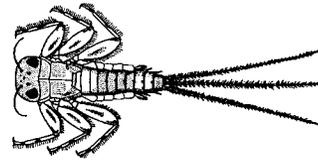
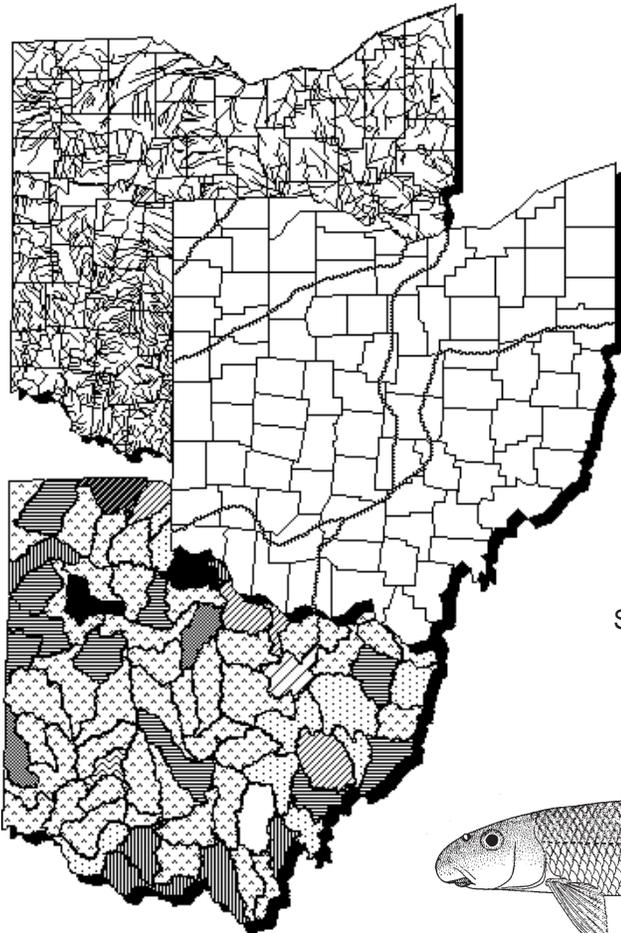
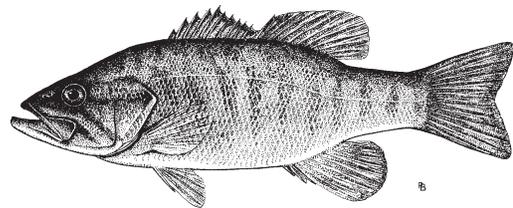


Biological and Water Quality Study of Twin Creek and Selected Tributaries 1995

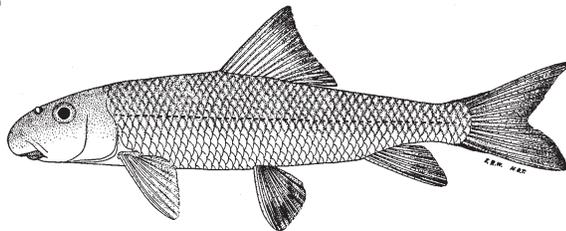
Darke, Preble, Montgomery, and Warren Counties, Ohio



Mayfly (*Stenonema*)



Smallmouth Bass (*Micropterus dolomieu*)



Black Redhorse (*Moxostoma duquesnei*)

December 31, 1997

**Biological and Water Quality Study
of
Twin Creek
1995**

Darke, Preble, Montgomery, and Warren Counties, Ohio

December 31, 1997

OEPA Technical Report MAS/1996-12-9

prepared by

State of Ohio Environmental Protection Agency
Division of Surface Water
Ecological Assessment Unit
1685 Westbelt Drive
Columbus, Ohio 43228
and
Water Quality Section
Southwest District Office
401 East Fifth Street
Dayton, Ohio 45402-2911

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NOTICE TO USERS

Ohio EPA incorporated biological criteria into the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) regulations in February 1990 (effective May 1990). These criteria consist of numeric values for the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), both of which are based on fish assemblage data, and the Invertebrate Community Index (ICI), which is based on macroinvertebrate assemblage data. Criteria for each index are specified for each of Ohio's five ecoregions (as described by Omernik 1987), and are further organized by organism group, index, site type, and aquatic life use designation. These criteria, along with the existing chemical and whole effluent toxicity evaluation methods and criteria, figure prominently in the monitoring and assessment of Ohio's surface water resources.

The following documents support the use of biological criteria by outlining the rationale for using biological information, the methods by which the biocriteria were derived and calculated, the field methods by which sampling must be conducted, and the process for evaluating results:

- Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.
- Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.
- Ohio Environmental Protection Agency. 1989b. Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Plan. & Assess., Ecological Assessment Section, Columbus, Ohio.
- Ohio Environmental Protection Agency. 1989c. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. Water Quality Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.
- Ohio Environmental Protection Agency. 1990. The use of biological criteria in the Ohio EPA surface water monitoring and assessment program. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.
- Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Since the publication of the preceding guidance documents, the following new publications by the Ohio EPA have become available. These publications should also be consulted as they represent the

latest information and analyses used by the Ohio EPA to implement the biological criteria.

- DeShon, J.D. 1995. Development and application of the invertebrate community index (ICI), pp. 217-243. in W.S. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995. Biological criteria program development and implementation in Ohio, pp. 109-144. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995. Biological response signatures and the area of degradation value: new tools for interpreting multimetric data, pp. 263-286. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. 1995. Policy issues and management applications for biological criteria, pp. 327-344. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995. The role of biological criteria in water quality monitoring, assessment, and regulation. *Environmental Regulation in Ohio: How to Cope With the Regulatory Jungle*. Inst. of Business Law, Santa Monica, CA. 54 pp.

These documents and this report may be obtained by writing to:

Ohio EPA, Division of Surface Water
Monitoring and Assessment Section
1685 Westbelt Drive
Columbus, Ohio 43228-3809
(614) 728-3401

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FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or “biosurvey”, is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This effort may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire drainage basins, multiple and overlapping stressors, and tens of sites. Each year Ohio EPA conducts biosurveys in 10-15 different study areas with an aggregate total of 250-300 sampling sites.

Ohio EPA employs biological, chemical, and physical monitoring and assessment techniques in biosurveys in order to meet three major objectives: 1) determine the extent to which use designations assigned in the Ohio Water Quality Standards (WQS) are either attained or not attained; 2) determine if use designations assigned to a given water body are appropriate and attainable; and 3) determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices. The data gathered by a biosurvey is processed, evaluated, and synthesized in a biological and water quality report. Each biological and water quality study contains a summary of major findings and recommendations for revisions to WQS, future monitoring needs, or other actions which may be needed to resolve existing impairment of designated uses. While the principal focus of a biosurvey is on the status of aquatic life uses, the status of other uses such as recreation and water supply, as well as human health concerns, are also addressed.

The findings and conclusions of a biological and water quality study may factor into regulatory actions taken by Ohio EPA (*e.g.*, NPDES permits, Director’s Orders, the Ohio Water Quality Standards [OAC 3745-1], Water Quality Permit Support Documents [WQPSDs]), and are eventually incorporated into, State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, and the Ohio Water Resource Inventory (305[b]) report.

Hierarchy of Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. Ohio EPA relies on a tiered approach in attempting to link the results of administrative activities with true environmental measures. This integrated approach outlined in Figure 1 includes a hierarchical continuum from administrative to true environmental indicators. The six “levels” of indicators include: 1) actions taken by regulatory agencies (permitting, enforcement, grants); 2) responses by the regulated community (treatment works, pollution prevention); 3) changes in discharged quantities (pollutant loadings); 4) changes in ambient conditions (water quality, habitat); 5) changes in uptake and/or assimilation (tissue contamination, biomarkers, wasteload allocation); and, 6) changes in health, ecology, or other effects (ecological condition, pathogens). In this process the results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate

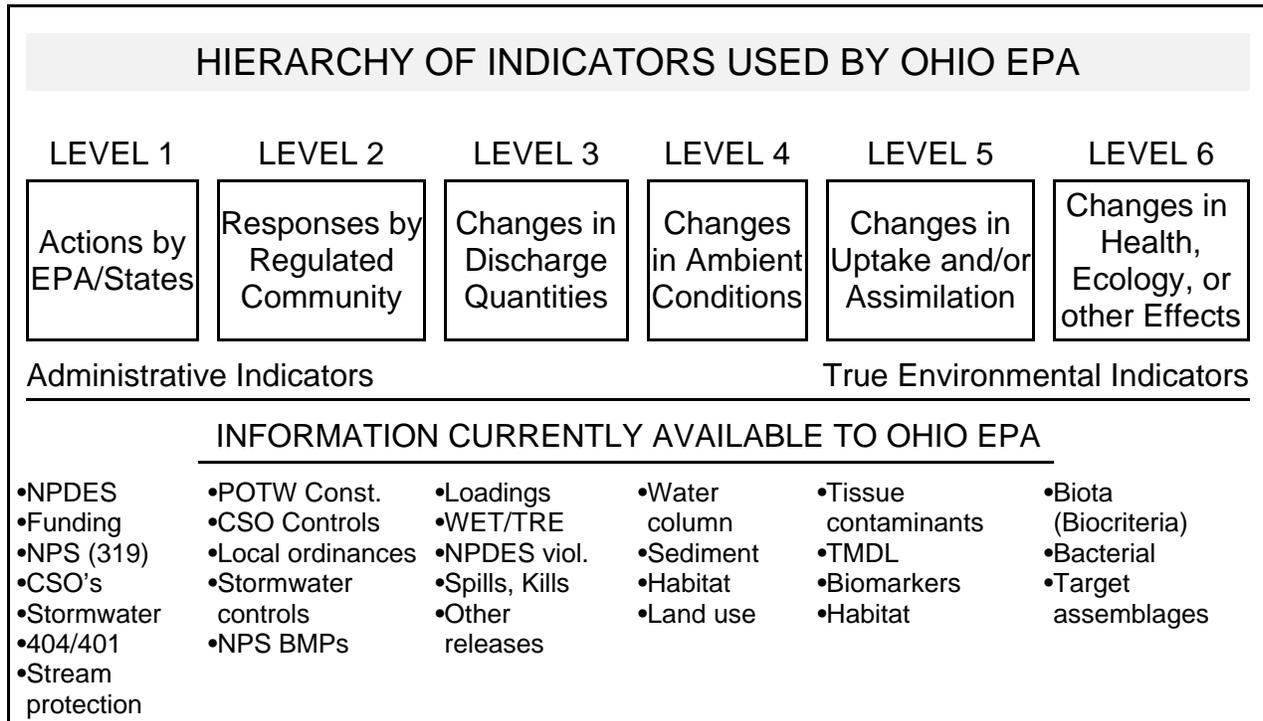


Figure 1 Hierarchy of administrative and environmental indicators used by Ohio EPA for monitoring, assessment, reporting, and evaluating program effectiveness (patterned after a model developed by the U.S. EPA, Office of Water).

into the environmental “results” (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition. Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent. *Response* indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise Ohio’s biological criteria. Other response indicators could include target assemblages, *i.e.*, rare, threatened, endangered, special status, and declining species or bacterial levels which serve as surrogates for the recreational uses. These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators *within* the roles which are most appropriate for each. Describing the causes and sources associated with observed impairments revealed by the biological criteria and linking this with pollution sources involves an interpretation of multiple lines of evidence including

water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data, and biological response signatures within the biological data itself. Thus the assignment of principal causes and sources of impairment represents the association of impairments (defined by response indicators) with stressor and exposure indicators. The principal reporting venue for this process on a watershed or subbasin scale is a biological and water quality report. These reports then provide the foundation for aggregated assessments such as the Ohio Water Resource Inventory (305[b] report), the Ohio Nonpoint Source Assessment, and other technical bulletins.

Ohio Water Quality Standards: Designated Aquatic Life Use

The Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the goals specified by each use designation. Use designations consist of two broad groups, aquatic life and non-aquatic life uses. In applications of the Ohio WQS to the management of water resource issues in Ohio's rivers and streams, the aquatic life use criteria frequently result in the most stringent protection and restoration requirements, hence their emphasis in biological and water quality reports. Also, an emphasis on protecting for aquatic life generally results in water quality suitable for all uses. The five different aquatic life uses currently defined in the Ohio WQS are described as follows:

- 1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*
- 2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (*i.e.*, declining species); *this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.*
- 3) *Cold-water Habitat (CWH)* - this use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR, Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.
- 4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned by state or federal law*; the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.

- 5) *Limited Resource Water (LRW)* - this use applies to small streams (usually <3 mi.² drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.*, true ephemeral streams), or other irretrievably altered waterways.

Chemical, physical, and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. As such the system of use designations employed in the Ohio WQS constitutes a “tiered” approach in that varying and graduated levels of protection are provided by each. This hierarchy is especially apparent for parameters such as dissolved oxygen, ammonia-nitrogen, temperature, and the biological criteria. For other parameters such as heavy metals, the technology to construct an equally graduated set of criteria has been lacking, thus the same water quality criteria may apply to two or three different use designations.

Ohio Water Quality Standards: Non-Aquatic Life Uses

In addition to assessing the appropriateness and status of aquatic life uses, each biological and water quality survey also addresses non-aquatic life uses such as recreation, water supply, and human health concerns as appropriate. The recreation uses most applicable to rivers and streams are the Primary Contact Recreation (PCR) and Secondary Contact Recreation (SCR) uses. The criterion for designating the PCR use is simply having a water depth of at least one meter over an area of at least 100 square feet or where canoeing is a feasible activity. If a water body is too small and shallow to meet either criterion the SCR use applies. The attainment status of PCR and SCR is determined using bacterial indicators (*e.g.*, fecal coliform, *E. coli*) and the criteria for each are specified in the Ohio WQS.

Water supply uses include Public Water Supply (PWS), Agricultural Water Supply (AWS), and Industrial Water Supply (IWS). Public Water Supplies are simply defined as segments within 500 yards of a potable water supply or food processing industry intake. The Agricultural Water Supply (AWS) and Industrial Water Supply (IWS) use designations generally apply to all waters unless it can be clearly shown that they are not applicable. An example of this would be an urban area where livestock watering or pasturing does not take place, thus the AWS use would not apply. Chemical criteria are specified in the Ohio WQS for each use and attainment status is based primarily on chemical-specific indicators. Human health concerns are additionally addressed with fish tissue data, but any consumption advisories are issued by the Ohio Department of Health and detailed in other documents.

**Biological and Water Quality Study
of
Twin Creek
1995**

Darke, Preble, Montgomery, and Warren Counties, Ohio

State of Ohio Environmental Protection Agency
Division of Surface Water
1800 WaterMark Drive
Columbus, Ohio 43266-1049

INTRODUCTION

As part of the five-year basin approach for monitoring, assessment, and the issuance of National Pollution Discharge Elimination System (NPDES) permits, ambient biological, water column chemical, sediment, and bioassay sampling was conducted in the Twin Creek basin from June to October 1995. This study area included a 46 mile reach of Twin Creek from Fowble Rd. (near Castine) downstream to the mouth, and sites on Swamp, Price, Goose, Aukerman, and Little Twin Creeks, Millers and Bantas Forks, Lesley and Tom's Runs, and Reigle Ditch. Table 4 and Figure 2 indicate sampling locations.

Specific objectives of this evaluation were to:

- 1) Monitor and assess the chemical, physical and biological integrity of the water bodies within the 1995 Twin Creek study area;
- 2) Evaluate the influence of the Lewisburg, Eldorado, West Alexandria, Gratis and Farmersville Wastewater Treatment Plants (WWTPs) within the Twin Creek watershed;
- 3) Evaluate the potential impacts from small industrial and commercial discharges, spills, nonpoint source pollution (NPS), and habitat alterations on the receiving streams;
- 4) Determine the attainment status of the current designated Exceptional Warmwater Habitat (EWH) and Warmwater Habitat (WWH) aquatic life use and other non-aquatic use designations and recommend changes in use where appropriate; and,
- 5) Conduct a water resource trend assessment where historical data exists.

The findings of this evaluation factor into regulatory actions taken by the Ohio EPA (*e.g.*, NPDES permits, Director's Orders, the Ohio Water Quality Standards [OAC 3745-1], Water Quality Permit Support Documents [WQPSDs]) and are incorporated into State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, and the biennial Water Resource Inventory (305[b]) report.

SUMMARY

Aquatic Life Use Attainment Status

Twin Creek

The 1995 Twin Creek study area included a mainstem reach beginning at RM 45.9 (Fowble Rd., near Castine) and extending downstream to the mouth and sites on 10 tributaries. Ambient mainstem water column chemical, physical and bacteriological sampling occurred at 13 stations; biological sampling occurred at 21 sites (Table 4). Based on the performance of biological communities with respect to ecoregional biocriteria, 92% (42.3 miles) of Twin Creek was considered to be in FULL attainment of the EWH aquatic life use designation. Only 3.6 miles (8%) demonstrated PARTIAL attainment of the EWH criteria.

Among Ohio streams this level of performance is nearly unrivaled. Twin Creek is home to the most exceptional macroinvertebrate community and second most exceptional fish community in the state. Likewise, physical habitat conditions are only better in one other Ohio stream. Only, Big Darby Creek attains slightly higher fish community and physical habitat scores over a 40 mile reach.

Tributaries

The various tributaries were sampled at 12 total locations where water column chemical, physical and bacteriological data were recorded. Biological samples were evaluated from 33 sites. Most locations surveyed throughout the basin met assigned aquatic life uses as determined by the applicable biological criteria. Exceptions were typically where nonpoint source pollution impinged on water quality and aquatic communities. **NON** and **PARTIAL** attainment of the EWH aquatic life use was recorded for Millers Fork downstream from SR 503 (RM10.0) and at Grubbs-Rex Rd. (RM10.75) respectively, due to poor golf course construction and agricultural drainage practices. Swamp Creek was determined to be in **PARTIAL** attainment of the WWH standard downstream from Verona (RM 5.2) where the impact of this unsewered community was apparent. Price Creek was in **NON** attainment downstream from Eldorado (RM 13.3-RM 7.6) and in **PARTIAL** attainment of the WWH aquatic life use upstream from Eldorado (RM 13.7) primarily attributable to nutrient enrichment from the WWTP although influences from agricultural practices and marginal habitat quality were also evident. Lesley Run at Snyder Rd. (RM 6.1) and Tom's Run from Amity Rd. to Bull Rd. were also in **PARTIAL** attainment of the WWH criteria. The departure from criteria at these locations was attributed to agricultural land use practices. Aquatic life use attainment status and biocriteria scores for all sampling locations are presented in Table 1.

Table 1. Attainment status of the existing or recommended aquatic life uses for the Twin Creek basin 1980 - 1995.

RIVER MILE Fish/Invert.	IBI	MIwb	ICI^a	QHEI	Attainment Status^b	Site Location
<i>Twin Creek 1995</i>						
<i>Eastern Corn Belt Plains (ECBP) - EWH Use Designation</i>						
45.9	46 ^{ns}	8.9 ^{ns}	—	44.0	(FULL)	Dst. Fowble Rd.
42.2	48 ^{ns}	8.7*	50/54	78.0	PARTIAL	Ust. Euphemia-Castine Rd.
37.9/ 38.1	53	9.5	46	81.0	FULL	Dst./ Ust. E. Lock Rd.
35.4/ 35.5	51	10.0	54	90.5	FULL	Dst. US 40, Swamp Ck.
35.0	56	9.6	E	84.0	FULL	Dst. Lewisburg WWTP
34.0	55	10.0	50	75.0	FULL	Dst. Iams & Ackey Co.s
31.7	54	9.9	48	64.0	FULL	Ust. Pyrmont Rd.
29.7	44*	9.2 ^{ns}	—	81.0	(PARTIAL)	Adj. New Market. Banta Rd.
27.5	50	9.9	50	91.5	FULL	Adj. Stotler Rd.
26.5/ 26.7	56	10.3	52	95.0	FULL	Dst. West Alexandria WWTP
25.2	56	10.1	48	88.0	FULL	Adj. N. Factory Rd.
23.9	52	9.9	—	91.5	(FULL)	Ust. Halderman Rd.
19.2	52	9.9	50	84.5	FULL	Ust. Gratis WWTP
19.0	54	10.6	48	87.5	FULL	Dst. Gratis WWTP
16.5/ 16.9	56	10.2	48	79.5	FULL	Adj. Lower Gratis Rd.
13.4	52	10.5	54	83.5	FULL	Dst. Tom's Run
9.8	56	10.9	E	89.5	FULL	Dst. Germantown Dam
8.2	56	9.7	—	80.5	(FULL)	Ust. Astoria Rd.
3.4	56	10.7	48	74.5	FULL	Ust. Chamberlain Rd.
0.6/ 1.0	52	10.5	E	80.5	FULL	Dst./ Ust. Franklin-Trenton Rd.
0.2/ 0.3	48 ^{ns}	10.3	E	77.0	FULL	Ust. Great Miami River
<i>Twin Creek 1988</i>						
0.3 ^B	43*	10.2	—	—	(PARTIAL)	Ust. Great Miami River
<i>Twin Creek 1986</i>						
35.5/35.8	49 ^{ns}	9.3 ^{ns}	46	84.5	FULL	Ust. US 40, Swamp Ck.
35.0	52	9.6	34*	92.0	PARTIAL	Dst. Lewisburg WWTP
31.7	38*	8.1*	44 ^{ns}	71.0	PARTIAL	Ust. Pyrmont Rd.
28.5	—	—	50	—	(FULL)	Adj. Lexington Salem Rd.
27.0	45*	9.5	—	88.0	(PARTIAL)	Ust. West Alexandria WWTP
26.7	41*	8.3*	—	80.0	(NON)	Dst. West Alexandria WWTP
25.2/25.8	49 ^{ns}	9.2 ^{ns}	48	—	FULL	Adj. N. Factory/ From Black Rd
23.9	45*	9.0 ^{ns}	50	88.5	(PARTIAL)	Ust. Halderman Rd.
19.2/19.1	48 ^{ns}	9.1 ^{ns}	46	90.5	FULL	Ust. Gratis WWTP
18.3/18.2	50	9.7	40*	89.5	PARTIAL	Dst. Gratis WWTP
16.9/16.6	54	8.4*	50	73.0	PARTIAL	Adj. Lower Gratis Rd.

Table 1. (continued)

RIVER MILE Fish/Invert.	IBI	MIwb	ICI^a	QHEI	Attainment Status^b	Site Location
<i>Twin Creek 1986 (continued)</i>						
12.2	—	—	52	—	(FULL)	Dst. Manning Rd.
9.8	51	9.7	—	90.5	(FULL)	Dst. Germantown Dam
6.9	—	—	52	—	(FULL)	Dst. S. Cherry St.
0.2 ^B /1.0	49	9.1 ^{ns}	48	73.5	FULL	Dst./ Ust. Franklin-Trenton Rd.
<i>Twin Creek 1984</i>						
41.3	—	—	30*	—	(NON)	Ust. Sonora Rd.
<i>Twin Creek 1983</i>						
42.2	41*	8.8*	—	51.0	(NON)	Ust. Euphemia-Castine Rd.
37.9/ 38.0	46 ^{ns}	8.8*	G*/42 ^{ns}	65.0	PARTIAL	Dst./ Ust. E. Lock Rd.
35.8	—	—	G*	—	(NON)	Ust. US 40, Swamp Ck.
34.9/ 35.0	52	9.8	G*	—	PARTIAL	Dst. Lewisburg WWTP
31.6/ 31.7	47 ^{ns}	8.8*	G*	—	PARTIAL	Ust. Pymont Rd.
27.5	—	—	G*	—	(NON)	Adj. Stotler Rd.
25.8	50	10.5	—	89.0	(FULL)	From Black Rd.
<i>Twin Creek 1980</i>						
0.3 ^B	39*	8.4*	—	—	(NON)	Ust. Great Miami River
<i>Millers Fork 1995 Eastern Corn Belt Plains (ECBP) - EWH Use Designation</i>						
10.7/10.75	46 ^{ns}	N/A	G*	28.5	PARTIAL	Dst. Grubbs-Rex Rd.
10.0/ 10.1	44*	N/A	F*	46.5	NON	Dst. SR 503
7.3	48 ^{ns}	N/A	VG ^{ns}	58.0	FULL	Adj. SR 503
0.3/ 0.4	56	9.7	E	76.0	FULL	Adj. Euphemia-Verona Rd.
<i>Swamp Creek 1995, Headwaters to RM 4.1 (ECBP) - WWH Use Designation</i>						
6.1/ 6.2	36 ^{ns}	N/A	MG ^{ns}	41.0	FULL	Dst. County Line Rd.
5.4/ 5.2	44	N/A	P*	58.0	NON	Adj. Euphemia Verona Rd.
<i>Swamp Creek 1995, RM 4.0 to Mouth (ECBP) - EWH Use Designation (Recommended)</i>						
2.7/ 1.7	56	N/A	E	67.5	FULL	From Swamp Ck/ Ust. Pundt Rd
0.3	56	N/A	—	78.0	(FULL)	Ust. US 40
<i>Price Creek 1995, Headwaters to RM 6.6 (ECBP) - WWH Use Designation</i>						
13.7/ 13.5	32*	N/A	MG ^{ns}	54.0	PARTIAL	Ust. Eldorado WWTP
13.3/ 13.2	34*	N/A	F*	52.0	NON	Dst. Eldorado WWTP
7.6	32*	N/A	F*	55.5	NON	Ust. US 40
<i>Price Creek 1995, RM 6.5 to Mouth (ECBP) - EWH Use Designation (Recommended)</i>						
3.9	48 ^{ns}	7.6*	E	87.0	PARTIAL	Ust. Jim's Run Rd.
0.6	52	9.5	E	82.0	FULL	Ust. SR 503
<i>Lesley Run 1995 Eastern Corn Belt Plains (ECBP) - WWH Use Designation</i>						
6.5/ 6.1	42	N/A	F*	53.5	PARTIAL	Ust. Snyder Rd.

Table 1. (continued)

RIVER MILE Fish/Invert.	IBI	MIwb	ICI ^a	QHEI	Attainment Status ^b	Site Location
Lesley Run 1995 (continued)						
1.2	48	N/A	—	70.0	(FULL)	At E. Factory Rd
Bantas Fork 1995 Eastern Corn Belt Plains (ECBP) - EWH Use Designation						
9.5/ 9.4	55	N/A	54	74.0	FULL	Ust. SR 127
1.4/ 1.3	52	9.9	56	96.5	FULL	Ust. SR 503
0.6/ 0.7	55	9.6	E	84.0	FULL	Adj. N. Factory Rd.
0.2	—	—	54	—	(FULL)	From Mill Rd.
Bantas Fork 1986						
9.4	47 ^{ns}	N/A	—	82.0	(FULL)	Ust. SR 127
7.8	—	—	VG ^{ns}	—	(FULL)	Ust. Eaton-Lewisburg Rd.
2.7	—	—	VG ^{ns}	—	(FULL)	Dst. Wolf Rd.
1.3	45	8.6*	VG ^{ns}	88.5	PARTIAL	Ust. SR 503
Goose Creek 1995, Headwaters to RM 3.1 (ECBP) - WWH Use Designation						
4.4	38 ^{ns}	N/A	G	56.5	FULL	Ust. Scheyhing Rd.
Goose Creek 1995, RM 3.0 to Mouth (ECBP) - EWH Use Designation (Recommended)						
0.2/0.4	50	N/A	E	70.0	FULL	Dst. Eaton-Lewisburg Rd.
Goose Creek 1994 Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
3.3 ⁽⁴²⁾	40	N/A	—	—	(FULL)	Ust. Winnerline Rd.
Aukerman Creek 1995 Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
0.2/ 0.5	44	8.7	E	66.5	FULL	Dst. Fudge Rd./ Eaton Rd.
Aukerman Creek 1994						
2.9 ⁽⁴²⁾	42	N/A	—	—	(FULL)	Dst. Ketterman Rd.
Tom's Run 1995 Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
12.1	38 ^{ns}	N/A	F*	68.0	PARTIAL	Ust. Amity Rd.
8.5/ 8.3	50	N/A	F*	78.0	PARTIAL	Ust./ Dst. Bull Rd.
0.4	50	8.5	E	69.5	FULL	Adj. Anthony Rd.
Tom's Run 1993						
9.7	—	—	VG/30*	—	(PARTIAL)	Dst. Old Dayton Rd.
5.3	40	N/A	VG	74.0	FULL	Farmersville-W. Alexandria
0.4/ 0.7	48	8.0 ^{ns}	E/46	80.0	FULL	Dst. Lower Gratis Rd.
Tributary to Tom's Run at RM 5.34 (ECBP) - WWH Use Designation (Recommended)						
0.9	40	N/A	—	58.5	(FULL)	Farmersville-W. Alexandria
0.1	46	N/A	MG ^{ns}	80.0	FULL	Ust Toms Run
Little Twin Creek 1995 E. Corn Belt Plains (ECBP) - EWH Use Designation (Recommended)						
6.3	45 ^{ns}	N/A	52	67.0	FULL	Ust. Hemple Rd.
4.7	53	N/A	34*	60.5	PARTIAL	Ust. Farmersville W. Carrollton
2.7	52	N/A	56	74.0	FULL	Ust. Little Twin Rd.

Table 1. (continued)

RIVER MILE Fish/Invert.	IBI	MIwb	ICI ^a	QHEI	Attainment Status ^b	Site Location
Little Twin Creek 1986 <i>Eastern Corn Belt Plains (ECBP) - WWH Use Designation</i>						
6.3	47	N/A	22*	65.5	PARTIAL	Ust. Hemple Rd.
4.7/ 4.8	46	N/A	32 ^{ns}	58.5	FULL	Ust. Farmersville W. Carrollton
2.7/ 2.8	47	N/A	26*	66.5	PARTIAL	Dst. Manning Rd.
Reigle Ditch 1995 <i>Eastern Corn Belt Plains (ECBP) - WWH Use Designation</i>						
0.5	41	N/A	G	69.0	FULL	Ust. Farmersville WWTP
0.3/ 0.4	45	N/A	MG ^{ns}	67.5	FULL	Dst. Farmersville WWTP
Reigle Ditch 1986						
0.5	37 ^{ns}	N/A	MG ^{ns}	68.0	FULL	Ust. Farmersville WWTP
0.3	27*	N/A	P*	64.5	NON	Dst. Farmersville WWTP

Ecoregion Biocriteria: E. Corn Belt Plains (ECBP)

INDEX - Site Type	WWH	EWH
IBI Headwater - Wading/ Boat	40/ 42	50
MIwb Wading/ Boat	8.3/ 8.5	9.4/ 9.6
ICI	36	46

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

ns Nonsignificant departure from biocriterion (≤4 IBI or ICI units; ≤0.5 MIwb units).

a Narrative evaluation used in lieu of ICI (E=Exceptional; G=Good; MG=Marginally Good; F=Fair; P=Poor).

b Use attainment status based on one organism group is parenthetically expressed.

N/A Not Applicable. The MIwb is not applicable to headwater sites.

B Boat site. Headwater - wading criteria apply to all other sites.

42 Data collected by Miami University and validated by Ohio EPA for attainment status.

Twin Creek

Twin Creek was in full attainment of EWH criteria at all but two locations in the 46 miles sampled in 1995. At these two sites the departure from ecoregional expectations was due to subpar fish community performance. All 1995 Twin Creek macroinvertebrate samples reflected exceptional performance. Likewise, the physical habitat in Twin Creek was also considered exceptional.

At Euphemia Castine Rd. (RM 42.2) low gradient and other natural wetland type qualities influenced the fish community resulting in a narratively good MIwb score (8.7). Although this score represented a significant departure from the EWH biocriterion (by 0.2 units), it was not considered indicative of any specific water quality perturbation. The average diel dissolved oxygen (D.O.) concentration was less than the EWH criterion but consistent with values from other wetland stream

reaches. Rather, the fish community performance was better than might have been expected given the site specific habitat limitations. The EWH MIwb biocriterion is an extremely high standard to meet in any wetland reach and attainment was achieved in one of the two samples at this site.

The other location at which EWH departure was recorded was downstream from the confluence with Price Creek, adjacent to New Market-Banta Rd. (RM 29.7). Here, the fish community averaged a narratively good IBI score (44). This score was interpreted as an indication of nutrient enrichment. It also reflected the nuances caused by the collection at this site of the highest amount of stoneroller biomass recorded by the Ohio EPA in more than 20 years of sampling. In deference to this and despite the IBI score, an exceptional fish community inhabited the site.

Evidence of nutrient enrichment was common throughout the Twin Creek watershed. Peak nitrate+nitrite-N concentrations during runoff were high and biological productivity was frequently extremely elevated. However within the mainstem, nutrients appeared to be assimilated and converted via the aquatic food chain into the production of fish biomass. Large populations of pollution sensitive fish species including black redhorse, northern hogsuckers, striped shiners, rock bass, smallmouth bass and rainbow darters were typically encountered. Many rare or pollution sensitive macroinvertebrates were also present. In all, xx macroinvertebrate taxa and 52 fish species were collected in Twin Creek in 1995.

These conditions represented an improvement since a 1986 biosurvey documented some modest impairment in several reaches immediately downstream from municipal WWTPs. Although biological performance in 1986 was generally very good, the 1995 biosurvey confirmed that facility upgrades were warranted and that biological performance would subsequently be enhanced.

Permitted Dischargers

Three small municipal WWTPs and four small private treatment facilities discharge directly to Twin Creek. The Lewisburg WWTP has an annual average discharge of 0.158 million gallons per day (MGD) and is operating at near capacity (0.174 MGD). Although the plant has generally been well operated, an increasing residential population and a system with infiltration and inflow (I&I) problems pointed to the need for future facility upgrades.

The West Alexandria WWTP was upgraded in 1990 following an Ohio EPA consent order agreement with the Village. The plant has a history of variable discharge quality and the highest ammonia-N loading in the Twin Creek basin. The present permit does not limit winter ammonia-N loadings and the summer limit is not restrictive. Water column sampling downstream from the WWTP recorded the highest mainstem ammonia-N concentrations, gross exceedences of fecal coliform bacteria recreational exposure criteria and atypical diel D.O. concentration regimes.

The Gratis WWTP permit compared to that of West Alexandria is restrictive of ammonia-N. As one consequence, the Gratis WWTP had the highest number of ammonia-N permit violations. This was partly due to lagoon treatment limitations although in recent years the ammonia-N loadings have

been nominal. Gratis has severe I&I problems and an occasionally variable discharge inherent to lagoon technology.

The Iams Company has proposed a treatment facility expansion to 0.075 MGD from an existing 0.038 MGD capacity. Presently, the plant is operating at capacity with a permit limiting concentration rather than loading. As such, the ammonia-N concentration limit was exceeded 18 times in four years. The Carl S. Akey Company discharges about 1000 gallons per day of apparently well treated wastewater. Information about the operation of package treatment facilities maintained by the Marathon Oil Company and Twin Valley Mobile Home Park suggested both were substandard.

Millers Fork

Millers Fork was biologically sampled at four locations including one site at which a round of chemical samples was collected. Initially, only two biological sample collection sites were planned on Millers Fork. However, during the first fish sampling pass, "murkiness" in the water column at RM 0.3 provided the impetus leading to the discovery of a construction site ten miles upstream.

The Beechwood golf course and housing development at SR 503 (RM 10.2) included over five acres of bare soil along both recently altered Millers Fork stream banks. Sediment runoff abatement practices were essentially absent. Despite the obvious pollution originating from the site and poor habitat conditions, biological scores improved longitudinally downstream from the most upstream site with only a slight interruption by the golf course. This was considered more reflective of the stream assimilative capacity and the lack of other overlying impacts than the absolution of poor construction practices. Full EWH attainment was recorded at RM 7.3 and RM 0.3.

Although the disruption in biological performance was longitudinally brief and likely limited in time, the pervasive influence of such nonpoint source pollution is a significant threat in a high quality watershed. Moreover, the fact that this situation was unusual is telling. Millers Fork and Twin Creek have retained a higher degree of integrity because large scale development common to other Ohio watersheds has been limited. Such development, if not properly controlled, will lead to an eventual decline in overall water resource integrity.

Swamp Creek

Four biological sampling sites including two at which chemical monitoring occurred bracketing the Village of Verona (RM 5.8) were located in Swamp Creek. Verona lacks a centralized wastewater treatment system. Poor macroinvertebrate community performance, gross exceedences of fecal coliform bacteria WQS criteria, high ammonia-N levels, strong septic odors, and human-hygiene devices in the water were evidence that poorly treated domestic sewage was contaminating the creek downstream from Verona. This severe impact was fairly localized as the biological performance recovered to exceptional at RM 2.7 and RM 0.3.

Price Creek

Biological sampling was conducted at five sites in Price Creek with chemical sampling at two bracketing the Eldorado WWTP. Results indicated that nutrient enrichment from the WWTP and polluted runoff from agricultural sources were significant sources of degradation. High nutrient concentrations downstream from the plant coincided with a decline in macroinvertebrate community performance. The fish community, while less affected by WWTP enrichment, appeared to be hampered by habitat impairment which was especially prevalent in the upper reach of Price Creek. Substrates were extremely embedded and unrestricted livestock access was observed at several locations. Overall, the fish community performance in the upper reach of Price Creek was distinguished as the most deficient in the entire study area.

Permitted Dischargers

The Eldorado WWTP is the only discharge to Price Creek. Built in 1980, the plant is currently operating at about half (0.052 MGD) of the design capacity (0.1 MGD). Generally the WWTP effluent comprises about half of the stream flow, hence the plant is capable of exerting a substantial influence on Price Creek. Elevated phosphorus in downstream water column samples and an increasing trend in ammonia-N concentrations were suggestive of some operational difficulties.

Lesley Run

Poor riparian conditions and impacts from polluted agricultural runoff including instream livestock watering were observed in Lesley Run. These conditions improved longitudinally downstream and biological performance increased narratively from fair to very good.

Permitted Dischargers

No influence was detected from the Mid Valley Pipeline Company transfer station stormwater discharge.

Bantas Fork

The biological performance in Bantas Fork was extraordinary. Among all small Ohio streams (<50 mi²) with more than one sample site in the Ohio EPA database, Bantas Fork is distinguished for having the highest macroinvertebrate and fish community index scores. Likewise, the physical habitat and chemical monitoring results were also indicative of exceptional quality.

Small intact EWH Ohio streams are rare in that these streams are more easily degraded than larger rivers and very few consistently maintain a high degree of biological integrity from headwaters to mouth. Bantas Fork with the exceptional performance documented in 1995 is unique among this category of Ohio streams.

Goose Creek

The influence of two small wastewater package treatment facilities was evident on the biological community in Goose Creek, a Bantas Fork tributary. Atypical chemical parameter results also implicated treatment inefficiencies. Although the impact was localized and downstream biological performance prior to the Bantas Fork confluence was exceptional, it is a concern in an otherwise

unique high quality subbasin.

Permitted Dischargers

Both the Truck Stop of America and Pilot Oil Travel Center discharge to Goose Creek. The Truck Stop of America lacks a current NPDES permit and self monitoring data has not been submitted to the Ohio EPA. The Pilot Oil Travel Center has had CBOD₅ and chlorine violations and an oily residue has been observed downstream from their outfall. Otherwise, little is known about the treatment efficiencies of either except that downstream sampling implicated one or both for faulty operation.

Aukerman Creek

Aukerman Creek supported good fish and exceptional macroinvertebrate communities including some rare, coldwater taxa. Despite the presence of an impressive macroinvertebrate assemblage, nutrient enrichment was also indicated by the collection of certain midge species and an inordinately high macroinvertebrate population density. Polluted runoff from Gratis and agricultural land use were considered the most likely sources of this enrichment.

Tom's Run

Polluted runoff from agricultural and other sources along with past channel modifications were deemed the likely factors which limited biological performance in the upper reaches of Tom's Run and an unnamed tributary at RM 5.34. Conditions improved longitudinally downstream with exceptional biological performance recorded near the Twin Creek confluence.

Little Twin Creek

Overall, an exceptional biological community inhabited Little Twin Creek in 1995. However, the Farmersville WWTP did affect the aquatic biota downstream from the Reigle Ditch confluence through gross organic enrichment and increased flow. While the fish community was able to capitalize on this, the macroinvertebrate community reflected the enrichment through a decline to marginally good performance. Observation of increasing rural housing development and associated polluted runoff and aspects of agricultural runoff were also considered possible threats to the aquatic community.

Reigle Ditch

Ample evidence of nutrient enrichment was evident in water chemistry results downstream from the Farmersville WWTP and displayed to a lesser extent by the biological community performance. As with the situation in Little Twin Creek, the fish community significantly increased numerically and included species atypical for the watershed size whereas the macroinvertebrate community shifted in the comparative presence of more tolerant taxa downstream from the WWTP.

Permitted Dischargers

Built in 1961 and most recently upgraded in 1994, the Farmersville WWTP has a history of permit violations which resulted in the 1995 signing of a consent order and payment of a civil penalty for

significant noncompliance. In the summer Reigle Ditch usually becomes intermittent. At these times, the stream flow downstream from the plant is entirely effluent. Any deviance in treatment efficiency then would have an immediate impact on biological communities. The WWTP has improved operation as compliance has been noted consistently since July, 1994

CONCLUSIONS

- C Twin Creek is home to the most exceptional macroinvertebrate community in Ohio. At all 1995 sampling locations, EWH ecoregional expectations were met without any significant biocriterion departure. Consistent macroinvertebrate community performance at this level over as long a sampling reach (>40 mi) has only been documented in Twin Creek.
- C Twin Creek is home to the second most exceptional fish community in Ohio. Although two incidences of significant EWH biocriterion departure were recorded in 1995, neither of these instances were the result of a compelling water quality issue. In Ohio, only Big Darby Creek maintains a fish community which consistently achieves higher biocriterion scores over as long a sampling reach (>40 mi) as Twin Creek.
- C Twin Creek warrants further distinction for the exceptional quality of physical habitat (QHEI \bar{O} =82.8, n=20) documented along its course in 1995. Again, in Ohio only Big Darby Creek is distinguished for higher QHEI scores (\bar{O} =86.8, n=16) recorded over a similar length reach.
- C Twin Creek merits the highest level of protection available in the effort to preserve and enhance exceptional water quality and biological health in Ohio. Only Big Darby Creek, a nationally recognized stream, achieves as high or higher biological and physical habitat index scores in Ohio.
- C Bantas Fork is unique among all small Ohio streams. The fish and macroinvertebrate performance in Bantas Fork achieved the highest index scores in the Ohio EPA database among small streams (<50 mi²) with more than one sample site. Likewise, the physical habitat was extraordinary as demonstrated by QHEI scores (\bar{O} =84.8, n=3).
- C Bantas Fork, like Twin Creek, merits the highest level of protection available in the effort to preserve and enhance water quality and biological integrity in Ohio.
- C Polluted runoff, primarily from agricultural land use and livestock operations but also from impervious surfaces, construction sites, and residential areas, was determined to be the most threatening aspect to water quality and biological integrity in the Twin Creek watershed in 1995.
- C Improved operational efficiency and upgrades at municipal WWTPs were correlated with increased biological community performance and better ambient water quality between 1986 and 1995 in the Twin Creek basin.

RECOMMENDATIONS

Status of Aquatic Life Uses

Most of the streams evaluated in this study were originally designated for aquatic life use in the 1978 and 1985 Ohio WQS (Table 2). The current biological data collection methods and numerical criteria did not exist then. Since this study was the first time a standardized biological approach was used to evaluate aquatic life use designations for several subbasin streams, some changes may appear to be “upgrades” (*i.e.*, WWH to EWH). However, these changes should not be so construed because this study as an objective and robust use evaluation is precedent setting in comparison to the 1978 and 1985 designations. Ohio EPA is obligated by a 1981 public notice to review and evaluate all aquatic life use designations outside of the WWH use prior to basing any permitting actions on the existing, unverified use designations. Thus some of the following aquatic life use recommendations constitute a fulfillment of that obligation.

Twin Creek has been assigned the EWH aquatic life use. In 1995, the consistent performance of the biological community in attaining the EWH biocriteria clearly demonstrated that this designation is appropriate and should be retained.

The current EWH aquatic life use designations for Millers Fork and Bantas Fork should also be maintained. These designations were considered appropriate based on ambient macrohabitat conditions and the 1995 attainment status. Although the upper reach of Millers Fork was impaired through some physical habitat degradation and impacted by polluted construction site runoff, good and very good biological performance in this reach indicated a reasonable likelihood that with the abatement of these stressors, the entire stream will achieve EWH attainment.

Little Twin Creek is presently designated for the WWH aquatic life use. In 1995, biological community performance was generally exceptional. Physical habitat conditions ($QHEIO=67.2, n=3$) in the subbasin, while more than adequate for WWH, were slightly below that generally present in EWH streams. However, the improving trend in biological and habitat index scores from 1986 was a critical factor in recommending Little Twin Creek for the EWH aquatic life use. Considering the status of Little Twin Creek in light of this improvement, it is apparent that the biological potential of the stream was previously underrated. Given the present community performance, it is reasonable to expect the stream to attain the EWH standard.

Similarly, the biological performance in the lower reaches of Swamp, Price, and Goose Creeks demonstrated that these streams can and do attain the EWH biocriteria. Habitat in and along these lower reaches was typically very good. Hence it is appropriate to designate the reaches identified in Tables 1 and 2 for the EWH aquatic life use. The upstream reaches of Swamp Creek and Price Creek were determined to be in non-attainment of the WWH use. In both instances, the ambient biological potential of the respective reaches was easily within the WWH range. With efforts to remediate the causes of the impairment in these upper reaches, it is possible that the length of EWH designation

Table 2. Waterbody use designations for the Twin Creek basin. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). Designations based on Ohio EPA biological field assessments appear as a plus sign (+). Designations based on the 1978 and 1985 standards for which results of a biological field assessment are now available are displayed to the right of existing markers. A delta () indicates a new recommendation based on the findings of this report.

Stream Segment	Use Designations												
		Aquatic Life Habitat						Water Supply			Recreation		
	S R W	W W H	E W H	M W W	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R	S C R
Twin Creek													
Lesley Run to SR 725	*		+						+	+		+	
all other segments			+						+	+		+	
Little Twin Creek		*)						*+	*+		*+	
Reigle Ditch		+							+	+		+	
Toms Run		*+							*+	*+		*+	
Tributary at RM 5.34))))	
Wysong Run		*							*	*		*	
Aukerman Creek		*+							*+	*+		*+	
Bantas Fork			*+						*+	*+		*+	
Goose Creek													
Headwater-RM 3.1		*+							*+	*+		*+	
RM 3.0-Mouth)						*+	*+		*+	
Lowry Run		*							*	*		*	
Lesley Run		*+							*+	*+		*+	
Coffman Run		*							*	*		*	
Price Creek													
Headwater-RM 6.6		*+							*+	*+		*+	
RM 6.5-Mouth)						*+	*+		*+	
Jims Run		*							*	*		*	
Swamp Creek													
Headwaters-RM 4.1		*+							*+	*+		*+	
RM 4.0 to Mouth)						*+	*+		*+	
Millers Fork			*+						*+	*+		*+	
Lick Run		*							*	*		*	
Dry Fork		*							*	*		*	

could some day be extended.

Other streams in the Twin Creek basin are appropriately designated for the WWH aquatic life use.

Based on 1993 biosurvey results, an unnamed tributary to Tom's Run at RM 5.34 should be designated for the WWH aquatic life use. This stream was previously not designated.

Status of Non-aquatic Life Uses

All non-aquatic life uses should remain as presently designated in the Ohio Water Quality Standards (Table 2). An unnamed tributary to Tom's Run at RM 5.34 was previously not designated. This stream should be designated for Agricultural and Industrial Water Supply and Primary Contact Recreation consistent with other streams in the watershed.

Future Monitoring Needs

A complete reevaluation of the Twin Creek study area should be conducted in the year 2000 or 2005 as provided in the five-year basin approach to monitoring and NPDES permit reissuance. The urgency of the reassessment should consider the rate of land use and population changes within the watershed.

Polluted runoff, primarily from agricultural sources, was determined to be the overall most significant cause of degradation in the 1995 Twin Creek study area. Future monitoring should attempt to better characterize this influence. Consideration should be given to more extensive habitat evaluation and to accurately compare relative sediment bed loads in the various tributaries. Riparian quality along the various tributaries should also be documented and compared with survey results.

Extensive use of continuous monitoring (Datasonde[®]) data is suggested for future surveys to identify sources of nutrient enrichment. Deployment of these devices for the 1995 survey was directed at assessing and modeling the Lewisburg and West Alexandria WWTPs. In the future, priority should be given to collecting continuous monitoring data from the tributaries and at mainstem sites bracketing the tributaries. In essence, the tributaries should be construed as potential pollution point sources and the monitoring effort arranged accordingly.

Other Recommendations

Across Ohio, many citizen groups have formed specifically to work toward improving the status of a favored stream. These watershed groups promote awareness of local water quality issues and focus attention on basin specific needs. Often they are successful in coordinating grants for pollution abatement or educational programs. We are unaware of any watershed group or of any grants dedicated to enhancing water resources in Twin Creek. With the probability that future development will occur and the importance that any land use changes in the basin be carefully implemented, it is appropriate to recommend the formation of a Twin Creek watershed group.

STUDY AREA

The Twin Creek watershed drains an area of 316 mi² (Figure 2). Twin Creek, 47.03 miles long, originates in Darke Co., Butler Twp., flows southeast into Preble Co. and generally south through the eastern portion of the county, then southeast through the southwest corner of Montgomery Co., and then into Warren Co., Franklin Twp. where it meets the Great Miami River. The average gradient is 9.1 feet per mile (from an elevation of 1067 to 645 feet above mean sea level, Ohio DNR 1960). Principal tributaries to Twin Creek include Maple Swamp Ditch (essentially the mainstem above RM 47.0), Millers Fork, Swamp Creek, Price Creek, Lesley Run, Bantas Fork, Aukerman Creek, Tom's Run and Little Twin Creek. Associated stream characteristics and identified pollution sources are listed in Table 3. Table 4 indicates the location of all chemical, physical, and biological sampling sites in the study area.

Located in the Eastern Corn Belt Plains ecoregion, the Twin Creek watershed is typified by gently rolling glacial till plains including moraines, kames and outwash features (Omernick and Gallant 1988). Original vegetation was mostly beech forest with areas of elm-ash swamp forests. Near the Great Miami River confluence an area of oak-sugar maple and bottomland hardwood forest existed in presettlement times. Remnants of these forest types still exist in isolated locations (Gordon 1966). Silurian and ordovician era bedrock is exposed principally as limestone with some shale outcrops. Soils are considered nearly level to gently sloping and tend to be neutral to slightly alkaline. Drainage varies from well to very poorly drained.

Land use is predominantly row crop agriculture with some livestock production. An extensive tile drainage system has been installed and the extreme headwaters of many small streams have been channelized. Soil erosion, a primary nonpoint source pollution type of impact in the study area, was most prevalent in Price Creek, where sand and silt bed loads were extensive in the upper reach. The Preble Co. Soil and Water Conservation District estimates about half of the land used for corn or soybean production is cultivated using conservation tillage techniques (Preble 1996). Seventy six animal feedlot operations including 10,026 animal units exist in the Darke, Preble and Montgomery county portions of the study area (MVRPC 1991, 1992). These operations produce approximately 9,614 tons of animal waste annually. Animal agricultural facilities are most dense in the Darke Co. upper watershed area.

Germantown, the largest community in the watershed (pop. 4916) is served by the Franklin WWTP which discharges to the Great Miami River (population sizes from U.S. Census Bureau, U.S. Gazetteer search; www.census.gov/cgi-bin/gazetteer). Five smaller communities in the watershed are served by WWTPs which discharge in the basin including Lewisburg (pop. 1584), Eldorado (pop. 549), West Alexandria (pop. 1460), Gratis (pop. 998), and Farmersville (pop. 932). A small part of Eaton lies within the basin but is served by city sewers flowing to a WWTP on Seven Mile Creek. The rest of the watershed is served by on-site septic systems.

Table 3. Stream characteristics and significant identified pollution sources in the Twin Creek study area.

Stream Name	Length (Miles)	Average Fall (Ft/Mile)	Drainage Area (Mi²)	Nonpoint Source Pollution Issues	Point Sources Evaluated
Twin Creek	47.03	9.1	316	Agriculture Storm runoff Land disposal	Lewisburg WWTP Iams Co. Carl Akey Co. W. Alexandria WWTP Gratis WWTP
Millers Fork	10.6	9.6	24.2	Agriculture Beechwood golf course construction	
Swamp Creek	7.3	12.2	18.0	Agriculture Verona sewage	
Price Creek	14.6	17.6	29.4	Agriculture	Eldorado WWTP
Lesley Run	8.5	22.8	8.2	Agriculture Land disposal	Mid Valley Pipeline
Bantas Fork	16.8	20.6	35.1	Agriculture	
Goose Creek	5.1	24.3	11.3	Agriculture Storm runoff	Truck Stop of America Pilot Oil Travel Center
Aukerman Creek	5.6	29.5	20.8	Agriculture	
Tom's Run	13.5	20.8	25.7	Agriculture Land disposal	
Little Twin Creek	7.8	25.1	22.7	Agriculture	
Reigle Ditch	4.7	29.4	3.4	Agriculture	Farmersville WWTP

Much of the Twin Creek watershed overlies the Great Miami River Buried Valley Aquifer System. This ancient river valley filled with glacially deposited sand, gravel and clay till to depths of 200 feet is the principal water source for the area. Designated as a Sole Source Aquifer by the U.S. EPA in 1988, all federally funded projects within the aquifer must be reviewed for their potential water quality impact. Additionally, many communities have enacted or are considering wellhead protection legislation.

The Miami Valley Conservancy District maintains Germantown Dam, a flow through structure at RM 10.08. Constructed after the 1913 flood, the dam reduces flood flows downstream at

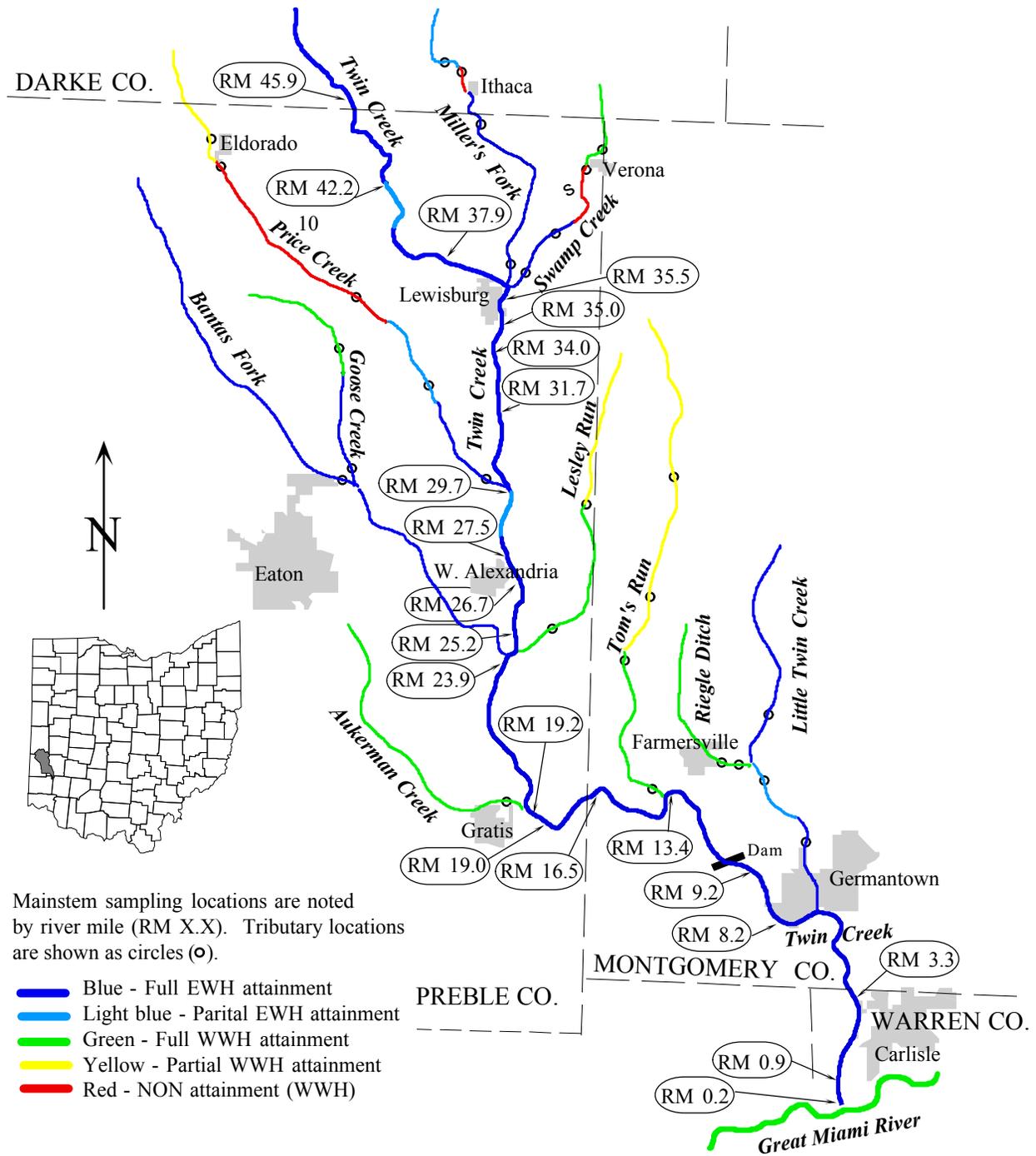


Figure 2 The Twin Creek study area showing principal streams, 1995 attainment status and population centers.

Table 4. Sampling locations in the Twin Creek study area, 1995 (C - conventional water chemistry, CO - water column organics, SO - sediment organics, SM - sediment metals, D - Datasonde[®] continuous monitors, M - macroinvertebrates, F - fish, FT - Fish Tissue).

<i>Stream/ River Mile</i>	Type of Sampling	Latitude/Longitude	Site Location	USGS 7.5' Map
<i>Twin Creek</i>				
45.9	F	39/55'43"/84/36'46"	Dst. Fowble Rd.	Arcanum
42.2	M, F	39/53'48"/84/35'41"	Ust. Euphemia-Castine Rd.	Lewisburg
42.08	C, SO, SM, D	39/53'48"/84/35'41"	Euphemia-Castine Road	Lewisburg
38.1	M	39/51'58"/84/34'01"	Ust. E. Lock Rd.	Lewisburg
37.9	F	39/51'56"/84/33'59"	Dst. E. Lock Rd.	Lewisburg
35.54	C,	39/51'10"/84/31'57"	Dst. US 40, Swamp Ck.	Lewisburg
35.5	M	39/51'09"/84/31'57"	Dst. US 40, Swamp Ck.	Lewisburg
35.4	F, FT	39/51'02"/84/31'56"	Dst. US 40, Swamp Ck.	Lewisburg
35.0	M, F	39/50'44"/84/32'04"	Dst. Lewisburg WWTP	Lewisburg
34.90	C, D,	39/50'39"/84/31'57"	Dst. Lewisburg WWTP	Lewisburg
34.00	C, CO, SO, SM	39/50'03"/84/32'16"	Dst. Iams & Ackey Co.s	Lewisburg
34.0	M, F	39/50'02"/84/32'15"	Dst. Iams & Ackey Co.s	Lewisburg
31.7	M, F	39/48'14"/84/31'50"	Ust. Pymont Rd.	Lewisburg
31.65	C	39/48'09"/84/31'49"	Ust. Pymont Rd.	Lewisburg
29.7	F	39/46'45"/84/31'27"	Adj. New Market. Banta Rd.	Lewisburg
27.57	C, D	39/45'07"/84/31'39"	Adj. Stotler Rd.	Lewisburg
27.5	M, F	39/45'03"/84/31'39"	Adj. Stotler Rd.	Lewisburg
26.7	M	39/44'30"/84/31'17"	Dst. West Alexandria WWTP	West Alexandria
26.70	C, CO, SO SM, D	39/44'27"/84/31'16"	Dst. West Alexandria WWTP	West Alexandria
26.5	F, D (25.8)	39/44'19"/84/31'07"	Dst. West Alexandria WWTP	West Alexandria
25.2	M, F,	39/43'27"/84/32'18"	Adj. N. Factory Rd.	West Alexandria
24.3	D	39/43'00"/84/32'00"	Dst. Bantas Fork	
23.9	F, D (21.4)	39/42'45"/84/31'28"	Ust. Halderman Rd.	West Alexandria
19.26	C,D	39/39'24"/84/30'44"	Ust. Gratis WWTP	West Alexandria
19.2	M, F	39/39'21"/84/30'41"	Ust. Gratis WWTP	West Alexandria
19.0	M, F	39/39'19"/84/30'27"	Dst. Gratis WWTP	West Alexandria
18.27	C, CO, D	39/38'53"/84/29'54"	Dst. Gratis WWTP	Farmersville
16.9	M	39/39'39"/84/28'58"	Ust. County Line Rd.	Farmersville
16.5	F	39/39'55"/84/28'33"	Adj. Lower Gratis Rd.	Farmersville
13.51	C	39/39'48"/84/26'36"	Dst. Tom's Run	Farmersville
13.4	M, F, D	39/39'53"/84/26'32"	Dst. Tom's Run	Farmersville
9.8	M, F, D	39/38'12"/84/23'55"	Dst. Germantown Dam	Farmersville
9.27	C	39/38'09"/84/23'50"	At USGS Gage	Farmersville
8.2	F	39/37'00"/84/23'11"	Ust. Astoria Rd.	Middletown

Table 4.

<i>Stream/ River Mile</i>	Type of Sampling	Latitude/Longitude	Site Location	USGS 7.5' Map
3.4	M, F, FT	39/35'08"/84/20'39"	Ust. Chamberlain Rd.	Franklin
3.3	C, D	39/35'04"/84/20'42"	Ust. Chamberlain Rd.	Franklin
1.0	M	39/33'22"/84/21'00"	Ust. Franklin-Trenton Rd.	Franklin
0.95	C, CO, SO SM, D	39/33'24"/84/21'02"	Ust. Franklin-Trenton Rd.	Franklin
0.6	F	39/33'08"/84/20'54"	Dst. Franklin-Trenton Rd.	Franklin
0.3	M	39/32'52"/84/20'58"	Ust. Great Miami River	Franklin
0.2	F	39/32'49"/84/20'55"	Ust. Great Miami River	Franklin
<i>Millers Fork</i>				
10.75	M	39/57'37"/84/34'06"	Dst. Grubbs-Rex Rd.	Arcanum
10.7	F	39/57'34"/84/34'08"	Dst. Grubbs-Rex Rd.	Arcanum
10.12	C	39/57'11"/84/34'22"	At SR 503	Arcanum
10.1	M	39/57'10"/84/34'22"	Dst. SR 503	Arcanum
10.0	F	39/57'03"/84/34'25"	Dst. SR 503	Arcanum
7.3	M, F	39/55'42"/84/33'09"	Adj. SR 503	Arcanum
0.4	M	39/51'38"/84/31'46"	Adj. Euphemia-Verona Rd.	Lewisburg
0.3	F	39/51'34"/84/31'48"	Adj. Euphemia-Verona Rd.	Lewisburg
<i>Swamp Creek</i>				
6.2	M	39/54'32"/84/29'08"	Dst. County Line Rd.	Laura
6.19	C	39/54'33"/84/29'09"	Dst. County Line Rd.	Laura
6.1	F	39/54'29"/84/29'13"	Dst. County Line Rd.	Laura
5.4	F	39/54'05"/84/29'37"	Adj. Euphemia Verona Rd.	Laura
5.2	M	39/54'00"/84/29'38"	Adj. Euphemia Verona Rd.	Laura
5.20	C	39/53'56"/84/29'39"	Adj. Euphemia Verona Rd.	Laura
2.7	F	39/52'39"/84/30'32"	From Swamp Ck. Rd. RR tracks	Laura
1.7	M	39/52'00"/84/31'02"	Ust. Pundt Rd.	Lewisburg
0.3	F	39/51'24"/84/31'49"	Ust. US 40	Lewisburg
<i>Price Creek</i>				
13.7	F	39/54'11"/84/40'52"	Ust. Pence Shewman Rd.	New Madison
13.61	C	39/54'07"/84/40'52"	Dst. Pence Shewman Rd.	New Madison
13.5	M	39/54'00"/84/40'49"	Dst. Pence Shewman Rd.	New Madison
13.3	F	39/53'57"/84/40'36"	Dst. Eldorado WWTP	New Madison
13.28	C	39/53'57"/84/40'36"	Dst. Eldorado WWTP	New Madison
13.2	M	39/53'53"/84/40'31"	Dst. Eldorado WWTP	New Madison
7.6	M, F	39/51'03"/84/36'28"	Ust. US 40	Lewisburg
3.9	M, F	39/48'53"/84/34'00"	Ust. Jim's Run Rd.	Lewisburg
0.6	M, F	39/46'50"/84/32'06"	Ust. SR 503	Lewisburg
<i>Goose Creek</i>				
4.4	M, F	39/49'49"/84/36'39"	Ust. Scheyhing Rd.	Lewisburg

Table 4.

<i>Stream/ River Mile</i>	Type of Sampling	Latitude/Longitude	Site Location	USGS 7.5' Map
4.30	C, CO, SO, SM	39/49'45"/84/36'42"	Ust. Scheyhing Rd.	Lewisburg
0.4	M	39/47'00"/84/36'22"	Ust. Eaton-Lewisburg Rd.	Lewisburg
0.2	F	39/46'54"/84/36'19"	Dst. Eaton-Lewisburg Rd.	Lewisburg
<i>Bantas Fork</i>				
9.5	F	39/47'20"/84/38'02"	Ust. SR 127	Eaton North
9.4	M	39/47'20"/84/38'00"	Dst. SR 127	Eaton North
1.4	F	39/43'27"/84/32'18"	Ust. SR 503	West Alexandria
1.3	M	39/43'32"/84/32'07"	Ust. SR 503	West Alexandria
1.25	C	39/43'32"/84/32'07"	Ust. SR 503	West Alexandria
0.7	M	39/43'24"/84/31'41"	Adj. N. Factory Rd.	West Alexandria
0.6	F	39/43'18"/84/31'43"	Adj. N. Factory Rd.	West Alexandria
0.2	M	39/43'01"/84/31'34"	From Mill Rd.	West Alexandria
<i>Lesley Run</i>				
6.5	F	39/46'48"/84/29'10"	Ust. Snyder Rd.	Brookville
6.1	M	39/46'30"/84/29'15"	Ust. Snyder Rd.	Brookville
6.10	C	39/46'27"/84/29'18"	Ust. Snyder Rd.	Brookville
1.2	F	39/43'21"/84/30'18"	At E. Factory Rd	West Alexandria
<i>Aukerman Creek</i>				
0.5	M	39/39'37"/84/31'16"	Ust. Fudge Rd./ Eaton Rd.	West Alexandria
0.2	F	39/39'31"/84/30'57"	Dst. Fudge Rd./ Eaton Rd.	West Alexandria
<i>Tom's Run</i>				
12.1	M, F	39/47'22"/84/26'46"	Ust. Amity Rd.	Brookville
9.7	M	39/45'32"/84/26'48"	Dst. Old Dayton Rd.	Brookville
8.5	F	39/44'34"/84/27'08"	Ust. Bull Rd.	Farmersville
8.30	C	39/44'30"/84/27'09"	Dst. Bull Rd.	Farmersville
8.3	M	39/44'27"/84/27'13"	Dst. Bull Rd.	Farmersville
5.3	M	39/42'40"/84/28'00"	Dst. Farmersville-W.Alexandria	Farmersville
0.7	M	39/40'06"/84/27'11"	Dst. Lower Gratis Rd.	Farmersville
0.4	M, F	39/39'57"/84/26'56"	Adj. Anthony Rd.	Farmersville
<i>Tributary to Tom's Run at RM 5.34</i>				
0.1	M	39/42'40"/84/28'06"	Near mouth at Toms Run	Farmersville
<i>Little Twin Creek</i>				
6.3	F	39/41'10"/84/24'44"	Ust. Hemple Rd.	Farmersville
4.7	F	39/40'24"/84/23'45"	Ust. Famersville W. Carrollton	Farmersville
4.67	C	39/40'20"/84/23'41"	Ust. Famersville W. Carrollton	Farmersville
2.7	F	39/39'17"/84/22'37"	Ust. Little Twin Rd.	Farmersville

Table 4.

<i>Stream/ River Mile</i>	Type of Sampling	Latitude/Longitude	Site Location	USGS 7.5' Map
<i>Reigle Ditch</i>				
0.5	M, F	39/40'34"/84/25'00"	Ust. Farmersville WWTP	Farmersville
0.47	C	39/40'34"/84/24'56"	Ust. Farmersville WWTP	Farmersville
0.4	M	39/40'35"/84/24'53"	Dst. Farmersville WWTP	Farmersville
0.35	C, CO, SO, SM	39/40'35"/84/24'52"	Dst. Farmersville WWTP	Farmersville
0.3	F	39/40'38"/84/24'43"	Dst. Farmersville WWTP	Farmersville

Middletown and Hamilton. With an 815 foot elevation, the dam is capable of impounding 2950 acres which would require seven and a half days to drain (Morgan 1951). The Conservancy District and Five Rivers MetroParks manage much of the potentially flooded property. Other mainstem hydromodifications include a breached low head dam at RM 26.6 and an area of historical gravel mining at RM 29.0

Twin Creek downstream from Lesley Run to SR 725, is designated as a State Resource Water (Table 2). Twin Creek, Millers Fork, and Bantas Fork are currently designated as Exceptional Warmwater Habitats (EWH). The current aquatic life use designation for all other tributaries is Warmwater Habitat (WWH) or the tributary is undesignated. Most are also designated for Agricultural and Industrial Water Supply and Primary Contact Recreation.

METHODS

All chemical, physical, and biological field, laboratory, data processing, and data analysis methodologies and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 1989a) and Biological Criteria for the Protection of Aquatic Life, Volumes I-III (Ohio Environmental Protection Agency 1987a, 1987b, 1989b, 1989c), and The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Rankin 1989, 1995) for aquatic habitat assessment. Chemical, physical and biological sampling locations are listed in Table 4.

Determining Use Attainment Status

Use attainment status is a term describing the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). Assessing aquatic use attainment status involves a primary reliance on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-14). These are confined to ambient assessments and apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate

Community Index (ICI), which indicates the response of the macroinvertebrate community. Numerical endpoints are stratified by ecoregion, use designation, and stream or river size. Three attainment status results are possible at each sampling location - Full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria. Non-attainment means that none of the applicable indices meet the biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (Table 1) is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (*i.e.*, Full, partial, or non), the Qualitative Habitat Evaluation Index (QHEI), and a sampling location description.

The attainment status of aquatic life uses (*i.e.*, full, partial, and non-attainment) is determined by using the biological criteria codified in the Ohio Water Quality Standards (WQS; Ohio Administrative Code [OAC] 3745-1-07, Table 7-14). The biological community performance measures used include the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), based on fish community characteristics, and the Invertebrate Community Index (ICI) which is based on macroinvertebrate community characteristics. The IBI and ICI are multimetric indices patterned after an original IBI described by Karr (1981) and Fausch *et al.* (1984). The ICI was developed by Ohio EPA (1987b) and further described by DeShon (1995). The MIwb is a measure of fish community abundance and diversity using numbers and weight information and is a modification of the original Index of Well-Being originally applied to fish community information from the Wabash River (Gammon 1976; Gammon *et al.* 1981).

Performance expectations for the principal aquatic life uses in the Ohio WQS (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH]) were developed using the regional reference site approach (Hughes *et al.* 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of the aquatic life use is FULL if all three indices (or those available) meet the applicable biocriteria, partial if at least one of the indices does not attain and performance is fair, and non-attainment if all indices fail to attain or any index indicates poor or very poor performance. Partial and non-attainment indicate that the receiving water is impaired and does not meet the designated use criteria specified by the Ohio WQS.

Habitat Assessment

Physical habitat was evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995). Various attributes of the habitat are scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrates, amount and quality of instream cover, channel morphology, extent and quality of riparian vegetation, pool, run, and riffle development and quality, and gradient are some of the habitat characteristics used to determine the QHEI score which generally ranges from 20 to less than 100. The QHEI is used to evaluate the characteristics of a stream segment, as opposed to the characteristics of a single sampling site. As

such, individual sites may have 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 greater than 60 are *generally* conducive to the existence of warmwater faunas whereas scores less than 45 generally cannot support a warmwater assemblage consistent with the WWH biological criteria. Scores greater than 75 frequently typify habitat conditions which have the ability to support exceptional warmwater faunas.

Macroinvertebrate Community Assessment

Macroinvertebrates were sampled quantitatively using multiple-plate, artificial substrate samplers (modified Hester/Dendy) in conjunction with a qualitative assessment of the available natural substrates. During the present study, macroinvertebrates collected from the natural substrates were also evaluated using an assessment tool currently in the field validation phase. This method relies on tolerance values derived for each taxon, based upon the abundance data for that taxon from artificial substrate (quantitative) samples collected throughout Ohio. To determine the tolerance value of a given taxon, ICI scores at all locations where the taxon has been collected are weighted by its abundance on the artificial substrates. The mean of the weighted ICI scores for the taxon results in a value which represents its relative level of tolerance on the 0 to 60 scale of the ICI. For the qualitative collections in the Twin Creek study area, the median tolerance value of all organisms from a site resulted in a score termed the Qualitative Community Tolerance Value (QCTV). The QCTV shows potential as a method to supplement existing assessment methods using the natural substrate collections. Use of the QCTV in evaluating sites in the Twin Creek study area was restricted to relative comparisons between sites and was not unilaterally used to interpret quality of the sites or aquatic life use attainment status.

Fish Community Assessment

Fish were sampled once or twice at each site using pulsed DC electrofishing wading methods. Discussion of the fish community assessment methodology used in this report is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989b).

Following the first fish sample pass on the Twin Creek mainstem, it was determined that some modification of the traditional electrofishing wading gear was warranted for application on the second sample pass due to the atypical clarity and depth of the mainstem. Essentially, fish were observed effectively avoiding capture during the first pass. Fish, which in other streams would have been easily caught, seemed to sense the investigator's presence and moved into deep water (over the investigators' heads) with great frequency. Other undetermined aspects of water quality may have also had a role in this fish avoidance. On several occasions when a properly functioning electrofishing wand was applied within 50cm of a fish, that fish was still able to avoid collection. To address these concerns on the second pass, a small boat 2500 watt electrofishing generator was used in combination with a Smith Root 5.0 GPP pulse box instead of the standard wading T&J 1736

VDC unit.

The larger electrical field created by the small boat unit was more effective at capturing fish than the T&J unit in Twin Creek. The improved second pass MIwb scores at sites with a greater than 200 mi² drainage area was considered sufficient to invalidate the data from the first pass at these sites. Therefore, attainment status and other discussion of the Twin Creek fish community beginning at Halderman Rd (RM 23.9) downstream to the Great Miami River confluence is based only on the second pass effort. At sites upstream from this reach, the mean values were used between both passes.

Area of Degradation Value (ADV)

An Area Of Degradation Value (ADV; Rankin and Yoder 1991; Yoder and Rankin 1995) was calculated for the study area based on the longitudinal performance of the biological community indices. The ADV portrays the length or "extent" of degradation to aquatic communities and is simply the distance that the biological index (IBI, MIwb, or ICI) departs from the applicable biocriterion or the upstream level of performance (Figure 3). The "magnitude" of impact refers to the vertical departure of each index below the biocriterion or the upstream level of performance. The total ADV is represented by the area beneath the biocriterion (or upstream level) when the results for each index are plotted against river mile. The results are expressed as ADV/mile to normalize comparisons between segments, sampling years, and other streams and rivers.

Causal Associations

Using the results, conclusions, and recommendations of this report requires an understanding of the methodology used to determine the use attainment status and assigning probable causes and sources of impairment. The identification of impairment in rivers and streams is straightforward - the numerical biological criteria are used to judge aquatic life use attainment and impairment (partial and non-attainment). The rationale for using the biological criteria, within a weight of evidence framework, has been extensively discussed elsewhere (Karr *et al.* 1986; Karr 1991; Ohio EPA 1987a,b; Yoder 1989; Miner and Borton 1991; Yoder 1991; Yoder 1995). Describing the causes and sources associated with observed impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, land use data, and biological results (Yoder and Rankin 1995). Thus the assignment of principal causes and sources of impairment in this report represent the association of impairments (based on response indicators) with stressor and exposure indicators. The reliability of the identification of probable causes and sources is increased where many such prior associations have been identified, or have been experimentally or statistically linked together. The ultimate measure of success in water resource management is the restoration of lost or damaged ecosystem attributes including aquatic community structure and function. While there have been criticisms of misapplying the metaphor of ecosystem "health" compared to human patient "health" (Suter 1993), in this document we are referring to the process for evaluating biological integrity and causes or sources associated with observed impairments, not whether human health and ecosystem health are analogous concepts.

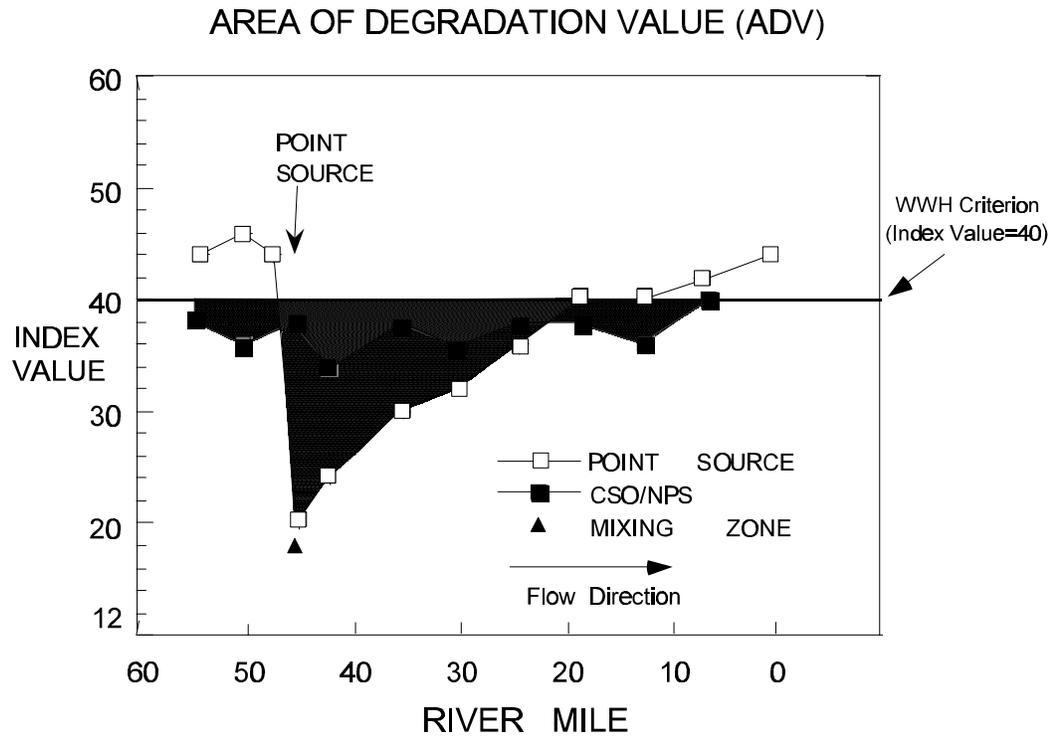


Figure 3 Graphic illustration of the Area of Degradation Value (ADV) based on the ecoregion biocriterion (WWH in this example). The index value trend line indicated by the unfilled boxes and solid shading (area of departure) represents a typical response to a point source impact (mixing zone appears 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.

RESULTS AND DISCUSSION

Pollutant Loadings: 1976-1995

Monthly effluent loadings are reported to the Ohio EPA by all NPDES (National Pollution Discharge Elimination System) permitted entities. Monthly Operating Report (MOR) data provided by the entity was used to assess the entities quantity and character of pollutant loadings. Pollutant loading trend analysis typically included: ammonia-nitrogen (NH₃-N), five day biochemical oxygen demand (BOD₅), or carbonaceous five day biochemical oxygen demand (CBOD₅), total suspended solids (TSS), and annual discharge (MGD). Information about the entities permit compliance history was also reviewed.

Figures 4 through 8 depict MOR data. In several instances the figures appear to lack information for median loadings but display 95th percentile loadings. This discrepancy occurred when an entity reported more than half of the parameter values below the applicable method detection limit (MDL). In that case the statistical median was reported as zero. A zero 95th percentile loading indicates that all of the parameter values were below the MDL or the reported value was considered to be an outlier.

Table 5 summarizes the discharge locations and treatment capacities for entities in the Twin Creek basin. Appendix Table A-1 is a chronological list of specific permit violations by dischargers in the study area, 1986-1995.

Lewisburg WWTP (Figure 4)

Operation

The Lewisburg WWTP, built in 1965 and modified in 1986, has a design capacity of 0.174 MGD and an annual average discharge of 0.158 MGD. Treatment includes an activated sludge aeration tank, clarifiers, aerobic sludge digestion, ultraviolet light disinfection, and sludge drying. The collection system consists of 100% separate sewers and serves 1560 people. Effluent is discharged to Twin Creek at RM 35.2.

Loadings

Median conduit flow has remained steady since 1976. However, expanding population pressure from Dayton has increased the area residential growth and will likely push conduit flow beyond design capacity in the near future. Annual 95th percentile conduit flow has remained above the plant design capacity since 1989. Lewisburg has experienced infiltration and inflow (I&I) problems in the sewer conveyance system which is also pushing the treatment system beyond design capacity.

Total suspended solids median values have remained stable from 1976-1995. Ninety-fifth percentile differences became noticeably larger starting in 1987 and were considered indicative of the I&I problems.

Table 4. NPDES permitted dischargers in the Twin Creek study area, 1995.

Entity	Receiving Stream	River Mile		Design Cap.	Avg. Flow
		Tributary	Twin Creek	MGD	MGD
Lewisburg WWTP	Twin Creek	—	35.2	0.174	0.158
Marathon Oil Co.	Twin Creek	—	34.2	unknown	0.001
Iams Company	Unnamed Trib.	0.2	34.1	0.038	0.038
Carl Akey Co.	Unnamed Trib.	0.2	34.1	0.005	0.001
Eldorado WWTP	Price Creek	13.34	29.74	0.1	0.052
Twin Valley Mobile Home Park	Unnamed Trib.	?	26.8	unknown	0.005
West Alexandria WWTP	Twin Creek	—	26.82	0.3	0.138
Mid Valley Pipeline	Lesley Run	6.85	24.6	stormwater	
Truck Stop of America	Unnamed Trib.	0.2		0.025	unknown
	to	4.75			
	Goose Creek to	7.55	24.32		
	Bantas Fork				
Pilot Oil Travel Center	Unnamed Trib.	0.2		0.02	unknown
	to	4.75			
	Goose Creek to	7.55	24.32		
	Bantas Fork				
Gratis WWTP	Twin Creek	—	19.05	0.119	0.088
Farmersville WWTP	Reigle Ditch to	0.45		0.22	0.15
	Little Twin	5.43	6.61		
	Creek				

As required by the NPDES permit, BOD₅ was measured through 1989 with a switch to CBOD₅ in 1987. The BOD₅ percentile differences were not significant but the CBOD₅ trend since 1990 has documented percentile differences indicative of discontinuity in the treatment process.

