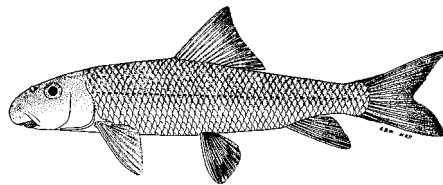


Division of Surface Water

Biological and Water Quality Study of Fish Creek

Steuben and Dekalb Counties, Indiana
Williams County, Ohio



February 18, 2005

Bob Taft, Governor
Joseph P. Koncelik, Director

Biological and Water Quality Study of Fish Creek 2002

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Introduction

This study evaluated the water resource quality of Fish Creek and is a follow-up to previous surveys conducted in 1997, 1995, and 1994 (Ohio EPA 2003a, 1996, 1995). Ohio EPA, as one of the Natural Resource Damage Assessment (NRDA) trustees for Fish Creek, collected in-stream biological data to assess the condition of the stream in 1994, 1995, 1997, and 2002. Ohio EPA had previously collected biological data in 1991 and 1992 and was conducting a routine basin survey in 1993, when the diesel fuel spill occurred.

Fish and macroinvertebrate communities were sampled during the summer and fall of 2002 at six locations in Fish Creek from river mile (RM) 21.6 to the mouth (Table 1, Figure 1). Sampling was conducted to continue the assessment of fish and macroinvertebrate community conditions following a rupture in a pipeline which spilled approximately 30,000 gallons of #2 diesel fuel into Fish Creek at RM 7.55 on September 15, 1993. Oil collection booms were placed in Fish Creek shortly after the spill, and reportedly the spill was confined before entering the St. Joseph River. Fish collections were made at each site in August and September 2002 using pulsed DC electrofishing gear, with sampling distance varying between 200 and 210 meter zones. Macroinvertebrate collections were made at each site using modified Hester-Dendy multiple-plate artificial substrate samplers colonized from August 5 - September 16, 2002. At the time of sample retrieval, a qualitative sample of the macroinvertebrate community was collected from all available natural substrates in the near vicinity of the sampling site. The macroinvertebrate quantitative artificial substrate and qualitative natural substrate samples and fish samples were collected by Ohio EPA, Ohio DNR, Indiana DEM, and Nature Conservancy scientists; laboratory work, data processing and data analysis were conducted by Ohio EPA. Fish and macroinvertebrate field work, laboratory, data processing and data analysis methods and procedures conducted by Ohio EPA were consistent with those specified in Ohio EPA manuals (1987, 1989a, 1989b). In addition to Ohio EPA biological sampling, the USFWS provided Fish Creek fish community results from 1999 and 2002 and followed sampling procedures by Simon (2000). Macroinvertebrate collections made by the USFWS (Simon 2000) in Fish Creek during 2002 were processed (sorted, identified, enumerated) by Ohio EPA and are included in this report. Indiana Water Quality Standards list Fish Creek as a Warmwater aquatic life use; within Ohio, Fish Creek has an Exceptional Warmwater Habitat use from RM 5.5 to 2.4, and a Warmwater Habitat use from RM 2.4 to the mouth. Previous Ohio EPA studies of Fish Creek assessed the portion in Indiana using Ohio's Exceptional Warmwater Habitat biocriteria.

Fish Creek sediment and surface water samples were collected from each biological station sampled by Ohio EPA. Fine grained sediment samples were collected in the upper six inches of bottom material at each location using decontaminated stainless steel scoop samplers (Ohio EPA 2001). Collected sediment was mixed and then placed into decontaminated clear glass jars with teflon lined lids, placed on ice (to maintain 4°C) and either delivered to the Ohio EPA environmental lab (most parameters) or an IDEM contract lab (diesel range organics). Sediment data is reported on a dry weight basis. Sediment evaluations were conducted using consensus-based sediment guidelines (MacDonald *et al.* 2000), reference conditions (Ohio EPA 2003b) and published literature. Surface water grab samples were collected twice from each sampling location. Chemical parameters measured in surface waters included metals, nutrients, solids, chloride, sulfate, oxygen demand, acidity, alkalinity, and herbicides. Water samples were collected directly into sample containers, appropriate preservatives added, and then placed on ice in coolers. Water samples were delivered to the Ohio EPA environmental lab for analyses. Instream dissolved oxygen, conductivity, pH, and temperature were measured hourly at each biological station from August 5 - 7, 2002 using Hydrolab

Datasonde continuous monitors. Single measurements of temperature, dissolved oxygen, percent dissolved oxygen saturation, conductivity, pH, total dissolved solids, nitrate-N, turbidity, ammonium-N, and oxidation/reduction potential were recorded with a Hydrolab sonde at each biological station between September 16 and 19, 2002.

Summary/ Conclusions

From August to September, 2002 Ohio EPA Division of Surface Water staff, at the request of the Division of Emergency and Remedial Response, conducted biological community, sediment, and surface water sampling of Fish Creek upstream and downstream from a diesel fuel spill which occurred September 15, 1993. Fish Creek in Indiana was evaluated using either Indiana or Ohio warmwater biological criteria; sections in Ohio were evaluated using either Ohio Warmwater Habitat or Exceptional Warmwater Habitat criteria. Biological data were collected by USFWS and IDEM during 1999 and are included in this report.

2002

A total of 30 miles of Fish Creek were assessed by the Ohio EPA, USFWS, and IDEM in 2002. Based on the performance of the biological communities, 19 miles of Fish Creek were in full support/attainment of the Indiana Warmwater use and Ohio Warmwater Habitat use, 2 miles were in partial attainment of the Ohio Exceptional Warmwater Habitat use, and 9 miles were not supporting or attaining the warmwater use (Table 2). The partial and non -attainment/support was due primarily to the failure of the fish community to meet biological criteria. The non-support of the Indiana Warmwater use at RMs 29.5 and 27.7 was the result of previous channel modifications negatively influencing the fish communities. As was noted during past sampling in Fish Creek, a heavy silt layer was covering the bottom substrates, generally causing moderate to extensive embeddedness (smothering) of the stream bottom. Macroinvertebrate sampling documented good to exceptional conditions at nearly all locations, excluding RM 27.7. Fish communities were indicative of marginally good to good conditions, excluding RMs 29.5, 27.7, and 20.4, where poor quality fish communities occurred. The continued predominance of highly pollution tolerant species, such as green sunfish, creek chub, and bluntnose minnow, hinder Fish Creek from achieving its potential as an exceptional fishery in Indiana (and Ohio).

Based on the limited number of water samples collected in this study, chemical water quality of Fish Creek was considered good, with only strontium exceeding Indiana and Ohio WQS criteria. All other chemical parameters were either within acceptable water quality criteria levels, were reported by the laboratory as not detected, or were at or below ecoregional reference conditions. Sediment collected in Fish Creek was not contaminated. Based on sediment screening guidelines, none of the Fish Creek sediment samples exceeded harmful levels for metals, polycyclic aromatic hydrocarbon (PAH) compounds, PCBs, or organochlorinated pesticides. In addition, all metal results were below Ohio Sediment Reference Values.

Biological sampling results from two tributaries to Fish Creek, Hiram Sweet Ditch and West Branch Fish Creek, documented non-support of the Indiana Warmwater use. Fish community results were in the poor range for both streams. Macroinvertebrate communities from both streams were not impaired, with index scores supporting the Warmwater use. Surface water and sediment samples were not collected from either stream during this study.

1999

A total of 30 miles of Fish Creek were assessed biologically by the USFWS, IDEM, and Ohio DNR in 1999. Based on the performance of the biological communities, 20 miles of Fish Creek were in full support/attainment of the Indiana Warmwater use and Ohio Warmwater Habitat or Exceptional Warmwater Habitat uses, and 10 miles were not supporting or attaining these uses (Table 3). As was

observed during 2002, the upper reach of Fish Creek has been channel modified, resulting in poor fish communities and non-support of the Indiana Warmwater use. Impaired fish communities were documented in Ohio at the two most downstream locations. Macroinvertebrate sampling occurred only at Indiana sampling locations, and all sample results were fully supporting the Indiana Warmwater use. Surface water and sediment samples were not collected in Fish Creek during 1999.

Biological sampling results from two tributaries to Fish Creek, Hiram Sweet Ditch and West Branch Fish Creek, documented non-support of the Indiana Warmwater use. Fish community results were in the poor range for both streams. Macroinvertebrate communities from both streams were not impaired, with index scores supporting the Warmwater use. Surface water and sediment samples were not collected from either stream during this study.

Table 1. Fish and macroinvertebrate sampling locations in Fish Creek, 1999 and 2002.

Stream/ River Mile	Latitude	Longitude	Landmark	County	USGS 7.5 min. Quad. Map
<i>Fish Creek</i>					
29.5	41.6395	84.8171	Dst. CR 40S, IN	Steuben	Clear Lake, IN-OH-MI
27.7	41.6153	84.8200	Dst. Metz Rd., IN	Steuben	Edon, IN-OH
21.6	41.5694	84.8269	TR 850E, IN	Steuben	Edon, IN-OH
20.4	41.5590	84.8356	Ust. SR 427, IN	Steuben	Edon, IN-OH
15.0	41.5340	84.8637	Adj. CR 775S, IN	Steuben	Edon, IN-OH
14.3	41.5160	84.8701	CR 4A, IN	Dekalb	Edon, IN-OH
8.3	41.4734	84.8268	CR 16, IN	Dekalb	Butler East, IN-OH
7.5	41.4650	84.8244	RR track, IN	Dekalb	Butler East, IN-OH
5.6	41.4680	84.8043	Ust. State Line Rd.	Dekalb	Butler East, IN-OH
5.4/5.5	41.4669	84.8019	TR 171, OH	Williams	Butler East, IN-OH
2.4	41.4726	84.7687	TR 47, OH	Williams	Edgerton, OH
0.4	41.4639	84.7492	Ust. SR 49, OH	Williams	Edgerton, OH
0.3	41.4628	84.7472	Dst. SR 49, OH	Williams	Edgerton, OH
<i>West Branch Fish Creek</i>					
1.2	41.6390	84.8327	Dst. CR 40S, IN	Steuben	Clear Lake, IN-OH-MI
<i>Hiram Sweet Ditch</i>					
0.1	41.5177	84.8707	Ust. CR 4A, IN	Dekalb	Edon, IN-OH

Table 2. Aquatic life use attainment status for Fish Creek based upon sampling conducted from August to September, 2002. Attainment status is based on biocriteria for the Eastern Corn Belt Plains ecoregion of Ohio (OAC Chapter 3745-1-07, Table 7-15) and Indiana biological index guidelines.

RIVER MILE Fish/Invert.	IBI OH/IN	Modified Iwb	ICI/MIBI	QHEI	Attainment/ Support Status	Comment
Fish Creek-2002		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
29.5/ 29.5	-/ <u>28</u> *	NA	-/3.4	47.5	NON	Channel modified
27.7/ 27.7	-/ <u>22</u> *	-	-/2.0*	60.0	NON	Channel modified
21.6/ 21.6	46/-	8.9	48/-	72.0	FULL	Natural channel/ cobble and gravel
20.4/ 20.4	-/ <u>34</u> *	-	-/3.0	68.5	NON	Natural channel/ sand and gravel
15.0/ 15.0	-/38	-	-/5.2	76.0	FULL	Upst. Hamilton/Hiram Sweet Ditch
14.3/ 14.3	41/-	9.2	52/-	75.0	FULL	Downstream Hamilton
14.3/ 14.3	-/42	-	-/4.0	71.5	FULL	Downstream Hamilton
8.3/ 8.3	44/-	9.2	44/-	70.5	FULL	Upstream diesel spill area
7.5/ 7.5	41/-	8.8	44/-	77.5	FULL	Diesel spill area - near field
<i>Eastern Corn Belt Plains Ecoregion - EWH Use Designation (Ohio)</i>						
5.4/ 5.4	43*/-	9.2 ^{ns}	50/-	75.5	PARTIAL	Diesel spill area - far field
<i>Eastern Corn Belt Plains Ecoregion - WWH Use Designation (Ohio)</i>						
0.3/ 0.3	39 ^{ns} /-	8.0 ^{ns}	50/-	69.5	FULL	Downstream recovery
West Branch Fish Creek-2002		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
1.2	-/ <u>30</u> *	NA	-/4.4	-	NON	Modified channel
Hiram Sweet Ditch - 2002		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
0.1	-/ <u>32</u> *	-	-/3.8	-	NON	Downstream Hamilton WWTP

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)

INDEX	WWH	EWH	MWH ^a
Ohio IBI - Wading	40	50	24
Ohio Mod. Iwb - Wading	8.3	9.4	6.2
Ohio ICI	36	46	22
Indiana IBI	35	-	-
Indiana MIBI	2.2	-	-

* - Significant departure from ecoregion biocriterion (For Ohio: >4 IBI or ICI units; >0.5 MIwb units).

^{ns} - Nonsignificant departure from ecoregion biocriterion (For Ohio: ≤4 IBI or ICI units; ≤0.5 MIwb units).

^a - Modified Warmwater Habitat for channel modified areas.

Table 3. Aquatic life use attainment status for Fish Creek based upon sampling conducted from October, 1999. Attainment status is based on biocriteria for the Eastern Corn Belt Plains ecoregion of Ohio (OAC Chapter 3745-1-07, Table 7-15) and Indiana ECBP biological index guidelines.

RIVER MILE Fish/Invert.	IBI OH/IN	Modified Iwb	ICI/MIBI	QHEI	Attainment/ Support Status	Comment
Fish Creek-1999		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
29.5/ 29.5	-/32*	NA	-/2.8	54	NON	Channel modified
27.7/ 27.7	-/28*	-	-/3.0	44	NON	Channel modified
20.4/ 20.4	-/36	-	-/5.6	59	FULL	Natural channel/ cobble and gravel
15.0/ 15.0	-/36	-	-/6.2	60	FULL	Upst. Hamilton/Hiram Sweet Ditch
14.3/ 14.3	-/42	-	-/5.2	65	FULL	Downstream Hamilton
8.3/ 8.3	-/48	-	-/4.8	76.5	FULL	Upstream diesel spill area
5.6/ 5.6	-/46	-	-/4.6	74.5	FULL	Diesel spill area - far field
<i>Eastern Corn Belt Plains Ecoregion - EWH Use Designation (Ohio)</i>						
5.5	46/-	9.5/-	-	70.0	(FULL)	Diesel spill area - far field
2.4	36*/-	8.1*/-	-	78.5	(NON)	Diesel spill area - far field
<i>Eastern Corn Belt Plains Ecoregion - WWH Use Designation (Ohio)</i>						
0.4	30*/-	7.6*/-	-	63.5	(NON)	Downstream recovery
West Branch Fish Creek-1999		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
1.2	-/32*	NA	-/4.2	60.5	NON	Modified channel
Hiram Sweet Ditch - 1999		<i>Eastern Corn Belt Plains Ecoregion - Warm Water Use Designation (Indiana)</i>				
0.1	-/28*	-	-/4.6	58.5	NON	Downstream Hamilton WWTP

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)

INDEX	WWH	EWH	MWH ^a
Ohio IBI - Wading	40	50	24
Ohio Mod. Iwb - Wading	8.3	9.4	6.2
Ohio ICI	36	46	22
Indiana IBI	35		
Indiana MIBI	2.2		

* - Significant departure from ecoregion biocriterion (For Ohio: >4 IBI or ICI units; >0.5 MIwb units).

^{ns} - Nonsignificant departure from ecoregion biocriterion (For Ohio: ≤4 IBI or ICI units; ≤0.5 MIwb units).

^a - Modified Warmwater Habitat for channel modified areas.

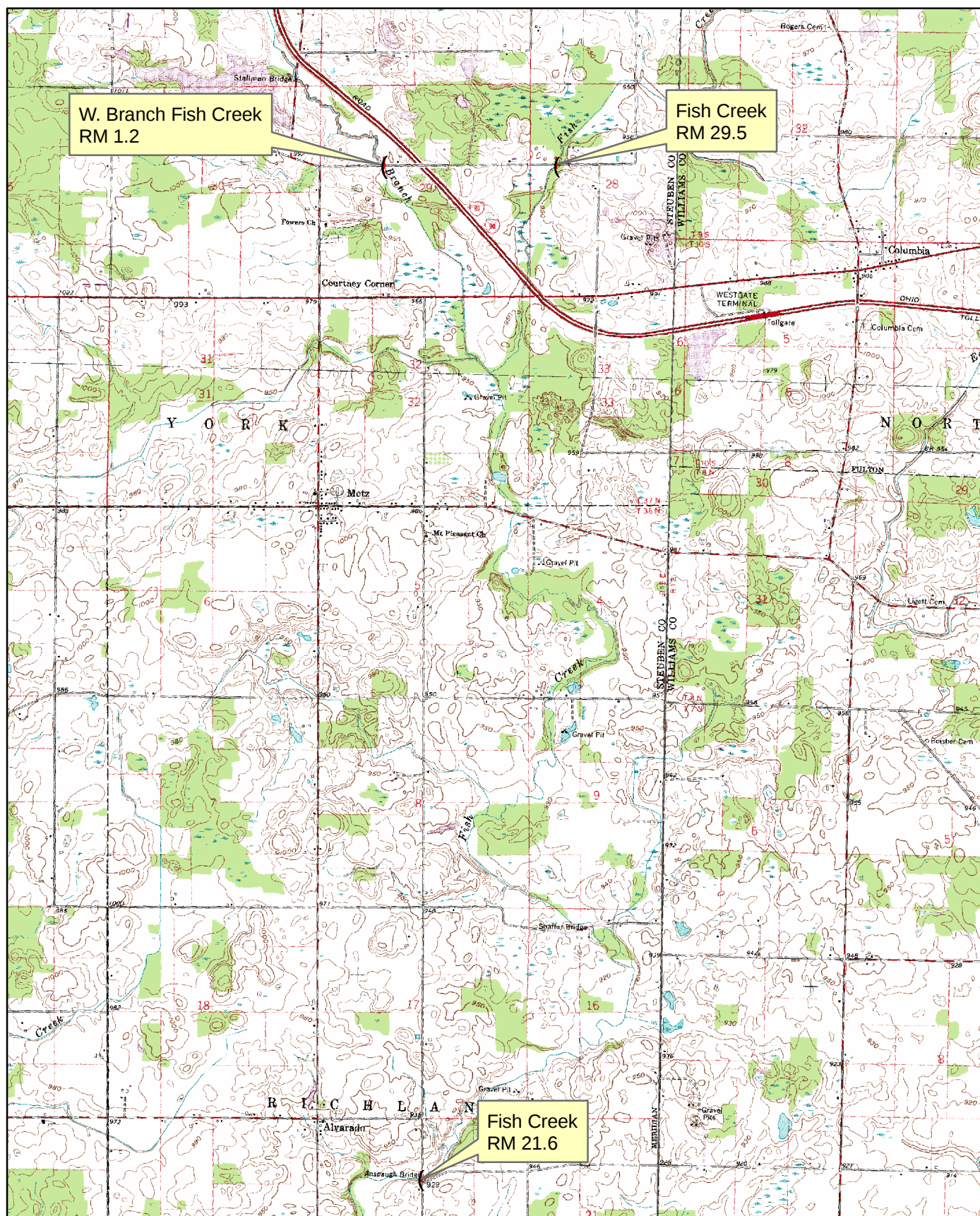


Figure 1
Sampling locations in Fish Creek study area, 1999 and 2002.

