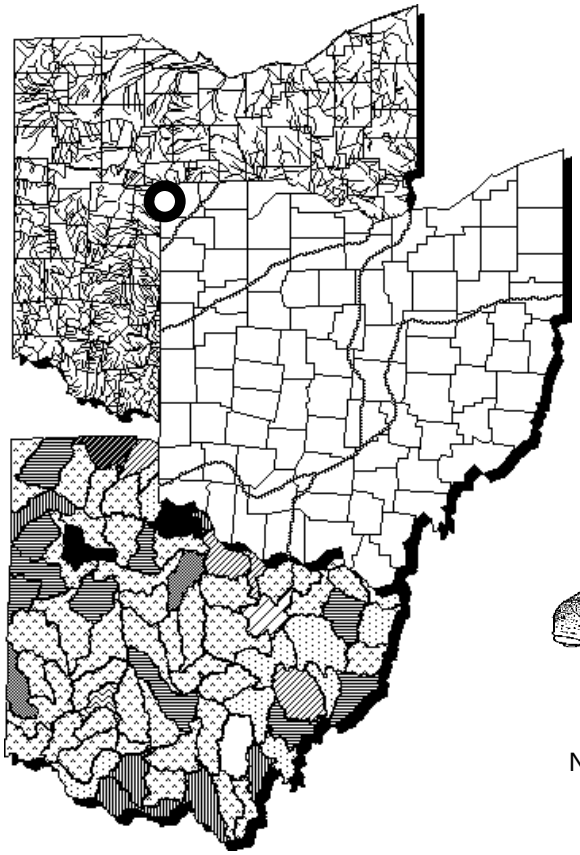
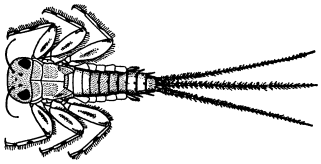
Addendum to Fish and Macroinvertebrate Study of Fish Creek 1994

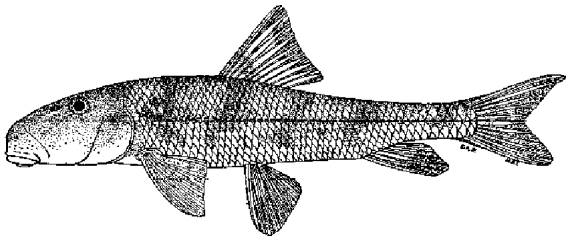
Steuben and Dekalb Counties (Indiana)

and Williams County (Ohio)





Mayfly *(Stenonema)*



Northern Hog Sucker *(Hypentelium nigricans)*

September 30, 1996

Addendum to Fish and Macroinvertebrate Study of Fish Creek 1994

Steuben and Dekalb Counties, Indiana
Williams County, Ohio

September 30, 1996

OEPA Technical Report MAS/1996-9-5

prepared for

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

prepared by

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Acknowledgements

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Coordinator - Bernie Counts
Data Management - Dennis Mishne and Ed Rankin
Fish Data Analysis - David Altfater
Macroinvertebrate Data Analysis - Bernie Counts
Reviewers - Chris Yoder and Jeff DeShon

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Introduction

This report is an update to the *Fish and Macroinvertebrate Study of Fish Creek 1994*, Ohio EPA (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 and 1995. 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. A detailed discussion of the previous survey results through 1994 can be found in Ohio EPA (1993a; 1993b; 1995). Fish and macroinvertebrate communities were sampled during the summer and fall of 1995 at six locations in Fish Creek from river mile (RM) 21.7 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 1995 using pulsed DC electrofishing gear, with sampling distance varying between 190 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 August 28 - September 17, 1995. 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 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).

White sucker and common carp were collected for biomarker processing during the 1994 community assessment sampling. Fish were kept in a floating livewell until biomarker tissue samples could be taken. Fish were anesthetized in MS222 and length and weight measured. Fish health/ condition was assessed using procedures in Goede (1988). Blood was drawn from the caudal vein through a 21 gauge needle into heparin treated 3 ml blood drawing tubes. Whole blood was centrifuged on-site and the plasma removed (flash frozen at -100°C in a liquid nitrogen dry shipper). The liver was excised, wrapped in aluminum foil and frozen in a liquid nitrogen dry shipper. Bile was removed, placed in amber microcentrifuge tubes and frozen in a liquid nitrogen dry shipper. Tissue samples were transported to the U.S. EPA in Cincinnati for laboratory analysis. Specific biomarker analyses included ethoxyresorufin-O-deethylase (EROD), blood urea nitrogen, and bile metabolites. Each bile sample was diluted with distilled/deionized water and measured by fixed fluorescence at four excitation/emission wavelength pairs according to Lin et al. (1996 in press). Although more than one compound is known to fluoresce under these conditions,

some compounds give a greater response. The metabolites are referred to by one of their most sensitive respondents: pyrenol-type at 340/380 nm, benzo(a)pyrenol-type at 380/430 nm, phenanthrol-type at 256/380 nm and naphthol-type at 290/335 nm. Microsomes for measuring EROD were prepared from liver tissue according to Lin et al. (1989). EROD activity was measured fluorometrically according to Pohl and Fouts (1980) and modified Lin et al. (1989).

Summary/ Conclusions

From August to September, 1995 Ohio EPA Division of Surface Water staff, at the request of the Division of Emergency and Remedial Response, conducted biological community sampling of Fish Creek upstream and downstream from a diesel fuel spill which occurred September 15, 1993. In 1994 biomarker samples were taken from common carp and white suckers at five sites on Fish Creek; the results of these samples were not available for inclusion in *FishandMacroinvertebrate Study of Fish Creek 1994*, Ohio EPA (1995). The results of these sampling events are summarized below. The portion of Fish Creek in Indiana was evaluated using the Ohio EPA Exceptional and Warmwater Habitat (EWH/WWH) biological criteria.

- Partial attainment of the EWH use designation was observed both upstream and downstream from the spill location. Overall, 1995 results for Fish Creek indicate that 0.1 miles of stream were meeting the EWH use designation and 21.3 miles were in partial attainment of the EWH/WWH uses. The lower 2.4 miles of Fish Creek is designated WWH. The partial attainment status was due primarily to the failure of the fish community to meet the IBI biological criterion.

- The fish community in Fish Creek has not yet fully recovered from the diesel fuel spill, as evidenced by the lower average IBI scores immediately downstream from the spill site (average IBI upstream = 46.3; average IBI downstream = 41.0). Results of the two sampling passes conducted at RM 7.5 revealed individual IBI scores of 32 and 46. These results suggest that full recovery has not occurred and that the large variability in IBI scores may be associated with low populations of intolerant species and thus their higher degree of sample collection variability. The 1995 macroinvertebrate data indicated the presence of exceptional macroinvertebrate communities throughout the study area. Diverse assemblages of pollution sensitive mayflies and caddisflies were well represented at all sites except RM 5.4 which continues to show a greatly reduced number of caddisflies as a percent of the total sample. The macroinvertebrates, due partially to their small size in relation to fish, are more sensitive to toxic impacts; however, their ability to aerially disperse allows them to quickly repopulate an area following an impact event. This is illustrated in Fish Creek with the dramatic decline in the macroinvertebrate community at RM 5.4 followed by a full recovery in two years.

- Area of Degradation Values (ADV) for the 1992, 1993, 1994, and 1995 sampling efforts provide a relative measure of the overall performance of the biological communities in Fish Creek. A substantial improvement in the IBI ADV was recorded in 1995 (ADV per mile = 19.9) in comparison to 1994 (ADV per mile = 49.3). This improvement occurred at Fish Creek sampling sites located upstream and downstream from the diesel spill. No apparent improvement or decline was observed in MIwb ADV scores. A significant improvement in the ICI ADV occurred since the spill (ADV per mile in 1993 = 52.6, 1995 = 0.0).

- A notable improvement in the silt bedload and bottom embeddedness of Fish Creek was observed in 1995 compared with the 1994 evaluation. This resulted in an overall improvement in QHEI scores for a majority of Fish Creek sites.

- The EROD and BUN results in Fish Creek from 1994 showed no significant difference between sampling locations for these two indicators.

- B[a]P-type metabolites showed no significant difference between the sites. However, the highest values were collected from RMs 0.3 and 14.3.

- Naph-type metabolites showed a significant increase in concentrations for common carp (Figure 3.), in the area of the spill and downstream, with the highest concentrations at RM 5.4.

Table 1. Fish and macroinvertebrate sampling locations in Fish Creek, 1995.

Stream/ River Mile	Latitude	Longitude	Landmark	County	USGS 7.5 min. Quad. Map
Fish Creek					
21.7	41°34’11”	84°49’33”	TR 850E, Indiana	Steuben	Edon, Ind.-Ohio
21.6	41°34’09”	84°49’42”	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
7.5	41°27’55”	84°49’34”	RR track, 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

Table 2. Aquatic life use attainment status for Fish Creek based upon sampling conducted from July to September, 1995. 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
Fish Creek-1995		*Eastern Corn Belt Plains Ecoregion - EWH Use Designation*				
21.6/ 21.7	45*	8.3*	54	72.5	PARTIAL	Background/small stream
14.3/14.3	48ns	7.9*	54	77.0	PARTIAL	Downstream Hamilton
8.3/ 8.3	46ns	8.5*	48	75.0	PARTIAL	Upstream diesel spill
7.5/ 7.5	39*	8.1*	56	73.0	PARTIAL	Diesel spill area
5.4/ 5.4	43*	8.7*	50	74.0	PARTIAL	Diesel spill area
		Eastern Corn Belt Plains Ecoregion - WWH Use Designation				
0.3/ 0.3	41	7.0*	Ea	64.0	PARTIAL	Downstream recovery

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)

INDEX	WWH	EWH	MWHb
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 - The narrative evaluation using the qualitative sample (E=Exceptional) is based on best professional judgment utilizing sample attributes such as taxa richness, EPT taxa richness, and community composition and is used in lieu of the ICI when artificial substrates are lost or deemed not useable.

b - Modified Warmwater Habitat for channel modified areas.