Discharge of NH₃-N has been negligible since 1991. Significant NH₃-N percentile differences in 1987 through 1989 were likely due to I&I problems.

NPDES violations

Ten of eleven NPDES permit violations reported between 1991 and 1995 were for fecal coliform bacteria exceedences likely due to improper operation of an ultraviolet light disinfection system. A suspended solids weekly loading violation occurred in May, 1991.

Marathon Oil Co. Service Station Operation

During a routine 1997 Ohio EPA drinking water inspection, it was discovered that the wastewater package treatment plant operated by the Marathon Oil Service Station was discharging 1200 gallons

of poorly treated sewage directly into the groundwater aquifer. The station's well water was contaminated. A seep attributed to the discharge was observed flowing into Twin Creek immediately south of I-70 (near RM 34.2).

Marathon Oil has applied for an NPDES permit and is constructing a wastewater treatment system to meet relevant requirements.

Iams Company

Operation

The Iams Company WWTP, constructed in 1982 and upgraded in 1988 and 1992, has a design capacity of 0.038 MGD. The Ohio EPA is presently reviewing a Permit to Install proposal to expand the treatment capacity to 0.075 MGD. Most (65 to 80%) of the existing facility's at capacity, average flow of 0.038 MGD originates as pretreated process wastewater which is mixed with sanitary sewage before undergoing extended aeration and upflow through fixed media. A sand filter provides final polishing prior to discharge to Twin Creek at RM 34.1.

The company processes about 400 tons of corn, poultry, beet pulp, fat, fish, lamb and rice per day

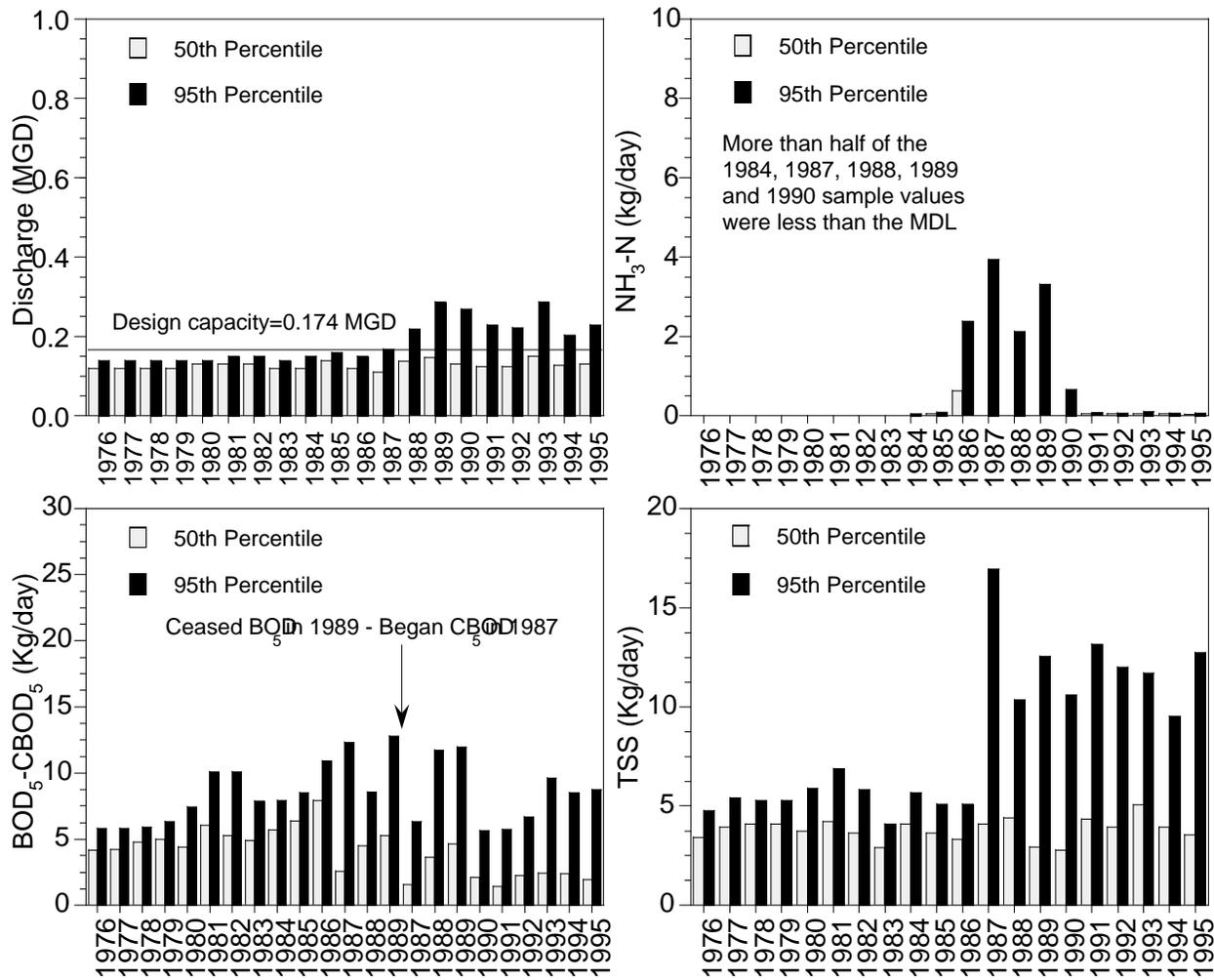


Figure 4 Median and 95th percentile annual discharge and pollutant loadings of NH₃-N, BOD₅-CBOD₅ and Twin Creek from the Lewisburg WWTP, 1976-1995.

to make pet food. Wastewater collected in a day tank is flocculated and exposed to dissolved air flotation prior to storage in a week tank. Pretreated batches are then sent to the facility WWTP.

Loadings

Annual conduit flow (1984-1995) reflected consistent input from the production facility with little percentile variability. However, increased 1995 plant production, indicated by greater median and 95th percentile flows supported the need for a treatment facility upgrade.

Loadings of TSS, NH₃-N and CBOD₅ have been sporadically elevated. Inconsistent treatment efficiency was implied by significant differences in median and 95th percentile parameter values in various years.

NPDES Violations

The Iams NPDES permit specifies concentration rather than loading limits. From 1989 to 1995, excluding two years (1992-1993) of misplaced MOR data, 18 NH₃-N and 4 TSS violations were recorded.

Carl S. Akey Company

Operation

The Carl S. Akey Company packages dry vitamin and drug base mixes for animal feed. The facility has a WWTP built in 1993, with a design capacity of 5894 gallons per day, and an annual average discharge of 1000 gallons of per day. Wastewater is primarily from sanitary service and truck washing operations. Pretreatment of truck wash wastewater is carried out in a 4800 gallon aerated holding tank with a 1000 gallon trash trap. Sanitary sewage and pretreated wash water is collected in a 3300 gallon aerated equalizer tank and then fed into an extended aeration tank with a 29 hour detention time. Sludge is conveyed to a sludge holding tank then sent to a sludge drying bed prior to land application. Effluent is treated in a single hopper clarifier, sent to a fixed media clarifier and then sand filtered prior to chlorination and post aeration before discharge to Twin Creek at RM 34.1.

Loadings

Median annual conduit flow has remained consistent at 1000 gallons per day from 1993-1995. Percentile differences were not significant and the discharge impact to Twin Creek was minimal. Loading values are so low they are reported in gm/day compared to kg/day for larger facilities. Ammonia-nitrogen median values were consistent and remained below 2 gm/day (95th percentile < 10 gm/day).

NPDES violations

No NPDES violations were on file.

Eldorado WWTP (Figure 5)

Operation

The Eldorado WWTP, built in 1980, has a design capacity of 0.1 MGD and an annual average discharge of 0.052 MGD. Treatment consists of a bar screen, equalization tank, extended aeration, rapid sand filter (not in use but functional), aerobic sludge digester, sludge drying bed and disinfection with sodium hypochlorite followed by dechlorination. The service area is 100%

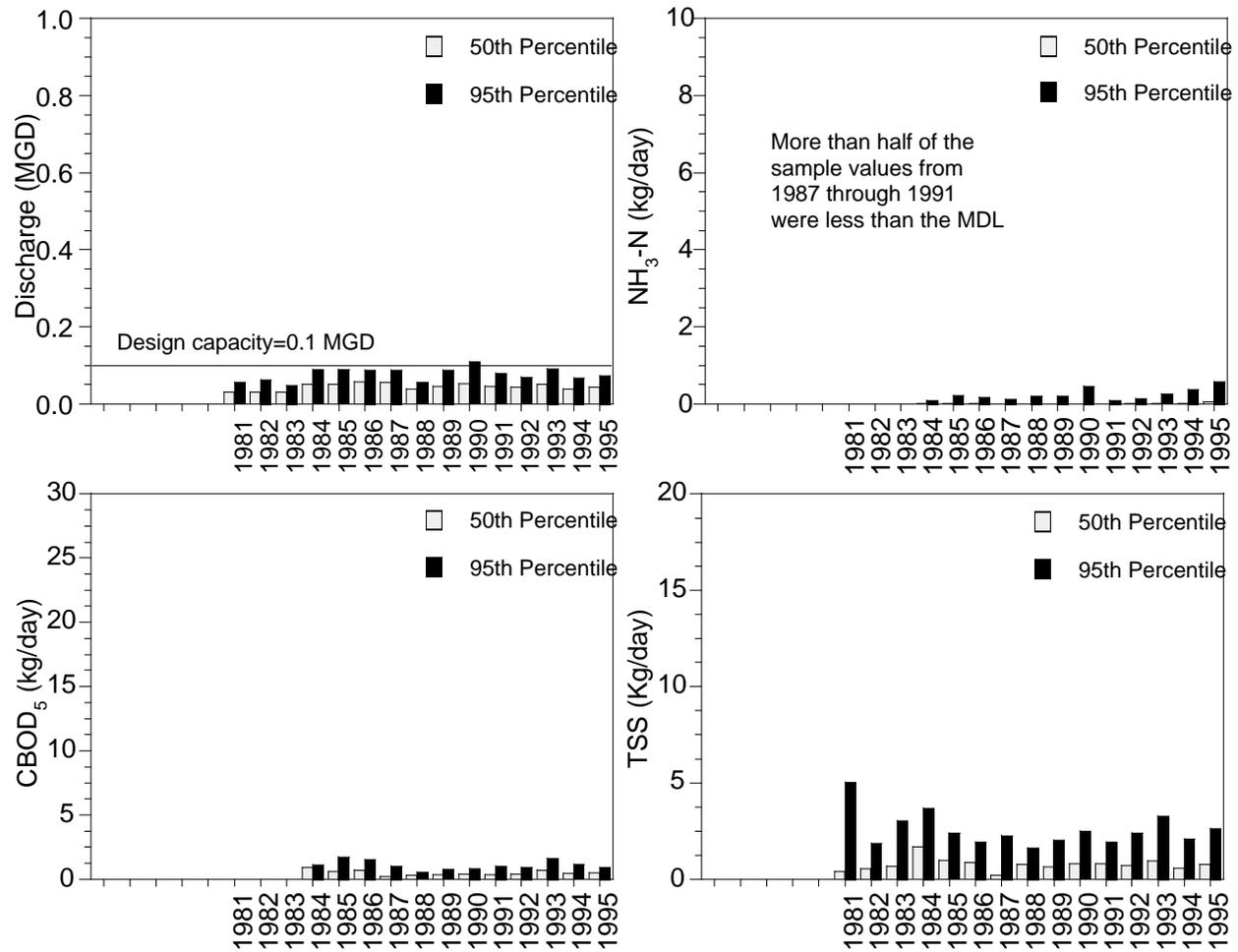


Figure 5 Median and 95th percentile annual discharge and pollutant loadings of NH₃-N, CBOD₅ and TSS to Creek from the Eldorado WWTP, 1981-1995. Note: although the Eldorado WWTP began operating in 1981, the annual scale of other comparable figures is retained.

separated sewers with one lift station. Effluent is discharged to Price Creek at RM 13.28 and subsequently to Twin Creek at RM 29.7.

Loadings

Annual conduit flow (1981 to 1995) has remained stable with little variability in percentile differences. Median conduit flow has generally been half of the design capacity. In 1990, the 95th percentile conduit flow exceeded the design flow.

The Q_{7,10} low flow value in Price Creek is 58,164 gallons/day (0.09 CFS). Hence, on average, the Eldorado effluent comprises nearly half of the stream flow during low flow conditions. Consequently, the plant has the capacity to have a major impact on Price Creek.

Median and the respective 95th percentile values for $\text{NH}_3\text{-N}$, TSS and CBOD_5 have been fairly consistent. Median CBOD_5 has generally been less than 0.8 kg/day.

NPDES violations

Five of six NPDES permit violations reported between 1989-1995 were for fecal coliform bacteria exceedences associated with a chlorinator start up in September of 1989. Heavy rains in May of 1990 caused a hydraulic overload and a subsequent total suspended solids violation.

Twin Valley Mobile Home Park

Operation

In 1996 Ohio EPA “discovered” a wastewater package treatment plant operated by the Twin Valley Mobile Home Park. Located outside the eastern West Alexandria city limits, no permit had ever been issued for the facility. The estimated annual average discharge of 4500 gallons per day flows into a drainage ditch which outlets near the West Alexandria WWTP outfall (RM 26.82). It was apparent from a trail of sewage sludge at the outfall, the 1950s treatment technology, and a general state of disrepair that the plant would not be able to comply with current NPDES requirements. The Mobile Home Park lacks the resources for a plant upgrade or to connect with the West Alexandria system. The situation remains unresolved.

West Alexandria WWTP (Figure 6)

Operation

The West Alexandria WWTP, built in 1939 and upgraded in 1972 and 1990, has a design capacity of 0.3 MGD and an annual average flow of 0.138 MGD. The 1990 upgrade followed an Ohio EPA consent order agreement with the Village to upgrade the contact stabilization system to a sequencing batch reactor. Influent passes through a comminutor (grinder) and is pumped to a sequencing batch reactor. Following an aeration phase, the wastewater is settled allowing the solids to fall out of solution. After settling the wastewater is sent to a chlorine contact basin, dechlorinated and then to a post aeration chamber before it is discharged to Twin Creek at RM 27.05. The 1400 person service area has 100% separated sewers and three lift stations. Untreated sewage is bypassed when either the lift station pumps malfunction or the incoming flow overwhelms the treatment system.

Loadings

Median conduit flow has remained steady since 1976. The 95th percentile conduit flow had distinct variability from the median flow in 1982 and 1983. In 1995, the 95th percentile flow was also higher than the trend from 1984 to 1994.

Ninety-fifth percentile BOD_5 loading values were elevated in 1976, 1979, 1982 and 1983. Additionally, the percentile differences in those years were markedly higher. In 1995, CBOD_5 median and high 95th percentile values were somewhat variable.

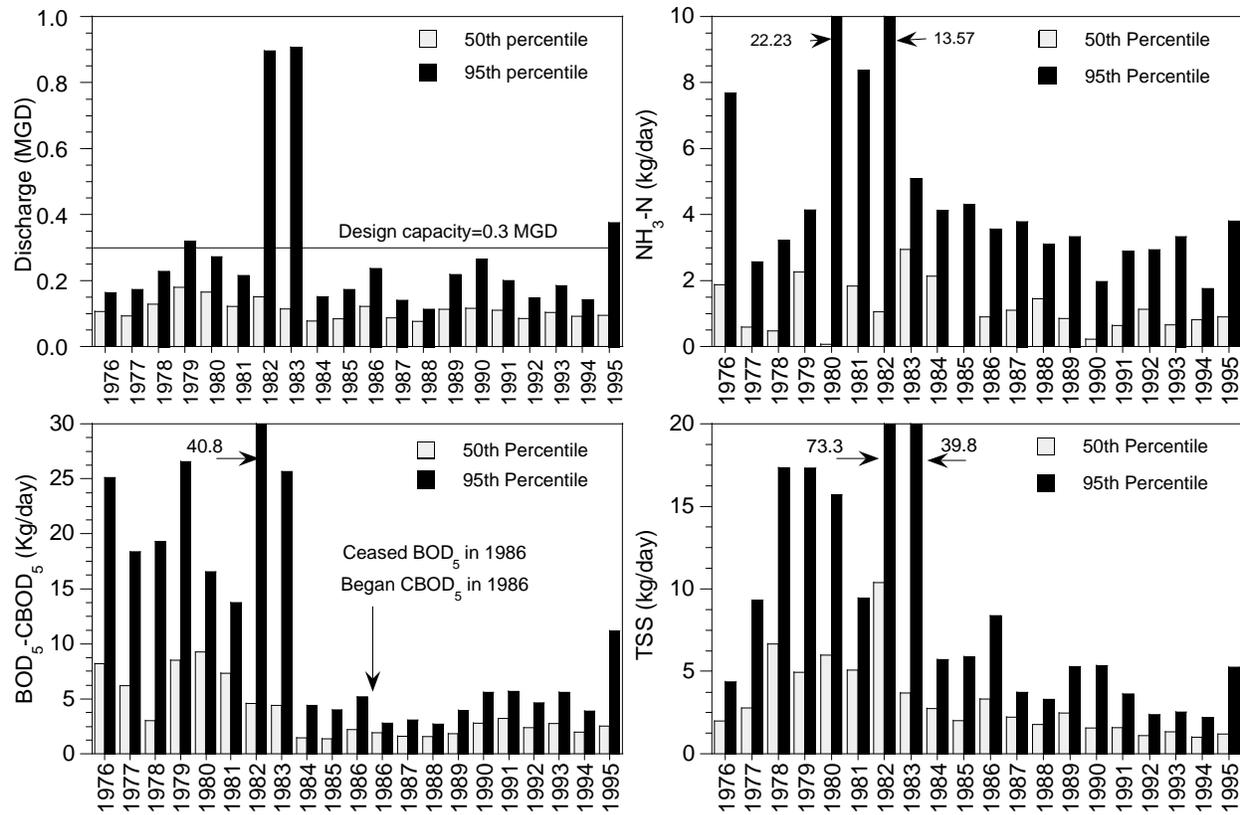


Figure 6 Median and 95th percentile annual discharge and pollutant loadings of NH₃-N, CBOD₅ and TSS to Creek from the West Alexandria WWTP, 1976-1995.

Median NH₃-N levels have been stable since 1986. In 1976 and from 1980 to 1982, 95th percentile ammonia values were significantly high and exhibited large percentile differences.

NPDES Violations

Between 1989 and 1995 three of four NPDES permit violations were for NH₃-N exceedences. West Alexandria has a high NH₃-N permit limit for summer months and no limit for winter months.

Mid Valley Pipeline Company

The Mid Valley Pipeline Company discharges storm water collected at a transfer station to Lesley Run (RM 6.85), a Twin Creek tributary (RM 24.6). The effluent is only monitored and limited for oil and grease (10 mg/l).

Truck Stop of America (Standard Oil Truck Stop, US 127 & I-70)Operation

The Truck Stop of America, built in 1965, uses an Aer-O-Flo package plant to treat approximately 0.025 MGD of sewage, oily service station wastewater, and restaurant wastewater. Effluent is discharged to a tributary (RM 0.2) of Goose Creek (RM 4.75) which flows into Bantas Fork (RM 7.55) which joins Twin Creek at RM 24.32. Following an inspection, the Ohio Department of Health (ODH) issued annual sewage discharge permits until 1970 when inadequate maintenance and improper operation were determined. Continuing problems were reported by ODH in 1971 and 1972. Ohio EPA documented excessive solids downstream from the facility in 1973 and 1974.

Despite installation of an oil and water separator in 1975, operational problems persisted. However, Ohio EPA staff determined the plant was in good operating condition after a lagoon was completed in 1976. In 1987, the entity applied for, but was never issued an NPDES permit. A new oil and water separator was installed in 1991. Since the entity does not have a permit, MOR data and the subsequent compliance history are not available.

*Pilot Oil Travel Center*Operation

Originally a Perkins Pancake House built in 1972, the Pilot Oil Travel Center wastewater package treatment plant is permitted to discharge 0.02 MGD. Additionally, an oil and water separator (1000 gal./min.) is used to treat stormwater from two retention basins which collect runoff from a parking lot and fueling bays. Effluent is discharged to an unnamed Goose Creek tributary (RM 0.2) which flows into Bantas Fork and then into Twin Creek.

Loadings

An oily residue has been observed downstream from the facility on several occasions.

NPDES violations

Eight CBOD₅ exceedences were recorded between 1990 and 1993. Residual chlorine violations occurred five times between 1990 and 1995.

Gratis WWTP (Figure 7)Operation

The Gratis WWTP, built in 1981, has a design capacity of 0.119 MGD and an annual average discharge of 0.088 MGD. Influent is pumped through a comminutor to a continuous flow four cell aerated lagoon. Effluent leaving the lagoon system passes through a slow sand filter, is chlorinated and then travels down a cascade aerator before being discharged to Twin Creek at RM 19.05. Two lift stations and a separate sewer system provide service to 950 people. Untreated sewage is bypassed when either the lift station pumps malfunction or the incoming flow overwhelms the treatment system.

Loadings

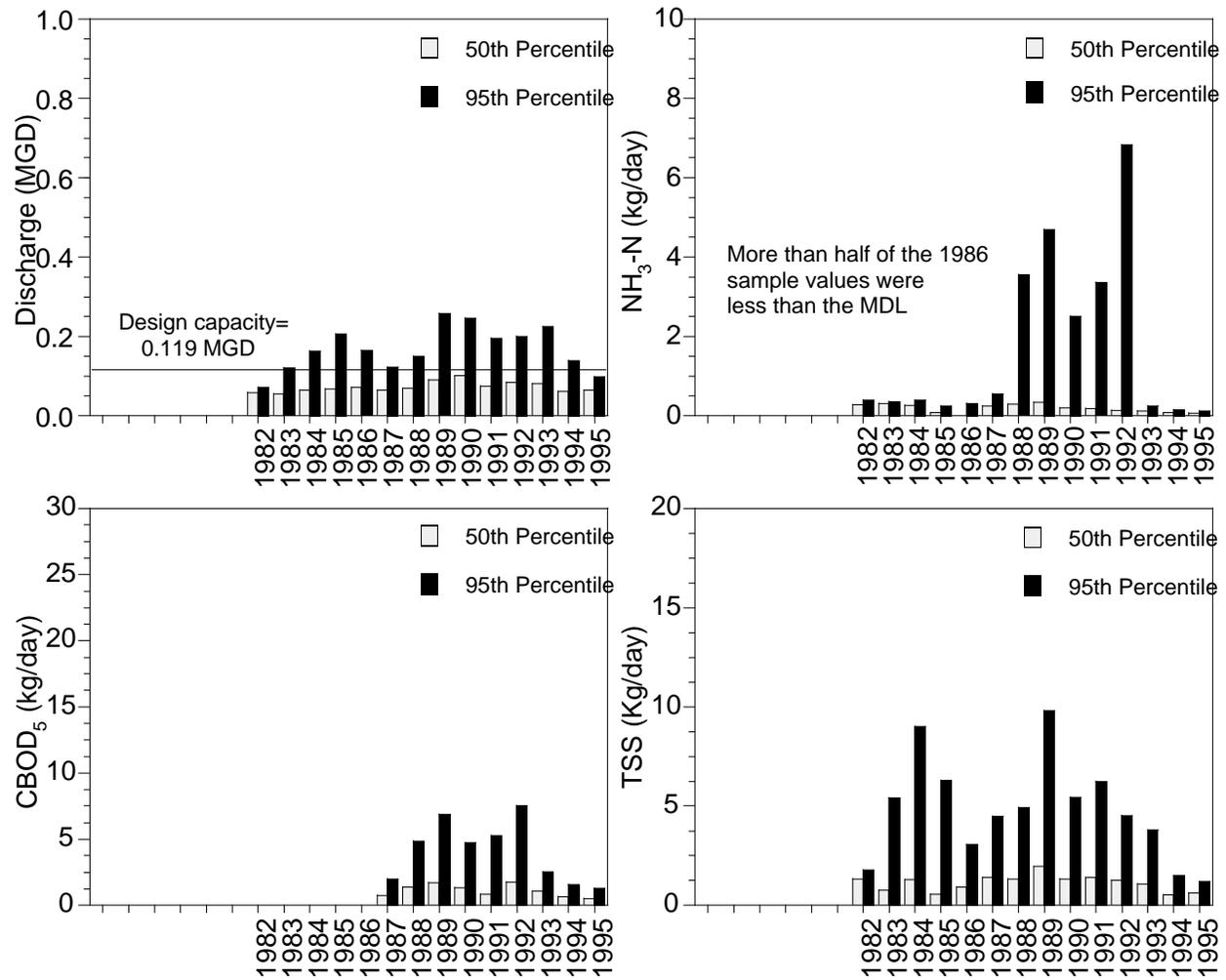


Figure 7 Median and 95th percentile annual discharge and pollutant loadings of NH₃-N, CBOD₅ and TSS to Creek from the Gratis WWTP, 1982-1995. Note: although the Gratis WWTP began operation in 1983, the annual scale of other comparable figures is retained.

Annual 95th percentile conduit flow was above the plant design flow each year from 1983 to 1994. Gratis has severe I&I problems in the conveyance system.

From 1988 to 1992, NH₃-N loadings exhibited wide variability in percentile differences. The lagoon system relies upon biological denitrification. During the winter months, ammonia removal efficiency decreases with the reduced biological activity. Third quarter annual NH₃-N loading data exhibited little percentile difference due to better summer biological denitrification.

Total suspended solids loading data for the period 1983 to 1993 exhibited wide percentile variance probably due to infiltration and inflow and the seasonal overturning of the lagoon.

Median CBOD₅ values have decreased since 1992. The 95th percentile data has been varied from median values partly due to decreased winter treatment performance, short residence time during high conduit flow, and seasonal lagoon turnover.

NPDES violations

Forty nine of 72 (68%) NPDES permit violations reported from 1986 to 1995 were for NH₃-N exceedences during winter months. Gratis has historically been unable to meet its winter NH₃-N limit. Fourteen (19%) violations were for BOD₅ and CBOD₅ exceedences likely due to winter treatment inefficiencies or I&I problems. Four TSS and six fecal coliform bacteria violations were also recorded.

Farmersville WWTP (Figure 8)
Operation

The Farmersville WWTP, built in 1961 and modified in 1969, 1992 and 1994, has a design capacity of 0.22 MGD and an annual average discharge of 0.15 MGD. Treatment includes screening, extended aeration, secondary clarification, chlorination, dechlorination, and post cascade aeration. Biosolids treated in an aerobic sludge digestion tank are land applied according to a March 1993 sludge management plan. The collection system consists of 100% separate sewers and serves 945 people. About 40 percent of the town relies on private septic systems. Effluent is discharged to Reigle Ditch (RM 0.45) which flows into Little Twin Creek (RM 5.43) which joins Twin Creek at RM 6.61.

Loadings

Annual 95th percentile conduit flow has exceeded design flow for 16 of the last 19 years (1976-1995). Percentile variability was significant during 1987. During the summer, Reigle Ditch

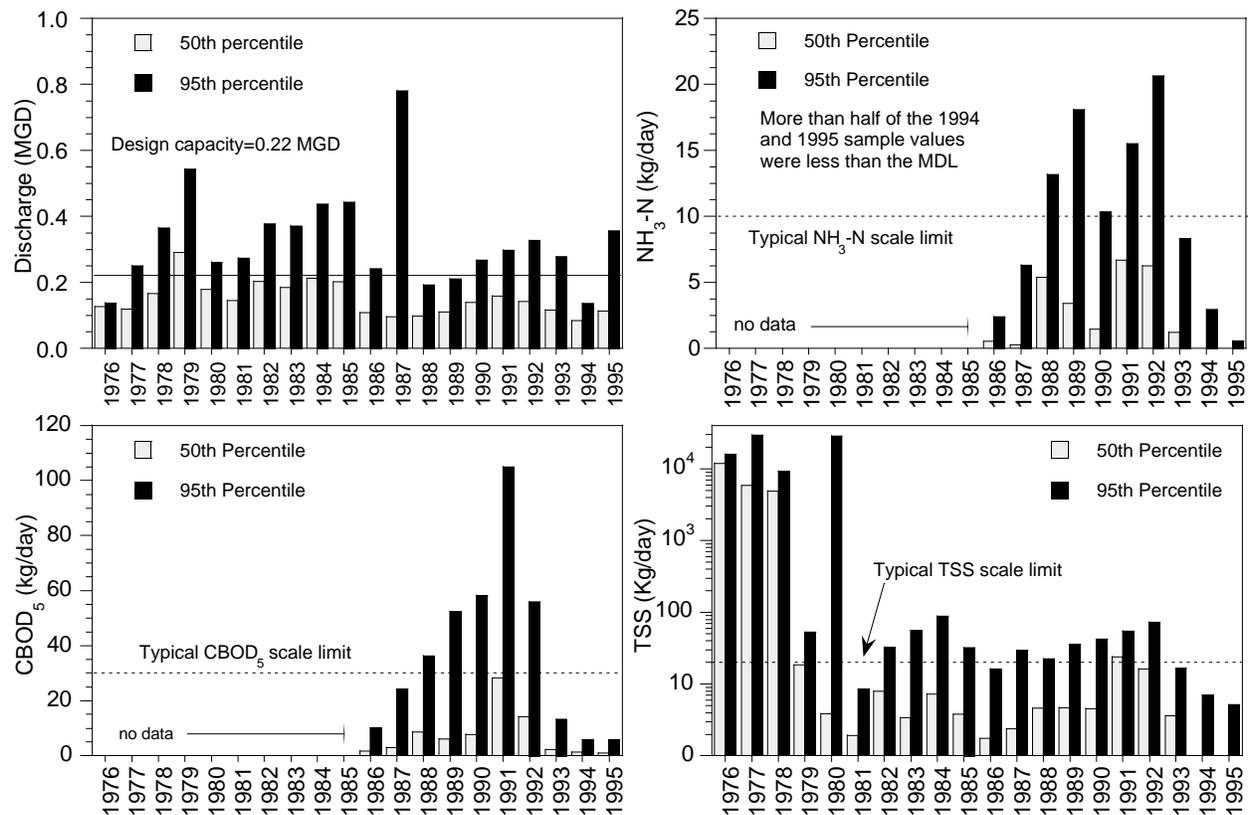


Figure 8 Median and 95th percentile annual discharge and pollutant loadings of NH₃-N, CBOD₅ and TSS to Creek from the Farmersville WWTP, 1976-1995. Note: the vertical scale of other comparable fig displayed.

typically becomes intermittent. As a result, the WWTP effluent comprises all of the stream flow.

Median NH₃-N levels were elevated from 1988 to 1992 due to a small digestion tank which limited solids settling and prevented complete NH₃ oxidation. This loading decreased in 1992 with the construction of a sludge digestion tank.

From 1976 to 1979, the primary treatment system was inoperable resulting in extremely elevated TSS levels. In 1991 and 1992, TSS values reflected undersized settling capacity at the plant which was improved with the installation of a sludge digestion tank.

Prior to the 1992 upgrade, variable CBOD₅ levels indicated poor WWTP operation. Since then CBOD₅ levels have been typical.

NPDES violations

From 1991 to 1994, monthly notice of permit violation letters were sent to Farmersville. Of 225 permit exceedences recorded through 1995, 63 (28%) were for TSS violations, 58 (26%) were for CBOD₅ and BOD₅ violations and 59 (26%) were for NH₃-N violations. The Village of Farmersville signed a consent order with the State of Ohio in November 1995 agreeing to pay a \$5,000 civil penalty for significant noncompliance. Compliance at this facility has been noted on a consistent basis since July, 1994.

Pollutant Spills and Unauthorized Releases

Pollution from spills or accidental discharges was not considered a significant lethal or sublethal aquatic community stressor in the Twin creek watershed. The Ohio EPA Division of Emergency and

Table 6 Summary of pollutants released in the Twin Creek watershed as reported to the Ohio EPA Division of Emergency and Remedial Response, January 1985 to December 1995.

Date	Entity	Material	Amount	Stream	County
12/30/95	Unknown	waste oil	2.5 gal.	Aukerman Creek	Preble
12/28/95	Unknown	waste oil	10 gal	Aukerman Creek	Preble
4/10/95	Greg Lovett	construction debris	unknown	Trib. to Twin Creek	Preble
4/07/95	Twin Valley Mobile Home Park	kerosene and oil	unknown	Twin Creek	Preble
7/16/91	Farmersville WWTP	sewage	unknown	Little Twin Creek	Montgomery
2/20/90	Farmersville WWTP	sewage	unknown	Little Twin Creek	Montgomery
5/8/89*	Farmersville WWTP	fertilizer	unknown	Little Twin Creek	Montgomery

*Data not reported to Ohio EPA but included to ensure table accuracy. See Fish Kills section.

Remedial Response (DERR) maintains a Release Reporting System (RRS) database which indicated only six releases have been recorded since 1985 (Table 6). Four of these incidents occurred in 1995 including three petroleum spills. In 1990 and 1991 the Farmersville WWTP discharged unknown quantities of sewage.

Fish Kills

A review of Water Pollution, Fish Kill and Stream Litter Investigation Reports from the Ohio Department of Natural Resources Division of Wildlife covering the period 1985-1996 indicated the only reported fish kill in the Twin Creek basin occurred in Little Twin Creek, Montgomery Co. on May 8, 1989 when 23,365 fish were killed. The incident resulted from the spill of an unknown amount of anhydrous ammonia (28% nitrogen) fertilizer.

Chemical Water Quality

Water column chemical sampling stations were selected to provide information about ambient water quality and to assess impacts from point and nonpoint pollution sources (Tables 3 and 5). Four to six sets of grab surface water samples for conventional inorganic (*i.e.* metals and nutrients) and microbiological analysis were submitted from 13 mainstem and 12 tributary sampling stations in the Twin Creek study area between July and September, 1995. Four sets of samples for the analysis of volatile and semi-volatile organic compounds were submitted from four mainstem sites and two tributary sites downstream from potential point sources of pollution. Results of the analyses conducted are presented in Appendix Table A-2.

During the study period, flows in Twin Creek as measured by U.S. Geological Survey gaging stations at Halderman Rd. (RM 23.8) and Germantown Dam (RM 9.7) remained above the $Q_{7,10}$ levels (Figure 6). Flows peaked in early August and continued to fall throughout August and September. Surface water run off was a major factor in some water column samples (Round #1) coinciding with a time of agricultural fertilizer application and heavy rain (1.9" at Halderman Rd.). Figure 9 and Table 7 display flow, rainfall and sampling dates.

Table 7. Twin Creek flow at Halderman Rd. (RM 23.8, Ingomar station 03271800) during water chemistry sample collection rounds 1995 (Shindel *et al.* 1996).

Sample	Date	Flow	Date	Flow	Date	Flow
Round #1	July 18	100 cfs	July 19	66 cfs	July 20	50 cfs
Round #2	August 2	95 cfs	Round #2 and #3 were completed in one day			
Round #3	August 16	69 cfs				
Round #4	August 29	26 cfs	August 30	26 cfs	August 31	25 cfs
Round #5	September 12	16 cfs	September 13	17 cfs	September 14	16 cfs
Round #6	September 26	12 cfs	September 27	12 cfs	September 28	11 cfs

The primary point sources evaluated in the study area were small municipal WWTPs at Lewisburg, West Alexandria, Gratis, Eldorado and Farmersville. Package plants operated by the Iams Co., Carl Akey Co., Truck Stop of America and Pilot Oil Travel Center were also evaluated. The primary non-point source pollution evaluated was runoff from agricultural areas. Other possible nonpoint sources which were investigated included the Mid Valley Pipeline and stormwater runoff from the previously mentioned municipalities and Germantown; the Germantown WWTP has been decommissioned and wastewater is now pumped to the Franklin WWTP. The potential influence from poor construction practices at a golf course near Ithaca was evaluated. Impacts from residential areas with no centralized collection or treatment of sanitary wastewater (unsewered areas) were also

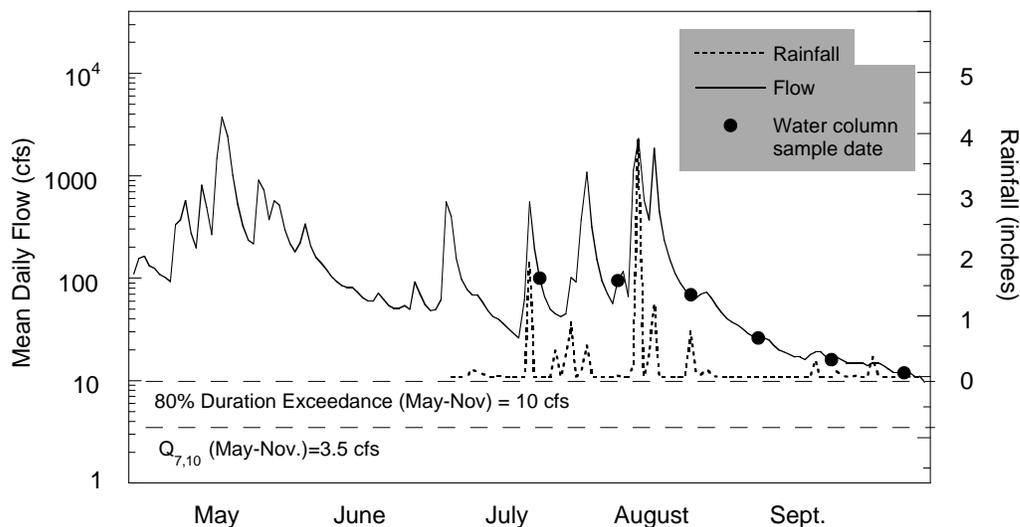


Figure 9 Flow hydrograph for Twin Creek at Ingomar (USGS gage station #03271800, RM 23.8), May through September, 1995. Sampling dates, rainfall (July through September) and May through November conditions ($Q_{7,10}$ [3.5 cfs] and 80% duration flow [10 cfs]; period of record 1946 to 1978) are indicated in the figure (Shindel *et al.* 1996, Johnson and Metzker 1981).

evaluated. These areas included the Villages of Castine, West Manchester, Ithaca, Verona and New Lexington. Analytical results were reviewed to determine the occurrence of violations and exceedences of Ohio Water Quality Standards (OAC 3745-1), based on Exceptional Warmwater Habitat (EWH) or Warmwater Habitat (WWH) aquatic life, Primary (PCR) and Secondary (SCR) Contact Recreation, Agricultural Water Supply (AWS), and Public Water Supply (PWS) use designations. Although Twin Creek is not designated as a Public Water Supply, exceedences of the human health criterion for $\text{NO}_3+\text{NO}_2\text{-N}$ (nitrate+nitrite-N) are noted to emphasize elevated levels (Table 8).

Numerical chemical criteria exist for the prevention of acute and chronic toxicity for most pollutants analyzed. The appropriate acute aquatic criterion (AAC) and chronic aquatic criterion (CAC) apply to samples collected outside of mixing zones. Minimum and average criteria exist for dissolved oxygen (D.O.). PCR and SCR criteria apply to fecal coliform bacteria counts. PCR waters are suitable for recreational activities where full body contact with the water will cause a minimal threat to public health as a result of water quality. SCR waters are suitable for partial body contact, such as wading, with minimal threat to public health as a result of water quality.

Mean and maximum concentrations of D.O. (minimum rather than maximum), BOD_5 (5-day biochemical oxygen demand), COD (chemical oxygen demand), $\text{NH}_3\text{-N}$ (ammonia-N), $\text{NO}_3+\text{NO}_2\text{-N}$

(nitrate+nitrite-N), total phosphorus, and total suspended solids (TSS) were determined and plotted longitudinally to display trends in these physical and chemical properties (Figures 10 and 11). In

Table 8. Exceedences and violations of Ohio EPA Exceptional Warmwater Habitat (EWH) and Warmwater Habitat (WWH) criteria (OAC 3745-1) for chemical, physical and bacteriological water quality parameters measured the in Twin Creek study area during 1995 (units are : g/l for metals and organics, # organisms/100 ml for fecal coliform bacteria, and mg/l for all other parameters).

Stream	River Mile	Parameter (value, mg/l)
Twin Creek	34.0	Dieldrin (0.009*#, 0.004#, 0.004#) Heptachlor (0.003*#) Methoxychlor (0.039*)
	27.57	Fecal Coliform (1240 ^{''}) NO ₃ +NO ₂ -N (10.6)
	26.7	Dieldrin (0.013*#, 0.004#, 0.002#, 0.003#) Heptachlor (0.003*#) Fecal Coliform (1530 ^{''} , 47000 ^{''''''})
	13.51	Fecal Coliform (3700 ^{''''})
	18.27	Dieldrin (0.008*#, 0.003#)
	0.95	Dieldrin (0.10*#, 0.003#)
	Millers Fork	10.12
Swamp Creek	6.19	Fecal Coliform (2700 ^{''''} , 1900 ^{''})
	5.2	Ammonia-N (2.09*, 2.07*) Dissolved Oxygen(2.8 ^{††} , 3.3 ^{††} , 3.9 ^{††}) Fecal Coliform (5200 ^{''''''} , 4300 ^{''''} , 33000 ^{''''''} , 34000 ^{''''''}) NO ₃ +NO ₂ -N (10.6)
	Prices Creek	13.61
Prices Creek	13.28	Ammonia-N (1.94*) Fecal Coliform (2200 ^{''''}) Phosphorus (2.64 [‡] , 2.68 [‡] , 2.43 [‡])
	Lesley Run	6.01

Table 8. (continued)

Stream	River Mile	Parameter (value, mg/l)
Goose Creek	4.3	Dieldrin (0.011*#, 0.003#)
		Endosulfan I (0.005*)
		Heptachlor (0.003*#)
		Fecal Coliform (2400''''')
		Phosphorus (1.90‡)
Reigle Ditch	0.47	Fecal Coliform (2100''''')
	0.35	Aldrin (0.005*#)
		Dieldrin (0.006*#, 0.004#, 0.003#)
		Endosulfan I (0.007*, 0.004*)
		Endrin (0.004*)
		Heptachlor (0.005*#)
		Phosphorus (1.83‡, 2.18‡, 2.83‡, 3.45‡)
		NO ₃ +NO ₂ -N (12.8), 17.7), 22.3))

- * Exceedence of numerical criterion for prevention of chronic toxicity (Chronic Aquatic Criteria [CAC]).
- ** Exceedence of numerical criterion for prevention of acute toxicity (Acute Aquatic Criteria [AAC]).
- # Exceedence of numerical criterion for human health (30 day average).
- † Indicates that the value is less than the average WWH dissolved oxygen (D.O.) criterion (5 mg/l).
- †† **Violation of the minimum WWH D.O. criterion (4 mg/l).**
- ††† Indicates that the value is less than the average EWH dissolved oxygen (D.O.) criterion (6 mg/l).
- '' Exceedence of the average Primary Contact Recreational criterion (fecal coliform 1000/100 ml).
- '''' Exceedence of the maximum Primary Contact Recreational criterion (fecal coliform 2000/100 ml).
- '''''' Exceedence of the maximum Secondary Contact Recreational criterion (fecal coliform 5000/100 ml).
- ‡ Exceedence of WQS guideline for daily average phosphorus (1 mg/l).
-) Exceedence of the public water supply criterion for NO₃+NO₂-N (10 mg/l).

calculating mean concentrations, a value equal to the analytical method detection limit (MDL) was used for results reported less than the MDL.

Appendix Table A-3 lists ECBP ecoregion chemical parameter values associated with fish community performance as measured by the IBI. A 75 percentile line from this table appears on Figures 10 and 11 to aid discussion of the frequency with which a particular concentration level is encountered. Generally, values above the 75 percentile were considered elevated or high. For D.O. values, concentrations below the 75 percentile were considered low or poor.

To determine if diel D.O. concentration fluctuations occurred, Datasonde® continuous monitors, recording hourly measurements over a 48 hr. period, were deployed at several sampling stations. (Figure 12, Appendix Table A-4). These measurements were useful in evaluating the presence of nuisance growths of algae or extensive oxidation of organic and inorganic matter, indicative of a

nutrient enrichment impact.

Standard U.S.EPA methods were used to assess the concentrations of volatile and semi-volatile organic compounds. Fifty-nine volatile organic compounds were analyzed using U.S.EPA method 624. Fifty-three semivolatile organics were analyzed using U.S.EPA method 625. Seven polychlorinated biphenyls (PCBs) and 21 pesticides were analyzed using U.S.EPA method 608. The concentrations of various modern pesticides (atrazine, alachlor, cyanazine, glyphosate, and 2-4-D, amine or ester) were not assessed because these compounds are not detected by standard methodology (method 608).

Twin Creek

Based on the results of 60 water column grab samples, the chemical water quality water in Twin Creek was considered exceptional (Figures 10 and 11). All mainstem daytime D.O. samples during the survey were above the Exceptional Warmwater Habitat minimum criterion (5.0 mg/l). Similar outstanding values for other parameters were also recorded. Levels below the applicable MDL were typical. Table 9 illustrates some mean parameter values recorded in Twin Creek in comparison with other high quality southwestern Ohio streams.

Table 9 Mean parameter values (mg/l) and sample frequency (n) for selected SW Ohio stream basins. Note: the relevant BOD₅ MDL is expressed as a superscript. NA=not analyzed.

Stream basin / Survey year	NO ₃ +NO ₂ -N	n	BOD ₅	n	COD	n	TSS	n	T-P	n	
Twin Creek	1995	3.14	60	2.1 ^{2.0}	60	11.4	48	11.7	57	0.09	60
U. Great Miami River	1994	1.40	156	4.6 ^{1.0}	155	30.0	156	34.0	155	0.39	153
L. Great Miami River	1995	2.95	272	5.2 ^{2.0}	285	23.8	272	65.3	285	0.26	283
Mad River	1994	3.35	163	1.3 ^{1.0}	163	11.5	163	8.3	161	0.14	163
Little Miami River	1993	3.40	186	NA	NA	16.2	186	49.0	186	0.33	186

Datasonde® continuous monitors deployed at 13 locations confirmed the water column sampling results (Figure 12, upper plot). Except for two locations, most sites maintained very good diel D.O. concentrations (>8 mg/l). At Euphemia Castine Rd. (RM 42.1) Twin Creek (28 mi²) exists as a transitional wetland reach (Figure 12, middle plot). Here, downstream from headwater drainage channel origins, the stream first displays the natural attributes more characteristic of the rest of the mainstem. Apparently, the wetland aspects inherent to this reach were sufficient to inhibit gaseous diffusion as the median D.O. concentration (4.95 mg/l) was less than the EWH minimum criterion (5 mg/l). However, a combination of upstream influences including polluted runoff from agricultural and rural residential sources may also have influenced the site as one ammonia-N concentration (0.21 mg/l) was also elevated, although wetland streams often have poor nitrification.

Downstream from the West Alexandria WWTP, organic enrichment was evident in another

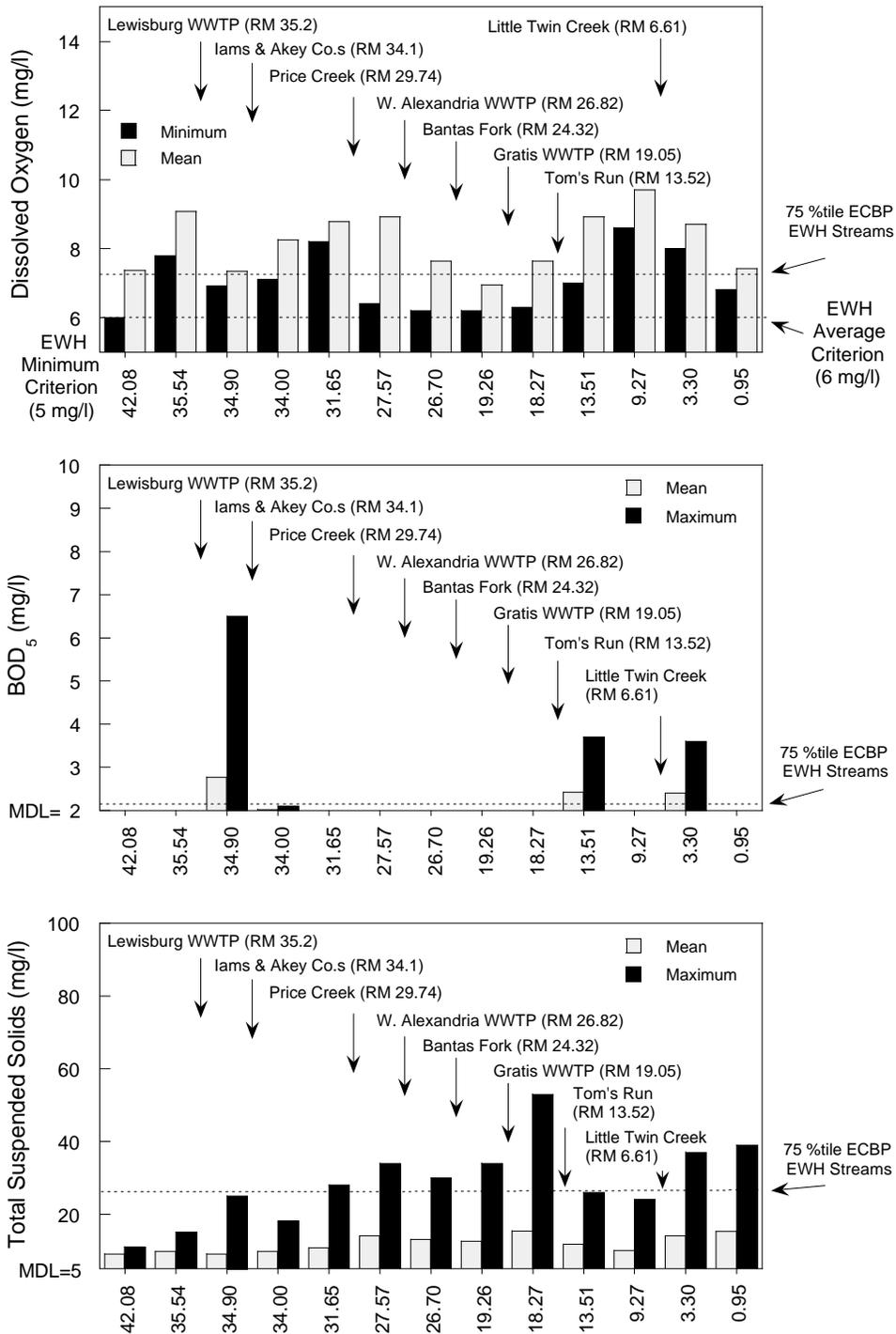


Figure 10 Longitudinal summary of minimum and mean D.O. concentrations and of mean and maximum concentrations of BOD₅ and TSS in Twin Creek, 1995. Note: except for D.O. (EWH avg. criterion=5mg/l) the base of the vertical axis is the applicable MDL.

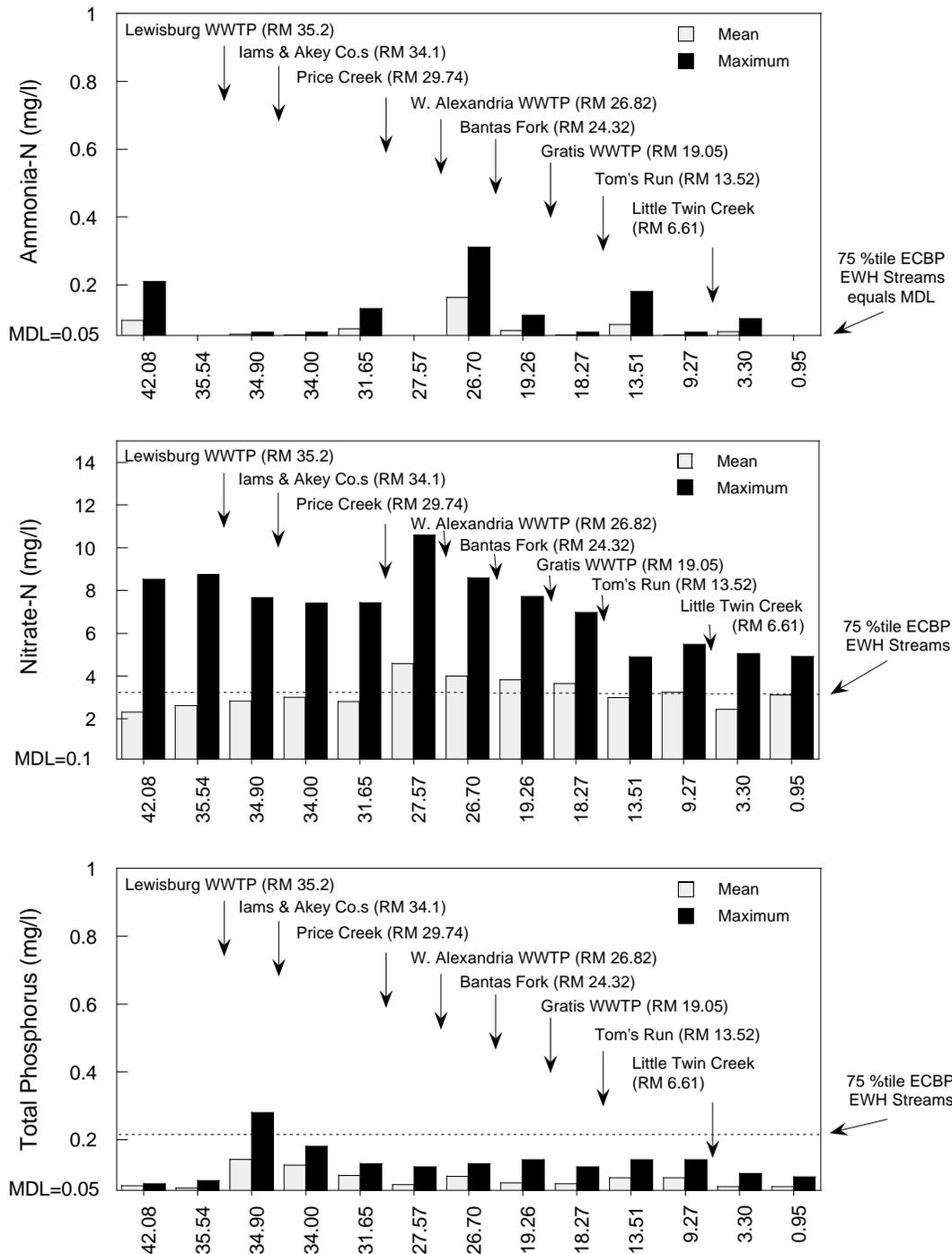


Figure 11 Longitudinal summary of mean and maximum concentrations of ammonia-N, nitrate+nitrite-N and total phosphorus in Twin Creek, 1995. Note: the base of the vertical axis is the applicable MDL. All maximum Nitrate (+NO₂-N) values were recorded during a high water sample round.

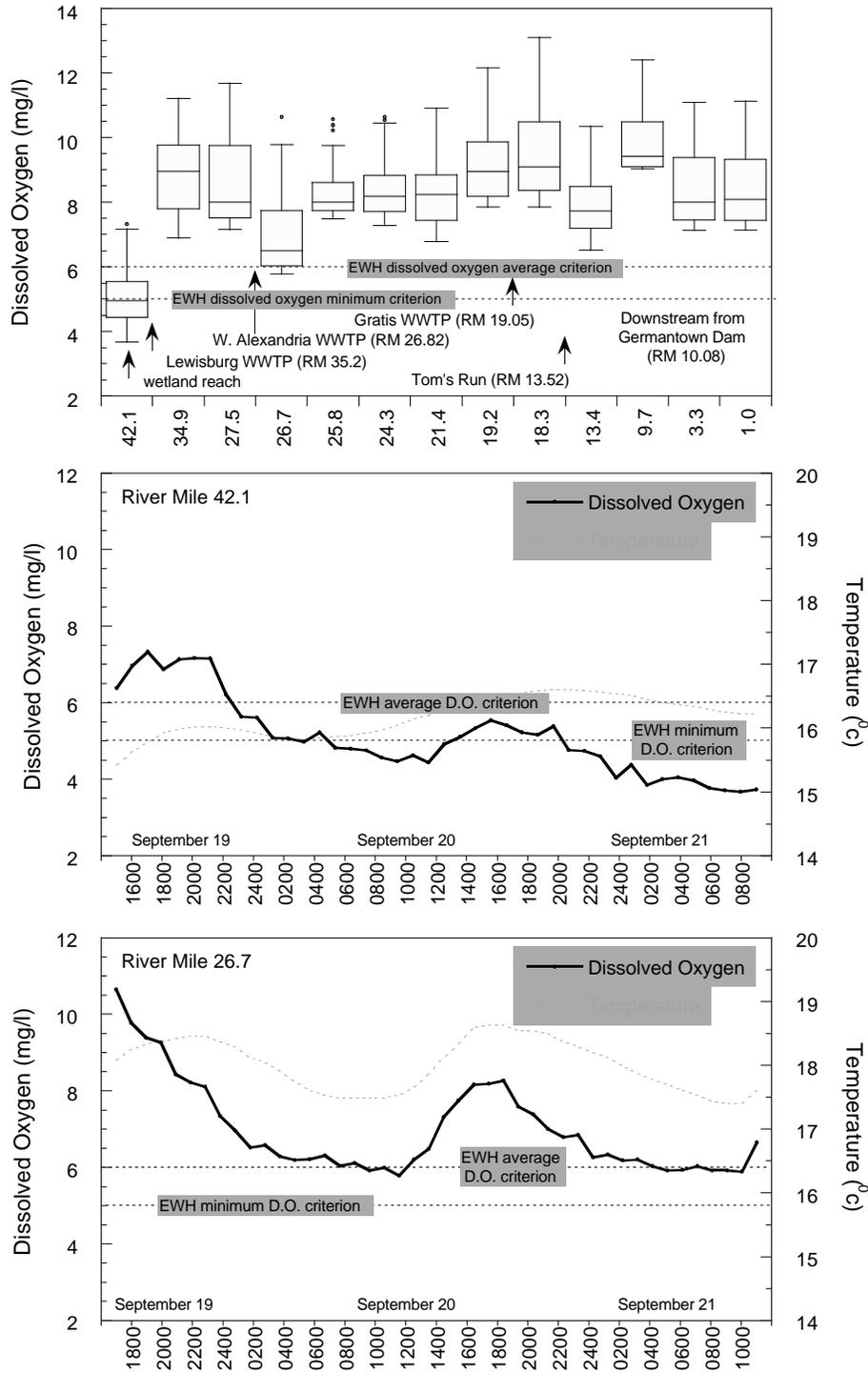


Figure 12 Box and whisker plot of diel D.O. data recorded with Datasonde® continuous monitors at 13 Twin Creek locations, September 19-21, 1995 (upper plot). Linear profile of the same data from RM 42.1 (middle plot) and RM 26.7 (lower plot).

anomalous D.O. concentration profile (Figure 12, lower plot) where minimum D.O. values (5.79 mg/l) fell below the EWH average criterion (6 mg/l). The West Alexandria WWTP NPDES permit allows discharge of relatively high ammonia-N concentrations. Inadequately treated effluent from the plant was considered the most likely source of the oxygen demand; however, other aspects were also relevant. The site is partially impounded by a breached low head dam at RM 26.6 and effluent from the Twin Valley Mobile Home Park also contributed to the nutrient enrichment.

Twin Creek ammonia-N concentrations were particularly low. The majority (75%, n=45/60) of samples were at or below the MDL (0.05 mg/l). Four locations (RMs 35.54, 27.57, 3.3 and 0.95) exhibited values below the MDL on all sampling rounds. The highest mainstem $\text{NH}_3\text{-N}$ mean (0.163 mg/l) and maximum values (0.31 mg/l-September 14) were recorded downstream from the West Alexander WWTP (RM 26.7).

Mean nitrate+nitrite-N concentrations were at an acceptable level for most mainstem sites. The highest mean value, considered moderately elevated (4.59mg/l), was recorded at RM 27.57. The maximum value (10.6 mg/l) also documented at this site, was above the Public Water Supply human health criterion (10 mg/l). This sample site was approximately 0.7 mile downstream from an unfenced and heavily grazed cattle pasture and the unsewered community of New Lexington. It was also 2.2 miles downstream from the Price Creek confluence.

The effects of agricultural nonpoint runoff were evident in $\text{NO}_3\text{+NO}_2\text{-N}$ concentrations. Maximum values for all 13 mainstem sites were recorded during Round #1 (July 18-20), coinciding with a period of fertilizer application followed by a heavy rain. On July 16 the Miami Conservancy District rainfall stations at Ingomar (Halderman Rd) and Germantown dam reported 1.91" and 1.24" of rain, respectively. Maximum $\text{NO}_3\text{+NO}_2\text{-N}$ levels tended, in general, to be elevated upstream from RM 18.27 but declined downstream to a moderately elevated level by RM 0.95 (4.91 mg/l).

Nearly all of the mainstem BOD_5 values recorded (92%, n=55/60) were at or below the MDL (2.0 mg/l). The highest mean (2.77 mg/l) and maximum (3.7 mg/l) values were detected downstream from the Lewisburg WWTP (RM 34.9). Similarly, mean mainstem COD values were very low. Only 16 of 48 (33%) samples were above the MDL (10 mg/l). The highest mean (13.3 mg/l) and maximum (20 mg/l) values were detected at US 40 (RM 35.54).

Throughout Twin Creek, TSS concentrations were normally very low. The July 16 rain resulted in 11 of 12 sites reaching seasonal TSS maximums during Round #1 (July 18-20). The site downstream from the Gratis WWTP (RM 18.27) had the highest mean (15.4 mg/l) and maximum (53 mg/l) mainstem levels.

Maximum phosphorus concentrations at all 13 mainstem sites were below the WQS guideline (1.0 mg/l). The highest values (O =0.14 mg/l, max.=0.28 mg/l) in Twin Creek were recorded downstream from the Lewisburg WWTP (RM 34.9). Round #1 (July 18-20) sampling was concurrent with fertilizer application on area farm fields. All 13 sites yielded phosphorus levels(O =0.12 mg/l,

max.=0.16 mg/l) above the MDL (0.05 mg/l). Conversely, in round #4 (August 29-31) 10 of 13 locations had phosphorus values (\bar{O} =0.05 mg/l, max.=0.10 mg/l) below the MDL.

High fecal coliform bacteria concentrations were the most concerning aspect of water column sample analysis in Twin Creek in 1995. An extremely elevated fecal coliform population (47,000 organisms/100ml) documented downstream from the West Alexander WWTP (RM 26.7) on September 14, grossly exceeded the maximum SCR standard (5000 organisms/100 ml). This value was considered evidence of the discharge of unchlorinated sewage. Although the West Alexander WWTP (RM 26.8) was the most culpable nearby entity, another possible and previously unknown discharge was documented during the survey. A small package treatment plant (max. flow 4500 gal./day) operated by the Twin Valley Mobile Home Park (appx. 20 trailers) discharges to Twin Creek at RM 26.8. Twin Valley Mobile Home Park does not have a wastewater discharge NPDES permit, uses 1950s sewage treatment technology, and has no final effluent chlorination. This entity likely contributed to the maximum SCR criterion exceedence at RM 26.6.

The average PCR criterion (1000 organisms/100ml) was also exceeded at RM 26.7 (1530 organisms/100ml) and upstream at RM 27.57 (1240 organisms/100ml) on July 19. These round #1 levels, recorded after a rain storm, were possibly correlated with the above inferred runoff from an upstream cattle pasture and the unsewered community of New Lexington.

On July 19, the fecal coliform bacteria maximum PCR standard (2000 organisms/100ml) was exceeded downstream from the Gratis WWTP (RM 18.27, 2200 organisms/100ml). This criterion was also exceeded downstream from Tom's Run (RM 13.51, 3700 organisms/100ml) on September 13. No source was attributed to these exceedences although runoff from rural residential areas and agricultural animal facilities were strong possibilities.

No toxicity or water quality impact was inferred from the analysis of nine metal parameters analyzed at 13 mainstem sites. Cadmium, copper, lead and nickel were not detected in any of the 41 samples. Calcium and magnesium concentrations were within expected levels for waters in equilibrium with the limestone and dolomite substrate. Arsenic was detected at levels just above the MDL (2 : g/l) in 21 of 41 samples at 9 of 13 sites. Selenium was detected in 4 of 41 samples at four sites. Zinc concentrations were above the MDL (10 : g/l) in 18 of 41 samples at 11 of the 13 sites.

Four sample rounds included organic compound analyses at sites downstream from Lewisburg and the Iams and Carl Akey Co.'s (RM 34.0), West Alexandria (RM 26.7), Gratis (RM 18.27), and near the mouth (RM 0.95). No PCBs were detected in any sample. Dieldrin concentrations, a banned insecticide detected in 11 of 16 samples, exceeded the CAC (0.005 : g/l, MDL=0.002 : g/l) at all round #1 (July 19-20) sampling sites following a heavy rain. Heptachlor, another banned insecticide, was detected twice. Both samples by default exceeded the CAC (0.001 : g/l, MDL=0.002 : g/l). Methoxychlor, present in one sample (0.39 : g/l at RM 34.0), registered another default exceedence of the CAC (0.005 : g/l, MDL=0.01 : g/l). All three insecticides are suspected to be possible endocrine (hormone) disrupters.

Chloroethane was detected in all samples from RM 34.0 and RM 0.95 and at all sites in round #6. Basin wide of the 24 organic samples collected, 18 contained chloroethane. Although, the presence of chloroethane was not considered harmful, its presence challenged explanation. Chloroethane is an industrial solvent. The source of this contamination should be investigated further.

Millers Fork

Following an initial investigation by the Ohio EPA Fish Evaluation Group, a chemical sampling site was located on Millers Fork downstream from construction activities at the Beechwood golf course (SR 503, RM 10.12). No silt fences or other best management practices were used on disturbed ground at the construction site. Sediment laden water was observed being pumped improperly from a poorly constructed settling pond into Millers Fork which directly exacerbated water clarity. Downstream at the sampling location, substrates were embedded and smothered to 8 inches with recently deposited silt.

The Beechwood golf course developer was asked to comply with stormwater regulations; however, this was apparently ignored. The site remained under construction throughout the study period. Silt fences, straw bales, temporary seeding, or other relevant best management practices were not utilized.

Water quality impacts were evident in all four samples. Polluted runoff from poor construction practices were generally most culpable although agricultural sources were also implicated. The average EWH D.O. criterion (6 mg/l) was exceeded (5.5 mg/l) in one sample. The PCR fecal coliform bacteria criterion (1000 organisms/100ml) was exceeded once (1110 organisms/100ml). Slightly elevated NH₃-N values (0.2 and 0.33 mg/l) were recorded twice. Two samples had increased NO₃+NO₂-N levels (6.86 and 2.79 mg/l). Total suspended solids (TSS) were elevated (179 mg/l) on one occasion.

Efforts to improve compliance with stormwater regulations are encouraged. Nonpoint source runoff especially from construction sites represented one of the most significant water quality *threats* in the 1995 Twin Creek study area. Conscientious and environmentally sensitive development must receive greater emphasis in the study area in order to maintain current water resource integrity.

Swamp Creek

Four samples each at locations (RM 6.19 and RM 5.20) bracketing the Village of Verona provided compelling argument for the installation of a centralized sanitary waste treatment system. Two downstream fecal coliform bacteria samples (33,000 and 34,000 organisms/100ml) grossly exceeded the maximum SCR standard (5000 organisms/100ml) while two other samples (5200 and 4300 organisms/100ml) were well above the PCR criterion (1000 organisms/100ml). Although two of the upstream samples (1790 and 2700 organisms/100ml) also exceeded the PCR concentration, the additional loading by the Village was obvious. Fecal coliform counts this high were considered evidence that at least several residences drain raw sewage directly into Swamp Creek.

Along with the high bacteria concentrations, other parameters were also elevated downstream from Verona. Ammonia -N levels (2.09 and 2.07 mg/l) exceeded the CAC (1.90 and 1.70 mg/l, respectively) in two samples. Dissolved oxygen was less than the WWH average (5 mg/l) and minimum (4 mg/l) criteria on three occasions (2.8, 3.3 and 3.9 mg/l; \bar{O} =4.6 mg/l, n=4). Additionally, $\text{NO}_3+\text{NO}_2\text{-N}$ increased in downstream samples. It was apparent that the Village of Verona is a significant source of sewage pollution to Swamp Creek.

Price Creek

The influence of the Eldorado WWTP on Price Creek was prominent in four sets of samples collected from sites bracketing the plant (RM 13.68 & RM 13.28). In particular the WWTP delivers an amount of phosphorus (2.64, 2.68 & 2.43 mg/l) to the stream well in excess of the WQS guidance (1.0 mg/l). It also appeared that the plant was not functioning properly in September 1995 when an $\text{NH}_3\text{-N}$ exceedence (1.94 mg/l) of the CAC criterion (1.1 mg/l) was determined and $\text{NO}_3+\text{NO}_2\text{-N}$ levels were elevated (2.09 and 12.8 mg/l). In late summer during low flow conditions, the WWTP effluent comprises about half of the flow in Price Creek.

Beyond the WWTP, the ambient conditions in Price Creek also reflected impacts from polluted agricultural runoff. Round #1 samples collected following a rain storm contained fecal coliform concentrations (2600 & 2200 organisms/100ml) in exceedence of the PCR standard (1000 organisms/100ml) and had elevated $\text{NO}_3+\text{NO}_2\text{-N}$ levels (9.43 & 8.12 mg/l). Biological oxygen demand ($\text{BOD } \bar{O}$ =3.3 mg/l, n=8) was generally the highest of any stream sampled in the basin and one WWH minimum D.O. criteria (4 mg/l) exceedence (3.8 mg/l) was recorded upstream from the plant.

Lesley Run

Four water column chemical samples were collected from Lesley Run at Snyder Rd. (RM 6.01). Agricultural practices influenced Lesley Run at this location where cattle were observed watering in the stream. Poor riparian conditions and intermittent flow combined with livestock impacts yielded substantial algal growth by late summer. These conditions were reflected by elevated TSS (\bar{O} =50 mg/l, max.=128 mg/l), increased BOD_5 (\bar{O} =3.6 mg/l, max.=4.7 mg/l), and some D.O. readings (4.5 mg/l and 4.85) below the WWH average criterion (5.0 mg/l). Polluted runoff in round #1 was indicated by a moderately elevated $\text{NO}_3+\text{NO}_2\text{-N}$ (5.46 mg/l) level and an exceedence of the PCR criterion (1000 organisms/100ml) for fecal coliform bacteria (1210 organisms/100ml). Surprisingly, all $\text{NH}_3\text{-N}$ values were below detection suggesting that the stream was able to assimilate the immediate loading.

Bantas Fork

Analysis of four samples collected at SR 503 (RM 1.25) confirmed that the chemical water quality in Bantas Fork, an EWH stream, was generally exceptional. All parameter values except $\text{NO}_3+\text{NO}_2\text{-N}$ concentrations were less than the pertinent MDL, D.O. was consistently high (\bar{O} =8.5 mg/l, n=4) and fecal coliform bacteria counts were typical (\bar{O} =398 organisms/100ml, n=4). Some polluted runoff from agricultural land use was reflected in moderately elevated $\text{NO}_3+\text{NO}_2\text{-N}$ levels (round

#1=6.0 mg/l, rounds#2-4=1.9 mg/l average).

Goose Creek

Four water column samples were collected from Goose Creek at Sheyhing Rd. (RM 4.3) downstream from the Truck Stop of America and Pilot Oil Travel Center wastewater package treatment plants. Poor operation at one or both of these facilities was regarded as the cause of noticeably elevated $\text{NO}_3+\text{NO}_2\text{-N}$ concentrations (\bar{O} =8.2 mg/l). Other parameters also exhibited values consistent with sporadic treatment efficiency including a fecal coliform bacteria PCR exceedence (2400 organisms/100ml), a basin maximum BOD_5 reading (8.1 mg/l), a basin maximum COD value (63.0 mg/l), an atypical $\text{NH}_3\text{-N}$ level (0.3 mg/l) and an excessive amount of phosphorus (\bar{O} =1 mg/l, n=3).

This site on Goose Creek (RM 4.3) and another on Reigle Ditch were the only tributary locations evaluated for the presence of organic or pesticide compounds. Toluene was detected in one sample (0.7 : g/l). Several pesticides, some in concentrations above the CAC, were documented at this location (dieldrin=0.011 : g/l & 0.003, endosulfan I=0.005 : g/l, heptachlor=0.003 : g/l, "BHC=0.004 : g/l, $\text{\$BHC}$ =0.003 : g/l and (BHC=0.008 : g/l; *CAC exceedences in italics*). The pesticide compounds likely reflected agricultural polluted runoff whereas the toluene was probably runoff from an upstream paved surface. Chloroethane was present in all four samples (max.=2.1 : g/l, \bar{O} =1.7 : g/l). As mentioned previously with regard to mainstem samples, the presence of this industrial solvent, while not considered harmful, should be investigated further.

Oil and grease concentrations were detected twice (1.47 mg/l and 1.08 mg/l) at levels well below the WQS criterion (10 mg/l).

Tom's Run

Results from four sampling passes at Bull Rd. (RM 8.41) indicated the chemical water quality in Tom's Run was very good. Most parameter values were less than the relevant MDL, D.O. levels (5.6, 6.2 and 5.7 mg/l) were above the average (5 mg/l) and minimum (4 mg/l) WWH criteria and fecal coliform bacteria concentrations were low (\bar{O} =303 organisms/100ml, n=4). Some polluted runoff, likely from agricultural sources, was apparent in round #1 as evidenced by the amount of $\text{NO}_3+\text{NO}_2\text{-N}$ (6.65 mg/l) in the sample.

Little Twin Creek

The influence of the Farmersville WWTP on Little Twin Creek was apparent in four samples at Farmersville-W. Carrollton Rd. (RM 4.67), effectively located 1.21 miles downstream from the plant via Reigle Ditch. Although some instream degradation occurred between the site downstream from the WWTP in Reigle Ditch (RM 0.47) and this location, $\text{NO}_3+\text{NO}_2\text{-N}$ levels (\bar{O} =5.4 mg/l) and phosphorus concentrations (\bar{O} =0.6 mg/l) were still moderately elevated. An atypical $\text{NH}_3\text{-N}$ value (0.19 mg/l) was also recorded in one sample. In general, these nutrient parameters were sufficiently high to indicate the fair water quality conditions were attributable to the plant.

Reigle Ditch

The Farmersville WWTP was bracketed on Reigle Ditch (RM 0.47 and RM 0.35) with four sample sets. Poor effluent quality was evidenced by downstream samples which had the highest $\text{NO}_3+\text{NO}_2\text{-N}$ levels ($\bar{O}=15.6$ mg/l) and phosphorus concentrations ($\bar{O}=2.6$ mg/l) anywhere in the Twin Creek watershed. All individual sample values for these parameters exceeded the applicable WQS guidance (Public Water Supply human health criteria for $\text{NO}_3+\text{NO}_2\text{-N}=10$ mg/l, phosphorus nuisance prevention criteria=1 mg/l). The plant was also considered the source of occasional COD (49 mg/l) loading. Despite the elevated $\text{NO}_3+\text{NO}_2\text{-N}$ concentrations, $\text{NH}_3\text{-N}$ amounts were at or below detection levels suggesting the plant has good nitrification capacity.

Reigle Ditch typically becomes intermittent. During this period the Farmersville WWTP effluent essentially comprises all of the stream flow. Otherwise the WWTP at least dominates the flow regime. Given the magnitude of nutrient loading documented in 1995, efforts to reduce the WWTP water quality impacts through denitrification and phosphorus removal are warranted.

Additionally, sampling upstream from the plant indicated that polluted runoff likely from a residential source is entering the stream. One fecal coliform bacteria PCR exceedence (2100 organisms/100ml) and a moderately elevated $\text{NO}_3+\text{NO}_2\text{-N}$ value were recorded upstream. An agricultural or natural source was also possible but given the adjacent proximity of several houses a domestic source seems most probable.

Reigle Ditch and Goose Creek were the only tributary locations evaluated for the presence of pesticide or organic compounds. Various pesticides, some in concentrations above the CAC, were detected in four samples collected at RM 0.35 (aldrin=0.005 : g/l, dieldrin=0.006 : g/l & 0.004 : g/l, endosulfan I=0.007 : g/l, 0.004 : g/l, & 0.003 : g/l, endrin= 0.004 : g/l, endrin aldehyde=0.008 : g/l, 4,4'-DDD=0.007, 4,4'-DDE=0.006, heptachlor=0.005 : g/l, heptachlor epoxide=0.006 : g/l, & 0.003 : g/l, "BHC=0.012 : g/l & 0.003 : g/l, β BHC=0.004 : g/l, 0.005 : g/l, & 0.007 : g/l and (BHC=0.003 : g/l, 0.0095 : g/l, & 0.045 : g/l; *CAC exceedences in italics*). These compounds likely reflected agricultural nonpoint source runoff.

Several trihalomethanes (bromodichloromethane $\bar{O}=7.4$: g/l, dibromochloromethane $\bar{O}=4.3$: g/l, and chloroform $\bar{O}=11.1$: g/l) were also detected in all four samples. Trihalomethanes are a byproduct of drinking water chlorination. Chloroethane was present in all four samples (max.=1.2 : g/l, $\bar{O}=0.9$: g/l). As previously mentioned, the source of this contamination should be investigated further.

Chemical Sediment Quality

Sediment samples were collected at four Twin Creek mainstem and two tributary locations in 1995 (Tables 10 and 11). Samples were typically a composite of the channel cross section substrates (Table A-5). The chemical analyses included nine heavy metals, 21 organochlorine pesticides and seven polychlorinated biphenyls (PCBs, USEPA Method 8080), 152 priority pollutants and 59 volatile organic compounds (VOCs, USEPA Method 8260), and 93 base neutral and acid extractable compounds (BNAs, USEPA Method 8270; note: Many modern pesticides, including atrazine,

glyphosate, 2-4-D amine or ester, cyanazine and alachlor, are not detected by these methods). Sediment contamination was characterized with respect to appropriate literature (Kelly and Hite 1984, Persaud *et al.* 1994) and metal concentrations were compared with statewide Ohio EPA data (Appendix Tables A-6 and A-7).

The Kelly and Hite stream sediment classification system (Illinois EPA) ranks relative pollutant concentrations, from non-elevated to extremely elevated based on mean values, plus 1, 2, 4, and 8 standard deviations from 94 background sites; it does not directly assess toxicity. In *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, Persaud *et al.* present a three tiered classification based on ecotoxic effects determined from bioassay testing or predicted toxicity derived from benthic communities in different contaminant concentrations using field data. Only the severe effect level was used in this report for heavy metal analysis due to differences in Ohio background levels.

USEPA method 8270 indicated 29 different tentatively identified compounds (TICs) were found in Twin Creek or tributary sediments. Most of the TICs were fatty acids in the $\text{CH}_3(\text{CH}_2)_{12}\text{COOH}$ (tetradecanoic acid - myristic acid) to $\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$ (octadecanoic acid - stearic acid) range and

Table 10. Dry weight concentrations (mg/kg) of heavy metals in sediments in the Twin Creek study area, 1995. Parameter concentrations were characterized in comparison with values described by Kelly and Hite (1984), Persaud *et al.* (1994), and with Ohio EPA statewide data (Table A-5).

Stream River Mile	Sediment Concentration (mg/kg dry weight) ¹								
	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni ²	Zn
Twin Creek									
42.08	8.54 ^b	0.484 ^a	26.9 ^c	16.7 ^a	19200 ^b	<17.9 ^a	0.0492 ^a	<23.9	85 ^b
34.0	7.09 ^a	0.659 ^{b*}	<38.0	22.8 ^{a*}	20700 ^b	<38.0	0.0697 ^a	<50.7	148 ^{c**}
26.7	15.0 ^{c*}	0.331 ^a	28.4 ^{c*}	25.9 ^{a*}	22000 ^b	29.5 ^b	<0.0433 ^a	<39.3	120 ^{c*}
0.95	7.46 ^a	0.354 ^a	<22.6	17.3 ^a	13800 ^a	<22.6	<0.0395 ^a	<30.1	77.6 ^a
Goose Creek									
4.3	11.6 ^c	0.729 ^{b*}	<47.6	25.4 ^{a*}	26900 ^c	<47.6	0.0931 ^b	<63.4	162 ^{c**}
Reigle Ditch									
0.35	10.6 ^b	0.443 ^a	<27.1	31.6 ^{a*}	14300 ^a	28.9 ^b	<0.0438 ^a	<36.2	132 ^{c*}

¹ Only the Persaud *et al.* (1994) severe effect level was used respecting differences in Ohio background conditions. All of the sample concentrations were less than the relevant severe effect level.

² The Kelly and Hite classification system does not evaluate Ni. Letter codes correspond to Kelly and Hite as follows:

a - nonelevated, b - slightly elevated, c - elevated, **d - highly elevated, e - extremely elevated**

* value is (slightly elevated) above the parameter median plus 1 interquartile in the Ohio EPA sediment database.

** value is (elevated) above the parameter median plus 2 interquartiles in the Ohio EPA sediment database.

Table 11. Dry weight concentrations (mg/kg) of priority organic pollutants detected in sediments in the Twin Creek study area, 1995. Parameter concentrations were characterized in comparison with values described by Kelly and Hite (1984)¹ and Persaud *et al.* (1994).

Stream/ River Mile	Class	Detected Compound	Concentration (mg/kg)
Twin Creek			
42.08	BNA	3&4 methyl phenol	2.0 [?]
34.0	BNA	benzo (b&k) fluoranthene	2.0 £=
		chrysene	1.5 £
		pyrene	2.1 £
		fluoranthene	2.9 £
26.7	BNA	3&4 methyl phenol	2.0 [?]
Goose Creek			
4.3	BNA	3&4 methyl phenol	3.4 [?]
Reigle Ditch			
0.35	VOC	chloroform	0.1 [?]
	BNA	3&4 methyl phenol	10.7 [?]
		bis (2-ethylhexly) phthalate	1.2 [?]
		benzo (b&k) fluoranthene	1.3 £=
		pyrene	1.3 £
fluoranthene	1.5 £		

¹ Kelly and Hite (1984) principally address metals and organochlorine compounds. Pesticides and PCBs were absent in

Twin Creek study area samples.

[?] This compound is not characterized by Kelly and Hite or Persaud *et al.* (1994).

