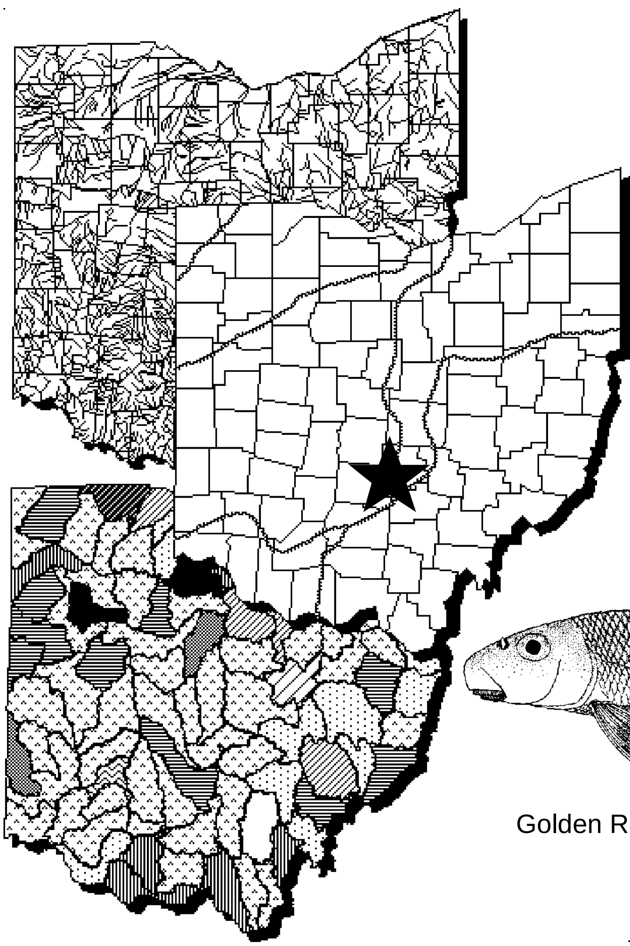
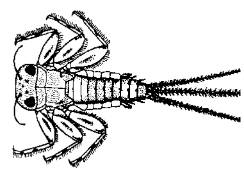
State of Ohio
Environmental Protection Agency

Ecological Assessment
Division of Surface Water

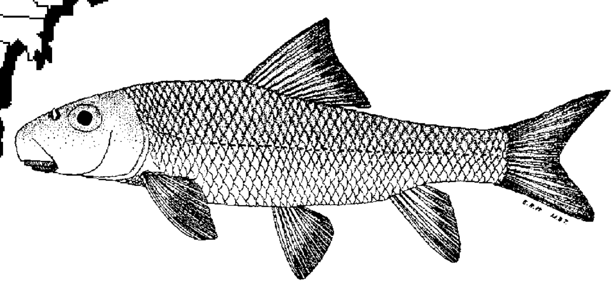
Biological and Water Quality Study of Walnut Creek and Selected Tributaries 1996

Fairfield, Franklin, and Pickaway Counties, Ohio





Mayfly *(Stenonema)*



Golden Redhorse *(Moxostoma erythrum)*

April 1, 1999

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Biological and Water Quality Study of Walnut Creek 1996

Fairfield, Franklin, and Pickaway Counties, Ohio

April 1, 1999

OEPA Technical Report MAS/1997-12-5

prepared by

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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
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ACKNOWLEDGEMENTS

The following Ohio EPA staff are acknowledged for their contribution to this report:

Study Area - Vince Mazeika
Pollutant Loadings - Kathy Karam, John Owen, Jan Rice, and Paul Vandermeer
Chemical Water Quality - Kathy Karam
Sediment Quality - Kathy Karam
Physical Habitat - Brian Alsdorf
Biological Assessment:
    Macroinvertebrate community - Ed Moore,
    Fish community - Brian Alsdorf.
Data Management - Dennis Mishne
TSD coordination - Brian Alsdorf.
Reviewers - Jeff Bohne, Jeff DeShon, Marc Smith, and Chris Yoder

The following individuals, employed through an Ohio EPA college internship program, are acknowledged for their assistance in field collections:

Water Chemistry Data - Jeremy Browand and Kristy Hunt
Macroinvertebrate Field Samples - Matt Coffee, Stephanie Harrington, and Tracy Morman
Fish Community Data - Kirk Banta, Rainie Gardner, and Tom Socha

This evaluation and report was possible only with the assistance of the study team, many full and part time field staff, and the chemistry analyses provided by the Ohio EPA Division of Environmental Services. Property owners who permitted access for sampling are also acknowledged for their cooperation.

Copies of this report are located on the Ohio EPA internet web page (www.epa.state.oh.us) or may be available from:

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Ecological Assessment Unit
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Groveport Ohio 43125
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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

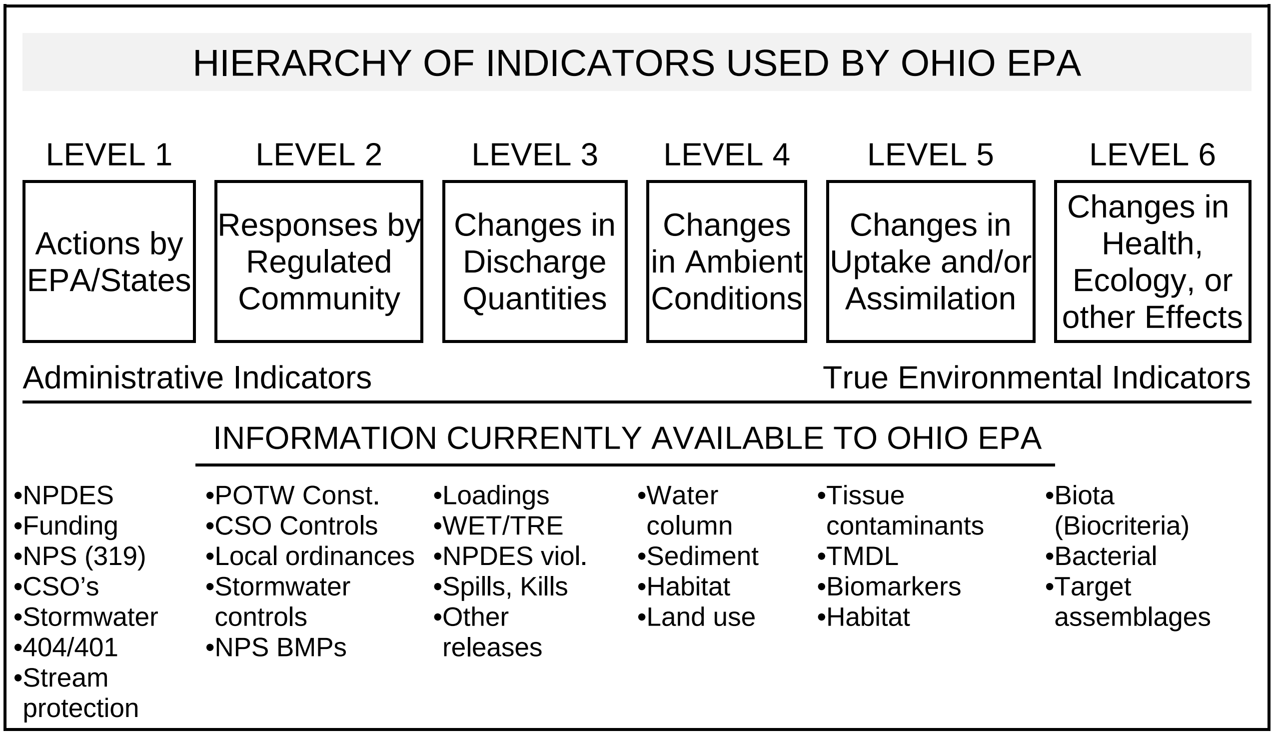

Figure 1 Hierarchy of administrative and environmental indicators used by Ohio EPA for monitoring, assessment, reporting, and evaluating program effectiveness (patterned after a model developed by the U.S. EPA, Office of Water).

and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate 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.

Biological and Water Quality Study of Walnut Creek 1996

Fairfield, Franklin, and Pickaway Counties, Ohio

State of Ohio Environmental Protection Agency
Division of Surface Water
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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 Walnut Creek basin from June to October 1996. This study area included a 53 mile reach of Walnut Creek from Cattail Rd. (near Buckeye Lake) downstream to the mouth, and sites on Pleasantville, Pawpaw, Poplar, Sycamore, George and Little Walnut Creeks, Gillette, Big, Rickenbacker, Mud, Mann's and Turkey Runs, and Tussing Ditch. Table 5 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 streams within the 1996 Walnut Creek study area;

2) Evaluate the influence of the Baltimore, Pickerington, Canal Winchester, Ashville and other smaller Wastewater Treatment Plants (WWTPs) within the Walnut Creek watershed;

3) Evaluate the potential impacts from small industrial (Ohio Paperboard Inc.) and commercial discharges, spills, nonpoint source pollution (NPS), and habitat alterations on the receiving streams;

4) Determine the attainment status of the current designated 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

Walnut Creek

The 1996 Walnut Creek study area included a mainstem reach beginning at RM 53.2 (Cattail Rd., near Buckeye Lake) and extending downstream to the mouth and sites on 13 tributaries. Ambient mainstem water column chemical, physical and bacteriological sampling occurred at 25 stations; biological sampling occurred at 26 sites (Table 4). Based on the performance of biological communities with respect to ecoregional biocriteria, 89% (47.0 miles) of Walnut Creek was considered to be in FULL attainment of the WWH aquatic life use designation. Only 5.8 miles (11%) demonstrated PARTIAL attainment of the WWH criteria. **NON** attainment was documented in a 0.2 mile reach (0.4%).

This level of performance was characterized as very good. Walnut Creek supported exceptional macroinvertebrate communities and very good fish communities at most sampling locations. Likewise, physical habitat conditions were generally very good. Although the possibility that Walnut Creek should be designated an EWH stream was considered, the overall performance and habitat conditions in 1996 were not consistant with this use.

Tributaries

The various tributaries were sampled at 28 locations where water column chemical, physical and bacteriological data were recorded. Biological samples were evaluated at 34 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. PARTIAL attainment of the WWH aquatic life use was recorded for Pleasantville Creek most likely due to agricultural land use and drainage practices. Pawpaw Creek was determined to be in FULL attainment of the WWH use. However, the West Branch of Pawpaw Creek was in PARTIAL attainment downstream from Ohio Paperboard Inc. where the impact of this small industry was apparent. Poplar Creek was in FULL attainment of the recommended EWH use in the upper reaches and in PARTIAL attainment in the lower reach where limiting factors were attributed to agricultural practices. Gillette Run was in FULL attainment of the WWH use.

Biological communities were evaluated at eight Sycamore Creek sites. FULL attainment of the WWH aquatic life use was recorded at all except one location where PARTIAL attainment was attributed to influences from the Pickerington WWTP. FULL attainment of the WWH use was recorded for Tussing Ditch. Georges Creek was in **NON** attainment of the WWH aquatic life use between Long Rd. and the confluence with the East Fork of Georges Creek. Rapid housing development with inadequate stormwater erosion controls were deemed culpable for this departure. The East Fork of Georges Creek was in PARTIAL attainment of the WWH aquatic life use between Wright Rd. and the confluence with Georges Creek due to the same causes. Biological performance in Big Run was in FULL attainment of the WWH use.

The WWH use designation was recommended for North Rickenbacker Run. **NON** attainment of this use near the confluence with Walnut Creek was attributed to marginal habitat quality. The MWH use designation was recommended for South Rickenbacker Run. Partial attainment of this use near the confluence with Walnut Creek was also attributed to marginal habitat quality. Mud Run was in FULL attainment of the WWH use. Mann's Run was in PARTIAL attainment of the WWH use. No definitive impact was related to this departure. Little Walnut Creek was in FULL attainment of the recommended EWH use in the upper reaches. However, **NON** attainment of the WWH use was recorded in the lower reach where influences from agricultural practices were evident. FULL attainment of the recommended EWH was documented in Turkey Run. Aquatic life use attainment status and biocriteria scores for all sampling locations are presented in Table 1.

Walnut Creek

Walnut Creek was in full attainment of WWH criteria at all but two locations in the 53 miles sampled in 1996. Upstream from the Baltimore WWTP (RM 40.06) the departure from ecoregional expectations was due to fair macroinvertebrate community performance. At the most downstream location (RM 1.3) a fair IBI fish community score (33) resulted in partial attainment. Otherwise, most 1996 Walnut Creek macroinvertebrate samples reflected exceptional performance. The fish community was generally very good. The physical habitat conditions in Walnut Creek were also generally considered very good.

Downstream from the Pawpaw Creek confluence, biological performance in Walnut Creek (RM 41.2) was very good (IBI=47, MIwb=9.4, and ICI=38). However, at RM 40.06 bypasses from the Baltimore WWTP depressed the macroinvertebrate community performance to fair. Likewise, within the Baltimore WWTP mixing zone the macroinvertebrate community performance remained fair (RM 40.0, ICI=18). In addition to inconsistant plant operation and collection system problems the macroinvertebrate community also reflected limitations imposed by site specific habitat conditions. Both, the site immediately upstream and the mixing zone were located in a low gradient reach comprised mostly of pool conditions. Despite the lack of habitat variation, community performance should improve with bypass elimination. Downstream from the WWTP (RM 39.7), biological performance was good (IBI=46, MIwb=9.6, and ICI=G[34]).

The other location at which WWH departure was recorded was also subject to some habitat

Table 1. Attainment status of the existing or recommended aquatic life uses for the Walnut Creek basin based on biological sampling conducted during July through September 1996.

RIVER MILE Fish/Invert.	IBI	MIwb	ICI[a]	QHEI	Attainment Status[b]	Site Location
Walnut Creek	*Erie Ontario Lake Plain (EOLP) - WWH Use Designation*					
53.0 /53.2	52	NA	48	82.0	FULL	Cattail Rd.
47.0 /47.1	44	7.7^{ns}	34	77.5	FULL	SR 256
42.6 /42.7	43	8.8	42	73.0	FULL	SR 158
41.3 /41.2	47	9.4	38	77.5	FULL	Basil Rd. (CR 46)
/40.06	--	--	F*	--	(NON)	Ust. Baltimore WWTP
40.0 /40.04	*42*	*7.5^{ns}*	*18**	--	*NA*	*Baltimore WWTP mixing zone*
39.7 /39.9	46	9.6	G	86.0	FULL	Baltimore WWTP
37.0	51	9.6	46	86.0	FULL	Bader Rd.
	Eastern Corn Belt Plains (ECBP) - WWH Use Designation					
34.5	44	9.2	50	75.5	FULL	Coakley Rd.
30.0/29.7	43	8.2^{ns}	52	57.0	FULL	Ust/Dst. Pickerington Rd.
29.1	46	9.0	48	62.5	FULL	At Amanda Northern Rd
26.4	45	9.3	50	75.5	FULL	Dst. Waterloo Rd.
24.4/24.5	54	9.1	52	79.0	FULL	Ust. Canal Winchester WWTP
24.1/24.19[1]	*38^{ns}*	*9.4*	*G*	--	*NA*	*Canal Winchester WWTP mix zone*
24.1/24.19[2]	*12*	*3.8*	*P*	--	*NA*	*Canal Winchester WWTP mix zone*
23.9/24.0	50	9.7	48	84.0	FULL	Dst. Canal Winchester WWTP
21.2	45	8.5	48	69.0	FULL	Ust. George Cr. confluence
19.4	42	8.2^{ns}	42	53.0	FULL	Ust. Richardson Rd.
16.9	43	8.9	G	63.0	FULL	Hayes Rd., CR 2
15.5	46	8.3	VG	64.0	FULL	Adj. Pontius Rd., CR 118
13.8	47	8.2^{ns}	E	68.0	FULL	Lancaster Rd., TR 12
11.0[B]	44	8.6	54	82.0	FULL	Walnut Ck. Pike/Groveport R.
9.1[B]	48	9.6	48	81.5	FULL	St. Paul/ Ashville Rd., CR 90
5.1[B]	49	8.8	48	72.5	FULL	Circleville/ Lockbourne E. Rd
/4.42	--	--	*28*	--	*NA*	*Ashville WWTP mix zone*
4.1[B]	40	9.5	54	72.0	FULL	Cromley Rd., CR 28
1.3[B]	33*	8.6	54	66.0	PARTIAL	Little Walnut Rd., CR 508
Pleasantville Creek	*Erie Ontario Lake Plain (EOLP) - WWH Use Designation*					
0.8	28*	NA	MG^{ns}	66.5	PARTIAL	Ust. Pleasantville WWTP
0.7	32*	NA	MG^{ns}	65.0	PARTIAL	Dst. Pleasantville WWTP
Pawpaw Creek	*Erie Ontario Lake Plain (EOLP) - WWH Use Designation*					
1.4	40	NA	G	81.0	FULL	Canal Rd., CR 11

Table 1. (continued)

RIVER MILE Fish/Invert.	IBI	MIwb	ICI[a]	QHEI	Attainment Status[b]	Site Location
Pawpaw Creek	*(continued)*					
0.3 /0.4	40	NA	36	68.0	FULL	From East St.
West Branch of Pawpaw Creek	*Erie Ontario Lake Plain (EOLP) - WWH Use Designation*					
1.0 /1.3	46	NA	G	87.0	FULL	Roley Rd
0.1	44	NA	F*	58.0	PARTIAL	Dst. Ohio Paperboard
Poplar Creek	*Eastern Corn Belt Plains (ECBP) - EWH Use Designation (Recommended)*					
6.6	58	NA	E	70.5	FULL	Dst. Steman Rd., Dst. trib.
0.7	42*	NA	VG^{ns}	86.5	PARTIAL	Bish Rd.
Gillette Run	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
0.1	42	NA	G	52.0	FULL	CR 17, Pleasantville Rd.
Sycamore Creek	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
12.2 /11.8	36^{ns}	NA	MG^{ns}	64.5	FULL	SR 204, Blacklick-Eastern Rd
9.5 /9.6	48	NA	G	75.5	FULL	Refugee Rd.
8.5 /8.4	48	NA	VG	71.5	FULL	Stemen Rd.
6.1	38	NA	VG	77.5	FULL	Sycamore Dr.
4.7 /4.9	46	NA	44	74.5	FULL	CR 18, Hill Rd. (north)
4.2	41	NA	36	73.0	FULL	CR 18, Hill Rd. (south)
2.6 /2.7	44	6.8*	42	78.0	PARTIAL	Busey Rd.
0.3 /0.1	45	9.0	40	73.5	FULL	Benadum Rd.
Tussing Ditch	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
0.3	44	NA	MG^{ns}	63.0	FULL	Groveport Rd., CR 7
Georges Creek	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
/6.4	--	--	MG^{ns}	--	(FULL)	
4.3	34*	NA	--	43.0	(**NON**)	Long Rd., TR 220
2.4 /2.1	<u>24</u>*	NA	F*	21.5	**NON**	Winchester Pike, Ust Trib.
0.1	40	NA	MG^{ns}	47.0	FULL	Groveport Rd., CR 7
East Fork of Georges Creek	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
6.0	40	NA	46	46.0	FULL	Refugee Rd., CR 7
2.4	34*	NA	G	61.5	PARTIAL	Wright Rd., CR 221
Big Run	*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
1.6	46	NA	MG^{ns}	39.5	FULL	Hayes Rd., CR 2
North Rickenbacker Run	*(ECBP) - WWH Use Designation (Recommended)*					
0.6	39^{ns}	NA	MG^{ns}	52.0	FULL	Off Pontius Rd., CR 118
0.2	--	--	F*	--	(**NON**)	Ust. Walnut Cr. confluence
South Rickenbacker Run	*(ECBP) - MWH Use Designation (Recommended)*					
0.1	30	NA	<u>P</u>*	55.0	PARTIAL	Dst. abandoned WWTP

Mud Run *Eastern Corn Belt Plains (ECBP) - WWH Use Designation*

Table 1. (continued)

RIVER MILE Fish/Invert.	**IBI**	**MIwb**	**ICI**[a]	**QHEI**	**Attainment Status**[b]	**Site Location**
0.7	48	NA	G	58.5	FULL	Perrill Rd., TR-93
Mann's Run		*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*				
1.0 /1.0-1.3	48	NA	F*	65.0	PARTIAL	Ust. Trailer Park, Dst. AFB
0.3	45	NA	F*	51.0	PARTIAL	From Miller Rd., T-92
Little Walnut Creek			*(ECBP) -EWH Use Designation (Recommended)*			
4.9 /5.7	52	NA	VG[ns]	69.0	FULL	Ringgold Northern, TR-43
			(ECBP) -WWH Use Designation			
1.5 /0.7	46	8.8	P*	71.5	**NON**	S. Bloomfield-Royalton Rd., TR-29
Turkey Run		*Eastern Corn Belt Plains (ECBP) - EWH Use Designation (Recommended)*				
0.2	58	NA	E	72.5	FULL	S. Bloomfield-Royalton Rd., TR-29

* 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.
NA Not Applicable. The MIwb is not applicable to headwater sites.
B Boat site. Headwater - wading criteria apply to all other sites.

limitations. At RM 1.3 habitat conditions were generally good (QHEI=66.0) although the stream substrates were principally depositional sand. The macroinvertebrate community achieved exceptional status (ICI=54) while the MIwb score (8.6) was good. However, the fair IBI score (33) seemed most likely influenced by substrate conditions. The component IBI metric scores for percentage of simple lithophils, round bodied suckers, omnivores and tolerant fish suggested an assemblage that was amenable to more uniform habitat availability. Whether the substrate conditions were singularly sufficient to prevent the community from achieving the biocriterion is speculation. No other likely causes of the decline were identified.

Habitat conditions at each site were considered the most influential aspect to Walnut Creek fish community performance. In particular, where habitat conditions were excellent (QHEI/80) the fish community generally demonstrated exceptional performance. Conversely, at the two sites where habitat conditions were fair (QHEI<60) the fish community was marginally good to good. The macroinvertebrate community was less sensitve to site specific habitat conditions but also generally followed this trend of better performance associated with better habitat.

Overall, water quality in Walnut Creek was considered very good. All dissolved oxygen concentrations were greater than water quality standards and results for most parameters were within reasonable levels. However, evidence of polluted runoff was common throughout the Walnut Creek

Table 2. Narrative ranges, WWH (bold), and MWH (italics) biocriteria for the Eastern Corn Belt and Erie Ontario Lake Plains ecoregions. Exceptional (EWH biocriteria), very good (EWH

nonsignificant departure), poor and very poor evaluations are common statewide. For WWH, the ranges of marginally good and nonsignificant departure are the same.

IBI			MIwb		ICI	Narrative Evaluation
Headwater	Wading	Boat	Wading	Boat	All	
50-60	50-60	48-60	$9.4	$9.6	46-60	Exceptional
46-49	46-49	44-47	8.9-9.3	9.1-9.5	42-44	Very Good
Eastern Corn Belt Plains						
40-45	**40**-45	**42**-43	**8.3**-8.8	**8.5**-9.0	**36**-40	Good
36-39	36-39	38-41	7.8-8.2	8.0-8.4	32-34	Marginally Good
28-35	28-35	26-37	5.9-(*6.2*) 7.7	6.4-7.9	14-(*22*) 30	Fair
Erie Ontario Lake Plain						
40-45	**38**-45	**40**-43	**7.9**-8.8	**8.7**-9.0	**34**-40	Good
36-39	34-37	36-39	7.4-7.8	8.2-8.6	30-32	Marginally Good
28-35	28-33	26-35	5.9-(*6.2*) 7.3	6.4-8.1	14-(*22*) 28	Fair
18-(*24*) 27	18-(*24*) 27	16-(*24*) 25	4.5-5.8	5.0-(*5.8*) 6.3	2-12	Poor
12-17	12-17	12-15	0-4.4	0-4.9	<2	Very Poor

watershed. Fecal coliform concentrations exceeded the water quality standards following a large rain storm (>1"). Concentrations of fecal coliform also increased downstream from the Baltimore WWTP and the Canal Winchester WWTP; indicative of sporadic treatment inefficiencies.

Likewise, some primary nutrient enrichment was evident following runoff and at those sites downstream from WWTPs. During runoff, peak nitrate+nitrite-N concentrations reached relatively moderate levels but it appeared to be assimilated. The Baltimore WWTP and Ashville WWTP were continuous sources of elevated nitrate+nitrite-N loading but neither was implicated as a cause of significant water quality degradation. Ammonia-N concentrations were high in the Canal Winchester WWTP effluent but this was also effectively assimilated immediately downstream. Phosphorus levels reflected this pattern also but remained in detectable concentrations for longer periods of time and for longer distances downstream from the WWTPs. Recent research (Miltner and Rankin 1998) indicates that the continuous phosphorus loading may be biologically limiting.

In 1996 the condition of Walnut Creek was typically very good. Instances of departure from ecoregional expectations were short in length and habitat quality was deemed to be the most restrictive aspect to better stream health. The stream appeared to be able to assimilate the various sources of pollution as strong populations of sensitive fish species including golden redhorse, northern hogsuckers, silver shiners, sand shiners, smallmouth bass and greenside darters were typically encountered. Many pollution sensitive macroinvertebrates were also present. In all, 86 macroinvertebrate taxa and 60 fish species were collected in Walnut Creek in 1996.

These conditions represented an improvement since a 1982 biosurvey documented relatively severe impairment in the reach immediately downstream from the Newark Group WWTP via Pawpaw Creek and the Baltimore WWTP. In 1996 pollutant loadings from both of these facilities were reduced and biological performance was much better in this reach than what was documented in 1982.

Other trends were less pronounced. Overall, ammonia-N concentrations in the water column were reduced in 1996 compared to 1982. This subtle improvement was attributed to better treatment efficiencies at the various WWTPs in the basin. Additionally, changes in land use and upgraded wastewater treatment technology were considered to be the most likely factors which influenced subtle improvements biological performance at most sites.

Permitted Dischargers

Ohio EPA has permitted 24 entities to discharge a little more than 5.6 million gallons per day (MGD) of treated wastewater in the Walnut Creek basin. Seven entities release wastewater directly to Walnut Creek while the others discharge to various tributaries. Three of the direct discharges have daily flows which are greater than 0.1 MGD. The other four dischargers, a Bloom-Carrol District school, Amerimark Inc., Walnut Heights WWTP, and Cooks Creek Golf Course, had a combined third quarter total flow of 0.034 MGD. Non of these smaller entities were considered to be a source of water quality degradation in Walnut Creek.

The three larger dischargers were all municipal WWTPs. The Baltimore WWTP has a third quarter median discharge of 0.413 MGD and is operating at near capacity (0.5 MGD). Although the plant has generally been well operated, the collection system has severe infiltration and inflow (I&I) problems. To alleviate residential sewage backup, wastewater is pumped from a sewer into Pawpaw Creek during some storms. These “spills” have been frequent and a large volume of diluted sewage has been delivered to Walnut Creek. Additionally, flooding at the WWTP has resulted in some plant overflows. Ohio EPA Director’s findings and orders were issued to the Village in 1991 to correct this situation.

The Canal Winchester WWTP was upgraded in 1987 to a design capacity of 0.45 MGD but the use of settling polymers increased that capacity to 0.65 MGD. Third quarter median flow in 1996 was 0.46 MGD. The plant had a history of variable discharge quality and had the highest ammonia-N loading in 1996 to the Walnut Creek basin. I&I problems and sludge management difficulties contibuted to the discharge of excessive solids and sewage sludge was observed in Walnut Creek immediately downstream from the plant in 1996. Essentially, the plant was too small for the rapidly growing Canal Winchester and Lithopolis area. Following a 1997 Ohio EPA consent order agreement with the Village the plant was expanded and upgraded. The new plant functionally replaced the old by incorporating the most recent treatment technology. The issues identified in 1996 in this report should be corrected.

Ashville effectively built a new WWTP in 1994 and now uses the older plant for sludge management. Like Baltimore and Canal Winchester, Ashville also has I&I problems. In 1996 a sewage bypass was discovered. A compliance schedule to eliminate this and the I&I sources began in 1997. Unlike Baltimore and Canal Winchester however, the flow at Ashville has been declining. The plant design capacity is 0.6 MGD and the 1996 third quarter median flow was 0.24 MGD. Effluent sampling indicated the facility has difficulty with nitrification despite its new technology as average nitrate-N concentrations (21.6 mg/l) were the highest of any discharger in the basin. Ambient biological performance and water quality was not unduely influenced by the WWTP in 1996.

Pleasantville Creek (Tributary to Walnut Creek at RM 45.45)
Sampling was conducted to assess the performance of the Walnut Creek Sewer District WWTP at two sites bracketing the plant. Although phosphorous concentrations increased downstream from the facility and some ammonia-N was detected in late summer samples, the plant was considered to be effectively operated. The habitat conditions were the same at both sites. The macroinvertebrate and fish communities were not influenced by the WWTP but did perform below ecoregional expectations. Further investigation is warranted to determine the cause of the partial attainment documented in this stream in 1996.

Pawpaw Creek
Two sites in Pawpaw Creek bracketing the confluence with the West Branch of Pawpaw Creek were used to evaluate the impact of the Newark Group Industry WWTP. Increased concentrations of oxygen demanding substances, nutrients, and suspended solids were apparent downstream from the confluence. Shifts in the macroinvertebrate population were evident as the downstream community included more organisms that were tolerant of nutrient enrichment. The fish community was mostly tolerant at both sites. The downstream population reflected the increased flow as it was comprised of fewer pioneer species and more omnivores.

The downstream biological samples were collected at locations which were also influenced by sporadic “spills” from a sewer line. During heavy rain storms, the Village of Baltimore pumps sewage and stormwater into Pawpaw Creek to prevent backups into residences. Between this and the Newark Group Industry WWTP, the source of downstream enrichment was difficult to discern. Since the stream fully met the WWH criteria at the downstream site the immediate impact of either of these sources was limited.

West Branch of Pawpaw Creek (Tributary to Pawpaw Creek at RM 0.55)
Sampling was conducted at two sites bracketing the Newark Group Industry WWTP with additional chemical analysis of the effluent. Results indicated that nutrient enrichment from the WWTP and some polluted runoff from agricultural and residential sources were sources of degradation. High

nutrient concentrations downstream from the plant coincided with a decline in macroinvertebrate community performance. The fish community, although affected by WWTP enrichment, appeared to be more influenced by the increased downstream flow. Effluent samples contained several pesticides while pesticides and polycyclic aromatic hydrocarbon (PAH) compounds were detected in the downstream sample. The downstream sediments also contained PAHs and highly elevated concentrations of copper and zinc. Although the various organic compounds and metals were present downstream, the excessive nutrient load was considered more likely to have been the cause of fair performance by the macroinvertebrate community resulting in partial attainment of the WWH use designation.

Permitted Discharger

The Newark Group Industry WWTP has a third quarter median discharge of 0.16 MGD, a design capacity of 0.3 MGD and is required to pump an additional 0.4 MGD of well water each day the plant delivers treated water into the West Branch of Pawpaw Creek. Generally the WWTP effluent and well water mixture comprises most of the stream flow, hence the plant is capable of exerting a substantial influence on the Creek. Permit violations for BOD_5 and ammonia-N loadings have been frequent since 1992 although only one oil and grease violation was documented during the 1996 survey. This, combined with elevated nutrients in downstream water column samples and variable trends in loading data were suggestive of some operational difficulties. Since the WWTP completely dominates the water characteristics in the West Branch of Pawpaw Creek, the importance of maintaining good effluent quality is particularly encouraged.

Poplar Creek

Geographically moving east from Columbus, the northen Walnut Creek tributary streams decline in overall quality consistant with a pattern of suburban sprawl. Certainly natural gradient and substrate components, historical land use, and other factors have also had a role in this observation but, today the prevelant threat to these streams is poor development practices. In 1996 the biological performance and habitat conditions in Poplar Creek were very good to exceptional. Chemical water quality was also outstanding. Recognizing these attributes, the EWH aquatic life use status was recommended for Poplar Creek.

Gillette Run

Gillette Run supported good fish and macroinvertebrate communities at one sample site. Upstream highway construction activities created muddy stream conditions, increased silt deposition, and fostered bank erosion. Despite the fair habitat conditions and the upstream Village of Carroll WWTP, the stream attained the WWH use designation.

Sycamore Creek

Sycamore Creek was evaluated over a twelve mile reach with eight biological sites, nine water chemistry locations and at three WWTPs. The combined median flow from four WWTPs which discharge to Sycamore Creek is about one MGD (0.96MGD). The area which these plants serve is growing fast. In 1996 the chemical water quality in Sycamore Creek varied downstream from each plant but was consistently enriched upon entering Walnut Creek. Although Walnut Creek was able to assimilate this load, the ongoing development will continue to tax the assimilative capacity of each stream.

Similarly, biological performance also varied. Upstream conditions were marginally good. As the stream gained size, moving from an agricultural drainage into a rural residential setting with better riparian corridor, biological index scores improved. However, subtle effects were evident downstream from the WWTPs as both macroinvertebrate and fish communities demonstrated slight declines in community composition and environmental tolerance. In particular, the fish community was reduced in size and biomass at Busey Rd. downstream from the Pickerington WWTP. Despite this departure, both communities performance was good prior to the Walnut Creek confluence.

Permitted Dischargers

Cansada Estates is presently served by a temporary package treatment plant but plans to construct another facility (0.014 MGD) as the size of the subdivision grows. Sampling bracketing the plant in 1996 produced similar results at both sites and the facility was perceived to have no impact.

The Huntington Hills WWTP has a history of variable treatment efficiency with 81 permit violations recorded between 1992 and 1996. Upgraded in 1978 with a design capacity of 0.16 MGD the facility is operating nearly at its limitations as third quarter median flow in 1996 was 0.11 MGD. Effluent samples indicated the plant discharges high concentrations of nutrients.

The Pickerington WWTP was in the process of being upgraded during the 1996 survey. The new plant is designed to treat 1.8 MGD, more than twice the 1996 third quarter median flow (0.78 MGD). Like Huntington Hills, effluent samples indicated the plant discharged high concentrations of nutrients in 1996. Additionally, influences from plant construction activities were apparent as downstream substrates were more embedded and silty.

The Jefferson Woods WWTP was upgraded in 1993 to treat 0.12 MGD. Although the 1996 third quarter median flow (0.06 MGD) indicated the plant is generally running at half capacity, the effluent nutrient concentrations were high. Average concentrations of Nitrate-N (14.6 mg/l) were the second highest of any Walnut Creek discharger. Even so, downstream biological performance was good.

Tussing Ditch

Fecal coliform bacterial contamination was frequent at one Tussing Ditch sample site which was inhabitated by the most tolerant macroinvertebrate community in the Walnut Creek basin. Fish community performance and overall habitat conditions were good. However, the substrates were extensively embedded and the riffles were impaired by heavy silt deposition. Water chemistry parameters suggested that in addition to the poor substrates the macroinvertebrates were probably limited by nutrient enrichment from an improperly functioning septic discharge.

Georges Creek

Aggressive subdivision development and suburban sprawl without adequate stormwater controls has degraded the Georges Creek sub basin as was evident in all sampling results. Fair to marginally good macroinvertebrate communities, poor to good fish communites, enriched water chemistry results and several instances of fecal coliform bacterial contamination, combined with degraded habitat conditions were indicative of the pervasive impacts from construction site erosion, flash flows, and polluted runoff. The fish community performance in this sub basin was the worst of all 1996 Walnut Creek tributaries. The proximity of Walnut Creek afforded an opportunity for fish to invade Georges Creek at the most downstream sample location which influenced the good performance here in spite of the impoverished habitat.

East Fork of Georges Creek (Tributary to Georges Creek at RM 2.0)

The effects of the suburbanization in the Georges Creek area seemed stabilized at an upstream location on the East Fork where biological performance was good. This represented some recovery since a 1987 survey documented fair conditions at the same site. In the period between that study and this, Chevington Woods WWTP discontinued operation and the area has largely been converted from agricultural to residential land use. However, the area downstream remains less stable like the rest of the sub-basin. Here, fish community performance was fair and water quality was enriched with evidence of fecal coliform bacterial contamination. The presence of a good quality macroinvertebrate community at this site was at odds with other indicators.

Permitted Dischargers

Just prior to this survey the Chevington Woods WWTP ceased operation in April 1996 and routed their service area to the Tussing Road WWTP in the Blacklick Creek watershed.

The New England Acres WWTP was upgraded in 1988 to treat 0.12 MGD. The 1996 third quarter median flow (0.12 MGD) suggests that half of the time the plant is operating beyond capacity. Much of the excess flow was attributed to I&I problems. Apparently, plans call for the service area to be also routed to the Tussing Road WWTP so it is unlikely any upgrades will be initiated to address the existing capacity issues.

Like other WWTPs in this area, flow from the Easton WWTP will be routed to the Tussing Road plant in the future. Presently, the Easton plant is also operating near capacity (0.16 MGD) with a third quarter median flow of 0.13 MGD. Despite the tenative plans for tie in to the Tussing facility, a permit for upgrades at the existing plant was approved in 1997.

Big Run

Strong groundwater flow in this small stream supported a very good fish community and several macroinvertebrate taxa which require cold water. The macroinvertebrate community performance was marginally good due to habitat limitations.

North Rickenbacker Run (Tributary to Walnut Creek at RM 15.64)

Marginally good biological performance at an upper reach North Rickenbacker Run site declined to fair quality near the Walnut Creek confluence where habitat quality was less than suitable for the macroinvertebrate population. Chemical water quality parameter results were good and no impact was inferred from the Rickenbacker Airport.

South Rickenbacker Run (Tributary to Walnut Creek at RM 15.54)
This small drainageway appears to have been created to move stormwater and flow from an abandoned WWTP on the Rickenbacker Airport property. As an impounded modified watercourse the habitat conditions that exist are insufficient to support anything but a poor quality macroinvertebrate community and fair quality fish performance. Water chemisty results were within reasonable ranges. The Rickenbacker Airport was not implicated in the sampling effort.

Mud Run
In contrast with slightly degraded habitat conditions, biological performance in Mud Run was good to very good. The Mud Run watershed is mostly agricultural, relatively sparcely populated and generally devoid of impaiment causes compared to other parts of the Walnut Creek basin.

Mann's Run
Good fish community performance was consistent with habitat conditions in Mann's Run. Water chemistry results indicated the Mann's Mobile Home Park WWTP has variable treatment efficiency and is a source of nutrient enrichment. The WWTP has a history of poor operation, disregard for permit requirements and has been referred to the Ohio Attorney General for enforcement action. The macroinvertebrate community performance was fair upstream and downstream from the plant. No cause was determined for this departure.

Little Walnut Creek
Polluted agricultural runoff was determined to impair the macroinvertebrate community in the lower reach of Little Walnut Creek. Water chemistry data also reflected a condition of continuous modest nutrient enrichment. The source of this pollution was most likely from unrestricted livestock access which was observed upstream from the lower sample site. Otherwise, very good biological performance was documented in the upstream portion of the creek.

Turkey Run
Exceptional fish and macroinvertebrate communities inhabited one sample site in Turkey Run. As a result, the EWH aquatic life use was recommended for this stream.

CONCLUSIONS

- Walnut Creek supports very good macroinvertebrate and fish communities. With two exceptions, all 1996 mainstem sampling locations attained WWH ecoregional expectations.

- Habitat conditions in Walnut Creek were consistent with the biological performance. Better performance was correlated with better habitat as opposed to wastewater treatment variability.

- Habitat quality was diminished in reaches where the stream was impaired by polluted runoff. Georges, Sycamore, and Poplar Creeks were sources of a fine sediment bedload which overwhelmed Walnut Creek downstream from the confluence with these tributaries.

- Aggressive subdivision development and suburban sprawl without adequate stormwater controls has degraded the Georges Creek sub basin and resulted in biological impairment.

- Poplar Creek and Turkey Run were unique among Walnut Creek tributaries. These streams were inhabited by exceptional fish and macroinvertebrate communities and are recommended for the exceptional warmwater habitat aquatic life use designation.

- Walnut Creek, a 286 square mile watershed, is home to 17 residential and 8 industrial wastewater treatment facilities which discharge a little more than 5.6 MGD of treated wastewater. Generally, the effluent quality from these facilities was acceptable although many were operating at or near full capacity.

- Walnut Creek, with 25 facilities, has more wastewater treatment plants than most other similar sized Ohio sub basins. Most of the Walnut Creek facilities are small, many are older, and some are inefficient. Regionalization is a possible solution to the potential threat of future inadequate treatment.

- Improved operational efficiency and upgrades at the Newark Group Industries and Village of Baltimore wastewater treatment plants resulted in increased biological community performance and better ambient water quality between 1982 and 1996.

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 3). The current biological assessment 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.

Walnut Creek was originally assigned the WWH aquatic life use in 1985. In 1996, the consistent performance of the biological community in attaining the WWH biocriteria clearly demonstrated that this designation is appropriate and should be retained.

The current WWH aquatic life use designations for most tributaries should also be maintained. These designations were considered appropriate based on ambient macrohabitat conditions and the 1996 aquatic life use attainment status.

Poplar Creek and Turkey Run were originally designated for the WWH aquatic life use. In 1996, biological community performance was generally exceptional. Physical habitat conditions in these streams was also generally exceptional. Given the exceptional community performance and habitat quality, it is reasonable to expect these streams to attain and therefore to recommend that these streams be redesignated for EWH aquatic life use.

Similarly, the biological performance in the upper reach of Little Walnut Creek demonstrated that this stream can and does attain the EWH biocriteria. Habitat in the upper reach was typically very good. Hence it is appropriate to designate the reach upstream from Turkey Run (RM 3.0) for the EWH aquatic life use. The downstream reach of Little Walnut Creek was determined to be in non-attainment of the WWH use. Although habitat quality was good and the ambient biological potential of the this reach was easily within the WWH range, the macroinvertebrate community was sensitive to some environmental disturbances. With efforts to remediate the causes of the impairment in this reach, it is possible that the length of EWH designation could be extended to the entire stream in the future.

South Rickenbacker Run is an undesignated, created drainage way that is maintained by the Rickenbacker Port Authority. This waterway was in partial attainment of the recommended

Table 3. Waterbody use designations for the Walnut 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		
	SRW	WWH	EWH	MWW	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
Walnut Creek		+							+	+		+	
Little Walnut Creek													
Mouth to Turkey Run		*+							*+	*+		*+	
Turkey Run - Headwater			)						)	)		)	
Turkey Run		+	)						*+	*+		*+	
Lick Run		*							*	*		*	
Cherry Run		*							*+	*+		*+	
Mud Run		*+							*+	*+		*+	
Slate Run	+	*							*	*		*	
South Rickenbacker Run				)					)	)		)	
North Rickenbacker Run		)							)	)		)	
Big Run		*+							*+	*+		*+	
Georges Creek		*+							*+	*+		*+	
East Fork		)							)	)		)	
Tussing Ditch													
Headwater-RM 0.4				+					*+	*+		*	
all other segments		*+							*+	*+		*+	
Sycamore Creek		+							+	+		+	
Carroll unnamed Trib.		+							+	+			+
Poplar Creek		*	)						*+	*+		*+	
Pawpaw Creek		+							+	+		*+	
Zellerbach Trib.		+							+	+			+
Pleasantville-Thurston WWTP Trib		+							+	+			+

modified warmwater designation.

North Rickenbacker Run and the East Fork of Georges Creek are not presently designated for aquatic life use. Habitat limitations were identified as the reasons for the limited attainment of the recommended WWH aquatic life use in both streams. With efforts to reduce stream silt and sediment bedload it is realistic to expect full WWH attainment in these streams.

Status of Non-aquatic Life Uses

All non-aquatic life uses should remain as presently designated in the Ohio Water Quality Standards (Table 2). The streams which previously were not designated 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 Walnut Creek study area should be conducted in the year 2005 as provided in the five-year basin approach to monitoring and assessment. The urgency of the reassessment should consider the rate of land use and population changes within the watershed and the upcoming TMDL development scheduled for 2007. Priority should be placed on evaluating previously unassessed small streams and revisiting segments which are identified as impaired in this report.

STUDY AREA

The Walnut Creek originates in central Ohio's Perry County in the Erie-Ontario Lake Plain ecoregion. Rising east of State Route 188 in Thorn township at an elevation of 1020 feet, it flows west into Fairfield County and the Eastern Corn Belt Plain Ecoregion. Continuing south of Baltimore,Walnut Creek flows west through Canal Winchester in Franklin County. Heading southwest into Pickaway County, it meets the Scioto River south of Ashville at an elevation of 652 feet. The length of the mainstem is 54.4 Miles. (Omernik 1987)

The stream system drains 286 square miles of Perry, Licking, Fairfield, Franklin and Pickaway Counties, with an average fall of 9.4 feet per mile. Some unnamed Walnut Creek tributaries were named as part of this report for ease of convention. For instance, the unnamed tributary to Georges Creek at RM 2.0 is called the East Fork of Georges Creek herein. Figure 2 displays the names of all streams in this report.

The Walnut Creek watershed lies within the Central Lowland physiographic region exhibiting an undulating topography intermixed with extensive near level areas. The bedrock underlying the Walnut Creek watershed is acidic sandstone or shale. The Cuyahoga fine grained sandstone interbedded with shale is found west of the Perry county line to approximately Pickerington Road, where Beria sandstone bedrock appears. Though sandstone and shale comprise the bedrock of the watershed, the stream itself flows over calcareous gravel and sand derived from glacial tills and outwash deposits. These tills were transported from calcareous bedrock sources from the west. Granite and quartzite brought from other source areas by glacial ice are also found in the substrate in small amounts.

The watershed soils indicate a glacial heritage as well. Calcareous tills and outwash deposits (along with alluvium) are the parent materials for soils found in the study area. The major associations, all formed in till, outwash and or alluvium, are Bennington-Cardington, Brookston-Crosby and Cardington-Bennington-Marengo.

Current land use trends have increased the potential for nonpoint source pollution of the stream system. Increased frequency in the number of construction sites, large lot development, horse and novelty livestock presence, separate treatment systems and residential use of old field tile systems contribute to this potential.

Population increases have resulted in greater demands on wastewater treatment plants and other infrastructure. Associated land use changes increase the potential for nonpoint source pollution during and after construction due to relative increases in impervious surface area. Table 4 indicates population trends in the Walnut Creek basin.

Table 4. Population trends in the Walnut Creek study area. Recent census estimates based on

information from the Mid Ohio Regional Planning Commission and the Ohio Department of Development, Office of Strategic Research.

Fairfield County	**1990**	**1996**	**% change**	**Franklin County**	**1990**	**1998**	**% change**
Baltimore	2971	3039	2.3 %	Brice	109	106	-2.8%
Lithopolis	563	566	0.0 %	Canal Winchester	2617	3482	33.1 %
Pickerington	5665	8696	54.0 %	Groveport	2948	3439	16.7%
Pleasantville	563	583	3.6 %	Obetz	3167	3770	19.0 %
Thurston	539	657	22.0 %	**Pickaway County**	**1990**	**1996**	
Bloom Township	5788	6873	18.7 %	Ashville	2254	2505	11.0 %
Liberty Township	6758	7610	12.6 %	Harrison Township	5292	5747	8.6 %
Violet Township	19253	25295	31.4 %	Madison Township	1586	1789	12.8 %
				Walnut Township	2168	2550	17.6 %

Development activity within the Fairfield county portion of the Walnut watershed is presently concentrated in Violet, Bloom and Liberty townships. This reflects close proximity to an expanding Columbus metropolitan area, the influence of Pickerington and Canal Winchester as growth nodes and the function of an upgraded US Route 33 as stimulus to development along and near its corridor.

High density, one half acre lot development is typical in Violet township. In 1998 Fairfield county SWCD staff noted frequent residential dependence on existent field tile systems in this township. Sycamore Creek and Georges Creek drain this portion of the watershed.

Development trends in Liberty township have been slower with a tendency toward two or more acre lots with well and septic tank service. Poplar Creek and Pawpaw Creek drain the bulk of this township.

Over the last six years the largest single land use change in the Pickaway county portion of the watershed has been the construction of Cooks Creek golf course (opened 1993) near the juncture of Walnut creek and the Scioto river. The most visible trend in land use change during the same period is the development of five acre home sites. The implications of this trend for Walnut creek water quality rest upon increased runoff from construction sites and expanded impervious surfaces, removal of riparian corridor vegetation, on lot sewage treatment systems, and home site practices such as lawn chemical application.

Local soil water conservation district staff indicated that no till practice in the watershed appears to be declining slightly. Conventional livestock operations in the watershed have not appreciably increased in the past five years. However, unusual livestock such llamas and saddle horses are common on the five acre lots. Conservation district staff stated that direct animal access to the stream and absence of erosion controls frequently accompany this small scale livestock ownership.

Table 5. Stream characteristics and significant identified pollution sources in the Walnut Creek study area.

Stream Name	Length (Miles)	Average Fall (Ft/Mile)	Drainage Area (Mi^2)	Nonpoint Source Pollution Issues	Point Sources Evaluated
Walnut Creek	54.4	9.4	286	Agriculture Storm runoff Septic systems	Baltimore WWTP Canal Winchester WWTP Ashville WWTP
Pleasantville Creek			12	Agriculture	Walnut Creek Sewer Dist.
Pawpaw Creek	4.7	30.0	16.58	Agriculture Storm runoff Septic systems sediments?	Newark Group Industries
Poplar Creek	9.3	29.5	17.68	Agriculture Septic systems	
Sycamore Creek	13.6	22.6	24.34	Agriculture Storm runoff Septic systems	Huntington Hills WWTP Pickerington WWTP
Georges Creek	7.1	10.9	15.42	Construction runoff	New England Ac. WWTP Easton Village WWTP
Little Walnut Ck.	8.8	27.7	44.46	Agriculture	
Turkey Run	7.0	27.9	15.52	Agriculture	

Figure 2. The Walnut Creek study area showing principal streams, 1996 stream condition and population centers.

Table 6. Sampling locations in the Walnut Creek study area, 1996 (C - conventional water chemistry, S - sediment, D - Datasonde® continuous monitors, M - macroinvertebrates, F - fish).

Stream/ RM	Type of Sampling	Lat./Long.		Mi.^{2}	Site Location	USGS 7.5' Map
Walnut Creek						
53.2	M	395201	822913	7.6	Ust. Cattail Rd	Rushville
53.00	C,F	395205	822921	7.6	At. Cattail Rd	Rushville
47.10	M	395029	823317	26.0	Ust. SR 256, Baltimore-Somerset Rd.	Baltimore
47.00	C,F	395026	823322	27.0	SR 256, Baltimore-Somerset Rd.	Baltimore
42.70	M	394950	823618	42.0	Ust. SR 158, Lancaster-Kirkersville	Baltimore
42.60	F	394957	823623	42.0	Ust. SR 158, Lancaster-Kirkersville	Baltimore
42.50	C,S,D	394758	823626	42.0	At SR 158, Lancaster-Kirkersville	Baltimore
41.30	F	395035	823653	60.0	Ust. Basil Rd., CR 46	Baltimore
41.20	C,S,D,M	395034	823659	60.0	At. Basil Rd., CR 46	Baltimore
40.75	D				Ust. Baltimore WWTP	Carrol
40.10	D	395007	823734	61.0	Ust. Baltimore WWTP	Carrol
40.06	M	395007	823735	61.0	Ust. Baltimore WWTP	Carrol
40.04	E	395006	823737	61.0	Baltimore WWTP Effluent	Carrol
40.00	*C,M,F*	*395006*	*823738*	*61.0*	*Baltimore WWTP Mixing Zone*	*Carrol*
39.90	D,M	395003	823743	61.0	Dst. Baltimore WWTP	Carrol
39.70	C,S,F	394957	823754	61.0	Dst. Baltimore WWTP	Carrol
38.90	D	394555	823823	63.0	Walnut Creek	Carrol
38.37	D					Carrol
37.00	M,F	394913	823916	66.0	Ust. Bader Rd.	Carrol
36.90	C,S,D	394915	823921	66.0	At. Bader Rd.	Carrol
35.20	D	394907	824034	69.0	Walnut Creek	Carrol
34.50	M,F	394934	824053	87.0	Ust. Coakley Rd	Carrol
34.40	C	394933	824057	87.0	Ust. Coakley Rd	Carrol
34.3	D				Coakley Rd	Carrol
30.00	F	394927	824437	114.0	Ust. Pickerington Rd., CR 20	Carrol
29.90	C	394929	824445	114.0	At Pickerington Rd., CR 20	Carrol
29.70	M	394933	824451	114.0	Dst. Pickerington Rd., CR 20	Carrol
29.10	C,S,M,F	394945	824516	138.0	From Amanda Northern Rd.	Canal Win.
28.90	D	394939	824523	138.0	Walnut Creek	Canal Win.
26.50	C,D	394957	824715	146.0	At. Waterloo Rd.	Canal Win.
26.40	M,F	395000	824720	146.0	Dst. Waterloo Rd.	Canal Win.
24.50	D,M	394949	824858	151.0	At Burgstresser Covered Bridge	Canal Win.
24.40	C,S,F	394947	824901	151.0	Ust. Canal Winchester WWTP	Canal Win.
24.20	E	394946	824913	152.0	Canal Winchester WWTP Effluent	Canal Win.
24.19	*C,M,F*	*394945*	*824916*	*152.0*	*Canal Winchester WWTP Mixing Zone*	*Canal Win.*
24.00	M	394940	824926	152.0	Dst. Canal Winchester WWTP	Canal Win.
23.90	C,S,D,F	394937	824929	152.0	Dst. Canal Winchester WWTP	Canal Win.
22.00	D					Canal Win.

Table 6. (continued)

Stream/ RM	Type of Sampling	Lat./Long.		Mi.[2]	Site Location	USGS 7.5' Map
Walnut Creek (continued)						
21.20	C,S,M,F	395041	825053	177.0	Ust. George Ck	Canal Win.
20.40	D	395038	825130	177.0	Walnut Creek	Canal Win.
19.40	M,F	395050	825221	182.0	Ust. Richardson Rd., CR 119	Canal Win.
19.30	C	395050	825227	182.0	At Richardson Rd., CR 119	Canal Win.
16.90	C,S,D,M,F	394940	825329	188.0	Ust. Hayes Rd., CR 2	Lockbourne
15.50	C,S,M,F	394859	825428	195.0	Adj. Pontius Rd., CR 118	Lockbourne
13.80	M,F	394726	825354	198.0	Ust. Lancaster Rd., TR 12	Lockbourne
13.70	C	394756	825355	198.0	At Lancaster Rd., TR 12	Lockbourne
13.30	D					Lockbourne
11.00	C,M,F	394609	825445	206.0	Walnut Ck. Pike/Groveport R.	Lockbourne
9.10	C,S,D,M,F	394456	825500	212.0	St. Paul/ Ashville Rd., CR 90	Ashville
5.10	C,S,D,M,F	394239	825642	272.0	Circleville/ Lockbourne E. Rd	Ashville
4.43	E				Ashville WWTP Effluent	Ashville
4.42	*C,M*	*394239*	*825730*	*273.0*	*Ashville WWTP Mixing Zone*	*Ashville*
4.10	C,S,D,M,F	394241	825744	273.0	Cromley Rd., CR 28	Ashville
1.30	M,F	394114	825807	285.0	Ust. Little Walnut Rd., CR 508	Ashville
1.20	C,S,D	394110	825836	285.0	Little Walnut Rd., CR 508	Ashville
Pleasantville Creek						
0.80	C,M,F	394919	823330	11.2	Leitnaker Rd.	Baltimore
0.70	C,M,F	394924	823331	11.2	Dst. Pleasantville WWTP	Baltimore
Pawpaw Creek						
1.40	C,M,F	395103	823534	10.5	Adj. Canal Rd., CR 11	Baltimore
0.50	C	395040	823623	16.5	SR 256, Market St.	Baltimore
0.40	M	395037	823630	16.5	From East St.	Baltimore
0.30	F	395037	823632	16.5	From East St.	Baltimore
West Branch of Pawpaw Creek						
1.30	C,M	395138	823637	5.0	Roley Rd.	Baltimore
1.00	F	395128	823627	5.1	Dst. Roley Rd.	Baltimore
0.34	E				Newark Group Industry effluent	Baltimore
0.10	C,M,F	395048	823619	5.5	Dst. Newark Group Industry	Baltimore
Poplar Creek						
6.60	C,M,F	395316	824017	8.1	Dst. Steman Rd.	Pataskala
0.70	C,M,F	394952	824021	17.5	Bish Rd.	Carrol
Gillette Run						
0.10	M,F	394858	824235	6.1	CR 17, Pleasantville Rd.	Carrol
Sycamore Creek						
12.20	F	395600	824339	4.6	Sycamore Creek	Pataskala
11.80	C,M	395544	824327	4.7	SR 204, Blacklick-Eastern Rd	Pataskala
9.60	M	395423	824221	8.7	Ust. Refugee Rd.	Pataskala
9.50	C,F	395419	824220	8.7	Refugee Rd.	Pataskala
8.90	E				Huntington Hills WWTP effluent	Pataskala

Sycamore Creek (continued)

Table 6. (continued)

Stream/ RM	Type of Sampling	Lat./Long.		Mi.[2]	Site Location	USGS 7.5' Map
8.50	F	395336	824244	9.7	Ust. Stemen Rd.	Pataskala
8.40	C,M	395332	824245	9.7	Dst. Stemen Rd.	Pataskala
6.67	C				SR 256, Reynoldsburg-Baltimore	Pataskala
6.10	M,F	395239	824428	14.8	Sycamore Dr.	Pataskala
4.90	M	395243	824527	17.3	Ust. CR 18, Hill Rd. (north)	Reynoldsburg
4.70	C,F	395241	824535	17.3	CR 18, Hill Rd. (north)	Reynoldsburg
4.35	E				Pickerington WWTP effluent	Canal Win.
4.30	*C*	*395218*	*824540*	*18.6*	*Pickerington WWTP Mixing Zone*	*Canal Win.*
4.20	C,M,F	395215	824537	18.6	CR 18, Hill Rd. (south)	Canal Win.
2.70	M	395128	824459	21.6	Ust. Busey Rd.	Canal Win.
2.60	F	395121	824503	21.6	Dst. Busey Rd.	Canal Win.
1.03	C				Ust. Jefferson Woods WWTP	Canal Win.
1.00	E				Jefferson Woods WWTP Effluent	Canal Win.
0.30	F	395000	824500	24.3	Ust. Benadum Rd.	Canal Win.
0.10	C,M	394951	824506	24.3	Benadum Rd.	Canal Win.
Tussing Ditch						
0.40	C	395047	825011	4.0	Groveport Rd., CR 7	Canal Win.
0.30	M,F	395047	825015	4.0	Dst. Groveport Rd., CR 7	Canal Win.
Georges Creek						
6.40	M	395357	824808	1.7		Reynoldsburg
4.30	F	395341	824928	3.2	Long Rd., TR 220	Reynoldsburg
2.40	F	395219	824947	4.4	From Winchester Pike, Ust. E. Fork	Canal Win.
2.10	C,M	395204	824954	4.5	Winchester Pike, Ust E. Fork	Canal Win.
0.10	C,M,F	395051	825058	15.4	Groveport Rd., CR 7	Canal Win.
East Fork of Georges Creek						
6.00	C,M,F	395433	824549	1.5	Refugee Rd., CR 7	Reynoldsburg
2.40	C,M,F	395306	824819	5.3	Wright Rd., CR 221	Reynoldsburg
Big Run						
1.60	M,F	394933	825129	6.3	Hayes Rd., CR 2	Canal Win.
North Rickenbacker Run						
0.85	C	394942	825412		Hayes Rd., CR 2	Lockbourne
0.6	M,F	394934	825407		Dst. Pontius Rd.	Lockbourne
0.2	M	394912	825422		Ust. Walnut Ck. confluence	Lockbourne
South Rickenbacker Run						
0.1	M,F	394900	825433		Ust. Pontius Rd.	Lockbourne
0.02	C	394900	825430		Pontius Rd.	Lockbourne
Mud Run						
0.70	M,F	394702	825347	11.5	Perrill Rd., TR-93	Lockbourne
Mann's Run						
2.17	C	394708	825523		Airbase Rd.	Lockbourne
1.3	M	394627	825522		Ust. Mann's Mobile Home Park	Lockbourne
Mann's Run (continued)						
1.0	M,F	394620	825527		Ust. Mann's Mobile Home Park	Lockbourne

Table 6. (continued)

Stream/ RM	Type of Sampling	Lat./Long.		Mi.^{2}	Site Location	USGS 7.5' Map
0.3	C,M,F	394547	825529		Miller Rd.	Lockbourne
Little Walnut Creek						
5.70	M	394239	825111	14.8	Ringgold Northern, TR-43	E. Ringgold
4.90	F	394233	825217	15.1	Little Walnut Creek	E. Ringgold
1.50	F	394218	825512	39.0	Little Walnut Creek	Ashville
0.70	M	394212	835553	44.0	Ust. South Bloomfield-Royalton Rd.	Ashville
0.50	C	394223	825602	44.0	Dst. South Bloomfield-Royalton Rd.	Ashville
Turkey Run						
0.20	F	394224	825352	15.5	South Bloomfield-Royalton Rd.	Ashville

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 6.

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 Walnut 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 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).

Walnut Creek is a rather deep stream. Many of the pools are difficult to wade in due to the depth and yet the frequency of riffles makes boating at least challenging. Most of Walnut Creek was previously sampled in 1982 using boat methods. Although the wading methods had not been developed then, it was surmised prior to this survey that some adaption of either method might be necessary to effectively sample in Walnut Creek. Ohio EPA boat methods are not calibrated for small drainages. Wading methods are impractical in deep areas because the electrical field is too small to effectively capture large fish which typically inhabit such pools. Additionally, if the depth is too great to wade in then undersampling is unavoidable. To address these concerns, 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. A longer electrode wand was also used to sample those pools which were to deep to wade into with the standard electrode.

This method was previously used at selected sites and for the entire 1995 mainstem survey in Twin Creek. The larger electrical field created by the small boat unit combined with the long wand is more effective at capturing fish than the T&J unit in deep pools. The use of other typical wading gear allows for effective sampling of riffle areas. The obvious drawback is that the higher electrical power of the unit creates an additional safety hazard. Other aspects including gear configuration and electrotaxic response continue to make the T&J the preferable wading unit, but this approach is usefull in specific circumstances.

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.