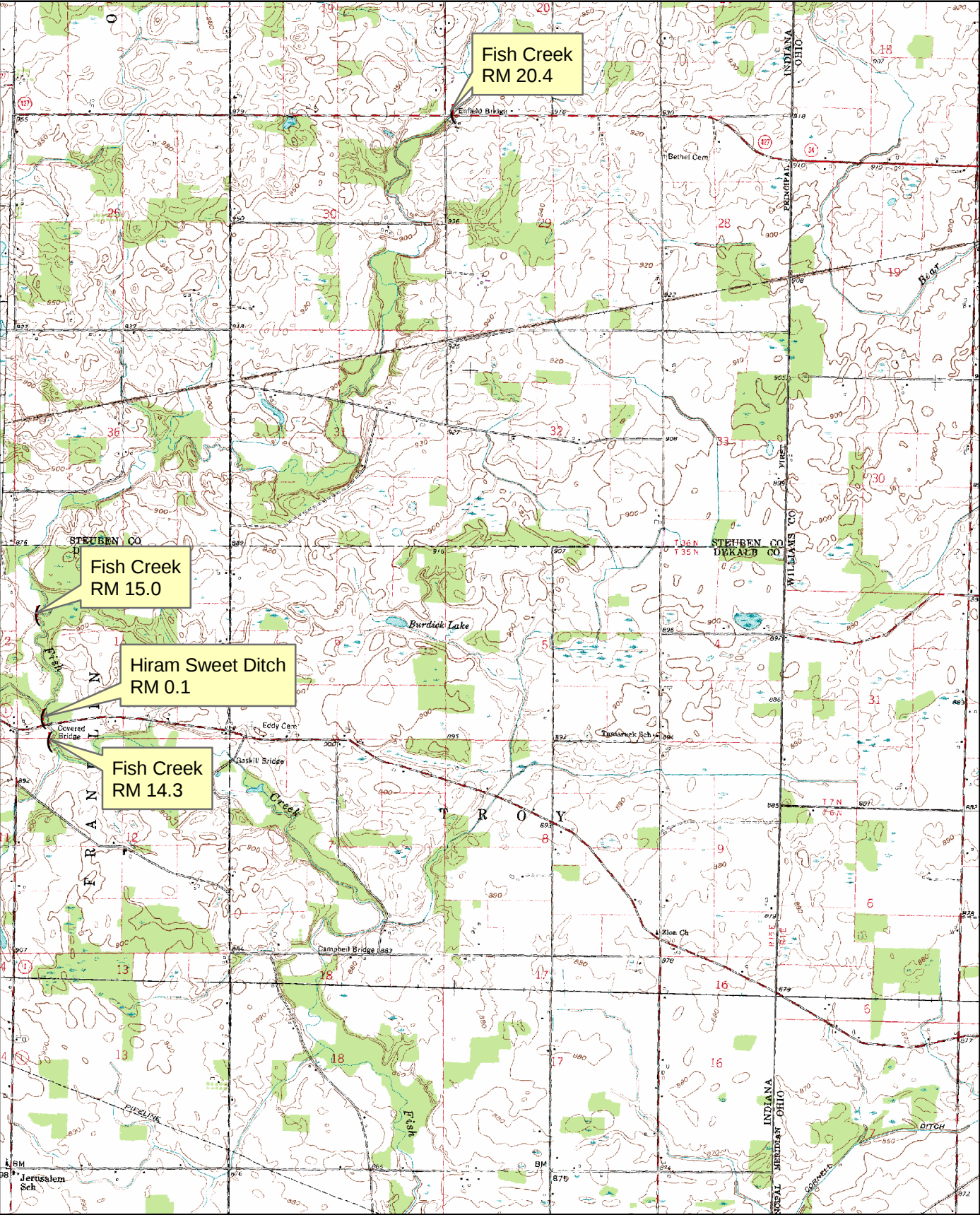


Figure 1. continued

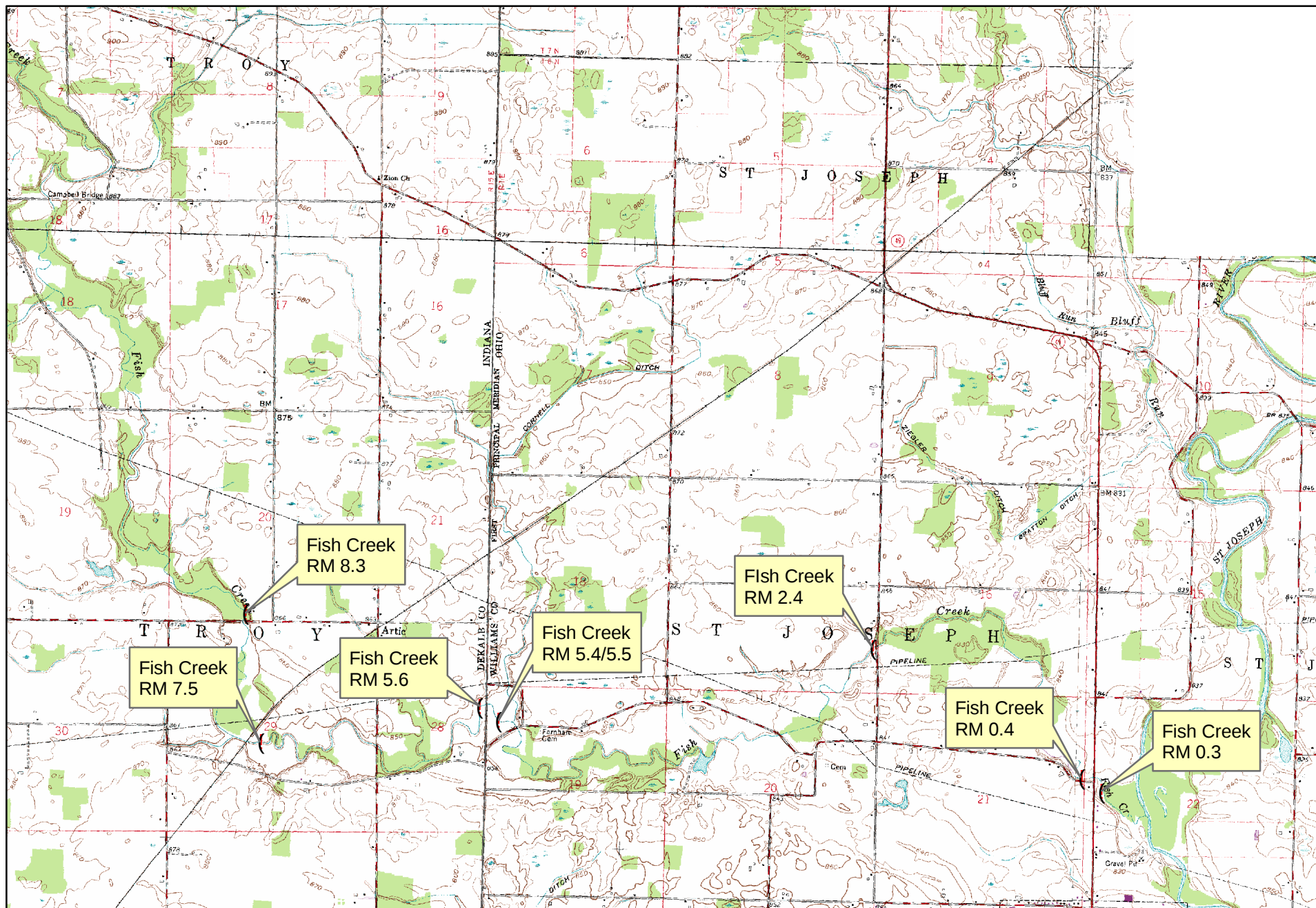


Figure 1. continued

Surface Water Chemistry

Surface water chemical analyses were conducted on grab samples collected from Fish Creek between RM 21.6 and RM 0.3 during 2002. Two samples were collected from each location; once in August and once in September. Water samples were tested for total analyte list metals, acidity, 5-day biochemical oxygen demand, chloride, nitrogen compounds, phosphorus, alkalinity, sulfate, total suspended solids, total dissolved solids and herbicides. Results of these tests are reported in Appendix Tables 1 and 2 and summarized below. Additionally, Datasonde^R continuous recording water quality monitors were placed in Fish Creek at each Ohio EPA biological sampling station from August 5-7, 2002, with measurements of dissolved oxygen, pH, temperature, and conductivity recorded hourly over the three-day period. IDEM collected instantaneous measurements of D.O., conductivity, pH, TDS, nitrate, ammonia, and turbidity at each Ohio EPA biological station during September, 2002. The results are reported in Appendix Table 3.

Nearly all of the water quality parameters measured in Fish Creek during August and September, 2002 were within acceptable levels. Only strontium levels exceeded Ohio and Indiana Water Quality Standards (WQS) criteria (Table 4). However, Fish Creek strontium concentrations were far below Ohio reference levels (3600 ug/l: 75th percentile). Ammonia-N, total dissolved solids, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were below Ohio and/or Indiana WQS criteria; iron, TKN, nitrate-N, total phosphorus, and sulfate were low based on values below the 75th percentile concentration for reference conditions in the Eastern Corn Belt Plain Ecoregion; or values were near or below the parameter laboratory detection limit (nitrite-N, beryllium, vanadium). Herbicide analysis documented nearly all results at non-detect levels. Atrazine was measured in low concentrations from two locations in Fish Creek during the August, 2002 sampling event. However, both values (0.24 and 0.21 ug/l) were far below the Indiana chronic aquatic life WQS criterion of 12 ug/l. Nitrate levels spiked upward at RM 14.3, a site immediately downstream from the confluence with the West Branch Fish Creek. West Branch Fish Creek receives effluent from the Hamilton, Indiana wastewater treatment plant.

Summer base flow conditions occurred in Fish Creek during each of the water quality sampling events during August and September, 2002.

Datasonde^R continuous water quality recorders monitored water quality conditions hourly over a three day period from August 5-7, 2002 at each of the Ohio EPA biological stations. Results are presented for dissolved oxygen, pH, temperature, and conductivity (Figure 2). Of the three parameters with WQS criteria (D.O, pH, temperature), all measurements were within acceptable levels. Particularly interesting is the narrow range of pH measurements recorded at each location in Fish Creek.

Overall water quality of the six surface water sampling locations was good, with only strontium exceeding Ohio's and Indiana's WQS criteria. All other chemical parameters were either within acceptable water quality criteria levels, were reported by the laboratory as not detected, or were at or below ecoregion reference conditions.

Table 4. Exceedences of Ohio or Indiana Water Quality Standards criteria (OAC 3745-1/327 IAC 2) for chemical/physical parameters measured in Fish Creek during 2002. Raw data results are presented in Appendix Tables 1-3.

River Mile	Parameter (value)
<i>Fish Creek</i>	
21.6 (IN)	None
14.3 (IN)	Strontium (1000 ug/l, 1180 ug/l)*
8.3 (IN)	Strontium (910 ug/l, 1140 ug/l)*
7.5 (IN)	Strontium (937 ug/l, 1170 ug/l)*
5.4 (OH)	Strontium (948 ug/l, 1100 ug/l)*
0.3 (OH)	Strontium (841 ug/l, 1100 ug/l)*

* Exceedence of Outside Mixing Zone Average criteria (Ohio)/ Chronic Aquatic Life (Indiana).

** Exceedence of Outside Mixing Zone Maximum criteria (Ohio)/ Acute Aquatic Life (Indiana).

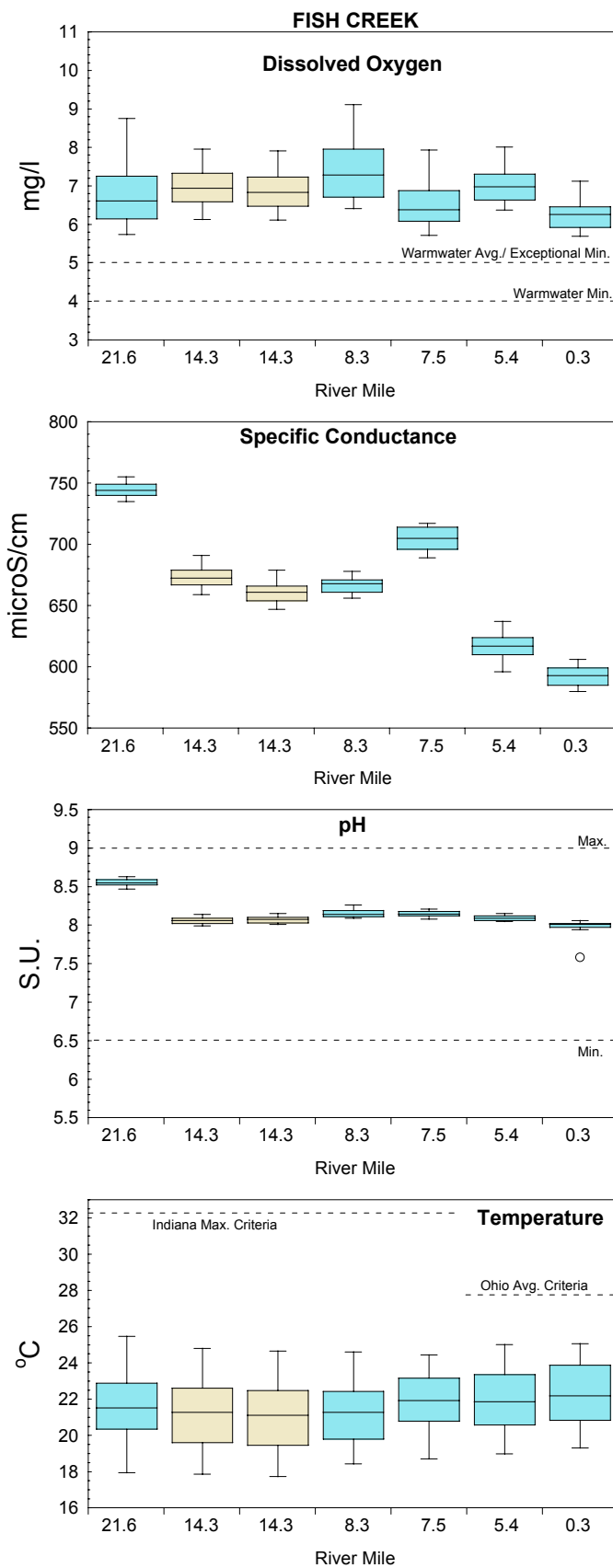


Figure 2. Box plots of Datasonde^R continuously recorded (hourly) pH, temperature, conductivity, and dissolved oxygen measurements from Fish Creek sampling locations, August 5-7, 2002. Duplicate Datasondes^R were set at RM 14.3.

Sediment Quality

Sediment samples were collected at six locations in Fish Creek during August 2002. All sampling locations are indicated by river mile in Figure 1. Samples were analyzed for total analyte list metals, semi-volatile organic compounds, PCBs, pesticides, total petroleum hydrocarbons, and organic carbon. Specific chemical parameters tested and results are listed in Appendix Table 4.

Sediment samples were evaluated in part using consensus-based sediment guidelines (MacDonald *et al.* 2000). The guidelines define two levels of ecotoxic effects - threshold effect concentration (TEC) and probable effect concentration (PEC). The TEC is a level in sediment below which harmful effects to benthic organisms are unlikely to be observed and the PEC indicates a level above which harmful effects are likely to be observed. For metal parameters, results were compared to Ohio *Sediment Reference Values* (Ohio EPA 2003b). Sediment reference values were developed from biological reference sites with co-located sediment data and represent the upper inner fence on a standard box plot. Based on the guidelines noted above, none of the Fish Creek sediment samples exceeded the TEC or PEC for numerous metals and polycyclic aromatic hydrocarbon (PAH) compounds (Table 5). The guidelines detailed in MacDonald *et al.* (2000) do not include evaluations of several PAHs and metals, and most non-PAH semivolatile organic compounds. In addition, all metal results were below Ohio Sediment Reference Values.

Aside from one detected measure of bis(2-ethylhexyl)phthalate at RM 8.3, all other semivolatile organic compounds were reported as not detected, including all PAH compounds. PCB aroclors were not detected in any of the sediment samples, and organochlorinated pesticides were reported as not detected or very low. Sediment chemical results reflected non-contaminated conditions.

Table 5. Select chemical compounds measured in sediment samples collected by Ohio EPA and IDEM from Fish Creek on August 12, 2002. Measurements in **bold** exceed the TEC as detailed in MacDonald *et al.* 2000 or sediment reference values (Ohio EPA 2003b). Sediment reference values (SRVs) were used to assess levels of metals only. Parameters in *italics* do not have review guidelines established in MacDonald *et al.* 2000. See appendix table 4 for a complete list of chemicals tested in Fish Creek sediments.

Parameter	SRVs	Fish Creek Sediment (River Mile)						Duplicate 0.3
		21.6	14.3	8.3	7.5	5.4	0.3	
<u>Metals - Total (mg/kg)</u>								
Arsenic	18	8.3	7.3	3.8	7.9	4.9	6.4	4.8
Beryllium	0.80	<4.4	<3.8	<2.4	<2.8	<2.5	<2.7	<2.5
Cadmium	0.90	0.339J	0.273J	<0.096	0.158J	0.102	0.383J	0.223J
Chromium	40	<26	<23	<14	<17	<15	<16	<15
Copper	34	10.4	10.6	<4.8	6.8	<5.1	<5.5	<5.0
Iron	33,000	17,100	15,000	7620	11,900	8420	10,800	8410
Lead	47	<35	<30	<19	<23	<20	<22	<20
Nickel	42	<35	<30	<19	<23	<20	<22	<20
Mercury	0.12	<0.049	<0.043	<0.024	<0.031	<0.029	<0.032	<0.024
Silver	0.43	<0.44	<0.38UJ	<0.24	<0.28	<0.25	<0.27	<0.25
Vanadium	40	<44	<38	<24	<28	<25	<27	<25
Zinc	160	66.1	75.9	27.9	45.8	32.5	27.4	25.8
<u>Semi-volatile Organic Analytes (mg/kg)</u>								
<i>bis(2-Ethylhexyl) phthalate</i>		<0.88	<0.75	7.21	<0.59	<0.57	<0.57	<0.57
All Other Analytes		<DL	<DL	<DL	<DL	<DL	<DL	<DL
<u>PCBs (ug/kg) - All Aroclors</u>		<DL	<DL	<DL	<DL	<DL	<DL	<DL
<u>Pesticides (ug/kg)</u>								
Gamma-Chlordane		<8.7	<7.5	<5.5	6.9P	<5.9	<5.7	<5.5
<u>Total Petroleum Hydrocarbons (mg/kg)</u>								
<i>Diesel Range Organics</i>		27J	33	30	38	26	24J	41 ^a

a- Diesel range organics duplicate was collected at RM 7.5.

