp</i>	40 +	83158	<i>Endochironomus nigricans</i>	+
13100	<i>Nixe sp</i>	+	83300	<i>Glyptotendipes (G.) sp</i>	+
13400	<i>Stenacron sp</i>	225 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	66
13510	<i>Maccaffertium exiguum</i>	48 +	84450	<i>Polypedilum (Uresipedilum) flavum</i>	525 +
13540	<i>Maccaffertium mediopunctatum</i>	19 +	84470	<i>Polypedilum (P.) illinoense</i>	+
13561	<i>Maccaffertium pulchellum</i>	573 +	85625	<i>Rheotanytarsus sp</i>	4460 +
13570	<i>Maccaffertium terminatum</i>	228 +	85821	<i>Tanytarsus glabrescens group sp 7</i>	65
16700	<i>Tricorythodes sp</i>	229 +	93900	<i>Elimia sp</i>	2 +
17200	<i>Caenis sp</i>	+	95100	<i>Physella sp</i>	+
18100	<i>Anthopotamus sp</i>	+	97601	<i>Corbicula fluminea</i>	+
21300	<i>Hetaerina sp</i>	25 +	99200	<i>Alasmidonta marginata</i>	+
22001	<i>Coenagrionidae</i>	+	99280	<i>Lasmigona costata</i>	+
22300	<i>Argia sp</i>	+	99880	<i>Lampsilis cardium</i>	+
34700	<i>Aagnetina capitata complex</i>	1			
50315	<i>Chimarra obscura</i>	+			
51206	<i>Cyrnellus fraternus</i>	32			
51400	<i>Nyctiophylax sp</i>	+	No. Quantitative Taxa: 39		Total Taxa: 68
51600	<i>Polycentropus sp</i>	32	No. Qualitative Taxa: 54		ICI: 52
52200	<i>Cheumatopsyche sp</i>	2233 +	Number of Organisms: 12022		Qual EPT: 22
52430	<i>Ceratopsyche morosa group</i>	948 +			
52510	<i>Hydropsyche aerata</i>	268 +			
52590	<i>Hydropsyche venularis</i>	86 +			
52801	<i>Potamyia flava</i>	1			
53400	<i>Protoptila sp</i>	+			
53501	<i>Hydroptilidae</i>	9			
58505	<i>Helicopsyche borealis</i>	+			
59415	<i>Nectopsyche exquisita</i>	+			
59970	<i>Petrophila sp</i>	5 +			
65800	<i>Berosus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68901	<i>Macronychus glabratus</i>	2 +			
69400	<i>Stenelmis sp</i>	1 +			
77500	<i>Conchapelopia sp</i>	66			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Great Miami River

Collection Date: 09/30/2009 River Code: 14-001 RM: 114.90 A upst. Piqua Power Plant

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	1478 +			
01801	<i>Turbellaria</i>	+			
03360	<i>Plumatella sp</i>	49 +			
03451	<i>Urnatella gracilis</i>	2			
03600	<i>Oligochaeta</i>	608 +			
04666	<i>Helobdella triserialis</i>	+			
05900	<i>Lirceus sp</i>	1 +			
06700	<i>Crangonyx sp</i>	+			
13400	<i>Stenacron sp</i>	330 +			
13521	<i>Stenonema femoratum</i>	3 +			
17200	<i>Caenis sp</i>	167 +			
22001	<i>Coenagrionidae</i>	3 +			
22300	<i>Argia sp</i>	36 +			
51206	<i>Cyrnellus fraternus</i>	32			
51600	<i>Polycentropus sp</i>	34 +			
53800	<i>Hydroptila sp</i>	33 +			
65800	<i>Berosus sp</i>	1 +			
68075	<i>Psephenus herricki</i>	+			
68901	<i>Macronychus glabratus</i>	4			
69400	<i>Stenelmis sp</i>	1 +			
80500	<i>Cricotopus (Isocladius) reversus group</i>	564			
81632	<i>Parakiefferiella n.sp 2</i>	94			
83040	<i>Dicrotendipes neomodestus</i>	470			
83051	<i>Dicrotendipes simpsoni</i>	94			
83158	<i>Endochironomus nigricans</i>	94			
83300	<i>Glyptotendipes (G.) sp</i>	7520 +			
83840	<i>Microtendipes pedellus group</i>	+			
85625	<i>Rheotanytarsus sp</i>	94			
85821	<i>Tanytarsus glabrescens group sp 7</i>	94			
93900	<i>Elimia sp</i>	1 +			
94400	<i>Fossaria sp</i>	+			
95100	<i>Physella sp</i>	295 +			
97601	<i>Corbicula fluminea</i>	+			