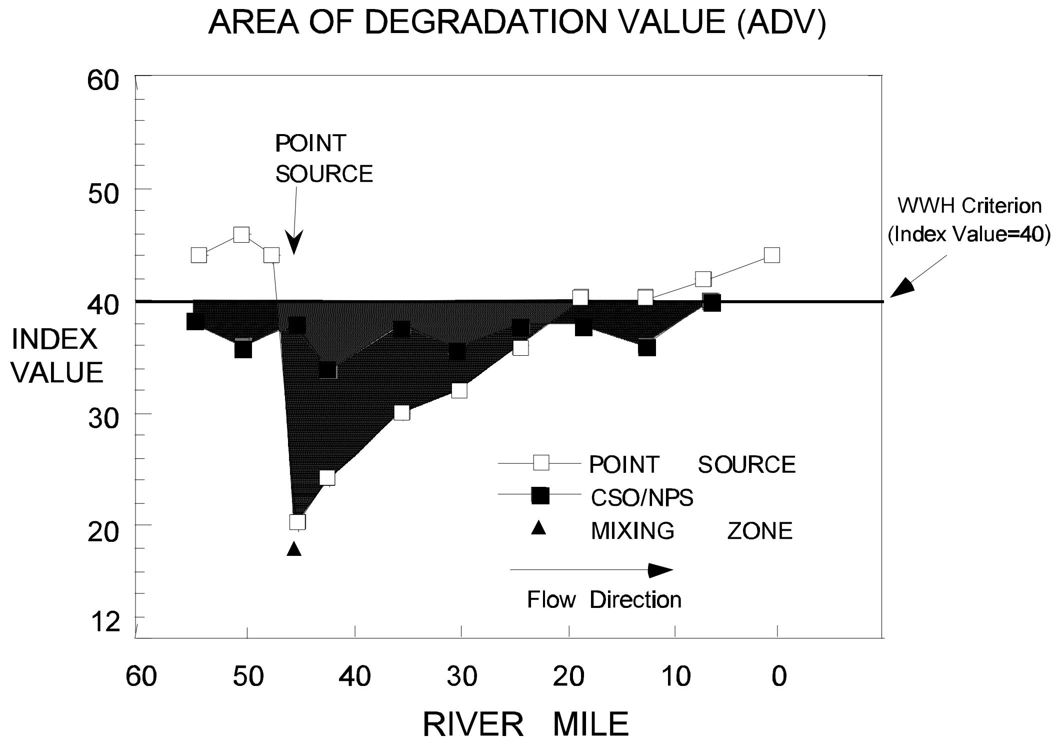

Figure 3 Graphic illustration of the Area of Degradation Value (ADV) based on the ecoregion biocriterion (WWH in this example). The index value trend line indicated by the unfilled boxes and solid shading (area of departure) represents a typical response to a point source impact (mixing zone appears 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: 1976-1996

Monthly effluent loadings are reported to Ohio EPA by all NPDES (National Pollutant Discharge Elimination System) permitted discharging entities. Twenty-five permitted facilities discharge into the Walnut Creek basin. Third quarter (July-September) Monthly Operating Report (MOR) data was used to evaluate the quantity and character of pollutant loadings from 1976 through 1996 for each discharger within the Walnut Creek study area. Figures are provided for those facilities with a third quarter median flow of at least 0.16 MGD (the five largest dischargers). Table 7 provides a list of all current and former NPDES permit holders in the Walnut Creek Basin.

Pollutant loading trends analysis included the 95th and 50th percentiles of four parameters when available: Ammonia-nitrogen (NH_3-N), Five-day Biochemical Oxygen Demand (BOD_5)/ Five-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$), Total Suspended Solids (TSS), and Annual discharge (MGD). Note that BOD_5 and $cBOD_5$ are combined on the same figure and reflect permit parameter changes emphasizing only carbonaceous BOD_5 not total BOD_5.

A file review was conducted to determine the number of NPDES permit violations from permitted discharges within the Walnut Creek basin. Permit violations during the third quarter of 1996 are listed in Appendix Table A-1 and a summary of NPDES permit violations between 1992 and 1996 are located in Appendix Table A-2.

Entities are discussed from upstream to downstream as each discharge reaches Walnut Creek.

Walnut Creek Sewer District (Pleasantville Creek RM 45.45; 0.78)

The Walnut Creek Sewer District WWTP is located at 1700 Leitnaker Road, Pleasantville Ohio, Fairfield County. This facility serves the villages of Pleasantville and Thurston and surrounding area. It was constructed in 1979 with a design flow of 0.181 MGD and an annual average flow of 0.093 MGD. The facility utilizes a bar screen, oxidation ditch, a final clarifier, chlorine disinfection and sludge holding prior to discharging into Pleasantville tributary at RM 0.78 (Lat. 39 49' 28"; Long. 82 33' 37.5"), which drains into Walnut Creek at RM 45.45.

Since the initial NPDES permit (4PA00005/OH0054917), issued in August 1979 to the Village of Pleasantville, effluent limitations for ammonia-nitrogen have been maintained. An average-summer limitation of 1.0 mg/l has been maintained in all subsequent renewals.

Ohio Dept. Of Transportation Park # 5-1 (Unnamed trib. of Pleasantville Creek RM 45.45)

ODOT Park # 5-1 is located on SR 37 approximately seven miles north of Lancaster in Pleasant Township. Wastewaster is treated by using a trash trap and bar screen, followed by an extended aeration treatment system, clarification, sand filtration and chlorination. A design flow of 0.007

Table 7. NPDES permitted dischargers in the Walnut Creek study area, 1996. Those in italics have

been discontinued but are listed to indicate historical presence. Those in bold are proposed facilities. Flow is the entities design capacity.

Entity	Flow (MGD)	Receiving Stream	River Mile Tributary	River Mile Mainstem
Walnut Cr Sewer Dist.	0.181	Pleasantville Creek	0.78	
ODOT Park #5-1	0.007	Unnamed Trib. to Pleasantville Creek	?	45.45
Sakas, Inc.	0.006	Field tile	--	44.95
Newark Group Industries	0.30	West Branch of Pawpaw Creek (0.32, 0.34)	0.55	41.39
Baltimore WWTP	0.50	Walnut Creek	--	40.05
Bloom-Carroll Local	0.015	Walnut Creek	--	32.1
Carrol WWTP	0.07	Unnamed trib	0.50	32.1
Diamond Electronics,Inc	0.002	Unnamed Trib	?	29.90
Royal Acres Subd. WWTP		*Sycamore Creek*	*14.11*	
Russel Hts. Subd. WWTP		*Sycamore Creek*	*13.07*	
Cansada Estates	0.014	Sycamore Creek	11.60	
Huntington Hills WWTP	0.16	Sycamore Creek	8.90	
Pickerington WWTP	1.8	Sycamore Creek	4.50	
Jefferson Woods WWTP	0.12	Sycamore Creek	1.00	29.18
L. Walnut Sycamore Water Reclamation WWTP	**0.75**	**Walnut Creek**	**--**	**29.15**
Canal Winchester WWTP	0.65	Walnut Creek	--	24.20
Canal Wire Inc.		*Tussing Ditch*	*0.73*	*21.84*
New England Acres WWTP	0.10	East Fork of Georges Creek (8.25)	--	
Chevington Woods		*East Fork of Georges Creek (8.0)*		
Easton Village WWTP	0.160	Unnamed trib (1.74) to East Fork of Georges Creek (5.38)	--	
Omega Oil Company	0.008	East Fork of Georges Creek (?)	--	
Mingo Estates WWTP		*East Fork of Georges Creek (5.33)*	2.00	21.15
Century Acres WWTP	0.025	Big Run	1.75	
Lithopolis WTP	0.005	Unnamed trib (1.86) to Big Run	1.59	19.83
Groveport WWTP		*Unnamed trib*	*0.32*	*18.90*
Rickenbacker Port Authority	600gal./day	North Rickenbacker Run	?	15.64
Ohio National Guard	100gal./day	South Rickenbacker Run	0.24	15.54
Mann's MHP WWTP	0.04	Mann's Run	0.90	9.96
Ashville WWTP	0.60	Walnut Creek	--	4.43
Amerimark	0.015	Walnut Creek	--	4.40
Walnut Heights WWTP	0.063	Walnut Creek	--	1.68
Cooks Creek Golf Course	0.025	Walnut Creek	--	0.02

MGD is discharged into a roadside ditch at (Lat. 39 52' 17"; Long. 82 39' 24") after which, it drains into an unnamed tributary of Pleasantville Tributary to Walnut Creek RM 45.45.

In May of 1989 an initial NPDES permit (4PP00014/OH0081477) was issued for Park #5-1. Originally, ammonia nitrogen limitations were set at a maximum of 3 mg/l. During the November 1995 renewal, ammonia-nitrogen limitations were reduced to 1.0 mg/l average-summer and 3.0 mg/l average winter. The renewal permit also required dechlorination facilities to be installed and new effluent limitations for total residual chlorine. In September of 1997 Ohio EPA had received notification from ODOT that the park would be closed by April of 1998 and the discharge eliminated.

Sakas, Inc. (Field Tile discharge to Walnut Creek RM 44.95)
Sakas Incorporated makes fabricated sheet products at 312 Baltimore-Somerset Road, Baltimore Ohio, Fairfield County. The plant was constructed in 1975 along with a WWTP designed to treat 0.006 MGD. The WWTP discharges into field tile at Lat. 39 50' 00"; Long. 82 34' 46" and subsequently drains into Walnut Creek at RM 44.95.

The facility generates three types of wastewaters: sanitary, process, and non-contact cooling wastewaters. The process wastewaters are from phosphating and painting processes. The phosphating is covered under the federal categorical effluent standards listed in Title 40 of the Code of Federal Regulations (40 CFR) Section 433 for the Metal Finishing Guidelines. Sanitary wastewater and non-contact cooling water are treated in a system that includes a trash trap, extended aeration, and sand filters. Phosphating waste water was originally directed to the package plant for treatment, and now are currently transported to an off-site facility for disposal. Direct discharge of process wastewaters are prohibited.

In January of 1995, Ohio EPA issued a NPDES permit (4IC00015/OH0081361) for the discharge from Sakas, Inc. The permit allowed for the discharge for non-contact cooling water and sanitary wastewater, but prohibited the discharge of any process wastewaters. Effluent limitations for ammonia (2.0 summer-average and 6.8 winter average), along with conventional pollutants, were included in the permit.

Ohio Paperboard (West Branch of Pawpaw Creek RM 41.39; 0.30)
The Baltimore Mill, of what is currently known as Ohio Paperboard Corporation, is owned by the Newark Group, Inc. The mill is located at 310 Water Street on the north side of the Village of Baltimore, Ohio. The facility has been known over the years as Crown Zellerbach Corporation, Gaylord Containers Limited, Fairfield Paper and Fairfield Recycled Papers, Inc. The facility recycles paper products for use as a corrugating medium and liner board. Wastewaters, except for sanitary wastes which are routed to Baltimore for disposal, are discharged to a 0.3 million gallon per day (MGD) wastewater treatment plant (WWTP) owned and operated by the facility. Wastewater pollutant limitations for the WWTP are contained in an NPDES permit (4IA00001/OH0004961). Wastewaters are discharged through outfall 001 into the West Branch of Pawpaw Creek which flows into Pawpaw Creek at RM 0.55. Outfall 002 in the permit is applicable to well water discharge used as flow augmentation. The permit requires that 0.4 million gallons per day be discharged from

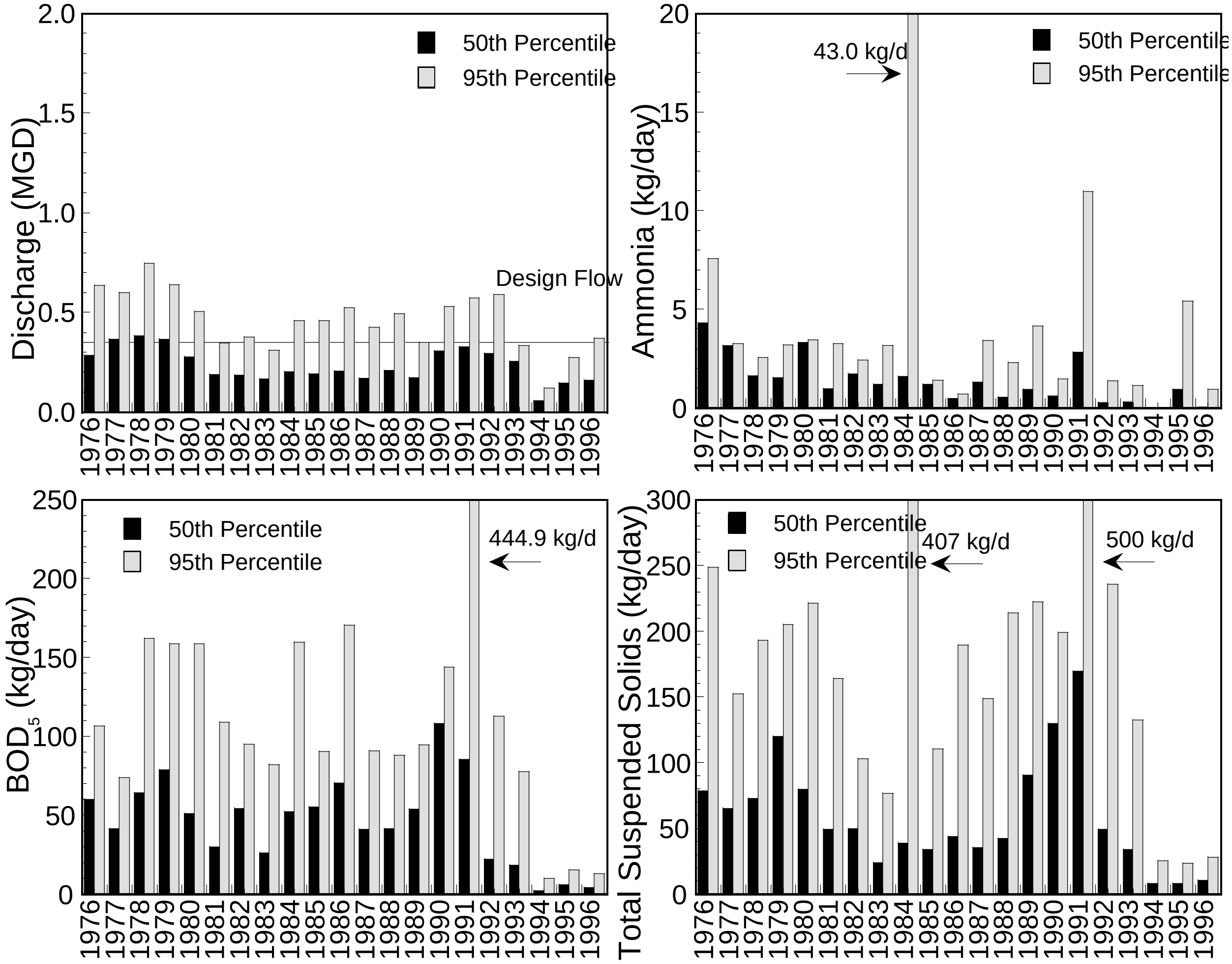

Figure 4 Third quarter median and 95th percentile discharge and pollutant loadings of ammonia, BOD suspended solids to Pawpaw Creek from the Newark Group Industries WWTP, 1976-1996.

outfall 002 each day there is discharge from outfall 001.

Wastewater from the paper mill is routed through a Krofta dissolved air floatation clarifier prior to discharge to the WWTP. The WWTP is comprised of two primary settling ponds operated in series, a surface aerated lagoon, two final settling ponds, an activated sludge system, a sludge holding pond and post aeration. Following primary treatment wastewater flow can be split between the aerated lagoon and the 0.2 MGD activated sludge system. A portion of flow from the WWTP can be recycled to the paper mill for reuse. In the 1980s wastewater from the lagoons was intermittently irrigated on 40 acres of underdrain tiled land adjacent to the WWTP. Drainage from the underdrains was routed back into the WWTP for additional treatment. This practice of irrigation has been discontinued. Sludge from the WWTP is disposed by land application at agronomic rates and is covered under a sludge management plan (Application No.: 01-053-IW).

In March of 1990, a Permit to Install (Application No.: 01-2502) was issued for WWTP improvements which included installation of the 0.2 MGD activated sludge treatment system. These improvements were completed in December of 1990 but were insufficient to allow permit compliance. Escalated enforcement action ensued resulting in a December 1992 issuance of Directors Final Findings and Orders to what was then known as Fairfield Recycled Papers. The DFFOs contained a financial penalty for permit noncompliance and required continued work necessary to meet permit conditions.

Improvements were somewhat delayed as the facility went through bankruptcy proceedings in the early 1990s and became renamed as Ohio Paperboard. Continued improvements at the facility in the mid 1990s included diversion of surface water away from the WWTP lagoons and a reduction in the hydraulic and organic loadings in wastewater delivered to the WWTP from the paper mill. These improvements provided more stable conditions at the WWTP and allowed for increased permit compliance.

The facility continues to use a landfill adjacent to the WWTP for disposal of solid wastes generated in the paper recycling process. The last cell in the landfill is in the process of being filled and the landfill will soon be closed. Leachate from the landfill had, at one time, seeped into a drainage ditch discharging into theWest Branch of Pawpaw Creek. Leachate is now collected and treated in the WWTP.

The first wastewater discharge permit for this facility was issued in 1974 and contained loading limitations for BOD and Suspended Solids. Subsequent permits contained additional parameters and increasingly stringent limitations. The 1993 permit included limitations for BOD5, Suspended Solids, Ammonia, Phenol, Bis(2-ethylehexyl) phthalate, oil and grease and toxicity. The 1993 permit also contained a schedule of compliance for additional improvements, if necessary, to provide compliance with permit limitations.

In 1995 and 1996 the paper mill experienced problems controlling the quality/quantity of wastewater delivered to the WWTP resulting in numerous permit violations. Early in 1997 the facility was advised by Ohio EPA that if consistent permit compliance is not attainable with the existing treatment system then additional improvements may be necessary. The facility is considering wastewater treatment options one of which may include connection with the Baltimore wastewater treatment system.

Only one permit violation for oil and grease was documented during the 1996 field sampling season. However, since 1992, Ohio Paperboard has had a total of 262 permit violations most of which have been for BOD_5 and ammonia.

Bioassays conducted by Ohio EPA determined effluent samples were acutely toxic to the fathead minnow (*P. promelas*) and only slightly toxic to *Ceriodaphnia dubia*, a water flea in both 1996 and 1991.

Ammonia and suspended solids loadings to theWest Branch of Pawpaw Creek have been very low since 1992 despite a significant number of permit violations for the same time period (Figure 4). BOD_5 loadings have dropped since 1994. Flows have increased slightly since 1992 but dropped to an all time low in 1994.

Baltimore WWTP (Walnut Creek RM 40.04)
The Village of Baltimore wastewater treatment plant (WWTP) is located on the south side of Basil Western Road in the southwest quadrant of the village. The WWTP has undergone two upgrades since the initial installation in 1959. The first upgrade was in the early 1980s and the second in the early 1990s. The WWTP has a design capacity of 0.50 MGD and uses mechanical bar screens, fine screens, trickling filters, aeration basins, final clarifiers, chlorine disinfection, dechlorination and post aeration to treat wastewater prior to discharge through outfall 001 (Latitude 39 50' 07"; Longitude 82 37' 35.5") into Walnut Creek. Storm water equalization basins are available for use as needed during wet weather events. Sludge can be dried on sand drying beds or in two unheated anaerobic digestors which now act as sludge storage tanks. A sludge management plan for the WWTP has been approved by Ohio EPA and provides for land application of sludge at agronomic rates on authorized sites. An NPDES permit (Ohio EPA No.: 4PB00011/OH0023990) is applicable to discharge from the facility.

The wastewater collection system in the village is subject to infiltration and inflow (I/I) which has, at times, caused sewage backups into some homes. The village installed pumps in a manhole at the intersection of Mill/Monroe streets to relieve the system during high-flow periods. During such periods flows in the collection system increase to the point where a combination of wastewater/stormwater is pumped from the manhole/pump station through a pipe to Pawpaw Creek. The pipe outlet location is approximately 150 feet downstream from the Market Street (Rt. 256) bridge across Pawpaw Creek. During such periods there have also been reports of overflow from the WWTP stormwater equalization basins. During 1996, a total of 6,921,800 gallons of wastewater/stormwater was discharged from the pump station. An additional 6,565,300 gallons of wastewater/stormwater was discharged during 1996 to Walnut Creek from the equalization basins.

Director's Findings and Orders (DFFOs) were issued to the Village in 1991 to study and eliminate the Mill/Monroe Street overflow events by December 1992. Overflow events continue and the village remains in noncompliance with the DFFOs. The village has been working to locate and eliminate I/I sources discovered through inspection of the collection system. Inflow sources, such as discharge from building basement sump pumps and roof drains are being removed from the sanitary sewers. WWTP operators have been involved in review of the wastewater collection system and have been working to remove I/I sources as they are discovered. Portions of the main sewer line are in need of repair or replacement to alleviate the Mill/Monroe street overflow. Unfortunately, the portion of the main sewer line in need of repair is located in an area where such repair would be extremely difficult and impractical. Proposed improvements include abandonment and rerouting of this section of the sewers.

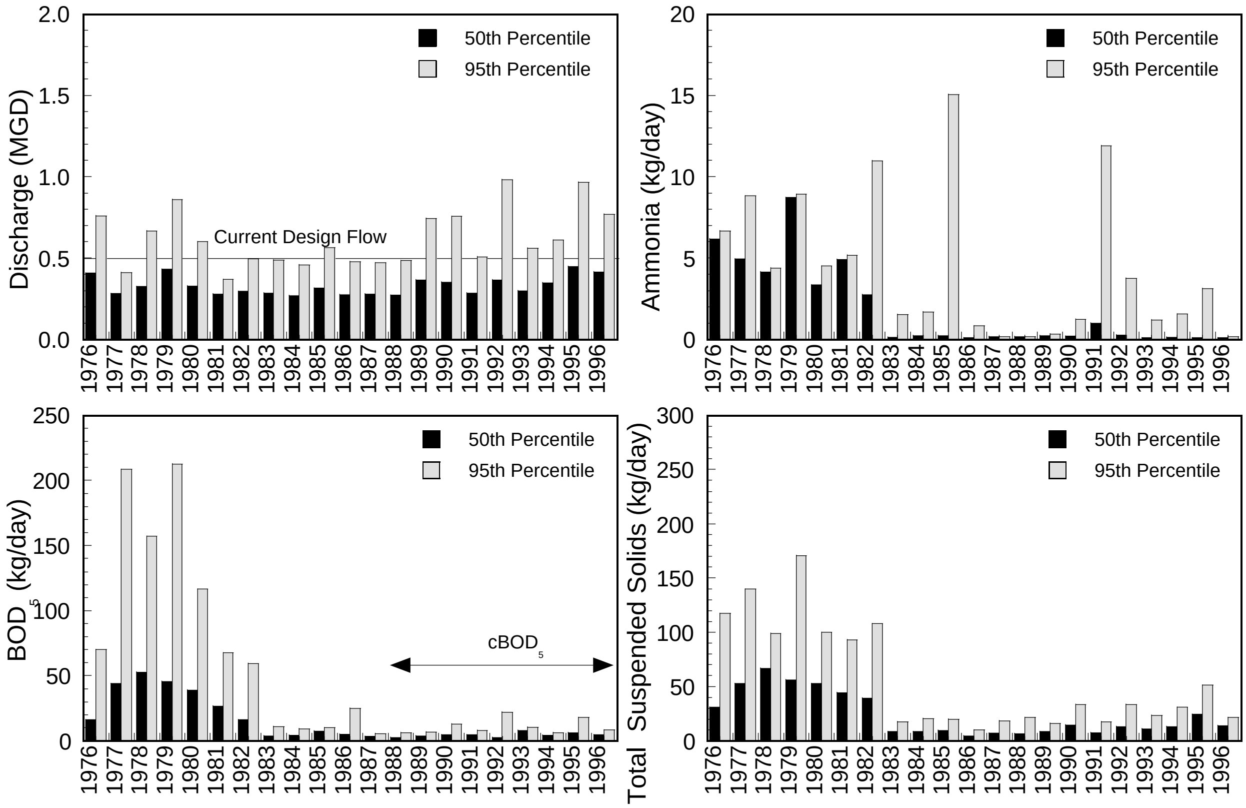

Figure 5 Third quarter median and 95th percentile discharge and pollutant loadings of NH_3-N, BOD_5 -CBOl to Walnut Creek from the Baltimore WWTP, 1976-1996.

Ohio EPA has met with the village on several occasions to discuss progress the village made towards compliance with the DFFOs. The village has enlisted the services of a consultant for development of a plan to eliminate the Mill/Monroe Street overflow and to upgrade the WWTP. The village has contacted the Ohio EPA Division of Environmental and Financial Assistance for assistance in funding improvements necessary to eliminate the overflow and for improvements necessary at the WWTP.

Permit limitations became more stringent with issuance of the July 1982 discharge permit. Monthly average permit limitations in that permit consisted of: BOD_5, 20 mg/l; Suspended Solids, 20 mg/l; Ammonia, 1.5 mg/l (summer) and 2.3 (winter). Issuance of the November 1992 permit showed slight change in limitations. Monthly average Carb BOD_5 limitations in that permit appeared as 10 mg/l (summer) and 25 mg/l (winter); Suspended solids 12 mg/l (summer) and 30 mg/l (winter);

Ammonia 1.5 mg/l (summer) and 9.0 mg/l (winter). Limitations and monitoring requirements for other parameters are included in the permit.

During 1996, a total of 6,921,800 gallons of sewage and stormwater was spilled at the Mill/Monroe street pump station into Pawpaw Creek. An additional 6,565,300 gallons of sewage was released to Walnut Creek from the equalization basin at the WWTP. According to the consultant for the Village, several overflow events at the WWTP occurred when Walnut Creek flooded the sludge drying beds. An abandoned overflow at Manhole #2 was also found as an inflow source from the creek and was it was closed. Most of these events occurred during periods of heavy rain and suggested a significant problem for the sewage collection system. This problem should be addressed immediately. In a December 1996 compliance inspection report the Village had hired a consultant to assist in the resolution of the problems. However, progress has been slow.

An acute bioassay was performed by Ohio EPA in August, 1997. No acute toxicity was found in either grab or composite samples.

Ammonia and BOD_5 loadings to Walnut Creek have decreased since 1983 (Figure 5). Suspended solids loadings have shown general increases during that same time period. Flows have been relatively consistent and near the current design capacity of 0.5 MGD. Most of the NPDES permit violations recorded since 1992 were for residual chlorine and suspended solids. No violations were reported during the third quarter 1996.

Bloom-Carroll Local School District (Walnut Creek via storm sewer RM 32.10)
The Bloom Carroll School district operates a wastewater facility at 65 S. Beaver Street in Carroll. The treatment system includes a lift station, extended aeration, tertiary sand filters and chlorine disinfection and dechlorination. Sludge handling processes at the WWTP include liquid sludge storage as well as a sand drying bed. The plant was constructed in 1967 and was most recently modified in 1974. It serves approximately thirteen hundred students and one hundred thirty-staff members. The plant has a design capacity of 0.015 MGD and discharges via storm sewer to an unnamed tributary of Walnut Creek (Latitude 39 47' 43" N; Longitude 82 41' 57" W). The unnamed tributary discharges in Walnut Creek at RM 32.10.

The facility operates under coverage of an NPDES permit (4PT00000/OH0101729) that was first issued in 1990. Permit monthly average limitations are: Carb BOD_5, 10 mg/l; Suspended Solids, 12 mg/l; Ammonia (Summer), 2 mg/l; Fecal Coliforms (Summer) 1000 #/100ml. Limitations and monitoring requirements for other parameters are included in the permit.

Village of Carroll (Unnamed Tributary of Walnut Creek RM 32.10; 0.50)
Prior to 1991 wastewater treatment in the Village of Carroll consisted primarily of on-site septic tanks and leach fields. As these systems failed discharge from the systems was routed to the villages storm sewer system. Analysis of surface water samples collected at various locations in the village confirmed unsanitary conditions and provided impetus for the village to initiate action to remedy this

problem.

In mid 1989 Ohio EPA issued a permit to install for installation of sanitary sewers and a wastewater treatment plant (WWTP). Operation of the WWTP began in mid 1991. Wastewater is collected and routed to the WWTP through a septic tank effluent pumping (STEP) system in the village. Each home or commercial establishment in the village has a STEP unit where initial treatment of wastes (primarily solids removal) occurs. Effluent from the STEP units is pumped to the treatment plant.

The 0.07 million gallon per day WWTP is located north of Carroll and is on the east side of U.S. Rt. 33. The WWTP is comprised of a two cell hydrograph-controlled discharge lagoon system that may discharge only when flow in the receiving stream reaches at least 1 cubic foot per second and provides a 5 to 1 dilution of treated effluent. Wastewater entering the plant is delivered to an aerated primary cell for treatment. Additional treatment and clarification occurs in the second cell prior to discharge through outfall 001. Effluent discharges into Gillette Run a tributary of Walnut Creek at RM 0.50 (Lat. 39º 48’ 57.5”; Long. 82º 42’ 37.5”) which subsequently reaches Walnut Creek at RM 32.10.

Wastewater discharged from the WWTP is regulated by an NPDES permit (4PS00015/OH0106062) with monthly average limitations as follows: Suspended solids, 65 mg/l; Carb BOD_5 25 mg/l. The permit also contains other monitoring and reporting requirements. The first NPDES permit for this facility became effective in August, 1991.

Diamond Electronics, Inc. (Unnamed Tributary of Walnut Creek RM 29.90;)
Diamond Electronics, Inc. owns and operates a facility which manufactures closed-circuit TV cameras and accessory equipment at 4465 Coonpath Road, Carroll Township, Fairfield County Ohio. The facility has one outfall to an unnamed tributary (abandoned Ohio Canal) (Latitude 39 46’ 18”; Long. 82 40’ 55”) to Walnut Creek at RM 29.90.

It is an existing industry that has operated a small package treatment plant for sanitary sewage without an NPDES permit for several years. During an environmental audit of the company it was determined that process wastewater was discharged along with sanitary wastewaters into its existing treatment system. Approximately 250 gpd of process wastewaters are generated from chromic acid and phosphoric acids baths use for preparing aluminum forms. This process wastewater is covered under the federal effluent guidelines listed in 40 CFR 433 - Metal Finishing Subcategory. The facility also generates approximately 2,000 gpd sanitary wastewaters. The facility maintains a secondary treatment plant to handle the these flows. The existing treatment plant consists of settling, extended aeration and chlorine disinfection without dechlorination with a design flow of 2,250 GPD.

Ohio EPA issued a NPDES permit (4IN00162/OH0121193) for the facility in September of 1996 for the existing discharge. The permit contains effluent limitations for both the process wastewaters and for the sanitary wastewaters at the final outfall. Effluent limitations at the final outfall are based on secondary treatment standards and the process wastewaters are limited by final effluent limitations at an internal station.

Cansada Estates (Sycamore Creek RM 29.18; 11.60)
The Cansada Estates WWTP is located in at the southeast quadrant of state route 204 and Ault Road, Violet Township, Fairfield County. The Cansada Estates is a 35 lot residential development serviced by a temporary package WWTP and centralized collection system. The temporary WWTP discharges treated sanitary wastewater directly to Sycamore Creek (Lat 39 55' 30"; Long 82 43' 20") at RM 11.60.

The Cansada Estates WWTP was originally proposed in 1995. However, due to administrative issues and litigation of the original NPDES permit, the applications were re-submitted in April of 1996. The WWTP will be constructed in two (2) phases; during the first phase of the development (up to 18 homes constructed), the design of the WWTP will be based on an average daily design flow of 7,000 gpd, and consist of a trash trap, flow equalization, extended aeration treatment plant with clarifiers, dosing station, sand filters, chlorination/dechlorination. The second phase (over 18 homes constructed) will allow for an increase in WWTP design flow to 14,000 gpd and will modify the plant to include an additional flow EQ tank along with a conversion of the existing EQ tank to an aeration tank, the addition of two fixed media clarifiers and the addition of a sludge holding tank.

The WWTP was designed to meet Ohio EPA's Best Available Demonstrated Control Technology (BADCT) standards. These standards require all new municipal WWTPs with direct discharges to provide nitrification (ammonia removal) in to treatment system to meet ammonia limitations of 1.0 mg/l average-summer and 3.0 mg/l average winter, as well as meet average effluent limitations of 12 mg/l for TSS, 10 mg/l Carb BOD_5 and a minimum of 6.0 mg/l for dissolved oxygen. Ohio EPA issued an Permit To Install (PTI) and NPDES permit (4PW00006/OH0121142) for the WWTP in September of 1996.

Huntington Hills WWTP (Sycamore Creek RM 29.18; 8.90)
The WWTP serving the Huntington Hills subdivision was constructed in 1974 and discharges through outfall 001 into Sycamore Creek at RM 8.9 (Lat. 39 53' 47"; Long. 82 42' 33"). The average daily design flow of the facility is 0.16 million gallons per day. The facility was upgraded in 1978 and currently treats an average daily flow of 0.14 million gallons per day. The treatment system used at this facility includes flow equalization, aeration, settling, fixed media clarification, sand filters and chlorination/dechlorination. Sludge produced at the WWTP is hauled to the Tussing Road WWTP for dewatering and disposal by land application on authorized sites.

Wastewater discharge from the WWTP is regulated through an NPDES permit (4PG00027/OH0054844). The first permit for this WWTP was issued in 1981. At that time 30 day average limitations for various parameters were as follows: Carb BOD_5, 10 mg/l; Suspended solids, 12 mg/l; Fecal Coliform, 1000 #/100 ml; Ammonia 2.0, mg/l. Permit limitations for these parameters in subsequent permits have remained relatively unchanged.

No permit violations were reported for third quarter, 1996. A total of 81 permit violations (1992-1996) were documented for suspended solids, ammonia, fecal coliform, cBOD5, and dissolved oxygen. In general, ammonia and BOD5 loadings to Sycamore Creek have been variable since 1981. Ammonia loadings were especially high during 1996 However, no permit violations were recorded. Suspended solids loadings have remained relatively stable and low when compared to other dischargers in the basin.

Pickerington WWTP (Sycamore Creek RM 29.18; 4.35)
The City of Pickerington owns and operates a municipal WWTP located at 525 South Hill Road, Pickerington Ohio, Fairfield County. The WWTP was originally constructed in 1972 and consisted of a comminutor, contact stabilization type aeration system, final clarifiers, and chlorine contact tank for disinfection. The facility directly discharges into Sycamore Creek at RM 4.35 (Lat. 39 52' 24"; Long. 82 45' 38").

Rapid growth has occurred in the City of Pickerington since 1980. To accommodate this growth, the WWTP was expanded under Ohio EPA's Construction Grants Program. In 1987 construction of the WWTP was completed to handle higher flows associated due to growth. The WWTP was designed to treat an average daily flow of 0.580 MGD with a peak flow of 2.2 MGD. The treatment plant consisted of an influent pump station, static screens, centrifugal grit clarifier, trickling filter, two (2) aerated solids contact tanks, two (2) final clarifiers, chlorination-dechlorination and two (2) aerobic sludge digestion tanks The treatment system was designed to meet average effluent limitations of 10 mg/l Carb BOD5, 12 mg/l TSS , .5 mg/l for summer nitrogen ammonia and 4.5 mg/l for winter nitrogen-ammonia, as well as . These limitations which were incorporated into the December 1995 renewal NPDES permit (4PB00017/OH0031119) along with minimum dissolved oxygen concentration of 7.0 mg/l during the summer and 5.0 mg/l during the winter.

Due to continued rapid growth, Pickerington submitted a PTI application for another facility upgrade and expansion, which would parallel the existing WWTP. Originally, Ohio EPA issued a PTI in December of 1995 for the upgrade and expansion of the WWTP. However, due to litigation and changes in administrative procedures, the PTI was never issued and a new application was submitted in July of 1996 Ohio EPA issued a PTI in September of 1996 which allowed for an increase the average design flow from 0.58 MGD to 1.8 MGD. The 1996 upgrade and expansion consisted of the construction of a new treatment system consisting of bar screens, aerated grit and grease removal, activated sludge aeration tanks, and independent final circular clarifiers. The new plant, along with the existing WWTP, minus disinfection by chlorination, was the connected to rapid tertiary sand filters, UV disinfection and post aeration prior to discharge to Sycamore Creek. The upgrade and expansion was designed to meet averages effluent limitations of 6.0 mg/l for TSS, 4.9 mg/l for Carb BOD_5, 0.92 mg/l for summer nitrogen-ammonia, and 2.8 mg/l for winter nitrogen ammonia.

A bioassay was performed on the effluent from September 22-23, 1997. Test results indicated that the effluent grab samples from day 1 and the composite samples were not toxic to the fathead minnow or the water flea, but both tests showed significant impacts to the test organisms on day 2.

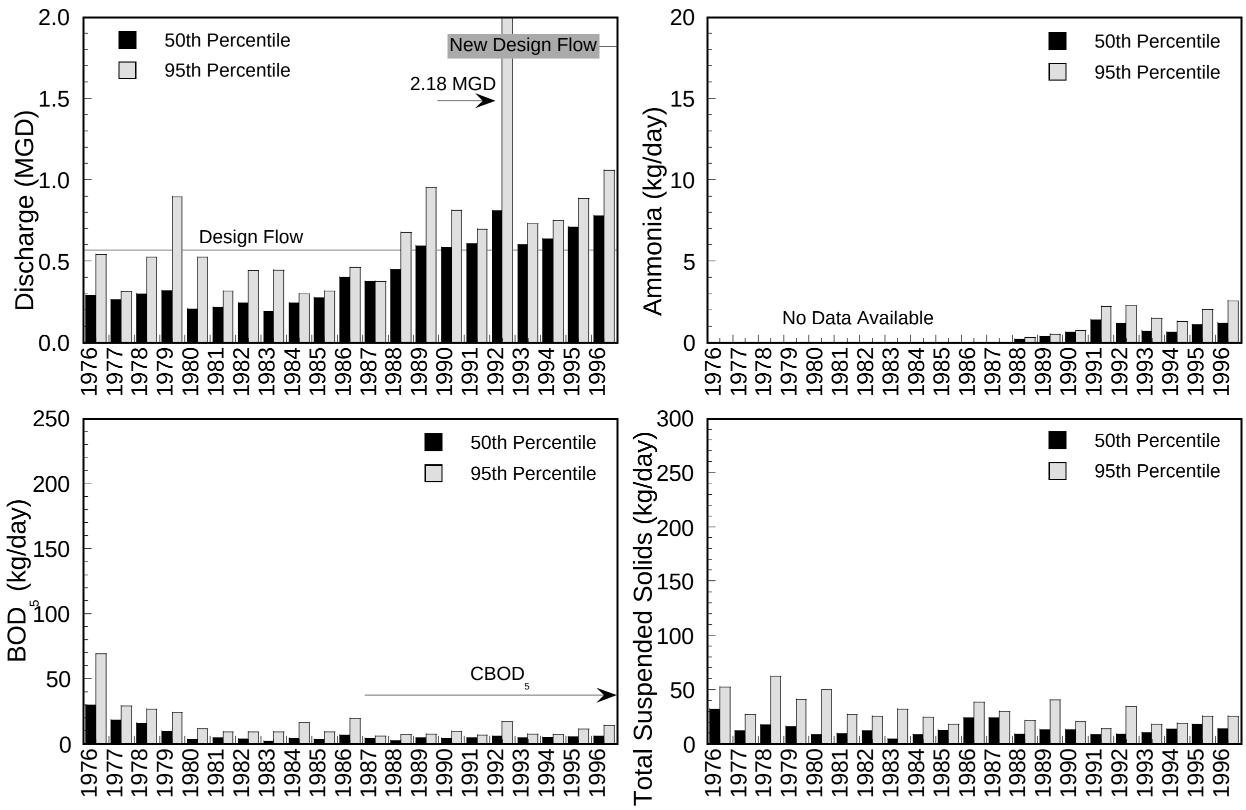

Figure 6 Third quarter median and 95th percentile discharge and pollutant loadings of NH_3-N, BOD_5 -CBOI to Sycamore Creek from the Pickerington WWTP, 1976-1996.

This may be the result of some type of toxic slug. The source of the toxicity is unclear and may be an intermittent problem. Additional monitoring should be performed to address this toxicity concern.

No permit violations were recorded during July to October ,1996. Suspended solids have been a problem with a total of 20 violations since 1992. Suspended solids loadings trends indicate an increase in the amount of solids Pickerington WWTP has been contributing to Sycamore Creek since 1991 (Figure 6). Ammonia and flows exceeding the design capacity are increasing while BOD5 loads remain stable. With the upgrade to Pickerington WWTP completed, treatment should significantly improve.

Jefferson Woods Water Reclamation Facility (Sycamore Creek RM 29.18; 1.00)
The wastewater treatment plant serving the Jefferson Woods subdivision was constructed in the early

1970's. The WWTP is located on the north side of Basil Western Road and discharges wastewater through outfall 001 into Sycamore Creek (Latitude 39 50' 32"; Longitude 82 45' 00") at RM 1.00. An expansion of the plant in 1993 (PTI No.: 01-3619) increased treatment capabilities from 0.08 MGD to the current design flow of 0.12 MGD. Plant components include bar screen, extended aeration, clarification, surface sand filters, and chlorination/dechorination. Sludge produced at the plant is stored in holding tank prior to hauling to the Tussing Road plant for dewatering and final disposal by land application on approved sites.

Wastewater discharge from the WWTP is regulated through an NPDES permit (4PG00026/OH0054839). The first permit for this WWTP was issued in 1981. At that time 30 day average limitations for various parameters were as follows: BOD5, 18 mg/l; Suspended solids, 18 mg/l; Fecal Coliform, 1000 #/100 ml. Permit limitations in subsequent permits became more stringent with limitations for some parameters now appearing as follows: Carb BOD_5, 10 mg/l; Suspended solids, 12 mg/l; Ammonia (summer), 2 mg/l.

No permit violations were recorded during the third quarter, 1996. Previously, most permit violations were for residual chlorine and dissolved oxygen. Flows from the wastewater treatment plant have continued to increase since 1981. Ammonia loadings have remained stable and BOD_5 loads, while increasing through 1995, declined during 1996. Suspended solids increased slightly since 1990.

Little Walnut Sycamore Water Reclamation Facility (Walnut Creek RM 29.15)
The Little Walnut Sycamore Water Reclamation facility is a proposed plant to be located west of the intersection between Amanda Northern Road and Waterloo-Eastern Road in Violet Township, Fairfield County. The WWTP is proposed to discharge treated sanitary wastewater directly to Walnut Creek (Lat 39 49' 45"; Long 82 45' 17") at RM 29.15, just downstream of the confluence with Sycamore Creek.

The facility was proposed in March of 1995, with the capacity to treat an average design flow of 0.750 MGD from residential, commercial and industrial waste. The proposed treatment system consists of mechanical fine screens, a vertical loop reactor activated sludge treatment unit, secondary clarifiers, post aeration and UV disinfection. Sludge management equipment would be installed once influent flow reached approximately 0.4 MGD. The PTI application proposal also included a centralized gravity collection system which would follow the path of Sycamore Creek, running north to Hill Road. The collection system was design to allow for the elimination of the Jefferson Woods WWTP which discharges directly to Sycamore Creek at RM 1.0. The WWTP was designed to meet Ohio EPA's Best Available Demonstrated Control Technology (BADCT) standards. These standards require all new municipal WWTPs with direct discharges to provide nitrification (ammonia removal) to meet ammonia limitations of 1.0 mg/1 average-summer and 3.0 mg/l average winter, as well as meet average effluent limitations of 12 mg/l for TSS, 10 mg/l Carb BOD_5 and a minimum of 6.0 mg/l for dissolved oxygen.

Ohio EPA issued a conditional PTI for the WWTP in December 1996, allowing for a phased WWTP construction, and subsequently issued a NPDES permit (4PJ00101/OH0121088) was issued for the discharge to Walnut Creek in March of 1996. According to agency records, construction of the plant began in February 1997, however, it has since stalled.

Canal Winchester WWTP (Walnut Creek RM 24.20)
The Village of Canal Winchester owns and operates a WWTP located 410 Ashbrook Road, in southeastern Franklin County. The WWTP discharges directly to Walnut Creek at RM 24.20 into Walnut Creek (Latitude 39 49’ 45”; Longitude 82 49’ 15”). The village provides services to a rapidly growing community of about thirty four-hundred residents along with the Village of Lithopolis. The original WWTP was constructed around 1960 and was designed to handle a flow of 0.33 MGD. The WWTP consisted of consisted of bar screens, influent pump station, two (2) rectangular aeration tanks, two (2) rectangular clarifiers, and a chlorine contact tank.

In 1987, a plant upgrade and expansion, reviewed under Ohio EPA's Construction Grant Program was approved. The upgrade/expansion included increasing the raw wastewater pumping capacity, installing a 1.3 million-gallon flow equalization basin, fine screen facilities, standby power, and bubble diffusers, increasing blower capacity, increase in size of waste sludge holding tank, and installing dechlorination equipment. After the 1987 improvements, the WWTP consisted of bar screens, a lift station, equalization tanks, fine screens, extended aeration tanks, polymer addition, secondary clarification, chlorine disinfection and dechlorination. The design flow of the WWTP increased from 0.33 MGD to 0.45 MGD. In March of 1992 a renewal NPDES was issued with effluent limitations based on an average design flow of 0.65 MGD. This increase was based on the addition of polymers to improve settling in the clarifiers.

Since being documented in the 1983 Walnut Creek CWQR, Canal Winchester has had problems with the inflow of storm water and infiltration of ground water into its collection system. The excessive inflow/infiltration coupled with problems in sludge management has led to poor treatment plant performance and the discharge of excessive solids. Since 1994 excessive solids loss had resulted in observations of sewage solids/sludge deposits in Walnut Creek at and immediately below the outfall pipe. Plant flows had exceeded the hydraulic design regularly, and the plant’s equalization capacity is not sufficient to prevent solids washout. This hydraulic overloading of the WWTP prohibits it from effectively treating the incoming sewage. Based on the permit violations associated with these problems, Ohio EPA and Canal Winchester entered into a Consent Order in the summer of 1997. The order requires Canal Winchester to complete construction the WWTP upgrades, reduce and remove inflow and infiltration into the collection system, develop an Operations and Maintenance (O&M) plan for the WWTP operations, revise/update its sludge management plan, and equip all lift stations with alarm systems to warn of equipment malfunctions.

In September of 1996, Ohio EPA issued a renewal NPDES permit (4PB00012/OH0024333) which allowed for the upgrade /expansion of the Canal Winchester WWTP. Subsequently in 1997 Ohio EPA issued an PTI for the upgrade/expansion of the WWTP. Essentially a new WWTP was

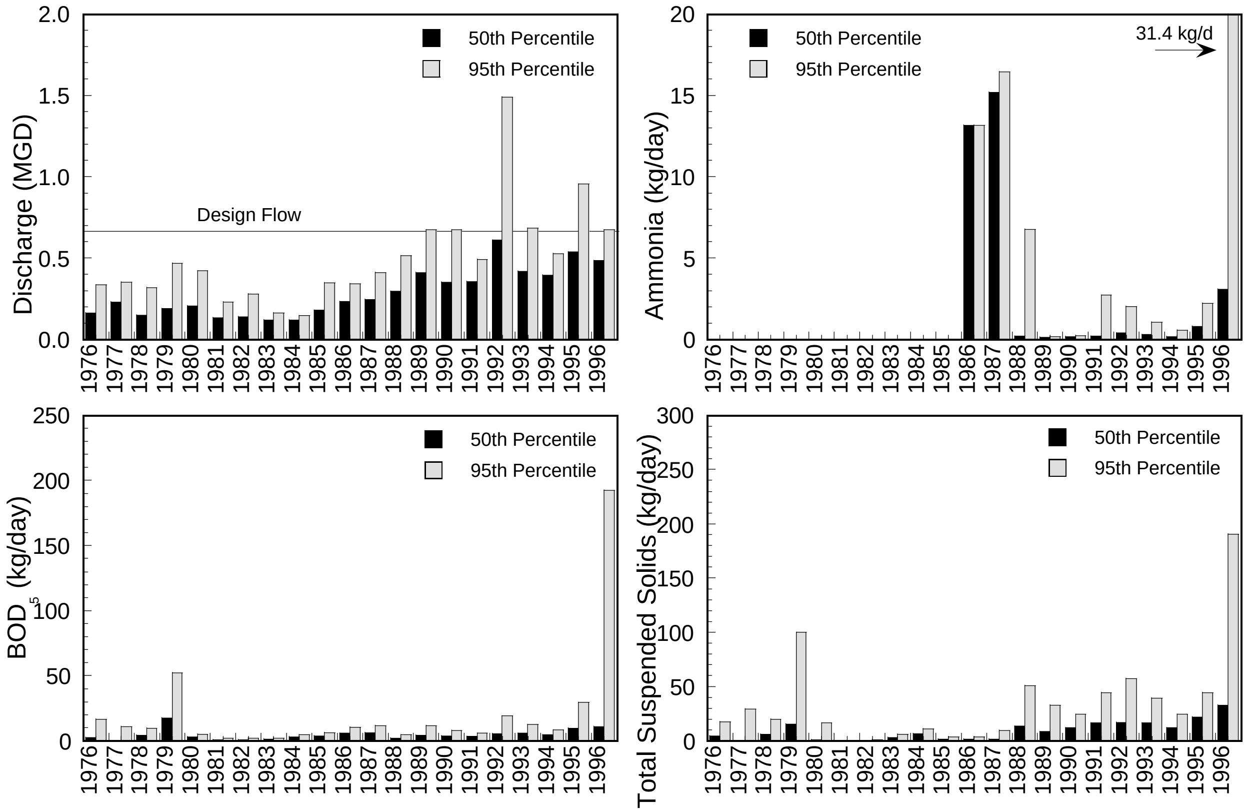

Figure 7 Third quarter median and 95th percentile discharge and pollutant loadings of NH_3-N, BOD_5 -CBOD to Walnut Creek from the Canal Winchester WWTP, 1976-1996.

constructed to replace the old facility. The new facility consists of a mechanical drum screen with a manually cleaned bar screen, a cyclone grit removal system, two parallel Schreiber extended aeration units (concentric aeration tanks and final clarifiers), and an ultraviolet (UV) disinfection system, The WWTP expansion/upgrade was designed to meet Ohio EPA's Best Available Demonstrated Control Technology (BADCT) standards. These standards require all new municipal WWTPs with direct discharges to provide nitrification (ammonia removal) in the treatment system to meet ammonia limitations of 1.0 mg/1 average-summer and 3.0 mg/l average winter, as well as meet average effluent limitations of 12 mg/l for TSS, 10 mg/l Carb BOD5 and a minimum of 6.0 mg/l for dissolved oxygen. Compared with permitted ammonia-nitrogen loadings, the new WWTP will reduce ammonia loadings to Walnut Creek by 59.8% in the summer and 11.9% in the winter.

Often during the 1996 field season, Ohio EPA field staff observed significant deposits of solids/sludge in Walnut Creek at, and immediately downstream from the Canal Winchester WWTP outfall. Also, during this period, Canal Winchester WWTP had many violations of their NPDES permit. Most of the violations were for exceedences of suspended solids, fecal coliform and $cBOD_5$. Since 1992, Canal Winchester has had a total of 109 permit violations. Ammonia and BOD_5 loadings to Walnut Creek increased during 1996 (Figure 7). Generally, BOD_5 and suspended solids have shown an increase since 1988 at this plant. Flows have been increasing since 1984. 95th percentile values reveal significant upsets during 1996. These values represent plant upsets and/or inconsistent treatment of wastewater.

New England Acres WWTP (East Fork of Georges Creek RM 21.15; 8.25)
The WWTP serving the New England Acres subdivision was constructed in 1972 and is located on the north side of State Route 204 in Violet Township. The plant was upgraded in 1988. The average daily design flow for the facility is 0.10 million gallon per day. Daily average flows are reported as being 0.12 million gallons per day. The facility discharges through outfall 001 into the East Fork of Georges Creek at RM 8.25 (Lat. 39 55' 48"; Long. 82 44' 09").

WWTP treatment units consist of flow equalization, activated sludge/aeration, upflow fixed media filters, slow sand filters and chlorination/dechlorination. An aerated sludge storage tank is available to hold sludge until it is hauled to the Tussing Road WWTP for dewatering and final disposal by land application on authorized sites. Actual plant flows are greater than design flow on average, due mostly to inflow/infiltration. Flow from this WWTP will be, at some point in time, routed to the Tussing Road WWTP for treatment. Once this occurs the New England Acres plant will be abandoned.

Wastewater discharge from the WWTP is regulated through an NPDES permit (4PH00010/OH0054887). The first permit for this WWTP was issued in 1981. At that time 30 day average limitations for various parameters were as follows: BOD5, 10 mg/l; Suspended solids, 12 mg/l; Fecal Coliform, 1000 #/100 ml; Ammonia, 1.5 mg/l.

Easton WWTP (Unnamed tributary to East Fork of Georges Creek RM 21.15; 1.74)
The WWTP serving the Easton Village subdivision was constructed between 1974 and 1976 to treat an approximate design flow of 0.080 MGD. A Permit to install was issued by Ohio EPA in October, 1979, for enlargement of the facility to 0.16 MGD. Plant components consist of manually operated bar screens, flow equalization, extended aeration, clarification, additional clarification through use of fixed media upflow filters, surface sand filtration, ultraviolet disinfection. A PTI (Application No.: 01-7029) was issued in 1997 for additional plant improvements which included installation of additional fixed media upflow filters, sand filter reconstruction and replacement of the ultraviolet disinfection unit. Discharge leaves the plant through outfall 001 and flows into an unnamed tributary of George's Creek at RM 1.74 (Latitude 39 54' 15"; Long. 82 44' 21.5"). Sludge produced at the plant is stored in a holding tank prior to hauling to the Tussing Road WWTP for dewatering and final disposal by land application on approved sites. Flow from this WWTP will be, at some point in time, routed to the Tussing Road WWTP for treatment. Once this occurs the Easton

Village plant will be abandoned.

Wastewater discharge from the WWTP is regulated through an NPDES permit (Ohio EPA No.: 4PH00011/OH0070637) with the first permit being issued in 1979. At that time 30 day average limitations for various parameters were as follows: BOD5, 10 mg/l; Suspended solids, 10 mg/l; Fecal Coliform, 1000 #/100 ml; Ammonia (summer), 1.5 mg/l, winter (4.0). Permit limitations for those parameters has remained unchanged in subsequent permits.

Omega Oil Company (East Fork of Georges Creek RM 21.15)
Amoco facility # 53 operates a groundwater pump-and-treat process with an activated carbon pump. It discharges a design flow of 0.008 MGD into the East Fork of Georges Creek via storm sewer at (Lat. 39 54' 41"; Long. 82 46' 46"). The facility is regulated under a NPDES permit (4IG00001/OH0102148). The permit was issued in July of 1995.

Century Acres (Big Run RM 19.83; 1.75)
The Franklin County Commissioners own and operated the Century Acres WWTP which is located at the east end of Greengate Drive in Madison Township, Franklin County. The facility is permitted to discharge 0.025 MGD directly to Big Run (Lat. 39 49' 34"; Long. 82 51' 30") at RM 1.75 which then confluences with Walnut Creek at RM 19.83.

The treatment system was originally designed to treat the wastewater from a 50 home subdivision and was issued a PTI from a design flow of 0.020 MGD in April of 1973. The treatment facility consisted of a bar screen and comminutor, flow splitter, two (2) parallel extended aeration plants with clarifiers, surface sand filters, and chlorination. Sludge was managed with a holding tank and drying beds.

The original NPDES permit (4PA00010/OH 0054992) was issued in June of 1976 with effluent limitation reflecting secondary treatment requirements. The subsequent renewal in 1982 reduced the permit limitations to average concentration of 10 mg/l for BOD5, 12 mg/l for TSS and minimum dissolved oxygen levels to 5.0 mg/l. The 1988 renewal permit included summer nitrogen-ammonia effluent limitations of 7.0 mg/l average-summer. Subsequent renewal have maintained summer ammonia requirements.

Village of Lithopolis WTP (Unnamed Tributary of Big Run RM 19.83; 1.86)
The Lithopolis water treatment plant is located at 5664 Elder Road in Franklin County. The facility provides treatment of well water which is then distributed for public consumption (average 50,000 gpd). The water treatment plant consists of a treatment process that uses aeration, pressure filtration, and chlorination. The effluent is filtered through slow sand filters before final discharge through outfall 001 into an unnamed tributary of Big Run at RM 1.86 (Lat. 39 48' 33"; Long. 82 49' 50").

Wastewater discharge from the facility is regulated by an NPDES permit (4IW00091/OH00544461) with monthly average limitations as follows: Suspended solids, 30 mg/l; Iron 1000 ug/l. The first permit for the facility was issued in 1975.

Rickenbacker Port Authority (North and South Rickenbacker Runs RMs 15.64, 15.54)
The Rickenbacker Port Authority operates the Rickebacker Airport (f.k.a. The Rickenbacker Air National Guard Base)which was originally operated by the Ohio Air National Guard Base. The base is located at the southern end of Alum Creek Drive, within both Franklin County (Hamilton and Madison Townships) and in Pickaway County (Harrison Township). The facility sits between Big Walnut Creek and Walnut Creek.

Up to 1983, the base operated a 0.9 MGD wastewater treatment plant which discharged to Walnut Creek at RM 15.20. The WWTP consisted of a pre-aeration flotation, primary settling, and two (2) trickling filters, secondary clarification, and chlorination. The WWTP was abandoned and the wastewater from the base was directed to Columbus sanitary sewer by a force main.

In November 1994, Ohio EPA issued a transfer of permit 4IO00000 from the Ohio Air National Guard to the U.S. Air Force- Air Force Based Conversion Agency (AFBCA). The AFBCA is the lead agency in transferring the Base from Federal to civilian ownership, the Rickenbacker Port Authority. Due to the transfer of ownership, the existing military-based operations, State of Ohio-Adjutant General's Department- Army Aviation Support Facility (AASF) and the Ohio Air National Guard - 121 Air Refueling Wing (121 ARW) submitted individual discharge applications for storm water related discharges, primarily from fuel storage and loading activities.

The Base also had a discharge from the water treatment plant (WTP) lime sludge lagoons and from a flue gas desulfurization sludge lagoon from the on-site steam production plant. The lagoons discharge to unnamed tributaries of Big Walnut Creek. In 1996 Ohio EPA issued plan approvals allowing land application of the lime sludge and FGD sludge, as a result of the lagoon closures.

Currently, there are three entities with discharges which use the airport. They are the AASF (4IN00178/OH0124052), the 121 ARW (4IN00178/OH0124095), and the Rickenbacker Port Authority (4IN00085/OH00081639). These discharges consist of storm water and run-off from fuel storage and loading operations, and airplane and run-way de-icing activities. The AASF and the 121 ARW both discharge to the Big Walnut basin, while the Rickenbacker Port Authority discharges to both the Walnut and Big Walnut Basins. As of March 1998, Ohio EPA was preparing to issue individual draft NPDES permits for the current entities storm water discharges to Walnut Creek and Big Walnut Creek.

Mann's MHP WWTP (Mann's Run RM 9.96; 0.90)
Mann's Mobile Home Park is at 4800 Duvall Road in Ashville. The WWTP serves approximately 217 mobile homes. The plant is designed for 0.04 MGD flow but averages 0.07 MGD. It discharges into an unnamed tributary of Walnut Creek at RM 0.90 and then to Walnut Creek at RM 9.96. The plant uses a comminutor, trash trap, aeration tanks with clarifiers, sand filters, and has the option to chlorinate.

This facility has a history of significant non-compliance with the NPDES permit. The original NPDES (4PR00028/OH0036072) permit was issued in 1981. Mann's Mobile Home Park NPDES permit was not renewed in August 1992 due to the obvious inability of the wastewater treatment plant to meet new, more stringent, and additional (ammonia) limits. In addition, the owner has historically neglected the wastewater treatment equipment such as the comminutor and trash traps. Inspections performed by Ohio EPA in December 1995 found evidence that the WWTP bypassed the sand filters and chlorine contact tank regularly. The bypass was achieved by allowing sewage to flow over the sand filter walls and through the walls, to the surrounding ground. In addition, a sludge wall was found lining the banks of Mann's Run.

Since 1992, a total of 389 permit violations has been recorded. The most frequent violations were for suspended solids and fecal coliform exceedences. Violations for dissolved oxygen, ammonia, cBOD5 and residual chlorine were also noted. During the survey period in 1996, many violations for suspended solids and fecal coliform were reported. The operator and owner of this facility have been referred by the Director of Ohio EPA to the Attorney General's Office for escalated enforcement action for surface water and drinking water violations.

The plant has been operating near or above its design capacity. Suspended solids and BOD5 loadings have been increasing since 1992. Ammonia was not reported because it was not in the original permit issued in 1981 and the facility does not monitor for this parameter. Median third quarter NH_3-N levels were elevated from 1988 to 1992 due to a small digestion tank which limited solids settling and prevented complete NH_3 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 $CBOD_5$ levels indicated poor WWTP operation. Since then $CBOD_5$ levels have been typical.

Ashville WWTP (Walnut Creek RM 4.43)
The Village of Ashville owns and operates a WWTP at 67 South Scioto Street, Ashville Ohio, Pickaway County. The facility discharges directly to Walnut Creek at RM 4.43 (Latitude 39 42' 35"N; Longitude 82 57' 29"W). Constructed in 1935, the plant has a design flow of 0.35 MGD.

In 1982, Ohio EPA issued DFFO's to the Village of Ashville for NPDES permit violations. Ashville was required to submit a Sanitary Sewer Evaluation Survey and a Facilities Plan for improvements to the WWTP. At the time, the WWTP consisted of a bar screen, two rectangular aeration tank in series, two (2) rectangular clarifiers, and chlorine contact tank. In January of 1988 the plant was upgraded with the addition of an aerobic digester and associated pumps and piping.

In October of 1993 the Village of Ashville submitted a PTI application to upgrade and expand their WWTP to 0.6 MGD. Subsequently Ohio EPA issued a PTI for the upgrade and expansion for the

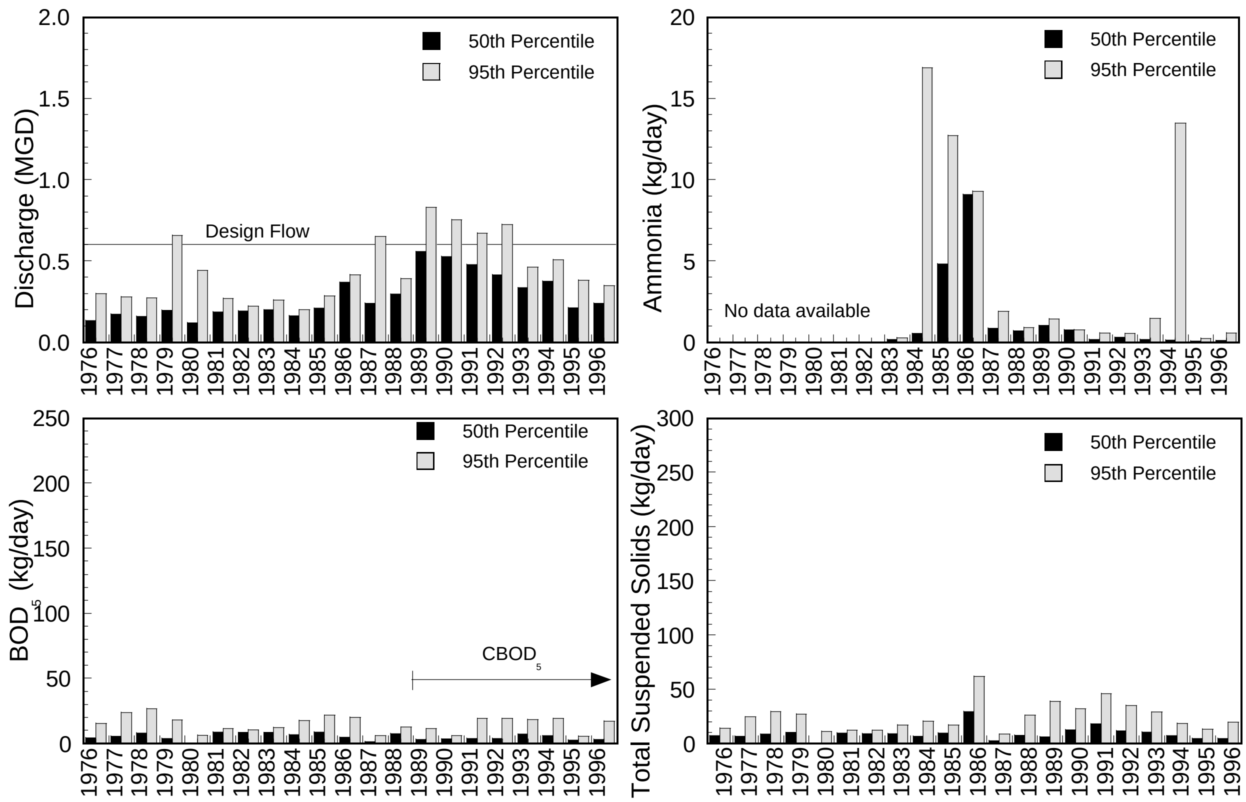

Figure 8 Third quarter median and 95th percentile annual discharge and pollutant loadings of NH_3-N, BOD_5 and TSS to Walnut Creek from the Ashville WWTP, 1976-1996.

