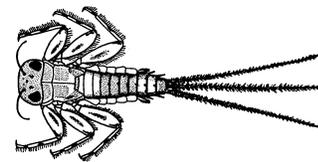
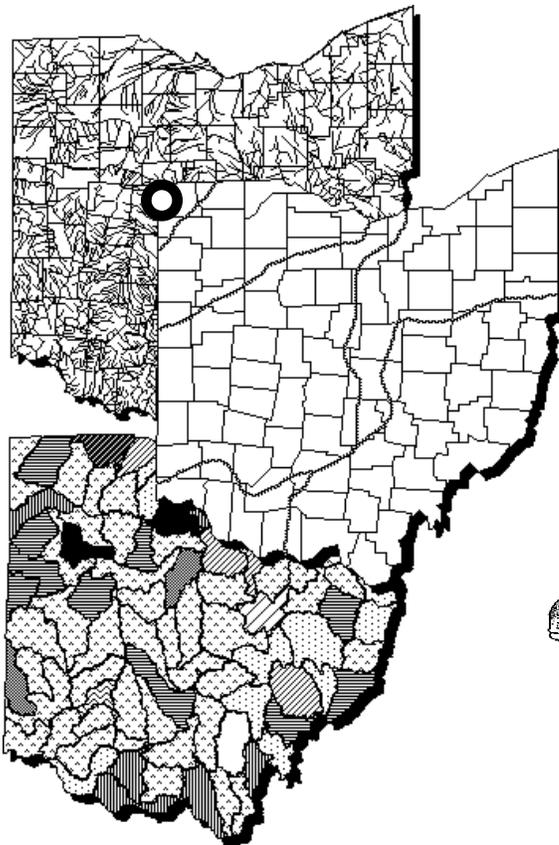
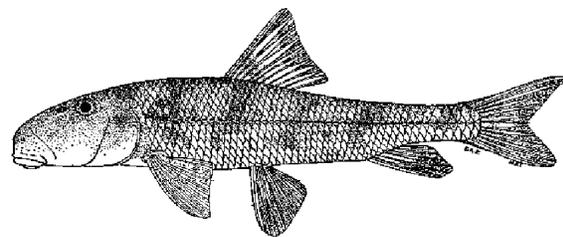


Fish and Macroinvertebrate Study of Fish Creek 1994

Steuben and Dekalb Counties (Indiana)
and Williams County (Ohio)



Mayfly (*Stenonema*)



Northern Hog Sucker (*Hypentelium nigricans*)

February 16, 1995

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Steuben and Dekalb Counties, Indiana
Williams County, Ohio

February 16, 1995

OEPA Technical Report MAS/1995-2-1

prepared for

State of Ohio Environmental Protection Agency
Division of Emergency and Remedial Response

prepared by

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Introduction and Methods

Fish and macroinvertebrate communities were sampled during the summer and fall of 1994 at six locations in Fish Creek from river mile (RM) 21.7 to the mouth (Table 1, Figure 1). Sampling was conducted to assess fish and macroinvertebrate communities one year after a ruptured pipeline spilled approximately 27,000 gallons of diesel fuel into Fish Creek at RM 7.55. 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 on July 27 and September 9 using pulsed DC electrofishing gear, with sampling distance varying between 180 and 220 meter zones. Macroinvertebrate collections were made at each site using modified Hester-Dendy multiple-plate artificial substrate samplers colonized for a six-week period from July 27 - September 9. At the time of sampler 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 and USFWS biologists; 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).

Evaluation of aquatic life use attainment status was determined by using biological criteria codified in Ohio Administrative Code (OAC) 3745-1-07, Table 7-17. The fish community performance measures that were used included the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb) while the macroinvertebrate data compiled for each location were evaluated using the Invertebrate Community Index (ICI). The IBI is a multi-metric index patterned after an original IBI described by Karr (1981) and Fausch *et al.* (1984). The MIwb is a measure of fish community abundance and diversity using numbers and weight information; it is a modification of the original Index of Well-Being applied to fish community information from the Wabash River (Gammon 1976, Gammon *et al.* 1981). The ICI is a multi-metric assessment tool which incorporates both the quantitative and qualitative invertebrate information.

Condition of the physical habitat was evaluated by Ohio EPA using the Qualitative Habitat Evaluation Index (QHEI) developed by Ohio EPA for streams and rivers in Ohio (Rankin 1989). Various attributes of the available habitat were scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas.

An Area of Degradation Value (ADV; Rankin and Yoder 1991) was calculated for the study area based on the longitudinal performance of the biological communities. The ADV portrays the length or "extent" of degradation to aquatic communities and is simply the distance that the biological index (IBI, MIwb, and ICI) departs from the stream criterion or the upstream level of

performance (Figure 2). The magnitude of impact refers to the vertical departure of each index below the criterion. The total ADV is the area beneath the ecoregional criterion when the results for each index are plotted against river mile. This is also expressed as ADV/mile to normalize comparisons between segments and other areas.

Fish Creek is located in the Eastern Corn Belt Plains ecoregion and, for Ohio reaches, is currently assigned the Warmwater Habitat (WWH) aquatic life use. Based on a 1992 St. Joseph River watershed survey (Ohio EPA 1993), the recommendation was made to designate lower Fish Creek as Exceptional Warmwater Habitat (EWH) in a three mile stretch from the Ohio-Indiana state line (RM 5.6) to the point where the St. Joseph River floodplain physically influences instream conditions (RM 2.4 near CR 3).

Table 1. Fish and macroinvertebrate sampling locations in Fish Creek, 1994.

Stream/ River Mile	Latitude	Longitude	Landmark	County	USGS 7.5 min. Quad. Map
<i>Fish Creek</i>					
21.7	41°34'11"	84°49'33"	TR 850E, Indiana	Steuben	Edon, Ind.-Ohio
14.3	41°42'29"	84°52'11"	CR 4A, Indiana	Dekalb	Edon, Ind-Ohio
8.3	41°28'27"	84°49'36"	CR 16, Indiana	Dekalb	Butler East, IN-OH
6.5	41°27'55"	84°48'55"	CR 79, Indiana	Dekalb	Butler East, IN-OH
5.4	41°27'58"	84°48'05"	TR 171, Ohio	Williams	Butler East, IN-OH
0.3	41°27'48"	84°44'51"	SR 49, Ohio	Williams	Edgerton, Ohio

Summary/ Conclusions

From August to September, 1994 Ohio EPA Division of Surface Water staff, at the request of the Division of Emergency and Remedial Response, conducted biological community and biomarker sampling of Fish Creek upstream and downstream from a diesel fuel spill which occurred during 1993. The results of these sampling events are summarized below. Biomarker results will be presented as an addendum to this report at a later date. The portion of Fish Creek in Indiana was evaluated using Ohio EPA Exceptional Warmwater Habitat biological criteria.

- NON attainment of the Exceptional Warmwater Habitat (EWH) aquatic life use designation occurred at the upper sampling location (RM 21.7) and at RM 5.4, a site located two miles downstream from the diesel fuel spill (Table 2). PARTIAL attainment of the EWH use was observed both upstream and downstream from the spill location. FULL attainment of the EWH use was noted at RM 8.3, an area located immediately upstream from the location of the diesel fuel spill. Overall 1994 results for Fish Creek indicate that 1.9 miles of stream were meeting the EWH use designation, 16.5 miles were in partial attainment of the EWH/WWH uses (lower 2.4 miles of Fish Creek is WWH) and 3.1 miles of stream were not meeting the EWH use designation.

- The fish community in Fish Creek has not fully recovered from the diesel fuel spill, as evidenced by the lower IBI scores immediately downstream from the spill site. Redhorse sucker species, a group of fish moderately tolerant to intolerant of pollution, were absent from both sampling passes conducted at RM 5.4. Adequate pool habitat was available for golden and black redbhorse; however, pool and margin areas had sediments contaminated with diesel fuel (as indicated by visual oil sheens/ diesel fuel odors created by walking in pool areas and other slack water locations). The 1994 macroinvertebrate data indicated the presence of good to exceptional macroinvertebrate communities throughout the study area. An exceptional macroinvertebrate community was documented at RM 6.5, one mile downstream from the spill site. Diverse assemblages of pollution sensitive mayflies and caddisflies were well represented at all sites except RM 5.4 (two miles downstream from the spill site), which was represented by a high percentage of tolerant taxa and the near exclusion of caddisfly taxa. Biological sampling results in Fish Creek downstream from the spill site indicate slightly reduced communities, although conditions were reflective of good to exceptional quality. Biological sampling results suggest that fuel oil residues in Fish Creek are having a more significant effect two miles downstream from the discharge point, as opposed to within one mile of the spill location.
- Higher than normal silt levels and substrate embeddedness in Fish Creek appear to be influencing the ability of Fish Creek to fully achieve its EWH potential.
- Area of Degradation Values (ADV) for the 1992, 1993 and 1994 sampling efforts provide a relative measure of performance of the biological communities in Fish Creek. No appreciable change in IBI or MIwb values was recorded between 1994 and 1992; a significant improvement in the ICI ADV occurred since the spill.
- Three notable observations of the physical habitat and riparian condition of Fish Creek were observed. 1) Substrate quality was influenced in Fish Creek by a pervasive layer of silt, causing moderate to extensive substrate embeddedness at most sampling locations. 2) Fish Creek at a majority of the sites sampled was represented by a moderate to wide, mature forested riparian area providing extensive shading of the stream. 3) A moderately strong diesel fuel odor was noted emanating from bottom sediments at the two sites in Fish Creek located immediately downstream from the diesel fuel spill tributary (RM 6.5 and RM 5.4). An oily sheen on the water surface was associated with the odor. The diesel fuel odor was not observed at any of the other sites sampled in Fish Creek.
- A majority of Fish Creek within the study area was represented by similar physical habitat features. Bottom substrates were predominated by sand and pea-size gravel, with logs and woody debris providing extensive instream cover for fish and macroinvertebrate habitat. Aside from the most downstream sampling location, physical habitat in Fish Creek is conducive to supporting an exceptional biological community.

- The Hamilton Lake Conservancy District operates the only known wastewater treatment plant in the Fish Creek drainage basin. Overall loadings of nutrients, oxygen demanding waste and ammonia-N was generally low; however, some significant increases in ammonia-N loadings occurred between January and March, 1994. During these months, ammonia-N effluent concentrations were quite high, with several daily values exceeding 20 mg/l. These elevated ammonia-N levels were attributed to extremely cold temperatures. Somewhat elevated ammonia-N levels were also reported in the Hamilton Lake WWTP effluent during June and July, 1994.
- Lists of chemical spills and wild animal kills are also indications of possible impacts due to pollutant loadings. No reported wildlife kills or chemical spills have occurred in Fish Creek (in Ohio and Indiana) other than the kill associated with the diesel fuel spill on September 15, 1993.

Table 2. Aquatic life use attainment status for Fish Creek based upon sampling conducted from July to September, 1994. Attainment status is based on biocriteria for the Eastern Corn Belt Plains ecoregion of Ohio (OAC Chapter 3745-1-07, Table 7-17).

RIVER MILE Fish/Invert.	IBI	Modified Iwb	ICI	QHEI	Attainment Status	Comment
<i>Fish Creek-1994</i>						
<i>Eastern Corn Belt Plains Ecoregion - EWH Use Designation (Recommended)</i>						
21.7/ 21.7	40*	8.1*	40*	76.0	NON	Background/small stream
14.3/14.3	42*	7.5*	48	71.0	PARTIAL	Downstream Hamilton
8.3/ 8.3	47 ^{ns}	9.3 ^{ns}	48	68.0	FULL	Upstream diesel spill
6.5/ 6.5	43*	8.9 ^{ns}	52	71.5	PARTIAL	Diesel spill area
5.4/ 5.4	41*	8.5*	38*	71.0	NON	Diesel spill area
<i>Eastern Corn Belt Plains Ecoregion - WWH Use Designation</i>						
0.3/ 0.3	41	7.6*	50	64.0	PARTIAL	Downstream recovery

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)

INDEX	WWH	EWH	MWH^a
IBI - Wading	40	50	24
Mod Iwb - Wading	8.3	9.4	6.2
ICI	36	46	22

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

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

a - Modified Warmwater Habitat for channel modified areas.