£ value is greater than the lowest effect level in Persaud *et al.*

= Persaud *et al.* guidance uses benzo (k) fluoranthene. USEPA Method 8270 can not differentiate whether the benzene functional group is attached in the "k" or "b" position on the fluoranthene molecule. Benzo (b) fluoranthene is less toxic.

long chain alkanes in the C₂₄H₅₀ (tetracosane) to C₃₀H₆₂ (tricontane) range. Also found at all six sites was cholest-5-EN-3-OL (3.beta, cholesterol) the principal sterol of higher animals, stigmast-5-EN-3-OL (3.beta,24s -Sitosterol) the principal sterol of soy bean oil and 3,7,11,15-tetramethyl-2-hexadecen-1-OL(phytol) a decomposition product of chlorophyll.

Twin Creek

Sediment samples were collected in Twin Creek at Euphemia-Castine Rd. (RM 42.08), downstream from the Lewisburg WWTP, Iams and Carl Akey Co. discharges (RM 34.0), downstream from the West Alexander WWTP (RM 26.7) and near the mouth (RM 0.95). All heavy metal concentrations were less than the Ontario severe effect level. The Kelly and Hite system indicated elevated

chromium (26.9 mg/kg) levels at RM 42.08, elevated zinc (148 mg/kg) levels at RM 34.0, and elevated arsenic (15.0 mg/kg), chromium (28.4 mg/kg), and zinc (120 mg/kg) levels at RM 26.7. All metals values at RM 0.95 were less than the non elevated level. The RM 34.0 zinc concentration was elevated in comparison with statewide Ohio EPA data.

All mainstem VOC, pesticide and PCB concentrations were less than the MDL. The BNA compound 3&4 methyl phenol (cresol; 2.0 mg/kg) was detected at RM 42.08 and RM 26.7. Neither classification system characterizes this compound. At RM 34.0 four polycyclic aromatic hydrocarbons (PAHs) were detected at concentrations just above the Ontario lowest effect level.

Goose Creek

Sediments in Goose Creek were evaluated at Scheyhing Rd. (RM 4.3) downstream from the Truck Stop of America and Pilot Oil Travel Center WWTPs. Although all heavy metal values were less than the Ontario severe effect level, the Kelly and Hite classification system indicated levels of arsenic (11.6 mg/kg), iron (26900 mg/kg), and zinc (162 mg/kg) were elevated. Compared with statewide Ohio EPA data, the concentration of zinc was elevated.

All VOC, pesticide and PCB concentrations were less than the MDL. The BNA compound 3&4 methyl phenol (cresol; 3.4 mg/kg) was detected. Neither classification system characterizes this compound.

Reigle Ditch

Reigle Ditch sediments were analyzed downstream from the Farmersville WWTP (RM 0.35). Zinc concentrations (132 mg/kg) were elevated based on the Kelly and Hite system. One VOC (chloroform 0.1 mg/kg) and the BNA compound 3&4 methyl phenol (cresol; 10.7 mg/kg) were detected, neither of which are addressed by either assessment system. Three PAHs were detected at concentrations just above the Ontario lowest effect level. No pesticides or PCBs were detected in the sediments.

Physical Habitat for Aquatic Life

Twin Creek

In 1995 the quality of the macrohabitats in Twin Creek were evaluated at 21 fish sampling sites extending from a site near Castine (Fowble Rd., RM 45.9) downstream to a site near the confluence with the Great Miami River (RM 0.2). Excellent quality stream macrohabitats were present at all but two locations (Table 12). QHEI scores ranged from 95.0 downstream from the West Alexandria WWTP to 44.0 at the most upstream site near Castine. Including all sites, the mean QHEI was 81.0. Generally, QHEI scores above 60 reflect habitat conditions which are able to support aquatic communities consistent with the WWH use designation. Scores of 75 and above are typical of very good to extraordinary macrohabitat conditions (Rankin 1989).

Overall, the macrohabitat quality in Twin Creek was impressive. Three locations had extraordinary QHEI scores (>90). All but two sites scored 75 or above. The most upstream site (Fowble Rd., RM 45.9) was channelized resulting in a QHEI of 44.0. Another site at Pymont Rd. consisted entirely of pool conditions. At this location, the lack of a riffle resulted in a good QHEI score (64.0). Excluding the near headwater upstream site (RM 45.9=20mi²), the remaining 45 mile continuous reach of Twin Creek had a mean QHEI score of 82.8. In Ohio, only Big Darby Creek, a nationally significant stream, has higher continuous reach QHEI scores (\bar{O} =86.8, n=16).

Boulder, cobble and gravel substrates predominated Twin Creek. Silt and embeddedness were normal or absent. Channel morphology tended to be moderately sinuous with very good development. Stability, however, was low or moderate especially at the most downstream locations where flow velocities were capable of exerting the forces necessary to shift large gravel bars and transport cobbles.

A moderate amount of instream cover was fairly uniform from site to site. Almost every location had logs, woody debris, rootwads, boulders, aquatic macrophytes and deep pools. Deep pools in particular were an outstanding habitat feature in Twin Creek. Nearly every site included at least one very deep pool (>1m). Although some sites did contain extensive amounts of instream cover, flow velocity attributes were the more impressive overall macrohabitat feature.

The variation in current velocity at each site was unique. Fast, moderate and slow currents were present at every location. Eddies were common. Near torrential flows were normal at several sites. Stream depth through riffles and runs was deep, often over 50cm. Essentially, a lot of water moves down the Twin Creek watershed (annual \bar{O} =264 cfs at 275mi²; Shindel, *et al.* 1996). Its course is often constricted into rapid boulder strewn chutes followed by deep cold pools. The combination of these specific elements was considered the most significant factor likely to influence aquatic species.

Agricultural land use was most prevalent in the watershed although areas adjacent to the stream were interspersed with rural residences and forested tracts. Riparian corridor tended to be moderate (10-

50m) to wide (>50m).

Table 12. Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Twin Creek study area, 1995.

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes							MWH Attributes																		
			No Channelization or Recovered	Eccel. Cobble/GraVel Substrates	Silt/Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overal	Embeddement	Max Depth > 40 cm	Low-Normal/High Embeddement	High Influence				Moderate Influence										
														Total WWH Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparsely No Cover	Max Depth < 40 cm (W/D, F/W)	Total H.I. MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Local)	Highly Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Inefficient and Poor Foods
(14-510) Price Creek																												
Year: 95																												
13.7	54.0	12.35	■			■						3		●	●		2	♦	♦	♦	♦	♦	♦	♦	7	0.75	2.50	
13.3	52.0	10.99	■			■		■	■			4		●	●		2	♦	♦	♦	♦	♦	♦	♦	7	0.60	2.00	
7.6	55.5	5.24	■			■						3		●			1	♦	♦			♦	♦	♦	6	0.50	2.00	
3.9	87.0	13.51	■	■	■	■	■	■	■	■	■	9					0								0	0.10	0.10	
0.6	82.0	25.00	■	■	■	■	■	■	■	■	■	9					0							♦	♦	2	0.10	0.30
(14-512) Swamp Creek																												
Year: 95																												
6.1	41.0	4.95										0		●	●	●	●	4	♦	♦	♦	♦	♦	♦	7	5.00	*. **	
5.4	58.0	4.24	■			■						3		●			1	♦	♦	♦	♦	♦	♦	♦	7	0.50	2.25	
2.7	67.5	11.90	■	■	■	■	■	■	■	■	■	9					0		♦				♦	♦	3	0.10	0.40	
0.3	78.0	9.90	■	■	■	■	■	■	■	■	■	7					0							♦	♦	2	0.13	0.38
(14-513) Millers Fork																												
Year: 95																												
10.7	28.5	3.62										0		●	●	●	●	4	♦	♦	♦	♦	♦	♦	7	5.00	*. **	
10.0	46.5	3.62	■	■		■						4		●	●		2		♦	♦			♦	♦	6	0.60	1.80	
7.3	58.0	8.77	■			■						3		●	●		2	♦	♦	♦	♦	♦	♦	♦	7	0.75	2.50	
0.3	76.0	9.52	■	■	■	■	■	■	■	■	■	9					0							♦	♦	2	0.10	0.30

Table 12. Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Twin Creek study area, 1995.

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes										MWH Attributes																			
													High Influence					Moderate Influence														
			No Channelization or Revegetated	Equal, Cobble, Gravel Substrates	Silt/Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overal	Embankment	Max Depth > 40 cm	Low-Normal/High Embankment	Total WWH Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparsely No Cover	Max Depth < 40 cm (W/D, F/W)	Total H.I. MWH Attributes	Revealing Channel	Heavy/Moderate Silt Cover	Sand Substrates (Local)	Highly Substrate Origin	Flow/Factor Development	Low Sinuosity	Only 1-2 Cover Types	Inefficient and Poor Focals	No Fast Current	High/Mcc. Overall Embankment	High/Mcc. Riprap Embankment	No Riprap
(14-501) Little Twin Creek																																
Year: 95																																
6.3	67.0	18.87	■	■	■	■	■	■	■	■	■	8	■	●	1	◆	◆	◆	3	0.22	0.56											
4.7	60.5	17.24	■	■	■	■	■	■	■	■	5	●	●	2	◆	◆	◆	4	0.50	1.17												
2.7	74.0	18.52	■	■	■	■	■	■	■	■	7	0	0	2	◆	◆	2	0.13	0.38													
(14-502) Toms Run																																
Year: 95																																
12.1	68.0	10.00	■	■	■	■	■	■	■	■	7	0	0	2	◆	◆	2	0.13	0.38													
8.5	78.0	12.50	■	■	■	■	■	■	■	■	8	0	0	2	◆	◆	2	0.11	0.33													
0.4	69.5	15.87	■	■	■	■	■	■	■	■	6	0	0	3	◆	◆	3	0.14	0.57													
(14-504) Aukerman Creek																																
Year: 95																																
0.2	66.5	15.63	■	■	■	■	■	■	■	■	7	0	0	3	◆	◆	3	0.13	0.50													
(14-506) Goose Run																																
Year: 95																																
4.4	56.5	20.41	■	■	■	■	■	■	■	■	4	●	●	2	◆	◆	◆	5	0.60	1.60												
0.2	70.0	20.00	■	■	■	■	■	■	■	■	9	0	0	0	0	0	0	0.10	0.10													
(14-516) Reigle Ditch																																
Year: 95																																
0.5	69.0	16.13	■	■	■	■	■	■	■	■	7	0	0	4	◆	◆	◆	4	0.13	0.63												
0.3	67.0	16.13	■	■	■	■	■	■	■	■	6	0	0	4	◆	◆	◆	4	0.14	0.71												

Table 12. (continued)

In summary, macrohabitat conditions in Twin Creek were adequate to support the EWH use designation. Furthermore, the macrohabitat quality in Twin Creek as measured by the QHEI was second in Ohio only to Big Darby Creek. Comparatively, Big Darby Creek has extensive instream cover, whereas the exceptional macrohabitats in Twin Creek are more influenced by flow regime. Efforts to increase and maintain the width of the riparian corridor in the watershed are recommended as the most effective way to preserve the impressive macrohabitat conditions in Twin Creek.

Millers Fork

The quality of the macrohabitats of Millers Fork were evaluated at four fish sampling stations. QHEI values increased downstream from a channelized headwater site (RM 10.7, QHEI=28.5) through a reach impacted by golf course construction activities (RM 10.0, QHEI=46.5) through a recovering reach downstream from Ithaca (RM 7.3, QHEI=58.0) to a lower, essentially natural reach (RM 0.3, QHEI=76.0).

A poor mean QHEI score (37.5) for the two upstream locations was indicative of macrohabitat conditions which were likely to negatively influence instream biological performance (Rankin 1989). The creek at the channelized upstream site was quite small, lacked riparian vegetation, was extensively embedded, and substrates were primarily silt and muck. Instream cover was basically limited to extensive aquatic macrophyte beds.

Seven tenths of a mile downstream, the stream had recovered from the historical channelization effects but was degraded by ongoing disturbances ensuing through polluted runoff. During the survey period, the Beechwood golf course at SR 503 (RM 10.0) was under construction. Many acres

(>5) of bare soil flanked both altered stream banks in this development. Proper sediment abatement practices were not present. An attempt at using a settling pond lacked appropriate mitigative measures and resulted in extremely turbid water being pumped into Millers Fork. No setbacks, silt fences, straw bales or other attempts to limit sediment entry to the stream were observed at this site.

Further downstream, wetland and historical channelization influences were evident at RM 7.3. However, a QHEI score of 58.0 was indicative of macrohabitat conditions which, although somewhat degraded, were nevertheless considered adequate to support at least a WWH aquatic community. Some excess sediment and turbidity through the reach was attributed to polluted runoff from the Beechwood golf course construction activities.

Upon arriving for the first time at Millers Fork the clarity at RM 0.3 was concerning. An opaque overcast in the water at this site was unusual. All of the other streams in the basin remained clear even after small showers. Furthermore, an increase in the amount of relative embeddedness and an observed orange precipitate was atypical. At that point, the source of these impacts was a mystery. Further reconnaissance resulted in the "discovery" of the golf course construction ten miles upstream.

Although it was difficult to quantify a specific amount of degradation directly attributable to Beechwood, the fact that their construction activities were detected ten miles downstream is telling. The fact that macrohabitat conditions at RM 0.3 were otherwise very good (QHEI=76.0) is also revealing. It is unlikely that the observed conditions would have been discerned from background had the difference not been as inherently great as it was. Millers Fork and most other streams in the Twin Creek basin displayed very good habitat attributes except where nonpoint source pollution impaired ambient conditions. A slow almost imperceptible diminishment of environmental quality is a real fate of these streams. Aggressive efforts to abate polluted runoff are needed immediately to protect this high quality basin.

Swamp Creek

QHEI scores of 41.0 (RM 6.1), 58.0 (RM 5.4), 67.5 (RM 2.7), and 78.0 (RM 0.3) were recorded at four fish sampling sites in Swamp Creek. The two upstream sites bracketing Verona were influenced by agricultural drainage and rural residential runoff. Downstream from Verona a septic odor along with human hygiene devices was evidence of malfunctioning home sewage treatment systems.

Despite a variety of nonpoint source pollution influences which exerted subtle effects at each site, an overall mean QHEI score of 61.1 reflected habitat conditions which were capable of supporting WWH aquatic communities.

Price Creek

Marked differences existed between three upstream sites and two downstream locations on Price Creek. Macrohabitats at stations bracketing the Eldorado WWTP (RM 13.7, QHEI=54.0 and RM 13.3, QHEI=52.0) and at US 40 (RM 7.6, QHEI=55.5) were degraded through agricultural and rural

residential runoff. Hardpan and gravel substrates were extensively embedded with sand and silt especially at US 40 where septic odors were attributed to a tile likely discharging from an adjacent house. A fair mean reach QHEI value of 53.8 was considered likely to limit biological community performance in this area.

Downstream at Jim's Run Rd. (RM 3.9, QHEI=87.0) and SR 503 (RM 0.6, QHEI=82.0) macrohabitat conditions were remarkably improved. The excellent scores here represented cobble substrates, extensive instream cover and good current variation. Stream habitat in this reach (QHEI \bar{O} =84.5) was considered capable of supporting EWH biotas.

Lesley Run

Macrohabitats of Lesley Run were evaluated at two fish sampling sites where QHEI values of 53.5 (RM 6.5) and 70.0 (RM 1.2) were determined. The upstream channelized site was within the backwater of a dam-ford used to access farm fields. Good substrate variety and high gradient characterized the downstream location which displayed some excess sand and silt bedload characteristic of polluted runoff.

Bantas Fork

The best overall habitat conditions encountered during the 1995 Twin Creek survey occurred in Bantas Fork (QHEI \bar{O} =84.8) at three fish sampling sites. Instream conditions were excellent at SR 127 (RM 9.5, QHEI=74.0) at SR 503 (RM 1.4, QHEI=96.5), and adjacent to North Factory Rd. (RM 0.6, QHEI=84.0). Impressive substrate variety with normal silt and embeddedness, extensive instream cover, good morphology and good flow dynamics were typical of the entire stream reach. Some hint of threats associated with polluted runoff were detected at the upstream site where moderate erosion and an increased amount of sand was observed. However, macrohabitats in general were consistent with the EWH aquatic life use designation.

Goose Creek

In evaluating the macrohabitats of Goose Creek, QHEI scores of 56.5 (RM 4.4) and 70.0 (RM 0.2) were recorded at two fish sampling sites. The upstream site was limited by bedrock and otherwise extensively embedded substrates combined with overall shallow water (<40cm) and limited flow conditions. Good macrohabitats were present at the downstream location. Generally, conditions were sufficient to support WWH aquatic life use designation.

Aukerman Creek

Good macrohabitat conditions (QHEI=66.5) existed in Aukerman Creek at one fish sampling location downstream from Fudge Rd. (RM 0.7). A variety of moderately embedded substrates existed with some indication of past channel modification and a marginal riparian zone existed at the site. The prevalent macrohabitat quality was deemed suitable for a WWH biological community.

Tom's Run

Similar macrohabitats (QHEI \bar{O} =71.8) were encountered at three fish sampling sites on Tom's Run.

Although moderately embedded, a good variety of substrates, instream cover and channel morphology was consistent at Amity Rd. (RM 12.1, QHEI=68.0), Bull Rd (RM 8.5, QHEI=78.0) and downstream adjacent to Anthony Rd. (RM 0.4, QHEI=69.5).

Little Twin Creek

Similar macrohabitats (QHEI \bar{O} =67.2) were also documented at three Little Twin Creek fish sampling locations. Primarily a gravel based stream, a normal amount of embeddeness at the upstream site (RM 6.3, QHEI=67.0) compared to extensively embedded and algae covered surfaces downstream from Reigle Ditch (RM 4.7, QHEI=60.5) differed with the most downstream location (RM 2.7, QHEI=74.0) where moderate embeddeness was compensated by extensive instream cover. A fine detritus like flocculent and excessive algal growth at RM 4.7 were attributed to nutrient loading from the Farmersville WWTP. Despite this impairment, the stream habitats were adequate to support the WWH aquatic life use designation.

Reigle Ditch

Two sites (QHEI \bar{O} =68.0) bracketing the Farmersville WWTP were used to assess macrohabitat conditions in Reigle Ditch. The most notable difference between sites was the increased flow downstream from the plant (RM 0.3, QHEI=67.0). Although the upstream site (RM 0.5, QHEI=69.0) became intermittent by late summer, the entire reach was still considered capable of sustaining WWH biological communities.

Biological Assessment: Macroinvertebrate Community

Twin Creek

Quantitative and qualitative data were evaluated from 17 Twin Creek mainstem stations between Euphemia-Castine Rd. (RM 42.2) and the mouth (0.3) and from 32 tributary locations (Table 13; 1993 Toms Run data is also included in this report). Artificial substrate samplers were set at 24 locations (August 7-15) with flows ranging from 0.6 fps to 4.0 fps. Twenty samplers were recovered (September 18 to October 2) with retrieval flows ranging from 0.05 fps to 1.0 fps. The sampler downstream from the Lewisburg WWTP (RM 35.0) upon retrieval was in nondetectable current. Samplers at the Germantown dam (RM 9.8) and near the mouth (RMs 1.0 and 0.3) were not recovered. Subsequently, qualitative evaluations were used to evaluate macroinvertebrate quality at these sites.

Twin Creek is home to the most consistently exceptional macroinvertebrate community in the state. No other stream in Ohio maintains macroinvertebrate populations which meet the EWH aquatic life use designation without exception over as long a sampling reach (>40 mi.) as Twin Creek did in 1995. From its headwaters to the Great Miami River confluence, Twin Creek ICI scores ranged from 46 to 54 representing a significant and diverse macroinvertebrate community with 197 taxa including several rare organisms (Figure 13).

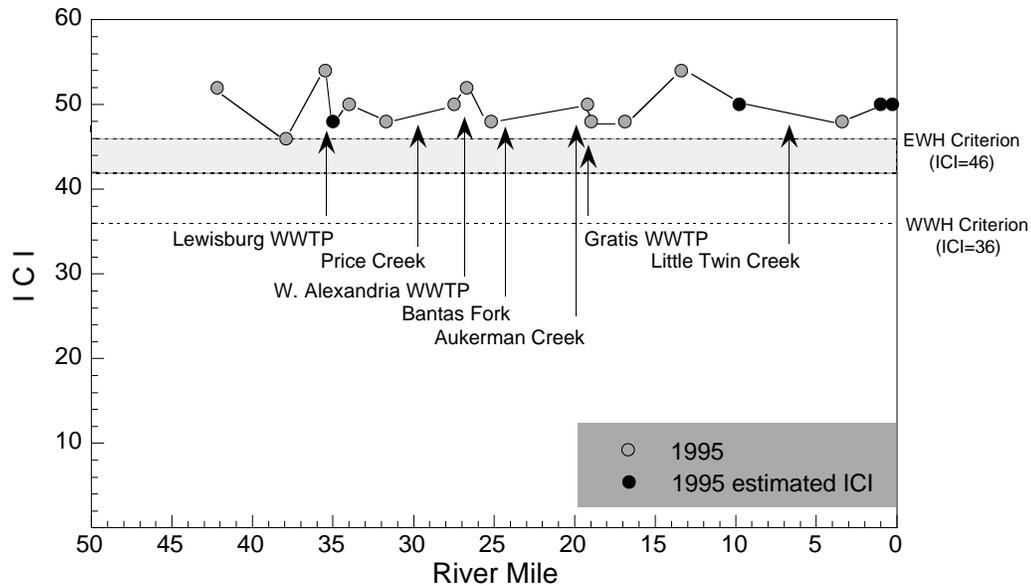


Figure 13 Longitudinal performance of the Invertebrate Community Index (ICI) in Twin Creek, 1995.

Attributes such as a largely intact riparian zone, perennial groundwater flow augmentation, and moderate to high gradients were common in the Twin Creek watershed. These characteristics foster reduced sediment loads, low water temperatures, and high D.O. concentrations. Along with these good general qualities, Twin Creek also afforded niches for many habitat specific organisms. For example, the rare mayflies *Acerpenna macdunnoughi* and *Paracloeodes sp. 3*, inhabitants of cool, oxygen-rich riffles, were collected at several sites. The coldwater fishfly *Nigronia fasciatus*, collected at one Twin Creek site, inhabits boulder strewn riffles and runs in cold fast-flowing streams (Hilsenhoff 1995, OEPA 1987b). The clean, rapid, oxygen-rich waters of Twin Creek facilitated the presence of many rare, intolerant or coldwater species including the caddisfly *Chimarra aterrima*, the snail-cased caddisfly *Helicopsyche borealis*, and the flathead mayfly *Stenonema mediopunctatum*.

The cased caddisfly genera *Triaenodes* was found in deep, cold runs where aquatic macrophytes, primarily water willow and tree roots, were profusely dense. The aquatic moth genus *Petrophila* and the dobsonfly *Corydalus cornutus*, common throughout the mainstem, further indicated exceptional riffle run qualities and high D.O. concentrations. River snails of the genus *Elimia* another species intolerant of low D.O. concentrations, were frequently collected in Twin Creek where they predominated reaches with large exposed broken slabs of shale or limestone bedrock. The intolerant riffle beetle *Optioservus fastiditus* and the water penny *Psephenus herricki* were also collected. Some unusual midges collected in Twin Creek which reflected these habitat attributes included *Corynoneura sp.*, *Polyedilum (P.) aviceps*, *Parametriocnemus sp.*, *Stempellinella spp.*,

Paratanytarsus n. sp.1 and *Rheotanytarsus distinctissimus* group.

While the overall macroinvertebrate community in Twin Creek was impressive, some modest nutrient enrichment was evident at several locations (Figure 14). At Euphemia Castine Rd. (RM 42.2) and

Table 13. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Twin Creek study area, 1995. A summary of the 1993 Tom's Run collection is also included.

<i>Stream</i> River Mile	Drainage Area (mi ²)	Relative Density (/ft ²)	Quan- titative Taxa	Qual- itative Taxa	Cum- ulative Taxa	Qual- itative EPT ^a	Cum- ulative EPT	Cumulative Predominate Organisms	QCTV ^c	ICI	Narrative Evaluation ^b
<i>Twin Creek (existing EWH)</i>											
42.2 ¹	28.0	882	49	43	67	7	13	9,11,4,12,6,5	39.2	50	Exceptional
42.2 ²	28.0	692	49	43	71	7	15	9,11,4,12,6,5		54	Exceptional
37.9	34.0	201	43	47	70	16	20	10,12,1,11,28	40.3	46	Exceptional
35.5	69.0	895	44	71	90	25	26	3,1,8,12,6	39.2	54	Exceptional
35.0	88.0	357	37	65	85	19	20	3,7,27,12,11,6,20	38.9	[34] ^d	Exceptional
34.0	89.0	573	46	67	86	22	22	3,1,10,11,12,5,20,6,14	39.7	50	Exceptional
31.7	96.0	384	48	56	85	20	24	3,8,10,11,12,6,14,20,6	39.7	48	Exceptional
27.5	143.0	1046	39	70	85	24	27	3,14,11,20,5,27	40.0	50	Exceptional
26.7	146.0	1722	50	70	85	26	28	3,1,2,5,7,6,20	40.3	52	Exceptional
25.2	150.0	1155	44	64	80	20	24	3,5,1,11,10,23,6,14,22	39.7	48	Exceptional
19.2	225.0	1580	42	61	77	23	27	3,1,2,5,8,6,17,20	40.3	50	Exceptional
19.0	228.0	734	37	52	63	19	22	5,3,8,11,6	40.3	48	Exceptional
16.9	235.0	976	46	74	92	19	23	5,3,1,8,17,20,6	39.2	48	Exceptional
13.4	271.0	860	44	59	77	18	22	3,1,8,5,6,27	40.5	54	Exceptional
9.8	275.0	Moderate	-	77	77	23	23	3,7,1,8,9,6	39.3	E	Exceptional
3.4	312.0	1187	37	60	74	17	21	3,1,8,7,5,6,27	39.7	48	Exceptional
1.0	315.0	Mod.-Low	-	58	58	20	20	3,1,8,7,27,5,6	40.5	E	Exceptional
0.3	316.0	Moderate	-	52	52	24	24	3,15,27,5,1,8,20,17	40.5	E	Exceptional
<i>Millers Fork (existing EWH)</i>											
10.75	5.9	Low.-High	-	35	35	6	6	10,32,21,27	38.3	G*	Good
10.1	7.0	Low-Mod.	-	33	33	7	7	3,10,7,16	34.2	F*	Fair
7.3	11.8	Mod.-High	-	43	43	10	10	3,6,22,20,9	39.2	VG ^{ns}	Very Good
0.4	25.9	Mod.-High	-	57	57	15	15	3,2,12,22,11,4,21	39.2	E	Exceptional
<i>Swamp Creek (existing WWH)</i>											
6.2	13.7	Low	-	37	37	6	6	9,18,24	38.5	MG ^{ns}	Mrg. Good
5.2	15.0	Low	-	25	25	1	1	18,7,9,16	31.3	P*	Poor
1.7	17.6	Low-High	-	53	53	18	18	10,11,4,12,22,21	39.1	E	Exceptional
<i>Price Creek (existing WWH)</i>											
13.5	5.6	Low-High	-	33	33	6	6	3,10,31,24,6	38.3	MG	Mrg. Good
13.2	6.1	Moderate	-	39	39	5	5	10,3,7,27,6,21	34.8	F*	Fair
7.6	15.5	Low-Mod.	-	41	41	6	6	3,27,5,9,21,18,6,10	36.8	F*	Fair
3.9	20.1	Moderate	-	43	43	15	15	3,2,11,10	39.8	E	Exceptional
0.6	29.5	Mod.-High	-	54	54	18	18	3,2,12,11,9,10,6	39.8	E	Exceptional

Table 13. (continued).

<i>Stream</i>	<i>Drainage</i>	<i>Relative</i>	<i>Quan-</i>	<i>Qual-</i>	<i>Cum-</i>	<i>Qual-</i>	<i>Cum-</i>	<i>Cumulative</i>	<i>QCTV^c</i>	<i>ICI</i>	<i>Narrative</i>
<i>River</i>	<i>Area</i>	<i>Density</i>	<i>titative</i>	<i>itative</i>	<i>ulative</i>	<i>itative</i>	<i>ulative</i>	<i>Predominate</i>			<i>Evaluation^b</i>
<i>Mile</i>	<i>(mi²)</i>	<i>(/ft²)</i>	<i>Taxa</i>	<i>Taxa</i>	<i>Taxa</i>	<i>EPT^a</i>	<i>EPT</i>	<i>Organisms</i>			
<i>Goose Creek (existing WWH)</i>											
4.4	3.6	Low-Mod.	-	42	42	8	8	10,9,30,2	35.3	G	Good
0.4	11.4	Low-Mod.	-	59	59	19	19	3,27,6,10,12	40.9	E	Exceptional
<i>Bantas Fork (existing EWH)</i>											
9.4	11.8	Moderate	40	22	51	10	16	11,12,3,6,10	41.3	54	Exceptional
1.3	34.0	201/ft. ²	41	45	64	18	20	2,27,12	39.3	56	Exceptional
0.7	35.2	Low-Mod.	-	58	58	22	22	1,3,6,12,20,23	40.5	E	Exceptional
0.2	35.4	436/ft. ²	56	79	96	23	26	3,7,8,27,23	39.7	54	Exceptional
<i>Lesley Run (existing WWH)</i>											
6.1	5.0	Low	-	24	24	3	3	21	35.5	F*	Fair
<i>Aukerman Creek (existing WWH)</i>											
0.5	21.1	Low-Mod.	-	70	70	20	20	3,7,8,12,6	39.2	E	Exceptional
<i>Toms Run 1995 (existing WWH)</i>											
12.1	6.0	Low-Mod.	-	33	33	4	4	20,13,22	31.3	F*	Fair
8.3	10.6	Low-Mod.	-	35	35	3	3	20,16,6,9	34.8	F*	Fair
0.4	25.1	Low	-	57	57	19	19	3,2,27,6,12	39.7	E	Exceptional
<i>Toms Run 1993 (existing WWH)</i>											
9.7 ¹	7.6	Mod.-High	-	46	46	12	12	11,18,28	38.9	VG	Very Good
9.7 ²	7.6	75/ft. ²	26	31	48	8	9	3,6,20	35.6	MG ^{ns}	Mrg. Good
5.3	17.9	Low-High	-	47	47	12	12	27,3,8,9,6,18	38.6	VG	Very Good
0.7 ¹	24.6	Low-High	-	60	60	14	14	3,15,18	39.2	E	Exceptional
0.7 ²	24.6	Low-High	35	57	72	18	19	3,8,20	39.6	46	Exceptional
<i>Unnamed Trib. To Toms Run (RM 5.34) 1993 (recommended WWH)</i>											
0.1	2.8	Low-Mod.	-	30	30	7	7	25,3,9,15,6,18	38.6	MG ^{ns}	Mrg. Good
<i>Little Twin Creek (existing WWH)</i>											
6.3	4.9	204/ft. ²	37	40	62	14	14	3,2,12,4,6	39.1	52	Exceptional
4.7	11.5	1333/ft. ²	46	45	67	7	9	3,27,5	34.8	34 ^{ns}	Mrg. Good
2.7	18.8	642/ft. ²	50	53	72	15	19	3,27,6	39.3	56	Exceptional
<i>Reigle Ditch (existing WWH)</i>											
0.5	3.3	Low-Mod.	-	27	27	6	6	3,6,4,27	39.2	G	Good
0.4	3.4	Low-Mod.	-	38	38	8	8	3,27,6,4	37.2	MG ^{ns}	Mrg. Good

Ecoregion Biocriteria: E. Corn Belt Plains (ECBP)

INDEX	WWH	EWH
ICI	36	46

- a EPT=total Ephemeroptera (mayflies), Plecoptera (stoneflies), & Trichoptera (caddisflies) taxa richness.
- b A qualitative narrative evaluation based on best professional judgment utilizing sample attributes such as taxa richness, EPT richness, and QCTV score was used when quantitative data was not available to calculate an Invertebrate Community Index (ICI) score.
- c Qualitative Community Tolerance Value (QCTV) was derived as the median of the tolerance values calculated for each qualitative taxon present (see METHODS section discussion).
- d Narrative assessment used in lieu of ICI score due to lack of current or vandalism of artificial substrate samplers.
- * Significant departure from ecoregion biocriterion (>4 ICI units); poor and very poor results are underlined.
- ns Nonsignificant departure from ecoregion biocriterion (#4 ICI units).

Predominant organism code list

1 Isonychia mayflies	6 flathead mayflies	11 cased caddisflies	16 aquatic worms	21 damselflies	26 scuds	31 water boatmen
2 Chimarra caddisflies	7 nonred midges	12 water pennies	17 Tricorythodes	22 fingernail clams	27 midges	32 dragonflies
3 Hydropsche caddisflies	8 minnow mayflies	13 L-Hand snails	18 red midges	23 burrowing mayfly	28 crayfish	
4 snail-cased caddisfly	9 riffle beetles	14 moth larvae	19 bryozoans	24 various beetles	29 flatworms	
5 Tanytarsini midges	10 river (R-H) snails	15 blackflies	20 Caenis mayfly	25 isopods	30 tipulids	

downstream from the Swamp Creek confluence (RM 35.5) relative densities indicated a slight nutrient input. Polluted runoff from agricultural practices and the unsewered communities of West Manchester, Castine, and Verona were plausible sources of this enrichment. Downstream from Aukerman Creek (RM 19.2) and Little Twin Creek (RM 3.4) similar density increases were interpreted as evidence of agricultural and suburban polluted runoff from Gratis, Germantown and Farmersville.

Nutrient input from an unfenced and denuded cattle pasture, from the unsewered town of New Lexington, and from Price Creek was likely responsible for a large relative density increase at Stotler Rd. (RM 27.5) near West Alexandria. Populations of two filter-feeding lotic midges, *Rheotanytarsus exiguus* and *Polypedilum (P.) convictum*, increased fourfold and tenfold, respectively, from the site (RM 31.7) upstream from these influences.

Macroinvertebrate relative density continued to increase at the next site (RM 26.7) downstream from the West Alexandria and Twin Valley Mobile Home Park WWTPs where the highest value (1722/ft.²) in the survey was recorded. The already elevated *Rheotanytarsus exiguus* and *Polypedilum (P.) convictum* populations doubled and tripled, respectively.

Despite this indication of nutrient loading, Twin Creek ICI scores remained exceptional. In fact the highest qualitative EPT and total EPT numbers were recorded downstream from West Alexandria (RM 26.7). However, a few caddisflies were collected here with deformed frontoclypeal sclerites. Deformities are generally an indication of environmental stress. As such, efforts to address the pollution at this site are warranted especially in recognition of this stress as a potential precursor to further degradation.

In summary, changes in relative density and community structure at several Twin Creek sites were attributed to polluted runoff from agricultural practices, unsewered communities, and suburban areas. Excessive nutrient loading downstream from the West Alexandria and Twin Valley Mobile Home

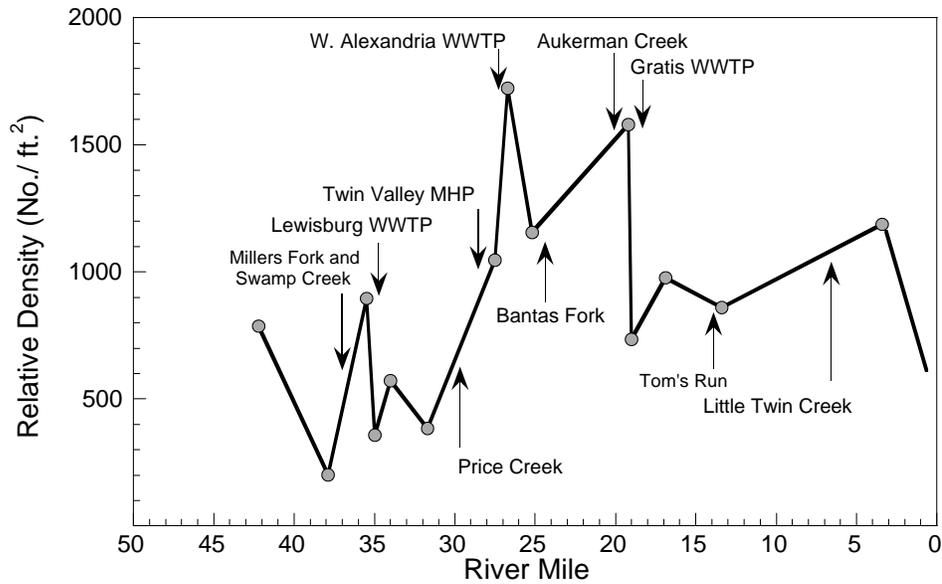


Figure 14 Longitudinal relative density of macroinvertebrate populations in Twin Creek, 1995.

Park WWTPs was indicated by shifts in the macroinvertebrate population. Water column chemistry and fecal bacteria concentrations also confirmed these conditions. Efforts should be initiated to remediate these conditions before the assimilative capacity of this high quality stream is compromised.

Millers Fork

The macroinvertebrate community in Millers Fork was evaluated at four locations. The two most upstream sites (RMs 10.75 and 10.1) bracketed a golf course and housing development project. Other sites were downstream from Ithaca (RM 7.3) and near the mouth (RM 0.4). Qualitative assessments were used at each site.

Channelization including slumped banks with depauperate riparian vegetation and nutrient enrichment impacts from polluted agricultural runoff were evident at RM 10.75. In spite of these undesirable aspects, the stream still performed in the good range. This status was interrupted at SR 503 (RM 10.1) where a fair assessment was recorded.

Polluted runoff from inappropriate construction techniques at the Beechwood golf course entered the stream at SR 503. Dark brown water and four to six inches of silt were observed at RM 10.1. The silt deposition caused a loss of habitat. Live fingernail clams were not collected in the pools at RM 10.1 although approximately 100 dead clams were observed on 9/29/95. These immobile organisms were present at all other Millers Fork sites. Three pollution tolerant midges, *Dicrotendipes simpsoni*,

Chironomus (C.) decorus gr. and *Cricotopus (C.) bicinctus* were common downstream from the barren construction area but essentially absent from other sites. Intolerant midges of the tribe *Tanytarsini*, collected at other Millers Fork sites, were missing at RM 10.1. Overall, the midge population at RM 10.1 was characteristic of an impacted and enriched community.

Downstream from these sites to the Twin Creek confluence, Millers Fork is flanked by a thin wooded riparian corridor which acts to keep water temperatures cool. Although the silty conditions continued downstream and embedded conditions persisted, the macroinvertebrate community improved to very good status at RM 7.3. Increased silt loads were observed near the mouth (RM 0.4); however, the riffles were not embedded and an exceptional macroinvertebrate community was collected. Generally, a very good to exceptional macroinvertebrate community populates Millers Fork due to numerous overwhelming positive physical habitat attributes.

Swamp Creek

Swamp Creek was qualitatively evaluated at three locations. Downstream from Verona, a poor macroinvertebrate community was collected. Otherwise, Swamp Creek supported marginally good to exceptional communities. The impacts downstream from Verona were characteristic of inadequate home sewage treatment including nutrient loading and low D.O. concentrations.

At the sites bracketing Verona, EPT taxa richness fell from six at RM 6.2 to one at RM 5.2. The single taxon at RM 5.2 was represented by only one individual caenid mayfly in the sample. Mayflies, case-building caddisflies, and water pennies, common at other Swamp Fork sites, were absent downstream from Verona. Conversely, this site was predominated by aquatic worms, leeches, physid snails and alderflies, all of which tolerate excessive nutrients and low D.O. concentrations.

Complete recovery occurred at RM 1.7 as evidenced by an exceptional macroinvertebrate community. The high quality community and subsequent EPT taxa richness here were influenced by various coldwater, rare or intolerant taxa.

Price Creek

Five Price Creek sites were assessed using qualitative techniques. The two most upstream locations bracketed Eldorado and the municipal WWTP. Other sites were selected to determine the magnitude of agricultural nonpoint source pollution.

Upstream from Eldorado (RM 13.5) the marginally good community included pollution sensitive caddisflies (*Chimarra obscura* and *Chimarra aterrima*) and water pennies. Downstream (RM 13.2) the fair macroinvertebrate community was comprised by many pollution tolerant taxa. Leech and aquatic worm populations increased, while the taxon *Chimarra* was not collected at this site. As a result, the Eldorado WWTP was considered to be a significant source of nutrient enrichment although the presence of four Tanytarsini midge species and other EPT taxa indicated the discharge was not acutely toxic.

Polluted agricultural runoff was apparent throughout the upper watershed where low gradient and subsequent sand and silt deposition were typical. The resulting smothering of appropriate substrates for macroinvertebrate colonization was particularly evident at US 40 (RM 7.6). A narrative rating of fair at this site was reflective of the macrohabitat conditions (QHEI=55.5).

Further downstream the gradient increased. Glacial till composed of boulder and cobble substrates, bedrock outcrops, and good riffle and run development were common at the two most downstream sites (QHEI \bar{O} =84.5). Correspondingly, exceptional macroinvertebrate communities (RMs 3.9 and 0.6) were present in the lower Price Creek watershed where less embeddedness provided better habitat conditions.

Lesley Run

At RM 6.1 Lesley Run was a grass-banked ditch which appeared channelized. The scattered cobble and gravel substrates were incorporated in firm sand and covered with a thick layer of mucky silt. This degradation from polluted agricultural runoff limited the macroinvertebrate community which was evaluated as fair. Fencing to exclude livestock from the stream is a recommended mitigation practice.

Bantas Fork

In the relative sense that Twin Creek is home to the most consistently exceptional macroinvertebrate community in Ohio, Bantas Fork supports the most exceptional macroinvertebrate assemblages and the highest ICI scores (ICI \bar{O} =54.7, n=3). This is particularly true when compared to Ohio streams of similar watershed size (<35mi²).

Quantitative and qualitative samples were collected from four Bantas Fork sites. All macroinvertebrate narrative evaluations and index scores were exceptional. ICI scores ranged from 54 to 56. Between 16 and 26 total EPT taxa were present at each site. The QCTV of 41.3 at RM 9.4 and the 96 total taxa collected at RM 0.2 were the highest values in the entire survey.

Several types of stoneflies, coldwater taxa, and rare specimens were collected in Bantas Fork. The caddisfly *Chimarra aterrima*, usually present only in headwaters (possibly because it is limited by temperature or D.O. concentrations), was collected throughout the stream. Some rare or intolerant taxa collected included the mayflies *Baetisca sp.* (armored mayfly), *Paracloeodes sp.*, and *Acerpenna macdunnoughi*. The midge population was of exceptional quality and included the sensitive genera *Tvetenia*, *Paratrichocladius*, *Corynoneura*, *Parametriocnemus*, *Thienemanniella*, and numerous Tanytarsini taxa.

During the course of sampling, it was noted that increased sedimentation and substrate embeddedness were occurring at several sites. Although the integrity of Bantas Fork remains high at present, efforts to protect this extremely valuable water resource are warranted. Increasing and maintaining a forested riparian buffer along the stream, excluding livestock access to the stream, and initiating other proactive stream conservation practices is encouraged.

Goose Creek

Goose Creek was sampled downstream from the Truckstop of America and Pilot Oil Travel Center WWTPs (RM 4.4) and near the confluence with Bantas Fork (0.4). A good macroinvertebrate community was present at the upstream site but diversity was lower than the stream potential based on substrate quality. At RM 4.4, the predominately coarse substrates were embedded and filamentous algae was abundant. A low QCTV score of 35.3 also indicated some degradation was occurring here due to nutrient enrichment. This was reflected by the presence of more tolerant taxa such as leeches, pouch snails, pillbugs and flatworms. The nutrient enrichment was attributed to faulty operation of either or both upstream package treatment plants.

At RM 0.4, better stream development and a more intact riparian zone were considered positive influences which enhanced the exceptional macroinvertebrate community. This community exhibited many coldwater attributes. Three coldwater midges (*Paratanytarsus n.sp. 1*, *Parametriocnemus sp.*, and *Polypedilum (P.) aviceps*), along with other temperature sensitive taxa and some rare, intolerant taxa were collected, including the caddisfly genus *Oecetis*, the mayfly *Dipheter hageni*, and the midge genus *Paratrichocladius*.

Aukerman Creek

The Aukerman Creek macroinvertebrate community was exceptional at RM 0.5. The 70 total qualitative taxa at this site was among the highest in the Twin Creek survey for this parameter. Similar to other western Twin Creek basin tributaries, several coldwater (≥ 3), rare and intolerant taxa were collected here. Some of the unique organisms in the community included the mayfly genera *Eurylophella* and *Paracloeodes*, the midges *Polypedilum (P.) aviceps*, *Zavrelimyia sp.*, and *Saetheria tylus*, two different species of the caddisfly genus *Triaenodes spp* and a stonefly taxon of the family *Perlodidae*. One of the caddisfly *Triaenodes* larvae was possibly a *T. dipsius*. This species is very rare and has not been collected in larval form since Ross described it in 1938 (pers. comm., Dr. James Glover 1996)

Tom's Run

Macroinvertebrate sampling in Tom's Run was conducted in 1993 and 1995. The work in 1993 was initiated to respond to siting issues for a potential landfill in Montgomery County. Essentially, the 1993 work confirmed the appropriateness of the existing WWH aquatic life use. Three sites were assessed in both years.

Upper reach sites (\$RM 8.3) became intermittent by late summer during both surveys. The effect of limited flow conditions was particularly evident between June and August 1993 at RM 9.7 when intolerant, rare taxa collected in June were not present in the later sample. Since the 1995 sampling occurred in late August, the absence of these organisms may have been due to their prior emergence rather than a water quality impact.

However in 1995, macroinvertebrates at the two, upper reach sites (RMs 12.1 and 8.3) were rated

fair despite the less than optimal water levels. The macroinvertebrate communities at both sites indicated polluted agricultural runoff was limiting performance. Embedded silty substrate at RM 12.1 and large growths of filamentous algae at RM 8.3 were viewed as factors in the lack of diversity at both sites. Also, only three and four qualitative EPT taxa were collected at these locations. Furthermore, low QCTV scores (31.3 and 34.8, respectively) and the presence of tolerant midges, aquatic worms, leeches and pouch snails helped to define the fair rating as an agricultural polluted runoff issue rather than the result of just low stream flow.

The importance of addressing the upstream non-point source pollution issues was evident at the lower reach sites (RMs 0.7 and 0.4) where exceptional macroinvertebrate assemblages were present in both studies. Tom's Run from approximately RM 6.0 downstream remains perennial, though late season flows are considerably reduced. Continual flow and positive habitat features influenced a predominance of hydropsychid caddisflies at downstream sites. Significantly improved qualitative EPT taxa (14-19) and QCTV scores (39.2-39.7) were registered at these locations. The presence of pollution sensitive mayflies (*Isonychia*, *Acerpenna*, *Caenis*, *Ephemera*, *Leucrocuta*), midges (*Paratanytarsus n.sp. 1*, *Nilotaypus fimbriatus*, *Labrundinia pilosella*, *Paratrichocladus sp.*), caddisflies (*Pycnopsyche*, *Triaenodes*) and water pennies suggested the impact of agricultural runoff pollution was concentrated in the upper reach.

Unnamed Tributary to Tom's Run (RM 5.34)

In 1993 the macroinvertebrate community at RM 0.1 in an unnamed tributary to Tom's Run was rated marginally good. The abundance of isopods and blackflies were considered evidence of polluted agricultural runoff and associated enrichment. Even so, the presence of two coldwater midge taxa (*Polypedilum (P.) aviceps* and *Parametriocnemus sp.*) and the predominance of riffle beetles and hydropsychid caddisflies, were sufficient for community performance to be within WWH expectations.

Little Twin Creek

Index scores from three Little Twin Creek sites indicated the Farmersville WWTP is a significant source of degradation via Reigle Ditch. Downstream from the WWTP, a marginally good ICI score (34) at RM 4.7 interrupted the otherwise exceptional macroinvertebrate performance recorded at upstream (RM 6.3, ICI=52) and downstream (RM 2.7, ICI=56) locations. Intolerant, rare baetid mayflies (*Acerpenna* and *Dipheter*) and an intolerant temperature sensitive caddisfly (*Chimarra aterrima*) were not collected at RM 4.7 but were present at the other sites. At RM 4.7 only seven qualitative EPT taxa were collected in contrast to 14 taxa at the upstream site and 15 at the downstream site.

Abundant algal growth and decreased macroinvertebrate diversity were attributed to organic enrichment at RM 4.7. Tolerant organisms including aquatic worms, pouch snails, leeches, midges, and hydras were abundant. Also, the relative density increased to 1333/ft.² from 204/ft.² at RM 6.3. The need to implement better treatment strategies at the Farmersville plant was confirmed by the 1995 survey. Additionally, the contribution of polluted agricultural runoff should not be overlooked

at this location.

Overall, the macroinvertebrate community in Little Twin Creek, composed of numerous intolerant taxa and represented by high ICI scores at the upstream and downstream sites, suggested that the EWH aquatic life use designation would be appropriate.

Reigle Ditch

Qualitative macroinvertebrate samples bracketing the Farmersville WWTP demonstrated a slight decline (good to marginally good) in community performance downstream from the facility. Organic enrichment was deemed culpable for the downstream absence of a number of pollution sensitive taxa which were collected upstream. QCTV scores also decreased longitudinally downstream from 39.2 to 37.2 and continued to decline in Little Twin Creek (34.8 at RM 4.7).

While the Farmersville WWTP effluent was not perceived to be acutely toxic, the “signature effect” of downstream nutrient enrichment was unmistakable. Although the influence of the plant within Reigle Ditch was not severe, it was very evident further downstream in Little Twin Creek at RM 4.7 where pollution tolerant organisms comprised 42% of an otherwise exceptional macroinvertebrate community. Furthermore, 14% of the assemblage included organisms which are associated with excessive nutrient concentrations.

Biological Assessment: Fish Community

Twin Creek

Fifty two fish species and seven hybrids (40,352 individuals) were collected in Twin Creek in 1995. Sampling occurred at 21 mainstem wading sites beginning downstream from Castine (RM 45.9) to a site upstream from the Great Miami River confluence (RM 0.2). Overall, the fish assemblage in Twin Creek was rated as exceptional (Table 14). This characterization was based on fish community indices which ranged from good-very good (MIwb=8.7, IBI=48 at RM 42.2) to exceptional (MIwb=10.9, IBI=56 at RM 9.8). Including all sites, the mean MIwb was 10.0 and the mean IBI was 52.5 (Figure 15).

Twin Creek is home to the second most exceptional fish community in Ohio. In the state, only Big Darby Creek maintains fish populations which more consistently meet the EWH aquatic life use designation (0MIwb=x, 0IBI=x) over as long a sampling reach (>40 mi.) as Twin Creek did in 1995. From its headwaters to the Great Miami River confluence, only one Twin Creek site (RM 29.7, IBI=44) recorded an IBI value below the EWH nonsignificant departure biocriterion (46). Similarly, only one site (RM 42.2, MIwb=8.7) scored below the EWH MIwb nonsignificant departure biocriterion (8.9). In all, 17 sites recorded full achievement of both EWH biocriteria scores. Performance at this level is extraordinary.

Although significant departures from exceptional ecoregional expectations were observed at the two sites noted above, the biological index scores were still considered indicative of good performance.

At RM 42.2 the difference between the first pass MIwb score (8.4) and the second pass score (MIwb=9.0) yielded a mean MIwb score of 8.7. The percentage of tolerant fish ($O=43\%$) in this near headwater (28 mi²) low gradient reach was sufficient to depress an otherwise very good first pass Iwb score into the good MIwb range (Table 15). In addition to tolerance, the community also registered moderate IBI metric scores for number of sunfish ($O=3$), percentage of omnivores ($O=26.5\%$) and of insectivores ($O=46.5\%$). Overall, the community was deemed reflective of the
w e t l a n d h a b i t a t

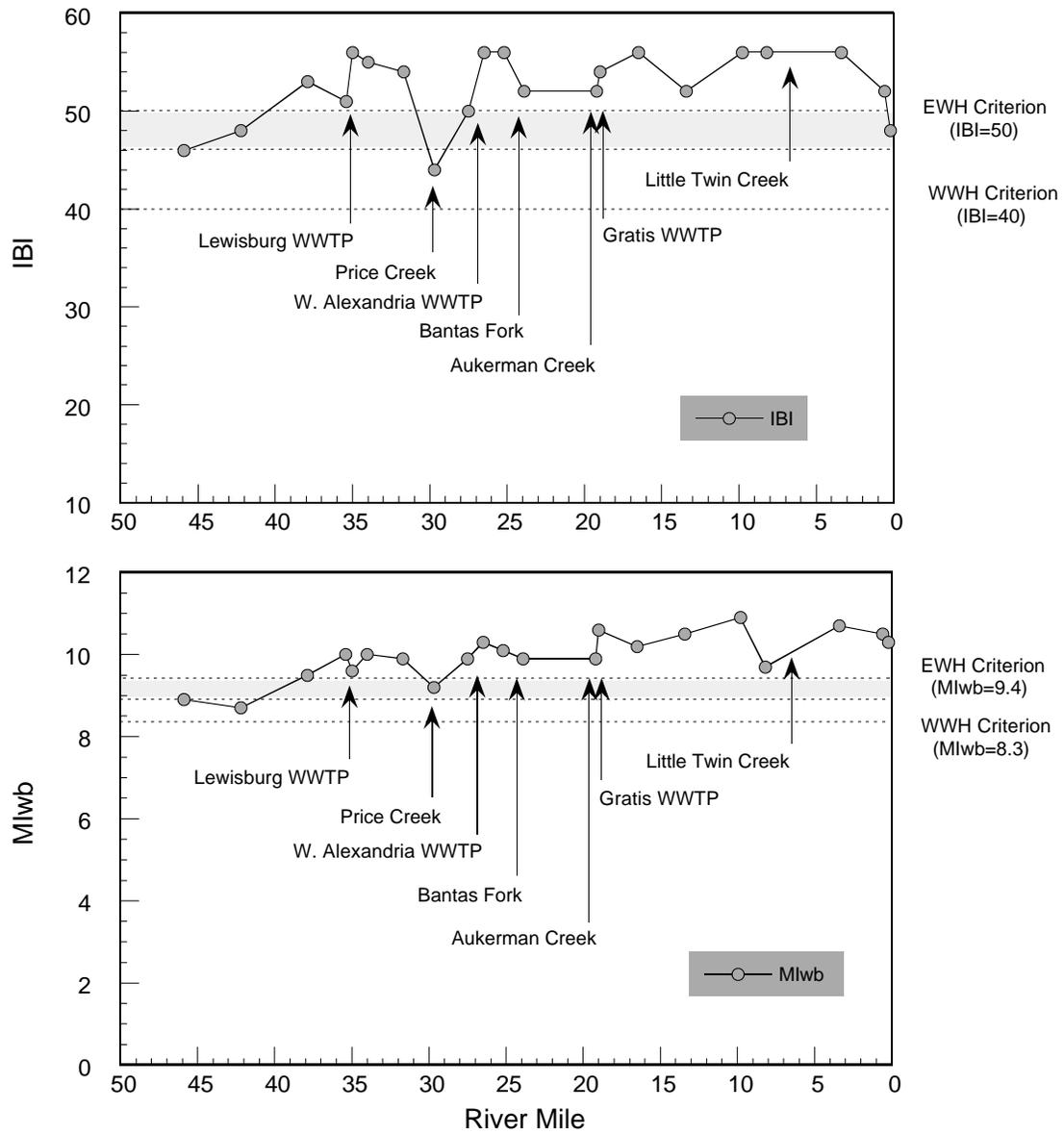


Figure 15 Longitudinal performance of the Index of Biotic Integrity (IBI, upper plot) and the Modified Index of Biotic Integrity (MIwb, lower plot) in Twin Creek, 1995.

qualities (*e.g.*: poorly defined riffles, glide like pools and some hardpan substrate) at the site and represented a transition from the upstream channelized headwater reach. No water quality perturbation was suspected at the RM 42.2 site.

The other Twin Creek site (RM 29.7) for which significant EWH departure was determined was in the vicinity of a large gravel quarry, immediately downstream from the Price Creek confluence. Here again, the variation between passes yielded a good score ($IBI_{O} = 44$). A first pass IBI score of 46

Table 14. Fish community indices based on pulsed D.C. electrofishing samples collected by Ohio EPA within the Twin Creek study area 1980-1995.

<i>Stream</i>	Mean River Number Mile Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation ^a
<i>Twin Creek (1995)</i>								
<i>Eastern Corn Belt Plains EWH Use Designation (Existing)</i>								
45.9	19.0	19	1392	9.7	44.0	8.9 ^{ns}	46 ^{ns}	Very Good
42.2	23.5	28	1078	22.8	78.0	8.7*	48 ^{ns}	Good-Very Good
37.9	21.0	23	1268	15.3	81.0	9.5	53	Exceptional
35.4	28.5	31	3137	66.2	90.5	10.0	51	Exceptional
35.0	28.5	31	1479	55.6	84.0	9.6	56	Exceptional
34.0	28.0	30	1800	35.3	75.0	10.0	55	Exceptional
31.7	25.0	27	956	53.9	64.0	9.9	54	Exceptional
29.7	24.0	27	5202	82.3	81.0	9.2 ^{ns}	44*	Very Good-Good
27.5	27.5	30	3082	67.4	91.5	9.9	50	Exceptional
26.5	28.0	29	1325	66.2	95.0	10.3	56	Exceptional
25.2	25.0	27	1258	54.1	88.0	10.1	56	Exceptional
23.9	27.0	27	2076	38.2	91.5	9.9	52	Exceptional
19.2	28.0	28	2772	63.9	84.5	9.9	52	Exceptional
19.0	32.0	32	2760	63.6	87.5	10.6	54	Exceptional
16.5	27.0	27	1161	99.2	79.5	10.2	56	Exceptional
13.4	26.0	26	2733	143.0	83.5	10.5	52	Exceptional
9.8	32.0	32	2460	97.3	89.5	10.9	56	Exceptional
8.2	26.0	26	1575	55.3	80.5	9.7	56	Exceptional
3.4	31.0	31	2010	127.0	74.5	10.7	56	Exceptional
0.6	29.0	29	1469	90.2	80.5	10.5	52	Exceptional
0.2	27.0	27	792	99.6	77.0	10.3	48 ^{ns}	Exceptional-Very Good
<i>(1988)</i>								
0.3 ^B	18.7	38	2250	25.3	--	10.2	43*	Exceptional-Good
<i>(1986)</i>								
35.5	24.7	30	2074	38.8	84.0	9.3 ^{ns}	49 ^{ns}	Very Good
35.0	26.7	32	910	32.5	89.0	9.6	52	Exceptional
31.7	18.7	24	452	15.6	68.0	8.1*	38*	Marginally Good
27.0	24.3	33	1764	44.6	86.0	9.5	45*	Exceptional-Good
26.7	18.7	24	507	23.4	80.0	8.3*	41*	Good
25.2	23.3	27	857	20.5		9.2 ^{ns}	49 ^{ns}	Very Good
23.9	22.3	26	1422	28.3	90.0	9.0 ^{ns}	45*	Very Good-Good
19.2	24.7	27	1906	48.1	89.0	9.1 ^{ns}	48 ^{ns}	Very Good
18.3	25.7	31	866	30.8	89.0	9.7	50	Exceptional
16.9	26.5	29	584	55.4	71.0	8.4*	54	Good-Exceptional

Table 14. (continued)

Stream	Mean River Number Mile Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation ^a
<i>Twin Creek (1986)</i>								
<i>Eastern Corn Belt Plains EWH Use Designation (Existing)</i>								
9.8	29.0	37	891	20.1	88.0	9.7	51	Exceptional
0.2 ^A	21.7	27	673	91.4	76.0	9.1 ^{ns}	49	Very Good-Exceptional
<i>(1983)</i>								
42.2	23.7	28	1622	50.7	51.0	8.8*	41*	Good
37.9	15.3	20	1460	14.0	65.0	8.8*	46 ^{ns}	Good-Very Good
34.9	29.5	35	782	59.8	--	9.8	52	Exceptional
31.6	25.0	28	786	17.3	--	8.8*	47 ^{ns}	Good-Very Good
25.8	26.0	26	3279	82.1	89.0	10.5	50	Exceptional
<i>(1980)</i>								
0.3 ^B	16.0	21	287	35.0	--	8.4*	42*	M.Good-Good
<i>Millers Fork (1995)</i>								
<i>Eastern Corn Belt Plains EWH Use Designation (Existing)</i>								
10.7	14.0	14	1190	3.2	28.5	N/A	40*	Good
10.0	28.0	28	1776	44.8	46.5	N/A	44*	Good
7.3	25.0	25	1155	33.8	58.0	N/A	48	Very Good
0.3	25.5	27	888	25.7	76.0	9.7	56	Exceptional
<i>Swamp Creek (1995) Headwaters to RM 4.1</i>								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
6.1	15.0	15	1294	11.6	41.0	N/A	36 ^{ns}	Marginally Good
5.4	14.0	14	144	1.6	58.0	N/A	44	Good
<i>Swamp Creek (1995) RM 4.0 to Mouth</i>								
<i>Eastern Corn Belt Plains EWH Use Designation (Recommended)</i>								
2.7	21.0	21	888	5.7	67.5	N/A	56	Exceptional
0.3	23.0	23	1406	7.2	78.0	N/A	56	Exceptional
<i>Price Creek (1995) Headwaters to RM 6.6</i>								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
13.7	12.0	12	1085	7.6	54.0	N/A	32*	Fair
13.3	12.0	12	3080	23.1	52.0	N/A	34*	Fair
7.6	14.0	14	1036	5.7	55.5	N/A	32*	Fair
<i>Price Creek (1995) RM 6.0 to Mouth</i>								
<i>Eastern Corn Belt Plains EWH Use Designation (Recommended)</i>								
3.9	17.0	17	306	7.9	87.0	7.6*	48	Fair-Very Good
0.6	28.0	28	2002	27.1	82.0	9.6	52	Exceptional

Table 14. (continued)

Stream	Mean River Number Mile Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation ^a
Lesley Run (1995)								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
6.5	18.0	18	318	20.7	53.5	N/A	42	Good
1.2	16.0	16	458	5.3	70.0	N/A	48	Very Good
Bantas Fork (1995)								
<i>Eastern Corn Belt Plains EWH Use Designation (Existing)</i>								
9.5	22.5	24	1831	15.8	74.0	N/A	55	Exceptional
1.4	24.0	25	2048	35.0	96.5	9.9	52	Exceptional
0.6	28.5	31	1702	31.7	84.0	9.6	55	Exceptional
(1986)								
9.4	16.7	20	904	11.1	82.0	N/A	48	Very Good
1.3	21.0	26	912	26.6	88.5	8.6	44	Good
Goose Creek (1995) Headwaters to RM 3.1								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
4.4	13.0	13	970	13.3	56.5	N/A	38 ^{ns}	Marginally Good
Goose Creek (1995) RM 3.0 to Mouth								
<i>Eastern Corn Belt Plains EWH Use Designation (Recommended)</i>								
0.2	24.0	24	1199	8.5	70.0	N/A	50	Exceptional
(1994)								
3.3 ⁴²	11.0	13	206	--	--	N/A	39 ^{ns}	Marginally Good
Aukerman Creek (1995)								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
0.2	23.0	23	3219	24.6	66.5	8.7	44	Good
(1994)								
2.9 ⁴²	11.5	13	1041	--	--	N/A	42	Good
Toms Run (1995)								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
12.1	14.0	14	1179	4.5	68.0	N/A	38	Marginally Good
8.5	18.0	18	807	7.9	78.0	N/A	50	Exceptional
0.4	25.0	25	1119	17.2	69.5	8.5	50	Good- Exceptional
(1993)								
5.3	17.0	17	851	9.6	74.0	N/A	44	Good
0.4	22.0	22	1089	10.0	73.5	8.1 ^{ns}	48	M.Good-Very Good
Tributary to Toms Run at RM 5.35 (1993)								
<i>Eastern Corn Belt Plains WWH Use Designation (Recommended)</i>								
0.9	9.0	9	370	--	58.5	N/A	40	Good
0.1	9.0	9	518	--	80.0	N/A	46	Very Good

Table 14. (continued)

<i>Stream</i>	Mean River Number Mile Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation ^a
Little Twin Creek (1995)								
<i>Eastern Corn Belt Plains EWH Use Designation (Recommended)</i>								
6.3	14.0	15	2688	13.5	67.0	N/A	45*	Good
4.7	22.5	26	8183	34.6	60.5	N/A	53	Exceptional
2.7	22.5	26	4481	54.1	74.0	N/A	52	Exceptional
(1986)								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
6.3	19.7	23	2386	18.6	65.5	N/A	49	Very Good
4.7	20.0	23	2060	28.5	58.5	N/A	46	Very Good
2.7	18.7	21	1921	25.6	66.5	N/A	48	Very Good
Reigle Ditch (1995)								
<i>Eastern Corn Belt Plains WWH Use Designation (Existing)</i>								
0.5	14.0	16	670	3.0	69.0	N/A	41	Good
0.3	16.5	19	3817	16.5	67.0	N/A	45	Good
(1986)								
0.5	11.7	14	776	5.1	68.0	N/A	39 ^{ns}	Marginally Good
0.3	6.0	12	638	4.2	64.5	N/A	28*	Fair

Ecoregion Biocriteria: E. Corn Belt Plains (ECBP)

INDEX - Site Type	WWH	EWH
IBI Headwater - Wading/ Boat	40/ 42	50
MIwb Wading/ Boat	8.3/ 8.5	9.4/ 9.6

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

ns Nonsignificant departure from biocriterion (≤ 4 IBI units; ≤ 0.5 MIwb units).

a Narrative evaluation is based on both MIwb and IBI scores, respectively.

N/A Not Applicable. The MIwb is not applicable to headwater sites.

B Boat site. Headwater - wading criteria apply to all other sites.

42 Data collected by Miami University and validated by Ohio EPA for attainment status.

Table 15. Comparison of Iwb and MIwb scores in Twin Creek at RM 42.2.

Pass	Index	# Species	0.5 ln No.	0.5 ln Wt.	H No.	H Wt.	Score	Difference
First	Iwb	22	3.261	1.400	2.601	1.946	9.208	0.839
	MIwb	15	3.031	0.791			8.369	
Second	Iwb	25	3.649	1.687	2.386	2.092	9.814	0.785
	MIwb	20	3.315	1.236			9.029	

differed from a second pass IBI score of 42 principally because four sunfish species in the first sample determined a high metric mark whereas three sunfish species in the second sample resulted a moderate metric value. As a long riffle run series over large gravel in an open sunny area, the site was not conducive to quiet pool dwelling species such as sunfish. In the first pass two longer sunfish were collected which were absent in the second pass. The sunfish species (rockbass, green and bluegill sunfishes) which were collected in both passes were present only in limited numbers.

Beyond this initial explanation, another and even more compelling aspect of the departure was the fact that the largest amount of stoneroller biomass in the Ohio EPA database (15,312 records) was collected at this site. The total relative weight of just stonerollers in the second pass was an incredible 62.4 Kg. This record is 33% higher than the second highest value in the database (42.0 Kg). Furthermore the tenth highest value in the database (22.9 Kg) was from the first pass at this site. By far, this is the most productive stream reach for stonerollers in Ohio. The relevance of this has at least three aspects:

First, the abundance of stonerollers (first pass=75.2%, second pass=62.4%) compressed the proportional IBI metrics for both samples. This resulted in low metric values for percent of insectivores (O=20.5%) in both samples and in the second sample for percent of simple lithophils (17%). A one percent increase in the number of simple lithophils (18%) in the first pass earned a moderate score. This one percent difference and the absence of longear sunfish in the second sample resulted in significant departure from the biocriterion for the site.

Second, the compression of the metric scores by such extreme abundances of stonerollers skews the IBI scores disproportionately from site to site (Table 16). For instance, 70.1% of the fish collected in the second pass at RM 27.5 were stonerollers. The 27.9 Kg of stonerollers here ranks ninth in the Ohio EPA database. Compared to the second pass sample at RM 29.7, the addition of quillback carpsucker and longear sunfish and a moderate percentage of simple lithophils (23%) earned a nonsignificant EWH departure IBI score of 48. This six point IBI improvement increased downstream by an additional 10 points at the next two sampling sites (RMs 26.5 & 25.2) where IBI values of 58 were recorded on both second passes. At these sites *slight* changes in the species composition yielded significantly different IBI values.

Table 16 A comparison of community aspects and IBI metric scores from four second pass Twin Creek sites.

RM	Total	Stonerollers		Simple	IBI	Top	IBI	Insectivores		IBI	IBI		
	Rel. No	Rel. No.	%	Lithophils	Metric	Carnivores	Metric	Rel. No	%	Metric		Score	
				Rel. No	%	Rel. No	%	Rel. No	%	Score	Score	Score	
29.7	7362.0	4764.0	64.7	1240.0	17	1	184.0	2.5	3	1528.0	21	1	42
27.5	3982.5	2791.5	70.1	906.0	23	3	81.0	2.0	3	1003.2	25	1	48
26.5	1959.0	292.5	14.9	1252.5	64	5	157.5	8.0	5	1395.0	71	5	58
25.2	1567.5	193.5	12.3	1011	65	5	138.0	8.8	5	1129.5	72	5	58

At RM 26.5 the presence of stonecat (7) and brindled madtoms (1), johnny darters (2) and longear sunfish (48) with fewer stonerollers (14.9%) resulted in the 16 point IBI improvement from RM 29.7. At RM 25.2 the incidental collection of one bigeye chub, one johnny darter and the presence of longear sunfish (40) coupled with fewer stonerollers (12.3%) were the driving factors between a near perfect score here and the significant EWH departure at RM 29.7. At these downstream sites IBI metrics for percentages of simple lithophils, insectivores and top carnivores scored high whereas at the upstream sites due to the overwhelming predominance by stonerollers the same metrics scored low.

This would all seem appropriate if not for the fact that the largest relative numbers of fish in these metric groups were collected at RM 29.7. In essence the percentile metrics at the upstream sites became surrogate measurements of stoneroller abundance rather than reflecting the respective longitudinal presence of the intended structural and functional community aspects. While this may be an inherently appealing aspect of the IBI it can also be misleading. The impairment at RM 29.7 is that the site is biologically over productive in spite of an otherwise exceptional fish assemblage.

Third, the tremendous amount of stoneroller biomass produced at RM 29.7 was interpreted as evidence that Twin Creek and Price Creek convey a considerable nutrient load despite the generally exceptional performance of the fish community. Herbivorous stonerollers feed by scraping algae and diatoms off rocks (Jenkins and Burkhead 1993). The presence of so many stonerollers was only possible due to a substantial forage base supported by ample nutrients and specific habitat conditions including an open canopy (*ie*: plenty of sunlight), large gravel and cobble substrate, a deep run type pool, and numerous riffles (Trautman 1981). Apparently, this nutrient load is assimilated in Twin Creek and converted into biomass rather than degraded by oxygen consuming instream processes.

The assimilative capacity of Twin Creek was further demonstrated other sites. Downstream from Swamp Creek at RM 35.5 similar habitat conditions coupled with nutrient loads supported an abundant stoneroller population (O=39.7%). At RM 23.9 downstream from Bantas Fork and Lesley Run the stoneroller abundance was high (44.7%) as it was downstream from Aukerman Creek (RM 19.2, 57.2%). Like the RM 29.7 site, the proportional metric scores at these sites were in contrast with the longitudinal presence of the respective metric component relative abundances. Overall, stonerollers clearly predominated the aggregate of all Twin Creek samples (37.1%, n=31). In light of this, the fish community in Twin Creek seems even more remarkable. Not only is it consistently exceptional, it is profoundly productive. Large populations of black redhorse (5.8%, rel. no.=116.1), northern hogsuckers (6.3%, rel. no.=126.0), striped shiners (8.2%, rel. no.=164.7), rock bass (2.2%, rel. no.=44.0), smallmouth bass (1.9%, rel. no.=38.1) and rainbow darters (6.6%, rel. no.=132.5) were also predominant.

Perhaps it is obvious, but a caution is warranted. In 1995 the nutrient load in Twin Creek was considered excessive. However for the most part, no significant impact was discerned by the fish community. Whether this situation can continue or for how long is speculation. Polluted runoff primarily from agricultural sources via tributary inputs was most closely associated with the pattern

of stoneroller abundance. Efforts to minimize or eliminate the potential sources of nutrients in Twin Creek should be pursued.

Millers Fork

Thirty one fish species and one hybrid (4,556 individuals) were collected in Millers Fork in 1995. Sampling occurred once at three upstream sites and twice at a site (RM 0.3) near the Twin Creek confluence. The two most upstream locations (RMs 10.7 & 10.0) bracketed a golf course construction site. The site at RM 7.3 was located downstream from Ithaca. Very Good (RM 10.7, IBI=46), good (RM 10.0, IBI=44), very good (RM 7.3, IBI=48) and exceptional (RM 0.3, IBI=56, MIwb=9.7) narrative ratings were recorded. The good IBI scores represented significant departure from the EWH use biocriterion.

The impetus to evaluate the golf course construction site occurred while sampling at RM 0.3 during the first pass. In contrast with other sub basin streams the water clarity at that time was opaque. The source of the murkiness at RM 0.3 was determined to be polluted runoff from construction activities ten miles upstream. After “discovering” the barren development, arrangements were made for macroinvertebrate and chemical sampling to bracket the site and for an Ohio EPA nonpoint pollution specialist to visit the site, also.

The Beechwood golf course and housing development at SR 503 included over five acres of bare soil along both recently altered stream banks of Millers Fork. Sediment abatement practices were essentially absent. A settling pond lacked appropriate mitigative measures and resulted in extremely turbid water being pumped into Millers Fork. No setbacks, silt fences, straw bales or other attempts to limit sediment entry to the stream were observed at the site.

Despite the obvious pollution originating from the site, the IBI scores improved longitudinally downstream from the most upstream site with only a slight interruption by the golf course. Instead, the scores reflected the habitat conditions which also improved downstream from very poor at RM 10.7 (QHEI=28.5), fair at RM 10.0 (QHEI=46.5), marginally good at RM 7.3 (QHEI=58.0), to very good at RM 0.3 (QHEI=76.0).

In other words, the severe ambient habitat impairment at the sites which bracketed the golf course was pervasive enough to mask most of the localized impact by the construction activity. Regardless of the ultimate cause *i.e.* poor habitat or unmitigated construction, both upstream sites failed to perform at a level consistent with EWH ecoregional expectations. Both of these sources of degradation need to be addressed in order for the stream to achieve biocriterion goals.

Downstream from Ithaca, past channel modifications and wetland type qualities were apparent but the stream maintained acceptable fish community performance. The site at the mouth consistently scored high. In general no impact was discerned from Ithaca to Millers Fork or to Twin Creek from the sub basin.

Swamp Creek

Twenty four fish species and two hybrids (2272 individuals) were collected in Swamp Creek in 1995. Sampling occurred once at four sites: RMs 6.1 and 5.4, upstream and downstream from Verona; RM 2.4, at an abandoned railroad bridge; and RM 0.3, upstream from Twin Creek. Marginally good (RM 6.1, IBI=36), good (RM 5.4, IBI=44), and exceptional (RM 2.4, IBI=56 and RM 0.3, IBI=56) headwater narrative ratings were recorded. These scores were consistent or above ecoregional expectations for the WWH use designation.

Like Millers Fork, habitat improved longitudinally downstream (RM 6.1, QHEI=41.0; RM 5.4, QHEI=58.0; RM 2.7, QHEI=67.5; and RM 0.3, QHEI=78.0) and the IBI scores reflected this. However, the score at RM 5.4 seemed at odds with site observations and the significantly smaller relative abundance. At this site downstream from Verona, a strong septic odor and human hygiene devices were evidence that poorly treated home sewage was contaminating the stream. Furthermore, only 96 fish were collected in the sample compared to 647 at RM 6.1, 592 at RM 2.7 and 937 at RM 0.3. Although the fish community at RM 5.4 was comprised by the requisite species to enable a good IBI score, the reduced population was considered indicative at the very least of some fish avoidance of the reach.

Price Creek

Thirty one fish species and one hybrid (3917 individuals) were captured in one sampling pass at five Price Creek sites. Fair narrative headwater IBI scores (RM 13.7, IBI=32; RM 13.3, IBI=34) were determined at the two upstream sites bracketing the Eldorado WWTP and at RM 7.6 (IBI=32) upstream of US 40. Polluted agricultural runoff coupled with fair habitat conditions (QHEI \bar{O} =53.8) were considered the most compelling factors in the significant departure by the fish community from WWH ecoregional expectations. Generally good to exceptional performance (RM 3.9, MIwb=7.6, IBI=48; RM 0.6, MIwb=9.6, IBI=34) was documented at other downstream Price Creek locations where habitat conditions were considerably better (QHEI \bar{O} =84.5).

The fair performance at the upstream Price Creek sites was in stark contrast with that observed downstream and with the performance in all other Twin Creek tributaries. As discussed previously, even in the plume of an obvious pollution source (e.g. polluted construction runoff in Millers Fork, poorly treated sewage in Swamp Creek) and in spite of comparatively worse habitat conditions other Twin Creek tributaries performed in at least the good range. Hence, the fair fish community performance in Price Creek was the most deficient in the entire survey.

Identical fish assemblages were collected upstream and downstream from the Eldorado WWTP with the exception that the downstream sample was roughly three times the relative abundance and weight of the upstream sample. Similar to the phenomenon in Twin Creek at RM 29.7 (downstream from Price Creek) the addition of a nutrient load from the Eldorado WWTP did not appear to degrade the fish community. Rather, the resident community already impoverished by polluted runoff and depauperate habitat conditions, appeared to capitalize on the additional nutrients and simply grew.

Polluted runoff primarily from agricultural sources was deemed to be the most influential cause of the overall subpar fish community performance. More stream encroachment through livestock grazing and riparian removal for row crop production was witnessed along Price Creek than along other Twin Creek tributaries. Additionally, poorly treated rural residential sewage was also a component of this pollution. At RM 7.6 a tile from an adjacent house was documented discharging nearly raw sewage. Price Creek should be given priority for any efforts to reduce nonpoint source pollution in the watershed.

Lesley Run

Twenty four fish species and one hybrid (441 individuals) were collected at two sites in one sampling pass in Lesley Run in 1995. Headwater narrative ratings of good (RM 6.5, IBI=42) and very good (RM 1.2, IBI=48) were consistent with WWH ecoregional expectations at these sites. These scores were comparable with habitat conditions (RM 6.5, QHEI=53.5; RM 1.2, QHEI=70.0) and the fish community performance at other nearby streams.

Bantas Fork

Thirty one fish species and three hybrids (6830 individuals) were captured at three Bantas Fork sites in two sample passes. Bantas Fork was distinguished for having the most exceptional fish community among the Twin Creek tributaries. The performance at each site (RM 9.5, IBI=55; RM 1.4, IBI=52, MIwb=9.9; RM 0.6, IBI=55, MIwb=9.6) was extraordinary with 48.5 % of the aggregate assemblage (excluding stonerollers) comprised by sensitive species. This level of performance further distinguishes Bantas Fork (35mi²) among all Ohio small streams (<50mi²) as having the best index scores (IBI_O=54, MIwb_O=9.75, n=6) for sub-basins with more than one sample site in the Ohio EPA database.

The importance of this finding merits additional commentary. At issue is not whether Bantas Fork is the best, for there are other outstanding small streams in Ohio, but rather that small streams in general are more easily degraded than larger streams. As a result, very few small streams maintain a high degree of biological integrity consistently from their headwaters to their confluence with larger waters. In Ohio the percentage of small streams (<50mi²) designated for EWH aquatic life use is significantly less than for large streams. In essence, small EWH Ohio streams are rare and Bantas Fork with the exceptional performance documented in 1995 is unique among this class of streams. Efforts to preserve Bantas Fork are worthwhile.

Goose Creek

Twenty six fish species (1284 individuals) were collected in Goose Creek at two sites in one 1995 sampling pass. The headwater fish community was narratively rated as marginally good (RM 4.4, IBI=38) and exceptional (RM 0.2, IBI=50), consistent with WWH ecoregional expectations. The community performance at RM 4.4 downstream from the Truckstop of America WWTP was indicative of some impact. Unlike other sites in the Bantas Fork sub-basin only one sensitive species (hog sucker) was present here and a high proportion (81%) of the assemblage was comprised by tolerant fish. Efforts to improve the Truckstop of America WWTP effluent should result in better

fish community performance and are certainly warranted given the high quality characteristics of the sub-basin.

Aukerman Creek

Twenty three fish species (2146 individuals) were captured in one Aukerman Creek (RM 0.2) sample where a wading narrative rating of good (IBI=44) was recorded consistent with WWH ecoregional expectations.

Tom's Run

Twenty eight fish species and two hybrids (2070 individuals) were collected at three Tom's Run locations in one sampling pass. The fish assemblage was narratively rated marginally good (IBI=38) at RM 12.1, exceptional (IBI=50) at RM 8.5, and exceptional-good (IBI=50, MIwb=8.5) at RM 0.4. Performance at all sites was within WWH ecoregional expectations. The upstream score reflected general nonpoint source degradation and recovery from historical channel modification.

Little Twin Creek

Twenty nine fish species and one hybrid (15,352 individuals) were captured in Little Twin Creek in 1995. Sampling occurred twice at two sites which bracketed the Reigle Ditch confluence (RM 6.3, IBI=45; RM 4.7, IBI=53) and downstream at RM 2.7 (IBI=52). Headwater ecoregional expectations for the WWH aquatic life use were met at all sites. Furthermore, the exceptional fish community performance was interpreted as an indication that the EWH aquatic life use designation would be appropriate.

The influence of stonerollers was less evident on the Little Twin Creek IBI scores than on the Twin Creek mainstem scores despite the species overwhelming presence in all samples (45.7%, n=6). In fact, the sixth highest Ohio EPA database record (n=15,312 records) for total stoneroller total relative weight (21.6 Kg) was recorded on the first pass at RM 4.7 (IBI=54). As discussed previously, excessive stoneroller abundance can variously influence IBI metric scores. For headwater sites, the number instead of the percent of simple lithophils is used for tabulating a metric score. Thus, this metric score was unaffected by stonerollers in Little Twin Creek and scored high. However, all of the percent of insectivore metric scores were lowered by stoneroller abundance. Little Twin Creek like the mainstem especially at RM 29.7 was biologically over productive in spite of an otherwise exceptional fish assemblage. In 1995, the instream nutrient load was generally converted to fish biomass and effectively assimilated.

The Farmersville WWTP via Reigle Ditch was the most significant source of enrichment in Little Twin Creek as subtle community changes were evident at the sites which bracketed this confluence. Upstream (RM 6.3), stonerollers (27%), blacknose dace (19%), creek chub (17%), and southern redbelly dace (12%) were numerically predominant. Downstream (RM 4.7), stonerollers (53%), striped shiners (13%), creek chub (9%), and bluntnose minnow (7%) predominated with one percent of the population comprised by southern redbelly dace. Southern redbelly dace is also an herbivore but unlike the stoneroller it tends to exclusively inhabit headwater streams (Etnier and Starnes 1993).