J- The analyte was positively identified, the associated numerical value is estimated.

UJ- The analyte was not detected above the sample quantitation limit (QL). However, the reported QL is estimated.

P- Analyte is quantitated and there is greater than 40% difference for detected concentrations from the two GC columns used for analysis.

DL- Detection limit.

Physical Habitat

Fish Creek

Stream habitat conditions were evaluated during 2002 and 1999 at twelve locations in Fish Creek, one location in West Branch Fish Creek, and one location in Hiram Sweet Ditch. Stream habitat was assessed using the Qualitative Habitat Evaluation Index (QHEI). QHEI scores, and warmwater and modified warmwater attributes are presented in Table 6.

The two most upstream sampling locations in Fish Creek (RMs 29.5 and 27.7) had been previously channel modified (unlike all other Fish Creek locations which have natural stream channels). Both sites had bottom substrates predominated by gravel and sand, with sparse to moderate amounts of instream cover. The riparian width at both locations was narrow, comprised largely of shrubs. Overall channel development was fair, with run habitat most common. A notable observation at these two locations was an improvement in the amount of silt cover and substrate embeddedness from 1999 to 2002. QHEI scores for 2002 were 47.5 and 60.0 at RMs 29.5 and 27.7, respectively, reflective of fair stream habitat.

Stream morphology at RM 21.6 consisted of good pool, riffle, and run development. Bottom substrates were different from other sampling locations, being predominated by cobble and gravel. Instream cover was primarily composed of boulders and cobble; logs and woody debris were sparse within the sampling zone. The QHEI score at RM 21.6 was 72.0, reflective of good stream habitat.

Physical habitats at Fish Creek sampling sites between RMs 15.0 and 2.4 were quite similar in quality. Bottom substrates were predominated by sand and pea-sized gravel, with lesser amounts of silt, cobble and boulders. Logs and woody debris were extensive within this reach of Fish Creek, providing valuable instream fish and macroinvertebrate habitat. QHEI scores within this reach ranged between 70.5 and 78.5, indicative of good to excellent stream habitat.

Macrohabitats evaluated at RM 0.3 in Fish Creek were of a lower quality than found at upstream sampling locations (RMs 15.0-2.4). Bottom substrates were predominantly composed of sand, and the few riffles observed were of fair quality (sand and woody debris were the dominant substrate types in the riffles). The QHEI score at RM 0.3 was 69.5, indicative of good stream habitat.

Substrate quality at Fish Creek sites evaluated in 2002 and 1999 were influenced by a moderate to heavy silt layer causing moderate to extensive embeddedness. These conditions were comparable to observations recorded during 1997, when a heavy silt layer covered the stream bottom (Ohio EPA 2003a).

West Branch Fish Creek

One site was evaluated on the West Branch Fish Creek (RM 1.2) during 1999. The stream meandered in a leveed shore channel, with some channel modification evident. Bottom substrates were predominated by cobble and hardpan, with lesser amounts of silt, muck, and gravel. Instream cover was sparse and channel development was fair. The QHEI score of 60.5 reflected marginally good stream habitat quality.

Hiram Sweet Ditch

One site was evaluated on Hiram Sweet Ditch (RM 0.1) near the mouth during 1999. At this location, the stream had natural channel characteristics, good development, and a moderate riparian width. Bottom substrates were dominated by sand, and the bottom was covered with a heavy silt layer, causing extensive embeddedness. The QHEI score at RM 0.1 was 58.5, reflective of fair stream habitat.

Table 6. Qualitative Habitat Evaluation Index (QHEI) scores for sites sampled in Fish Creek, 1999 and 2002.

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes										MWH Attributes										Total MLL MWH Attributes	(MWH HL+1)/(WWH+1) Ratio	(MWH ML+1)/(WWH+1) Ratio						
			Key QHEI Components										High Influence					Moderate Influence													
			No Channelization or Recovered Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low Normal Overall Embeddedness	Max Depth > 40 cm	Low Normal Riffle Embeddedness	Total WWH Attributes	Channelized or No Recovery Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WVD, HW)	Total HLL MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development				Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness
(04-405) Fish Creek																															
Year: 2002																															
29.5	47.5	3.53	#					#	#		3		◆	◆	◆	3	●			●			●						3	1.00	1.75
27.7	60.0	3.53	#	#	#	#		#	#		6					0	●					●					●		3	0.14	0.57
21.6	72.0	3.62	#	#	#	#			#		5					0	●			●		●	●	●	●				5	0.17	1.00
20.4	68.5	5.35	#	#	#	#			#	#	6					0	●			●		●	●	●					4	0.14	0.71
15.0	76.0	4.24	#	#	#	#	#	#	#	#	8					0						●							1	0.11	0.22
14.3	75.0	4.24	#		#	#	#	#	#		6					0	●						●	●	●				3	0.14	0.57
14.3	71.5	4.24	#	#	#	#	#		#		6					0	●					●	●	●					4	0.14	0.71
8.3	70.5	4.24	#	#	#	#	#		#		6					0	●					●	●	●					4	0.14	0.71
7.5	77.5	4.24	#	#	#	#	#	#	#	#	8					0	●						●	●					3	0.11	0.44
5.4	75.5	3.96	#	#	#	#	#	#	#		7					0	●			●			●	●					4	0.13	0.63
0.3	69.5	2.67	#		#	#	#		#		5					0	●			●	●		●	●	●				6	0.17	1.17
Year: 1999																															
29.5	54.0	3.53	#	#				#	#		4		◆	◆	◆	3	●			●			●	●					4	0.80	1.60
27.7	44.0	3.53	#			#		#			3		◆	◆		3	●			●	●		●	●			●		6	1.00	2.50
20.4	59.0	5.35	#	#	#	#		#	#		6					0	●	●		●			●	●					5	0.14	0.86
15.0	60.0	4.24	#		#	#		#	#	#	6		◆			1				●		●	●						3	0.29	0.71
14.3	65.0	4.24	#	#	#	#	#		#		6			◆		1	●					●	●	●					4	0.29	0.86
8.3	76.5	4.24	#	#	#	#	#		#	#	7					0	●					●	●						3	0.13	0.50
5.6	74.5	3.96	#	#	#	#	#		#	#	7					0	●					●	●	●					4	0.13	0.63
5.5	70.0	3.96	#	#	#	#	#		#	#	7					0	●					●	●						3	0.13	0.50
2.4	78.5	4.28	#	#	#	#	#	#	#		7					0	●	●				●	●	●					5	0.13	0.75
0.4	63.5	2.67	#	#		#		#			4					0	●			●	●		●	●			●		6	0.20	1.40
(04-425) West Branch Fish Creek																															
Year: 1999																															
1.2	60.5	6.85	#	#		#		#			4			◆	◆	2	●			●			●	●					4	0.60	1.40
(04-426) Hiram Sweet Ditch																															
Year: 1999																															
0.1	58.5	4.24	#		#	#	#		#		5			◆		1	●					●	●	●			●		4	0.33	1.00

Macroinvertebrate Community

2002

Fish Creek

Macroinvertebrate communities were sampled by Ohio EPA using modified Hester-Dendy artificial substrate samplers colonized from August- September 2002 at six locations in Fish Creek (RMs 21.6, 14.3, 8.3, 7.5, 5.4, and 0.3). Summarized results from the 2002 sampling as well as previous data from 1997, 1995, 1994, 1993, and 1992 are compiled in Table 7. Invertebrate Community Index metrics and scores from 2002 are in Appendix Table 5 and the raw data is listed in Appendix Table 6. A discussion of the 1993 data is provided in Ohio EPA (1993a). The 1993 data, including a discussion of impacts from the September 15, 1993 diesel fuel spill, is provided in Ohio EPA (1993b). Sampling in 1994 to monitor biological recovery following the spill is discussed in Ohio EPA (1995). Monitoring data from 1995 is summarized in Ohio EPA (1996). Sampling locations in Indiana (RM 21.6- RM 7.5) and in Ohio at RM 0.3 were evaluated using Ohio's Warmwater Habitat (WWH) biocriterion. The site at RM 5.4 was evaluated using the Exceptional Warmwater Habitat (EWH) biocriterion.

The macroinvertebrate communities at the four sampling sites in Indiana (RM 21.6, 14.3, 8.3, and 7.5), with ICI scores of 48, 52, 44, and 44 respectively, met the Ohio EWH use as well as attaining the designated Indiana Warm Water use. The macroinvertebrate community from the Ohio site at RM 5.4 had an ICI of 50, achieving the EWH use. Downstream, at RM 0.3, the macroinvertebrate community reflected exceptional quality (ICI = 50), attaining the designated WWH use as well as the EWH use.

Plots of Ohio EPA historical data from Fish Creek for macroinvertebrate (ICI) and fish (IBI) community scores at six sampling locations are presented in Figure 3. The ICI scores for Fish Creek sites at RM 21.6, 14.3, and 8.3 show no pronounced trends through time with all samples attaining the Indiana Warm Water use. At RM 7.5 a decline in ICI scores from 1995 to 2002 is evident but the macroinvertebrate community still attained the Warm Water use for all sampling periods. The macroinvertebrate community at RM 5.4 has generally attained the EWH use except in 1993 following the fuel spill and in 1997 with no apparent cause. The macroinvertebrate community at the most downstream sampling location in Fish Creek (RM 0.3) has consistently attained both the designated WWH use and the EWH use.

Macroinvertebrate communities were sampled in 1999 and 2002 by the Indiana Department of Environmental Management (IDEM) using a modification of the USEPA Rapid Bioassessment Protocols in riffle habitats. Table 8 summarizes the sample results for the macroinvertebrate Index of Biotic Integrity (mIBI) and the component metrics. The mIBI is composed of ten metrics based on family level taxonomy. The Hilsenhoff Biotic Index (HBI) is determined for each sample by calculating the average tolerance value for the sample based on a summation of the relative abundance times the specific family tolerance value. Number of taxa is based on the number of families identified in the sample. The number of individuals represents the number of macroinvertebrates identified in the subsample that was processed. Percent dominant taxa is calculated by dividing the number of individuals from the most abundant family in the sample by the total number of individuals identified in the sample. The EPT metric represents the number of families in the sample from the Ephemeroptera, Plecoptera, and Trichoptera orders. The EPT count is the number of individuals from the Ephemeroptera, Plecoptera and Trichoptera orders. The percent EPT is calculated by dividing the EPT count by the number of individuals identified from the sample. The percent EPT relative to chironomids is calculated by dividing the EPT count by the chironomid count. The chironomid count metric is the number of individuals from the family Chironomidae. The final metric is a relative abundance of macroinvertebrates in the sample calculated by dividing the number of macroinvertebrates identified in the sample by the number of randomly selected squares that were subsampled from the sample to produce at least 300 individuals. Each metric is assigned a score ranging from 0 to 8 based on a distribution of the values for each metric. The mIBI is calculated by determining the average metric score for the ten metrics. An mIBI above 2.2 is considered in support of the Indiana Warm Water use designation.

Fish Creek was sampled at RMs 29.5, 27.7, 20.4, 15.0, and 14.3. All Indiana sampling locations were evaluated using the Indiana Warm Water use designation. The Fish Creek sampling locations at RMs 29.5, 20.4, 15.0, and 14.3 were in attainment of the Warm Water use with mIBI scores of 3.4, 3.0, 5.2, and 4.0 respectively. Fish Creek at RM 27.7, with an mIBI score of 2.0, did not attain the Warm Water use. A high proportion of pollution tolerant organisms and low numbers of EPT taxa contributed to the low score.

West Branch Fish Creek

West Branch Fish Creek was sampled by IDEM at RM 1.2 during 2002. The mIBI score of 4.4 supported the Warm Water use. The 2002 sample results were similar to the 1999 results.

Hiram Sweet Ditch

Hiram Sweet Ditch was sampled by IDEM near the mouth at RM 0.1. The mIBI score of 3.8 was in support of the Warm Water use. While still supporting the Warm Water use, the 2002 sample results indicated a decline in the macroinvertebrate community from the 1999 results.

1999

Fish Creek

Fish Creek sites evaluated by IDEM at RMs 29.5, 27.7, 20.4, 15.0, 14.3, 8.3, and 5.6 were in support of the Warm Water use with mIBI scores of 2.8, 3.0, 5.6, 6.2, 5.2, 4.8, and 4.6, respectively.

West Branch Fish Creek

West Branch Fish Creek was sampled at RM 1.2 in 1999 by IDEM. The site had an mIBI score of 4.2 which supported the Warm Water use.

Hiram Sweet Ditch

In 1999 Hiram Sweet Ditch was sampled by IDEM near the mouth at RM 0.1. The mIBI score of 4.6 supported the designated Warm Water use.

Fish Creek Mussel Survey

In 1999 and 2002 the staff from the Indiana Department of Natural Resources conducted a survey to determine the condition of the mussel populations at the same nine sites sampled by IDEM for macroinvertebrates. The raw data is attached in Appendix Table 7. A summary table showing the mussel species present at each sampling location is presented in Table 9.

Table 7. Summary of macroinvertebrate data collected by Ohio EPA from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in Fish Creek, 1992 - 2002. Fish Creek from RM 5.6 to RM 2.4 has an EWH aquatic life use designation and WWH from RM 2.4 to the mouth in the Ohio Water Quality Standards. Sampling locations in Indiana (RM 21.6 - RM 7.5) were evaluated using Ohio's Warmwater Habitat ecoregional biocriterion.

Stream/ River Mile	Relative Density	Total Taxa	Quantitative Evaluation			ICI	Narrative Evaluation
			Quantitative Taxa	Qualitative Taxa	Qualitative EPT ^a		
<i>Fish Creek - 2002</i>							
21.6	565	58	45	31	13	48	Exceptional
14.3	471	54	36	37	15	52	Exceptional
8.3	463	66	42	40	13	44	Very Good
7.5	697	76	45	53	12	44	Very Good
5.4	810	66	41	51	16	50	Exceptional
0.3	594	56	39	36	11	50	Exceptional
<i>Fish Creek - 1997</i>							
21.7	273	69	52	40	15	54	Exceptional
14.3	157	62	46	38	14	52	Exceptional
8.3	194	55	44	27	13	46	Exceptional
7.5	484	50	40	26	11	50	Exceptional
5.4	325	47	34	32	13	40*	Good
0.3	402	54	44	29	14	50	Exceptional
<i>Fish Creek - 1995</i>							
21.7	451	74	51	50	20	54	Exceptional
14.3	758	62	46	40	16	54	Exceptional
8.3	716	59	43	38	15	48	Exceptional
7.5	860	82	47	56	14	56	Exceptional
5.4	688	72	44	54	12	50	Exceptional
<i>Fish Creek - 1994</i>							
21.7	568	58	38	32	7	40	Good
14.3	801	48	36	25	8	48	Exceptional
8.3	1260	48	42	22	7	48	Exceptional
6.5	1701	65	41	45	9	52	Exceptional
5.4	774	73	44	43	6	38*	Good
0.3	842	72	46	42	12	50	Exceptional
<i>Fish Creek - 1993</i>							
21.7	658	87	46	69	20	56	Exceptional
17.1	290	65	43	44	14	52	Exceptional
13.8	417	69	47	37	11	44	Very Good
9.9	761	70	52	39	14	46	Exceptional

Table 7. Continued.

Stream/ River Mile	Relative Density	Total Taxa	Quantitative Evaluation			ICI	Evaluation
			Quantitative Taxa	Qualitative Taxa	Qualitative EPT ^a		
<i>Fish Creek - 1993</i>							
5.4	155	45	32	24	7	20*	Fair
0.3	118	60	53	23	8	36	Good
<i>Fish Creek - 1992</i>							
5.4	698	54	38	34	13	50	Exceptional

Qualitative Evaluation					
Stream/ River Mile	No. Qual. Taxa	Qual. EPT ^a	Relative Density	Predominant Organisms	Narrative Evaluation ^b
<i>Fish Creek -1995</i>					
0.3	52	18	Moderate	Caddisflies and mayflies	Exceptional
<i>Fish Creek -1992</i>					
0.3	26	12	Moderate	Midges and caddisflies	Good

Ecoregional Biocriteria: Eastern Corn Belt Plains (ECBP)

(from OAC 3745-1-07, Table 7-15)

INDEX	WWH	EWB
ICI	36	46

^a - EPT= total Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxa richness.

^b - The qualitative narrative evaluation is based on best professional judgement utilizing sample attributes such as taxa richness, EPT richness, and QCTV score and is used when quantitative data is not available to calculate the Invertebrate Community Index (ICI) scores.

* - Significant departure from ecoregional biocriterion (>4 ICI units); poor and very poor results are underlined.

ns - Nonsignificant departure from WWH or EWB biocriterion (≤4 ICI units).