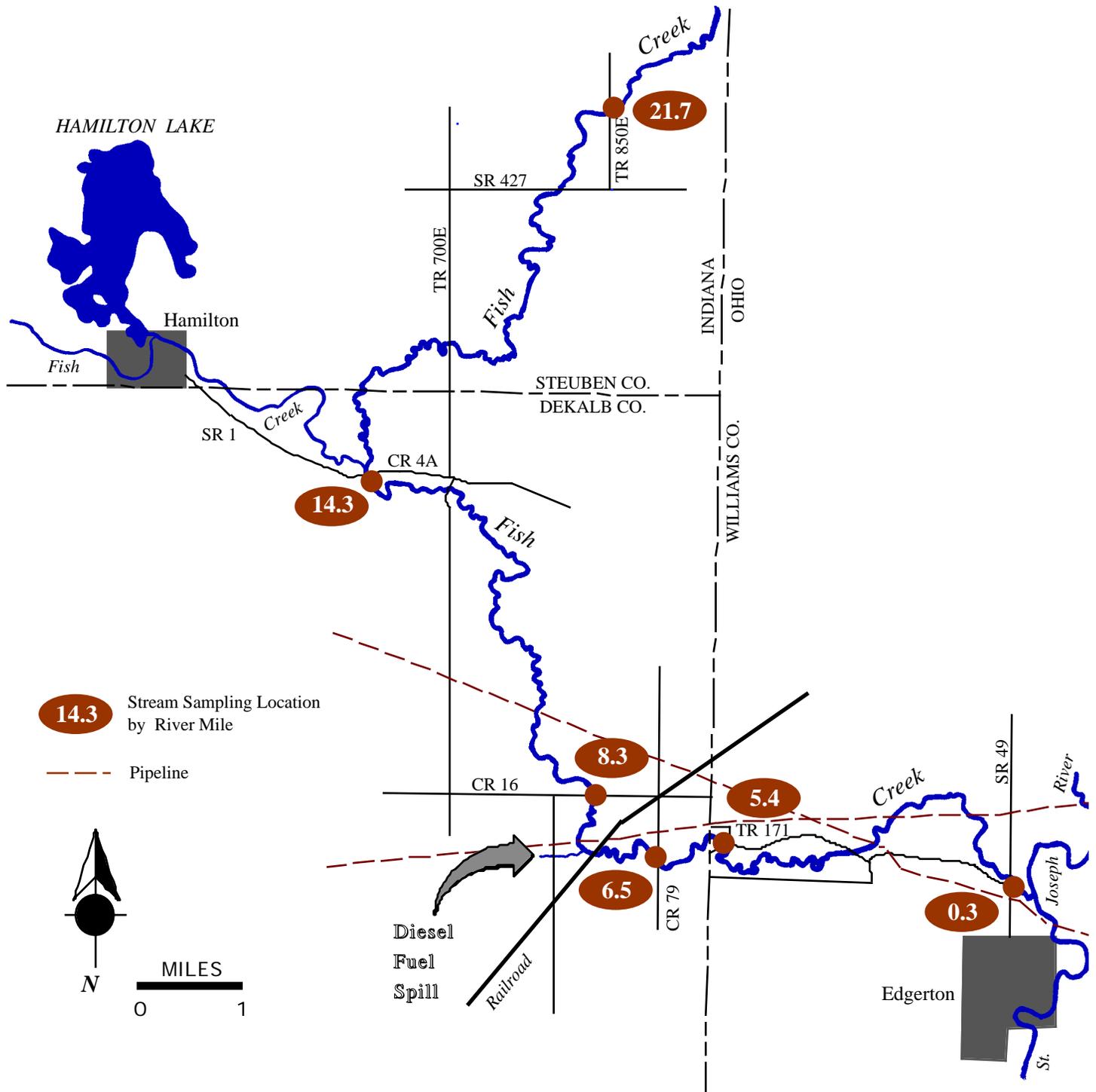


Figure 1. Map of the Fish Creek study area showing principal streams, landmarks, the diesel fuel spill location and Ohio EPA biological sampling locations, 1994.

AREA OF DEGRADATION VALUE (ADV)

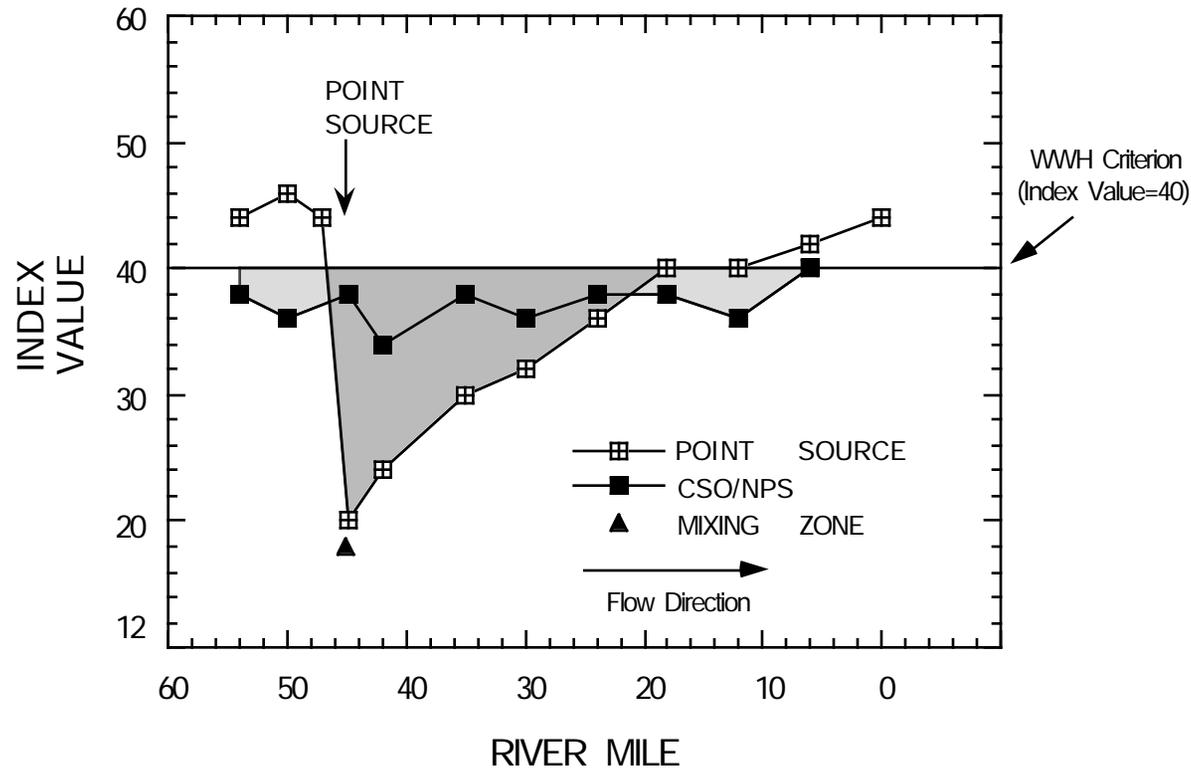


Figure 2. Graphic illustration of the Area of Degradation Value (ADV) based on the ecoregion biocriterion (WWH in this example). The index value trend line indicated by the unfilled boxes and solid shading (area of departure) represents a typical response to a point source impact (mixing zone appears as a solid triangle); the filled boxes and dashed shading (area of departure) represent a typical response to a nonpoint source or combined sewer overflow impact. The blended shading represents the overlapping impact of the point and nonpoint sources.

Physical Habitat for Aquatic Life

Physical habitat was evaluated in Fish Creek at each 1994 biological sampling location. Qualitative Habitat Evaluation Index (QHEI) scores are detailed in Table 3.

- Stream morphology at the upper most sampling location (RM 21.7) consisted of good pool, riffle and run development. Bottom substrates were different than other sampling locations, being predominated by cobble and gravel, with lesser amounts of boulders and sand. Instream cover was primarily composed of boulders and cobble; logs and woody debris were sparse within the sampling zone. The QHEI score at RM 21.7 was 76.0, reflective of good to excellent stream habitat.
- Physical habitats at Fish Creek sampling sites between RM 14.3 and RM 5.4 were quite similar in quality. Bottom substrates were predominated by sand and pea-size 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 68.0 and 71.5, indicative of good stream habitat.
- Macrohabitats evaluated at RM 0.3 were of a lower quality than found at upstream sampling locations in Fish Creek. Bottom substrates were predominantly composed of sand, silt embeddedness was extensive, and the few riffles observed were of poor quality (sand and woody debris were the dominant substrate types in the riffles). The QHEI score at RM 0.3 was 64.0, the lowest within the study area.
- Three notable observations of the physical habitat and riparian condition of Fish Creek were observed.
 - Substrate quality was influenced in Fish Creek by a pervasive layer of silt, causing moderate to extensive substrate embeddedness at most sampling locations.
 - Fish Creek at a majority of the sites sampled was represented by a moderate to wide, mature forested riparian area providing extensive shading of the stream.
 - A moderately strong diesel fuel odor was noted emanating from bottom sediments at the two sites in Fish Creek located immediately downstream from the diesel fuel spill tributary (RM 6.5 and RM 5.4). An oily sheen on the water surface was associated with the odor. The diesel fuel odor was not observed at any of the other sites sampled in Fish Creek.

Macroinvertebrate Community

Macroinvertebrate communities were sampled during the summer of 1994 at six locations in Fish Creek from RM 21.7 to the mouth at RM 0.3 (Table 1). Summarized results from the 1994 macroinvertebrate sampling are compiled in Table 4 and longitudinally depicted in Figure 3. ICI metrics and scores and raw data tables by river mile are attached as Appendix Tables 1 and 2. Included in Table 4 and Figure 6 are macroinvertebrate results collected in prior years by Ohio EPA. These include two quantitative sites (RMs 5.40 and 0.30) and one qualitative site (RM 30.50) collected in 1992; a detailed discussion of this data is provided in Ohio EPA (1993a). Additionally, macroinvertebrate data were collected from six quantitative sites in 1993, with two sites (RMs 5.40 and 0.30) being downstream from the September 15, 1993 diesel fuel spill. A detailed discussion of this data is provided in Ohio EPA (1993b).

- The 1994 data indicated the presence of good to exceptional macroinvertebrate communities throughout the study area. ICI scores ranged from 38 (good) at CR 60 (RM 5.40), about two miles downstream from the spill site (RM 7.55), to 52 (exceptional) at CR 79 (RM 6.50 - approximately one mile downstream from the spill site). All sites except two (RMs 21.70 and 5.40) exceeded the EWH ecoregion biocriterion (ICI=46). At RM 21.70 this decline seemed to be partially due to low stream flow, and its effect on artificial substrate colonization. Diverse assemblages of pollution sensitive mayflies and caddisflies were well represented at all sites except RM 5.40.
- At RM 5.4 there was a good macroinvertebrate community predominated by midges and mayflies of the genus *Paraleptophlebia*. However, there was a high percentage of pollution tolerant organisms and a much reduced caddisfly population both in the number of taxa present (3) and as a percent of the sample (0.3%).

Table 4. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in Fish Creek, 1992 - 1994. Fish Creek has a WWH aquatic life use designation in the Ohio Water Quality Standards, with the EWH use designation recommended from RM 5.6 to RM 2.4 in a recent Ohio EPA report (1993b). For purposes of data evaluation, the EWH criterion was used to evaluate data collected in Indiana (RM 21.7 - 6.5).