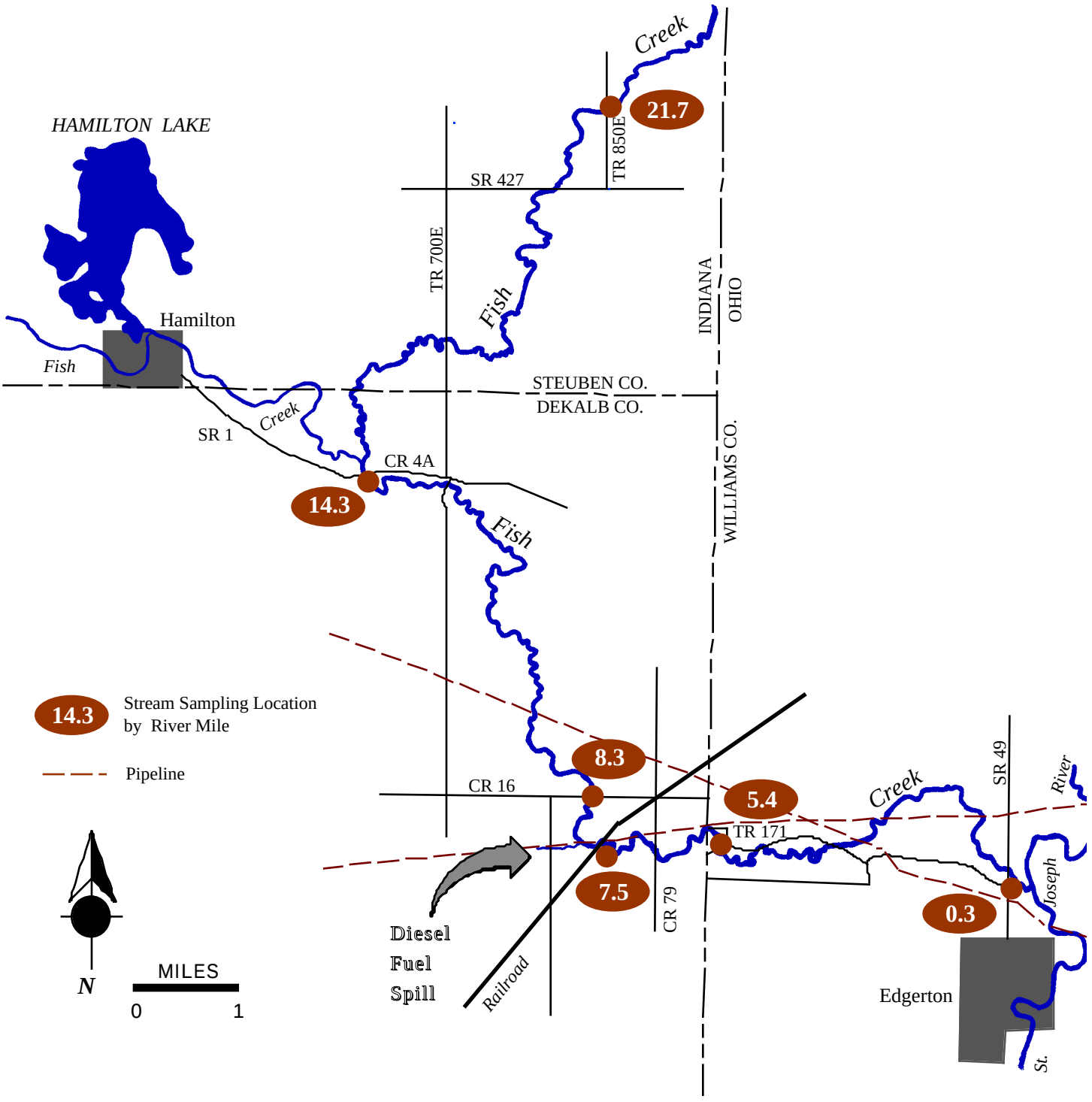

Figure 1. Map of the Fish Creek study area showing principal streams, landmarks, the diesel fuel spill location and Ohio EPA biological sampling locations, 1995.

Macroinvertebrate Community

Macroinvertebrate communities were sampled during the summer of 1995 at six locations in Fish Creek from RM 21.7 to the mouth at RM 0.3 (Table 1). Summarized results from the 1995 macroinvertebrate sampling are compiled in Table 3. ICI metrics and scores and raw data tables by river mile are attached as Appendix Tables 1 and 2. Included in Table 3 and Figure 2 are macroinvertebrate results collected in prior years by Ohio EPA. These include two sites (RMs 5.40 and 0.30) sampled in 1992; a detailed discussion of this data is provided in Ohio EPA (1993a). Additionally, macroinvertebrate data were collected from six 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). Six sites were sampled in 1994, as part of the continuous monitoring of Fish Creek following the spill. A detailed discussion of this data is provided in Ohio EPA (1995). Sampling locations in Indiana (RM 21.6 - RM 7.5) 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.

- The 1995 data indicated the presence of exceptional macroinvertebrate communities throughout the study area. ICI scores ranged from 48 at CR 16 (RM 8.3), about 3/4 of a mile upstream from the spill site (RM 7.55), to 56 at RM 7.50 - approximately 250 feet downstream from the spill site. All sites exceeded the EWH ecoregion biocriterion (ICI=46). Diverse assemblages of pollution sensitive mayflies and caddisflies were well represented at all sites except RM 5.40, which continued to show greatly reduced numbers of caddisflies as a percent of the total sample.

- The artificial substrates at the mouth (RM 0.3) were buried under six inches of sand. The qualitative sample indicated a macroinvertebrate community in the exceptional range. The total taxa collected was 52 with an EPT taxa richness of 18. Caddisflies and mayflies predominated the community collected mostly from woody debris.

Table 3. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in Fish Creek, 1992 - 1995. 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). Sampling locations in Indiana (RM 21.6 - RM 7.5) 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.

	Quantitative Evaluation						
Stream/ River Mile	Relative Density	Total Taxa	Quantitative Taxa	Qualitative Taxa	Qualitative EPT[a]	ICI	Evaluation
Fish Creek - 1995							
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
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	658	87	46	69	20	56	Exceptional
17.1	290	65	43	44	14	52	Exceptional
13.8	417	69	47	37	11	44[ns]	Very Good
9.9	761	70	52	39	14	46	Exceptional
5.4	155	45	32	24	7	20*	Fair
0.3	118	60	53	23	8	36	Good
Fish Creek - 1992							
5.4	698	54	38	34	13	50	Exceptional

Table 3. Continued.

Stream/ River Mile	No. Qual. Taxa	QCTV[b]	Qual. EPT[a]	Relative Density	Predominant Organisms	Narrative Evaluation[c]
			Qualitative Evaluation			
Fish Creek -1995						
0.3	52	40.9	18	Moderate	Caddisflies and mayflies	Exceptional
Fish Creek -1992						
0.3	26	42.9	12	Moderate	Midges and caddisflies	Good

Ecoregional Biocriteria: Eastern Corn Belt Plains (ECBP)
(from OAC 3745-1-07, Table 7-17)

INDEX	WWH	EWH
ICI	36	46

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.

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

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

Fish Community

A total of 4,239 fish representing 41 species and two hybrids were collected from Fish Creek between August and September, 1995. The sampling effort included a cumulative distance electrofished of 2.43 km at six locations (Figure 1). Relative numbers and species collected per location is presented in Appendix Table 4. Sampling locations in Indiana (RM 21.6 - RM 7.5) 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 (24.1%) and creek chub (9.6%) predominated the catch numerically, while common carp (46.8%) and white sucker (14.4%) predominated in weight. Fish highly tolerant of pollution made up 24.6% of the total catch in Fish Creek.

- A notable improvement in the silt bedload and bottom embeddedness of Fish Creek was observed in 1995 compared with the 1994 evaluation. This resulted in an overall improvement in QHEI scores for a majority of Fish Creek sites.

- The fish communities at three sites (RMs 21.6-8.3) upstream from the diesel spill ditch exhibited marginally good to very good performance (Table 4). Two of the IBI scores were in the nonsignificant departure range for the EWH biocriterion, but one significantly departed from the EWH biocriterion. All three Modified Index of Well-being (MIwb) scores were significantly departed from the EWH biocriterion. Average IBI and MIwb scores for the three upstream sites were 46.3 and 8.2, respectively.

- Sampling results from two sites (RMs 7.5 and 5.4) in Fish Creek located immediately downstream from the diesel fuel spill yielded fish communities in the marginally good to good range. Both of the IBI and MIwb scores significantly departed from their respective EWH biocriteria. Average IBI and MIwb scores for the two immediately downstream sites were 41.0 and 8.4, respectively.

- The fish community in Fish Creek has not fully recovered from the diesel fuel spill, as evidenced by the lower average IBI scores immediately downstream from the spill site. Results of the two sampling passes conducted at RM 7.5 revealed individual IBI scores of 32 and 46. These results suggest that full recovery has not occurred and that the large variability in IBI scores may be associated with low populations of intolerant species and thus their higher degree of sample collection variability.