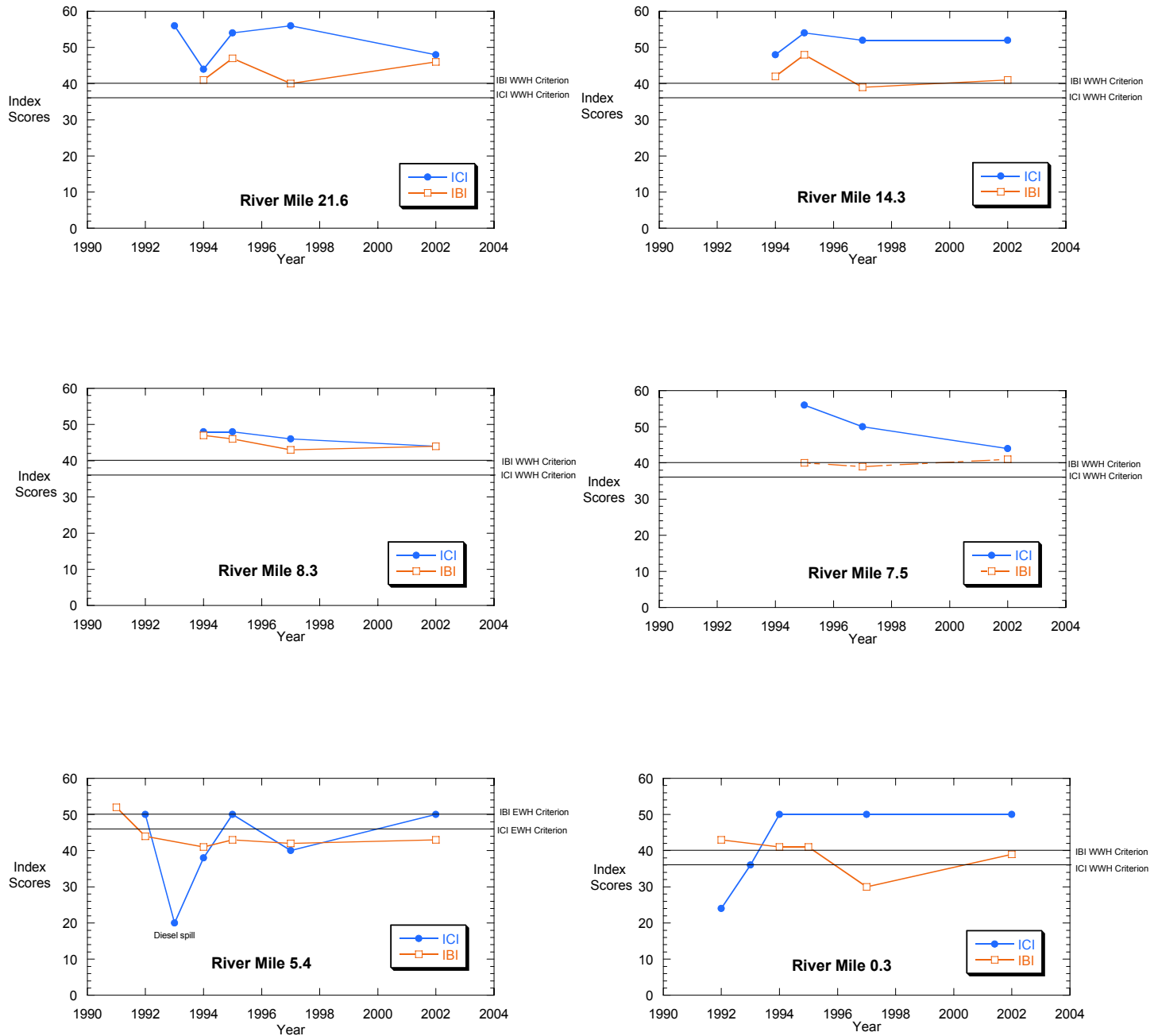


Figure 3. ICI and IBI scores reported at six Fish Creek sampling locations between 1991 and 2002. Results are based on Ohio EPA collections.

Table 8. Summary of Indiana Department of Environmental Management riffle kick samples using a Modified USEPA Rapid Bioassessment Protocol. Sampling locations are found in column 1. Columns 2-11 contain the sample attributes for the metrics that make up the macroinvertebrate Index of Biotic Integrity (mIBI). The final column lists the mIBI score for each site. Sites that score less than 2.2 do not support the Indiana Warm Water use designation.

Stream/ RM/date	HBI	# Taxa	# Individuals	% Dominant	EPT index	EPT count	# EPT/ # individuals	# EPT/ # Chironomids	Chironomid count	# indiv/ # squares	mIBI
Fish Cr											
29.5/ 1999	6.64	23	275	38.9	6	28	0.10	0.38	74	17	2.8
2002	6.40	30	319	18.8	5	45	0.14	0.75	60	29	3.4
27.7/ 1999	6.10	16	290	31.7	5	24	0.08	2.18	11	15	3.0
2002	7.28	23	302	50.0	5	13	0.04	0.09	152	16	2.0
20.4/ 1999	3.93	24	198	28.2	10	103	0.52	2.86	36	3	5.6
2002	5.42	23	333	47.0	7	33	0.10	0.70	47	28	3.0
15.0/ 1999	4.44	27	254	18.5	12	139	0.55	12.6	11	9	6.2
2002	4.41	35	311	24.4	12	137	0.44	3.19	43	19	5.2
14.3/ 1999	3.74	20	231	35.5	9	124	0.54	2.34	53	13	5.2
2002	5.04	31	303	26.0	11	64	0.21	0.80	80	17	4.0
8.3/ 1999	4.65	30	249	21.7	13	79	0.32	1.46	54	6	4.8
5.6/ 1999	5.05	23	259	31.7	9	124	0.48	1.75	71	20	4.6
W. Br. Fish Cr.											
1.2/ 1999	5.24	18	285	21.1	7	89	0.31	1.75	51	14	4.2
2002	5.59	28	380	20.3	4	83	0.22	1.41	59	76	4.4
Hiram Sweet Ditch											
0.1/ 1999	4.69	18	121	26.4	8	45	0.37	2.81	16	4	4.6
2002	5.10	29	323	28.0	10	60	0.19	0.78	77	11	3.8

Table 9. Summary of mussel data collected by Indiana Department of Natural Resources from Fish Creek basin sampling locations.

Mussel Species	Date	Fish Creek RM 29.5	Fish Creek RM 27.7	Fish Creek RM 20.4	Fish Creek RM 15.0	Fish Creek RM 14.3	Fish Creek RM 8.3	Fish Creek RM 5.6	Hiram Sweet D. RM 0.1	W. Br. Fish Creek RM 1.2
<i>Pleurobema clava</i> *	2002 1999					X				
<i>Strophitus undulatus</i>	2002 1999		X	X	X	X	X	X		
<i>Anodontoidea ferussacianus</i>	2002 1999	X X		X		X			X X	
<i>Lampsilis siliquoidea</i>	2002 1999					X X	X X	X X		
<i>Ptychobranchus fasciolaris</i> +	2002 1999			X	X	X X	X X	X		
<i>Pleurobema sintoxia</i>	2002 1999			X X	X X	X X	X X	X		
<i>Elliptio dilatata</i>	2002 1999			X X	X X	X X		X X		
<i>Amblema plicata</i>	2002 1999			X X				X		
<i>Lasmigona complanata</i>	2002 1999			X		X				
<i>Lasmigona compressa</i>	2002 1999	X				X X	X X	X		
<i>Pyganodon grandis</i>	2002 1999	X				X	X	X		
<i>Fusconaia flava</i>	2002 1999	X				X X	X	X X		
<i>Lasmigona costata</i>	2002 1999					X	X	X		

Villosa iris	2002 1999			X						
Lampsilis fasciola +	2002 1999			X						
Corbicula fluminea	2002 1999							X	X X	
Alasmidonta marginata	2002 1999							X		
Cyclonaias tuberculata	2002 1999							X	X	
Simpsonaias ambigua +	2002 1999							X	X	
Lampsilis cardium	2002 1999								X	

* Denotes Federally listed endangered species.

+ Denotes Indiana listed species of special concern.

Fish Community 2002

Fish Creek

A total of 7,185 fish representing 46 species and four hybrids were collected from Fish Creek between August and September, 2002. Relative numbers and species collected per location is presented in Appendix Table 8. US Fish and Wildlife sampling locations in Indiana (RMs 29.5, 27.7, 20.4, 15.0, and 14.3) were evaluated using Indiana's Warm Water use criterion: Ohio EPA sampling locations in Indiana (RMs 21.6, 14.3, 8.3, and 7.5) were evaluated using Ohio's Warmwater Habitat biocriteria. Fish Creek in Ohio has two aquatic life use designations - Exceptional Warmwater Habitat (RMs 5.5 to 2.4) and Warmwater Habitat (RM 2.4 to the mouth). Sampling sites in Ohio were evaluated using either Exceptional or Warmwater Habitat biocriteria. Index of Biotic Integrity scores and metrics are presented in Appendix Tables 9 - 11.

Bluntnose minnow (15.4%), creek chub (13.5%), and green sunfish (12.4%) predominated the catch numerically, while common carp (27.5%), golden redhorse (20.3%), and white sucker (13.1%) predominated in weight. Fish highly tolerant of pollution made up 48.2% of the total catch in Fish Creek in 2002, the highest percentage from all monitoring years (1994, 1995, 1997, 1999, and 2002).

Pollution intolerant fish species collected in the study area included black redhorse, hornyhead chub, river chub, silver shiner, rosyface shiner, and stonecat madtom. These species together comprised 5.6% of the catch within the Fish Creek study area.

The two most upstream sampling locations in Fish Creek (RMs 29.5 and 27.7) were represented by poor fish communities. IBI scores (28 and 22, respectively) for these two sites did not support the Indiana Warm Water use designation for Fish Creek. These two sites scored low due to a virtual lack of pollution sensitive species, lack of darters at RM 27.7, and a high proportion of pollution tolerant species. Of the remaining six locations sampled in Indiana, five (RMs 21.6, 15.0, 14.3, 8.3, and 7.5) were attaining the Warm Water use, with fish communities in the fair to very good range. Smallmouth bass were recorded for the first time in Fish Creek since monitoring began in 1994.

Monitoring results in Ohio yielded fish communities partially attaining the EWH use at RM 5.4 and in full attainment of the WWH use at RM 0.3. The IBI score (43) from RM 5.4 failed to meet the EWH biocriterion, resulting in the partial attainment. As noted overall in Fish Creek, the predominance of pollution tolerant fish contributed to the lower than expected IBI score. Historically, part of Fish Creek within Ohio (RM 5.5 - 2.4) has shown the ability to attain EWH conditions.

As was observed during the 1997 survey, a heavy silt layer was encountered during 2002 at all sampling locations in Fish Creek. Fine grained sediment constitutes a major environmental factor in the degradation of stream fisheries (Waters 1995). An encouraging observation was a substantial increase in the relative number of silver shiner and black redhorse from 1997 to 2002. These two fish species are very sensitive to environmental pollution. In addition, a large increase in the relative number of darter species occurred between 1997 and 2002. The continued predominance of highly pollution tolerant species, such as green sunfish, creek chub, and bluntnose minnow, prevent Fish

Creek from achieving its potential as an exceptional fishery in Indiana (and Ohio).

West Branch Fish Creek

One site was sampled on the West Branch Fish Creek at RM 1.2 during 2002. The IBI score of 30 did not support the Warm Water use. Although the West Branch Fish Creek is listed as a Warm Water use stream, some channel modification was evident. Pollution tolerant fish predominated the catch.

Hiram Sweet Ditch

One site was sampled on Hiram Sweet Ditch at the mouth (RM 0.1). This stream receives wastewater effluent from the Town of Hamilton, Indiana along with overflow from Hamilton Lake. The IBI score of 32 did not support the Warm Water use. Pollution tolerant fish predominated the catch, along with low numbers of top carnivores and simple lithophils. Bottom substrates in Hiram Sweet Ditch near the mouth are dominated by sand, and the bottom is covered with a heavy silt layer, causing extensive embeddedness.

1999

Fish Creek

During 1999, Fish Creek was sampled in Indiana by the USFWS and in Ohio by the Ohio DNR, with a total of 10 sampling locations. The two most upstream sampling locations in Fish Creek (RMs 29.5 and 27.7) were represented by poor fish communities. IBI scores (32 and 28, respectively) for these two sites did not support the Indiana Warm Water use designation for Fish Creek.

Of the remaining five locations sampled in Indiana, all (RMs 20.4, 15.0, 14.3, 8.3, and 5.6) were attaining the Warm Water use, with fish communities in the fair to good range.

Sampling results in Ohio revealed full attainment of the EWH biocriteria at RM 5.5, non-attainment of the EWH biocriteria at RM 2.4, and non-attainment of the WWH biocriteria at RM 0.4. Non-attainment was associated with an increased level of pollution tolerant fish at both locations, a decline in pollution intolerant species, and a near absence of darters at RM 0.4. The sampling location at RM 0.4 was located in 100 percent pool habitat.

West Branch Fish Creek

One site was sampled on the West Branch Fish Creek at RM 1.2 during 1999. The IBI score of 32 did not support the Warm Water use. Low scoring IBI metrics included number of species, pollution sensitive species, and simple lithophil spawners. The IBI score was comparable with 2002 results.

Hiram Sweet Ditch

One site was sampled on Hiram Sweet Ditch at the mouth (RM 0.1). The IBI score of 28 did not support the Warm Water use. Low scoring IBI metrics included sunfish species, pollution sensitive species, pollution tolerant abundance, percent carnivores, and fish abundance. The IBI score was comparable with 2002 results. As was noted in 2002, bottom substrates in Hiram Sweet Ditch near the mouth were dominated by sand, and the bottom was covered with a heavy silt layer, causing extensive embeddedness.

Table 10. Fish community indices from Fish Creek, 2002 and 1999, based on pulsed D.C. electrofishing at sites sampled by Ohio EPA, Ohio DNR, and USFWS. Sites were sampled using wading methods. Relative number and weight for Ohio EPA and Ohio DNR samples are per 0.3 km. Indiana relative numbers are based on Catch Per Unit Effort (CPUE). Fish Creek has a WWH aquatic life use designation in the Ohio Water Quality Standards from RM 2.4 (County Road 3) to the mouth, and an EWH use designation from RM 5.6 (State Line) to RM 2.4. Within Indiana, Fish Creek has an aquatic life use designation of Warm Water.

<i>Stream</i> RM	Sampling Method ^a	Mean # Species	Total # Species	Mean Relative Number	Mean Relative Weight(kg)	QHEI	Mean Modified Index of Well Being	Mean Index of Biotic Integrity	Narrative Evaluation ^b
<i>Fish Creek (2002)</i>									
<i>Ohio EPA</i>								OH or IN ^d	
21.6 (IN)	Wading -2	23.0	26	757	20.9	72.0	8.9	46	Very Good
14.3 (IN)	Wading -2	29.0	34	871	51.8	75.0	9.2	41	Good/Very Good
8.3 (IN)	Wading -2	28.0	32	941	27.2	70.5	9.2	44	Good/Very Good
7.5 (IN)	Wading -2	27.0	32	790	36.2	77.5	8.8	41	Good
5.4 (OH)	Wading -2	27.5	32	837	31.3	75.5	9.2 ^{ns}	43*	Good/Very Good
0.3 (OH)	Wading -2	24.5	27	467	23.4	69.5	8.0 ^{ns}	39 ^{ns}	Marginally Good
<i>USFWS</i>									
29.5 (IN)	BP-1	13	13	188	-	47.5	NA	28*	Poor
27.7 (IN)	BP-1	12	12	109	-	60.0	-	22*	Very Poor
20.4 (IN)	BP-1	15	15	209	-	68.5	-	34*	Poor
15.0 (IN)	BP-1	18	18	165	-	76.0	-	38	Fair
14.3 (IN)	BP-1	24	24	233	-	71.5	-	42	Fair
<i>Fish Creek (1999)</i>									
<i>USFWS</i>									
29.5 (IN)	BP-1	9	9	100	-	54.0	NA	32*	Poor
27.7 (IN)	BP-1	15	15	49	-	44.0	-	28*	Poor
20.4 (IN)	BP-1	14	14	100	-	59.0	-	36	Fair
15.0 (IN)	BP-1	15	15	113	-	60.0	-	36	Fair
14.3 (IN)	BP-1	18	18	158	-	65.0	-	42	Fair
8.3 (IN)	BP-1	19	19	211	-	76.5	-	48	Good
5.6 (IN)	BP-1	15	15	82	-	74.5	-	46	Good/Fair
<i>Ohio DNR</i>									
5.5 (OH)	Wading -1	30	30	612	22.7	70.0	9.5	46 ^{ns}	V. Gd./Exceptional
2.4 (OH)	Wading -1	25	25	665	37.1	78.5	8.1*	36*	Marginally Good
0.4 (OH)	Wading -1	18	18	320	66.0	63.5	7.6*	30*	Fair
<i>West Branch Fish Creek (2002)</i>									
<i>USFWS</i>									
1.2 (IN)	BP-1	11	11	216	-	-	NA	30*	Poor
<i>West Branch Fish Creek (1999)</i>									
<i>USFWS</i>									
1.2 (IN)	BP-1	7	7	181	-	56	NA	32*	Poor

Table 10. Continued.

<i>Stream</i>	Sampling Method ^a	Mean # Species	Total # Species	Mean Relative Number	Mean Relative Weight(kg)	QHEI	Mean Modified Index of Well Being	Mean Index of Biotic Integrity	Narrative Evaluation ^b
<i>Hiram Sweet Ditch (2002)</i>									
<i>USFWS</i>									
0.1 (IN)	BP-1	16	16	184	-	-	-	<u>32*</u>	Poor
<i>Hiram Sweet Ditch (1999)</i>									
<i>USFWS</i>									
0.1 (IN)	BP-1	10	10	65	-	52	-	<u>28*</u>	Poor

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)
(from Ohio Administrative Code 3745-1-07, Table 7-15)

INDEX	WWH	EWB	MWH^c
Ohio IBI - Wading	40	50	24
Ohio MIwb - Wading	8.3	9.4	6.2

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)
(From IDEM 2002 305(b) Annual Update, W.F. & Lower White R. Basin/Patoka R. Basin)

INDEX	WWH
Indiana IBI- Wading	35

- Significant departure from Ohio ecoregional biocriterion (>4 IBI units, >0.5 MIwb units) or Indiana expectations; poor and very poor results are underlined. Samples collected by USFWS were compared to Indiana criteria for use support: fully supporting = ≥35.
- ^{ns} Nonsignificant departure from Ohio biocriterion (≤4 IBI units, ≤0.5 MIwb units).
- ^a BP = backpack electrofisher. Number listed is sampling passes per site.
- ^b Narrative evaluation is based on MIwb and IBI scores.
- ^c Modified Warmwater Habitat for channel modified areas.
- ^d Scores were based on calculations using Ohio EPA or Indiana Index of Biotic Integrity metric scoring.
- NA Headwater site; MIwb is not applicable.