Stream/ River Mile	Relative Density	Total Taxa	Quantitative Evaluation			ICI	Narrative Evaluation
			Quantitative Taxa	Qualitative Taxa	Qualitative EPT ^a		
Fish Creek - 1994							
21.7	568	58	38	32	7	40	Very 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
Fish Creek - 1993							
21.7	3290	87	46	69	20	56	Exceptional
17.1	1450	65	43	44	14	52	Exceptional
13.8	2084	69	47	37	11	44	Very Good
9.9	3804	70	52	39	14	46	Exceptional
5.4	776	45	32	24	7	20*	Fair
0.3	589	60	53	23	8	36	Good
Fish Creek - 1992							
5.4	3492	54	38	34	13	50	Exceptional
Stream/ River Mile	No. Qual. Taxa	QCTV ^b	Qualitative Evaluation			Narrative Evaluation ^c	
			Qual. EPT ^a	Relative Density	Predominant Organisms		
Fish Creek -1992							
30.5	35	31.8	7	Moderate	Fingernail clams,	Fair	
0.3	26	41.4	12	Moderate	Midges and caddisflies	Good	
Ecoregional Biocriteria: Eastern Corn Belt Plains (ECBP) (from OAC 3745-1-07, Table 7-17)							
<u>INDEX</u>		<u>WWH</u>	<u>EWH</u>	<u>MWH^d</u>			
ICI		36	46	22			

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

^b Qualitative Community Tolerance Value (QCTV) derived as the median of the tolerance values calculated for each qualitative taxon present.

^c 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.

^d Modified Warmwater Habitat for channel modified areas.

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

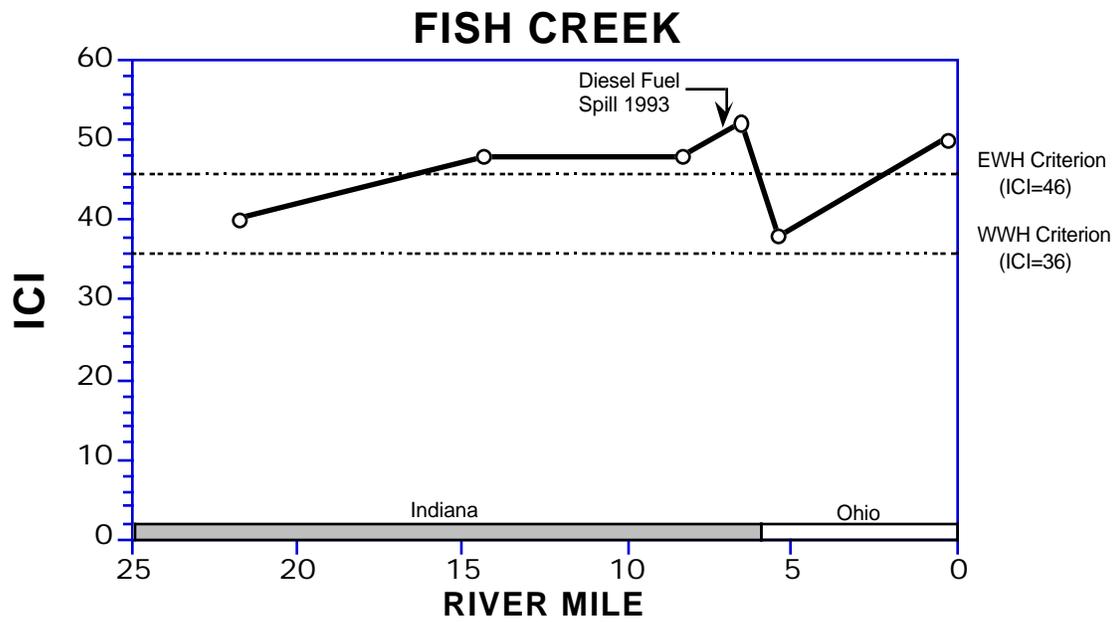


Figure 3. Longitudinal performance of the Invertebrate Community Index (ICI) in Fish Creek, 1994.

Fish Community

A total of 5,028 fish representing 43 species and one hybrid were collected from Fish Creek between July and September, 1994. The sampling effort included a cumulative distance electrofished of 2.57 km at six locations (Figure 1). Relative numbers and species collected per location is presented in Appendix Table 4. Sampling locations in Indiana (RM 21.7 - RM 6.5) and in Ohio at RM 5.4 were evaluated using Ohio's Exceptional Warmwater Habitat criteria. The site at RM 0.3 was evaluated using Warmwater Habitat criteria.

- Gizzard shad (25.7%) and creek chub (14.8%) predominated the catch numerically, while common carp predominated in weight (46.0%). Fish species highly tolerant of pollution made up over 27% of the total catch in Fish Creek.
- The fish communities at three sites (RMs 21.7 - 8.3) upstream from the diesel spill ditch (RM 7.55) exhibited fair to very good performance (Table 5). An increase in IBI values occurred between RM 21.7, RM 14.3 and RM 8.3, with scores of 40, 42 and 47, respectively (Figure 4). The IBI scores of 40 and 42 significantly departed from the EWH ecoregional biocriterion; the score of 47 was in the nonsignificant departure range for the EWH biocriterion. MIwb scores at RM 21.7 (8.1) and RM 14.3 (7.5) were significantly less than the EWH biocriterion; the MIwb value at RM 8.3 (9.3) was in the nonsignificant departure range for the EWH biocriterion.
- Sampling results from two sites in Fish Creek located immediately downstream from the diesel fuel spill yielded a decline in IBI scores (41 and 43) and a decrease in MIwb values (8.9 and 8.5). Fish results from these two locations downstream from the spill (RMs 6.5 and 5.4) were indicative of good to very good community performance; however, both IBI scores and one MIwb score were not meeting the EWH criteria. The third downstream sampling site, at RM 0.3, was considered fair to good, with the IBI score meeting the WWH biocriterion and the MIwb significantly departing from the WWH biocriterion.
- The fish community in Fish Creek has not fully recovered from the diesel fuel spill, as evidenced by the lower IBI scores immediately downstream from the spill site.
- Redhorse sucker species, a group of fish moderately tolerant to intolerant of pollution, were absent from both sampling passes conducted at RM 5.4. Adequate pool habitat was available for golden and black redhorse; however, pool and margin areas had sediments contaminated with diesel fuel (as indicated by visual oil sheens/ diesel fuel odors created by walking in pool areas and other slack water locations).
- The relatively low number of intolerant fish species and elevated number of omnivores in Fish Creek appears to be at least partly associated with a moderate silt level and embeddedness of the bottom substrates. Higher than normal silt levels and substrate embeddedness appear to be influencing the ability of Fish Creek to fully achieve its EWH potential.
- The highest number of fish species were collected in Fish Creek at RM 14.3; however, this site also had the highest common carp biomass in the study area (comprised 79% of weight of the catch).

- 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 combined for an average of 33.5 individuals per 0.3 km sampled (5.8% of the catch).
- The upward trend of the IBI in Fish Creek from upstream to downstream was disrupted at sites sampled downstream from the spill. A clear trend in the MIwb was not discernible upstream and downstream from the spill area.

Table 5. Fish community indices from Fish Creek, 1992 - 1994, based on pulsed D.C. electrofishing at sites sampled by Ohio EPA. Sites were sampled using wading methods. Relative number and weight are per 0.3 km. Fish Creek has a WWH aquatic life use designation in the Ohio Water Quality Standards, with the EWH use designation recommended from RM 5.6 to RM 2.4 in a recent Ohio EPA report (1993b). For purposes of data evaluation, the EWH criteria were used to evaluate data collected from sites sampled in Indiana (RM 21.7 - 6.5).

Stream/ River Mile	Mean Number of Species	Cumul ative Species	Mean Relative Number	Mean Relative Weight	QHEI	Mean Modified Index of Well-Being	Mean Index of Biotic Integrity	Narrative Evaluation ^a
<i>Fish Creek - 1994</i>								
21.7	22.5	26	819	11.6	76.0	8.1*	40*	M.Good
14.3	27.0	34	411	60.8	71.0	7.5*	42*	Fair/Good
8.3	26.0	28	429	38.4	68.0	9.3 ^{ns}	47 ^{ns}	V.Good
6.5	25.0	27	903	31.2	71.5	8.9 ^{ns}	43*	V.Good/Good
5.4	23.5	26	617	9.6	71.0	8.5*	41*	Good
0.3	19.5	24	457	15.1	64.0	7.6*	41	Fair/ Good
<i>Fish Creek - 1992</i>								
30.5	16.5	17	4,777	14.9	42.5	NA	44	Good
5.4	26.5	30	587	21.8	77.0	9.3 ^{ns}	44*	V. Good/Good
0.2	21.5	26	695	42.7	65.0	7.5*	43	Fair/Good
<i>Fish Creek - 1991</i>								
5.4	27	-	572	-	79.0	-	52	Exceptional
Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP) (from Ohio Administrative Code 3745-1-07, Table 7-17)								
			<u>INDEX</u>	<u>WWH</u>	<u>EWH</u>	<u>MWH</u>^b		
			IBI - Wading	40	50	24		
			Mod Iwb - Wading	8.3	9.4	6.2		

* - Significant departure from applicable biological criterion (>4 IBI units or >0.5 MIwb units).

ns - Nonsignificant departure from WWH or EWH biocriterion (≤4 IBI units or ≤0.5 MIwb units).

a - Narrative evaluation is based on both MIwb and IBI scores, when available (M.Good = Marginally Good; V.Good = Very Good).

b - Modified Warmwater Habitat for channel modified areas.

NA -Headwater site; MIwb is not applicable.

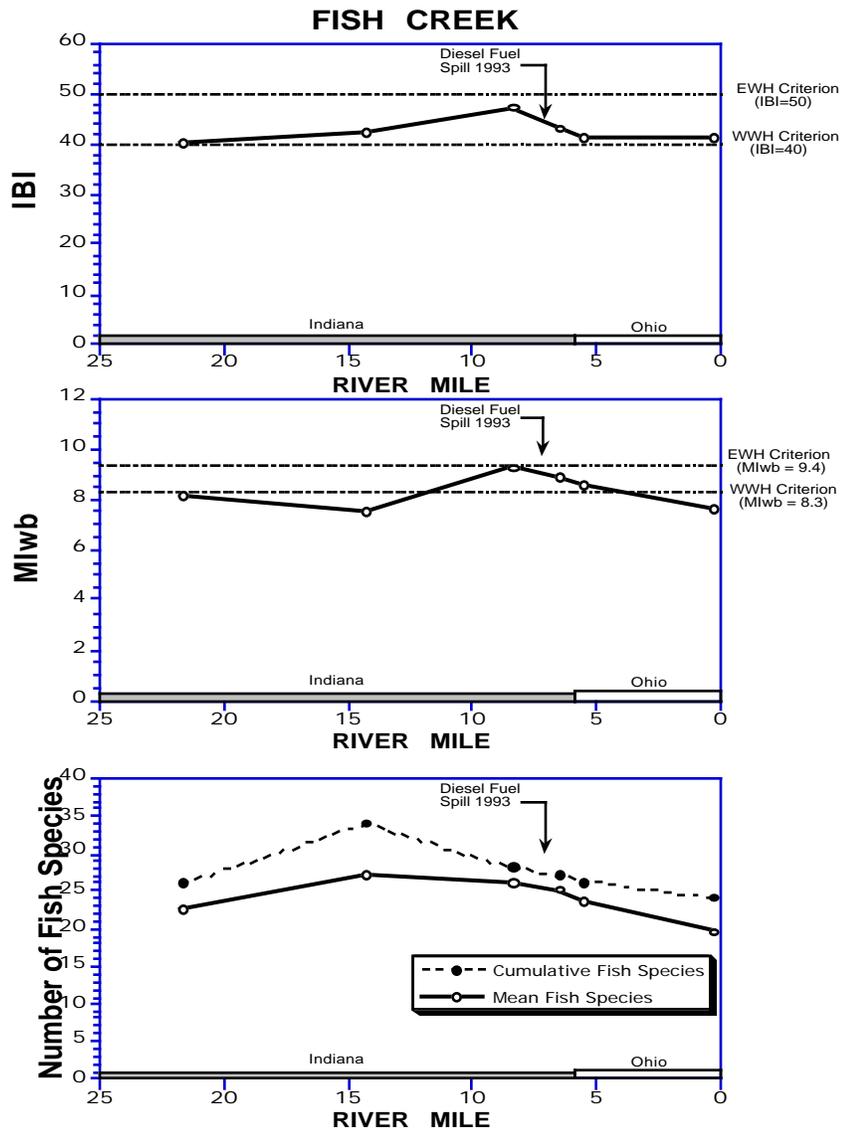


Figure 4. Longitudinal performance of the Index of Biotic Integrity, Modified Index of Well-being and number of species in Fish Creek, 1994.