- Pollution intolerant fish species collected in the study area included black redhorse, river chub, silver shiner, rosyface shiner, stonecat madtom and brindled madtom. These species together comprised 4% of the catch within the Fish Creek study area.

Table 4. Fish community indices from Fish Creek, 1995, 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). Sampling locations in Indiana (RM 21.6 - RM 7.5) 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.

Stream/ River Mile	Mean Number of Species	Cumulative Species	Mean Relative Number	Mean Relative Weight	QHEI	Mean Modified Index of Well-Being	Mean Index of Biotic Integrity	Narrative Evaluation[a]
Fish Creek - 1995								
21.6	22.0	25	651	26.8	72.5	8.3*	45*	Good
14.3	28.5	34	360	34.2	77.0	7.9*	48[ns]	M.Good/
8.3	25.0	29	694	20.2	75.0	8.5*	46[ns]	Good/V.Good
7.5	25.0	28	410	31.4	73.0	8.1*	39*	M.Good
5.4	23.5	26	727	6.3	74.0	8.7*	43*	Good
0.3	19.0	23	308	19.5	64.0	7.0*	41	Fair/ Good

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)
(from Ohio Administrative Code 3745-1-07, Table 7-17)

INDEX	WWH	EWH	MWH[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.

Trend Assessment

Changes in Macroinvertebrate Performance: 1992 - 1995

- Fish Creek macroinvertebrate communities within the study area were sampled by Ohio EPA in 1992 at RMs 5.40 and 0.30 and in 1993, 1994, and 1995 at 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 score of 50 in 1992 to a 20 in 1993. The site showed a slight recovery in 1994 with an ICI score of 38. In 1995 the site had returned to an ICI score of 50. Mayflies had recovered to pre-spill conditions; however, caddisflies, though nearly equal in number of taxa, have not returned in total numbers as a percent of the sample. The rest of the study area demonstrated exceptional macroinvertebrate communities. The cause of the decline in the ICI score at RM 21.7 in 1994 from a 56 in 1993 to a 40 in 1994 is unknown. However, the stream flows and conditions in 1995 were similar to 1994 levels and the ICI score recovered to a 54. 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. The artificial substrates in 1995 were buried in sand but the qualitative sample confirmed the 1994 results indicating a macroinvertebrate community in the exceptional range.

- Area of Degradation Values (ADV) for the 1993, 1994, and 1995 sampling effort provides a relative measure of performance of the ICI in Fish Creek. The ADV/mile of the ICI demonstrate the improvements noted between 1993 and 1994 and the further improvement in 1995. ICI ADV/mile improved substantially from 52.6 in 1993 to 2.7 in 1994 and to 0.0 in 1995.

Changes in Fish Community Performance: 1991 - 1995

- Fish Creek fish communities were sampled by Ohio EPA in 1991 (RM 5.4), 1992 (RMs 5.4 and 0.3), 1994 (RMs 21.7 - 0.3) and 1995 (RMs 21.6-0.3). 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.

- Area of Degradation Values (ADV) for the 1995, 1994, and 1992 sampling efforts provide a relative measure of performance of the IBI and MIwb in Fish Creek (Table 6). A substantial improvement in the IBI ADV was recorded in 1995 (ADV per mile = 19.9) in comparison to 1994 (ADV per mile = 49.3). This improvement occurred at Fish Creek sampling sites located upstream and downstream from the diesel spill. No apparent improvement or decline was observed in MIwb ADV scores.

Table 5. Area of Degradation (ADV) statistics for Fish Creek from 1995, 1994, 1993, and 1992. Scores were calculated using the ecoregion biocriteria as the background community performance.

	Biological Index Scores				ADV Statistics			Attainment Status (miles)			
Stream Index	Upper RM	Lower RM	Mini-mum	Maxi-mum	ADV	**ADV/ Mile**	Poor/VP ADV	FULL	PAR-TIAL	**NON**	POOR/ VP
Fish Creek (1995)											
IBI	21.7	0.3	38	46	424	**19.9**	0				
MIwb			7.0	8.6	778	**36.5**	0	0.1	21.3	0	0
ICI			46	56	0	**0.0**	0				
Fish Creek (1994)											
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				
Fish Creek (1993)											
ICI	21.7	0.3	20	56	1130	**52.6**	0				
Fish Creek (1992)											
IBI	5.4	0.3	38	44	258	**49.6**	0				
MIwb			7.5	9.3	145	**27.9**	0				

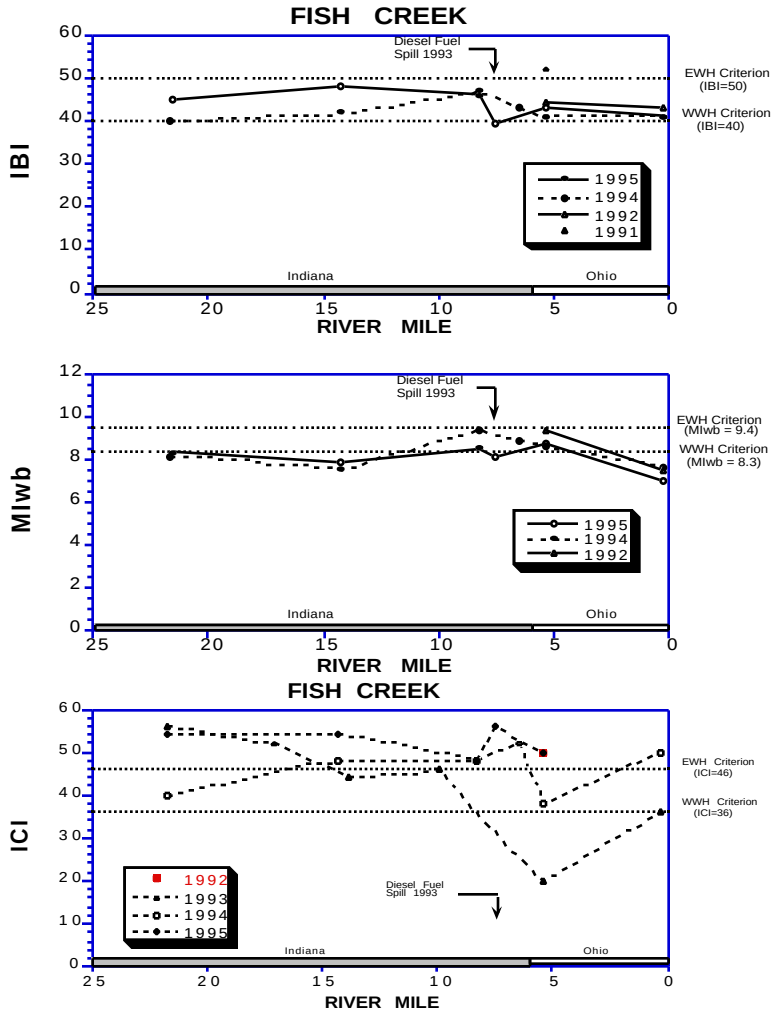

Figure 2. Longitudinal trend of the Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb), and Invertebrate Community Index (ICI) in Fish Creek during 1991, 1992, 1993, 1994, and 1995.

Biomarker Results

White sucker and common carp were collected at five fish sampling locations (no samples were collected at RM 21.7) during 1994. Samples were collected as part of a study by the United States Environmental Protection Agency, Office of Research and Development (National Exposure Research Laboratory) in collaboration with Ohio EPA. The purpose of this joint study was to collect liver, blood, and bile samples from white sucker and common carp for various analyses to detect physiological and biochemical responses to various chemical and environmental exposures. Three indicators reported here are ethoxyresorufin-o-deethylase (EROD) activity, blood urea nitrogen (BUN) and bile metabolites. EROD activity is an indicator of the induction of hepatic detoxification systems quantified by measures of a class of metabolic enzymes that are induced by planar xenobiotics such as polycyclic aromatic hydrocarbons and halogenated hydrocarbons. A white sucker score below 100 pmol EROD/mg protein and a common carp score below 50 pmol EROD/mg protein are a conservative indication of non-induction. Scores greater than 100 (white sucker) and 50 (common carp) indicate induction and are a measure of the exposure to these contaminants and detoxification activity by fish. Blood samples were analyzed for blood urea nitrogen (BUN) as an indicator of exposure to elevated concentrations of ammonia or organic nitrogen. Bile samples were analyzed for bile metabolites as indicators of exposure to polycyclic aromatic hydrocarbons (PAHs) and to determine relative amounts of exposure among different sites. PAHs with four or more condensed benzene rings are often mutagenic and/ or carcinogenic. The prevalence of neoplasia (*i.e.*, tumors or abnormal tissue growth) in fish has been associated with elevated PAH levels in sediments. Due to their hydrophobic and lipophilic nature, PAHs in aquatic environments rapidly become associated with suspended particles and particles deposited in sediments (McElroy *et al.* 1989). Bioavailability of these PAHS can be addressed by measuring contaminant levels of their metabolites in aquatic organisms. In fish, metabolites of PAHs accumulate in the bile.

In this study, two wavelength pairs were used to measure fluorescence in bile, one pair is more sensitive for detecting benzo (a) pyrene (B[a]P)-type compounds and the other for naphthalene (Naph)-type compounds (Cormier, U.S. EPA, personal communication). The B[a]P-type metabolites are generally associated with combustion by-products. The Naph-type metabolites are associated with oil contamination.

- The EROD and BUN results from Fish Creek in 1994 showed no significant difference between sampling locations for these two indicators.

- B[a]P-type metabolites showed no significant difference between the sites. However, the highest values were collected from RMs 0.3 and 14.3.