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APPENDICES

Appendix Table 1. Results of chemical surface water sampling conducted in Fish Creek on August 12, 2002. Samples were collected by Ohio EPA and Indiana DEM.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled	01:30 PM	12:50 PM	12:05 PM	11:30 AM	10:45 AM	09:50 AM	09:50 AM
TAL Metals							Duplicate
Arsenic (ug/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Aluminum (ug/l)	260	230	894	790	294	1440	1450
Barium (ug/l)	86	145	107	107	105	99	102
Beryllium (ug/l)	<5	<5	<5	<5	<5	<5	<5
Cadmium (ug/l)	<5	<5	<5	<5	<5	<5	<5
Calcium (mg/l)	86	72	80	79	82	78	77
Chromium (ug/l)	<30	<30	<30	<30	<30	<30	<30
Cobalt (ug/l)	<50	<50	<50	<50	<50	<50	<50
Copper (ug/l)	<10	<10	<10	<10	<10	<10	<10
Iron (ug/l)	382	607	1140	758	438	1230	1250
Magnesium (mg/l)	26	23	25	25	26	24	25
Manganese (ug/l)	80	43	113	86	59	75	77
Nickel (ug/l)	<40	<40	<40	<40	<40	<40	<40
Potassium (mg/l)	2	3	2	2	2	3	3
Sodium (mg/l)	16	33	20	19	19	18	18
Strontium (ug/l)	671	1000	910	937	948	840	842
Titanium (ug/l)	<50	<50	<50	<50	<50	<50	<50
Vanadium (ug/l)	<50	<50	<50	<50	<50	<50	<50
Zinc (ug/l)	<10	<10	<10	<10	<10	<10	<10
Lead (ug/l)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Mercury (ug/l)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (ug/l)	<0.50	<0.50	<0.50	<0.50UJ	<0.50	<0.50	<0.50
Nutrients							
Nitrite-N (mg/l)	<0.020	0.028	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N (mg/l)	0.055	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Nitrate+Nitrite-N (mg/l)	0.25	3.27	0.76	0.65	0.51	0.40	0.41
TKN (mg/l)	0.46	0.64	0.45	0.46	0.32	0.32	0.33
Total Phosphorus (mg/l)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Other							
BOD5 (mg/l)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TDS (mg/l)	424	420	394	398	388	388	388
TSS (mg/l)	7	14	6	13	6	23	24
Acidity (mg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Alkalinity (mg/l)	238	253	724	276	152	260	262
Bicarbonate (mg/l)	250	232	247	241	234	240	236
Carbonate (mg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride (mg/l)	30.3	56.5	33.8	31.7	31.6	31.7	31.6
Sulfate (mg/l)	66.4	36.9	50.9	50.1	51.1	51.5	45.9
Total Hardness (mg/l)	322	274	303	300	312	294	295

Appendix Table 1. Continued.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled	01:30 PM	12:50 PM	12:05 PM	11:30 AM	10:45 AM	09:50 AM	09:50 AM
Herbicides (ug/l)							Duplicate
Acetochlor	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Alachlor	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Atrazine	<0.21	0.24	<0.20	<0.20	<0.20	0.21	0.21
Benzo(a)pyrene	<0.51	<0.51	<0.51	<0.51	<0.51	<0.52	<0.51UJ
bis(2-Ethylhexyl)adipate	<0.51R	<0.51R	<0.51	<0.51	<0.51	<0.52	<0.51UJ
bis(2-Ethylhexyl)phthalate	<0.51	<0.51	<0.51	<0.51	<0.51	<0.52	<0.51UJ
Butachlor	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Cyanazine	<0.20	<0.20	<0.20	<0.21	<0.20	<0.21	<0.21
Metolachlor	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Metribuzin	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Pentachlorophenol	<5.1	<5.1	<5.1	<5.1	<5.1	<5.2	<5.1
Propachlor	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20
Simazine	<0.21	<0.20	<0.20	<0.20	<0.20	<0.21	<0.20

UJ - The analyte was not detected above the sample quantitation limit (QL). However, the reported QL is estimated.

R - The analyte result is unusable because quality control criteria was not met.

Appendix Table 2. Results of chemical surface water sampling conducted in Fish Creek on September 18, 2002. Samples were collected by Ohio EPA and Indiana DEM.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02
Time Sampled	10:50 AM	10:30 AM	10:10 AM	09:45 AM	09:10 AM	08:30 AM	08:30 AM
TAL Metals							Duplicate
Arsenic (ug/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Aluminum (ug/l)	318	398	492	875	455	778	926
Barium (ug/l)	101	142	118	116	111	112	112
Beryllium (ug/l)	<5	<5	<5	<5	<5	<5	<5
Cadmium (ug/l)	<5	<5	<5	<5	<5	<5	<5
Calcium (mg/l)	89	75	76	76	72	74	74
Chromium (ug/l)	<30	<30	<30	<30	<30	<30	<30
Cobalt (ug/l)	<50	<50	<50	<50	<50	<50	<50
Copper (ug/l)	<10	<10	<10	<10	<10	<10	<10
Iron (ug/l)	522	724	575	897	654	774	790
Magnesium (mg/l)	28	26	26	26	26	25	25
Manganese (ug/l)	86	49	73	75	62	64	63
Nickel (ug/l)	<40	<40	<40	<40	<40	<40	<40
Potassium (mg/l)	2	3	3	3	3	3	3
Sodium (mg/l)	18	32	26	24	24	23	23
Strontium (ug/l)	823	1180	1140	1170	1150	1100	1100
Titanium (ug/l)	<50	<50	<50	<50	<50	<50	<50
Vanadium (ug/l)	<50	<50	<50	<50	<50	<50	<50
Zinc (ug/l)	<10	13	35	15	10	<10	<10
Lead (ug/l)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Mercury (ug/l)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (ug/l)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nutrients							
Nitrite-N (mg/l)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N (mg/l)	0.065	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Nitrate+Nitrite-N (mg/l)	0.24	1.94	0.86	0.57	0.48	0.18	0.18
TKN (mg/l)	0.48	0.57	0.48	0.42	0.40	0.53	0.43
Total Phosphorus (mg/l)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Other							
BOD5 (mg/l)	<2.0	<2.0	<2.0	<2.0	5.5	<2.0	<2.0
TDS (mg/l)	430	412	428	420	410	416	412
TSS (mg/l)	7	12	12	20	13	18	19
Acidity (mg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Alkalinity (mg/l)	279	265	264	263	278	281	269
Bicarbonate (mg/l)	294	271	278	269	278	276	282
Carbonate (mg/l)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride (mg/l)	31.3	51.9	41.4	37.3	38.5	35.8	36.0
Sulfate (mg/l)	72.9	47.6	45.2	48.3	49.0	47.9	47.8
Total Hardness (mg/l)	338	294	297	297	287	288	288
pH (S.U)	8.09	8.08	8.14	8.15	8.15	8.12	8.14

Appendix Table 2. Continued.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02	09/18/02
Time Sampled	10:50 AM	10:30 AM	10:10 AM	09:45 AM	09:10 AM	08:30 AM	08:30 AM
Herbicides (ug/l)							Duplicate
Acetochlor	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Alachlor	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Atrazine	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Benzo(a)pyrene	<0.52	<0.52	<0.51	<0.51	<0.52	<0.51	<0.51UJ
bis(2-Ethylhexyl)adipate	<0.52	<0.52	<0.51	<0.51	<0.52	<0.51	<0.51UJ
bis(2-Ethylhexyl)phthalate	<0.52	<0.52	<0.51	0.8	<0.52	<0.51	<0.51UJ
Butachlor	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Cyanazine	<0.21	<0.21	<0.21	<0.21	<0.21	<0.20	<0.21
Metolachlor	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Metribuzin	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Pentachlorophenol	<5.2R	<5.2R	<5.1R	<5.1R	<5.2R	<5.1R	<5.1R
Propachlor	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21
Simazine	<0.21	<0.21	<0.20	<0.21	<0.21	<0.20	<0.21

UJ - The analyte was not detected above the sample quantitation limit (QL). However, the reported QL is estimated.

R - The analyte result is unusable because quality control criteria was not met.

Appendix Table 3. Water quality monitoring data collected in Fish Creek during September, 2002 by the Indiana Department of Environmental Management. Measurements were recorded instantaneously using a Hydrolab datasonde.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3
Date Sampled	17-Sept-02	17-Sept-02	19-Sept-02	16-Sept-02	16-Sept-02	16-Sept-02
Temperature (Celsius)	19.5	16.7	19.7	16.7	19.6	18.2
Dissolved Oxygen (mg/l)	9.08	9.38	6.83	6.58	9.04	5.75
Conductivity (microS/cm)	479	502	471	465	461	456
pH (S.U.)	8.37	8.23	8.2	8.39	8.31	8.16
Total Dissolved Solids (mg/l)	306	321	302	293	295	292
Nitrate-N (mg/l)	0.89	4.77	2.68	2.21	1.74	1.53
Turbidity (NTU)	26.1	24	33.8	37.2	55.4	37.1
Ammonia-N (mg/l)	0.18	0.21	0.28	0.13	0.17	0.16

Appendix Table 4. Results of Ohio EPA and Indiana DEM sediment sampling conducted in Fish Creek, August 12, 2002.

Stream		Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile		21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled		08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled		01:35 PM	12:55 PM	12:10 PM	11:35 AM	11:00 AM	10:20 AM	10:20 AM
TAL Metals (mg/kg)	SRV							Duplicate
Arsenic	18	8.3	7.3	3.8	7.9	4.9	6.4	4.8
Cadmium	0.90	0.339J	0.273J	<0.096	0.158J	0.102	0.383J	0.223J
Aluminum	39,000	9910	8780	3640	4540	4760	5090	3840
Barium	240	90.4	75.9	33.7	44.1	41.7	44.9	33.2
Beryllium	0.80	<4.4	<3.8	<2.4	<2.8	<2.5	<2.7	<2.5
Calcium	120,000	20,000J	17,400J	27,000J	27,700J	14,700J	64,100J	40,100J
Chromium	40	<26	<23	<14	<17	<15	<16	<15
Cobalt	12	<44	<38	<24	<28	<25	<27	<25
Copper	34	10.4	10.6	<4.8	6.8	<5.1	<5.5	<5.0
Iron	33,000	17,100	15,000	7620	11,900	8420	10,800	8410
Lead	47	<35	<30	<19	<23	<20	<22	<20
Magnesium	35,000	6,090	6,070	9,630	9,610	4,580	11,500	12,400
Manganese	780	687J	390	308J	306	307	309	272J
Nickel	42	<35	<30	<19	<23	<20	<22	<20
Potassium	11,000	1740	1520	<963	<1130	1020	1100	<991
Sodium	NA	<4350	<3790	<2410	<2820	<2540	<2740	<2480
Strontium	390	57	65	36	44	38	55	40
Titanium	NA	106	105	104	64	104	62	59
Vanadium	40	<44	<38	<24	<28	<25	<27	<25
Zinc	160	66.1	75.9	27.9	45.8	32.5	27.4	25.8
Mercury	0.12	<0.049	<0.043	<0.024	<0.031	<0.029	<0.032	<0.024
Silver	0.43	<0.44	<0.38UJ	<0.24	<0.28	<0.25	<0.27	<0.25
Semi-volatile Organic Analytes (mg/kg)								
Acenaphthene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Acenaphthylene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Acetophenone		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2-Acetylaminofluorene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
4-Aminobiphenyl		<4.4R	<3.7R	<2.8R	<3.0R	<2.8R	<2.9R	<2.9R
Aniline		<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
Anthracene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benzo(a)anthracene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benzo(a)pyrene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benzo(b)fluoranthene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benzo(g,h,i)perylene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benzo(k)fluoranthene		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Benyl alcohol		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
bis(2-Chloroethoxy)methane		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
bis(2-Chloroethyl)ether		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
bis(2-Chloroisopropyl) ether		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
bis(2-Ethylhexyl) phthalate		<0.88	<0.75	7.21	<0.59	<0.57	<0.57	<0.57
4-Bromophenyl-phenylether		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Butylbenzylphthalate		<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57

Appendix Table 4. Continued.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled	01:35 PM	12:55 PM	12:10 PM	11:35 AM	11:00 AM	10:20 AM	10:20 AM
Semi-volatile Organic Analytes (mg/kg)							Duplicate
4-Chlorophenyl-phenyl ether	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Chrysene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Di-n-butylphthalate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Di-n-octylphthalate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Dibenz(a,h)anthracene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Dibenzofuran	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
1,3-Dichlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
1,4-Dichlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
1,2-Dichlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
3,3'-Dichlorobenzidine	<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
2,6-Dichlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,4-Dichlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Diethylphthalate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
p-Dimethylaminoazobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
7,12-Dimethylbenz(a)anthracene	<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
3,3'-Dimethylbenzidine	<4.4R	<3.7R	<2.8R	<3.0R	<2.8R	<2.9R	<2.9R
2,4-Dimethylphenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Dimethylphthalate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
4,6-Dinitro-2-methylphenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
1,3-Dinitrobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,4-Dinitrophenol	<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
2,6-Dinitrotoluene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,4-Dinitrotoluene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Dinoseb	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Diphenylamine	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Ethyl methanesulfonate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Fluoranthene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Fluorene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Hexachlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Hexachlorobutadiene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Hexachlorocyclopentadiene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Hexachloroethane	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Hexachloropropene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Indeno(1,2,3-cd)pyrene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Isophorone	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Methyl methanesulfonate	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
3-Methylchoanthrene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2-Methylnaphthalene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
3&4-Methylphenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2-Methylphenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
N-Nitroso-di-n-butylamine	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
N-Nitroso-di-n-propylamine	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
N-Nitrosomorpholine	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
N-Nitrosopiperidine	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57

Appendix Table 4. Continued.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled	01:35 PM	12:55 PM	12:10 PM	11:35 AM	11:00 AM	10:20 AM	10:20 AM
Semi-volatile Organic Analytes (mg/kg)							Duplicate
2-Nitroaniline	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
3-Nitroaniline	<0.88R	<0.75R	<0.56R	<0.59R	<0.57R	<0.57R	<0.57R
4-Nitroaniline	<0.88R	<0.75R	<0.56R	<0.59R	<0.57R	<0.57R	<0.57R
Nitrobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
4-Nitrophenol	<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
2-Nitrophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Pentachlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Pentachlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Phenacetin	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Phenanthrene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Phenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2-Picoline	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Pronamide	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Pyrene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
Safrole	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
1,2,4,5-Tetrachlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,3,4,6-Tetrachlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
o-Toluidine	<4.4	<3.7	<2.8	<3.0	<2.8	<2.9	<2.9
1,2,4-Trichlorobenzene	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,4,6-Trichlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
2,4,5-Trichlorophenol	<0.88	<0.75	<0.56	<0.59	<0.57	<0.57	<0.57
PCBs (ug/kg)							
Aroclor 1016	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1221	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1232	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1242	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1248	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1254	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Aroclor 1260	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Pesticides (ug/kg)							
Aldrin	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
alpha-BHC	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
beta-BHC	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
delta-BHC	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
gamma-BHC (Lindane)	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
4,4'-DDD	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
4,4'-DDE	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
4,4'-DDT	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Dieldrin	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Endosulfan I	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Endosulfan II	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Endosulfan sulfate	<8.7	<7.5	<5.5	<6.0	<5.9UJ	<5.7	<5.5
Endrin	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Endrin aldehyde	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Heptachlor	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5

Appendix Table 4. Continued.

Stream	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek	Fish Creek
River Mile	21.6	14.3	8.3	7.5	5.4	0.3	0.3
Date Sampled	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Time Sampled	01:35 PM	12:55 PM	12:10 PM	11:35 AM	11:00 AM	10:20 AM	10:20 AM
Pesticides (ug/kg)							Duplicate
Heptachlor epoxide	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Methoxychlor	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Mirex	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Hexachlorobenzene	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Alpha-Chlordane	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Gamma-Chlordane	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Oxychlordane	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
cis-Nonachlor	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
trans-Nonachlor	<8.7	<7.5	<5.5	<6.0	<5.9	<5.7	<5.5
Toxaphene	<43.5	<37.3	<27.5	<30.2	<29.2	<28.7	<27.4
Other							
Percent Solids	43.4	48.8	71.6	63.2	69.0	66.4	68.4
Total Organic Carbon (%)	5.5	5.1	3.1	4.0	2.2	4.9	4.8
Total Petroleum Hydrocarbons							
- Diesel Range Organics (mg/kg)	27J	33	30	38	26	24J	41 ^a

J - The analyte was positively identified, the associated numerical value is estimated.

UJ - The analyte was not detected above the sample quantitation limit (QL). However, the reported QL is estimated.

P - Analyte is quantitated and there is greater than 40% difference for detected concentrations from the two GC columns used for analysis.

R - The analyte result is unusable because quality control criteria was not met.

^a - Duplicate sample for DRO taken at river mile 7.5

Appendix Table 5. Invertebrate Community Index (IC) scores and metrics for sites sampled in Fish Creek, 2002.