Pollutant Loadings

- The Hamilton Lake Conservancy District WWTP (Indiana permit number 0050822), located in Hamilton, Indiana, is the only known point source discharge of wastewater to the Fish Creek watershed. Plant operations result in an average discharge of 0.3 million gallons per day (MGD) of tertiary treated wastewater into Fish Creek, a tributary to Fish Creek at RM 14.37. The discharge occurs approximately 3.5 miles upstream from the confluence with the mainstem Fish Creek. The plant consists of a dual oxidation ditch-type treatment facility with dual clarifiers, a two-day polishing pond, phosphorus removal and effluent chlorination. The collection system currently consists of separate sanitary sewers. There are no known overflows or bypasses. Current monthly average and weekly average permit limits for ammonia-nitrogen are 1.9 mg/l and 2.85 mg/l, respectively, for summer and 2.9 mg/l and 4.35 mg/l, respectively, for winter. Limits for carbonaceous biochemical oxygen demand (CBOD₅) are 25.0 mg/l (monthly average) and 40.0 mg/l (weekly average). Current total residual chlorine limits (which apply between May 1 and November 30 of each year) are for a daily minimum of 0.5 mg/l and a daily maximum of 1.0 mg/l. The permit requires the entity to meet a total residual chlorine final effluent limit of 0.03 mg/l (daily maximum) and 0.01 mg/l (monthly average) by January 1, 1996.
- Loading trends of BOD₅/CBOD₅, total nonfilterable residue, ammonia-N and total phosphorus from the Hamilton Lake WWTP 001 effluent between 1992 and 1994 are shown in Figure 5. Overall loadings of the four parameters was generally low, however, some significant increases in ammonia-N loadings occurred in January - March, 1994. These elevated ammonia-N levels were attributed to extremely cold temperatures. Seasonal fluctuations in total phosphorus are evident in Figure 5, with lower values generally occurring during the colder months and higher values during the warmer months.
- Ammonia-N permit limits became final during July, 1993. During January, February, March, June and July, 1994, the Hamilton Lake WWTP effluent discharge violated monthly and weekly ammonia-N permit limits. During these months, ammonia-N effluent concentrations were quite high, with several daily values exceeding 20 mg/l.
- During the 1994 study period, the Hamilton Lake WWTP was chlorinating the effluent discharged to Fish Creek (a tributary to the mainstem Fish Creek). Monthly Report of Operation data reported by the entity revealed daily total residual chlorine concentrations ranging between 0.5 mg/l and 1.0 mg/l. These levels can be toxic to aquatic life within the near-field area of the effluent discharge. Several studies (Karr *et al.* 1985, Paller *et al.* 1983) have documented instream biological impairment with total residual chlorine levels as low as 0.1 to 0.2 mg/l.
- Lists of chemical spills and wild animal kills are also indications of possible impacts due to pollutant loadings. Reviews were conducted for discharges and kills in Fish Creek as reported by Ohio EPA's Division of Emergency and Remedial Response, Ohio DNR's Division of Wildlife Pollution Investigation Reports, Indiana's Department of Environmental Management, and the Indiana DNR. No reported wildlife kills or chemical spills have occurred in Fish Creek (in Ohio and Indiana) other than the kill associated with the diesel fuel spill on September 15, 1993.

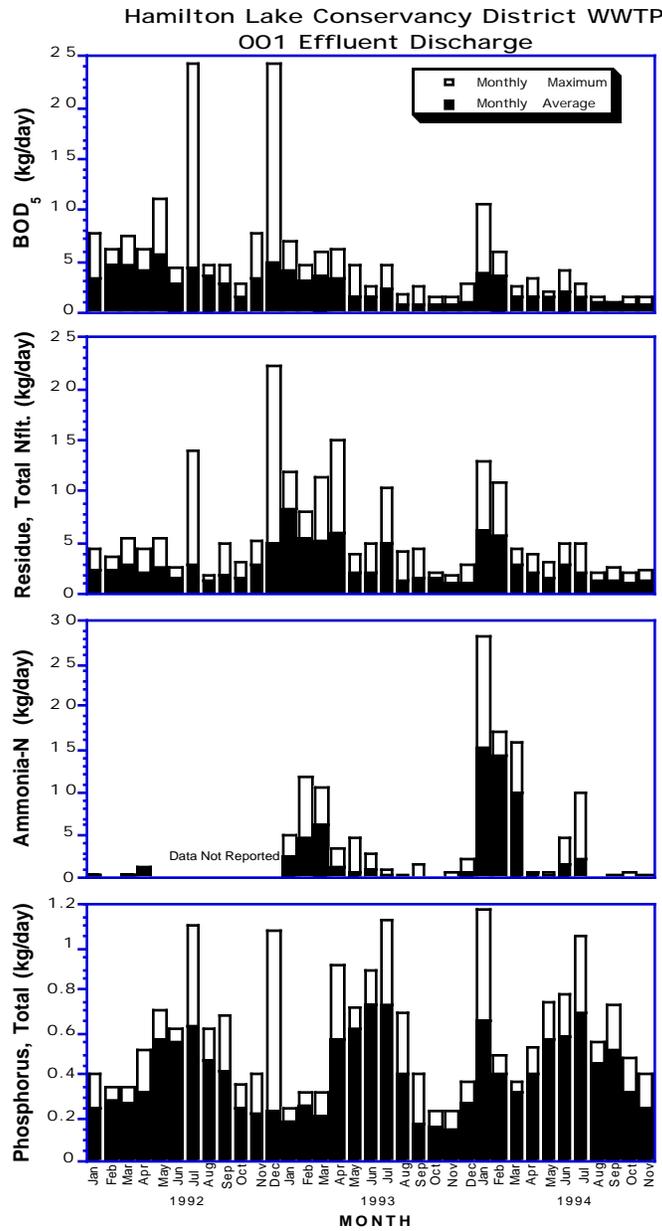


Figure 5. Loadings (kg/day) of biochemical oxygen demand (BOD₅), total nonfilterable residue, ammonia-N and total phosphorus from the Hamilton Lake Conservancy District WWTP 001 effluent to Fish Creek (a tributary to the mainstem Fish Creek) from January 1992 to November 1994. Reporting for BOD₅ changed to CBOD₅ after December 1992.

Trend Assessment

Changes in Fish Community Performance: 1991 - 1994

- Fish Creek fish communities were sampled by Ohio EPA in 1991 (RM 5.4), 1992 (RMs 5.4 and 0.3) and 1994 (RMs 21.7 - 0.3). Sampling by Ohio EPA in 1991 and 1992 occurred at sites located downstream from the diesel fuel spill; Ohio EPA fish data is not available for locations upstream from the spill. Fish community results show a decline in the IBI scores between 1991 and 1994 (Figure 6). A decline in the IBI score occurred at RM 5.4, and appeared to be associated with the spill of diesel fuel which happened on September 15, 1993.
- A significant decline in the number of pollution intolerant fish species was documented in Fish Creek between 1991 and 1994, downstream from the spill location. Sampling at RM 5.4 in 1991 and 1992 revealed 83 and 71 intolerant fish per 0.3 km, respectively. During 1994, one year after the diesel fuel spill, sampling at RM 5.4 recorded 36 intolerant fish per 0.3 km. Similar results were observed at RM 0.3, where sampling in 1992 revealed 62 intolerant fish compared to 21 collected in 1994.
- Area of Degradation Values (ADV) for the 1994 and 1992 sampling effort provides a relative measure of performance of the IBI and MIwb in Fish Creek (Table 6). The ADV/ mile of the IBI and MIwb was not very different between the 1992 and 1994 sampling periods.

Changes in Macroinvertebrate Performance: 1992 - 1994

- Fish Creek macroinvertebrate communities within the study area were sampled by Ohio EPA in 1992 with quantitative samples from RMs 5.40 and 0.30 and in 1993 and 1994 with quantitative samples from six locations between RMs 21.7 and 0.3 - the RM 0.3 artificial substrates in 1992 were partially buried in sand and gravel due to high stream flows; this situation invalidated the ICI score for that year. The diesel fuel spill in Fish Creek in September 1993 occurred about four weeks into that year's six week artificial substrate colonization period. The spill had a dramatic impact on the macroinvertebrate community at RM 5.40 in 1993 going from an ICI of 50 in 1992 to an ICI of 20 in 1993. The site showed a slight recovery in 1994 with an ICI of 38. This recovery stemmed largely from the return of mayflies and an increase in total taxa; however, the caddisflies have not recovered and the percent of tolerant taxa is still elevated but nowhere near the predominance of 1993. The rest of the study area continues to exhibit very good to exceptional macroinvertebrate communities. A decline at RM 21.7 from an ICI of 56 in 1993 to an ICI of 40 in 1994 appears to be partially related to lower stream flows in 1994. The site at the mouth (RM 0.30) is within the area of influence of the St. Joseph River floodplain. The site improved considerably between 1993 (ICI=36) and 1994 when the site scored an ICI of 50 exceeding the EWH biocriterion.
- Area of Degradation Values (ADV) for the 1993 and 1994 sampling effort provides a relative measure of performance of the ICI in Fish Creek. The ADV/mile of the ICI demonstrates the improvement noted between 1993 and 1994. ICI ADV/mile improved substantially from 52.6 in 1993 to 2.7 in 1994.

Table 6. Area of Degradation (ADV) statistics for Fish Creek from 1994, 1993, and 1992. Scores were calculated using the ecoregion biocriteria as the background community performance.