No. Quantitative Taxa: 26 Total Taxa: 33
 No. Qualitative Taxa: 23 ICI: 16
 Number of Organisms: 12102 Qual EPT: 5

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Great Miami River
upst. Piqua Power Plant

Collection Date: 09/30/2009 River Code: 14-001 RM: 114.90 B

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	339			
01801	<i>Turbellaria</i>	2			
03360	<i>Plumatella sp</i>	24			
03600	<i>Oligochaeta</i>	736			
05900	<i>Lirceus sp</i>	1			
13400	<i>Stenacron sp</i>	331			
13521	<i>Stenonema femoratum</i>	4			
17200	<i>Caenis sp</i>	58			
18100	<i>Anthopotamus sp</i>	7			
22300	<i>Argia sp</i>	4			
51206	<i>Cyrnellus fraternus</i>	155			
51400	<i>Nyctiophylax sp</i>	32			
51600	<i>Polycentropus sp</i>	17			
59415	<i>Nectopsyche exquisita</i>	1			
68901	<i>Macronychus glabratus</i>	1			
74501	<i>Ceratopogonidae</i>	16			
83002	<i>Dicrotendipes modestus</i>	169			
83040	<i>Dicrotendipes neomodestus</i>	24			
83050	<i>Dicrotendipes lucifer</i>	169			
83300	<i>Glyptotendipes (G.) sp</i>	1951			
84000	<i>Parachironomus sp</i>	24			
84040	<i>Parachironomus frequens</i>	48			
93900	<i>Elimia sp</i>	3			
95100	<i>Physella sp</i>	388			
99998	NO QUALITATIVE SAMPLE COLLECTED				+

No. Quantitative Taxa: 24 Total Taxa: 25
 No. Qualitative Taxa: 1 ICI: 14
 Number of Organisms: 4504 Qual EPT:

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Great Miami River

Collection Date: 09/30/2009 River Code: 14-001 RM: 114.40 A adj. Piqua Power Plant

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	+			
01320	<i>Hydra sp</i>	645			
01801	<i>Turbellaria</i>	16 +			
03360	<i>Plumatella sp</i>	41 +			
03451	<i>Urnatella gracilis</i>	1			
03600	<i>Oligochaeta</i>	192			
06700	<i>Crangonyx sp</i>	+			
08601	<i>Hydrachnidia</i>	16			
13400	<i>Stenacron sp</i>	18 +			
13521	<i>Stenonema femoratum</i>	2 +			
13561	<i>Maccaffertium pulchellum</i>	1			
17200	<i>Caenis sp</i>	19			
22001	<i>Coenagrionidae</i>	2			
22300	<i>Argia sp</i>	1 +			
51206	<i>Cyrnellus fraternus</i>	5			
51600	<i>Polycentropus sp</i>	+			
54200	<i>Orthotrichia sp</i>	8			
65800	<i>Berosus sp</i>	1			
68075	<i>Psephenus herricki</i>	+			
68901	<i>Macronychus glabratus</i>	9			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
80411	<i>Cricotopus (Isocladius) sp nr. absurdus</i>	293			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	146			
82890	<i>Demeijerea sp</i>	146			
83045	<i>Dicrotendipes nervosus</i>	146			
83050	<i>Dicrotendipes lucifer</i>	293			
83300	<i>Glyptotendipes (G.) sp</i>	11118 +			
83840	<i>Microtendipes pedellus group</i>	+			
84040	<i>Parachironomus frequens</i>	146			
84888	<i>Xenochironomus xenolabis</i>	+			
93200	<i>Hydrobiidae</i>	1 +			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	265 +			
96900	<i>Ferrissia sp</i>	16			

No. Quantitative Taxa: 26 Total Taxa: 34
 No. Qualitative Taxa: 16 ICI: 14
 Number of Organisms: 13547 Qual EPT: 3

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Great Miami River
adj. Piqua Power Plant