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco- region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddis- flies	Tany- tarsini	Other Dipt/NI	Tolerant Organisms			
Fish Creek (04-405)													
Year: 2002													
21.60	36.5	45(6)	10(6)	5(6)	19(4)	41.7(6)	3.6(2)	13.1(2)	41.0(4)	4.1(6)	13(6)	5	48
14.30	82.0	36(4)	10(6)	5(6)	17(4)	28.2(4)	11.1(4)	41.0(6)	17.7(6)	0.4(6)	15(6)	5	52
8.30	97.0	42(6)	7(4)	4(6)	21(6)	18.8(4)	9.8(4)	31.4(4)	38.2(4)	10.9(2)	13(4)	5	44
7.50	98.0	45(6)	7(4)	6(6)	22(6)	15.6(2)	6.9(2)	37.8(6)	37.9(4)	9.2(4)	12(4)	5	44
5.40	105.0	41(6)	7(4)	10(6)	14(4)	28.2(4)	4.0(2)	40.0(6)	25.6(6)	4.6(6)	16(6)	5	50
0.30	109.0	39(6)	7(4)	9(6)	14(4)	39.8(6)	39.4(6)	3.9(2)	13.2(6)	0.8(6)	11(4)	5	50

Appendix Table 6 - Macroinvertebrate data collected from Fish Creek by the Ohio EPA, 2002.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/17/2002 River Code: 04-405 RM: 21.60 Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	Hydra sp	59	83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)	+
01801	Turbellaria	11			
03600	Oligochaeta	16	83840	Microtendipes pedellus group	96
08250	Orconectes (Procericambarus) rusticus	+	84460	Polypedilum (P.) fallax group	68
08601	Hydracarina	1	84470	Polypedilum (P.) illinoense	14
11020	Acerpenna pygmaea	196	84700	Stenochironomus sp	41 +
11120	Baetis flavistriga	40 +	85625	Rheotanytarsus sp	164
11130	Baetis intercalaris	101 +	85720	Stempellinella n.sp nr. flavidula	41
12200	Isonychia sp	39 +	85802	Tanytarsus curticornis group	27
13400	Stenacron sp	144 +	85821	Tanytarsus glabrescens group sp 7	137
13510	Stenonema exiguum	7 +	86100	Chrysops sp	+
13540	Stenonema mediopunctatum	34 +	87540	Hemerodromia sp	43
13561	Stenonema pulchellum	289 +	93900	Elimia sp	+
14950	Leptophlebia sp or Paraleptophlebia sp	279 +	96900	Ferrissia sp	4
17200	Caenis sp	49 +	98600	Sphaerium sp	16 +
21200	Calopteryx sp	1 +			
22300	Argia sp	+	No. Quantitative Taxa: 45		Total Taxa: 59
23909	Boyeria vinosa	1	No. Qualitative Taxa: 31		ICI: 48
42700	Belostoma sp	+	Number of Organisms: 2824		Qual EPT: 13
43300	Ranatra sp	+			
45300	Sigara sp	+			
45400	Trichocorixa sp	+			
50804	Lype diversa	6			
51001	Polycentropodidae	8			
52200	Cheumatopsyche sp	85 +			
52430	Ceratopsyche morosa group	1			
52530	Hydropsyche depravata group	3 +			
57400	Neophylax sp	+			
58505	Helicopsyche borealis	+			
68075	Psephenus herricki	1 +			
68901	Macronychus glabratus	10			
69400	Stenelmis sp	2 +			
71900	Tipula sp	+			
71910	Tipula abdominalis	1			
72700	Anopheles sp	+			
74100	Simulium sp	1			
77500	Conchapelopia sp	55 +			
78450	Nilotanytus fimbriatus	14			
78750	Rheopelopia paramaculipennis	14			
80370	Corynoneura lobata	608			
80420	Cricotopus (C.) bicinctus	14			
81650	Parametriocnemus sp	+			
81825	Rheocricotopus (Psilocricotopus) robacki	27			
82121	Thienemanniella lobapodema	32			
82141	Thienemanniella xena	24			

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/17/2002 River Code: 04-405 RM: 14.30 Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+	82141	<i>Thienemanniella xena</i>	16
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	83840	<i>Microtendipes pedellus group</i>	14 +
08601	<i>Hydracarina</i>	8	84450	<i>Polypedilum (Uresipedilum) flavum</i>	14
11020	<i>Acerpenna pygmaea</i>	74	84700	<i>Stenochironomus sp</i>	+
11120	<i>Baetis flavistriga</i>	1 +	85500	<i>Paratanytarsus sp</i>	13
11130	<i>Baetis intercalaris</i>	14 +	85625	<i>Rheotanytarsus sp</i>	872 +
12200	<i>Isonychia sp</i>	44 +	85800	<i>Tanytarsus sp</i>	41
13400	<i>Stenacron sp</i>	29 +	85802	<i>Tanytarsus curticornis group</i>	27
13510	<i>Stenonema exiguum</i>	91 +	85821	<i>Tanytarsus glabrescens group sp 7</i>	14 +
13540	<i>Stenonema mediopunctatum</i>	3	87540	<i>Hemerodromia sp</i>	116 +
13561	<i>Stenonema pulchellum</i>	355 +	96900	<i>Ferrissia sp</i>	10
13570	<i>Stenonema terminatum</i>	29 +			
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	24	No. Quantitative Taxa: 36		Total Taxa: 54
17608	<i>Baetisca lacustris</i>	+	No. Qualitative Taxa: 37		ICI: 52
21200	<i>Calopteryx sp</i>	+	Number of Organisms: 2357		Qual EPT: 15
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
34130	<i>Acroneuria frisoni</i>	9 +			
42700	<i>Belostoma sp</i>	+			
43300	<i>Ranatra sp</i>	+			
45300	<i>Sigara sp</i>	+			
45400	<i>Trichocorixa sp</i>	+			
50804	<i>Lype diversa</i>	17 +			
52200	<i>Cheumatopsyche sp</i>	172 +			
52430	<i>Ceratopsyche morosa group</i>	55 +			
52530	<i>Hydropsyche depravata group</i>	15 +			
52550	<i>Hydropsyche frisoni</i>	3 +			
56001	<i>Limnephilidae</i>	+			
67500	<i>Laccobius sp</i>	+			
68700	<i>Dubiraphia sp</i>	+			
68901	<i>Macronychus glabratus</i>	37 +			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	3			
72340	<i>Dixella sp</i>	+			
74100	<i>Simulium sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
78450	<i>Nilotanypus fimbriatus</i>	13			
80370	<i>Corynoneura lobata</i>	24			
80410	<i>Cricotopus (C.) sp</i>	14			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	27			
81632	<i>Parakiefferiella n.sp 2</i>	13 +			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	82			
82121	<i>Thienemanniella lobapodema</i>	64			

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/17/2002 River Code: 04-405 RM: 8.30 Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	Hydra sp	9		"rectinervis"	
01801	Turbellaria	8	81632	Parakiefferiella n.sp 2	+
03600	Oligochaeta	16 +	81825	Rheocricotopus (Psilocricotopus) robacki	124 +
08250	Orconectes (Procericambarus) rusticus	+	82121	Thienemanniella lobapodema	80
11130	Baetis intercalaris	24 +	82730	Chironomus (C.) decorus group	+
12200	Isonychia sp	19 +	82885	Cryptotendipes pseudotener	+
13400	Stenacron sp	18	83840	Microtendipes pedellus group	89
13510	Stenonema exiguum	18 +	84460	Polypedilum (P.) fallax group	18
13561	Stenonema pulchellum	298	84470	Polypedilum (P.) illinoense	18
14950	Leptophlebia sp or Paraleptophlebia sp	58 +	84540	Polypedilum (Tripodura) scalaenum group	+
17200	Caenis sp	1	84700	Stenochironomus sp	+
17608	Baetisca lacustris	+	84790	Tribelos fuscicorne	+
18750	Hexagenia limbata	+	85500	Paratanytarsus sp	18
21200	Calopteryx sp	+	85625	Rheotanytarsus sp	425
22300	Argia sp	+	85720	Stempellinella n.sp nr. flavidula	18
23909	Boyeria vinosa	1	85800	Tanytarsus sp	18 +
24501	Gomphidae	+	85802	Tanytarsus curticornis group	18
34130	Acroneuria frisoni	15 +	85821	Tanytarsus glabrescens group sp 7	230
45300	Sigara sp	+	86100	Chrysops sp	+
45400	Trichocorixa sp	+	87540	Hemerodromia sp	56
50315	Chimarra obscura	+	96900	Ferrissia sp	76 +
50804	Lype diversa	28 +	97601	Corbicula fluminea	+
52200	Cheumatopsyche sp	107 +	98200	Pisidium sp	9 +
52430	Ceratopsyche morosa group	86 +			
52530	Hydropsyche depravata group	5 +	No. Quantitative Taxa: 42		Total Taxa: 66
52550	Hydropsyche frisoni	+	No. Qualitative Taxa: 40		ICI: 44
68130	Helichus sp	1 +	Number of Organisms: 2314		Qual EPT: 13
68201	Scirtidae	+			
68601	Ancyronyx variegata	1			
68700	Dubiraphia sp	+			
68901	Macronychus glabratus	24 +			
69400	Stenelmis sp	+			
71910	Tipula abdominalis	1			
72340	Dixella sp	+			
72700	Anopheles sp	+			
74100	Simulium sp	1			
77120	Ablabesmyia mallochi	18			
77500	Conchapelopia sp	+			
77750	Hayesomyia senata or Thienemannimyia norena	18			
78450	Nilotanypus fimbriatus	18			
80370	Corynoneura lobata	40			
80410	Cricotopus (C.) sp	71			
80420	Cricotopus (C.) bicinctus	124			
81231	Nanocladius (N.) crassicornus or N. (N.)	89			

Ohio EPA/DSW Ecological Assessment Section Macroinvertebrate Collection

Collection Date: 09/17/2002 River Code: 04-405 RM: 7.50

Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	2 +	80420	<i>Cricotopus (C.) bicinctus</i>	174 +
03600	<i>Oligochaeta</i>	+	80490	<i>Cricotopus (Isocladius) intersectus group</i>	50
06201	<i>Hyalella azteca</i>	+	81231	<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	99
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	81250	<i>Nanocladius (N.) minimus</i>	25
08601	<i>Hydracarina</i>	16	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	298 +
11130	<i>Baetis intercalaris</i>	29 +	82121	<i>Thienemanniella lobapodema</i>	88
12200	<i>Isonychia sp</i>	2 +	82141	<i>Thienemanniella xena</i>	8
13400	<i>Stenacron sp</i>	18 +	82885	<i>Cryptotendipes pseudotener</i>	+
13510	<i>Stenonema exiguum</i>	4 +	83040	<i>Dicrotendipes neomodestus</i>	50
13561	<i>Stenonema pulchellum</i>	465 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
14950	<i>Leptophlebia sp</i> or <i>Paraleptophlebia sp</i>	17 +	83840	<i>Microtendipes pedellus group</i>	149
17200	<i>Caenis sp</i>	8	84300	<i>Phaenopsectra obediens group</i>	+
21200	<i>Calopteryx sp</i>	+	84450	<i>Polypedilum (Uresipedilum) flavum</i>	+
22300	<i>Argia sp</i>	1 +	84460	<i>Polypedilum (P.) fallax group</i>	50 +
23909	<i>Boyeria vinosa</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
25320	<i>Ophiogomphus carolus</i>	+	84700	<i>Stenochironomus sp</i>	25
34130	<i>Acroneuria frisoni</i>	14 +	84790	<i>Tribelos fuscicorne</i>	+
48410	<i>Corydalus cornutus</i>	1 +	85230	<i>Cladotanytarsus mancus group</i>	+
50315	<i>Chimarra obscura</i>	+	85500	<i>Paratanytarsus sp</i>	75
50804	<i>Lype diversa</i>	65	85625	<i>Rheotanytarsus sp</i>	945 +
51600	<i>Polycentropus sp</i>	4	85800	<i>Tanytarsus sp</i>	25
52200	<i>Cheumatopsyche sp</i>	99 +	85802	<i>Tanytarsus curticornis group</i>	99
52430	<i>Ceratopsyche morosa group</i>	61 +	85821	<i>Tanytarsus glabrescens group sp 7</i>	174
52530	<i>Hydropsyche depravata group</i>	3 +	86100	<i>Chrysops sp</i>	+
52550	<i>Hydropsyche frisoni</i>	7 +	87540	<i>Hemerodromia sp</i>	64
63300	<i>Hydroporus sp</i>	+	95100	<i>Physella sp</i>	+
66500	<i>Enochrus sp</i>	+	96900	<i>Ferrissia sp</i>	98 +
67500	<i>Laccobius sp</i>	+	97601	<i>Corbicula fluminea</i>	+
67800	<i>Tropisternus sp</i>	+	98600	<i>Sphaerium sp</i>	+
68130	<i>Helichus sp</i>	+	99100	<i>Pyganodon grandis</i>	+
68201	<i>Scirtidae</i>	+	99520	<i>Pleurobema sintoxia</i>	+
68601	<i>Ancyronyx variegata</i>	1	99560	<i>Ptychobranchnus fasciolaris</i>	+
68700	<i>Dubiraphia sp</i>	8	99860	<i>Lampsilis radiata luteola</i>	+
68901	<i>Macronychus glabratus</i>	39 +			
69275	<i>Optioservus trivittatus</i>	+			
69400	<i>Stenelmis sp</i>	1 +			
71910	<i>Tipula abdominalis</i>	+	No. Quantitative Taxa: 45	Total Taxa: 76	
74100	<i>Simulium sp</i>	1	No. Qualitative Taxa: 53	ICI: 44	
77500	<i>Conchapelopia sp</i>	+	Number of Organisms: 3485	Qual EPT: 12	
77750	<i>Hayesomyia senata</i> or <i>Thienemannimyia norena</i>	50			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	8			
80370	<i>Corynoneura lobata</i>	40			
80410	<i>Cricotopus (C.) sp</i>	25 +			

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 07/16/2002 River Code: 04-405 RM: 5.40 Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	Hydra sp	26	81632	Parakiefferiella n.sp 2	+
01801	Turbellaria	1	81825	Rheocricotopus (Psilocricotopus) robacki	22
02960	Paragordius sp	+	82121	Thienemanniella lobapodema	160
03360	Plumatella sp	+	83040	Dicrotendipes neomodestus	22 +
03600	Oligochaeta	41 +	83840	Microtendipes pedellus group	108
06700	Crangonyx sp	+	84470	Polypedilum (P.) illinoense	+
08250	Orconectes (Procericambarus) rusticus	+	85500	Paratanytarsus sp	65
08601	Hydracarina	8 +	85625	Rheotanytarsus sp	1210 +
11020	Acerpenna pygmaea	8	85800	Tanytarsus sp	64 +
11130	Baetis intercalaris	1 +	85821	Tanytarsus glabrescens group sp 7	281 +
12200	Isonychia sp	29 +	87540	Hemerodromia sp	222 +
13400	Stenacron sp	128 +	93900	Elimia sp	+
13510	Stenonema exiguum	236 +	96900	Ferrissia sp	124 +
13540	Stenonema mediopunctatum	+	97601	Corbicula fluminea	+
13561	Stenonema pulchellum	707 +	98600	Sphaerium sp	+
14950	Leptophlebia sp or Paraleptophlebia sp	31 +	99100	Pyganodon grandis	+
17608	Baetisca lacustris	+	99260	Lasmigona compressa	+
21200	Calopteryx sp	3 +	99280	Lasmigona costata	+
22300	Argia sp	+	99480	Cyclonaias tuberculata	+
23909	Boyeria vinosa	+	99520	Pleurobema sintoxia	+
24501	Gomphidae	+	99560	Ptychobranchus fasciolaris	+
34130	Acroneuria frisoni	4 +	99860	Lampsilis radiata luteola	+
45300	Sigara sp	+			
50315	Chimarra obscura	7 +	No. Quantitative Taxa: 41		Total Taxa: 66
50804	Lype diversa	45 +	No. Qualitative Taxa: 51		ICI: 50
51400	Nyctiophylax sp	32	Number of Organisms: 4049		Qual EPT: 16
51600	Polycentropus sp	1			
52200	Cheumatopsyche sp	22 +			
52430	Ceratopsyche morosa group	48 +			
52530	Hydropsyche depravata group	1 +			
52550	Hydropsyche frisoni	1 +			
57400	Neophylax sp	+			
59400	Nectopsyche sp	1			
59580	Oecetis persimilis	5			
68130	Helichus sp	+			
68601	Ancyronyx variegata	1			
68901	Macronychus glabratus	81 +			
69400	Stenelmis sp	2 +			
71910	Tipula abdominalis	1 +			
77500	Conchapelopia sp	43 +			
77750	Hayesomyia senata or Thienemannimyia norena	43			
80370	Corynoneura lobata	192			
80420	Cricotopus (C.) bicinctus	22			
80430	Cricotopus (C.) tremulus group	+			

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/2002 River Code: 04-405 RM: 0.30 Site: Fish Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	3
03600	<i>Oligochaeta</i>	9	85625	<i>Rheotanytarsus sp</i>	108 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	85821	<i>Tanytarsus glabrescens group sp 7</i>	9 +
08601	<i>Hydracarina</i>	16	87540	<i>Hemerodromia sp</i>	88
11130	<i>Baetis intercalaris</i>	334 +	94400	<i>Fossaria sp</i>	+
12200	<i>Isonychia sp</i>	135 +	95100	<i>Physella sp</i>	+
13400	<i>Stenacron sp</i>	52	96900	<i>Ferrissia sp</i>	4
13510	<i>Stenonema exiguum</i>	53 +	97601	<i>Corbicula fluminea</i>	+
13540	<i>Stenonema mediopunctatum</i>	15	99440	<i>Fusconaia flava</i>	+
13561	<i>Stenonema pulchellum</i>	592 +	99520	<i>Pleurobema sintoxia</i>	+
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	1	99860	<i>Lampsilis radiata luteola</i>	+
21200	<i>Calopteryx sp</i>	+	99880	<i>Lampsilis cardium</i>	+
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+	No. Quantitative Taxa: 39		Total Taxa: 57
23909	<i>Boyeria vinosa</i>	+	No. Qualitative Taxa: 36		ICI: 50
34130	<i>Acroneuria frisoni</i>	1	Number of Organisms: 2972		Qual EPT: 11
48410	<i>Corydalus cornutus</i>	1 +			
50315	<i>Chimarra obscura</i>	154 +			
51400	<i>Nyctiophylax sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	655 +			
52430	<i>Ceratopsyche morosa group</i>	113 +			
52520	<i>Hydropsyche bidens</i>	7			
52530	<i>Hydropsyche depravata group</i>	36 +			
52550	<i>Hydropsyche frisoni</i>	132 +			
52570	<i>Hydropsyche simulans</i>	58 +			
53501	<i>Hydroptilidae</i>	8			
59500	<i>Oecetis sp</i>	8			
67500	<i>Laccobius sp</i>	+			
68201	<i>Scirtidae</i>	3			
68601	<i>Ancyronyx variegata</i>	9 +			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	78 +			
69400	<i>Stenelmis sp</i>	17 +			
71910	<i>Tipula abdominalis</i>	4 +			
72340	<i>Dixella sp</i>	+			
74100	<i>Simulium sp</i>	17			
77500	<i>Conchapelopia sp</i>	6			
80370	<i>Corynoneura lobata</i>	25			
80410	<i>Cricotopus (C.) sp</i>	6			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	149			
82141	<i>Thienemanniella xena</i>	43			
83840	<i>Microtendipes pedellus group</i>	+			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	11			
84460	<i>Polypedilum (P.) fallax group</i>	6 +			
84470	<i>Polypedilum (P.) illinoense</i>	6			

Appendix Table 7. Mussel data collected by Indiana Department of Natural Resources from Fish Creek and two tributaries, 1999 and 2002.