Between stonerollers and southern redbelly dace, herbivores at the upstream site numbered 39% increasing to 54% downstream. This indication of increased nutrient loading, also suggested a significant change in stream size. Sensitive species absent upstream, scored moderate to high downstream. The downstream presence of these fish (golden redhorse, northern hogsucker, smallmouth bass, etc.) was however, more typical of an even larger basin than the 11.5 mi² area at RM 4.7. Basically, the year round elevated WWTP flow in Little Twin Creek enabled an exceptional fish community with species more typical of a wadeable stream (>20 mi²) to inhabit a headwater reach. Ironically, the stoneroller influence on the headwater IBI metrics yielded an exceptional score atypical of enriched flow conditions. The caution previously proffered relative to enriched mainstem conditions is reiterated again. Whether this situation can continue or for how long is speculation. Conscientious WWTP operation and effective watershed management to address increasing rural housing development and agricultural runoff were considered critical to the continued health of Little Twin Creek.

Reigle Ditch

Twenty fish species and one hybrid (5384 individuals) were collected in two passes at two Reigle Ditch sites which bracketed the Farmersville WWTP. Good IBI scores were recorded at both sites (RM 0.5, IBI=41; RM 0.3, IBI=45) and fish community performance was considered consistent with WWH expectations. The slightly higher IBI score downstream from the plant was attributed to increased flow, the subsequent support of species atypical for drainage size, and the presence of nearly six times (4580) the number of fish that were captured upstream (804). Again, the doubling of herbivores downstream from the plant (RM 0.5=16.7%, RM 0.3=35.0%) and the increased abundance were signatures of nutrient enrichment despite the lack of community impairment. Although the Farmersville WWTP did not appear to limit fish community performance in 1995, the plant did provide an ample amount of nutrient enrichment to the stream. While this load did not appear to exceed the assimilative capacity of the downstream reach, some initial signs of stress were evident in the presence of a moderate number of DEALT anomalies.

TREND ASSESSMENT

Chemical Water Quality Trend Assessment: 1986-1995

The 1986 Ohio EPA Twin Creek study area included 15 mainstem water column chemical sampling stations, three each on Bantas Fork and Little Twin Creek, and two sites on Reigle Ditch. In comparison, the 1995 survey included 13 mainstem sites, one each on Bantas Fork and Little Twin Creek, and the same two sites on Reigle Ditch.

Mean concentrations of D.O., NH₃-N (ammonia-N), NO₃+NO₂-N (nitrate+nitrite-N), total phosphorus, and total suspended solids (TSS) were determined for both study periods and plotted longitudinally to display physical and chemical trends. In calculating mean concentrations, a value equal to the analytical method detection limit (MDL) was used for results reported less than the MDL.

Twin Creek

Between 1986 and 1995 several subtle shifts in mean parameter concentrations were evident in Twin Creek. However, the most noticeable improvement in overall water quality was attributed to the 1988 upgrade of the Lewisburg WWTP (Figures 17 and 18). The plant discharged high $\text{NH}_3\text{-N}$ concentrations ($\bar{O}=24.68$ mg/l, $n=4$) in 1986 and continued to have nitrification difficulties associated with I&I problems through 1990. In 1986 the influence of the WWTP extended five miles downstream before water quality recovered. The plant did not have a significant influence on water quality in 1995.

The West Alexandria WWTP completed an upgrade in 1990. Their discharge is located near that of the Twin Valley Mobile Home Park. Downstream from these entities, the 1995 NH₃-N

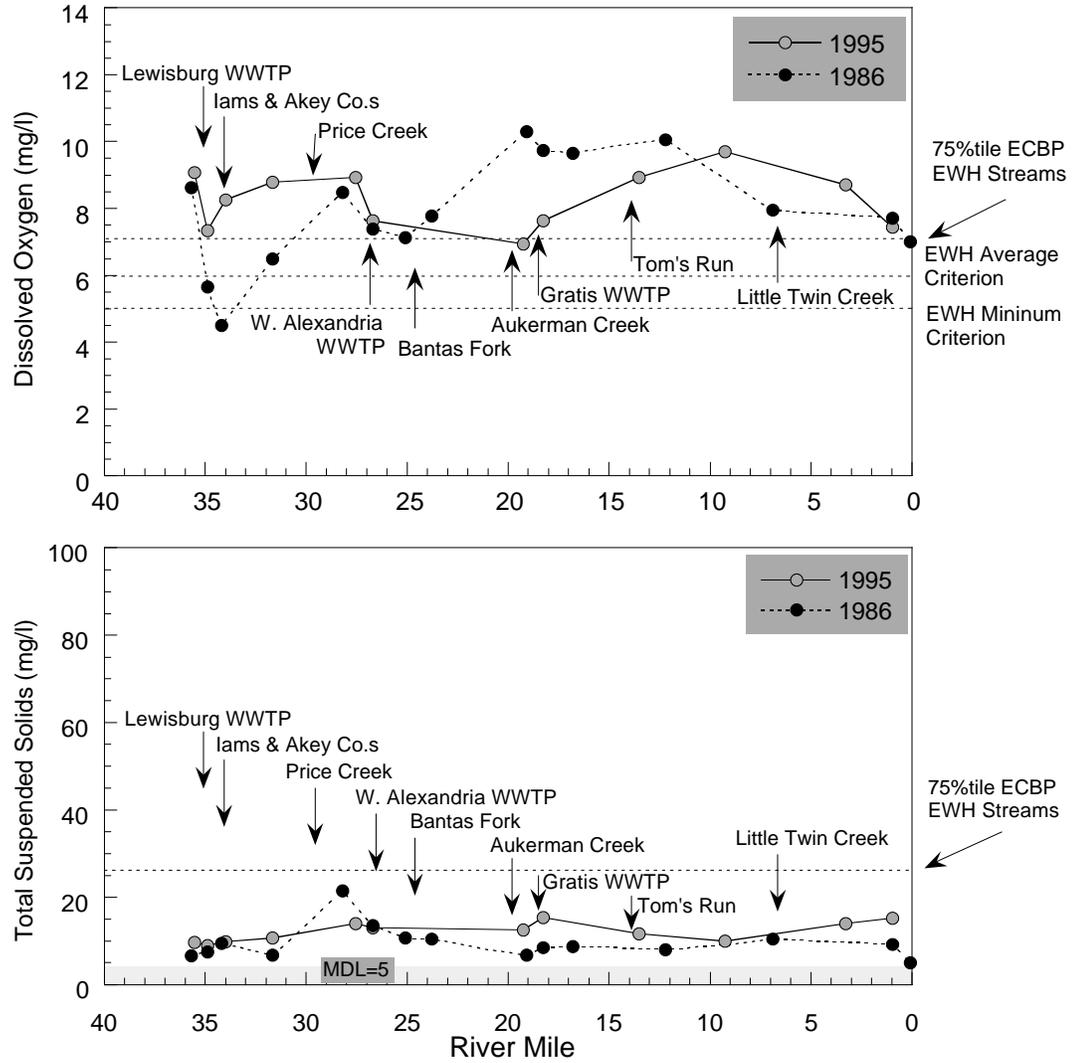


Figure 16 Longitudinal trend of mean concentrations of dissolved oxygen and total suspended solids in Twin Creek 1986-1995.

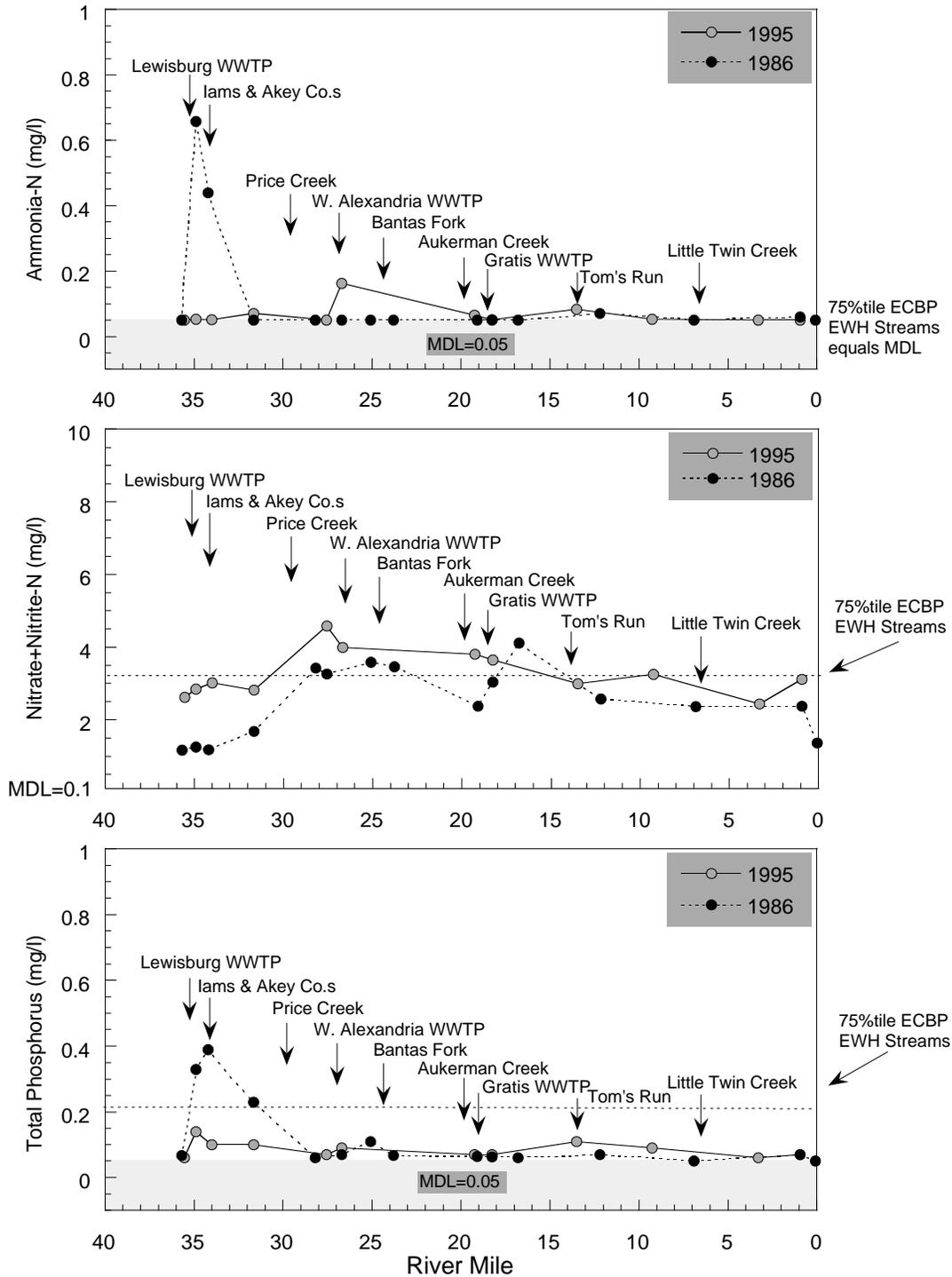


Figure 17 Longitudinal trend of mean concentrations of ammonia-N, nitrate+nitrite-N, and total phosphorus in Twin Creek 1986-1995.

concentrations (\bar{O} =0.16 mg/l, n=6) increased especially in comparison to 1986 levels which were at the MDL. Although less is known about the Mobile Home Park, it appeared that either one or both of these entities was the source of excessive instream $\text{NH}_3\text{-N}$ concentrations.

Otherwise, Twin Creek $\text{NH}_3\text{-N}$ concentrations have been remarkably low. In 1986 at 12 of 15 sampling sites $\text{NH}_3\text{-N}$ levels were at or below the MDL (0.05 mg/l). Levels at seven of the 13 1995 sites were likewise at or slightly above the MDL. However, no $\text{NH}_3\text{-N}$ WQS violations were recorded in either survey.

Dissolved oxygen levels in Twin Creek have generally been above the EWH minimum criterion (6.0 mg/l) except in 1986 when nutrient loading downstream from the Lewisburg WWTP caused a significant sag. An emerging concern evident in the comparison of the data sets is the loading attributable to Aukerman Creek. Although 1995 Twin Creek mainstem D.O. concentrations remained adequate, the shift between the years was substantial. Further investigation is warranted to determine the cause of a sag in this vicinity.

Total suspended solids is not a parameter of concern in Twin Creek. Between 1986 and 1995 TSS concentrations were nominally increased but all of the values were considered very low. Mean Nitrate+Nitrite-N concentrations increased. However the 1995 inclusion of data from a high water sampling pass skews this comparison. In both years a similar trend of increased $\text{NO}_3+\text{NO}_2\text{-N}$ downstream from Price Creek was evident (1986 \bar{O} =3.26 mg/l, n=4; 1995 \bar{O} =4.59 mg/l, n=4). Both the overall elevated 1995 levels and the high concentrations detected downstream from Price Creek were attributed to agricultural land use activities.

Mean phosphorus concentrations were generally low in both surveys. An exception in 1986 was observed downstream from the Lewisburg WWTP (1986 \bar{O} =0.33 mg/l, n=4; 1995 \bar{O} =0.14 mg/l, n=6). Phosphorus removal was improved at the Lewisburg WWTP in the 1988 upgrade. Longitudinally, phosphorus levels beyond the Lewisburg WWTP influence (. 0.09 mg/l) remained near detection (0.05 mg/l) in both surveys.

Bantas Fork

Although comparison of results from three 1986 Bantas Fork sampling sites with one 1995 station provides a rather limited trend analysis, it seems likely that additional data would confirm the same findings. Water quality in Bantas Fork is and has been exceptional. All $\text{NH}_3\text{-N}$ and phosphorus values have been less than the relevant MDL. Mean total suspended solids have been recorded (5.25 - 6.0 mg/l) at just above the MDL (5.0 mg/l). Mean D.O. concentrations in both surveys (1986 \bar{O} =9.68 mg/l, n=12; 1995 \bar{O} =8.47 mg/l, n=4) were adequate and well above the EWH minimum criterion (6 mg/l).

Mean $\text{NO}_3+\text{NO}_2\text{-N}$ concentrations have been low (1986 \bar{O} =1.78 mg/l, n=12; 1995 \bar{O} =1.9 mg/l, n=3) except in one 1995 sample (6.0 mg/l) during high flow conditions. Along Bantas Fork many positive farm management practices were observed including the existence of an intact

wide forested riparian buffer strip. The elevated high water $\text{NO}_3+\text{NO}_2\text{-N}$ level represents a potential negative agricultural land use influence and is one validation of the need to maintain the buffer strip.

Little Twin Creek

In 1995 replicate samples were only collected at one of three 1986 stations. This site downstream from the Reigle Ditch confluence was sufficient to characterize the influence of the Farmersville WWTP especially in comparison with the 1986 work which bracketed the Ditch. Despite the 1986 plant discharge of $\text{NH}_3\text{-N}$ in toxic concentrations, sampling 1.21 miles downstream in Little Twin Creek indicated rapid assimilation ($\bar{O}=0.063$ mg/l, n=4). In 1995 the $\text{NH}_3\text{-N}$ level at this site was higher ($\bar{O}=0.09$ mg/l, n=4). With nitrification improvements at the plant this value suggests polluted runoff was likely culpable for the atypical 1995 value. Ammonia-N values at the two other ambient 1986 sites were less than the MDL.

However, the 1986 data did reflect the WWTP influence in total phosphorus and $\text{NO}_3+\text{NO}_2\text{-N}$ values. At the ambient sites in 1986 these parameter values were less than the MDL or very low. At the site downstream from the Reigle Ditch confluence mean total phosphorus was elevated (0.795 mg/l, n=4) and was still enriched in 1995 (0.57 mg/l, n=4). Similarly, the 1986 $\text{NO}_3+\text{NO}_2\text{-N}$ levels (1.44 mg/l, n=4) were indicative of the upstream plant and even more so in 1995 (5.4 mg/l, n=4).

Mean D.O. concentrations in both surveys were adequate. The overall effect of this nutrient load in Little Twin Creek appears to be nuisance enrichment which is capable of exerting stress on aquatic communities.

Reigle Ditch

The 1986 sampling at two sites bracketing the Farmersville WWTP was replicated in 1995. The results indicate that the plant has made major operational improvements but still discharges a significant nutrient load. The Farmersville WWTP has had a history of NPDES permit violations and compliance has only consistently been recorded since July, 1994 following 1992 and 1994 plant upgrades. During the 1986 survey one sample pass coincided with an August 5 plant upset in which partially treated sewage was discharged. Downstream, toxic $\text{NH}_3\text{-N}$ concentrations (25.6 mg/l) and other grossly elevated parameter values (T-P=15.5 mg/l, TSS=108 mg/l, CBOD_{20} =3000 mg/l) were recorded including a D.O. reading of only 1.6 mg/l. Fecal coliform bacteria concentrations were too numerous to count (>60,000 colonies/100 ml).

The 1995 mean $\text{NH}_3\text{-N}$ level (0.06 mg/l, n=4) downstream from the Farmersville WWTP was evidence of the increased plant efficiency (1986, $\bar{O}=7.20$ mg/l, n=4) as values at the upstream control site were consistently less than the MDL (0.05 mg/l) in both surveys. Likewise other parameter levels also improved at the downstream site over those from 1986. Mean total phosphorus (1986 $\bar{O}=8.44$ mg/l, n=4; 1995 $\bar{O}=2.57$ mg/l, n=4) and TSS (1986 $\bar{O}=30.75$ mg/l, n=4; 1995 $\bar{O}=8.25$ mg/l, n=4) values declined and D.O. levels improved (1986 $\bar{O}=5.0$ mg/l, n=4;

1995 \bar{O} =8.43 mg/l, n=4). Upstream control levels for these same parameters were typical of background conditions in both surveys.

The 1995 concentration of $\text{NO}_3+\text{NO}_2\text{-N}$ (\bar{O} =15.6 mg/l, n=4) downstream from the WWTP was consistent with the improved nitrification capacity but was nevertheless very high (1986 \bar{O} =5.41 mg/l, n=4). And, although phosphorus treatment has improved, this 1995 concentration was also significantly elevated indicating that additional increases in plant operating technology are warranted.

Biological Trend Assessment: Macroinvertebrate Community 1983-1995

Twin Creek

Macroinvertebrates were collected from Twin Creek in 1986 and 1995 from RM 35.8 to RM 1.0. Some limited sampling also occurred in 1983 and 1984. Higher 1995 ICI scores indicated improvement downstream from the WWTPs in Lewisburg, Gratis and Farmersville via Little Twin Creek and Reigle Ditch (Figure 19; upper plot). The Lewisburg WWTP was upgraded in 1988. The Gratis WWTP has reduced some loadings. In 1992 and 1994 Farmersville upgraded various plant operations. Overall, improved WWTP operation has led to decreased nutrient input and consequently higher quality benthic communities in the respective reaches immediately downstream from the plants. The number and percentage of tolerant organisms usually associated with organic waste or nutrient loading, including aquatic worms, turbellaria (flatworms), and various midge taxa, decreased between 1995 and 1986.

Qualitative Community Tolerance Values (QCTVs) demonstrated this improvement and illustrated the 1995 predominance of high quality intolerant organisms (Figure 19; middle plot). Excessive nutrient and organic waste loads, and polluted runoff suppressed intolerant abundance in 1986. Comparison of QCTV scores indicated the greatest improvements in the Twin Creek basin were downstream from Lewisburg and the Little Twin Creek confluence. The 1995 QCTV scores were all above the ecoregion high performance threshold (38.2), a number which corresponds to the minimum acceptable value (25th percentile) from other sites where the biocriterion was met or exceeded.

The number of EPT taxa collected during qualitative natural substrate sampling also increased in 1995 (Figure 19; lower plot). Between 18 and 25 EPT taxa were collected at most sites indicative of an exceptionally diverse macroinvertebrate community. Improved water quality facilitated colonization by sensitive taxa in reaches which were previously moderately degraded.

Bantas Fork

The Bantas Fork macroinvertebrate community was exceptional in 1995 and 1986. Similar numbers of qualitative EPT taxa were collected in both years (1995, 10-22; 1986, 13-17) and the QCTV values were consistently in the high performance range. Embedded substrates at RM 9.4 were considered a potential threat to the community in 1995.

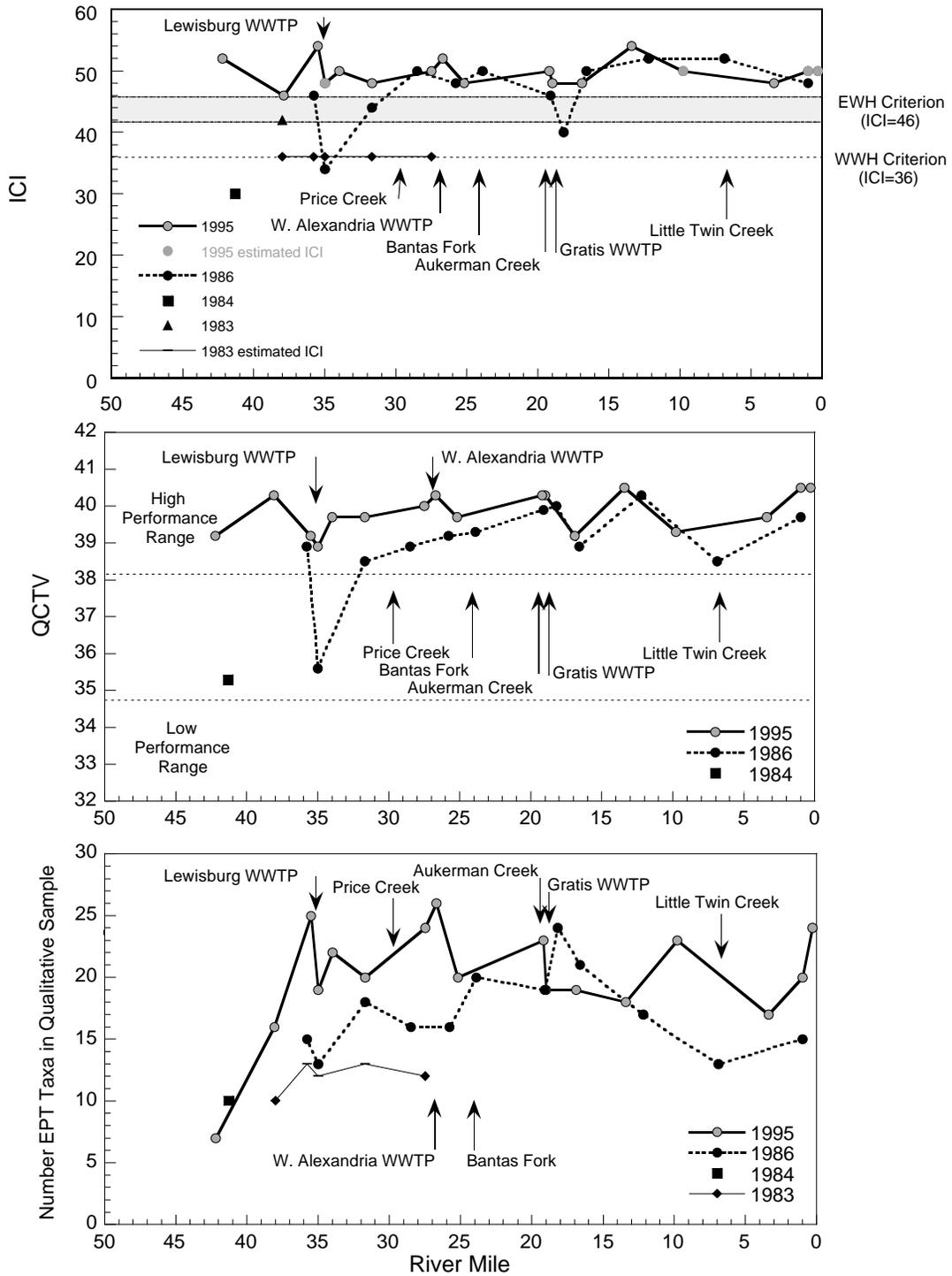


Figure 18 Longitudinal trend of ICI (upper plot), QCTV (middle plot), and number of qualitative EPT taxa (lower plot) in Twin Creek, 1983-1995.

Little Twin Creek

Between 1986 and 1995 the macroinvertebrate communities in Little Twin Creek at RM 6.3 and RM 2.7 demonstrated significant improvement moving from fair to exceptional evaluations. However, at RM 4.7 downstream from the Farmersville WWTP via Reigle Ditch, the community remained marginally good in both surveys. In 1995 at RM 4.7 the number of qualitative EPT decreased to seven from twelve in 1986 and tolerant organisms increased to 29.6% from 6.7%. The tolerant taxon *Physella* (pond snail) and *Ferrissia* (limpets) predominated while other tolerant taxa including aquatic worms and the midge *Dicrotendipes simpsoni* were well represented. *Dicrotendipes simpsoni* is highly tolerant of sewage and toxic waste pollution, thrives where many organisms can not survive, and is an aquatic worm associate (Simpson and Bode, 1980). Relative density also increased to 1333/ft.² in 1995 from 125/ft.² in 1986 at RM 4.7 indicative of an organically enriched community.

Reigle Ditch

Macroinvertebrate communities in Reigle Ditch downstream from the Farmersville WWTP improved to marginally good in 1995 from poor in 1986. Enhanced nitrification and other improvements allowed increased numbers of mayflies and caddisflies to survive immediately downstream from the discharge where acutely toxic conditions previously persisted. With further WWTP upgrades, it is likely that the macroinvertebrate communities in Reigle Ditch and Little Twin Creek will sustain additional improvement.

Biological Trend Assessment: Fish Community 1983-1995

Twin Creek

Fish community data were previously collected from Twin Creek in 1983 and 1986 (Table 14). The 1983 survey included five sites from RM 42.2 to RM 25.8. The 1986 survey commenced at RM 35.5, essentially duplicating four of the 1983 sites and longitudinally continued to the Great Miami River confluence including 12 sampling locations in all. All previous survey sites were revisited in 1995 when sampling occurred at 21 stations from RM 45.9 to the mouth.

In general a pattern of modest improvement was apparent across the entire stream between 1995 and prior surveys (Figure 20). In 1995 fish community performance in Twin Creek was characterized as exceptional (IBIO=52.5, MIwbO=10.0). In contrast, the 1986 survey determined performance was very good (IBIO=47.6, MIwbO=9.1) as it was also in 1983 (IBIO=47.2, MIwbO=9.3). The improvement documented in this study was most closely associated with upgrades at the various small municipal WWTP's in the Twin Creek basin.

In the period between the two surveys, the Lewisburg, West Alexandria, and Farmersville WWTPs upgraded their operations. The overall reduction of nutrient loading and associated effluent quality improvements have been sufficient to enable Twin Creek to support one of the most impressive fish faunas in Ohio. Biological index scores from previous surveys were

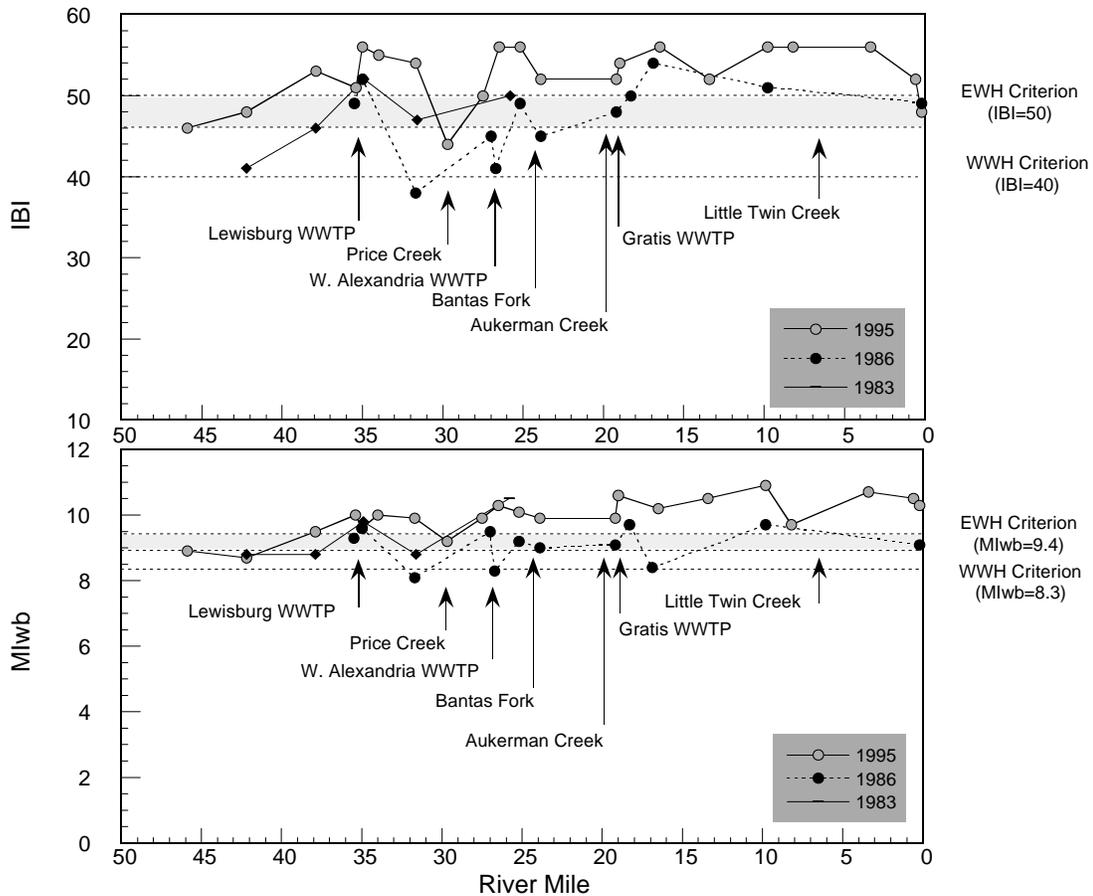


Figure 19 Longitudinal trend of the IBI (upper plot) and the MIwb (lower plot) in Twin Creek, 1983-1995.

Bantas Fork

The fish community in Bantas Fork was narratively evaluated in 1986 as very good-good (IBI_O=46, MIwb=8.6). Exceptional fish community performance (IBI_O=54, MIwb_O=9.75) in 1995 distinguished Bantas Fork as unique for having the best index scores among similar size streams sampled by Ohio EPA. Subtle differences between the fish assemblages documented in 1986 and 1995 were attributed to changes in sub-basin land use.

In 1986 compared to 1995 the darter assemblage was significantly reduced. Likewise the number of sensitive and intolerant species were also limited in 1986. Mottled sculpin absent in 1986, were fairly abundant in 1995. Furthermore about twice as many fish were collected at each site in 1995 as were captured in 1986. When viewed wholistically, these and other shifts were

considered evidence of a reduction of the amount of polluted runoff in the stream. Improved agricultural conservation practices were credited for the exceptional 1995 performance.

suggestive of the potential of Twin Creek to consistently perform in the exceptional range. It was rewarding to observe this performance in 1995.

Toms Run

In 1993 Toms Run was sampled at RM 5.3 where the fish assemblage was narratively considered good (IBI=44). In 1995 samples were collected at RMs 12.1 and 8.5 which were narratively characterized as marginally good (IBI=38) and exceptional (IBI=50), respectively. In both years a sample was collected at the mouth (RM 0.4) which was narratively very good-marginally good (IBI=48, MIwb=8.1) in 1993 and exceptional-good (IBI=50, MIwb=8.5) in 1995. Overall, no appreciable difference was determined over the two year period between samples. Fish community performance at all sites was within WWH ecoregional expectations. The upper reach of Toms Run was considered slightly impaired from nonpoint source impacts.

Little Twin Creek

The Little Twin Creek fish community was narratively rated very good (IBI=47.7) in 1986 in the aggregate of three sites. At the same sites in 1995 a narrative rating of exceptional (IBI=50.0) was recorded. Better operation at the Farmersville WWTP was credited for this improvement although the stream was considered enriched in both surveys.

Reigle Ditch

Sampling at the same sites bracketing the Farmersville WWTP occurred in 1986 and 1995. In 1986 during the second sampling pass a complete fish kill (IBI=12) was documented downstream from the Farmersville WWTP. Some recovery had occurred by the third pass (IBI=30) to yield a narrative rating of fair (IBI=28). Otherwise, survey results were similar in both years. Upstream from the plant in 1986 the fish community was narratively marginally good (IBI=39) whereas in 1995 it was good (IBI=41). Downstream from the WWTP prior to the 1986 fish kill the community was characterized as good (IBI=42) as it was in 1995 (IBI=45). The slight improvement in index scores in 1995 was attributed to improved operation at the Farmersville WWTP.

Area of Degradation Value Trend Assessment: 1983-1995

The Area of Degradation Value (ADV) portrays the length and amount of departure from a biocriterion by an aquatic community. It reflects the distance that the biological index (IBI, MIwb, or ICI) moves longitudinally from the applicable biocriterion or from an upstream measurement of performance. A positive ADV is represented by the area above the biocriterion (or upstream level) when the results for each index are plotted against river mile (Figures 17 upper plot and 18). Conversely, a negative ADV represents the more typical degradation (Figure

3). The results are also expressed as ADV/mile to normalize comparisons between segments and other streams and rivers. ADV statistics reported in Table 17 reflect positive and negative influences on the aquatic communities because a given reach can have segments which exceed and which do not attain biocriteria.

Table 17. Area of Degradation Values (ADV) statistics for Twin Creek, Bantas Fork and Little Twin Creek, 1983-1995. Values obtained for Twin Creek and Bantas Fork were calculated using Eastern Corn Belt Plain EWH biocriteria as the baseline for community performance. WWH biocriteria were used for Little Twin Creek.

<i>Stream (Year)</i>			Biological Index Values		ADV Statistics				Attainment Status		
Reach		Positive			Negative		(miles)				
Index	Upper RM	Lower RM	Minimum	Maximum	ADV	ADV/Mile	ADV	ADV/Mile	FULL	PARTIAL	NON
<i>Twin Creek (1995)</i>											
IBI			44	56	2499	54.4	12	0.2	42.3	3.6	--
MIwb	45.9	0	8.7	10.5	2301	50.1	10	0.2			
ICI			46	54	3149	68.6	--	--			
<i>Twin Creek (1995)</i>											
IBI			44	56	2120	59.7	12	0.3	34.4	1.1	--
MIwb	35.5	0	9.2	10.5	2148	60.5	--	--			
ICI			46	54	2397	67.5	--	--			
<i>Twin Creek (1986)</i>											
IBI			38	52	634	17.7	506	14.1	18.2	16.5	1.1
MIwb	35.8	0	8.1	9.7	524	14.6	180	5.0			
ICI			34	52	2298	64.2	133	3.7			
<i>Twin Creek (1995)</i>											
IBI			44	56	771	59.8	12	0.9	11.8	1.1	--
MIwb	38.1	25.2	9.2	10.5	653	50.6	--	--			
ICI			46	54	948	73.4	--	--			
<i>Twin Creek (1986)</i>											
IBI			38	52	81	7.7	321	30.3	0.6	8.9	1.1
MIwb	35.8	25.2	8.1	9.6	87	8.2	104	9.8			
ICI			34	50	390	36.8	126	11.9			
<i>Twin Creek (1983)</i>											
IBI	38.0	25.8	45	53	361	29.6	3	0.3	--	11.6	0.6

MIwb			7.6	9.8	321	26.3	62	5.1			
ICI			36	36	--	--	732	60.0			

Three comparative reaches of Twin Creek are represented in Table 17. The attainment statistics for the longest reach (RM 45.9 to the mouth) imply that 92 percent of Twin Creek fully met the EWH biocriteria. The remaining 3.6 miles of partial attainment was comprised by 1.1 miles of fish community departure from the minimum EWH IBI standard and 2.5 miles of departure from the minimum EWH MIwb mark. The macroinvertebrate community was in full attainment across the reach and registered an Ohio EPA record positive ADV (3149) with no reciprocal negative number.

For comparison ADVs were calculated for similar studied reaches. Between 1995 and 1986 across the reach from RM 35.8 to the mouth, 16.5 miles of stream biologically improved from partial to full attainment and 1.1 miles which previously did not attain improved to partial attainment. Limiting the reach to compare the 1983 survey with 1986 and 1995 results yielded a similar trend. The greatest degree of biological community improvement was most closely associated with the various upgrades and increased operational efficiencies at municipal WWTPs in the Twin Creek basin.

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Appendix Table A-1. NPDES permit violations for Twin Creek basin dischargers including all permit limit exceedances. Ohio Revised Code 6111.13 details provisions regarding enforcement of water quality based effluent limits below practical quantification limits. Note the following denotations of exceedence types: *- monthly average, **- weekly average, ***- daily maximum, and AK - to numerous to count.

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
Lewisburg WWTP (Twin Creek RM 35.2)			
05/91	Suspended Solids	19.75 kg/day**	27.0 kg/day
06/91	Fecal Coliform	1000 #/100 mls*	1200 #/100mls
07/91	Fecal Coliform	2000 #/100 mls**	7000, 4000, 5000 #/100 mls
10/91	Fecal Coliform	2000 #/100 mls**	3300 #/100 mls
07/92	Fecal Coliform	2000 #/100 mls**	4800 #/100 mls
07/94	Fecal Coliform	2000 #/100 mls**	3000 #/100 mls
08/94	Fecal Coliform	2000 #/100 mls**	4000#/100 mls
10/94	Fecal Coliform	2000 #/100 mls**	4000 #/100mls
05/95	Fecal Coliform	2000 #/100 mls**	3000 #/100 mls
06/95	Fecal Coliform	2000 #/100 mls**	9000 #/100 mls
10/95	Fecal Coliform	2000 #/100 mls**	50000 #/100 ml
Iams WWTP (Twin Creek RM 34.1)			
12/89	Ammonia	5 mg/l ***	8 mg/l
1/90	Ammonia	5mg/l ***	5.05,18.3,11.6,6.18 mg/l
	Ammonia	2.50 mg/l **	9.15 mg/l
3/90	Ammonia	5 mg/l ***	7.20 mg/l
4/90	Ammonia	5 mg/l ***	13.9 mg/l
	Ammonia	2.5 mg/l **	4.63 mg/l
7/90	suspended solids	18 mg/l***	33 mg/l
	Ammonia	1.5 mg/l**	4.8 mg/l
	Ammonia	2.3 mg/l***	17 mg/l
12/90	Ammonia	5.0 mg/l***	6.25 mg/l
1/91	Suspended Solids	18 mg/l ***	23 mg/l
	Ammonia	5.0 mg/l ***	5.9, 9.0, 11.0, 18.0 mg/l
	Ammonia	2.5 mg/l **	11 mg/l
	CBOD ₅	15 mg/l ***	45 mg/l
	CBOD ₅	10 mg/l **	23 mg/l
2/91	Suspended Solids	18 mg/l ***	23 mg/l
	Suspended Solids	12 mg/l**	14mg/l
	oil & grease	10 mg/l	54 mg/
	Ammonia	5.0 mg/l ***	18.0, 13.0, 15.0, 23.0, 7.0 mg/l
	Ammonia	2.5 mg/l **	15 mg/l
3/91	Ammonia	5.0 mg/l ***	9.9 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	Ammonia	2.5 mg/l **	3.9 mg/l
1/94	Ammonia	5.0 mg/l ***	9.62,6.9, 7.97 mg/l
	Ammonia	2.5 mg/l **	7.24 mg/l
1/95	Ammonia	5.0 mg/l ***	22.3 mg/l
	Ammonia	2.5 mg/l **	4.5 mg/l
Eldorado WWTP (Price Creek RM 13.28)			
09/89	Fecal Coliform	1000 #/100 mls*	AK/100mls
	Fecal Coliform	2000 #/100 mls	AK/100 mls
10/89	Fecal Coliform	2000 #/100 mls	6300/100 mls
05/90	Suspended Solids	6.8 kg/day*	9.25 kg/day
10/94	Chlorine Residual	0.5 mg/l (max)	1.2 mg/l
09/95	Ammonia	3.0 mg/l **	6.33 mg/l
West Alexandria WWTP (Twin Creek RM 26.82)			
06/92	Ammonia	6.9 mg/l**	7.3 mg/l
08/92	Chlorine residual	0.5 mg/l (max)	2 days > .5 mg/l
05/95	Ammonia	3.9 Kg/day**	5.27 kg/day
	Ammonia	2.6 kg/day*	2.82 kg/day
Pilot Oil Travel Center (Unnamed Goose Creek tributary RM 0.2)			
3/90	CBOD ₅	10 mg/l *	12.0 mg/l
	CBOD ₅	0.87 kg/day *	0.91 kg/day
4/90	CBOD ₅	10 mg/l *	11.0 mg/l
5/90	CBOD ₅	10 mg/l *	12.0 mg/l
6/90	chlorine	0.5 mg/l***	1.0 mg/l
7/90	chlorine	0.5 mg/l***	>2 days
8/90	chlorine	0.5 mg/l***	> 1 day
7/92	CBOD ₅	10 mg/l *	16.0 mg/l
	CBOD ₅	0.87 kg/day *	1.51 kg/day
	CBOD ₅	15 mg/l **	20.0 mg/l
	CBOD ₅	1.31 kg/day**	1.51 kg/day
	TSS	12 mg/l*	13 mg/l
10/92	CBOD ₅	10 mg/l *	10.5 mg/l
11/92	CBOD ₅	10 mg/l *	11.0 mg/l
	CBOD ₅	0.87 kg/day *	0.91 kg/day
3/93	CBOD ₅	10 mg/l *	10.5 mg/l
Gratis WWTP (Twin Creek RM 19.05)			
01/86	BOD5	10 mg/l*	15 mg/l
	BOD5	15 mg/l **	17 mg/l
02/86	BOD5	10 mg/l*	14 mg/l
02/87	BOD5	10/mg/l*	11 mg/l
12/88	Ammonia	2.5 mg/l *	5.1 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	Ammonia	3.8 mg/l**	6.8,6.2,6.1 mg/l
	CBOD5	10.0 mg/l *	11.5 mg/l
02/89	Suspended Solids	5.4 kg/day*	7.1 kg/day
	Suspended Solids	8.1kg/day**	11.2 kg/day
	Ammonia	2.5 mg/l*	7.8 mg/l
	Ammonia	3.8 mg/l**	7.2,6.9,10.0 mg/l
	CBOD5	10.0 mg/l*	11.0 mg/l
04/89	Ammonia	2.5 mg/l*	3.9 mg/l
	Ammonia	3.8 mg/l**	4.0,4.1,4.6 mg/l
	Ammonia	1.7 kg/day**	3.96,1.73 kg/day
	Ammonia	1.1 kg/day*	2.05 kg/day
03/89	Ammonia	1.7 kg/day**	2.0,1.8 kg/day
	Ammonia	1.1 kg/day*	1.7 kg/day
06/89	Fecal Coliform	1000#/100 ml*	AK
	Fecal Coliform	2000#/100 ml**	AK,AK
12/89	Ammonia	2.5 mg/l*	4.9 mg/l
	Ammonia	3.8 mg/l**	4.6,4.0,8.0 mg/l
	Ammonia	1.7 kg/day**	2.86 kg/day
	Ammonia	1.1 kg/day*	1.42 kg/day
01/90	Ammonia	2.5 mg/l*	4.9 mg/l
	Ammonia	3.8 mg/l**	5.8,4.2,3.9,5.1 mg/l
	Ammonia	1.7 kg/day**	2.5,2.6 kg/day
	Ammonia	1.1 kg/day*	1.93 kg/day
02/90	Ammonia	3.8 mg/l**	4.7 mg/l
	Ammonia	1.7 kg/day**	3.2 kg/day
06/90	Fecal Coliform	2000#/100 ml**	AK
01/91	Ammonia	2.5 mg/l*	4.7 mg/l
	Ammonia	3.8 mg/l**	4.1,4.4,6.6 mg/l
	Ammonia	1.7 kg/day**	2.6,2.2,2.5 kg/day
	Ammonia	1.1 kg/day*	2.2 kg/day
02/91	Ammonia	2.5 mg/l*	5.4 mg/l
	Ammonia	3.8 mg/l**	7.2,3.9,5.8,4.6 mg/l
	Ammonia	1.7 kg/day**	2.6,2.2,2.5 kg/day
	Ammonia	1.1 kg/day*	3.7 kg/day
	CBOD5	4.5 kg/day*	4.9 kg/day
	CBOD5	6.8 kg/day**	8.9 kg/day
03/91	Suspended Solids	8.1 kg/day**	10 kg/day
	Ammonia	2.5 mg/l*	4.5 mg/l
	Ammonia	3.8 mg/l**	11 mg/l
	Ammonia	1.7 kg/day**	9.7 kg/day

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	Ammonia	1.1 kg/day*	3.4 kg/day
11/91	Ammonia	3.8 mg/l**	4.2 mg/l
12/91	Ammonia	2.5 mg/l*	8.4 mg/l
	Ammonia	3.8 mg/l**	4.6,9.2,11,8.7 mg/l
	Ammonia	1.7 kg/day**	1.9,2.9,3.1 kg/day
	Ammonia	1.1 kg/day*	2.3 kg/day
01/92	Ammonia	2.5 mg/l *	14 mg/l
	Ammonia	1.1 kg/day *	6.3 kg/day
	Ammonia	3.8 mg/l **	12,10,14,18 mg/l
	Ammonia	1.7 kg/day**	6.8,3.7,8.6,5.9 kg/day
02/92	Ammonia	2.5 mg/l *	4.7 mg/l
	Ammonia	3.8 mg/l **	6.2,4.1,4.6 mg/l
	Ammonia	1.1 kg/day *	1.3 kg/day
03/92	Ammonia	2.5 mg/l *	4.6 mg/l
	Ammonia	1.1 kg/day *	1.6 kg/day
	Ammonia	3.8 mg/l **	4.7,3.9,5.1,4.3 mg/l
	Ammonia	1.7 kg/day**	2.4 kg/day
04/92	Ammonia	1.7 kg/day**	1.8 kg/day
06/92	CBOD5	10.0 mg/l *	12.1 mg/l
	CBOD5	4.5 kg/day *	5.3 kg/day
	CBOD5	6.8 kg/day **	8.3 kg/day
07/92	TSS	8.1 kg/day**	9.4 kg/day
	CBOD5	4.5 kg/day *	4.6 kg/day
	CBOD5	6.8 kg/day **	7.5 kg/day
06/94	Fecal Coliform	1000 #/100 ml*	2319 #/100 mls
	Fecal Coliform	2000 #/100 ml**	110,000,AK #/100 mls
06/95	Fecal Coliform	2000 #/100 ml**	2700 #/100 mls
Farmersville WWTP (Reigle Ditch RM 0.45)			
09/91	Dissolved Oxygen	5.0 mg/l (min)	exceeded 19 days
	suspended solids	15 mg/l *	41 mg/l
	suspended solids	12.5 kg/day*	29.9 kg/day
	suspended solids		26,38,58,44 kg/day
09/91	suspended solids	19.2 kg/day **	26.9, 36.5, 38.3 kg/day
	Ammonia	2.0 mg/l *	12 mg/l
	Ammonia	1.7 kg/day *	5.4 kg/day
	Ammonia	3.5 mg/l **	9.9, 15 mg/l
	Ammonia	2.9 kg/day **	4.7,6.1 kg/day
	Fecal Coliform	1000 #/100 mls*	40800 #/100mls
	Fecal Coliform	2000 #/100 mls**	50000,34000,11000 #/100 mls
	CBOD	15mg/l*	60.2 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	CBOD	12.5 kg/day*	44.0 kg/day
	CBOD	23.0 mg/l **	55,72,64,50 mg/l
	CBOD	19.2 kg/day **	42.3,50.2,40.5,43.0 kg/day
10/91	Dissolved Oxygen	5.0 mg/l (min)	exceeded 23 days
	suspended solids	15 mg/l *	78 mg/l
	suspended solids	12.5 kg/day*	49.3 kg/day
	suspended solids	23 mg/l **	151,97,56,40,83 kg/day
	suspended solids	19.2 kg/day **	88.0,54.6,39.7,25.5,57.9kg/day
	Ammonia	2.0 mg/l *	35 mg/l
	Ammonia	1.7 kg/day *	22.8 kg/day
	Ammonia	3.5 mg/l **	33,37 mg/l
	Ammonia	2.9 kg/day **	19.7,25.9 kg/day
	CBOD	15mg/l*	130 mg/l
	CBOD	12.5 kg/day*	86.8 kg/day
	CBOD	23.0 mg/l **	140,95,200,100,140 mg/l
	CBOD	19.2 kg/day **	81.6,53.5,133,65.4,97.3 kg/day
	Fecal Coliform	1000 #/100 mls*	2806 #/100mls
	Fecal Coliform	2000 #/100 mls**	2700,3900,2100 #/100 mls
12/91	Dissolved Oxygen	5.0 mg/l (min)	exceeded 2 days
	suspended solids	15 mg/l *	48 mg/l
	suspended solids	12.5 kg/day*	21.2 kg/day
	suspended solids	23 mg/l **	33,56,38,65 mg/l
	suspended solids	19.2 kg/day **	19.7,21.2,27.9 kg/day
	Ammonia	5.0 mg/l *	12 mg/l
	Ammonia	4.2 kg/day *	5.4kg/day
	Ammonia	3.5 mg/l **	9.0,16 mg/l
	CBOD	15 kg/day*	25 kg/day
	CBOD	23.0 mg/l **	25.4,28.2,41.0 mg/l
	CBOD	19.2 kg/day **	22.4 kg/day
01/92	Dissolved Oxygen	5.0 mg/l (min)	exceeded 3 days
	suspended solids	15 mg/l *	51 mg/l
	suspended solids	12.5 kg/day*	32.1 kg/day
	suspended solids	23 mg/l **	40,60,43,64 mg/l
	suspended solids	19.2 kg/day **	23.9,51.7,20.4,32.3 kg/day
	Ammonia	5.0 mg/l *	17 mg/l
	Ammonia	4.2 kg/day *	9.7 kg/day
	Ammonia	7.5 mg/l **	16,17 mg/l
	Ammonia	2.9 kg/day **	12.9,7.3 kg/day
	CBOD	15mg/l*	60.2 mg/l
	CBOD	12.5 kg/day*	44.0 kg/day

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE	
02/92	CBOD	23.0 mg/l **	55,72,64,50 mg/l	
	CBOD	19.2 kg/day **	42.3,50.2,40.5,43.0 kg/day	
	Dissolved Oxygen	5.0 mg/l (min)	exceeded 6 days	
	suspended solids	15 mg/l *	89 mg/l	
	suspended solids	12.5 kg/day*	29.9 kg/day	
	suspended solids	23 mg/l **	51.4 kg/day	
	suspended solids	23 mg/l **	115,225,30 mg/l	
	suspended solids	19.2 kg/day **	56.3,20.5,118 kg/day	
	Ammonia	5.0 mg/l *	11.7 mg/l	
	Ammonia	4.2 kg/day *	5.8 kg/day	
	Ammonia	7.5 mg/l **	12,11 mg/l	
	CBOD	15mg/l*	42 mg/l	
	CBOD	12.5 kg/day*	22.5 kg/day	
	CBOD	23.0 mg/l **	37,77,36 mg/l	
03/92	CBOD	19.2 kg/day **	41.3 kg/day	
	Dissolved Oxygen	5.0 mg/l (min)	exceeded 4 days	
	suspend edsolids	15 mg/l *	68.5 mg/l	
	suspended solids	12.5 kg/day*	39.5 kg/day	
	suspended solids	23 mg/l **	198,29.3,57.4,48.0 mg/l	
	suspended solids	19.2 kg/day **	77.7,38.8,23.8 kg/day	
	Ammonia	5.0 mg/l *	8.6 mg/l	
	CBOD5	15mg/l*	46.5 mg/l	
	CBOD5	12.5 kg/day*	24.4 kg/day	
	CBOD5	23.0 mg/l **	85.3,44.7,51.4,26.0 mg/l	
	CBOD5	19.2 kg/day **	33.4,20.0,34.7 kg/day	
	04/92	Dissolved Oxygen	5.0 mg/l (min)	exceeded2 days
		suspended solids	15 mg/l *	39 mg/l
		suspended solids	12.5 kg/day*	24.1 kg/day
suspended solids		23 mg/l **	51,31,35 mg/l	
suspended solids		19.2 kg/day **	26.3,27.5 kg/day	
Ammonia		5.0 mg/l *	8.9 mg/l	
Ammonia		4.2 kg/day *	6.0 kg/day	
Ammonia		7.5 mg/l **	13 mg/l	
Ammonia		6.3 kg/day **	6.5 kg/day	
CBOD5		15mg/l*	37 mg/l	
CBOD5		12.5 kg/day*	23 kg/day	
CBOD5		23.0 mg/l **	72,25,32 mg/l	
CBOD5		19.2 kg/day **	36.7,24.8 kg/day	
05/92		Dissolved Oxygen	5.0 mg/l (min)	exceeded11 days
	suspended solids	15 mg/l *	41 mg/l	

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	suspended solids	12.5 kg/day*	23.3 kg/day
	suspended solids	23 mg/l **	69,57,25 mg/l
	suspended solids	19.2 kg/day **	37.1,31.6 kg/day
	Ammonia	2.0 mg/l *	12 mg/l
	Ammonia	1.7 kg/day *	6.8 kg/day
	Ammonia	3.5 mg/l **	19mg/l
	Ammonia	2.9 kg/day **	10.6 kg/day
	CBOD5	15mg/l*	36 mg/l
	CBOD5	12.5 kg/day*	20.1 kg/day
	CBOD5	23.0 mg/l **	57,60 mg/l
	CBOD5	19.2 kg/day **	30.1,33.8 kg/day
	Chlorine residual	0.5 mg/l (max)	exceeded 2 days
06/92	Dissolved Oxygen	5.0 mg/l (min)	exceeded 9 days
	suspended solids	15 mg/l *	55 mg/l
	suspended solids	12.5 kg/day*	43.6 kg/day
	suspended solids	23 mg/l **	125,40,45 mg/l
	suspended solids	19.2 kg/day **	95.4,28.7,51.4 kg/day
	Ammonia	2.0 mg/l *	11.5 mg/l
	Ammonia	1.7 kg/day *	7.8 kg/day
	Ammonia	3.5 mg/l **	12,11 mg/l
	Ammonia	2.9 kg/day **	9.3,6.3 kg/day
	CBOD5	15mg/l*	28 mg/l
	CBOD5	12.5 kg/day*	22 kg/day
	CBOD5	23.0 mg/l **	47 mg/l
	CBOD5	19.2 kg/day **	53.2 kg/day
	Chlorine Residual	0.5 mg/l (max)	exceeded 3 days
	Fecal Coliform	1000 #/100 ml*	26800/100 ml
	Fecal Coliform	2000 #/100 ml**	72000/100 ml
07/92	Dissolved Oxygen	5.0 mg/l (min)	exceeded 5 days
	suspended solids	15 mg/l *	26 mg/l
	suspended solids	12.5 kg/day*	22.2 kg/day
	suspended solids	23 mg/l **	38,35 mg/l
	suspended solids	19.2 kg/day **	41.0,31.1 kg/day
	Ammonia	2.0 mg/l *	19 mg/l
	Ammonia	1.7 kg/day *	9.2 kg/day
	Ammonia	3.5 mg/l **	23,33 mg/l
	Ammonia	2.9 kg/day **	9.0,14,4.3 kg/day
	CBOD5	15mg/l*	29 mg/l
	CBOD5	12.5 kg/day*	22.7 kg/day
	CBOD5	23.0 mg/l **	44,51 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
08/92	CBOD5	19.2 kg/day **	49.7,20.5 kg/day
	Fecal Coliform	1000 #/100 ml*	4050/100 ml
	Fecal Coliform	2000 #/100ml**	4500,50000,120000/100 ml
	Dissolved Oxygen	5.0 mg/l (min)	exceeded21 days
	suspended solids	15 mg/l *	48 mg/l
	suspended solids	12.5 kg/day*	37.1 kg/day
	suspended solids	23 mg/l **	37,127 mg/l
	suspended solids	19.2 kg/day*	111 kg/day
	Oil and Grease	10.0 mg/l (daily avg.)	286 mg/l
	Ammonia	2.0 mg/l *	19 mg/l
	Ammonia	1.7 kg/day *	12 kg/day
	Ammonia	3.5 mg/l **	14,25 mg/l
	Ammonia	2.9 kg/day **	10.5,12.7 kg/day
	09/92	CBOD5	15mg/l*
CBOD5		12.5 kg/day*	19.9 kg/day
CBOD5		23.0 mg/l **	23 mg/l
CBOD5		19.2 kg/day **	19.2 kg/day
Fecal Coliform		1000 #/100 ml*	22470/100 ml
Fecal Coliform		2000 #/100 ml**	210000,180000,1700000/100 ml
Dissolved Oxygen		5.0 mg/l (min)	exceeded20 days
suspended solids		15 mg/l *	34 mg/l
suspended solids		12.5 kg/day*	38.6 kg/day
suspended solids		23 mg/l **	27,45,50 mg/l
suspended solids		19.2 kg/day **	31.1, 50.2,53.8 kg/day
Ammonia		2.0 mg/l *	21 mg/l
Ammonia		1.7 kg/day *	22.5 kg/day
Ammonia		3.5 mg/l **	18,25,20 mg/l
Ammonia		2.9 kg/day **	20.6,26.4,20.5 kg/day
CBOD5		15mg/l*	34 mg/l
CBOD5		12.5 kg/day*	37.7 kg/day
CBOD5		23.0 mg/l **	41,50,34 mg/l
CBOD5		19.2 kg/day **	47.3, 55.3, 36.1 kg/day
10/92	Fecal Coliform	1000 #/100 ml*	31340 /100 ml
	Fecal Coliform	2000 #/100 ml*	70000,20000,100000,180000/100 ml
	Dissolved Oxygen	5.0 mg/l (min)	exceeded 10 days
	suspended solids	12.5 kg/day*	15.4 kg/day
	suspended solids	23 mg/l **	53 mg/l
	suspended solids	19.2 kg/day **	57.5 kg/day
	CBOD5	15mg/l*	18 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	CBOD5	12.5 kg/day*	18.4 kg/day
	CBOD5	23.0 mg/l **	66 mg/l
	CBOD5	19.2 kg/day **	71.6 kg/day
	Fecal Coliform	1000 #/100 ml*	47030/100 ml
	Fecal Coliform	2000 #/100 ml**	480000,200000,/30000/100 ml
01/93	CBOD5	23.0 mg/l**	28.8 mg/l
03/93	suspended solids	15 mg/l *	23 mg/l
	suspended solids	12.5 kg/day*	21.2 kg/day
	suspended solids	23 mg/l **	27,45,50 mg/l
	suspended solids	19.2 kg/day **	63.8 kg/day
	Ammonia	5.0 mg/l *	10 mg/l
	Ammonia	4.2 kg/day *	6.8 kg/day
	Ammonia	7.5 mg/l **	8.5,12 mg/l
	Ammonia	6.3 kg/day **	8.3 kg/day
	CBOD5	15mg/l*	15.1 mg/l
	CBOD5	12.5 kg/day*	13.7 kg/day
	CBOD5	23.0 mg/l **	32.5mg/l
	CBOD5	19.2 kg/day **	40.7 kg/day
05/93	Ammonia	2.0 mg/k **	2.3 mg/l
	Fecal Coliform	2000/100 ml**	
	Chlorine Residual	0.5 mg/l (max)	Exceeded 1 day
06/93	Ammonia	2.0/day **	3.5mg/l *
	Ammonia	1.7/day **	1.84/l
	Chlorine Residual	0.5 mg/l (max)	exceeded 4 days
	Oil and Grease	10.0 mg/l (max)	52 mg/l
08/92	suspended solids	23 mg/l **	31 mg/l
	Fecal Coliform	1000 #/100 ml*	2729 /100 ml
	Fecal Coliform	2000 #/100 ml**	28000,2200,41000/100 ml
	Chlorine Residual	0.5 mg/l (max)	Exceeded 2 days
09/93	Fecal Coliform	2000 #/100 ml**	4000/100 ml
	Chlorine Residual	0.5 mg/l (max)	Exceeded 4 days
10/93	suspended solids	15 mg/l *	20 mg/l
	suspended solids	23 mg/l **	33,30 mg/l
	Ammonia	2.0/day **	5.75 mg/l
	Ammonia	1.7/day *	2.17 mg/l
	Fecal Coliform	2000 #/100 ml**	6200,20000/100 ml
12/93	Ammonia	5.0 mg/l*	14.8 mg/l
	Ammonia	7.5mg/l **	14.8 mg/l
02/94	suspended solids	15 mg/l *	44 mg/l
	suspended solids	23 mg/l **	47,37,81 mg/l

Table A-1. (continued).

DATE	PARAMETER	PERMIT LIMITATION	REPORTED VALUE
	CBOD5	15mg/l*	49 mg/l
	CBOD5	23.0 mg/l **	50,59,74,20 mg/l
	Ammonia	5.0 mg/l*	20 mg/l
	Ammonia	7.5mg/l **	18,21 mg/l
03/94	suspended solids	15 mg/l *	22 mg/l
	suspended solids	23 mg/l **	23.5,30.5,24 mg/l
	CBOD5	15mg/l*	24 mg/l
	CBOD5	23.0 mg/l **	28.5,23.5,34 mg/l
	Ammonia	5.0 mg/l*	12 mg/l
	Ammonia	7.5mg/l **	12.8 mg/l
04/94	Ammonia	5.0 mg/l*	10.5 mg/l
	Ammonia	7.5mg/l **	10.7,10.3 mg/l
06/94	Fecal Coliform	1000 #/100 ml*	18153 /100 ml
	Fecal Coliform	2000 #/100 ml**	70000,2500/100 ml

Appendix Table A-2 Results of water column chemical, physical and bacteriological sampling conducted in the Twin Creek study area during July-September, 1995. Results preceded by a less-than (<) indicate values below the method detection limit. Note: mainstem results precede tributaries and metals follow demand and nutrient parameters.

Twin Creek (RM 42.08) Euphemia-Castine Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	7.4	21.2	8.00	--	12	--	8.53	<.05	0.07	--	--	663
8/29/95	6.0	23	7.99	<2.0	--	648	0.26	0.07	0.07	372	6	430
9/14/95	7.9	16.5	8.23	<2.0	14	695	0.21	0.21	0.06	416	10	782
9/27/95	8.2	11	8.16	<2.0	<10	711	0.20	0.05	0.06	459	11	460
Mean	7.4	17.9	8.1	<2.0	12.0	685	2.3	0.10	0.07	416	9	584

Twin Creek (RM 35.54) US 40

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	10.6	23	8.15	<2.0	20	698	8.75	<0.05	0.08	420	15	991
8/29/95	8.4	22.0	8.21	<2.0	--	690	0.97	<0.05	<0.05	438	11	460
9/14/95	7.8	19	8.20	<2.0	<10	665	0.40	<0.05	<0.05	390	5	540
9/27/95	9.5	12.5	8.21	<2.0	<10	702	0.34	<0.05	<0.05	430	5	180
Mean	9.1	19.1	8.19	<2.0	11	689	2.62	<0.05	0.06	420	9	543

Twin Creek (RM 34.90) Dst. Lewisburg WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	6.9	21.5	8.17	<2.0	12	640	7.66	<0.05	0.13	392	25	654
8/02/95	--	--	8.11	2.1	<10	664	3.64	<0.05	0.10	396	--	300
8/16/95	7.7	24	8.43	<2	<10	736	3.36	0.06	0.10	428	<5	450
8/29/95	7.5	20.8	8.09	<2.0	--	689	1.17	<0.05	0.10	434	<5	330
9/14/95	7.2	19	8.15	<2.0	15	700	0.90	<0.05	0.14	404	<5	540
9/27/95	7.4	14	8.10	6.5	15	740	0.33	0.06	0.28	446	<5	320
Mean	7.3	19.9	8.18	2.8	12	695	2.84	0.05	0.14	417	9	432

Twin Creek (RM34.00) Dst. Iams and Carl Akey Co.s

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	9.6	21	8.20	<2.0	18	652	7.42	<0.05	0.13	396	9	636
8/02/95	7.1	23.5	8.11	2.1	12	661	3.6	<0.05	0.11	394	--	600
8/16/95	7.4	24	8.15	<2.0	<10	741	3.19	<0.05	0.07	422	<5	340
8/29/95	7.7	21	8.26	<2.0	--	732	1.16	<0.05	0.08	458	<5	270
9/14/95	8.5	19	8.10	<2.0	<10	--	1.42	<0.05	<0.05	446	18	52
9/27/95	9.2	13	8.22	<2.0	<10	806	1.33	0.06	0.18	508	12	330
Mean	8.3	20.3	8.17	2.0	12	718	3.02	0.05	0.10	437	10	371

Twin Creek (RM31.65) Pymont Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	9.8	21.5	8.18	<2.0	12	636	7.44	<0.05	0.13	388	28	590
8/29/95	8.4	21.8	8.17	<2.0	--	735	1.24	<0.05	<0.05	456	<5	290
9/14/95	8.2	18.5	8.14	<2.0	<10	758	1.26	<0.05	0.1	442	<5	185
9/27/95	8.7	12.5	8.09	<2.0	<10	784	1.33	0.13	0.1	500	<5	140
Mean	8.8	18.6	8.15	<2.0	11	728	2.82	0.07	0.10	447	11	301

Twin Creek (RM27.57) Stotler Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	6.4	23	8.09	<2.0		623	10.6	<0.05	0.12	382	34	1240
8/29/95	8.4	24	8.20	<2.0	--	667	2.38	<0.05	<0.05	408	7	510
9/14/95	9.35	19.8	8.12	<2.0	<10	671	2.49	<0.05	<0.05	394	8	370
9/28/95	11.5	15	8.03	<2.0	<10	699	2.87	<0.05	<0.05	456	7	--
Mean	8.9	20.5	8.11	<2.0	<10	665	4.59	<0.05	0.07	410	14	707

Twin Creek (RM26.7) Dst. West Alexandria WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	6.2	23	8.07	<2.0	17	627	8.60	0.09	0.13	382	30	1530
8/02/95	6.5	24.5	8.16	<2.0	<10	679	4.16	0.09	0.13	396	--	--
8/16/95	8.2	24.6	8.16	<2.0	<10	722	3.74	<0.05	0.06	400	7	410
8/29/95	7.5	23	8.14	<2.0	--	671	2.27	0.22	<0.05	418	14	30
9/14/95	8.0	19.5	8.15	<2.0	<10	702	2.41	0.31	0.12	400	6	47000
9/28/95	9.4	13.5	8.08	<2.0	14	720	2.82	0.22	<0.05	468	8	<10
Mean	7.6	21.4	8.13	<2.0	12	687	4.00	0.16	0.09	411	13	9796

Twin Creek (RM 19.26) Ust. Gratis WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	6.6	22.5	7.72	<2.0	17	588	7.72	<0.05	0.14	366	34	891
8/29/95	6.2	17	8.19	<2.0	--	680	2.15	<0.05	<0.05	408	6	60
9/14/95	6.82	18.9	8.10	<2.0	<10	696	2.57	0.11	<0.05	400	<5	190
9/28/95	8.2	13.5	8.03	<2.0	<10	702	2.79	<0.05	<0.05	442	<5	90
Mean	7.0	18.0	8.01	<2.0	12	667	3.81	0.07	0.07	404	13	308

Twin Creek (RM 18.27) Dst. Gratis WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	6.4	22.2	8.09	<2.0	<10	606	6.98	<0.05	0.12	384	53	220
8/02/95	7.8	25	8.2	<2.0	<10	670	3.88	0.06	0.09	398	<5	380
8/16/95	8.8	24	8.19	<2.0	<10	714	3.48	<0.05	0.06	398	<5	300
8/30/95	6.3	21	8.17	<2.0	--	683	2.17	<0.05	<0.05	422	6	120
9/13/95	6.9	18.9	8.08	<2.0	12	700	2.58	<0.05	<0.05	416	7	430
9/26/95	9.6	13	8.05	<2.0	<10	706	2.77	<0.05	<0.05	450	6	110
Mean	7.6	20.7	8.13	<2.0	10	679	3.64	0.05	0.07	411	14	260

Twin Creek (RM 13.51) Dst. Tom's Run

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	8.3	21	8.09	<2.0	<10	638	4.89	<0.05	0.11	382	26	490
8/30/95	8.2	23	8.2	<2.0	--	669	1.96	<0.05	<0.05	370	10	--
9/13/95	7	20	8.08	3.7	11	700	2.44	0.18	0.14	400	6	3700
9/26/95	12.2	13	8.16	<2.0	<10	706	2.66	0.05	0.14	422	<5	60
Mean	8.9	19	8.13	2.4	10	678	2.99	0.08	0.11	394	12	1417

Twin Creek (RM 9.72) Dst. Germantown Dam

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	9.4	22.4	8.17	<2.0	<10	623	5.48	0.05	0.16	378	24	510
8/30/95	8.6	22.2	8.23	<2.0	--	674	2.18	<0.05	<0.05	394	<5	230
9/13/95	8.6	19.5	--	<2.0	<10	669	2.62	0.06	--	406	6	320
9/26/95	12.2	13	8.23	<2.0	<10	710	2.71	<0.05	<0.05	423	<5	70
Mean	9.7	19.3	8.21	<2.0	<10	669	3.25	0.05	0.09	400	10	283

Twin Creek (RM 3.3) Chamberlain Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	8.0	21.8	8.09	<2.0	12	626	5.05	<0.05	0.10	374	37	580
8/30/95	8.0	21.2	7.95	3.6	--	829	0.21	<0.05	<0.05	484	6	773
9/13/95	8.4	18.5	8.31	<2.0	<10	672	2.18	<0.05	<0.05	394	8	640
9/26/95	10.4	13	8.05	<2.0	<10	717	2.3	<0.10	<0.05	426	<5	90
Mean	8.7	18.6	8.1	2.4	11	711	2.44	<0.06	0.06	420	14	521

Twin Creek (RM 0.95) Franklin-Trenton Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	6.8	22	7.14	<2.0	<10	721	4.91	<0.05	0.09	370	39	360
8/02/95	7.8	25	8.20	<2.0	<10	670	3.88	0.06	0.09	398	<5	380
8/16/95	8.8	24	8.19	<2.0	<10	714	3.48	<0.05	0.06	398	<5	300
8/30/95	6.8	22	8.13	<2.0	--	666	1.91	<0.05	<0.05	342	6	100
9/13/95	7.4	17	8.12	<2.0	<10	686	2.20	<0.05	0.06	396	8	220
9/26/95	8.7	13	8.09	<2.0	12	707	2.25	<0.05	<0.05	418	8	100
Mean	7.7	21	7.98	<2.0	10	694	3.11	0.05	0.07	387	12	243

Millers Fork (RM 10.12) SR 503

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/18/95	7.2	19	7.99	<2.0	<10	630	6.86	<.05	0.06	402	12	1110
8/31/95	5.5	17.0	7.52	<2.0	--	749	<0.10	0.2	<.05	434	20	30
9/12/95	6.2	15	8.32	<2.0	26	730	<0.10	0.33	0.06	448	179	140
9/25/95	7.9	12	7.74	<2.0	10	766	2.79	<0.05	<0.05	442	<5	90
Mean	6.7	15.8	7.89	<2.0	15	719	2.46	0.16	0.06	432	72	343

Swamp Creek (RM 6.19) Ust. Verona

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/18/95	8.8	20	8.09	<2.0	<10	734	9.98	<0.05	<0.05	454	<5	1790
8/31/95	5.0	22.1	7.88	<2.0	--	741	0.40	0.08	<0.05	436	12	754
9/12/95	6.4	16.5	7.88	<2.0	11	768	0.18	0.15	<0.05	469	<5	300
9/25/95	7.9	10	7.96	<2.0	14	878	0.29	<.05	<0.05	510	<5	2700
Mean	7.0	17.2	7.95	<2.0	11.7	780	2.71	0.08	<0.05	467	7	1386

Swamp Creek (RM 5.20) Dst. Verona

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/18/95	8.2	20	8.05	<2.0	<10	743	10.6	<0.05	0.07	434	<5	5200
8/31/95	2.8	22.2	7.75	<2.0	--	829	0.88	0.63	0.19	482	<5	4300
9/12/95	3.3	16	7.78	5.0	17	962	0.60	2.09	0.34	568	<5	33000
9/25/95	3.9	11	7.92	5.0	21	978	1.28	2.07	0.45	556	6	34000
Mean	4.6	17.3	7.88	3.5	16	878	3.34	1.21	0.26	510	5	19125

Price Creek (RM 13.61) Ust. Eldorado WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/18/95	7.5	19.8	8.07	<2.0	<10	730	9.43	<0.05	0.06	448	6	2600
8/31/95	3.8	23.5	7.88	2.9	--	847	<0.10	0.14	0.10	508	52	190
9/12/95	6.3	17	8.10	5.8	37	828	<0.10	0.24	0.10	534	20	40
9/25/95	6.4	11	8.20	5	30	901	<0.10	<0.05	0.09	546	10	30
Mean	6.0	17.8	8.06	3.9	25.7	827	2.43	0.12	0.09	509	22	715

Price Creek (RM 13.28) Dst. Eldorado WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/18/95	9.6	21.5	8.17	<2.0	18	609	8.12	0.09	0.12	570	<5	220
8/31/95	9.7	24	8.18	4.3	--	1510	0.80	0.45	2.64	854	18	440
9/12/95	7.1	17.5	8.03	4.0	32	1550	2.09	1.94	2.68	888	8	290
9/25/95	6.3	11	7.95	<2.0	15	695	12.8	0.08	2.43	978	8	90
Mean	8.2	18.5	8.08	3.1	21.7	1,091	5.95	0.64	1.97	823	9.8	755

Lesley Run (RM 6.01) Snyder Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	7.0	21.0	8.05	4.7	17	684	5.46	<0.05	0.10	412	128	1210
8/29/95	6.3	23.9	8.12	4.0	--	657	0.31	<0.05	<0.05	428	33	140
9/14/95	4.5	20	8.06	<2.0	21	659	<0.10	<0.05	<0.05	380	20	110
9/28/95	4.85	15.1	8.11	3.7	27	695	<0.10	<0.05	<0.05	434	20	20
Mean	5.66	20	8.09	3.6	21.7	674	1.49	<0.05	<0.05	414	50	370

Bantas Fork (RM 1.25) SR 503.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	7.8	21	8.33	<2.0	--	683	6.00	<0.05	<0.05	408	<5	450
8/29/95	7.3	21	8.28	<2.0	--	681	1.86	<0.05	<0.05	406	<5	440
9/14/95	8.35	18.4	8.23	<2.0	<10	700	1.96	<0.05	<0.05	408	<5	560
9/28/95	10.4	12.0	8.2	<2.0	<10	719	1.88	<0.05	<0.05	478	6	140
Mean	8.46	18.1	8.26	<2.0	<10	696	2.93	<0.05	<0.05	425	5	398

Goose Creek (RM 4.3) Scheyhing Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	8.0	19.0	8.16	<2.0	<10	1220	6.86	<0.05	0.21	592	<5	490
8/29/95	7.4	21	8.65	<2.0	--	2000	4.72	<0.05	0.74	1140	26	2400
9/14/95	5.7	18	7.98	8.1	63	1810	10.1	0.33	--	1020	7	--
9/27/95	8.7	12.1	8.28	<2.0	24	2670	11	<0.05	1.90	1430	15	918
Mean	7.5	17.5	8.27	3.5	32	1925	8.17	0.12	0.95	1046	13	1260

Tom's Run (RM 8.41) Bull Rd.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/19/95	5.6	22	7.96	<2.0	-	644	6.65	<0.05	<0.05	402	20	891
8/29/95	6.2	23.9	8.06	<2.0	-	790	<0.10	<0.05	<0.05	370	10	230
9/14/95	--	--	7.93	<2.0	<10	828	<0.10	<0.05	<0.05	468	7	10
9/28/95	5.7	13	8.02	<2.0	<10	961	<0.10	<0.05	<0.05	596	15	80
Mean	5.8	20	7.99	<2.0	<10	806	1.74	<0.05	<0.05	459	13	303

Little Twin Creek (RM 4.67) Farmersville W Carrollton Pk.

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	7.2	22.2	8.02	<2.0	<10	910	2.4	0.06	0.23	542	8	475
8/30/95	7.8	23	8.28	<2.0	--	1060	3.33	0.05	0.34	616	5	190
9/13/95	7.8	20	8.19	<2.0	<10	1160	7.49	<0.05	0.78	648	<5	590
9/26/95	10.8	14.5	8.41	<2.0	<10	1200	8.38	0.19	0.92	712	16	50
Mean	8.4	19.2	8.23	<2.0	<10	1083	5.4	0.09	0.57	630	9	326

Reigle Ditch (RM 0.47) Ust. Farmersville WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	8.0	21.0	8.11	<2.0	<10	724	0.34	<0.05	--	434	<5	290
8/29/95	5.6	22	7.79	<2.0	--	1080	4.55	<0.05	0.79	606	10	2100
9/13/95	6.2	19	7.95	<2.0	<10	748	0.20	<0.05	0.06	436	10	420
9/26/95	10	14	7.96	<2.0	<10	767	<0.10	<0.05	<0.05	490	33	110
Mean	7.5	19	7.95	<2.0	<10	830	1.30	<0.05	0.3	492	15	730

Reigle Ditch (RM 0.35) Dst. Farmersville WWTP

DATE	D.O. (mg/l)	Temp (C)	pH (SU)	BOD (mg/l)	COD (mg/l)	Cond. (umhos/cm)	NO ₃ +NO ₂ (mg/l)	NH ₃ -N (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)	F. Coli (#/100ml)
7/20/95	7.7	21	7.88	2.1	49	1340	9.64	<0.05	1.83	774	6	400
8/30/95	7.6	22	-	<2.0	--	1450	12.8	0.06	2.18	814	6	390
9/13/95	8.2	20.0	8.16	<2.0	14	1370	17.7	<0.05	2.83	786	<5	270
9/26/95	10.5	14	7.87	<2.0	18	1600	22.3	0.06	3.45	926	16	110
Mean	8.5	19	7.97	2.0	27	1440	15.6	0.06	2.57	825	8	293

Twin Creek (RM 42.08) Euphemia-Castine Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	2	<0.2	71	<10	<2	39	<40	<2	<10	338
9/14/95	2	<0.2	85	<10	<2	40	<40	<2	<10	377
9/27/95	<2	<0.2	90	<10	<2	43	<40	<2	15	402
Mean	2	<0.2	82	<10	<2	41	<40	<2	12	372

Twin Creek (RM 35.54) US 40

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	3	<0.2	77	<10	<2	37	<40	2	<10	345
9/14/95	<2	<0.2	78	<10	<2	40	<40	<2	10	359
9/27/95	2	<0.2	83	<10	<2	41	<40	<2	<10	376
Mean	2	<0.2	79	<10	<2	39	<40	2	10	360

Twin Creek (RM34.90) Dst. Lewisburg WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/16/95	<2	<0.2	95	<10	<2	40	<40	<2	15	402
8/29/95	4	<0.2	78	<10	<2	39	<40	<2	<10	355
9/14/95	<2	<0.2	80	<10	<2	40	<40	<2	11	369
9/27/95	2	<0.2	80	<10	<2	40	<40	<2	20	364
Mean	3	<0.2	83	<10	<2	40	<40	<2	14	373

Twin Creek (RM34.00) Dst. Iams and Carl Akey Co.s

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/16/95	<2	<0.2	93	<10	<2	39	<40	<2	19	393
8/29/95	<2	<0.2	78	<10	<2	33	<40	<2	<10	351
9/14/95	<2	<0.2	83	<10	<2	41	<40	<2	15	376
9/27/95	<2	<0.2	84	<10	<2	41	<40	<2	14	379
Mean	<2	<0.2	85	<10	<2	39	<40	<2	15	375

Twin Creek (RM31.65) Pymont Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	3.0	<0.2	83	<10	<2	39	<40	<2	<10	368
9/14/95	3.0	<0.2	83	<10	<2	40	<40	<2	<10	372
9/27/95	3.0	<0.2	86	<10	<2	41	<40	<2	10	384
Mean	3.0	<0.2	84	<10	<2	40	<40	<2	<10	375

Twin Creek (RM27.57) Stotler Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	<2.0	<0.2	72	<10	<2	34	<40	<2	<10	320
9/14/95	<2.0	<0.2	79	<10	<2	37	<40	3	<10	372
9/28/95	<2.0	<0.2	82	<10	<2	38	<40	<2	12	361
Mean	<2.0	<0.2	78	<10	<2	36	<40	2.3	11	351

Twin Creek (RM 26.7) Dst. West Alexandria WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/16/95	<2.0	<0.2	92	<10	<2	38	<40	<2	20	386
8/29/95	3.0	<0.2	75	<10	<2	34	<40	2	<10	327
9/14/95	<2.0	<0.2	79	<10	<2	36	<40	<2	<10	346
9/28/95	3.0	<0.2	84	<10	<2	39	<40	2	12	370
Mean	2.5	<0.2	83	<10	<2	37	<40	<2	13	357

Twin Creek (RM 19.26) Ust. Gratis WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	3.0	<0.2	76	<10	<2	34	<40	2	<10	330
9/14/95	<2.0	<0.2	83	<10	<2	36	<40	<2	<10	355
9/28/95	<2.0	<0.2	87	<10	<2	38	<40	<2	<10	374
Mean	2.3	<0.2	82	<10	<2	36	<40	2	<10	353

Twin Creek (RM 18.27) Dst. Gratis WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	<2.0	<0.2	77	<10	<2	34	<40	<2	<10	332
9/13/95	<2.0	<0.2	84	<10	<2	36	<40	<2	<10	358
9/26/95	<2.0	<0.2	89	<10	<2	38	<40	<2	23	379
Mean	<2.0	<0.2	83	<10	<2	36	<40	<2	14	356

Twin Creek (RM 13.51) Dst. Tom's Run

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	2	<0.2	77	<10	<2	35	<40	<2	<10	336
9/13/95	2	<0.2	76	<10	<2	32	<40	<2	<10	322
9/26/95	2	<0.2	88	<10	<2	37	<40	<2	<10	372
Mean	2	<0.2	80	<10	<2	35	<40	<2	<10	343

Twin Creek (RM 9.72) Dst. Germantown Dam

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	2	<0.2	80	<10	<2	34	<40	<2	<10	340
9/13/95	2	<0.2	82	<10	<2	34	<40	<2	<10	345
9/26/95	2	<0.2	89	<10	<2	37	<40	<2	12	375
Mean	2	<0.2	83	<10	<2	35	<40	<2	11	353

Twin Creek (RM 3.3) Chamberlain Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	2	<0.2	116	<10	<2	36	<40	<2	<10	438
9/13/95	2	<0.2	81	<10	<2	33	<40	<2	<10	338
9/26/95	2	<0.2	87	<10	<2	36	<40	<2	13	365
Mean	2	<0.2	94	<10	<2	35	<40	<2	11	380

Twin Creek (RM 0.95) Franklin-Trenton Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/16/95	<2	<0.2	93	<10	<2	37	<40	<2	15	385
8/30/95	<2	<0.2	77	<10	<2	34	<40	<2	10	332
9/13/95	<2	<0.2	82	<10	<2	34	<40	<2	<10	345
9/26/95	<2	<0.2	88	<10	<2	35	<40	<2	20	364
Mean	<2	<0.2	85	<10	<2	35	<40	<2	14	357

Millers Fork (RM 10.12) SR 503

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/31/95	5.0	<0.2	96	<10	<2	40	<40	<2	<10	404
9/12/95	6.0	<0.2	102	<10	2	42	<40	<2	31	428
9/25/95	3	<0.2	101	<10	2	43	<40	2	50	429
Mean	4.7	<0.2	100	<10	2	42	<40	2	30	420

Swamp Creek (RM 6.19) Ust. Verona

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/31/95	<2.0	<0.2	91	<10	<2	37	<40	<2	<10	380
9/12/95	<2.0	<0.2	92	<10	<2	36	<40	<2	<10	378
9/25/95	<2.0	<0.2	88	<10	<2	38	<40	2	<10	376
Mean	<2.0	<0.2	90	<10	<2	37	<40	<2	<10	378

Swamp Creek (RM 5.29) Dst. Verona

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/31/95	3	<0.2	90	<10	<2	38	<40	<2	12	381
9/12/95	3	<0.2	89	<10	<2	39	<40	<2	11	383
9/25/95	3	<0.2	95	<10	<2	41	<40	2	11	406
Mean	3	<0.2	91	<10	<2	39	<40	<2	11	390

Price Creek (RM 13.61) Ust. Eldorado WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/31/95	4	<0.2	74	<10	<2	39	<40	2	17	345
9/12/95	2	<0.2	60	<10	<2	38	<40	2	11	306
9/25/95	2	<0.2	58	<10	<2	44	<40	2	14	326
Mean	2.7	<0.2	64	<10	<2	40	<40	2	14	326

Price Creek (RM 13.28) Dst. Eldorado WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/31/95	9.0	<0.2	89	<10	<2	44	<40	<2	24	403
9/12/95	7.0	<0.2	90	<10	<2	43	<40	<2	21	402
9/25/95	7.0	<0.2	96	<10	<2	46	<40	<2	65	429
Mean	7.7	<0.2	92	<10	<2	44	<40	<2	37	411

Lesley Run (RM 6.01) Snyder Rd

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	<2	<0.2	62	<10	<2	39	<40	2	15	315
9/13/95	2	<0.2	64	<10	<2	40	<40	2	<10	325
9/28/95	3	<0.2	65	<10	<2	41	<40	<2	13	331
Mean	2	<0.2	64	<10	<2	41	<40	<2	39	324

Bantas Fork (RM 1.25) SR 503.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	<2	<0.2	73	<10	<2	34	<40	2	<10	322
9/14/95	<2	<0.2	85	<10	<2	38	<40	2	<10	369
9/28/95	<2	<0.2	90	<10	<2	39	<40	2	<10	385
Mean	<2	<0.2	83	<10	<2	37	<40	2	<10	359

Goose Creek (RM 4.3) Scheyhing Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	4	0.2	95	<10	<2	47	<40	2	11	431
9/14/95	4	0.2	58	<10	<2	27	<40	2	20	256
9/27/95	6	<0.2	108	<10	<2	52	<40	<2	31	484
Mean	5	0.2	87	<10	<2	42	<40	2	21	390

Tom's Run (RM 8.41) Bull Rd.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	2	<0.2	66	<10	<2	34	<40	2	<10	305
9/13/95	2	<0.2	69	<10	<2	37	<40	2	16	325
9/28/95	<2	<0.2	86	<10	<2	40	<40	<2	13	379
Mean	2	<0.2	74	<10	<2	37	<40	<2	13	336

Little Twin Creek (RM 4.67) Farmersville W Carrollton Pk.