- Naph-type metabolites showed a significant increase in concentrations, for common carp (Figure 3.), in the area of the spill and downstream with the highest concentrations at RM 5.4. These data agree with the biological community data which showed the greatest impact at RM 5.4. The mean Naph-type metabolite values for all sites downstream from the spill site exceeded the upper 10 percentile common carp reference value (90,000 ng/mg protein) for the Eastern Corn Belt Plains ecoregion based on randomly selected sites on first, second, and third order streams sampled in 1995 as part of the U.S. EPA's REMAP project (Cormier, U.S. EPA, personal communication).

- The white sucker data showed trends similar to the common carp data; however, due to white suckers having been collected at fewer sites with fewer individuals at these sites the results presented are based on the common carp data.

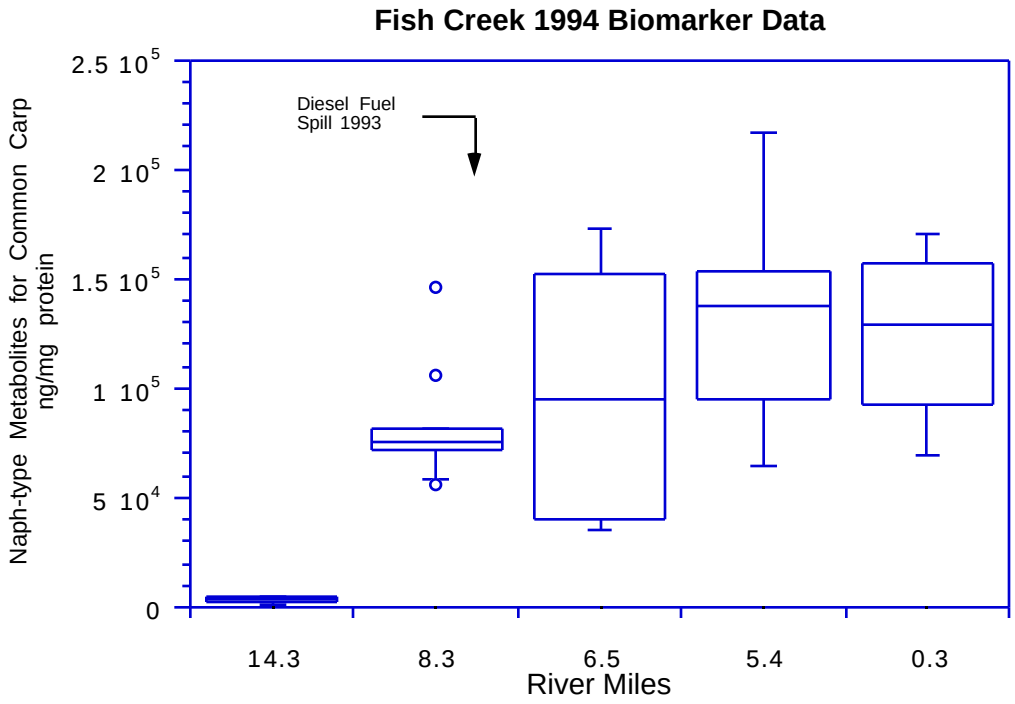

Figure 3. Naphthalene-type metabolites from common carp collect on Fish Creek in 1994 by river mile.

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Appendix Table 1. ICI metrics and scores for Fish Creek, 1995.

Fish Creek 1995 ICI Table

River Mile	Drainage Area (sq mi)	Number of: Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Percent: Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Taxa	Qual. EPT	Eco-region	ICI
FISH CREEK (IN) — 04-405													
Year: 95													
21.70	71.0	51(6)	10(6)	4(6)	24(6)	57.6(6)	8.8(4)	5.3(2)	26.5(6)	2.7(6)	20(6)	5	**54**
14.30	82.0	46(6)	9(6)	6(6)	23(6)	56.9(6)	12.3(4)	9.6(2)	19.8(6)	2.2(6)	16(6)	5	**54**
8.30	97.0	43(6)	7(4)	6(6)	17(4)	51.7(6)	14.1(4)	7.8(2)	24.5(6)	6.3(4)	15(6)	5	**48**
7.50	98.0	47(6)	9(6)	7(6)	21(6)	38.9(6)	23.3(6)	22.8(4)	14.3(6)	1.9(6)	14(4)	5	**56**
5.40	105.0	44(6)	9(6)	5(6)	19(4)	40.9(6)	4.0(2)	25.4(4)	27.6(6)	5.2(6)	12(4)	5	**50**

Appendix Table 2. Raw macroinvertebrate data by river mile for Fish Creek, 1995.

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/95 River Code: 04-405 River: Fish Creek RM: 21.70

Taxa Code	Taxa	Quan/Qual	
01320	*Hydra sp*	10	
01801	*Turbellaria*	10	+
03600	*Oligochaeta*	21	+
04685	*Placobdella ornata*	1	+
06800	*Gammarus sp*	0	+
08250	*Orconectes (Procericambarus) rusticus*	1	+
08601	*Hydracarina*	4	
11020	*Acerpenna pygmaeus*	403	+
11120	*Baetis flavistriga*	56	+
11130	*Baetis intercalaris*	12	+
11650	*Procloeon sp (w/ hindwing pads)*	0	+
12200	*Isonychia sp*	123	+
13400	*Stenacron sp*	126	+
13540	*Stenonema mediopunctatum*	148	+
13561	*Stenonema pulchellum*	148	+
13590	*Stenonema vicarium*	48	+
14900	*Leptophlebia sp*	224	+
17200	*Caenis sp*	12	+
18750	*Hexagenia limbata*	0	+
21200	*Calopteryx sp*	0	+
22300	*Argia sp*	5	+
23909	*Boyeria vinosa*	0	+
24900	*Gomphus sp*	0	+
42700	*Belostoma sp*	0	+
43300	*Ranatra sp*	0	+
45900	*Notonecta sp*	0	+
47600	*Sialis sp*	1	+
50315	*Chimarra obscura*	0	+
50804	*Lype diversa*	12	
50906	*Psychomyia flavida*	0	+
52200	*Cheumatopsyche sp*	181	+
52430	*Ceratopsyche morosa group*	0	+
52450	*Ceratopsyche sparna*	0	+
52530	*Hydropsyche depravata group*	4	+
57900	*Pycnopsyche sp*	0	+
58505	*Helicopsyche borealis*	2	+
67800	*Tropisternus sp*	0	+
68075	*Psephenus herricki*	0	+
68708	*Dubiraphia vittata group*	2	+
68901	*Macronychus glabratus*	29	+
69400	*Stenelmis sp*	2	+
71700	*Pilaria sp*	0	+
74100	*Simulium sp*	0	+
77500	*Conchapelopia sp*	24	
77750	*Hayesomyia senata or Thienemannimyia norena*	6	
77800	*Helopelopia sp*	12	+
80370	*Corynoneura lobata*	108	
80470	*Cricotopus (C.) or Orthocladius (O.) sp*	6	
81231	*Nanocladius (N.) crassicornus or N. (N.) rectinervus*	78	
81270	*Nanocladius (N.) spiniplenus*	6	
81631	*Parakiefferiella n.sp 1*	12	
81632	*Parakiefferiella n.sp 2*	18	
81650	*Parametriocnemus sp*	6	
81825	*Rheocricotopus (Psilocricotopus) robacki*	24	
82121	*Thienemanniella n.sp 3*	36	
82141	*Thienemanniella xena*	6	
82200	*Tvetenia bavarica group*	6	
82820	*Cryptochironomus sp*	6	
83840	*Microtendipes pedellus group*	108	+
84450	*Polypedilum (P.) convictum*	12	+
84460	*Polypedilum (P.) fallax group*	30	
84470	*Polypedilum (P.) illinoense*	0	+
84540	*Polypedilum (Tripodura) scalaenum group*	12	
84750	*Stictochironomus sp*	6	
85625	*Rheotanytarsus exiguus group*	48	
85800	*Tanytarsus sp*	18	
85814	*Tanytarsus glabrescens group*	54	
86100	*Chrysops sp*	0	+
87540	*Hemerodromia sp*	16	+
93900	*Elimia sp*	0	+
96900	*Ferrissia sp*	10	
97601	*Corbicula fluminea*	0	+
98600	*Sphaerium sp*	4	+
99440	*Fusconaia flava*	0	+

No. Quantitative Taxa:	51	Total Taxa:	74
No. Qualitative Taxa:	50	ICI:	**54**
Number of Organisms:	2257	Qual EPT:	**20**

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/95 River Code: 04-405 River: Fish Creek RM: 14.30