Common Name	Genus	Species	BestCondition	Waterbody	River Mile
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 15.0
CREEPER	Strophitus	undulatus		1 FISHCREEK	RM 15.0
CLYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus		1 FISHCREEK	RM 15.0
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 15.0
KIDNEYSHELL	Ptychobranhus	fasciolaris		1 FISHCREEK	RM 15.0
PURPLE WARTYBACK	Cyclonaias	tuberculata	WD	FISHCREEK	RM 15.0
RAINBOW	Villosa	iris	WD	FISHCREEK	RM 15.0
ROUNDPIGTOE	Pleurobema	sintoxia		1 FISHCREEK	RM 15.0
SPIKE	Elliptio	dilatata		3 FISHCREEK	RM 15.0
THREERIDGE	Amblema	plicata		9 FISHCREEK	RM 15.0
WABASHPIGTOE	Fusconaia	flava	WD	FISHCREEK	RM 15.0
WAVYRAYED LAMPMUSSEL	Lampsilis	fasciola	WD	FISHCREEK	RM 15.0
WHITE HEELSPLITTER	Lasmigona	complanata		1 FISHCREEK	RM 15.0
CYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	WD	FISHCREEK	RM 15.0
KIDNEYSHELL	Ptychobranhus	fasciolaris	WD	FISHCREEK	RM 15.0
PURPLE WARTYBACK	Cyclonaias	tuberculata	WD	FISHCREEK	RM 15.0
ROUND PIGTOE	Pleurobema	sintoxia		1 FISHCREEK	RM 15.0
SPIKE	Elliptio	dilatata		2 FISHCREEK	RM 15.0
THREERIDGE	Amblema	plicata		8 FISHCREEK	RM 15.0
ASIAN CLAM	Corbicula	fluminea	WD	FISHCREEK	RM 8.3
CLUBSHELL	Pleurobema	clava		1 FISHCREEK	RM 8.3
CREEK HEELSPLITTER	Lasmigona	compressa		1 FISHCREEK	RM 8.3
CREEPER	Strophitus	undulatus		1 FISHCREEK	RM 8.3
CYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	WD	FISHCREEK	RM 8.3
ELKTOE	Alasmidonta	marginata	WD	FISHCREEK	RM 8.3
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 8.3
GIANT FLOATER	Pyganodon	grandis		1 FISHCREEK	RM 8.3
KIDNEYSHELL	Ptychobranhus	fasciolaris		1 FISHCREEK	RM 8.3
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 8.3
ROUND PIGTOE	Pleurobema	sintoxia		12 FISHCREEK	RM 8.3
SPIKE	Elliptio	dilatata		6 FISHCREEK	RM 8.3
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 8.3
WABASH PIGTOE	Fusconaia	flava		3 FISHCREEK	RM 8.3
WHITE HEELSPLITTER	Lasmigona	complanata		1 FISHCREEK	RM 8.3
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 8.3
CREEK HEELSPLITTER	Lasmigona	compressa		3 FISHCREEK	RM 8.3
CLYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	FD	FISHCREEK	RM 8.3
FATMUCKET	Lampsilis	siliquoidea		4 FISHCREEK	RM 8.3
FLUTEDSHELL	Lasmigona	costata		2 FISHCREEK	RM 8.3
KIDNEYSHELL	Ptychobranhus	fasciolaris		2 FISHCREEK	RM 8.3
MUCKET	Actinonaias	ligamentina	WD	FISHCREEK	RM 8.3
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 8.3
PURPLE WARTYBACK	Cyclonaias	tuberculata	WD	FISHCREEK	RM 8.3
RAINBOW	Villosa	iris	WD	FISHCREEK	RM 8.3
ROUND PIGTOE	Pleurobema	sintoxia		3 FISHCREEK	RM 8.3
SPIKE	Elliptio	dilatata		5 FISHCREEK	RM 8.3
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 8.3
WABASH PIGTOE	Fusconaia	flava		8 FISHCREEK	RM 8.3
CREEK HEELSPLITTER	Lasmigona	compressa		2 FISHCREEK	RM 29.5
CYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	FD	FISHCREEK	RM 29.5
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 29.5
GIANT FLOATER	Pyganodon	grandis		5 FISHCREEK	RM 29.5
WABASH PIGTOE	Fusconaia	flava		1 FISHCREEK	RM 29.5
CYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	FD	FISHCREEK	RM 29.5
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 29.5
ASIAN CLAM	Corbicula	fluminea	WD	FISHCREEK	RM 14.3

Appendix Table 7. Continued.

Common Name	Genus	Species	BestCondition	Waterbody	River Mile
CLUBSHELL	Pleurobema	clava	SF	FISHCREEK	RM 14.3
GIANT FLOATER	Pyganodon	grandis	SF	FISHCREEK	RM 14.3
ROUND PIGTOE	Pleurobema	sintoxia	1	FISHCREEK	RM 14.3
SPIKE	Elliptio	dilatata	1	FISHCREEK	RM 14.3
CREEPER	Strophitus	undulatus	1	FISHCREEK	RM 14.3
KIDNEYSHELL	Ptychobranhus	fasciolaris	1	FISHCREEK	RM 14.3
ROUND PIGTOE	Pleurobema	sintoxia	1	FISHCREEK	RM 14.3
SPIKE	Elliptio	dilatata	1	FISHCREEK	RM 14.3
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 27.7
GIANT FLOATER	Pyganodon	grandis	WD	FISHCREEK	RM 27.7
FATMUCKET	Lampsilis	siliquoidea	WD	FISHCREEK	RM 27.7
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 20.4
CREEPER	Strophitus	undulatus	FD	FISHCREEK	RM 20.4
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 20.4
RAINBOW	Villosa	iris	1	FISHCREEK	RM 20.4
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 20.4
WABASH PIGTOE	Fusconaia	flava	WD	FISHCREEK	RM 20.4
WAVYRAYED LAMPMUSSEL	Lampsilis	fasciolaris	FD	FISHCREEK	RM 20.4
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 20.4
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 20.4
RAINBOW	Villosa	iris	WD	FISHCREEK	RM 20.4
SLIPPERSHELL MUSSEL	Alasmidonta	viridis	WD	FISHCREEK	RM 20.4
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 20.4
WABASH PIGTOE	Fusconaia	flava	WD	FISHCREEK	RM 20.4
WAVYRAYED LAMPMUSSEL	Lampsilis	fasciolaris	WD	FISHCREEK	RM 20.4
ASIAN CLAM	Corbicula	fluminea	L	FISHCREEK	RM 5.6
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 5.6
CREEK HEELSPLITTER	Lasmigona	compressa	3	FISHCREEK	RM 5.6
CREEPER	Strophitus	undulatus	WD	FISHCREEK	RM 5.6
ELKTOE	Alasmidonta	marginata	1	FISHCREEK	RM 5.6
FATMUCKET	Lampsilis	siliquoidea	2	FISHCREEK	RM 5.6
FLUTEDSHELL	Lasmigona	costata	1	FISHCREEK	RM 5.6
GIANT FLOATER	Pyganodon	grandis	FD	FISHCREEK	RM 5.6
KIDNEYSHELL	Ptychobranhus	fasciolaris	20	FISHCREEK	RM 5.6
MUCKET	Actinonaias	ligamentina	WD	FISHCREEK	RM 5.6
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 5.6
PURPLE WARTYBACK	Cyclonaias	tuberculata	1	FISHCREEK	RM 5.6
RAINBOW	Villosa	iris	WD	FISHCREEK	RM 5.6
ROUND PIGTOE	Pleurobema	sintoxia	4	FISHCREEK	RM 5.6
SALAMANDER MUSSEL	Simpsonaias	ambigua	FD	FISHCREEK	RM 5.6
SLIPPERSHELL MUSSEL	Alasmidonta	viridis	SF	FISHCREEK	RM 5.6
SPIKE	Elliptio	dilatata	WD	FISHCREEK	RM 5.6
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 5.6
WABASH PIGTOE	Fusconaia	flava	WD	FISHCREEK	RM 5.6
WAVYRAYED LAMPMUSSEL	Lampsilis	fasciolaris	WD	FISHCREEK	RM 5.6
CLUBSHELL	Pleurobema	clava	WD	FISHCREEK	RM 5.6
CREEK HEELSPLITTER	Lasmigona	compressa	1	FISHCREEK	RM 5.6
CREEPER	Strophitus	undulatus	1	FISHCREEK	RM 5.6
FATMUCKET	Lampsilis	siliquoidea	4	FISHCREEK	RM 5.6
FLUTEDSHELL	Lasmigona	costata	WD	FISHCREEK	RM 5.6
KIDNEYSHELL	Ptychobranhus	fasciolaris	14	FISHCREEK	RM 5.6
PLAIN POCKETBOOK	Lampsilis	cardium	WD	FISHCREEK	RM 5.6
PURPLE WARTYBACK	Cyclonaias	tuberculata	WD	FISHCREEK	RM 5.6
RAINBOW	Villosa	iris	WD	FISHCREEK	RM 5.6
ROUND PIGTOE	Pleurobema	sintoxia	3	FISHCREEK	RM 5.6
SPIKE	Elliptio	dilatata	WD	FISHCREEK	RM 5.6
THREERIDGE	Amblema	plicata	WD	FISHCREEK	RM 5.6

Appendix Table 7. Continued.

Common Name	Genus	Species	BestCondition	Waterbody	River Mile
WABASH PIGTOE	Fusconaia	flava		2 FISHCREEK	RM 5.6
ASIAN CLAM	Corbicula	fluminea	L	Hiram Sweet Ditch	RM 0.1
CREEK HEELSPLITTER	Lasmigona	compressa		2 Hiram Sweet Ditch	RM 0.1
CREEPER	Strophitus	undulatus		1 Hiram Sweet Ditch	RM 0.1
FATMUCKET	Lampsilis	siliquoidea		2 Hiram Sweet Ditch	RM 0.1
FLUTEDSHELL	Lasmigona	costata		4 Hiram Sweet Ditch	RM 0.1
KIDNEYSHELL	Ptychobranhus	fasciolaris		3 Hiram Sweet Ditch	RM 0.1
PLAIN POCKETBOOK	Lampsilis	cardium		3 Hiram Sweet Ditch	RM 0.1
PURPLE WARTYBACK	Cyclonaias	tuberculata		3 Hiram Sweet Ditch	RM 0.1
ROUND PIGTOE	Pleurobema	sintoxia		5 Hiram Sweet Ditch	RM 0.1
SALAMANDER MUSSEL	Simpsonaias	ambigua	FD	Hiram Sweet Ditch	RM 0.1
SLIPPERSHELL MUSSEL	Alasmidonta	viridis	WD	Hiram Sweet Ditch	RM 0.1
SPIKE	Elliptio	dilatata		22 Hiram Sweet Ditch	RM 0.1
THREERIDGE	Amblema	plicata		3 Hiram Sweet Ditch	RM 0.1
WABASH PIGTOE	Fusconaia	flava		4 Hiram Sweet Ditch	RM 0.1
ASIAN CLAM	Cyclonaias	fluminea	L	Hiram Sweet Ditch	RM 0.1
CLUBSHELL	Pleurobema	clava	SF	Hiram Sweet Ditch	RM 0.1
FATMUCKET	Lampsilis	siliquoidea		1 Hiram Sweet Ditch	RM 0.1
GIANT FLOATER	Pyganodon	grandis		1 Hiram Sweet Ditch	RM 0.1
ROUND PIGTOE	Pleurobema	sintoxia	WD	Hiram Sweet Ditch	RM 0.1
SPIKE	Elliptio	dilatata		4 Hiram Sweet Ditch	RM 0.1
WABASH PIGTOE	Fusconaia	flava		4 Hiram Sweet Ditch	RM 0.1
CYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus	FD	West Br.Fish Cr.	RM 1.2
FATMUCKET	Lampsilis	siliquoidea	WD	West Br.Fish Cr.	RM 1.2
CLYLINDRICAL PAPERSHELL	Anodontoides	ferussacianus		1 West Br.Fish Cr.	RM 1.2
FATMUCKET	Lampsilis	siliquoidea	WD	West Br.Fish Cr.	RM 1.2

FD - Fresh dead; WD - weather dead; SF - subfossil; L - live

Appendix Table 8 - Fish data collected from Fish Creek by the Ohio EPA, 2002.

River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 21.60	Location:	Date Range: 08/06/2002
Time Fished: 7980 sec	Drainage: 36.5 sq mi	Thru: 09/17/2002
Dist Fished: 0.40 km	Basin: Maumee River	No of Passes: 2
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Golden Redhorse	R	I	S	M	12	9.00	1.19	2.47	11.83	274.83
Northern Hog Sucker	R	I	S	M	52	39.00	5.15	4.61	22.02	118.14
White Sucker	W	O	S	T	47	35.25	4.65	3.23	15.42	91.54
Common Carp	G	O	M	T	3	2.25	0.30	3.62	17.32	1,610.67
Hornyhead Chub	N	I	N	I	11	8.25	1.09	0.08	0.40	10.09
Blacknose Dace	N	G	S	T	13	9.75	1.29	0.05	0.23	4.85
Creek Chub	N	G	N	T	175	131.25	17.33	3.07	14.65	23.36
Silver Shiner	N	I	S	I	87	65.25	8.61	0.33	1.57	5.05
Striped Shiner	N	I	S		1	0.75	0.10	0.05	0.22	60.00
Common Shiner	N	I	S		15	11.25	1.49	0.06	0.30	5.60
Bluntnose Minnow	N	O	C	T	69	51.75	6.83	0.13	0.62	2.50
Central Stoneroller	N	H	N		29	21.75	2.87	0.14	0.65	6.23
Black Bullhead		I	C	P	4	3.00	0.40	0.32	1.51	105.50
Stonecat Madtom		I	C	I	3	2.25	0.30	0.08	0.40	37.00
Black Crappie	S	I	C		1	0.75	0.10	0.01	0.04	10.00
Rock Bass	S	C	C		11	8.25	1.09	0.49	2.32	58.82
Largemouth Bass	F	C	C		4	3.00	0.40	0.20	0.97	67.50
Green Sunfish	S	I	C	T	71	53.25	7.03	0.58	2.78	10.91
Bluegill Sunfish	S	I	C	P	10	7.50	0.99	0.17	0.80	22.30
Pumpkinseed Sunfish	S	I	C	P	1	0.75	0.10	0.01	0.04	11.00
Green Sf X Bluegill Sf					2	1.50	0.20	0.10	0.48	66.50
Green Sf X Pumpkinseed					1	0.75	0.10	0.02	0.09	25.00
Green Sf X Hybrid					2	1.50	0.20	0.05	0.23	32.50
Blackside Darter	D	I	S		35	26.25	3.47	0.09	0.42	3.34
Logperch	D	I	S	M	3	2.25	0.30	0.03	0.14	12.67
Johnny Darter	D	I	C		28	21.00	2.77	0.04	0.19	1.89
Greenside Darter	D	I	S	M	81	60.75	8.02	0.20	0.95	3.28
Fantail Darter	D	I	C		57	42.75	5.64	0.10	0.47	2.32
Mottled Sculpin		I	C		182	136.50	18.02	0.62	2.96	4.53
<i>Mile Total</i>					1,010	757.50		20.92		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					3					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 14.30	Location:	Date Range: 08/06/2002
Time Fished: 6720 sec	Drainage: 82.0 sq mi	Thru: 09/17/2002
Dist Fished: 0.40 km	Basin: Maumee River	No of Passes: 2
		Sampler Type: D

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	9	6.75	0.77	0.51	0.98	75.33
Central Mudminnow		I	C T	2	1.50	0.17	0.02	0.03	11.50
Grass Pickerel		P	M P	6	4.50	0.52	0.37	0.72	82.50
Black Redhorse	R	I	S I	6	4.50	0.52	1.36	2.63	303.00
Golden Redhorse	R	I	S M	50	37.50	4.30	14.38	27.75	383.53
Northern Hog Sucker	R	I	S M	82	61.50	7.06	5.09	9.83	82.81
White Sucker	W	O	S T	114	85.50	9.81	9.89	19.09	115.72
Spotted Sucker	R	I	S	2	1.50	0.17	0.24	0.47	162.00
Common Carp	G	O	M T	8	6.00	0.69	12.69	24.49	2,115.63
Hornyhead Chub	N	I	N I	1	0.75	0.09	0.00	0.00	3.00
Creek Chub	N	G	N T	95	71.25	8.18	0.63	1.22	8.85
Silver Shiner	N	I	S I	43	32.25	3.70	0.23	0.45	7.16
Striped Shiner	N	I	S	2	1.50	0.17	0.01	0.03	9.00
Common Shiner	N	I	S	1	0.75	0.09	0.00	0.01	6.00
Spotfin Shiner	N	I	M	59	44.25	5.08	0.15	0.28	3.33
Bluntnose Minnow	N	O	C T	195	146.25	16.78	0.47	0.91	3.24
Central Stoneroller	N	H	N	14	10.50	1.20	0.03	0.06	2.86
Channel Catfish	F		C	1	0.75	0.09	1.46	2.82	1,950.00
Yellow Bullhead		I	C T	5	3.75	0.43	0.42	0.81	112.07
Black Bullhead		I	C P	7	5.25	0.60	0.27	0.53	52.19
Stonecat Madtom		I	C I	1	0.75	0.09	0.06	0.12	82.00
Brook Silverside		I	M M	18	13.50	1.55	0.02	0.04	1.39
Black Crappie	S	I	C	3	2.25	0.26	0.03	0.06	13.33
Rock Bass	S	C	C	10	7.50	0.86	0.56	1.08	74.30
Largemouth Bass	F	C	C	3	2.25	0.26	0.04	0.08	19.00
Green Sunfish	S	I	C T	214	160.50	18.42	1.61	3.12	10.06
Bluegill Sunfish	S	I	C P	54	40.50	4.65	0.47	0.90	11.52
Pumpkinseed Sunfish	S	I	C P	2	1.50	0.17	0.01	0.02	8.00
Green Sf X Bluegill Sf				4	3.00	0.34	0.10	0.19	33.00
Green Sf X Hybrid				5	3.75	0.43	0.12	0.24	33.20
Yellow Perch			M	25	18.75	2.15	0.17	0.33	9.13
Blackside Darter	D	I	S	52	39.00	4.48	0.15	0.28	3.74
Logperch	D	I	S M	10	7.50	0.86	0.09	0.17	11.50
Johnny Darter	D	I	C	24	18.00	2.07	0.04	0.07	2.04
Greenside Darter	D	I	S M	20	15.00	1.72	0.04	0.08	2.80
Mottled Sculpin		I	C	15	11.25	1.29	0.06	0.11	5.20
<i>Mile Total</i>				1,162	871.50		51.82		
<i>Number of Species</i>				34					
<i>Number of Hybrids</i>				2					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 8.30	Location:	Date Range: 08/06/2002
Time Fished: 6780 sec	Drainage: 97.0 sq mi	Thru: 09/17/2002
Dist Fished: 0.42 km	Basin: Maumee River	No of Passes: 2
		Sampler Type: D