WWTP in October of 1994. The upgrade and expansion consisted of building a new WWTP consisting of a bar screen, primary clarifier, oxidation ditch style extended aeration system, independent circular final clarifiers, chlorine contact tank for disinfection. This existing WWTP was converted into a liquid sludge holding tanks and thickeners. Design criteria for the WWTP was based on existing permitted loads, with the expansion flow were based on BADCT standards. Up to the October 1994 expansion, nitrification was not required and secondary treatment standards were maintained in Ashville's NPDES permit (4PC00005/OH0020877) With the expansion, ammonia limitations, based on the design criteria, were included in NPDES after the expansion to 0.600 MGD (9.2 mg/l average summer and 10.0 mg/l average winter).

This facility has experienced significant inflow/infiltration problems and was issued a compliance schedule to assess this problem and begin elimination of inflow and infiltration sources by October 31, 1997. On May 11, 1996 during a rain event, a sewage bypass was discovered by the village of

Ashville and an unknown quantity of untreated sewage was discharged into Walnut Creek.

Median flow from this WWTP has decreased since 1989. BOD_5 and suspended solids loadings have also shown a decreasing trend during the 1990's (Figure 8). Ammonia loadings were high in the mid 1980's but have been low and consistent since 1987. Ashville WWTP did not have any permit violations during the 1996 field sampling season. Suspended solids and fecal coliform violations were the most frequent violations between 1992-1996.

Amerimark (Walnut Creek RM 4.40)
Amerimark Inc., formerly known as the Reynold's Metals Company, is located on Reynold's Road in Ashville Ohio, Pickaway County. The facility's wastewater discharges consists of process wastwater from coil coating and aluminum form processes, and sanitary wastewater and directly discharge Walnut Creek at RM 4.40 (Lat. 39 42 39; Long 82 57 15). Amerimark Inc. is considered to be a major industrial discharger. Their process related wastewater is covered by federal categorical effluent standards listed in Title 40, Code of Federal Regulations (40CFR). The process at the facility were coil coating and aluminum forming effluent guidelines listed in 40 CFR 645 and 467 respectively. Currently, the company discharges process wastewater covered by Section 465, Subpart C - Coil Coating Aluminum Basis Material.

In 1982 effluent limitations for both conventional pollutants (TSS, ammonia-nitrogen) and metals (total chromium and zinc) were established. During the 1990 renewal of the NPDES permit (4IC00002/OH0003891), the effluent limitations were expanded to included limitations based on both federal effluent limitation and water quality, as well as whole effluent toxicity Several acute bioassays have been performed at this facility since 1990. During 1990, the effluent samples were acutely toxic to both the fathead minnow (P. promelas) and the water flea (C. dubia). Slight toxicity was observed in the water flea during the 1991 test. Testing conducted during 1996 suggests that the effluent is more toxic to Ceriodaphnia than to the fish. June 1996 test results suggest that the fathead minnow was impacted but to a lesser degree than the Ceriodaphnia tests. It is not clear what is causing the toxicity and further studies are warranted.

Generally, ammonia, BOD5 and suspended solids loads to Walnut Creek have been decreasing although it appears inconsistent treatment may have allowed for a variable ammonia load. The plant currently operates at or above the design capacity of the plant. Amerimark did not have any permit violations during the field sampling season. Most of the facility violations since 1992 have been for pH (58).

Walnut Heights (Walnut Creek RM 1.68)
The Pickaway County Commissioners own and operate the Walnut Heights wastewater treatment plant located on the north side of Cornstalk Drive, Walnut Township, Pickaway County. The WWTP discharges directly into Walnut Creek at RM 1.68 (Lat. 39 41' 56", Long. 82 58' 30").

The WWTP was constructed in 1973 with a design capacity of 63,000 gpd and consists of a comminutor, two (2) parallel 35,000 gpd extended aeration plants with integrated clarifiers and sludge holding tanks, four (4) tertiary sand filters and chlorine disinfection. The plant was designed to treat domestic sewage from 159 lots. Currently, there are approximately forty homes are served by this plant. In January 1992, Ohio EPA issued a PTI for the installation of an effluent flow meter.

The initial NPDES permit (4PG00018/OH010834) included effluent limitations for ammonia-nitrogen (mg/l average-summer, monitoring winter) as well as tertiary limitations for TSS (12 mg/l average and Carb BOD_5 (10 mg/l average). These limitations have been maintained in subsequent renewal permits. After a review of the permit file the facility appears to meet the NPDES permit effluent limitations with only sporadic violations for TSS, ammonia-nitrogen, and fecal coliforms.

Cook's Creek Golf Course (Walnut Creek RM 0.02)
Cook's Creek Golf Course, 16504 US Route 23, Harrison Township, Pickaway County, is a driving range and golf course which as constructed in 1993. Wastewater treatment consists of septic tanks, a lift station, with a sphagnum moss/sand filter disinfection system, and has a design flow of 0.025 MGD. The WWTP was approved in October of 1993. Effluent from the treatment system is discharged into a network of lakes (located north of the confluence of Walnut Creek and the Scioto River) that overflow into Walnut Creek during rainfall events at RM 0.02.

A NPDES permit (4PX00021/OH0114103), issued in February of 1995, requires only monitoring since the wastewater is land applied and any discharge to Walnut Creek only occurs during wet weather events

Pollutant Spills and Unauthorized Releases
In addition to NPDES permit violations and water quality criteria exceedences, a review of the Ohio EPA Division of Emergency and Remedial Response (DERR) Release Reporting System (RRS) database indicated 34 unpermitted releases of toxic or oxygen-demanding substances occurred in 1996 in the Walnut Creek study area (Table 8). Accidental spills and unauthorized discharges of pollutants represent a potential impact on aquatic life which may or may not be traceable to a specific source. Spills occur at random and may significantly impact aquatic and terrestrial organisms without leaving obvious signs. It is likely that the reported spills represent a fraction of the actual spills occurrences within the Walnut Creek study area.

Untreated sewage was the most common pollutant reported (31 out of 34 reports). Most of the spills were reported by Baltimore WWTP and were a result of bypasses at the pump station located at Mill and Monroe streets or bypasses that occurred at the wastewater treatment plant. Rain events or snow melt were the reason given for these discharges. At least 907,850 gallons of raw sewage was discharged to Pawpaw Creek.

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 1990-1998 indicated the

Table 7 Summary of pollutants released in the Walnut Creek watershed as reported to the Ohio EPA Division of Emergency and Remedial Response, January 1996 to December 1996.

Date	Entity	Material	Amount	Stream
1/19/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
1/24/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
1/25/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
1/25/1996	Canal Winchester WWTP	Sewage	Unknown	Walnut Creek
1/29/1996	Baltimore WWTP	Sewage	3750 gal.	Pawpaw Creek
2/22/1996	Scott Pfeifer & Scott	Diesel	35 gal.	Sycamore
2/27/1996	Baltimore WWTP	Sewage	17250 gal.	Pawpaw Creek
3/18/1996	Fairfield County WWTP	Sewage	3000 gal.	Sycamore
3/19/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
3/20/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
3/21/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
4/30/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
4/30/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
5/5/1996	Rickenbacker AFB	Jet Fuel	50 gal.	Walnut Creek Trib.
5/6/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw and Walnut Creek
5/9/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
5/9/1996	Canal Win WWTP	Sewage	Unknown	Walnut Creek
5/9/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
5/11/1996	Ashville WWTP	Sewage	Unknown	Walnut Creek
5/13/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
5/16/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
5/16/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
5/28/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
5/29/1996	Baltimore WWTP	Sewage	445050 gal.	Pawpaw Creek
6/10/1996	Baltimore WWTP	Sewage	Unknown	Walnut Creek
6/10/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
6/17/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
6/20/1996	Canal Winchester WWTP	Sewage	Unknown	Walnut Creek
7/18/1996	Baltimore WWTP	Sewage	178050 gal.	Pawpaw Creek
7/22/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek
9/30/1996	Baltimore WWTP	Sewage	135000 gal.	Pawpaw Creek
11/21/1996	Unknown	Unknown	Unknown	Walnut Creek
12/2/1996	Baltimore WWTP	Sewage	146000 gal.	Pawpaw Creek
12/17/1996	Baltimore WWTP	Sewage	Unknown	Pawpaw Creek

only 3 reported fish kills occurred in the Walnut Creek basin. In an unnamed Poplar Creek tributary in Fairfield Co. on September 3, 1995 1670 fish were killed. The kill was attributed to a manure spill which affected about one mile of stream. In Sycamore Creek in Licking Co. on May 23, 1993 127 fish were killed. The incident apparently resulted from the decomposition of grass clippings in the stream which affected D.O. concentrations. On September 28, 1992, 103 fish were killed downstream from a home sewage tile in Poplar Creek in Fairfield Co.

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 5 and 6). Five sets of grab surface water samples for conventional inorganic (*i.e.* metals and nutrients) and microbiological analysis were submitted from 22 mainstem and 26 tributary sampling stations in the Walnut Creek study area between July and September, 1996 (Appendix Table A-2). Samples for the analysis of typical organic compounds (*i.e.* volatile, semi-volatile, pesticides and PCBs) were submitted from ten mainstem and one tributary site downstream from potential point sources of pollution (Table 11). Seven effluent and four mixing zone samples from WWTPs were evaluated for conventional parameters. Additionally, the Canal Winchester, Newark Group Industries and Pickerington WWTPs were tested for organic compounds.

There are no active USGS gauge stations located in the Walnut Creek basin. Data from these facilities are typically used to illustrate flow conditions during the study period. Instead total daily precipitation was used to estimate flows within the Walnut Creek study area. All attempts were made to collect water chemistry samples under identical weather conditions. However, there were two occasions (July 24 and August 8) when more than one inch of precipitation occurred during a sample run. A bias for some parameters, such as total suspended solids which generally rise after rainfall, may have resulted from the sample results collected on these occasions. The daily precipitation totals for Columbus during May 1996 through November 1996 can be found in Table 9.

The primary point sources evaluated in the study area were small and moderate sized municipal type WWTPs at Pleasantville (Walnut Creek Sewer District), Baltimore, Carrol, Huntington Hills, Pickerington, Jefferson Woods, Canal Winchester, New England Acres, Easton Village, Century Acres, Mann's Mobile Home Park, Ashville, and Walnut Heights. Several industrial treatment facilities were also evaluated including Sakas Inc., Newark Group Industries, Diamond Electronics Inc., and Amerimark. Other point sources evaluated are listed in Table 7. The primary non-point source pollution evaluated was runoff from agricultural areas. Other possible nonpoint sources which were investigated included stormwater runoff from the previously mentioned muncipalities and Groveport; the Groveport WWTP has been decommissioned and wastewater is now pumped to the Columbus Southerly WWTP. The potential influence from rapid subdivision development and associated poor construction practices especially in the Georges Creek subbasin was evaluated. Impacts from residential areas with no centralized collection or treatment of sanitary wastewater (unsewered areas) were also evaluated. These areas included the Villages of Lockville, Lithopolis, and South Bloomfield.

Analytical results were reviewed to determine the occurrence of violations and exceedences of Ohio Water Quality Standards (OAC 3745-1), based on Warmwater Habitat (WWH) aquatic life, Primary (PCR) and Secondary (SCR) Contact Recreation, Agricultural Water Supply (AWS), and Industrial Water Supply (IWS) use designations (Table 10).

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 concentrations of D.O., BOD_5 (5-day biochemical oxygen demand), COD (chemical oxygen demand), NH_3-N (ammonia-N), NO_3+NO_2-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 9 and 10). In calculating mean concentrations, a value one half of the analytical method detection limit (MDL) was used for results reported less than the MDL. If the resultant mean value was less than the MDL, then the MDL was used for discussion purposes and displayed in figures.

To determine if diel D.O. concentration fluctuations occurred, Datasonde® continuous monitors, recording hourly measurements over a 48 hr. period, were deployed during August 1996, at 22 stations on Walnut Creek located between RMs 42.50 and 1.20 (Figure 12, Appendix Table A-4). Similar data were gathered at stations on Little Walnut Creek (1 site), Pawpaw Creek (5 sites) and Sycamore Creek (9 sites). 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).

Table 9. Precipitation in inches for Columbus Ohio reported by the National Weather Service, Wilmington, Ohio, May through November 1996 (WS Form: F-6). **Bold values indicate days when chemical samples were collected.**

Day	May	June	July	August	September	October	November
1	0.26	0	0	0	0	0	T
2	T	0.31	0.00	0.01	0.00	T	0.00
3	0.04	0.83	0.00	0.00	**T**	0.00	0.00
4	0.54	0.13	0.00	0.00	**T**	0.00	0.00
5	0.29	0.00	0.00	**0.00**	**0.00**	0.00	T
6	0.00	0.42	0.00	**0.00**	**0.30**	0.00	0.11
7	0.15	0.66	T	**0.00**	0.24	0.00	0.71
8	1.21	0.01	0.00	**1.39**	0.07	0.00	0.01
9	0.06	0.06	0.00	0.00	0.21	0.19	0.12
10	0.33	0.02	**0.00**	0.00	**0.00**	0.01	T
11	0.61	0.13	**0.00**	0.00	**0.00**	0.00	T
12	0.02	0.29	**0.00**	T	**0.01**	0.00	0.00
13	0.00	0.00	0.06	0.00	**0.04**	0.00	T
14	0.02	0.00	T	0.00	0.00	0.00	0.00
15	1.03	T	**0.24**	T	0.00	0.00	0.00
16	0.06	0.00	0.07	0.00	1.46	0.00	0.00
17	0.00	T	0.01	0.00	T	0.00	0.25
18	0.00	0.60	2.15	0.00	0.00	0.81	T
19	0.00	0.01	T	**0.00**	0.00	0.01	T
20	0.00	T	0.00	**T**	0.00	T	0.00
21	0.09	0.00	0.59	**0.00**	0.43	0.00	0.12
22	0.00	0.00	0.05	**0.00**	T	0.01	0.00
23	0.10	0.00	**0.00**	T	**T**	0.20	0.00
24	0.03	0.35	**1.15**	0.18	**0.08**	0.00	0.01
25	0.00	0.00	**T**	0.00	**0.00**	T	1.08
26	0.07	0.00	**0.00**	0.00	**0.01**	0.13	0.28
27	0.45	0.00	0.00	0.00	**0.58**	0.04	T
28	0.10	0.00	T	0.00	2.07	0.04	0.00
29	0.35	0.00	**0.09**	0.00	0.00	0.00	0.01
30	0.00	T	0.68	0.00	0.00	T	0.50
31	0.00	--	0.01	0.00	--	0.00	--
Total	5.81	3.82	5.10	1.58	5.50	1.44	3.20
Departure	1.88	-0.22	0.79	-2.14	2.54	-0.71	-0.02

T indicates a trace amount was recorded.

Table 10. Exceedences and violations of Ohio EPA Warmwater Habitat (WWH) criteria (OAC 3745-1) for chemical, physical and bacteriological water quality parameters measured the in Walnut Creek study area during 1996 (units are :g/l for metals and organics, # organisms/100 ml for fecal coliform bacteria, and mg/l for all other parameters). *Effluent samples with organic pesticide exceedences are included here as these are not currently violations of standard NPDES permits.*

Stream	River Mile	Parameter (value, mg/l)
Walnut Creek	40.00	Fecal coliform (3800, 3800)• •
	39.7	Fecal coliform (4200)• •, (30000)• • • Dieldrin (0.006)*
	24.45	Lead (16)* Fecal coliform (4900)• •
Canal Winchester WWTP		*Aldrin (0.018)** *Endrin (0.019)**
	24.15	Total Phosphorus (2.78, 2.56)§ Lead (19)* Fecal coliform (51000, 8000)• • •
	23.9	Fecal coliform (1000)•
	21.20	Total Phosphorus (2.39)§ Lead (18)*
	19.30	Total Phosphorus (1.22)§ Lead (18)* Fecal coliform (5900, 11500)• • •
	16.88	Lead (120, 24)* Fecal coliform (2900, 4900)• •
	13.75	Fecal coliform (13000)• • •
	5.17	Fecal coliform (1420)•
	4.41	Fecal coliform (4900)• •
	4.14	Fecal coliform (1400)•, (2200)• •
	1.22	Copper (283)*** Fecal coliform (2470)• •

Table 10. (continued)

Stream	River Mile	Parameter (value, mg/l)
Pawpaw Creek Tributary at RM 1.0	1.30	Dissolved Oxygen (3.7)‡‡ Fecal coliform (1060) •
Ohio Paperboard		*Dieldrin (0.011)** *Heptachlor (0.009)**
	0.10	Total Phosphorus (1.14)§ Fecal coliform (1070) • Endrin (0.005)* Heptachlor (0.003)* Methoxychlor (0.043)*
Poplar Creek	0.7	Fecal coliform (3350) • •
Sycamore Creek	11.81	Fecal coliform (6400, 5600) • • •
	8.36	Total Phosphorus (1.32)§
	4.30	Total Phosphorus (1.26, 1.93, 1.75)§ Copper (410)***
	4.18	Total Phosphorus (1.63, 1.58)§
	2.60	Total Phosphorus (1.02, 1.32)§
	1.03	Total Phosphorus (1.75)§
Tussing Ditch	0.41	Fecal coliform (2800, 2300) • •
Georges Creek	2.10	Fecal coliform (1000) •, (5000) • • •
	0.12	Total Phosphorus (2.41)§ Fecal coliform (11500) • • •
Tributary to Georges Creek at RM 6.0	6.05	Total Phosphorus (2.51)§ Copper (340)*** Fecal coliform (1220, 1200) •, (2400) • •
	2.38	Fecal coliform (4500) • •
Tributary to Walnut Creek at RM 15.64		Fecal coliform (2000) • •
Tributary to Walnut Creek at RM 15.54		Fecal coliform (4200) • •
Mann's Run	1.2	Fecal coliform (1100) •
	0.3	Fecal coliform (1270, 1620) •, (2030) • •

Table 10. (continued)

Stream	River Mile	Parameter (value, mg/l)
Little Walnut Creek	0.6	Fecal coliform (4700) • •

* 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 prevention of acute toxicity inside of the mixing zone (Final Acute Value [FAV]).
‡ 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).**
" 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).

Walnut Creek

Based on the results of 60 water column grab samples, the chemical water quality water in Walnut Creek was considered very good (Figures 9 and 10). All mainstem daytime D.O. samples during the survey were above the warmwater habitat minimum criterion (5.0 mg/l). Similar outstanding values for other parameters were also recorded. Levels near or below the applicable MDL were typical. The larger WWTPs located on the mainstem (Baltimore, Canal Winchester and Ashville) did not negatively impact the instream DO concentrations.

Datasonde® continuous monitors deployed at 22 locations confirmed the water column sampling results (Figure 11). Mean dissolved oxygen concentrations were above the minimum DO criterion for warmwater habitats (4 mg/l) at all sampling sites in Walnut Creek and showed typical diel fluctuations. The highest D.O. readings were found at RM 1.20 near the confluence with the Scioto River. Most sites maintained very good diel D.O. concentrations (>6 mg/l).

Mean BOD_5 values were longitudinally stable and were at or below the detection limit of 2.0 mg/l except for effluent and mixing zone samples collected from Baltimore WWTP and Canal Winchester WWTP. BOD_5 effluent samples from Baltimore WWTP ranged from 2.4 to 11.7 mg/l and appeared to be rapidly assimilated by Walnut Creek with mixing zone samples ranging from below detection (2.0 mg/l) to 2.9 mg/l. On July 11, 1996 the BOD_5 concentration from Canal Winchester WWTP was measured at 203 mg/l. Effluent from the plant during sample collection was black in color and had a strong septic odor. It was later determined that the plant was bypassing the treatment system and discharging improperly treated sewage to Walnut Creek. However, this did not appear to significantly impact Walnut Creek since the mixing zone sample was below detection. BOD_5 concentrations on August 20 were 32 mg/l and resulted in high mixing zone concentration (37 mg/l). Further downstream from Canal Winchester at RM 23.90, BOD_5 values were at or below detection

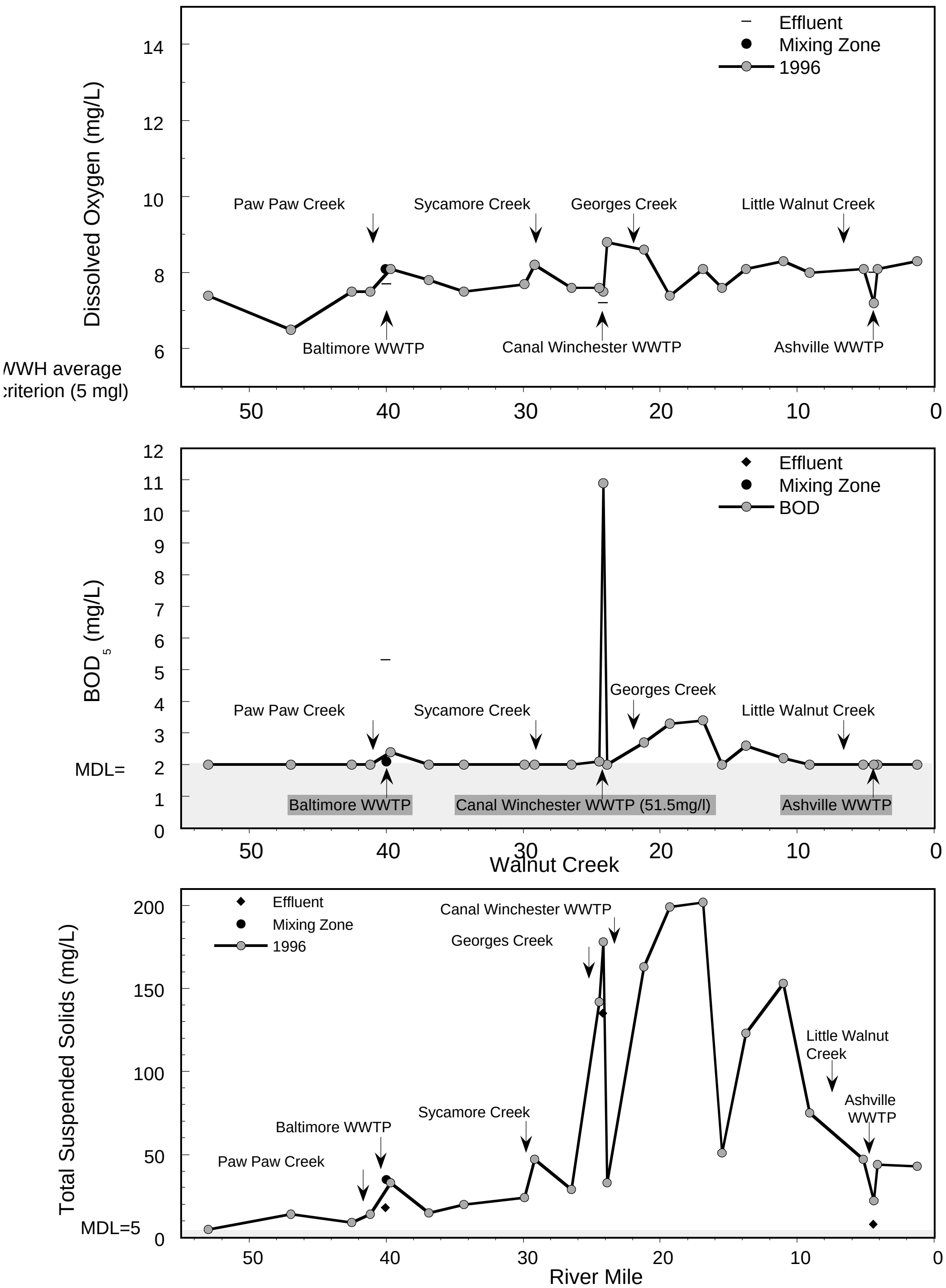

Figure 9 Longitudinal summary of mean concentrations of D.O., BOD_5, and TSS in Walnut Creek, 1996.

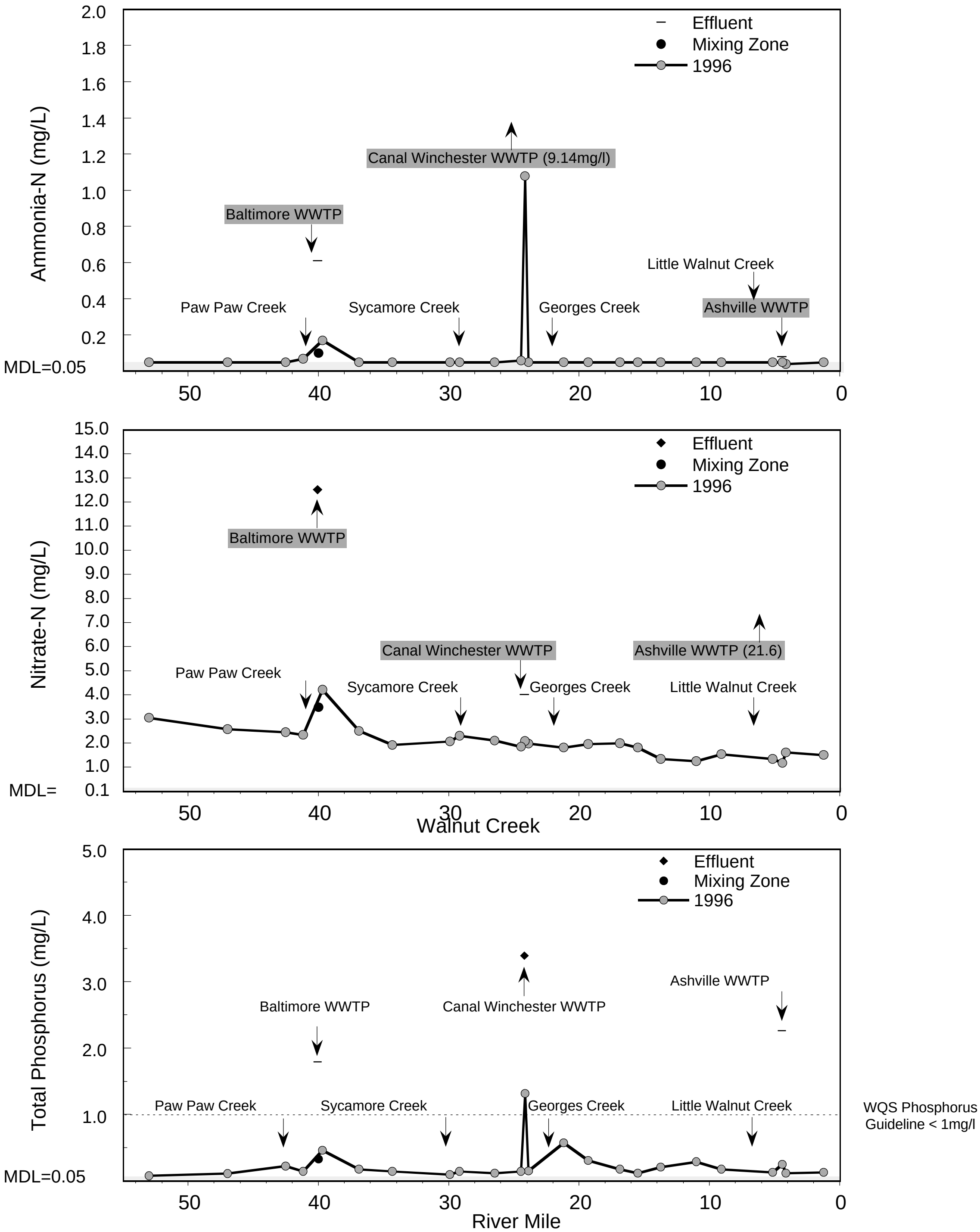

Figure 10 Longitudinal summary of mean concentrations of ammonia-N, nitrate+nitrite-N and total phosphorus in Walnut Creek, 1995.

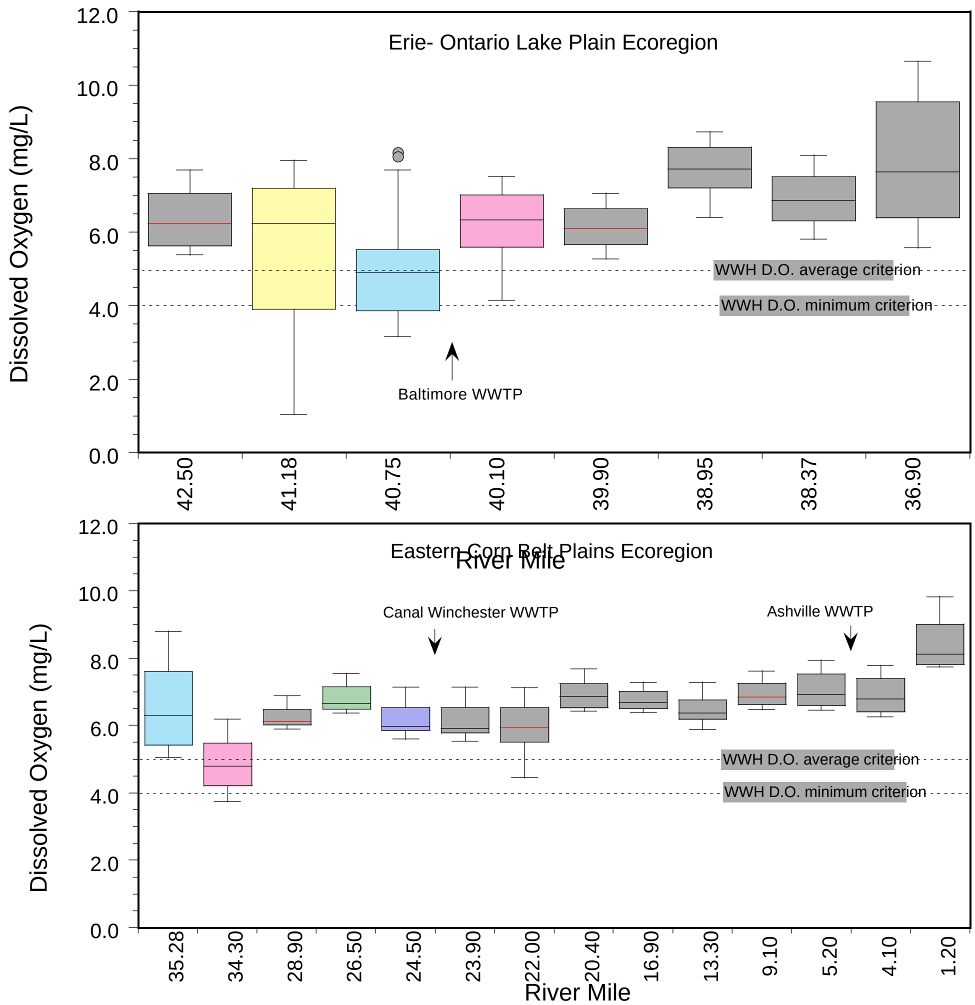

Figure 11 Box and whisker plot of diel D.O. data recorded with Datasonde® continuous monitors at 22 Walnut Creek locations, August, 1996. Sites within the Erie Ontario Lake Plain are displayed in the upper plot. Sites within the Eastern Corn Belt Plains are displayed in the lower plot.

with the exception of the sample collected on September 4 (4.1 mg/l).

Chemical oxygen demand (COD) values were elevated immediately downstream from Pawpaw Creek, Canal Winchester WWTP and Ashville WWTP. The highest concentrations were found in effluent samples from Canal Winchester on July 11 and August 20, 1996. Concentrations near the detection limit (10 mg/l) were found in the upper reaches of the mainstem (RMs 53.00 to 42.52) and in the lower reaches (RMs 9.10 to 1.20).

Fecal coliform exceedences were the most common departure from the water quality standards noted. Concentrations of fecal coliform generally increased from upstream to downstream with significant inputs from Baltimore WWTP and Canal Winchester WWTP. Bacteriological samples collected on July 24 and July 25 were collected during and following a significant rain event (greater than 1 inch). This resulted in many of the observed exceedences of the WQS. The occurrence of such peak concentrations concurrent with higher stream flows (measured indirectly via precipitation) indictated that nonpoint source runoff is the likely origin of these exceedences. Other nonpoint sources of fecal coliform include agricultural inputs, on-site septic systems and other diffuse sources. Fecal streptoccous were also found throughout the Walnut Creek mainstem. While there is no Ohio water quality standard for this parameter, concentrations did exceed the ecoregion value for WWH small rivers (ECBP 320 #/100 ml). Generally, concentrations increased from the upper reaches of Walnut Creek to RM 13.75.

Total suspended solids concentrations increased longitudinally (upstream to downstream) along Walnut Creek, dropped sharply at RM 5.18, but TSS concentrations still remained higher than those found upstream. TSS values ranged from the detection limit of 5 mg/l to 728 mg/l. Neither Baltimore WWTP nor Ashville WWTP were significant sources of suspended solids as determinded by our grab samples collected on the same days. Canal Winchester was a source of suspended solids, but it did not account for all the instream loadings. For example, on July 25 the TSS concentration for the effluent sample was 6 mg/l and the mixing zone sample was 632 mg/l. Upstream from the treatment plant, the TSS value was 650 mg/l indicating the source was not entirely from the plant. Possible sources include construction site activities, ereoding stream banks, and/or agricultural runoff.

Ammonia concentrations were at or near the detection limit of 0.05 mg/l throughout the mainstem. Average ammonia concentrations rose immediately downstream from the Baltimore WWTP and Canal Winchester WWTPs. The highest ammonia concentration recorded for Canal Winchester was 37.7 mg/l on July 11 and was a result of incomplete treatment of sewage. Exclusion of this one data point still resulted in an average ammonia concentration of 2.0 mg/l for the WWTP. Instream ammonia concentrations ranged from 0.05 mg/l (detection limit) to 0.17 mg/l (RM 39.70).

Instream average nitrate-nitrite concentrations were near 2.5 mg/l throughout the upper reaches of Walnut Creek mainstem. Concentrations declined downstream from Canal Winchester WWTP. The Baltimore WWTP and Ashville WWTP had significant inputs of nitrates compared to Canal Winchester and are an indication of nitrification. Water samples collected on July 24 and 25 during a rain event generally had the highest concentrations of nitrate-nitrite. Mean nitrite concentrations showed two distinct peaks at RM 41.17 (Basil Street) and RM 24.15 (Canal Winchester WWTP mixing zone) while most sampling locations were near the ecoregion median value for warmwater small streams. Like nitrate-nitrite, nitrite concentrations were rapidly assimilated downstream from these two sites.

Analysis for total metal concentrations were performed on all water samples collected. Several metals, including total cadmium, chromium and nickel were found to be below the laboratory detection limit at all sample locations or the mean value was found to be below the detection limit.

Mean concentrations for metals found above the laboratory detection method generally increased from upstream to downstream for lead, copper and zinc. Specifically, elevated lead levels were noted upstream of Canal Winchester WWTP. The highest concentration of lead was found at RM 16.88 (Hayes Road) on July 25. Bridge repair and paint work were being performed during the sampling season and it is possible that these activities accounted for the elevateded total lead concentrations. It did not appear that the WWTPs were sources of lead but all three plants appeared to contribute to increased zinc levels and Canal Winchester WWTP appeared to contribute to copper concentrations in Walnut Creek. The source of copper at RM 1.22 is unknown.

Average arsenic concentrations were found to be 3 ug/L throughout the mainstem with the exception of effluent samples from the three WWTPs. The highest mean concentration was 8 ug/L at Canal Winchester WWTP. Despite the high concentration, no significant impact was observed downstream.

Mean instream total phosphorus concentrations were below the Ohio EPA recommended guideline of 1.0 mg/l for warmwater streams. Several individual exceedences of the guideline were a result of elevated stream flow after rain fell on July 24th. Mean concentrations for effluent samples from Baltimore WWTP, Canal Winchester WWTP and Ashville WWTP were significantly above that guideline. The agency guideline of 1 mg/l is for prevention of "nuisance algae growth" and is not directly related to the protection of aquatic life. None of the permits issued to the WWTPs limits the amount of phosphorus the plant can discharge. In contrast, median and 75th percentile phosphorus concentrations for small river reference sites in the Eastern Corn Belt Plain ecoregion range from 0.160 to 0.243 mg/l (Ohio EPA 1996). The 90th percentile concentration (0.55 mg/l) is still well below the guideline. In Walnut Creek, those sites influenced by municipal WWTPs had phosphorus levels that deviated from ecoregional norms

In the Walnut Creek mainstem, no semivolatile compounds or PCBs were detected (Table 11). Only two volatile compounds were noted at RM 39.7 (downstream Baltimore WWTP), and one was found in the Canal Winchester effluent sample.

Pesticides were detected in two Walnut Creek mainstem samples. Dieldrin was detected downstream of Baltimore WWTP. All other detected pesticides were found in the Canal Winchester effluent sample. Aldrin and endrin exceeded the chronic aquatic concentration (CAC) for the prevention of chronic toxicity. Pesticide monitoring and limits are not addressed in the current permit for Canal Winchester. However, additional monitoring should be done in order to assess the magnitude and extent of the presence of pesticides in the waste stream.

Pleasantville Creek

There were two sampling stations located on Pleasantville Creek bracketing the Pleasantville

Table 11. Summary of detected concentrations (ug/l) of volatile and semivolatile organic compounds and pesticides in 11 water column and 3 *effluent* samples from the Walnut

Creek study area, 1996. No compounds were present in Walnut Creek samples from RMs 42.5, 24.4, 23.9, 16.8, 15.5, 9.1, 5.1, 4.1, or 1.2. Likewise, the lack of a sample value below indicates the compound was not present. Exceedences of numerical criteria for the prevention of chronic toxicity [Chronic Aquatic Concentration (**CAC**)] are in bold.

Compound	Stream/ Location				
	Walnut Creek	Canal Winchester WWTP	Pickerington WWTP	West Branch of Pawpaw Creek	Newark Group Industry WWTP
River Mile	39.7	*24.2*	*4.35*	0.10	*0.34*
VOCs					
Bromodichloromethane	0.8	-	-	-	-
Chloroform	1.5	-	0.6	-	-
Toluene	-	1.0	-	-	-
Semivolatiles					
Benzo[a]anthracene	-	-	-	2.3	-
Benzo[a] pyrene	-	-	-	3.1	-
Benzo[a] fluoranthene	-	-	-	3.8	-
Benzo[ghi] perylene	-	-	-	2.7	-
Benzo[k] fluoranthene	-	-	-	3.9	-
Chrysene	-	-	-	5.2	-
Fluoranthene	-	-	-	9.9	-
Indeno[123-cd] pyrene	-	-	-	3.0	-
Phenanthrene	-	-	-	5.3	-
Pyrene	-	-	-	7.5	-
Pesticides/ PCBs					
Aldrin	-	**0.018**	-	-	-
a-BHC	-	0.005	-	0.004	-
d-BHC	-	0.023	0.014	-	0.013
y-BHC	-	0.002	-	-	-
4-4'DDD	-	0.010	-	-	-
4-4' DDE	-	-	0.003	-	-
4 4' DDT	-	-	-	-	0.006
Dieldrin	**0.006**	0.004	0.002	-	**0.011**
Endosulfan I	-	-	-	0.003	0.003
Endosulfan II	-	-	-	-	0.006
Endrin	-	**0.019**	-	**0.005**	-
Heptachlor	-	-	-	**0.003**	**0.009**
Heptachlor epoxide	-	0.017	0.004	-	-
Methoxychlor	-	-	-	**0.043**	-
Hexachlorobenzene	-	-	-	0.008	-
All PCBs	-	-	-	-	-

WWTP. The upstream location was at Leitnaker Road (RM 0.8). While the downstream site was at RM 0.74, immediately downstream of the wastewater treatment plant discharge. There were no violations of water quality standards during the sampling period. Upstream and downstream dissolved oxygen levels were similar. No oxygen demanding substances as measured by BOD 5-day and COD were detected.

Pawpaw Creek and West Branch of Pawpaw

Two sampling sites were located on Pawpaw Creek adjacent to Canal Road (RM 1.4) and at State Route 256 (RM 0.54). Three sites were located on the West Branch of Pawpaw Creek at Roley Road (RM 1.30), Ohio Paperboard effluent (RM 0.34) and downstream of Ohio Paperboard (RM 0.10). There was one instance of an exceedence of the average PCR criterion upstream and downstream of Ohio Paperboard for fecal coliform. Mean fecal coliform concentrations were found to be above the erie ontario lake plains ecoregion references site concentrations at three of the five sampling locations. There was no comparable WQS standard or a standard for the erie ontario lake plains (EOLP) for fecal strep. However, comparison with the ECBP concentration for headwater streams all of the instream (excluding Ohio Paperboard) were above the 600 /100 ml value.

Dissolved oxygen concentrations were found to be below the minimum warmwater habitat criterion at the upstream location on the West Branch of Pawpaw Creek on September 3. On all other sample dates, the DO concentration was above 6.5 mg/l. No other DO violations were noted and mean values exceeded the warmwater habitat average criterion (5 mg/l). Ohio Paperboard appeared to be a significant source of oxygen demanding substances in the West Branch of Pawpaw Creek as well as downstream of the confluence with Pawpaw Creek. Datasonde results indicated dissolved oxygen concentrations were lower on Pawpaw Creek below Ohio Paperboard. BOD-5 day concentrations were above other headwater streams in the EOLP ecoregion. COD concentrations were significantly above the ecoregion reference sites at both downstream locations.

Nutrient impacts were observed within the Pawpaw Creek area. Ammonia concentrations were elevated downstream of Ohio Paperboard and again downstream of the confluence of the West Branch with Pawpaw Creek. Although Ohio Paperboard is a significant source of ammonia, it may not account for all the ammonia observed. On all sample days, the concentration downstream exceeded the upstream contribution from Ohio Paperboard. The source of the ammonia is not known. Nitrate concentrations were above the ecoregion reference concentration at all of the sampling sites with a significant contribution from Ohio Paperboard. Nitrite values were lower upstream, while downstream values appeared to be influenced by contributions from Ohio Paperboard. An exceedence of the phosphorus guideline was noted for the downstream site on the West Branch of Pawpaw Creek. Upstream phosphorus concentrations were similar to or lower than the downstream samples.

Suspended solids concentrations were lower at the upstream sites than the downstream sites and reflect the contribution from Ohio Paperboard. Only the upstream mean values did not exceed the EOLP reference concentrations.

Arsenic was the only metal detected in the instream water samples but none of the concentrations exceeded the water quality standards. Lead, nickel and zinc were below the laboratory detection limit.

Organics sampling was performed at two locations on the West Branch of Pawpaw Creek. These included Ohio Paperboard and immediately downstream of Ohio Paperboard at RM 0.10. No volatile compounds or PCBs were detected in these samples. Semivolatile compounds were not detected in the Ohio Paperboard effluent sample but numerous compounds called PAHs were detected in the downstream sample and maybe a result of road tars and oils runoff.

Numerous pesticides were found in both samples on the West Branch of Pawpaw Creek. Dieldrin and heptachlor found in the Ohio Paperboard effluent sample exceeded the CAC criterion. Endrin, heptachlor and methoxychlor exceeded the CAC criterion in the downstream sample. The source of these compounds in the effluent is unknown but surface runoff from the surrounding land into the on-site treatment ponds might serve as a possible source for the pesticides.

Poplar Creek

Water samples were collected at two locations on Poplar Creek. One sample site was at Stemen Road (RM 6.6) and the other site was near the mouth at Bish Road (RM 0.7). Only one exceedence of the maximum Primary Contact criterion (2000 /100 ml) for fecal coliform was observed during the sample collection period at the downstream location. Similar results were observed for fecal strep. Fecal strep was higher downstream (6888 colonies per 100 ml) than what was observed upstream (1417 colonies per 100 ml).

Dissolved oxygen concentrations ranged from 7.1 mg/l to 8.5 mg/l throughout the sampling period. No oxygen demanding substances were recorded. Mean suspended solids concentration was slightly above the detection limit at the upstream site (5.2 mg/l) and increased to 11 mg/l downstream. Nitrates and phosphorus were higher upstream than downstream. No metals were detected other than arsenic which did not exceed the water quality standard.

Sycamore Creek

Thirteen sample sites were located between RM 11.81 (SR 204) to RM 0.13 (Benadum Road) on Sycamore Creek. Elevated total phosphorus concentrations were the most frequent occurances noted during the survey. Phosphorus exceedences of the Ohio EPA guideline were most prevalant in the lower reach of Sycamore downstream of Pickerington WWTP.

Dissolved oxygen concentrations were above the minimum WWH criterion (4.0 mg/l) at all sampling locations on Sycamore Creek. Similar datasonde results were observed on Sycamore Creek with the highest DO values found near the mouth of Sycamore Creek. BOD concentrations were near or below lab detection limits throughout the stream. Slightly elevated BOD levels were observed upstream at RM 11.81 and below Pickerington WWTP. Chemical oxygen demand was found to be extremely elevated (445 mg/l) in the effluent sample collected from Pickerington WWTP on July 15. Excluding that one sample the average COD concentration was 17 mg/l and is consistent with concentrations found throughout the mainstem. Elevated levels were also observed in the mixing zone downstream of the WWTP outfall. The cause of the high COD value is unknown but may have been the result of a toxic slug of material entering the plant. Since other oxygen demanding parameters could not be analyzed because of a leaking sample container the source of the high COD value is unclear.

Suspended solids concentrations were variable throughout the stream. The highest concentrations were found at RM 11.81 and may be a result of horses or other domesticated animals crossing the stream. Suspended solids increased again downstream of Pickerington WWTP and were a direct result of construction at the plant. Stream bank erosion was observed by Ohio EPA personnel.

Nutrient concentrations were generally elevated immediately below the three WWTPs on Sycamore Creek. Instream ammonia concentrations were slightly elevated above the detection limit downstream of Huntington Hills and Pickerington WWTPs. Ammonia values recovered to below detection further downstream of each plant. No ammonia inputs were observed from Jefferson Woods WWTP. Nitrate concentrations increased longitudinally. Typical peaks in nitrates were observed downstream of the three WWTPs. Phosphorus concentrations increased longitudinally with the highest concentrations found downstream of Pickerington WWTP.

Metals concentrations were at or below laboratory detection limits for copper, lead, nickel, and cadmium. A copper exceedence of the numerical criteria for prevention of acute toxicity in a Pickerington WWTP mix zone sample was noted. The source of copper is not known but maybe due to an increase in the use of new copper pipes in housing construction. Zinc concentrations above the detection limit were found downstream of Pickerington WWTP.

In Sycamore Creek, an effluent sample from Pickerington WWTP detected chloroform along with several pesticides, including gamma-BHC (Lindane), DDE, dieldrin and heptachlor epoxide (a degradation product of heptachlor). No semivolatile compounds or PCBs were detected in this sample. The source of these pesticides is unknown and additional monitoring should be performed to determine the frequency and concentration of these compounds in the effluent.

Tussing Ditch

One sample station was located near the mouth of Tussing Ditch at Groveport Road (RM 0.41). Several exceedences of the maximum PCR criterion (2000 /100 ml) were the only violations of water quality standards observed.

Dissolved oxygen concentrations ranged from 11.2 mg/l to 13.26 mg/l on all sample days but one (September 13) which was still above (8.2 mg/l) the average WWH criterion of 5 mg/l. Oxygen demanding substances were not detected on any sampling day.

Nutrients were detected in the water column. Ammonia was found in two samples just slightly above the detection limit. Nitrates were common but well below ecoregion norms. Phosphorus was also detected on two days but both values were below the Ohio EPA guideline (1 mg/l).

Zinc was the only metal detected in the water column but the concentration found did not exceed the Ohio Water Quality Standards.

Georges Creek
Water samples were collected at two sites on the mainstem of Georges Creek at Groveport Road (RM 0.12) and at Winchester Pike (RM 2.1). Two sampling locations were on the East Fork of Georges Creek at Wright Road (RM 2.38) and at Refugee Road (RM 6.05). Numerous exceedences of the water quality standards for fecal coliform were noted on Georges Creek and the East Fork of Georges Creek and are a direct result of failing on-site treatment systems associated with increased urbanization of the nearby land. Two of the values on the mainstem exceeded the maximum Secondary Contact Recreation criterion (5000/100 ml). Although there is no water quality standard for fecal streptococcus, the concentrations found within Georges Creek exceeded the concentration at wadeable reference sites in the Eastern Corn Belt Plains ecoregion (335/100 ml).

Exceedences of the Ohio EPA phosphorus guideline (1 mg/l) occurred near the mouth (RM 0.12) and at RM 6.05 (Refugee Road). Nitrate concentrations were above the median value ECBP for wadeable streams (1.27 mg/l) on the East Fork of Georges Creek and may be due to agricultural inputs. Ammonia concentrations were below detection throughout the subbasin.

A copper violation exceeding the Final Acute Value (FAV) was noted at RM 6.05. A possible source of the copper may be from the copper pipes used in the new development that has been occurring in the area. Other metals were detected but did not exceed water quality standards.

Mean dissolved oxygen concentrations were above the WWH average criterion (5.0 mg/l). Mean BOD-5 day and COD concentrations were above the detection limit and indicate the presence of oxygen demanding parameters. The highest BOD concentrations of the five passes were all on July 25 after a significant rain event (greater than 1 inch rainfall). Similar results were found for COD, although elevated concentrations were also observed on other sample collection days.

North Rickenbacker Run
One of the five North Rickenbacker Run samples contained a fecal coliform bacteria concentration (4200 organisms/100ml) in excess of the SCR criteria. Some nutrient enrichment was evident following a rain storm. Otherwise, water quality in this stream was good.

South Rickenbacker Run
One of the five South Rickenbacker Run samples contained a fecal coliform bacteria concentration (2000 organisms/100ml) equal to the SCR criteria. Zinc was elevated in sample (94ug/l). However, nutrient levels were typical and water quality was considered good. Lower water temperature than was recorded in adjacent streams suggested groundwater probably influences this stream.

Mann's Run
Sampling bracketing Mann's Mobile Home Park WWTP indicated the facility was a source of chronic stress. Three of five downstream samples exceeded the PCR fecal coliform bacteria criteria. Downstream nutrient concentrations reflected consistently enriched conditions. Upstream sample results were consistent with background conditions.

Little Walnut Creek
Five grab samples were collected near the mouth of Little Walnut Creek at RM 0.60 (South Bloomfield-Royalton Road). One fecal coliform exceedence of the maximum Primary Contact Recreation criterion (2000/100 ml) was observed during the study period. This occurred on July 25 and may be related to the rainfall that occurred the day before.

Dissolved oxygen concentrations were above the WWH average criterion (5 mg/l) on all sample days. No oxygen demanding parameters were detected. Nutrients such as ammonia, nitrates, and phosphorus were either below detection or below comparable reference ecoregion sites. Lead was detected once but it did not exceed Ohio's water quality standards.

Chemical Sediment Quality
Sediment samples were collected at fourteen Walnut Creek mainstem and two tributary locations in 1996 (Tables 12 and 13). 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.

Table 10. Dry weight concentrations (mg/kg) of heavy metals in sediments in the Walnut 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-6).

Stream	Sediment Concentration (mg/kg dry weight)[1]								
River Mile	As	Cd	Cr	Cu	Fe	Pb	Hg[2]	Ni[3]	Zn
Walnut Creek									
42.5	7.92[a]	0.333[a]	<16	9[a]	12500[a]	<22	<0.034	<22	54[a]
41.17	13.1[c]*	0.646[b]*	<19	15[a]	19800[b]	<26	0.0409[a]	<26	118[c]*
39.7	11.5[c]	0.646[b]*	<20	17[a]	17900[a]	<27	0.0395[a]	<27	97[b]
36.89	12.2[c]	0.605[b]*	<18	15[a]	18300[b]	<24	0.0346[a]	<24	88[b]
29.9	12.6[c]*	0.619[b]*	22[b]*	18[a]	20300[b]	<26	<0.0339	<26	94[b]
24.45	12.9[c]*	0.635[b]*	21[b]*	19[a]	19400[b]	<25	<0.0351	<25	70[a]
23.9	11.8[c]	0.901[b]**	<31	37[a]	21600[b]	<41	<0.0680	<41	142[c]*
21.20	7.18[a]	0.332[a]	<16	13[a]	13000[a]	<22	<0.0171	<22	42[a]
16.88	10.6[b]	0.519[b]	17[b]	14[a]	16500[a]	<22	<0.0261	<22	58[a]
15.50	8.93[b]	0.521[b]	<19	16[a]	15200[a]	<26	<0.0294	<26	68[a]
9.1	9.44[b]	0.347[a]	16[b]	10[a]	16200[a]	<20	<0.0187	<20	55[a]
5.17	13.9[c]*	0.535[b]	19[b]	15[a]	17500[a]	<24	<0.0371	<24	56[a]
4.14	12.1[c]	0.627[b]*	21[b]*	16[a]	18900[b]	<26	<0.0251	<26	81[b]
1.22	4.39[a]	0.345[a]	22[b]*	17[a]	20100[b]	<28	<0.0402	<28	74[a]
West Branch of Pawpaw Creek									
0.10	13.5[c]*	0.891[b]**	<107	**57[b]*** **	24800[c]	<143	<0.0354	<143	**360[e]*** **
Sycamore Creek									
0.13	10.4[b]	0.586[b]*	19[b]	22[a]	18100[b]	<26	<0.0354	<26	85[b]

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 Mercury data was insufficient to appropriately characterize elevation levels in Ohio.
3 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.
***** value is (highly elevated) above the parameter median plus 4 interquartiles in the Ohio EPA sediment database.**

Table 11. Dry weight concentrations (mg/kg) of priority organic pollutants detected in sediments in the Walnut Creek study area, 1996. 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)
West Branch of Pawpaw Creek			
0.10	BNA	Benzo[a]athracene	5.3 £
		Benzo[a] pyrene	5.6 £
		Benzo[b] fluoranthene*	6.1
		Benzo[k] fluoranthene	5.4 £
		Bis (2ethylhexyl) phthalate*	20.5
		Chrysene	8.2 £
		Fluoranthene	15.6 £
		3&4 Methyl phenol*	6.8
		Phenanthrene	7.5 £
		Pyrene	12.2 £
Sycamore Creek			
0.13	BNA	Fluoranthene	0.8 £

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

Only the severe effect level was used in this report for heavy metal analysis due to differences in Ohio background levels.

Highly elevated levels of zinc and copper were in the sediments of the West Branch of Pawpaw Creek (RM 0.10) compared to Ohio EPA data. No other samples revelead elevated concentrations of metals in the sediment.

Sediment samples were also analyzed for organic compounds including pesticides and PCBs. Only two samples had concentrations above the laboratory detection method and are shown in Table 13. None of the samples collected in the Walnut Creek mainstem revealed the presence of organic compounds. Only one semivolatile compound was detected in Sycamore Creek near the confluence with Walnut Creek. The largest number of compounds were detected near the mouth of the West Branch of Pawpaw Creek. All of these compounds are classified as polycyclic or nuclear aromatic hydrocarbons (PAHs) and are most commonly associated with the heavy fractions of distilled petroleum products like road and roofing tars, blacktop sealers, etc. None of these compounds were in concentrations that would severely impact benthic organisms according to Persuad *et al.*

Particle size analysis of the sediment revealed that most of the samples contained sand or larger particles (Appendix Table A-4). With the exception of samples collected at RM 1.22 (Walnut Creek) and RM 0.10 (West Branch of Pawpaw Creek), all the sediment samples were similar in composition consisting primarily of sand and medium to fine silts. These two samples contained less than 20 percent sand or larger particles and greater than 25 percent fine silt than the other samples. All samples contained less than ten percent clay composition (coarse, medium, fine).

Physical Habitat for Aquatic Life

Walnut Creek

In 1996 the quality of the macrohabitats in Walnut Creek was evaluated at 22 fish sampling sites extending from a site at Cattail Rd. (RM 53.0) downstream to a site near the confluence with the Scioto River (RM 1.3). Good quality stream macrohabitats were present at most locations (Table 14). QHEI scores ranged from 86.0 downstream from the Baltimore WWTP and at Bader Rd. to 57.0 at Pickerington Rd. Including all sites, the mean QHEI was 73.0. 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).

Six fairly distinct reaches were apparent based on habitat attributes (Table 15). The most upstream locations had very good QHEI scores (θ=79.6, n=7). The next two sites averaged fair to good conditions (QHEI θ=59.8). The subsequent reach again resulted in very good QHEI scores (θ=79.5, n=3). The following locations reflected fair to good conditions (QHEI θ=63.4, n=5) and this pattern was repeated one more time (QHEI θ=77.0, n=4) before Walnut Creek joined the Scioto River (QHEI =66.0, n=1). Stream development was the significant dividing factor between these reaches. Additionally, substrate quality was distinctly different as the better habitat locations were less embedded.

Although riffles were present at all but two sites (RM 30.0 and RM 19.4) and every site included deep pools, the general condition and sequence of the riffle, run, and pool complex was poor to fair in the lower scoring reaches. This combination of characteristics called development was especially influenced by the deposition and movement of large sand bedloads in the fair to good reaches. Throughout Walnut Creek inordinately high amounts of silty sand smothered many places which otherwise should have afforded diverse habitat niches. Streambank erosion was an obvious source of some of the depositional fines. Several locations along Walnut Creek exhibited severe erosion accompanied by a very narrow riparian corridor. However, it appeared that an even greater source of fines was from overland erosion. At the confluence with Poplar Creek a large sand delta has formed in Walnut Creek. Likewise, at the mouths of Sycamore and Georges Creeks it was apparent that these streams were delivering abundant quantities of depositional material.

Boulders and cobbles were present at some locations and gravel substrates even predominated a few Walnut Creek sites but moderately silty, sandy embedded substrate conditions were most prevalent across the watershed. Channel morphology tended to be moderately sinuous and fairly stable except in the the lower scoring reaches which were relatively straight and unstable. Flow velocities were variable and all but one location (RM 42.6) included very deep (>1m) pools. The deep pools in particular were an outstanding habitat feature in Walnut Creek. Extensive and moderate amounts of instream cover including logs, woody debris, and rootwads were consistent from site to site.

Table 14. Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Walnut Creek study area, 1996.

			WWH Attributes											MWH Attributes																				
														High Influence						*Moderate Influence*														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	**Total H.I. MWH Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total M.I. MWH Attributes**	**(MWH H.I.+1)/(WWH+1) Ratio**	**(MWH M.I.+1)/(WWH+1) Ratio**
(02-078) Walnut Creek																																		
Year: 1996																																		
53.0	**82.0**	14.08	■	■		■	■	■	■	■	■	■	9						0		■								■			2	0.10	0.30
47.0	**77.5**	6.29	■	■		■	■	■	■		■	■	8						0		■								■			2	0.11	0.33
42.6	**73.0**	4.52	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
41.2	**77.5**	4.83	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
39.7	**86.0**	4.88	■	■		■	■	■	■	■	■		9						0		■											1	0.10	0.20
37.0	**86.0**	6.76	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
34.5	**75.5**	2.85	■	■		■	■	■	■	■	■	■	9						0		■											1	0.10	0.20
30.0	**57.0**	5.56	■					■			■		3						0		■			■	■			■	■		■	6	0.25	1.75
29.1	**62.5**	5.56	■					■			■		3						0		■			■	■			■	■	■		6	0.25	1.75
26.4	**75.5**	3.21	■	■		■	■	■	■		■	■	8						0		■								■			2	0.11	0.33
24.4	**79.0**	4.12	■	■		■	■	■	■		■		8						0		■								■	■		3	0.11	0.44
23.9	**84.0**	4.12	■	■		■	■	■	■	■	■		9						0										■	■		2	0.10	0.30
21.2	**69.0**	5.10	■	■			■	■	■		■		7						0		■			■					■	■		4	0.13	0.63
19.4	**53.0**	4.20		■				■			■		3				◆		1	■	■			■	■			■	■		■	7	0.50	2.25
16.9	**63.0**	2.49	■	■			■	■	■		■		6						0		■			■					■	■		4	0.14	0.71
15.5	**64.0**	2.49	■	■				■	■		■		5						0		■			■	■				■	■		5	0.17	1.00
13.8	**68.0**	2.49	■	■			■	■	■		■		6				◆		1		■			■					■	■		4	0.29	0.86
11.0	**82.0**	3.36	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
9.1	**81.5**	2.67	■	■		■	■	■	■	■	■	■	9						0		■											1	0.10	0.20
5.1	**72.5**	2.55	■	■		■	■	■	■	■	■	■	9						0		■								■			2	0.10	0.30
4.1	**72.0**	2.55	■	■		■	■	■	■		■	■	8						0		■			■					■			3	0.11	0.44
1.3	**66.0**	3.27	■	■			■	■	■		■		6						0		■	■		■					■	■		4	0.14	0.71

Key
QHEI
Components

Table 14. Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Walnut Creek study area, 1996.

Key
QHEI
Components

			WWH Attributes											MWH Attributes																					
														High Influence						Moderate Influence														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	Total WWH Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	Total M.I. MWH Attributes	(MWH H.I.+1)/(WWH+1) Ratio	(MWH M.I.+1)/(WWH+1) Ratio
(02-079) Little Walnut Creek																																		
Year: 1996																																		
4.9	69.0	10.75	■	■		■	■	■	■	■	■		9						0					■								1	0.10	0.20
1.5	71.5	6.85	■	■		■	■	■	■		■		8						0		■								■			2	0.11	0.33
(02-080) Turkey Run																																		
Year: 1996																																		
0.2	72.5	20.83	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
(02-083) Big Run																																		
Year: 1996																																		
1.6	39.5	5.95		■									1			◆	◆	◆	3	■	■			■	■	■		■	■	■	■	9	2.00	6.50
(02-084) Georges Creek																																		
Year: 1996																																		
4.3	43.0	7.88	■	■				■			■		4		◆	◆	◆		3	■	■			■	■			■	■	■	■	8	0.80	2.40
2.4	21.5	7.75											0	◆	◆	◆	◆	◆	5	■	■			■	■			■	■		■	7	6.00	*.**
0.1	47.0	5.46	■	■			■	■			■		5		◆		◆		2		■			■				■	■	■	■	6	0.50	1.50
(02-085) Sycamore Creek																																		
Year: 1996																																		
12.2	64.5	23.81	■	■		■	■	■			■		6				◆		1		■							■	■	■		4	0.29	0.86
9.5	75.5	32.26	■	■		■	■	■		■	■		8						0									■				1	0.11	0.22
8.5	71.5	23.76	■	■		■	■	■		■	■		8						0		■							■	■	■		4	0.11	0.56
6.1	77.5	15.63	■	■		■	■	■		■	■	■	8						0		■							■				2	0.11	0.33
4.7	74.5	12.20	■	■			■	■		■	■		7						0					■				■				2	0.13	0.38
4.2	73.0	6.90	■	■		■	■	■	■		■		8						0		■								■	■		3	0.11	0.44
2.6	78.0	17.86	■	■		■		■	■	■	■	■	8						0		■			■	■							3	0.11	0.44
0.3	73.5	12.99	■	■		■	■	■	■		■	■	8						0					■					■			2	0.11	0.33

Table 14. Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Walnut Creek study area, 1996.