Taxa Code	Taxa	Quan/Qual	
03600	*Oligochaeta*	8	+
06840	*Gammarus pseudolimnaeus*	0	+
08250	*Orconectes (Procericambarus) rusticus*	0	+
11020	*Acerpenna pygmaeus*	200	+
11120	*Baetis flavistriga*	0	+
11130	*Baetis intercalaris*	146	+
12200	*Isonychia sp*	131	+
13400	*Stenacron sp*	568	+
13510	*Stenonema exiguum*	155	+
13540	*Stenonema mediopunctatum*	219	+
13561	*Stenonema pulchellum*	375	+
14950	*Leptophlebia sp or Paraleptophebia sp*	347	+
17200	*Caenis sp*	16	+
21200	*Calopteryx sp*	0	+
22300	*Argia sp*	2	
30000	*Plecoptera*	2	
42700	*Belostoma sp*	0	+
45900	*Notonecta sp*	0	+
47600	*Sialis sp*	0	+
50315	*Chimarra obscura*	9	
50804	*Lype diversa*	32	
51400	*Nyctiophylax sp*	0	+
52200	*Cheumatopsyche sp*	356	+
52430	*Ceratopsyche morosa group*	39	+
52530	*Hydropsyche depravata group*	22	+
52550	*Hydropsyche frisoni*	9	+
52580	*Hydropsyche valanis*	0	+
68708	*Dubiraphia vittata group*	6	
68901	*Macronychus glabratus*	20	+
69400	*Stenelmis sp*	21	+
71900	*Tipula sp*	2	
74100	*Simulium sp*	0	+
77500	*Conchapelopia sp*	14	
77750	*Hayesomyia senata or Thienemannimyia norena*	14	
77800	*Helopelopia sp*	68	
78655	*Procladius (Holotanypus) sp*	0	+
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	14	
81231	*Nanocladius (N.) crassicornus or N. (N.) rectinervus*	0	+
81250	*Nanocladius (N.) minimus*	162	
81460	*Orthocladius (O.) sp*	0	+
81631	*Parakiefferiella n.sp 1*	27	+
81632	*Parakiefferiella n.sp 2*	27	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	135	+
82121	*Thienemanniella n.sp 3*	108	+
82141	*Thienemanniella xena*	14	
83300	*Glyptotendipes (G.) sp*	14	+
83840	*Microtendipes pedellus group*	14	
84450	*Polypedilum (P.) convictum*	14	+
84460	*Polypedilum (P.) fallax group*	68	
84470	*Polypedilum (P.) illinoense*	0	+
84540	*Polypedilum (Tripodura) scalaenum group*	14	
84800	*Tribelos jucundum*	0	+
85500	*Paratanytarsus sp*	27	+
85615	*Rheotanytarsus distinctissimus group*	68	
85625	*Rheotanytarsus exiguus group*	162	
85800	*Tanytarsus sp*	27	
85802	*Tanytarsus curticornis group*	27	
85814	*Tanytarsus glabrescens group*	54	
87540	*Hemerodromia sp*	28	
96900	*Ferrissia sp*	6	
97601	*Corbicula fluminea*	1	+
99420	*Amblema plicata plicata*	0	+

No. Quantitative Taxa:	46	Total Taxa:	62
No. Qualitative Taxa:	40	ICI:	**54**
Number of Organisms:	3792	Qual EPT:	**16**

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/95 River Code: 04-405 River: Fish Creek RM: 8.30

Taxa Code	Taxa	Quan/Qual	
01801	*Turbellaria*	0	+
03600	*Oligochaeta*	48	+
08250	*Orconectes (Procericambarus) rusticus*	0	+
08601	*Hydracarina*	4	
11130	*Baetis intercalaris*	146	+
11670	*Procloeon irrubrum*	0	+
12200	*Isonychia sp*	326	+
13400	*Stenacron sp*	446	+
13510	*Stenonema exiguum*	208	+
13540	*Stenonema mediopunctatum*	155	+
13561	*Stenonema pulchellum*	269	+
14950	*Leptophlebia sp or Paraleptophebia sp*	302	+
21200	*Calopteryx sp*	0	+
22001	*Coenagrionidae*	2	
22300	*Argia sp*	2	+
23909	*Boyeria vinosa*	0	+
34130	*Acroneuria evoluta*	15	
42700	*Belostoma sp*	0	+
43300	*Ranatra sp*	0	+
47600	*Sialis sp*	1	+
48410	*Corydalus cornutus*	1	
50315	*Chimarra obscura*	55	+
50804	*Lype diversa*	0	+
52200	*Cheumatopsyche sp*	215	+
52430	*Ceratopsyche morosa group*	146	+
52530	*Hydropsyche depravata group*	43	+
52550	*Hydropsyche frisoni*	43	+
55300	*Ptilostomis sp*	0	+
57900	*Pycnopsyche sp*	1	
68707	*Dubiraphia quadrinotata*	4	
68708	*Dubiraphia vittata group*	2	+
68901	*Macronychus glabratus*	12	+
69200	*Optioservus sp*	12	
69400	*Stenelmis sp*	16	
71100	*Hexatoma sp*	0	+
74100	*Simulium sp*	22	
74501	*Ceratopogonidae*	4	
77500	*Conchapelopia sp*	40	
77800	*Helopelopia sp*	54	+
78450	*Nilotanypus fimbriatus*	0	+
80370	*Corynoneura lobata*	8	
81825	*Rheocricotopus (Psilocricotopus) robacki*	402	+
82141	*Thienemanniella xena*	27	+
83840	*Microtendipes pedellus group*	40	
84300	*Phaenopsectra obediens group*	0	+
84460	*Polypedilum (P.) fallax group*	147	
84470	*Polypedilum (P.) illinoense*	27	
84540	*Polypedilum (Tripodura) scalaenum group*	13	
84790	*Tribelos fuscicorne*	0	+
84800	*Tribelos jucundum*	27	+
85615	*Rheotanytarsus distinctissimus group*	13	
85625	*Rheotanytarsus exiguus group*	214	+
85800	*Tanytarsus sp*	13	
85814	*Tanytarsus glabrescens group*	40	
87540	*Hemerodromia sp*	12	
96900	*Ferrissia sp*	2	
99480	*Cyclonaias tuberculata*	0	+
99860	*Lampsilis radiata luteola*	0	+
99880	*Lampsilis ventricosa*	0	+

No. Quantitative Taxa:	43	Total Taxa:	59
No. Qualitative Taxa:	38	ICI:	**48**
Number of Organisms:	3579	Qual EPT:	**15**

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/28/95 River Code: 04-405 River: Fish Creek RM: 7.50

Taxa Code	Taxa	Quan/Qual		Taxa Code	Taxa	Quan/Qual	
01801	*Turbellaria*	2		68708	*Dubiraphia vittata group*	8	+
03360	*Plumatella sp*	0	+	68901	*Macronychus glabratus*	7	+
03600	*Oligochaeta*	10		69400	*Stenelmis sp*	6	
08250	*Orconectes (Procericambarus) rusticus*	0	+	71900	*Tipula sp*	0	+
08601	*Hydracarina*	24		74100	*Simulium sp*	4	+
11020	*Acerpenna pygmaeus*	42		74501	*Ceratopogonidae*	0	+
11120	*Baetis flavistriga*	25		77120	*Ablabesmyia mallochi*	0	+
11130	*Baetis intercalaris*	74	+	77740	*Hayesomyia senata*	0	+
11200	*Callibaetis sp*	0	+	80370	*Corynoneura lobata*	8	
11670	*Procloeon irrubrum*	0	+	80410	*Cricotopus (C.) sp*	11	
12200	*Isonychia sp*	202	+	80420	*Cricotopus (C.) bicinctus*	11	+
13400	*Stenacron sp*	331	+	80430	*Cricotopus (C.) tremulus group*	0	+
13510	*Stenonema exiguum*	498	+	81240	*Nanocladius (N.) distinctus*	11	
13540	*Stenonema mediopunctatum*	150		81460	*Orthocladius (O.) sp*	34	+
13561	*Stenonema pulchellum*	320	+	81631	*Parakiefferiella n.sp 1*	34	
14950	*Leptophlebia sp or Paraleptophebia sp*	32		81632	*Parakiefferiella n.sp 2*	23	
17200	*Caenis sp*	0	+	81825	*Rheocricotopus (Psilocricotopus) robacki*	125	+
21200	*Calopteryx sp*	1	+	82121	*Thienemanniella n.sp 3*	103	
22001	*Coenagrionidae*	0	+	82141	*Thienemanniella xena*	0	+
22300	*Argia sp*	0	+	82200	*Tvetenia bavarica group*	0	+
23909	*Boyeria vinosa*	0	+	82710	*Chironomus (C.) sp*	0	+
24900	*Gomphus sp*	0	+	83840	*Microtendipes pedellus group*	11	
28955	*Libellula lydia*	0	+	84300	*Phaenopsectra obediens group*	11	+
31800	*Taeniopteryx sp*	2		84302	*Phaenopsectra punctipes*	34	
42700	*Belostoma sp*	0	+	84460	*Polypedilum (P.) fallax group*	46	
43300	*Ranatra sp*	0	+	84470	*Polypedilum (P.) illinoense*	0	+
45100	*Palmacorixa sp*	0	+	84540	*Polypedilum (Tripodura) scalaenum group*	0	+
45300	*Sigara sp*	0	+	85500	*Paratanytarsus sp*	34	+
50315	*Chimarra obscura*	21	+	85615	*Rheotanytarsus distinctissimus group*	103	
50804	*Lype diversa*	28		85625	*Rheotanytarsus exiguus group*	775	+
51400	*Nyctiophylax sp*	18		85720	*Stempellinella n.sp nr. flavidula*	11	
52200	*Cheumatopsyche sp*	356	+	85800	*Tanytarsus sp*	0	+
52430	*Ceratopsyche morosa group*	451	+	85802	*Tanytarsus curticornis group*	34	
52530	*Hydropsyche depravata group*	30	+	85814	*Tanytarsus glabrescens group*	23	
52550	*Hydropsyche frisoni*	100	+	85840	*Tanytarsus guerlus group*	0	+
55300	*Ptilostomis sp*	0	+	86100	*Chrysops sp*	0	+
60900	*Peltodytes sp*	0	+	87540	*Hemerodromia sp*	108	
63300	*Hydroporus sp*	0	+	89501	*Ephydridae*	0	+
66500	*Enochrus sp*	0	+	95100	*Physella sp*	0	+
67700	*Paracymus sp*	0	+	96900	*Ferrissia sp*	6	
68601	*Ancyronyx variegata*	2	+	97601	*Corbicula fluminea*	0	+