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	84	60.00	6.38	0.23	0.86	3.90
Grass Pickerel		P	M P	1	0.71	0.08	0.06	0.23	89.00
Black Redhorse	R	I	S I	9	6.43	0.68	1.40	5.15	218.22
Golden Redhorse	R	I	S M	77	55.00	5.85	12.09	44.39	219.73
Northern Hog Sucker	R	I	S M	68	48.57	5.16	2.21	8.13	45.58
White Sucker	W	O	S T	63	45.00	4.78	2.16	7.92	47.93
Spotted Sucker	R	I	S	4	2.86	0.30	0.08	0.29	28.00
Common Carp	G	O	M T	2	1.43	0.15	3.68	13.51	2,575.00
River Chub	N	I	N I	5	3.57	0.38	0.07	0.26	20.00
Creek Chub	N	G	N T	128	91.43	9.72	0.86	3.17	9.44
Silver Shiner	N	I	S I	54	38.57	4.10	0.29	1.07	7.58
Common Shiner	N	I	S	2	1.43	0.15	0.01	0.04	7.00
Spotfin Shiner	N	I	M	85	60.71	6.45	0.20	0.72	3.22
Bluntnose Minnow	N	O	C T	264	188.57	20.05	0.48	1.76	2.55
Central Stoneroller	N	H	N	9	6.43	0.68	0.03	0.10	4.22
Black Bullhead		I	C P	1	0.71	0.08	0.12	0.44	166.00
Stonecat Madtom		I	C I	3	2.14	0.23	0.14	0.53	67.33
Brook Silverside		I	M M	1	0.71	0.08	0.00	0.00	1.00
White Crappie	S	I	C	3	2.14	0.23	0.03	0.10	12.67
Black Crappie	S	I	C	1	0.71	0.08	0.03	0.10	39.00
Rock Bass	S	C	C	22	15.71	1.67	1.24	4.57	79.14
Largemouth Bass	F	C	C	6	4.29	0.46	0.18	0.67	42.33
Green Sunfish	S	I	C T	114	81.43	8.66	0.76	2.78	9.28
Bluegill Sunfish	S	I	C P	18	12.86	1.37	0.24	0.90	19.00
Yellow Perch			M	4	2.86	0.30	0.05	0.17	16.00
Dusky Darter	D	I	S M	6	4.29	0.46	0.02	0.07	4.50
Blackside Darter	D	I	S	76	54.29	5.77	0.16	0.59	2.96
Logperch	D	I	S M	12	8.57	0.91	0.09	0.32	10.00
Johnny Darter	D	I	C	106	75.71	8.05	0.10	0.38	1.36
Greenside Darter	D	I	S M	64	45.71	4.86	0.10	0.35	2.08
Fantail Darter	D	I	C	6	4.29	0.46	0.01	0.04	2.83
Mottled Sculpin		I	C	19	13.57	1.44	0.10	0.37	7.53
<i>Mile Total</i>				1,317	940.71		27.22		
<i>Number of Species</i>				32					
<i>Number of Hybrids</i>				0					

River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 7.50	Location:	Date Range: 08/06/2002
Time Fished: 6420 sec	Drainage: 98.0 sq mi	Thru: 09/17/2002
Dist Fished: 0.40 km	Basin: Maumee River	No of Passes: 2
		Sampler Type: D

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	273	204.75	25.93	0.63	1.74	3.08
Northern Pike	F	P	M	7	5.25	0.66	1.45	3.99	275.29
Black Redhorse	R	I	S I	19	14.25	1.80	5.00	13.79	350.68
Golden Redhorse	R	I	S M	48	36.00	4.56	9.54	26.33	265.10
Northern Hog Sucker	R	I	S M	98	73.50	9.31	4.01	11.06	54.52
White Sucker	W	O	S T	21	15.75	1.99	2.30	6.33	145.76
Spotted Sucker	R	I	S	2	1.50	0.19	0.02	0.04	10.00
Common Carp	G	O	M T	5	3.75	0.47	10.65	29.38	2,840.00
River Chub	N	I	N I	3	2.25	0.28	0.08	0.21	34.33
Blacknose Dace	N	G	S T	2	1.50	0.19	0.01	0.02	4.50
Creek Chub	N	G	N T	10	7.50	0.95	0.12	0.34	16.40
Silver Shiner	N	I	S I	32	24.00	3.04	0.15	0.41	6.26
Common Shiner	N	I	S	1	0.75	0.09	0.01	0.03	14.00
Spotfin Shiner	N	I	M	43	32.25	4.08	0.10	0.27	3.02
Sand Shiner	N	I	M M	1	0.75	0.09	0.00	0.00	2.00
Silverjaw Minnow	N	I	M	2	1.50	0.19	0.00	0.01	2.00
Bluntnose Minnow	N	O	C T	214	160.50	20.32	0.45	1.23	2.78
Central Stoneroller	N	H	N	2	1.50	0.19	0.01	0.04	9.50
Yellow Bullhead		I	C T	1	0.75	0.09	0.24	0.66	320.00
White Crappie	S	I	C	3	2.25	0.28	0.03	0.09	14.00
Rock Bass	S	C	C	7	5.25	0.66	0.49	1.36	93.57
Smallmouth Bass	F	C	C M	3	2.25	0.28	0.02	0.05	7.67
Largemouth Bass	F	C	C	5	3.75	0.47	0.01	0.04	3.60
Green Sunfish	S	I	C T	112	84.00	10.64	0.66	1.82	7.87
Bluegill Sunfish	S	I	C P	3	2.25	0.28	0.02	0.05	7.33
Green Sf X Bluegill Sf				1	0.75	0.09	0.03	0.07	33.00
Dusky Darter	D	I	S M	3	2.25	0.28	0.01	0.02	3.33
Blackside Darter	D	I	S	30	22.50	2.85	0.07	0.18	2.94
Logperch	D	I	S M	3	2.25	0.28	0.01	0.04	5.67
Johnny Darter	D	I	C	42	31.50	3.99	0.03	0.09	1.07
Greenside Darter	D	I	S M	43	32.25	4.08	0.06	0.17	1.91
Fantail Darter	D	I	C	4	3.00	0.38	0.01	0.02	2.00
Mottled Sculpin		I	C	10	7.50	0.95	0.05	0.13	6.35
<i>Mile Total</i>				1,053	789.75		36.25		
<i>Number of Species</i>				32					
<i>Number of Hybrids</i>				1					

Species List

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River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 5.40	Location:	Date Range: 08/07/2002
Time Fished: 6360 sec	Drainage: 105.0 sq mi	Thru: 09/16/2002
Dist Fished: 0.40 km	Basin: Maumee River	Sampler Type: D
	No of Passes: 2	

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	9	6.75	0.81	0.09	0.29	13.22
Northern Pike	F	P	M	2	1.50	0.18	0.06	0.19	39.00
Black Redhorse	R	I	S I	10	7.50	0.90	2.02	6.46	269.20
Golden Redhorse	R	I	S M	23	17.25	2.06	3.57	11.42	206.91
Northern Hog Sucker	R	I	S M	78	58.50	6.99	2.64	8.45	45.16
White Sucker	W	O	S T	35	26.25	3.14	1.75	5.58	66.49
Common Carp	G	O	M T	13	9.75	1.16	12.73	40.73	1,305.92
River Chub	N	I	N I	78	58.50	6.99	1.39	4.45	23.76
Blacknose Dace	N	G	S T	1	0.75	0.09	0.00	0.01	3.00
Creek Chub	N	G	N T	75	56.25	6.72	1.01	3.24	18.01
Silver Shiner	N	I	S I	54	40.50	4.84	0.28	0.90	6.93
Rosyface Shiner	N	I	S I	9	6.75	0.81	0.02	0.07	3.11
Striped Shiner	N	I	S	13	9.75	1.16	0.36	1.14	36.38
Common Shiner	N	I	S	7	5.25	0.63	0.13	0.41	24.57
Spotfin Shiner	N	I	M	17	12.75	1.52	0.06	0.20	5.00
Sand Shiner	N	I	M M	1	0.75	0.09	0.00	0.01	4.00
Bluntnose Minnow	N	O	C T	194	145.50	17.38	0.37	1.20	2.57
Central Stoneroller	N	H	N	5	3.75	0.45	0.04	0.14	11.60
Common Sh X Rosyface Sh		I		1	0.75	0.09	0.00	0.01	3.00
Channel Catfish	F		C	2	1.50	0.18	2.55	8.15	1,698.00
Stonecat Madtom		I	C I	1	0.75	0.09	0.00	0.01	3.00
White Crappie	S	I	C	1	0.75	0.09	0.01	0.03	12.00
Rock Bass	S	C	C	9	6.75	0.81	0.39	1.25	58.00
Green Sunfish	S	I	C T	126	94.50	11.29	0.73	2.33	7.72
Bluegill Sunfish	S	I	C P	10	7.50	0.90	0.04	0.12	5.20
Pumpkinseed Sunfish	S	I	C P	1	0.75	0.09	0.00	0.01	5.00
Dusky Darter	D	I	S M	1	0.75	0.09	0.00	0.01	5.00
Blackside Darter	D	I	S	41	30.75	3.67	0.12	0.37	3.80
Logperch	D	I	S M	11	8.25	0.99	0.11	0.34	12.91
Johnny Darter	D	I	C	44	33.00	3.94	0.05	0.16	1.49
Greenside Darter	D	I	S M	126	94.50	11.29	0.25	0.80	2.65
Fantail Darter	D	I	C	18	13.50	1.61	0.04	0.14	3.22
Mottled Sculpin		I	C	100	75.00	8.96	0.43	1.39	5.78
<i>Mile Total</i>				1,116	837.00		31.26		
<i>Number of Species</i>				32					
<i>Number of Hybrids</i>				1					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 2002
River Mile: 0.30	Location:	Date Range: 08/07/2002
Time Fished: 6900 sec	Drainage: 109.0 sq mi	Thru: 09/16/2002
Dist Fished: 0.40 km	Basin: Maumee River	Sampler Type: D
	No of Passes: 2	

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	14	10.50	2.25	0.36	1.54	34.29
Northern Pike	F	P	M	3	2.25	0.48	0.18	0.75	78.33
Golden Redhorse	R	I	S M	8	6.00	1.28	1.57	6.71	261.75
Northern Hog Sucker	R	I	S M	27	20.25	4.33	1.63	6.97	80.59
White Sucker	W	O	S T	4	3.00	0.64	0.65	2.79	217.75
Common Carp	G	O	M T	12	9.00	1.93	13.03	55.64	1,447.92
River Chub	N	I	N I	53	39.75	8.51	0.58	2.49	14.64
Blacknose Dace	N	G	S T	2	1.50	0.32	0.00	0.02	3.00
Creek Chub	N	G	N T	25	18.75	4.01	0.11	0.48	6.04
Spotfin Shiner	N	I	M	84	63.00	13.48	0.12	0.53	1.95
Sand Shiner	N	I	M M	5	3.75	0.80	0.01	0.04	2.20
Bluntnose Minnow	N	O	C T	84	63.00	13.48	0.14	0.60	2.23
Central Stoneroller	N	H	N	2	1.50	0.32	0.01	0.03	4.50
Channel Catfish	F		C	1	0.75	0.16	1.80	7.69	2,400.00
Yellow Bullhead		I	C T	4	3.00	0.64	0.74	3.15	246.00
Stonecat Madtom		I	C I	6	4.50	0.96	0.19	0.80	41.83
White Crappie	S	I	C	5	3.75	0.80	0.03	0.13	8.00
Rock Bass	S	C	C	14	10.50	2.25	1.01	4.31	96.14
Largemouth Bass	F	C	C	1	0.75	0.16	0.00	0.01	3.00
Green Sunfish	S	I	C T	160	120.00	25.68	0.92	3.94	7.69
Bluegill Sunfish	S	I	C P	10	7.50	1.61	0.04	0.19	5.90
Green Sf X Bluegill Sf				1	0.75	0.16	0.03	0.14	43.00
Dusky Darter	D	I	S M	48	36.00	7.70	0.16	0.70	4.56
Blackside Darter	D	I	S	11	8.25	1.77	0.03	0.13	3.64
Johnny Darter	D	I	C	26	19.50	4.17	0.03	0.11	1.28
Greenside Darter	D	I	S M	5	3.75	0.80	0.02	0.06	4.00
Fantail Darter	D	I	C	5	3.75	0.80	0.01	0.05	3.00
Mottled Sculpin		I	C	3	2.25	0.48	0.00	0.02	2.00
<i>Mile Total</i>				623	467.25		23.42		
<i>Number of Species</i>				27					
<i>Number of Hybrids</i>				1					

Appendix Table 9. Index of Biotic Integrity (IBI) scores and metrics for sites sampled in Fish Creek, 2002.

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals						Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni- vores	Top carnivores	Insect- ivores	DELT anomalies			
Fish Creek - (04405)																	
Year: 2002																	
21.60	E	08/06/2002	36	21(5)	4(5)	3(3)	3(3)	4(3)	37(5)	37(3)	12(5)	0.8(1)	65(5)	0.8(3)	497(3)	44	8.9
21.60	E	09/17/2002	36	23(5)	4(5)	3(3)	3(3)	5(5)	32(3)	38(3)	11(5)	2.3(3)	64(5)	0.0(5)	452(3)	48	8.9
14.30	D	08/06/2002	82	26(5)	4(5)	3(3)	3(3)	4(3)	34(3)	54(1)	28(3)	2.3(3)	58(5)	0.9(3)	332(3)	40	8.9
14.30	D	09/17/2002	82	30(5)	5(5)	5(5)	2(1)	4(3)	32(3)	55(1)	28(3)	1.2(3)	58(5)	0.0(5)	462(3)	42	9.5
8.30	D	08/06/2002	97	27(5)	4(5)	5(5)	4(3)	6(5)	42(5)	46(1)	27(3)	2.9(3)	61(5)	0.0(5)	366(3)	48	9.0
8.30	D	09/17/2002	97	28(5)	5(5)	5(5)	2(1)	6(5)	28(3)	42(1)	34(3)	1.8(3)	53(3)	0.4(3)	700(3)	40	9.3
7.50	D	08/06/2002	98	22(3)	3(3)	4(5)	2(1)	4(3)	43(5)	49(1)	33(3)	2.9(3)	63(5)	1.6(1)	270(3)	36 ☹	8.4
7.50	D	09/17/2002	98	29(5)	4(5)	5(5)	3(3)	6(5)	35(3)	45(1)	29(3)	2.8(3)	66(5)	0.0(5)	353(3)	46 ☹	9.0
5.40	D	08/07/2002	105	26(5)	3(3)	4(3)	4(3)	5(3)	40(5)	36(3)	17(5)	1.1(3)	74(5)	0.0(5)	614(3)	46	9.6
5.40	D	09/16/2002	105	27(5)	5(5)	4(3)	4(3)	6(5)	32(3)	44(1)	29(3)	0.9(1)	63(5)	0.2(3)	395(3)	40	8.8
0.30	D	08/07/2002	109	23(5)	4(5)	3(3)	2(1)	5(3)	15(1)	48(1)	12(5)	1.4(3)	80(5)	0.4(5)	224(3)	40	7.7
0.30	D	09/16/2002	109	24(5)	4(5)	3(3)	2(1)	5(3)	18(1)	46(1)	24(3)	4.1(3)	68(5)	0.0(5)	275(3)	38	8.3

na - Qualitative data, Modified Iwb not applicable.

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 10. Index of Biotic Integrity scores and metric values for Fish Creek fish community samples (wading sites) collected in Indiana by the United States Fish and Wildlife Service during 1999 and 2002. Scoring was based on sampling protocols and metric development detailed in *Development of Index of Biotic Integrity Expectations for the Ecoregions of Indiana, V. Eastern Corn Belt Plain* (Simon and Dufour 1998).

River Mile	Drainage Area (sq mi)	Number of					Percent of Individuals						Rel. No. Individuals (CPUE)	IBI	
		Total Species	Darter Species	Sunfish Species	Sucker Species	Sensitive Species	Tolerant Fish	Omni- vores	Insect- ivores	Carni- vores	Simple Lithophils	DELT Anomalies			
<i>Fish Creek (2002)</i>															
27.7	29.6	12(3)	0(1)	3(3)	2(3)	1(1)	69(1)	44(3)	18(1)	0.9(1)	28(3)	6.4(1)	109(1)	22	
20.4	36.5	15(3)	4(5)	3(3)	3(3)	5(3)	72(1)	35(3)	33(3)	1.9(1)	12(1)	0(5)	209(3)	34	
15.0	44.6	18(5)	5(5)	1(1)	3(3)	4(3)	40(3)	16(5)	52(5)	0.6(1)	32(3)	7.9(1)	165(3)	38	
14.3	82.0	24(5)	4(5)	4(5)	3(3)	8(5)	53(1)	19(5)	65(5)	1.7(1)	23(3)	2.6(1)	233(3)	42	
<i>Fish Creek (1999)</i>															
27.7	29.6	15(3)	3(5)	2(3)	2(3)	1(1)	49(3)	22(1)*	49(3)	2(1)	26(3)	0(1)*	49(1)	28	
20.4	36.5	14(3)	3(5)	2(3)	2(3)	4(3)	62(1)	17(5)	39(3)	3(1)	29(3)	0(5)	100(1)	36	
15.0	44.6	15(3)	4(5)	1(1)	4(5)	5(3)	50(1)	14(5)	42(3)	0(1)	42(5)	0.9(3)	113(1)	36	
14.3	82.0	18(3)	3(5)	3(3)	2(3)	3(1)	23(5)	15(5)	75(5)	1.9(1)	41(5)	0(5)	158(1)	42	
8.3	97.0	19(5)	4(5)	3(3)	4(5)	6(3)	17(5)	9(5)	82(5)	2(1)	37(3)	0(5)	211(3)	48	
5.6	105.0	15(3)	4(5)	1(1)	3(3)	7(5)	16(5)	5(5)	66(5)	18(5)	24(3)	0(5)	82(1)	46	
<i>Hiram Sweet Ditch (2002)</i>															
0.1	39.0	16(5)	3(5)	1(1)	2(3)	3(3)	70(1)	56(1)	35(3)	0.5(1)	16(1)	0(5)	184(3)	32	
<i>Hiram Sweet Ditch (1999)</i>															
0.1	39.0	10(3)	2(3)	1(1)	2(3)	2(1)	72(1)	34(3)	35(3)	1.5(1)	28(3)	0(5)	65(1)	28	

* Low end scoring adjustment.

Appendix Table 11. Index of Biotic Integrity scores and metric values for Fish Creek fish community samples (headwater sites) collected in Indiana by the United States Fish and Wildlife Service during 1999 and 2002. Scoring was based on sampling protocols and metric development detailed in *Development of Index of Biotic Integrity Expectations for the Ecoregions of Indiana, V. Eastern Corn Belt Plain* (Simon and Dufour 1998).

River Mile	Drainage Area (sq mi)	Number of											Rel. No. Individuals (CPUE)	IBI	
		Total Species	Darter/ Madtom/ Sculpin Species	Minnow Species	Sensitive Species	Percent of Individuals									
						Headwater Species	Tolerant Fish	Omni- vores	Insect- ivores	Pioneer Species	Simple Lithophils	DELT Anomalies			
<i>Fish Creek (2002)</i>															
29.5	13.8	13(3)	4(5)	2(1)	0(1)	14(1)	56(1)	1.6(5)	38(3)	80(1)	5(1)	1.1(3)	188(3)	28	
<i>Fish Creek (1999)</i>															
29.5	13.8	9(3)	4(5)	4(3)	1(1)	22(3)	55(1)	1(5)	44(3)	77(1)	8(1)	0(5)	100(1)	32	
<i>West Branch Fish Creek (2002)</i>															
1.2	14.8	11(3)	4(5)	3(1)	0(1)	15(1)	69(1)	8(5)	35(3)	73(1)	16(1)	0(5)	216(3)	30	
<i>West Branch Fish Creek (1999)</i>															
1.2	14.8	7(1)	3(3)	3(1)	0(1)	44(5)	48(3)	1(5)	49(3)	55(1)	18(1)	0(5)	181(3)	32	