Key QHEI Components

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes: No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	Total WWH Attributes	MWH Attributes, High Influence: Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	MWH Attributes, Moderate Influence: Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	Total M.I. MWH Attributes	(MWH H.I.+1)/(WWH+1) Ratio	(MWH M.I.+1)/(WWH+1) Ratio
(02-086) Poplar Creek																																		
Year: 1996																																		
6.6	**70.5**	17.86	■	■		■	■	■		■	■	■	8						0									■	■			2	0.11	0.33
0.7	**86.5**	14.08	■	■		■	■	■	■	■	■		9						0													0	0.10	0.10
(02-087) Pawpaw Creek																																		
Year: 1996																																		
1.4	**81.0**	16.39	■	■		■	■	■	■	■	■	■	9						0										■			1	0.10	0.20
0.3	**68.0**	10.00	■	■		■	■	■			■		6						0		■							■	■	■		4	0.14	0.71
(02-198) Mud Run																																		
Year: 1996																																		
0.7	**58.5**	14.93	■	■		■	■	■		■	■	■	8				◆		1					■		■		■				3	0.22	0.56
(02-199) Gillette Run (Carroll)																																		
Year: 1996																																		
0.1	**52.0**	6.90	■	■		■	■	■			■		6				◆		1		■			■				■	■	■		5	0.29	1.00
(02-224) Trib. to Pawpaw Creek (Zellerbach Trib.)																																		
Year: 1996																																		
1.0	**87.0**	27.03	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
0.1	**58.0**	16.95	■	■			■	■	■		■		6			◆	◆		2		■			■	■				■	■	■	6	0.43	1.29
(02-225) Trib. to Walnut Creek (Pleasantville)																																		
Year: 1996																																		
0.8	**66.5**	9.71	■	■		■	■	■			■		6						0		■			■				■	■	■		5	0.14	0.86
0.7	**65.0**	9.71	■	■		■	■	■			■		6						0		■			■				■	■	■		5	0.14	0.86

Table 14 Qualitative Habitat Evaluation Index (QHEI) matrix showing warmwater and modified habitat attributes for the Walnut Creek study area, 1996.

Key QHEI Components

WWH Attributes | MWH Attributes: *High Influence*, *Moderate Influence*

River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	Total WWH Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	Total M.I. MWH Attributes	(MWH H.I.+1)/(WWH+1) Ratio	(MWH M.I.+1)/(WWH+1) Ratio
(02-226) Tussing Ditch																																		
Year: 1996																																		
0.3	63.0	8.85	■	■			■	■			■		5				◆		1		■			■				■	■	■		5	0.33	1.17
(02-231) Trib. to Georges Creek (RM 2.0)																																		
Year: 1996																																		
6.0	46.0	43.48		■		■	■	■					4		◆			◆	2	■	■			■				■	■	■	■	7	0.60	2.00
2.4	61.5	6.45	■	■		■	■	■			■		6						0		■							■	■	■		4	0.14	0.71
(02-277) Trib. to Walnut Creek (RM 15.54)																																		
Year: 1996																																		
0.1	55.0	17.24		■				■			■		3	◆		◆	◆		3		■		■	■	■			■	■		■	7	1.00	2.75
(02-278) Trib. to Walnut Creek (RM 15.64)																																		
Year: 1996																																		
0.6	52.0	11.49	■	■		■	■	■			■		6			◆	◆		2		■			■	■			■	■	■		6	0.43	1.29
(02-279) Manns Run																																		
Year: 1996																																		
1.0	65.0	10.87	■	■		■	■	■			■	■	7						0		■							■	■			3	0.13	0.50
0.3	51.0	10.87		■			■						3				◆	◆	2	■	■		■	■				■	■	■		7	0.75	2.50

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 narrow to moderate in width (5-50m).

Evidence of the now abandoned Ohio and Erie Canal is apparent along much of the Walnut Creek corridor. Water from Walnut Creek was once used to feed the canal system and portions of the Creek were incorporated for tow boat use. It is plausible that some of the channel disruptions which were fostored during the canal era still influence habitat conditions today. Further investigation of this premise is encouraged.

In summary, macrohabitat conditions in Walnut Creek were adequate to support the WWH use designation. Efforts to prevent polluted runoff from entering the stream and to increase and maintain the width of the riparian corridor in the watershed are recommended as the most effective ways to improve macrohabitat conditions in Walnut Creek.

Table 15. Average QHEI scores for relatively homogenous segments of Walnut Creek based on sampling conducted during July to October, 1996.

Segment Location								**Average QHEI**
Segment 1: Cattail Rd. to Coakley Rd.								
River Mile	53.0	47.0	42.6	41.3	39.7	37.0	34.5	
QHEI Score	82.0	77.5	73.0	77.5	86.0	86.0	75.5	**79.6**
Segment 2: Pickerington Rd. to Amanda Northern Rd.								
River Mile	30.0	29.1						
QHEI Score	57.0	62.5						**59.8**
Segment 3: Waterloo Rd. to Dst. Canal Winchester WWTP								
River Mile	26.4	24.4	23.9					
QHEI Score	75.5	79.0	84.0					**79.5**
Segment 4: Ust. Georges Creek to Lancaster Rd.								
River Mile	21.2	19.4	16.9	15.5	13.8			
QHEI Score	69.0	53.0	63.0	64.0	68.0			**63.4**
Segment 5: Walnut Creek Pike to Cromley Rd.								
River Mile	11.0	9.1	5.1	4.1				
QHEI Score	82.0	81.5	72.5	72.0				**77.0**
Segment 6: Little Walnut Rd. to Scioto River confluence								
River Mile	1.3							
QHEI Score	66.0							**66.0**

Pleasantville Creek

The quality of the macrohabitats of Pleasantville Creek were evaluated at two fish sampling stations bracketing the Pleasantville WWTP. QHEI values of 66.5 (RM 0.8) and 65.0 (RM 0.7) suggested habitat conditions were sufficient to maintain WWH aquatic life use. As with portions of the mainstem, the silty, sandy, pea gravel substrates were considered a likely limiting factor.

Pawpaw Creek
Better quality riffles upstream from Baltimore were the biggest difference between two Pawpaw Creek fish sampling sites where QHEI scores of 81.0 (RM 1.4), and 68.0 (RM 0.3) were recorded. Again, silty, sandy, pea gravel substrates were considered a likely limiting factor despite the good overall QHEI scores.

West Branch Pawpaw Creek
The highest QHEI score (87.0) in the Walnut Creek basin in 1996 was determined downstream from Roley Rd. (RM 1.0). The gravel and larger sized substrates here were not embedded and the stable well developed morphology had good sinuosity. In contrast, downstream from Newark Industries (RM 0.1, QHEI=58.0) the substrates were extensively embedded with heavy amounts of silt and the channel exhibited glide type characteristics.

Poplar Creek
The best overall habitat conditions in the 1996 study were documented in Poplar Creek at two fish sampling sites (RM 6.6, QHEI=70.5; RM 0.7, QHEI=86.5). Good substrate variety with normal silt and embeddedness, moderate and extensive amounts of instream cover, good morphology and good flow dynamics were typical of the entire stream reach. The threats associated with polluted runoff from agricultural land use and increasing rural residential development were perceived as potential limiting factors. However, the existing habitat conditions (QHEI Θ=78.5) were adequate for recommending and maintaining the EWH aquatic life use designation.

Gillette Run
Fair macrohabitat conditions (QHEI=52.0) existed in Gillette Run at one fish sampling location downstream from Pleasantville Rd. (RM 0.1). A variety of moderately embedded substrates with some indication of past channel modification and a marginal riparian zone existed at the site. The prevalent habitat quality was deemed less than suitable for a WWH biological community.

Sycamore Creek
Similar macrohabitats (QHEI Θ=73.5) were encountered at eight fish sampling sites on Sycamore Creek. Good substrate variety, instream cover including deep pools and channel morphology were consistent across the entire sampling reach (RM 12.2 to RM 0.3). Suburban and rural residential land use was most prevalent in the Sycamore Creek basin. The riparian corridor reflected the patchwork ownership as some property owners manicured the stream banks leaving few trees while others maintained wide natural areas. Although some sporadic embeddedness was observed the relatively strong local gradient (22.6 ft/mi) seemed to keep Sycamore Creek rather silt free and flow in the lower reach was noticably greater especially downstream from the Pickerington WWTP.

Tussing Ditch
Macrohabitats of Tussing Ditch were evaluated at one fish sampling site (RM 0.3) where a QHEI value of 63.0 was determined. Tussing Ditch is channelized upstream from RM 0.8. Downstream, however, the creek retains some normal attributes including adequate instream cover, fair channel morphology, and good second growth forested corridor conditions. Despite the natural appearance in this reach, the gravel substrates were extensively embedded with heavy amounts of silt and the riffles lacked interstitial voids necessary for many aquatic organisms.

Georges Creek
In evaluating the macrohabitats of Georges Creek, QHEI scores of 43.0 (RM 4.3), 21.5 (RM 2.4) and 47.0 (RM 0.1) were recorded at three fish sampling sites. The middle site was channelzed otherwise the stream was extensively embedded with heavy amounts of silt. This combined with the resulting overall poor morphology and a limited amount of instream cover created conditions (QHEI Θ=37.2) which were considered insufficient to support the WWH aquatic life use designation.

Aggressive subdivision development and suburban sprawl without responsible stormwater control was considered the source for the polluted runoff observed in Georges Creek. The amount of fines and erosion increased longitudinally downstream. The gradient in Georges Creek (10.9 ft/mi) has less potential energy to flush fines than that of other sub basin streams. Lacking higher gradient, the fines will continue to affect habitat quality for some time.

East Fork Georges Creek
Similar macrohabitats (QHEI Θ=53.8) were also documented at two East Fork Georges Creek fish sampling locations. Like the Georges Creek sites, the gravel was extensively embedded with heavy amounts of silt and riffle conditions were poor. The most upstream site (RM 6.0, QHEI=46.0) differed from the other location (RM 2.4, QHEI=61.5) because it had been channelized and lacked deep pools.

Big Run
A poor QHEI score (39.5) was recorded in Big Run at Hayes Rd. (RM 1.6). Strong groundwater flow augmented this channelized, ditch like waterway. Lacking the spring water supply this stream would likely be annually intermittent.

North Rickenbacker Run
A fair QHEI score (52.0) was recorded in North Rickenbacker Run at Pontius Rd. (RM 0.6). Sandy pea gravel substrates were extensively and moderately embedded with silt. The previously channelized stream contained sparse to moderate amounts of instream cover and lacked deep pools.

South Rickenbacker Run
A fair QHEI score (55.0) was recorded in South Rickenbacker Run upstream from Pontius Rd. (RM 0.1). This one half mile long waterway was built to convey water and wastewater from the

Rickenbcker Airbase. The sampling site was impounded by a lowhead dam and did not include riffle habitat. Extensively embedded silty, sandy pea gravel substrates predominated a reach with sparse to moderate amounts of instream cover.

Mud Run
At a single sampling site (RM 0.7) on Mud Run a fair QHEI score (58.5) was determined. Cobble and gravel substrates were unimpacted by silt especially compared to other sub basin streams. However, the stream appeared to have been channelized and only contained sparse to moderate amounts of instream cover. Agricultural land use has encroached on the stream leaving only a narrow band of riparian vegetation along the margins.

Mann's Run
Two sites (QHEI θ=58.0) bracketing the Mann's Mobile Home Park WWTP were used to assess macrohabitat conditions in Mann's Run. The most notable difference between the upstream site (RM 1.0, QHEI=65.0) and the downstream site (RM 0.3, QHEI=51.0) was that the lower reach had been channelized and had less instream cover. However, the entire reach was still considered capable of sustaining WWH biological communities.

Little Walnut Creek
Similar macrohabitats (QHEI θ=70.3) were documented at two Little Walnut Creek fish sampling locations. Primarily a gravel based stream, a normal amount of embeddedness at the upstream site (RM 4.9, QHEI=69.0) differed from the most downstream location (RM 1.5, QHEI=71.5) where moderate embeddedness was offset by better pool conditions. Strong groundwater flow and high gradient (27.7 ft/mi) likely enhanced the moderate amount of instream cover at both sites. Overall, the stream habitats were considered adequate to support an EWH aquatic life use designation.

Turkey Run
Turkey Run was sampled at S. Bloomfield-Royalton Rd. (RM 0.2) where a good QHEI score of 72.5 was determined. The cobble, gravel substrates here were not embedded, the site exhibited an extensive amount of cover, and the channel morphology was good. Similar to Little Walnut Creek, good groundwater flow and high gradient (27.9 ft/mi) contributed to conditions that were considered capable of sustaining EWH biological communities.

Biological Assessment: Macroinvertebrate Community

Walnut Creek mainstem, 1996
The macroinvertebrate community in the Walnut Creek mainstem in 1996 was primarily of very

good to exceptional in quality. Downstream from municipal point sources there was good or exceptional macroinvertebrate community performance within 0.3 river miles of the discharge (Table M, Figure 12). There was a maximum total of 18 EPT taxa and 81 total taxa collected at an individual site (RM 42.7) in the EOLP ecoregion which comprised the upper watershed from the headwaters near Buckeye Lake and Thornville to RM 35 upstream from the Poplar Creek confluence. Maximum totals of 25 EPT taxa and 86 total taxa were collected at RM 4.1, a regional reference site, in the lower mainstem reach of the ECBP segment of Walnut Creek (Table 16).

Downstream from the exceptional and very good performances in the macroinvertebrate communities at RM 53.2 and 42.7, respectively, there were sampled sites at RM 47.1 and 41.2 assessed as good performance. Though attaining the WWH ecoregion criterion, the community quality declined compared to each respective upstream site (Figure 12).

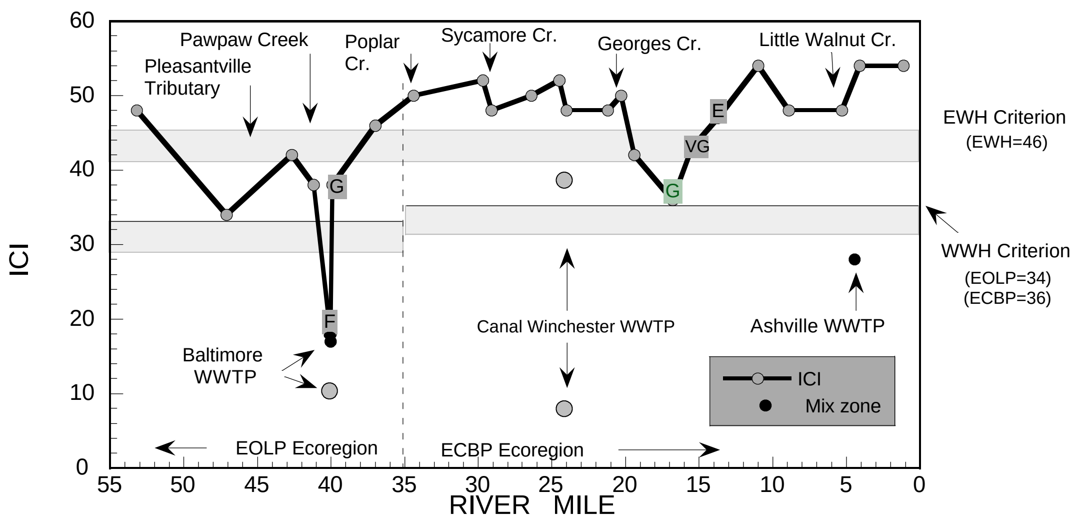

Figure 12 Longitudinal performance of the Invertebrate Community Index (ICI) in Walnut Creek, 1996.

The regional reference site at RM 47.1 decreased likely from silty, embedded substrates conditions restricting habitat. Total taxa and EPT taxa collected decreased by 25 percent or greater from the upstream sample site (Figure 13). It was noted that almost all of the rocky substrates were buried. The small volume and velocity flow through this reach just downstream from Thurston facilitated silt deposition from upstream agricultural nonpoint source inputs. Some trash and artifacts (i.e., tires) were also observed in the stream.

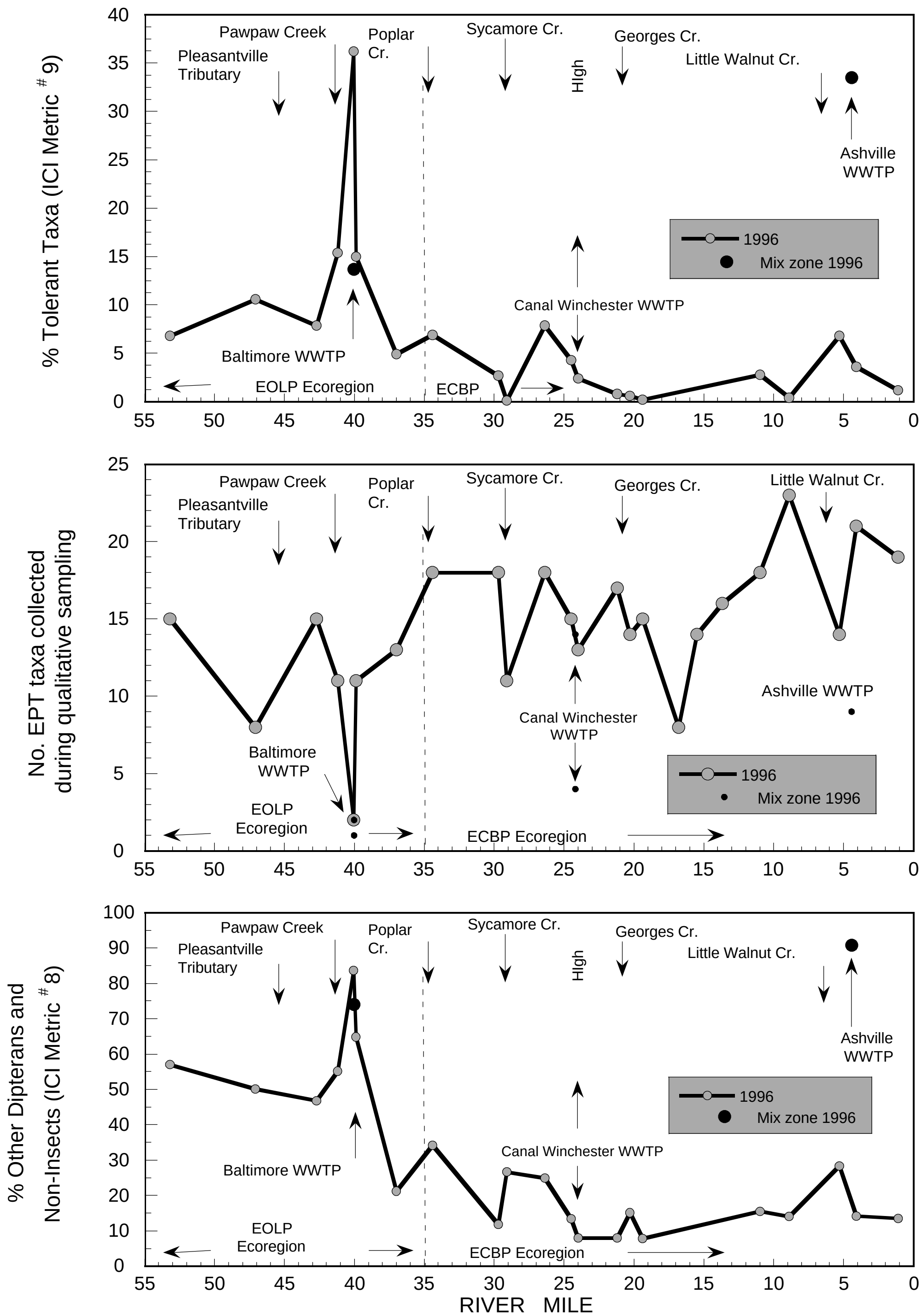

Figure 13 Longitudinal percentage of tolerant organisms (upper plot), number of qualitative EPT taxa (middle plot), and percentage of dipterans and non-insects (lower plot) for macroinvertebrate populations in Walnut Creek, 1996.

The slight decrease in community quality from RM 42.7 (upstream from Baltimore) to downstream from Pawpaw Creek at RM 41.2 (at Basil Rd) can be attributed to municipal influences (increase in solids with some combined sewer discharge from Pawpaw Creek). There was a decrease in the number of baetid mayflies (like *Acerpenna pygmaeus* whose sensitivity is indicated by its weighted ICI= 46.4) and dipteran midge *Rheotanytarsus exiguus group* collected. Chimarra caddisflies were not collected again until well past any urban influences from Baltimore at Bader Road (RM 37.0). The decreased presence of these groups can be indicative of decreases in water quality. There were also increases in the number and percentage of tolerant taxa collected related to the solids and BOD increases.

There was a small segment of non-attainment just upstream from Baltimore WWTP (RM 40.06) at which there was only a fair performance by the macroinvertebrate community. The sampled community was dominated (68% of total sampled population) by dipteran midges tolerant to sewage and toxic wastes (*Dicrotendipes simpsoni*), high BOD/low dissolved oxygen concentrations (*Dicrotendipes lucifer*), and tolerant to abundant nutrient or organic wastes (*Dicrotendipes neomodestus* and *Glyptotendipes (G.) sp*.) (Simpson and Bode, 1980). Percent pollution tolerant organisms (oligochaete worms, midges *Dicrotendipes simpsoni* and *Chironomus (C.) decorus gr.*, the limpet *Ferrissia* and pond snail *Physella*) were greater than 36 percent of the total sampled population. A zero score from this metric of the ICI indicated the lower quality and degraded macroinvertebrate community present. This condition was primarily due to WWTP plant bypasses with additive accumulative inputs from Baltimore (including solids accumulation from TSS with increased COD and from Mill/Monroe St. CSO inputs) exacerbated by the low gradient, slow run/pooled stream reach where minimal aeration and solids deposition occurs.

The Baltimore WWTP acute mixing zone (RM 40.04) was assessed quantitatively as fair performance and not acutely toxic during sampling in September 1996. The earlier qualitative sample in July 1996 was assessed as poor with red midges and leeches predominant. The macroinvertebrate community present (numbers of tolerant midges, one mayfly genera collected, and no caddisflies) indicated varying water quality with possible toxic impacts from past plant upsets or bypassess.

Recovery to good macroinvertebrate community performance occurred within 0.2 miles downstream (RM 39.9). Eleven EPT taxa were present and the predominant *Rheotanytarsus* midge poplation indicated good water quality conditions downstream from Baltimore WWTP. The large numbers of red midges were indicative though of some nutrient enrichment from Baltimore. (1418 organisms/ft.^{2}), though the full effects of nutrient inputs are not completely manifest until 2-3 miles downstream from the discharge. Three miles downstream from Baltimore at RM 37.0 nutrient enrichment was evident from Baltimore and some agriculture NPS inputs, as relative density increased to 2391/ft.^{2} from 558/ft.^{2} upstream from Baltimore. Still, recovery to an exceptional macroinvertebrate community performance was exhibited indicating the potential of Walnut Creek mainstem in the EOLP ecoregion.

The overall exceptional macroinvertebrate community performance continued in the Walnut Creek mainstem from RM 37.0 in the EOLP into the ECBP ecoregion downstream to the site at RM 1.1 near the confluence with the Scioto River. At RM 19.4 (cumulative sediment bedload) and RM 15.5 (in recovery from upstream NPS inputs), the community performance was very good - that is, marginally exceptional or not significantly different from an exceptional score.

The stream reach encompassing the sample site at Hayes Road (RM 16.8) was the only exception to this continuous exceptional to near exceptional macroinvertebrate performance throughout the middle and lower mainstem of Walnut Creek. It was assessed as good which was still in attainment, but this reach was affected by urban stormwater and agricultural NPS sedimentation. These inputs culminated in very unstable, natural substrates and embedded conditions. The lack of stable habitat (embedded or buried) decreased diversity and affected macroinvertebrate community quality.

Exceptional macroinvertebrate communities were observed upstream and downstream from Canal Winchester WWTP in the mainstem of Walnut Creek. The communities were similar immediately upstream and downstream of the outfall. Qual. EPT totals were 14, 13 and 17, respectively, at RM 24.5 (ust.), RM 24.0, and RM 21.2 (downstream sites). Predominate organisms were Rheotanytarsus midges, Hydropsychid caddisflies, and mayflies. Relative densities were similar upstream and downstream (2178/ft^2 to 1591/ft^2 and 2357/ft^2 , respectively, at the above listed sites).

The acute mixing zone of the Canal Winchester WWTP outfall 001 discharge was qualitatively sampled on 7/17/95 and 8/29/96. The macroinvertebrate community sampled on 17 July 95 was narratively evaluated as Good. There were 14 qual. EPT taxa with *Polypedilum* and *Chironomus* midges, *Rheotanytarsus* midges, and Hydropsychid caddisflies predominant. There was evidence of some nutrient enrichment but not acutely toxic conditions due to presence of some of the more sensitive taxa: 1) *Rheotanytarsus* midges, 2) mayflies such as *Leucrocuta* and *Caenis*, and 3) *Hydropsyche simulans* and *Chimarra* caddisflies. There was some dilution of the effluent from a side channel flowing past the discharge.

The second sampling on 29 August 95 indicated the macroinvertebrate community was being organically impacted due likely to nutrient sludge/solids with symptomatic high BOD and probable low diel D.O. concentrations. Acutely toxic conditions were present, and the community in the acute mixing zone was as assessed as poor. The qual. EPT taxa collected decreased from 14 to 4 with all of the sensitive or generally intolerant taxa disappearing. The predominant organism was *Chironomus (C.) riparians*, which is tolerant of large nutrient waste sludge/solids inputs (high BOD) and low D.O. concentrations as low as 1 mg/l (Simpson and Bode, 1980). A waste sludge depositional zone was present in the margin (2-3 ft. wide), and no insects (except possibly *Chironomus (C.) riparians*) were collected. All of the mayflies and caddisflies collected (which corporately totalled less than 10 individuals) were found at the distant end of the sampling zone, where possibly some interstitial dilution was occurring. The side channel was not flowing as before because of normal summer low flow conditions (no upstream dilution water was flowing on surface).

Table 16. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Walnut Creek study area, 1996. Biocriteria and narrative ranges are in Table 2.

Stream River Mile	Drainage Area (mi^2)	Relative Density ($/ft^2$)	Quantitative Taxa	Qualitative Taxa	Cumulative Taxa	Qualitative EPT[a]	Cumulative EPT	Cumulative Predominate Organisms	QCTV[c]	ICI	Narrative Evaluation[b]
Walnut Creek (WWH) EOLP											
53.2	7.6	233	47	51	74	15	16	8,5,27,9,6	39.6	48	Exceptional
	26.0	368	31	42	55	8	12	9,5,27	38.9	34	Good
42.7	42.0	554	44	62	81	15	18	5,3,8,1,6,27	38.9	42	Very Good
41.2	60.0	861	44	49	66	11	15	5,18,6	38.2	38	Good
40.06	61.0	598	23	25	39	2	2	18,9,21	35.0	[12*][d]	Fair*
40.04A	*61.0*	*Low*	--	*12*	*12*	*1*	*1*	*18*	*26.3*	*P*	*Poor*
40.04B	*61.0*	*Mod.-Low*	*22*	*13*	*29*	*2*	*3*	*18,34,35*	*33.9*	*18*	*Fair*
39.9	61.0	1418	34	55	68	11	11	5,18,34,6	38.2	[30[ns]][d]	Good
37.0	66.0	2391	41	54	68	13	17	5,3	38.2	46	Exceptional
Walnut Creek (WWH) ECBP											
34.4	87.0	1739	54	60	78	18	18	5,15,3,1,18	39.0	50	Exceptional
29.7	114	3159	48	61	78	18	21	5,1,3	39.7	52	Exceptional
29.1	138	2304	36	55	69	11	18	5,18,7,34	36.3	48	Exceptional
26.4	146	836	45	55	71	18	22	5,3,34,9,6	40.9	50	Exceptional
24.5	151	2178	43	60	73	15	17	5,8,27,6,11	38.7	52	Exceptional
24.19A	*152*	*High-Mod.*	--	*43*	*43*	*14*	*14*	*18,3,5*	*38.5*	*G*	*Good*
24.19B	*152*	*Mod.-Low*	--	*22*	*22*	*4*	*4*	*18,11*	*37.2*	*P*	*Poor*
24.0	152	1591	27	47	51	13	13	5,1,3,6,17	38.9	48	Exceptional
21.2	177	2357	32	39	54	17	20	5,3,1,8	39.7	48	Exceptional
20.3	177	4194	41	57	69	14	20	3,5,15,8,1,7	40.0	50	Exceptional
19.4A	182	High-Mod.	--	59	59	15	15	3,1,8,27	38.9	VG	Very Good
19.4B	182	2951	28	50	61	15	19	8,3,17,34,27	38.2	42	Very Good
	188	Mod.-Low	--	33	33	8	8	3,1,8,6	38.9	G	Good
15.5	195	High-Mod.	--	50	50	14	14	8,5,17,7,11,34	39.1	VG	Very Good
13.7	198	High-Mod.	--	70	70	16	16	5,17,18,6	38.9	E	Exceptional
11.0	206	2219	47	63	76	18	21	1,5,17,27,6	38.9	54	Exceptional
8.9_{RR}	212	905	34	81	83	23	23	5,15,1,19,11,10,34,6	38.9	48	Exceptional
5.3	272	2175	53	63	80	14	18	18,5,31,17,27	38.5	48	Exceptional
4.42B	*273*	*2670*	*44*	*35*	*57*	*9*	*15*	*1,6,29,13,18*	*39.1*	*28*	*Fair*
4.1_{RR}	273	3389	40	74	86	21	25	5,3,27,34	39.2	54	Exceptional
1.1	285	948	43	60	75	19	21	17,6,1,31,26	39.3	54	Exceptional

Stream River Mile	Drainage Area (mi^2)	Relative Density ($/ft^2$)	Quantitative Taxa	Qualitative Taxa	Cumulative Taxa	Qualitative EPT[a]	Cumulative EPT	Cumulative Predominate Organisms	QCTV[c]	ICI	Narrative Evaluation[b]
Pleasantville Creek. (Trib. To Walnut Creek (RM 45.45)) (WWH) EOLP											
0.8	11.2	Low	--	30	30	4	4	10,22,7,3,28	37.2	MGns	Marginally Good
0.6	11.2	Mod.-Low	--	32	32	4	4	3,9,18,6,12	37.2	MGns	Marginally Good
Pawpaw Creek (WWH) EOLP											
1.4	10.5	Low	--	41	41	6	6	9,3,6	38.9	G	Good
0.4	16.5	428	39	49	63	6	9	15,18,5,16	35.5	36	Good
West Branch of Pawpaw Creek (Trib. To Pawpaw Creek RM 0.55.) (WWH) EOLP											
1.3	5.0	Low	--	39	39	8	8	8,7,3,6	38.3	G	Good
0.1	5.5	High-Low	--	42	42	7	7	15,8,7,18	34.2	F*	Fair
Poplar Creek (WWH / Recommended EWH) ECBP											
6.6	8.1	Mod.	--	57	57	16	16	3,11,6	36.3	E	Exceptional
0.7	17.5	Mod.	--	39	39	12	12	15,3,5	39.1	VG[ns]	Very Good
Gillette Run (WWH) ECBP											
0.1	6.1	Mod.-Low	--	42	42	11	11	15,3	38.2	G	Good
Sycamore Creek (WWH) ECBP											
11.8	4.7	Mod.	--	45	45	8	8	3,29,15,8,7,6	34.2	MGns	Marginally Good
9.6	8.7	Mod.-Low	--	50	50	12	12	3,29,9,2,6	38.3	G	Good
8.4	9.7	High-Mod.	--	59	59	12	12	3,2,29,15,8	38.3	VG	Very Good
6.1	14.8	High-Mod.	--	60	60	15	15	3,9,2,18,8	38.9	VG	Very Good
	17.3	348	44	34	54	9	14	3,27,6,9	39.2	44	Very Good
4.3	18.6	1706	40	38	52	8	9	15,7,18,16,5	37.5	36	Good
2.7	21.6	590	41	46	65	6	12	3,5	38.2	42	Very Good
0.1	24.3	700	45	30	54	10	17	15,5,27	40.5	40	Good
Tussing Ditch (WWH) ECBP											
0.4	4.0	Mod.-Low	--	51	51	8	8	15,3,7,10,6,19	31.4	MG[ns]	Marginally Good
Georges Creek (WWH) ECBP											
6.4	1.7	Mod.-Low	--	34	34	6	6	3,7,6	39.1	MGns	Marginally Good
2.1	4.5	Low	--	27	27	2	2	33,16	35.3	F*	Fair
0.1	15.4	Mod.-Low	--	46	46	7	7	8,15,27,6	35.3	MGn	Marginally Good
East Fork of Georges Creek (Trib. To Georges Creek RM 2.0) (Recommended WWH) ECBP											
	1.5	532	45	34	62	8	12	3,15,18,6,27	38.9	46	Exceptional
2.4	5.3	Mod.-Low	--	32	32	7	7	3,8,6,12	39.1	G	Good
Big Run (Existing WWH) ECBP											
1.5	6.3	Mod.	--	42	42	6	6	3,18,6	35.3	MG[ns]	Marginally Good
North Rickenbacker Run (Trib. To Walnut Creek RM 15.64) (Recommended WWH) ECBP											
0.6	2.4	Mod.	--	29	29	6	6	27	32.6	MGns	Marginally Good
0.2	2.5	Mod.-Low	--	31	31	2	2	25,21,28,26	34.8	F*	Fair

Stream River Mile	Drainage Area (mi^2)	Relative Density ($/ft^2$)	Quantitative Taxa	Qualitative Taxa	Cumulative Taxa	Qualitative EPT[a]	Cumulative EPT	Cumulative Predominate Organisms	QCTV[c]	ICI	Narrative Evaluation[b]
South Rickenbacker Run (Trib. To Walnut Creek RM 15.54) (Recommended MWH) ECBP											
0.1A	0.6	Low	--	14	14	0	0	13	24.8	P*	Poor
0.1B	0.6	Low	--	13	13	0	0	13	32.8	P*	Poor
Mud Run (WWH) ECBP											
0.7	11.5	High-Mod.	--	46	46	10	10	8,3,18,7	38.2	G	Good
Manns Run (Recommended WWH) ECBP											
1.3	3.7	Mod.-Low	--	35	35	3	3	3,22	37.5	F*	Fair
1.0	3.8	Low	--	19	19	4	4	9	38.3	F*	Fair
0.3A	4.7	Low	--	16	16	2	2	9	38.3	F*	Fair
0.3B	4.7	Low	--	40	40	4	4	9,5	36.3	F*	Fair
Little Walnut Creek (WWH / Recommended EWH) ECBP											
5.7	14.8	High-Mod.	--	64	64	10	10	8,7,18,10	37.8	VGns	Very Good
	44.0	Low	--	20	20	1	1	27,13,24	34.2	<u>P</u>*	Poor
Turkey Run (WWH / Recommended EWH) ECBP											
0.2	15.5	Mod.-Low	--	60	60	20	20	3,8,6,30,10,9	38.2	E	Exceptional

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).

<u>Predominant organism code list</u>

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	

Ashville WWTP acute mixing zone was asssessed as not acutely toxic. Fifteen EPT taxa were collected, and an ICI score of 28 (fair) was recorded. Relative densities did increase over 36 percent from 2175/$ft.^2$ upstream from Ashville to 3389/$ft.^2$ downstream from Ashville WWTP.

The macroinvertebrate community performance in the Walnut Creek mainstem indicated near exceptional to exceptional water quality through most of its length. Main points of concern that could threaten future attainment (decreased ICI scores) were: 1) near Baltimore downstream from Pawpaw Creek (solids/BOD accumulation, combined sewer discharges) to the Baltimore WWTP (raw sewage bypasses, upsets); 2) urban NPS sedimentation/siltation from suburbanization effects including increased erosion, unstable moving sediment bedloads, and direct and indirect loss of riparian corridor; 3) agricultural NPS effects (riparian encroachment, sedimentation or siltation, nutrients); and 4) increasing accumulating nutrient loads from mainstem discharges and tributaries.

Pleasantville Creek

The macroinvertebrate community both upstream (RM 0.8) and downstream from Thurston WWTP (RM 0.6) were assessed as marginally good based on qualitative sampling of the natural substrates. The WWTP 001 discharge effluent did not seem to largely impact the macroinvertebrate community. There were four EPT taxa collected at both sampled sites. Rheotanytarsus midges were collected only downstream from the discharge during sampling, but so were tolerant *Chironomus (C.) decorus group* midges. This factor and the increase in rifflle beetle predominance indicates that there was some nutrient influences. The total number of caddisflies and mayflies collected increased at RM 0.6 due to the slight increase in rocky riffle/run substrates and volume flow downstream from the discharge compared to upstream at RM 0.8. Physical habitat was limited due to past erosion, overall embedded conditions, and a lack of available rocky substrates. This generally lowered diversity at both sites.

Pawpaw Creek (RM 41.39)

The upstream site on Pawpaw Creek (RM 1.4) indicated good water quality, but some municipal influences were apparent. The large number of Chironomus midges present indicated a organic input - possibly agriculture NPS or on-site septic system discharges. The EPT taxa total collected was lower than expected, and riffle beetles were one of the predominant organisms in the riffles and runs. Probable factors for these conditions were more gravel/sand substrates in the riffles and runs (more typical of EOLP streams) and also probable agriculture NPS inputs from the upper watershed (stormwater runoff, sedimentation and nutrient inputs). Hydropsychids and Heptageneid mayflies were also predominant organisms and typical of good macroinvertebrate community conditions.

This highly contrasts with the downstream site in Pawpaw Creek at RM 0.4 which is downstream from the confluence with the tributary into which the Ohio Paperboard Co. discharges. Abundant blackflies were present in the riffles, and red and nonred midges, and *Physella* snails were predominant in the other available stream habitats. All of these organisms, including oligochaete worms which populated the artificial substrate samplers, indicated obvious nutrient-enriched conditions. The ICI score of 36 (good) still attained the WWH criterion. The riparian cover benefitted the stream community keeping stream temperatures cooler and diel dissolved oxygen concentrations moderate, especially night time D.O.s when high TSS and COD and a known localized municipal combined sewer discharge (Mill/Monroe St. overflow) could potentially impact the stream community downstream from Ohio Paperboard. The higher gradient and inherent aeration also contributed to a decreased effect through this reach. Potential for delayed impacts downstream to the Walnut Creek mainstem is noted due to accumulated solids, elevated COD, and possible low diel D.O.s in slow run/pooled area downstream from Basil Road. This reach is threatened if good treatment of Ohio Paperboard final effluent, particularly solids removal, is not sufficient.

West Branch of Pawpaw Creek

There was a good macroinvertebrate community at the upstream site at RM 1.3. Predominant organisms included baetid mayflies, nonred and red midges, hydropsychid caddisflies, and heptageneid mayflies. Eight EPT taxa were collected during qualitative samping. There was however some embedded conditions from sedimentation, and some recovery had occurred from past channelization.

The sampled site at RM 0.1 downstream from the Ohio Paperboard effluent discharge indicated decreased water quality from accumulated suspended solids (high TSS - 22-60 mg/l) and elevated COD (mean=138 mg/l from five effluent samples). High densitites of blackflies were the most predominant organism in the riffles followed by baetid mayflies and nonred midges *Helopelopia sp*. and *Conchapelopia sp*. from the subfamily Tanypodinae. The tolerant midge *Chironomus (C.) decorus gr*. was predominant in the run and pools. Tolerant taxa *Physella* snails and oligochaete worms also increased significantly in response to the degraded conditions. The sampled community was assessed as fair which did not attain the WWH criterion. The QCTV (median community tolerance value) decreased from 38.3 upstream to 34.2 which falls below the lower quartile value (35.5) for all sites attaining the WWH criteria for the EOLP ecoregion. Possible effects downstream from Ohio Paperboard with respect to Pawpaw Creek and Walnut Creek mainstem downstream from Basil Road were discussed above.

Poplar Creek

Poplar Creek was a nice rubble-filled stream with good riffle/run development, deeper pools and varied margin habitats. The upstream site at RM 6.6 was assessed as exceptional. There was 16 EPT taxa collected, including Helicopsyche and Chimarra caddisflies and the baetid mayfly *Diphetor hageni*. Ceratopsyche and hydroptilid caddisflies and stenonemid mayflies were predominant at the upstream site. There was high diversity, as 57 total taxa were collected during qualitative sampling. However there was some NPS siltation effects observed. Some riparian encroachment from agricultural and some residential lots in addition combined with stormwater runoff to increase erosion effects.

The riparian encroachment and accumulating NPS sedimentation through the subwatershed was observed at the downstream sample site (RM 0.7). Higher than normal riffle embeddedness and silt/sand accumulation in pools limited some habitat and did decrease taxa diversity. Water pennies, several caddisflies (*Chimarra*, *Helicopsyche*, and *Hydroptila* sp.), heptageneid mayflies and the baetid mayfly *Diphetor hageni* were not collected compared to upstream at RM 6.6. The total EPT taxa collected decreased 25 percent from 16 to 12. Besides caddisflies and Rheotanytarsus midges, the presence of large numbers of blackflies indicated some nutrient inputs. The QCTV did increase to 39.1 which correlated to some of the more tolerant organisms not being collected (Chironomus midges, oligochaete worms and flatworms). The macroinvertebrate community was still assesssed as very good (which was nonsignificant departure from exceptional) and still attained the recommended EWH criterion. In conclusion, obvious threats to the biological community in Poplar Creek were agricultural NPS siltation, loss of riparian corridor which increases erosion and other

NPS effects, and expanding suburbanization.

Gillette Run
The macroinvertebrate community was assessed as good attaining the WWH criterion. However the community had been impacted by localized channelization and bank contouring near Carroll at State Route 33 during highway construction in spring and summer of 1996. The eroded banks and muddy stream conditions with silt and mud on the bottoms of the rocks observed downstream during sampling at RM 0.1 pointed to these NPS impacts. Stormwater runoff from Carroll and St. Rt. 33 also contributed to the sedimented and eroded conditions. Also the predominance of blackflies over caddisflies in the riffle and the green color from algal production in the pools indicated some structural effects in the macroinvertebrate community from nutrient inputs from Carroll WWTP.

Sycamore Creek
Overall, Sycamore Creek, which still was a very nice ECBP stream, attained the WWH criterion, but sampling did document some municipal and NPS effects to community quality and diversity. Assessments ranged from marginlly good at the furthest upstream site to very good community perfromance at four of the eight sites sampled. Total EPT taxa collected ranged from 8 to 17, and totals of 45 to 65 different organisms were collected at each site sampled.

The upstream sample site at RM 12.2 documented a marginally good macroinvertebrate community performance due to NPS effects. Blackflies and flatworms were among the predominant organisms along with nonred midges and expected family taxa groups like hydropsychid caddisflies, baetid and heptageneid mayflies. Blackflies and flatworms in abundance coupled with the additional presence of leeches, oligochaete worms, *Physella* snails and some tolerant midges indicated degradation and correlated to upstream nutrient inputs, narrowed riparian cover, and other NPS runoff effects. A horse farm, Stonyrise Thoroughbred Farm with fenced pastures, was located adjacent to the stream and contributed to NPS nutrient inputs. Other possible slight nutrient inputs were from some on-site septic systems. Riparian cover ranged from 50 percent to completely open canopy conditions magnifying nutrient effects and contributed to the decrease in community structural quality compared to reference expectations.

At RM 9.6 at Refugee Road there was more riparian cover and a decrease in silt deposition compared to the upstream site. There was still NPS nutrient inputs, as hydorpsychid and *Chimarra* caddisflies and riffle beetles shared predominance with blackflies and flatworms. An increase to good quality was apparent with the presence of *Helicopsyche* and *Chimarra* caddisflies, *Elimia* snails, and *Stenonema vicarium* (with a weighted ICI of 46.5).

The sampled site at Stemen Road (RM 8.4) also had 12 EPT taxa like upstream. The macroinvertebrate community was assessed as very good. A similar community was present with increased diversity including higher quality dipteran midges *Parametriocnemus sp.* and *Tanytarsus guerlus group*. Now the hydropsychid and Chimarra caddisflies were more predominant than the flatworms and blackflies present. Baetid mayflies and hydropsychid caddisflies were predominant in the run with oligochaete worms common. The relative density was increased due to nutrient inputs from Huntington Hills WWTP (RM 8.9). There was slightly more silt present, as noted by the increased numbers of Ferrissia limpet snails in the run, and downstream from a tributary confluence (downstream from Stemen Rd.) there were high water marks and some very eroded banks.

The site in Sycamore Park (RM 6.1) at the upstream edge of Pickerington had more grassy open area and a smaller and younger tree canopy that allowed more stream exposure increasing the algal production, and the relative density in the riffle was high. The community quality improved though compared to upstream, as only higher quality organisms, like hydropsychid and Chimarra caddisflies and the riffle beetle Stenelmis sp., were now predominant. This very good macroinvertebrate community had the highest number of EPT taxa collected during qualitative sampling (15) and the highest number of taxa collected during qualitative sampling. Upstream from the park was a naturally wooded reach which helped mitigate and assimilate effluent and some nutrient inputs from upstream.

The Hill Road (N.) sample site upstream from Pickerington WWTP at RM 4.9 scored a macroinvertebrate ICI of 44 showing continued very good quality. There was a high quality midge community present, including *Parametriocnemus sp., Nilotanypus fimbriatus, Corynoneura lobata, Thienemanniella n. sp. 1, Tvetenia bavarica group,* and *Rheotanytarsus distinctissimus group*. These complemented the different caddisflies and mayflies present. However siltation limited the mayfly population numbers due to embedded conditions in the natural substrates, and NPS stormwater runoff has widened the steam and rendered much of the margin unusable at lower flows except for the shallows and a very small amount of undercut banks and root mats.

Downstream from the Pickerington WWTP at RM 4.3 the macroinvertebrate community scored an ICI of 36 (good). The effluent, though not acutely toxic outside the mixing zone as evidenced by a large population of Tanytarsini midges, contained a moderate amount of solids which deposited on the natural and artificial substrates. The settled solids stimulated a very large oligochaete worm population which was over 23 percent of the total sampled population. Nutrient enriched conditions were present immediately downstream from the WWTP, as the relative density increased to 1706 organisms/ft.^{2} from 348 organisms/ft.^{2} upstream. A high density of blackflies and moderate numbers of midges were predominant in the riffles. Likely due to solids deposition and periodic low dissolved oxygen concentrations the run and pool habitat was underutilized, as low densities and low diversity of mostly tolerant organisms (e.g, tolerant midges and oligochaete worms) were present in these areas.

The enriched stream conditions were short-lived; the macroinvertebrate ICI at RM 2.7 near Busey Road scored a 42 or very good conditions. Caddisflies and *Rheotanytarsus* midges were predominant in the riffle and runs, and 65 total taxa were collected. The relative denstiy had decreased to 590 organisms/ft.^{2} and indicated more ambient conditions. The embedded conditions from NPS sedimentation upstream (Pickerington WWTP construction) limited the mayfly population totals, and other organisms like the water penny, which utilizes the undersides of rocks, were not present. By contrast, *Ferrissia* limpets, tolerant of siltation and embedded conditions, comprised 15 percent of the total sampled population.

The site at the mouth of Sycamore Creek downstream from Benadum Road scored a macroinvertebrate ICI of 40 (good), still attaining the WWH criterion. The predominance of blackflies in the riffles and oligochates on the quantitative substreate samplers (16% of the total sampled population) indicated nutrients had changed the community structure. Jefferson Woods WWTP (RM 1.0) and private on-site septic systems were nutrient sources located upstream. Riparian removal and thinning increased any accumulating nutrient effects. The larger substrates in the riffle/run habitats were moderately embedded. There was increased bedload movement of sand and gravel from upstream, and riprap placed in eroded areas illustrated NPS stormwater and sedimentation effects.

Sycamore Creek was still a very good quality stream. For the amount of effluent discharged into it (> 2.1 MGD), the stream macroinvertebrate community continued at a good to very good performance. Continued suburbanization, additional effluent discharges, losses of riparian corridor, and other related NPS stormwater and nutrient inputs will continue to threaten to degrade the quality and diversity of the biological communities that are still present in Sycamore Creek. Keeping effluent treatment quality high, increasing riparian width, and finding ways to decrease or slow down suburban stormwater runoff would likely increase Sycamore Creek and its biological communities to exceptional quality conditions.

Tussing Ditch

Downstream from Groveport Road there was good habitat (good riffle, natural substrates, varied moderate flow and velocity) with sufficient potential for a typical WWH macroinvertebrate community to be present. There was a mixture of positive and negative attributes found during qualitative sampling. Eight EPT taxa were collected, and predominant organisms commonly observed in typical warmwater streams included hydropsychid caddisflies, *Elimia* snails, heptageneid and baetid mayflies, and *Bryozoa*. Predominant organisms indicative of nutrient waste inputs or possible toxic stresses were blackflies and leeches. The dipteran midge, *Conchapelopia sp.*, was also among the predominant taxa in the riffle/run habitat and can become prevalent downstream from toxic or organic stresses (Simpson and Bode 1980). Other tolerant taxa collected were *Cricotopus (C.) bicinctus*, *Cricotopus (Isocladius) sylvestris group*, and *Chironomus (C.) sp*. midges, oligochaete worms, and the snails *Physella sp*. and *Planorbella pilsbryi*. The QCTV was 31.4 - the lowest of the survey.

The marginally good performance of the macroinvertebrate community was possibly due to influences from these possible sources: malfunctioning on-site septic systems and/or residual downstream movement and exposure to affected sediment from past upstream industrial discharges. There were elevated D.O.'s (12-13.3 mg/l), increased conductivity (1176 and 1187 umhos/cm), fecal coliform and fecal strep. bacterial counts (4100 and 46,000/100 ml., respectively), and sulfate concentrations similar to WWTP effluent discharge concentrations.

Nestaway, Inc. (formerly Canal Wire, Inc.) discharged both process and sanitary waters to Tussing Ditch at RM 0.74 and 0.76 until February 1993. Follow- up sediment analyses of Tussing Ditch is recommended to confirm the identity of sources inputs that have increased the tolerant structure in the macroinvertebrate community.

Georges Creek
This subwatershed has a large amount of suburbanization and growth in the upstream reaches. Stormwater NPS runoff effects from new construction and roadwork influenced the macroinvertebrate community. There was silt and mud in the run and pools at the sampling site at Long Road (RM 6.4), but the macroinvertebrate community was still marginally good. Six EPT taxa were collected, and hydropsychid caddisflies, heptageneid mayflies and nonred midges were predominant in the riffle and runs. Two quality organisms collected of note were *Helichus sp*., a dryopoid beetle whose weighted ICI was 41.4, and the dipteran midge *Tvetenia bavarica group* with a weighted ICI of 44.1. The QCTV was 39.1 - near the median for ECBP streams attaining WWH criterion.

The fair performance at RM 2.1 upstream from Winchester Pike Road and the confluence with the unnamed trib. to Georges Creek was due to degradation of habitat from agricultural practices. It was a muddy ditch running through a corn field with a grass and weed riparian corridor and a half-open canopy. The density and diversity of organisms decreased substantially. Leeches and oligochaetes were predominate in the margins. Low numbers of Stenonemid mayflies were present in the pool on the small amount of rocky substrates available. Mud and muck covered a large portion of the stream bottom. There were no caddisflies collected, and only two mayfly taxa were present. The QCTV of 35.3 was consistent with the fair performance evaluation (non-attainment). The habitat improved downstream from the confluence with the unnamed tributary to Georges Creek.

Near the mouth (RM 0.1) the riparian habitat was similar to the upstream reach at RM 6.4. The stream was was still very muddy from accumulating sediment from stormwater and agricultural influences. Baetid mayflies, blackflies, and midges were predominant in the riffles. The heptageneid mayflies were primarily under rocks and logs in the run, while the Asian clam *Corbicula fluminea* preferred the accumulating silt and sand in the runs. The EPT taxa and total taxa collected increased to seven and 46, repectively. The presence of *Dipetor hageni*, a more rare and sensitive baetid mayfly (weighted ICI=45.9), contrasted with the predominant blackflies (nutrient influences) and increased presence of silt tolerant *Ferrissia* limpets and the alderfly *Sialus sp*. confirm NPS influences. The marginally good macroinvertebrate community quality still attained the warmwater habitat criterion. This watershed needs riparian corridor improvements and some stormwater abatement actions to improve stream quality.

East Fork of Georges Creek
The reference site at RM 6.0 downstream from Refugee Road was now enclosed by newer housing developments with a wetlands and stormwater retention area 200 yards upstream with largely a partially open canopy upstream. There was still a narrow but intact riparian corridor (closed canopy)

downstream from Refugee Road. Good rocky natural substrates were available in the stream, though silt was evident along with some embedded conditions. Despite the nutrient inputs upstream from New England Acres East WWTP at RM 8.25 and suburbanization NPS stormwater and sedimentation effects, the macroinvertebrate community present still scored an exceptional ICI score of 46. Predominant organisms included hydropsychid caddisflies, blackflies (symptomatic of some nutrient inputs and more open canopy conditions), midges (including *Stictochironomus sp*.), and Stenonemid mayflies. Twelve total EPT taxa and 62 total taxa were indicative of the higher quality and the diverse midge, beetle, and mayfly taxa sampled, particularly in the quantitative sampling.

There was a good macroinvertebrate assessment downstream ar RM 2.4. Moderate densities of hydropsychid caddisflies, baetid mayflies, and heptegeneid mayflies (7 total EPT taxa) were present, and water pennies were very common under most big rocks. The number qual. EPT taxa did not increase, however *Diphetor hageni*, a more sensitive mayfly, collected upstream was also present downstream. The QCTV was 39.1 which was roughly equivalent to the upstream site. The *Elimia* river snail, which is usually indicative of good water quality, was also collected at RM 2.4. Some other organisms more tolerant of waste inputs (oligochaetes, *Physella* snails) were not collected or were not present in higher numbers (blackflies) compared to upstream. *Ferrissia sp*. limpets, tolerant of siltation and other deposition, were present downstream at RM 2.4. These factors indicated hydromodification issues may now be the more significant influence than waste inputs. Effects from Easton Village WWTP (from a tributary at RM 5.38) and Mingo Estates WWTP at RM 5.33 were not apparent that far downstream. NPS suburbanization, stormwater runoff, and smaller riparian areas have increased the effects of erosion. Silt accumulation on the natural substrates and partially embedded conditions reduced available habitat and restricted any increases in diversity and quality.

Big Run

This subwatershed of Walnut Creek south and west of Lithopolis was affected by decreased riparian cover in the lower watershed and NPS nutrient runoff and erosion from livestock (some with direct access to the stream) and some agriculture. A lower portion of Big Run was channelized and had not completely recovered. In that reach downstream from Hayes Road at RM 1.5, the macroinvertebrate community performance was marginally good and still attained the WWH criterion. Six EPT taxa were collected including the coldwater caddisfly *Ceratopsyche slossonae* and a couple of other taxa that have been collected in cooler water temperatures. Hydropsychid caddisflies were predominant in the riffle and run segments of the stream. Red midges, comprised largely of the tolerant *Chironomus (C.) decorus group*, were predominant in sandy substrates, and heptageneid mayflies (*Stenacron sp*. and *Stenonema femoratum*) were primarily on the small amount of rocky substrates available in the pools. Colder water coming in and augmenting flow decreased temperatures and helped diminish the possible low diel D.O. effects from nutrient enrichment effects from NPS inputs. The predominance of *Chironomus (C.) decorus group* midges in the pools and planorbid snails in the margins (whose weighted ICIs were 14.5 and 19.8, respectively) indicated some adverse habitat conditions.

North Rickenbacker Run

North Rickenbacker Run was sampled at two locations. The macroinvertebrates at the upper site (RM 0.6) were evaluated as marginally good, while those at the lower site (RM 0.2) reflected fair quality. The upper site had an EPT taxa richness was six, and caddisflies predominated in the riffle habitats. The primary difference between the two sites appeared to be due to habitat differences. The lower site at RM 0.2 had soft substrates of sand, silt, detritus, and muck, and it lacked definition with no gravel riffles present in contrast to upstream. Some NPS erosion had occurred, as corn cob detritus, mud, and muck clogged channels. Some oily sheen was sporadically kicked up while sampling, and there was a strong odor of rotting vegetation. EPT taxa richness was two with isopods, damselflies and crayfish predominanted the macroinvertebrate community at RM 0.2.

South Rickenbacker Run

This cold tributary has been ditched with concrete aprons near the mouth and was culverted for most of its length under the AFB. The macroinvertebrate community sampling conducted at RM 0.1 revealed a poor community performance. Taxa diversity and density were low, and no EPT taxa were collected. The predominant taxa collected was the pulmonate pond snail *Physella sp.*. The prevailing instream habitat conditions (deep pools, no riffles, steep banks) were the primary cause of the poor macroinvertebrate community present.The mean QCTV score of 28.8 mirrored the poor community performance.

Mud Run

Mus Run was a nice stream with moderately good riffle development and some deeper pools. Coarse rubble and gravel from till deposition were the predominant substrates in riffles, runs and bank margins. Rip rap was placed along bank to strem erosion adjacent tho corn field. The macroinvertebrate community collected during qualitative sampling was a good community that was comprised primarily of baetid mayflies, hydropsychid caddisflies and cranefly (tipulid) larvae. Diversity however was somewhat limited. Some severe NPS erosional problems via riparian encroachment from agricultural rowcrop production increased the sand in the stream substrates. Nutrient runoff from adjacent agricultural sources combined with open canopy conditions from riparian corridor reductions to cause increased filamentous algal growth. These above conditions and the presence of certain tolerant organisms (i.e., *Chironomus decorus group* midges, *Physella* snails, *Ferrissia* limpets, and oligochaete worms) indicated some degradation had occurred.

Manns Run

At RM 1.3 the macroinvertebrate community was fair. Only three EPT taxa were collected with a very limited dipteran population. Hydropsychid caddisflies and fingernail clams were predominant with riffle beetles and snails common. Very few mayflies and no Tanytarsini midges were collected. The Rickenbacker AFB was upstream from this site, and the trailer park was downstream. At RM 1.0 nearer the trailer park there was more trash observed in the stream. Riffle beetles, leeches, and fingernail clams were predominant or common. Low numbers of EPT taxa, low relative density and overall fair performance was consistent with the RM 1.3 site.

At RM 0.3 there was slightly more gravel and rubble downstream compared to more sandy conditions upstream. Trapezoidal shape and straight channel indicated old channelization with some recovery. Both samples had riffle beetles predominant (one sample also had *Rheotanytarsus* midges). Increased numbers of blackflies, flatworms, leeches and *Conchapelopia* sp. midges, all listed as common, can be found in areas where some increased organic waste inputs occurred. The mixed performance, low EPT taxa with very few mayflies, continued low diversity, and the predominance or presence of quite a number of tolerant organisms indicated an assessment of fair performance for this site downstream from Manns MHP WWTP. Neither Manns Run site attained the WWH macroinvertebrate criterion standards.

Little Walnut Creek

The upper reach of the stream was heavily influenced by cattle (slumped banks) but maintained a fairly high gradient with loosely compacted strong till riffles composed of boulders, rubble and coarse gravel (RM 5.7). These drop into shallow runs and long sandy pools. Outside of the riffles, most large substrates were embedded and covered with algae and silt. There was very good macroinvertebrate performance despite the NPS effects. That assessment attained the recommended EWH use designation, as very good was nonsignificant departue from exceptional. A total of 64 taxa was collected including ten EPT taxa. Notable collections included *Chimarra* caddisflies, water pennies, *Stenonema vicarium* and a rare baetid mayfly (*B*. *dubius* or *virile*). The higher quality organisms were collected primarily in the riffle which was still largely unembedded. Baetid mayfllies and midges were predominant with hydropsychid caddisflies, stenonemid mayflies, flatworms and blackflies common. The latter two increased in population due to increased NPS nutrients and open canopies generating increased algal production.

Downstream at RM 0.7 NPS sedimentation from erosion and loss of riparian corridor adjacent the sampling area and upstream resulted in a huge bedload of unstable substrates of fine gravel and sand. Eroding caved-in banks and corn plants in the riffles and runs indicated the extent of NPS effects. Midges, particularly *Cricotopus (C.) trifascia group* which likes current and living on decaying organic matter (like corn stalks), were the predominant organism, and only 20 total taxa were collected. EPT taxa richness also decreased, as only one caddisfly taxa were collected and no mayflies. Due to the NPS effects noted, the macroinvertebrate community performance was assessed as poor and did not attain the WWH criterion.

Turkey Run

The lower reach where sample site was taken near the mouth (RM 0.2) was mostly open canopy upstream from a bridge across farm fields and closed through a small wood lot. There was some NPS sedimentation evident, as the shallow run was mostly embedded and portions of the pool was mostly sandy and also less productive. There was still an exceptional macroinvertebrate performance which confirmed the recommended EWH use designation. There were 20 EPT taxa collected. Hydropsychid caddisflies, baetid mayflies, stenonemid mayflies, and cranefly larvae were predominant in the riffles or runs. The river snail *Elimia* sp. and riffle beetles were predominant in the margin areas. There was good community quality and diversity overall. Some noteworthy mayflies collected included *Isonychia sp*., the burrowing mayfly *Hexagenia sp*., stenonemids *Nixe sp*. and *Stenonema vicarium*, and baetid mayfly *Labiobaetis propinquus*. Significant caddisflies found included *Ceratopsyche morosa group*, *Chimarra obscura*, and *Oecetis persimilis*.

Biological Assessment: Fish Community

Walnut Creek

Sixty species and six hybrid types of fish (17,690 individuals) were collected in Walnut Creek in 1996. Sampling occurred once at the most upstream headwater site at Cattail Rd. (RM 53.0); twice at 17 wading sites from SR 256 (RM 40.0) downstream to Walnut Ck. Pike (RM 11.0); and two to three times at four boat sites from St. Paul Rd. (RM 9.1) downstream to Little Walnut Rd. (RM 1.3). Overall, the fish assemblage in Walnut Creek was very good (Table 17). This characterization was based on fish community indices which ranged from good-fair (MIwb=8.6; IBI=33 at RM 1.3) to exceptional at several locations (MIwb=9.6; IBI=51 at RM 37.0). Including all sites, the mean MIwb was 8.9. The mean IBI was 46 (Figure 14).

Ecoregional expectations for the WWH use designation were met at all but the most downsteam study site. At this location (RM 1.3), the fish community failed to meet the IBI nonsignificant WWH departure criterion (38). The factors which influenced this decline were uncertain. Although the habitat conditions here were generally good (QHEI=66.0), the substrate was principally depositional sand. Moderate metric scores for percentage of simple lithophils, round bodied suckers, omnivores and tolerant fish reflected a fish population which was likely limited by substrate conditions. No other likely causes of the decline were identified.