Collection Date: 09/30/2009 River Code: 14-001 RM: 114.40 B

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	490			
01801	<i>Turbellaria</i>	1			
03360	<i>Plumatella sp</i>	27			
03600	<i>Oligochaeta</i>	96			
05900	<i>Lirceus sp</i>	1			
06700	<i>Crangonyx sp</i>	1			
13400	<i>Stenacron sp</i>	121			
13521	<i>Stenonema femoratum</i>	1			
17200	<i>Caenis sp</i>	73			
18100	<i>Anthopotamus sp</i>	3			
22300	<i>Argia sp</i>	1			
51206	<i>Cyrnellus fraternus</i>	157			
51600	<i>Polycentropus sp</i>	2			
83002	<i>Dicrotendipes modestus</i>	128			
83300	<i>Glyptotendipes (G.) sp</i>	6633			
83840	<i>Microtendipes pedellus group</i>	64			
93900	<i>Elimia sp</i>	13			
95100	<i>Physella sp</i>	122			
96900	<i>Ferrissia sp</i>	45			
99998	NO QUALITATIVE SAMPLE COLLECTED	+			

No. Quantitative Taxa: 19 Total Taxa: 20
 No. Qualitative Taxa: 1 ICI: **10**
 Number of Organisms: 7979 Qual EPT:

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Great Miami River

Collection Date: 09/30/2009 River Code: 14-001 RM: 114.00

dst. Piqua dam

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00650	<i>Eunapius sp</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	+
01801	<i>Turbellaria</i>	38 +	80500	<i>Cricotopus (Isocladius) reversus group</i>	+
03040	<i>Fredericella sp</i>	+	80510	<i>Cricotopus (Isocladius) sylvestris group</i>	+
03121	<i>Paludicella articulata</i>	+	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	671
03360	<i>Plumatella sp</i>	42 +	81240	<i>Nanocladius (N.) distinctus</i>	447
03600	<i>Oligochaeta</i>	64 +	83300	<i>Glyptotendipes (G.) sp</i>	559 +
06700	<i>Crangonyx sp</i>	+	84000	<i>Parachironomus sp</i>	+
11119	<i>Plauditus dubius or P. virilis</i>	6 +	84030	<i>Parachironomus directus</i>	+
11130	<i>Baetis intercalaris</i>	244 +	84039	<i>Parachironomus frequens group</i>	112
11670	<i>Procloeon viridoculare</i>	+	84450	<i>Polypedilum (Uresipedilum) flavum</i>	1229 +
12200	<i>Isonychia sp</i>	8 +	84470	<i>Polypedilum (P.) illinoense</i>	+
13000	<i>Leucrocuta sp</i>	+	85500	<i>Paratanytarsus sp</i>	+
13400	<i>Stenacron sp</i>	187 +	85625	<i>Rheotanytarsus sp</i>	6483 +
13510	<i>Maccaffertium exiguum</i>	1	87540	<i>Hemerodromia sp</i>	32
13561	<i>Maccaffertium pulchellum</i>	519 +	93200	<i>Hydrobiidae</i>	+
13570	<i>Maccaffertium terminatum</i>	42 +	93900	<i>Elimia sp</i>	2 +
16700	<i>Tricorythodes sp</i>	65 +	95100	<i>Physella sp</i>	+
17200	<i>Caenis sp</i>	+	95900	<i>Gyraulus sp</i>	+
18100	<i>Anthopotamus sp</i>	+	96100	<i>Menetus (Micromenetus) sp</i>	+
21300	<i>Hetaerina sp</i>	+	97601	<i>Corbicula fluminea</i>	+
22001	<i>Coenagrionidae</i>	+	98600	<i>Sphaerium sp</i>	1 +
22300	<i>Argia sp</i>	+	99200	<i>Alasmidonta marginata</i>	+
34700	<i>Agnatina capitata complex</i>	+			
43300	<i>Ranatra sp</i>	+			
50315	<i>Chimarra obscura</i>	+	No. Quantitative Taxa: 30		Total Taxa: 66
52200	<i>Cheumatopsyche sp</i>	3628 +	No. Qualitative Taxa: 56		ICI: 46
52430	<i>Ceratopsyche morosa group</i>	1600 +	Number of Organisms: 16609		Qual EPT: 18
52510	<i>Hydropsyche aerata</i>	302 +			
52520	<i>Hydropsyche bidens</i>	32			
52801	<i>Potamyia flava</i>	2			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	35			
60400	<i>Gyrinus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68201	<i>Scirtidae</i>	+			
68901	<i>Macronychus glabratus</i>	2			
69400	<i>Stenelmis sp</i>	+			
74100	<i>Simulium sp</i>	32 +			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
78140	<i>Labrundinia pilosella</i>	+			
78750	<i>Rheopelopia paramaculipennis</i>	112			
80310	<i>Cardiocladius obscurus</i>	112 +			
80410	<i>Cricotopus (C.) sp</i>	+			