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/28/95 River Code: 04-405 River: Fish Creek RM: 7.50

Taxa Code	Taxa	Quan/Qual	Taxa Code	Taxa	Quan/Qual

No. Quantitative Taxa:	47	Total Taxa:	82
No. Qualitative Taxa:	56	ICI:	**56**
Number of Organisms:	4300	Qual EPT:	**14**

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/28/95 River Code: 04-405 River: Fish Creek RM: 5.40

Taxa Code	Taxa	Quan/Qual	
01801	*Turbellaria*	2	
03360	*Plumatella sp*	0	+
03600	*Oligochaeta*	32	+
06840	*Gammarus pseudolimnaeus*	0	+
08250	*Orconectes (Procericambarus) rusticus*	0	+
08601	*Hydracarina*	9	
11130	*Baetis intercalaris*	10	+
12200	*Isonychia sp*	50	+
13400	*Stenacron sp*	439	+
13510	*Stenonema exiguum*	242	+
13540	*Stenonema mediopunctatum*	96	
13561	*Stenonema pulchellum*	403	+
14950	*Leptophlebia sp or Paraleptophebia sp*	149	+
16700	*Tricorythodes sp*	10	+
17200	*Caenis sp*	8	
21200	*Calopteryx sp*	1	+
22300	*Argia sp*	12	+
23909	*Boyeria vinosa*	0	+
24501	*Gomphidae*	2	
24900	*Gomphus sp*	0	+
25300	*Ophiogomphus sp*	0	+
42700	*Belostoma sp*	0	+
43300	*Ranatra sp*	0	+
50315	*Chimarra obscura*	0	+
50804	*Lype diversa*	10	
51600	*Polycentropus sp*	2	
52200	*Cheumatopsyche sp*	86	+
52430	*Ceratopsyche morosa group*	39	+
52530	*Hydropsyche depravata group*	0	+
52580	*Hydropsyche valanis*	0	+
53800	*Hydroptila sp*	2	
60400	*Gyrinus sp*	0	+
67800	*Tropisternus sp*	0	+
68601	*Ancyronyx variegata*	7	+
68702	*Dubiraphia bivittata*	7	+
68708	*Dubiraphia vittata group*	7	+
68901	*Macronychus glabratus*	35	+
71910	*Tipula abdominalis*	0	+
74100	*Simulium sp*	0	+
74501	*Ceratopogonidae*	12	+
77500	*Conchapelopia sp*	38	
77750	*Hayesomyia senata or Thienemannimyia norena*	0	+
77800	*Helopelopia sp*	76	
78450	*Nilotanypus fimbriatus*	0	+
80420	*Cricotopus (C.) bicinctus*	19	+
81460	*Orthocladius (O.) sp*	0	+
81631	*Parakiefferiella n.sp 1*	76	
81632	*Parakiefferiella n.sp 2*	114	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	190	+
82121	*Thienemanniella n.sp 3*	76	+
82141	*Thienemanniella xena*	0	+
83840	*Microtendipes pedellus group*	76	
84300	*Phaenopsectra obediens group*	57	+
84460	*Polypedilum (P.) fallax group*	76	
84470	*Polypedilum (P.) illinoense*	19	+
84540	*Polypedilum (Tripodura) scalaenum group*	19	+
84800	*Tribelos jucundum*	0	+
85500	*Paratanytarsus sp*	57	
85615	*Rheotanytarsus distinctissimus group*	76	
85625	*Rheotanytarsus exiguus group*	703	+
85802	*Tanytarsus curticornis group*	19	
85814	*Tanytarsus glabrescens group*	19	
86100	*Chrysops sp*	0	+
87540	*Hemerodromia sp*	24	
93900	*Elimia sp*	0	+
95100	*Physella sp*	0	+
96900	*Ferrissia sp*	33	+
97601	*Corbicula fluminea*	0	+
99400	*Quadrula quadrula*	0	+
99420	*Amblema plicata plicata*	0	+
99560	*Ptychobranchus fasciolaris*	0	+
99880	*Lampsilis ventricosa*	0	+

No. Quantitative Taxa:	44	Total Taxa:	72
No. Qualitative Taxa:	54	ICI:	**50**
Number of Organisms:	3439	Qual EPT:	**12**

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection

Collection Date: 09/28/95 River Code: 04-405 River: Fish Creek RM: 0.30

Taxa Code	Taxa	Quan/Qual	
03600	*Oligochaeta*	0	+
08250	*Orconectes (Procericambarus) rusticus*	0	+
11130	*Baetis intercalaris*	0	+
11150	*Labiobaetis propinquus*	0	+
11670	*Procloeon irrubrum*	0	+
12200	*Isonychia sp*	0	+
13400	*Stenacron sp*	0	+
13510	*Stenonema exiguum*	0	+
13540	*Stenonema mediopunctatum*	0	+
13570	*Stenonema terminatum*	0	+
14950	*Leptophlebia sp or Paraleptophebia sp*	0	+
16700	*Tricorythodes sp*	0	+
21200	*Calopteryx sp*	0	+
22325	*Argia tibialis*	0	+
23909	*Boyeria vinosa*	0	+
24900	*Gomphus sp*	0	+
24915	*Gomphus fraternus*	0	+
31800	*Taeniopteryx sp*	0	+
43300	*Ranatra sp*	0	+
45300	*Sigara sp*	0	+
45900	*Notonecta sp*	0	+
51600	*Polycentropus sp*	0	+
52200	*Cheumatopsyche sp*	0	+
52430	*Ceratopsyche morosa group*	0	+
52530	*Hydropsyche depravata group*	0	+
52550	*Hydropsyche frisoni*	0	+
52570	*Hydropsyche simulans*	0	+
59407	*Nectopsyche candida*	0	+
67000	*Helophorus sp*	0	+
67200	*Hydrochara sp*	0	+
68130	*Helichus sp*	0	+
68201	*Scirtidae*	0	+
68702	*Dubiraphia bivittata*	0	+
68708	*Dubiraphia vittata group*	0	+
68901	*Macronychus glabratus*	0	+
74100	*Simulium sp*	0	+
77120	*Ablabesmyia mallochi*	0	+
81632	*Parakiefferiella n.sp 2*	0	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	0	+
82121	*Thienemanniella n.sp 3*	0	+
82141	*Thienemanniella xena*	0	+
84470	*Polypedilum (P.) illinoense*	0	+
85500	*Paratanytarsus sp*	0	+
85625	*Rheotanytarsus exiguus group*	0	+
85800	*Tanytarsus sp*	0	+
86100	*Chrysops sp*	0	+
86401	*Atherix lantha*	0	+
95100	*Physella sp*	0	+
98600	*Sphaerium sp*	0	+
99100	*Anodonta grandis*	0	+
99200	*Alasmidonta marginata*	0	+
99560	*Ptychobranchus fasciolaris*	0	+

No. Quantitative Taxa: 0 Total Taxa: 52

No. Qualitative Taxa: 52 ICI:

Number of Organisms: 0 Qual EPT:

Appendix Table 3. IBI metrics and scores for Fish Creek, 1995.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Percent of Individuals: Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)		IBI		Modified Iwb
Fish Creek - (04405)																			
Year: 95																			
21.60	D	08/17/95	71	22(5)	5(5)	3(3)	2(1)	5(5)	49(5)	32(3)	13(5)	1.0(1)	59(5)	0.0(5)	455(3)		46		8.2
21.60	D	09/29/95	71	22(5)	2(3)	3(3)	2(1)	5(5)	43(5)	37(3)	15(5)	3.2(3)	48(3)	0.0(5)	400(3)		44		8.4
14.30	D	08/17/95	82	26(5)	4(5)	3(3)	1(1)	5(5)	47(5)	35(3)	13(5)	5.4(5)	64(5)	0.0(5)	157(1)		48	✯	7.3
14.30	D	09/29/95	82	28(5)	4(5)	3(3)	2(1)	5(5)	55(5)	19(5)	19(3)	2.6(3)	71(5)	0.0(5)	336(3)		48		8.4
8.30	D	08/17/95	97	24(5)	2(3)	3(3)	3(3)	5(5)	53(5)	36(3)	15(5)	6.2(5)	63(5)	0.0(5)	179(1)		48	✯	8.0
8.30	D	09/29/95	97	23(5)	2(3)	4(5)	4(3)	5(5)	41(5)	34(3)	25(3)	4.2(3)	50(3)	0.3(3)	340(3)		44		8.9
7.50	D	08/16/95	98	20(3)	3(3)	3(3)	2(1)	4(3)	34(3)	43(1)	30(3)	5.8(5)	50(3)	0.5(3)	192(1)		32	✯	7.7
7.50	D	09/28/95	98	27(5)	3(3)	4(5)	5(3)	5(5)	43(5)	30(3)	21(3)	7.8(5)	50(3)	0.9(3)	242(3)		46		8.4
5.40	D	08/16/95	105	20(3)	3(3)	2(1)	3(3)	5(3)	41(5)	31(3)	11(5)	2.0(3)	61(5)	0.0(5)	260(3)		42	✯	8.5
5.40	D	09/28/95	105	25(5)	4(5)	3(3)	5(3)	5(3)	37(5)	33(3)	24(3)	2.1(3)	53(3)	0.0(5)	381(3)		44		8.9
0.30	D	08/16/95	109	18(3)	2(3)	3(3)	2(1)	4(3)	28(3)	21(5)	15(5)	5.7(5)	72(5)	0.0(5)	144(1)	*	42		7.2
0.30	D	09/28/95	109	18(3)	2(3)	3(3)	1(1)	5(3)	20(3)	19(5)	8(5)	3.5(3)	81(5)	0.7(3)	353(3)		40		6.7

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, 1995. Relative numbers are per 0.3 km.