<i>Stream Index</i>	<u>Biological Index Scores</u>				<u>ADV Statistics</u>			<u>Attainment Status (miles)</u>			
	Upper RM	Lower RM	Mini- mum	Maxi- mum	ADV ADV	ADV/ Mile	Poor/VP ADV	FULL	PAR- TIAL	NON	POOR/ VP
<i>Fish Creek (1994)</i>											
IBI	21.7	0.3	36	47	1061	49.3	0				
MIwb			7.5	9.3	780	36.3	0	1.9	16.5	3.1	0
ICI			38	52	59	2.7	0				
<i>Fish Creek (1993)</i>											
ICI	21.7	0.3	20	56	1130	52.6	0				
<i>Fish Creek (1992)</i>											
IBI	5.4	0.3	38	44	258	49.6	0				
MIwb			7.5	9.3	145	27.9	0				

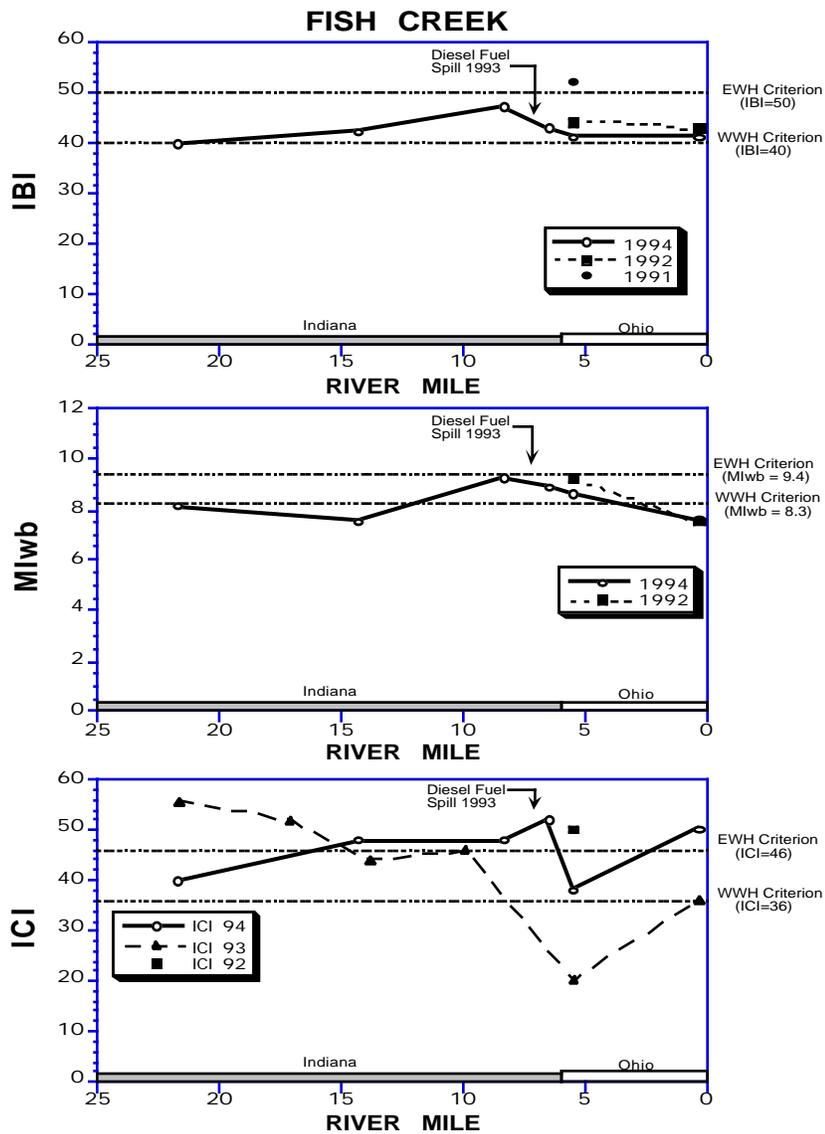


Figure 6. Longitudinal trend of the Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb), and Invertebrate Community Index (ICI) in Fish Creek during 1991, 1992, 1993 and 1994.

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Appendix Table 1. ICI metrics and scores for Fish Creek, 1994.

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 Taxa			
FISH CREEK (IN) — 04-405													
Year: 94													
21.70	71.0	38(6)	8(4)	3(4)	19(4)	29.0(4)	7.6(4)	26.9(4)	32.0(4)	6.1(4)	7(2)	5	40
14.30	82.0	36(4)	11(6)	5(6)	16(4)	49.0(6)	8.1(4)	30.4(4)	11.3(6)	3.5(6)	8(2)	5	48
8.30	97.0	42(6)	7(4)	6(6)	23(6)	25.4(4)	5.9(2)	46.3(6)	21.7(6)	1.7(6)	7(2)	5	48
6.50	99.0	41(6)	9(6)	7(6)	20(6)	22.7(4)	10.8(4)	52.3(6)	12.6(6)	4.4(6)	9(2)	5	52
5.40	105.0	44(6)	6(4)	3(4)	27(6)	27.1(4)	0.3(2)	31.0(4)	40.4(4)	12.3(2)	6(2)	5	38
0.30	109.0	46(6)	11(6)	7(6)	23(6)	44.0(6)	2.8(2)	29.0(4)	20.1(6)	8.1(4)	12(4)	5	50

**Appendix Table 2. Raw macroinvertebrate data by river mile for
Fish Creek, 1994.**

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/09/94 River Code: 04-405 River: Fish Creek

RM: 21.70

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
01320	<i>Hydra sp</i>	12	81650	<i>Parametrioconemus sp</i>	17 +
01801	<i>Turbellaria</i>	4	82141	<i>Thienemanniella xena</i>	17
03600	<i>Oligochaeta</i>	4	82820	<i>Cryptochironomus sp</i>	0 +
04685	<i>Placobdella ornata</i>	0 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	119 +
05900	<i>Lirceus sp</i>	0 +	84450	<i>Polypedilum (P.) convictum</i>	0 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	0 +	84460	<i>Polypedilum (P.) fallax group</i>	119
11020	<i>Acerpenna pygmaeus</i>	38	84470	<i>Polypedilum (P.) illinoense</i>	17 +
11120	<i>Baetis flavistriga</i>	29 +	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	0 +
11130	<i>Baetis intercalaris</i>	35 +	84700	<i>Stenochironomus sp</i>	17
12200	<i>Isonychia sp</i>	69 +	85625	<i>Rheotanytarsus exiguus group</i>	663 +
13540	<i>Stenonema mediopunctatum</i>	31 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	17
13561	<i>Stenonema pulchellum</i>	88 +	85800	<i>Tanytarsus sp</i>	34
13590	<i>Stenonema vicarium</i>	4	85814	<i>Tanytarsus glabrescens group</i>	51
15000	<i>Paraleptophlebia sp</i>	51	86200	<i>Tabanus sp</i>	0 +
21200	<i>Calopteryx sp</i>	4	87501	<i>Empididae</i>	9
21300	<i>Hetaerina sp</i>	1 +	93900	<i>Elimia sp</i>	0 +
42700	<i>Belostoma sp</i>	0 +	97601	<i>Corbicula fluminea</i>	0 +
42800	<i>Lethocerus sp</i>	0 +	98200	<i>Pisidium sp</i>	0 +
43570	<i>Neoplea sp</i>	0 +	98600	<i>Sphaerium sp</i>	0 +
45300	<i>Sigara sp</i>	0 +			
47600	<i>Sialis sp</i>	0 +			
52200	<i>Cheumatopsyche sp</i>	184 +	No. Quantitative Taxa: 38		Total Taxa: 58
52430	<i>Ceratopsyche morosa group</i>	23	No. Qualitative Taxa: 32		ICI: 40
52530	<i>Hydropsyche depravata group</i>	10 +	Number of Organisms: 2362		Qual EPT: 7
60400	<i>Gyrinus sp</i>	1			
67800	<i>Tropisternus sp</i>	0 +			
68075	<i>Psephenus herricki</i>	0 +			
68708	<i>Dubiraphia vittata group</i>	8			
68901	<i>Macronychus glabratus</i>	112			
69400	<i>Stenelmis sp</i>	0 +			
77500	<i>Conchapelopia sp</i>	34			
77800	<i>Helopelopia sp</i>	68			
78450	<i>Nilotanypus fimbriatus</i>	51			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	0 +			
80370	<i>Corynoneura lobata</i>	336			
80410	<i>Cricotopus (C.) sp</i>	17			
80420	<i>Cricotopus (C.) bicinctus</i>	17			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) rectinervus</i>	34			
81240	<i>Nanocladius (N.) distinctus</i>	17			

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/09/94 River Code: 04-405 River: Fish Creek

RM: 14.30

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
01320	<i>Hydra sp</i>	33	84460	<i>Polypedilum (P.) fallax group</i>	112 +
01801	<i>Turbellaria</i>	0 +	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	14
06700	<i>Crangonyx sp</i>	0 +	85201	<i>Cladotanytarsus species group A</i>	0 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	0 +	85500	<i>Paratanytarsus sp</i>	14
11020	<i>Acerpenna pygmaeus</i>	176	85625	<i>Rheotanytarsus exiguus group</i>	1148 +
11120	<i>Baetis flavistriga</i>	29	85802	<i>Tanytarsus curticornis group</i>	56
11130	<i>Baetis intercalaris</i>	309 +	87501	<i>Empididae</i>	16
12200	<i>Isonychia sp</i>	124 +	96900	<i>Ferrissia sp</i>	16
13400	<i>Stenacron sp</i>	561 +	97601	<i>Corbicula fluminea</i>	0 +
13510	<i>Stenonema exiguum</i>	127			
13521	<i>Stenonema femoratum</i>	1	No. Quantitative Taxa:	36	Total Taxa: 48
13540	<i>Stenonema mediopunctatum</i>	202	No. Qualitative Taxa:	25	ICI: 48
13561	<i>Stenonema pulchellum</i>	344 +	Number of Organisms:	4007	Qual EPT: 8
15000	<i>Paraleptophlebia sp</i>	88			
17200	<i>Caenis sp</i>	4			
21200	<i>Calopteryx sp</i>	0 +			
21300	<i>Hetaerina sp</i>	5 +			
22300	<i>Argia sp</i>	0 +			
23909	<i>Boyeria vinosa</i>	0 +			
48410	<i>Corydalus cornutus</i>	0 +			
51400	<i>Nyctiophylax sp</i>	8 +			
51600	<i>Polycentropus sp</i>	4			
52200	<i>Cheumatopsyche sp</i>	270 +			
52430	<i>Ceratopsyche morosa group</i>	12 +			
52530	<i>Hydropsyche depravata group</i>	30 +			
60400	<i>Gyrinus sp</i>	0 +			
68601	<i>Ancyronyx variegata</i>	0 +			
68708	<i>Dubiraphia vittata group</i>	0 +			
68901	<i>Macronychus glabratus</i>	41 +			
71900	<i>Tipula sp</i>	1			
74501	<i>Ceratopogonidae</i>	8			
77500	<i>Conchapelopia sp</i>	14			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	14			
77800	<i>Helopelopia sp</i>	28			
80370	<i>Corynoneura lobata</i>	16			
80420	<i>Cricotopus (C.) bicinctus</i>	14			
82121	<i>Thienemanniella n.sp 3</i>	28			
83300	<i>Glyptotendipes (Phytotendipes) sp</i>	28			
83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	112 +			

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/09/94 River Code: 04-405 River: Fish Creek

RM: 8.30

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
03600	<i>Oligochaeta</i>	8 +	85230	<i>Cladotanytarsus mancus group</i>	31
11020	<i>Acerpenna pygmaeus</i>	49	85500	<i>Paratanytarsus sp</i>	217
11130	<i>Baetis intercalaris</i>	105 +	85625	<i>Rheotanytarsus exiguus group</i>	1023 +
12200	<i>Isonychia sp</i>	15	85720	<i>Stempellinella n.sp nr. flavidula</i>	31
13400	<i>Stenacron sp</i>	308	85800	<i>Tanytarsus sp</i>	93 +
13510	<i>Stenonema exiguum</i>	362	85802	<i>Tanytarsus curticornis group</i>	775
13561	<i>Stenonema pulchellum</i>	279 +	85814	<i>Tanytarsus glabrescens group</i>	713
15000	<i>Paraleptophlebia sp</i>	482	96900	<i>Ferrissia sp</i>	9
21200	<i>Calopteryx sp</i>	17	99520	<i>Pleurobema sintoxia</i>	0 +
22300	<i>Argia sp</i>	0 +			
23909	<i>Boyeria vinosa</i>	0 +	No. Quantitative Taxa:	42	Total Taxa: 48
25300	<i>Ophiogomphus sp</i>	0 +	No. Qualitative Taxa:	22	ICI: 48
45300	<i>Sigara sp</i>	0 +	Number of Organisms:	6300	Qual EPT: 7
47600	<i>Sialis sp</i>	1 +			
51400	<i>Nyctiophylax sp</i>	16			
51600	<i>Polycentropus sp</i>	2 +			
52200	<i>Cheumatopsyche sp</i>	291 +			
52430	<i>Ceratopsyche morosa group</i>	13 +			
52530	<i>Hydropsyche depravata group</i>	1 +			
52550	<i>Hydropsyche frisoni</i>	52 +			
68708	<i>Dubiraphia vittata group</i>	8 +			
68901	<i>Macronychus glabratus</i>	19 +			
77500	<i>Conchapelopia sp</i>	93			
77800	<i>Helopelopia sp</i>	31			
80370	<i>Corynoneura lobata</i>	16 +			
80410	<i>Cricotopus (C.) sp</i>	62			
80420	<i>Cricotopus (C.) bicinctus</i>	31			
80430	<i>Cricotopus (C.) tremulus group</i>	62			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) rectinervus</i>	31			
81631	<i>Parakiefferiella n.sp 1</i>	93			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	62			
82121	<i>Thienemanniella n.sp 3</i>	31			
82880	<i>Cryptotendipes sp</i>	0 +			
83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	713			
84450	<i>Polypedilum (P.) convictum</i>	31 +			
84460	<i>Polypedilum (P.) fallax group</i>	31			
84470	<i>Polypedilum (P.) illinoense</i>	31 +			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	31			
85201	<i>Cladotanytarsus species group A</i>	31			