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	3	<0.2	84	<10	<2	38	<40	2	<10	366
9/13/95	4	<0.2	86	<10	<2	38	<40	<2	10	371
9/26/95	3	<0.2	95	<10	<2	41	<40	<2	16	406
Mean	3	<0.2	88	<10	<2	39	<40	2	12	381

Reigle Ditch (RM 0.47) Ust. Farmersville WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/29/95	<2	<0.2	86	<10	<2	35	<40	<2	<10	359
9/13/95	<2	<0.2	83	<10	<2	36	<40	<2	16	355
9/26/95	<2	<0.2	94	<10	<2	40	<40	<2	12	399
Mean	<2	<0.2	88	<10	<2	37	<40	<2	13	371

Reigle Ditch (RM 0.35) Dst. Farmersville WWTP

DATE	T-As (ug/l)	T-Cd (ug/l)	T-Ca (mg/l)	T-Cu (ug/l)	T-Pb (ug/l)	T-Mg (mg/l)	T-Ni (ug/l)	T-Se (ug/l)	T-Zn (ug/l)	Hardness (mg/l)
8/30/95	4.0	<0.2	82	<10	<2	34	<40	<2	21	345
9/13/95	5.0	<0.2	79	<10	<2	34	<40	<2	25	337
9/26/95	4.0	<0.2	83	14	<2	35	<40	<2	48	351
Mean	4.3	<0.2	81	<10	<2	34	<40	<2	31	344

Appendix Table A-3 Summary of Ohio EPA database water column chemistry statistics based on samples from Eastern Corn Belt Plains ecoregion streams categorized by drainage basin size where the fish community performed within the warmwater (IBI=40-49) or exceptional warmwater (IBI=50-60) range based on Index of Biotic Integrity scores.

Ohio EPA water column chemical analysis (1981-1994)

Eastern Corn Belt Plains-Headwater Streams (<20mi²)

Parameter (units)	IBI Range	Sample (n)	Media n	75th %tile	90th %tile	95th %tile	Median + 1.5*IQR	Median + 2*IQR
D.O. (mg/l)	40-49	84	8.0	6.75	6.09	3.50	6.13	5.50
	50-60	13	8.9	7.48	6.74	6.50	6.76	6.05
BOD (mg/l)	40-49	74	1.0	1.4	2.2	2.8	1.6	1.8
	50-60	28	1.0	1.0	1.1	1.3	1.0	1.0
COD (mg/l)	40-49	50	11.5	17.0	21.5	24.0	19.75	22.5
	50-60	8	12.0	15.5	20.1	21.0	17.25	19.0
T-Ammonia (mg/l)	40-49	85	0.05	0.05	0.15	0.26	0.05	0.05
	50-60	28	0.05	0.05	0.05	0.05	0.05	0.05
Nitrate (mg/l)	40-49	86	1.25	2.14	3.78	4.0	2.59	3.03
	50-60	28	0.17	1.40	3.55	5.0	2.02	2.63
Phosphorus (mg/l)	40-49	82	0.07	0.24	0.43	0.68	0.33	0.41
	50-60	31	0.05	0.07	0.09	0.10	0.08	0.09
TSS (mg/l)	40-49	71	6.0	9.0	29.0	187.0	10.5	12.0
	50-60	28	6.0	10.0	22.5	30.3	12.0	14.0
TDS (mg/l)	40-49	17	424.0	443.5	604.8	659.2	453.3	463.0
	50-60	25	402.0	434.0	478.0	502.5	450.0	466.0
Arsenic (µg/l)	40-49	29	2.0	2.0	6.6	10.05	2.0	2.0
	50-60	8	2.0	2.0	2.0	2.0	2.0	2.0
Zinc (µg/l)	40-49	72	10.0	17.5	53.0	78.2	21.25	25.0
	50-60	14	11.5	27.0	55.0	62.0	34.75	42.5
Fecal Coliform (#/100ml)	40-49	51	470.0	1011.3	4868.0	9035.5	1281.9	1552.5
	50-60	8	375.0	548.5	771.7	838.0	635.3	722.0

Appendix Table A-3. (continued)

Ohio EPA water column chemical analysis (1981-1994)								
<i>Eastern Corn Belt Plains-Wadeable Streams (20-200mi²)</i>								
Parameter (units)	IBI Range	Sample (n)	Media n	75th %tile	90th %tile	95th %tile	Median + 1.5*IQR	Median + 2*IQR
D.O.	40-49	539	7.7	6.5	5.3	2.2	5.9	5.3
(mg/l)	50-60	158	8.05	7.2	6.43	2.5	6.78	6.35
BOD	40-49	463	1.60	2.98	5.0	5.60	3.66	4.35
(mg/l)	50-60	144	1.25	2.10	3.61	4.60	2.53	2.95
COD	40-49	354	17.5	22.0	30.0	34.0	24.25	26.5
(mg/l)	50-60	134	15.5	20.0	25.0	29.6	22.25	24.5
T-Ammonia	40-49	521	0.05	0.07	0.20	0.48	0.08	0.09
(mg/l)	50-60	166	0.05	0.05	0.09	0.25	0.05	0.05
Nitrate	40-49	531	1.27	3.00	4.85	6.03	3.87	4.74
(mg/l)	50-60	166	1.55	3.22	5.57	7.81	4.06	4.89
Phosphorus	40-49	569	0.11	0.24	0.55	1.10	0.31	0.38
(mg/l)	50-60	163	0.08	0.21	0.44	1.06	0.28	0.34
TSS	40-49	466	15.0	31.0	55.9	91.4	39.0	47.0
(mg/l)	50-60	148	12.0	26.0	60.0	104.2	33.0	40.0
TDS	40-49	291	442.0	521.0	592.4	707.6	560.5	600.0
(mg/l)	50-60	76	449.0	477.5	534.8	715.8	491.8	506.0
Arsenic	40-49	150	2.0	2.0	3.0	4.0	2.0	2.0
(µg/l)	50-60	87	2.0	2.0	2.8	3.3	2.0	2.0
Zinc	40-49	427	10.0	15.0	30.0	50.0	17.5	20.0
(µg/l)	50-60	140	10.0	15.0	30.0	52.5	17.5	20.0
Fecal Coliform	40-49	278	390.0	748.0	2373.0	6384.0	927.0	1106.0
(#/100ml)	50-60	115	390.0	1420.0	8180.0	25500.0	1935.0	2450.0

Appendix Table A-4. Summary of dissolved oxygen concentrations recorded with Datasonde© continuous monitors at 13 Twin Creek locations from September 19 to September 21, 1994. Bold denotes a violation of the EWH minimum D.O. criterion (5.0 mg/l).

River Mile	Total Hours	Mean (mg/l)	Median (mg/l)	Minimum (mg/l)	Maximum (mg/l)	25th %tile (mg/l)	75 %tile (mg/l)
42.1	42	5.11	4.95	3.68	7.33	3.81	5.31
34.9	46	8.90	8.96	6.90	11.22	7.60	9.52
27.5	45	8.68	8.00	7.16	11.69	7.44	9.49
26.7	44	6.99	6.51	5.79	10.65	5.94	7.34
25.8	43	8.30	8.01	7.49	10.57	7.63	8.40
24.3	51	8.40	8.18	7.28	10.64	7.74	8.73
21.4	47	8.38	8.24	6.78	10.90	7.32	8.82
19.2	47	9.20	8.95	7.85	12.15	8.12	9.77
18.3	50	9.61	9.10	7.86	13.10	8.36	10.45
13.4	50	7.95	7.72	6.52	10.35	7.13	8.44
9.7	50	9.92	9.43	9.03	12.41	9.10	10.42
3.3	52	8.42	8.01	7.13	11.09	7.45	9.08
1.0	54	8.47	8.09	7.15	11.13	7.45	9.30

Appendix Table A-5 Percentage of particle sizes in sediment samples collected in the Twin Creek study area, 1995

<i>Stream</i> River Mile	Sand or larger (\$0.5)	Coarse Silt (0.5-3)	Medium Silt (3-10)	Fine Silt (10-90)	V. Fine Silt (90-270)	Coarse Clay (270-720)	Medium Clay (720-1440)	Fine Clay (>1440)
Settling time (0)	[<60]	[60-30]	[30-15]	[15-8]	[8-4]	[4-2]	[2-1]	[<1]
<i>Twin Creek</i>								
42.2	55.7	8.1	16.2	6.0	6.0	2.0	2.0	4.0
34.0	35.9	8.3	29.0	8.3	8.3	4.1	2.1	4.1
26.7	35.9	8.7	12.1	26.0	5.2	3.5	0.0	8.6
1.0	30.0	9.8	13.0	29.3	5.1	3.0	1.9	8.1
<i>Goose Creek</i>								
4.4	22.6	8.2	36.7	14.3	8.2	2.0	2.0	6.1
<i>Riegle Ditch</i>								
0.2	50.4	9.4	21.3	9.0	5.2	3.0	1.9	10.7

Appendix Table A-6 Summary of Ohio EPA database sediment chemistry statistics from samples collected at statewide reference sites. All values expressed as mg/kg.

Parameter	(n)	Mean	Mini- mum	25th %tile	50th %tile	75th %tile	90th %tile	95th %tile	Maxi- mum	Inter- Quatile	Std. Dev.
Aluminum	80	10409	2210	4540	6855	11700	15650	19350	170000	7160	18701
Arsenic	154	7.96	0.61	4.54	6.84	10.2	13.8	16.1	57.9	5.66	6.379
Barium	66	74.0	1.11	36.0	68.0	95.0	142	175	202	59.0	45.564
Cadmium	153	0.330	0.038	0.143	0.280	0.430	0.563	0.804	2.140	0.287	0.286
Chromium	164	13.2	0.98	8.0	11.1	16.8	24.6	27.2	43.8	8.8	7.844
Copper	163	16.4	2.69	9.36	13.2	18.7	23.7	27.0	306	9.34	23.973
Iron	147	20459	4380	13700	18300	24600	33900	40700	56600	10900	9819
Lead	165	21.1	2.41	12.0	16.9	27.3	38.1	44.5	66.8	15.3	12.812
Manganes e	90	904	96.6	309	704	1170	1970	2560	6030	861	878
Nickel	162	20.5	4.0	11.0	17.3	24.6	39.8	47.0	151	13.6	15.894
Zinc	162	71.2	13.5	46.5	65.6	86.6	112	140	247	40.1	35.346

Appendix Table A-7 Comparison of Ohio EPA database sediment chemistry statistics (Table A-6) with values reported for use in Illinois (Kelly and Hite 1984) and Ontario (Persaud *et al.* 1994). Ohio elevation categories based on median value plus 1, 2, 4 and 8 inter-quartile range values. All values expressed as mg/kg.

Parameter	State	Non-Elevated	Slightly Elevated	Elevated	Highly Elevated	Extremely Elevated
Arsenic	Ohio	<12.5	12.5-18.2	18.3-29.5	29.6-52.1	>52.1
	Illinois	<8.0	8.0-10.9	11.0-16.9	17.0-28.0	>28.0
	Ontario	<6.0				>33.0
Cadmium	Ohio	<0.567	0.567-0.854	0.855-1.428	1.429-2.576	>2.576
	Illinois	<0.500	0.500-1.000	1.001-2.000	2.001-20.00	>20.00
	Ontario	<0.600				>10.00
Chromium	Ohio	<19.9	19.9-28.8	28.9-46.5	46.6-81.9	>81.9
	Illinois	<16.0	16.0-23.0	23.1-38.0	38.1-60.0	>60.0
	Ontario	<26.0				>110
Copper	Ohio	<22.5	22.5-31.9	32.0-50.6	50.7-87.9	>87.9
	Illinois	<38.0	38.0-60.0	60.1-100	101-200	>200
	Ontario	<16.0				>110
Iron	Ohio	<29200	29200-40100	40101-61900	61901-105500	>105500
	Illinois	<18000	18000-23000	23001-32000	32001-50000	>50000
	Ontario	<20000				>40000
Lead	Ohio	<32.2	32.2-47.5	47.6-78.1	78.2-139	>139
	Illinois	<28.0	28.0-38.0	38.1-60.0	60.1-100	>100
	Ontario	<31.0				>250
Manganese	Ohio	<1565	1565-2426	2427-4148	4149-7592	>7592
	Illinois	<1300	1300-1800	1801-2800	2801-5000	>5000
	Ontario	<460				>1100
Nickel	Ohio	<30.9	30.9-44.5	44.6-71.7	71.8-126	>126
	Illinois	N/A				N/A
	Ontario	<16.0				>75.0
Zinc	Ohio	<106	106-146	147-226	227-386	>386
	Illinois	<80.0	80.0-100	101-170	171-300	>300
	Ontario	<120				

Table A-8 Macroinvertebrate Community Index Scores

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco-region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddisflies	Tanytarsini	Other Dipt/NI	Tolerant Organisms			
Twin Creek (14-500)													
Year: 1995													
42.20 A	28.0	49(6)	7(4)	3(6)	24(6)	18.4(4)	9.7(6)	33.2(6)	31.9(4)	5.0(6)	7(2)	5	50
42.20 B	28.0	49(6)	11(6)	4(6)	23(6)	14.4(4)	8.2(6)	52.6(6)	23.5(6)	3.1(6)	7(2)	5	54
38.10	34.0	43(6)	9(6)	3(4)	23(6)	40.6(6)	3.1(2)	4.4(2)	51.4(2)	0.4(6)	16(6)	5	46
35.50	69.0	44(6)	11(6)	3(4)	21(6)	51.8(6)	14.2(6)	8.2(2)	25.1(6)	3.6(6)	25(6)	5	54
35.00	88.0	37(4)	5(2)	1(2)	25(6)	12.6(2)	0.7(2)	29.4(4)	57.2(2)	9.6(4)	19(6)	5	34
34.00	89.0	46(6)	12(6)	4(6)	22(6)	28.6(4)	2.4(2)	23.0(4)	45.8(4)	5.1(6)	22(6)	5	50
31.70	96.0	48(6)	12(6)	3(4)	27(6)	43.7(6)	2.5(2)	11.9(2)	41.7(4)	2.7(6)	20(6)	5	48
27.50	143.0	39(6)	11(6)	3(4)	20(6)	32.5(6)	8.4(2)	25.0(4)	33.5(4)	1.4(6)	24(6)	5	50
26.70	146.0	50(6)	12(6)	6(6)	20(6)	20.0(4)	9.6(4)	32.6(4)	36.7(4)	1.0(6)	26(6)	5	52
25.20	150.0	45(6)	11(6)	5(6)	24(6)	31.1(4)	6.8(2)	18.2(4)	43.7(2)	4.3(6)	20(6)	5	48
19.20	225.0	42(6)	10(6)	7(6)	21(6)	28.1(4)	10.2(2)	31.5(4)	30.2(4)	3.8(6)	23(6)	5	50
19.00	225.0	37(6)	12(6)	4(4)	19(6)	36.3(6)	6.7(2)	28.4(4)	28.6(4)	4.6(4)	19(6)	5	48
16.90	235.0	46(6)	11(6)	4(4)	26(6)	34.9(6)	3.6(2)	29.8(4)	31.7(4)	5.2(4)	19(6)	5	48
13.40	271.0	44(6)	13(6)	5(6)	22(6)	53.7(6)	2.2(2)	20.6(4)	23.3(6)	1.0(6)	18(6)	5	54
3.40	312.0	37(6)	10(6)	5(6)	18(6)	31.1(4)	6.8(2)	34.1(4)	27.2(4)	3.8(4)	17(6)	5	48
Little Twin Creek (14-501)													
Year: 1995													
6.30	4.9	37(4)	5(4)	2(4)	23(6)	32.3(6)	2.0(6)	23.6(6)	41.3(4)	2.3(6)	14(6)	5	52
4.70	11.5	46(6)	3(2)	4(6)	25(6)	0.8(2)	0.8(2)	29.0(6)	69.2(0)	29.6(0)	7(4)	5	34
2.70	18.8	50(6)	10(6)	3(6)	30(6)	26.0(6)	14.5(6)	14.8(4)	44.3(4)	2.4(6)	15(6)	5	56
Bantas Fork (14-505)													
Year: 1995													
9.40	11.8	40(6)	10(6)	3(6)	24(6)	21.2(4)	8.2(6)	38.6(6)	30.9(4)	0.9(6)	10(4)	5	54
1.30	34.0	41(6)	10(6)	5(6)	20(6)	28.8(6)	10.7(6)	21.3(4)	37.2(4)	3.9(6)	18(6)	5	56
0.20	35.4	56(6)	10(6)	4(6)	26(6)	52.8(6)	6.0(4)	11.1(2)	28.8(6)	0.7(6)	22(6)	5	54

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

Collection Date: 09/18/1995 River Code: 14-500 RM: 42.20 A Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	476	82141	<i>Thienemanniella xena</i>	11
01801	<i>Turbellaria</i>	2	82730	<i>Chironomus (C.) decorus group</i>	+
03360	<i>Plumatella sp</i>	1	83040	<i>Dicrotendipes neomodestus</i>	+
03600	<i>Oligochaeta</i>	32 +	83840	<i>Microtendipes pedellus group</i>	40
04686	<i>Placobdella papillifera</i>	1	84300	<i>Phaenopsectra obediens group</i>	+
07875	<i>Cambarus (Tubericambarus) sp A</i>	+	84450	<i>Polypedilum (P.) flavum</i>	120 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	40 +
08601	<i>Hydracarina</i>	1 +	84470	<i>Polypedilum (P.) illinoense</i>	100 +
11020	<i>Acerpenna pygmaeus</i>	82	84490	<i>Polypedilum (Cerobregma) ontario</i>	20
12200	<i>Isonychia sp</i>	103	85500	<i>Paratanytarsus sp</i>	279
13400	<i>Stenacron sp</i>	127 +	85501	<i>Paratanytarsus n.sp 1</i>	20
13540	<i>Stenonema mediopunctatum</i>	196	85615	<i>Rheotanytarsus distinctissimus group</i>	+
13561	<i>Stenonema pulchellum</i>	93	85625	<i>Rheotanytarsus exiguus group</i>	259 +
13570	<i>Stenonema terminatum</i>	52	85720	<i>Stempellinella n.sp nr. flavidula</i>	245 +
17200	<i>Caenis sp</i>	156 +	85800	<i>Tanytarsus sp</i>	140 +
21200	<i>Calopteryx sp</i>	+	85802	<i>Tanytarsus curticornis group</i>	80 +
22001	<i>Coenagrionidae</i>	+	85814	<i>Tanytarsus glabrescens group</i>	319 +
22300	<i>Argia sp</i>	13	85840	<i>Tanytarsus guerlus group</i>	120 +
42700	<i>Belostoma sp</i>	+	86100	<i>Chrysops sp</i>	1
52200	<i>Cheumatopsyche sp</i>	338 +	87540	<i>Hemerodromia sp</i>	32
52530	<i>Hydropsyche depravata group</i>	76 +	93900	<i>Elimia sp</i>	1 +
57400	<i>Neophylax sp</i>	+	94400	<i>Fossaria sp</i>	1
57900	<i>Pycnopsyche sp</i>	+	96900	<i>Ferrissia sp</i>	49 +
58505	<i>Helicopsyche borealis</i>	15 +	98600	<i>Sphaerium sp</i>	+
68075	<i>Psephenus herricki</i>	25 +	99860	<i>Lampsilis radiata luteola</i>	+
68130	<i>Helichus sp</i>	+			
68601	<i>Ancyronyx variegata</i>	1 +	No. Quantitative Taxa: 49		Total Taxa: 67
68708	<i>Dubiraphia vittata group</i>	34 +	No. Qualitative Taxa: 43		ICI: 50
68901	<i>Macronychus glabratus</i>	73	Number of Organisms: 4408		Qual EPT: 7
69400	<i>Stenelmis sp</i>	155 +			
71100	<i>Hexatoma sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	80 +			
77150	<i>Ablabesmyia simpsoni</i>	+			
77500	<i>Conchapelopia sp</i>	40 +			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
77800	<i>Helopelopia sp</i>	140			
78140	<i>Labrundinia pilosella</i>	64			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	43			
80370	<i>Corynoneura lobata</i>	32 +			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	60			
81250	<i>Nanocladius (N.) minimus</i>	20			
81630	<i>Parakiefferiella sp</i>	+			

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/18/1995 River Code: 14-500 RM: 42.20 B Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	68	85800	<i>Tanytarsus sp</i>	71
01801	<i>Turbellaria</i>	5	85802	<i>Tanytarsus curticornis group</i>	88
03600	<i>Oligochaeta</i>	8	85814	<i>Tanytarsus glabrescens group</i>	265
08601	<i>Hydracarina</i>	4	85840	<i>Tanytarsus guerlus group</i>	53
11018	<i>Acerpenna macdunnoughi</i>	26	87540	<i>Hemerodromia sp</i>	45
11020	<i>Acerpenna pygmaeus</i>	74	96900	<i>Ferrissia sp</i>	47
11130	<i>Baetis intercalaris</i>	48	99998	NO QUALITATIVE SAMPLE COLLECTED	
11651	<i>Procloeon sp (w/o hindwing pads)</i>	1			
12200	<i>Isonychia sp</i>	48	No. Quantitative Taxa: 49	Total Taxa: 49	
13120	<i>Nixe perfida</i>	2	No. Qualitative Taxa: 0	ICI: 54	
13400	<i>Stenacron sp</i>	150	Number of Organisms: 3458	Qual EPT:	
13521	<i>Stenonema femoratum</i>	3			
13540	<i>Stenonema mediopunctatum</i>	106			
13561	<i>Stenonema pulchellum</i>	33			
13570	<i>Stenonema terminatum</i>	6			
21200	<i>Calopteryx sp</i>	3			
21300	<i>Hetaerina sp</i>	1			
22300	<i>Argia sp</i>	12			
52200	<i>Cheumatopsyche sp</i>	255			
52430	<i>Ceratopsyche morosa group</i>	4			
52530	<i>Hydropsyche depravata group</i>	25			
58505	<i>Helicopsyche borealis</i>	1			
68601	<i>Ancyronyx variegata</i>	4			
68901	<i>Macronychus glabratus</i>	19			
69400	<i>Stenelmis sp</i>	4			
77120	<i>Ablabesmyia mallochi</i>	53			
77500	<i>Conchapelopia sp</i>	53			
77800	<i>Helopelopia sp</i>	18			
78140	<i>Labrundinia pilosella</i>	112			
78450	<i>Nilotanytus fimbriatus</i>	12			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	64			
80370	<i>Corynoneura lobata</i>	148			
80420	<i>Cricotopus (C.) bicinctus</i>	35			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	53			
81270	<i>Nanocladius (N.) spiniplenus</i>	18			
82101	<i>Thienemanniella taurocapita</i>	16			
83003	<i>Dicrotendipes fumidus</i>	18			
84450	<i>Polypedilum (P.) flavum</i>	18			
84460	<i>Polypedilum (P.) fallax group</i>	18			
85500	<i>Paratanytarsus sp</i>	301			
85615	<i>Rheotanytarsus distinctissimus group</i>	124			
85625	<i>Rheotanytarsus exiguus group</i>	902			
85720	<i>Stempellinella n.sp nr. flavidula</i>	16			

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

Collection Date: 09/25/1995 River Code: 14-500 RM: 38.10 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	78450	<i>Nilotanypus fimbriatus</i>	3
03600	<i>Oligochaeta</i>	4 +	80351	<i>Corynoneura n.sp 1</i>	59
04964	<i>Mooreobdella microstoma</i>	+	80370	<i>Corynoneura lobata</i>	257
05800	<i>Caecidotea sp</i>	+	81650	<i>Parametriocnemus sp</i>	3
05900	<i>Lirceus sp</i>	1 +	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	17
06201	<i>Hyalella azteca</i>	+	82101	<i>Thienemanniella taurocapita</i>	2
06700	<i>Crangonyx sp</i>	+	82141	<i>Thienemanniella xena</i>	8
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	82200	<i>Tvetenia bavarica group</i>	11
11020	<i>Acerpenna pygmaeus</i>	29	83040	<i>Dicrotendipes neomodestus</i>	3
11120	<i>Baetis flavistriga</i>	35 +	83840	<i>Microtendipes pedellus group</i>	3 +
11130	<i>Baetis intercalaris</i>	159 +	84210	<i>Paratendipes albimanus or P. duplicatus</i>	+
12200	<i>Isonychia sp</i>	57 +	84440	<i>Polypedilum (P.) aviceps</i>	3
13000	<i>Leucrocota sp</i>	9	84450	<i>Polypedilum (P.) flavum</i>	33 +
13400	<i>Stenacron sp</i>	34 +	84700	<i>Stenochironomus sp</i>	3
13521	<i>Stenonema femoratum</i>	5 +	85501	<i>Paratanytarsus n.sp 1</i>	3
13540	<i>Stenonema mediopunctatum</i>	62 +	85625	<i>Rheotanytarsus exiguus group</i>	22
13561	<i>Stenonema pulchellum</i>	19	85711	<i>Stempellinella n.sp 1</i>	4
13570	<i>Stenonema terminatum</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	1 +
17200	<i>Caenis sp</i>	+	85800	<i>Tanytarsus sp</i>	11
18600	<i>Ephemera sp</i>	+	85814	<i>Tanytarsus glabrescens group</i>	3
22001	<i>Coenagrionidae</i>	+	86100	<i>Chrysops sp</i>	+
22300	<i>Argia sp</i>	1 +	86200	<i>Tabanus sp</i>	+
24900	<i>Gomphus sp</i>	+	87540	<i>Hemerodromia sp</i>	4
35001	<i>Perlodidae</i>	1 +	93900	<i>Elimia sp</i>	76 +
47600	<i>Sialis sp</i>	+	98600	<i>Sphaerium sp</i>	+
48410	<i>Corydalus cornutus</i>	1			
48610	<i>Nigronia fasciatus</i>	+	No. Quantitative Taxa: 43		Total Taxa: 70
48620	<i>Nigronia serricornis</i>	+	No. Qualitative Taxa: 47		ICI: 46
50301	<i>Chimarra aterrima</i>	+	Number of Organisms: 1007		Qual EPT: 16
52200	<i>Cheumatopsyche sp</i>	24 +			
52430	<i>Ceratopsyche morosa group</i>	6 +			
52530	<i>Hydropsyche depravata group</i>	1			
57400	<i>Neophylax sp</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	1 +			
68901	<i>Macronychus glabratus</i>	1 +			
69400	<i>Stenelmis sp</i>	+			
72700	<i>Anopheles sp</i>	1 +			
74100	<i>Simulium sp</i>	+			
77150	<i>Ablabesmyia simpsoni</i>	+			
77500	<i>Conchapelopia sp</i>	19			
77800	<i>Helopelopia sp</i>	8 +			

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

Collection Date: 09/25/1995 River Code: 14-500 RM: 35.50 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	66500	<i>Enochrus sp</i>	+
01320	<i>Hydra sp</i>	24	67800	<i>Tropisternus sp</i>	+
01801	<i>Turbellaria</i>	+	68075	<i>Psephenus herricki</i>	1 +
02600	<i>Nematomorpha</i>	4	68201	<i>Scirtidae</i>	+
03600	<i>Oligochaeta</i>	8	68708	<i>Dubiraphia vittata group</i>	4 +
04935	<i>Erpobdella punctata punctata</i>	+	68901	<i>Macronychus glabratus</i>	4 +
05800	<i>Caecidotea sp</i>	+	69400	<i>Stenelmis sp</i>	+
05900	<i>Lirceus sp</i>	+	71100	<i>Hexatoma sp</i>	+
06201	<i>Hyaella azteca</i>	+	72700	<i>Anopheles sp</i>	+
08200	<i>Orconectes sp</i>	+	74100	<i>Simulium sp</i>	+
08601	<i>Hydracarina</i>	+	77120	<i>Ablabesmyia mallochii</i>	+
11020	<i>Acerpenna pygmaeus</i>	63 +	77500	<i>Conchapelopia sp</i>	13
11120	<i>Baetis flavistriga</i>	95 +	77800	<i>Helopelopia sp</i>	+
11125	<i>Pseudocloeon frondalis</i>	4 +	78450	<i>Nilotanypus fimbriatus</i>	4
11130	<i>Baetis intercalaris</i>	330 +	78650	<i>Procladius sp</i>	+
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	80204	<i>Brillia flavifrons group</i>	+
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80351	<i>Corynoneura n.sp 1</i>	8
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	8
11670	<i>Procloeon irrubrum</i>	+	80370	<i>Corynoneura lobata</i>	72
12200	<i>Isonychia sp</i>	89 +	80420	<i>Cricotopus (C.) bicinctus</i>	25 +
13000	<i>Leucrocota sp</i>	2 +	80430	<i>Cricotopus (C.) tremulus group</i>	13
13400	<i>Stenacron sp</i>	36 +	81690	<i>Paratrichocladius sp</i>	38
13521	<i>Stenonema femoratum</i>	+	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	13 +
13540	<i>Stenonema mediopunctatum</i>	225 +	82101	<i>Thienemanniella taurocapita</i>	24
13561	<i>Stenonema pulchellum</i>	74 +	82141	<i>Thienemanniella xena</i>	24
13570	<i>Stenonema terminatum</i>	6	82200	<i>Tvetenia bavarica group</i>	19 +
16700	<i>Tricorythodes sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
17200	<i>Caenis sp</i>	4 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
18600	<i>Ephemera sp</i>	+	84440	<i>Polypedilum (P.) aviceps</i>	6
21200	<i>Calopteryx sp</i>	1 +	84450	<i>Polypedilum (P.) flavum</i>	75 +
22001	<i>Coenagrionidae</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	31 +
22300	<i>Argia sp</i>	2 +	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	+
45300	<i>Sigara sp</i>	+	84700	<i>Stenochironomus sp</i>	6
47600	<i>Sialis sp</i>	+	85500	<i>Paratanytarsus sp</i>	6 +
50315	<i>Chimarra obscura</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	19
51600	<i>Polycentropus sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	116 +
52200	<i>Cheumatopsyche sp</i>	123 +	85802	<i>Tanytarsus curticornis group</i>	6
52430	<i>Ceratopsyche morosa group</i>	94 +	85840	<i>Tanytarsus guerlus group</i>	+
52530	<i>Hydropsyche depravata group</i>	37 +	87540	<i>Hemerodromia sp</i>	33
57400	<i>Neophylax sp</i>	+	89501	<i>Ephydriidae</i>	+
57900	<i>Pycnopsyche sp</i>	+	93900	<i>Elimia sp</i>	+
58505	<i>Helicopsyche borealis</i>	+	95100	<i>Physella sp</i>	+
59970	<i>Petrophila sp</i>	+	96900	<i>Ferrissia sp</i>	1
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			

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

Collection Date: 09/25/1995 River Code: 14-500 RM: 35.50 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
98200	<i>Pisidium sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 44 Total Taxa: 90
No. Qualitative Taxa: 71 ICI: **54**
Number of Organisms: 1790 Qual EPT: 25

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 35.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	1	77500	<i>Conchapelopia sp</i>	32 +
01320	<i>Hydra sp</i>	133	77800	<i>Helopelopia sp</i>	+
01801	<i>Turbellaria</i>	+	78450	<i>Nilotanypus fimbriatus</i>	+
03360	<i>Plumatella sp</i>	1 +	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	32
03600	<i>Oligochaeta</i>	+	80370	<i>Corynoneura lobata</i>	35
04664	<i>Helobdella stagnalis</i>	+	80410	<i>Cricotopus (C.) sp</i>	63
05800	<i>Caecidotea sp</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	16
06201	<i>Hyalella azteca</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	111
08200	<i>Orconectes sp</i>	+	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	32
08601	<i>Hydracarina</i>	+	81250	<i>Nanocladius (N.) minimus</i>	16 +
11130	<i>Baetis intercalaris</i>	+	81690	<i>Paratrichocladus sp</i>	32
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	10	82101	<i>Thienemanniella taurocapita</i>	+
12200	<i>Isonychia sp</i>	+	82730	<i>Chironomus (C.) decorus group</i>	16 +
13000	<i>Leucrocuta sp</i>	+	82820	<i>Cryptochironomus sp</i>	+
13400	<i>Stenacron sp</i>	39 +	83040	<i>Dicrotendipes neomodestus</i>	143 +
13521	<i>Stenonema femoratum</i>	72 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	48 +
13540	<i>Stenonema mediopunctatum</i>	+	83840	<i>Microtendipes pedellus group</i>	48
13561	<i>Stenonema pulchellum</i>	+	84210	<i>Paratendipes albimanus or P. duplicatus</i>	+
16700	<i>Tricorythodes sp</i>	2 +	84300	<i>Phaenopsectra obediens group</i>	32
17200	<i>Caenis sp</i>	101 +	84315	<i>Phaenopsectra flavipes</i>	16
18600	<i>Ephemera sp</i>	+	84440	<i>Polypedilum (P.) aviceps</i>	+
21200	<i>Calopteryx sp</i>	2 +	84450	<i>Polypedilum (P.) flavum</i>	+
22001	<i>Coenagrionidae</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	111
22300	<i>Argia sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	16 +
23909	<i>Boyeria vinosa</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	+
45300	<i>Sigara sp</i>	+	84700	<i>Stenochironomus sp</i>	16
47600	<i>Sialis sp</i>	+	84750	<i>Stictochironomus sp</i>	+
50315	<i>Chimarra obscura</i>	+	84790	<i>Tribelos fuscicorne</i>	16
51600	<i>Polycentropus sp</i>	13 +	85500	<i>Paratanytarsus sp</i>	333
52200	<i>Cheumatopsyche sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	48 +
52430	<i>Ceratopsyche morosa group</i>	+	85800	<i>Tanytarsus sp</i>	+
52530	<i>Hydropsyche depravata group</i>	+	85802	<i>Tanytarsus curticornis group</i>	+
57400	<i>Neophylax sp</i>	+	85814	<i>Tanytarsus glabrescens group</i>	127
57900	<i>Pycnopsyche sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	16
58505	<i>Helicopsyche borealis</i>	+	87540	<i>Hemerodromia sp</i>	8 +
59970	<i>Petrophila sp</i>	+	93900	<i>Elimia sp</i>	1 +
63300	<i>Hydroporus sp</i>	+	96900	<i>Ferrissia sp</i>	13 +
68075	<i>Psephenus herricki</i>	+	98200	<i>Pisidium sp</i>	+
68601	<i>Ancyronyx variegata</i>	+	98600	<i>Sphaerium sp</i>	+
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	32			

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 35.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 37	Total Taxa: 85
No. Qualitative Taxa: 65	ICI: 34
Number of Organisms: 1783	Qual EPT: 19

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 34.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	336	69200	<i>Optioservus sp</i>	+
01801	<i>Turbellaria</i>	25 +	69400	<i>Stenelmis sp</i>	+
03369	<i>Plumatella repens</i>	+	71100	<i>Hexatoma sp</i>	+
03600	<i>Oligochaeta</i>	+	71910	<i>Tipula abdominalis</i>	+
04964	<i>Mooreobdella microstoma</i>	+	74100	<i>Simulium sp</i>	+
05800	<i>Caecidotea sp</i>	1 +	77800	<i>Helopelopia sp</i>	17
05900	<i>Lirceus sp</i>	+	78140	<i>Labrundinia pilosella</i>	8
06201	<i>Hyalella azteca</i>	+	78402	<i>Natarsia baltimoreus</i>	+
06700	<i>Crangonyx sp</i>	+	78450	<i>Nilotanypus fimbriatus</i>	16
08200	<i>Orconectes sp</i>	+	78650	<i>Procladius sp</i>	+
11020	<i>Acerpenna pygmaeus</i>	92 +	80310	<i>Cardiocladius obscurus</i>	+
11120	<i>Baetis flavistriga</i>	30 +	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	56 +
11130	<i>Baetis intercalaris</i>	35 +			
12200	<i>Isonychia sp</i>	5 +	80370	<i>Corynoneura lobata</i>	312
13000	<i>Leucrocuta sp</i>	1 +	80410	<i>Cricotopus (C.) sp</i>	52
13400	<i>Stenacron sp</i>	239 +	80420	<i>Cricotopus (C.) bicinctus</i>	87
13521	<i>Stenonema femoratum</i>	26 +	80430	<i>Cricotopus (C.) tremulus group</i>	70
13540	<i>Stenonema mediopunctatum</i>	155 +	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	87
13561	<i>Stenonema pulchellum</i>	84 +			
13570	<i>Stenonema terminatum</i>	60 +	81650	<i>Parametriocnemus sp</i>	+
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	+	81690	<i>Paratrachocladus sp</i>	17
16700	<i>Tricorythodes sp</i>	7 +	82101	<i>Thienemanniella taurocapita</i>	56
17200	<i>Caenis sp</i>	84 +	82141	<i>Thienemanniella xena</i>	16
18600	<i>Ephemera sp</i>	+	82200	<i>Tvetenia bavarica group</i>	+
21200	<i>Calopteryx sp</i>	1 +	82820	<i>Cryptochironomus sp</i>	+
22001	<i>Coenagrionidae</i>	1 +	83840	<i>Microtendipes pedellus group</i>	17 +
22300	<i>Argia sp</i>	2 +	84440	<i>Polypedilum (P.) aviceps</i>	+
23909	<i>Boyeria vinosa</i>	+	84450	<i>Polypedilum (P.) flavum</i>	52 +
24900	<i>Gomphus sp</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	52 +
47600	<i>Sialis sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
48410	<i>Corydalus cornutus</i>	+	85500	<i>Paratanytarsus sp</i>	105
50315	<i>Chimarra obscura</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	17
51600	<i>Polycentropus sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	226 +
52200	<i>Cheumatopsyche sp</i>	48 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	32
52430	<i>Ceratopsyche morosa group</i>	19 +	85800	<i>Tanytarsus sp</i>	157
52530	<i>Hydropsyche depravata group</i>	1 +	85814	<i>Tanytarsus glabrescens group</i>	87
57400	<i>Neophylax sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	35
58505	<i>Helicopsyche borealis</i>	2 +	86100	<i>Chrysops sp</i>	+
59730	<i>Triaenodes melaca</i>	+	86200	<i>Tabanus sp</i>	+
59970	<i>Petrophila sp</i>	+	93900	<i>Elimia sp</i>	28 +
68075	<i>Psephenus herricki</i>	+	96900	<i>Ferrissia sp</i>	8
68130	<i>Helichus sp</i>	+	98200	<i>Pisidium sp</i>	+
68601	<i>Ancyronyx variegata</i>	+	98600	<i>Sphaerium sp</i>	+
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 34.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 46	Total Taxa: 86
No. Qualitative Taxa: 67	ICI: 50
Number of Organisms: 2864	Qual EPT: 22

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 31.70 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	+	69400	<i>Stenelmis sp</i>	+
01320	<i>Hydra sp</i>	103	71100	<i>Hexatoma sp</i>	+
03040	<i>Fredericella sp</i>	+	74100	<i>Simulium sp</i>	+
03451	<i>Urnatella gracilis</i>	11	77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	11
03600	<i>Oligochaeta</i>	8 +	77800	<i>Helopelopia sp</i>	26 +
05800	<i>Caecidotea sp</i>	+	78140	<i>Labrundinia pilosella</i>	29
06700	<i>Crangonyx sp</i>	+	78450	<i>Nilotanypus fimbriatus</i>	3
08200	<i>Orconectes sp</i>	+	80204	<i>Brillia flavifrons group</i>	7
11020	<i>Acerpenna pygmaeus</i>	39	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	80
11120	<i>Baetis flavistriga</i>	+	80370	<i>Corynoneura lobata</i>	207
11130	<i>Baetis intercalaris</i>	+	80410	<i>Cricotopus (C.) sp</i>	7
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	44
11651	<i>Procloeon sp (w/o hindwing pads)</i>	1 +	80430	<i>Cricotopus (C.) tremulus group</i>	15 +
12200	<i>Isonychia sp</i>	1	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	22
13000	<i>Leucrocuta sp</i>	17 +	81250	<i>Nanocladius (N.) minimus</i>	7
13400	<i>Stenacron sp</i>	306 +	81631	<i>Parakiefferiella n.sp 1</i>	7
13521	<i>Stenonema femoratum</i>	30 +	81650	<i>Parametriocnemus sp</i>	+
13540	<i>Stenonema mediopunctatum</i>	239	82101	<i>Thienemanniella taurocapita</i>	40
13561	<i>Stenonema pulchellum</i>	82 +	82121	<i>Thienemanniella lobapodema</i>	5
13570	<i>Stenonema terminatum</i>	53 +	82141	<i>Thienemanniella xena</i>	7
16700	<i>Tricorythodes sp</i>	19 +	82820	<i>Cryptochironomus sp</i>	+
17200	<i>Caenis sp</i>	48 +	83000	<i>Dicrotendipes sp</i>	7
18600	<i>Ephemera sp</i>	3 +	83840	<i>Microtendipes pedellus group</i>	29
21200	<i>Calopteryx sp</i>	+	84450	<i>Polypedilum (P.) flavum</i>	89 +
22001	<i>Coenagrionidae</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
22300	<i>Argia sp</i>	+	84750	<i>Stictochironomus sp</i>	+
23909	<i>Boyeria vinosa</i>	1 +	85500	<i>Paratanytarsus sp</i>	22
24900	<i>Gomphus sp</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	7
47600	<i>Sialis sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	95 +
49200	<i>Climacia sp</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	9
50315	<i>Chimarra obscura</i>	+	85800	<i>Tanytarsus sp</i>	15
51600	<i>Polycentropus sp</i>	+	85802	<i>Tanytarsus curticornis group</i>	7
52200	<i>Cheumatopsyche sp</i>	42 +	85814	<i>Tanytarsus glabrescens group</i>	51
52430	<i>Ceratopsyche morosa group</i>	5 +	85840	<i>Tanytarsus guerlus group</i>	22
52530	<i>Hydropsyche depravata group</i>	+	86100	<i>Chrysops sp</i>	+
53501	<i>Hydroptilidae</i>	1	93900	<i>Elimia sp</i>	37 +
57400	<i>Neophylax sp</i>	+	95100	<i>Physella sp</i>	+
58505	<i>Helicopsyche borealis</i>	+	96900	<i>Ferrissia sp</i>	+
59730	<i>Triaenodes melaca</i>	+	98600	<i>Sphaerium sp</i>	+
59970	<i>Petrophila sp</i>	+	99100	<i>Pyganodon grandis</i>	+
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	3 +			
68901	<i>Macronychus glabratus</i>	+			
69225	<i>Optioservus fastiditus</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 31.70 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 48	Total Taxa: 85
No. Qualitative Taxa: 56	ICI: 48
Number of Organisms: 1919	Qual EPT: 20

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 27.50 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	99	68707	<i>Dubiraphia quadrinotata</i>	+
01801	<i>Turbellaria</i>	+	68708	<i>Dubiraphia vittata group</i>	+
03369	<i>Plumatella repens</i>	+	69400	<i>Stenelmis sp</i>	+
05900	<i>Lirceus sp</i>	+	71910	<i>Tipula abdominalis</i>	+
06201	<i>Hyaella azteca</i>	+	72700	<i>Anopheles sp</i>	+
06700	<i>Crangonyx sp</i>	+	74100	<i>Simulium sp</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	77120	<i>Ablabesmyia mallochii</i>	+
08601	<i>Hydracarina</i>	9	77500	<i>Conchapelopia sp</i>	25 +
11020	<i>Acerpenna pygmaeus</i>	133 +	77800	<i>Helopelopia sp</i>	25 +
11120	<i>Baetis flavistriga</i>	174 +	78450	<i>Nilotanypus fimbriatus</i>	1 +
11130	<i>Baetis intercalaris</i>	543 +	78650	<i>Procladius sp</i>	+
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	80310	<i>Cardiocladius obscurus</i>	101 +
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	9
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	80370	<i>Corynoneura lobata</i>	210
11670	<i>Procloeon irrubrum</i>	+	80410	<i>Cricotopus (C.) sp</i>	50 +
12200	<i>Isonychia sp</i>	138 +	80420	<i>Cricotopus (C.) bicinctus</i>	75
13000	<i>Leucrocota sp</i>	2	80430	<i>Cricotopus (C.) tremulus group</i>	201 +
13400	<i>Stenacron sp</i>	66 +	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	75
13521	<i>Stenonema femoratum</i>	18 +	81650	<i>Parametriocnemus sp</i>	+
13540	<i>Stenonema mediopunctatum</i>	269	82101	<i>Thienemanniella taurocapita</i>	214
13561	<i>Stenonema pulchellum</i>	293 +	82121	<i>Thienemanniella lobapodema</i>	8
13570	<i>Stenonema terminatum</i>	12	82130	<i>Thienemanniella similis</i>	8
16700	<i>Tricorythodes sp</i>	+	82141	<i>Thienemanniella xena</i>	146
17200	<i>Caenis sp</i>	50 +	82730	<i>Chironomus (C.) decorus group</i>	+
18600	<i>Ephemera sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
21200	<i>Calopteryx sp</i>	+	83840	<i>Microtendipes pedellus group</i>	+
21300	<i>Hetaerina sp</i>	24 +	84450	<i>Polypedilum (P.) flavum</i>	427 +
22001	<i>Coenagrionidae</i>	9 +	84470	<i>Polypedilum (P.) illinoense</i>	+
22300	<i>Argia sp</i>	+	85500	<i>Paratanytarsus sp</i>	+
30000	<i>Plecoptera</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	50
48410	<i>Corydalus cornutus</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	1156 +
50315	<i>Chimarra obscura</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
51600	<i>Polycentropus sp</i>	+	85800	<i>Tanytarsus sp</i>	50 +
52200	<i>Cheumatopsyche sp</i>	169 +	85814	<i>Tanytarsus glabrescens group</i>	50 +
52430	<i>Ceratopsyche morosa group</i>	266 +	85840	<i>Tanytarsus guerlus group</i>	+
52530	<i>Hydropsyche depravata group</i>	5 +	87540	<i>Hemerodromia sp</i>	65
52801	<i>Potamyia flava</i>	+	93900	<i>Elimia sp</i>	3 +
53800	<i>Hydroptila sp</i>	+	95100	<i>Physella sp</i>	+
57400	<i>Neophylax sp</i>	+	97601	<i>Corbicula fluminea</i>	+
58505	<i>Helicopsyche borealis</i>	+	98600	<i>Sphaerium sp</i>	+
59970	<i>Petrophila sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68201	<i>Scirtidae</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-500 RM: 27.50 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 39	Total Taxa: 85
No. Qualitative Taxa: 70	ICI: 50
Number of Organisms: 5228	Qual EPT: 24

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 26.70 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	80	68075	<i>Psephenus herricki</i>	+
01801	<i>Turbellaria</i>	8 +	68130	<i>Helichus sp</i>	+
03360	<i>Plumatella sp</i>	1	68601	<i>Ancyronyx variegata</i>	8
03600	<i>Oligochaeta</i>	32 +	68708	<i>Dubiraphia vittata group</i>	+
05900	<i>Lirceus sp</i>	+	68901	<i>Macronychus glabratus</i>	+
06201	<i>Hyalella azteca</i>	+	69400	<i>Stenelmis sp</i>	52 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	71100	<i>Hexatoma sp</i>	+
11020	<i>Acerpenna pygmaeus</i>	26	72700	<i>Anopheles sp</i>	+
11120	<i>Baetis flavistriga</i>	18 +	77120	<i>Ablabesmyia mallochii</i>	52 +
11130	<i>Baetis intercalaris</i>	10 +	77500	<i>Conchapelopia sp</i>	104 +
11200	<i>Callibaetis sp</i>	+	77800	<i>Helopelopia sp</i>	104 +
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	78140	<i>Labrundinia pilosella</i>	32 +
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	78450	<i>Nilotanypus fimbriatus</i>	24
11670	<i>Procloeon irrubrum</i>	+	80310	<i>Cardiocladius obscurus</i>	52 +
12200	<i>Isonychia sp</i>	327 +	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	24 +
13000	<i>Leucrocuta sp</i>	+	80370	<i>Corynoneura lobata</i>	136
13400	<i>Stenacron sp</i>	46 +	80430	<i>Cricotopus (C.) tremulus group</i>	+
13521	<i>Stenonema femoratum</i>	2 +	81229	<i>Nanocladius (N.) crassicornus</i>	52
13540	<i>Stenonema mediopunctatum</i>	287 +	82101	<i>Thienemanniella taurocapita</i>	232 +
13561	<i>Stenonema pulchellum</i>	555 +	82121	<i>Thienemanniella lobapodema</i>	8
13570	<i>Stenonema terminatum</i>	12	82130	<i>Thienemanniella similis</i>	8
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	8 +	82141	<i>Thienemanniella xena</i>	240 +
16700	<i>Tricorythodes sp</i>	2 +	82220	<i>Tvetenia discoloripes group</i>	+
17200	<i>Caenis sp</i>	432 +	82820	<i>Cryptochironomus sp</i>	52 +
18600	<i>Ephemera sp</i>	+	83840	<i>Microtendipes pedellus group</i>	+
21200	<i>Calopteryx sp</i>	1 +	84300	<i>Phaenopsectra obediens group</i>	+
21300	<i>Hetaerina sp</i>	18 +	84440	<i>Polypedilum (P.) aviceps</i>	+
22001	<i>Coenagrionidae</i>	+	84450	<i>Polypedilum (P.) flavum</i>	1814 +
22300	<i>Argia sp</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	52
45300	<i>Sigara sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
47600	<i>Sialis sp</i>	1	85615	<i>Rheotanytarsus distinctissimus group</i>	363
48410	<i>Corydalus cornutus</i>	5 +	85625	<i>Rheotanytarsus exiguus group</i>	2436 +
50315	<i>Chimarra obscura</i>	66 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	8 +
51400	<i>Nyctiophylax sp</i>	+	85800	<i>Tanytarsus sp</i>	+
51600	<i>Polycentropus sp</i>	2 +	85840	<i>Tanytarsus guerlus group</i>	+
52200	<i>Cheumatopsyche sp</i>	572 +	86200	<i>Tabanus sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	134 +	87540	<i>Hemerodromia sp</i>	33
52530	<i>Hydropsyche depravata group</i>	32 +	93900	<i>Elimia sp</i>	23 +
52540	<i>Hydropsyche dicantha</i>	23 +	95100	<i>Physella sp</i>	+
53501	<i>Hydroptilidae</i>	+	98200	<i>Pisidium sp</i>	1
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
65800	<i>Berosus sp</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 26.70 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 50 Total Taxa: 85

No. Qualitative Taxa: 70 ICI: **52**

Number of Organisms: 8610 Qual EPT: 26

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 25.20 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	68901	<i>Macronychus glabratus</i>	1
01320	<i>Hydra sp</i>	65	69400	<i>Stenelmis sp</i>	1 +
03040	<i>Fredericella sp</i>	+	70600	<i>Antocha sp</i>	8
03360	<i>Plumatella sp</i>	+	71910	<i>Tipula abdominalis</i>	+
03373	<i>Plumatella reticulata</i>	+	74100	<i>Simulium sp</i>	+
03600	<i>Oligochaeta</i>	+	77120	<i>Ablabesmyia mallochi</i>	28
04666	<i>Helobdella triserialis</i>	+	77500	<i>Conchapelopia sp</i>	55 +
05800	<i>Caecidotea sp</i>	+	78450	<i>Nilotanypus fimbriatus</i>	56 +
06700	<i>Crangonyx sp</i>	+	80310	<i>Cardiocladius obscurus</i>	55 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	56 +
08601	<i>Hydracarina</i>	+	80370	<i>Corynoneura lobata</i>	416 +
11020	<i>Acerpenna pygmaeus</i>	144	80420	<i>Cricotopus (C.) bicinctus</i>	166
11120	<i>Baetis flavistriga</i>	67 +	80430	<i>Cricotopus (C.) tremulus group</i>	277 +
11130	<i>Baetis intercalaris</i>	377 +	81250	<i>Nanocladius (N.) minimus</i>	+
12200	<i>Isonychia sp</i>	380 +	81690	<i>Paratrichocladius sp</i>	28
13000	<i>Leucrocuta sp</i>	76 +	82101	<i>Thienemanniella taurocapita</i>	400 +
13400	<i>Stenacron sp</i>	39 +	82121	<i>Thienemanniella lobapodema</i>	24
13521	<i>Stenonema femoratum</i>	20 +	82130	<i>Thienemanniella similis</i>	8
13540	<i>Stenonema mediopunctatum</i>	117 +	82141	<i>Thienemanniella xena</i>	136 +
13561	<i>Stenonema pulchellum</i>	448 +	82220	<i>Tvetenia discoloripes group</i>	28
13570	<i>Stenonema terminatum</i>	130	83840	<i>Microtendipes pedellus group</i>	+
16700	<i>Tricorythodes sp</i>	+	84315	<i>Phaenopsectra flavipes</i>	+
18600	<i>Ephemera sp</i>	1 +	84450	<i>Polypedilum (P.) flavum</i>	609 +
21200	<i>Calopteryx sp</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	28
22001	<i>Coenagrionidae</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	55 +
22300	<i>Argia sp</i>	+	84888	<i>Xenochironomus xenolabis</i>	+
23909	<i>Boyeria vinosa</i>	+	85500	<i>Paratanytarsus sp</i>	+
24900	<i>Gomphus sp</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	166 +
47600	<i>Sialis sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	776 +
48410	<i>Corydalus cornutus</i>	5 +	85800	<i>Tanytarsus sp</i>	28 +
50315	<i>Chimarra obscura</i>	+	85814	<i>Tanytarsus glabrescens group</i>	55
50906	<i>Psychomyia flavida</i>	2	85840	<i>Tanytarsus guerlus group</i>	28 +
51600	<i>Polycentropus sp</i>	+	86100	<i>Chrysops sp</i>	+
52200	<i>Cheumatopsyche sp</i>	158 +	86200	<i>Tabanus sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	219 +	87540	<i>Hemerodromia sp</i>	8
52530	<i>Hydropsyche depravata group</i>	4 +	93900	<i>Elimia sp</i>	17 +
52801	<i>Potamyia flava</i>	12	95100	<i>Physella sp</i>	+
53800	<i>Hydroptila sp</i>	+	97601	<i>Corbicula fluminea</i>	+
57400	<i>Neophylax sp</i>	+	98200	<i>Pisidium sp</i>	+
57900	<i>Pycnopsyche sp</i>	+	98600	<i>Sphaerium sp</i>	+
58505	<i>Helicopsyche borealis</i>	+	99280	<i>Lasmigona costata</i>	+
59110	<i>Ceraclea ancylus</i>	+	99880	<i>Lampsilis cardium</i>	+
59970	<i>Petrophila sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68601	<i>Ancyronyx variegata</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 25.20 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
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No. Quantitative Taxa: 45	Total Taxa: 87
No. Qualitative Taxa: 71	ICI: 48
Number of Organisms: 5777	Qual EPT: 20

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 19.20 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	71100	<i>Hexatoma sp</i>	+
01320	<i>Hydra sp</i>	97	74100	<i>Simulium sp</i>	48 +
03360	<i>Plumatella sp</i>	+	77120	<i>Ablabesmyia mallochi</i>	+
03600	<i>Oligochaeta</i>	162 +	77800	<i>Helopelopia sp</i>	34 +
06700	<i>Crangonyx sp</i>	+	78450	<i>Nilotanypus fimbriatus</i>	16
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	80310	<i>Cardiocladius obscurus</i>	34 +
11020	<i>Acerpenna pygmaeus</i>	44	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	32
11120	<i>Baetis flavistriga</i>	84 +	80370	<i>Corynoneura lobata</i>	256
11130	<i>Baetis intercalaris</i>	336 +	80420	<i>Cricotopus (C.) bicinctus</i>	136
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	307
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	34
12200	<i>Isonychia sp</i>	585 +	82101	<i>Thienemanniella taurocapita</i>	128 +
13000	<i>Leucrocota sp</i>	+	82121	<i>Thienemanniella lobapodema</i>	16 +
13400	<i>Stenacron sp</i>	143 +	82141	<i>Thienemanniella xena</i>	224
13521	<i>Stenonema femoratum</i>	58 +	82220	<i>Tvetenia discoloripes group</i>	68
13540	<i>Stenonema mediopunctatum</i>	90	82820	<i>Cryptochironomus sp</i>	+
13561	<i>Stenonema pulchellum</i>	794 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
13570	<i>Stenonema terminatum</i>	57 +	84300	<i>Phaenopsectra obediens group</i>	34 +
13590	<i>Stenonema vicarium</i>	+	84450	<i>Polypedilum (P.) flavum</i>	716 +
16700	<i>Tricorythodes sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
17200	<i>Caenis sp</i>	28 +	84700	<i>Stenochironomus sp</i>	34
18100	<i>Anthopotamus sp</i>	+	85500	<i>Paratanytarsus sp</i>	34
18600	<i>Ephemera sp</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	341 +
21200	<i>Calopteryx sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	2080 +
22001	<i>Coenagrionidae</i>	+	85800	<i>Tanytarsus sp</i>	34 +
22300	<i>Argia sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	+
23909	<i>Boyeria vinosa</i>	+	87540	<i>Hemerodromia sp</i>	9
48410	<i>Corydalus cornutus</i>	3 +	93900	<i>Elimia sp</i>	+
50315	<i>Chimarra obscura</i>	1 +	95100	<i>Physella sp</i>	+
50906	<i>Psychomyia flavida</i>	52	97601	<i>Corbicula fluminea</i>	+
51600	<i>Polycentropus sp</i>	+	98200	<i>Pisidium sp</i>	+
52200	<i>Cheumatopsyche sp</i>	354 +	98600	<i>Sphaerium sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	368 +			
52530	<i>Hydropsyche depravata group</i>	11 +			
52540	<i>Hydropsyche dicantha</i>	1			
53501	<i>Hydroptilidae</i>	16 +			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68901	<i>Macronychus glabratus</i>	1 +			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	+			

No. Quantitative Taxa: 42 Total Taxa: 77
 No. Qualitative Taxa: 61 ICI: 50
 Number of Organisms: 7900 Qual EPT: 23

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

Collection Date: 10/02/1995 River Code: 14-500 RM: 19.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	81460	<i>Orthocladius (O.) sp</i>	+
01320	<i>Hydra sp</i>	18	81632	<i>Parakiefferiella n.sp 2</i>	+
01801	<i>Turbellaria</i>	+	82101	<i>Thienemanniella taurocapita</i>	56 +
03360	<i>Plumatella sp</i>	+	82141	<i>Thienemanniella xena</i>	72 +
03600	<i>Oligochaeta</i>	32 +	83003	<i>Dicrotendipes fumidus</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
08601	<i>Hydracarina</i>	+	84450	<i>Polypedilum (P.) flavum</i>	136 +
11020	<i>Acerpenna pygmaeus</i>	65	84460	<i>Polypedilum (P.) fallax group</i>	23
11120	<i>Baetis flavistriga</i>	53 +	84470	<i>Polypedilum (P.) illinoense</i>	+
11130	<i>Baetis intercalaris</i>	264 +	85500	<i>Paratanytarsus sp</i>	45 +
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	136 +
12200	<i>Isonychia sp</i>	82 +	85625	<i>Rheotanytarsus exiguus group</i>	724 +
13400	<i>Stenacron sp</i>	44 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
13521	<i>Stenonema femoratum</i>	44 +	85800	<i>Tanytarsus sp</i>	91 +
13540	<i>Stenonema mediopunctatum</i>	66 +	85814	<i>Tanytarsus glabrescens group</i>	23 +
13561	<i>Stenonema pulchellum</i>	630 +	85840	<i>Tanytarsus guerlus group</i>	23 +
13570	<i>Stenonema terminatum</i>	49 +	87540	<i>Hemerodromia sp</i>	8
13590	<i>Stenonema vicarium</i>	1	93900	<i>Elimia sp</i>	+
16700	<i>Tricorythodes sp</i>	26 +	96900	<i>Ferrissia sp</i>	+
17200	<i>Caenis sp</i>	8 +			
18600	<i>Ephemera sp</i>	+	No. Quantitative Taxa: 37		Total Taxa: 63
22001	<i>Coenagrionidae</i>	+	No. Qualitative Taxa: 52		ICI: 48
22300	<i>Argia sp</i>	+	Number of Organisms: 3668		Qual EPT: 19
50315	<i>Chimarra obscura</i>	+			
51600	<i>Polycentropus sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	33 +			
52430	<i>Ceratopsyche morosa group</i>	164 +			
52431	<i>Ceratopsyche morosa</i>	27 +			
52530	<i>Hydropsyche depravata group</i>	20			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
66500	<i>Enochrus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
77500	<i>Conchapelopia sp</i>	45			
78450	<i>Nilotanytus fimbriatus</i>	16			
80310	<i>Cardiocladius obscurus</i>	+			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	64			
80370	<i>Corynoneura lobata</i>	376			
80410	<i>Cricotopus (C.) sp</i>	23 +			
80420	<i>Cricotopus (C.) bicinctus</i>	113 +			
80430	<i>Cricotopus (C.) tremulus group</i>	45 +			
81250	<i>Nanocladius (N.) minimus</i>	23			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 16.90 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	291	67800	<i>Tropisternus sp</i>	+
01801	<i>Turbellaria</i>	+	68075	<i>Psephenus herricki</i>	+
03360	<i>Plumatella sp</i>	1	68130	<i>Helichus sp</i>	+
03600	<i>Oligochaeta</i>	130	68901	<i>Macronychus glabratus</i>	+
05900	<i>Lirceus sp</i>	+	69400	<i>Stenelmis sp</i>	+
06201	<i>Hyalella azteca</i>	+	71100	<i>Hexatoma sp</i>	+
06700	<i>Crangonyx sp</i>	+	74100	<i>Simulium sp</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	77120	<i>Ablabesmyia mallochi</i>	95 +
11130	<i>Baetis intercalaris</i>	+	77500	<i>Conchapelopia sp</i>	32
11650	<i>Procloeon sp (w/ hindwing pads)</i>	1 +	77800	<i>Helopelopia sp</i>	32 +
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	78140	<i>Labrundinia pilosella</i>	32
12200	<i>Isonychia sp</i>	23 +	78650	<i>Procladius sp</i>	32 +
13000	<i>Leucrocota sp</i>	3 +	80310	<i>Cardiocladius obscurus</i>	+
13400	<i>Stenacron sp</i>	400 +	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	40
13521	<i>Stenonema femoratum</i>	115 +	80370	<i>Corynoneura lobata</i>	48
13540	<i>Stenonema mediopunctatum</i>	115	80410	<i>Cricotopus (C.) sp</i>	32
13561	<i>Stenonema pulchellum</i>	592	80420	<i>Cricotopus (C.) bicinctus</i>	63 +
13570	<i>Stenonema terminatum</i>	86	80430	<i>Cricotopus (C.) tremulus group</i>	63 +
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	8	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	63
16700	<i>Tricorythodes sp</i>	222 +	81250	<i>Nanocladius (N.) minimus</i>	32
17200	<i>Caenis sp</i>	138 +	82101	<i>Thienemanniella taurocapita</i>	248 +
18100	<i>Anthopotamus sp</i>	+	82141	<i>Thienemanniella xena</i>	56 +
18600	<i>Ephemera sp</i>	+	82220	<i>Tvetenia discoloripes group</i>	+
18704	<i>Hexagenia atrocaudata</i>	+	82820	<i>Cryptochironomus sp</i>	32 +
21200	<i>Calopteryx sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	63 +
21300	<i>Hetaerina sp</i>	1 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
22001	<i>Coenagrionidae</i>	+	84210	<i>Paratendipes albimanus or P. duplicatus</i>	32
22300	<i>Argia sp</i>	+	84300	<i>Phaenopsectra obediens group</i>	32
23909	<i>Boyeria vinosa</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
24900	<i>Gomphus sp</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	63 +
26705	<i>Macromia illinoensis</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
42700	<i>Belostoma sp</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	32
47600	<i>Sialis sp</i>	+	85500	<i>Paratanytarsus sp</i>	32
48410	<i>Corydalus cornutus</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	63 +
51600	<i>Polycentropus sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	664 +
52200	<i>Cheumatopsyche sp</i>	116 +	85711	<i>Stempellinella n.sp 1</i>	+
52430	<i>Ceratopsyche morosa group</i>	51 +	85800	<i>Tanytarsus sp</i>	253 +
53501	<i>Hydroptilidae</i>	8 +	85814	<i>Tanytarsus glabrescens group</i>	158 +
57400	<i>Neophylax sp</i>	1 +	85840	<i>Tanytarsus guerlus group</i>	285 +
58505	<i>Helicopsyche borealis</i>	+	86100	<i>Chrysops sp</i>	+
59110	<i>Ceraclea ancylus</i>	+	93900	<i>Elimia sp</i>	1 +
59970	<i>Petrophila sp</i>	+	95100	<i>Physella sp</i>	+
60300	<i>Dineutus sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
66500	<i>Enochrus sp</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 16.90 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
97601	<i>Corbicula fluminea</i>	+			
98200	<i>Pisidium sp</i>	+			
98600	<i>Sphaerium sp</i>	+			
99100	<i>Pyganodon grandis</i>	+			
99880	<i>Lampsilis cardium</i>	+			

No. Quantitative Taxa: 46 Total Taxa: 92
No. Qualitative Taxa: 74 ICI: **48**
Number of Organisms: 4880 Qual EPT: 19

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

Collection Date: 09/28/1995 River Code: 14-500 RM: 13.40 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+		<i>norena</i>	
01320	<i>Hydra sp</i>	121 +	77800	<i>Helopelopia sp</i>	16 +
03042	<i>Fredericella australiensis</i>	+	78450	<i>Nilotanypus fimbriatus</i>	8
03360	<i>Plumatella sp</i>	+	80310	<i>Cardiocladius obscurus</i>	+
03600	<i>Oligochaeta</i>	+	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	32 +
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	80370	<i>Corynoneura lobata</i>	128
08601	<i>Hydracarina</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	33
11020	<i>Acerpenna pygmaeus</i>	50	80430	<i>Cricotopus (C.) tremulus group</i>	147 +
11120	<i>Baetis flavistriga</i>	65 +	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	65
11130	<i>Baetis intercalaris</i>	707 +	81270	<i>Nanocladius (N.) spiniplenus</i>	16
12200	<i>Isonychia sp</i>	103 +	81690	<i>Paratrichocladius sp</i>	16
13000	<i>Leucrocuta sp</i>	6 +	82101	<i>Thienemanniella taurocapita</i>	176 +
13400	<i>Stenacron sp</i>	73 +	82121	<i>Thienemanniella lobapodema</i>	8
13510	<i>Stenonema exiguum</i>	130	82141	<i>Thienemanniella xena</i>	48
13521	<i>Stenonema femoratum</i>	77 +	82220	<i>Tvetenia discoloripes group</i>	+
13540	<i>Stenonema mediopunctatum</i>	39	82730	<i>Chironomus (C.) decorus group</i>	+
13561	<i>Stenonema pulchellum</i>	627 +	82820	<i>Cryptochironomus sp</i>	+
13570	<i>Stenonema terminatum</i>	379	83040	<i>Dicrotendipes neomodestus</i>	+
16700	<i>Tricorythodes sp</i>	19 +	83840	<i>Microtendipes pedellus group</i>	16
17200	<i>Caenis sp</i>	34 +	84450	<i>Polypedilum (P.) flavum</i>	98 +
18619	<i>Ephemera simulans</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
21300	<i>Hetaerina sp</i>	3	84750	<i>Stictochironomus sp</i>	+
22001	<i>Coenagrionidae</i>	+	85230	<i>Cladotanytarsus mancus group</i>	+
24900	<i>Gomphus sp</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	212 +
42700	<i>Belostoma sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	603 +
43300	<i>Ranatra sp</i>	+	85711	<i>Stempellinella n.sp 1</i>	8
48410	<i>Corydalus cornutus</i>	4 +	85720	<i>Stempellinella n.sp nr. flavidula</i>	16
50315	<i>Chimarra obscura</i>	+	85814	<i>Tanytarsus glabrescens group</i>	33 +
52200	<i>Cheumatopsyche sp</i>	25 +	85840	<i>Tanytarsus guerlus group</i>	16
52430	<i>Ceratopsyche morosa group</i>	27 +	87540	<i>Hemerodromia sp</i>	49 +
52431	<i>Ceratopsyche morosa</i>	+	93900	<i>Elimia sp</i>	+
52530	<i>Hydropsyche depravata group</i>	1 +	95100	<i>Physella sp</i>	9 +
53800	<i>Hydroptila sp</i>	42 +	99100	<i>Pyganodon grandis</i>	+
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	1 +			
59970	<i>Petrophila sp</i>	+			
65800	<i>Berosus sp</i>	+	No. Quantitative Taxa: 44		Total Taxa: 77
68075	<i>Psephenus herricki</i>	+	No. Qualitative Taxa: 59		ICI: 54
68130	<i>Helichus sp</i>	+	Number of Organisms: 4302		Qual EPT: 18
68700	<i>Dubiraphia sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
74100	<i>Simulium sp</i>	+			
77500	<i>Conchapelopia sp</i>	16			
77750	<i>Hayesomyia senata or Thienemannimyia</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 9.80 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	68708	<i>Dubiraphia vittata group</i>	+
03040	<i>Fredericella sp</i>	+	68901	<i>Macronychus glabratus</i>	+
03360	<i>Plumatella sp</i>	+	69400	<i>Stenelmis sp</i>	+
03600	<i>Oligochaeta</i>	+	71100	<i>Hexatoma sp</i>	+
05900	<i>Lirceus sp</i>	+	71300	<i>Limonia sp</i>	+
06700	<i>Crangonyx sp</i>	+	74100	<i>Simulium sp</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	77500	<i>Conchapelopia sp</i>	+
08601	<i>Hydracarina</i>	+	80310	<i>Cardiocladius obscurus</i>	+
11120	<i>Baetis flavistriga</i>	+	80410	<i>Cricotopus (C.) sp</i>	+
11130	<i>Baetis intercalaris</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	+
11625	<i>Paracloeodes sp 3</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	+
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80440	<i>Cricotopus (C.) trifascia group</i>	+
12200	<i>Isonychia sp</i>	+	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	+
13000	<i>Leucrocuta sp</i>	+	82220	<i>Tvetenia discoloripes group</i>	+
13400	<i>Stenacron sp</i>	+	82820	<i>Cryptochironomus sp</i>	+
13521	<i>Stenonema femoratum</i>	+	84116	<i>Paracladopelma nereis</i>	+
13540	<i>Stenonema mediopunctatum</i>	+	84210	<i>Paratendipes albimanus or P. duplicatus</i>	+
13561	<i>Stenonema pulchellum</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
16700	<i>Tricorythodes sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
17200	<i>Caenis sp</i>	+	84700	<i>Stenochironomus sp</i>	+
18100	<i>Anthopotamus sp</i>	+	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	+
18619	<i>Ephemera simulans</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	+
21200	<i>Calopteryx sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
22001	<i>Coenagrionidae</i>	+	85800	<i>Tanytarsus sp</i>	+
22300	<i>Argia sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	+
23909	<i>Boyeria vinosa</i>	+	86100	<i>Chrysops sp</i>	+
24700	<i>Dromogomphus sp</i>	+	86200	<i>Tabanus sp</i>	+
24900	<i>Gomphus sp</i>	+	93900	<i>Elimia sp</i>	+
47600	<i>Sialis sp</i>	+	95100	<i>Physella sp</i>	+
48410	<i>Corydalus cornutus</i>	+	97601	<i>Corbicula fluminea</i>	+
50315	<i>Chimarra obscura</i>	+	98200	<i>Pisidium sp</i>	+
52200	<i>Cheumatopsyche sp</i>	+	98600	<i>Sphaerium sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	+			
52540	<i>Hydropsyche dicantha</i>	+			
52570	<i>Hydropsyche simulans</i>	+	No. Quantitative Taxa: 0	Total Taxa: 77	
53800	<i>Hydroptila sp</i>	+	No. Qualitative Taxa: 77	ICI:	
57400	<i>Neophylax sp</i>	+	Number of Organisms: 0	Qual EPT: 23	
58505	<i>Helicopsyche borealis</i>	+			
59110	<i>Ceraclea ancylus</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
63900	<i>Laccophilus sp</i>	+			
67500	<i>Laccobius sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 3.40 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	74100	<i>Simulium sp</i>	+
01320	<i>Hydra sp</i>	105	77120	<i>Ablabesmyia mallochi</i>	+
03040	<i>Fredericella sp</i>	+	77500	<i>Conchapelopia sp</i>	+
03600	<i>Oligochaeta</i>	+	77800	<i>Helopelopia sp</i>	29
06201	<i>Hyaella azteca</i>	+	78140	<i>Labrundinia pilosella</i>	+
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	80310	<i>Cardiocladius obscurus</i>	59 +
11120	<i>Baetis flavistriga</i>	60	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	128
11130	<i>Baetis intercalaris</i>	110 +	80370	<i>Corynoneura lobata</i>	152
11625	<i>Paracloeodes sp 3</i>	+	80410	<i>Cricotopus (C.) sp</i>	29
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	88 +
11670	<i>Procloeon irrubrum</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	147 +
12200	<i>Isonychia sp</i>	285 +	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	59
13000	<i>Leucrocuta sp</i>	+	82101	<i>Thienemanniella taurocapita</i>	48 +
13400	<i>Stenacron sp</i>	40 +	82141	<i>Thienemanniella xena</i>	152
13510	<i>Stenonema exiguum</i>	7	82820	<i>Cryptochironomus sp</i>	+
13521	<i>Stenonema femoratum</i>	55 +	84300	<i>Phaenopsectra obediens group</i>	+
13561	<i>Stenonema pulchellum</i>	717 +	84450	<i>Polypedilum (P.) flavum</i>	235 +
13570	<i>Stenonema terminatum</i>	280 +	84470	<i>Polypedilum (P.) illinoense</i>	117 +
16700	<i>Tricorythodes sp</i>	18 +	84700	<i>Stenochironomus sp</i>	+
17200	<i>Caenis sp</i>	89 +	84750	<i>Stictochironomus sp</i>	+
18100	<i>Anthopotamus sp</i>	+	85230	<i>Cladotanytarsus mancus group</i>	+
21200	<i>Calopteryx sp</i>	+	85500	<i>Paratanytarsus sp</i>	+
22001	<i>Coenagrionidae</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	470 +
22300	<i>Argia sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	1292 +
23909	<i>Boyeria vinosa</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
24900	<i>Gomphus sp</i>	+	85800	<i>Tanytarsus sp</i>	29 +
47600	<i>Sialis sp</i>	+	85814	<i>Tanytarsus glabrescens group</i>	29 +
48410	<i>Corydalus cornutus</i>	1 +	85840	<i>Tanytarsus guerlus group</i>	+
50315	<i>Chimarra obscura</i>	+	87540	<i>Hemerodromia sp</i>	104
52200	<i>Cheumatopsyche sp</i>	202 +	No. Quantitative Taxa: 37		Total Taxa: 74
52430	<i>Ceratopsyche morosa group</i>	151 +	No. Qualitative Taxa: 60		ICI: 48
52431	<i>Ceratopsyche morosa</i>	1	Number of Organisms: 5341		Qual EPT: 17
52540	<i>Hydropsyche dicantha</i>	1			
53501	<i>Hydroptilidae</i>	9 +			
59970	<i>Petrophila sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
65800	<i>Berosus sp</i>	+			
68130	<i>Helichus sp</i>	+			
68201	<i>Scirtidae</i>	40			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	1 +			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	2			
72700	<i>Anopheles sp</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 1.00 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
03600	<i>Oligochaeta</i>	+	84440	<i>Polypedilum (P.) aviceps</i>	+
06700	<i>Crangonyx sp</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
11120	<i>Baetis flavistriga</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
11130	<i>Baetis intercalaris</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
11625	<i>Paracloeodes sp 3</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	85800	<i>Tanytarsus sp</i>	+
11670	<i>Procloeon irrubrum</i>	+	85814	<i>Tanytarsus glabrescens group</i>	+
12200	<i>Isonychia sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	+
13000	<i>Leucrocuta sp</i>	+	89570	<i>Ochthera sp</i>	+
13400	<i>Stenacron sp</i>	+	93900	<i>Elimia sp</i>	+
13521	<i>Stenonema femoratum</i>	+	95100	<i>Physella sp</i>	+
13561	<i>Stenonema pulchellum</i>	+	97601	<i>Corbicula fluminea</i>	+
13570	<i>Stenonema terminatum</i>	+			
16700	<i>Tricorythodes sp</i>	+	No. Quantitative Taxa: 0		Total Taxa: 58
17200	<i>Caenis sp</i>	+	No. Qualitative Taxa: 58		ICI:
18100	<i>Anthopotamus sp</i>	+	Number of Organisms: 0		Qual EPT: 20
18600	<i>Ephemera sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
21300	<i>Hetaerina sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
24700	<i>Dromogomphus sp</i>	+			
43300	<i>Ranatra sp</i>	+			
47600	<i>Sialis sp</i>	+			
48410	<i>Corydalus cornutus</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
53800	<i>Hydroptila sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
60400	<i>Gyrinus sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
68130	<i>Helichus sp</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77800	<i>Helopelopia sp</i>	+			
80310	<i>Cardiocladius obscurus</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83003	<i>Dicrotendipes fumidus</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-500 RM: 0.30 Site: Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
06201	<i>Hyalella azteca</i>	+	85711	<i>Stempellinella n.sp 1</i>	+
11120	<i>Baetis flavistriga</i>	+	85800	<i>Tanytarsus sp</i>	+
11130	<i>Baetis intercalaris</i>	+	85814	<i>Tanytarsus glabrescens group</i>	+
11175	<i>Plauditus virile</i>	+	89501	<i>Ephydriidae</i>	+
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	95100	<i>Physella sp</i>	+
11625	<i>Paracloeodes sp 3</i>	+	96900	<i>Ferrissia sp</i>	+
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	97601	<i>Corbicula fluminea</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+			
11670	<i>Procloeon irrubrum</i>	+	No. Quantitative Taxa: 0		Total Taxa: 52
12200	<i>Isonychia sp</i>	+	No. Qualitative Taxa: 52		ICI:
13000	<i>Leucrocota sp</i>	+	Number of Organisms: 0		Qual EPT: 24
13521	<i>Stenonema femoratum</i>	+			
13540	<i>Stenonema mediopunctatum</i>	+			
13561	<i>Stenonema pulchellum</i>	+			
13570	<i>Stenonema terminatum</i>	+			
16700	<i>Tricorythodes sp</i>	+			
17200	<i>Caenis sp</i>	+			
18100	<i>Anthopotamus sp</i>	+			
18600	<i>Ephemera sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
24900	<i>Gomphus sp</i>	+			
26700	<i>Macromia sp</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52510	<i>Hydropsyche aerata</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
53800	<i>Hydroptila sp</i>	+			
68601	<i>Ancyronyx variegata</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
74100	<i>Simulium sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
80310	<i>Cardiocladius obscurus</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
82130	<i>Thienemanniella similis</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84700	<i>Stenochironomus sp</i>	+			
85615	<i>Rheotanytarsus distinctissimus group</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-501 RM: 6.30 Site: Little Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	4	83040	<i>Dicrotendipes neomodestus</i>	15 +
01801	<i>Turbellaria</i>	+	83300	<i>Glyptotendipes (G.) sp</i>	8
03600	<i>Oligochaeta</i>	1	83840	<i>Microtendipes pedellus group</i>	117
05900	<i>Lirceus sp</i>	1 +	84450	<i>Polypedilum (P.) flavum</i>	+
06201	<i>Hyaella azteca</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	8 +
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	8 +
11120	<i>Baetis flavistriga</i>	1 +	84700	<i>Stenochironomus sp</i>	4
11130	<i>Baetis intercalaris</i>	+	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	8
11430	<i>Dipheter hageni</i>	+	85500	<i>Paratanytarsus sp</i>	47
11651	<i>Procloeon sp (w/o hindwing pads)</i>	1 +	85501	<i>Paratanytarsus n.sp 1</i>	15
13400	<i>Stenacron sp</i>	186 +	85625	<i>Rheotanytarsus exiguus group</i>	+
13521	<i>Stenonema femoratum</i>	141 +	85802	<i>Tanytarsus curticornis group</i>	31
17200	<i>Caenis sp</i>	1 +	85814	<i>Tanytarsus glabrescens group</i>	140
21200	<i>Calopteryx sp</i>	3 +	87540	<i>Hemerodromia sp</i>	7
22001	<i>Coenagrionidae</i>	+	95100	<i>Physella sp</i>	+
22300	<i>Argia sp</i>	+	96900	<i>Ferrissia sp</i>	6
35001	<i>Perlodidae</i>	+	98600	<i>Sphaerium sp</i>	+
50301	<i>Chimarra aterrima</i>	+			
52200	<i>Cheumatopsyche sp</i>	4 +	No. Quantitative Taxa: 37		Total Taxa: 62
52430	<i>Ceratopsyche morosa group</i>	+	No. Qualitative Taxa: 40		ICI: 52
52530	<i>Hydropsyche depravata group</i>	+	Number of Organisms: 1021		Qual EPT: 14
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	16 +			
60900	<i>Peltodytes sp</i>	+			
68075	<i>Psephenus herricki</i>	1 +			
68708	<i>Dubiraphia vittata group</i>	+			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	4 +			
71100	<i>Hexatoma sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	8 +			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	93			
78140	<i>Labrundinia pilosella</i>	8			
78450	<i>Nilotanypus fimbriatus</i>	4			
79400	<i>Zavreliomyia sp</i>	8			
80204	<i>Brillia flavifrons group</i>	+			
80351	<i>Corynoneura n.sp 1</i>	4			
80370	<i>Corynoneura lobata</i>	40			
80410	<i>Cricotopus (C.) sp</i>	23			
80420	<i>Cricotopus (C.) bicinctus</i>	8			
81270	<i>Nanocladius (N.) spiniplenus</i>	8			
81650	<i>Parametriocnemus sp</i>	+			
81690	<i>Paratrichocladius sp</i>	39			
82200	<i>Tvetenia bavarica group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-501 RM: 4.70 Site: Little Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	439	83003	<i>Dicrotendipes fumidus</i>	+
01801	<i>Turbellaria</i>	3 +	83040	<i>Dicrotendipes neomodestus</i>	442
03360	<i>Plumatella sp</i>	1 +	83051	<i>Dicrotendipes simpsoni</i>	166
03600	<i>Oligochaeta</i>	120	83158	<i>Endochironomus nigricans</i>	+
04666	<i>Helobdella triserialis</i>	1	83300	<i>Glyptotendipes (G.) sp</i>	55
04935	<i>Erpobdella punctata punctata</i>	1 +	83840	<i>Microtendipes pedellus group</i>	16
11120	<i>Baetis flavistriga</i>	+	84210	<i>Paratendipes albimanus or P. duplicatus</i>	+
13521	<i>Stenonema femoratum</i>	13 +	84300	<i>Phaenopsectra obediens group</i>	+
16700	<i>Tricorythodes sp</i>	1	84315	<i>Phaenopsectra flavipes</i>	+
17200	<i>Caenis sp</i>	37 +	84450	<i>Polypedilum (P.) flavum</i>	110 +
21200	<i>Calopteryx sp</i>	10 +	84470	<i>Polypedilum (P.) illinoense</i>	+
22001	<i>Coenagrionidae</i>	2 +	84790	<i>Tribelos fuscicorne</i>	+
22300	<i>Argia sp</i>	1 +	85500	<i>Paratanytarsus sp</i>	276
28001	<i>Libellulidae</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	55
47600	<i>Sialis sp</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	55 +
52200	<i>Cheumatopsyche sp</i>	32 +	85800	<i>Tanytarsus sp</i>	110
52430	<i>Ceratopsyche morosa group</i>	1	85814	<i>Tanytarsus glabrescens group</i>	1325 +
52530	<i>Hydropsyche depravata group</i>	+	85840	<i>Tanytarsus guerlus group</i>	110
53800	<i>Hydroptila sp</i>	19 +	87540	<i>Hemerodromia sp</i>	272
58505	<i>Helicopsyche borealis</i>	2 +	94400	<i>Fossaria sp</i>	16
60900	<i>Peltodytes sp</i>	+	95100	<i>Physella sp</i>	1028 +
68130	<i>Helichus sp</i>	+	95907	<i>Gyraulus (Torquis) parvus</i>	130 +
69400	<i>Stenelmis sp</i>	2 +	96900	<i>Ferrissia sp</i>	661 +
71300	<i>Limonia sp</i>	+	98200	<i>Pisidium sp</i>	+
71900	<i>Tipula sp</i>	3 +			
71910	<i>Tipula abdominalis</i>	14 +	No. Quantitative Taxa: 46		
72700	<i>Anopheles sp</i>	+	Total Taxa: 67		
74100	<i>Simulium sp</i>	+	No. Qualitative Taxa: 45		
77500	<i>Conchapelopia sp</i>	166	ICI: 34		
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	55	Number of Organisms: 6664		
77800	<i>Helopelopia sp</i>	166 +	Qual EPT: 7		
80351	<i>Corynoneura n.sp 1</i>	+			
80370	<i>Corynoneura lobata</i>	16			
80430	<i>Cricotopus (C.) tremulus group</i>	110 +			
81259	<i>Nanocladius (N.) "rectinervis" (sensu Simpson and Bode, 1980)</i>	386			
81270	<i>Nanocladius (N.) spiniplenus</i>	55			
81460	<i>Orthocladius (O.) sp</i>	55			
81632	<i>Parakiefferiella n.sp 2</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
81690	<i>Paratrichocladius sp</i>	55 +			
82141	<i>Thienemanniella xena</i>	16 +			
82710	<i>Chironomus (C.) sp</i>	+			
82820	<i>Cryptochironomus sp</i>	55			