Species List

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **21.60**	Basin: Maumee River	Date Range: 08/17/95
Data Source: 01	Time Fished: 5127 sec Drain Area: 71.0 sq mi	Thru: 09/29/95
Purpose:	Dist Fished: 0.38 km No of Passes: 2	Sampler Type: D

Species Name / Stage / 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		6	4.74	0.73	0.08	0.28	16.00
GRASS PICKEREL		P	M	P	7	5.53	0.85	0.11	0.42	20.43
GOLDEN REDHORSE	R	I	S	M	13	10.26	1.58	3.54	13.21	344.69
NORTHERN HOG SUCKER	R	I	S	M	44	34.74	5.34	3.24	12.08	93.14
WHITE SUCKER	W	O	S	T	100	78.95	12.14	14.64	54.65	185.39
BLACKNOSE DACE	N	G	S	T	1	0.79	0.12	0.00	0.01	2.00
CREEK CHUB	N	G	N	T	143	112.89	17.35	1.53	5.71	13.54
SILVER SHINER	N	I	S	I	35	27.63	4.25	0.15	0.57	5.54
STRIPED SHINER	N	I	S		26	20.53	3.16	0.48	1.78	23.17
COMMON SHINER	N	I	S		97	76.58	11.77	0.91	3.41	11.94
BLUNTNOSE MINNOW	N	O	C	T	8	6.32	0.97	0.03	0.10	4.13
CENTRAL STONEROLLER	N	H	N		109	86.05	13.23	0.38	1.43	4.45
STRIPED SH X COMMON SH		I			6	4.74	0.73	0.12	0.44	24.67
STONECAT MADTOM		I	C	I	6	4.74	0.73	0.04	0.13	7.67
WHITE CRAPPIE	S	I	C		4	3.16	0.49	0.06	0.24	20.00
ROCK BASS	S	C	C		8	6.32	0.97	0.62	2.31	97.88
LARGEMOUTH BASS	F	C	C		2	1.58	0.24	0.01	0.05	9.00
GREEN SUNFISH	S	I	C	T	31	24.47	3.76	0.30	1.14	12.42
BLUEGILL SUNFISH	S	I	C	P	10	7.89	1.21	0.07	0.25	8.40
PUMPKINSEED SUNFISH	S	I	C	P	1	0.79	0.12	0.01	0.02	8.00
GR'N SF X PUMPKINS'D					1	0.79	0.12	0.03	0.10	33.00
BLACKSIDE DARTER	D	I	S		13	10.26	1.58	0.06	0.22	5.85
LOGPERCH	D	I	S	M	3	2.37	0.36	0.03	0.13	14.67
JOHNNY DARTER	D	I	C		19	15.00	2.31	0.04	0.14	2.42
GREENSIDE DARTER	D	I	S	M	45	35.53	5.46	0.13	0.47	3.53
FANTAIL DARTER	D	I	C		33	26.05	4.00	0.06	0.23	2.38
MOTTLED SCULPIN		I	C		53	41.84	6.43	0.13	0.50	3.19
	Mile Total				824	650.53		26.78		
	Number of Species				25					
	Number of Hybrids				2					

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **14.30**	Basin: Maumee River	Date Range: 08/17/95
Data Source: 01	Time Fished: 6778 sec Drain Area: 82.0 sq mi	Thru: 09/29/95
Purpose:	Dist Fished: 0.43 kmP No of Passes: 2	Sampler Type: D

Species Name / Stage / 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		76	53.28	14.80	0.50	1.47	9.60
CENTRAL MUDMINNOW		I	C	T	1	0.68	0.19	0.01	0.02	9.00
GRASS PICKEREL		P	M	P	5	3.54	0.98	0.08	0.24	23.00
NORTHERN PIKE	F	P	M		1	0.71	0.20	2.04	5.95	2,850.00
GOLDEN REDHORSE	R	I	S	M	5	3.47	0.96	0.81	2.37	234.20
NORTHERN HOG SUCKER	R	I	S	M	87	60.03	16.67	2.61	7.62	43.43
WHITE SUCKER	W	O	S	T	16	11.10	3.08	2.32	6.77	207.81
COMMON CARP	G	O	M	T	16	11.30	3.14	23.38	68.30	2,068.32
RIVER CHUB	N	I	N	I	1	0.68	0.19	0.02	0.06	31.00
BLACKNOSE DACE	N	G	S	T	1	0.71	0.20	0.00	0.00	1.00
CREEK CHUB	N	G	N	T	42	29.48	8.19	0.44	1.29	15.00
SILVER SHINER	N	I	S	I	3	2.14	0.60	0.03	0.08	12.67
STRIPED SHINER	N	I	S		13	8.99	2.50	0.14	0.40	15.08
COMMON SHINER	N	I	S		9	6.27	1.74	0.08	0.23	12.78
SPOTFIN SHINER	N	I	M		24	16.62	4.62	0.08	0.23	4.71
BLUNTNOSE MINNOW	N	O	C	T	16	11.01	3.06	0.03	0.08	2.56
CENTRAL STONEROLLER	N	H	N		8	5.49	1.52	0.03	0.09	5.50
YELLOW BULLHEAD		I	C	T	1	0.68	0.19	0.15	0.43	215.00
BLACK BULLHEAD		I	C	P	1	0.68	0.19	0.07	0.20	102.00
STONECAT MADTOM		I	C	I	2	1.36	0.38	0.07	0.20	51.50
BROOK SILVERSIDE		I	M	M	6	4.25	1.18	0.00	0.01	0.50
WHITE CRAPPIE	S	I	C		2	1.40	0.39	0.01	0.04	9.00
ROCK BASS	S	C	C		5	3.44	0.96	0.67	1.97	195.20
LARGEMOUTH BASS	F	C	C		6	4.19	1.16	0.04	0.12	9.67
GREEN SUNFISH	S	I	C	T	24	16.69	4.63	0.21	0.63	12.75
BLUEGILL SUNFISH	S	I	C	P	8	5.52	1.53	0.04	0.13	7.88
YELLOW PERCH			M		3	2.14	0.60	0.00	0.01	1.67
DUSKY DARTER	D	I	S	M	1	0.68	0.19	0.01	0.03	16.00
BLACKSIDE DARTER	D	I	S		29	20.13	5.59	0.08	0.22	3.72
LOGPERCH	D	I	S	M	14	9.74	2.70	0.09	0.27	9.43
JOHNNY DARTER	D	I	C		7	4.87	1.35	0.02	0.05	3.24
GREENSIDE DARTER	D	I	S	M	68	47.01	13.06	0.11	0.33	2.41
FANTAIL DARTER	D	I	C		1	0.71	0.20	0.00	0.00	2.00
MOTTLED SCULPIN		I	C		16	11.07	3.07	0.06	0.17	5.24
Mile Total					518	360.10		34.23		
Number of Species					34					
Number of Hybrids					0					

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **8.30**	Basin: Maumee River	Date Range: 08/17/95
Data Source: 01	Time Fished: 6637 sec Drain Area: 97.0 sq mi	Thru: 09/29/95
Purpose:	Dist Fished: 0.42 km@ No of Passes: 2	Sampler Type: D

Species Name / Stage / 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		464	331.43	47.79	0.97	4.79	2.92
GRASS PICKEREL		P	M	P	2	1.43	0.21	0.01	0.06	9.00
NORTHERN PIKE	F	P	M		1	0.71	0.10	0.54	2.65	750.00
BLACK REDHORSE	R	I	S	I	1	0.71	0.10	0.02	0.08	22.00
GOLDEN REDHORSE	R	I	S	M	23	16.43	2.37	2.55	12.59	155.06
NORTHERN HOG SUCKER	R	I	S	M	48	34.29	4.94	1.70	8.38	49.46
WHITE SUCKER	W	O	S	T	31	22.14	3.19	1.14	5.63	51.45
COMMON CARP	G	O	M	T	7	5.00	0.72	9.63	47.60	1,925.77
RIVER CHUB	N	I	N	I	12	8.57	1.24	0.33	1.62	38.17
BLACKNOSE DACE	N	G	S	T	16	11.43	1.65	0.05	0.23	4.06
CREEK CHUB	N	G	N	T	86	61.43	8.86	1.11	5.46	17.99
SILVER SHINER	N	I	S	I	30	21.43	3.09	0.11	0.57	5.33
ROSYFACE SHINER	N	I	S	I	2	1.43	0.21	0.00	0.01	2.00
STRIPED SHINER	N	I	S		15	10.71	1.54	0.31	1.53	28.80
COMMON SHINER	N	I	S		2	1.43	0.21	0.03	0.15	21.50
SPOTFIN SHINER	N	I	M		47	33.57	4.84	0.10	0.47	2.85
BLUNTNOSE MINNOW	N	O	C	T	35	25.00	3.60	0.10	0.50	4.06
CENTRAL STONEROLLER	N	H	N		1	0.71	0.10	0.00	0.00	1.00
STONECAT MADTOM		I	C	I	1	0.71	0.10	0.01	0.04	12.00
BROOK SILVERSIDE		I	M	M	1	0.71	0.10	0.00	0.00	1.00
ROCK BASS	S	C	C		23	16.43	2.37	1.10	5.46	67.17
LARGEMOUTH BASS	F	C	C		1	0.71	0.10	0.01	0.06	18.00
GREEN SUNFISH	S	I	C	T	17	12.14	1.75	0.16	0.80	13.35
BLACKSIDE DARTER	D	I	S		37	26.43	3.81	0.08	0.42	3.19
LOGPERCH	D	I	S	M	9	6.43	0.93	0.06	0.28	8.78
JOHNNY DARTER	D	I	C		10	7.14	1.03	0.02	0.08	2.20
GREENSIDE DARTER	D	I	S	M	36	25.71	3.71	0.07	0.33	2.61
FANTAIL DARTER	D	I	C		11	7.86	1.13	0.04	0.20	5.00
MOTTLED SCULPIN		I	C		2	1.43	0.21	0.00	0.00	1.00
Mile Total					971	693.57		20.23		
Number of Species					29					
Number of Hybrids					0					