Habitat conditions at each site were considered the most influential aspect to Walnut Creek fish community performance. A significant positive correlation (R^2=0.27, p<0.01) between IBI and QHEI scores supported this premise (Figure 14, lower plot). In particular, where habitat conditions were excellent (QHEI$\geq$80) the fish community demonstrated exceptional performance. This relationship was consistent at six of the seven (86%) better habitat sites. Conversly, at the two sites where habitat conditions were fair (QHEI<60) the fish community was marginally

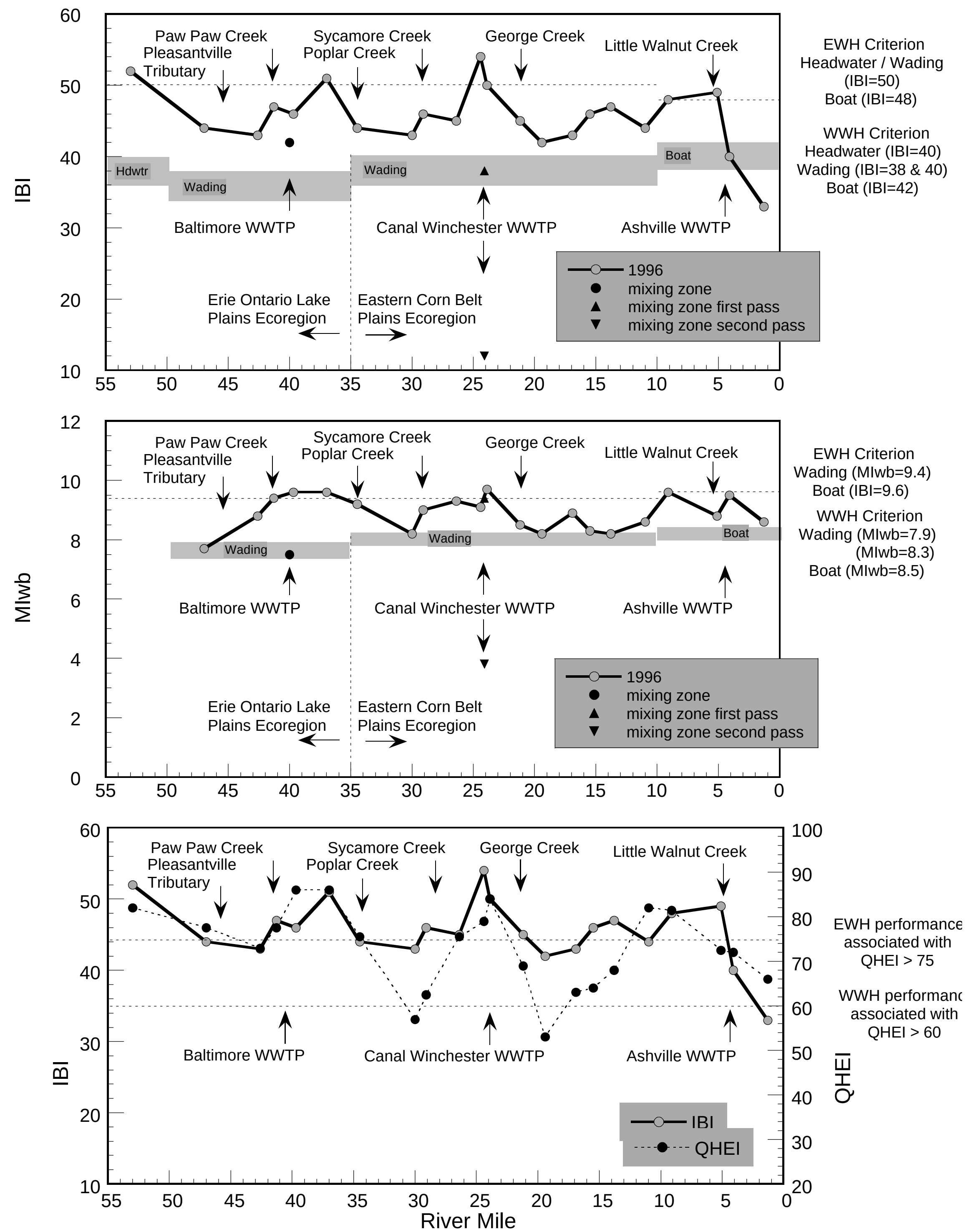

Figure 14 Longitudinal performance of the Index of Biotic Integrity (IBI, upper plot), the Modified Index of Well-being (MIwb, middle plot), and comparison of IBI performance with QHEI scores in Walnut Creek, 1996.

Table 17. Fish community indices based on pulsed D.C. electrofishing samples collected by Ohio EPA within the Walnut Creek study area 1979-1996. Biocriteria and narrative ranges are in Table 2.

Stream River Mile	Mean Number Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation
Walnut Creek 1996								
		Erie Ontario Lake Plain (EOLP) - WWH Use Designation						
53.0	16.0	16	1052	8.1	82.0	NA	52	Exceptional
47.0	27.0	30	1082	21.3	77.5	7.7	44	M.Good-Good
42.6	24.5	28	970	7.5	73.0	8.8	43	Good
41.3	29.0	32	750	27.4	77.5	9.4	47	Except.-V.Good
40.0	*16.0*	*20*	*450*	*55.9*	--	*7.5*	*42*	M.Good-Good
39.7	27.5	28	1985	30.3	86.0	9.6	46	Except.-V.Good
37.0	26.0	31	718	35.0	86.0	9.6	51	Exceptional
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
34.5	25.5	31	1066	61.8	75.5	9.2	44	V.Good-Good
30.0	19.5	26	227	32.9	57.0	8.2	43	M.Good-Good
29.1	25.0	31	465	42.8	62.5	9.0	46	Very Good
26.4	25.0	28	792	47.2	75.5	9.3	45	V.Good-Good
24.4	29.0	33	485	79.2	79.0	9.1	54	V.Good-Except.
24.1	*21.0*	*21*	*1062*	*37.6*	--	*9.4*	*38*	*Except.-M.Good*
24.1	*5.0*	*5*	*90*	*0.2*	--	*3.8*	*12*	*Very Poor*
23.9	25.0	31	579	58.2	84.0	9.7	50	Exceptional
21.2	24.5	30	339	57.2	69.0	8.5	45	Good
19.4	19.5	24	290	74.1	53.0	8.2	42	M.Good-Good
16.9	24.5	31	581	88.0	63.0	8.9	43	V.Good-Good
15.5	22.5	30	346	24.4	64.0	8.3	46	Good -V.Good
13.8	19.5	25	283	16.4	68.0	8.2	47	M.Good-Good
11.0[B]	28.5	36	518	34.6	82.0	8.6	44	Good -V.Good
9.1[B]	28.5	38	466	141.3	81.5	9.6	48	Exceptional
5.1[B]	22.0	33	253	82.4	72.5	8.8	49	Good -V.Good
4.1[B]	30.0	40	271	109.5	72.0	9.5	40	Except.-Good
1.3[B]	22.0	28	209	126.9	66.0	8.6	33	Good-Fair
(1994)		*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*						
29.9	29.5	7	1394	32.3	75.5	9.5	49	Except.-V.Good
24.8	26.0	30	508	17.1	74.0	8.4	49	Good -V.Good
20.4	30.0	36	823	57.7	72.0	9.0	52	V.Good-Except.
16.8	27.0	27	1826	22.5	76.5	9.4	54	Exceptional

Table 17. (continued)

Stream River Mile	Mean Number Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation
Walnut Creek (continued)								
(1993)		*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*						
29.9	26.0	9	1325	44.5	81.0	9.7	50	Exceptional
26.5	28.0	10	777	79.4	76.0	10.0	54	Exceptional
(1982)		*Erie Ontario Lake Plain (EOLP) - WWH Use Designation*						
47.1[B]	18.5	24	563	91.8	--	7.3	26	Fair
42.6[B]	19.7	27	318	15.7	--	7.4	27	M.Good-Fair
40.2[B]	14.0	18	328	15.8	--	5.6	23	Poor
39.9[B]	16.0	16	2057	100.9	--	5.7	22	Poor
37.0[B]	16.0	22	373	84.2	--	6.8	24	Fair
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
32.3[B]	23.0	29	1858	130.6	--	9.5	35	Except.-Fair
31.7[B]	16.3	21	367	71.2	--	8.2	31	M.Good-Fair
29.9[B]	20.3	27	485	62.4	--	8.7	35	Good-Fair
26.5[B]	19.0	22	390	72.3	--	8.8	37	Good-Fair
24.6[B]	18.7	24	353	60.0	--	8.4	37	Good-Fair
23.8[B]	19.7	26	500	101.1	--	8.9	44	Very Good
18.9[B]	20.3	27	482	90.2	65.5	8.7	41	Good-M.Good
16.3[B]	14.5	22	359	73.3	--	8.1	40	Marginally Good
13.5[B]	17.3	24	271	58.5	--	8.1	39	Marginally Good
9.3[B]	24.5	31	486	98.2	79.0	9.3	49	V.Good-Except.
5.4[B]	22.3	31	437	94.7	81.0	8.9	49	V.Good-Except.
3.8[B]	25.7	33	398	97.6	79.0	9.1	51	V.Good-Except.
1.2[B]	20.0	28	304	60.6	74.0	8.7	39	Good-M.Good
(1981)			*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
0.4[B]	9.0	4	83	127.1	--	6.6	28	Fair
(1980)			*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
0.4[B]	9.7	16	100	164.9	--	6.9	22	Fair-Poor
(1979)			*Eastern Corn Belt Plains (ECBP) - WWH Use Designation*					
0.4[B]	6.0	8	160	252.7	--	5.4	16	Poor
Pleasantville Creek (1996)								
		Erie Ontario Lake Plain (EOLP) - WWH Use Designation						
0.8	17.0	17	486	6.5	66.5	NA	28	Fair
0.7	17.0	17	518	5.9	65.0	NA	32	Fair
(1982)								
0.7[S]	11.0	15	391	23.7	--	NA	24	Poor
0.5[S]	10.3	15	414	49.5	--	NA	22	Fair

Pawpaw Creek (1996)

Table 17. (continued)

Stream River Mile	Mean Number Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation
			Erie Ontario Lake Plain (EOLP) - WWH Use Designation					
1.4	17.0	17	1366	13.6	81.0	NA	40	Good
0.3	23.0	23	1413	24.4	68.0	NA	40	Good
(1982)								
0.9	9.7	14	647	9.1	--	NA	28	Fair
0.5	9.0	14	94	4.0	--	NA	24	Poor
West Branch of Pawpaw Creek(1996)								
			Erie Ontario Lake Plain (EOLP) - WWH Use Designation					
1.0	18.0	18	1028	9.7	87.0	NA	46	Very Good
0.1	21.0	21	2302	32.0	58.0	NA	44	Good
(1982)								
1.7^S	9.3	12	831	5.6	--	NA	33	Fair
Poplar Creek (1996)								
			Eastern Corn Belt Plains (ECBP) - WWH Use Designation					
6.6	18.0	18	1391	17.2	70.5	NA	58	Exceptional
0.7	21.0	21	1289	12.0	86.5	NA	42	Good
Gillette Run (1996)								
			Eastern Corn Belt Plains (ECBP) - WWH Use Designation					
0.1	18.0	18	686	6.2	52.0	NA	42	Good
(1982)								
0.2^S	12.5	17	497	5.0	--	NA	32	Fair
Sycamore Creek (1996)								
			Eastern Corn Belt Plains (ECBP) - WWH Use Designation					
12.2	12.0	12	1010	9.6	64.5	NA	36	Marginally Good
9.5	18.0	18	2118	10.8	75.5	NA	48	Very Good
8.5	16.0	16	1738	19.4	71.5	NA	48	Very Good
6.1	19.0	19	768	21.7	77.5	NA	38	Marginally Good
4.7	20.5	23	972	12.3	74.5	NA	46	Very Good
4.2	21.5	25	923	24.9	73.0	NA	41	Good
2.6	21.5	26	428	39.3	78.0	6.8	44	Fair-Good
0.3	24.5	29	1714	14.7	73.5	9.0	45	V.Good-Good
(1994)								
4.8	22.5	25	1085	11.2	80.0	NA	44	Good
4.2	25.0	11	2139	37.8	78.0	NA	46	Very Good
0.2	26.0	30	2681	20.3	68.0	9.7	48	Except.-V.Good

Sycamore Creek (1993, continued)								
0.1	22.0	22	1317	20.8	77.0	8.9	50	V.Good-Except.

Table 17. (continued)

Stream River Mile	Mean Number Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation
(1984)								
4.7	16.5	20	3036	--	61.0	NA	39	Marginally Good
4.2	17.5	20	4188	--	--	NA	31	Fair
2.7	22.5	26	1939	--	--	6.0	44	Good
Tussing Ditch (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
0.3	19.0	19	988	20.6	63.0	NA	44	Good
George Creek (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
4.3	13.0	13	1446	11.5	43.0	NA	34	Fair
2.4	11.0	11	232	3.5	21.5	NA	24	Poor
0.1	20.0	20	368	10.1	47.0	NA	40	Good
(1987)								
8.3	4.0	4	321	--	--	NA	28	Fair
6.5	5.0	5	348	--	--	NA	24	Poor
East Fork of George Creek (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
6.0	11.0	14	1761	17.0	46.0	NA	40	Good
2.4	12.0	12	872	6.8	61.5	NA	34	Fair
(1987)								
7.9	3.0	3	205	--	--	NA	26	Poor
6.0	5.0	1	538	2.7	--	NA	26	Poor
(1984)								
6.0	5.5	6	677	--	65.0	NA	38	Marginally Good
5.1	6.0	7	1005	--	--	NA	25	Poor
3.8	11.5	14	1621	--	--	NA	28	Fair
2.4	18.0	24	1235	--	--	NA	34	Fair
Big Run (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
1.6	18.0	18	3578	5.7	39.5	NA	46	Very Good
North Rickenbacker Run (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
0.6	17.5	21	1845	--	52.0	NA	39	Marginally Good

South Rickenbacker Run (1996)

		Eastern Corn Belt Plains (ECBP) - MWH Use Designation (Recommended)						
0.1	7.0	8	224	--	55.0	NA	31	Fair

Table 17. (continued)

Stream River Mile	Mean Number Species	Cumulative Species	Mean Rel. No. (No./0.3Km)	Mean Rel. Wt. (Wt./0.3Km)	QHEI	Mean MIwb	Mean IBI	Narrative Evaluation
Mud Run (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
0.7	22.0	22	1245	7.5	58.5	NA	48	Very Good
Manns Run (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
1.0	19.0	21	1338	--	65.0	NA	48	Very Good
0.3	17.0	18	542	--	51.0	NA	46	Very Good
Little Walnut Creek (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
4.9	18.0	18	710	8.7	69.0	NA	52	Exceptional
1.5	24.5	27	911	11.0	71.5	8.8	46	Very Good
(1982)								
0.5[S]	23.0	27	2731	23.2	58.0	9.6	45	Except.- Good
Turkey Run (1996)								
		Eastern Corn Belt Plains (ECBP) - WWH Use Designation						
0.2	20.0	20	1202	8.1	72.5	NA	56	Exceptional

*	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.

good to good. This comparison was less consistent as there were three other sites where the fish assemblage was narratively similar, but at which habitat conditions were good (QHEI=60-75).

Study objectives included evaluating the potential influences of discharges from the Baltimore, Canal Winchester, and Ashley WWTPs and from other entities via tributaries to Walnut Creek. Although acutely stressful conditions were indicated in one Canal Winchester WWTP mixing zone sample, the impact was limited to the mixing zone. Likewise some hint of stressful conditions were indicated in one Baltimore WWTP mixing zone sample but any impact was restricted to the mixing zone reach. No impact was evident from the Ashville WWTP. A decline in IBI scores downstream from Ashville was attributed to habitat conditions. At all sites downstream from entites, the relevant biocriteria scores were achieved and no longitudinally significant impacts were perceived. Two mixing zone samples were collected at the Canal Winchester WWTP. The shorter distance encompassed in this sampling strategy limits direct biocriteria score comparison between the samples which bracket the site. However, trends between the mixing zone sample results did suggest some changes in effluent quality occurred between August and September, 1996.

Biological index scores on August 6 for the Canal Winchester WWTP mixing zone were marginally good (IBI=38) and exceptional (MIwb=9.4). For this sample, fish were collected downstream from the outfall in the side channel extending approximately five meters into the mainstem to encompass a standard 50 meter mixing zone sample. At the time, the side channel included flow from upstream of the WWTP outfall and appeared similar to a small tributary entering the mainstem at its downstream confluence. Essentially, the side channel could also have been construed as the river's right side passage of a mainstem island.

At least seven of the 21 fish species (177 individuals) collected in the first mixing zone sample were present only in the mainstem of Walnut Creek. These larger bodied fish (*ie*: suckers) positively influenced the MIwb score in particular and resulted in favorable scores for related IBI metrics. Although the inclusion of mainstem fish in the first sample made analysis of the side channel alone difficult this was not an issue. Numerous smaller fish considered typical of a small tributary (*i.e.*: dace, shiners) were present in the side channel. Two intolerant species (stonecat madtom, banded darter) were also collected. Basically there was no indication of any issue associated with WWTP effluent during the first sample.

The second sample occurred on September 12. Upon arrival at the site it was immediately apparent that the WWTP discharge was different. Sludge deposits and thick layers of a black organic flocculent were interspersed with brilliant green and turquoise colored algal mats throughout the mixing zone which no longer received flow from upstream of the WWTP. In order to accurately characterize the possible impact of the WWTP, the mixing zone was sampled in two parts. Fish from the mainstem (appx. 5m) were processed separately from those collected in the undiluted side channel. Only the scores from the 45m second pass mixing zone are reported here. Since the resulting mixing zone scores from both passes entailed slightly different reaches and because the second pass was indicative of significantly different conditions, the biological scores are reported separately in Tables 1 and 17.

Only 15 individual fish representing five species were collected in the second Canal Winchester WWTP mixing zone sample. This limited number of fish was a direct reflection of acutely stressful conditions. The very poor MIwb (3.8) and IBI (12) scores were symptomatic of a recent significant failure in the WWTP operation as the scores from the first pass were consistent with ecoregional expectations. The need to correct this deficiency is obvious.

Mixing zone samples were also collected at the Baltimore WWTP. The fish assemblages in both samples were similar although about half as many fish were collected in the second sample. This general avoidance of the mixing zone along with a fair MIwb second sample score (6.8) were symptoms of stessful conditions. Neither sample downstream from the WWTP indicated this impairment extended beyond the mixing zone.

In summary, in 1996 Walnut Creek supported a very good fish community with exceptional assemblages at several locations. Site specific habitat attributes were considered the most influential factor affecting fish community performance. At sites which bracketed the the Baltimore, Canal Winchester and Ashley WWTPs the fish communities were consistent with ecoregional expectations and habitat conditions. Some degradation was evident in one Baltimore WWTP mixing zone sample. Acutely stressful conditions were also present in one Canal Winchester WWTP sample. In both situations the impact was limited to the mixing zone. Given the very good quality habitat conditions and essential lack of impact from point sources of pollution in Walnut Creek, efforts to reduce the influence of nonpoint pollution sources are encouraged. Effective abatement of nonpoint pollution sources should result in even better overall fish community performance.

Pleasantville Creek
Twenty four fish species and one hybrid (669 individuals) were collected in Pleasantville Creek in 1996. Sampling occurred once at two sites bracketing the Walnut Creek Sewer District WWTP where fair (RM 0.8, IBI=28; RM 0.7, IBI=32) headwater scores were recorded. These ratings were significantly below ecoregional expectations for the WWH use designation.

Although habitat conditions (RM 0.8, QHEI=66.5; RM 0.7, QHEI=65.0) seemed adequate, the silty, sandy, pea gravel substrates may have limited fish community performance. At both sites high percentages of tolerant (Θ=61%) and omnivorous (Θ=36.5%) fish predominated and relatively few fish (Θ=334.5) were collected at either location. The WWTP did not appear to influence the fish assemblage. Further study is suggested to definitively identify specific impairment causes.

Pawpaw Creek
Twenty five fish species (1625 individuals) were captured in one sampling pass at two Pawpaw Creek sites. Good headwater IBI scores (RM 1.4, IBI=40; RM 0.3, IBI=40) were determined at the sites which bracketed the West Branch of Pawpaw Creek confluence. Both assemblages included mostly tolerant (Θ=69%) fish but the more downstream community reflected the increased West Branch flow as it was comprised of fewer pioneer species and more omnivores.

West Branch of Pawpaw Creek
Twenty three fish species (1665 individuals) were captured at two West Branch of Pawpaw Creek sites bracketing the Newark Group Industry WWTP in one sampling pass. The upstream fish community performance was very good (RM 1.0, IBI=46) while downstream a good score was slightly lower (RM 0.1, IBI=44). As noted in Pawpaw Creek, both assemblages were tolerant (Θ=61.5%) and the more downstream community exhibited a likely response to the increased flow from the WWTP.

The downstream fish community numerically doubled in size and increased to 21 species from 18 upstream. Some subtle shifts in trophic structure were also evident downstream as the community was slightly more omnivorous than the more insectivorous upstream composition. Although the IBI scores did not reflect any significant influence from the WWTP and the habitat quality was comparatively reduced downstream, the increased numbers of fish and the disproportionate increase in omnivores indicated that the WWTP influences the aquatic food web.

While it is not surprising that a large discharge on a small stream can have a direct impact it does call attention to the fact that this impact will vary with effluent quality. In the summer of 1996 the Newark Group Industry WWTP did not appear to have an undue influence on the fish community in Pawpaw Creek or the West Branch tributary.

Poplar Creek
Twenty five fish species (1786 individuals) were collected at two headwater sites in one sampling pass in Poplar Creek. A nearly perfect IBI score (58) at the upstream location (RM 6.6) was the highest rating in the 1996 study. Downstream (RM 0.7) fish community performance was good (IBI=44). Recognizing the exceptional performance at the upstream location and the overall very good habitat conditions (QHEIΘ=78.5) it is appropriate to recommend EWH aquatic life use for Poplar Creek.

Performance at the downstream location was just below the EWH benchmark. The IBI percentile metric scores were influenced here by the collection of the tolerant creek chub (51%) and white sucker (10%). Although many striped shiner (17%) and other insectivores (13%) were present, the disproportionate abundance of tolerant fish among the 21 species in the sample skewed the IBI result. Many mottled sculpin (5%) suggested groundwater flow likely improved habitat conditions.

Gillette Run
Eighteen fish species (457 individuals) were captured in one Gillette Run (RM 0.1) sample where a good headwater rating (IBI=44) was recorded.

Sycamore Creek
Thirty eight fish species and one hybrid (8,328 individuals) were captured in Sycamore Creek in 1996. Sampling occurred once at four upstream sites and twice at four downstream sites, two of which bracketed the Pickerington WWTP (RMs 4.7 and 4.2). Ecoregional expectations for the WWH aquatic life use were met at all except the Busey Rd. (RM 2.6) site where a fair MIwb score (6.8) was determined.

Fewer fish (Θ=286) were at Busey Rd. in comparison to other Sycamore Creek sites (Θ=776) and carp comprised the majority of biomass (Θ=75%). As a result the MIwb which is sensitive to how evenly the number of fish and biomass are distributed among a species assemblage scored lower here than at any other study location. With very good habitat (QHEI=78.0), the low number of fish and the low overall amount of biomass reflected a stream segment which is subjected to a water quality impairment. The Pickerington WWTP upstream was an obvious source of stress. During the sampling period the WWTP was upgrading their facility. Without information about any other potential pollution sources between the WWTP and Busey Rd. it is reasonable to consider the Pickerington facility as the culpable agent for the fair MIwb score.

Fish community performance recovered at Benadum Rd. (RM 0.3) where very good index scores were recorded (IBI=45, MIwb=9.0). Likewise, generally good IBI scores were documented at most other Sycamore Creek sites. While performance at RM 12.2 was marginally good (IBI=36) probably due to limited flow, the community status was very good at RMs 9.5 (IBI=48) and 8.5 (IBI=48). At RM 6.1 another marginally good value (IBI=36) resulted from relatively fewer fish, fewer minnow species, and the predominance of tolerant fish in the sample. Although this decline was subtle it was attributed to the influence of the Huntingtom Hills WWTP as the habitat here (QHEI=77.5) was very good. Downstream at the sites bracketing the Pickerington WWTP the fish assemblages scored in the good range.

Tussing Ditch
Nineteen fish species (494 individuals) were collected in one Tussing Ditch (RM 0.3) sample where a headwater rating of good (IBI=44) was consistent with WWH ecoregional expectations.

Georges Creek
Twenty three fish species (1084 individuals) were collected in Georges Creek at three sites in one 1996 sampling pass. The headwater fish community was rated as fair (RM 4.3, IBI=34), poor (RM 2.4, IBI=24), and good (RM 0.1, IBI=40). The fish community performance in this sub-basin was the worst of all 1996 Walnut Creek tributaries. Habitat degradation (QHEI Θ=37.2) resulting from poor stormwater control and channelization were driving forces behind the biocriteria departure.

Fish assemblages at the upstream sites essentially lacked sensitive species and insectivores and were comprised of extremely high proportions of tolerant (Θ=93%) and pioneering (Θ=81%) fish. The community at the downstream site (RM 0.1) scored higher due to the presence of several species which were represented by few individuals. The proximity of Walnut Creek afford an opportunity for these fish to invade Georges Creek and the IBI score was improved in contrast to its impoverished habitat.

East Fork of Georges Creek
Eighteen fish species and one hybrid (2168 individuals) were collected at two East Fork of Georges Creek locations. The fish assemblage was good (IBI=40) at RM 6.0 in two sampling passes and fair (IBI=34) at RM 2.4 in a single pass. As with Georges Creek, habitat degradation (QHEI Θ=53.8) resulting from surbanization, channelization, and associated flow was the principal factor limiting better performance.

No sensitive species, darters or sculpins were captured at the upstream location while the presence of sand shiners and greenside darters downstream improved these metric scores. Tolerant fish predominated both samples (Θ=64%). Other community attributes earned moderate IBI metric values and was reflective of habitat limitations.

Big Run
Eighteen fish species (1789 individuals) in one Big Run (RM 1.6) sample scored a very good headwater rating (IBI=46) consistent with WWH ecoregional expectations. Strong groundwater flow supported good diversity in a small drainage area ($6.3 mi^2$).

North Rickenbacker Run

Twenty one fish species and one hybrid (2090 individuals) were captured in North Rickenbacker Run at Pontius Rd. (RM 0.6) in two samples. The resulting marginally good (IBI=39) headwater rating was within the WWH criterion nonsignificant departure range. The community had surprising richness for a small drainage area (2.4mi^2) but it was highly tolerant (71%), omnivorous (35%), and mostly comprised of pioneering fish (64%) which are adapted to rapid recolonization following periods of stress.

South Rickenbacker Run

Eight fish species (224 individuals) were captured in South Rickenbacker Run downstream from an abandoned Airport WWTP and within a small dam pool (RM 0.1) in two samples. The resulting fair (IBI=30) headwater score was above the recommended MWH aquatic life use criterion. A tolerant (99%), omnivorous (58%), pioneering (94%) fish assemblage comprised of few fish inhabited this modified reach.

Mud Run

Twenty two fish species (1245 individuals) were captured in one Mud Run sample at Perrill Rd. (RM 0.7). The resulting very good headwater IBI score (48) was influenced by good community diversity and trophic organization. Also, a large number of stoneroller minnows (37%) were collected which helped to dampen the effects of tolerant, omnivores on the IBI score.

Mann's Run

Twenty two fish species and one hybrid (2149 individuals) were collected at two Mann's Run locations bracketing the Mann's mobile home park WWTP in two sampling passes. The very good (RM 1.0, IBI=48) and good (RM 0.3, IBI=45) community performance at each site was above WWH ecoregional expectations. The slight decline in scores was consistent with habitat conditions which were good upstream (QHEI=65) and fair downstream (QHEI=51).

Darters were especially abundant at both locations. In aggregate, six species were collected which comprised 40% of the fish population. Pioneering species predominated both sites (70%) but trophic organization was balanced and the tolerant fish metric scored in the moderate range.

Little Walnut Creek

Twenty seven fish species (1569 individuals) were captured in Little Walnut Creek in 1996. Sampling occurred once at RM 4.9 (IBI=52) and twice at RM 1.5 (IBI=46). Exceptional performance at the upstream headwater site and the very good results at the lower wading site were interpreted as an indication that the EWH aquatic life use designation would be appropriate.

Few tolerant fish were collected at either site (Θ=24%), six darter species were represented, and good trophic composition was documented at each location. The change in IBI scores was mostly due to the different expectations between the headwater and wading criteria. In aggregate, eight sensitive species were collected earning a high headwater metric score, while only two of these species were intolerant, thus a low wading metic score was received. Likewise, eight minnow species scored high headwater marks and three sunfish species gained a moderate wading value.

Turkey Run
Twenty fish species (601 individuals) were collected in one Turkey Run sample. The almost perfect IBI score of 58 here was influenced by a moderate headwater metric score for percentage of pioneering species (39%). This exceptional performance justifies recommending the EWH aquatic life use designation for this stream.

TREND ASSESSMENT

Chemical Water Quality Trend Assessment: 1982-1996
Historical water column chemistry data from the Walnut Creek were employed to perform a long term water quality trend analysis. The most comprehensive data sets available were collected by Ohio EPA during the summer of 1982 for Walnut Creek and 1994 for Sycamore Creek. The 1982 data for Walnut Creek included samples collected from fourteen sites between RM 47.1 and RM1.2. In addition, samples were collected on Pawpaw Creek at RM 0.5 (State Route 256). The 1994 data for Sycamore Creek were collected at six sample locations between RM 9.55 and RM 0.18.

Walnut Creek
During the 1982 survey the most degraded portion of the stream was found to be between RM 42.4 to 38.9. Examination of the data summarized in the 1983 Comprehensive Water Quality Report found that the Ohio Paperboard (f.k.a. Crown Zellerbach Corporation) and to a lesser extent the Baltimore WWTP are the primary sources of degradation to Walnut Creek. Elevated concentrations of zinc, phosphorus, fecal coliforms and low dissolved oxygen concentrations were indicative of organic and other inputs to the stream. Other wastewater treatment plants which discharged directly to Walnut Creek (Canal Winchester, Groveport WWTP, Rickenbacker WWTP, Ashville, Amerimark) impacted water quality but to a lesser degree.

There were few changes in water quality between 1982 and 1996 (Figure 15). Dissolved oxygen

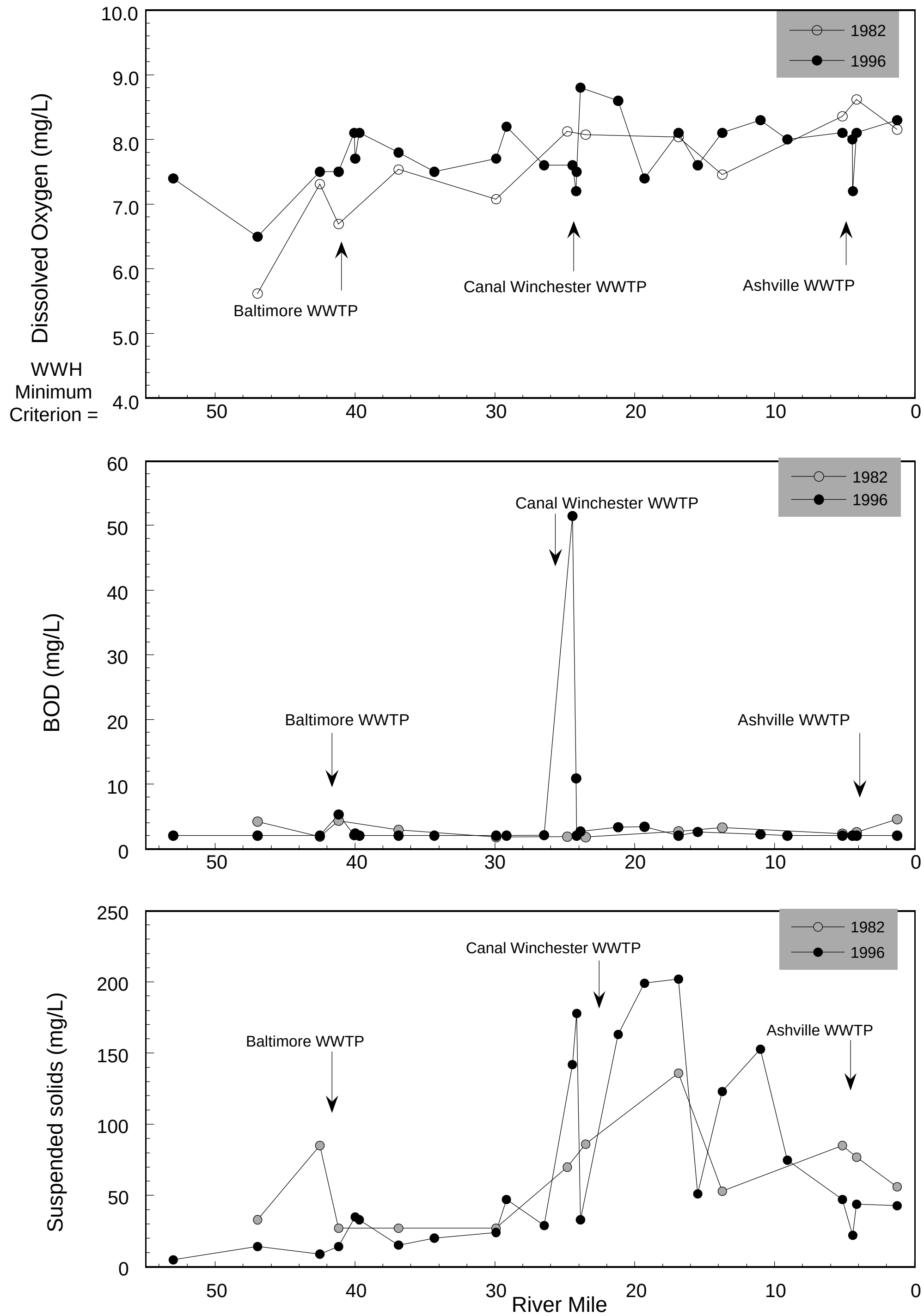

Figure 15 Longitudinal trend of mean concentrations of dissolved oxygen, 5-day biochemical oxygen demand, and total suspended solids in Walnut Creek 1982-1996.

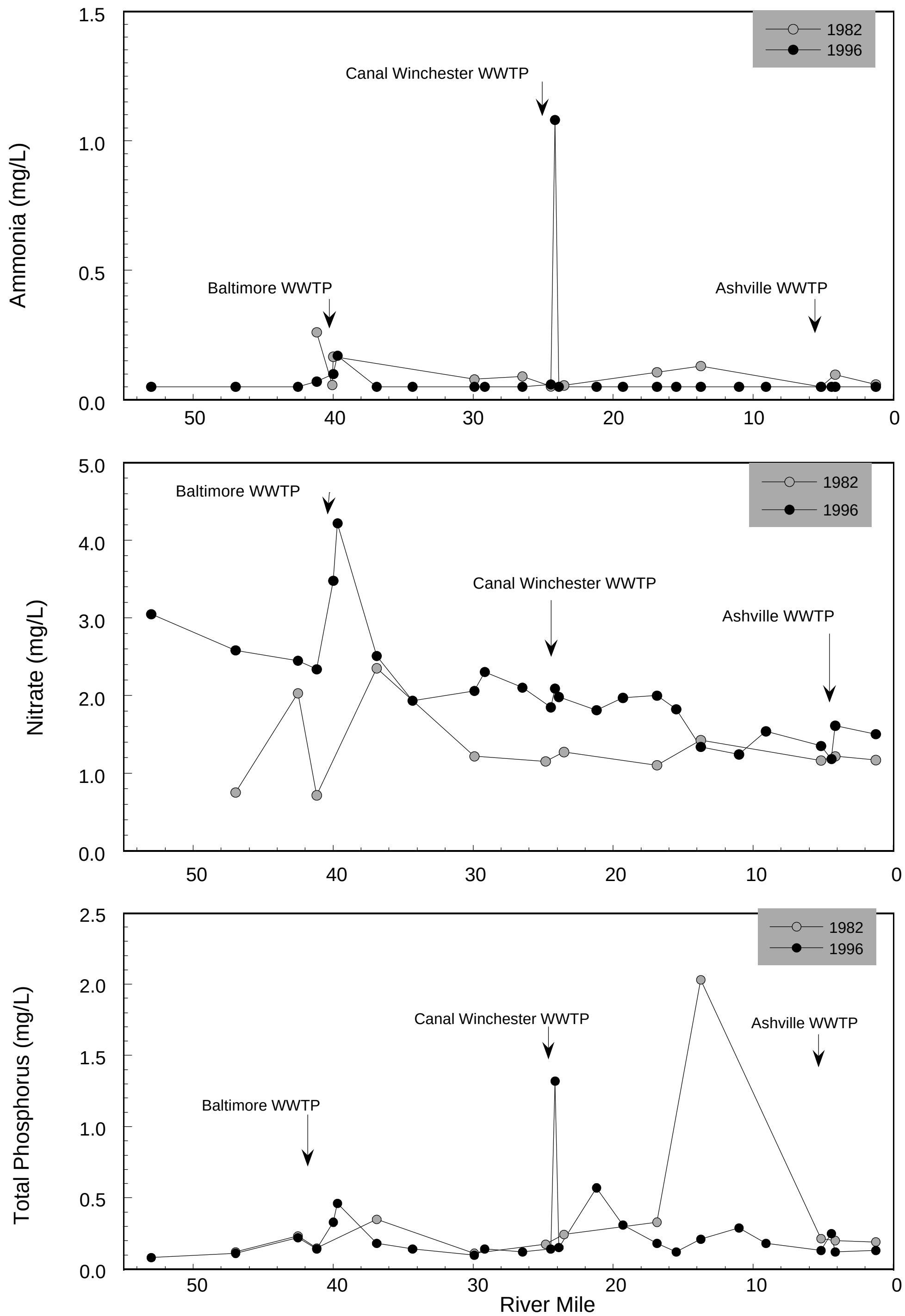

Figure 16 Longitudinal trend of mean concentrations of ammonia-N, nitrate+nitrite-N, and total phosphorus in Walnut Creek 1982-1996.

concentrations were found to be above the EWH criterion (6 mg/L) at all sample locations except for RM 47.1 during 1982. BOD and ammonia concentrations were similar during both studies. Ammonia concentrations showed a slight improvement (lower concentrations) during 1996 with a corresponding increase in the concentration of nitrate indicating an increase in the efficiency of WWTP operations. Phosphorus concentrations remained relatively stable in the upper part of the watershed. Downstream of Canal Winchester, phosphorus concentrations were lower in 1996 than during the previous survey. Suspended solids increased longitudinally (upstream to downstream) during both surveys. The middle reach had higher suspended solids and may be a reflection of the increase in construction in the Canal Winchester area during 1996.

Fecal coliform concentrations showed a similar pattern in the upper reach of Walnut Creek. A peak was observed near Baltimore WWTP during both surveys and indicate a chronic problem with bypasses at both the WWTP and at the intersection of Mill and Monroe streets. Fecal coliform concentrations peaked again downstream of Canal Winchester and during 1982 remained elevated to the mouth.

Instream metals concentrations were compared for copper, lead and zinc. With some exceptions most samples were below detection during both surveys. Higher concentrations of copper were observed in 1982 at RMs 41.17 and 13.7. The highest copper concentration was recorded at RM 1.22 during 1996. Lead showed an improvement over concentrations found during 1982 with the exception of RM 19.30. Generally, zinc levels were found to be lower in 1996 than in 1982 except at RM 24.15 (Canal Winchester WWTP mixing zone) and at RM 1.22 near the mouth of Walnut Creek.

Sycamore Creek
Similar water quality conditions were found between 1994 and 1996. Mean dissolved oxygen levels were above the average water quality criterion (5.0 mg/L) at all sample locations. A dissolved oxygen sag downstream of the Pickerington WWTP was observed during both surveys with stream recovering by RM 2.60 (Busey Road). BOD concentrations were identical to 1994 data except for the mixing zone sample from Pickerington WWTP. Nitrate-N and phosphorus concentrations increased longitudinally during both surveys. Suspended solids showed a dramatic improvement from the 1994 survey.

Pawpaw Creek
The survey conducted in 1982 had three sample sites in common with the 1996 survey. Data were not available for all parameters of interest at all sites making a full analysis difficult. Dissolved oxygen concentrations were similar in both survey years and all sites were above EWH criterion of 6 mg/L. Oxygen demanding parameters were slightly higher in 1996 than in 1982. Ammonia concentrations were lower in 1996. Nitrates and phosphorus concentrations were slightly higher in 1996. Suspended solids were found to be slightly lower at RM 0.54 of Pawpaw Creek.

Biological Trend Assessment: Macroinvertebrate Community 1982-1996

Walnut Creek

Overall there was a significant improvement in the macroinvertebrate community in 1996 compared to the 1982 results. In 1996 macroinvertebrate assessments indicated that 19 of 24 stations were exceptional or very good (nonsignificant depature from exceptional) quality (79%) compared to 7 of 16 sites in 1982 (44%) (Figure 17, upper plot). Excluding mix zones every sample site showed a comparative increase in the number of qual. EPT taxa collected except for the short reach downstream from Basil Road to the Baltimore WWTP which was below Baltimore and Pawpaw Creek (Figure 17, lower plot). Most sites showed significant increases.

The lower gradient reach near Thurston (RM 47) scored the same ICI score - a good evaluation for both samples. There was a significant increase in EPT taxa collected in 1996, but with increased flow (caddisfly presence on artificial substrates) the ICI score would have scored slightly higher yet still would have likely been an assessment of good. Regardless, there was an improvement in water quality as also evidenced by the QCTV scores; it was 34.4 in 1982 versus 38.9 in 1996 (which was the median for EOLP ecoregion E/G streams). There was however still a continued sedimentation problem through this reach which decreased macroinvertebrate diversity, as the total taxa decreased 25 to30 percent from upstream and downstream stations. There was an increase in the percent tolerant taxa which could have been related to decreased flow (Figure 17, middle plot).

There was attainment in Walnut Creek downstream from Pawpaw Creek at Basil Road station in 1996 in contrast to 1982 (fair conditions), but the slow run and pooled reach downstream from Basil Road to the Baltimore WWTP discharge had decreased further in quality. Both were assessed as fair, but the 1996 results appeared worse than in 1982. Two EPT and no caddisflies were collected during qualitative sampling in 1996 compared to 10 EPT in 1982. There was also an increase in the tolerant organism population including tolerant dipteran midges that were predominant. The community structure was likely due to WWTP bypasses/overflows with additive accumulative inputs from Baltimore (primarily including solids accumulation from TSS with increased COD and from CSO inputs from Pawpaw Creek). These inputs were exacerbated by the low gradient slow/pooled stream reach where solids deposition occurred with minimal reaeration.

Quicker recovery occurred downstream from Baltimore in 1996 compared to the 1982 survey results. This conveys better wastewater treatment other than when there were volume problems and bypasses/overflows. Recovery to exceptional conditions occurred in less than 3 river miles in 1996, and Walnut Creek continued with very good to exceptional conditions from just downstream from the Baltimore WWTP (>RM 38.0) to the mouth except for a short reach around RM 16.8. This was a large improvement compared to 1982, when exceptional macroinvertebrate performance was not exhibited until the station upstream from Canal Winchester WWTP (RM 24.4). The increased number of EPT taxa collected illustrated similar significant improvements.

The reach affected by organic enrichment from the Rickenbacker WWTP and agricultural NPS inputs

(RM 13.7) in 1982 had improved to exceptional conditions which was likely due to decreased influences from Rickenbacker, improved farm practices and improved riparian corridor. There still was some nutrient enriched conditions through this reach, but it was not appreciably affecting the exceptional macroinvertebrate community present.

Decreased quality conditions were present downstream from Hayes Road (RM 16.8) in 1996 compared to 1982 results. This reach was affected by urban stormwater and agricultural NPS sedimentation causing very unstable sandy substrate bedloads, embedded and buried larger substrates and had decreased commumity diversity compared to upstream and downstream stations.

Downstream from Sycamore Creek confluence, the community quality had decreased slightly since 1993 sampling. The number of EPT taxa collected from the natural substrates decreased decreased from 1993 to 1996 (21 versus 11) at RM 29.1 downstream from the Sycamore Creek confluence. This was likely due to the large effluent input from Sycamore Creek that increased with the Pickerington WWTP upgrade/expansion (ongoing in 1996), suburban stormwater runoff and sedimentation and sand bedload inputs downstream into Walnut Creek. Also the percent tolerant taxa increased downstream compared to 1982 results which was likely related to suburbanization and the increased organic loadings from Sycamore Creek.

Though there has been community performance improvements since the 1982 survey as related to the station downstream from Little Walnut Creek confluence (RM 5.3), the 1996 macroinvertebrate data from the mainstem and the lower reach station on Little Walnut Creek also indicated increased negative agricultural NPS nutrient and sedimentation effects from Little Walnut Creek. There was an increased percentage of tolerant taxa present, no ICI improvement from RM 8.9, and a decrease in the number of qual. EPT collected (23 to 14) in 1996. This was in contrast to a lower percent tolerant taxa population and positive trends in ICI score and number of qual. EPT taxa collected in 1982. Improvements in agricultural practices in Little Walnut Creek subbasin would keep Little Walnut Creek at a higher quality and decrease the agriculural NPS nutrient and sedimentation inputs to the Walnut Creek mainstem in the lower reach.

Pleasantville Creek

There was a decrease in quality from 1982 to 1996. Both sites were good in 1982 and were marginally good in 1996. Six and 10 EPT taxa were collected upstream and downstream from the WWTP in 1982 compared to 4 and 4, respectively, in the 1996 survey. Some high quality organims, such as *Stenonema vicarium*, *Helichus sp.*, riffle beetles, *Elimia sp.*, and *Sphaerium sp.*, were present during both surveys. But in 1996 baetid mayflies and *Rheotanytarsus* midges were not collected. Other more tolerant organisms, such as the leech *Helobdella*, *Ferrissia* limpets, and *Sialus sp.*, were collected in the 1996 survey. The QCTV scores decreased from 40.9 to 36.7 at the upstream station and from 37.2 to 31.1 at the downstream site. These conditions also indicated a decrease in overall

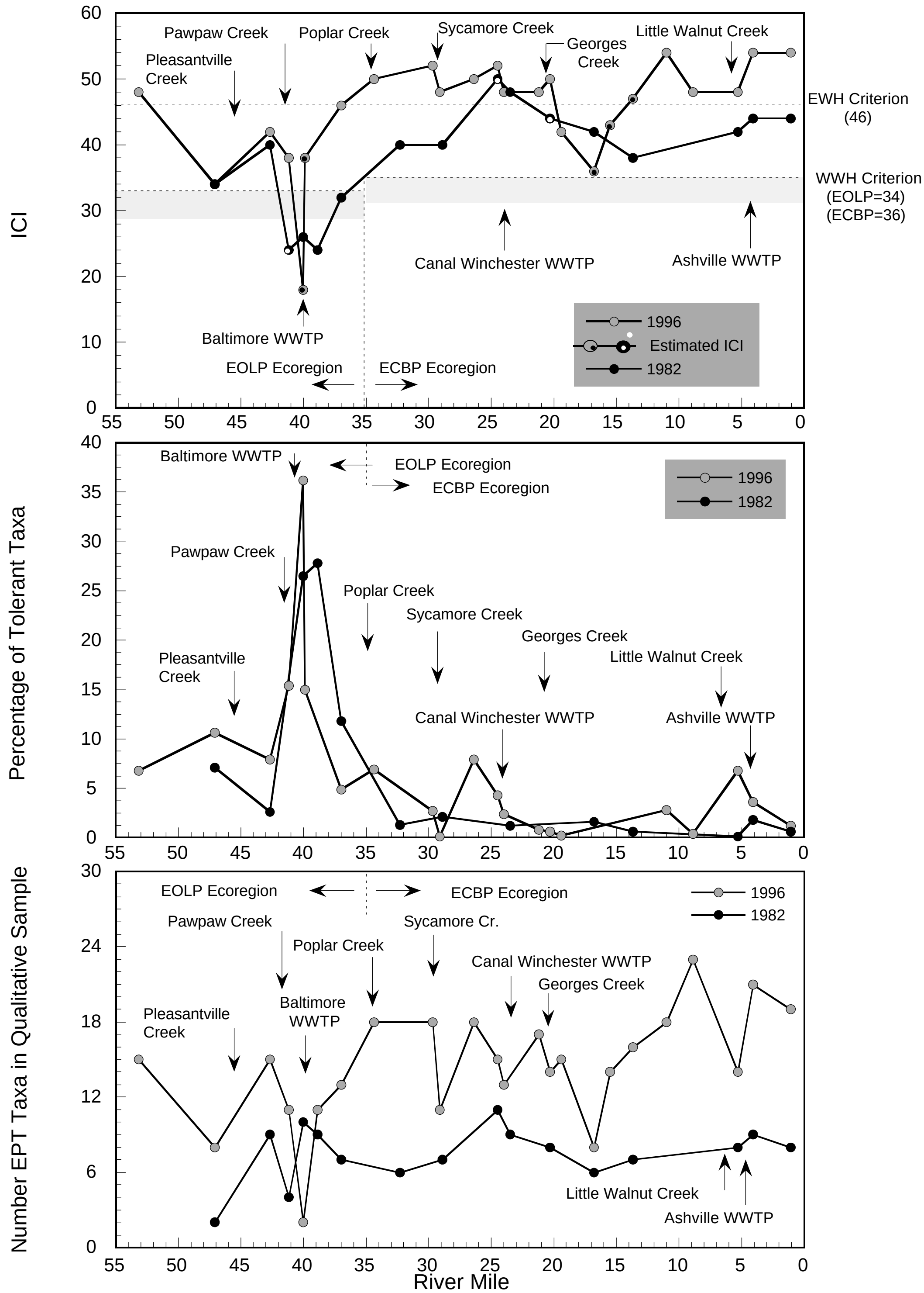

Figure 17 Longitudinal trend of ICI (upper plot), percentage of tolerant taxa (middle plot), and number of qualitative EPT taxa (lower plot) in Walnut Creek, 1982-1996.

water quality.

Pawpaw Creek

In 1982 the marginally good macroinvertebrate community comprised of predominantly riffle beetles with some baetid mayflies and caddisflies. The 1996 sample contained similar qual. EPT totals and QCTV values. The ICI of 36 (good) indicated a slight improvement as illustrated by the presence in large numbers of pollution-sensitive to intermediate Tanytarsini midges and the collection during quantitative sampling of the rare and sensitive baetic mayfly *Acerpenna macdunnoughi* (whose weighted ICI = 49.9). The 1996 results also found that blackflies were now predominant in high densities along with moderate numbers of red midges with baetid mayflies, caddisflies, Tanytarsini midges and riffle beetles common. Like the 1982 survey nutrient enrichment was still evident downstream from Ohio Paperboard and the Mill/Monroe Street CSO, but the community structure had changed slightly.

Gillette Run

Gillette Run at RM 0.1 downstream from Carroll showed progressive improvements in water quality from fair conditions in 1982 to marginally good conditions in 1987. The good quality observed in Gillette Run in 1996 at RM 0.1 likely resulted from the construction and maintenance of the Carroll WWTP. The number of EPT taxa collected at RM 0.1 almost doubled compared to the 1987 survey (11 to 6, respectively) which was indicative of the improvement (Fig. GilRnEPT). Some nutrient enriched conditions still persisted however as indicated with joint predominance of blackflies and caddisflies. The nutrient sources include Carroll and agricultural nonpoint source inputs. Erosion from channelization, decreased riparian area and unstable banks increased siltation and muddy substrate conditions at the mouth.

Sycamore Creek

There was slightly better stream conditions upstream from Pickerington WWTP in 1996 thatn in 1984 (Fig. SycICItr). That could have been due to decreased effluent discharged upstream (Royal Acres and Russell Heights WWTPs no longer discharge). Downstream from Pickerington WWTP the 1996 survey results indicated good conditions (ICI=36) were maintained (attainment) with recovery to very good water quality at RM 2.7 comparatively close to upstream conditions (more qualitative and total taxa and almost equal number of EPT taxa (Fig. SycTaxatr). This was an improvement from 1984 survey results. In 1984 fair conditions (non-attainment) existed in Sycamore Creek downstream from Pickerington WWTP with recovery to good conditions at RM 2.7 similar to those found upstream at RM 4.7. The number of taxa and EPT taxa collected downstream from the Pickerington WWTP between the 1984 and 1996 surveys increased approximately 20 to 35 percent (Fig. SycTaxatr and SycEPTtr). Efficient wastewater treatment at Pickerington WWTP enabled Sycamore Creek water quality to stay in attainment with good conditions downstream from the 001 discharge. There was still some slight nutrient enrichment associated with Pickerington WWTP for a short distance downstream.

The increased sedimentation from suburbanization (NPS stormwater, erosion) of the Sycamore Creek subwatershed and short-term NPS inputs from Pickerington WWTP expansion construction continued to increase bedload movement accumulating in large sand and sediment piles at the mouth and into Walnut Creek downstream burying substrates. Upstream in Walnut Creek at RM 34.5 and downstream at RM 26.4 the QHEI scores were 75.5 and indicated esceptional potential. At RM 29.1 downstream from the Sycamore Creek confluence in Walnut Creek the QHEI had dropped to 62.5. (The macroinvertebrate site immediately upstream at RM 29.7 consisted of excellent habitat with large fast riffle, runs and deep pools with undercut banks and good cover. The fish sampling site was further upstream at a site with less development, no riffle and a subsequent lower QHEI score.) The decreased habitat conditions at RM 29.1 included poor substrates, poor development/low sinuosity, and embedded and silted substrates. All of these conditions could be affected by Sycamore Creek substrate (sand and silt) bedload inputs into Walnut Creek just upstream.

The helgrammite *Corydalus cornutus*, which prefer spaces under large substrates, were collected in Sycamore Creek at RM 0.1 in 1993 and in Walnut Creek upstream from the Sycamore Creek confluence (RM 29.7) in both 1993 and 1996. They were not collected downstream from Sycamore Creek in Walnut Creek (RM 29.1) in 1993. They were not collected in 1996 at RM 0.1 in Sycamore Creek and again at the Amanda Road station downstream in Walnut Creek at RM 29.1. There was also a decrease in the number of EPT taxa collected during qualitative sampling (18 to 11), total taxa (78 to 69), and ICI scores (52 to 48). The QCTV scores dropped significantly from 39.7 to 36.3. This conditions indicated likely continued sedimentation effects from the Sycamore Creek subwatershed to Walnut Creek. Stormwater and sedimentation abatements and continued efficient wastewater treatment in the Sycamore Creek watershed will help prevent long-term degradation to Sycamore Creek water quality and to the biological community and curtail future possible impacts to Walnut Creek downstream from Sycamore Creek.

Georges Creek

The upstream stations in 1987 (RM 9.0 and 8.3) bracketing unsewered East Chester Estates concluded that the primary flow was based on septic discharge, and poor conditions existed in the upstream reach. In 1996 at RM 6.4 a marginally good conditions were observed indicated possible improvements in the upper reach of Georeges Creek.

East Fork of Georges Creek

In 1984 fair water quality conditions were present in the East Fork of Georges Creek from the upstream site at RM 6.0 (upstream sources - Chevington Woods N. WWTP, unsewered septic discharges from Chevington Woods S. and agricultural NPS inputs) to RM 3.8 (upstream discharges were Mingo Estates WWTP at RM 5.33 and inputs from Easton Village WWTP via an unnamed tributary to the tributary to Georges Creek whose confluence was at RM 5.38). Intermediate pollution-sensitive to pollution intolerant organisms were predominant (e.g., midges, riffle beetles, flatworms, blackflies, oligochaete worms). Recovery to good conditions in 1984 survey was observed at RM 2.4 where 7 EPT taxa were collected and good qualtity organisms, like *Elimia* snails, riffle beetles, and hydropychid caddisflies were predominant.

In 1987 sampling further upstream at RM 7.9 documented poor water quality conditions due to the Chevington Woods N. WWTP discharges (zero EPT taxa with a low QCTV of 20.7). Conditions improved downstream from the WWTP inputs and some observed poor quality septic tank discharges from the unsewered Chevington Woods South development by natural instream assimilation and treatment. At RM 6.1 water quality conditions improved to marginally good from fair in 1984. Higher quality organisms like water pennies, riffle beetles, and *Chimarra* and hydropsychid caddisflies were predominant, and eight qual. EPT taxa were collected.

In 1996 at RM 6.0 an improvement to exceptional (ICI = 46) water quality conditions was documented. There still was some slight effects from upstream (possible sources were WWTP discharges, unsewered areas, and NPS stormwater and sedimentation). More sensitive *Chimarra* caddsiflies and *Ectopria* water pennies were not collected in 1996 compared to the 1987 survey, and the community structure shifted slightly toward organisms more tolerant of organic inputs.

At RM 2.4 in 1984 and 1996 good conditions were found. Similar macroinvertebrate communities were observed, though more mayflies were present in the 1996 survey. Equal numbers of EPT taxa (7) were collected, and the QCTV values were similar. Effects from the Easton Village WWTP (from a tributary at RM 5.38) and Mingo Estates WWTP at RM 5.33 had not been affected the macroinvertebrate community to the downstream station. There had been apparently similar macroinvertebrate performance through this lower reach between sampling years. Hydromodification issues likely have been the more significant influence than waste inputs in this lower reach. NPS suburbanization, stormwater runoff, and smaller riparian areas have increased the effects of erosion. Silt accumulation on the natural substrates and partially embedded conditions reduced available habitat and restricted any increases in diversity and quality. Abatement of NPS effects would likely increase diversity and quality based on the higher performance observed upstream during the 1996 sampling.

Biological Trend Assessment: Fish Community 1979-1996

Walnut Creek

Fish community data were previously collected from Walnut Creek in 1979, 1980, 1981, 1982, 1993 and 1994 (Table 17). In 1979 a single sample (IBI=16, MIwb=5.4) was collected at RM 0.4. In 1980 three passes at the same site yielded the same poor results (IBI=22, MIwb=6.9). Performance in a single 1981 sample was fair (IBI=28, MIwb=6.6). Little information is available to associate with this impacted condition but the health of the downstream Scioto River was degraded by sewage and other pollutants emanating from Columbus at that time (Ohio EPA 1979).

The 1982 survey included 18 sites from RM 47.1 to RM 1.2 and was conducted using the boat method. As such, the IBI scores for this survey were based metrics which are different from those used for the wading methods employed in the 1996 survey. Therefore, direct comparison of the results is only applicable to the lower eleven miles of both surveys. In both cases generally very good performance was noted in this lower reach although the 1996 scores were slightly lower than the scores reported in 1982 (Figure 18).

Biological performance in the upper reach of Walnut Creek in 1982 was impacted by the Newark Group Industry and Baltimore WWTP's. However, the improvement determined in 1996 also reflects the different expectations based on wading methodology. The wading methods which had not been developed in 1982 include several metrics in common with the boat assessment but the associated calibration can produce different results. For instance, relative numbers of fish and the percentage of simple lithophils at several sites were similar in Walnut Creek in both surveys (Figure 18, lower plot). Notice the interpretation of the results varies with the method used to capture the fish. In Figure 18, the 1982 samples collected in the lighter shaded reach earn a moderate boat score. Whereas, only two of the 1996 wading samples in the darker shaded portion received the same metric score of 3. In this case, porportionally more simple lithophils would have had to have been collected in 1982 in order to gain a metric score of 5. This differential scoring occurred across many of the IBI metrics. To compensate for this, the 1982 boat survey data at sites with a drainage area less than 100 mi^2 was evaluated using some of of the current wading IBI calibrations. The result of these adjustments appear in Figure 18.

Overall, a pattern of improvement was apparent across the upper reach of Walnut Creek between 1996 and 1982. Both, the Newark Group Industry WWTP via Pawpaw Creek and the Baltimore WWTP have increased their treatment efficiencies and the fish community demonstrated a commensurate improvement. Since habitat conditions in the upper reach are good it is reasonable to expect continued advances in fish community performance with any further WWTP upgrades.

Pleasantville Creek

The Pleasantville Creek fish community was narratively rated as poor (IBIθ23) in 1982 based on sampling at two sites using a battery operated backpack. At the same sites in 1996 a narrative rating of fair (IBIθ=30) was recorded. Operation at the Walnut Creek Sewer District WWTP did not appear to influence the stream in either survey. Habitat conditions were adequate to support a better fish community. No reason for the general malaise of the fish community was apparent in either study. Further study is recommended to discover to reason for the biocriteria departure in this stream.

Pawpaw Creek

Sampling at two sites bracketing the Newark Group Industry WWTP via the West Branch of Pawpaw Creek occurred in 1982 and 1996. Fair fish community performance (IBI=28) declined to poor (IBI=28) downstream from the tributary in 1982. Performance at both sites in 1996 was good. Better operation at the facility was credited for the downstream improvement in combination

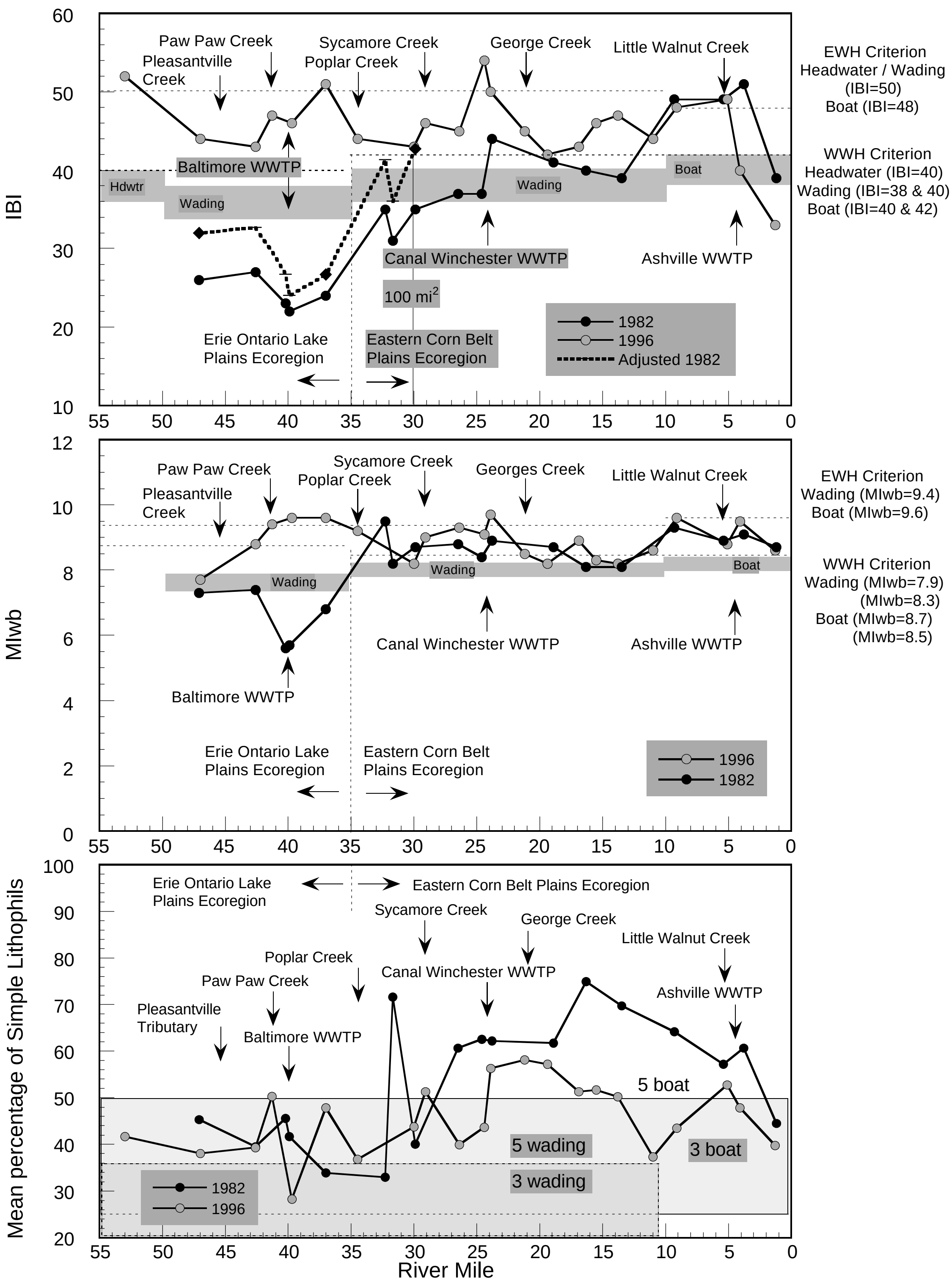

Figure 18 Longitudinal trend of the IBI (upper plot), MIwb (middle plot) and the mean percentage of simple lithophils (lower plot) in Walnut Creek, 1982-1996.

with an overall improved ambient water quality condion. In 1982 oily odors and a sheen were observed on the water surface and an flocculent was prevelant at the upstream site. This condition was not observed in 1996.