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

Collection Date: 09/26/1995 River Code: 14-501 RM: 2.70 Site: Little Twin Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	17	80370	<i>Corynoneura lobata</i>	90
01801	<i>Turbellaria</i>	1	80420	<i>Cricotopus (C.) bicinctus</i>	+
03600	<i>Oligochaeta</i>	16 +	80430	<i>Cricotopus (C.) tremulus group</i>	26 +
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	80440	<i>Cricotopus (C.) trifascia group</i>	+
11020	<i>Acerpenna pygmaeus</i>	10	81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	13
11120	<i>Baetis flavistriga</i>	107 +	81650	<i>Parametrioctenemus sp</i>	53 +
11130	<i>Baetis intercalaris</i>	130 +	81690	<i>Paratrachocladus sp</i>	26
12200	<i>Isonychia sp</i>	136 +	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	132 +
13000	<i>Leucrocota sp</i>	+	82101	<i>Thienemanniella taurocapita</i>	129
13400	<i>Stenacron sp</i>	10 +	82141	<i>Thienemanniella xena</i>	23 +
13521	<i>Stenonema femoratum</i>	187 +	82200	<i>Tvetenia bavarica group</i>	26 +
13561	<i>Stenonema pulchellum</i>	81	83840	<i>Microtendipes pedellus group</i>	13
13570	<i>Stenonema terminatum</i>	5	84450	<i>Polypedilum (P.) flavum</i>	93 +
16700	<i>Tricorythodes sp</i>	26 +	84460	<i>Polypedilum (P.) fallax group</i>	13
17200	<i>Caenis sp</i>	142 +	84470	<i>Polypedilum (P.) illinoense</i>	+
18600	<i>Ephemera sp</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	13
21200	<i>Calopteryx sp</i>	10 +	85230	<i>Cladotanytarsus mancus group</i>	+
22001	<i>Coenagrionidae</i>	+	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	26 +
23804	<i>Basiaeschna janata</i>	+	85500	<i>Paratanytarsus sp</i>	40 +
23909	<i>Boyeria vinosa</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	40
24900	<i>Gomphus sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	93 +
45300	<i>Sigara sp</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	66 +
48410	<i>Corydalus cornutus</i>	3 +	85800	<i>Tanytarsus sp</i>	53 +
50301	<i>Chimarra aterrima</i>	+	85802	<i>Tanytarsus curticornis group</i>	26
50315	<i>Chimarra obscura</i>	+	85814	<i>Tanytarsus glabrescens group</i>	79 +
52200	<i>Cheumatopsyche sp</i>	168 +	85840	<i>Tanytarsus guerlus group</i>	53 +
52430	<i>Ceratopsyche morosa group</i>	296 +	87540	<i>Hemerodromia sp</i>	306 +
52530	<i>Hydropsyche depravata group</i>	+	95100	<i>Physella sp</i>	24 +
53501	<i>Hydroptilidae</i>	+	96900	<i>Ferrissia sp</i>	24 +
58505	<i>Helicopsyche borealis</i>	1			
60900	<i>Peltodytes sp</i>	+			
68075	<i>Psephenus herricki</i>	+	No. Quantitative Taxa: 50		Total Taxa: 72
69400	<i>Stenelmis sp</i>	+	No. Qualitative Taxa: 53		ICI: 56
70600	<i>Antocha sp</i>	2	Number of Organisms: 3211		Qual EPT: 15
71100	<i>Hexatoma sp</i>	+			
71900	<i>Tipula sp</i>	+			
74100	<i>Simulium sp</i>	1 +			
77500	<i>Conchapelopia sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	40			
77800	<i>Helopelopia sp</i>	238 +			
78450	<i>Nilotanypus fimbriatus</i>	26			
80351	<i>Corynoneura n.sp 1</i>	26 +			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	52			

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

Collection Date: 09/27/1995 River Code: 14-502 RM: 12.10 Site: Toms Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	+			
03600	<i>Oligochaeta</i>	+			
04686	<i>Placobdella papillifera</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05900	<i>Lirceus sp</i>	+			
06201	<i>Hyalella azteca</i>	+			
06700	<i>Crangonyx sp</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
18704	<i>Hexagenia atrocaudata</i>	+			
18750	<i>Hexagenia limbata</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23600	<i>Aeshna sp</i>	+			
24700	<i>Dromogomphus sp</i>	+			
27610	<i>Epitheca (Tetragoneuria) cynosura</i>	+			
28500	<i>Libellula sp</i>	+			
45300	<i>Sigara sp</i>	+			
45900	<i>Notonecta sp</i>	+			
47600	<i>Sialis sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
66500	<i>Enochrus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
77355	<i>Clinotanypus pinguis</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
95100	<i>Physella sp</i>	+			
96264	<i>Planorbella (Pierosoma) pilsbryi</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 33
No. Qualitative Taxa: 33	ICI:
Number of Organisms: 0	Qual EPT: 4

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

Collection Date: 09/27/1995 River Code: 14-502 RM: 8.30 Site: Toms Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+			
01320	<i>Hydra sp</i>	+			
03600	<i>Oligochaeta</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05900	<i>Lirceus sp</i>	+			
06201	<i>Hyalella azteca</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
18600	<i>Ephemera sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
27500	<i>Somatochlora sp</i>	+			
47600	<i>Sialis sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
78402	<i>Natarsia baltimoreus</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84460	<i>Polypedilum (P.) fallax group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85230	<i>Cladotanytarsus mancus group</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
95100	<i>Physella sp</i>	+			
96264	<i>Planorbella (Pierosoma) pilsbryi</i>	+			
96900	<i>Ferrissia sp</i>	+			
98600	<i>Sphaerium sp</i>	+			
99180	<i>Strophitus undulatus undulatus</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 35

No. Qualitative Taxa: 35 ICI:

Number of Organisms: 0 Qual EPT: 3

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

Collection Date: 09/26/1995 River Code: 14-502 RM: 0.40 Site: Toms Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+		<i>Bode, 1980)</i>	
01801	<i>Turbellaria</i>	+	81650	<i>Parametriocnemus sp</i>	+
03360	<i>Plumatella sp</i>	+	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+
05800	<i>Caecidotea sp</i>	+	83840	<i>Microtendipes pedellus group</i>	+
05900	<i>Lirceus sp</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	85500	<i>Paratanytarsus sp</i>	+
08601	<i>Hydracarina</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	+
11018	<i>Acerpenna macdunnoughi</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
11020	<i>Acerpenna pygmaeus</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
11120	<i>Baetis flavistriga</i>	+	85800	<i>Tanytarsus sp</i>	+
11130	<i>Baetis intercalaris</i>	+	86100	<i>Chrysops sp</i>	+
12200	<i>Isonychia sp</i>	+	93900	<i>Elimia sp</i>	+
13000	<i>Leucrocuta sp</i>	+	95100	<i>Physella sp</i>	+
13400	<i>Stenacron sp</i>	+			
13521	<i>Stenonema femoratum</i>	+	No. Quantitative Taxa: 0		Total Taxa: 57
16700	<i>Tricorythodes sp</i>	+	No. Qualitative Taxa: 57		ICI:
17200	<i>Caenis sp</i>	+	Number of Organisms: 0		Qual EPT: 19
18600	<i>Ephemera sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
27500	<i>Somatochlora sp</i>	+			
35001	<i>Perlodidae</i>	+			
47600	<i>Sialis sp</i>	+			
48410	<i>Corydalus cornutus</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
51600	<i>Polycentropus sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
68025	<i>Ectopria sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
80360	<i>Corynoneura "celeripes" (sensu Simpson &</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-504 RM: 0.50 Site: Aukerman Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
08250	<i>Orconectes (Procericambarus) rusticus</i>	+		<i>norena</i>	
08601	<i>Hydracarina</i>	+	77800	<i>Helopelopia sp</i>	+
11120	<i>Baetis flavistriga</i>	+	78402	<i>Natarsia baltimoreus</i>	+
11130	<i>Baetis intercalaris</i>	+	79400	<i>Zavreliomyia sp</i>	+
11625	<i>Paracloeodes sp 3</i>	+	80410	<i>Cricotopus (C.) sp</i>	+
12200	<i>Isonychia sp</i>	+	80415	<i>Cricotopus (C.) absurdus</i>	+
13521	<i>Stenonema femoratum</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	+
13561	<i>Stenonema pulchellum</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	+
13590	<i>Stenonema vicarium</i>	+	80440	<i>Cricotopus (C.) trifascia group</i>	+
16200	<i>Eurylophella sp</i>	+	81650	<i>Parametriocnemus sp</i>	+
17200	<i>Caenis sp</i>	+	82101	<i>Thienemanniella taurocapita</i>	+
18619	<i>Ephemera simulans</i>	+	82141	<i>Thienemanniella xena</i>	+
21200	<i>Calopteryx sp</i>	+	82820	<i>Cryptochironomus sp</i>	+
22300	<i>Argia sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
23804	<i>Basiaeschna janata</i>	+	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
23909	<i>Boyeria vinosa</i>	+			
24700	<i>Dromogomphus sp</i>	+	84440	<i>Polypedilum (P.) aviceps</i>	+
24900	<i>Gomphus sp</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
35001	<i>Perlodidae</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
50301	<i>Chimarra aterrima</i>	+	84612	<i>Saetheria tylus</i>	+
50315	<i>Chimarra obscura</i>	+	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	+
52200	<i>Cheumatopsyche sp</i>	+	85500	<i>Paratanytarsus sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
52530	<i>Hydropsyche depravata group</i>	+	85814	<i>Tanytarsus glabrescens group</i>	+
53501	<i>Hydroptilidae</i>	+	89704	<i>Limnophora aequifrons</i>	+
58505	<i>Helicopsyche borealis</i>	+	93900	<i>Elimia sp</i>	+
59700	<i>Triaenodes sp</i>	+	95100	<i>Physella sp</i>	+
59730	<i>Triaenodes melaca</i>	+			
60900	<i>Peltodytes sp</i>	+	No. Quantitative Taxa: 0		Total Taxa: 70
63300	<i>Hydroporus sp</i>	+	No. Qualitative Taxa: 70		ICI:
63900	<i>Laccophilus sp</i>	+	Number of Organisms: 0		Qual EPT: 20
65800	<i>Berosus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia</i>	+			

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

Collection Date: 09/18/1995 River Code: 14-505 RM: 9.40 Site: Bantas Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	168 +
11018	<i>Acerpenna macdunnoughi</i>	1	85800	<i>Tanytarsus sp</i>	56
11020	<i>Acerpenna pygmaeus</i>	19	85814	<i>Tanytarsus glabrescens group</i>	63
11120	<i>Baetis flavistriga</i>	3	85840	<i>Tanytarsus guerlus group</i>	14
11130	<i>Baetis intercalaris</i>	82 +	86200	<i>Tabanus sp</i>	+
11430	<i>Dipheter hageni</i>	42 +	87540	<i>Hemerodromia sp</i>	4
12200	<i>Isonychia sp</i>	65 +	93900	<i>Elimia sp</i>	3 +
13400	<i>Stenacron sp</i>	21 +			
13521	<i>Stenonema femoratum</i>	68 +	No. Quantitative Taxa: 40		Total Taxa: 51
13540	<i>Stenonema mediopunctatum</i>	37	No. Qualitative Taxa: 22		ICI: 54
17200	<i>Caenis sp</i>	8	Number of Organisms: 1630		Qual EPT: 10
21200	<i>Calopteryx sp</i>	+			
21300	<i>Hetaerina sp</i>	1			
35500	<i>Isoperla sp</i>	17			
42700	<i>Belostoma sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
52200	<i>Cheumatopsyche sp</i>	64 +			
52430	<i>Ceratopsyche morosa group</i>	59 +			
52530	<i>Hydropsyche depravata group</i>	11 +			
58505	<i>Helicopsyche borealis</i>	+			
60900	<i>Peltodytes sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
72340	<i>Dixella sp</i>	+			
77500	<i>Conchapelopia sp</i>	35			
78450	<i>Nilotanypus fimbriatus</i>	36			
80370	<i>Corynoneura lobata</i>	172			
80420	<i>Cricotopus (C.) bicinctus</i>	14			
80430	<i>Cricotopus (C.) tremulus group</i>	7			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	7			
81650	<i>Parametriocnemus sp</i>	14			
81690	<i>Paratrichocladius sp</i>	21			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	14			
82101	<i>Thienemanniella taurocapita</i>	60			
82121	<i>Thienemanniella lobapodema</i>	4			
82141	<i>Thienemanniella xena</i>	56			
82200	<i>Tvetenia bavarica group</i>	7 +			
84450	<i>Polypedilum (P.) flavum</i>	42			
84700	<i>Stenochironomus sp</i>	7			
85261	<i>Cladotanytarsus vanderwulpi group Type I</i>	7			
85500	<i>Paratanytarsus sp</i>	42			
85501	<i>Paratanytarsus n.sp I</i>	272			
85615	<i>Rheotanytarsus distinctissimus group</i>	7			

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

Collection Date: 09/27/1995 River Code: 14-505 RM: 1.30 Site: Bantas Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	1 +	80370	<i>Corynoneura lobata</i>	74
03600	<i>Oligochaeta</i>	2	80430	<i>Cricotopus (C.) tremulus group</i>	18 +
05900	<i>Lirceus sp</i>	+	81650	<i>Parametriocnemus sp</i>	12
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	82101	<i>Thienemanniella taurocapita</i>	74
11120	<i>Baetis flavistriga</i>	49	82141	<i>Thienemanniella xena</i>	4
11130	<i>Baetis intercalaris</i>	40 +	82200	<i>Tvetenia bavarica group</i>	+
12200	<i>Isonychia sp</i>	21 +	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	6
13000	<i>Leucrocuta sp</i>	1 +	84450	<i>Polypedilum (P.) flavum</i>	86 +
13400	<i>Stenacron sp</i>	37 +	84460	<i>Polypedilum (P.) fallax group</i>	25
13521	<i>Stenonema femoratum</i>	22 +	84470	<i>Polypedilum (P.) illinoense</i>	12 +
13540	<i>Stenonema mediopunctatum</i>	83 +	85501	<i>Paratanytarsus n.sp 1</i>	6
13561	<i>Stenonema pulchellum</i>	21 +	85615	<i>Rheotanytarsus distinctissimus group</i>	25
13570	<i>Stenonema terminatum</i>	10 +	85625	<i>Rheotanytarsus exiguus group</i>	141
17200	<i>Caenis sp</i>	5 +	85800	<i>Tanytarsus sp</i>	6
17600	<i>Baetisca sp</i>	+	85802	<i>Tanytarsus curticornis group</i>	12
18619	<i>Ephemera simulans</i>	+	85814	<i>Tanytarsus glabrescens group</i>	18
21200	<i>Calopteryx sp</i>	+	85840	<i>Tanytarsus guerlus group</i>	6
22001	<i>Coenagrionidae</i>	+	86100	<i>Chrysops sp</i>	+
22300	<i>Argia sp</i>	+	87540	<i>Hemerodromia sp</i>	6 +
23909	<i>Boyeria vinosa</i>	+	93900	<i>Elimia sp</i>	+
24900	<i>Gomphus sp</i>	+			
35001	<i>Perlodidae</i>	4			
50301	<i>Chimarra aterrima</i>	+	No. Quantitative Taxa: 41		Total Taxa: 64
50315	<i>Chimarra obscura</i>	47 +	No. Qualitative Taxa: 45		ICI: 56
52200	<i>Cheumatopsyche sp</i>	39 +	Number of Organisms: 1004		Qual EPT: 18
52430	<i>Ceratopsyche morosa group</i>	16 +			
52530	<i>Hydropsyche depravata group</i>	4 +			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	1 +			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	8 +			
69200	<i>Optioservus sp</i>	4 +			
69400	<i>Stenelmis sp</i>	5 +			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	25			
77800	<i>Helopelopia sp</i>	+			
78450	<i>Nilotanypus fimbriatus</i>	18			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	10			

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

Collection Date: 09/27/1995 River Code: 14-505 RM: 0.70 Site: Bantas Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	+	80351	<i>Corynoneura n.sp 1</i>	+
05900	<i>Lirceus sp</i>	+	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	+
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	80370	<i>Corynoneura lobata</i>	+
08601	<i>Hydracarina</i>	+	81650	<i>Parametriocnemus sp</i>	+
11120	<i>Baetis flavistriga</i>	+	82101	<i>Thienemanniella taurocapita</i>	+
11130	<i>Baetis intercalaris</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
11625	<i>Paracloeodes sp 3</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	85230	<i>Cladotanytarsus mancus group</i>	+
12200	<i>Isonychia sp</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	+
13000	<i>Leucrocuta sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
13400	<i>Stenacron sp</i>	+	85814	<i>Tanytarsus glabrescens group</i>	+
13521	<i>Stenonema femoratum</i>	+	86100	<i>Chrysops sp</i>	+
13540	<i>Stenonema mediopunctatum</i>	+	93900	<i>Elimia sp</i>	+
13561	<i>Stenonema pulchellum</i>	+			
13570	<i>Stenonema terminatum</i>	+			
16700	<i>Tricorythodes sp</i>	+	No. Quantitative Taxa: 0		Total Taxa: 58
17200	<i>Caenis sp</i>	+	No. Qualitative Taxa: 58		ICI:
18619	<i>Ephemera simulans</i>	+	Number of Organisms: 0		Qual EPT: 22
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
24900	<i>Gomphus sp</i>	+			
33501	<i>Capniidae</i>	+			
35001	<i>Perlodidae</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
63300	<i>Hydroporus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68601	<i>Ancyronyx variegata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	+			
78450	<i>Nilotanypus fimbriatus</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-505 RM: 0.20 Site: Bantas Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	1 +	68075	<i>Psephenus herricki</i>	+
01320	<i>Hydra sp</i>	4	68130	<i>Helichus sp</i>	+
01801	<i>Turbellaria</i>	2 +	68708	<i>Dubiraphia vittata group</i>	1 +
03600	<i>Oligochaeta</i>	4 +	68901	<i>Macronychus glabratus</i>	5
05900	<i>Lirceus sp</i>	4	69225	<i>Optioservus fastiditus</i>	1
06700	<i>Crangonyx sp</i>	+	69400	<i>Stenelmis sp</i>	8 +
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	71700	<i>Pilaria sp</i>	+
11018	<i>Acerpenna macdunnoughi</i>	18	71910	<i>Tipula abdominalis</i>	+
11120	<i>Baetis flavistriga</i>	44 +	72700	<i>Anopheles sp</i>	+
11130	<i>Baetis intercalaris</i>	134 +	74100	<i>Simulium sp</i>	+
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	77120	<i>Ablabesmyia mallochii</i>	+
11625	<i>Paracloeodes sp 3</i>	+	77500	<i>Conchapelopia sp</i>	21 +
12200	<i>Isonychia sp</i>	149 +	77740	<i>Hayesomyia senata</i>	4 +
13000	<i>Leucrocuta sp</i>	+	77800	<i>Helopelopia sp</i>	7 +
13400	<i>Stenacron sp</i>	47 +	78450	<i>Nilotanypus fimbriatus</i>	28
13521	<i>Stenonema femoratum</i>	97 +	79210	<i>Thienemannimyia norena</i>	3 +
13540	<i>Stenonema mediopunctatum</i>	335 +	80351	<i>Corynoneura n.sp 1</i>	24
13561	<i>Stenonema pulchellum</i>	276	80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	16 +
13570	<i>Stenonema terminatum</i>	35 +	80370	<i>Corynoneura lobata</i>	276
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	+	80420	<i>Cricotopus (C.) bicinctus</i>	+
16700	<i>Tricorythodes sp</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	+
17200	<i>Caenis sp</i>	16 +	81650	<i>Parametriocnemus sp</i>	+
17600	<i>Baetisca sp</i>	+	81690	<i>Paratrichocladius sp</i>	+
18600	<i>Ephemera sp</i>	+	81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	8
21200	<i>Calopteryx sp</i>	+	82101	<i>Thienemanniella taurocapita</i>	52 +
21300	<i>Hetaerina sp</i>	4	82121	<i>Thienemanniella lobapodema</i>	8 +
22001	<i>Coenagrionidae</i>	1 +	82141	<i>Thienemanniella xena</i>	16 +
22300	<i>Argia sp</i>	+	82200	<i>Tvetenia bavarica group</i>	14 +
23804	<i>Basiaeschna janata</i>	+	82220	<i>Tvetenia discoloripes group</i>	7 +
23909	<i>Boyeria vinosa</i>	3 +	82820	<i>Cryptochironomus sp</i>	+
24900	<i>Gomphus sp</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
35001	<i>Perlodidae</i>	4	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
42700	<i>Belostoma sp</i>	+	83840	<i>Microtendipes pedellus group</i>	14
48410	<i>Corydalus cornutus</i>	1 +	84210	<i>Paratendipes albimanus or P. duplicatus</i>	7 +
50301	<i>Chimarra aterrima</i>	+	84300	<i>Phaenopsectra obediens group</i>	+
50315	<i>Chimarra obscura</i>	+	84450	<i>Polypedilum (P.) flavum</i>	76 +
52200	<i>Cheumatopsyche sp</i>	69 +	84470	<i>Polypedilum (P.) illinoense</i>	7 +
52430	<i>Ceratopsyche morosa group</i>	54 +	84888	<i>Xenochironomus xenolabis</i>	+
52530	<i>Hydropsyche depravata group</i>	5 +	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	7 +
57400	<i>Neophylax sp</i>	+	85501	<i>Paratanytarsus n.sp 1</i>	+
58505	<i>Helicopsyche borealis</i>	2 +	85615	<i>Rheotanytarsus distinctissimus group</i>	62
60900	<i>Peltodytes sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	124 +
63300	<i>Hydroporus sp</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	8
65800	<i>Berosus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-505 RM: 0.20 Site: Bantas Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
85800	<i>Tanytarsus sp</i>	7 +			
85814	<i>Tanytarsus glabrescens group</i>	7			
85840	<i>Tanytarsus guerlus group</i>	28 +			
86100	<i>Chrysops sp</i>	+			
86200	<i>Tabanus sp</i>	+			
87540	<i>Hemerodromia sp</i>	16			
93900	<i>Elimia sp</i>	5 +			
95100	<i>Physella sp</i>	5 +			

No. Quantitative Taxa: 56 Total Taxa: 96
No. Qualitative Taxa: 79 ICI: **54**
Number of Organisms: 2181 Qual EPT: 22

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

Collection Date: 09/26/1995 River Code: 14-506 RM: 4.40 Site: Goose Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	<hr/> No. Quantitative Taxa: 0 Total Taxa: 42 No. Qualitative Taxa: 42 ICI: Number of Organisms: 0 Qual EPT: 8		
03600	<i>Oligochaeta</i>	+			
04685	<i>Placobdella ornata</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05800	<i>Caecidotea sp</i>	+			
05900	<i>Lirceus sp</i>	+			
06201	<i>Hyalella azteca</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
13400	<i>Stenacron sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23804	<i>Basiaeschna janata</i>	+			
23909	<i>Boyeria vinosa</i>	+			
28955	<i>Libellula lydia</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
53501	<i>Hydroptilidae</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59500	<i>Oecetis sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
65800	<i>Berosus sp</i>	+			
66500	<i>Enochrus sp</i>	+			
68025	<i>Ectopria sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71300	<i>Limonia sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
77500	<i>Conchapelopia sp</i>	+			
79100	<i>Thienemannimyia group</i>	+			
80351	<i>Corynoneura n.sp 1</i>	+			
80470	<i>Cricotopus (C.) or Orthocladius (O.) sp</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	+			
95907	<i>Gyraulus (Torquis) parvus</i>	+			
98600	<i>Sphaerium sp</i>	+			

**Ohio EPA/DW/ESW Ecological Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/26/1995 River Code: 14-506 RM: 0.40 Site: Goose Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+	82101	<i>Thienemanniella taurocapita</i>	+
11020	<i>Acerpenna pygmaeus</i>	+	82200	<i>Tvetenia bavarica group</i>	+
11120	<i>Baetis flavistriga</i>	+	82820	<i>Cryptochironomus sp</i>	+
11130	<i>Baetis intercalaris</i>	+	84440	<i>Polypedilum (P.) aviceps</i>	+
11430	<i>Dipheter hageni</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	84750	<i>Stictochironomus sp</i>	+
12200	<i>Isonychia sp</i>	+	85262	<i>Cladotanytarsus vanderwulpi group Type 2</i>	+
13400	<i>Stenacron sp</i>	+	85500	<i>Paratanytarsus sp</i>	+
13521	<i>Stenonema femoratum</i>	+	85501	<i>Paratanytarsus n.sp 1</i>	+
17200	<i>Caenis sp</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
23909	<i>Boyeria vinosa</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
24900	<i>Gomphus sp</i>	+	85800	<i>Tanytarsus sp</i>	+
35001	<i>Perlodidae</i>	+	85840	<i>Tanytarsus guerlus group</i>	+
50301	<i>Chimarra aterrima</i>	+	93900	<i>Elimia sp</i>	+
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+	No. Quantitative Taxa: 0		Total Taxa: 59
52430	<i>Ceratopsyche morosa group</i>	+	No. Qualitative Taxa: 59		ICI:
52530	<i>Hydropsyche depravata group</i>	+	Number of Organisms: 0		Qual EPT: 19
53800	<i>Hydroptila sp</i>	+			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68601	<i>Ancyronyx variegata</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
80204	<i>Brillia flavifrons group</i>	+			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
81690	<i>Paratrichocladus sp</i>	+			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+			

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

Collection Date: 09/27/1995 River Code: 14-508 RM: 6.10 Site: Lesley Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+			
03600	<i>Oligochaeta</i>	+			
05900	<i>Lirceus sp</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
18750	<i>Hexagenia limbata</i>	+			
22001	<i>Coenagrionidae</i>	+			
23600	<i>Aeshna sp</i>	+			
45100	<i>Palmacorixa sp</i>	+			
47600	<i>Sialis sp</i>	+			
60400	<i>Gyrinus sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
65800	<i>Berosus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
81040	<i>Limnophyes sp</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84700	<i>Stenochironomus sp</i>	+			
84750	<i>Stictochironomus sp</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 24
No. Qualitative Taxa: 24 ICI:
Number of Organisms: 0 Qual EPT: 3

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

Collection Date: 09/21/1995 River Code: 14-510 RM: 13.50 Site: Price Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03040	<i>Fredericella sp</i>	+			
03360	<i>Plumatella sp</i>	+			
04666	<i>Helobdella triserialis</i>	+			
04685	<i>Placobdella ornata</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
13400	<i>Stenacron sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
23600	<i>Aeshna sp</i>	+			
45300	<i>Sigara sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
63900	<i>Laccophilus sp</i>	+			
67000	<i>Helophorus sp</i>	+			
67700	<i>Paracymus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
69400	<i>Stenelmis sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
80370	<i>Corynoneura lobata</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 33
No. Qualitative Taxa: 33	ICI:
Number of Organisms: 0	Qual EPT: 6

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

Collection Date: 09/21/1995 River Code: 14-510 RM: 13.20 Site: Price Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	+			
03600	<i>Oligochaeta</i>	+			
04666	<i>Helobdella triserialis</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
11200	<i>Callibaetis sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
28001	<i>Libellulidae</i>	+			
45300	<i>Sigara sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
53501	<i>Hydroptilidae</i>	+			
60900	<i>Peltodytes sp</i>	+			
63900	<i>Laccophilus sp</i>	+			
65800	<i>Berosus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
72340	<i>Dixella sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
77800	<i>Helopelopia sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85230	<i>Cladotanytarsus mancus group</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85800	<i>Tanytarsus sp</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 39

No. Qualitative Taxa: 39 ICI:

Number of Organisms: 0 Qual EPT: 5

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

Collection Date: 09/21/1995 River Code: 14-510 RM: 7.60 Site: Price Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	+			
01801	<i>Turbellaria</i>	+			
03040	<i>Fredericella sp</i>	+			
04666	<i>Helobdella triserialis</i>	+			
08601	<i>Hydracarina</i>	+			
11130	<i>Baetis intercalaris</i>	+			
13400	<i>Stenacron sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
13540	<i>Stenonema mediopunctatum</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
45300	<i>Sigara sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
60900	<i>Peltodytes sp</i>	+			
68130	<i>Helichus sp</i>	+			
68201	<i>Scirtidae</i>	+			
69400	<i>Stenelmis sp</i>	+			
71300	<i>Limonia sp</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochii</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84315	<i>Phaenopsectra flavipes</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84700	<i>Stenochironomus sp</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
85720	<i>Stempellinella n.sp nr. flavidula</i>	+			
85800	<i>Tanytarsus sp</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
93900	<i>Elimia sp</i>	+			
96900	<i>Ferrissia sp</i>	+			
98200	<i>Pisidium sp</i>	+			
98600	<i>Sphaerium sp</i>	+			
99100	<i>Pyganodon grandis</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 41
 No. Qualitative Taxa: 41 ICI:
 Number of Organisms: 0 Qual EPT: 6

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

Collection Date: 09/21/1995 River Code: 14-510 RM: 3.90 Site: Price Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00675	<i>Heteromeyenia latitenta</i>	+			
00805	<i>Spongilla lacustris</i>	+	No. Quantitative Taxa: 0		Total Taxa: 43
01801	<i>Turbellaria</i>	+	No. Qualitative Taxa: 43		ICI:
05900	<i>Lirceus sp</i>	+	Number of Organisms: 0		Qual EPT: 15
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
11130	<i>Baetis intercalaris</i>	+			
12200	<i>Isonychia sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
13540	<i>Stenonema mediopunctatum</i>	+			
13570	<i>Stenonema terminatum</i>	+			
18600	<i>Ephemera sp</i>	+			
22300	<i>Argia sp</i>	+			
23804	<i>Basiaeschna janata</i>	+			
30000	<i>Plecoptera</i>	+			
48620	<i>Nigronia serricornis</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
57400	<i>Neophylax sp</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
67700	<i>Paracymus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
77800	<i>Helopelopia sp</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
93900	<i>Elimia sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

**Ohio EPA/DW/ESW Ecological Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/21/1995 River Code: 14-510 RM: 0.60 Site: Price Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+	82820	<i>Cryptochironomus sp</i>	+
00805	<i>Spongilla lacustris</i>	+	83840	<i>Microtendipes pedellus group</i>	+
01801	<i>Turbellaria</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
03040	<i>Fredericella sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
03600	<i>Oligochaeta</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	+
05900	<i>Lirceus sp</i>	+	85230	<i>Cladotanytarsus mancus group</i>	+
06201	<i>Hyaella azteca</i>	+	85261	<i>Cladotanytarsus vanderwulpi group Type 1</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	93900	<i>Elimia sp</i>	+
11120	<i>Baetis flavistriga</i>	+	98600	<i>Sphaerium sp</i>	+
11130	<i>Baetis intercalaris</i>	+			
11670	<i>Procloeon irrubrum</i>	+	No. Quantitative Taxa: 0		Total Taxa: 54
12200	<i>Isonychia sp</i>	+	No. Qualitative Taxa: 54		ICI:
13000	<i>Leucrocota sp</i>	+	Number of Organisms: 0		Qual EPT: 18
13521	<i>Stenonema femoratum</i>	+			
13540	<i>Stenonema mediopunctatum</i>	+			
13570	<i>Stenonema terminatum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
48410	<i>Corydalus cornutus</i>	+			
48620	<i>Nigronia serricornis</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
53800	<i>Hydroptila sp</i>	+			
57400	<i>Neophylax sp</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59970	<i>Petrophila sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
65800	<i>Berosus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68702	<i>Dubiraphia bivittata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
72700	<i>Anopheles sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
80310	<i>Cardiocladius obscurus</i>	+			
80370	<i>Corynoneura lobata</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-512 RM: 6.20 Site: Swamp Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
04664	<i>Helobdella stagnalis</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05900	<i>Lirceus sp</i>	+			
06201	<i>Hyalella azteca</i>	+			
07875	<i>Cambarus (Tubericambarus) sp A</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
11130	<i>Baetis intercalaris</i>	+			
11150	<i>Pseudocloeon propinquus</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
23600	<i>Aeshna sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
27500	<i>Somatochlora sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
53800	<i>Hydroptila sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
67000	<i>Helophorus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71900	<i>Tipula sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
82141	<i>Thienemanniella xena</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
93900	<i>Elimia sp</i>	+			
98200	<i>Pisidium sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 37
No. Qualitative Taxa: 37	ICI:
Number of Organisms: 0	Qual EPT: 6

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

Collection Date: 09/26/1995 River Code: 14-512 RM: 5.20 Site: Swamp Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
04664	<i>Helobdella stagnalis</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05800	<i>Caecidotea sp</i>	+			
05900	<i>Lirceus sp</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
08601	<i>Hydracarina</i>	+			
17200	<i>Caenis sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
27500	<i>Somatochlora sp</i>	+			
47600	<i>Sialis sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84460	<i>Polypedilum (P.) fallax group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	+			
96900	<i>Ferrissia sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 25
 No. Qualitative Taxa: 25 ICI:
 Number of Organisms: 0 Qual EPT: 1

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

Collection Date: 09/26/1995 River Code: 14-512 RM: 1.70 Site: Swamp Creek

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
06201	<i>Hyalella azteca</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	85800	<i>Tanytarsus sp</i>	+
08601	<i>Hydracarina</i>	+	87540	<i>Hemerodromia sp</i>	+
11130	<i>Baetis intercalaris</i>	+	93900	<i>Elimia sp</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	95100	<i>Physella sp</i>	+
12200	<i>Isonychia sp</i>	+	95907	<i>Gyraulus (Torquis) parvus</i>	+
13400	<i>Stenacron sp</i>	+	98600	<i>Sphaerium sp</i>	+
13521	<i>Stenonema femoratum</i>	+			
13540	<i>Stenonema mediopunctatum</i>	+	No. Quantitative Taxa: 0		Total Taxa: 53
13561	<i>Stenonema pulchellum</i>	+	No. Qualitative Taxa: 53		ICI:
17200	<i>Caenis sp</i>	+	Number of Organisms: 0		Qual EPT: 18
18600	<i>Ephemera sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23804	<i>Basiaeschna janata</i>	+			
23909	<i>Boyeria vinosa</i>	+			
24710	<i>Dromogomphus spinosis</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
53501	<i>Hydroptilidae</i>	+			
57400	<i>Neophylax sp</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
59700	<i>Triaenodes sp</i>	+			
59730	<i>Triaenodes melaca</i>	+			
59970	<i>Petrophila sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
68025	<i>Ectopria sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69400	<i>Stenelmis sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
79100	<i>Thienemannimyia group</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
82141	<i>Thienemanniella xena</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			

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

Collection Date: 09/28/1995 River Code: 14-513 RM: 10.75 Site: Millers Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03301	<i>Plumatellidae</i>	+			
03600	<i>Oligochaeta</i>	+			
04685	<i>Placobdella ornata</i>	+			
04686	<i>Placobdella papillifera</i>	+			
04935	<i>Erpobdella punctata punctata</i>	+			
05900	<i>Lirceus sp</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
13400	<i>Stenacron sp</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
45300	<i>Sigara sp</i>	+			
47600	<i>Sialis sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
60900	<i>Peltodytes sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68201	<i>Scirtidae</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69200	<i>Optioservus sp</i>	+			
74501	<i>Ceratopogonidae</i>	+			
77500	<i>Conchapelopia sp</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85615	<i>Rheotanytarsus distinctissimus group</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
85840	<i>Tanytarsus guerlus group</i>	+			
93900	<i>Elimia sp</i>	+			
95100	<i>Physella sp</i>	+			
96002	<i>Helisoma anceps anceps</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 35

No. Qualitative Taxa: 35 ICI:

Number of Organisms: 0 Qual EPT: 6

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

Collection Date: 09/28/1995 River Code: 14-513 RM: 10.10 Site: Millers Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
06201	<i>Hyalella azteca</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
13400	<i>Stenacron sp</i>	+			
14950	<i>Leptophlebia sp or Paraleptophlebia sp</i>	+			
17200	<i>Caenis sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
23600	<i>Aeshna sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
47600	<i>Sialis sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
59730	<i>Triaenodes melaca</i>	+			
60900	<i>Peltodytes sp</i>	+			
67300	<i>Hydrochus sp</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71900	<i>Tipula sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
78650	<i>Procladius sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
83003	<i>Dicrotendipes fumidus</i>	+			
83051	<i>Dicrotendipes simpsoni</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84315	<i>Phaenopsectra flavipes</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
93900	<i>Elimia sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 33
 No. Qualitative Taxa: 33 ICI:
 Number of Organisms: 0 Qual EPT: 7

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

Collection Date: 09/18/1995 River Code: 14-513 RM: 7.30 Site: Millers Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	<hr/> No. Quantitative Taxa: 0 Total Taxa: 43 No. Qualitative Taxa: 43 ICI: Number of Organisms: 0 Qual EPT: 10		
03000	<i>Ectoprocta</i>	+			
03600	<i>Oligochaeta</i>	+			
05900	<i>Lirceus sp</i>	+			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
08601	<i>Hydracarina</i>	+			
11130	<i>Baetis intercalaris</i>	+			
12200	<i>Isonychia sp</i>	+			
13000	<i>Leucrocuta sp</i>	+			
13400	<i>Stenacron sp</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
23600	<i>Aeshna sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
24900	<i>Gomphus sp</i>	+			
45300	<i>Sigara sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
60400	<i>Gyrinus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochii</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
77800	<i>Helopelopia sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83040	<i>Dicrotendipes neomodestus</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85625	<i>Rheotanytarsus exiguus group</i>	+			
85840	<i>Tanytarsus guerlus group</i>	+			
98600	<i>Sphaerium sp</i>	+			
99860	<i>Lampsilis radiata luteola</i>	+			

**Ohio EPA/DW/ESW Ecological Assessment Section
Macroinvertebrate Collection**

Collection Date: 09/18/1995 River Code: 14-513 RM: 0.40 Site: Millers Fork

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	84450	<i>Polypedilum (P.) flavum</i>	+
04686	<i>Placobdella papillifera</i>	+	84480	<i>Polypedilum (P.) laetum group</i>	+
05800	<i>Caecidotea sp</i>	+	84520	<i>Polypedilum (Tripodura) halterale group</i>	+
06201	<i>Hyalella azteca</i>	+	84750	<i>Stictochironomus sp</i>	+
08250	<i>Orconectes (Procericambarus) rusticus</i>	+	85615	<i>Rheotanytarsus distinctissimus group</i>	+
08601	<i>Hydracarina</i>	+	85625	<i>Rheotanytarsus exiguus group</i>	+
11120	<i>Baetis flavistriga</i>	+	85720	<i>Stempellinella n.sp nr. flavidula</i>	+
11130	<i>Baetis intercalaris</i>	+	85840	<i>Tanytarsus guerlus group</i>	+
11651	<i>Procloeon sp (w/o hindwing pads)</i>	+	86100	<i>Chrysops sp</i>	+
12200	<i>Isonychia sp</i>	+	93900	<i>Elimia sp</i>	+
13000	<i>Leucrocuta sp</i>	+	96900	<i>Ferrissia sp</i>	+
13521	<i>Stenonema femoratum</i>	+	98200	<i>Pisidium sp</i>	+
13540	<i>Stenonema mediopunctatum</i>	+	98600	<i>Sphaerium sp</i>	+
18600	<i>Ephemera sp</i>	+	99160	<i>Anodontoides ferussacianus</i>	+
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+	No. Quantitative Taxa: 0		Total Taxa: 57
22300	<i>Argia sp</i>	+	No. Qualitative Taxa: 57		ICI:
23909	<i>Boyeria vinosa</i>	+	Number of Organisms: 0		Qual EPT: 15
45300	<i>Sigara sp</i>	+			
48620	<i>Nigronia serricornis</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
57400	<i>Neophylax sp</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
60400	<i>Gyrinus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69200	<i>Optioservus sp</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
74100	<i>Simulium sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
77800	<i>Helopelopia sp</i>	+			
80360	<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	+			
80370	<i>Corynoneura lobata</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83300	<i>Glyptotendipes (G.) sp</i>	+			

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

Collection Date: 09/26/1995 River Code: 14-516 RM: 0.50 Site: Reigle Ditch

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
05900	<i>Lirceus sp</i>	+			
08270	<i>Orconectes (Rhoadesius) sloanii</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
69400	<i>Stenelmis sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
72700	<i>Anopheles sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85501	<i>Paratanytarsus n.sp 1</i>	+			
85720	<i>Stempellinella n.sp nr. flavidula</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 27
 No. Qualitative Taxa: 27 ICI:
 Number of Organisms: 0 Qual EPT: 6

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

Collection Date: 09/26/1995 River Code: 14-516 RM: 0.40 Site: Reigle Ditch

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
05900	<i>Lirceus sp</i>	+			
06201	<i>Hyalella azteca</i>	+			
13521	<i>Stenonema femoratum</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
51600	<i>Polycentropus sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
53501	<i>Hydroptilidae</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporus sp</i>	+			
65800	<i>Berosus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
69225	<i>Optioservus fastiditus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71910	<i>Tipula abdominalis</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77800	<i>Helopelopia sp</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84450	<i>Polypedilum (P.) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84520	<i>Polypedilum (Tripodura) halterale group</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85814	<i>Tanytarsus glabrescens group</i>	+			
86100	<i>Chrysops sp</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 38
 No. Qualitative Taxa: 38 ICI:
 Number of Organisms: 0 Qual EPT: 8

Table A-12 Fish Community Index Scores

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals					Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb	
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores				DELT anomalies
Twin Creek - (14500)																	
Year: 1995																	
45.90	D	08/03/1995	20	19(5)	2(3)	2(3)	1(1)	7(5)	30(3)	31(3)	16(5)	11.5(5)	42(3)	0.0(5)	965(5)	46	8.9
42.20	D	08/01/1995	28	21(5)	3(3)	2(3)	2(3)	6(5)	40(5)	37(3)	19(3)	6.4(5)	50(3)	0.0(5)	429(3)	46	8.4
42.20	D	09/12/1995	28	24(5)	3(3)	4(5)	4(5)	6(5)	41(5)	49(3)	34(3)	3.7(3)	43(3)	0.0(5)	758(5)	50	9.0
37.90	D	07/25/1995	34	19(5)	4(5)	3(3)	2(3)	4(3)	62(5)	9(5)	1(5)	2.9(3)	75(5)	0.3(3)	927(5)	50	9.3
37.90	D	09/12/1995	34	22(5)	4(5)	3(3)	4(5)	5(5)	58(5)	15(5)	4(5)	2.1(3)	67(5)	0.0(5)	1283(5)	56	9.6
35.40	D	08/01/1995	88	28(5)	4(5)	3(3)	5(3)	7(5)	32(3)	9(5)	6(5)	4.1(3)	41(3)	0.0(5)	1841(5)	50	9.7
35.40	D	09/13/1995	88	27(5)	3(3)	4(5)	5(3)	6(5)	38(5)	16(5)	12(5)	2.0(3)	49(3)	0.0(5)	3575(5)	52	10.3
35.00	D	08/01/1995	88	29(5)	4(5)	4(5)	5(3)	7(5)	41(5)	8(5)	5(5)	6.7(5)	56(5)	0.0(5)	884(5)	58	8.6
35.00	D	09/13/1995	88	26(5)	4(5)	4(5)	5(3)	4(3)	39(5)	15(5)	11(5)	5.3(5)	49(3)	0.0(5)	1686(5)	54	10.6
34.00	D	08/01/1995	89	26(5)	4(5)	3(3)	5(3)	6(5)	40(5)	9(5)	7(5)	2.3(3)	49(3)	0.0(5)	1229(5)	52	9.3
34.00	D	09/13/1995	89	29(5)	4(5)	4(5)	6(5)	6(5)	46(5)	17(5)	16(5)	3.7(3)	56(5)	0.0(5)	1865(5)	58	10.6
31.70	D	09/14/1995	96	23(5)	4(5)	4(5)	2(1)	4(3)	54(5)	17(5)	13(5)	8.7(5)	73(5)	0.0(5)	1080(5)	54	10.5
31.70	D	08/02/1995	96	26(5)	4(5)	4(5)	3(3)	6(5)	44(5)	23(3)	13(5)	13.9(5)	68(5)	0.0(5)	471(3)	54	9.2
29.70	D	08/02/1995	131	23(5)	4(5)	3(3)	4(3)	5(3)	18(3)	3(5)	2(5)	1.7(3)	20(1)	0.0(5)	2951(5)	46	8.4
29.70	D	09/14/1995	131	25(5)	3(3)	4(3)	5(3)	5(3)	17(1)	12(5)	10(5)	2.5(3)	21(1)	0.0(5)	6472(5)	42	10.0
27.50	D	08/04/1995	143	26(5)	4(5)	4(3)	5(3)	6(5)	38(5)	5(5)	3(5)	3.4(3)	45(3)	0.0(5)	2076(5)	52	9.8
27.50	D	09/14/1995	143	28(5)	4(5)	5(5)	5(3)	5(3)	23(3)	3(5)	2(5)	2.0(3)	25(1)	0.0(5)	3881(5)	48	9.9
26.50	D	08/16/1995	146	28(5)	4(5)	4(3)	7(5)	6(5)	53(5)	5(5)	2(5)	9.4(5)	77(5)	0.4(3)	654(3)	54	9.8
26.50	D	09/15/1995	146	28(5)	4(5)	4(3)	7(5)	6(5)	64(5)	6(5)	5(5)	8.0(5)	71(5)	0.0(5)	1842(5)	58	10.7
25.20	D	08/14/1995	150	23(5)	4(5)	4(3)	5(3)	5(3)	63(5)	5(5)	4(5)	6.0(5)	70(5)	0.0(5)	899(5)	54	9.7
25.20	D	09/14/1995	150	27(5)	4(5)	4(3)	6(5)	6(5)	65(5)	7(5)	6(5)	8.8(5)	72(5)	0.0(5)	1457(5)	58	10.4
23.90	D	09/15/1995	192	27(5)	4(5)	4(3)	6(5)	5(3)	35(3)	5(5)	3(5)	7.4(5)	43(3)	0.0(5)	1977(5)	52	9.9
19.20	D	09/18/1995	225	28(5)	4(5)	5(5)	6(5)	4(3)	27(3)	4(5)	3(5)	3.3(3)	35(3)	0.1(5)	2654(5)	52	9.9

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Table A-12 Fish Community Index Scores

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals						Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies			
19.00	D	09/18/1995	225	32(5)	5(5)	4(3)	7(5)	7(5)	43(5)	15(5)	13(5)	3.4(3)	50(3)	0.1(5)	2342(5)	54	10.6
16.50	D	09/15/1995	236	26(5)	4(5)	6(5)	6(5)	4(3)	66(5)	4(5)	4(5)	4.0(3)	77(5)	0.0(5)	1110(5)	56	10.2
13.40	D	09/19/1995	271	26(5)	3(3)	5(5)	6(5)	4(3)	51(5)	10(5)	11(5)	3.2(3)	56(5)	0.8(3)	2468(5)	52	10.5
9.80	D	09/19/1995	275	31(5)	4(5)	6(5)	7(5)	4(3)	48(5)	8(5)	10(5)	6.3(5)	54(3)	0.0(5)	2253(5)	56	10.9
8.20	D	09/19/1995	285	26(5)	4(5)	5(5)	6(5)	5(3)	56(5)	3(5)	2(5)	4.0(3)	60(5)	0.0(5)	1526(5)	56	9.7
3.40	D	09/20/1995	312	30(5)	5(5)	6(5)	4(3)	4(3)	53(5)	8(5)	8(5)	5.4(5)	67(5)	0.1(5)	1859(5)	56	10.7
0.60	D	09/20/1995	316	27(5)	4(5)	6(5)	4(3)	5(3)	61(5)	4(5)	2(5)	4.0(3)	73(5)	0.2(3)	1409(5)	52	10.5
0.20	D	09/21/1995	316	25(5)	4(5)	6(5)	3(3)	2(1)	46(5)	3(5)	27(3)	2.7(3)	55(5)	0.4(3)	768(5)	48	10.3

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Table A-12 Fish Community Index Scores

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals					Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb	
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores				DELT anomalies
Little Twin Creek - (14501)																	
Year: 1995																	
6.30	E	07/27/1995	4	13(5)	2(0)	1(0)	0(1)	3(0)	45(5)	46(3)	5(5)	0.0(0)	20(3)	0.0(5)	1698(5)	46	8.3
6.30	E	09/26/1995	4	15(5)	2(0)	1(0)	0(1)	3(0)	45(5)	48(3)	8(5)	0.1(0)	17(1)	0.0(5)	1172(5)	44	7.9
4.70	D	07/26/1995	11	20(5)	3(0)	2(0)	0(3)	5(0)	34(5)	17(5)	6(5)	0.0(0)	32(3)	0.0(5)	8130(5)	54	9.7
4.70	D	09/27/1995	11	24(5)	3(0)	4(0)	0(5)	4(0)	18(5)	24(5)	13(5)	0.4(0)	18(1)	0.0(5)	4964(5)	52	9.1
2.70	D	07/27/1995	18	21(5)	3(0)	4(0)	0(3)	5(0)	29(5)	31(5)	8(5)	0.6(0)	14(1)	0.0(5)	2880(5)	52	8.9
2.70	D	09/27/1995	18	24(5)	3(0)	4(0)	1(5)	5(0)	34(5)	48(3)	11(5)	0.8(0)	11(1)	0.0(5)	2502(5)	52	9.2
Toms Run - (14502)																	
Year: 1995																	
12.10	D	08/10/1995	6	15(5)	1(0)	1(0)	0(1)	3(0)	41(5)	60(1)	15(3)	1.3(0)	21(3)	0.0(5)	476(3)	38	6.9
8.50	D	08/10/1995	10	18(5)	2(0)	0(0)	1(3)	6(0)	42(5)	38(3)	11(5)	4.3(0)	47(5)	0.0(5)	504(3)	50	7.7
Bantas Fork - (14505)																	
Year: 1995																	
9.50	D	08/18/1995	11	23(5)	2(0)	3(0)	4(5)	5(0)	37(5)	21(5)	10(5)	0.9(0)	43(3)	0.0(5)	1468(5)	56	9.2
9.50	D	09/26/1995	11	22(5)	1(0)	3(0)	3(5)	5(0)	46(5)	28(5)	18(3)	1.1(0)	42(3)	0.0(5)	1296(5)	54	8.9
Goose Creek - (14506)																	
Year: 1995																	
4.40	D	08/11/1995	3	13(5)	0(0)	2(0)	0(1)	3(0)	33(5)	81(1)	16(3)	0.0(0)	15(1)	0.0(5)	180(3)	38	6.4
0.20	D	08/11/1995	11	24(5)	3(0)	2(0)	2(5)	5(0)	35(5)	49(3)	13(5)	2.6(0)	38(3)	0.0(5)	606(3)	50	8.3

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Table A-12 Fish Community Index Scores

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals					Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb	
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores				DELT anomalies
Price Creek - (14510)																	
Year: 1995																	
3.90	D	08/07/1995	20	17(5)	2(3)	2(3)	1(1)	5(5)	34(3)	23(5)	9(5)	18.6(5)	57(5)	0.0(5)	236(3)	48	7.6
0.60	D	08/17/1995	29	28(5)	4(5)	4(5)	3(3)	6(5)	26(3)	11(5)	5(5)	3.4(3)	32(3)	0.0(5)	1780(5)	52	9.6
Millers Fork - (14513)																	
Year: 1995																	
0.30	D	08/18/1995	25	25(5)	4(5)	4(5)	3(3)	5(5)	55(5)	16(5)	3(5)	6.7(5)	75(5)	0.4(3)	563(3)	54	9.3
0.30	D	09/21/1995	25	25(5)	4(5)	4(5)	3(3)	6(5)	55(5)	18(5)	9(5)	5.8(5)	75(5)	0.1(5)	906(5)	58	10.1