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **7.50**	Basin: Maumee River	Date Range: 08/16/95
Data Source: 01	Time Fished: 5837 sec Drain Area: 98.0 sq mi	Thru: 09/28/95
Purpose:	Dist Fished: 0.40 km No of Passes: 2	Sampler Type: D

Species Name / Stage / 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		112	84.00	20.51	0.54	1.73	6.45
NORTHERN PIKE	F	P	M		1	0.75	0.18	0.79	2.51	1,050.00
BLACK REDHORSE	R	I	S	I	4	3.00	0.73	1.21	3.87	404.00
GOLDEN REDHORSE	R	I	S	M	17	12.75	3.11	2.73	8.70	214.06
NORTHERN HOG SUCKER	R	I	S	M	53	39.75	9.71	2.25	7.19	56.68
WHITE SUCKER	W	O	S	T	14	10.50	2.56	1.10	3.52	104.98
COMMON CARP	G	O	M	T	14	10.50	2.56	18.58	59.26	1,769.57
RIVER CHUB	N	I	N	I	6	4.50	1.10	0.24	0.76	52.67
BLACKNOSE DACE	N	G	S	T	5	3.75	0.92	0.01	0.03	2.60
CREEK CHUB	N	G	N	T	49	36.75	8.97	0.43	1.36	11.56
SILVER SHINER	N	I	S	I	24	18.00	4.40	0.11	0.36	6.28
ROSYFACE SHINER	N	I	S	I	1	0.75	0.18	0.00	0.00	2.00
STRIPED SHINER	N	I	S		11	8.25	2.01	0.10	0.32	12.27
SPOTFIN SHINER	N	I	M		34	25.50	6.23	0.09	0.27	3.35
BLUNTNOSE MINNOW	N	O	C	T	68	51.00	12.45	0.21	0.67	4.10
CENTRAL STONEROLLER	N	H	N		26	19.50	4.76	0.09	0.29	4.69
YELLOW BULLHEAD		I	C	T	1	0.75	0.18	0.14	0.43	180.00
STONECAT MADTOM		I	C	I	1	0.75	0.18	0.00	0.00	1.00
BROOK SILVERSIDE		I	M	M	2	1.50	0.37	0.00	0.01	1.00
ROCK BASS	S	C	C		28	21.00	5.13	2.41	7.69	114.82
LARGEMOUTH BASS	F	C	C		2	1.50	0.37	0.05	0.14	30.00
GREEN SUNFISH	S	I	C	T	14	10.50	2.56	0.13	0.42	12.46
BLUEGILL SUNFISH	S	I	C	P	3	2.25	0.55	0.01	0.04	6.00
BLACKSIDE DARTER	D	I	S		16	12.00	2.93	0.04	0.12	3.06
LOGPERCH	D	I	S	M	4	3.00	0.73	0.04	0.12	12.50
JOHNNY DARTER	D	I	C		6	4.50	1.10	0.01	0.03	2.00
GREENSIDE DARTER	D	I	S	M	27	20.25	4.95	0.05	0.16	2.52
FANTAIL DARTER	D	I	C		3	2.25	0.55	0.00	0.01	1.67
Mile Total					546	409.50		31.36		
Number of Species					28					
Number of Hybrids					0					

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **5.40**	Basin: Maumee River	Date Range: 08/16/95
Data Source: 01	Time Fished: 6745 sec Drain Area: 105.0 sq mi	Thru: 09/28/95
Purpose:	Dist Fished: 0.40 km No of Passes: 2	Sampler Type: D

Species Name / Stage / 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		374	280.50	38.60	1.19	18.93	4.23
GOLDEN REDHORSE	R	I	S	M	3	2.25	0.31	0.02	0.33	9.33
NORTHERN HOG SUCKER	R	I	S	M	49	36.75	5.06	1.43	22.75	38.84
WHITE SUCKER	W	O	S	T	24	18.00	2.48	0.36	5.66	19.71
COMMON CARP	G	O	M	T	1	0.75	0.10	0.16	2.53	212.00
RIVER CHUB	N	I	N	I	8	6.00	0.83	0.22	3.50	36.54
BLACKNOSE DACE	N	G	S	T	19	14.25	1.96	0.05	0.74	3.26
CREEK CHUB	N	G	N	T	55	41.25	5.68	0.73	11.64	17.71
SILVER SHINER	N	I	S	I	5	3.75	0.52	0.04	0.57	9.40
ROSYFACE SHINER	N	I	S	I	4	3.00	0.41	0.01	0.10	2.00
STRIPED SHINER	N	I	S		10	7.50	1.03	0.13	2.02	16.86
SPOTFIN SHINER	N	I	M		34	25.50	3.51	0.09	1.35	3.32
BLUNTNOSE MINNOW	N	O	C	T	61	45.75	6.30	0.14	2.27	3.12
CENTRAL STONEROLLER	N	H	N		69	51.75	7.12	0.32	5.16	6.25
STONECAT MADTOM		I	C	I	3	2.25	0.31	0.00	0.06	1.67
BRINDLED MADTOM		I	C	I	1	0.75	0.10	0.00	0.05	4.00
WHITE CRAPPIE	S	I	C		2	1.50	0.21	0.01	0.14	6.00
ROCK BASS	S	C	C		13	9.75	1.34	0.67	10.68	68.69
GREEN SUNFISH	S	I	C	T	39	29.25	4.02	0.18	2.87	6.15
BLUEGILL SUNFISH	S	I	C	P	4	3.00	0.41	0.06	0.96	20.00
BLACKSIDE DARTER	D	I	S		20	15.00	2.06	0.04	0.62	2.60
LOGPERCH	D	I	S	M	13	9.75	1.34	0.12	1.86	11.92
JOHNNY DARTER	D	I	C		11	8.25	1.14	0.02	0.37	2.82
GREENSIDE DARTER	D	I	S	M	95	71.25	9.80	0.17	2.77	2.44
FANTAIL DARTER	D	I	C		29	21.75	2.99	0.05	0.80	2.29
MOTTLED SCULPIN		I	C		23	17.25	2.37	0.08	1.31	4.74
Mile Total					969	726.75		6.27		
Number of Species					26					
Number of Hybrids					0					

River Code: **04-405**	Stream: **Fish Creek**	Sample Date: **1995**
River Mile: **0.30**	Basin: Maumee River	Date Range: 08/16/95
Data Source: 01	Time Fished: 5284 sec Drain Area: 109.0 sq mi	Thru: 09/28/95
Purpose:	Dist Fished: 0.40 km No of Passes: 2	Sampler Type: D

Species Name / Stage / 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	6.00	1.95	0.09	0.44	14.29
GOLDEN REDHORSE	R	I	S	M	4	3.00	0.97	0.03	0.16	10.25
NORTHERN HOG SUCKER	R	I	S	M	49	36.75	11.92	2.22	11.41	60.46
WHITE SUCKER	W	O	S	T	12	9.00	2.92	0.43	2.22	47.92
COMMON CARP	G	O	M	T	8	6.00	1.95	13.00	66.77	2,166.50
RIVER CHUB	N	I	N	I	20	15.00	4.87	0.43	2.19	28.45
CREEK CHUB	N	G	N	T	27	20.25	6.57	0.48	2.46	23.63
STRIPED SHINER	N	I	S		1	0.75	0.24	0.00	0.01	1.00
SPOTFIN SHINER	N	I	M		187	140.25	45.50	0.24	1.24	1.71
SAND SHINER	N	I	M	M	2	1.50	0.49	0.00	0.02	2.50
SILVERJAW MINNOW	N	I	M		1	0.75	0.24	0.00	0.01	1.00
BLUNTNOSE MINNOW	N	O	C	T	14	10.50	3.41	0.03	0.14	2.50
CENTRAL STONEROLLER	N	H	N		1	0.75	0.24	0.00	0.01	3.00
CHANNEL CATFISH	F		C		1	0.75	0.24	0.90	4.62	1,200.00
STONECAT MADTOM		I	C	I	1	0.75	0.24	0.08	0.43	112.00
ROCK BASS	S	C	C		16	12.00	3.89	1.26	6.47	104.94
LARGEMOUTH BASS	F	C	C		1	0.75	0.24	0.01	0.03	7.00
GREEN SUNFISH	S	I	C	T	19	14.25	4.62	0.15	0.78	10.63
BLACKSIDE DARTER	D	I	S		15	11.25	3.65	0.07	0.38	6.53
LOGPERCH	D	I	S	M	3	2.25	0.73	0.00	0.01	1.00
JOHNNY DARTER	D	I	C		8	6.00	1.95	0.01	0.05	1.75
GREENSIDE DARTER	D	I	S	M	9	6.75	2.19	0.03	0.15	4.22
FANTAIL DARTER	D	I	C		4	3.00	0.97	0.01	0.03	2.00
Mile Total					411	308.25		19.47		
Number of Species					23					
Number of Hybrids					0					