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/08/94 River Code: 04-405 River: Fish Creek

RM: 6.50

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
03600	<i>Oligochaeta</i>	48 +	80370	<i>Corynoneura lobata</i>	16
06700	<i>Crangonyx sp</i>	0 +	80420	<i>Cricotopus (C.) bicinctus</i>	114 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	0 +	80430	<i>Cricotopus (C.) tremulus group</i>	114
11120	<i>Baetis flavistriga</i>	1	81632	<i>Parakiefferiella n.sp 2</i>	57 +
11130	<i>Baetis intercalaris</i>	382 +	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	114 +
12200	<i>Isonychia sp</i>	288 +	82121	<i>Thienemanniella n.sp 3</i>	57
13400	<i>Stenacron sp</i>	167	82710	<i>Chironomus (C.) sp</i>	0 +
13510	<i>Stenonema exiguum</i>	749	82820	<i>Cryptochironomus sp</i>	0 +
13540	<i>Stenonema mediopunctatum</i>	51	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	0 +
13561	<i>Stenonema pulchellum</i>	231	84300	<i>Phaenopsectra obediens group</i>	0 +
15000	<i>Paraleptophlebia sp</i>	65 +	84450	<i>Polypedilum (P.) convictum</i>	57
16700	<i>Tricorythodes sp</i>	1	84460	<i>Polypedilum (P.) fallax group</i>	114 +
18700	<i>Hexagenia sp</i>	0 +	84470	<i>Polypedilum (P.) illinoense</i>	0 +
21200	<i>Calopteryx sp</i>	0 +	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	57
22300	<i>Argia sp</i>	0 +	85500	<i>Paratanytarsus sp</i>	114 +
23909	<i>Boyeria vinosa</i>	0 +	85625	<i>Rheotanytarsus exiguus group</i>	3762 +
24820	<i>Gomphurus externus</i>	0 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	57
42700	<i>Belostoma sp</i>	0 +	85800	<i>Tanytarsus sp</i>	57
45300	<i>Sigara sp</i>	0 +	85802	<i>Tanytarsus curticornis group</i>	228
47600	<i>Sialis sp</i>	0 +	85814	<i>Tanytarsus glabrescens group</i>	228 +
48410	<i>Corydalis cornutus</i>	34 +	86100	<i>Chrysops sp</i>	0 +
50315	<i>Chimarra obscura</i>	1	87501	<i>Empididae</i>	49
50601	<i>Psychomyiidae</i>	32	96900	<i>Ferrissia sp</i>	100 +
51600	<i>Polycentropus sp</i>	0 +	97601	<i>Corbicula fluminea</i>	0 +
52200	<i>Cheumatopsyche sp</i>	229 +	98600	<i>Sphaerium sp</i>	0 +
52430	<i>Ceratopsyche morosa group</i>	471 +	No. Quantitative Taxa: 41 Total Taxa: 65 No. Qualitative Taxa: 45 ICI: 52 Number of Organisms: 8506 Qual EPT: 9		
52530	<i>Hydropsyche depravata group</i>	3 +			
52550	<i>Hydropsyche frisoni</i>	120 +			
53800	<i>Hydroptila sp</i>	64			
67000	<i>Helophorus sp</i>	0 +			
68708	<i>Dubiraphia vittata group</i>	0 +			
68901	<i>Macronychus glabratus</i>	101 +			
69400	<i>Stenelmis sp</i>	1 +			
71900	<i>Tipula sp</i>	0 +			
74501	<i>Ceratopogonidae</i>	1			
77500	<i>Conchapelopia sp</i>	57 +			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	0 +			
77800	<i>Helopelopia sp</i>	57 +			
78650	<i>Procladius sp</i>	0 +			
80204	<i>Brillia flavifrons group</i>	57			

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/08/94 River Code: 04-405 River: Fish Creek

RM: 5.40

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
01801	<i>Turbellaria</i>	4	80430	<i>Cricotopus (C.) tremulus group</i>	0 +
03600	<i>Oligochaeta</i>	48 +	81231	<i>Nanocladius (N.) crassicornus or N. (N.) retinervus</i>	48
07875	<i>Cambarus (Tubericambarus) sp A</i>	0 +	81270	<i>Nanocladius (N.) spiniplenus</i>	48
11130	<i>Baetis intercalaris</i>	0 +	81631	<i>Parakiefferiella n.sp 1</i>	24
12200	<i>Isonychia sp</i>	1 +	81632	<i>Parakiefferiella n.sp 2</i>	168 +
13400	<i>Stenacron sp</i>	89	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	24 +
13510	<i>Stenonema exiguum</i>	88	82121	<i>Thienemanniella n.sp 3</i>	48
13561	<i>Stenonema pulchellum</i>	53 +	82141	<i>Thienemanniella xena</i>	24
15000	<i>Paraleptophlebia sp</i>	808	82730	<i>Chironomus (C.) decorus group</i>	0 +
16700	<i>Tricorythodes sp</i>	8	82820	<i>Cryptochironomus sp</i>	0 +
18700	<i>Hexagenia sp</i>	0 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	96
21200	<i>Calopteryx sp</i>	10 +	84300	<i>Phaenopsectra obediens group</i>	96
22300	<i>Argia sp</i>	17 +	84302	<i>Phaenopsectra punctipes</i>	24
23600	<i>Aeshna sp</i>	0 +	84460	<i>Polypedilum (P.) fallax group</i>	264
23909	<i>Boyeria vinosa</i>	0 +	84470	<i>Polypedilum (P.) illinoense</i>	0 +
25605	<i>Stylurus laurae</i>	0 +	84520	<i>Polypedilum (Tripodura) halterale group</i>	0 +
30000	<i>Plecoptera</i>	8	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	96
42700	<i>Belostoma sp</i>	0 +	84700	<i>Stenochironomus sp</i>	0 +
43300	<i>Ranatra sp</i>	0 +	84790	<i>Tribelos fuscicorne</i>	24
43570	<i>Neoplea sp</i>	0 +	84800	<i>Tribelos jucundum</i>	0 +
47600	<i>Sialis sp</i>	0 +	85201	<i>Cladotanytarsus species group A</i>	48 +
51600	<i>Polycentropus sp</i>	1	85500	<i>Paratanytarsus sp</i>	360 +
52200	<i>Cheumatopsyche sp</i>	0 +	85625	<i>Rheotanytarsus exiguus group</i>	144
52530	<i>Hydropsyche depravata group</i>	0 +	85800	<i>Tanytarsus sp</i>	48
53800	<i>Hydroptila sp</i>	10	85802	<i>Tanytarsus curticornis group</i>	288
59400	<i>Nectopsyche sp</i>	1	85814	<i>Tanytarsus glabrescens group</i>	288 +
67800	<i>Tropisternus sp</i>	0 +	85840	<i>Tanytarsus guerlus group</i>	24
68130	<i>Helichus sp</i>	0 +	87501	<i>Empididae</i>	14 +
68700	<i>Dubiraphia sp</i>	10	89570	<i>Ochthera sp</i>	0 +
68901	<i>Macronychus glabratus</i>	1	93900	<i>Elimia sp</i>	0 +
69400	<i>Stenelmis sp</i>	0 +	96900	<i>Ferrissia sp</i>	138
71100	<i>Hexatoma sp</i>	0 +	97601	<i>Corbicula fluminea</i>	0 +
74501	<i>Ceratopogonidae</i>	24	98200	<i>Pisidium sp</i>	0 +
77500	<i>Conchapelopia sp</i>	0 +			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	120 +			
77800	<i>Helopelopia sp</i>	120 +	No. Quantitative Taxa:	44	Total Taxa: 73
78450	<i>Nilotanypus fimbriatus</i>	24	No. Qualitative Taxa:	43	ICI: 38
80370	<i>Corynoneura lobata</i>	64	Number of Organisms:	3869	Qual EPT: 6
80410	<i>Cricotopus (C.) sp</i>	0 +			
80420	<i>Cricotopus (C.) bicinctus</i>	24 +			

**Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/08/94 River Code:04-405 River: Fish Creek

RM: 0.30

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual
01320	<i>Hydra sp</i>	12	77500	<i>Conchapelopia sp</i>	60 +
03600	<i>Oligochaeta</i>	0 +	77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	20
08250	<i>Orconectes (Procericambarus) rusticus</i>	0 +	77800	<i>Helopelopia sp</i>	40
11020	<i>Acerpenna pygmaeus</i>	119	78450	<i>Nilotanypus fimbriatus</i>	40
11130	<i>Baetis intercalaris</i>	146 +	79100	<i>Thienemannimyia group</i>	0 +
11150	<i>Labiobaetis propinquus</i>	0 +	80370	<i>Corynoneura lobata</i>	112
11670	<i>Procloeon irrubrum</i>	0 +	80420	<i>Cricotopus (C.) bicinctus</i>	20
12200	<i>Isonychia sp</i>	110 +	80570	<i>Doncricotopus prob. bicaudatus</i>	0 +
13000	<i>Leucrocuta sp</i>	16	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	20
13400	<i>Stenacron sp</i>	185	82121	<i>Thienemanniella n.sp 3</i>	20
13510	<i>Stenonema exiguum</i>	318 +	83410	<i>Harnischia curtilamellata</i>	0 +
13540	<i>Stenonema mediopunctatum</i>	1	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	20
13560	<i>Stenonema pulchellum group</i>	292	84300	<i>Phaenopsectra obediens group</i>	40
13570	<i>Stenonema terminatum</i>	35	84450	<i>Polypedilum (P.) convictum</i>	20
15000	<i>Paraleptophlebia sp</i>	612	84460	<i>Polypedilum (P.) fallax group</i>	320
16700	<i>Tricorythodes sp</i>	18 +	84470	<i>Polypedilum (P.) illinoense</i>	0 +
19102	<i>Ephoron album</i>	0 +	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	20
21200	<i>Calopteryx sp</i>	0 +	84700	<i>Stenochironomus sp</i>	0 +
22300	<i>Argia sp</i>	17 +	84800	<i>Tribelos jucundum</i>	20 +
23909	<i>Boyeria vinosa</i>	0 +	85500	<i>Paratanytarsus sp</i>	40
24915	<i>Gomphus fraternus</i>	0 +	85625	<i>Rheotanytarsus exiguus group</i>	760 +
25605	<i>Stylurus laurae</i>	0 +	85800	<i>Tanytarsus sp</i>	60 +
34500	<i>Perlesta placida complex</i>	0 +	85802	<i>Tanytarsus curticornis group</i>	100
45300	<i>Sigara sp</i>	0 +	85814	<i>Tanytarsus glabrescens group</i>	200 +
47600	<i>Sialis sp</i>	0 +	85840	<i>Tanytarsus guerlus group</i>	60
50804	<i>Lype diversa</i>	4	86401	<i>Atherix lantha</i>	40 +
51400	<i>Nyctiophylax sp</i>	9	87540	<i>Hemerodromia sp</i>	16
51600	<i>Polycentropus sp</i>	4	95100	<i>Physella sp</i>	0 +
52200	<i>Cheumatopsyche sp</i>	10 +	96900	<i>Ferrissia sp</i>	1
52430	<i>Ceratopsyche morosa group</i>	87 +	97601	<i>Corbicula fluminea</i>	0 +
52530	<i>Hydropsyche depravata group</i>	1 +	98200	<i>Pisidium sp</i>	0 +
52550	<i>Hydropsyche frisoni</i>	5			
52570	<i>Hydropsyche simulans</i>	0 +			
67703	<i>Paracymus subcupreus</i>	0 +	No. Quantitative Taxa: 46		Total Taxa: 72
67750	<i>Sperchopsis tessellatus</i>	0 +	No. Qualitative Taxa: 42		ICI: 50
68130	<i>Helichus sp</i>	0 +	Number of Organisms: 4212		Qual EPT: 12
68901	<i>Macronychus glabratus</i>	138 +			
69400	<i>Stenelmis sp</i>	16 +			
71100	<i>Hexatoma sp</i>	0 +			
71910	<i>Tipula abdominalis</i>	0 +			
74501	<i>Ceratopogonidae</i>	8			