West Branch of Pawpaw Creek
In 1982 fair (IBI=33) fish community performance was documented at RM 1.7. In 1996 very good (IBI=46) performance was noted downstream from this site at RM 1.0. Changes in area land use through implementation of better agricultural practices were deemed to be the most likely factor behind this improvement.

Gillette Run
The same site on Gillette Run was sampled in 1996 (IBI=42) and in 1982 (IBI=32) where an improvement to good from fair was recorded. Like the situation in the West Branch of Pawpaw Creek the implementation of better agricultural practices were deemed to be the most likely factor behind this improvement.

Sycamore Creek
The Sycamore Creek fish community was rated marginally good (IBIθ=38) in 1984 in the aggregate of three sites bracketing the Pickerington WWTP. At four similar sites in 1994 a rating of very good (IBIθ=47) was recorded. Upgrades at the WWTP in 1987 was credited for this improvement. In 1996 while the facility was being expanded again, fish community performance through the same reach was good (IBIθ=44, n=4). The subtle shift in 1996 was attributed to the construction activity at the plant and some treatment inefficiencies. Both of these concerns should be rectified with the completion of this upgrade.

Georges Creek
In 1987 two upstream Georges Creek sites (RMs 8.3 and 6.5) earned fair (IBI=28) and poor (IBI=24) scores. In 1996 fish community scores at three downstream sites were considered fair (IBIθ=32.7). Although the sites did not overlap it was apparent that no improvement has occurred in the sub-basin over this period of time. Suburban sprawl and aggressive land development with poor implementation of practices to reduce polluted runoff appear to be degrading this stream.

East Fork of Georges Creek
As with Georges Creek, the East Fork is impacted by habitat degradation as a consequence of suburban sprawl. In 1984 the results from four sites indicated the fish community was in fair condition (IBIθ=31.3). The performance was poor (IBIθ=24) in 1987 at two sites. Some recovery was suggested in 1996 at an upstream site in a subdivision where good (IBI=40) performance was recorded. However, a lower reach 1996 site remained in fair condition (IBI=34).

Little Walnut Creek
Similar performance was recorded in Little Walnut Creek in 1982 and 1996. Generally very good conditions were observed in both surveys. In contrast to the Georges Creek sub-basin, the Little

Walnut Creek area has retained a rural character and habitat conditions have been stable. The buffer strip of trees along much of the stream was considered to be an important factor which has contributed to habitat stability.

Area of Degradation Value Trend Assessment: 1982-1996

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 18 reflect positive and negative influences on the aquatic communities because a given reach can have segments which exceed and which do not attain biocriteria.

Comparative reaches of Walnut Creek are represented in Table 18. The attainment statistics imply that 89 percent of Walnut Creek fully met the WWH biocriteria in 1996. The remaining 6.0 miles were in partial attainment of the biocriteria. In the 1982 across a similar reach only half (50.5%) of

Table 18. Area of Degradation Values (ADV) statistics for Walnut Creek,1982-1996. Values were calculated using Erie Ontario Lake Plain and Eastern Corn Belt Plain WWH biocriteria as the baseline for community performance.

Stream (Year)			Biological Index Values		ADV Statistics				Attainment Status		
	Reach				Positive		Negative		(miles)		
Index	Upper RM	Lower RM	Mini-mum	Maxi-mum	ADV	**ADV/ Mile**	ADV	**ADV/ Mile**	FULL	PARTIAL	**NON**
Walnut Creek (1996)											
IBI	53.0	1.3	32	54	4361	**82.7**	111	**2.1**	46.7	6.0	--
MIwb			7.7	9.7	2398	**51.3**	18	**0.3**			
ICI			25	54	5998	**136.3**	25	**0.5**			
Walnut Creek (1982)											
IBI	47.1	1.2	22	51	1405	**29.9**	1849	**39.4**	23.7	17.8	**5.4**
MIwb			5.6	9.5	1237	**26.3**	734	**15.6**			
ICI			24	48	3578	**76.4**	255	**5.4**			

the stream was in full achievement of the criteria. Eleven percent of the stream was in non-attainment and 38 percent partially attained. The greatest degree of biological community improvement was most closely associated with the various upgrades and increased operational efficiencies at municipal WWTPs in the Walnut Creek basin.

REFERENCES

DeShon, J.D. 1995. Development and application of Ohio EPA's invertebrate community index (ICI), *in* W.S. Davis and T. Simon (eds.). Biological assessment and criteria: tools for risk-based planning and decision making. CRC Press/Lewis Publishers, Ann Arbor.

Fausch, D.O., Karr, J.R. and P.R. Yant. 1984. Regional application of an index of biotic integrity based on stream fish communities. Trans. Amer. Fish. Soc. 113:39-55.

Gammon, J.R., A. Spacie, J.L. Hamelink, and R.L. Kaesler. 1981. Role of electrofishing in assessing environmental quality of the Wabash River. pp. 307-324. In: Ecological assessments of effluent impacts on communities of indigenous aquatic organisms. ASTM STP 703, J.M. Bates and C.I. Weber (eds.). Philadelphia, PA.

Gammon, J.R. 1976. The fish populations of the middle 340 km of the Wabash River. Tech. Report No. 86. Purdue University. Water Resources Research Center, West Lafayette, Indiana. 73 pp.

Gordon, R.B. 1969. The natural vegetation of Ohio in pioneer days. The Ohio State University. Ohio Biological Survey, Columbus. III-2. 113pp.

Hughes, R. M., D. P. Larsen, and J. M. Omernik. 1986. Regional reference sites: a method for assessing stream pollution. Env. Mgmt. 10(5): 629-635.

Johnson, D.P. and K.D. Metzker. 1981. Low-flow characteristics of Ohio streams. United States Department of the Interior-Geological Survey. 81-1195. 285pp.

Karr, J. R. 1991**.** Biological integrity: A long-neglected aspect of water resource management. Ecological Applications 1(1): 66-84.

Karr, J.R., K.D. Fausch, P.L. Angermier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Ill. Nat. Hist. Surv. Spec. Publ. 5. 28 pp.

Karr, J.R. 1981. Assessment of biotic integrity using fish communities. Fisheries 6 (6): 21-27.

Karr, J.R. and D.R. Dudley. 1981. Ecological perspective on water quality goals. Env. Mgmt. 5(1): 55-68.

Kelly, M. H. and R. L. Hite. 1984. Evaluation of Illinois stream sediment data: 1974-1980. Illinois Environmental Protection Agency, Division of Water Pollution Control. Springfield, Illinois.

Miner R. and D. Borton. 1991. Considerations in the development and implementation of biocriteria, Water Quality Standards for the 21st Century, U.S. EPA, Offc. Science and Technology, Washington, D.C., 115.

Ohio Department of Natural Resources. 1985. Principal streams and their drainage area. Division of Water. Ohio Department of Natural Resources. Columbus, Ohio.

___ 1960. Gazetteer of Ohio streams. Ohio Dept. Natural Resources, Division of Water, Ohio Water Plan Inventory Report No. 12.

Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

___ 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

___ 1989a. Addendum to biological criteria for the protection of aquatic life: Users manual for biological field assessment of Ohio surface waters. Division of Water Quality Planning and Assessment, Surface Water Section, Columbus, Ohio.

___ 1989b. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Division of Water Quality Planning and Assessment, Columbus, Ohio.

___ 1989c. Ohio EPA policy for implementing chemical specific water quality based effluent limits and whole effluent toxicity controls in NPDES permits. Divisions of Water Pollution Control and Water Quality Planning and Assessment, Columbus, Ohio.

___ 1989d. Assessment of the 1988 drought: chemical, biological, and physical impacts at selected Ohio stream sites. Division of Water Quality Planning and Assessment, Columbus, Ohio.

___ 1990. The cost of biological field monitoring. Division of Water Quality Planning and Assessment, Columbus, Ohio.

___ 1990a. State of Ohio nonpoint source assessment: Volume 5. Region. Division of Water Quality Planning and Assessment, Nonpoint Source Program Management Section, Columbus, Ohio.

___ 1990b. Ohio water resource inventory - 1990 305b report. Volume II. Edward T. Rankin, editor. Division of Water Quality Planning and Assessment, Surface Water Section, Columbus, Ohio.

___ 1991. Calculation and uses of the Area of Degradation Value (ADV). Division of Water Quality Planning and Assessment, Surface Water Section, Columbus, Ohio.

Omernik, J.M. 1988. Ecoregions of the conterminous United States. Ann. Assoc. Amer. Geogr. 77(1): 118-125.

Omernik, J.M. and A.L. Gallant. 1988. Ecoregions of the upper midwest states. EPA/600/3-88/037. U. S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon. 56 pp.

Rankin, E.T. 1995. The qualitative habitat evaluation index (QHEI), *in* W.S. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making. CRC Press/Lewis Publishers, Ann Arbor. (in press).

Rankin, E.T. and C.O. Yoder. 1991 Calculation and use of the area of degradation value (ADV). Division of Water Quality Planning and Assessment, Surface Water Section, Columbus, Ohio.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Division of Water Quality Planning and Assessment, Columbus, Ohio.

Shindel, H.L., J.P. Mangus, and L.E. Trimble. 1995. Water resources data Ohio, Water year 1994, Volume 1. Ohio River basin excluding project data. United States Department of the

Interior-Geological Survey. Water-Data Report OH-90-1. 287pp.

Suter, G.W., II. 1993. A critique of ecosystem health concepts and indexes. Environmental Toxicology and Chemistry, 12: 1533-1539.

Trautman, M. B. 1981. The fishes of Ohio with illustrated keys. Ohio State Univ. Press, Columbus. 782 p

Whittier, T.R., D.P. Larsen, R.M. Hughes, C.M. Rohm, A.L. Gallant, and J.M. Omernik. 1987. The Ohio stream regionalization project: a compendium of results. EPA/600/3-87/025. 66 pp.

Yoder, C.O., J. DeShon, R. Thoma, E. Rankin, and R. Beaumier. 1986. Evaluation of effluent toxicity screening of two selected discharges. Division of Water Quality Monitoring and Assessment, Columbus, Ohio.

Yoder, C.O. 1989. The development and use of biological criteria for Ohio surface waters. U.S. EPA, Criteria and Standards Div., Water Quality Stds. 21st Century, 1989: 139-146.

Yoder, C. O. 1991**.** Answering some concerns about biological criteria based on experiences in Ohio, *in* G. H. Flock (ed.) Water quality standards for the 21st century. Proceedings of a National Conference, U. S. EPA, Office of Water, Washington, D.C.

Yoder, C.O. 1995. Policy issues and management applications of biological criteria, *in* W.S. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making. CRC Press/Lewis Publishers, Ann Arbor.

Yoder, C.O. and E.T. Rankin. 1995. Biological response signatures and the area of degradation value: new tools for interpreting multi-metric data, *in* W.S. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making. CRC Press/Lewis Publishers, Ann Arbor.

Appendix Table A-1. NPDES permit violations for Walnut Creek basin dischargers in the third quarter of 1996 (July1- September 30). Data evaluated was contained in monthly operating reports submitted to the Ohio EPA by those facilities. TNTC = too numerous to count.

Entity/ Date	**Vioated Parameter**	**Reported/ Permit Limit**	**Units**
Walnut Creek Sewer District			
July 1996	Chlorine Residual	22times/0.038	mg/l
August 1996	Chlorine Residual	21times/0.038	mg/l
Sept 1996	Chlorine Residual	19times/0.038	mg/l
ODOT 5-1			
7/16	Dissolved Oxygen	3.9/5.0	mg/l
July 1996	Suspended Solids	21/12	mg/l
July 1996	Fecal coliform	14800/1000	#/100 ml
July 1996	Fecal coliform	14800/2000	#/100 ml
July 1996	cBOD5	20/10	mg/l
8/6/96	Dissolved Oxygen	3.4/9.0	mg/l
8/1-7/96	Fecal coliform	2100/2000	#/100 ml
Aug 1996	Fecal coliform	2100/1000	#/100 ml
8/1-7/96	cBOD5	27/15	mg/l
Aug 1996	cBOD5	27/10	mg/l
Ohio Paperboard			
7/18/96	Oil & Grease	4.3/3.7	mg/L
Bloom Carroll WWTP			
August 1996	Residual Chlorine	5times/daily	mg/l
Sept 1996	Residual Chlorine	4times/daily	mg/l
Huntington Hills WWTP			
July 1996	Ammonia	5.36/2.0	mg/l
July 1996	Ammonia	2.3/1.2	kg/day
7/15-21/95	Ammonia	11.5/3.0	mg/l
7/15-21/95	Ammonia	4.5/1.8	kg/day
7/22	Residual Chlorine	0.1/0.038	mg/l
August 1996	Ammonia	6.85/2.0	mg/l
August 1996	Ammonia	3.0/1.21	kg/day
8/22-28/96	Ammonia	13.6/3.0	mg/l
8/22-28/96	Ammonia	6.0/1.8	kg/day
8/12	Residual Chlorine	0.3/0.038	mg/l
Sept. 1996	Fecal Coliform	1025/1000	#/100 ml
Canal Winchester WWTP			
July 1996	Fecal coliform	TNTC/1000	#/100 mL

Table A-1. (continued)

Entity/ Date	**Vioated Parameter**	**Reported/ Permit Limit**	**Units**
Canal Winchester WWTP (continued)			
7/1-7/7/96	Fecal coliform	TNTC/2000	#/100 mL
7/8-7/14/96	Fecal coliform	TNTC/2000	#/100 mL
7/15-7/21/96	Fecal coliform	TNTC/2000	#/100 mL
July 1996	cBOD-5	50.0/15.0	mg/L
July 1996	cBOD-5	120.45/36.9	kg/d
7/01-07/96	cBOD-5	44.0/24.0	mg/l
7/01-07/96	cBOD-5	109.95/56.6	kg/d
7/08-14/96	cBOD-5	118.9/24.0	mg/l
7/08-14/96	cBOD-5	221.32/56.6	kg/d
7/22-28/96	cBOD-5	54.5/24.0	mg/l
7/22-28/96	cBOD-5	189.64/56.6	kg/d
July 1996	Suspended Solids	135.5/20.0	mg/l
July 1996	Suspended Solids	293.22/49.2	kg/d
7/01-07/96	Suspended Solids	147.0/30.0	mg/l
7/01-07/96	Suspended Solids	376.78/73.8	kg/d
7/08-14/96	Suspended Solids	397.0/30.0	mg/l
7/08-14/96	Suspended Solids	747.5/73.8	kg/d
7/15-21/96	Suspended Solids	63.5/30.0	mg/l
7/15-21/96	Suspended Solids	132.96/73.8	kg/d
7/22-28/96	Suspended Solids	95.66/73.8	kg/d
7/25-31/96	Suspended Solids	43.0/30.0	mg/l
7/25-31/96	Suspended Solids	113.22/73.8	kg/d
8/08-14/96	Fecal Coliform	TNTC/2000	#/100ml
August 1996	Suspended Solids	31.0/20.0	mg/l
August 1996	Suspended Solids	57.93/49.2	kg/d
8/01-07/96	Suspended Solids	48.0/30.0	mg/l
8/01-07/96	Suspended Solids	89.11/73.8	kg/d
8/08-14/96	Suspended Solids	36.5/30.0	mg/l
Sept. 1996	Suspended Solids	40.0/20.0	mg/l
Sept. 1996	Suspended Solids	74.6/49.2	kg/d
9/01-07/96	Suspended Solids	49.5/30.0	mg/l
9/01-07/96	Suspended Solids	96.19/73.8	kg/d
9/08-14/96	Suspended Solids	71.0/30.0	mg/l
9/08-14/96	Suspended Solids	133.37/73.8	kg/d
Huntington Hills WWTP			
July 1996	Ammonia	5.36/2.0	mg/l
July 1996	Ammonia	2.3/1.2	kg/day

Huntington Hills WWTP (continued)

Table A-1. (continued)

Entity/ Date	**Vioated Parameter**	**Reported/ Permit Limit**	**Units**
7/15-21/95	Ammonia	11.5/3.0	mg/l
7/15-21/95	Ammonia	4.5/1.8	kg/day
7/22	Residual Chlorine	0.1/0.038	mg/l
August 1996	Ammonia	6.85/2.0	mg/l
August 1996	Ammonia	3.0/1.21	kg/day
8/22-28/96	Ammonia	13.6/3.0	mg/l
8/22-28/96	Ammonia	6.0/1.8	kg/day
8/12	Residual Chlorine	0.3/0.038	mg/l
Sept. 1996	Fecal Coliform	1025/1000	#/100 ml
Lithopolis Water Treatment Plant			
July 1996	Suspended Solids	38/30	mg/l
7/8	Suspended Solids	38/45	mg/l
Rickenbacker Air National Guard Base			
August 1996	Oil & Grease	16.0/10.0	mg/L
Mann's Mobile Home Park			
July 1996	Suspended Solids	87.0/30.0	mg/l
July 1996	Suspended Solids	21.4/4.5	kg/d
7/01-07/96	Suspended Solids	64.0/45.0	mg/l
7/01-07/96	Suspended Solids	15.0/6.8	kg/d
7/08-14/96	Suspended Solids	148.0/45.0	mg/l
7/08-14/96	Suspended Solids	34.0/6.8	kg/d
7/15-21/96	Suspended Solids	164.0/45.0	mg/l
7/15-21/96	Suspended Solids	44.0/6.8	kg/d
July 1996	Fecal Coliform	14537/1000	#/100ml
7/01-07/96	Fecal Coliform	30000/2000	#/100ml
7/08-14/96	Fecal Coliform	20000/2000	#/100ml
7/15-21/96	Fecal Coliform	10300/2000	#/100ml
7/22-28/96	Fecal Coliform	14200/2000	#/100ml
Aug. 1996	Suspended Solids	4.8/4.5	kg/d
Aug. 1996	Fecal Coliform	8801/1000	#/100ml
8/08-14/96	Fecal Coliform	3162/2000	#/100ml
8/15-21/96	Fecal Coliform	20000/2000	#/100ml
8/22-21/96	Fecal Coliform	30000/2000	#/100ml
Sept. 1996	Suspended Solids	45.0/30.0	mg/l
Sept. 1996	Suspended Solids	10.3/4.5	kg/d
9/01-07/96	Suspended Solids	176.0/45.0	mg/l
9/01-07/96	Suspended Solids	40.6/6.8	kg/d

Mann's Mobile Home Park (continued)			
Sept. 1996	Fecal Coliform	3223/1000	#/100ml

Table A-1. (continued)

Entity/ Date	**Vioated Parameter**	**Reported/ Permit Limit**	**Units**
9/07/96	Fecal Coliform	4000/2000	#/100ml
9/21/96	Fecal Coliform	9000/2000	#/100ml
9/28/96	Fecal Coliform	3000/2000	#/100ml
Ashville WWTP			
6/18/96	Fecal Coliform	21100/2000	#/100ml

Appendix Table A-2. NPDES permit violations for Walnut Creek basin dischargers 1992-1996. Data evaluated was contained in facility monthly operating reports submitted to the Ohio EPA. The facility's cumulative number of violations is listed next to its name and expressed as a percentage of the total number of violations (1575) recorded in the basin over the four year period.

Facility/ Violated parameters	No.#	**Facility**/ Violated parameters	No.#
Walnut Creek Sewer District 60 (3.8%)		**Ohio Paperboard** (continued)	
Ammonia	30	pH	11
Fecal coliform	13	Bis(2ethylhexyl)phthalate	2
Suspended Solids	1	Flow	1
cBOD5	2	Oil and Grease	4
Chlorine Residual	6	**Baltimore WWTP** 146 (9.3%)	
Dissolved Oxygen	8	Oil and Grease	1
ODOT 5-1 23 (1.5%)		Fecal coliform	8
Ammonia	4	E. coli	1
Dissolved Oxygen	4	Chlorine Residual	69
Suspended Solids	4	Ammonia	12
cBOD5	4	Nitrite	1
Fecal coliform	7	Nitrate	1
Sakas 34 (2.1%)		Suspended Solids	36
Suspended Solids	20	Dissolved Oxygen	17
cBOD5	10	**Bloom Carroll WWTP** 39 (2.4%)	
Ammonia	4	Suspended Solids	7
Ohio Paperboard 262 (16.6%)		cBOD5	9
BOD-5	125	Ammonia	1
Suspended Solids	29	Color	6
Ammonia	63	Odor	6
Phenolic	18	Turbidity	6
Dissolved Oxygen	9	Chlorine Residual	2

Table A-2. (continued)

Facility/ Violated parameters	No.#	**Facility**/ Violated parameters	No.#
Bloom Carroll WWTP (continued)		**New England Acres WWTP** (continued)	

Table A-2. (continued)

Facility/ Violated parameters	No.#	**Facility**/ Violated parameters	No.#
Dissolved Oxygen	2	cBOD5	2
Carroll WWTP 24 (1.5%)		pH	1
Suspended Solids	10	Chlorine Residual	2
Flow	3	Dissolved Oxygen	1
cBOD5	6	**Century Acres WWTP** 9 (0.6%)	
Color	1	Ammonia	1
Odor	1	Fecal coliform	5
Turbidity	1	pH	1
pH	2	Suspended Solids	1
Huntington Hills WWTP 96 (6.1%)		cBOD	1
Suspended Solids	36	**Lithopolis WTP** 17 (1.1%)	
cBOD-5	7	Suspended Solids	7
Ammonia	27	Iron	6
Fecal coliform	13	Total Residue	4
Dissolved Oxygen	4	**Rickenbacker Air Nat'l Guard** 3 (0.2%)	
Chlorine Residual	**4**	Oil and Grease	2
Pickerington WWTP 45 (2.8%)		pH	1
Suspended Solids	24	**Rickenbacker Port Authority** 7 (0.4%)	
Ammonia	5	pH	3
cBOD-5	11	Oil and Grease	4
Fecal coliform	1	**Mann's Mobile Home Park** 389 (24.7%)	
pH	4	Suspended Solids	228
Jefferson Woods 38 (2.4%)		cBOD-5	40
Dissolved Oxygen	18	Fecal coliform	113
Suspended Solids	4	Dissolved Oxygen	6
Chlorine Residual	14	Chlorine Residual	2
Ammonia	**1**	**Ashville WWTP** 120 (7.6%)	
Odor	1	Suspended Solids	56
Canal Winchester WWTP 109 (6.9%)		Fecal coliform	21
Suspended Solids	66	Dissolved oxygen	5
Fecal coliform	11	cBOD-5	13
Chlorine Residual	1	Ammonia	6
cBOD-5	29	pH	16
Dissolved Oxygen	2	Chlorine Residual	2
New England Acres WWTP 64 (4.1%)		Oil and Grease	1
Ammonia	4		
Suspended Solids	41		
Fecal coliform	13		
Amerimark 90 (5.7%)		**Amerimark** (continued)	
Cyanide	1	Odor	1

Table A-2. (continued)

Facility/ Violated parameters	No.#	**Facility**/ Violated parameters	No.#
Aluminum	5	Turbidity	1
Suspended Solids	8	Ammonia	5
Dissolved Oxygen	2	cBOD-5	3
pH	58	Fecal coliform	2
Flow	2	Chlorine Residual	1
Color	1		

Appendix Table A-3. Results of chemical/physical sampling conducted in the Walnut Creek study area during July-September, 1996. Values proceeded by (*) indicate concentration below method detection limit. NA indicates not analyzed or recorded. CG indicates confluent growth. Italicized values represent effluent samples. Note: mainstem results precede tributaries and metals follow demand and nutrient parameters.

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (°C)	TRC (mg/l)	CL^G (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
Walnut Creek													
53.00	7/10	1040	500	NA	7.60	17.5	NA	NA	NA	NA	71	800	1340
	7/23	1115	410	NA	7.44	19.0	NA	19	NA	NA	50	520	4400
	8/5	0930	500	NA	7.43	20.0	NA	17	NA	NA	55	636	2500
	8/19	0905	500	NA	7.30	18.5	NA	17	NA	NA	68	160	1960
	9/3	0950	500	NA	7.34	18.0	NA	16	NA	NA	66	150	1310
46.97	7/10	1100	550	NA	7.79	20.0	NA	23	NA	NA	66	640	805
	7/23	1135	400	NA	7.42	20.0	NA	17	NA	NA	48	980	6600
	8/5	1030	550	NA	7.38	22.0	NA	22	NA	NA	66	410	890
	8/19	1055	600	NA	7.54	21.0	NA	20	NA	NA	88	550	1320
	9/3	1130	500	NA	7.68	20.0	NA	18	NA	NA	92	250	1080
42.52	7/10	1120	700	NA	8.13	20.0	NA	36	NA	NA	89	140	365
	7/23	1155	400	NA	7.50	21.0	NA	18	NA	NA	48	520	7800
	8/5	1105	500	NA	7.81	22.0	NA	25	NA	NA	74	200	420
	8/19	1010	700	NA	7.73	20.5	NA	40	NA	NA	99	120	690
	9/3	1115	700	NA	8.07	20.0	NA	47	NA	NA	113	390	900
41.17	7/10	1210	750	NA	7.84	20.0	NA	44	NA	NA	100	820	680
	7/23	1230	420	NA	7.48	21.0	NA	21	NA	NA	45	500	6400
	8/5	1215	600	NA	7.64	22.0	NA	30	NA	NA	91	460	790
	8/19	1025	800	NA	7.69	20.0	NA	43	NA	NA	111	410	975
	9/3	1055	900	NA	7.96	20.0	NA	55	NA	NA	129	130	1020
40.05	*7/10*	*1249*	*1000*	*NA*	*7.84*	*21.0*	*0.40*	*98*	*10**	*1.0**	*146*	*140*	*150*
	7/23	*1300*	*700*	*NA*	*7.53*	*20.5*	*0.05*	*56*	*10**	*1.0**	*79*	*1040*	*940*

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (°C)	TRC (mg/l)	CL^G (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	8/5	*1240*	*600*	*NA*	*7.68*	*22.0*	*0.08*	*95*	*10**	*1.00**	*141*	*50*	*40*
	8/19	*1315*	*1000*	*NA*	*7.79*	*21.5*	*0.08*	*102*	*10**	*2.23*	*136*	*121000*	*20000*
	9/4	*1050*	*1200*	*NA*	*7.58*	*21.0*	*0.11*	*252*	*10**	*1.0**	*137*	*10*	*10*
40.00	7/10	1315	800	NA	8.07	21.0	NA	51	NA	NA	119	390	170
	7/23	1315	430	NA	7.69	21.0	NA	21	NA	NA	53	3800	5600
	8/5	1245	600	NA	7.67	23.0	NA	33	NA	NA	75	243	390
	8/19	1335	850	NA	7.67	22.0	NA	50	NA	NA	113	3800	1360
	9/4	1100	1000	NA	7.80	21.0	NA	90	NA	NA	135	240	530
39.70	7/23	1330	410	NA	7.72	21.0	NA	20	NA	NA	55	4200	4600
	8/5	1250	600	NA	7.74	22.0	NA	34	NA	NA	90	290	420
	8/19	1345	800	NA	7.69	21.5	NA	55	NA	NA	114	30000	6500
	9/4	1105	1000	NA	7.87	21.0	NA	86	NA	NA	136	190	740
36.89	7/10	1150	750	NA	7.82	20.0	NA	41	NA	NA	101	140	310
	7/24	0940	500	NA	7.64	20.0	NA	24	NA	NA	51	470	1840
	8/6	0910	1082	694	8.01	22.70	NA	34	NA	NA	75	355	812
	8/20	0905	1316	843	8.03	21.68	NA	44	NA	NA	96	250	790
	9/4	1210	900	NA	7.97	22.0	NA	55	NA	NA	132	90	270
34.33	7/11	0915	650	NA	6.67	19.5	NA	28	NA	NA	92	285	650
	7/24	1000	400	NA	7.68	20.0	NA	22	NA	NA	56	560	1990
	8/6	0930	1047	676	8.06	22.52	NA	30	NA	NA	76	210	890
	8/20	0920	1206	780	7.96	21.41	NA	37	NA	NA	92	380	580
	9/4	1230	700	NA	7.57	22.0	NA	37	NA	NA	120	230	710
29.91	7/11	0955	500	NA	6.76	18.0	NA	23	NA	NA	83	760	920
	7/26	1140	676	NA	7.80	19.81	NA	15	NA	NA	41	CG	10900
	8/6	0945	991	650	7.94	21.81	NA	23	NA	NA	71	675	1810
	8/20	0945	1081	697	7.87	20.93	NA	25	NA	NA	75	625	775
	9/4	1300	600	NA	7.66	20.5	NA	26	NA	NA	78	230	645
29.18	7/11	1020	500	NA	7.70	18.5	NA	42	NA	NA	80	590	700
	7/26	1210	692	NA	7.87	19.83	NA	17	NA	NA	44	500	7600
	8/6	1010	1037	678	7.92	21.86	NA	31	NA	NA	68	590	1140
	8/20	1005	1195	782	7.93	21.05	NA	48	NA	NA	71	375	880
	9/4	1325	700	NA	NA	21.0	NA	73	NA	NA	82	160	865
26.48	7/11	1045	650	NA	7.77	19.0	NA	41	NA	NA	77	250	435
	7/26	1230	691	NA	7.86	20.23	NA	17	NA	NA	42	960	23000
	8/6	1035	1063	687	8.02	22.54	NA	35	NA	NA	68	460	1240
	8/20	1025	1210	792	7.93	21.19	NA	48	NA	NA	69	630	660
	9/4	1350	700	NA	7.68	21.0	NA	53	NA	NA	79	590	415
24.45	7/11	1100	650	NA	7.88	19.5	NA	37	NA	NA	75	300	720
	7/25	1205	240	NA	7.54	21.0	NA	13	NA	NA	32	4900	85000

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (ºC)	TRC (mg/l)	CL[G] (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	8/7	0955	600	NA	7.53	24.0	NA	37	NA	NA	63	420	965
	8/20	1225	928	767	8.09	23.67	NA	45	NA	NA	69	680	330
	9/5	0955	600	NA	7.85	22.0	NA	54	NA	NA	81	510	315
24.20	*7/11*	*1125*	*2400*	*NA*	*7.11*	*19.0*	*NA*	*648*	*10**	*1.80*	*572*	*>60000*	*23000*
	7/25	*1145*	*700*	*NA*	*7.60*	*22.0*	*0.05*	*78*	*10**	*1.0**	*112*	*40*	*140*
	8/7	*1020*	*1300*	*NA*	*7.25*	*22.0*	*0.02*	*84*	*10**	*7.50*	*106*	*4200*	*855*
	8/20	*1150*	*1438*	*977*	*7.71*	*21.30*	*NA*	*83*	*10**	*NA*	*103*	*31000*	*59000*
	9/5	*1010*	*800*	*NA*	*7.48*	*21.0*	*0.12*	83	10*	1.00*	101	450	4300
24.15	7/11	1135	1600	NA	7.50	20.0	NA	134	NA	NA	152	51000	4600
	7/25	1155	290	NA	7.43	21.0	NA	15	NA	NA	45	CG	98000
	8/7	1030	700	NA	7.49	24.0	NA	41	NA	NA	70	465	765
	8/20	1205	1230	863	8.04	22.71	NA	62	NA	NA	86	8000	38000
	9/5	1025	700	NA	7.92	22.0	NA	57	NA	NA	82	760	860
23.90	7/11	1415	NA	NA	NA	NA	NA	38	NA	NA	82	240	230
	7/26	1300	682	NA	7.88	22.46	NA	18	NA	NA	40	1000	15400
	8/7	1115	600	NA	7.60	25.0	NA	37	NA	NA	64	315	610
	8/21	1200	750	NA	8.11	24.0	NA	51	NA	NA	78	320	360
	9/4	0940	700	NA	7.69	22.0	NA	48	NA	NA	77	340	750
21.20	7/11	1135	630	NA	8.46	19.8	NA	36	NA	NA	84	300	210
	7/25	1030	330	NA	7.01	20.5	NA	17	NA	NA	33	8200	59000
	8/7	0915	600	NA	7.49	25.0	NA	31	NA	NA	69	490	875
	8/21	1325	750	NA	8.20	25.0	NA	46	NA	NA	73	240	200
	9/4	0850	700	NA	7.55	21.0	NA	46	NA	NA	84	647	713
19.30	7/11	1040	700	NA	7.80	19.0	NA	36	NA	NA	73	240	547
	7/25	1330	350	NA	7.28	21.0	NA	17	NA	NA	39	5900	89000
	7/25	0905	330	NA	6.97	21.0	NA	16	NA	NA	35	11500	82000
	8/7	0850	600	NA	7.49	24.0	NA	34	NA	NA	63	405	955
	8/20	1300	700	NA	8.01	25.0	NA	42	NA	NA	72	200	355
	9/5	1100	700	NA	8.04	22.0	NA	45	NA	NA	81	385	250
16.88	7/11	1025	700	NA	7.94	19.0	NA	35	NA	NA	78	300	660
	7/25	1210	300	NA	6.90	21.0	NA	16	NA	NA	39	2900	75000
	7/25	0935	340	NA	6.93	21.0	NA	17	NA	NA	37	4900	60000
	8/6	1345	700	NA	7.87	24.0	NA	30	NA	NA	67	355	1240
	8/20	1240	700	NA	8.01	23.0	NA	39	NA	NA	72	220	375
	9/5	1120	700	NA	8.03	22.0	NA	44	NA	NA	80	480	200
15.50	7/11	0945	610	NA	8.03	19.0	NA	36	NA	NA	78	190	980
	7/26	0000	637	NA	7.62	21.21	NA	18	NA	NA	43	690	42500
	8/6	1255	650	NA	7.68	25.0	NA	31	NA	NA	69	210	450
	8/20	1210	600	NA	8.03	23.0	NA	39	NA	NA	69	160	395

Stream			Conductivity		pH	Temp.	TRC	CL^{G}	T-CN	O&G	SO_4	Fecal	
RM	Date	Time	Field	Lab	Field							Coliform	Strept.
			(umhos/cm)		(S.U.)	(°C)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	number/100ml	
	9/5	1215	700	NA	8.26	22.5	NA	44	NA	NA	82	370	300
13.75	7/11	1000	700	NA	8.03	19.0	NA	37	NA	NA	79	240	530
	7/25	1140	350	NA	7.10	20.5	NA	15	NA	NA	38	13000	92000
	8/6	1240	650	NA	7.77	24.5	NA	32	NA	NA	62	260	580
	8/20	1150	600	NA	7.20	22.0	NA	40	NA	NA	72	140	440
	9/5	1235	700	NA	8.30	22.5	NA	43	NA	NA	82	425	180
11.00	7/10	1425	610	NA	8.33	22.2	NA	34	NA	NA	59	180	150
	7/25	1045	300	NA	7.25	21.0	NA	15	NA	NA	42	CG	74000
	8/6	1105	650	NA	7.62	24	NA	31	NA	NA	63	210	680
	8/20	1035	600	NA	7.85	22.0	NA	37	NA	NA	50	250	570
	9/5	1250	650	NA	8.12	23.0	NA	39	NA	NA	80	455	150
9.10	7/10	1415	610	NA	8.34	22.1	NA	NA	NA	NA	64	100	160
	7/25	1025	500	NA	7.62	21.0	NA	22	NA	NA	49	CG	40000
	8/6	1045	600	NA	7.79	24.0	NA	30	NA	NA	60	445	575
	8/20	1020	760	NA	7.82	22.0	NA	38	NA	NA	68	150	540
	9/6	1140	600	NA	8.06	22.0	NA	39	NA	NA	82	210	695
5.17	7/10	1350	650	NA	8.34	22.1	NA	28	NA	NA	67	200	260
	7/25	1000	450	NA	7.36	21.0	NA	20	NA	NA	53	1420	6500
	8/6	1015	600	NA	7.61	23.5	NA	27	NA	NA	63	280	820
	8/20	0955	600	NA	7.66	22.0	NA	33	NA	NA	72	880	1000
	9/6	1105	600	NA	7.96	22.0	NA	36	NA	NA	81	220	645
4.43	7/10	1315	980	NA	8.19	22.1	NA	NA	10*	1.28	100	10*	50
	7/25	0925	800	NA	7.67	21.5	NA	59	10*	1.0*	84	100	1890
	8/6	0935	1000	NA	7.68	23.0	0.05	76	10*	1.00*	103	545	60
	8/20	0925	800	NA	7.73	22.0	NA	83	10*	1.00*	93	470	170
	9/6	1020	1000	NA	7.86	23.0	0.01	79	10*	1.08	107	260	200
4.41	7/10	1325	700	NA	8.30	22.0	NA	28	NA	NA	74	4900	400
	8/6	0950	600	NA	7.56	23.5	NA	28	NA	NA	63	665	760
	8/20	0940	600	NA	7.56	22.0	NA	33	NA	NA	58	390	610
	9/6	1030	700	NA	7.83	23.0	NA	36	NA	NA	85	280	1720
4.14	7/10	1300	680	NA	8.33	21.5	NA	28	NA	NA	73	1400	270
	7/25	0900	500	NA	7.47	21.0	NA	22	NA	NA	53	2200	4300
	8/6	0910	600	NA	7.63	23.0	NA	26	NA	NA	67	420	810
	8/20	0905	600	NA	7.65	21.0	NA	34	NA	NA	71	390	660
	9/6	0945	600	NA	7.67	22.0	NA	35	NA	NA	82	280	900
1.22	7/10	1245	610	NA	8.34	21.4	NA	27	NA	NA	73	240	380
	7/25	0845	450	NA	7.47	21.0	NA	21	NA	NA	51	2470	5300
	8/6	0855	600	NA	7.56	23.0	NA	25	NA	NA	69	380	1808
	8/20	0855	700	NA	7.60	21.0	NA	32	NA	NA	64	345	547

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (°C)	TRC (mg/l)	CL[G] (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	9/6	0930	700	NA	7.73	22.0	NA	36	NA	NA	87	220	1370
Little Walnut													
0.6	7/12	930	650	NA	7.85	18.5	NA	18	NA	NA	88	478	2050
	7/25	1010	500	NA	6.89	20.0	NA	15	NA	NA	63	4700	33000
	8/6	1025	650	NA	7.51	22.0	NA	18	NA	NA	69	240	1260
	8/20	1005	600	NA	7.60	20.0	NA	19	NA	NA	71	485	1010
	9/6	1120	600	NA	7.79	22.0	NA	19	NA	NA	84	490	1560
George Creek													
2.1	7/11	1305	700	NA	7.69	20	NA	38	NA	NA	93	520	765
	7/25	1230	390	NA	7.56	21.0	NA	23	NA	NA	45	5000	44000
	8/6	1200	1080	697	7.90	22.51	NA	32	NA	NA	78	1100	1320
	8/20	1245	1240	791	7.99	22.59	NA	40	NA	NA	82	685	1560
	9/13	1020	650	NA	7.11	15.0	NA	48	NA	NA	98	740	3300
0.12	7/11	1245	700	NA	8.00	20.0	NA	40	NA	NA	105	485	580
	7/25	1050	340	NA	7.41	21.0	NA	25	NA	NA	44	11500	41000
	8/6	1055	1056	685	7.93	22.46	NA	32	NA	NA	74	NA	NA
	8/7	0940	NA	NA	NA	NA	NA	NA	NA	NA	NA	CG	2500
	8/20	1045	1192	780	7.98	21.07	NA	38	NA	NA	74	560	1045
	9/13	0945	600	NA	7.29	17.0	NA	44	NA	NA	99	660	3250
Tributary to George Creek													
6.05	7/11	1345	800	NA	7.93	20.5	NA	12	NA	NA	81	2400	10818
	7/25	1310	400	NA	7.85	21.0	NA	39	NA	NA	40	820	18900
	8/6	1230	1330	855	8.04	22.95	NA	86	NA	NA	77	1220	6700
	8/20	1315	1658	1040	8.17	22.90	NA	109	NA	NA	88	1200	4100
	9/13	1125	900	NA	7.60	17.0	NA	133	NA	NA	103	760	4000
2.38	7/11	1325	700	NA	7.82	18.5	NA	60	NA	NA	88	560	980
	7/25	1250	370	NA	7.80	21.0	NA	29	NA	NA	42	4500	79000
	8/6	1215	1144	762	8.03	21.36	NA	54	NA	NA	70	620	2900
	8/20	1300	1328	862	8.13	20.98	NA	64	NA	NA	79	615	1200
	9/13	1035	700	NA	7.37	16.0	NA	84	NA	NA	91	580	5000
Tussing Ditch													
0.41	7/11	1255	700	NA	7.58	19.5	NA	26	NA	NA	102	2800	9650
	7/25	1115	600	NA	7.56	18.0	NA	27	NA	NA	91	2300	46000
	8/6	1145	1187	810	7.85	19.05	NA	26	NA	NA	105	495	260
	8/20	1055	1176	854	7.62	16.43	NA	27	NA	NA	104	4100	620
	9/13	1000	600	NA	6.98	14.5	NA	29	NA	NA	111	40	595
Poplar Creek													
6.6	7/12	1310	650	NA	7.98	20	NA	24	NA	NA	91	385	610
	7/26	1310	500	NA	7.85	20.0	NA	36	NA	NA	66	425	1840

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (ºC)	TRC (mg/l)	CL[G] (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	8/7	1245	600	NA	7.50	23.0	NA	34	NA	NA	75	200	955
	8/22	1020	1092	719	7.76	20.65	NA	30	NA	NA	94	650	1800
	9/13	1105	500	NA	7.44	16.5	NA	26	NA	NA	104	70	1880
0.70	7/11	0925	600	NA	7.75	17.5	NA	22	NA	NA	93	730	2200
	8/7	1220	550	NA	7.64	23.0	NA	26	NA	NA	73	560	2530
	8/21	0910	700	NA	7.91	21.5	NA	23	NA	NA	78	430	2320
	9/12	1350	610	701	8.19	19.5	NA	22	NA	NA	90	3350	20500
Rickenbacker Tributary at Walnut Creek RM 15.54													
0.1	7/11	925	600	NA	7.4	14	NA	23	NA	NA	29	880	69000
	7/26	1045	826	NA	7.41	15.97	NA	22	NA	NA	49	2000	42000
	8/6	1315	600	NA	7.11	17.5	NA	47	NA	NA	75	400	550
	8/20	1220	600	NA	7.21	18.0	NA	131	NA	NA	76	10	90
	9/5	1155	500	NA	7.17	19.0	NA	47	NA	NA	84	380	190
Rickenbacker Tributary at Walnut Creek RM 15.64													
	7/25	1155	500	NA	7.08	23	NA	12	NA	NA	87	NA	NA
	7/25	0950	400	NA	6.89	20.5	NA	18	NA	NA	71	350	2600
	8/6	1340	800	NA	7.54	28.5	NA	14	NA	NA	78	260	1560
	8/20	1230	900	NA	7.62	25.0	NA	14	NA	NA	69	160	880
	9/5	1135	700	NA	7.67	23.5	NA	13	NA	NA	80	4200	760
Pawpaw Creek													
1.4	7/12	1230	620	NA	7.92	20.3	NA	22	NA	NA	126	450	1240
	7/24	1245	400	NA	7.81	20.0	NA	26	NA	NA	52	270	2030
	8/5	1040	500	NA	7.60	20.0	NA	26	NA	NA	69	250	1700
	8/19	0930	600	NA	7.41	19.0	NA	31	NA	NA	115	110	9900
	9/3	1020	750	NA	7.49	19.0	NA	27	NA	NA	162	260	3200
0.54	7/12	1100	970	NA	7.94	19.0	NA	39	NA	NA	108	660	3800
	7/24	1040	700	NA	7.64	20.0	NA	78	NA	NA	71	940	7000
	8/5	1120	800	NA	7.64	20.0	NA	39	NA	NA	103	745	4600
	8/19	1040	800	NA	7.47	19.0	NA	55	NA	NA	148	330	1910
	9/3	1040	1100	NA	7.83	18.5	NA	63	NA	NA	147	10*	1340
Zellerbach Tributary													
1.3	7/12	1205	425	NA	8.15	20	NA	18	NA	NA	56	700	1780
	7/24	1140	500	NA	7.84	20.0	NA	26	NA	NA	54	1060	4200
	8/5	1155	500	NA	7.71	21.0	NA	25	NA	NA	61	560	2500
	8/19	0955	550	NA	7.34	19.0	NA	31	NA	NA	53	940	3000
	9/3	1325	650	NA	7.68	19.0	NA	66	NA	NA	64	680	1200
0.34	*7/12*	*1130*	*1680*	*NA*	*8.35*	*30.0*	*NA*	*45*	*NA*	*1.35*	*128*	*220*	*1880*
	7/23	*1120*	*1750*	*NA*	*8.15*	*30.0*	*NA*	*42*	*NA*	*1.00**	*117*	*CG*	*280*
	8/5	*1140*	*1000*	*NA*	*8.17*	*31.0*	*NA*	*49*	*NA*	*1.43*	*140*	*CG*	*445*

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (ºC)	TRC (mg/l)	CL[G] (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	8/19	*1255*	*1700*	*NA*	*8.22*	*28.0*	*NA*	*54*	*10**	*NA*	*141*	*10**	*310*
	9/3	*1410*	*1800*	*NA*	*8.38*	*28.0*	*NA*	59	NA	NA	134	10	1640
0.10	7/12	1115	800	NA	8.05	20.0	NA	27	NA	NA	96	575	3400
	7/24	1100	700	NA	7.69	20.0	NA	28	NA	NA	72	680	7900
	8/5	1130	800	NA	7.72	20.0	NA	29	NA	NA	88	1070	4100
	8/19	1235	800	NA	6.70	20.5	NA	30	NA	NA	98	150	1260
	9/3	1345	1050	NA	7.91	20.5	NA	36	NA	NA	102	CG	1980
Sycamore Creek													
11.8	7/12	1340	650	NA	8.31	25	NA	95	NA	NA	51	980	5000
	7/26	1335	500	NA	7.88	20.0	NA	37	NA	NA	52	700	1660
	8/7	1345	700	NA	8.20	28.0	NA	73	NA	NA	54	6400	9900
	8/22	1050	1664	983	8.04	23.60	NA	127	NA	NA	56	5600	4000
	9/12	1255	900	981	8.15	19.80	NA	116	NA	NA	76	700	1810
9.55	7/12	1325	600	NA	8.04	24.0	NA	44	NA	NA	79	180	780
	7/26	1250	400	NA	7.64	21.0	NA	28	NA	NA	52	380	3300
	8/7	1330	500	NA	7.80	26.0	NA	49	NA	NA	62	400	955
	8/22	1035	1137	725	7.84	21.93	NA	49	NA	NA	62	530	1860
	9/12	1240	700	738	7.98	19.0	NA	55	NA	NA	76	200	1025
8.90	*7/15*	*1310*	*1150*	*NA*	*7.52*	*25.0*	*0.00*	*226*	*10**	*NA*	*117*	*60*	*905*
	7/29	*0945*	*2362*	*1540*	*7.82*	*20.7*	*NA*	*188*	*10**	*1.00**	*110*	*3200*	*1950*
	8/8	*1130*	*600*	*NA*	*7.69*	*23.0*	*0.06*	*446*	*10**	*1.00**	*106*	*10**	*10**
	8/22	*1000*	*2524*	*1820*	*7.43*	*22.65*	*NA*	*239*	*10**	*1.60*	*123*	*440*	*665*
	9/12	*1205*	*1550*	*1660*	*7.36*	*21.0*	*0.02*	233	10*	1.00*	116	30	480
8.36	7/12	1255	1000	NA	8.18	21.5	NA	99	NA	NA	94	220	400
	7/26	1235	400	NA	7.47	20.0	NA	30	NA	NA	51	210	3000
	8/7	1305	700	NA	7.86	26.0	NA	52	NA	NA	69	560	1460
	8/22	0945	1693	1090	7.67	21.17	NA	107	NA	NA	88	260	1360
	9/12	1140	950	1040	7.66	23.4	NA	98	NA	NA	90	540	935
6.67	7/12	1235	850	NA	7.99	21.5	NA	62	NA	NA	82	330	545
	7/26	1220	400	NA	7.52	21.0	NA	25	NA	NA	52	CG	4100
	8/8	1110	700	NA	8.09	23.0	NA	51	NA	NA	64	660	1160
	8/22	0930	1258	811	7.90	21.58	NA	62	NA	NA	70	760	2320
	9/12	1125	780	826	7.58	23.3	NA	63	NA	NA	67	460	920
4.75	7/12	1220	800	NA	8.01	20.0	NA	59	NA	NA	82	500	515
	7/26	1140	450	NA	7.95	20.0	NA	31	NA	NA	55	470	3300
	8/8	1030	650	NA	8.02	23.0	NA	52	NA	NA	74	320	1180
	8/22	0910	1231	797	7.98	21.56	NA	55	NA	NA	74	240	2130
	9/10	0945	790	873	7.74	23.7	NA	69	NA	NA	82	180	1020
4.35	*7/15*	*1135*	*2800*	*NA*	*7.49*	*23.0*	*NA*	*NA*	*10**	*3.05*	*NA*	*645*	*15300*

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (°C)	TRC (mg/l)	CL^G (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	7/26	*1110*	*2500*	*NA*	*7.75*	*20.0*	*0.13*	*652*	*10**	*NA*	*102*	*50*	*3400*
	8/8	*0955*	*1750*	*NA*	*7.74*	*21.0*	*0.07*	*413*	*10**	*1.00**	*109*	*10*	*100*
	8/21	*1100*	*2500*	*NA*	*7.74*	*21.5*	*0.07*	*652*	*10**	*1.00**	*104*	*40*	*40*
	9/10	*1345*	*2376*	*NA*	*7.47*	*21.25*	*0.00*	446	10*	NA	118	190	775
4.30	7/15	1140	1600	NA	7.80	24.0	NA	223	NA	NA	80	20000	31000
	7/26	1115	700	NA	7.87	20.0	NA	108	NA	NA	64	505	2900
	8/8	1005	1000	NA	7.85	24.0	NA	122	NA	NA	81	520	1960
	8/21	1110	1300	NA	7.78	22.5	NA	522	NA	NA	101	80	650
	9/10	1400	1816	1710	7.71	21.59	NA	303	NA	NA	104	40	150
4.18	7/12	1210	1800	NA	7.62	20.0	NA	387	NA	NA	103	230	610
	7/26	1035	700	NA	7.92	20.0	NA	109	NA	NA	56	500	5200
	8/8	0940	1000	NA	7.70	23.0	NA	142	NA	NA	92	475	1860
	8/21	1125	1500	NA	7.83	24.0	NA	404	NA	NA	92	150	650
	9/10	1315	1910	1740	7.59	21.03	NA	336	NA	NA	104	270	780
2.60	7/11	1330	1500	NA	8.13	19.0	NA	326	NA	NA	97	350	370
	7/26	0955	500	NA	7.87	20.0	NA	48	NA	NA	49	460	6400
	8/8	0920	1150	NA	7.67	27.0	NA	231	NA	NA	113	470	1560
	8/21	1035	1400	NA	8.05	23.0	NA	232	NA	NA	79	210	1200
	9/10	1245	1993	1870	7.69	21.20	NA	360	NA	NA	100	360	1380
1.03	7/11	1300	1200	NA	8.26	20.0	NA	199	NA	NA	95	475	540
	7/26	0915	500	NA	7.75	20.0	NA	43	NA	NA	49	CG	18500
	8/8	0850	900	NA	7.62	24.0	NA	110	NA	NA	112	360	2340
	8/21	1015	1300	NA	8.11	23.0	NA	234	NA	NA	80	620	960
	9/10	1200	1434	2640	7.84	21.07	NA	559	NA	NA	108	10*	10*
1.00	*7/11*	*1250*	*2100*	*NA*	*7.26*	*19.0*	*NA*	*550*	*10**	*1.0**	*114*	*10**	*10**
	7/26	*0910*	*1200*	*NA*	*7.66*	*20.0*	*0.43*	*374*	*10**	*NA*	*100*	*10**	*80*
	8/8	*0840*	*800*	*NA*	*7.51*	*22.0*	*0.01*	*216*	*10**	*NA*	*107*	*7820*	*2740*
	8/21	*1000*	*550*	*NA*	*7.85*	*22.0*	*0.07*	*243*	*10**	*1.00**	*91*	*10**	*960*
	9/10	*1145*	*2812*	*1330*	*7.76*	*20.89*	*0.16*	208	10*	NA	94	690	1660
0.13	7/11	1230	1200	NA	8.9	20.0	NA	214	NA	NA	88	415	660
	7/26	0840	400	NA	7.66	20.0	NA	38	NA	NA	46	760	8900
	8/8	0830	900	NA	7.23	24.0	NA	126	NA	NA	71	220	1700
	8/21	0940	1300	NA	8.10	22.5	NA	229	NA	NA	77	250	1000
	9/10	1120	730	1330	7.82	21.16	NA	206	NA	NA	90	200	1630
Mann's Run													
1.2	7/12	1000	510	NA	7.8	21	NA	12	NA	NA	39	130	1050
	7/25	1125	400	NA	7.19	21.5	NA	7	NA	NA	38	1100	7000
	8/6	1230	500	NA	7.32	26.0	NA	5	NA	NA	17	70	565
	8/20	1140	500	NA	7.58	25.0	NA	6	NA	NA	68	80	862

Stream RM	Date	Time	Conductivity Field (umhos/cm)	Conductivity Lab (umhos/cm)	pH Field (S.U.)	Temp. (°C)	TRC (mg/l)	CL^G (mg/l)	T-CN (mg/l)	O&G (mg/l)	SO_4 (mg/l)	Fecal Coliform number/100ml	Fecal Strept. number/100ml
	9/5	1330	500	NA	8.04	25.5	NA	6	NA	NA	13	710	50
0.30	7/12	0945	590	NA	7.45	19.5	NA	19	NA	NA	59	470	1360
	7/25	1105	200	NA	7.10	20.0	NA	6	NA	NA	48	1270	33000
	8/6	1125	400	NA	7.56	23.0	NA	19	NA	NA	55	480	3300
	8/20	1045	600	NA	7.47	21.0	NA	31	NA	NA	47	2030	1850
	9/5	1310	700	NA	8.17	23.0	NA	27	NA	NA	49	1620	230
Pleasantville Tributary													
0.8	7/12	1250	690	NA	8.12	20.5	NA	22	NA	NA	123	410	640
	7/24	1310	550	NA	7.73	20.0	NA	24	NA	NA	62	580	2800
	8/5	1000	600	NA	7.53	21.0	NA	26	NA	NA	82	510	2800
	8/19	1110	750	NA	7.60	19.5	NA	26	NA	NA	104	525	2150
	9/3	1235	650	NA	7.96	20.5	NA	21	NA	NA	117	495	1640
0.74	7/12	1320	850	NA	8.25	21.5	NA	64	NA	NA	112	100	80
	7/24	1320	500	NA	7.64	20.0	NA	31	NA	NA	71	940	1420
	8/5	1010	700	NA	7.55	22.0	NA	41	NA	NA	99	718	980
	8/19	1130	850	NA	7.58	20.5	NA	78	NA	NA	121	10*	10
	9/3	1300	700	NA	7.93	21.0	NA	58	NA	NA	111	10*	10*

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
Walnut Creek											
53.00	7/10	2.0*	10*	7.8	2.58	0.02*	0.05*	0.3	0.1	382	6
	7/23	2.0*	12	9.2	7.83	0.06	0.05*	0.4	0.05*	354	7
	8/5	2.0*	10*	7.2	2.35	0.02*	0.05*	0.3	0.25	398	5
	8/19	2.0*	10*	6.3	1.67	0.02*	0.05*	0.2*	0.05*	392	5*
	9/3	2.0*	10*	6.7	0.83	0.02*	0.05*	0.6	0.05*	380	5
46.97	7/10	2.0*	12	5.4	1.43	0.02	0.05*	0.3	0.36	398	13
	7/23	2.0*	19	8.9	8.51	0.10	0.06	0.7	0.06	362	32
	8/5	2.0*	10*	7.0	2.43	0.02	0.05*	0.3	0.06	424	8
	8/19	2.0*	12	5.5	0.49	0.02*	0.05*	0.2*	0.05*	430	10
	9/3	2.0*	18	5.7	0.10*	0.02*	0.05*	0.7	0.05*	418	7
42.52	7/10	2.0*	10*	7.8	0.96	0.02*	0.05*	0.2	0.11	488	7
	7/23	2.0*	19	8.7	7.95	0.09	0.05	0.8	0.59	372	27
	8/5	2.0*	10*	8.0	2.33	0.02*	0.05*	0.4	0.20	452	5*
	8/19	2.0*	10*	6.5	0.83	0.02*	0.05*	0.2*	0.09	510	5
	9/3	2.0*	15	6.5	0.20	0.02*	0.05*	0.5	0.12	550	5
41.17	7/10	2.0*	10*	6.9	0.79	0.02	0.05*	0.3	0.24	554	10
	7/23	2.4	25	8.7	7.98	0.10	0.07	0.8	0.11	394	34
	8/5	2.0*	10*	8.5	2.10	0.05	0.15	0.6	0.09	484	8

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/19	2.0*	15	6.5	0.59	0.03	0.05*	0.2*	0.13	546	7
	9/3	2.0*	25	6.7	0.26	0.02*	0.06	0.8	0.12	665	9
40.05	*7/10*	*4.4*	*15*	*8.8*	*13.6*	*0.02**	*0.05**	*1.2*	*1.56*	*800*	*12*
	7/23	*4.3*	*22*	*9.7*	*7.75*	*0.02*	*0.05**	*0.8*	*0.91*	*532*	*14*
	8/5	*2.4*	*21*	*8.5*	*14.8*	*0.02**	*0.05**	*1.0*	*1.46*	*750*	*8*
	8/19	*11.7*	*18*	*8.2*	*13.0*	*0.38*	*2.95*	*5.0*	*2.71*	*810*	*48*
	9/4	*3.7*	*16*	*5.50*	13.4	0.02*	0.05*	0.2*	2.29	1020	8
40.00	7/10	2.2	15	7.7	2.36	0.02*	0.05*	0.5	0.24	590	17
	7/23	2.2	28	8.7	8.02	0.10	0.06	0.7	0.20	380	33
	8/5	2.0*	12	8.0	2.80	0.06	0.08	0.5	0.21	494	18
	8/19	2.9	10*	6.5	1.66	0.07	0.27	0.7	0.46	602	38
	9/4	2.3	24	7.5	2.55	0.02*	0.06	0.2	0.56	776	69
39.7	7/23	2.2	25	9.0	8.21	0.10	0.06	0.8	0.41	384	37
	8/5	2.0*	16	8.0	2.88	0.06	0.09	0.5	0.19	496	20
	8/19	4.2	10*	7.5	3.22	0.08	0.48	1.2	0.75	624	37
	9/4	2.2	12	8.0	2.57	0.02	0.06	0.4	0.5	734	36
36.89	7/10	2.0*	19	8.2	1.07	0.02*	0.05*	0.4	0.13	536	12
	7/24	2.0*	16	7.4	7.02	0.05	0.05	0.5	0.11	404	35
	8/6	2.0*	10*	7.69	2.41	0.02	0.05*	0.6	0.29	452	7
	8/20	2.0	27	6.68	0.98	0.02*	0.08	0.5	0.13	554	9
	9/4	2.0	18	9.0	1.07	0.02*	0.05*	0.3	0.22	644	11
34.33	7/11	2.0*	15	5.9	0.56	0.02*	0.05*	0.2*	0.30	500	9
	7/24	2.0*	34	7.8	6.60	0.04	0.05*	0.5	0.09	408	29
	8/6	2.0*	10*	8.65	1.86	0.02*	0.05*	0.4	0.26	440	6
	8/20	2.0*	24	8.59	0.58	0.02*	0.07	0.4	0.05*	544	37
	9/4	4.2	10*	6.5	0.10*	0.02*	0.05*	0.3	0.05	554	20
29.91	7/11	2.0*	12	6.9	0.98	0.02*	0.05*	0.2*	0.05*	482	27
	7/26	2.0*	22	8.61	6.66	0.08	0.05*	0.3	0.14	386	61
	8/6	2.0*	10*	7.59	1.61	0.02	0.05*	0.4	0.24	428	9
	8/20	2.0*	21	6.49	0.67	0.02*	0.07	0.2	0.05*	474	15
	9/4	2.0*	12	8.9	0.38	0.02*	0.05*	0.3	0.07	462	9
29.18	7/11	2.0*	10*	6.2	1.10	0.02*	0.05*	0.2*	0.05*	498	27
	7/26	2.0*	25	8.42	6.91	0.08	0.05*	0.3	0.15	404	80
	8/6	2.0*	10*	7.79	1.61	0.02*	0.05*	0.4	0.29	444	14
	8/20	2.0*	10*	8.67	1.07	0.02*	0.06	0.4	0.08	570	65
	9/4	2.1	15	10.0	0.81	0.02*	0.05*	0.2*	0.16	584	47
26.48	7/11	2.0*	10*	8.5	1.04	0.02*	0.05*	0.2*	0.07	494	18
	7/26	2.4	25	8.39	6.72	0.09	0.06	0.5	0.18	418	94
	8/6	2.0*	10*	7.99	1.61	0.02*	0.05*	0.4	0.30	450	10
	8/20	2.0*	27	7.78	0.70	0.02*	0.05*	0.4	0.05*	524	11