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/03/95
River Mile: 45.90	Basin: Great Miami River	
Data Source: 01	Time Fished: 2152 sec Drain Area: 20.2 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
NORTHERN HOG SUCKER	R	I	S	M	19	28.50	2.05	0.75	7.76	26.32
WHITE SUCKER	W	O	S	T	4	6.00	0.43	0.26	2.69	43.33
CREEK CHUB	N	G	N	T	138	207.00	14.87	1.86	19.19	8.96
ROSEFIN SHINER	N	I	S	M	1	1.50	0.11	0.01	0.09	6.00
STRIPED SHINER	N	I	S		31	46.50	3.34	0.71	7.29	15.16
SAND SHINER	N	I	M	M	10	15.00	1.08	0.03	0.33	2.10
BLUNTNOSE MINNOW	N	O	C	T	143	214.50	15.41	0.69	7.10	3.20
CENTRAL STONEROLLER	N	H	N		147	220.50	15.84	1.88	19.44	8.52
STRIPED SH X STONEROLLER					1	1.50	0.11	0.03	0.31	20.00
BL'KSTRIPE TOPMINNOW		I	M		2	3.00	0.22	0.01	0.06	2.00
ROCK BASS	S	C	C		91	136.50	9.81	1.57	16.19	11.46
SMALLMOUTH BASS	F	C	C	M	16	24.00	1.72	0.03	0.34	1.38
LONGEAR SUNFISH	S	I	C	M	60	90.00	6.47	0.92	9.47	10.17
JOHNNY DARTER	D	I	C		2	3.00	0.22	0.01	0.06	2.00
GREENSIDE DARTER	D	I	S	M	63	94.50	6.79	0.39	4.06	4.14
BANDED DARTER	D	I	S	I	1	1.50	0.11	0.01	0.05	3.00
RAINBOW DARTER	D	I	S	M	148	222.00	15.95	0.49	5.05	2.20
ORANGETHROAT DARTER	D	I	S		12	18.00	1.29	0.03	0.28	1.50
FANTAIL DARTER	D	I	C		1	1.50	0.11	0.00	0.03	2.00
LEAST DARTER	D	I	N		38	57.00	4.09	0.02	0.24	0.39
<i>Date Total</i>					928	1,392.00		9.67		
<i>Number of Species</i>					19					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/01/95
River Mile: 42.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 4043 sec Drain Area: 28.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
NORTHERN HOG SUCKER	R	I	S	M	4	6.00	0.88	0.37	2.24	61.50
WHITE SUCKER	W	O	S	T	32	48.00	7.06	2.18	13.23	45.31
COMMON CARP	G	O	M	T	2	3.00	0.44	7.28	44.24	2,425.00
CREEK CHUB	N	G	N	T	69	103.50	15.23	1.20	7.32	11.62
SILVER SHINER	N	I	S	I	9	13.50	1.99	0.04	0.25	3.00
ROSEFIN SHINER	N	I	S	M	18	27.00	3.97	0.06	0.34	2.06
STRIPED SHINER	N	I	S		32	48.00	7.06	1.26	7.66	26.25
SPOTFIN SHINER	N	I	M		17	25.50	3.75	0.11	0.68	4.38
FATHEAD MINNOW	N	O	C	T	1	1.50	0.22	0.01	0.03	3.00
BLUNTNOSE MINNOW	N	O	C	T	53	79.50	11.70	0.26	1.58	3.26
CENTRAL STONEROLLER	N	H	N		39	58.50	8.61	0.52	3.14	8.82
YELLOW BULLHEAD		I	C	T	6	9.00	1.32	0.54	3.28	60.00
ROCK BASS	S	C	C		28	42.00	6.18	1.49	9.03	35.36
SMALLMOUTH BASS	F	C	C	M	1	1.50	0.22	0.05	0.27	30.00
GREEN SUNFISH	S	I	C	T	4	6.00	0.88	0.12	0.73	20.00
LONGEAR SUNFISH	S	I	C	M	48	72.00	10.60	0.72	4.40	10.04
JOHNNY DARTER	D	I	C		1	1.50	0.22	0.00	0.02	2.00
GREENSIDE DARTER	D	I	S	M	35	52.50	7.73	0.15	0.89	2.77
BANDED DARTER	D	I	S	I	4	6.00	0.88	0.01	0.05	1.50
RAINBOW DARTER	D	I	S	M	44	66.00	9.71	0.10	0.60	1.48
ORANGETHROAT DARTER	D	I	S		3	4.50	0.66	0.00	0.02	0.67
LEAST DARTER	D	I	N		3	4.50	0.66	0.00	0.02	0.67
<i>Date Total</i>					453	679.50		16.44		
<i>Number of Species</i>					22					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/12/95
River Mile: 42.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 2558 sec Drain Area: 28.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: Flow: C	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
BLACK REDHORSE	R	I	S	I	2	3.00	0.20	1.50	5.14	500.00
GOLDEN REDHORSE	R	I	S	M	1	1.50	0.10	0.38	1.29	250.00
NORTHERN HOG SUCKER	R	I	S	M	21	31.50	2.13	1.59	5.45	50.48
WHITE SUCKER	W	O	S	T	119	178.50	12.09	9.54	32.71	53.45
COMMON CARP	G	O	M	T	2	3.00	0.20	0.05	0.16	16.00
CREEK CHUB	N	G	N	T	148	222.00	15.04	6.32	21.67	28.47
SILVER SHINER	N	I	S	I	46	69.00	4.67	0.25	0.85	3.61
ROSYFACE SHINER	N	I	S	I	1	1.50	0.10	0.00	0.01	2.00
ROSEFIN SHINER	N	I	S	M	93	139.50	9.45	0.35	1.20	2.52
STRIPED SHINER	N	I	S		91	136.50	9.25	2.69	9.22	19.70
SPOTFIN SHINER	N	I	M		10	15.00	1.02	0.06	0.21	4.00
SILVERJAW MINNOW	N	I	M		1	1.50	0.10	0.00	0.01	2.00
BLUNTNOSE MINNOW	N	O	C	T	209	313.50	21.24	1.38	4.73	4.40
CENTRAL STONEROLLER	N	H	N		44	66.00	4.47	1.50	5.15	22.76
BL'KSTRIPE TOPMINNOW		I	M		2	3.00	0.20	0.01	0.02	1.50
ROCK BASS	S	C	C		32	48.00	3.25	1.36	4.66	28.28
SMALLMOUTH BASS	F	C	C	M	4	6.00	0.41	0.26	0.87	42.50
GREEN SUNFISH	S	I	C	T	1	1.50	0.10	0.02	0.08	15.00
LONGEAR SUNFISH	S	I	C	M	111	166.50	11.28	1.81	6.19	10.85
LOGPERCH	D	I	S	M	1	1.50	0.10	0.03	0.09	18.00
JOHNNY DARTER	D	I	C		12	18.00	1.22	0.01	0.05	0.75
GREENSIDE DARTER	D	I	S	M	11	16.50	1.12	0.03	0.10	1.73
BANDED DARTER	D	I	S	I	5	7.50	0.51	0.01	0.03	1.20
RAINBOW DARTER	D	I	S	M	14	21.00	1.42	0.02	0.08	1.14
LEAST DARTER	D	I	N		3	4.50	0.30	0.01	0.02	1.33
<i>Date Total</i>					984	1,476.00		29.17		
<i>Number of Species</i>					25					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 07/25/95
River Mile: 37.90	Basin: Great Miami River	
Data Source: 01	Time Fished: 2558 sec Drain Area: 34.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 45 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	3	4.50	0.44	1.12	9.08	248.00
NORTHERN HOG SUCKER	R	I	S	M	21	31.50	3.08	1.46	11.87	46.33
WHITE SUCKER	W	O	S	T	5	7.50	0.73	0.27	2.22	36.40
CREEK CHUB	N	G	N	T	44	66.00	6.46	1.41	11.44	21.32
SILVER SHINER	N	I	S	I	29	43.50	4.26	0.13	1.02	2.90
ROSEFIN SHINER	N	I	S	M	2	3.00	0.29	0.03	0.22	9.00
STRIPED SHINER	N	I	S		113	169.50	16.59	2.08	16.87	12.24
BLUNTNOSE MINNOW	N	O	C	T	4	6.00	0.59	0.02	0.16	3.25
CENTRAL STONEROLLER	N	H	N		98	147.00	14.39	1.01	8.17	6.84
ROCK BASS	S	C	C		6	9.00	0.88	0.76	6.15	84.00
SMALLMOUTH BASS	F	C	C	M	14	21.00	2.06	1.79	14.58	85.36
GREEN SUNFISH	S	I	C	T	10	15.00	1.47	0.59	4.76	39.00
BLUEGILL SUNFISH	S	I	C	P	2	3.00	0.29	0.01	0.07	3.00
LONGEAR SUNFISH	S	I	C	M	3	4.50	0.44	0.13	1.04	28.33
LOGPERCH	D	I	S	M	3	4.50	0.44	0.05	0.43	11.67
GREENSIDE DARTER	D	I	S	M	125	187.50	18.36	0.59	4.79	3.14
RAINBOW DARTER	D	I	S	M	119	178.50	17.47	0.27	2.20	1.52
FANTAIL DARTER	D	I	C		32	48.00	4.70	0.08	0.67	1.72
MOTTLED SCULPIN		I	C		48	72.00	7.05	0.52	4.26	7.27
<i>Date Total</i>					681	1,021.50		12.30		
<i>Number of Species</i>					19					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/12/95
River Mile: 37.90	Basin: Great Miami River	
Data Source: 01	Time Fished: 3098 sec Drain Area: 34.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	6	9.00	0.59	1.80	9.81	200.00
NORTHERN HOG SUCKER	R	I	S	M	33	49.50	3.27	3.29	17.92	66.45
WHITE SUCKER	W	O	S	T	5	7.50	0.50	0.54	2.93	71.60
COMMON CARP	G	O	M	T	1	1.50	0.10	0.02	0.10	12.00
CREEK CHUB	N	G	N	T	108	162.00	10.70	3.95	21.54	24.41
SILVER SHINER	N	I	S	I	178	267.00	17.64	0.37	2.04	1.40
ROSYFACE SHINER	N	I	S	I	13	19.50	1.29	0.05	0.25	2.31
ROSEFIN SHINER	N	I	S	M	24	36.00	2.38	0.11	0.60	3.05
STRIPED SHINER	N	I	S		116	174.00	11.50	2.55	13.89	14.66
SILVERJAW MINNOW	N	I	M		1	1.50	0.10	0.00	0.02	2.00
BLUNTNOSE MINNOW	N	O	C	T	36	54.00	3.57	0.15	0.82	2.78
CENTRAL STONEROLLER	N	H	N		160	240.00	15.86	1.52	8.29	6.34
ROCK BASS	S	C	C		2	3.00	0.20	0.29	1.56	95.50
SMALLMOUTH BASS	F	C	C	M	19	28.50	1.88	2.09	11.37	73.26
GREEN SUNFISH	S	I	C	T	4	6.00	0.40	0.22	1.19	36.25
BLUEGILL SUNFISH	S	I	C	P	3	4.50	0.30	0.06	0.32	13.00
LONGEAR SUNFISH	S	I	C	M	3	4.50	0.30	0.15	0.82	33.33
LOGPERCH	D	I	S	M	8	12.00	0.79	0.18	0.98	14.88
GREENSIDE DARTER	D	I	S	M	94	141.00	9.32	0.42	2.30	2.99
BANDED DARTER	D	I	S	I	3	4.50	0.30	0.01	0.04	1.67
RAINBOW DARTER	D	I	S	M	107	160.50	10.60	0.22	1.17	1.34
FANTAIL DARTER	D	I	C		13	19.50	1.29	0.04	0.21	1.92
MOTTLED SCULPIN		I	C		72	108.00	7.14	0.35	1.88	3.20
<i>Date Total</i>					1,009	1,513.50		18.36		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/01/95
River Mile: 35.40	Basin: Great Miami River	
Data Source: 01	Time Fished: 2988 sec Drain Area: 88.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 55 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	3	4.50	0.22	0.87	3.00	194.00
NORTHERN HOG SUCKER	R	I	S	M	48	72.00	3.55	4.56	15.66	63.30
WHITE SUCKER	W	O	S	T	13	19.50	0.96	0.81	2.77	41.38
COMMON CARP	G	O	M	T	1	1.50	0.07	7.05	24.22	4,700.00
RIVER CHUB	N	I	N	I	2	3.00	0.15	0.16	0.54	52.50
CREEK CHUB	N	G	N	T	42	63.00	3.10	0.53	1.83	8.45
SILVER SHINER	N	I	S	I	15	22.50	1.11	0.08	0.29	3.73
ROSYFACE SHINER	N	I	S	I	33	49.50	2.44	0.11	0.39	2.27
ROSEFIN SHINER	N	I	S	M	17	25.50	1.26	0.06	0.21	2.35
STRIPED SHINER	N	I	S		86	129.00	6.35	1.60	5.51	12.42
SPOTFIN SHINER	N	I	M		11	16.50	0.81	0.08	0.29	5.00
SAND SHINER	N	I	M	M	45	67.50	3.32	0.16	0.54	2.32
SILVERJAW MINNOW	N	I	M		4	6.00	0.30	0.03	0.09	4.50
BLUNTNOSE MINNOW	N	O	C	T	67	100.50	4.95	0.39	1.33	3.84
CENTRAL STONEROLLER	N	H	N		623	934.50	46.01	5.83	20.03	6.24
STRIPED SH X ROSYFACE SH		I			1	1.50	0.07	0.01	0.02	3.00
STRIPED SH X ROSEFIN SH		I			1	1.50	0.07	0.00	0.01	2.00
ROCK BASS	S	C	C		38	57.00	2.81	4.50	15.47	78.98
SMALLMOUTH BASS	F	C	C	M	10	15.00	0.74	0.77	2.65	51.40
LARGEMOUTH BASS	F	C	C		8	12.00	0.59	0.13	0.44	10.63
GREEN SUNFISH	S	I	C	T	4	6.00	0.30	0.09	0.32	15.50
BLUEGILL SUNFISH	S	I	C	P	6	9.00	0.44	0.04	0.12	4.00
LONGEAR SUNFISH	S	I	C	M	13	19.50	0.96	0.48	1.64	24.46
LOGPERCH	D	I	S	M	7	10.50	0.52	0.10	0.34	9.29
JOHNNY DARTER	D	I	C		2	3.00	0.15	0.01	0.02	1.50
GREENSIDE DARTER	D	I	S	M	37	55.50	2.73	0.15	0.52	2.70
BANDED DARTER	D	I	S	I	18	27.00	1.33	0.04	0.15	1.65
RAINBOW DARTER	D	I	S	M	152	228.00	11.23	0.24	0.83	1.06
ORANGETHROAT DARTER	D	I	S		1	1.50	0.07	0.00	0.01	2.00
FANTAIL DARTER	D	I	C		9	13.50	0.66	0.04	0.14	3.11
MOTTLED SCULPIN		I	C		37	55.50	2.73	0.19	0.66	3.44
<i>Date Total</i>					1,354	2,031.00		29.11		
<i>Number of Species</i>					29					
<i>Number of Hybrids</i>					2					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/13/95
River Mile: 35.40	Basin: Great Miami River	
Data Source: 01	Time Fished: 4748 sec Drain Area: 88.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	21	31.50	0.74	6.57	6.36	208.57
GOLDEN REDHORSE	R	I	S	M	14	21.00	0.49	7.80	7.54	371.21
NORTHERN HOG SUCKER	R	I	S	M	88	132.00	3.11	5.56	5.38	42.14
WHITE SUCKER	W	O	S	T	25	37.50	0.88	1.61	1.56	43.00
COMMON CARP	G	O	M	T	11	16.50	0.39	51.04	49.38	3,093.18
CREEK CHUB	N	G	N	T	110	165.00	3.89	2.74	2.65	16.60
SILVER SHINER	N	I	S	I	43	64.50	1.52	0.17	0.17	2.67
ROSYFACE SHINER	N	I	S	I	75	112.50	2.65	0.23	0.22	2.05
ROSEFIN SHINER	N	I	S	M	41	61.50	1.45	0.12	0.12	1.95
STRIPED SHINER	N	I	S		435	652.50	15.38	4.58	4.43	7.02
SPOTFIN SHINER	N	I	M		12	18.00	0.42	0.08	0.08	4.42
SAND SHINER	N	I	M	M	88	132.00	3.11	0.25	0.24	1.90
MIMIC SHINER	N	I	M	I	3	4.50	0.11	0.01	0.01	2.00
SILVERJAW MINNOW	N	I	M		15	22.50	0.53	0.09	0.08	3.87
BLUNTNOSE MINNOW	N	O	C	T	300	450.00	10.60	1.80	1.74	4.00
CENTRAL STONEROLLER	N	H	N		942	1,413.00	33.30	10.46	10.12	7.40
ROCK BASS	S	C	C		27	40.50	0.95	3.35	3.24	82.74
SMALLMOUTH BASS	F	C	C	M	26	39.00	0.92	4.58	4.43	117.38
LARGEMOUTH BASS	F	C	C		4	6.00	0.14	0.23	0.22	37.50
BLUEGILL SUNFISH	S	I	C	P	36	54.00	1.27	0.17	0.16	3.06
LONGEAR SUNFISH	S	I	C	M	15	22.50	0.53	0.63	0.61	27.87
GREEN SF X BLUEGILL					1	1.50	0.04	0.02	0.02	15.00
LOGPERCH	D	I	S	M	11	16.50	0.39	0.22	0.21	13.27
JOHNNY DARTER	D	I	C		2	3.00	0.07	0.01	0.00	1.50
GREENSIDE DARTER	D	I	S	M	28	42.00	0.99	0.12	0.12	2.93
BANDED DARTER	D	I	S	I	27	40.50	0.95	0.05	0.05	1.33
RAINBOW DARTER	D	I	S	M	258	387.00	9.12	0.41	0.40	1.06
FANTAIL DARTER	D	I	C		5	7.50	0.18	0.01	0.01	1.80
MOTTLED SCULPIN		I	C		166	249.00	5.87	0.47	0.45	1.88
<i>Date Total</i>					2,829	4,243.50		103.36		
<i>Number of Species</i>					28					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/01/95
River Mile: 35.00	Basin: Great Miami River	
Data Source: 01	Time Fished: 2438 sec Drain Area: 88.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 45 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	7	10.50	1.09	2.78	7.95	264.29
GOLDEN REDHORSE	R	I	S	M	1	1.50	0.16	0.45	1.29	300.00
NORTHERN HOG SUCKER	R	I	S	M	33	49.50	5.13	1.39	3.98	28.06
WHITE SUCKER	W	O	S	T	5	7.50	0.78	0.78	2.22	103.40
COMMON CARP	G	O	M	T	5	7.50	0.78	21.80	62.48	2,906.25
CREEK CHUB	N	G	N	T	12	18.00	1.87	0.42	1.20	23.33
SILVER SHINER	N	I	S	I	9	13.50	1.40	0.03	0.09	2.44
ROSYFACE SHINER	N	I	S	I	8	12.00	1.24	0.03	0.09	2.50
ROSEFIN SHINER	N	I	S	M	9	13.50	1.40	0.02	0.05	1.33
STRIPED SHINER	N	I	S		62	93.00	9.64	0.70	1.99	7.48
SPOTFIN SHINER	N	I	M		2	3.00	0.31	0.01	0.03	3.00
SAND SHINER	N	I	M	M	57	85.50	8.86	0.17	0.47	1.93
MIMIC SHINER	N	I	M	I	1	1.50	0.16	0.00	0.01	2.00
SILVERJAW MINNOW	N	I	M		1	1.50	0.16	0.01	0.01	3.00
BLUNTNOSE MINNOW	N	O	C	T	25	37.50	3.89	0.07	0.21	1.92
CENTRAL STONEROLLER	N	H	N		191	286.50	29.70	1.33	3.81	4.64
ROCK BASS	S	C	C		30	45.00	4.67	3.51	10.07	78.07
SMALLMOUTH BASS	F	C	C	M	5	7.50	0.78	0.11	0.30	14.00
LARGEMOUTH BASS	F	C	C		8	12.00	1.24	0.11	0.31	9.00
GREEN SUNFISH	S	I	C	T	7	10.50	1.09	0.32	0.91	30.29
BLUEGILL SUNFISH	S	I	C	P	7	10.50	1.09	0.06	0.18	6.00
LONGEAR SUNFISH	S	I	C	M	11	16.50	1.71	0.37	1.07	22.55
GREEN SF X BLUEGILL					1	1.50	0.16	0.10	0.29	68.00
LOGPERCH	D	I	S	M	4	6.00	0.62	0.07	0.20	11.50
JOHNNY DARTER	D	I	C		3	4.50	0.47	0.01	0.02	1.33
GREENSIDE DARTER	D	I	S	M	8	12.00	1.24	0.03	0.09	2.57
BANDED DARTER	D	I	S	I	7	10.50	1.09	0.01	0.03	1.14
RAINBOW DARTER	D	I	S	M	110	165.00	17.11	0.16	0.46	0.96
ORANGETHROAT DARTER	D	I	S		1	1.50	0.16	0.00	0.01	2.00
FANTAIL DARTER	D	I	C		2	3.00	0.31	0.01	0.01	1.50
MOTTLED SCULPIN		I	C		11	16.50	1.71	0.05	0.15	3.27
<i>Date Total</i>					643	964.50		34.88		
<i>Number of Species</i>					30					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/13/95
River Mile: 35.00	Basin: Great Miami River	
Data Source: 01	Time Fished: 2982 sec Drain Area: 88.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 55 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	74	111.00	5.57	23.29	30.50	209.78
GOLDEN REDHORSE	R	I	S	M	14	21.00	1.05	5.44	7.12	258.93
NORTHERN HOG SUCKER	R	I	S	M	57	85.50	4.29	4.62	6.05	54.04
WHITE SUCKER	W	O	S	T	55	82.50	4.14	6.41	8.40	77.73
COMMON CARP	G	O	M	T	2	3.00	0.15	9.19	12.03	3,062.50
RIVER CHUB	N	I	N	I	1	1.50	0.08	0.02	0.02	10.00
CREEK CHUB	N	G	N	T	46	69.00	3.46	1.23	1.61	17.83
SILVER SHINER	N	I	S	I	40	60.00	3.01	0.25	0.33	4.20
ROSYFACE SHINER	N	I	S	I	22	33.00	1.66	0.07	0.09	2.18
ROSEFIN SHINER	N	I	S	M	27	40.50	2.03	0.06	0.07	1.35
STRIPED SHINER	N	I	S		81	121.50	6.09	1.92	2.51	15.80
SPOTFIN SHINER	N	I	M		10	15.00	0.75	0.06	0.08	4.00
SAND SHINER	N	I	M	M	35	52.50	2.63	0.10	0.13	1.86
SILVERJAW MINNOW	N	I	M		1	1.50	0.08	0.00	0.00	2.00
BLUNTNOSE MINNOW	N	O	C	T	90	135.00	6.77	0.41	0.54	3.04
CENTRAL STONEROLLER	N	H	N		412	618.00	31.00	9.39	12.30	15.20
ROCK BASS	S	C	C		38	57.00	2.86	5.47	7.16	95.92
SMALLMOUTH BASS	F	C	C	M	27	40.50	2.03	3.68	4.83	90.96
LARGEMOUTH BASS	F	C	C		6	9.00	0.45	0.80	1.05	89.17
GREEN SUNFISH	S	I	C	T	12	18.00	0.90	0.57	0.75	31.58
BLUEGILL SUNFISH	S	I	C	P	28	42.00	2.11	0.29	0.38	6.96
LONGEAR SUNFISH	S	I	C	M	51	76.50	3.84	2.25	2.95	29.41
LONGEAR SF X B'GILL					2	3.00	0.15	0.32	0.41	105.00
LOGPERCH	D	I	S	M	8	12.00	0.60	0.12	0.16	10.00
GREENSIDE DARTER	D	I	S	M	16	24.00	1.20	0.06	0.08	2.63
BANDED DARTER	D	I	S	I	5	7.50	0.38	0.02	0.02	2.00
RAINBOW DARTER	D	I	S	M	123	184.50	9.26	0.20	0.27	1.10
MOTTLED SCULPIN		I	C		46	69.00	3.46	0.11	0.15	1.63
<i>Date Total</i>					1,329	1,993.50		76.35		
<i>Number of Species</i>					27					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/01/95
River Mile: 34.00	Basin: Great Miami River	Invalid Sample:
Data Source: 01	Time Fished: 2447 sec Drain Area: 89.0 sq mi	Sampler Type: D
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
BLACK REDHORSE	R	I	S	I	14	21.00	1.56	4.60	27.28	219.23
NORTHERN HOG SUCKER	R	I	S	M	44	66.00	4.89	2.38	14.12	36.09
WHITE SUCKER	W	O	S	T	25	37.50	2.78	0.94	5.56	25.04
CREEK CHUB	N	G	N	T	14	21.00	1.56	0.21	1.24	10.00
SILVER SHINER	N	I	S	I	3	4.50	0.33	0.01	0.07	2.67
ROSYFACE SHINER	N	I	S	I	16	24.00	1.78	0.05	0.30	2.14
ROSEFIN SHINER	N	I	S	M	2	3.00	0.22	0.01	0.04	2.00
STRIPED SHINER	N	I	S		49	73.50	5.45	0.93	5.52	12.67
SPOTFIN SHINER	N	I	M		10	15.00	1.11	0.09	0.53	6.00
SAND SHINER	N	I	M	M	54	81.00	6.01	0.17	1.03	2.13
MIMIC SHINER	N	I	M	I	1	1.50	0.11	0.00	0.02	2.00
SILVERJAW MINNOW	N	I	M		4	6.00	0.44	0.02	0.14	3.75
BLUNTNOSE MINNOW	N	O	C	T	36	54.00	4.00	0.18	1.05	3.28
CENTRAL STONEROLLER	N	H	N		363	544.50	40.38	3.84	22.78	7.06
ROCK BASS	S	C	C		16	24.00	1.78	0.69	4.07	28.56
SMALLMOUTH BASS	F	C	C	M	5	7.50	0.56	1.52	9.03	203.00
GREEN SUNFISH	S	I	C	T	5	7.50	0.56	0.16	0.92	20.80
BLUEGILL SUNFISH	S	I	C	P	7	10.50	0.78	0.10	0.56	9.00
LONGEAR SUNFISH	S	I	C	M	13	19.50	1.45	0.37	2.18	18.85
LOGPERCH	D	I	S	M	5	7.50	0.56	0.06	0.36	8.00
JOHNNY DARTER	D	I	C		1	1.50	0.11	0.00	0.02	2.00
GREENSIDE DARTER	D	I	S	M	46	69.00	5.12	0.21	1.26	3.09
BANDED DARTER	D	I	S	I	14	21.00	1.56	0.03	0.18	1.43
RAINBOW DARTER	D	I	S	M	144	216.00	16.02	0.28	1.64	1.28
FANTAIL DARTER	D	I	C		6	9.00	0.67	0.02	0.11	2.00
MOTTLED SCULPIN		I	C		2	3.00	0.22	0.00	0.02	1.00
<i>Date Total</i>					899	1,348.50		16.88		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					0					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 09/13/95
River Mile: 34.00	Basin: Great Miami River	
Data Source: 01	Time Fished: 2446 sec	Drain Area: 89.0 sq mi
Purpose:	Dist Fished: 0.20 km	Depth: 40 cm Flow: C
		Invalid Sample:
		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
BLACK REDHORSE	R	I	S	I	49	73.50	3.26	16.28	30.33	221.43
GOLDEN REDHORSE	R	I	S	M	16	24.00	1.07	6.60	12.30	275.00
NORTHERN HOG SUCKER	R	I	S	M	102	153.00	6.80	7.68	14.31	50.21
WHITE SUCKER	W	O	S	T	50	75.00	3.33	5.08	9.46	67.66
COMMON CARP	G	O	M	T	2	3.00	0.13	0.35	0.64	115.00
CREEK CHUB	N	G	N	T	14	21.00	0.93	0.48	0.89	22.71
SILVER SHINER	N	I	S	I	16	24.00	1.07	0.08	0.15	3.44
ROSYFACE SHINER	N	I	S	I	23	34.50	1.53	0.08	0.14	2.17
ROSEFIN SHINER	N	I	S	M	32	48.00	2.13	0.10	0.18	2.00
STRIPED SHINER	N	I	S		138	207.00	9.19	2.36	4.40	11.40
SPOTFIN SHINER	N	I	M		8	12.00	0.53	0.05	0.09	4.13
SAND SHINER	N	I	M	M	97	145.50	6.46	0.26	0.49	1.80
MIMIC SHINER	N	I	M	I	8	12.00	0.53	0.02	0.04	1.88
SILVERJAW MINNOW	N	I	M		1	1.50	0.07	0.01	0.01	5.00
BLUNTNOSE MINNOW	N	O	C	T	187	280.50	12.46	0.71	1.32	2.52
CENTRAL STONEROLLER	N	H	N		349	523.50	23.25	4.60	8.56	8.78
STONECAT MADTOM		I	C	I	4	6.00	0.27	0.02	0.03	2.50
ROCK BASS	S	C	C		31	46.50	2.07	2.93	5.45	62.94
SMALLMOUTH BASS	F	C	C	M	20	30.00	1.33	2.29	4.26	76.20
LARGEMOUTH BASS	F	C	C		5	7.50	0.33	0.62	1.15	82.40
GREEN SUNFISH	S	I	C	T	5	7.50	0.33	0.20	0.37	26.20
BLUEGILL SUNFISH	S	I	C	P	13	19.50	0.87	0.12	0.22	6.15
LONGEAR SUNFISH	S	I	C	M	43	64.50	2.86	1.96	3.65	30.36
LOGPERCH	D	I	S	M	13	19.50	0.87	0.19	0.35	9.62
JOHNNY DARTER	D	I	C		1	1.50	0.07	0.00	0.01	2.00
GREENSIDE DARTER	D	I	S	M	29	43.50	1.93	0.12	0.23	2.83
BANDED DARTER	D	I	S	I	24	36.00	1.60	0.05	0.09	1.29
RAINBOW DARTER	D	I	S	M	198	297.00	13.19	0.35	0.64	1.16
FANTAIL DARTER	D	I	C		4	6.00	0.27	0.01	0.02	1.50
MOTTLED SCULPIN		I	C		19	28.50	1.27	0.12	0.22	4.21
<i>Date Total</i>					1,501	2,251.50		53.67		
<i>Number of Species</i>					30					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/02/95
River Mile: 31.70	Basin: Great Miami River	
Data Source: 01	Time Fished: 2696 sec Drain Area: 96.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	6	9.00	1.46	2.04	7.67	226.67
GOLDEN REDHORSE	R	I	S	M	2	3.00	0.49	1.05	3.94	349.00
NORTHERN HOG SUCKER	R	I	S	M	17	25.50	4.15	1.23	4.62	48.24
WHITE SUCKER	W	O	S	T	28	42.00	6.83	2.34	8.80	55.71
COMMON CARP	G	O	M	T	2	3.00	0.49	11.76	44.20	3,920.00
CREEK CHUB	N	G	N	T	13	19.50	3.17	0.25	0.95	13.00
SILVER SHINER	N	I	S	I	22	33.00	5.37	0.12	0.46	3.68
ROSEFIN SHINER	N	I	S	M	21	31.50	5.12	0.06	0.21	1.76
STRIPED SHINER	N	I	S		36	54.00	8.78	0.94	3.51	17.31
SPOTFIN SHINER	N	I	M		5	7.50	1.22	0.03	0.11	4.00
SAND SHINER	N	I	M	M	3	4.50	0.73	0.01	0.03	2.00
MIMIC SHINER	N	I	M	I	1	1.50	0.24	0.00	0.01	2.00
SILVERJAW MINNOW	N	I	M		1	1.50	0.24	0.00	0.01	1.00
BLUNTNOSE MINNOW	N	O	C	T	24	36.00	5.85	0.11	0.39	2.92
CENTRAL STONEROLLER	N	H	N		9	13.50	2.20	0.15	0.56	11.11
ROCK BASS	S	C	C		48	72.00	11.71	2.26	8.50	31.42
SMALLMOUTH BASS	F	C	C	M	8	12.00	1.95	0.71	2.67	59.00
LARGEMOUTH BASS	F	C	C		1	1.50	0.24	0.04	0.13	23.00
GREEN SUNFISH	S	I	C	T	29	43.50	7.07	1.34	5.02	30.69
BLUEGILL SUNFISH	S	I	C	P	32	48.00	7.80	0.28	1.04	5.75
LONGEAR SUNFISH	S	I	C	M	45	67.50	10.98	1.73	6.48	25.56
BLACKSIDE DARTER	D	I	S		1	1.50	0.24	0.01	0.03	6.00
LOGPERCH	D	I	S	M	3	4.50	0.73	0.06	0.23	13.33
JOHNNY DARTER	D	I	C		5	7.50	1.22	0.01	0.03	1.20
GREENSIDE DARTER	D	I	S	M	13	19.50	3.17	0.04	0.15	2.08
RAINBOW DARTER	D	I	S	M	33	49.50	8.05	0.06	0.21	1.15
FANTAIL DARTER	D	I	C		2	3.00	0.49	0.01	0.03	2.50
<i>Date Total</i>					410	615.00		26.60		
<i>Number of Species</i>					27					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/14/95
River Mile: 31.70	Basin: Great Miami River	
Data Source: 01	Time Fished: 2984 sec Drain Area: 96.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 65 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	79	118.50	9.14	26.76	32.93	225.84
GOLDEN REDHORSE	R	I	S	M	23	34.50	2.66	11.54	14.20	334.52
NORTHERN HOG SUCKER	R	I	S	M	77	115.50	8.91	8.16	10.05	70.68
WHITE SUCKER	W	O	S	T	42	63.00	4.86	8.04	9.89	127.57
CREEK CHUB	N	G	N	T	7	10.50	0.81	0.11	0.14	10.57
SILVER SHINER	N	I	S	I	34	51.00	3.94	0.20	0.25	3.97
ROSEFIN SHINER	N	I	S	M	63	94.50	7.29	0.20	0.24	2.08
STRIPED SHINER	N	I	S		98	147.00	11.34	2.03	2.49	13.78
SPOTFIN SHINER	N	I	M		7	10.50	0.81	0.03	0.04	3.00
SAND SHINER	N	I	M	M	32	48.00	3.70	0.08	0.09	1.56
SILVERJAW MINNOW	N	I	M		6	9.00	0.69	0.03	0.04	3.33
BLUNTNOSTE MINNOW	N	O	C	T	70	105.00	8.10	0.32	0.39	3.04
CENTRAL STONEROLLER	N	H	N		42	63.00	4.86	0.38	0.47	6.07
ROCK BASS	S	C	C		38	57.00	4.40	5.65	6.95	99.03
SMALLMOUTH BASS	F	C	C	M	33	49.50	3.82	11.98	14.74	241.97
LARGEMOUTH BASS	F	C	C		4	6.00	0.46	0.06	0.07	9.50
GREEN SUNFISH	S	I	C	T	25	37.50	2.89	1.46	1.80	39.00
BLUEGILL SUNFISH	S	I	C	P	42	63.00	4.86	0.47	0.58	7.45
LONGEAR SUNFISH	S	I	C	M	92	138.00	10.65	3.40	4.18	24.62
BLACKSIDE DARTER	D	I	S		1	1.50	0.12	0.01	0.01	5.00
LOGPERCH	D	I	S	M	20	30.00	2.31	0.31	0.38	10.25
GREENSIDE DARTER	D	I	S	M	10	15.00	1.16	0.03	0.04	2.00
RAINBOW DARTER	D	I	S	M	19	28.50	2.20	0.03	0.04	1.05
<i>Date Total</i>					864	1,296.00		81.26		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/02/95
River Mile: 29.70	Basin: Great Miami River	
Data Source: 01	Time Fished: 1778 sec Drain Area: 131.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 45 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	24	36.00	1.18	7.45	21.95	206.88
NORTHERN HOG SUCKER	R	I	S	M	54	81.00	2.66	3.75	11.05	46.26
WHITE SUCKER	W	O	S	T	3	4.50	0.15	0.06	0.18	13.33
CREEK CHUB	N	G	N	T	18	27.00	0.89	0.37	1.10	13.82
SILVER SHINER	N	I	S	I	5	7.50	0.25	0.03	0.10	4.40
ROSYFACE SHINER	N	I	S	I	23	34.50	1.13	0.08	0.23	2.22
ROSEFIN SHINER	N	I	S	M	3	4.50	0.15	0.01	0.04	2.67
STRIPED SHINER	N	I	S		70	105.00	3.45	0.96	2.82	9.10
SPOTFIN SHINER	N	I	M		1	1.50	0.05	0.01	0.01	3.00
SAND SHINER	N	I	M	M	21	31.50	1.03	0.07	0.21	2.28
BLUNTNOSE MINNOW	N	O	C	T	40	60.00	1.97	0.15	0.45	2.55
CENTRAL STONEROLLER	N	H	N		1,525	2,287.50	75.16	18.30	53.94	8.00
STRIPED SH X ROSYFACE SH		I			1	1.50	0.05	0.01	0.04	9.00
ROCK BASS	S	C	C		2	3.00	0.10	0.12	0.36	40.50
SMALLMOUTH BASS	F	C	C	M	33	49.50	1.63	1.79	5.26	36.06
GREEN SUNFISH	S	I	C	T	1	1.50	0.05	0.06	0.18	41.00
BLUEGILL SUNFISH	S	I	C	P	3	4.50	0.15	0.06	0.18	13.33
LONGEAR SUNFISH	S	I	C	M	2	3.00	0.10	0.03	0.09	10.00
LOGPERCH	D	I	S	M	11	16.50	0.54	0.12	0.36	7.45
GREENSIDE DARTER	D	I	S	M	39	58.50	1.92	0.18	0.52	3.03
BANDED DARTER	D	I	S	I	20	30.00	0.99	0.05	0.14	1.60
RAINBOW DARTER	D	I	S	M	116	174.00	5.72	0.21	0.62	1.20
FANTAIL DARTER	D	I	C		13	19.50	0.64	0.04	0.10	1.77
MOTTLED SCULPIN		I	C		1	1.50	0.05	0.03	0.08	18.00
<i>Date Total</i>					2,029	3,043.50		33.92		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/14/95
River Mile: 29.70	Basin: Great Miami River	
Data Source: 01	Time Fished: 3050 sec Drain Area: 131.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.15 km Depth: 40 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	76	152.00	2.06	28.10	21.51	184.86
GOLDEN REDHORSE	R	I	S	M	10	20.00	0.27	2.85	2.18	142.50
NORTHERN HOG SUCKER	R	I	S	M	121	242.00	3.29	10.15	7.77	41.95
WHITE SUCKER	W	O	S	T	4	8.00	0.11	0.18	0.14	22.50
RIVER CHUB	N	I	N	I	2	4.00	0.05	0.16	0.12	39.00
CREEK CHUB	N	G	N	T	75	150.00	2.04	5.54	4.24	36.95
SILVER SHINER	N	I	S	I	5	10.00	0.14	0.04	0.03	4.20
ROSYFACE SHINER	N	I	S	I	35	70.00	0.95	0.16	0.12	2.27
ROSEFIN SHINER	N	I	S	M	9	18.00	0.24	0.03	0.02	1.67
STRIPED SHINER	N	I	S		137	274.00	3.72	2.66	2.03	9.69
SPOTFIN SHINER	N	I	M		2	4.00	0.05	0.01	0.01	2.50
SAND SHINER	N	I	M	M	126	252.00	3.42	0.43	0.33	1.69
SILVERJAW MINNOW	N	I	M		9	18.00	0.24	0.06	0.05	3.33
BLUNTNOSE MINNOW	N	O	C	T	364	728.00	9.89	1.98	1.52	2.72
CENTRAL STONEROLLER	N	H	N		2,382	4,764.00	64.71	62.41	47.77	13.10
ROCK BASS	S	C	C		6	12.00	0.16	1.14	0.88	95.33
SMALLMOUTH BASS	F	C	C	M	78	156.00	2.12	10.86	8.31	69.62
LARGEMOUTH BASS	F	C	C		8	16.00	0.22	2.50	1.91	156.25
GREEN SUNFISH	S	I	C	T	2	4.00	0.05	0.27	0.21	67.50
BLUEGILL SUNFISH	S	I	C	P	2	4.00	0.05	0.01	0.01	3.50
LOGPERCH	D	I	S	M	12	24.00	0.33	0.24	0.19	10.08
GREENSIDE DARTER	D	I	S	M	79	158.00	2.15	0.47	0.36	2.99
BANDED DARTER	D	I	S	I	19	38.00	0.52	0.06	0.04	1.53
RAINBOW DARTER	D	I	S	M	113	226.00	3.07	0.30	0.23	1.31
FANTAIL DARTER	D	I	C		5	10.00	0.14	0.02	0.02	2.20
<i>Date Total</i>					3,681	7,362.00		130.63		
<i>Number of Species</i>					25					
<i>Number of Hybrids</i>					0					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 08/04/95
River Mile: 27.50	Basin: Great Miami River	
Data Source: 01	Time Fished: 2972 sec	Drain Area: 143.0 sq mi
Purpose:	Dist Fished: 0.20 km	Depth: 40 cm Flow: C
		Invalid Sample:
		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
BLACK REDHORSE	R	I	S	I	8	12.00	0.55	2.05	4.94	171.00
GOLDEN REDHORSE	R	I	S	M	7	10.50	0.48	2.23	5.36	211.86
NORTHERN HOG SUCKER	R	I	S	M	154	231.00	10.58	10.98	26.45	47.52
WHITE SUCKER	W	O	S	T	8	12.00	0.55	0.39	0.94	32.50
RIVER CHUB	N	I	N	I	9	13.50	0.62	0.41	1.00	30.67
CREEK CHUB	N	G	N	T	18	27.00	1.24	0.51	1.22	18.78
SILVER SHINER	N	I	S	I	24	36.00	1.65	0.11	0.27	3.13
ROSYFACE SHINER	N	I	S	I	34	51.00	2.34	0.09	0.22	1.76
ROSEFIN SHINER	N	I	S	M	9	13.50	0.62	0.03	0.07	2.00
STRIPED SHINER	N	I	S		89	133.50	6.12	1.13	2.73	8.49
SPOTFIN SHINER	N	I	M		15	22.50	1.03	0.11	0.27	5.00
SAND SHINER	N	I	M	M	3	4.50	0.21	0.01	0.02	2.00
BLUNTNOSE MINNOW	N	O	C	T	34	51.00	2.34	0.11	0.26	2.12
CENTRAL STONEROLLER	N	H	N		684	1,026.00	47.01	8.45	20.37	8.24
ROCK BASS	S	C	C		15	22.50	1.03	2.34	5.64	104.00
SMALLMOUTH BASS	F	C	C	M	31	46.50	2.13	9.71	23.39	208.77
LARGEMOUTH BASS	F	C	C		4	6.00	0.27	0.10	0.25	17.00
GREEN SUNFISH	S	I	C	T	11	16.50	0.76	0.68	1.65	41.45
BLUEGILL SUNFISH	S	I	C	P	9	13.50	0.62	0.11	0.26	7.89
LONGEAR SUNFISH	S	I	C	M	17	25.50	1.17	0.68	1.63	26.59
GREEN SF X BLUEGILL					1	1.50	0.07	0.04	0.09	26.00
GREEN SF X LONGEAR					2	3.00	0.14	0.35	0.85	118.00
LOGPERCH	D	I	S	M	12	18.00	0.82	0.12	0.29	6.58
JOHNNY DARTER	D	I	C		1	1.50	0.07	0.01	0.01	3.00
GREENSIDE DARTER	D	I	S	M	73	109.50	5.02	0.39	0.94	3.56
BANDED DARTER	D	I	S	I	26	39.00	1.79	0.05	0.12	1.31
RAINBOW DARTER	D	I	S	M	116	174.00	7.97	0.23	0.54	1.29
FANTAIL DARTER	D	I	C		41	61.50	2.82	0.09	0.22	1.46
<i>Date Total</i>					1,455	2,182.50		41.50		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					2					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 09/14/95
River Mile: 27.50	Basin: Great Miami River	
Data Source: 01	Time Fished: 3534 sec Drain Area: 143.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 70 cm Flow: C	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		6	9.00	0.23	1.50	1.61	166.67
QUILLBACK CARPSUCKER	C	O	M		2	3.00	0.08	1.46	1.57	487.50
BLACK REDHORSE	R	I	S	I	94	141.00	3.54	26.91	28.85	190.83
GOLDEN REDHORSE	R	I	S	M	46	69.00	1.73	19.34	20.73	280.23
NORTHERN HOG SUCKER	R	I	S	M	107	160.50	4.03	6.39	6.85	39.81
WHITE SUCKER	W	O	S	T	13	19.50	0.49	1.68	1.80	85.92
COMMON CARP	G	O	M	T	1	1.50	0.04	1.16	1.25	775.00
RIVER CHUB	N	I	N	I	5	7.50	0.19	0.21	0.22	27.60
CREEK CHUB	N	G	N	T	5	7.50	0.19	0.18	0.19	24.00
SILVER SHINER	N	I	S	I	11	16.50	0.41	0.08	0.09	5.00
ROSYFACE SHINER	N	I	S	I	44	66.00	1.66	0.14	0.15	2.12
ROSEFIN SHINER	N	I	S	M	18	27.00	0.68	0.03	0.04	1.25
STRIPED SHINER	N	I	S		62	93.00	2.34	1.43	1.53	15.32
SPOTFIN SHINER	N	I	M		3	4.50	0.11	0.02	0.02	5.00
SAND SHINER	N	I	M	M	3	4.50	0.11	0.01	0.01	2.33
SILVERJAW MINNOW	N	I	M		4	6.00	0.15	0.01	0.01	1.50
BLUNTNOSE MINNOW	N	O	C	T	42	63.00	1.58	0.19	0.20	2.98
CENTRAL STONEROLLER	N	H	N		1,861	2,791.50	70.09	19.04	20.41	6.82
ROCK BASS	S	C	C		18	27.00	0.68	2.08	2.23	76.94
SMALLMOUTH BASS	F	C	C	M	35	52.50	1.32	8.74	9.37	166.46
LARGEMOUTH BASS	F	C	C		1	1.50	0.04	0.02	0.02	15.00
GREEN SUNFISH	S	I	C	T	7	10.50	0.26	0.41	0.44	39.00
BLUEGILL SUNFISH	S	I	C	P	17	25.50	0.64	0.26	0.28	10.29
LONGEAR SUNFISH	S	I	C	M	21	31.50	0.79	0.87	0.93	27.62
GREEN SF X LONGEAR					2	3.00	0.08	0.17	0.18	55.00
LOGPERCH	D	I	S	M	14	21.00	0.53	0.18	0.19	8.43
GREENSIDE DARTER	D	I	S	M	83	124.50	3.13	0.45	0.48	3.61
BANDED DARTER	D	I	S	I	21	31.50	0.79	0.05	0.06	1.71
RAINBOW DARTER	D	I	S	M	91	136.50	3.43	0.21	0.23	1.55
FANTAIL DARTER	D	I	C		18	27.00	0.68	0.05	0.05	1.76
<i>Date Total</i>					2,655	3,982.50		93.26		
<i>Number of Species</i>					29					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 08/16/95
River Mile: 26.50	Basin: Great Miami River	
Data Source: 01	Time Fished: 2512 sec Drain Area: 146.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	7	10.50	1.52	1.63	9.48	155.29
GOLDEN REDHORSE	R	I	S	M	10	15.00	2.17	1.22	7.10	81.40
NORTHERN HOG SUCKER	R	I	S	M	52	78.00	11.30	5.70	33.14	73.08
WHITE SUCKER	W	O	S	T	4	6.00	0.87	0.11	0.63	18.00
RIVER CHUB	N	I	N	I	12	18.00	2.61	0.66	3.82	36.50
CREEK CHUB	N	G	N	T	1	1.50	0.22	0.04	0.24	28.00
SILVER SHINER	N	I	S	I	11	16.50	2.39	0.06	0.33	3.36
ROSYFACE SHINER	N	I	S	I	11	16.50	2.39	0.03	0.19	1.91
ROSEFIN SHINER	N	I	S	M	2	3.00	0.43	0.01	0.03	2.00
STRIPED SHINER	N	I	S		41	61.50	8.91	0.89	5.14	14.39
SPOTFIN SHINER	N	I	M		9	13.50	1.96	0.05	0.26	3.33
SAND SHINER	N	I	M	M	9	13.50	1.96	0.03	0.17	2.22
BLUNTNOSE MINNOW	N	O	C	T	5	7.50	1.09	0.03	0.17	4.00
CENTRAL STONEROLLER	N	H	N		52	78.00	11.30	0.51	2.97	6.55
YELLOW BULLHEAD		I	C	T	1	1.50	0.22	0.51	2.96	339.00
STONECAT MADTOM		I	C	I	1	1.50	0.22	0.14	0.83	95.00
BRINDLED MADTOM		I	C	I	2	3.00	0.43	0.02	0.10	6.00
ROCK BASS	S	C	C		39	58.50	8.48	2.42	14.09	41.41
SMALLMOUTH BASS	F	C	C	M	4	6.00	0.87	0.53	3.10	88.75
GREEN SUNFISH	S	I	C	T	13	19.50	2.83	0.55	3.17	28.00
BLUEGILL SUNFISH	S	I	C	P	12	18.00	2.61	0.34	1.98	18.92
LONGEAR SUNFISH	S	I	C	M	47	70.50	10.22	1.36	7.89	19.26
LOGPERCH	D	I	S	M	6	9.00	1.30	0.10	0.58	11.00
JOHNNY DARTER	D	I	C		1	1.50	0.22	0.00	0.02	2.00
GREENSIDE DARTER	D	I	S	M	25	37.50	5.43	0.12	0.72	3.28
BANDED DARTER	D	I	S	I	11	16.50	2.39	0.02	0.12	1.27
RAINBOW DARTER	D	I	S	M	62	93.00	13.48	0.11	0.66	1.22
FANTAIL DARTER	D	I	C		10	15.00	2.17	0.02	0.13	1.50
<i>Date Total</i>					460	690.00		17.20		
<i>Number of Species</i>					28					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/15/95
River Mile: 26.50	Basin: Great Miami River	
Data Source: 01	Time Fished: 3716 sec Drain Area: 146.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 50 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	204	306.00	15.62	42.44	36.83	138.69
GOLDEN REDHORSE	R	I	S	M	75	112.50	5.74	28.72	24.92	255.24
NORTHERN HOG SUCKER	R	I	S	M	117	175.50	8.96	10.66	9.25	60.75
WHITE SUCKER	W	O	S	T	34	51.00	2.60	4.85	4.21	95.16
RIVER CHUB	N	I	N	I	28	42.00	2.14	1.40	1.22	33.39
CREEK CHUB	N	G	N	T	15	22.50	1.15	0.53	0.46	23.57
SILVER SHINER	N	I	S	I	32	48.00	2.45	0.18	0.15	3.69
ROSYFACE SHINER	N	I	S	I	28	42.00	2.14	0.06	0.05	1.43
ROSEFIN SHINER	N	I	S	M	13	19.50	1.00	0.04	0.03	1.92
STRIPED SHINER	N	I	S		128	192.00	9.80	3.68	3.19	19.14
SPOTFIN SHINER	N	I	M		23	34.50	1.76	0.11	0.10	3.30
SAND SHINER	N	I	M	M	5	7.50	0.38	0.01	0.01	1.60
BLUNTNOSE MINNOW	N	O	C	T	25	37.50	1.91	0.08	0.07	2.24
CENTRAL STONEROLLER	N	H	N		195	292.50	14.93	2.53	2.19	8.64
STRIPED SH X ROSYFACE SH		I			2	3.00	0.15	0.02	0.01	5.00
STONECAT MADTOM		I	C	I	7	10.50	0.54	0.23	0.20	21.43
BRINDLED MADTOM		I	C	I	1	1.50	0.08	0.01	0.01	5.00
ROCK BASS	S	C	C		60	90.00	4.59	6.10	5.29	67.75
SMALLMOUTH BASS	F	C	C	M	43	64.50	3.29	10.52	9.13	163.02
LARGEMOUTH BASS	F	C	C		2	3.00	0.15	0.02	0.02	7.50
GREEN SUNFISH	S	I	C	T	4	6.00	0.31	0.21	0.18	34.50
BLUEGILL SUNFISH	S	I	C	P	7	10.50	0.54	0.08	0.07	7.43
LONGEAR SUNFISH	S	I	C	M	48	72.00	3.68	1.88	1.63	26.04
GREEN SF X LONGEAR					2	3.00	0.15	0.14	0.12	47.50
LOGPERCH	D	I	S	M	18	27.00	1.38	0.27	0.23	10.00
JOHNNY DARTER	D	I	C		2	3.00	0.15	0.01	0.01	2.00
GREENSIDE DARTER	D	I	S	M	39	58.50	2.99	0.18	0.16	3.08
BANDED DARTER	D	I	S	I	31	46.50	2.37	0.06	0.05	1.29
RAINBOW DARTER	D	I	S	M	116	174.00	8.88	0.23	0.20	1.29
FANTAIL DARTER	D	I	C		2	3.00	0.15	0.01	0.01	2.00
<i>Date Total</i>					1,306	1,959.00		115.22		
<i>Number of Species</i>					28					
<i>Number of Hybrids</i>					2					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 08/14/95
River Mile: 25.20	Basin: Great Miami River	Invalid Sample:
Data Source: 01	Time Fished: 2172 sec Drain Area: 150.0 sq mi	Sampler Type: D
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight	
BLACK REDHORSE	R	I	S	I	29	43.50	4.59	6.74	23.27	154.86
GOLDEN REDHORSE	R	I	S	M	15	22.50	2.37	3.80	13.14	169.00
NORTHERN HOG SUCKER	R	I	S	M	40	60.00	6.33	3.56	12.29	59.30
WHITE SUCKER	W	O	S	T	17	25.50	2.69	0.96	3.33	37.76
RIVER CHUB	N	I	N	I	17	25.50	2.69	0.54	1.85	21.06
CREEK CHUB	N	G	N	T	4	6.00	0.63	0.14	0.47	22.50
SILVER SHINER	N	I	S	I	15	22.50	2.37	0.06	0.21	2.67
ROSYFACE SHINER	N	I	S	I	11	16.50	1.74	0.04	0.12	2.18
ROSEFIN SHINER	N	I	S	M	13	19.50	2.06	0.03	0.10	1.54
STRIPED SHINER	N	I	S		198	297.00	31.33	4.86	16.79	16.37
SPOTFIN SHINER	N	I	M		4	6.00	0.63	0.02	0.08	4.00
BLUNTNOSTE MINNOW	N	O	C	T	9	13.50	1.42	0.03	0.12	2.50
CENTRAL STONEROLLER	N	H	N		122	183.00	19.30	1.92	6.62	10.48
STRIPED SH X ROSYFACE SH		I			1	1.50	0.16	0.04	0.12	24.00
ROCK BASS	S	C	C		27	40.50	4.27	2.73	9.43	67.41
SMALLMOUTH BASS	F	C	C	M	11	16.50	1.74	1.74	6.00	105.27
GREEN SUNFISH	S	I	C	T	3	4.50	0.47	0.12	0.41	26.67
BLUEGILL SUNFISH	S	I	C	P	6	9.00	0.95	0.03	0.09	3.00
LONGEAR SUNFISH	S	I	C	M	32	48.00	5.06	1.36	4.70	28.34
LOGPERCH	D	I	S	M	5	7.50	0.79	0.07	0.23	8.80
GREENSIDE DARTER	D	I	S	M	28	42.00	4.43	0.13	0.44	3.00
BANDED DARTER	D	I	S	I	5	7.50	0.79	0.01	0.03	1.00
RAINBOW DARTER	D	I	S	M	19	28.50	3.01	0.05	0.16	1.58
FANTAIL DARTER	D	I	C		1	1.50	0.16	0.00	0.01	2.00
<i>Date Total</i>				632	948.00		28.95			
<i>Number of Species</i>				23						
<i>Number of Hybrids</i>				1						

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/14/95
River Mile: 25.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 2521 sec Drain Area: 150.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	156	234.00	14.93	35.02	44.20	149.67
GOLDEN REDHORSE	R	I	S	M	25	37.50	2.39	8.54	10.77	227.60
NORTHERN HOG SUCKER	R	I	S	M	96	144.00	9.19	7.18	9.06	49.86
WHITE SUCKER	W	O	S	T	18	27.00	1.72	3.64	4.59	134.72
RIVER CHUB	N	I	N	I	38	57.00	3.64	1.39	1.75	24.34
BIGEYE CHUB	N	I	S	I	1	1.50	0.10	0.00	0.00	2.00
CREEK CHUB	N	G	N	T	11	16.50	1.05	0.78	0.99	47.45
SILVER SHINER	N	I	S	I	12	18.00	1.15	0.06	0.08	3.33
ROSYFACE SHINER	N	I	S	I	35	52.50	3.35	0.11	0.14	2.06
ROSEFIN SHINER	N	I	S	M	11	16.50	1.05	0.03	0.04	2.00
STRIPED SHINER	N	I	S		179	268.50	17.13	2.66	3.35	9.90
SPOTFIN SHINER	N	I	M		6	9.00	0.57	0.04	0.05	4.67
SAND SHINER	N	I	M	M	1	1.50	0.10	0.00	0.00	2.00
BLUNTNOSE MINNOW	N	O	C	T	42	63.00	4.02	0.16	0.20	2.57
CENTRAL STONEROLLER	N	H	N		129	193.50	12.34	3.05	3.85	15.76
ROCK BASS	S	C	C		71	106.50	6.79	8.99	11.34	84.37
SMALLMOUTH BASS	F	C	C	M	19	28.50	1.82	4.58	5.78	160.68
LARGEMOUTH BASS	F	C	C		2	3.00	0.19	0.24	0.31	80.50
GREEN SUNFISH	S	I	C	T	3	4.50	0.29	0.11	0.14	25.00
BLUEGILL SUNFISH	S	I	C	P	7	10.50	0.67	0.11	0.14	10.14
LONGEAR SUNFISH	S	I	C	M	40	60.00	3.83	1.99	2.51	33.13
LOGPERCH	D	I	S	M	7	10.50	0.67	0.11	0.13	10.00
JOHNNY DARTER	D	I	C		1	1.50	0.10	0.00	0.00	2.00
GREENSIDE DARTER	D	I	S	M	54	81.00	5.17	0.26	0.33	3.22
BANDED DARTER	D	I	S	I	27	40.50	2.58	0.07	0.08	1.63
RAINBOW DARTER	D	I	S	M	53	79.50	5.07	0.12	0.15	1.47
FANTAIL DARTER	D	I	C		1	1.50	0.10	0.01	0.01	3.00
<i>Date Total</i>					1,045	1,567.50		79.23		
<i>Number of Species</i>					27					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/15/95
River Mile: 23.90	Basin: Great Miami River	
Data Source: 01	Time Fished: 2963 sec Drain Area: 192.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 50 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	62	93.00	4.48	8.69	22.89	93.47
GOLDEN REDHORSE	R	I	S	M	3	4.50	0.22	0.09	0.24	20.67
NORTHERN HOG SUCKER	R	I	S	M	44	66.00	3.18	3.12	8.22	47.27
WHITE SUCKER	W	O	S	T	4	6.00	0.29	0.12	0.32	20.00
RIVER CHUB	N	I	N	I	33	49.50	2.38	1.09	2.86	21.97
CREEK CHUB	N	G	N	T	22	33.00	1.59	1.08	2.84	32.73
SILVER SHINER	N	I	S	I	7	10.50	0.51	0.04	0.10	3.57
ROSYFACE SHINER	N	I	S	I	26	39.00	1.88	0.09	0.23	2.23
ROSEFIN SHINER	N	I	S	M	8	12.00	0.58	0.02	0.06	2.00
STRIPED SHINER	N	I	S		86	129.00	6.21	1.10	2.90	8.55
SPOTFIN SHINER	N	I	M		17	25.50	1.23	0.08	0.21	3.18
SAND SHINER	N	I	M	M	18	27.00	1.30	0.05	0.13	1.89
BLUNTNOSE MINNOW	N	O	C	T	35	52.50	2.53	0.18	0.47	3.38
CENTRAL STONEROLLER	N	H	N		619	928.50	44.73	10.00	26.34	10.77
STONECAT MADTOM		I	C	I	1	1.50	0.07	0.02	0.06	15.00
ROCK BASS	S	C	C		66	99.00	4.77	7.44	19.59	75.14
SMALLMOUTH BASS	F	C	C	M	33	49.50	2.38	1.90	5.00	38.33
LARGEMOUTH BASS	F	C	C		4	6.00	0.29	0.07	0.17	10.75
GREEN SUNFISH	S	I	C	T	5	7.50	0.36	0.14	0.38	19.00
BLUEGILL SUNFISH	S	I	C	P	14	21.00	1.01	0.24	0.63	11.43
LONGEAR SUNFISH	S	I	C	M	27	40.50	1.95	1.47	3.88	36.35
GREEN SF X BLUEGILL					5	7.50	0.36	0.11	0.30	15.00
LOGPERCH	D	I	S	M	2	3.00	0.14	0.03	0.08	10.00
GREENSIDE DARTER	D	I	S	M	55	82.50	3.97	0.33	0.87	4.00
BANDED DARTER	D	I	S	I	28	42.00	2.02	0.06	0.16	1.43
RAINBOW DARTER	D	I	S	M	155	232.50	11.20	0.35	0.92	1.50
FANTAIL DARTER	D	I	C		2	3.00	0.14	0.04	0.09	12.00
MOTTLED SCULPIN		I	C		3	4.50	0.22	0.02	0.06	5.00
<i>Date Total</i>					1,384	2,076.00		37.98		
<i>Number of Species</i>					27					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/18/95
River Mile: 19.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 2584 sec Drain Area: 225.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
QUILLBACK CARPSUCKER	C	O	M	10	15.00	0.54	6.86	10.74	457.50
BLACK REDHORSE	R	I	S I	55	82.50	2.98	8.65	13.54	104.90
GOLDEN REDHORSE	R	I	S M	15	22.50	0.81	2.57	4.03	114.33
NORTHERN HOG SUCKER	R	I	S M	143	214.50	7.74	11.44	17.90	53.32
WHITE SUCKER	W	O	S T	12	18.00	0.65	1.05	1.64	58.18
RIVER CHUB	N	I	N I	62	93.00	3.35	3.00	4.70	32.26
BLACKNOSE DACE	N	G	S T	1	1.50	0.05	0.00	0.00	2.00
CREEK CHUB	N	G	N T	28	42.00	1.52	1.09	1.70	25.86
SILVER SHINER	N	I	S I	5	7.50	0.27	0.03	0.05	4.40
ROSYFACE SHINER	N	I	S I	53	79.50	2.87	0.17	0.27	2.13
ROSEFIN SHINER	N	I	S M	1	1.50	0.05	0.00	0.00	2.00
STRIPED SHINER	N	I	S	84	126.00	4.55	1.80	2.82	14.29
SPOTFIN SHINER	N	I	M	16	24.00	0.87	0.08	0.12	3.25
SAND SHINER	N	I	M M	54	81.00	2.92	0.19	0.29	2.28
SILVERJAW MINNOW	N	I	M	4	6.00	0.22	0.01	0.02	2.00
BLUNTNOSE MINNOW	N	O	C T	37	55.50	2.00	0.22	0.34	3.92
CENTRAL STONEROLLER	N	H	N	1,057	1,585.50	57.20	22.83	35.73	14.40
STRIPED SH X ROSYFACE SH		I		1	1.50	0.05	0.02	0.04	15.00
STONECAT MADTOM		I	C I	4	6.00	0.22	0.13	0.20	21.25
ROCK BASS	S	C	C	29	43.50	1.57	1.64	2.56	37.59
SMALLMOUTH BASS	F	C	C M	31	46.50	1.68	1.59	2.48	34.07
GREEN SUNFISH	S	I	C T	1	1.50	0.05	0.01	0.01	6.00
BLUEGILL SUNFISH	S	I	C P	1	1.50	0.05	0.01	0.01	6.00
LONGEAR SUNFISH	S	I	C M	1	1.50	0.05	0.06	0.09	40.00
GREENSIDE DARTER	D	I	S M	34	51.00	1.84	0.19	0.30	3.74
BANDED DARTER	D	I	S I	46	69.00	2.49	0.10	0.15	1.37
RAINBOW DARTER	D	I	S M	57	85.50	3.08	0.13	0.21	1.56
FANTAIL DARTER	D	I	C	4	6.00	0.22	0.02	0.02	2.50
MOTTLED SCULPIN		I	C	2	3.00	0.11	0.02	0.04	7.50
<i>Date Total</i>				1,848	2,772.00		63.90		
<i>Number of Species</i>				28					
<i>Number of Hybrids</i>				1					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 09/18/95
River Mile: 19.00	Basin: Great Miami River	
Data Source: 01	Time Fished: 3156 sec Drain Area: 225.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	132	198.00	7.17	16.45	25.88	83.08
GOLDEN REDHORSE	R	I	S	M	20	30.00	1.09	2.42	3.80	80.53
NORTHERN HOG SUCKER	R	I	S	M	151	226.50	8.21	10.48	16.48	46.25
WHITE SUCKER	W	O	S	T	89	133.50	4.84	8.43	13.26	63.13
RIVER CHUB	N	I	N	I	40	60.00	2.17	2.29	3.60	38.11
CREEK CHUB	N	G	N	T	31	46.50	1.68	0.86	1.36	18.55
SILVER SHINER	N	I	S	I	21	31.50	1.14	0.12	0.19	3.85
ROSYFACE SHINER	N	I	S	I	57	85.50	3.10	0.17	0.27	2.02
ROSEFIN SHINER	N	I	S	M	6	9.00	0.33	0.02	0.04	2.50
STRIPED SHINER	N	I	S		189	283.50	10.27	2.95	4.64	10.40
SPOTFIN SHINER	N	I	M		32	48.00	1.74	0.15	0.24	3.13
SAND SHINER	N	I	M	M	38	57.00	2.07	0.11	0.18	1.97
SILVERJAW MINNOW	N	I	M		4	6.00	0.22	0.02	0.03	2.75
BLUNTNORSE MINNOW	N	O	C	T	145	217.50	7.88	1.01	1.59	4.64
CENTRAL STONEROLLER	N	H	N		589	883.50	32.01	10.74	16.90	12.16
STRIPED SH X ROSYFACE SH		I			3	4.50	0.16	0.05	0.08	11.33
STONECAT MADTOM		I	C	I	7	10.50	0.38	0.34	0.54	32.50
BRINDLED MADTOM		I	C	I	1	1.50	0.05	0.02	0.02	10.00
ROCK BASS	S	C	C		25	37.50	1.36	1.55	2.44	41.40
SMALLMOUTH BASS	F	C	C	M	33	49.50	1.79	2.26	3.56	45.73
LARGEMOUTH BASS	F	C	C		4	6.00	0.22	0.13	0.21	21.75
GREEN SUNFISH	S	I	C	T	14	21.00	0.76	0.42	0.66	20.00
BLUEGILL SUNFISH	S	I	C	P	31	46.50	1.68	0.52	0.82	11.17
OR'GESPOTTED SUNFISH	S	I	C		1	1.50	0.05	0.01	0.02	9.00
LONGEAR SUNFISH	S	I	C	M	47	70.50	2.55	1.50	2.36	21.28
GREEN SF X BLUEGILL					1	1.50	0.05	0.06	0.09	38.00
LOGPERCH	D	I	S	M	4	6.00	0.22	0.08	0.13	13.75
JOHNNY DARTER	D	I	C		1	1.50	0.05	0.00	0.00	2.00
GREENSIDE DARTER	D	I	S	M	30	45.00	1.63	0.20	0.31	4.37
BANDED DARTER	D	I	S	I	26	39.00	1.41	0.06	0.09	1.40
RAINBOW DARTER	D	I	S	M	63	94.50	3.42	0.13	0.20	1.35
ORANGETHROAT DARTER	D	I	S		1	1.50	0.05	0.00	0.00	2.00
FANTAIL DARTER	D	I	C		2	3.00	0.11	0.01	0.01	2.50
MOTTLED SCULPIN		I	C		2	3.00	0.11	0.02	0.03	6.00
<i>Date Total</i>					1,840	2,760.00		63.57		
<i>Number of Species</i>					32					
<i>Number of Hybrids</i>					2					

Species List

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River Code: 14-500	Stream: Twin Creek	Sample Date: 09/15/95
River Mile: 16.50	Basin: Great Miami River	Invalid Sample:
Data Source: 01	Time Fished: 2802 sec Drain Area: 236.0 sq mi	Sampler Type: D
Purpose:	Dist Fished: 0.20 km Depth: 50 cm Flow: C	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
QUILLBACK CARPSUCKER	C	O	M		1	1.50	0.13	0.33	0.33	218.00
BLACK REDHORSE	R	I	S	I	124	186.00	16.02	39.00	39.31	209.67
GOLDEN REDHORSE	R	I	S	M	41	61.50	5.30	18.13	18.27	294.74
SHORHEAD REDHORSE	R	I	S	M	2	3.00	0.26	0.90	0.91	300.00
NORTHERN HOG SUCKER	R	I	S	M	141	211.50	18.22	12.85	12.95	60.77
WHITE SUCKER	W	O	S	T	6	9.00	0.78	0.96	0.97	106.67
COMMON CARP	G	O	M	T	4	6.00	0.52	10.95	11.04	1,825.00
RIVER CHUB	N	I	N	I	4	6.00	0.52	0.28	0.28	46.75
CREEK CHUB	N	G	N	T	2	3.00	0.26	0.01	0.01	4.00
SILVER SHINER	N	I	S	I	33	49.50	4.26	0.23	0.24	4.73
ROSYFACE SHINER	N	I	S	I	13	19.50	1.68	0.05	0.05	2.31
ROSEFIN SHINER	N	I	S	M	1	1.50	0.13	0.00	0.00	2.00
STRIPED SHINER	N	I	S		92	138.00	11.89	2.76	2.78	20.00
SPOTFIN SHINER	N	I	M		12	18.00	1.55	0.08	0.08	4.17
SAND SHINER	N	I	M	M	20	30.00	2.58	0.06	0.06	1.90
BLUNTNORSE MINNOW	N	O	C	T	17	25.50	2.20	0.06	0.06	2.47
CENTRAL STONEROLLER	N	H	N		117	175.50	15.12	4.16	4.19	23.71
STONECAT MADTOM		I	C	I	9	13.50	1.16	0.33	0.33	24.44
ROCK BASS	S	C	C		8	12.00	1.03	0.94	0.95	78.13
SMALLMOUTH BASS	F	C	C	M	23	34.50	2.97	5.26	5.30	152.48
GREEN SUNFISH	S	I	C	T	5	7.50	0.65	0.23	0.23	30.00
BLUEGILL SUNFISH	S	I	C	P	9	13.50	1.16	0.17	0.17	12.22
LONGEAR SUNFISH	S	I	C	M	34	51.00	4.39	1.34	1.35	26.18
LOGPERCH	D	I	S	M	1	1.50	0.13	0.02	0.02	10.00
GREENSIDE DARTER	D	I	S	M	8	12.00	1.03	0.04	0.04	3.63
BANDED DARTER	D	I	S	I	32	48.00	4.13	0.07	0.07	1.50
RAINBOW DARTER	D	I	S	M	15	22.50	1.94	0.03	0.03	1.33
<i>Date Total</i>					774	1,161.00		99.22		
<i>Number of Species</i>					27					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/19/95
River Mile: 13.40	Basin: Great Miami River	
Data Source: 01	Time Fished: 3609 sec Drain Area: 271.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 50 cm Flow: C	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
QUILLBACK CARPSUCKER	C	O	M	17	25.50	0.93	10.05	7.03	394.12
BLACK REDHORSE	R	I	S I	277	415.50	15.20	65.86	46.06	158.52
GOLDEN REDHORSE	R	I	S M	62	93.00	3.40	21.49	15.03	231.03
NORTHERN HOG SUCKER	R	I	S M	180	270.00	9.88	18.35	12.84	67.97
WHITE SUCKER	W	O	S T	20	30.00	1.10	4.16	2.91	138.75
RIVER CHUB	N	I	N I	13	19.50	0.71	1.02	0.71	52.31
BLACKNOSE DACE	N	G	S T	1	1.50	0.05	0.00	0.00	2.00
SILVER SHINER	N	I	S I	38	57.00	2.09	0.11	0.07	1.84
ROSYFACE SHINER	N	I	S I	51	76.50	2.80	0.20	0.14	2.55
ROSEFIN SHINER	N	I	S M	3	4.50	0.16	0.01	0.01	1.67
STRIPED SHINER	N	I	S	160	240.00	8.78	3.06	2.14	12.76
SPOTFIN SHINER	N	I	M	26	39.00	1.43	0.15	0.10	3.77
SAND SHINER	N	I	M M	43	64.50	2.36	0.15	0.11	2.38
SILVERJAW MINNOW	N	I	M	1	1.50	0.05	0.01	0.01	5.00
BLUNTNOSE MINNOW	N	O	C T	156	234.00	8.56	1.06	0.74	4.52
CENTRAL STONEROLLER	N	H	N	548	822.00	30.08	11.64	8.14	14.16
STRIPED SH X ROSYFACE SH		I		1	1.50	0.05	0.01	0.01	9.00
STONECAT MADTOM		I	C I	9	13.50	0.49	0.30	0.21	22.22
ROCK BASS	S	C	C	14	21.00	0.77	1.46	1.02	69.36
SMALLMOUTH BASS	F	C	C M	45	67.50	2.47	3.05	2.13	45.11
BLUEGILL SUNFISH	S	I	C P	4	6.00	0.22	0.02	0.01	3.50
LONGEAR SUNFISH	S	I	C M	11	16.50	0.60	0.33	0.23	20.00
LOGPERCH	D	I	S M	1	1.50	0.05	0.02	0.02	15.00
GREENSIDE DARTER	D	I	S M	21	31.50	1.15	0.17	0.12	5.24
BANDED DARTER	D	I	S I	44	66.00	2.41	0.11	0.07	1.61
RAINBOW DARTER	D	I	S M	74	111.00	4.06	0.20	0.14	1.82
MOTTLED SCULPIN		I	C	2	3.00	0.11	0.01	0.00	2.00
<i>Date Total</i>				1,822	2,733.00		142.98		
<i>Number of Species</i>				26					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/19/95
River Mile: 9.80	Basin: Great Miami River	
Data Source: 01	Time Fished: 3129 sec Drain Area: 275.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 50 cm Flow: C	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	14	21.00	0.85	2.45	2.52	116.79
QUILLBACK CARPSUCKER	C	O	M	17	25.50	1.04	6.59	6.77	258.24
BLACK REDHORSE	R	I	S I	161	241.50	9.82	26.82	27.58	111.05
GOLDEN REDHORSE	R	I	S M	77	115.50	4.70	18.15	18.67	157.16
SHORthead REDHORSE	R	I	S M	5	7.50	0.30	1.13	1.16	150.00
NORTHERN HOG SUCKER	R	I	S M	159	238.50	9.70	11.83	12.16	49.58
WHITE SUCKER	W	O	S T	7	10.50	0.43	0.94	0.97	89.43
GOLDFISH	G	O	M T	1	1.50	0.06	0.00	0.00	2.00
RIVER CHUB	N	I	N I	22	33.00	1.34	0.86	0.89	26.14
CREEK CHUB	N	G	N T	6	9.00	0.37	0.18	0.18	19.67
SUCKERMOUTH MINNOW	N	I	S	14	21.00	0.85	0.14	0.14	6.43
SILVER SHINER	N	I	S I	8	12.00	0.49	0.04	0.04	3.00
ROSYFACE SHINER	N	I	S I	28	42.00	1.71	0.08	0.09	2.00
ROSEFIN SHINER	N	I	S M	8	12.00	0.49	0.03	0.03	2.25
STRIPED SHINER	N	I	S	95	142.50	5.79	1.48	1.52	10.40
SPOTFIN SHINER	N	I	M	22	33.00	1.34	0.07	0.07	2.00
SAND SHINER	N	I	M M	46	69.00	2.80	0.11	0.11	1.61
SILVERJAW MINNOW	N	I	M	5	7.50	0.30	0.03	0.03	3.60
BLUNTNOSE MINNOW	N	O	C T	123	184.50	7.50	0.61	0.63	3.30
CENTRAL STONEROLLER	N	H	N	478	717.00	29.15	8.53	8.77	11.90
STONECAT MADTOM		I	C I	2	3.00	0.12	0.05	0.05	17.50
BRINDLED MADTOM		I	C I	1	1.50	0.06	0.02	0.02	15.00
ROCK BASS	S	C	C	61	91.50	3.72	7.09	7.29	77.43
SMALLMOUTH BASS	F	C	C M	41	61.50	2.50	8.04	8.27	130.78
LARGEMOUTH BASS	F	C	C	1	1.50	0.06	0.64	0.66	425.00
GREEN SUNFISH	S	I	C T	1	1.50	0.06	0.07	0.07	48.00
BLUEGILL SUNFISH	S	I	C P	2	3.00	0.12	0.05	0.05	17.50
LONGEAR SUNFISH	S	I	C M	13	19.50	0.79	0.36	0.37	18.31
GREEN SF X BLUEGILL				2	3.00	0.12	0.07	0.07	22.50
LOGPERCH	D	I	S M	12	18.00	0.73	0.15	0.15	8.33
GREENSIDE DARTER	D	I	S M	57	85.50	3.48	0.32	0.33	3.77
BANDED DARTER	D	I	S I	83	124.50	5.06	0.18	0.18	1.42
RAINBOW DARTER	D	I	S M	68	102.00	4.15	0.16	0.16	1.54
<i>Date Total</i>				1,640	2,460.00		97.25		
<i>Number of Species</i>				32					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/19/95
River Mile: 8.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 2427 sec Drain Area: 285.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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
BLACK REDHORSE	R	I	S	I	128	192.00	12.19	22.99	41.58	119.72
GOLDEN REDHORSE	R	I	S	M	20	30.00	1.90	6.17	11.16	205.56
SHORTHEAD REDHORSE	R	I	S	M	2	3.00	0.19	0.14	0.26	47.00
NORTHERN HOG SUCKER	R	I	S	M	124	186.00	11.81	9.15	16.55	49.19
WHITE SUCKER	W	O	S	T	5	7.50	0.48	0.83	1.49	110.00
RIVER CHUB	N	I	N	I	5	7.50	0.48	0.15	0.27	20.00
CREEK CHUB	N	G	N	T	7	10.50	0.67	0.20	0.36	19.14
SUCKERMOUTH MINNOW	N	I	S		1	1.50	0.10	0.01	0.02	6.00
SILVER SHINER	N	I	S	I	36	54.00	3.43	0.10	0.17	1.78
ROSYFACE SHINER	N	I	S	I	13	19.50	1.24	0.04	0.06	1.77
STRIPED SHINER	N	I	S		172	258.00	16.38	3.07	5.55	11.88
SPOTFIN SHINER	N	I	M		24	36.00	2.29	0.13	0.24	3.71
SAND SHINER	N	I	M	M	4	6.00	0.38	0.01	0.02	2.00
BLUNTNOSE MINNOW	N	O	C	T	20	30.00	1.90	0.10	0.18	3.25
CENTRAL STONEROLLER	N	H	N		342	513.00	32.57	6.05	10.95	11.80
STONECAT MADTOM		I	C	I	1	1.50	0.10	0.03	0.05	20.00
ROCK BASS	S	C	C		13	19.50	1.24	1.31	2.38	67.38
SMALLMOUTH BASS	F	C	C	M	29	43.50	2.76	4.15	7.52	95.48
GREEN SUNFISH	S	I	C	T	1	1.50	0.10	0.06	0.11	42.00
BLUEGILL SUNFISH	S	I	C	P	11	16.50	1.05	0.08	0.14	4.73
LONGEAR SUNFISH	S	I	C	M	4	6.00	0.38	0.10	0.17	16.00
GREEN SF X BLUEGILL					4	6.00	0.38	0.09	0.16	15.00
LOGPERCH	D	I	S	M	7	10.50	0.67	0.09	0.16	8.57
GREENSIDE DARTER	D	I	S	M	19	28.50	1.81	0.10	0.19	3.63
BANDED DARTER	D	I	S	I	33	49.50	3.14	0.07	0.13	1.48
RAINBOW DARTER	D	I	S	M	24	36.00	2.29	0.06	0.11	1.63
FANTAIL DARTER	D	I	C		1	1.50	0.10	0.00	0.01	2.00
<i>Date Total</i>					1,050	1,575.00		55.27		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/20/95
River Mile: 3.40	Basin: Great Miami River	
Data Source: 01	Time Fished: 3403 sec Drain Area: 312.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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	10	15.00	0.75	1.82	1.43	121.10
QUILLBACK CARPSUCKER	C	O	M	5	7.50	0.37	0.35	0.28	46.80
BLACK REDHORSE	R	I	S I	261	391.50	19.48	38.79	30.55	99.07
GOLDEN REDHORSE	R	I	S M	69	103.50	5.15	14.45	11.38	139.63
SHORthead REDHORSE	R	I	S M	10	15.00	0.75	1.50	1.18	100.10
NORTHERN HOG SUCKER	R	I	S M	146	219.00	10.90	21.01	16.55	95.95
WHITE SUCKER	W	O	S T	8	12.00	0.60	1.06	0.83	88.25
COMMON CARP	G	O	M T	10	15.00	0.75	23.63	18.61	1,575.00
CREEK CHUB	N	G	N T	1	1.50	0.07	0.02	0.02	14.00
SILVER SHINER	N	I	S I	6	9.00	0.45	0.04	0.03	4.33
ROSYFACE SHINER	N	I	S I	24	36.00	1.79	0.09	0.07	2.42
ROSEFIN SHINER	N	I	S M	8	12.00	0.60	0.02	0.02	1.63
STRIPED SHINER	N	I	S	123	184.50	9.18	1.88	1.48	10.20
SPOTFIN SHINER	N	I	M	31	46.50	2.31	0.10	0.08	2.19
SAND SHINER	N	I	M M	107	160.50	7.99	0.50	0.39	3.10
SILVERJAW MINNOW	N	I	M	4	6.00	0.30	0.02	0.01	2.75
BLUNTNOSE MINNOW	N	O	C T	74	111.00	5.52	0.44	0.35	3.97
CENTRAL STONEROLLER	N	H	N	252	378.00	18.81	5.79	4.56	15.32
CHANNEL CATFISH	F		C	3	4.50	0.22	2.33	1.83	516.67
BROOK SILVERSIDE		I	M M	1	1.50	0.07	0.01	0.00	3.00
ROCK BASS	S	C	C	24	36.00	1.79	2.16	1.70	60.04
SMALLMOUTH BASS	F	C	C M	44	66.00	3.28	9.67	7.62	146.57
LARGEMOUTH BASS	F	C	C	4	6.00	0.30	0.14	0.11	24.00
GREEN SUNFISH	S	I	C T	8	12.00	0.60	0.22	0.17	18.00
BLUEGILL SUNFISH	S	I	C P	27	40.50	2.01	0.29	0.23	7.07
LONGEAR SUNFISH	S	I	C M	9	13.50	0.67	0.41	0.32	30.11
PUMPKINSEED SUNFISH	S	I	C P	3	4.50	0.22	0.06	0.05	13.67
GREEN SF X BLUEGILL				1	1.50	0.07	0.03	0.02	17.00
GREENSIDE DARTER	D	I	S M	4	6.00	0.30	0.03	0.02	5.00
BANDED DARTER	D	I	S I	32	48.00	2.39	0.07	0.05	1.44
RAINBOW DARTER	D	I	S M	22	33.00	1.64	0.05	0.04	1.64
FANTAIL DARTER	D	I	C	9	13.50	0.67	0.02	0.01	1.11
<i>Date Total</i>				1,340	2,010.00		126.97		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/20/95
River Mile: 0.60	Basin: Great Miami River	
Data Source: 01	Time Fished: 3290 sec Drain Area: 316.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 40 cm Flow: C	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		1	1.50	0.10	0.14	0.16	95.00
QUILLBACK CARPSUCKER	C	O	M		6	9.00	0.61	2.70	3.00	300.00
BLACK REDHORSE	R	I	S	I	218	327.00	22.27	20.90	23.18	63.92
GOLDEN REDHORSE	R	I	S	M	37	55.50	3.78	9.16	10.16	165.00
SHORHEAD REDHORSE	R	I	S	M	8	12.00	0.82	0.60	0.67	50.00
NORTHERN HOG SUCKER	R	I	S	M	131	196.50	13.38	23.52	26.09	119.72
WHITE SUCKER	W	O	S	T	4	6.00	0.41	0.71	0.79	118.75
COMMON CARP	G	O	M	T	4	6.00	0.41	11.21	12.44	1,868.75
SUCKERMOUTH MINNOW	N	I	S		12	18.00	1.23	0.14	0.15	7.58
SILVER SHINER	N	I	S	I	17	25.50	1.74	0.17	0.19	6.76
STRIPED SHINER	N	I	S		66	99.00	6.74	1.19	1.32	12.05
SPOTFIN SHINER	N	I	M		15	22.50	1.53	0.06	0.07	2.67
SAND SHINER	N	I	M	M	8	12.00	0.82	0.03	0.03	2.25
BLUNTNOSE MINNOW	N	O	C	T	8	12.00	0.82	0.04	0.04	3.25
CENTRAL STONEROLLER	N	H	N		186	279.00	19.00	6.56	7.27	23.50
CHANNEL CATFISH	F		C		12	18.00	1.23	5.33	5.91	296.00
STONECAT MADTOM		I	C	I	3	4.50	0.31	0.03	0.03	6.67
ROCK BASS	S	C	C		2	3.00	0.20	0.02	0.02	5.00
SMALLMOUTH BASS	F	C	C	M	33	49.50	3.37	5.35	5.94	108.16
LARGEMOUTH BASS	F	C	C		4	6.00	0.41	0.17	0.18	27.50
GREEN SUNFISH	S	I	C	T	24	36.00	2.45	0.60	0.67	16.67
BLUEGILL SUNFISH	S	I	C	P	41	61.50	4.19	0.14	0.15	2.20
LONGEAR SUNFISH	S	I	C	M	30	45.00	3.06	0.95	1.05	21.07
REDEAR SUNFISH	E	I	C		3	4.50	0.31	0.05	0.05	10.00
HYBRID X SUNFISH					1	1.50	0.10	0.02	0.02	14.00
LOGPERCH	D	I	S	M	3	4.50	0.31	0.05	0.06	11.67
GREENSIDE DARTER	D	I	S	M	12	18.00	1.23	0.09	0.10	5.00
BANDED DARTER	D	I	S	I	31	46.50	3.17	0.08	0.09	1.65
RAINBOW DARTER	D	I	S	M	57	85.50	5.82	0.15	0.17	1.75
FANTAIL DARTER	D	I	C		2	3.00	0.20	0.01	0.01	2.00
<i>Date Total</i>					979	1,468.50		90.15		
<i>Number of Species</i>					29					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-500	Stream: Twin Creek	Sample Date: 09/21/95
River Mile: 0.20	Basin: Great Miami River	
Data Source: 01	Time Fished: 3346 sec Drain Area: 316.0 sq mi	Invalid Sample:
Purpose:	Dist Fished: 0.20 km Depth: 60 cm Flow: C	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
GIZZARD SHAD		O	M	84	126.00	15.91	18.42	18.48	146.15
QUILLBACK CARPSUCKER	C	O	M	44	66.00	8.33	19.88	19.95	301.14
BLACK REDHORSE	R	I	S I	94	141.00	17.80	11.51	11.55	81.60
GOLDEN REDHORSE	R	I	S M	51	76.50	9.66	13.02	13.06	170.16
SHORTHEAD REDHORSE	R	I	S M	7	10.50	1.33	1.40	1.41	133.57
NORTHERN HOG SUCKER	R	I	S M	40	60.00	7.58	5.28	5.30	88.00
WHITE SUCKER	W	O	S T	1	1.50	0.19	0.61	0.61	408.00
COMMON CARP	G	O	M T	10	15.00	1.89	13.69	13.74	912.50
GOLDFISH	G	O	M T	2	3.00	0.38	0.98	0.98	325.00
BLACKNOSE DACE	N	G	S T	1	1.50	0.19	0.00	0.00	2.00
SILVER SHINER	N	I	S I	7	10.50	1.33	0.06	0.06	5.43
STRIPED SHINER	N	I	S	19	28.50	3.60	0.25	0.25	8.58
SPOTFIN SHINER	N	I	M	38	57.00	7.20	0.18	0.18	3.16
SAND SHINER	N	I	M M	1	1.50	0.19	0.01	0.01	3.00
CENTRAL STONEROLLER	N	H	N	62	93.00	11.74	0.89	0.89	9.55
CHANNEL CATFISH	F		C	17	25.50	3.22	8.48	8.51	332.65
FLATHEAD CATFISH	F	P	C	1	1.50	0.19	1.69	1.69	1,125.00
BROOK SILVERSIDE		I	M M	2	3.00	0.38	0.01	0.01	2.00
WHITE BASS	F	P	M	1	1.50	0.19	0.05	0.05	35.00
ROCK BASS	S	C	C	2	3.00	0.38	0.23	0.23	75.50
SMALLMOUTH BASS	F	C	C M	8	12.00	1.52	2.78	2.79	231.88
LARGEMOUTH BASS	F	C	C	2	3.00	0.38	0.12	0.12	40.00
GREEN SUNFISH	S	I	C T	2	3.00	0.38	0.03	0.03	10.00
BLUEGILL SUNFISH	S	I	C P	8	12.00	1.52	0.03	0.03	2.63
LONGEAR SUNFISH	S	I	C M	1	1.50	0.19	0.03	0.03	19.00
BANDED DARTER	D	I	S I	12	18.00	2.27	0.01	0.01	0.75
RAINBOW DARTER	D	I	S M	11	16.50	2.08	0.03	0.03	1.64
<i>Date Total</i>				528	792.00		99.63		
<i>Number of Species</i>				27					
<i>Number of Hybrids</i>				0					

Species List

River Code: 14-500	Stream: Twin Creek	River Segment Totals
Mile 0.20	Basin: Great Miami River	Date Range: 07/25/95
Thru: 45.90	Time Fished: 91102 sec	Thru: 09/21/95
	Dist Fished: 6.15 km No of Passes: 31	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	115	5.56	0.28	0.78	1.26	141.03
QUILLBACK CARPSUCKER	C	O	M	102	4.94	0.25	1.56	2.50	315.12
BLACK REDHORSE	R	I	S I	2,374	116.10	5.77	16.05	25.85	137.76
GOLDEN REDHORSE	R	I	S M	654	31.81	1.58	6.63	10.68	208.82
SHORTHEAD REDHORSE	R	I	S M	34	1.65	0.08	0.18	0.29	111.18
NORTHERN HOG SUCKER	R	I	S M	2,564	126.02	6.26	7.37	11.87	58.74
WHITE SUCKER	W	O	S T	665	32.24	1.60	2.24	3.61	69.64
COMMON CARP	G	O	M T	57	2.76	0.14	5.46	8.79	1,978.43
GOLDFISH	G	O	M T	3	0.15	0.01	0.03	0.05	217.33
RIVER CHUB	N	I	N I	293	14.21	0.71	0.44	0.71	30.90
BIGEYE CHUB	N	I	S I	1	0.05	0.00	0.00	0.00	2.00
BLACKNOSE DACE	N	G	S T	3	0.15	0.01	0.00	0.00	2.00
CREEK CHUB	N	G	N T	1,009	50.03	2.49	1.04	1.68	20.39
SUCKERMOUTH MINNOW	N	I	S	27	1.31	0.06	0.01	0.01	6.93
SILVER SHINER	N	I	S I	737	35.74	1.78	0.11	0.17	2.98
ROSYFACE SHINER	N	I	S I	677	33.32	1.66	0.07	0.11	2.12
ROSEFIN SHINER	N	I	S M	463	22.55	1.12	0.05	0.08	2.11
STRIPED SHINER	N	I	S	3,358	164.69	8.19	2.00	3.23	12.20
SPOTFIN SHINER	N	I	M	388	18.81	0.93	0.07	0.11	3.52
SAND SHINER	N	I	M M	928	46.94	2.33	0.10	0.16	2.07
MIMIC SHINER	N	I	M I	14	0.68	0.03	0.00	0.00	1.93
SILVERJAW MINNOW	N	I	M	66	3.34	0.17	0.01	0.02	3.26
FATHEAD MINNOW	N	O	C T	1	0.05	0.00	0.00	0.00	3.00
BLUNTNOSTE MINNOW	N	O	C T	2,420	122.97	6.11	0.42	0.67	3.42
CENTRAL STONEROLLER	N	H	N	14,619	745.79	37.07	7.93	12.77	10.50
STRIPED SH X ROSYFACE SH		I		10	0.48	0.02	0.01	0.01	10.40
STRIPED SH X STONEROLLER				1	0.05	0.00	0.00	0.00	20.00
STRIPED SH X ROSEFIN SH		I		1	0.05	0.00	0.00	0.00	2.00
CHANNEL CATFISH	F		C	32	1.55	0.08	0.52	0.84	336.16
YELLOW BULLHEAD		I	C T	7	0.34	0.02	0.03	0.05	99.86
FLATHEAD CATFISH	F	P	C	1	0.05	0.00	0.05	0.09	1,125.00
STONECAT MADTOM		I	C I	48	2.32	0.12	0.05	0.08	22.45
BRINDLED MADTOM		I	C I	5	0.24	0.01	0.00	0.00	8.40
BL'KSTRIPE TOPMINNOW		I	M	4	0.19	0.01	0.00	0.00	1.75
BROOK SILVERSIDE		I	M M	3	0.15	0.01	0.00	0.00	2.33
WHITE BASS	F	P	M	1	0.05	0.00	0.00	0.00	35.00
ROCK BASS	S	C	C	907	43.98	2.19	2.70	4.34	61.19
SMALLMOUTH BASS	F	C	C M	762	38.13	1.90	3.95	6.36	104.67
LARGEMOUTH BASS	F	C	C	72	3.61	0.18	0.20	0.32	50.90
GREEN SUNFISH	S	I	C T	211	10.24	0.51	0.30	0.48	29.05
BLUEGILL SUNFISH	S	I	C P	387	18.76	0.93	0.13	0.21	7.09
OR'GESPOTTED SUNFISH	S	I	C	1	0.05	0.00	0.00	0.00	9.00
LONGEAR SUNFISH	S	I	C M	892	43.16	2.15	0.95	1.54	22.11
REDEAR SUNFISH	E	I	C	3	0.15	0.01	0.00	0.00	10.00

Species List

River: 14-500 Twin Creek

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
PUMPKINSEED SUNFISH	S	I	C	P	3	0.15	0.01	0.00	0.00	13.67
GREEN SF X BLUEGILL					16	0.77	0.04	0.02	0.03	21.50
LONGEAR SF X B'GILL					2	0.10	0.00	0.01	0.02	105.00
GREEN SF X LONGEAR					6	0.29	0.01	0.02	0.03	73.50
HYBRID X SUNFISH					1	0.05	0.00	0.00	0.00	14.00
BLACKSIDE DARTER	D	I	S		2	0.10	0.00	0.00	0.00	5.50
LOGPERCH	D	I	S	M	198	9.77	0.49	0.10	0.16	9.97
JOHNNY DARTER	D	I	C		35	1.69	0.08	0.00	0.00	1.37
GREENSIDE DARTER	D	I	S	M	1,175	58.13	2.89	0.19	0.31	3.34
BANDED DARTER	D	I	S	I	635	31.03	1.54	0.05	0.07	1.45
RAINBOW DARTER	D	I	S	M	2,701	132.52	6.59	0.18	0.29	1.35
ORANGETHROAT DARTER	D	I	S		18	0.87	0.04	0.00	0.00	1.44
FANTAIL DARTER	D	I	C		185	9.03	0.45	0.02	0.03	1.89
LEAST DARTER	D	I	N		44	2.13	0.11	0.00	0.00	0.48
MOTTLED SCULPIN		I	C		411	19.89	0.99	0.06	0.10	3.10
<i>Stream</i>					40,352	2,011.89		62.09		
<i>Number of Species</i>					52					
<i>Number of Hybrids</i>					7					

Species List

River Code: 14-501	Stream: Little Twin Creek	Sample Date: 1995
River Mile: 6.30	Location:	Date Range: 07/27/1995
Time Fished: 5115 sec	Drainage: 4.9 sq mi	Thru: 09/26/1995
Dist Fished: 0.30 km	Basin: Great Miami River	Sampler Type: E
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	107	107.00	3.98	2.36	17.45	22.04
Blacknose Dace	N	G	S	T	517	517.00	19.23	0.98	7.22	1.89
Creek Chub	N	G	N	T	453	453.00	16.85	5.02	37.13	11.08
South. Redbelly Dace	N	H	S		311	311.00	11.57	0.58	4.28	1.86
Striped Shiner	N	I	S		57	57.00	2.12	0.42	3.12	7.39
Silverjaw Minnow	N	I	M		2	2.00	0.07	0.01	0.06	4.00
Fathead Minnow	N	O	C	T	2	2.00	0.07	0.00	0.01	1.00
Bluntnose Minnow	N	O	C	T	58	58.00	2.16	0.10	0.73	1.71
Central Stoneroller	N	H	N		731	731.00	27.19	2.33	17.22	3.18
Largemouth Bass	F	C	C		1	1.00	0.04	0.01	0.06	8.00
Green Sunfish	S	I	C	T	116	116.00	4.32	1.32	9.77	11.38
Bluegill Sunfish	S	I	C	P	20	20.00	0.74	0.11	0.81	5.45
Green Sf X Bluegill Sf					3	3.00	0.11	0.04	0.29	13.00
Johnny Darter	D	I	C		44	44.00	1.64	0.04	0.33	1.00
Orangethroat Darter	D	I	S		220	220.00	8.18	0.16	1.19	0.73
Fantail Darter	D	I	C		46	46.00	1.71	0.05	0.33	0.98
<i>Mile Total</i>					2,688	2,688.00		13.51		
<i>Number of Species</i>					15					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-501	Stream: Little Twin Creek	Sample Date: 1995
River Mile: 4.70	Location:	Date Range: 07/26/1995
Time Fished: 4013 sec	Drainage: 11.5 sq mi	Thru: 09/27/1995
Dist Fished: 0.30 km	Basin: Great Miami River	Sampler Type: D
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback Carpsucker	C	O	M	20	20.00	0.24	0.26	0.62	13.00
Golden Redhorse	R	I	S M	1	1.00	0.01	0.44	1.04	440.00
Northern Hog Sucker	R	I	S M	30	30.00	0.37	0.67	1.59	22.33
White Sucker	W	O	S T	176	176.00	2.15	3.95	9.37	22.43
Common Carp	G	O	M T	1	1.00	0.01	0.03	0.08	34.00
Blacknose Dace	N	G	S T	163	163.00	1.99	0.24	0.57	1.48
Creek Chub	N	G	N T	700	700.00	8.55	7.88	18.71	11.26
Suckermouth Minnow	N	I	S	22	22.00	0.27	0.13	0.32	6.09
South. Redbelly Dace	N	H	S	83	83.00	1.01	0.14	0.33	1.69
Striped Shiner	N	I	S	1,040	1,040.00	12.71	3.91	9.28	3.76
Spotfin Shiner	N	I	M	1	1.00	0.01	0.00	0.00	2.00
Sand Shiner	N	I	M M	46	46.00	0.56	0.09	0.22	2.00
Silverjaw Minnow	N	I	M	60	60.00	0.73	0.11	0.26	1.85
Bluntnose Minnow	N	O	C T	542	542.00	6.62	1.30	3.08	2.39
Central Stoneroller	N	H	N	4,310	4,310.00	52.67	20.64	48.97	4.79
Yellow Bullhead		I	C T	14	14.00	0.17	0.41	0.96	29.00
Smallmouth Bass	F	C	C M	1	1.00	0.01	0.06	0.14	57.00
Largemouth Bass	F	C	C	12	12.00	0.15	0.26	0.61	21.33
Green Sunfish	S	I	C T	40	40.00	0.49	0.47	1.12	11.75
Bluegill Sunfish	S	I	C P	5	5.00	0.06	0.04	0.09	7.40
Longear Sunfish	S	I	C M	2	2.00	0.02	0.04	0.09	19.50
Green Sf X Bluegill Sf				7	7.00	0.09	0.19	0.45	27.14
Johnny Darter	D	I	C	92	92.00	1.12	0.12	0.28	1.29
Greenside Darter	D	I	S M	1	1.00	0.01	0.01	0.02	8.00
Rainbow Darter	D	I	S M	438	438.00	5.35	0.44	1.05	1.01
Orangethroat Darter	D	I	S	332	332.00	4.06	0.26	0.63	0.79
Fantail Darter	D	I	C	44	44.00	0.54	0.05	0.12	1.11
<i>Mile Total</i>				8,183	8,183.00		42.14		
<i>Number of Species</i>				26					
<i>Number of Hybrids</i>				1					

River Code: 14-501	Stream: Little Twin Creek	Sample Date: 1995
River Mile: 2.70	Location:	Date Range: 07/27/1995
Time Fished: 3188 sec	Drainage: 18.8 sq mi	Thru: 09/27/1995
Dist Fished: 0.30 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback Carpsucker	C	O	M	4	4.00	0.09	0.03	0.05	6.50
Black Redhorse	R	I	S I	1	1.00	0.02	0.28	0.51	278.00
Golden Redhorse	R	I	S M	2	2.00	0.04	0.69	1.28	346.00
Northern Hog Sucker	R	I	S M	70	70.00	1.56	3.48	6.44	49.76
White Sucker	W	O	S T	364	364.00	8.12	17.70	32.70	48.62
Blacknose Dace	N	G	S T	451	451.00	10.06	1.31	2.43	2.91
Creek Chub	N	G	N T	903	903.00	20.15	10.09	18.64	11.17
Suckermouth Minnow	N	I	S	3	3.00	0.07	0.01	0.01	1.67
South. Redbelly Dace	N	H	S	134	134.00	2.99	0.33	0.61	2.45
Striped Shiner	N	I	S	229	229.00	5.11	2.48	4.58	10.82
Sand Shiner	N	I	M M	8	8.00	0.18	0.02	0.03	1.88
Silverjaw Minnow	N	I	M	6	6.00	0.13	0.02	0.03	2.67
Bluntnose Minnow	N	O	C T	49	49.00	1.09	0.18	0.33	3.69
Central Stoneroller	N	H	N	1,977	1,977.00	44.12	15.43	28.50	7.80
Yellow Bullhead		I	C T	3	3.00	0.07	0.13	0.24	43.33
Rock Bass	S	C	C	1	1.00	0.02	0.09	0.16	85.00
Smallmouth Bass	F	C	C M	20	20.00	0.45	0.83	1.52	41.25
Largemouth Bass	F	C	C	9	9.00	0.20	0.11	0.21	12.44
Green Sunfish	S	I	C T	20	20.00	0.45	0.31	0.58	15.65
Bluegill Sunfish	S	I	C P	17	17.00	0.38	0.13	0.23	7.41
Longear Sunfish	S	I	C M	2	2.00	0.04	0.03	0.06	15.50
Green Sf X Bluegill Sf				7	7.00	0.16	0.16	0.30	23.29
Johnny Darter	D	I	C	29	29.00	0.65	0.05	0.09	1.62
Greenside Darter	D	I	S M	10	10.00	0.22	0.05	0.10	5.40
Rainbow Darter	D	I	S M	65	65.00	1.45	0.10	0.18	1.51
Orangethroat Darter	D	I	S	93	93.00	2.08	0.10	0.19	1.12
Fantail Darter	D	I	C	4	4.00	0.09	0.01	0.01	2.00
<i>Mile Total</i>				4,481	4,481.00		54.12		
<i>Number of Species</i>				26					
<i>Number of Hybrids</i>				1					

River Code: 14-501	Stream: Little Twin Creek	River Segment Totals
Mile Range: 2.70		Date Range: 07/26/1995
Thru: 6.30		Thru: 09/27/1995
Dist Fished: 0.90 km	Basin: Great Miami River	No of Passes: 6
		Sampler Type: D E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback Carpsucker	C	O	M	24	8.00	0.16	0.10	0.26	11.92
Black Redhorse	R	I	S I	1	0.33	0.01	0.09	0.25	278.00
Golden Redhorse	R	I	S M	3	1.00	0.02	0.38	1.03	377.33
Northern Hog Sucker	R	I	S M	100	33.33	0.65	1.38	3.78	41.53
White Sucker	W	O	S T	647	215.67	4.21	8.00	21.87	37.10
Common Carp	G	O	M T	1	0.33	0.01	0.01	0.03	34.00
Blacknose Dace	N	G	S T	1,131	377.00	7.37	0.84	2.30	2.24
Creek Chub	N	G	N T	2,056	685.33	13.39	7.66	20.94	11.18
Suckermouth Minnow	N	I	S	25	8.33	0.16	0.05	0.13	5.56
South. Redbelly Dace	N	H	S	528	176.00	3.44	0.35	0.95	1.98
Striped Shiner	N	I	S	1,326	442.00	8.64	2.27	6.20	5.14
Spotfin Shiner	N	I	M	1	0.33	0.01	0.00	0.00	2.00
Sand Shiner	N	I	M M	54	18.00	0.35	0.04	0.10	1.98
Silverjaw Minnow	N	I	M	68	22.67	0.44	0.05	0.12	1.99
Fathead Minnow	N	O	C T	2	0.67	0.01	0.00	0.00	1.00
Bluntnose Minnow	N	O	C T	649	216.33	4.23	0.53	1.44	2.43
Central Stoneroller	N	H	N	7,018	2,339.33	45.71	12.80	34.97	5.47
Yellow Bullhead		I	C T	17	5.67	0.11	0.18	0.49	31.53
Rock Bass	S	C	C	1	0.33	0.01	0.03	0.08	85.00
Smallmouth Bass	F	C	C M	21	7.00	0.14	0.29	0.80	42.00
Largemouth Bass	F	C	C	22	7.33	0.14	0.13	0.34	17.09
Green Sunfish	S	I	C T	176	58.67	1.15	0.70	1.92	11.95
Bluegill Sunfish	S	I	C P	42	14.00	0.27	0.09	0.25	6.48
Longear Sunfish	S	I	C M	4	1.33	0.03	0.02	0.06	17.50
Green Sf X Bluegill Sf				17	5.67	0.11	0.13	0.36	23.06
Johnny Darter	D	I	C	165	55.00	1.07	0.07	0.19	1.27
Greenside Darter	D	I	S M	11	3.67	0.07	0.02	0.06	5.64
Rainbow Darter	D	I	S M	503	167.67	3.28	0.18	0.49	1.08
Orangethroat Darter	D	I	S	645	215.00	4.20	0.18	0.48	0.82
Fantail Darter	D	I	C	94	31.33	0.61	0.03	0.09	1.09
<i>Stream Total</i>				15,352	5,117.33		36.59		
<i>Number of Species</i>				29					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-502 River Mile: 12.10 Time Fished: 2355 sec Dist Fished: 0.20 km	Stream: Toms Run Location: Drainage: 6.0 sq mi Basin: Great Miami River	Sample Date: 1995 Date Range: 08/10/1995 No of Passes: 1 Sampler Type: D
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	82	123.00	10.43	1.18	26.27	9.61
Blacknose Dace	N	G	S	T	17	25.50	2.16	0.06	1.38	2.41
Creek Chub	N	G	N	T	332	498.00	42.24	1.59	35.42	3.20
South. Redbelly Dace	N	H	S		63	94.50	8.02	0.16	3.64	1.73
Rosefin Shiner	N	I	S	M	9	13.50	1.15	0.05	1.04	3.44
Striped Shiner	N	I	S		75	112.50	9.54	0.94	20.89	8.36
Fathead Minnow	N	O	C	T	18	27.00	2.29	0.05	1.20	2.00
Bluntnose Minnow	N	O	C	T	19	28.50	2.42	0.05	1.11	1.74
Central Stoneroller	N	H	N		76	114.00	9.67	0.26	5.73	2.26
Stoneroller X Srbd	N	H			1	1.50	0.13	0.01	0.27	8.00
Yellow Bullhead		I	C	T	1	1.50	0.13	0.00	0.07	2.00
Rock Bass	S	C	C		10	15.00	1.27	0.02	0.33	1.00
Johnny Darter	D	I	C		7	10.50	0.89	0.01	0.27	1.14
Rainbow Darter	D	I	S	M	5	7.50	0.64	0.02	0.33	2.00
Orangethroat Darter	D	I	S		71	106.50	9.03	0.09	2.09	0.88
<i>Mile Total</i>					786	1,179.00		4.50		
<i>Number of Species</i>					14					
<i>Number of Hybrids</i>					1					