Appendix Table 3. IBI metrics and scores for Fish Creek, 1994.

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	Omnivores	Top carnivores	Insectivores				DELT anomalies
Fish Creek - (04405)																	
Year: 94																	
21.70	D	07/28/94	71	22(5)	3(3)	3(3)	2(1)	3(3)	35(3)	36(3)	6(5)	1.8(3)	56(5)	0.0(5)	523(3)	42	8.4
21.70	D	09/09/94	71	23(5)	3(3)	2(3)	3(3)	4(3)	24(3)	52(1)	7(5)	1.4(3)	41(3)	0.6(3)	395(3)	38	7.8
14.30	D	07/28/94	82	27(5)	5(5)	5(5)	4(3)	4(3)	32(3)	42(1)	29(3)	2.5(3)	50(3)	0.9(3)	218(3)	40	7.6
14.30	D	09/09/94	82	25(5)	4(5)	3(3)	1(1)	4(3)	44(5)	39(3)	24(3)	3.4(3)	59(5)	0.0(5)	274(3)	44	7.4
8.30	D	07/28/94	97	24(5)	3(3)	4(5)	4(3)	5(5)	44(5)	21(5)	25(3)	8.1(5)	57(5)	4.7(1)	237(3)	48	9.1
8.30	D	09/09/94	97	26(5)	3(3)	4(5)	5(3)	5(5)	47(5)	29(3)	23(3)	6.2(5)	57(5)	1.9(1)	396(3)	46	9.5
6.50	D	07/27/94	99	23(5)	3(3)	4(5)	3(3)	5(5)	43(5)	42(1)	24(3)	7.6(5)	51(3)	0.7(3)	229(3)	44	8.6
6.50	D	09/08/94	99	23(5)	2(3)	5(5)	4(3)	5(5)	44(5)	43(1)	26(3)	6.9(5)	49(3)	2.2(1)	304(3)	42	9.2
5.40	D	07/27/94	105	21(3)	3(3)	2(1)	3(3)	5(3)	39(5)	38(3)	12(5)	5.5(5)	51(3)	0.7(3)	201(3)	40	8.4
5.40	D	09/08/94	105	23(5)	3(3)	2(1)	4(3)	5(3)	42(5)	30(3)	6(5)	2.3(3)	62(5)	1.1(3)	329(3)	42	8.6
0.30	D	09/08/94	109	22(3)	3(3)	4(3)	4(3)	6(5)	26(3)	33(3)	17(5)	9.3(5)	61(5)	0.0(5)	173(1)	44	8.3
0.30	D	07/27/94	109	15(3)	2(3)	3(3)	2(1)	4(3)	25(3)	44(1)	12(5)	13.5(5)	59(5)	0.0(5)	132(1)	38	7.0
0.20	E	09/08/94	109	13(3)	1(1)	4(3)	2(1)	4(3)	68(5)	34(3)	2(5)	6.2(5)	62(5)	0.0(5)	143(1)	40	7.2

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low-end adjusted.

● - One or more species excluded from IBI calculation.

Appendix Table 4. Summary of relative numbers of fish and species collected at each location (by river mile) sampled in Fish Creek, 1994. Relative numbers are per 0.3 km.