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	9/4	2.1	10*	5.4	0.44	0.02*	0.05*	1.1	0.05*	526	14
24.45	7/11	2.0*	15	8.0	1.03	0.02*	0.05*	0.2*	0.05	502	19
	7/25	5.7	79	7.6	6.00	0.18	0.17	0.7	0.38	894	650
	8/7	2.0*	10*	7.5	1.20	0.02*	0.05	0.3	0.09	484	18
	8/20	2.0	12	9.54	0.62	0.02*	0.05*	0.5	0.08	484	9
	9/5	2.0*	12	5.5	0.39	0.02*	0.05*	0.3	0.08	545	15
24.20	7/11	203	120	2.7	0.10*	0.02	37.7	46.2	4.69	2910	54
	7/25	7.1	16	8.2	7.31	0.96	7.35	8.2	0.47	610	6
	8/7	8.7	32	7.8	7.59	0.05	0.30	1.4	2.40	684	88
	8/20	32	331	9.13	3.15	0.13	0.22	6.5	8.57	1140	523
	9/5	6.6	21	7.9	1.87	0.07	0.12	1.2	0.84	578	6
24.15	7/11	2.0*	36	6.0	0.80	0.06	4.83	6.3	0.71	898	39
	7/25	7.7	57	7.9	5.89	0.18	0.42	1.0	2.78	890	632
	8/7	2.0*	10*	8.0	1.42	0.02*	0.05*	0.2	0.30	480	8
	8/20	37	97	9.54	1.83	0.06	0.12	2.0	2.56	714	173
	9/5	7.6	10*	6.0	0.53	0.02	0.05*	0.5	0.25	570	36
23.9	7/11	2.0*	10*	NA	1.02	0.02*	0.05*	0.2*	0.07	494	12
	7/26	2.1	38	8.54	6.61	0.09	0.06	0.6	0.16	428	110
	8/7	2.0*	10*	8.0	1.30	0.02*	0.05*	0.2*	0.23	478	7
	8/21	2.0*	15	9.2	0.79	0.02*	0.05*	0.9	0.13	494	12
	9/4	4.1	10*	9.5	0.17	0.02*	0.08	0.3	0.17	518	23
21.2	7/11	2.0*	27	8.2	0.89	0.02*	0.05*	0.2*	0.14	530	20
	7/25	6.2	76	7.9	6.21	0.13	0.12	0.6	2.39	990	672
	8/7	2.0*	10*	7.4	1.18	0.02*	0.06	0.2	0.13	468	12
	8/21	2.0*	10	10.5	0.59	0.02	0.05*	0.9	0.10	500	10
	9/4	4.1	15	9.0	0.18	0.02	0.05*	0.6	0.11	688	99
19.3	7/11	2.0*	10*	8.1	0.87	0.02*	0.05*	0.2	0.08	524	18
	7/25	8.1	76	8.5	4.88	0.22	0.09	0.4	1.22	1000	728
	7/25	4.4	66	7.2	4.37	0.12	0.09	0.9	0.25	666	392
	8/7	2.0*	10*	7.0	1.15	0.02*	0.05*	0.3	0.12	482	18
	8/20	2.0*	21	5.5	0.38	0.02*	0.06	0.3	0.07	516	14
	9/5	4.4	12	8.0	0.14	0.02	0.05*	0.5	0.11	540	23
16.88	7/11	2.0*	15	7.5	0.89	0.02	0.05*	0.3	0.05	530	23
	7/25	7.4	63	8.5	5.22	0.16	0.08	0.5	0.40	986	648
	7/25	5.7	66	7.9	4.14	0.11	0.10	0.6	0.33	860	494
	8/6	2.0*	10*	7.7	1.32	0.02*	0.05*	0.4	NA	460	13
	8/20	2.0*	33	9.0	0.35	0.02*	0.06	0.3	0.05*	508	12
	9/5	4.0	10*	7.9	0.10*	0.02*	0.05*	0.6	0.09	542	24
15.50	7/11	2.0*	10*	7.8	0.85	0.02	0.05*	0.2	0.06	508	15
	7/26	2.6	38	8.25	6.40	0.12	0.05*	0.5	0.18	496	188

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/6	2.0*	10*	8.5	1.45	0.02*	0.05*	0.3	0.26	464	16
	8/20	2.0*	30	5.5	0.30	0.02*	0.05*	0.3	0.05*	514	12
	9/5	2.9	12	8.0	0.10*	0.02*	0.05*	0.2*	0.08	528	24
13.75	7/11	2.0*	10*	7.4	0.85	0.02	0.05*	0.2	0.07	506	14
	7/25	7.3	72	8.5	4.06	0.14	0.07	0.3	0.64	870	552
	8/6	2.0*	10*	7.7	1.39	0.02*	0.05*	0.3	0.27	464	17
	8/20	2.0*	23	9.5	0.33	0.02*	0.05*	0.3	0.05*	510	12
	9/5	2.6	10*	7.6	0.10*	0.02*	0.05*	0.2*	0.05	540	20
11.0	7/10	2.0*	10*	8.8	0.96	0.02	0.05*	0.2*	0.73	492	17
	7/25	4.5	65	8.4	3.33	0.14	0.08	0.4	0.42	996	680
	8/6	2.0*	10*	7.5	1.47	0.02*	0.05*	0.3	0.27	484	24
	8/20	2.0*	27	9.0	0.37	0.02*	0.05*	0.3	0.05*	508	18
	9/5	3.4	12	7.7	0.10*	0.02*	0.05*	0.2*	0.05*	523	24
9.1	7/10	2.0*	10*	8.7	1.02	0.02	0.05*	NA	0.37	496	16
	7/25	3.0	32	8.8	4.24	0.06	0.05*	0.2*	0.18	604	289
	8/6	2.0*	10*	7.4	1.49	0.02*	0.05*	0.3	0.23	468	19
	8/20	2.0*	10*	8.2	0.38	0.02*	0.05*	0.3	0.05*	510	28
	9/6	2.0	10*	6.7	0.18	0.02*	0.05*	0.2*	0.07	524	23
5.17	7/10	2.0*	10*	9.1	1.07	0.02*	0.05*	0.2	0.06	482	16
	7/25	2.0	13	8.7	3.47	0.04	0.05*	0.2*	0.21	504	159
	8/6	2.0*	10*	7.2	1.57	0.02*	0.05*	0.3	0.25	468	18
	8/20	2.0*	10*	9.0	0.38	0.02*	0.05*	0.2	0.05	488	18
	9/6	3.4	10*	6.5	0.25	0.02*	0.05*	0.2*	0.08	510	23
4.43	7/10	2.2	15	9.2	23.3	0.02*	0.05	1.1	2.54	746	9
	7/25	2.0*	10*	9.2	16.7	0.02	0.09	1.0	1.71	690	19
	8/6	2.0*	13	8.3	18.8	0.02	0.09	1.0	2.42	750	5*
	8/20	2.9	24	5.0	23.2	0.11	0.10	1.2	2.02	790	5
	9/6	2.8	21	8.5	26.2	0.06	0.08	0.9	2.60	814	5
4.41	7/10	2.0*	10*	9.5	1.39	0.02*	0.05*	0.2*	0.38	480	14
	8/6	2.0*	10*	7.7	1.56	0.02*	0.05*	0.3	0.27	454	22
	8/20	2.0*	10*	5.0	0.43	0.02*	0.05*	0.2	0.15	488	14
	9/6	2.1	12	6.5	1.32	0.02*	0.08	0.2	0.20	532	38
4.14	7/10	2.0*	10*	9.2	1.36	0.02*	0.05*	0.2	0.11	480	13
	7/25	2.0*	28	8.9	4.06	0.04	0.05*	0.2*	0.13	528	155
	8/6	2.0*	10*	7.2	1.60	0.02*	0.05*	0.3	0.26	446	20
	8/20	2.0*	21	8.5	0.48	0.02*	0.05*	0.3	0.05*	480	15
	9/6	2.0*	12	6.8	0.56	0.02*	0.08	0.2*	0.08	520	15
1.22	7/10	2.0*	10*	9.7	1.01	0.02*	0.05*	0.2	0.06	486	15
	7/25	2.0*	28	8.9	4.12	0.04	0.05*	0.2*	0.17	506	138
	8/6	2.0*	10*	7.2	1.50	0.02*	0.05*	0.3	0.25	456	21

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/20	2.0*	10*	8.8	0.40	0.02*	0.05*	0.3	0.10	484	17
	9/6	2.0*	10*	6.8	0.46	0.02*	0.08	0.2*	0.06	534	24
Little Walnut											
0.6	7/12	2.0*	10*	7.6	1.75	0.02	0.05*	0.2*	0.05*	488	5*
	7/25	2.0*	10*	9.6	1.98	0.06	0.05*	0.2*	0.16	426	54
	8/6	2.0*	10*	8.3	1.37	0.02*	0.05*	0.3	0.18	430	5*
	8/20	2.0*	15	9.5	0.93	0.02*	0.05*	0.2*	0.05*	468	5*
	9/6	2.0*	10*	6.5	0.75	0.02*	0.05*	0.2*	0.05*	478	5*
George Creek											
2.1	7/11	2.0*	10*	12	0.27	0.02*	0.05*	0.3	0.1	531	7
	7/25	3.2	31	8.2	1.82	0.07	0.08	0.5	0.19	464	155
	8/6	2.0*	10*	9.20	0.72	0.02	0.05*	0.4	0.08	456	10
	8/20	2.5	15	11.27	0.36	0.02*	0.05*	0.4	0.05*	526	7
	9/13	2.0*	10*	6.7	0.24	0.02*	0.06	0.3	0.05*	586	8
0.12	7/11	2.0*	10*	10.2	0.69	0.02*	0.07	0.3	0.06	538	5
	7/25	4.5	41	7.7	1.65	0.09	0.08	0.4	2.41	622	306
	8/6	2.0*	13	8.51	0.90	0.02	0.05*	0.5	0.32	462	16
	8/7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/20	2.0*	15	10.03	0.95	0.02*	0.06	0.4	0.07	522	10
	9/13	2.0*	10*	7.9	0.95	0.02*	0.05*	0.2	0.10	564	8
Tributary to George Creek											
6.05	7/11	3	12	10.5	1.74	0.02*	0.05*	0.6	0.11	648	51
	7/25	5.3	32	9.0	2.00	0.03	0.05*	0.6	2.51	354	52
	8/6	2.0	12	9.44	1.53	0.02*	0.05*	0.6	0.05*	561	14
	8/20	2.0*	30	13.36	1.21	0.02*	0.05*	0.4	0.07	710	31
	9/13	2.0*	10*	8.6	1.47	0.02*	0.05*	0.2	0.09	760	7
2.38	7/11	2.0*	10*	8.8	1.02	0.02*	0.05	0.3	0.10	538	6
	7/25	3.6	32	8.4	2.33	0.05	0.05	0.4	0.94	390	111
	8/6	2.0*	10*	8.33	1.46	0.02*	0.05*	0.4	0.15	488	10
	8/20	2.0*	10*	8.96	1.18	0.02*	0.05*	0.3	0.12	568	39
	9/13	2.0*	13	6.7	0.82	0.02*	0.05*	0.2	0.19	622	25
Tussing Ditch											
0.41	7/11	2.0*	10*	12.3	0.11	0.02	0.05	0.2*	0.05*	576	5*
	7/25	2.0*	10*	11.2	1.12	0.09	0.05*	0.2	0.06	500	5*
	8/6	2.0*	10*	13.26	0.26	0.02	0.05*	0.3	0.24	548	5*
	8/20	2.0*	10*	12.09	0.22	0.02	0.06	0.2	0.05*	622	5*
	9/13	2.0*	10*	8.2	0.10*	0.02*	0.05*	0.2*	0.05*	588	9
Poplar Creek											
6.6	7/12	2.0*	10*	8.7	0.33	0.02*	0.05*	0.2*	0.05*	522	9
	7/26	2.0*	10*	8.2	7.03	0.03	0.05*	0.2*	0.08	416	5

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/7	2.0*	10*	8.0	0.33	0.02*	0.05*	0.2	0.10	490	5*
	8/22	2.0*	18	8.25	0.26	0.02*	0.05*	0.4	0.05*	474	5*
	9/13	2.0*	10*	7.8	0.10*	0.02*	0.05*	0.2*	0.05*	514	7
0.7	7/11	2.0*	12	8.5	0.54	0.02*	0.05*	0.2*	0.06	476	5*
	8/7	2.0*	10*	8.0	0.61	0.02*	0.05*	0.2*	0.12	496	13
	8/21	2.0*	10*	7.9	0.38	0.02*	0.05*	1.0	0.05*	474	6
	9/12	2.0*	18	7.1	0.26	0.02*	0.06	0.2*	0.05*	532	23
Rickenbacker Tributary at Walnut Creek RM 15.64											
	7/25	3	38	5.4	3.21	0.05	0.05*	0.4	0.19	380	11
	7/25	2.4	13	6.47	2.96	0.05	0.06	0.5	0.44	344	18
	8/6	2.0*	10*	7.6	0.17	0.02	0.05	0.6	0.21	528	6
	8/20	2.0*	24	8.2	0.10*	0.02*	0.06	0.2	0.05*	604	5*
	9/5	2.0*	10*	6.5	0.10*	0.02*	0.05*	0.3	0.05*	576	5*
Rickenbacker Tributary at Walnut Creek RM 15.54											
0.1	7/11	2.0*	10*	11	0.24	0.02*	0.05	0.2*	0.05*	494	5*
	7/26	2.0*	10*	6.7	1.14	0.03	0.10	0.2*	0.15	444	
	8/6	2.0*	10*	10.5	0.54	0.02	0.06	0.2*	0.20	494	5*
	8/20	2.0*	33	6.2	0.18	0.02*	0.06	0.2*	0.05*	504	5*
	9/5	3.7	10*	6.9	0.61	0.02	0.05*	0.2	0.05*	486	22
Pawpaw Creek											
1.4	7/12	2.0*	12	8.6	0.35	0.02*	0.05*	0.2*	0.38	626	6
	7/24	2.0*	28	8.7	6.21	0.02	0.05*	0.4	0.06	378	10
	8/5	2.0*	10*	8.0	2.28	0.02*	0.05*	0.4	0.21	438	7
	8/19	2.0*	12	6.9	0.35	0.02*	0.05*	0.2*	0.05*	552	18
	9/3	2.0*	10*	5.7	0.10*	0.02*	0.05*	0.2	0.05*	638	5*
0.54	7/12	4.1	36	7.4	0.63	0.10	0.26	1.1	0.11	708	13
	7/24	6.1	113	7.5	3.59	0.07	0.27	1.4	0.22	558	38
	8/5	2.0	24	7.8	1.19	0.02	0.13	0.8	0.19	572	7
	8/19	2.0*	15	7.3	1.10	0.07	0.23	0.2*	0.54	684	5*
	9/3	39	80	5.8	0.54	0.02	0.18	1.1	0.15	894	15
Zellerbach Tributary											
1.3	7/12	2.0*	30	8.7	0.73	0.02*	0.05*	0.4	0.05*	378	5*
	7/24	2.0*	12	8.7	4.08	0.02	0.05*	0.3	0.07	396	32
	8/5	2.0*	10*	9.5	1.37	0.02*	0.05*	0.3	0.10	404	6
	8/19	2.0*	10*	6.5	0.47	0.02*	0.05*	0.2*	0.05*	418	5
	9/3	2.0*	12	3.7	0.10*	0.02*	0.05*	0.6	0.05*	496	5*
0.34	7/12	11	155	7.3	2.13	0.91	0.27	3.4	0.26	1234	29
	7/23	18	204	6.0	2.25	0.09	0.18	2.5	1.14	1240	59
	8/5	20.0	201	7.5	0.10*	0.02	0.06	4.2	0.54	1370	49
	8/19	11.7	122	7.0	11.1	0.04	0.07	3.1	7.63	1300	22

RM	Date	BOD$_5$ (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	9/3	*7.2*	*157*	*7.9*	3.84	0.04	0.10	2.8	0.50	1410	60
0.10	7/12	3.0	36	7.3	0.64	0.10	0.36	1.0	0.10	644	8
	7/24	4.3	34	7.0	3.48	0.06	0.26	1.1	0.17	516	18
	8/5	4.0	41	7.0	0.83	0.03	0.18	1.2	0.21	597	15
	8/19	2.5	21	7.6	1.83	0.10	0.36	0.8	1.14	608	11
	9/3	36	151	6.5	1.01	0.08	0.25	1.6	0.36	912	48
Sycamore Creek											
11.8	7/12	5	10*	13.8	0.10*	0.02*	0.05*	0.9	0.12	606	31
	7/26	2.0*	18	9.0	4.65	0.03	0.05	0.4	0.07	400	7
	8/7	6.7	19	14.0	0.25	0.02*	0.05*	1.0	0.44	546	74
	8/22	3.4	15	13.05	0.10*	0.02*	0.05*	0.2*	0.05	616	12
	9/12	3.1	18	8.1	0.34	0.04	0.27	0.7	0.11	646	10
9.55	7/12	2.0*	10*	7.9	0.10*	0.02*	0.05*	0.2*	0.05*	521	16
	7/26	2.0*	15	8.5	4.95	0.02	0.05*	0.3	0.11	352	5
	8/7	2.0*	10*	10.6	0.18	0.02*	0.05*	0.3	0.08	456	10
	8/22	2.0*	10*	7.90	0.10*	0.02*	0.05*	0.3	0.05*	466	9
	9/12	2.0*	15	6.8	0.10*	0.02*	0.05*	0.2*	0.05*	512	9
8.90	*7/15*	*5.3*	*18*	*6.7*	*2.78*	*0.24*	*11.3*	*1.47*	*4.90*	*972*	*5**
	7/29	*11*	*22*	*8.13*	*0.54*	*0.34*	*9.30*	*10.9*	*3.97*	*884*	*5**
	8/8	*2.0**	*10**	*6.9*	*15.3*	*0.02**	*0.05**	*0.8*	*1.74*	*1320*	*5**
	8/22	*6.9*	*22*	*7.78*	*16.9*	*0.95*	*8.26*	*8.7*	*5.50*	*1080*	*5**
	9/12	*2.0**	*10**	*6.5*	10.7	0.49	1.22	1.8	1.34	1000	5*
8.36	7/12	2.0*	10*	10.4	3.23	0.15	0.05*	0.4	0.46	672	5*
	7/26	2.0*	18	8.0	4.98	0.05	0.11	0.4	0.12	358	5
	8/7	2.0*	10*	9.0	0.80	0.09	0.06	0.4	0.28	484	5*
	8/22	5.2	15	5.2	4.31	0.75	1.24	0.9	1.32	676	5*
	9/12	2.0*	10*	6.9	3.66	0.02	0.05*	0.3	0.44	650	12
6.67	7/12	2.0*	10*	7.5	0.85	0.02*	0.05*	0.2*	0.05*	532	6
	7/26	2.0*	15	7.3	5.46	0.02	0.05*	0.3	0.12	350	5
	8/8	2.0*	10*	7.3	0.60	0.02*	0.05*	0.4	0.11	480	5*
	8/22	2.0*	10*	6.82	1.24	0.02*	0.05*	0.2*	0.14	496	5*
	9/12	2.0*	10*	5.8	0.10*	0.02*	0.05*	0.2*	0.05*	584	39
4.75	7/12	2.0*	10*	8.6	0.24	0.02*	0.05*	0.2*	0.05*	538	5*
	7/26	2.0*	18	8.0	5.62	0.04	0.05*	0.2*	0.75	372	11
	8/8	2.0*	10*	7.3	0.54	0.02*	0.05*	0.3	0.09	496	5*
	8/22	2.0*	10*	7.48	0.51	0.02*	0.05*	0.2*	0.05*	495	5*
	9/10	2.0*	10*	8.3	0.31	0.02*	0.05*	0.2*	0.05*	560	16
4.35	*7/15*	*NA*	*445*	*7.5*	*4.21*	*NA*	*1.20*	*5.0*	*8.49*	*NA*	*NA*
	7/26	*4.4*	*10**	*7.5*	*7.85*	*0.22*	*0.72*	*1.9*	*2.47*	*1782*	*6*
	8/8	*2.3*	*29*	*7.7*	*4.72*	*0.13*	*0.21*	*1.6*	*2.95*	*1200*	*5*

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/21	*2.9*	*15*	*8.9*	*7.36*	*0.17*	*0.38*	*1.2*	*2.88*	*1650*	*5**
	9/10	*6.3*	*20*	*7.46*	15.3	0.62	3.30	4.3	3.36	1280	118
4.30	7/15	40	89	7.9	1.08	0.07	0.18	1.4	1.26	1044	184
	7/26	2.0*	22	8.0	5.74	0.06	0.14	0.7	0.49	532	10
	8/8	2.0*	10*	7.5	1.56	0.03	0.05	0.8	0.68	642	21
	8/21	2.9	15	9.0	4.49	0.13	0.29	1.0	1.93	1400	13
	9/10	6.9	18	7.45	6.08	0.32	1.50	2.1	1.75	994	13
4.18	7/12	2.7	21	7.6	2.85	0.08	0.34	1.1	1.91	1210	11
	7/26	2.1	10*	8.5	5.56	0.05	0.10	0.5	0.41	560	12
	8/8	2.0*	10*	5.8	2.07	0.05	0.07	1.0	0.96	694	7
	8/21	2.3	10*	7.2	2.30	0.09	0.18	1.0	1.63	1220	27
	9/10	5.3	15	6.1	3.36	0.24	0.66	1.3	1.58	1070	11
2.60	7/11	2.0*	21	8.2	4.66	0.08	0.07	0.9	0.99	494	5*
	7/26	2.3	19	8.0	5.75	0.04	0.07	0.2	0.39	412	21
	8/8	2.0*	16	5.3	3.00	0.08	0.12	0.8	0.74	964	10
	8/21	2.0*	10*	6.1	2.29	0.2	0.07	NA	1.02	848	5*
	9/10	2.0*	12	6.0	3.09	0.15	0.26	0.5	1.32	1150	7
1.03	7/11	2.0*	12	9.0	1.46	0.02*	0.05*	0.6	0.61	814	5*
	7/26	2.0*	10*	8.0	6.24	0.05	0.07	0.5	0.33	394	28
	8/8	2.0*	10*	6.7	1.74	0.02	0.05*	0.4	0.63	618	41
	8/21	2.0*	12	7.5	2.00	0.02	0.10	0.7	0.76	852	5*
	9/10	2.0*	12	7.0	18.6	0.02*	0.05*	0.2	1.75	1500	5*
1.00	*7/11*	*2.0**	*12*	*9.0*	*17.6*	*0.02**	*0.05**	*0.6*	*NA*	*1492*	*5**
	7/26	*2.0**	*10**	*9.0*	*16.3*	*0.02**	*0.05**	*0.7*	*1.86*	*1220*	*5**
	8/8	*7.5*	*16*	*8.7*	*8.92*	*1.47*	*6.58*	*8.0*	*4.90*	*961*	*5**
	8/21	*2.0**	*10**	*9.6*	*13.0*	*0.02**	*0.05**	*0.6*	*1.77*	*1410*	*5**
	9/10	*2.0**	*13*	*8.5*	17.2	0.02	0.05*	0.3	0.98	782	5*
0.13	7/11	2.0*	10*	9.8	1.79	0.02*	0.05*	0.3	0.69	850	5*
	7/26	2.3	32	8.0	6.27	0.06	0.05*	0.6	0.29	406	37
	8/8	2.0*	13	7.0	2.18	0.02	0.05*	0.5	0.60	655	33
	8/21	2.0*	10*	8.2	2.68	0.02	0.05*	0.6	0.67	826	5*
	9/10	2.0*	21	7.80	2.55	0.02*	0.05*	0.3	0.89	784	5*
Mann's Run											
1.2	7/12	2.0*	12	7.4	0.10*	0.02*	0.05*	0.3	0.05*	410	16
	7/25	2.0*	16	9.0	0.85	0.02	0.05*	0.2	0.39	352	5
	8/6	2.0*	16	7.3	0.10*	0.02*	0.05*	0.4	0.21	372	33
	8/20	2.0*	24	7.9	0.10*	0.02*	0.05*	0.2	0.05*	326	5
	9/5	2.0*	10*	6.7	0.10*	0.02*	0.05*	0.2*	0.05*	334	11
0.3	7/12	2.0*	10*	5.9	1.52	0.19	0.98	1.4	0.18	488	5*
	7/25	2.0*	10*	8.5	1.74	0.03	0.07	0.2*	0.14	204	9

RM	Date	BOD_5 (mg/l)	COD (mg/l)	D.O. (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	NH_3-N (mg/l)	TKN (mg/l)	T-P (mg/l)	TDS (mg/l)	TSS (mg/l)
	8/6	2.0*	10*	6.6	1.16	0.02	0.05	0.3	0.33	434	5*
	8/20	3.9	10*	6.5	1.68	0.28	0.89	1.2	0.24	468	5*
	9/5	2.0*	10*	9.7	2.64	0.04	0.05*	0.4	0.41	472	5*
Pleasantville Tributary											
0.8	7/12	2.0*	10*	8.3	0.3	0.02*	0.05*	0.2*	0.05*	578	8
	7/24	2.0*	10*	7.7	3.51	0.03	0.05	0.4	0.08	426	6
	8/5	2.0*	10*	6.5	1.41	0.02*	0.05*	0.5	0.26	498	10
	8/19	2.0*	10*	6.5	0.22	0.02*	0.05*	0.2*	0.05*	554	5
	9/3	2.0*	10*	7.0	0.11	0.02*	0.05*	0.7	0.05*	548	5*
0.74	7/12	2.0*	10*	8.5	1.23	0.03	0.06	0.3	0.29	684	22
	7/24	2.0*	10*	8.0	3.93	0.03	0.05	0.3	0.16	502	59
	8/5	2.0*	10*	6.5	1.93	0.03	0.06	0.6	0.52	548	15
	8/19	2.0*	10*	6.4	2.41	0.03	0.11	0.4	0.85	670	9
	9/3	2.0*	10*	6.2	0.35	0.07	0.40	0.9	0.50	638	13

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
Walnut Creek											
53.00	7/10	2*	0.2*	30*	10*	2*	40*	10*	79	26	304
	7/23	2*	0.2*	30*	10*	2*	40*	10*	63	20	240
	8/5	2*	0.2*	30*	10*	2*	40*	10*	64	22	250
	8/19	2*	0.2*	30*	10*	2*	40*	10*	76	27	301
	9/3	2	0.3	30*	10*	2*	40*	10*	80	27	311
46.97	7/10	2	0.2*	30*	10*	2*	40*	10*	73	28	298
	7/23	2*	0.2*	30*	10*	2*	40*	10*	57	19	221
	8/5	2*	0.2*	30*	10*	2*	40*	10*	60	23	245
	8/19	2*	0.2*	30*	10*	2*	40*	10*	71	28	293
	9/3	2*	0.2*	30*	10*	2*	40*	10*	76	31	317
42.52	7/10	3	0.2*	30*	10*	5	40*	10*	85	32	344
	7/23	2	0.2*	30*	10*	2	40*	26	53	17	202
	8/5	2	0.2*	30*	10*	2*	40*	10*	65	24	261
	8/19	3	0.2*	30*	10*	2*	40*	10*	81	33	338
	9/3	4	0.2*	30*	10*	2*	40*	10*	92	38	386
41.17	7/10	3	0.2*	30*	10*	2*	40*	11	93	33	368
	7/23	3	0.2*	30*	10*	2*	40*	10*	52	16	196
	8/5	2*	0.2*	30*	10*	2*	40*	10*	81	27	313
	8/19	3	0.2*	30*	10*	2*	40*	10*	91	33	363
	9/3	4	0.2*	30*	10*	2*	40*	12	108	39	430
40.05	*7/10*	*5*	*0.2**	*30**	*10**	*2**	*40**	*40*	*75*	*28*	*303*
	7/23	*4*	*0.2**	*30**	*10**	*2**	*40**	*16*	*69*	*22*	*263*

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	8/5	2	0.2*	30*	10*	2*	40*	26	80	28	315
	8/19	4	0.2	30*	17	2*	40*	35	78	30	318
	9/4	3	0.2*	30*	10*	2*	40*	27	69	27	283
40.00	7/10	4	0.2*	30*	10*	2*	40*	13	89	32	354
	7/23	3	0.2*	30*	10*	2*	40*	10*	54	17	205
	8/5	2	0.2*	30*	10*	2*	40*	10*	79	26	304
	8/19	2	0.2*	30*	10*	4	40*	12	88	33	356
	9/4	4	0.2*	30*	10*	2*	40*	10	100	36	398
39.70	7/23	3	0.2*	30*	10*	2*	40*	10*	54	17	205
	8/5	3	0.2*	30*	10*	2*	40*	10*	80	27	311
	8/19	2*	0.2*	30*	10*	2*	40*	35	87	32	349
	9/4	4	0.2*	30*	10*	2*	40*	10*	95	36	385
36.89	7/10	3	0.2*	30*	10*	2*	40*	10*	86	31	342
	7/24	2	0.4	30*	10*	2*	40*	12	60	20	232
	8/6	3	0.2*	30*	10*	2*	40*	10*	79	26	304
	8/20	4	0.2*	30*	10*	2*	40*	10*	86	32	347
	9/4	4	0.2*	30*	10*	2*	40*	10*	97	37	395
34.33	7/11	2	0.2*	30*	10*	2*	40*	10*	90	32	357
	7/24	3	0.2*	30*	10*	2*	40*	13	62	20	237
	8/6	2	0.2*	30*	10*	2*	40*	10*	81	26	309
	8/20	3	0.2*	30*	10*	2*	40*	10	88	32	352
	9/4	3	0.2*	30*	10*	2*	40*	10*	94	36	383
29.91	7/11	3	0.2*	30*	10*	2*	40*	10*	84	28	325
	7/26	2	0.2*	30*	10*	2	40*	14	53	16	198
	8/6	3	0.2*	30*	10*	2*	40*	10*	82	26	312
	8/20	4	0.2*	30*	10*	2*	40*	10*	82	29	324
	9/4	2	0.2*	30*	10*	2*	40*	10*	88	33	356
29.18	7/11	3	0.2*	30*	10*	2*	40*	18	86	29	334
	7/26	3	0.2	30*	10*	3	40*	14	46	16	211
	8/6	3	0.2*	30*	10*	2*	40*	10*	81	26	309
	8/20	2	0.2	30*	10*	2*	40*	53	85	29	332
	9/4	2	0.2*	30*	10*	2*	40*	10*	92	33	366
26.48	7/11	3	0.2*	30*	10*	2*	40*	10*	86	28	330
	7/26	2	0.2*	30*	10*	3	40*	26	53	16	198
	8/6	3	0.4	30*	10*	2*	40*	11	82	26	312
	8/20	3	0.2*	30*	10*	2*	40*	20	85	29	332
	9/4	3	0.2*	30*	10*	2*	40*	10*	90	32	357
24.45	7/11	3	0.2*	30*	10*	2*	40*	10*	83	27	318
	7/25	4	0.5	30*	19	16	40*	103	44	15	172
	8/7	4	0.3	30*	10*	8	40*	26	88	27	331

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	8/20	2*	0.2*	30*	10*	2*	40*	11	83	29	327
	9/5	3	0.2*	30*	10*	2*	40*	10*	92	32	362
24.20	7/11	30	0.2*	30*	10*	2*	40*	10	399	85	1350
	7/25	2	0.2*	30*	10*	3	40*	17	73	27	293
	8/7	4	0.2*	30*	10*	2	40*	46	70	28	290
	8/20	4	1.2	30*	118	19	74	598	97	31	370
	9/5	2	0.2*	30*	10*	2*	40*	47	62	27	266
24.15	7/11	5	0.2*	30*	10*	2*	40*	14	106	32	396
	7/25	4	0.6	30*	28	19	40*	168	45	16	178
	8/7	2	0.2*	30*	10*	3	40*	10*	88	27	331
	8/20	3	0.6	30*	43	8	40*	221	86	30	338
	9/5	2	0.2*	30*	10*	2*	40*	21	88	31	347
23.90	7/11	3	0.2*	30*	10*	2*	40*	10*	82	28	320
	7/26	2	0.2*	30*	10*	3	40*	20	52	16	196
	8/7	3	0.2*	30*	10*	2*	40*	10*	84	27	321
	8/21	3	0.2*	30*	10*	2*	40*	10*	82	28	320
	9/4	4	0.2*	30*	10*	2*	40*	10*	89	31	350
21.20	7/11	3	0.2*	30*	10*	2*	40*	14	87	29	337
	7/25	4	0.6	30*	23	18	40*	104	49	18	196
	8/7	4	0.2*	30*	10*	2*	40*	10	87	26	324
	8/21	3	0.2*	30*	10*	2*	40*	10*	86	29	334
	9/4	2*	0.2*	30*	10*	2*	40*	10	93	32	364
19.30	7/11	3	0.2*	30*	10*	2*	40*	14	89	29	342
	7/25	4	0.5	30*	23	18	40*	138	49	16	214
	7/25	4	0.4	30*	15	12	40*	79	45	15	174
	8/7	3	0.2	30*	10*	5	40*	16	85	27	323
	8/20	2	0.2*	30*	10*	2*	40*	10*	87	30	341
	9/5	3	0.2*	30*	10*	2*	40*	10	92	31	357
16.88	7/11	3	0.2*	30*	10*	2*	40*	10	92	30	353
	7/25	4	0.5	30*	20	120	40*	104	54	17	229
	7/25	5	1.0	30*	28	24	40*	136	57	20	225
	8/6	3	0.2*	30*	10*	23	40*	10*	83	26	314
	8/20	3	0.2*	30*	10*	3	40*	10*	84	29	329
	9/5	3	0.2*	30*	10*	10	40*	10*	92	31	357
15.50	7/11	4	0.2*	30*	10*	2*	40*	10*	91	30	351
	7/26	3	**2**	30*	10*	5	40*	32	50	15	187
	8/6	3	0.2*	30*	10*	2*	40*	10*	83	27	318
	8/20	2	0.2*	30*	10*	2*	40*	10*	87	30	341
	9/5	3	0.2*	30*	10*	2*	40*	10*	92	31	357
13.75	7/11	4	0.2*	30*	10*	2*	40*	10*	92	30	353

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	7/25	4	0.4	30*	19	15	40*	93	53	17	228
	8/6	2	0.2*	30*	10*	2*	40*	10*	82	26	312
	8/20	2	0.2*	30*	10*	2*	40*	10*	87	29	337
	9/5	3	0.2*	30*	10*	2*	40*	10*	91	31	355
11.00	7/10	3	0.2*	30*	10*	2*	40*	10*	91	29	347
	7/25	4	0.6	30*	26	20	40*	136	58	19	253
	8/6	4	0.2*	30*	10*	2*	40*	13	82	26	312
	8/20	2	0.2*	30*	10*	2*	40*	10*	86	29	334
	9/5	4	0.2*	30*	10*	2*	40*	10*	90	30	348
9.10	7/10	2*	0.2*	30*	10*	2*	40*	15	94	30	358
	7/25	5	0.3	30*	11	10	40*	61	72	21	288
	8/6	3	0.2*	30*	10*	2	40*	10*	82	26	312
	8/20	3	0.2*	30*	10*	2*	40*	10*	88	30	343
	9/6	4	0.2	30*	10*	2*	40*	10*	93	31	360
5.17	7/10	2	0.2*	30*	10*	2*	40*	10	97	30	366
	7/25	2	0.4	30*	10*	7	40*	45	66	19	261
	8/6	4	0.2*	30*	10*	2*	40*	10*	82	26	312
	8/20	3	0.2*	30*	10*	2*	40*	10	86	30	338
	9/6	3	0.2	30*	10*	2*	40*	10*	90	30	348
4.43	7/10	5	0.2*	30*	10*	2*	40*	28	97	35	386
	7/25	4	0.2	30*	10*	2*	NA	36	97	32	426
	8/6	5	0.3	30*	10*	2*	40*	38	98	34	385
	8/20	4	0.3	30*	10*	2*	40*	46	99	35	391
	9/6	4	0.4	30*	10*	2*	40*	50	96	35	384
4.41	7/10	3	0.2*	30*	10*	2*	40*	10*	94	31	362
	8/6	3	0.2*	30*	10*	2*	40*	10*	83	26	314
	8/20	2	0.2*	30*	10*	2*	40*	10*	87	30	341
	9/6	4	0.2	30*	10*	2*	40*	13	92	31	357
4.14	7/10	2	0.2*	30*	10*	2*	40*	10*	95	30	361
	7/25	3	0.3	30*	10*	5	40*	28	69	22	295
	8/6	2*	0.2*	30*	10*	2*	40*	10*	83	26	314
	8/20	4	0.2*	30*	10*	2*	40*	10*	87	29	337
	9/6	3	0.2*	30*	10*	2*	40*	10*	92	31	357
1.22	7/10	3	0.2*	30*	10*	2*	40*	10*	98	30	368
	7/25	2*	0.2	30*	10*	4	40*	19	68	21	284
	8/6	4	0.2	30*	283	2*	63	128	81	25	305
	8/20	4	0.2*	30*	10*	2*		10*	88	30	343
	9/6	2	0.2*	30*	10*	2*	40*	10*	94	32	366
Little Walnut Creek											
0.6	7/12	2*	0.2*	30*	10*	2*	40*	10*	89	30	346

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	7/25	2*	0.2*	30*	10*	3	40*	10*	78	26	345
	8/6	2*	0.2*	30*	10*	2*	40*	10*	88	29	339
	8/20	2*	0.2*	30*	10*	2*	40*	10*	88	31	347
	9/6	2*	0.2*	30*	10*	2*	40*	10*	94	32	366
George Creek											
2.1	7/11	3	0.2*	30*	10*	2*	40*	10*	87	29	337
	7/25	4	0.2*	30*	10*	6	40*	42	54	16	200
	8/6	4	0.2*	30*	10*	2	40*	21	86	27	326
	8/20	3	0.2*	30*	10*	2	40*	30	92	30	353
	9/13	6	0.2*	30*	10*	2*	40*	10*	102	32	386
0.12	7/11	4	0.2*	30*	10*	2*	40*	10*	89	29	342
	7/25	4	0.4	30*	14	11	40*	72	52	16	196
	8/6	5	0.4	30*	10*	3	40*	10*	85	26	319
	8/7	NA	NA	NA	NA	NA					
	8/20	4	0.2*	30*	10*	2*	40*	71	93	31	360
	9/13	6	0.2*	30*	10*	2*	40*	10*	96	32	371
Tributary to George Creek											
6.05	7/11	5	0.2*	30*	10*	2	40*	16	79	27	308
	7/25	4	0.2*	30*	10*	4	40*	22	47	14	175
	8/6	4	0.2*	30*	340	2*	88	342	76	26	297
	8/20	4	0.2	30*	10*	3	40*	38	100	34	390
	9/13	7	0.2*	30*	10*	2	40*	11	105	35	406
2.38	7/11	4	0.2*	30*	10*	2*	40*	10*	87	30	341
	7/25	4	0.2*	30*	10*	5	40*	40	46	14	173
	8/6	4	0.2*	30*	10*	2*	40*	10	80	26	307
	8/20	3	0.2*	30*	10*	3	40*	23	90	30	348
	9/13	6	0.2*	30*	10*	2	40*	10*	94	30	358
Tussing Ditch											
0.41	7/11	4	0.2*	30*	10*	2*	40*	10*	106	33	400
	7/25	3	0.2*	30*	10*	2*	40*	10*	97	29	362
	8/6	5	0.2*	30*	10*	2*	40*	10*	113	34	422
	8/20	3	0.2*	30*	10*	2*	40*	21	116	36	438
	9/13	7	0.2*	30*	10*	2*	40*	10*	119	37	450
Poplar Creek											
6.6	7/12	2*	0.2*	30*	10*	2*	40*	10*	89	29	342
	7/26	2*	0.2*	30*	10*	2*	40*	10*	62	19	233
	8/7	2*	0.2*	30*	10*	2*	40*	10*	90	27	336
	8/22	2*	0.2*	30*	10*	2*	40*	10*	88	30	343
	9/13	4	0.2*	30*	10*	2*	40*	10*	94	31	362
0.7	7/11	3	0.2*	30*	10*	2*	40*	10*	96	30	363

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	8/7	2*	0.2*	30*	10*	2*	40*	10*	91	28	343
	8/21	2*	0.2*	30*	10*	2*	40*	10*	91	30	351
	9/12	4	0.2*	30*	10*	2*	40*	10*	97	31	370
Rickenbacker Tributary at Walnut Creek RM 15.64											
	7/25	3	0.2*	30*	10*	2	40*	16	63	15	217
	7/25	4	0.2*	30*	10*	4	40*	20	56	14	197
	8/6	3	0.2*	30*	10*	2*	40*	10	89	28	338
	8/20	2	0.2*	30*	10*	2*	40*	10*	98	35	389
	9/5	3	0.2*	30*	10*	2	40*	10	98	30	368
Rickenbacker Tributary at Walnut Creek RM 15.54											
0.1	7/11	2	0.2*	30*	10*	2*	40*	10*	106	31	392
	7/26	2*	0.2*	30*	10*	2*	40*	10*	79	24	296
	8/6	4	0.2*	30*	10*	2*	40*	17	107	30	391
	8/20	2*	0.2*	30*	19	2*	65	33	104	30	383
	9/5	4	0.4	30*	10*	4	40*	94	113	27	393
Pawpaw Creek											
1.4	7/12	2*	0.2*	30*	10*	2*	40*	10*	96	35	384
	7/24	2*	0.2*	30*	10*	2*	40*	10*	62	21	241
	8/5	2*	0.2*	30*	10*	2*	40*	10*	65	23	257
	8/19	2*	0.2*	30*	10*	2*	40*	10*	94	33	371
	9/3	2*	0.2*	30*	10*	2*	40*	10*	120	43	477
0.54	7/12	4	0.2*	30*	10*	2*	40*	10*	93	31	360
	7/24	5	0.2	30*	10*	4	40*	14	79	24	296
	8/5	2	0.2*	30*	10*	2	40*	10*	80	25	303
	8/19	5	0.2*	30*	10*	2*	40*	10*	105	34	402
	9/3	6	0.2*	30*	10*	2*	40*	12	127	39	478
Zellerbach Tributary											
1.3	7/12	2*	0.2*	30*	10*	2*	40*	10*	65	21	249
	7/24	2	0.2*	30*	10*	3	40*	10*	65	21	249
	8/5	2*	0.2*	30*	10*	2*	40*	10*	69	22	263
	8/19	2*	0.2*	30*	10*	2*	40*	10*	74	24	284
	9/3	3	0.2*	30*	10*	2*	40*	10*	104	28	375
0.34	*7/12*	*7*	*0.2**	*30**	*10**	*2**	*40**	*10*	*100*	*26*	*357*
	7/23	*10*	*0.2**	*30**	*10**	*2**	*40**	*16*	*107*	*24*	*366*
	8/5	*9*	*0.2**	*30**	*10**	*4**	*40**	*10**	*111*	*24*	*376*
	8/19	*11*	*0.3*	*30**	*10**	*2**	*40**	*17*	*92*	*25*	*333*
	9/3	*12*	*0.2**	*30**	*10**	*2**	*40**	*10**	*127*	*28*	*432*
0.10	7/12	4	0.2*	30*	10*	2*	40*	10*	83	28	323
	7/24	4	0.2*	30*	10*	2*	40*	10*	78	24	294
	8/5	4	0.2*	30*	10*	2*	40*	10*	86	26	322

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	8/19	6	0.2*	30*	10*	2*	40*	10*	85	29	332
	9/3	12	0.2*	30*	10*	4	40*	19	104	32	391
Sycamore Creek											
11.8	7/12	4	0.2*	30*	10*	2*	40*	10*	71	31	305
	7/26	2*	0.2*	30*	10*	2	40*	10*	58	19	223
	8/7	5	0.2*	30*	10*	2	40*	13	63	27	268
	8/22	5	0.2*	30*	10*	2*	40*	10*	75	32	319
	9/12	5	0.2*	30*	10*	2	40*	10*	83	33	343
9.55	7/12	2	0.2*	30*	10*	2*	40*	10*	77	27	303
	7/26	2*	0.2*	30*	10*	2	40*	16	54	17	205
	8/7	3	0.2*	30*	10*	2*	40*	10*	69	25	275
	8/22	3	0.2*	30*	10*	2*	40*	10*	77	28	308
	9/12	3	0.2*	30*	10*	2*	40*	10*	84	28	325
8.90	*7/15*	*2*	*0.2**	*30**	*10**	*2**	*40**	*17**	*54*	*20*	*217*
	7/29	*2**	*0.2**	*30**	*10**	*2**	*40**	*30*	*57*	*18*	*216*
	8/8	*9*	*0.2**	*30**	*10**	*2**	*40**	*27*	*95*	*33*	*373*
	8/22	*4*	*0.2**	*30**	*10**	*2**	*40**	*12*	*58*	*19*	*223*
	9/12	*4*	*0.2**	*30**	*10**	*2**	*40**	*40*	*60*	*19*	*228*
8.36	7/12	4	0.2*	30*	10*	2*	40*	10*	79	28	313
	7/26	2*	0.2*	30*	10*	2*	40*	10*	53	17	202
	8/7	3	0.2*	30*	10*	2*	40*	10*	78	27	306
	8/22	4	0.4	30*	10*	2*	40*	10*	77	27	303
	9/12	6	0.2*	30*	10*	2*	40*	10*	84	28	325
6.67	7/12	2*	0.2*	30*	10*	2*	40*	10*	82	28	320
	7/26	2*	0.2*	30*	10*	2*	40*	10*	54	17	205
	8/8	2*	0.2*	30*	10*	2*	40*	10*	78	27	306
	8/22	2	0.2*	30*	10*	2*	40*	10*	76	26	297
	9/12	4	0.2*	30*	10*	2*	40*	10*	99	34	387
4.75	7/12	2*	0.2*	30*	10*	2*	40*	10*	83	29	327
	7/26	2*	0.2*	30*	10*	2*	40*	12	56	17	210
	8/8	3	0.2*	30*	10*	2*	40*	10*	86	28	330
	8/22	4	0.2*	30*	10*	2*	40*	10*	80	28	315
	9/10	4	0.2*	30*	10*	2*	40*	10*	89	30	346
4.35	*7/15*	*6*	*1.1*	*30**	*630*	*16*	*40**	*360*	*244*	*62*	*865*
	7/26	*2**	*0.2**	*30**	*12*	*2**	*40**	*16*	*135*	*43*	*514*
	8/8	*4*	*0.2**	*30**	*10**	*2**	*40**	*25*	*96*	*31*	*367*
	8/21	*2**	*0.2**	*30**	*10**	*2**	*40**	*23*	*117*	*37*	*445*
	9/10	*2**	*0.2**	*30**	*28*	*2**	*40**	*23*	*83*	*27*	*318*
4.30	7/15	5	0.7	30*	410	12	40*	233	93	28	348
	7/26	2	0.2*	30*	10*	2*	40*	10*	66	20	247

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
	8/8	3	0.2*	30*	10*	2*	40*	10	83	27	318
	8/21	2	0.2*	30*	10*	2*	40*	22	109	35	416
	9/10	2*	0.2*	30*	18	2*	40*	18	89	28	338
4.18	7/12	3	0.2*	30*	10	2*	40*	22	102	34	395
	7/26	2*	0.2*	30*	10*	2*	40*	10*	67	20	250
	8/8	4	0.2*	30*	10*	2*	40*	17	91	28	343
	8/21	2*	0.2*	30*	10*	2*	40*	26	114	37	437
	9/10	3	0.2*	30*	14	2*	40*	20	97	31	370
2.60	7/11						40*	13	100	33	386
	7/26	2	0.2*	30*	10*	2*	40*	11	57	17	212
	8/8	4	0.2*	30*	10*	2*	40*	11	112	35	424
	8/21	3	0.2*	30*	10*	2*	40*	10*	91	29	347
	9/10	2	0.2*	30*	10*	2*	40*	10*	110	36	423
1.03	7/11	4	0.2*	30*	10*	2*	NA	10	93	31	360
	7/26	2*	0.2*	30*	10*	2*	40*	10	52	16	196
	8/8	5	0.2*	30*	10*	2*	40*	12	85	26	319
	8/21	5	0.2*	30*	10*	2*	40*	12	96	31	367
	9/10	5	0.2*	30*	10*	2*	40*	31	97	34	382
1.00	*7/11*	*9*	*0.2**	*30**	*10**	*2**	*40**	*30*	*95*	*33*	*373*
	7/26	*8*	*0.2**	*30**	*10**	*2**	*40**	*16*	*90*	*30*	*348*
	8/8	*3*	*0.2**	*30**	*10**	*2**	*40**	*23*	*57*	*18*	*216*
	8/21	*12*	*0.2**	*30**	*10**	*2**	*40**	*24*	*94*	*33*	*371*
	9/10	*10*	*0.2**	*30**	*10**	*2**	*40**	*10**	*87*	*28*	333
0.13	7/11	5	0.2*	30*	10*	2*	40*	12	94	32	366
	7/26	2	0.2*	30*	10*	2*	40*	13	52	16	196
	8/8	5	0.2*	30*	10*	2*	40*	10	89	27	333
	8/21	5	0.2*	30*	10*	2*	40*	10*	93	30	356
	9/10	4	0.2*	30*	10*	2*	40*	10*	83	27	318
Mann's Run											
1.2	7/12	2*	0.2*	30*	10*	2*	40*	10*	6.8	26	277
	7/25	2	0.2*	30*	10*	2*	40*	10*	70	23	307
	8/6	2	0.2	30*	10*	3	40*	20	73	28	298
	8/20	2	0.2*	30*	10*	2*	40*	10*	60	28	265
	9/5	3	0.2*	30*	10*	2*	40*	10*	64	28	275
0.30	7/12	3	0.2*	30*	10*	2*	40*	10*	86	29	334
	7/25	2*	0.2*	30*	10*	2	40*	10*	41	11	154
	8/6	4	0.2*	30*	10*	2*	40*	10*	83	28	323
	8/20	5	0.2*	30*	10*	2*	40*	10*	83	29	327
	9/5	5	0.2*	30*	10*	2*	40*	10*	88	30	343
Pleasantville Tributary											

RM	Date	T-As (µg/l)	T-Cd (µg/l)	T-Cr (µg/l)	T-Cu (µg/l)	T-Pb (µg/l)	T-Ni (µg/l)	T-Zn (µg/l)	T-Ca (mg/l)	T-Mg (mg/l)	Hardness (mg/l)
0.8	7/12	3	0.2*	30*	10*	2*	40*	10*	93	38	389
	7/24	3	0.2*	30*	10*	2*	40*	10*	73	26	289
	8/5	4	0.2*	30*	10*	2*	40*	10*	71	29	297
	8/19	3	0.2*	30*	10*	2*	40*	10*	97	38	399
	9/3	4	0.2*	30*	10*	2*	40*	10*	105	41	431
0.74	7/12	2	0.2*	30*	10*	2*	40*	10*	97	38	399
	7/24	4	0.2*	30*	10*	2*	40*	10*	74	27	296
	8/5	4	0.2*	30*	10*	2*	40*	10*	73	28	298
	8/19	4	0.2*	30*	10*	2*	40*	10*	96	37	392
	9/3	4	0.2*	30*	10*	2*	40*	10*	105	41	431

Appendix Table A-4 Summary of Ohio EPA database water column chemistry statistics based on samples from Eastern Corn Belt Plains ecoregion streams categorized by drainge 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 (<20mi^2)

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

Appendix Table A-4. (continued)

Ohio EPA water column chemical analysis (1981-1994)

Eastern Corn Belt Plains-Wadeable Streams (20-200mi^2)

Parameter (units)	IBI Range	Sample (n)	Median	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 34 Walnut Creek basin locations, August 27 to August 29, and September 9 to September 12, 1996. Bold denotes a violation of the WWH minimum D.O. criterion (4.0 mg/l).

Stream River Mile	Total Hours	Mean (mg/l)	Median (mg/l)	Minimum (mg/l)	Maximum (mg/l)	25th %tile (mg/l)	75 %tile (mg/l)
Walnut Creek							
42.5	52	6.41	6.23	5.38	7.7	5.85	6.94
41.18	50	5.44	6.23	**1.05**	7.96	**3.86**	7.01
40.75	47	4.96	4.90	**3.16**	8.16	4.06	5.85
40.10	50	6.23	6.33	4.15	7.51	5.61	6.84
39.90	47	6.11	6.10	5.28	7.06	5.73	6.48
38.95	55	7.72	7.72	6.41	8.73	7.28	8.15
38.37	48	6.85	6.87	5.82	8.09	6.38	7.31
36.90	48	7.92	7.64	5.58	10.66	6.77	9.06
35.28	50	6.50	6.30	5.06	8.80	5.67	7.32
34.30	50	4.85	4.79	**3.74**	6.19	4.36	5.33
28.90	46	6.24	6.10	5.90	6.88	6.03	6.44
26.50	48	6.79	6.65	6.36	7.54	6.52	7.05
24.50	48	6.17	5.97	5.60	7.13	5.87	6.46
23.90	48	6.13	5.91	5.54	7.13	5.80	6.45
22.00	48	5.89	5.93	4.43	7.12	5.38	6.39
20.40	47	6.92	6.87	6.43	7.68	6.63	7.20
16.90	46	6.75	6.68	6.38	7.29	6.54	6.95
13.30	45	6.47	6.36	5.89	7.28	6.21	6.73
9.10	47	6.94	6.85	6.47	7.62	6.69	7.18
5.20	47	7.04	6.92	6.46	7.94	6.70	7.37
4.10	47	6.91	6.78	6.29	7.78	6.55	7.26
1.20	47	8.40	8.12	7.74	9.82	7.92	8.87
Pawpaw Creek							
1.4	47	5.39	5.24	4.79	6.29	5.04	5.74
0.55	48	7.00	6.60	5.79	8.99	6.28	7.71
0.30	50	5.00	4.91	4.16	7.11	4.63	5.36
0.10	52	4.82	4.51	**2.35**	8.67	**3.59**	6.06

Table A-4 (continued)

Stream River Mile	Total Hours	Mean (mg/l)	Median (mg/l)	Minimum (mg/l)	Maximum (mg/l)	25th %tile (mg/l)	75 %tile (mg/l)
Sycamore Creek							
11.8	51	7.51	6.59	4.5	11.7	5.69	9.33
10.10	47	7.15	6.68	5.77	9.76	6.28	8.02
8.36	45	5.59	5.30	4.16	7.77	4.84	6.34
6.64	47	7.06	6.65	5.68	9.85	6.22	7.89
4.78	46	6.36	6.08	5.42	8.03	5.79	6.92
4.20	47	6.82	6.63	6.18	7.58	2.37	11.27
2.60	46	6.33	6.04	4.86	9.13	5.51	7.15
0.94	45	9.07	8.83	6.91	14.92	7.80	10.35

Appendix Table A-5 Percentage of particle sizes in sediment samples collected in the Walnut Creek study area, 1996.

Stream River Mile	Sand or larger	Coarse Silt	Medium Silt	Fine Silt	V. Fine Silt	Coarse Clay	Medium Clay	Fine Clay
Settling time (0) Particle size [µ]	($0.5) [$60]	(0.5-3) [60-30]	(3-10) [30-15]	(10-90) [15-8]	(90-270) [8-4]	(270-720) [4-2]	(720-1440) [2-1]	(>1440) [<1]
Walnut Creek								
42.52	44.4	11.9	9.9	13.9	4	2	2	2
41.17	45.9	10.4	4.2	16.6	12.5	0.0	2.1	0.0
39.70	51.5	9.4	7.6	12.6	3.1	3.1	1.6	1.6
36.89	37.7	9.9	12.7	18.4	4.2	2.8	1.4	1.4
29.91	40.7	12.5	10.9	17.1	3.1	3.1	3.1	1.6
24.45	40.5	12.6	14.4	16.2	1.8	1.8	1.8	3.6
23.90	48.6	4.0	10.5	17.1	4.0	4.0	1.3	1.3
21.20	66.8	7.2	5.8	7.2	1.4	2.9	0.0	1.4
16.88	60.3	5.5	6.8	10.9	2.7	2.7	1.4	2.7
15.50	35.2	15.3	13.6	15.3	3.4	1.7	3.4	1.7
9.10	43.9	10.7	12.0	14.7	2.7	1.3	4.0	1.3
5.17	48.7	7.9	9.2	13.2	3.9	3.9	2.6	0.0
4.14	31.5	16.5	9.4	23.6	4.7	4.7	2.4	0.0
1.22	17.0	7.1	16.6	30.9	7.1	4.7	4.7	2.4
Sycamore Creek								
0.13	33.5	10	11.9	23.8	4.8	4.8	2.4	0
West Branch of Pawpaw Creek								
0.1	8.9	0	7	28	7	7	7	0

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
Manganese	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 catagories 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				

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-078 RM: 53.20 Site: Walnut Creek upst. Cattail Rd.

Taxa Code	Taxa	Quant	Qual
01801	*Turbellaria*	1	
03600	*Oligochaeta*	4	
08250	*Orconectes (Procericambarus) rusticus*		+
11018	*Acerpenna macdunnoughi*	1	
11120	*Baetis flavistriga*	11	+
11130	*Baetis intercalaris*	31	+
11430	*Diphetor hageni*	1	+
12200	*Isonychia sp*		+
13400	*Stenacron sp*		+
13521	*Stenonema femoratum*		+
13590	*Stenonema vicarium*	25	+
17200	*Caenis sp*		+
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
35001	*Perlodidae*		+
50315	*Chimarra obscura*		+
51400	*Nyctiophylax sp*		+
52200	*Cheumatopsyche sp*	33	+
52430	*Ceratopsyche morosa group*	1	+
52530	*Hydropsyche depravata group*		+
53800	*Hydroptila sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68708	*Dubiraphia vittata group*		+
69400	*Stenelmis sp*	76	+
70600	*Antocha sp*		+
71100	*Hexatoma sp*	16	+
71900	*Tipula sp*		+
72110	*Pericoma or Telmatoscopus sp*		+
74100	*Simulium sp*		+
74501	*Ceratopogonidae*	4	+
77500	*Conchapelopia sp*	33	+
77800	*Helopelopia sp*	20	
78450	*Nilotanypus fimbriatus*	4	
80204	*Brillia flavifrons group*	7	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	4	
80370	*Corynoneura lobata*	8	
80410	*Cricotopus (C.) sp*	20	+
80420	*Cricotopus (C.) bicinctus*	13	+
80430	*Cricotopus (C.) tremulus group*	20	+
81250	*Nanocladius (N.) minimus*	7	
81270	*Nanocladius (N.) spiniplenus*	13	+
81650	*Parametriocnemus sp*	100	+
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82200	*Tvetenia bavarica group*		+
82300	*Xylotopus par*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	20	
83840	*Microtendipes pedellus group*	7	+
84210	*Paratendipes albimanus or P. duplicatus*	40	+
84300	*Phaenopsectra obediens group*	7	+
84315	*Phaenopsectra flavipes*	7	
84430	*Polypedilum (P.) albicorne*	13	
84450	*Polypedilum (P.) flavum*	20	+
84460	*Polypedilum (P.) fallax group*	46	
84470	*Polypedilum (P.) illinoense*		+
84520	*Polypedilum (Tripodura) halterale group*	7	
84540	*Polypedilum (Tripodura) scalaenum group*	166	
85261	*Cladotanytarsus vanderwulpi group Type 1*	60	
85500	*Paratanytarsus sp*	33	
85501	*Paratanytarsus n.sp 1*	7	
85615	*Rheotanytarsus distinctissimus group*	33	+
85625	*Rheotanytarsus exiguus group*	86	+
85720	*Stempellinella n.sp nr. flavidula*	4	
85800	*Tanytarsus sp*	40	
85802	*Tanytarsus curticornis group*	7	
85814	*Tanytarsus glabrescens group*	13	
85815	*Tanytarsus glabrescens group sp 1*	13	
85840	*Tanytarsus guerlus group*	27	+
87540	*Hemerodromia sp*	42	+
96900	*Ferrissia sp*	16	+

No. Quantitative Taxa: 47 Total Taxa: 74

No. Qualitative Taxa: 51 ICI: **48**

Number of Organisms: 1167 Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-078 RM: 47.10 Site: Walnut Creek upst. St. Rt. 256

Taxa Code	Taxa	Quant/Qual
03360	*Plumatella sp*	+
03600	*Oligochaeta*	61 +
08255	*Orconectes rusticus x sanbornii*	+
11130	*Baetis intercalaris*	+
11651	*Procloeon sp (w/o hindwing pads)*	1
11670	*Procloeon irrubrum*	+
13000	*Leucrocuta sp*	7
13100	*Nixe sp*	+
13400	*Stenacron sp*	249 +
13521	*Stenonema femoratum*	63 +
13561	*Stenonema pulchellum*	4 +
13570	*Stenonema terminatum*	7
13590	*Stenonema vicarium*	7
17200	*Caenis sp*	13 +
21200	*Calopteryx sp*	5 +
22001	*Coenagrionidae*	1 +
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
66200	*Cymbiodyta sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	3 +
68901	*Macronychus glabratus*	23 +
69400	*Stenelmis sp*	33 +
71100	*Hexatoma sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	78 +
77500	*Conchapelopia sp*	34 +
77800	*Helopelopia sp*	45 +
78140	*Labrundinia pilosella*	101
78350	*Meropelopia sp*	+
80370	*Corynoneura lobata*	356
82121	*Thienemanniella lobapodema*	11
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	22
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	+
84210	*Paratendipes albimanus or P. duplicatus*	45
84315	*Phaenopsectra flavipes*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	101
84540	*Polypedilum (Tripodura) scalaenum group*	34 +
84612	*Saetheria tylus*	+
84700	*Stenochironomus sp*	+
84750	*Stictochironomus sp*	+
85500	*Paratanytarsus sp*	11
85625	*Rheotanytarsus exiguus group*	22 +
85800	*Tanytarsus sp*	34
85814	*Tanytarsus glabrescens group*	347 +
85840	*Tanytarsus guerlus group*	89 +
87540	*Hemerodromia sp*	1
95100	*Physella sp*	+
96900	*Ferrissia sp*	34 +
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 31	Total Taxa: 55
No. Qualitative Taxa: 42	ICI: **34**
Number of Organisms: 1842	Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-078 RM: 42.70 Site: Walnut Creek upst. St. Rt. 158

Taxa Code	Taxa	Quant	Qual
00401	*Spongillidae*		+
01801	*Turbellaria*		+
03600	*Oligochaeta*	27	
06201	*Hyalella azteca*		+
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	26	+
11020	*Acerpenna pygmaeus*	73	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	44	+
11250	*Centroptilum sp (w/o hindwing pads)*		+
11650	*Procloeon sp (w/ hindwing pads)*	24	+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	20	+
13000	*Leucrocuta sp*		+
13100	*Nixe sp*		+
13400	*Stenacron sp*	126	+
13521	*Stenonema femoratum*	7	
13590	*Stenonema vicarium*	1	
17200	*Caenis sp*	10	+
21200	*Calopteryx sp*	5	+
22001	*Coenagrionidae*		+
22300	*Argia sp*	10	+
23909	*Boyeria vinosa*		+
42700	*Belostoma sp*		+
47600	*Sialis sp*		+
50315	*Chimarra obscura*		+
52200	*Cheumatopsyche sp*	113	+
52430	*Ceratopsyche morosa group*		+
53501	*Hydroptilidae*		+
57900	*Pycnopsyche sp*		+
63300	*Hydroporus sp*		+
63900	*Laccophilus sp*		+
64050	*Liodessus sp*		+
65800	*Berosus sp*		+
67000	*Helophorus sp*		+
67500	*Laccobius sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	18	
68708	*Dubiraphia vittata group*	1	+
68901	*Macronychus glabratus*	20	+
69400	*Stenelmis sp*	2	+
71100	*Hexatoma sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*	19	+
77500	*Conchapelopia sp*	74	
77750	*Hayesomyia senata or Thienemannimyia norena*	37	+
77800	*Helopelopia sp*	56	+
78140	*Labrundinia pilosella*	56	
78450	*Nilotanypus fimbriatus*	130	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	48	+
80370	*Corynoneura lobata*	208	+
80410	*Cricotopus (C.) sp*	37	
80420	*Cricotopus (C.) bicinctus*	37	
80430	*Cricotopus (C.) tremulus group*	37	
81270	*Nanocladius (N.) spiniplenus*	56	
81631	*Parakiefferiella n.sp 1*	19	
82100	*Thienemanniella sp*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	37	
84210	*Paratendipes albimanus or P. duplicatus*	19	+
84300	*Phaenopsectra obediens group*	19	+
84450	*Polypedilum (P.) flavum*	74	+
84460	*Polypedilum (P.) fallax group*	111	+
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	74	
85261	*Cladotanytarsus vanderwulpi group Type 1*		+
85500	*Paratanytarsus sp*	56	
85625	*Rheotanytarsus exiguus group*	500	+
85800	*Tanytarsus sp*	74	
85814	*Tanytarsus glabrescens group*	333	
85840	*Tanytarsus guerlus group*	37	
87540	*Hemerodromia sp*	45	+
93900	*Elimia sp*	5	+
96900	*Ferrissia sp*	45	+
98200	*Pisidium sp*		+
98600	*Sphaerium sp*		+
99440	*Fusconaia flava*		+
99860	*Lampsilis radiata luteola*		+

No. Quantitative Taxa: 44 Total Taxa: 81

No. Qualitative Taxa: 62 ICI: **42**

Number of Organisms: 2770 Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/28/1996 River Code: 02-078 RM: 41.20 Site: Walnut Creek Basil St.