River Code: 14-502	Stream: Toms Run	Sample Date: 1995
River Mile: 8.50	Location:	Date Range: 08/10/1995
Time Fished: 2166 sec	Drainage: 10.6 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Blacknose Dace	N	G	S	T	5	7.50	0.93	0.02	0.19	2.00
Creek Chub	N	G	N	T	118	177.00	21.93	2.14	26.96	12.07
South. Redbelly Dace	N	H	S		2	3.00	0.37	0.01	0.10	2.50
Striped Shiner	N	I	S		35	52.50	6.51	0.38	4.83	7.29
Silverjaw Minnow	N	I	M		2	3.00	0.37	0.01	0.06	1.50
Fathead Minnow	N	O	C	T	51	76.50	9.48	0.15	1.93	2.00
Bluntnose Minnow	N	O	C	T	6	9.00	1.12	0.01	0.18	1.50
Central Stoneroller	N	H	N		79	118.50	14.68	0.64	8.03	5.37
Yellow Bullhead		I	C	T	1	1.50	0.19	0.01	0.06	3.00
Black Bullhead		I	C	P	1	1.50	0.19	0.11	1.33	70.00
Rock Bass	S	C	C		23	34.50	4.28	0.16	1.96	4.50
Green Sunfish	S	I	C	T	21	31.50	3.90	0.25	3.13	7.86
Johnny Darter	D	I	C		4	6.00	0.74	0.01	0.08	1.00
Greenside Darter	D	I	S	M	2	3.00	0.37	0.02	0.29	7.50
Banded Darter	D	I	S	I	80	120.00	14.87	3.86	48.76	32.19
Rainbow Darter	D	I	S	M	33	49.50	6.13	0.07	0.91	1.45
Orangethroat Darter	D	I	S		71	106.50	13.20	0.09	1.14	0.85
Fantail Darter	D	I	C		4	6.00	0.74	0.01	0.11	1.50
<i>Mile Total</i>					538	807.00		7.92		
<i>Number of Species</i>					18					
<i>Number of Hybrids</i>					0					

River Code: 14-502	Stream: Toms Run	Sample Date: 1995
River Mile: 0.40	Location:	Date Range: 08/17/1995
Time Fished: 2688 sec	Drainage: 25.1 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	29	43.50	3.89	1.85	10.74	42.52
White Sucker	W	O	S	T	82	123.00	10.99	4.65	26.99	37.80
Blacknose Dace	N	G	S	T	8	12.00	1.07	0.04	0.24	3.38
Creek Chub	N	G	N	T	177	265.50	23.73	5.64	32.74	21.24
Silver Shiner	N	I	S	I	3	4.50	0.40	0.02	0.12	4.67
Rosefin Shiner	N	I	S	M	6	9.00	0.80	0.02	0.12	2.33
Striped Shiner	N	I	S		72	108.00	9.65	1.11	6.44	10.28
Spotfin Shiner	N	I	M		3	4.50	0.40	0.01	0.08	3.00
Sand Shiner	N	I	M	M	10	15.00	1.34	0.03	0.17	2.00
Silverjaw Minnow	N	I	M		1	1.50	0.13	0.01	0.05	5.00
Bluntnose Minnow	N	O	C	T	3	4.50	0.40	0.02	0.13	5.00
Central Stoneroller	N	H	N		76	114.00	10.19	0.56	3.26	4.93
Yellow Bullhead		I	C	T	1	1.50	0.13	0.20	1.18	135.00
Rock Bass	S	C	C		23	34.50	3.08	1.90	11.02	55.00
Smallmouth Bass	F	C	C	M	22	33.00	2.95	0.43	2.52	13.16
Green Sunfish	S	I	C	T	3	4.50	0.40	0.04	0.21	8.00
Bluegill Sunfish	S	I	C	P	4	6.00	0.54	0.03	0.16	4.50
Longear Sunfish	S	I	C	M	3	4.50	0.40	0.14	0.83	31.67
Green Sf X Longear Sf					1	1.50	0.13	0.08	0.48	55.00
Johnny Darter	D	I	C		5	7.50	0.67	0.02	0.09	2.00
Greenside Darter	D	I	S	M	17	25.50	2.28	0.08	0.48	3.24
Banded Darter	D	I	S	I	9	13.50	1.21	0.02	0.12	1.56
Rainbow Darter	D	I	S	M	159	238.50	21.31	0.23	1.36	0.98
Orangethroat Darter	D	I	S		5	7.50	0.67	0.01	0.08	1.80
Fantail Darter	D	I	C		19	28.50	2.55	0.03	0.17	1.05
Mottled Sculpin		I	C		5	7.50	0.67	0.04	0.24	5.60
<i>Mile Total</i>					746	1,119.00		17.23		
<i>Number of Species</i>					25					
<i>Number of Hybrids</i>					1					

River Code: 14-502	Stream: Toms Run	River Segment Totals
Mile Range: 0.40		Date Range: 08/10/1995
Thru: 12.10		Thru: 08/17/1995
Dist Fished: 0.60 km	Basin: Great Miami River	No of Passes: 3
		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
Northern Hog Sucker	R	I	S M	29	14.50	1.40	0.62	6.24	42.52
White Sucker	W	O	S T	164	82.00	7.92	1.94	19.67	23.70
Blacknose Dace	N	G	S T	30	15.00	1.45	0.04	0.40	2.60
Creek Chub	N	G	N T	627	313.50	30.29	3.12	31.60	9.96
South. Redbelly Dace	N	H	S	65	32.50	3.14	0.06	0.58	1.75
Silver Shiner	N	I	S I	3	1.50	0.14	0.01	0.07	4.67
Rosefin Shiner	N	I	S M	15	7.50	0.72	0.02	0.23	3.00
Striped Shiner	N	I	S	182	91.00	8.79	0.81	8.21	8.91
Spotfin Shiner	N	I	M	3	1.50	0.14	0.00	0.05	3.00
Sand Shiner	N	I	M M	10	5.00	0.48	0.01	0.10	2.00
Silverjaw Minnow	N	I	M	3	1.50	0.14	0.00	0.04	2.67
Fathead Minnow	N	O	C T	69	34.50	3.33	0.07	0.70	2.00
Bluntnose Minnow	N	O	C T	28	14.00	1.35	0.03	0.29	2.04
Central Stoneroller	N	H	N	231	115.50	11.16	0.49	4.91	4.20
Stoneroller X Sbrd	N	H		1	0.50	0.05	0.00	0.04	8.00
Yellow Bullhead		I	C T	3	1.50	0.14	0.07	0.71	46.67
Black Bullhead		I	C P	1	0.50	0.05	0.04	0.35	70.00
Rock Bass	S	C	C	56	28.00	2.71	0.69	6.97	24.62
Smallmouth Bass	F	C	C M	22	11.00	1.06	0.14	1.46	13.16
Green Sunfish	S	I	C T	24	12.00	1.16	0.09	0.96	7.88
Bluegill Sunfish	S	I	C P	4	2.00	0.19	0.01	0.09	4.50
Longear Sunfish	S	I	C M	3	1.50	0.14	0.05	0.48	31.67
Green Sf X Longear Sf				1	0.50	0.05	0.03	0.28	55.00
Johnny Darter	D	I	C	16	8.00	0.77	0.01	0.11	1.38
Greenside Darter	D	I	S M	19	9.50	0.92	0.04	0.36	3.68
Banded Darter	D	I	S I	89	44.50	4.30	1.29	13.10	29.09
Rainbow Darter	D	I	S M	197	98.50	9.52	0.11	1.08	1.09
Orangethroat Darter	D	I	S	147	73.50	7.10	0.07	0.67	0.90
Fantail Darter	D	I	C	23	11.50	1.11	0.01	0.13	1.13
Mottled Sculpin		I	C	5	2.50	0.24	0.01	0.14	5.60
<i>Stream Total</i>				2,070	1,035.00		9.88		
<i>Number of Species</i>				28					
<i>Number of Hybrids</i>				2					

Species List

River Code: 14-504	Stream: Aukerman Creek	Sample Date: 1995
River Mile: 0.20	Location:	Date Range: 07/28/1995
Time Fished: 2227 sec	Drainage: 21.1 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	87	130.50	4.05	4.16	16.91	31.91
White Sucker	W	O	S	T	32	48.00	1.49	1.30	5.29	27.16
Blacknose Dace	N	G	S	T	6	9.00	0.28	0.02	0.07	2.00
Creek Chub	N	G	N	T	324	486.00	15.10	4.65	18.86	9.56
Rosefin Shiner	N	I	S	M	1	1.50	0.05	0.01	0.02	4.00
Striped Shiner	N	I	S		77	115.50	3.59	1.18	4.79	10.22
Spotfin Shiner	N	I	M		4	6.00	0.19	0.02	0.07	2.75
Sand Shiner	N	I	M	M	44	66.00	2.05	0.14	0.57	2.14
Silverjaw Minnow	N	I	M		13	19.50	0.61	0.08	0.32	4.00
Bluntnose Minnow	N	O	C	T	29	43.50	1.35	0.19	0.78	4.41
Central Stoneroller	N	H	N		1,267	1,900.50	59.04	9.66	39.20	5.08
Stonecat Madtom		I	C	I	2	3.00	0.09	0.05	0.22	17.50
Rock Bass	S	C	C		18	27.00	0.84	0.77	3.13	28.50
Smallmouth Bass	F	C	C	M	29	43.50	1.35	1.86	7.53	42.62
Largemouth Bass	F	C	C		6	9.00	0.28	0.02	0.07	2.00
Green Sunfish	S	I	C	T	6	9.00	0.28	0.03	0.13	3.67
Bluegill Sunfish	S	I	C	P	2	3.00	0.09	0.01	0.04	3.00
Johnny Darter	D	I	C		2	3.00	0.09	0.01	0.02	1.50
Greenside Darter	D	I	S	M	15	22.50	0.70	0.06	0.26	2.80
Rainbow Darter	D	I	S	M	164	246.00	7.64	0.38	1.56	1.56
Orangethroat Darter	D	I	S		6	9.00	0.28	0.02	0.06	1.67
Fantail Darter	D	I	C		11	16.50	0.51	0.02	0.10	1.45
Mottled Sculpin		I	C		1	1.50	0.05	0.00	0.01	2.00
<i>Mile Total</i>					2,146	3,219.00		24.63		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					0					

River Code: 14-504 Mile Range: 0.20	Stream: Aukerman Creek		River Segment Totals Date Range: 07/28/1995		
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1	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
Northern Hog Sucker	R	I	S	M	87	130.50	4.05	4.16	16.91	31.91
White Sucker	W	O	S	T	32	48.00	1.49	1.30	5.29	27.16
Blacknose Dace	N	G	S	T	6	9.00	0.28	0.02	0.07	2.00
Creek Chub	N	G	N	T	324	486.00	15.10	4.65	18.86	9.56
Rosefin Shiner	N	I	S	M	1	1.50	0.05	0.01	0.02	4.00
Striped Shiner	N	I	S		77	115.50	3.59	1.18	4.79	10.22
Spotfin Shiner	N	I	M		4	6.00	0.19	0.02	0.07	2.75
Sand Shiner	N	I	M	M	44	66.00	2.05	0.14	0.57	2.14
Silverjaw Minnow	N	I	M		13	19.50	0.61	0.08	0.32	4.00
Bluntnose Minnow	N	O	C	T	29	43.50	1.35	0.19	0.78	4.41
Central Stoneroller	N	H	N		1,267	1,900.50	59.04	9.66	39.20	5.08
Stonecat Madtom		I	C	I	2	3.00	0.09	0.05	0.22	17.50
Rock Bass	S	C	C		18	27.00	0.84	0.77	3.13	28.50
Smallmouth Bass	F	C	C	M	29	43.50	1.35	1.86	7.53	42.62
Largemouth Bass	F	C	C		6	9.00	0.28	0.02	0.07	2.00
Green Sunfish	S	I	C	T	6	9.00	0.28	0.03	0.13	3.67
Bluegill Sunfish	S	I	C	P	2	3.00	0.09	0.01	0.04	3.00
Johnny Darter	D	I	C		2	3.00	0.09	0.01	0.02	1.50
Greenside Darter	D	I	S	M	15	22.50	0.70	0.06	0.26	2.80
Rainbow Darter	D	I	S	M	164	246.00	7.64	0.38	1.56	1.56
Orangethroat Darter	D	I	S		6	9.00	0.28	0.02	0.06	1.67
Fantail Darter	D	I	C		11	16.50	0.51	0.02	0.10	1.45
Mottled Sculpin		I	C		1	1.50	0.05	0.00	0.01	2.00
<i>Stream Total</i>					2,146	3,219.00		24.63		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					0					

River Code: 14-505	Stream: Bantas Fork	Sample Date: 1995
River Mile: 9.50	Location:	Date Range: 08/18/1995
Time Fished: 4193 sec	Drainage: 11.8 sq mi	Thru: 09/26/1995
Dist Fished: 0.30 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	5	5.00	0.27	0.72	4.56	144.20
Northern Hog Sucker	R	I	S M	58	58.00	3.17	1.59	10.03	27.33
White Sucker	W	O	S T	96	96.00	5.24	4.23	26.80	44.09
River Chub	N	I	N I	2	2.00	0.11	0.06	0.39	31.00
Bigeye Chub	N	I	S I	93	93.00	5.08	0.27	1.70	2.88
Blacknose Dace	N	G	S T	18	18.00	0.98	0.03	0.17	1.49
Creek Chub	N	G	N T	171	171.00	9.34	2.89	18.29	16.90
Silver Shiner	N	I	S I	14	14.00	0.76	0.04	0.28	3.14
Rosefin Shiner	N	I	S M	81	81.00	4.42	0.17	1.08	2.11
Striped Shiner	N	I	S	171	171.00	9.34	1.89	11.94	11.04
Sand Shiner	N	I	M M	17	17.00	0.93	0.04	0.27	2.53
Silverjaw Minnow	N	I	M	14	14.00	0.76	0.03	0.22	2.43
Bluntnose Minnow	N	O	C T	162	162.00	8.85	0.42	2.68	2.61
Central Stoneroller	N	H	N	584	584.00	31.90	1.95	12.34	3.34
Rock Bass	S	C	C	2	2.00	0.11	0.23	1.43	113.00
Smallmouth Bass	F	C	C M	14	14.00	0.76	0.74	4.69	52.93
Largemouth Bass	F	C	C	2	2.00	0.11	0.01	0.07	5.50
Green Sunfish	S	I	C T	2	2.00	0.11	0.05	0.30	24.00
Johnny Darter	D	I	C	34	34.00	1.86	0.03	0.18	0.82
Greenside Darter	D	I	S M	52	52.00	2.84	0.10	0.61	1.87
Rainbow Darter	D	I	S M	166	166.00	9.07	0.21	1.31	1.25
Orangethroat Darter	D	I	S	9	9.00	0.49	0.02	0.09	1.67
Fantail Darter	D	I	C	52	52.00	2.84	0.06	0.38	1.15
Mottled Sculpin		I	C	12	12.00	0.66	0.03	0.18	2.33
<i>Mile Total</i>				1,831	1,831.00		15.80		
<i>Number of Species</i>				24					
<i>Number of Hybrids</i>				0					

Species List

River Code: 14-505	Stream: Bantas Fork	Sample Date: 1995
River Mile: 1.40	Location:	Date Range: 07/26/1995
Time Fished: 6339 sec	Drainage: 34.0 sq mi	Thru: 09/26/1995
Dist Fished: 0.40 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	39	29.25	1.43	6.67	19.07	227.87
Northern Hog Sucker	R	I	S M	171	128.25	6.26	4.67	13.36	36.40
White Sucker	W	O	S T	56	42.00	2.05	1.82	5.20	43.23
River Chub	N	I	N I	74	55.50	2.71	1.32	3.78	23.81
Bigeye Chub	N	I	S I	1	0.75	0.04	0.00	0.01	3.00
Creek Chub	N	G	N T	91	68.25	3.33	1.46	4.16	21.32
Silver Shiner	N	I	S I	18	13.50	0.66	0.04	0.12	3.00
Rosyface Shiner	N	I	S I	10	7.50	0.37	0.02	0.06	2.60
Rosefin Shiner	N	I	S M	43	32.25	1.58	0.08	0.24	2.60
Striped Shiner	N	I	S	344	258.00	12.60	2.86	8.19	11.09
Spotfin Shiner	N	I	M	19	14.25	0.70	0.06	0.18	4.32
Sand Shiner	N	I	M M	11	8.25	0.40	0.02	0.05	2.18
Silverjaw Minnow	N	I	M	17	12.75	0.62	0.05	0.13	3.65
Bluntnose Minnow	N	O	C T	24	18.00	0.88	0.14	0.39	7.50
Central Stoneroller	N	H	N	1,050	787.50	38.46	10.14	29.00	12.87
Striped Sh X River Chub		I		1	0.75	0.04	0.01	0.03	12.00
Rock Bass	S	C	C	55	41.25	2.01	2.49	7.12	60.31
Smallmouth Bass	F	C	C M	70	52.50	2.56	2.08	5.94	39.55
Green Sunfish	S	I	C T	4	3.00	0.15	0.04	0.11	13.00
Bluegill Sunfish	S	I	C P	5	3.75	0.18	0.03	0.08	7.00
Green Sf X Bluegill Sf				2	1.50	0.07	0.04	0.11	24.50
Johnny Darter	D	I	C	3	2.25	0.11	0.00	0.01	1.67
Greenside Darter	D	I	S M	119	89.25	4.36	0.32	0.91	3.58
Banded Darter	D	I	S I	42	31.50	1.54	0.04	0.12	1.36
Rainbow Darter	D	I	S M	292	219.00	10.70	0.30	0.84	1.35
Fantail Darter	D	I	C	75	56.25	2.75	0.09	0.24	1.51
Mottled Sculpin		I	C	94	70.50	3.44	0.20	0.58	2.86
<i>Mile Total</i>				2,730	2,047.50		34.95		
<i>Number of Species</i>				25					
<i>Number of Hybrids</i>				2					

River Code: 14-505	Stream: Bantas Fork	Sample Date: 1995
River Mile: 0.60	Location:	Date Range: 08/04/1995
Time Fished: 4909 sec	Drainage: 35.2 sq mi	Thru: 09/26/1995
Dist Fished: 0.40 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	50	37.50	2.20	10.20	32.16	272.00
Golden Redhorse	R	I	S M	2	1.50	0.09	0.48	1.52	322.00
Northern Hog Sucker	R	I	S M	123	92.25	5.42	2.90	9.14	31.43
White Sucker	W	O	S T	70	52.50	3.09	1.92	6.05	36.57
River Chub	N	I	N I	24	18.00	1.06	0.32	1.00	17.58
Bigeye Chub	N	I	S I	11	8.25	0.48	0.03	0.08	3.18
Blacknose Dace	N	G	S T	6	4.50	0.26	0.01	0.03	2.00
Creek Chub	N	G	N T	90	67.50	3.97	1.40	4.42	20.78
Silver Shiner	N	I	S I	11	8.25	0.48	0.03	0.09	3.64
Rosyface Shiner	N	I	S I	12	9.00	0.53	0.02	0.06	2.08
Rosefin Shiner	N	I	S M	73	54.75	3.22	0.05	0.17	0.99
Striped Shiner	N	I	S	147	110.25	6.48	1.64	5.17	14.86
Spotfin Shiner	N	I	M	7	5.25	0.31	0.02	0.05	3.14
Sand Shiner	N	I	M M	65	48.75	2.86	0.10	0.33	2.15
Silverjaw Minnow	N	I	M	41	30.75	1.81	0.08	0.24	2.51
Bluntnose Minnow	N	O	C T	80	60.00	3.53	0.30	0.94	4.95
Central Stoneroller	N	H	N	959	719.25	42.27	6.83	21.55	9.50
Striped Sh X Stoneroller				1	0.75	0.04	0.00	0.01	3.00
Yellow Bullhead		I	C T	1	0.75	0.04	0.04	0.12	49.00
Rock Bass	S	C	C	38	28.50	1.67	2.26	7.12	79.18
Smallmouth Bass	F	C	C M	28	21.00	1.23	1.73	5.45	82.25
Largemouth Bass	F	C	C	3	2.25	0.13	0.15	0.48	67.00
Green Sunfish	S	I	C T	15	11.25	0.66	0.25	0.79	22.20
Bluegill Sunfish	S	I	C P	21	15.75	0.93	0.13	0.42	8.52
Longear Sunfish	S	I	C M	8	6.00	0.35	0.24	0.76	40.38
Green Sf X Bluegill Sf				2	1.50	0.09	0.01	0.02	5.00
Johnny Darter	D	I	C	2	1.50	0.09	0.00	0.01	2.00
Greenside Darter	D	I	S M	25	18.75	1.10	0.06	0.20	3.28
Banded Darter	D	I	S I	13	9.75	0.57	0.02	0.05	1.62
Rainbow Darter	D	I	S M	252	189.00	11.11	0.24	0.75	1.25
Orangethroat Darter	D	I	S	7	5.25	0.31	0.01	0.03	1.43
Fantail Darter	D	I	C	25	18.75	1.10	0.02	0.07	1.24
Mottled Sculpin		I	C	57	42.75	2.51	0.23	0.73	5.44
<i>Mile Total</i>				2,269	1,701.75		31.72		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				2					

Species List

River Code: 14-505	Stream: Bantas Fork	River Segment Totals
Mile Range: 0.60		Date Range: 07/26/1995
Thru: 9.50		Thru: 09/26/1995
Dist Fished: 1.10 km	Basin: Great Miami River	No of Passes: 6
		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
Black Redhorse	R	I	S I	94	23.92	1.29	5.86	21.33	246.89
Golden Redhorse	R	I	S M	2	0.50	0.03	0.16	0.59	322.00
Northern Hog Sucker	R	I	S M	352	92.83	4.99	3.05	11.10	33.17
White Sucker	W	O	S T	222	63.50	3.41	2.66	9.66	41.50
River Chub	N	I	N I	100	25.17	1.35	0.57	2.06	22.46
Bigeye Chub	N	I	S I	105	34.00	1.83	0.10	0.36	2.91
Blacknose Dace	N	G	S T	24	7.50	0.40	0.01	0.04	1.62
Creek Chub	N	G	N T	352	102.25	5.50	1.92	6.97	19.03
Silver Shiner	N	I	S I	43	11.92	0.64	0.04	0.14	3.21
Rosyface Shiner	N	I	S I	22	5.50	0.30	0.01	0.05	2.32
Rosefin Shiner	N	I	S M	197	56.00	3.01	0.10	0.37	1.80
Striped Shiner	N	I	S	662	179.75	9.66	2.13	7.75	11.92
Spotfin Shiner	N	I	M	26	6.50	0.35	0.03	0.09	4.00
Sand Shiner	N	I	M M	93	24.67	1.33	0.06	0.20	2.22
Silverjaw Minnow	N	I	M	72	19.17	1.03	0.05	0.19	2.76
Bluntnose Minnow	N	O	C T	266	80.00	4.30	0.29	1.04	3.76
Central Stoneroller	N	H	N	2,593	696.92	37.47	6.31	22.94	9.48
Striped Sh X River Chub		I		1	0.25	0.01	0.00	0.01	12.00
Striped Sh X Stoneroller				1	0.25	0.01	0.00	0.00	3.00
Yellow Bullhead		I	C T	1	0.25	0.01	0.01	0.04	49.00
Rock Bass	S	C	C	95	23.92	1.29	1.66	6.03	68.97
Smallmouth Bass	F	C	C M	112	29.17	1.57	1.52	5.51	51.90
Largemouth Bass	F	C	C	5	1.42	0.08	0.05	0.20	42.40
Green Sunfish	S	I	C T	21	5.42	0.29	0.11	0.41	20.62
Bluegill Sunfish	S	I	C P	26	6.50	0.35	0.05	0.20	8.23
Longear Sunfish	S	I	C M	8	2.00	0.11	0.08	0.29	40.38
Green Sf X Bluegill Sf				4	1.00	0.05	0.01	0.05	14.75
Johnny Darter	D	I	C	39	12.58	0.68	0.01	0.04	0.95
Greenside Darter	D	I	S M	196	53.33	2.87	0.16	0.58	3.08
Banded Darter	D	I	S I	55	13.75	0.74	0.02	0.07	1.42
Rainbow Darter	D	I	S M	710	191.33	10.29	0.25	0.90	1.29
Orangethroat Darter	D	I	S	16	4.75	0.26	0.01	0.03	1.56
Fantail Darter	D	I	C	152	42.33	2.28	0.06	0.20	1.34
Mottled Sculpin		I	C	163	41.75	2.24	0.15	0.56	3.72
<i>Stream Total</i>				6,830	1,860.08		27.49		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				3					

Species List

River Code: 14-506	Stream: Goose Run	Sample Date: 1995
River Mile: 4.40	Location:	Date Range: 08/11/1995
Time Fished: 1694 sec	Drainage: 3.6 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	3	6.00	0.62	0.09	0.68	15.00
White Sucker	W	O	S	T	34	68.00	7.01	0.79	5.93	11.62
Blacknose Dace	N	G	S	T	63	126.00	12.99	0.40	3.00	3.17
Creek Chub	N	G	N	T	252	504.00	51.96	5.70	42.73	11.30
South. Redbelly Dace	N	H	S		15	30.00	3.09	0.06	0.47	2.07
Striped Shiner	N	I	S		19	38.00	3.92	0.12	0.90	3.16
Silverjaw Minnow	N	I	M		16	32.00	3.30	0.12	0.89	3.69
Bluntnose Minnow	N	O	C	T	46	92.00	9.48	0.14	1.08	1.57
Central Stoneroller	N	H	N		2	4.00	0.41	0.01	0.06	2.00
Black Bullhead		I	C	P	1	2.00	0.21	0.02	0.18	12.00
Johnny Darter	D	I	C		7	14.00	1.44	0.02	0.15	1.43
Orangethroat Darter	D	I	S		26	52.00	5.36	5.85	43.89	112.50
Fantail Darter	D	I	C		1	2.00	0.21	0.01	0.06	4.00
<i>Mile Total</i>					485	970.00		13.33		
<i>Number of Species</i>					13					
<i>Number of Hybrids</i>					0					

River Code: 14-506	Stream: Goose Run	Sample Date: 1995
River Mile: 0.20	Location:	Date Range: 08/11/1995
Time Fished: 1976 sec	Drainage: 11.4 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	10	15.00	1.25	0.33	3.87	21.80
White Sucker	W	O	S	T	70	105.00	8.76	1.25	14.83	11.94
Bigeye Chub	N	I	S	I	1	1.50	0.13	0.01	0.06	3.00
Blacknose Dace	N	G	S	T	53	79.50	6.63	0.23	2.70	2.87
Creek Chub	N	G	N	T	236	354.00	29.54	3.61	42.69	10.20
Silver Shiner	N	I	S	I	8	12.00	1.00	0.04	0.45	3.13
Rosefin Shiner	N	I	S	M	6	9.00	0.75	0.03	0.35	3.33
Striped Shiner	N	I	S		17	25.50	2.13	0.37	4.39	14.53
Sand Shiner	N	I	M	M	6	9.00	0.75	0.02	0.21	2.00
Silverjaw Minnow	N	I	M		16	24.00	2.00	0.08	0.91	3.20
Fathead Minnow	N	O	C	T	1	1.50	0.13	0.00	0.04	2.00
Bluntnose Minnow	N	O	C	T	32	48.00	4.01	0.14	1.60	2.81
Central Stoneroller	N	H	N		82	123.00	10.26	0.50	5.85	4.02
Rock Bass	S	C	C		8	12.00	1.00	0.62	7.38	52.00
Smallmouth Bass	F	C	C	M	2	3.00	0.25	0.05	0.64	18.00
Largemouth Bass	F	C	C		11	16.50	1.38	0.04	0.48	2.50
Green Sunfish	S	I	C	T	3	4.50	0.38	0.01	0.14	2.67
Bluegill Sunfish	S	I	C	P	3	4.50	0.38	0.04	0.48	9.00
Johnny Darter	D	I	C		10	15.00	1.25	0.03	0.32	1.80
Greenside Darter	D	I	S	M	23	34.50	2.88	0.08	0.98	2.39
Rainbow Darter	D	I	S	M	72	108.00	9.01	0.11	1.35	1.06
Orangethroat Darter	D	I	S		17	25.50	2.13	0.03	0.31	1.00
Fantail Darter	D	I	C		37	55.50	4.63	0.07	0.80	1.22
Mottled Sculpin		I	C		75	112.50	9.39	0.78	9.22	6.93
<i>Mile Total</i>					799	1,198.50		8.46		
<i>Number of Species</i>					24					
<i>Number of Hybrids</i>					0					

River Code: 14-506	Stream: Goose Run		River Segment Totals		
Mile Range: 0.20			Date Range: 08/11/1995		
Thru: 4.40					
Dist Fished: 0.35 km	Basin: Great Miami River	No of Passes: 2	Sampler Type: D		

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	13	10.50	0.97	0.21	1.91	20.23
White Sucker	W	O	S	T	104	86.50	7.98	1.02	9.38	11.84
Bigeye Chub	N	I	S	I	1	0.75	0.07	0.00	0.02	3.00
Blacknose Dace	N	G	S	T	116	102.75	9.48	0.31	2.88	3.03
Creek Chub	N	G	N	T	488	429.00	39.57	4.65	42.71	10.77
South. Redbelly Dace	N	H	S		15	15.00	1.38	0.03	0.28	2.07
Silver Shiner	N	I	S	I	8	6.00	0.55	0.02	0.17	3.13
Rosefin Shiner	N	I	S	M	6	4.50	0.42	0.02	0.14	3.33
Striped Shiner	N	I	S		36	31.75	2.93	0.25	2.25	8.53
Sand Shiner	N	I	M	M	6	4.50	0.42	0.01	0.08	2.00
Silverjaw Minnow	N	I	M		32	28.00	2.58	0.10	0.89	3.44
Fathead Minnow	N	O	C	T	1	0.75	0.07	0.00	0.01	2.00
Bluntnose Minnow	N	O	C	T	78	70.00	6.46	0.14	1.28	2.08
Central Stoneroller	N	H	N		84	63.50	5.86	0.25	2.31	3.98
Black Bullhead		I	C	P	1	1.00	0.09	0.01	0.11	12.00
Rock Bass	S	C	C		8	6.00	0.55	0.31	2.86	52.00
Smallmouth Bass	F	C	C	M	2	1.50	0.14	0.03	0.25	18.00
Largemouth Bass	F	C	C		11	8.25	0.76	0.02	0.19	2.50
Green Sunfish	S	I	C	T	3	2.25	0.21	0.01	0.06	2.67
Bluegill Sunfish	S	I	C	P	3	2.25	0.21	0.02	0.19	9.00
Johnny Darter	D	I	C		17	14.50	1.34	0.02	0.22	1.65
Greenside Darter	D	I	S	M	23	17.25	1.59	0.04	0.38	2.39
Rainbow Darter	D	I	S	M	72	54.00	4.98	0.06	0.52	1.06
Orangethroat Darter	D	I	S		43	38.75	3.57	2.94	26.97	68.42
Fantail Darter	D	I	C		38	28.75	2.65	0.04	0.35	1.29
Mottled Sculpin		I	C		75	56.25	5.19	0.39	3.58	6.93
<i>Stream Total</i>					1,284	1,084.25		10.89		
<i>Number of Species</i>					26					
<i>Number of Hybrids</i>					0					

River Code: 14-508	Stream: Lesley Run	Sample Date: 1995
River Mile: 6.50	Location:	Date Range: 08/10/1995
Time Fished: 1823 sec	Drainage: 5.0 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Golden Redhorse	R	I	S	M	1	1.50	0.47	0.26	1.26	173.00
White Sucker	W	O	S	T	13	19.50	6.13	0.35	1.70	18.00
Creek Chubsucker	R	I	M		2	3.00	0.94	0.12	0.58	40.00
Common Carp	G	O	M	T	6	9.00	2.83	14.66	70.97	1,628.67
Creek Chub	N	G	N	T	11	16.50	5.19	0.45	2.18	27.27
Rosefin Shiner	N	I	S	M	15	22.50	7.08	0.03	0.15	1.40
Striped Shiner	N	I	S		15	22.50	7.08	0.27	1.32	12.08
Bluntnose Minnow	N	O	C	T	20	30.00	9.43	0.06	0.31	2.10
Central Stoneroller	N	H	N		3	4.50	1.42	0.10	0.46	21.00
Yellow Bullhead		I	C	T	2	3.00	0.94	0.21	1.00	69.00
Black Bullhead		I	C	P	2	3.00	0.94	0.27	1.29	89.00
Rock Bass	S	C	C		5	7.50	2.36	0.49	2.37	65.20
Largemouth Bass	F	C	C		2	3.00	0.94	0.67	3.23	222.50
Green Sunfish	S	I	C	T	64	96.00	30.19	1.93	9.33	20.06
Longear Sunfish	S	I	C	M	45	67.50	21.23	0.79	3.82	11.67
Johnny Darter	D	I	C		1	1.50	0.47	0.00	0.01	1.00
Orangethroat Darter	D	I	S		2	3.00	0.94	0.01	0.02	1.50
Least Darter [S]	D	I	N		3	4.50	1.42	0.01	0.02	1.00
<i>Mile Total</i>					212	318.00		20.65		
<i>Number of Species</i>					18					
<i>Number of Hybrids</i>					0					

River Code: 14-508	Stream: Lesley Run	Sample Date: 1995
River Mile: 1.20	Location:	Date Range: 08/17/1995
Time Fished: 1896 sec	Drainage: 7.7 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	5	10.00	2.18	1.42	26.87	142.00
White Sucker	W	O	S	T	7	14.00	3.06	0.24	4.62	17.43
Blacknose Dace	N	G	S	T	34	68.00	14.85	0.15	2.88	2.24
Creek Chub	N	G	N	T	75	150.00	32.75	2.47	46.71	16.45
South. Redbelly Dace	N	H	S		10	20.00	4.37	0.04	0.76	2.00
Rosefin Shiner	N	I	S	M	2	4.00	0.87	0.01	0.19	2.50
Striped Shiner	N	I	S		38	76.00	16.59	0.37	7.04	4.89
Silverjaw Minnow	N	I	M		1	2.00	0.44	0.01	0.11	3.00
Bluntnose Minnow	N	O	C	T	5	10.00	2.18	0.02	0.45	2.40
Central Stoneroller	N	H	N		14	28.00	6.11	0.12	2.35	4.43
Green Sunfish	S	I	C	T	1	2.00	0.44	0.14	2.73	72.00
Green Sf X Bluegill Sf					2	4.00	0.87	0.20	3.79	50.00
Johnny Darter	D	I	C		1	2.00	0.44	0.00	0.08	2.00
Rainbow Darter	D	I	S	M	14	28.00	6.11	0.03	0.61	1.14
Orangethroat Darter	D	I	S		9	18.00	3.93	0.02	0.45	1.33
Fantail Darter	D	I	C		9	18.00	3.93	0.02	0.30	0.89
Least Darter [S]	D	I	N		2	4.00	0.87	0.00	0.08	1.00
<i>Mile Total</i>					229	458.00		5.28		
<i>Number of Species</i>					16					
<i>Number of Hybrids</i>					1					

River Code: 14-508	Stream: Lesley Run		River Segment Totals		
Mile Range: 1.20			Date Range: 08/10/1995		
Thru: 6.50			Thru: 08/17/1995		
Dist Fished: 0.35 km	Basin: Great Miami River	No of Passes: 2	Sampler Type: E 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
Golden Redhorse	R	I	S	M	1	0.75	0.19	0.13	1.00	173.00
Northern Hog Sucker	R	I	S	M	5	5.00	1.29	0.71	5.47	142.00
White Sucker	W	O	S	T	20	16.75	4.32	0.30	2.29	17.80
Creek Chubsucker	R	I	M		2	1.50	0.39	0.06	0.46	40.00
Common Carp	G	O	M	T	6	4.50	1.16	7.33	56.51	1,628.67
Blacknose Dace	N	G	S	T	34	34.00	8.76	0.08	0.59	2.24
Creek Chub	N	G	N	T	86	83.25	21.46	1.46	11.25	17.84
South. Redbelly Dace	N	H	S		10	10.00	2.58	0.02	0.15	2.00
Rosefin Shiner	N	I	S	M	17	13.25	3.41	0.02	0.16	1.53
Striped Shiner	N	I	S		53	49.25	12.69	0.32	2.48	6.93
Silverjaw Minnow	N	I	M		1	1.00	0.26	0.00	0.02	3.00
Bluntnose Minnow	N	O	C	T	25	20.00	5.15	0.04	0.34	2.16
Central Stoneroller	N	H	N		17	16.25	4.19	0.11	0.84	7.35
Yellow Bullhead		I	C	T	2	1.50	0.39	0.10	0.80	69.00
Black Bullhead		I	C	P	2	1.50	0.39	0.13	1.03	89.00
Rock Bass	S	C	C		5	3.75	0.97	0.24	1.89	65.20
Largemouth Bass	F	C	C		2	1.50	0.39	0.33	2.58	222.50
Green Sunfish	S	I	C	T	65	49.00	12.63	1.04	7.98	20.86
Longear Sunfish	S	I	C	M	45	33.75	8.70	0.39	3.04	11.67
Green Sf X Bluegill Sf					2	2.00	0.52	0.10	0.77	50.00
Johnny Darter	D	I	C		2	1.75	0.45	0.00	0.02	1.50
Rainbow Darter	D	I	S	M	14	14.00	3.61	0.02	0.12	1.14
Orangethroat Darter	D	I	S		11	10.50	2.71	0.01	0.11	1.36
Fantail Darter	D	I	C		9	9.00	2.32	0.01	0.06	0.89
Least Darter [S]	D	I	N		5	4.25	1.10	0.00	0.03	1.00
<i>Stream Total</i>					441	388.00		12.97		
<i>Number of Species</i>					24					
<i>Number of Hybrids</i>					1					

Species List

River Code: 14-510	Stream: Price Creek	Sample Date: 1995
River Mile: 13.70	Location:	Date Range: 08/11/1995
Time Fished: 2529 sec	Drainage: 5.6 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
White Sucker	W	O	S	T	30	45.00	4.15	0.68	8.95	15.10
Creek Chub	N	G	N	T	322	483.00	44.54	4.87	64.09	10.08
Striped Shiner	N	I	S		20	30.00	2.77	0.18	2.41	6.10
Silverjaw Minnow	N	I	M		10	15.00	1.38	0.06	0.79	4.00
Fathead Minnow	N	O	C	T	51	76.50	7.05	0.12	1.58	1.57
Bluntnose Minnow	N	O	C	T	88	132.00	12.17	0.32	4.16	2.39
Central Stoneroller	N	H	N		75	112.50	10.37	0.47	6.19	4.18
Yellow Bullhead		I	C	T	3	4.50	0.41	0.31	4.11	69.33
Rock Bass	S	C	C		5	7.50	0.69	0.19	2.53	25.60
Green Sunfish	S	I	C	T	6	9.00	0.83	0.22	2.91	24.50
Johnny Darter	D	I	C		49	73.50	6.78	0.09	1.15	1.18
Orangethroat Darter	D	I	S		64	96.00	8.85	0.09	1.16	0.92
<i>Mile Total</i>					723	1,084.50		7.60		
<i>Number of Species</i>					12					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-510	Stream: Price Creek	Sample Date: 1995
River Mile: 13.30	Location:	Date Range: 08/11/1995
Time Fished: 2314 sec	Drainage: 6.1 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	84	168.00	5.45	4.32	18.71	25.74
Creek Chub	N	G	N	T	538	1,076.00	34.94	11.58	50.10	10.76
Striped Shiner	N	I	S		37	74.00	2.40	0.60	2.60	8.11
Silverjaw Minnow	N	I	M		6	12.00	0.39	0.04	0.19	3.67
Fathead Minnow	N	O	C	T	47	94.00	3.05	0.17	0.73	1.79
Bluntnose Minnow	N	O	C	T	240	480.00	15.58	1.60	6.94	3.34
Central Stoneroller	N	H	N		179	358.00	11.62	1.86	8.06	5.20
Yellow Bullhead		I	C	T	2	4.00	0.13	0.24	1.06	61.00
Rock Bass	S	C	C		14	28.00	0.91	1.24	5.37	44.29
Green Sunfish	S	I	C	T	9	18.00	0.58	0.38	1.66	21.33
Johnny Darter	D	I	C		145	290.00	9.42	0.41	1.78	1.42
Orangethroat Darter	D	I	S		239	478.00	15.52	0.65	2.81	1.36
<i>Mile Total</i>					1,540	3,080.00		23.11		
<i>Number of Species</i>					12					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-510	Stream: Price Creek	Sample Date: 1995
River Mile: 7.60	Location:	Date Range: 08/17/1995
Time Fished: 1678 sec	Drainage: 15.5 sq mi	
Dist Fished: 0.13 km	Basin: Great Miami River	No of Passes: 1
		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
White Sucker	W	O	S	T	23	53.08	5.12	1.48	26.01	27.91
Creek Chub	N	G	N	T	154	355.39	34.30	1.97	34.49	5.53
Rosefin Shiner	N	I	S	M	18	41.54	4.01	0.08	1.46	2.00
Striped Shiner	N	I	S		42	96.92	9.35	0.32	5.55	3.26
Sand Shiner	N	I	M	M	13	30.00	2.90	0.04	0.61	1.15
Silverjaw Minnow	N	I	M		15	34.62	3.34	0.05	0.93	1.53
Bluntnose Minnow	N	O	C	T	95	219.23	21.16	0.33	5.81	1.51
Central Stoneroller	N	H	N		33	76.15	7.35	0.15	2.63	1.97
Rock Bass	S	C	C		3	6.92	0.67	0.44	7.74	63.67
Green Sunfish	S	I	C	T	13	30.00	2.90	0.76	13.37	25.38
Johnny Darter	D	I	C		25	57.69	5.57	0.04	0.74	0.72
Greenside Darter	D	I	S	M	2	4.62	0.45	0.01	0.16	2.00
Rainbow Darter	D	I	S	M	3	6.92	0.67	0.01	0.21	1.67
Orangethroat Darter	D	I	S		10	23.08	2.23	0.02	0.32	0.80
<i>Mile Total</i>					449	1,036.15		5.70		
<i>Number of Species</i>					14					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-510	Stream: Price Creek	Sample Date: 1995
River Mile: 3.90	Location:	Date Range: 08/07/1995
Time Fished: 2518 sec	Drainage: 20.1 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	3	4.50	1.47	0.50	6.36	111.33
White Sucker	W	O	S	T	12	18.00	5.88	1.27	16.07	70.33
Bigeye Chub	N	I	S	I	1	1.50	0.49	0.01	0.11	6.00
Creek Chub	N	G	N	T	28	42.00	13.73	0.91	11.52	21.61
Rosefin Shiner	N	I	S	M	6	9.00	2.94	0.02	0.27	2.33
Striped Shiner	N	I	S		9	13.50	4.41	0.38	4.76	27.78
Silverjaw Minnow	N	I	M		4	6.00	1.96	0.02	0.19	2.50
Bluntnose Minnow	N	O	C	T	6	9.00	2.94	0.02	0.23	2.00
Central Stoneroller	N	H	N		4	6.00	1.96	0.03	0.37	4.75
Rock Bass	S	C	C		26	39.00	12.75	3.86	49.00	99.00
Smallmouth Bass	F	C	C	M	12	18.00	5.88	0.66	8.34	36.50
Green Sunfish	S	I	C	T	1	1.50	0.49	0.03	0.34	18.00
Johnny Darter	D	I	C		2	3.00	0.98	0.01	0.06	1.50
Greenside Darter	D	I	S	M	16	24.00	7.84	0.05	0.65	2.13
Rainbow Darter	D	I	S	M	21	31.50	10.29	0.03	0.41	1.00
Orangethroat Darter	D	I	S		1	1.50	0.49	0.00	0.04	2.00
Fantail Darter	D	I	C		52	78.00	25.49	0.10	1.32	1.33
<i>Mile Total</i>					204	306.00		7.88		
<i>Number of Species</i>					17					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-510	Stream: Price Creek	Sample Date: 1995
River Mile: 0.60	Location:	Date Range: 08/17/1995
Time Fished: 2373 sec	Drainage: 29.5 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		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
Black Redhorse	R	I	S I	9	18.00	0.90	5.00	18.48	277.78
Golden Redhorse	R	I	S M	1	2.00	0.10	0.08	0.28	38.00
Northern Hog Sucker	R	I	S M	32	64.00	3.20	1.95	7.21	30.47
White Sucker	W	O	S T	25	50.00	2.50	1.26	4.64	25.12
Creek Chub	N	G	N T	46	92.00	4.60	2.90	10.72	31.52
Silver Shiner	N	I	S I	2	4.00	0.20	0.02	0.07	5.00
Rosyface Shiner	N	I	S I	12	24.00	1.20	0.04	0.14	1.58
Rosefin Shiner	N	I	S M	16	32.00	1.60	0.06	0.21	1.80
Striped Shiner	N	I	S	65	130.00	6.49	2.20	8.13	16.92
Spotfin Shiner	N	I	M	3	6.00	0.30	0.02	0.06	2.67
Sand Shiner	N	I	M M	8	16.00	0.80	0.03	0.10	1.75
Silverjaw Minnow	N	I	M	2	4.00	0.20	0.02	0.06	4.00
Bluntnose Minnow	N	O	C T	30	60.00	3.00	0.19	0.69	3.13
Central Stoneroller	N	H	N	542	1,084.00	54.15	5.90	21.80	5.44
Yellow Bullhead		I	C T	2	4.00	0.20	0.24	0.87	59.00
Black Bullhead		I	C P	1	2.00	0.10	0.05	0.18	25.00
Rock Bass	S	C	C	16	32.00	1.60	3.04	11.25	95.13
Smallmouth Bass	F	C	C M	17	34.00	1.70	2.33	8.62	68.61
Largemouth Bass	F	C	C	1	2.00	0.10	0.00	0.01	2.00
Green Sunfish	S	I	C T	8	16.00	0.80	0.60	2.23	37.75
Bluegill Sunfish	S	I	C P	29	58.00	2.90	0.22	0.82	3.83
Longear Sunfish	S	I	C M	5	10.00	0.50	0.30	1.12	30.40
Green Sf X Bluegill Sf				1	2.00	0.10	0.08	0.31	42.00
Blackside Darter	D	I	S	1	2.00	0.10	0.01	0.04	5.00
Logperch	D	I	S M	8	16.00	0.80	0.14	0.52	8.75
Johnny Darter	D	I	C	1	2.00	0.10	0.00	0.01	2.00
Greenside Darter	D	I	S M	46	92.00	4.60	0.23	0.85	2.50
Rainbow Darter	D	I	S M	40	80.00	4.00	0.08	0.28	0.95
Fantail Darter	D	I	C	32	64.00	3.20	0.07	0.25	1.06
<i>Mile Total</i>				1,001	2,002.00		27.05		
<i>Number of Species</i>				28					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-510	Stream: Price Creek	River Segment Totals
Mile Range: 0.60		Date Range: 08/07/1995
Thru: 13.70		Thru: 08/17/1995
Dist Fished: 0.83 km	Basin: Great Miami River	No of Passes: 5
		Sampler Type: D E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	9	3.60	0.24	1.00	7.01	277.78
Golden Redhorse	R	I	S M	1	0.40	0.03	0.02	0.11	38.00
Northern Hog Sucker	R	I	S M	35	13.70	0.91	0.49	3.44	37.40
White Sucker	W	O	S T	174	66.82	4.45	1.80	12.63	27.18
Bigeye Chub	N	I	S I	1	0.30	0.02	0.00	0.01	6.00
Creek Chub	N	G	N T	1,088	409.68	27.28	4.44	31.15	10.98
Silver Shiner	N	I	S I	2	0.80	0.05	0.00	0.03	5.00
Rosyface Shiner	N	I	S I	12	4.80	0.32	0.01	0.05	1.58
Rosefin Shiner	N	I	S M	40	16.51	1.10	0.03	0.23	1.97
Striped Shiner	N	I	S	173	68.88	4.59	0.73	5.15	11.03
Spotfin Shiner	N	I	M	3	1.20	0.08	0.00	0.02	2.67
Sand Shiner	N	I	M M	21	9.20	0.61	0.01	0.09	1.38
Silverjaw Minnow	N	I	M	37	14.32	0.95	0.04	0.26	2.78
Fathead Minnow	N	O	C T	98	34.10	2.27	0.06	0.40	1.67
Bluntnose Minnow	N	O	C T	459	180.05	11.99	0.49	3.44	2.75
Central Stoneroller	N	H	N	833	327.33	21.80	1.68	11.79	5.13
Yellow Bullhead		I	C T	7	2.50	0.17	0.16	1.11	64.00
Black Bullhead		I	C P	1	0.40	0.03	0.01	0.07	25.00
Rock Bass	S	C	C	64	22.68	1.51	1.76	12.31	78.67
Smallmouth Bass	F	C	C M	29	10.40	0.69	0.60	4.19	55.32
Largemouth Bass	F	C	C	1	0.40	0.03	0.00	0.01	2.00
Green Sunfish	S	I	C T	37	14.90	0.99	0.40	2.80	26.73
Bluegill Sunfish	S	I	C P	29	11.60	0.77	0.04	0.31	3.83
Longear Sunfish	S	I	C M	5	2.00	0.13	0.06	0.43	30.40
Green Sf X Bluegill Sf				1	0.40	0.03	0.02	0.12	42.00
Blackside Darter	D	I	S	1	0.40	0.03	0.00	0.01	5.00
Logperch	D	I	S M	8	3.20	0.21	0.03	0.20	8.75
Johnny Darter	D	I	C	222	85.24	5.68	0.11	0.77	1.29
Greenside Darter	D	I	S M	64	24.12	1.61	0.06	0.41	2.39
Rainbow Darter	D	I	S M	64	23.68	1.58	0.02	0.17	1.00
Orangethroat Darter	D	I	S	314	119.72	7.97	0.15	1.06	1.25
Fantail Darter	D	I	C	84	28.40	1.89	0.03	0.24	1.23
<i>Stream Total</i>				3,917	1,501.73		14.27		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				1					

Species List

River Code: 14-512	Stream: Swamp Creek	Sample Date: 1995
River Mile: 6.10	Location:	Date Range: 08/03/1995
Time Fished: 1993 sec	Drainage: 13.7 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		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
White Sucker	W	O	S	T	80	160.00	12.36	2.23	19.23	13.94
Creek Chub	N	G	N	T	204	408.00	31.53	6.71	57.84	16.44
Rosefin Shiner	N	I	S	M	17	34.00	2.63	0.09	0.78	2.65
Striped Shiner	N	I	S		23	46.00	3.55	0.38	3.31	8.35
Bluntnose Minnow	N	O	C	T	46	92.00	7.11	0.34	2.97	3.74
Central Stoneroller	N	H	N		11	22.00	1.70	0.26	2.24	11.82
Rock Bass	S	C	C		34	68.00	5.26	0.64	5.52	9.41
Smallmouth Bass	F	C	C	M	1	2.00	0.15	0.04	0.33	19.00
Largemouth Bass	F	C	C		3	6.00	0.46	0.29	2.51	48.50
Green Sunfish	S	I	C	T	4	8.00	0.62	0.06	0.52	7.50
Longear Sunfish	S	I	C	M	8	16.00	1.24	0.25	2.18	15.83
Johnny Darter	D	I	C		3	6.00	0.46	0.01	0.05	1.00
Rainbow Darter	D	I	S	M	32	64.00	4.95	0.10	0.90	1.63
Orangethroat Darter	D	I	S		30	60.00	4.64	0.09	0.74	1.43
Least Darter [S]	D	I	N		151	302.00	23.34	0.10	0.89	0.34
<i>Mile Total</i>					647	1,294.00		11.60		
<i>Number of Species</i>					15					
<i>Number of Hybrids</i>					0					

Species List

River Code: 14-512	Stream: Swamp Creek	Sample Date: 1995
River Mile: 5.40	Location:	Date Range: 08/03/1995
Time Fished: 1490 sec	Drainage: 15.0 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
White Sucker	W	O	S	T	11	16.50	11.46	0.35	22.59	21.27
Creek Chub	N	G	N	T	8	12.00	8.33	0.35	22.52	29.14
Silver Shiner	N	I	S	I	3	4.50	3.13	0.03	1.74	6.00
Rosefin Shiner	N	I	S	M	9	13.50	9.38	0.04	2.32	2.67
Striped Shiner	N	I	S		2	3.00	2.08	0.04	2.70	14.00
Bluntnose Minnow	N	O	C	T	6	9.00	6.25	0.03	1.74	3.00
Central Stoneroller	N	H	N		4	6.00	4.17	0.13	8.11	21.00
Rock Bass	S	C	C		17	25.50	17.71	0.37	23.94	14.59
Green Sunfish	S	I	C	T	3	4.50	3.13	0.17	10.81	37.33
Johnny Darter	D	I	C		6	9.00	6.25	0.01	0.71	1.17
Greenside Darter	D	I	S	M	6	9.00	6.25	0.01	0.58	1.00
Rainbow Darter	D	I	S	M	11	16.50	11.46	0.03	1.74	1.64
Orangethroat Darter	D	I	S		2	3.00	2.08	0.00	0.19	1.00
Least Darter [S]	D	I	N		8	12.00	8.33	0.01	0.39	0.50
<i>Mile Total</i>					96	144.00		1.55		
<i>Number of Species</i>					14					
<i>Number of Hybrids</i>					0					

River Code: 14-512	Stream: Swamp Creek	Sample Date: 1995
River Mile: 2.70	Location:	Date Range: 08/03/1995
Time Fished: 1880 sec	Drainage: 17.6 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	4	6.00	0.68	0.16	2.87	27.00
White Sucker	W	O	S	T	6	9.00	1.01	0.35	6.25	39.17
Creek Chub	N	G	N	T	40	60.00	6.76	1.04	18.48	17.40
Silver Shiner	N	I	S	I	4	6.00	0.68	0.02	0.27	2.50
Rosefin Shiner	N	I	S	M	23	34.50	3.89	0.08	1.49	2.43
Striped Shiner	N	I	S		79	118.50	13.34	1.06	18.80	8.96
Sand Shiner	N	I	M	M	9	13.50	1.52	0.02	0.30	1.22
Bluntnose Minnow	N	O	C	T	75	112.50	12.67	0.23	3.98	2.00
Central Stoneroller	N	H	N		81	121.50	13.68	0.68	11.99	5.57
Rock Bass	S	C	C		15	22.50	2.53	0.23	3.98	10.00
Smallmouth Bass	F	C	C	M	1	1.50	0.17	0.00	0.05	2.00
Largemouth Bass	F	C	C		5	7.50	0.84	0.12	2.05	15.40
Green Sunfish	S	I	C	T	16	24.00	2.70	0.65	11.58	27.25
Bluegill Sunfish	S	I	C	P	16	24.00	2.70	0.23	4.13	9.69
Longear Sunfish	S	I	C	M	4	6.00	0.68	0.11	2.00	18.75
Green Sf X Bluegill Sf					1	1.50	0.17	0.23	4.14	156.00
Longear Sf X Bluegill Sf					1	1.50	0.17	0.05	0.80	30.00
Johnny Darter	D	I	C		2	3.00	0.34	0.01	0.11	2.00
Greenside Darter	D	I	S	M	12	18.00	2.03	0.04	0.78	2.42
Rainbow Darter	D	I	S	M	168	252.00	28.38	0.26	4.64	1.04
Orangethroat Darter	D	I	S		21	31.50	3.55	0.04	0.73	1.30
Fantail Darter	D	I	C		3	4.50	0.51	0.01	0.16	2.00
Mottled Sculpin		I	C		6	9.00	1.01	0.03	0.48	3.00
<i>Mile Total</i>					592	888.00		5.65		
<i>Number of Species</i>					21					
<i>Number of Hybrids</i>					2					

River Code: 14-512	Stream: Swamp Creek	Sample Date: 1995
River Mile: 0.30	Location:	Date Range: 08/02/1995
Time Fished: 2442 sec	Drainage: 18.9 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Northern Hog Sucker	R	I	S	M	9	13.50	0.96	0.43	6.01	31.89
White Sucker	W	O	S	T	4	6.00	0.43	0.16	2.20	26.25
Creek Chub	N	G	N	T	38	57.00	4.06	0.68	9.46	11.89
Silver Shiner	N	I	S	I	6	9.00	0.64	0.03	0.42	3.33
Rosyface Shiner	N	I	S	I	1	1.50	0.11	0.00	0.04	2.00
Rosefin Shiner	N	I	S	M	7	10.50	0.75	0.03	0.38	2.57
Striped Shiner	N	I	S		92	138.00	9.82	0.83	11.63	6.04
Bluntnose Minnow	N	O	C	T	32	48.00	3.42	0.13	1.76	2.63
Central Stoneroller	N	H	N		435	652.50	46.42	2.96	41.31	4.54
Rock Bass	S	C	C		8	12.00	0.85	0.47	6.53	39.00
Smallmouth Bass	F	C	C	M	7	10.50	0.75	0.07	0.95	6.43
Largemouth Bass	F	C	C		1	1.50	0.11	0.00	0.03	1.00
Green Sunfish	S	I	C	T	2	3.00	0.21	0.10	1.37	32.50
Bluegill Sunfish	S	I	C	P	13	19.50	1.39	0.23	3.21	11.77
Longear Sunfish	S	I	C	M	1	1.50	0.11	0.49	6.82	326.00
Johnny Darter	D	I	C		4	6.00	0.43	0.01	0.11	1.25
Greenside Darter	D	I	S	M	14	21.00	1.49	0.07	0.91	3.07
Banded Darter	D	I	S	I	2	3.00	0.21	0.01	0.07	1.50
Rainbow Darter	D	I	S	M	238	357.00	25.40	0.44	6.18	1.24
Orangethroat Darter	D	I	S		8	12.00	0.85	0.02	0.21	1.25
Fantail Darter	D	I	C		2	3.00	0.21	0.01	0.11	2.50
Least Darter [S]	D	I	N		2	3.00	0.21	0.00	0.03	0.50
Mottled Sculpin		I	C		11	16.50	1.17	0.03	0.36	1.55
<i>Mile Total</i>					937	1,405.50		7.17		
<i>Number of Species</i>					23					
<i>Number of Hybrids</i>					0					

River Code: 14-512	Stream: Swamp Creek	River Segment Totals
Mile Range: 0.30		Date Range: 08/02/1995
Thru: 6.10		Thru: 08/03/1995
Dist Fished: 0.75 km	Basin: Great Miami River	No of Passes: 4
		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
Northern Hog Sucker	R	I	S	M	13	4.88	0.52	0.15	2.28	30.38
White Sucker	W	O	S	T	101	47.88	5.13	0.77	11.91	16.72
Creek Chub	N	G	N	T	290	134.25	14.39	2.20	33.81	16.33
Silver Shiner	N	I	S	I	13	4.88	0.52	0.02	0.28	3.69
Rosyface Shiner	N	I	S	I	1	0.38	0.04	0.00	0.01	2.00
Rosefin Shiner	N	I	S	M	56	23.13	2.48	0.06	0.91	2.55
Striped Shiner	N	I	S		196	76.38	8.19	0.58	8.94	7.57
Sand Shiner	N	I	M	M	9	3.38	0.36	0.00	0.07	1.22
Bluntnose Minnow	N	O	C	T	159	65.38	7.01	0.18	2.78	2.67
Central Stoneroller	N	H	N		531	200.50	21.49	1.01	15.50	4.97
Rock Bass	S	C	C		74	32.00	3.43	0.43	6.57	13.92
Smallmouth Bass	F	C	C	M	9	3.50	0.38	0.03	0.42	7.33
Largemouth Bass	F	C	C		9	3.75	0.40	0.10	1.58	24.83
Green Sunfish	S	I	C	T	25	9.88	1.06	0.25	3.77	25.72
Bluegill Sunfish	S	I	C	P	29	10.88	1.17	0.12	1.78	10.62
Longear Sunfish	S	I	C	M	13	5.88	0.63	0.21	3.29	40.59
Green Sf X Bluegill Sf					1	0.38	0.04	0.06	0.90	156.00
Longear Sf X Bluegill Sf					1	0.38	0.04	0.01	0.17	30.00
Johnny Darter	D	I	C		15	6.00	0.64	0.01	0.12	1.27
Greenside Darter	D	I	S	M	32	12.00	1.29	0.03	0.45	2.44
Banded Darter	D	I	S	I	2	0.75	0.08	0.00	0.02	1.50
Rainbow Darter	D	I	S	M	449	172.38	18.48	0.21	3.22	1.20
Orangethroat Darter	D	I	S		61	26.63	2.85	0.04	0.56	1.35
Fantail Darter	D	I	C		5	1.88	0.20	0.00	0.07	2.20
Least Darter [S]	D	I	N		161	79.25	8.50	0.03	0.43	0.35
Mottled Sculpin		I	C		17	6.38	0.68	0.01	0.20	2.06
<i>Stream Total</i>					2,272	932.88		6.49		
<i>Number of Species</i>					24					
<i>Number of Hybrids</i>					2					

Species List

River Code: 14-513	Stream: Millers Fork	Sample Date: 1995
River Mile: 10.70	Location:	Date Range: 09/25/1995
Time Fished: 1734 sec	Drainage: 5.9 sq mi	
Dist Fished: 0.15 km	Basin: Great Miami River	No of Passes: 1
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Creek Chub	N	G	N	T	144	288.00	18.51	1.16	40.64	4.04
Striped Shiner	N	I	S		1	2.00	0.13	0.01	0.21	3.00
Bluntnose Minnow	N	O	C	T	91	182.00	11.70	0.34	12.01	1.89
Central Stoneroller	N	H	N		9	18.00	1.16	0.08	2.79	4.44
Blackstripe Topminnow		I	M		4	8.00	0.51	0.01	0.49	1.75
Rock Bass	S	C	C		2	4.00	0.26	0.24	8.38	60.00
Green Sunfish	S	I	C	T	18	36.00	2.31	0.48	16.76	13.33
Bluegill Sunfish	S	I	C	P	12	24.00	1.54	0.01	0.35	0.42
Johnny Darter	D	I	C		23	46.00	2.96	0.05	1.75	1.09
Greenside Darter	D	I	S	M	7	14.00	0.90	0.02	0.84	1.71
Rainbow Darter	D	I	S	M	29	58.00	3.73	0.06	2.23	1.10
Orangethroat Darter	D	I	S		150	300.00	19.28	0.18	6.28	0.60
Fantail Darter	D	I	C		12	24.00	1.54	0.02	0.77	0.92
Least Darter [S]	D	I	N		276	552.00	35.48	0.19	6.49	0.34
<i>Mile Total</i>					778	1,556.00		2.86		
<i>Number of Species</i>					14					
<i>Number of Hybrids</i>					0					

River Code: 14-513	Stream: Millers Fork	Sample Date: 1995
River Mile: 10.00	Location:	Date Range: 09/25/1995
Time Fished: 2800 sec	Drainage: 7.0 sq mi	
Dist Fished: 0.20 km	Basin: Great Miami River	No of Passes: 1
		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
Black Redhorse	R	I	S I	7	10.50	0.59	2.78	6.20	264.29
Golden Redhorse	R	I	S M	9	13.50	0.76	4.50	10.06	333.33
Northern Hog Sucker	R	I	S M	3	4.50	0.25	0.17	0.39	38.67
White Sucker	W	O	S T	85	127.50	7.18	6.58	14.70	51.59
Common Carp	G	O	M T	2	3.00	0.17	13.43	30.00	4,475.00
Creek Chub	N	G	N T	323	484.50	27.28	5.77	12.88	11.90
Silver Shiner	N	I	S I	28	42.00	2.36	0.17	0.39	4.11
Rosefin Shiner	N	I	S M	28	42.00	2.36	0.07	0.15	1.64
Striped Shiner	N	I	S	60	90.00	5.07	1.39	3.11	15.47
Sand Shiner	N	I	M M	1	1.50	0.08	0.00	0.01	2.00
Bluntnose Minnow	N	O	C T	263	394.50	22.21	1.18	2.65	3.00
Central Stoneroller	N	H	N	46	69.00	3.89	0.47	1.05	6.78
Black Bullhead		I	C P	18	27.00	1.52	0.30	0.67	11.11
Blackstripe Topminnow		I	M	1	1.50	0.08	0.00	0.01	2.00
Rock Bass	S	C	C	31	46.50	2.62	1.69	3.78	36.35
Smallmouth Bass	F	C	C M	9	13.50	0.76	0.45	1.01	33.33
Largemouth Bass	F	C	C	2	3.00	0.17	0.13	0.28	41.50
Green Sunfish	S	I	C T	27	40.50	2.28	1.03	2.31	25.48
Bluegill Sunfish	S	I	C P	67	100.50	5.66	3.90	8.71	38.81
Longear Sunfish	S	I	C M	14	21.00	1.18	0.40	0.90	19.23
Logperch	D	I	S M	8	12.00	0.68	0.10	0.21	8.00
Johnny Darter	D	I	C	5	7.50	0.42	0.01	0.02	1.20
Greenside Darter	D	I	S M	10	15.00	0.84	0.04	0.08	2.40
Rainbow Darter	D	I	S M	89	133.50	7.52	0.14	0.32	1.07
Orangethroat Darter	D	I	S	25	37.50	2.11	0.03	0.06	0.76
Fantail Darter	D	I	C	11	16.50	0.93	0.02	0.04	1.00
Least Darter [S]	D	I	N	10	15.00	0.84	0.01	0.02	0.50
Rainbow X Orangethroat	D	I	S	1	1.50	0.08	0.00	0.01	2.00
Mottled Sculpin		I	C	1	1.50	0.08	0.01	0.01	3.00
<i>Mile Total</i>				1,184	1,776.00		44.75		
<i>Number of Species</i>				28					
<i>Number of Hybrids</i>				1					

River Code: 14-513	Stream: Millers Fork	Sample Date: 1995
River Mile: 7.30	Location:	Date Range: 09/21/1995
Time Fished: 2972 sec	Drainage: 11.8 sq mi	
Dist Fished: 0.22 km	Basin: Great Miami River	No of Passes: 1
		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
Black Redhorse	R	I	S I	4	5.46	0.25	1.51	2.84	276.50
Golden Redhorse	R	I	S M	7	9.55	0.44	4.59	8.66	481.14
Northern Hog Sucker	R	I	S M	5	6.82	0.31	0.21	0.40	31.00
White Sucker	W	O	S T	108	147.27	6.78	13.11	24.73	89.05
Common Carp	G	O	M T	3	4.09	0.19	14.32	27.00	3,500.00
Creek Chub	N	G	N T	426	580.91	26.74	3.90	7.36	6.72
Silver Shiner	N	I	S I	71	96.82	4.46	0.36	0.67	3.66
Rosefin Shiner	N	I	S M	62	84.55	3.89	0.17	0.31	1.95
Striped Shiner	N	I	S	122	166.36	7.66	2.18	4.11	13.11
Spotfin Shiner	N	I	M	4	5.46	0.25	0.03	0.05	4.75
Sand Shiner	N	I	M M	7	9.55	0.44	0.02	0.03	1.86
Silverjaw Minnow	N	I	M	2	2.73	0.13	0.01	0.02	4.50
Bluntnose Minnow	N	O	C T	337	459.55	21.16	1.03	1.94	2.24
Central Stoneroller	N	H	N	92	125.46	5.78	1.14	2.16	9.12
Black Bullhead		I	C P	6	8.18	0.38	0.05	0.08	5.50
Blackstripe Topminnow		I	M	1	1.36	0.06	0.00	0.01	2.00
Rock Bass	S	C	C	5	6.82	0.31	0.20	0.37	29.00
Smallmouth Bass	F	C	C M	22	30.00	1.38	8.86	16.71	295.45
Largemouth Bass	F	C	C	8	10.91	0.50	0.23	0.44	21.25
Green Sunfish	S	I	C T	54	73.64	3.39	0.33	0.62	4.48
Bluegill Sunfish	S	I	C P	74	100.91	4.65	0.31	0.59	3.10
Longear Sunfish	S	I	C M	5	6.82	0.31	0.13	0.24	18.80
Logperch	D	I	S M	6	8.18	0.38	0.09	0.17	10.83
Johnny Darter	D	I	C	23	31.36	1.44	0.03	0.06	1.00
Greenside Darter	D	I	S M	22	30.00	1.38	0.03	0.06	1.14
Rainbow Darter	D	I	S M	69	94.09	4.33	0.09	0.17	0.97
Orangethroat Darter	D	I	S	23	31.36	1.44	0.03	0.06	1.00
Fantail Darter	D	I	C	2	2.73	0.13	0.01	0.01	2.00
Rainbow X Orangethroat	D	I	S	1	1.36	0.06	0.00	0.01	2.00
Mottled Sculpin		I	C	22	30.00	1.38	0.06	0.12	2.05
<i>Mile Total</i>				1,593	2,172.27		53.04		
<i>Number of Species</i>				29					
<i>Number of Hybrids</i>				1					

River Code: 14-513	Stream: Millers Fork	Sample Date: 1995
River Mile: 0.30	Location:	Date Range: 08/18/1995
Time Fished: 5314 sec	Drainage: 25.9 sq mi	Thru: 09/21/1995
Dist Fished: 0.40 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	20	15.00	1.69	3.26	12.70	217.60
Golden Redhorse	R	I	S M	5	3.75	0.42	1.43	5.56	380.80
Northern Hog Sucker	R	I	S M	39	29.25	3.29	2.00	7.78	68.33
White Sucker	W	O	S T	42	31.50	3.55	3.25	12.64	103.14
Common Carp	G	O	M T	1	0.75	0.08	2.83	11.02	3,775.00
Creek Chub	N	G	N T	99	74.25	8.36	1.11	4.31	14.93
Silver Shiner	N	I	S I	88	66.00	7.43	0.25	0.99	3.85
Rosefin Shiner	N	I	S M	65	48.75	5.49	0.10	0.40	2.12
Striped Shiner	N	I	S	229	171.75	19.34	2.39	9.31	13.93
Spotfin Shiner	N	I	M	4	3.00	0.34	0.01	0.04	3.75
Sand Shiner	N	I	M M	9	6.75	0.76	0.02	0.06	2.22
Silverjaw Minnow	N	I	M	2	1.50	0.17	0.01	0.02	4.00
Bluntnose Minnow	N	O	C T	40	30.00	3.38	0.07	0.26	2.23
Central Stoneroller	N	H	N	43	32.25	3.63	0.16	0.63	5.02
Rock Bass	S	C	C	35	26.25	2.96	2.55	9.93	97.17
Smallmouth Bass	F	C	C M	30	22.50	2.53	3.79	14.75	168.43
Largemouth Bass	F	C	C	8	6.00	0.68	0.33	1.27	54.25
Green Sunfish	S	I	C T	23	17.25	1.94	0.56	2.19	32.61
Bluegill Sunfish	S	I	C P	23	17.25	1.94	0.11	0.41	6.09
Longear Sunfish	S	I	C M	48	36.00	4.05	0.82	3.20	22.85
Logperch	D	I	S M	12	9.00	1.01	0.12	0.45	12.92
Greenside Darter	D	I	S M	16	12.00	1.35	0.03	0.10	2.06
Banded Darter	D	I	S I	6	4.50	0.51	0.01	0.04	2.00
Rainbow Darter	D	I	S M	128	96.00	10.81	0.09	0.36	0.95
Orangethroat Darter	D	I	S	2	1.50	0.17	0.00	0.01	2.00
Fantail Darter	D	I	C	10	7.50	0.84	0.01	0.03	1.10
Mottled Sculpin		I	C	157	117.75	13.26	0.40	1.56	3.39
<i>Mile Total</i>				1,184	888.00		25.70		
<i>Number of Species</i>				27					
<i>Number of Hybrids</i>				0					

River Code: 14-513	Stream: Millers Fork		River Segment Totals		
Mile Range: 0.30			Date Range: 08/18/1995		
Thru: 10.70			Thru: 09/25/1995		
Dist Fished: 0.97 km	Basin: Great Miami River	No of Passes: 5	Sampler Type: D E		

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Black Redhorse	R	I	S I	31	9.19	0.63	2.16	7.11	235.74
Golden Redhorse	R	I	S M	21	6.11	0.42	2.39	7.86	393.90
Northern Hog Sucker	R	I	S M	47	13.96	0.96	0.88	2.88	62.47
White Sucker	W	O	S T	235	67.55	4.64	5.24	17.22	78.02
Common Carp	G	O	M T	6	1.72	0.12	6.68	21.97	3,870.83
Creek Chub	N	G	N T	992	300.38	20.63	2.61	8.58	8.84
Silver Shiner	N	I	S I	187	54.16	3.72	0.21	0.68	3.82
Rosefin Shiner	N	I	S M	155	44.81	3.08	0.09	0.29	1.97
Striped Shiner	N	I	S	412	120.37	8.27	1.67	5.50	13.89
Spotfin Shiner	N	I	M	8	2.29	0.16	0.01	0.03	4.25
Sand Shiner	N	I	M M	17	4.91	0.34	0.01	0.03	2.06
Silverjaw Minnow	N	I	M	4	1.15	0.08	0.00	0.02	4.25
Bluntnose Minnow	N	O	C T	731	219.21	15.05	0.54	1.77	2.47
Central Stoneroller	N	H	N	190	55.39	3.80	0.40	1.33	7.40
Black Bullhead		I	C P	24	7.04	0.48	0.07	0.23	9.71
Blackstripe Topminnow		I	M	6	2.17	0.15	0.00	0.01	1.83
Rock Bass	S	C	C	73	21.96	1.51	1.45	4.75	65.66
Smallmouth Bass	F	C	C M	61	17.70	1.22	3.38	11.11	194.31
Largemouth Bass	F	C	C	18	5.18	0.36	0.20	0.66	38.17
Green Sunfish	S	I	C T	122	36.93	2.54	0.59	1.95	15.74
Bluegill Sunfish	S	I	C P	176	51.98	3.57	0.89	2.91	16.90
Longear Sunfish	S	I	C M	67	19.96	1.37	0.44	1.43	21.79
Logperch	D	I	S M	26	7.64	0.52	0.08	0.27	10.92
Johnny Darter	D	I	C	51	16.97	1.17	0.02	0.06	1.06
Greenside Darter	D	I	S M	55	16.60	1.14	0.03	0.09	1.71
Banded Darter	D	I	S I	6	1.80	0.12	0.00	0.01	2.00
Rainbow Darter	D	I	S M	315	95.52	6.56	0.10	0.32	1.00
Orangethroat Darter	D	I	S	200	74.37	5.11	0.05	0.16	0.68
Fantail Darter	D	I	C	35	11.65	0.80	0.01	0.04	1.06
Least Darter [S]	D	I	N	286	113.40	7.79	0.04	0.13	0.34
Rainbow X Orangethroat	D	I	S	2	0.57	0.04	0.00	0.00	2.00
Mottled Sculpin		I	C	180	53.40	3.67	0.17	0.57	3.23
<i>Stream Total</i>				4,739	1,456.05		30.41		
<i>Number of Species</i>				31					
<i>Number of Hybrids</i>				1					

River Code: 14-516	Stream: Reigle Ditch	Sample Date: 1995
River Mile: 0.50	Location:	Date Range: 07/27/1995
Time Fished: 3433 sec	Drainage: 3.3 sq mi	Thru: 09/27/1995
Dist Fished: 0.36 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Golden Redhorse	R	I	S	M	3	2.50	0.37	0.17	5.81	69.33
White Sucker	W	O	S	T	16	13.33	1.99	0.39	13.13	29.38
Blacknose Dace	N	G	S	T	85	70.83	10.57	0.06	1.98	0.84
Creek Chub	N	G	N	T	405	337.50	50.37	1.44	48.12	4.26
South. Redbelly Dace	N	H	S		41	34.17	5.10	0.05	1.77	1.55
Striped Shiner	N	I	S		47	39.17	5.85	0.16	5.31	4.04
Silverjaw Minnow	N	I	M		17	14.17	2.11	0.02	0.55	1.18
Fathead Minnow	N	O	C	T	3	2.50	0.37	0.01	0.28	3.33
Bluntnose Minnow	N	O	C	T	16	13.33	1.99	0.02	0.70	1.56
Central Stoneroller	N	H	N		93	77.50	11.57	0.15	4.86	1.87
Yellow Bullhead		I	C	T	1	0.83	0.12	0.03	1.12	40.00
Green Sunfish	S	I	C	T	21	17.50	2.61	0.33	11.20	19.10
Bluegill Sunfish	S	I	C	P	4	3.33	0.50	0.01	0.45	4.00
Green Sf X Bluegill Sf					3	2.50	0.37	0.10	3.31	39.67
Johnny Darter	D	I	C		23	19.17	2.86	0.02	0.65	1.00
Orangethroat Darter	D	I	S		15	12.50	1.87	0.01	0.30	0.73
Fantail Darter	D	I	C		11	9.17	1.37	0.02	0.50	1.64
<i>Mile Total</i>					804	670.00		2.99		
<i>Number of Species</i>					16					
<i>Number of Hybrids</i>					1					

River Code: 14-516	Stream: Reigle Ditch	Sample Date: 1995
River Mile: 0.30	Location:	Date Range: 07/27/1995
Time Fished: 4391 sec	Drainage: 3.4 sq mi	Thru: 09/27/1995
Dist Fished: 0.36 km	Basin: Great Miami River	No of Passes: 2
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback Carpsucker	C	O	M	1	0.83	0.02	0.01	0.05	10.00
Golden Redhorse	R	I	S M	1	0.83	0.02	0.00	0.02	3.00
Northern Hog Sucker	R	I	S M	2	1.67	0.04	0.04	0.25	25.00
White Sucker	W	O	S T	46	38.33	1.00	0.72	4.34	18.74
Blacknose Dace	N	G	S T	803	669.17	17.53	1.38	8.37	2.07
Creek Chub	N	G	N T	1,564	1,303.33	34.15	9.71	58.68	7.45
Suckermouth Minnow	N	I	S	2	1.67	0.04	0.00	0.02	2.00
South. Redbelly Dace	N	H	S	485	404.17	10.59	0.72	4.37	1.79
Striped Shiner	N	I	S	195	162.50	4.26	0.59	3.55	3.61
Silverjaw Minnow	N	I	M	49	40.83	1.07	0.09	0.53	2.12
Fathead Minnow	N	O	C T	1	0.83	0.02	0.00	0.01	1.00
Bluntnose Minnow	N	O	C T	127	105.83	2.77	0.29	1.75	2.74
Central Stoneroller	N	H	N	661	550.83	14.43	2.29	13.81	4.15
Green Sunfish	S	I	C T	8	6.67	0.17	0.16	0.98	24.25
Bluegill Sunfish	S	I	C P	2	1.67	0.04	0.01	0.08	7.50
Green Sf X Bluegill Sf				4	3.33	0.09	0.09	0.56	27.50
Johnny Darter	D	I	C	74	61.67	1.62	0.07	0.42	1.14
Rainbow Darter	D	I	S M	7	5.83	0.15	0.01	0.06	1.86
Orangethroat Darter	D	I	S	484	403.33	10.57	0.31	1.85	0.76
Fantail Darter	D	I	C	64	53.33	1.40	0.05	0.32	0.98
<i>Mile Total</i>				4,580	3,816.67		16.54		
<i>Number of Species</i>				19					
<i>Number of Hybrids</i>				1					

River Code: 14-516	Stream: Reigle Ditch	River Segment Totals
Mile Range: 0.30		Date Range: 07/27/1995
Thru: 0.50		Thru: 09/27/1995
Dist Fished: 0.72 km	Basin: Great Miami River	No of Passes: 4
		Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback Carpsucker	C	O	M		1	0.42	0.02	0.00	0.04	10.00
Golden Redhorse	R	I	S	M	4	1.67	0.07	0.09	0.90	52.75
Northern Hog Sucker	R	I	S	M	2	0.83	0.04	0.02	0.21	25.00
White Sucker	W	O	S	T	62	25.83	1.15	0.56	5.68	21.48
Blacknose Dace	N	G	S	T	888	370.00	16.49	0.72	7.39	1.95
Creek Chub	N	G	N	T	1,969	820.42	36.57	5.57	57.07	6.79
Suckermouth Minnow	N	I	S		2	0.83	0.04	0.00	0.02	2.00
South. Redbelly Dace	N	H	S		526	219.17	9.77	0.39	3.97	1.77
Striped Shiner	N	I	S		242	100.83	4.49	0.37	3.82	3.69
Silverjaw Minnow	N	I	M		66	27.50	1.23	0.05	0.53	1.88
Fathead Minnow	N	O	C	T	4	1.67	0.07	0.00	0.05	2.75
Bluntnose Minnow	N	O	C	T	143	59.58	2.66	0.16	1.59	2.61
Central Stoneroller	N	H	N		754	314.17	14.00	1.22	12.44	3.87
Yellow Bullhead		I	C	T	1	0.42	0.02	0.02	0.17	40.00
Green Sunfish	S	I	C	T	29	12.08	0.54	0.25	2.54	20.52
Bluegill Sunfish	S	I	C	P	6	2.50	0.11	0.01	0.13	5.17
Green Sf X Bluegill Sf					7	2.92	0.13	0.10	0.98	32.71
Johnny Darter	D	I	C		97	40.42	1.80	0.04	0.46	1.10
Rainbow Darter	D	I	S	M	7	2.92	0.13	0.01	0.05	1.86
Orangethroat Darter	D	I	S		499	207.92	9.27	0.16	1.61	0.76
Fantail Darter	D	I	C		75	31.25	1.39	0.03	0.35	1.08
<i>Stream Total</i>					5,384	2,243.33		9.76		
<i>Number of Species</i>					20					
<i>Number of Hybrids</i>					1					