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 21.70	Basin: Maumee River	Date Range: 07/28/94
Data Source: 01	Time Fished: 6001 sec Drain Area: 71.0 sq mi	Thru: 09/09/94
Purpose:	Dist Fished: 0.36 km 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		8	6.67	0.81	0.04	0.33	5.75
GRASS PICKEREL		P	M	P	1	0.83	0.10	0.01	0.07	10.00
GOLDEN REDHORSE	R	I	S	M	2	1.67	0.20	0.17	1.47	102.00
NORTHERN HOG SUCKER	R	I	S	M	19	15.83	1.93	1.27	10.94	80.16
WHITE SUCKER	W	O	S	T	44	36.67	4.48	1.69	14.54	46.02
GOLDEN SHINER	N	I	M	T	1	0.83	0.10	0.00	0.02	3.00
HORNYHEAD CHUB	N	I	N	I	1	0.83	0.10	0.02	0.21	29.00
BLACKNOSE DACE	N	G	S	T	10	8.33	1.02	0.04	0.34	4.70
CREEK CHUB	N	G	N	T	342	285.00	34.83	4.72	40.70	16.57
SILVER SHINER	N	I	S	I	44	36.67	4.48	0.08	0.66	2.09
STRIPED SHINER	N	I	S		13	10.83	1.32	0.22	1.87	20.08
COMMON SHINER	N	I	S		19	15.83	1.93	0.12	1.00	7.37
BLUNTNOSTE MINNOW	N	O	C	T	13	10.83	1.32	0.06	0.50	5.38
CENTRAL STONEROLLER	N	H	N		72	60.00	7.33	0.55	4.76	9.21
YELLOW BULLHEAD		I	C	T	1	0.83	0.10	0.00	0.02	3.00
BLACK BULLHEAD		I	C	P	1	0.83	0.10	0.11	0.92	128.00
STONECAT MADTOM		I	C	I	10	8.33	1.02	0.39	3.34	46.54
ROCK BASS	S	C	C		11	9.17	1.12	0.47	4.08	51.64
LARGEMOUTH BASS	F	C	C		4	3.33	0.41	0.01	0.12	4.25
GREEN SUNFISH	S	I	C	T	20	16.67	2.04	0.26	2.22	15.45
PUMPKINSEED SUNFISH	S	I	C	P	2	1.67	0.20	0.02	0.21	14.50
GREEN SF X BLUEGILL					1	0.83	0.10	0.01	0.08	11.00
BLACKSIDE DARTER	D	I	S		27	22.50	2.75	0.11	0.95	4.89
JOHNNY DARTER	D	I	C		25	20.83	2.55	0.04	0.37	2.06
GREENSIDE DARTER	D	I	S	M	112	93.33	11.41	0.38	3.30	4.11
FANTAIL DARTER	D	I	C		35	29.17	3.56	0.09	0.79	3.14
MOTTLED SCULPIN		I	C		144	120.00	14.66	0.72	6.17	5.97
<i>Mile Total</i>					982	818.33		11.60		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					1					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 14.30	Basin: Maumee River	Date Range: 07/28/94
Data Source: 01	Time Fished: 10228 sec Drain Area: 82.0 sq mi	Thru: 09/09/94
Purpose:	Dist Fished: 0.44 km 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	51	34.77	8.46	0.10	0.17	2.92
CENTRAL MUDMINNOW		I	C T	2	1.36	0.33	0.01	0.01	4.00
GRASS PICKEREL		P	M P	1	0.68	0.17	0.04	0.06	51.00
NORTHERN PIKE	F	P	M	1	0.68	0.17	0.18	0.29	261.00
BLACK REDHORSE	R	I	S I	3	2.05	0.50	0.71	1.17	346.67
GOLDEN REDHORSE	R	I	S M	6	4.09	1.00	1.33	2.19	325.83
NORTHERN HOG SUCKER	R	I	S M	81	55.23	13.43	3.66	6.03	66.34
WHITE SUCKER	W	O	S T	20	13.64	3.32	2.00	3.29	146.45
SPOTTED SUCKER	R	I	S	1	0.68	0.17	0.24	0.40	352.00
COMMON CARP	G	O	M T	42	28.64	6.97	47.82	78.73	1,669.91
CREEK CHUB	N	G	N T	80	54.55	13.27	0.34	0.56	6.19
SILVER SHINER	N	I	S I	3	2.05	0.50	0.01	0.02	4.67
ROSYFACE SHINER	N	I	S I	1	0.68	0.17	0.01	0.01	7.00
STRIPED SHINER	N	I	S	7	4.77	1.16	0.06	0.09	11.57
COMMON SHINER	N	I	S	37	25.23	6.14	0.14	0.22	5.35
SPOTFIN SHINER	N	I	M	6	4.09	1.00	0.02	0.03	4.83
BLUNTNOSE MINNOW	N	O	C T	45	30.68	7.46	0.08	0.14	2.73
CENTRAL STONEROLLER	N	H	N	1	0.68	0.17	0.01	0.01	12.00
CHANNEL CATFISH	F		C	1	0.68	0.17	1.06	1.74	1,550.00
YELLOW BULLHEAD		I	C T	3	2.05	0.50	0.17	0.28	82.67
STONECAT MADTOM		I	C I	5	3.41	0.83	0.15	0.25	45.20
WHITE CRAPPIE	S	I	C	4	2.73	0.66	0.18	0.30	66.75
ROCK BASS	S	C	C	11	7.50	1.82	1.45	2.39	193.73
LARGEMOUTH BASS	F	C	C	5	3.41	0.83	0.02	0.04	6.40
GREEN SUNFISH	S	I	C T	50	34.09	8.29	0.34	0.55	9.87
BLUEGILL SUNFISH	S	I	C P	10	6.82	1.66	0.14	0.22	19.98
PUMPKINSEED SUNFISH	S	I	C P	1	0.68	0.17	0.01	0.01	7.00
GREEN SF X BLUEGILL				12	8.18	1.99	0.18	0.30	22.08
YELLOW PERCH			M	1	0.68	0.17	0.00	0.01	6.00
BLACKSIDE DARTER	D	I	S	20	13.64	3.32	0.06	0.09	4.10
LOGPERCH	D	I	S M	1	0.68	0.17	0.02	0.03	26.00
JOHNNY DARTER	D	I	C	11	7.50	1.82	0.01	0.02	1.91
GREENSIDE DARTER	D	I	S M	50	34.09	8.29	0.10	0.17	3.01
FANTAIL DARTER	D	I	C	1	0.68	0.17	0.00	0.00	3.00
MOTTLED SCULPIN		I	C	29	19.77	4.81	0.11	0.19	5.77
<i>Mile Total</i>				603	411.14		60.74		
<i>Number of Species</i>				34					
<i>Number of Hybrids</i>				1					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 8.30	Basin: Maumee River	Date Range: 07/28/94
Data Source: 01	Time Fished: 7625 sec	Drain Area: 97.0 sq mi
Purpose:	Dist Fished: 0.42 km	No of Passes: 2
		Thru: 09/09/94
		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		53	37.86	8.82	0.17	0.44	4.42
BLACK REDHORSE	R	I	S	I	2	1.43	0.33	0.31	0.81	218.50
GOLDEN REDHORSE	R	I	S	M	29	20.71	4.83	4.00	10.41	192.98
NORTHERN HOG SUCKER	R	I	S	M	66	47.14	10.98	2.42	6.31	51.38
WHITE SUCKER	W	O	S	T	44	31.43	7.32	2.31	6.01	73.36
COMMON CARP	G	O	M	T	15	10.71	2.50	12.52	32.61	1,168.07
RIVER CHUB	N	I	N	I	32	22.86	5.32	0.77	1.99	33.50
BLACKNOSE DACE	N	G	S	T	2	1.43	0.33	0.01	0.01	4.00
CREEK CHUB	N	G	N	T	61	43.57	10.15	1.35	3.50	30.86
SILVER SHINER	N	I	S	I	24	17.14	3.99	0.08	0.20	4.53
ROSYFACE SHINER	N	I	S	I	6	4.29	1.00	0.03	0.07	6.50
STRIPED SHINER	N	I	S		21	15.00	3.49	0.40	1.03	26.36
COMMON SHINER	N	I	S		9	6.43	1.50	0.10	0.25	15.00
SPOTFIN SHINER	N	I	M		33	23.57	5.49	0.10	0.26	4.21
BLUNTNOSE MINNOW	N	O	C	T	29	20.71	4.83	0.09	0.23	4.17
CENTRAL STONEROLLER	N	H	N		4	2.86	0.67	0.06	0.16	21.75
CHANNEL CATFISH	F		C		7	5.00	1.16	9.36	24.38	1,871.43
YELLOW BULLHEAD		I	C	T	1	0.71	0.17	0.10	0.25	133.00
STONECAT MADTOM		I	C	I	2	1.43	0.33	0.14	0.36	97.00
ROCK BASS	S	C	C		41	29.29	6.82	3.53	9.20	120.57
GREEN SUNFISH	S	I	C	T	6	4.29	1.00	0.07	0.18	16.67
BLUEGILL SUNFISH	S	I	C	P	8	5.71	1.33	0.21	0.54	36.25
BLACKSIDE DARTER	D	I	S		31	22.14	5.16	0.07	0.19	3.37
LOGPERCH	D	I	S	M	6	4.29	1.00	0.09	0.22	20.00
JOHNNY DARTER	D	I	C		24	17.14	3.99	0.02	0.06	1.39
GREENSIDE DARTER	D	I	S	M	36	25.71	5.99	0.09	0.23	3.42
FANTAIL DARTER	D	I	C		8	5.71	1.33	0.02	0.06	4.25
MOTTLED SCULPIN		I	C		1	0.71	0.17	0.01	0.01	7.00
<i>Mile Total</i>					601	429.29		38.38		
<i>Number of Species</i>					28					
<i>Number of Hybrids</i>					0					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 6.50	Basin: Maumee River	Date Range: 07/27/94
Data Source: 01	Time Fished: 6667 sec Drain Area: 99.0 sq mi	Thru: 09/08/94
Purpose:	Dist Fished: 0.42 km 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	611	436.43	48.38	1.19	3.83	2.73
BLACK REDHORSE	R	I	S I	17	12.14	1.35	3.32	10.65	273.38
GOLDEN REDHORSE	R	I	S M	26	18.57	2.06	4.16	13.37	224.24
NORTHERN HOG SUCKER	R	I	S M	88	62.86	6.97	4.70	15.09	74.79
WHITE SUCKER	W	O	S T	49	35.00	3.88	2.31	7.41	65.94
SPOTTED SUCKER	R	I	S	1	0.71	0.08	0.33	1.06	462.00
COMMON CARP	G	O	M T	7	5.00	0.55	9.71	31.16	1,941.86
RIVER CHUB	N	I	N I	25	17.86	1.98	0.60	1.93	33.60
BLACKNOSE DACE	N	G	S T	11	7.86	0.87	0.04	0.12	4.72
CREEK CHUB	N	G	N T	90	64.29	7.13	1.06	3.41	16.51
SILVER SHINER	N	I	S I	18	12.86	1.43	0.02	0.08	1.83
STRIPED SHINER	N	I	S	9	6.43	0.71	0.20	0.64	31.11
COMMON SHINER	N	I	S	9	6.43	0.71	0.12	0.40	19.33
SPOTFIN SHINER	N	I	M	17	12.14	1.35	0.08	0.26	6.71
SILVERJAW MINNOW	N	I	M	1	0.71	0.08	0.00	0.00	2.00
BLUNTNOSE MINNOW	N	O	C T	107	76.43	8.47	0.29	0.94	3.83
CENTRAL STONEROLLER	N	H	N	15	10.71	1.19	0.08	0.27	7.91
STONECAT MADTOM		I	C I	1	0.71	0.08	0.09	0.29	128.00
ROCK BASS	S	C	C	47	33.57	3.72	2.47	7.93	73.64
GREEN SUNFISH	S	I	C T	15	10.71	1.19	0.15	0.47	13.73
BLUEGILL SUNFISH	S	I	C P	2	1.43	0.16	0.04	0.13	28.50
BLACKSIDE DARTER	D	I	S	31	22.14	2.45	0.05	0.15	2.13
LOGPERCH	D	I	S M	2	1.43	0.16	0.01	0.04	10.00
JOHNNY DARTER	D	I	C	25	17.86	1.98	0.03	0.10	1.68
GREENSIDE DARTER	D	I	S M	25	17.86	1.98	0.05	0.15	2.67
FANTAIL DARTER	D	I	C	9	6.43	0.71	0.01	0.04	2.00
MOTTLED SCULPIN		I	C	5	3.57	0.40	0.02	0.07	6.40
<i>Mile Total</i>				1,263	902.14		31.16		
<i>Number of Species</i>				27					
<i>Number of Hybrids</i>				0					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 5.40	Basin: Maumee River	Date Range: 07/27/94
Data Source: 01	Time Fished: 6277 sec Drain Area: 105.0 sq mi	Thru: 09/08/94
Purpose:	Dist Fished: 0.44 km 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		325	221.59	36.31	0.62	6.52	2.79
NORTHERN HOG SUCKER	R	I	S	M	66	45.00	7.37	2.93	30.83	65.04
WHITE SUCKER	W	O	S	T	29	19.77	3.24	0.69	7.30	35.07
COMMON CARP	G	O	M	T	1	0.68	0.11	1.04	10.95	1,525.00
RIVER CHUB	N	I	N	I	35	23.86	3.91	0.68	7.16	28.49
BLACKNOSE DACE	N	G	S	T	32	21.82	3.58	0.08	0.83	3.59
CREEK CHUB	N	G	N	T	101	68.86	11.28	0.74	7.81	10.78
SILVER SHINER	N	I	S	I	5	3.41	0.56	0.01	0.08	2.20
ROSYFACE SHINER	N	I	S	I	1	0.68	0.11	0.00	0.03	4.00
STRIPED SHINER	N	I	S		24	16.36	2.68	0.42	4.38	25.38
COMMON SHINER	N	I	S		3	2.05	0.34	0.04	0.46	21.33
SPOTFIN SHINER	N	I	M		16	10.91	1.79	0.04	0.41	3.50
SAND SHINER	N	I	M	M	2	1.36	0.22	0.01	0.05	3.50
BLUNTNOSE MINNOW	N	O	C	T	18	12.27	2.01	0.05	0.56	4.33
CENTRAL STONEROLLER	N	H	N		45	30.68	5.03	0.40	4.20	12.99
YELLOW BULLHEAD		I	C	T	2	1.36	0.22	0.27	2.80	195.00
STONECAT MADTOM		I	C	I	2	1.36	0.22	0.00	0.03	2.00
ROCK BASS	S	C	C		21	14.32	2.35	0.98	10.37	68.76
GREEN SUNFISH	S	I	C	T	8	5.45	0.89	0.06	0.61	10.50
BLUEGILL SUNFISH	S	I	C	P	2	1.36	0.22	0.04	0.38	26.50
BLACKSIDE DARTER	D	I	S		11	7.50	1.23	0.05	0.54	6.82
LOGPERCH	D	I	S	M	5	3.41	0.56	0.05	0.53	14.60
JOHNNY DARTER	D	I	C		22	15.00	2.46	0.02	0.24	1.50
GREENSIDE DARTER	D	I	S	M	60	40.91	6.70	0.11	1.13	2.64
FANTAIL DARTER	D	I	C		33	22.50	3.69	0.08	0.84	3.53
MOTTLED SCULPIN		I	C		26	17.73	2.90	0.09	1.00	5.36
<i>Mile Total</i>					895	610.23		9.50		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					0					

Species List

River Code: 04-405	Stream: Fish Creek	Sample Date: 1994
River Mile: 0.30	Basin: Maumee River	Date Range: 07/27/94
Data Source: 01	Time Fished: 5317 sec Drain Area: 109.0 sq mi	Thru: 09/08/94
Purpose:	Dist Fished: 0.40 km No of Passes: 2	Sampler Type: D

Species Name / ODNR Status	IBI	Feed Grp	Breed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
GIZZARD SHAD		O	M			300	225.00	49.18	0.46	3.00	2.02
BLACK REDHORSE	R	I	S	I		1	0.75	0.16	0.22	1.48	298.00
GOLDEN REDHORSE	R	I	S	M		8	6.00	1.31	1.16	7.66	193.25
NORTHERN HOG SUCKER	R	I	S	M		30	22.50	4.92	1.86	12.27	82.60
WHITE SUCKER	W	O	S	T		14	10.50	2.30	0.49	3.21	46.29
COMMON CARP	G	O	M	T		6	4.50	0.98	6.89	45.50	1,531.40
RIVER CHUB	N	I	N	I		24	18.00	3.93	0.45	2.95	24.81
CREEK CHUB	N	G	N	T		44	33.00	7.21	0.37	2.41	11.07
SILVER SHINER	N	I	S	I		2	1.50	0.33	0.01	0.06	6.00
STRIPED SHINER	N	I	S			1	0.75	0.16	0.00	0.01	2.00
SPOTFIN SHINER	N	I	M			30	22.50	4.92	0.07	0.46	3.09
FATHEAD MINNOW	N	O	C	T		1	0.75	0.16	0.00	0.01	2.00
BLUNTNOSE MINNOW	N	O	C	T		10	7.50	1.64	0.02	0.16	3.20
YELLOW BULLHEAD		I	C	T		1	0.75	0.16	0.09	0.60	121.00
STONECAT MADTOM		I	C	I		1	0.75	0.16	0.11	0.73	148.00
ROCK BASS	S	C	C			37	27.75	6.07	2.38	15.69	85.66
GREEN SUNFISH	S	I	C	T		49	36.75	8.03	0.40	2.64	10.87
BLUEGILL SUNFISH	S	I	C	P		1	0.75	0.16	0.01	0.08	16.00
GREEN SF X BLUEGILL						1	0.75	0.16	0.02	0.12	24.00
DUSKY DARTER	D	I	S	M		3	2.25	0.49	0.02	0.13	8.67
BLACKSIDE DARTER	D	I	S			12	9.00	1.97	0.05	0.33	5.50
LOGPERCH	D	I	S	M		1	0.75	0.16	0.02	0.14	28.00
JOHNNY DARTER	D	I	C			17	12.75	2.79	0.02	0.11	1.22
GREENSIDE DARTER	D	I	S	M		12	9.00	1.97	0.03	0.20	3.42
FANTAIL DARTER	D	I	C			4	3.00	0.66	0.01	0.06	3.00
<i>Mile Total</i>						610	457.50		15.15		
<i>Number of Species</i>						24					
<i>Number of Hybrids</i>						1					