Taxa Code	Taxa	Quant	Qual
00653	*Eunapius fragilis*		+
01801	*Turbellaria*	17	+
03121	*Paludicella articulata*		+
03600	*Oligochaeta*	295	
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	40	
11020	*Acerpenna pygmaeus*	5	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	15	+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	2	+
13000	*Leucrocuta sp*	11	
13100	*Nixe sp*		+
13400	*Stenacron sp*	27	+
13521	*Stenonema femoratum*		+
13561	*Stenonema pulchellum*	11	
17200	*Caenis sp*	12	
21200	*Calopteryx sp*	1	+
22001	*Coenagrionidae*		+
22300	*Argia sp*	1	+
23909	*Boyeria vinosa*	1	+
27500	*Somatochlora sp*		+
52200	*Cheumatopsyche sp*	181	+
52430	*Ceratopsyche morosa group*	9	+
52530	*Hydropsyche depravata group*		+
54160	*Ochrotrichia sp*		+
68075	*Psephenus herricki*		+
68601	*Ancyronyx variegata*	3	+
68708	*Dubiraphia vittata group*	1	+
68901	*Macronychus glabratus*	28	+
69400	*Stenelmis sp*	66	+
71100	*Hexatoma sp*	1	+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*	29	
77500	*Conchapelopia sp*	58	+
77750	*Hayesomyia senata or Thienemannimyia norena*	29	
77800	*Helopelopia sp*	115	+
78140	*Labrundinia pilosella*	29	
78450	*Nilotanypus fimbriatus*	86	
80370	*Corynoneura lobata*	32	+
80410	*Cricotopus (C.) sp*	58	
80420	*Cricotopus (C.) bicinctus*		+
80430	*Cricotopus (C.) tremulus group*	29	
81825	*Rheocricotopus (Psilocricotopus) robacki*	29	+
82730	*Chironomus (C.) decorus group*	29	
82820	*Cryptochironomus sp*	86	+
83040	*Dicrotendipes neomodestus*	58	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
84210	*Paratendipes albimanus or P. duplicatus*	115	+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*		+
84460	*Polypedilum (P.) fallax group*	317	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	865	+
85500	*Paratanytarsus sp*	202	+
85625	*Rheotanytarsus exiguus group*	29	+
85800	*Tanytarsus sp*	86	
85814	*Tanytarsus glabrescens group*	922	
85840	*Tanytarsus guerlus group*	317	
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	33	+
89501	*Ephydridae*		+
93900	*Elimia sp*	2	+
96900	*Ferrissia sp*	24	+
98200	*Pisidium sp*		+
99540	*Elliptio dilatata*		+

No. Quantitative Taxa: 44 — Total Taxa: 66

No. Qualitative Taxa: 49 — ICI: **38**

Number of Organisms: 4306 — Qual EPT: 11

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/1996 River Code: 02-078 RM: 40.06 Site: Walnut Creek just upst. Baltimore

Taxa Code	Taxa	Quant/Qual	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	122	
04685	*Placobdella ornata*	1	
06700	*Crangonyx sp*		+
08255	*Orconectes rusticus x sanbornii*		+
13400	*Stenacron sp*	2	+
13521	*Stenonema femoratum*	3	+
17200	*Caenis sp*	12	
22001	*Coenagrionidae*		+
22300	*Argia sp*	14	+
23909	*Boyeria vinosa*		+
42700	*Belostoma sp*		+
47600	*Sialis sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*		+
68707	*Dubiraphia quadrinotata*		+
68708	*Dubiraphia vittata group*		+
69400	*Stenelmis sp*		+
77120	*Ablabesmyia mallochi*	24	
78140	*Labrundinia pilosella*	24	
79085	*Telopelopia okoboji*	24	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	8	
80370	*Corynoneura lobata*	40	
82730	*Chironomus (C.) decorus group*	48	+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	626	+
83050	*Dicrotendipes lucifer*	313	
83051	*Dicrotendipes simpsoni*	891	
83300	*Glyptotendipes (G.) sp*	193	+
83840	*Microtendipes pedellus group*	24	
84210	*Paratendipes albimanus or P. duplicatus*	24	
84790	*Tribelos fuscicorne*	120	
85500	*Paratanytarsus sp*	265	+
85800	*Tanytarsus sp*		+
85814	*Tanytarsus glabrescens group*	72	
85840	*Tanytarsus guerlus group*	120	+
86100	*Chrysops sp*		+
95100	*Physella sp*		+
96900	*Ferrissia sp*	21	+

No. Quantitative Taxa: 23 Total Taxa: 39

No. Qualitative Taxa: 25 ICI: **12**

Number of Organisms: 2991 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 07/16/1996 River Code: 02-078 RM: 40.04 A Site: Walnut Creek Baltimore WWTP mixing

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04964	*Mooreobdella microstoma*	+
08250	*Orconectes (Procericambarus) rusticus*	+
13400	*Stenacron sp*	+
67700	*Paracymus sp*	+
74501	*Ceratopogonidae*	+
82730	*Chironomus (C.) decorus group*	+
83040	*Dicrotendipes neomodestus*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85840	*Tanytarsus guerlus group*	+
96900	*Ferrissia sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 12

No. Qualitative Taxa: 12 ICI:

Number of Organisms: 0 Qual EPT: 1

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/1996 River Code: 02-078 RM: 40.04 B Site: Walnut Creek Baltimore WWTP mixing

Taxa Code	Taxa	Quant/Qual	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	128	
04510	*Hirudinea*		+
08250	*Orconectes (Procericambarus) rusticus*		+
13400	*Stenacron sp*	2	+
13521	*Stenonema femoratum*	1	
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	6	+
52200	*Cheumatopsyche sp*	8	+
77500	*Conchapelopia sp*	19	
77750	*Hayesomyia senata or Thienemannimyia norena*	58	
80370	*Corynoneura lobata*	72	
80410	*Cricotopus (C.) sp*	58	
82730	*Chironomus (C.) decorus group*	19	+
83040	*Dicrotendipes neomodestus*	773	+
83050	*Dicrotendipes lucifer*	19	
83051	*Dicrotendipes simpsoni*	116	
83300	*Glyptotendipes (G.) sp*	97	
84210	*Paratendipes albimanus or P. duplicatus*	39	
84300	*Phaenopsectra obediens group*		+
84790	*Tribelos fuscicorne*	116	
85500	*Paratanytarsus sp*	213	
85625	*Rheotanytarsus exiguus group*		+
85800	*Tanytarsus sp*	39	
85814	*Tanytarsus glabrescens group*	232	
85840	*Tanytarsus guerlus group*	39	
95100	*Physella sp*	18	
96900	*Ferrissia sp*	4	+

No. Quantitative Taxa: 22 Total Taxa: 29

No. Qualitative Taxa: 13 ICI: **18**

Number of Organisms: 2076 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/28/1996 River Code: 02-078 RM: 39.90 Site: Walnut Creek dst. Baltimore WWTP

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	8	
03600	*Oligochaeta*	720	
05800	*Caecidotea sp*	1	
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	24	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*		+
11670	*Procloeon irrubrum*		+
13000	*Leucrocuta sp*		+
13100	*Nixe sp*		+
13400	*Stenacron sp*		+
13521	*Stenonema femoratum*		+
17200	*Caenis sp*	18	+
21200	*Calopteryx sp*		+
23804	*Basiaeschna janata*		+
24900	*Gomphus sp*		+
27500	*Somatochlora sp*		+
42700	*Belostoma sp*		+
52200	*Cheumatopsyche sp*	72	+
52430	*Ceratopsyche morosa group*	1	+
53800	*Hydroptila sp*	1	+
68075	*Psephenus herricki*		+
68601	*Ancyronyx variegata*	1	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	56	+
69400	*Stenelmis sp*	110	+
71100	*Hexatoma sp*	1	+
71300	*Limonia sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
74650	*Atrichopogon sp*		+
77120	*Ablabesmyia mallochi*	223	+
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	111	
77800	*Helopelopia sp*	56	+
78401	*Natarsia species A (sensu Roback, 1978)*		+
78450	*Nilotanypus fimbriatus*	56	+
78650	*Procladius sp*		+
80410	*Cricotopus (C.) sp*	223	
80420	*Cricotopus (C.) bicinctus*		+
80430	*Cricotopus (C.) tremulus group*	167	+
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	56	
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82121	*Thienemanniella lobapodema*		+
82141	*Thienemanniella xena*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	111	+
83040	*Dicrotendipes neomodestus*	613	+
83051	*Dicrotendipes simpsoni*	56	
84210	*Paratendipes albimanus or P. duplicatus*	167	+
84300	*Phaenopsectra obediens group*		+
84315	*Phaenopsectra flavipes*		+
84450	*Polypedilum (P.) flavum*	56	+
84460	*Polypedilum (P.) fallax group*	279	
84540	*Polypedilum (Tripodura) scalaenum group*	1560	+
84700	*Stenochironomus sp*		+
84750	*Stictochironomus sp*		+
85500	*Paratanytarsus sp*	167	
85625	*Rheotanytarsus exiguus group*	446	+
85800	*Tanytarsus sp*	111	
85814	*Tanytarsus glabrescens group*	724	+
85840	*Tanytarsus guerlus group*	780	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	104	
93900	*Elimia sp*		+
95100	*Physella sp*		+
96900	*Ferrissia sp*	11	+
98600	*Sphaerium sp*	1	

No. Quantitative Taxa: 34 Total Taxa: 68

No. Qualitative Taxa: 55 ICI: **30**

Number of Organisms: 7091 Qual EPT: 11

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/28/1996 River Code: 02-078 RM: 37.00 Site: Walnut Creek upst. Bader Rd.

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	32	
01801	*Turbellaria*	32	+
03045	*Fredericella indica*	1	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	211	+
08601	*Hydracarina*	291	+
11020	*Acerpenna pygmaeus*	4	+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	1	+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	18	+
13000	*Leucrocuta sp*	123	+
13100	*Nixe sp*		+
13400	*Stenacron sp*	54	+
13510	*Stenonema exiguum*	59	
13561	*Stenonema pulchellum*	5	
16700	*Tricorythodes sp*	30	
17200	*Caenis sp*	57	
21200	*Calopteryx sp*	3	
22001	*Coenagrionidae*	1	+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
45100	*Palmacorixa sp*		+
48410	*Corydalus cornutus*		+
50301	*Chimarra aterrima*		+
50315	*Chimarra obscura*		+
52200	*Cheumatopsyche sp*	461	+
52430	*Ceratopsyche morosa group*	13	+
53800	*Hydroptila sp*	37	+
66500	*Enochrus sp*		+
67000	*Helophorus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	4	+
68707	*Dubiraphia quadrinotata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	24	+
69400	*Stenelmis sp*	59	+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*	116	+
77500	*Conchapelopia sp*	232	+
77750	*Hayesomyia senata or Thienemannimyia norena*	232	
77800	*Helopelopia sp*		+
78401	*Natarsia species A (sensu Roback, 1978)*		+
78450	*Nilotanypus fimbriatus*	116	
78650	*Procladius sp*		+
80370	*Corynoneura lobata*	32	
80410	*Cricotopus (C.) sp*	116	+
80430	*Cricotopus (C.) tremulus group*	116	+
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	116	+
82820	*Cryptochironomus sp*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
83840	*Microtendipes pedellus group*	116	
84210	*Paratendipes albimanus or P. duplicatus*		+
84300	*Phaenopsectra obediens group*		+
84315	*Phaenopsectra flavipes*		+
84450	*Polypedilum (P.) flavum*	116	+
84460	*Polypedilum (P.) fallax group*	348	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	116	+
85500	*Paratanytarsus sp*	116	
85625	*Rheotanytarsus exiguus group*	5684	+
85814	*Tanytarsus glabrescens group*	1856	
85840	*Tanytarsus guerlus group*	812	+
87540	*Hemerodromia sp*	155	+
95100	*Physella sp*		+
96900	*Ferrissia sp*	32	+
98600	*Sphaerium sp*	8	+

No. Quantitative Taxa: 41 Total Taxa: 68

No. Qualitative Taxa: 54 ICI: **46**

Number of Organisms: 11955 Qual EPT: 13

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/28/1996 River Code: 02-078 RM: 34.40 Site: Walnut Creek Coakley Rd.

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	8	
01801	*Turbellaria*		+
03121	*Paludicella articulata*	1	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	280	
06700	*Crangonyx sp*		+
08601	*Hydracarina*	304	+
11120	*Baetis flavistriga*	6	+
11130	*Baetis intercalaris*	84	+
11200	*Callibaetis sp*		+
11600	*Paracloeodes sp 1*		+
11650	*Procloeon sp (w/ hindwing pads)*		+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	72	+
13000	*Leucrocuta sp*	41	+
13100	*Nixe sp*		+
13400	*Stenacron sp*	61	+
13510	*Stenonema exiguum*	95	
13521	*Stenonema femoratum*		+
13561	*Stenonema pulchellum*	3	
13570	*Stenonema terminatum*	3	
16700	*Tricorythodes sp*	136	+
17200	*Caenis sp*	9	+
21200	*Calopteryx sp*	1	
22300	*Argia sp*	3	+
23909	*Boyeria vinosa*		+
45400	*Trichocorixa sp*		+
48410	*Corydalus cornutus*	3	
50315	*Chimarra obscura*	15	+
52200	*Cheumatopsyche sp*	1054	+
52430	*Ceratopsyche morosa group*	123	+
52570	*Hydropsyche simulans*	1	+
53800	*Hydroptila sp*	108	+
60400	*Gyrinus sp*		+
64050	*Liodessus sp*		+
65800	*Berosus sp*	1	
66500	*Enochrus sp*		+
67500	*Laccobius sp*	2	+
67700	*Paracymus sp*		+
67800	*Tropisternus sp*		+
68130	*Helichus sp*	2	+
68601	*Ancyronyx variegata*	21	+
68708	*Dubiraphia vittata group*	8	+
68901	*Macronychus glabratus*	288	+
69400	*Stenelmis sp*	200	+
71100	*Hexatoma sp*	1	+
74100	*Simulium sp*	11	+
77001	*Tanypodinae*		+
77120	*Ablabesmyia mallochi*	72	+
77500	*Conchapelopia sp*	216	+
77750	*Hayesomyia senata or Thienemannimyia norena*	72	
77800	*Helopelopia sp*	216	+
78450	*Nilotanypus fimbriatus*	288	
80370	*Corynoneura lobata*	24	
80410	*Cricotopus (C.) sp*	144	+
80420	*Cricotopus (C.) bicinctus*	72	+
81270	*Nanocladius (N.) spiniplenus*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*	144	
82141	*Thienemanniella xena*	8	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	144	+
83040	*Dicrotendipes neomodestus*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	216	+
84460	*Polypedilum (P.) fallax group*	216	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	216	+
84700	*Stenochironomus sp*	72	+
85261	*Cladotanytarsus vanderwulpi group Type 1*	144	
85264	*Cladotanytarsus vanderwulpi group Type 4*	72	
85625	*Rheotanytarsus exiguus group*	1368	+
85800	*Tanytarsus sp*	648	
85814	*Tanytarsus glabrescens group*	864	+
85840	*Tanytarsus guerlus group*	288	+
87540	*Hemerodromia sp*	216	+
95100	*Physella sp*		+
96900	*Ferrissia sp*	30	+
97601	*Corbicula fluminea*		+

No. Quantitative Taxa: 54 Total Taxa: 78
No. Qualitative Taxa: 60 ICI: **50**
Number of Organisms: 8695 Qual EPT: 18

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/28/1996 River Code: 02-078 RM: 29.70 Site: Walnut Creek dst. Pickerington Rd.

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	16	
03040	*Fredericella sp*	4	
03360	*Plumatella sp*	2	
03600	*Oligochaeta*	16	+
08255	*Orconectes rusticus x sanbornii*	1	+
08601	*Hydracarina*	104	+
11115	*Baetis tricaudatus*	17	+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	83	+
11200	*Callibaetis sp*		+
12200	*Isonychia sp*	553	+
13000	*Leucrocuta sp*	32	+
13120	*Nixe perfida*	16	+
13400	*Stenacron sp*	18	+
13510	*Stenonema exiguum*	186	+
13560	*Stenonema pulchellum group*	151	
16700	*Tricorythodes sp*	82	
17200	*Caenis sp*		+
21300	*Hetaerina sp*	1	
22001	*Coenagrionidae*		+
23909	*Boyeria vinosa*		+
45300	*Sigara sp*		+
45400	*Trichocorixa sp*		+
45501	*Notonectidae*		+
48410	*Corydalus cornutus*		+
50315	*Chimarra obscura*	1	+
51300	*Neureclipsis sp*	1	+
52200	*Cheumatopsyche sp*	1185	+
52430	*Ceratopsyche morosa group*	250	+
52440	*Ceratopsyche slossonae*	2	
52530	*Hydropsyche depravata group*	8	+
52540	*Hydropsyche dicantha*	31	+
52570	*Hydropsyche simulans*	420	+
53800	*Hydroptila sp*	82	+
60900	*Peltodytes sp*		+
63900	*Laccophilus sp*		+
67800	*Tropisternus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	64	+
68700	*Dubiraphia sp*	17	
68901	*Macronychus glabratus*	76	+
69400	*Stenelmis sp*	32	+
69420	*Stenelmis sexlineata*		+
71100	*Hexatoma sp*		+
74100	*Simulium sp*		+
74501	*Ceratopogonidae*	8	
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	101	+
77800	*Helopelopia sp*	202	
78140	*Labrundinia pilosella*	32	+
78450	*Nilotanypus fimbriatus*	8	
78655	*Procladius (Holotanypus) sp*		+
80370	*Corynoneura lobata*	24	
80420	*Cricotopus (C.) bicinctus*	303	+
80440	*Cricotopus (C.) trifascia group*		+
80474	*Cricotopus (C.) or Paratrichocladius sp*		+
81650	*Parametriocnemus sp*	202	
81825	*Rheocricotopus (Psilocricotopus) robacki*	303	
82101	*Thienemanniella taurocapita*	8	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	202	+
84460	*Polypedilum (P.) fallax group*	101	
84540	*Polypedilum (Tripodura) scalaenum group*	101	+
85615	*Rheotanytarsus distinctissimus group*	404	+
85625	*Rheotanytarsus exiguus group*	9501	+
85800	*Tanytarsus sp*	101	+
85802	*Tanytarsus curticornis group*		+
85814	*Tanytarsus glabrescens group*	101	+
85840	*Tanytarsus guerlus group*	505	+
87540	*Hemerodromia sp*	137	
95100	*Physella sp*		+
96900	*Ferrissia sp*		+

No. Quantitative Taxa: 48 Total Taxa: 78

No. Qualitative Taxa: 61 ICI: **52**

Number of Organisms: 15795 Qual EPT: 18

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 29.10 Site: Walnut Creek upst. Amanda-Northern

Taxa Code	Taxa	Quant	Qual
03600	*Oligochaeta*		+
06700	*Crangonyx sp*	1	
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	233	+
11120	*Baetis flavistriga*	11	
11130	*Baetis intercalaris*	384	+
11250	*Centroptilum sp (w/o hindwing pads)*		+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	88	+
13000	*Leucrocuta sp*	43	+
13400	*Stenacron sp*	4	+
13510	*Stenonema exiguum*	142	+
13561	*Stenonema pulchellum*	26	
13590	*Stenonema vicarium*	4	
16700	*Tricorythodes sp*	45	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
45100	*Palmacorixa sp*		+
47600	*Sialis sp*		+
51300	*Neureclipsis sp*	2	
52200	*Cheumatopsyche sp*	824	+
52430	*Ceratopsyche morosa group*	137	+
52530	*Hydropsyche depravata group*	29	
52540	*Hydropsyche dicantha*	20	
52570	*Hydropsyche simulans*	157	
53800	*Hydroptila sp*	195	+
68601	*Ancyronyx variegata*	2	+
68708	*Dubiraphia vittata group*	8	+
68901	*Macronychus glabratus*	34	+
69400	*Stenelmis sp*	1	+
71100	*Hexatoma sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	349	+
77740	*Hayesomyia senata*		+
78140	*Labrundinia pilosella*	116	
78450	*Nilotanypus fimbriatus*	116	
79085	*Telopelopia okoboji*		+
80370	*Corynoneura lobata*	64	
80410	*Cricotopus (C.) sp*	698	+
80420	*Cricotopus (C.) bicinctus*		+
80430	*Cricotopus (C.) tremulus group*	465	+
80440	*Cricotopus (C.) trifascia group*	116	+
81650	*Parametriocnemus sp*	116	
81825	*Rheocricotopus (Psilocricotopus) robacki*	582	+
82770	*Chironomus (C.) riparius group*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*		+
84210	*Paratendipes albimanus or P. duplicatus*		+
84300	*Phaenopsectra obediens group*		+
84315	*Phaenopsectra flavipes*		+
84450	*Polypedilum (P.) flavum*	116	+
84475	*Polypedilum (P.) ophioides*		+
84540	*Polypedilum (Tripodura) scalaenum group*		+
85200	*Cladotanytarsus sp*		+
85230	*Cladotanytarsus mancus group*		+
85264	*Cladotanytarsus vanderwulpi group Type 4*		+
85615	*Rheotanytarsus distinctissimus group*	233	
85625	*Rheotanytarsus exiguus group*	6051	+
85814	*Tanytarsus glabrescens group*		+
85840	*Tanytarsus guerlus group*		+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	105	
95100	*Physella sp*		+
96900	*Ferrissia sp*	2	+
99220	*Alasmidonta viridis*		+

No. Quantitative Taxa: 36 Total Taxa: 69

No. Qualitative Taxa: 55 ICI: **48**

Number of Organisms: 11519 Qual EPT: 11

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 26.40 Site: Walnut Creek

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*		+
03040	*Fredericella sp*	1	+
03121	*Paludicella articulata*		+
03360	*Plumatella sp*		+
03600	*Oligochaeta*	128	
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	16	+
11130	*Baetis intercalaris*	182	+
11150	*Pseudocloeon propinquus*		+
11625	*Paracloeodes sp 3*		+
11650	*Procloeon sp (w/ hindwing pads)*		+
12200	*Isonychia sp*	606	+
13000	*Leucrocuta sp*	80	+
13120	*Nixe perfida*	54	+
13400	*Stenacron sp*	54	+
13510	*Stenonema exiguum*	223	+
13561	*Stenonema pulchellum*	117	+
16700	*Tricorythodes sp*	83	+
17200	*Caenis sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
30000	*Plecoptera*		+
44501	*Corixidae*		+
48410	*Corydalus cornutus*	3	
50315	*Chimarra obscura*	9	
51300	*Neureclipsis sp*	3	+
52200	*Cheumatopsyche sp*	208	+
52430	*Ceratopsyche morosa group*	27	+
52530	*Hydropsyche depravata group*	32	
52540	*Hydropsyche dicantha*		+
52560	*Hydropsyche orris*	2	
52570	*Hydropsyche simulans*	101	+
53800	*Hydroptila sp*	1	
65800	*Berosus sp*		+
68130	*Helichus sp*		+
68201	*Scirtidae*		+
68601	*Ancyronyx variegata*	17	+
68708	*Dubiraphia vittata group*	33	+
68901	*Macronychus glabratus*	16	+
69400	*Stenelmis sp*	138	+
71100	*Hexatoma sp*		+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*	19	
77500	*Conchapelopia sp*	130	+
77750	*Hayesomyia senata or Thienemannimyia norena*	56	+
77800	*Helopelopia sp*	37	
78450	*Nilotanypus fimbriatus*	19	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	8	
80370	*Corynoneura lobata*	40	
80420	*Cricotopus (C.) bicinctus*	19	+
80430	*Cricotopus (C.) tremulus group*	19	
81825	*Rheocricotopus (Psilocricotopus) robacki*	37	+
82200	*Tvetenia bavarica group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*	37	
84210	*Paratendipes albimanus or P. duplicatus*	19	+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	19	
84460	*Polypedilum (P.) fallax group*	185	+
84540	*Polypedilum (Tripodura) scalaenum group*	93	
84750	*Stictochironomus sp*		+
85615	*Rheotanytarsus distinctissimus group*	19	+
85625	*Rheotanytarsus exiguus group*	777	+
85800	*Tanytarsus sp*	37	+
85814	*Tanytarsus glabrescens group*	148	
85840	*Tanytarsus guerlus group*	167	+
87540	*Hemerodromia sp*	163	+
89501	*Ephydridae*		+

No. Quantitative Taxa: 45 Total Taxa: 71

No. Qualitative Taxa: 55 ICI: **50**

Number of Organisms: 4182 Qual EPT: 18

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 24.50 Site: Walnut Creek covered bridge

Taxa Code	Taxa	Quant/Qual	
00401	*Spongillidae*		+
01320	*Hydra sp*	16	
01801	*Turbellaria*	14	
03045	*Fredericella indica*		+
03600	*Oligochaeta*	172	
04664	*Helobdella stagnalis*	1	
04666	*Helobdella triserialis*		+
07800	*Cambarus sp*		+
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	232	+
11130	*Baetis intercalaris*	400	+
11200	*Callibaetis sp*		+
11650	*Procloeon sp (w/ hindwing pads)*		+
12200	*Isonychia sp*	466	+
13000	*Leucrocuta sp*	5	+
13100	*Nixe sp*		+
13400	*Stenacron sp*		+
13510	*Stenonema exiguum*	473	+
13561	*Stenonema pulchellum*	410	+
16700	*Tricorythodes sp*	210	+
17200	*Caenis sp*	12	
21300	*Hetaerina sp*		+
22300	*Argia sp*	9	+
23909	*Boyeria vinosa*		+
45100	*Palmacorixa sp*		+
48410	*Corydalus cornutus*		+
51300	*Neureclipsis sp*		+
52200	*Cheumatopsyche sp*	1017	+
52430	*Ceratopsyche morosa group*	114	+
52530	*Hydropsyche depravata group*	73	
52570	*Hydropsyche simulans*	260	+
53800	*Hydroptila sp*	316	+
65800	*Berosus sp*		+
67800	*Tropisternus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	19	
68708	*Dubiraphia vittata group*	20	+
68901	*Macronychus glabratus*	20	+
69400	*Stenelmis sp*	39	+
71100	*Hexatoma sp*	1	
74100	*Simulium sp*	2	+
74501	*Ceratopogonidae*	32	
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	49	
77800	*Helopelopia sp*		+
78450	*Nilotanypus fimbriatus*	16	+
78650	*Procladius sp*		+
80350	*Corynoneura sp*		+
80410	*Cricotopus (C.) sp*	98	+
80420	*Cricotopus (C.) bicinctus*	49	+
80430	*Cricotopus (C.) tremulus group*	49	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	148	+
82141	*Thienemanniella xena*	48	+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	49	+
84060	*Parachironomus pectinatellae*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	49	+
84460	*Polypedilum (P.) fallax group*	246	+
84470	*Polypedilum (P.) illinoense*		+
84520	*Polypedilum (Tripodura) halterale group*		+
84540	*Polypedilum (Tripodura) scalaenum group*	49	+
85201	*Cladotanytarsus species group A*		+
85261	*Cladotanytarsus vanderwulpi group Type 1*	49	
85500	*Paratanytarsus sp*		+
85625	*Rheotanytarsus exiguus group*	4826	+
85800	*Tanytarsus sp*		+
85802	*Tanytarsus curticornis group*	49	
85814	*Tanytarsus glabrescens group*	295	
85840	*Tanytarsus guerlus group*	345	+
87540	*Hemerodromia sp*	140	+
89501	*Ephydridae*		+
96900	*Ferrissia sp*	2	+

No. Quantitative Taxa: 43 Total Taxa: 73

No. Qualitative Taxa: 60 ICI: **52**

Number of Organisms: 10889 Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 07/17/1996 River Code: 02-078 RM: 24.19 A Site: Walnut Creek Canal Wincester WWTP

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
08250	*Orconectes (Procericambarus) rusticus*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
12200	*Isonychia sp*	+
13000	*Leucrocuta sp*	+
13510	*Stenonema exiguum*	+
16700	*Tricorythodes sp*	+
17200	*Caenis sp*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
50315	*Chimarra obscura*	+
51300	*Neureclipsis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
52570	*Hydropsyche simulans*	+
53501	*Hydroptilidae*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
67700	*Paracymus sp*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
72900	*Culex sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
80440	*Cricotopus (C.) trifascia group*	+
81650	*Parametriocnemus sp*	+
82141	*Thienemanniella xena*	+
82730	*Chironomus (C.) decorus group*	+
82770	*Chironomus (C.) riparius group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	+
84470	*Polypedilum (P.) illinoense*	+
84520	*Polypedilum (Tripodura) halterale group*	+
85625	*Rheotanytarsus exiguus group*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 43
No. Qualitative Taxa: 43 ICI:
Number of Organisms: 0 Qual EPT: 14

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 24.19 B Site: Walnut Creek Canal Wincester WWTP

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
07860	*Cambarus (Puncticambarus) robustus*	+
08601	*Hydracarina*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
21300	*Hetaerina sp*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
52200	*Cheumatopsyche sp*	+
53501	*Hydroptilidae*	+
68130	*Helichus sp*	+
69400	*Stenelmis sp*	+
77120	*Ablabesmyia mallochi*	+
77750	*Hayesomyia senata or Thienemannimyia norena*	+
77800	*Helopelopia sp*	+
82770	*Chironomus (C.) riparius group*	+
83040	*Dicrotendipes neomodestus*	+
84470	*Polypedilum (P.) illinoense*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+
99680	*Leptodea fragilis*	+

No. Quantitative Taxa: 0 Total Taxa: 22

No. Qualitative Taxa: 22 ICI:

Number of Organisms: 0 Qual EPT: 4

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 24.00 Site: Walnut Creek dst Canal Winchester

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	16	
01801	*Turbellaria*	47	+
03040	*Fredericella sp*		+
03600	*Oligochaeta*	153	+
06700	*Crangonyx sp*		+
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	72	+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	437	+
12200	*Isonychia sp*	361	+
13000	*Leucrocuta sp*		+
13400	*Stenacron sp*	165	+
13510	*Stenonema exiguum*	1783	+
13561	*Stenonema pulchellum*	106	+
16700	*Tricorythodes sp*	104	+
21200	*Calopteryx sp*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
47600	*Sialis sp*		+
51300	*Neureclipsis sp*	8	+
52200	*Cheumatopsyche sp*	1646	+
52430	*Ceratopsyche morosa group*	241	+
52570	*Hydropsyche simulans*	402	+
53800	*Hydroptila sp*	22	+
63900	*Laccophilus sp*		+
67800	*Tropisternus sp*		+
68708	*Dubiraphia vittata group*	8	+
68901	*Macronychus glabratus*	20	+
69400	*Stenelmis sp*	22	+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	38	+
78450	*Nilotanypus fimbriatus*		+
80410	*Cricotopus (C.) sp*		+
80420	*Cricotopus (C.) bicinctus*		+
81632	*Parakiefferiella n.sp 2*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*	77	+
82141	*Thienemanniella xena*	19	
83003	*Dicrotendipes fumidus*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	134	+
84460	*Polypedilum (P.) fallax group*	38	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*		+
85625	*Rheotanytarsus exiguus group*	1958	+
85814	*Tanytarsus glabrescens group*	19	
85840	*Tanytarsus guerlus group*	19	+
87540	*Hemerodromia sp*	42	+
89501	*Ephydridae*		+
96900	*Ferrissia sp*		+
98600	*Sphaerium sp*		+

No. Quantitative Taxa:	27	Total Taxa:	51
No. Qualitative Taxa:	47	ICI:	**48**
Number of Organisms:	7957	Qual EPT:	13

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/30/1996 River Code: 02-078 RM: 21.20 Site: Walnut Creek end of lane, N of Lithoplis

Taxa Code	Taxa	Quant	Qual
03040	*Fredericella sp*		+
03600	*Oligochaeta*	16	
08250	*Orconectes (Procericambarus) rusticus*		+
08255	*Orconectes rusticus x sanbornii*	1	
08601	*Hydracarina*	49	+
11130	*Baetis intercalaris*	888	+
11200	*Callibaetis sp*		+
12200	*Isonychia sp*	1007	+
13000	*Leucrocuta sp*	47	+
13120	*Nixe perfida*	3	+
13400	*Stenacron sp*		+
13510	*Stenonema exiguum*	505	+
13521	*Stenonema femoratum*	3	+
13561	*Stenonema pulchellum*	522	+
13570	*Stenonema terminatum*	8	+
16700	*Tricorythodes sp*		+
21200	*Calopteryx sp*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
45100	*Palmacorixa sp*		+
48410	*Corydalus cornutus*	2	
50315	*Chimarra obscura*		+
51300	*Neureclipsis sp*	20	+
52200	*Cheumatopsyche sp*	1010	+
52430	*Ceratopsyche morosa group*	228	+
52520	*Hydropsyche bidens*	4	
52540	*Hydropsyche dicantha*	5	
52570	*Hydropsyche simulans*	2573	+
52580	*Hydropsyche valanis*	2	
53501	*Hydroptilidae*		+
65800	*Berosus sp*		+
67800	*Tropisternus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	18	+
69400	*Stenelmis sp*	16	+
74100	*Simulium sp*	417	+
80420	*Cricotopus (C.) bicinctus*	80	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	40	
81825	*Rheocricotopus (Psilocricotopus) robacki*	159	
82141	*Thienemanniella xena*	16	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
84450	*Polypedilum (P.) flavum*	119	+
84470	*Polypedilum (P.) illinoense*		+
85615	*Rheotanytarsus distinctissimus group*	119	
85625	*Rheotanytarsus exiguus group*	3779	
85800	*Tanytarsus sp*	40	
85814	*Tanytarsus glabrescens group*	40	
87540	*Hemerodromia sp*	48	
99240	*Lasmigona complanata*		+
99420	*Amblema plicata plicata*		+
99680	*Leptodea fragilis*		+

No. Quantitative Taxa: 32 Total Taxa: 54

No. Qualitative Taxa: 39 ICI: **48**

Number of Organisms: 11784 Qual EPT: 17

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 20.30 Site: Walnut Creek Lithoplis Rd.

Taxa Code	Taxa	Quant/Qual	
03040	*Fredericella sp*	3	+
03600	*Oligochaeta*	48	
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	337	+
11130	*Baetis intercalaris*	860	+
12200	*Isonychia sp*	489	+
13000	*Leucrocuta sp*		+
13100	*Nixe sp*		+
13400	*Stenacron sp*	352	+
13510	*Stenonema exiguum*	247	+
13561	*Stenonema pulchellum*	11	+
13570	*Stenonema terminatum*	127	+
16700	*Tricorythodes sp*	166	+
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*	1	+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
24700	*Dromogomphus sp*		+
24900	*Gomphus sp*		+
48410	*Corydalus cornutus*	2	
50315	*Chimarra obscura*	16	
51300	*Neureclipsis sp*		+
52200	*Cheumatopsyche sp*	2629	+
52430	*Ceratopsyche morosa group*	396	+
52440	*Ceratopsyche slossonae*	4	
52530	*Hydropsyche depravata group*	4	
52540	*Hydropsyche dicantha*	436	
52560	*Hydropsyche orris*	4	
52570	*Hydropsyche simulans*	1832	+
53800	*Hydroptila sp*	503	
57900	*Pycnopsyche sp*		+
65800	*Berosus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	1	+
68702	*Dubiraphia bivittata*	3	+
68708	*Dubiraphia vittata group*	13	+
68901	*Macronychus glabratus*	64	+
69420	*Stenelmis sexlineata*	56	+
71910	*Tipula abdominalis*		+
74100	*Simulium sp*	989	+
77120	*Ablabesmyia mallochi*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	87	+
78450	*Nilotanypus fimbriatus*	48	
80410	*Cricotopus (C.) sp*	87	
80420	*Cricotopus (C.) bicinctus*		+
80430	*Cricotopus (C.) tremulus group*		+
81690	*Paratrichocladius sp*	261	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	435	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	87	+
83158	*Endochironomus nigricans*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
84040	*Parachironomus frequens*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	348	+
84460	*Polypedilum (P.) fallax group*	87	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	87	+
85500	*Paratanytarsus sp*		+
85615	*Rheotanytarsus distinctissimus group*	87	+
85625	*Rheotanytarsus exiguus group*	9396	+
85800	*Tanytarsus sp*	87	+
85840	*Tanytarsus guerlus group*		+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	279	+
95100	*Physella sp*		+
97601	*Corbicula fluminea*	1	+
98600	*Sphaerium sp*		+
99680	*Leptodea fragilis*		+

No. Quantitative Taxa: 41 Total Taxa: 69

No. Qualitative Taxa: 57 ICI: **50**

Number of Organisms: 20970 Qual EPT: 14

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 19.40 A Site: Walnut Creek Richardson Rd.

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
04960	*Mooreobdella sp*	+
06201	*Hyalella azteca*	+
08250	*Orconectes (Procericambarus) rusticus*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
12200	*Isonychia sp*	+
13000	*Leucrocuta sp*	+
13100	*Nixe sp*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
13561	*Stenonema pulchellum*	+
16700	*Tricorythodes sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
27500	*Somatochlora sp*	+
45100	*Palmacorixa sp*	+
45900	*Notonecta sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52540	*Hydropsyche dicantha*	+
52560	*Hydropsyche orris*	+
52570	*Hydropsyche simulans*	+
53800	*Hydroptila sp*	+
63300	*Hydroporus sp*	+
65800	*Berosus sp*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68702	*Dubiraphia bivittata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71700	*Pilaria sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82141	*Thienemanniella xena*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84612	*Saetheria tylus*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
97601	*Corbicula fluminea*	+
99680	*Leptodea fragilis*	+
99860	*Lampsilis radiata luteola*	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 59
Number of Organisms: 0
Total Taxa: 59
ICI:
Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/1996 River Code: 02-078 RM: 19.40 B Site: Walnut Creek Richardson Rd.

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	73	
03360	*Plumatella sp*	8	
03600	*Oligochaeta*		+
06201	*Hyalella azteca*		+
06700	*Crangonyx sp*		+
07840	*Cambarus (Cambarus) sciotensis*	1	
08601	*Hydracarina*	457	
11130	*Baetis intercalaris*	580	+
11625	*Paracloeodes sp 3*		+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	206	+
13000	*Leucrocuta sp*	44	+
13100	*Nixe sp*		+
13400	*Stenacron sp*	6	+
13510	*Stenonema exiguum*	931	
13570	*Stenonema terminatum*	83	+
16700	*Tricorythodes sp*	192	+
17200	*Caenis sp*	8	+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
45400	*Trichocorixa sp*		+
47600	*Sialis sp*		+
51206	*Cyrnellus fraternus*	1	
52200	*Cheumatopsyche sp*	360	+
52430	*Ceratopsyche morosa group*	67	+
52540	*Hydropsyche dicantha*	7	
52570	*Hydropsyche simulans*	592	+
52580	*Hydropsyche valanis*	7	
53800	*Hydroptila sp*	12	+
59400	*Nectopsyche sp*		+
60900	*Peltodytes sp*		+
63900	*Laccophilus sp*		+
65800	*Berosus sp*		+
67500	*Laccobius sp*		+
67800	*Tropisternus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	2	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	13	+
69400	*Stenelmis sp*		+
71100	*Hexatoma sp*		+
74501	*Ceratopogonidae*		+
77120	*Ablabesmyia mallochi*		+
77130	*Ablabesmyia rhamphe group*		+
77750	*Hayesomyia senata or Thienemannimyia norena*		+
78450	*Nilotanypus fimbriatus*	64	
80370	*Corynoneura lobata*	32	
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*		+
84315	*Phaenopsectra flavipes*		+
84450	*Polypedilum (P.) flavum*	359	+
84612	*Saetheria tylus*		+
85625	*Rheotanytarsus exiguus group*	10400	+
85840	*Tanytarsus guerlus group*	90	+
87540	*Hemerodromia sp*	125	
95100	*Physella sp*		+
96900	*Ferrissia sp*	33	+
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*		+
99680	*Leptodea fragilis*		+

No. Quantitative Taxa: 28 Total Taxa: 61

No. Qualitative Taxa: 50 ICI: **42**

Number of Organisms: 14753 Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-078 RM: 16.80 Site: Walnut Creek Hayes Rd.

Taxa Code	Taxa	Quant/Qual
06700	*Crangonyx sp*	+
08250	*Orconectes (Procericambarus) rusticus*	+
11130	*Baetis intercalaris*	+
12200	*Isonychia sp*	+
13100	*Nixe sp*	+
13510	*Stenonema exiguum*	+
13561	*Stenonema pulchellum*	+
16700	*Tricorythodes sp*	+
21200	*Calopteryx sp*	+
21300	*Hetaerina sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52570	*Hydropsyche simulans*	+
66500	*Enochrus sp*	+
67700	*Paracymus sp*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
82820	*Cryptochironomus sp*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
85625	*Rheotanytarsus exiguus group*	+
87540	*Hemerodromia sp*	+
98600	*Sphaerium sp*	+
99680	*Leptodea fragilis*	+
99720	*Potamilus ohiensis*	+

No. Quantitative Taxa: 0 Total Taxa: 33

No. Qualitative Taxa: 33 ICI:

Number of Organisms: 0 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/05/1996 River Code: 02-078 RM: 15.50 Site: Walnut Creek

Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	+
03360	*Plumatella sp*	+
08250	*Orconectes (Procericambarus) rusticus*	+
08601	*Hydracarina*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
12200	*Isonychia sp*	+
13000	*Leucrocuta sp*	+
13100	*Nixe sp*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
16700	*Tricorythodes sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
45300	*Sigara sp*	+
50315	*Chimarra obscura*	+
51300	*Neureclipsis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52570	*Hydropsyche simulans*	+
53800	*Hydroptila sp*	+
60900	*Peltodytes sp*	+
67700	*Paracymus sp*	+
67811	*Staphylinidae*	+
68601	*Ancyronyx variegata*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
79085	*Telopelopia okoboji*	+
80370	*Corynoneura lobata*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85840	*Tanytarsus guerlus group*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
97601	*Corbicula fluminea*	+
99420	*Amblema plicata plicata*	+
99680	*Leptodea fragilis*	+

No. Quantitative Taxa: 0   Total Taxa: 50
No. Qualitative Taxa: 50   ICI:
Number of Organisms: 0   Qual EPT: 14

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/05/1996 River Code: 02-078 RM: 13.70 Site: Walnut Creek

Taxa Code	Taxa	Quant/Qual
03360	*Plumatella sp*	+
05900	*Lirceus sp*	+
08250	*Orconectes (Procericambarus) rusticus*	+
08601	*Hydracarina*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
11670	*Procloeon irrubrum*	+
12200	*Isonychia sp*	+
13100	*Nixe sp*	+
13510	*Stenonema exiguum*	+
13561	*Stenonema pulchellum*	+
13570	*Stenonema terminatum*	+
16700	*Tricorythodes sp*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
21300	*Hetaerina sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
45300	*Sigara sp*	+
45400	*Trichocorixa sp*	+
47600	*Sialis sp*	+
50315	*Chimarra obscura*	+
51300	*Neureclipsis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52570	*Hydropsyche simulans*	+
53800	*Hydroptila sp*	+
63300	*Hydroporus sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
67000	*Helophorus sp*	+
67700	*Paracymus sp*	+
67800	*Tropisternus sp*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68702	*Dubiraphia bivittata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
69420	*Stenelmis sexlineata*	+
70501	*Tipulidae*	+
72700	*Anopheles sp*	+
74501	*Ceratopogonidae*	+

Taxa Code	Taxa	Quant/Qual
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
83840	*Microtendipes pedellus group*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85800	*Tanytarsus sp*	+
87540	*Hemerodromia sp*	+
89001	*Sciomyzidae*	+
89570	*Ochthera sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
97601	*Corbicula fluminea*	+
99400	*Quadrula quadrula*	+
99680	*Leptodea fragilis*	+
99880	*Lampsilis cardium*	+

No. Quantitative Taxa: 0 Total Taxa: 70

No. Qualitative Taxa: 70 ICI:

Number of Organisms: 0 Qual EPT: 16

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/15/1996 River Code: 02-078 RM: 11.00 Site: Walnut Creek Walnut Creek Pike

Taxa Code	Taxa	Quant/Qual	
00401	*Spongillidae*		+
01320	*Hydra sp*	88	
01801	*Turbellaria*	13	+
03040	*Fredericella sp*	2	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	88	+
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	48	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	290	+
11200	*Callibaetis sp*		+
12200	*Isonychia sp*	928	+
13000	*Leucrocuta sp*	3	+
13400	*Stenacron sp*	166	+
13510	*Stenonema exiguum*	1230	+
13561	*Stenonema pulchellum*	169	
13570	*Stenonema terminatum*	187	+
16700	*Tricorythodes sp*	768	+
17200	*Caenis sp*	8	+
21300	*Hetaerina sp*	9	+
22001	*Coenagrionidae*	1	+
22300	*Argia sp*	40	+
23909	*Boyeria vinosa*		+
45400	*Trichocorixa sp*		+
48410	*Corydalus cornutus*	5	+
49200	*Climacia sp*		+
50315	*Chimarra obscura*		+
51300	*Neureclipsis sp*	8	+
52200	*Cheumatopsyche sp*	214	+
52430	*Ceratopsyche morosa group*	13	+
52520	*Hydropsyche bidens*	1	
52570	*Hydropsyche simulans*	142	+
52801	*Potamyia flava*		+
53800	*Hydroptila sp*	427	+
59140	*Ceraclea maculata*		+
59400	*Nectopsyche sp*	8	
59970	*Petrophila sp*	8	
60400	*Gyrinus sp*		+
60900	*Peltodytes sp*		+
63900	*Laccophilus sp*		+
65800	*Berosus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*	1	+
68601	*Ancyronyx variegata*	25	
68708	*Dubiraphia vittata group*	16	+
68901	*Macronychus glabratus*	31	+
69400	*Stenelmis sp*	42	+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	169	+
77800	*Helopelopia sp*		+
78450	*Nilotanypus fimbriatus*	56	
79085	*Telopelopia okoboji*		+
80370	*Corynoneura lobata*	64	
80410	*Cricotopus (C.) sp*	113	
80430	*Cricotopus (C.) tremulus group*		+
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*		+
82730	*Chironomus (C.) decorus group*		+
83040	*Dicrotendipes neomodestus*	56	
84300	*Phaenopsectra obediens group*	113	+
84450	*Polypedilum (P.) flavum*	226	+
84460	*Polypedilum (P.) fallax group*	169	
84470	*Polypedilum (P.) illinoense*	56	+
84540	*Polypedilum (Tripodura) scalaenum group*	338	+
85625	*Rheotanytarsus exiguus group*	3552	+
85814	*Tanytarsus glabrescens group*	507	+
85840	*Tanytarsus guerlus group*	564	+
87540	*Hemerodromia sp*	114	+
95100	*Physella sp*		+
96900	*Ferrissia sp*	2	+
97601	*Corbicula fluminea*	16	+
98600	*Sphaerium sp*		+
99400	*Quadrula quadrula*		+
99720	*Potamilus ohiensis*		+
99860	*Lampsilis radiata luteola*		+

No. Quantitative Taxa: 47 Total Taxa: 76

No. Qualitative Taxa: 63 ICI: **54**

Number of Organisms: 11094 Qual EPT: 18

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/05/1996 River Code: 02-078 RM: 8.90 Site: Walnut Creek St. Paul Rd.

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	1	+
02600	*Nematomorpha*		+
03360	*Plumatella sp*	2	+
03600	*Oligochaeta*	16	+
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	8	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	520	+
11200	*Callibaetis sp*		+
12200	*Isonychia sp*	472	+
13000	*Leucrocuta sp*		+
13100	*Nixe sp*		+
13400	*Stenacron sp*	13	+
13510	*Stenonema exiguum*	416	+
13561	*Stenonema pulchellum*	134	+
13570	*Stenonema terminatum*	363	+
16700	*Tricorythodes sp*	48	+
17200	*Caenis sp*		+
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*	8	+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
45100	*Palmacorixa sp*		+
47600	*Sialis sp*		+
48410	*Corydalus cornutus*	12	+
50315	*Chimarra obscura*	1	+
51300	*Neureclipsis sp*	1	+
52200	*Cheumatopsyche sp*	125	+
52430	*Ceratopsyche morosa group*	189	+
52440	*Ceratopsyche slossonae*		+
52530	*Hydropsyche depravata group*		+
52540	*Hydropsyche dicantha*	8	+
52570	*Hydropsyche simulans*	165	+
52620	*Macrostemum zebratum*		+
52801	*Potamyia flava*	4	+
53800	*Hydroptila sp*	18	+
60300	*Dineutus sp*		+
63900	*Laccophilus sp*		+
68075	*Psephenus herricki*		+
68601	*Ancyronyx variegata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	2	+
69400	*Stenelmis sp*	4	+
70501	*Tipulidae*		+
71900	*Tipula sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*	8	+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	23	+
77750	*Hayesomyia senata or Thienemannimyia norena*		+
77800	*Helopelopia sp*		+
78450	*Nilotanypus fimbriatus*	45	+
78650	*Procladius sp*		+
80410	*Cricotopus (C.) sp*		+
80430	*Cricotopus (C.) tremulus group*	45	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*		+
81650	*Parametriocnemus sp*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*	272	+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*		+
83310	*Glyptotendipes (Trichotendipes) amplus*		+
84040	*Parachironomus frequens*		+
84060	*Parachironomus pectinatellae*		+
84450	*Polypedilum (P.) flavum*	136	+
84460	*Polypedilum (P.) fallax group*		+
84470	*Polypedilum (P.) illinoense*		+
85265	*Cladotanytarsus vanderwulpi group Type 5*		+
85615	*Rheotanytarsus distinctissimus group*	23	+
85625	*Rheotanytarsus exiguus group*	1316	+
85814	*Tanytarsus glabrescens group*	23	+
85840	*Tanytarsus guerlus group*	23	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	82	+
89716	*Limnophora discreta*		+
93900	*Elimia sp*		+
95100	*Physella sp*		+
96900	*Ferrissia sp*		+
97601	*Corbicula fluminea*		+
98200	*Pisidium sp*		+
98600	*Sphaerium sp*		+
99680	*Leptodea fragilis*		+

No. Quantitative Taxa: 34 Total Taxa: 83

No. Qualitative Taxa: 81 ICI: **48**

Number of Organisms: 4526 Qual EPT: 23

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/09/1996 River Code: 02-078 RM: 5.30 Site: Walnut Creek Circleville-Lockbourne E.

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	104	
01801	*Turbellaria*	37	
03360	*Plumatella sp*	1	
03600	*Oligochaeta*	272	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	1	+
08601	*Hydracarina*	40	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	224	+
11200	*Callibaetis sp*		+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	145	+
13000	*Leucrocuta sp*	4	
13400	*Stenacron sp*	127	
13510	*Stenonema exiguum*	950	+
13561	*Stenonema pulchellum*	249	
13570	*Stenonema terminatum*	604	+
13590	*Stenonema vicarium*	4	
16700	*Tricorythodes sp*	1436	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	27	+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
45400	*Trichocorixa sp*	1	+
47600	*Sialis sp*		+
48410	*Corydalus cornutus*	1	+
51300	*Neureclipsis sp*	26	+
52200	*Cheumatopsyche sp*	192	+
52430	*Ceratopsyche morosa group*	2	+
52570	*Hydropsyche simulans*	40	+
53800	*Hydroptila sp*	98	+
59400	*Nectopsyche sp*		+
60900	*Peltodytes sp*		+
63300	*Hydroporus sp*		+
65800	*Berosus sp*	1	
66500	*Enochrus sp*		+
67800	*Tropisternus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*	4	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	80	+
69400	*Stenelmis sp*	64	+
74100	*Simulium sp*		+
74501	*Ceratopogonidae*	16	
77120	*Ablabesmyia mallochi*	52	+
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	155	+
77800	*Helopelopia sp*	52	
78650	*Procladius sp*		+
79085	*Telopelopia okoboji*	52	
80370	*Corynoneura lobata*	96	
80410	*Cricotopus (C.) sp*	103	+
80420	*Cricotopus (C.) bicinctus*	52	+
80430	*Cricotopus (C.) tremulus group*	155	+
81632	*Parakiefferiella n.sp 2*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82141	*Thienemanniella xena*	112	+
82730	*Chironomus (C.) decorus group*	52	+
83040	*Dicrotendipes neomodestus*	155	+
84155	*Paralauterborniella nigrohalteralis*		+
84300	*Phaenopsectra obediens group*	155	+
84450	*Polypedilum (P.) flavum*	413	+
84460	*Polypedilum (P.) fallax group*	258	
84470	*Polypedilum (P.) illinoense*	52	+
84540	*Polypedilum (Tripodura) scalaenum group*	516	+
84612	*Saetheria tylus*		+
85265	*Cladotanytarsus vanderwulpi group Type 5*		+
85625	*Rheotanytarsus exiguus group*	2012	+
85720	*Stempellinella n.sp nr. flavidula*	52	
85800	*Tanytarsus sp*		+
85814	*Tanytarsus glabrescens group*	671	+
85840	*Tanytarsus guerlus group*	774	+
87540	*Hemerodromia sp*	120	
89501	*Ephydridae*		+
89716	*Limnophora discreta*	1	
93900	*Elimia sp*	5	+
95100	*Physella sp*	16	+
96900	*Ferrissia sp*	42	+
97601	*Corbicula fluminea*		+
99400	*Quadrula quadrula*		+

No. Quantitative Taxa: 53 Total Taxa: 80

No. Qualitative Taxa: 63 ICI: **48**

Number of Organisms: 10873 Qual EPT: 14

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/1996 River Code: 02-078 RM: 4.42 B Site: Walnut Creek Ashville WWTP mixing

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	6656	
01801	*Turbellaria*	141	+
03360	*Plumatella sp*	1	
03600	*Oligochaeta*	2880	+
04964	*Mooreobdella microstoma*		+
06700	*Crangonyx sp*		+
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	48	
11130	*Baetis intercalaris*	65	+
12200	*Isonychia sp*	7	+
13000	*Leucrocuta sp*		+
13400	*Stenacron sp*	11	
13510	*Stenonema exiguum*	425	+
13570	*Stenonema terminatum*	56	
16700	*Tricorythodes sp*	81	+
21200	*Calopteryx sp*	26	+
21300	*Hetaerina sp*		+
22300	*Argia sp*	4	+
23909	*Boyeria vinosa*		+
48410	*Corydalus cornutus*	1	+
51300	*Neureclipsis sp*	1	
52200	*Cheumatopsyche sp*	117	+
52430	*Ceratopsyche morosa group*	35	+
52540	*Hydropsyche dicantha*	4	+
52570	*Hydropsyche simulans*	82	+
53400	*Protoptila sp*	1	
53800	*Hydroptila sp*	15	
59500	*Oecetis sp*	24	
63300	*Hydroporus sp*		+
65800	*Berosus sp*	1	
68130	*Helichus sp*	1	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	36	+
69400	*Stenelmis sp*	10	+
71900	*Tipula sp*	1	
71910	*Tipula abdominalis*	1	
74100	*Simulium sp*	16	+
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	23	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	47	
81240	*Nanocladius (N.) distinctus*	23	
82770	*Chironomus (C.) riparius group*	862	+
82820	*Cryptochironomus sp*	23	+
84300	*Phaenopsectra obediens group*	233	
84460	*Polypedilum (P.) fallax group*	23	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	140	
85625	*Rheotanytarsus exiguus group*	47	
85800	*Tanytarsus sp*	23	
85814	*Tanytarsus glabrescens group*	70	
85840	*Tanytarsus guerlus group*	70	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	332	+
89570	*Ochthera sp*		+
95100	*Physella sp*	563	+
96900	*Ferrissia sp*	122	
97601	*Corbicula fluminea*		+

No. Quantitative Taxa: 44 Total Taxa: 57
No. Qualitative Taxa: 35 ICI: **28**
Number of Organisms: 13348 Qual EPT: 9

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/09/1996 River Code: 02-078 RM: 4.10 Site: Walnut Creek dst Ashville WWTP

Taxa Code	Taxa	Quant/Qual	
00401	*Spongillidae*		+
01801	*Turbellaria*	1	+
03360	*Plumatella sp*	1	+
03600	*Oligochaeta*	696	+
05800	*Caecidotea sp*		+
06201	*Hyalella azteca*		+
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*	552	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	1488	+
11200	*Callibaetis sp*		+
11670	*Procloeon irrubrum*		+
12200	*Isonychia sp*	576	+
13000	*Leucrocuta sp*	82	+
13400	*Stenacron sp*	65	+
13510	*Stenonema exiguum*	1047	+
13521	*Stenonema femoratum*		+
13570	*Stenonema terminatum*	98	+
16700	*Tricorythodes sp*	832	+
17200	*Caenis sp*		+
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
26700	*Macromia sp*		+
45100	*Palmacorixa sp*		+
45300	*Sigara sp*		+
45400	*Trichocorixa sp*		+
47600	*Sialis sp*		+
48410	*Corydalus cornutus*	4	+
50315	*Chimarra obscura*		+
51300	*Neureclipsis sp*	83	+
52200	*Cheumatopsyche sp*	2735	+
52430	*Ceratopsyche morosa group*	556	+
52530	*Hydropsyche depravata group*	23	
52540	*Hydropsyche dicantha*		+
52560	*Hydropsyche orris*	23	+
52570	*Hydropsyche simulans*	1669	
52580	*Hydropsyche valanis*	23	+
52801	*Potamyia flava*	70	
53800	*Hydroptila sp*	292	+
59400	*Nectopsyche sp*		+
59500	*Oecetis sp*	40	
59970	*Petrophila sp*	8	
60300	*Dineutus sp*	1	
60900	*Peltodytes sp*		+
64050	*Liodessus sp*		+
65800	*Berosus sp*		+
66500	*Enochrus sp*		+
67500	*Laccobius sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	9	+
68708	*Dubiraphia vittata group*	1	+
68901	*Macronychus glabratus*	50	+
69400	*Stenelmis sp*	9	+
71100	*Hexatoma sp*		+
74100	*Simulium sp*	16	+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*		+
77750	*Hayesomyia senata or Thienemannimyia norena*	65	
78650	*Procladius sp*		+
80430	*Cricotopus (C.) tremulus group*		+
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	65	
81825	*Rheocricotopus (Psilocricotopus) robacki*	130	
82600	*Axarus sp*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	65	+
83040	*Dicrotendipes neomodestus*		+
83300	*Glyptotendipes (G.) sp*	65	
84060	*Parachironomus pectinatellae*		+
84450	*Polypedilum (P.) flavum*	912	+
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*		+
84612	*Saetheria tylus*		+
84960	*Pseudochironomus sp*		+
85615	*Rheotanytarsus distinctissimus group*	65	
85625	*Rheotanytarsus exiguus group*	6645	+
85840	*Tanytarsus guerlus group*	195	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	185	+
94400	*Fossaria sp*		+
96900	*Ferrissia sp*		+
97601	*Corbicula fluminea*	1	+
98600	*Sphaerium sp*		+

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/09/1996 River Code: 02-078 RM: 4.10 Site: Walnut Creek dst Ashville WWTP

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa:	40	Total Taxa:	86
No. Qualitative Taxa:	74	ICI:	**54**
Number of Organisms:	19443	Qual EPT:	21

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/09/1996 River Code: 02-078 RM: 1.10 Site: Walnut Creek dst. Little Walnut Rd.

Taxa Code	Taxa	Quant/Qual
00401	*Spongillidae*	+
01320	*Hydra sp*	8
01801	*Turbellaria*	36
03040	*Fredericella sp*	5 +
03121	*Paludicella articulata*	2
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
11130	*Baetis intercalaris*	235 +
11200	*Callibaetis sp*	+
11670	*Procloeon irrubrum*	+
12200	*Isonychia sp*	659 +
13000	*Leucrocuta sp*	301 +
13100	*Nixe sp*	+
13400	*Stenacron sp*	144 +
13510	*Stenonema exiguum*	397 +
13550	*Stenonema mexicanum integrum*	241
13561	*Stenonema pulchellum*	192 +
13570	*Stenonema terminatum*	415 +
14950	*Leptophlebia sp or Paraleptophlebia sp*	8
16700	*Tricorythodes sp*	120 +
17200	*Caenis sp*	8 +
21200	*Calopteryx sp*	+
21300	*Hetaerina sp*	+
22300	*Argia sp*	8 +
23909	*Boyeria vinosa*	1
24710	*Dromogomphus spinosis*	+
24900	*Gomphus sp*	+
25305	*Ophiogomphus rupinsulensis*	+
26700	*Macromia sp*	+
45300	*Sigara sp*	+
45400	*Trichocorixa sp*	+
47600	*Sialis sp*	1 +
51300	*Neureclipsis sp*	17 +
51400	*Nyctiophylax sp*	+
52200	*Cheumatopsyche sp*	104 +
52430	*Ceratopsyche morosa group*	2 +
52570	*Hydropsyche simulans*	3 +
52580	*Hydropsyche valanis*	17
57900	*Pycnopsyche sp*	+
59300	*Mystacides sp*	+
60300	*Dineutus sp*	+
63900	*Laccophilus sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	1 +
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	1
69400	*Stenelmis sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	28 +
77500	*Conchapelopia sp*	43
77800	*Helopelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
80370	*Corynoneura lobata*	64
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	14
81825	*Rheocricotopus (Psilocricotopus) robacki*	28 +
82141	*Thienemanniella xena*	32
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	14 +
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	85 +
84460	*Polypedilum (P.) fallax group*	43
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	185
84700	*Stenochironomus sp*	14
84800	*Tribelos jucundum*	+
85615	*Rheotanytarsus distinctissimus group*	14 +
85625	*Rheotanytarsus exiguus group*	997 +
85800	*Tanytarsus sp*	57 +
85814	*Tanytarsus glabrescens group*	71 +
85840	*Tanytarsus guerlus group*	85 +
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	24 +
96900	*Ferrissia sp*	16 +
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 43 Total Taxa: 75

No. Qualitative Taxa: 60 ICI: **54**

Number of Organisms: 4740 Qual EPT: 19

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-079 RM: 5.70 Site: Little Walnut Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03360	*Plumatella sp*	+
03600	*Oligochaeta*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
11101	*Plauditus sp*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11670	*Procloeon irrubrum*	+
13510	*Stenonema exiguum*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
27500	*Somatochlora sp*	+
42700	*Belostoma sp*	+
44501	*Corixidae*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
60400	*Gyrinus sp*	+
60900	*Peltodytes sp*	+
63300	*Hydroporus sp*	+
63400	*Hydrovatus sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
66500	*Enochrus sp*	+
67500	*Laccobius sp*	+
67700	*Paracymus sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
69930	*Lampyridae*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80370	*Corynoneura lobata*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
81650	*Parametriocnemus sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83003	*Dicrotendipes fumidus*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85615	*Rheotanytarsus distinctissimus group*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
94400	*Fossaria sp*	+
95100	*Physella sp*	+

No. Quantitative Taxa: 0 Total Taxa: 64

No. Qualitative Taxa: 64 ICI:

Number of Organisms: 0 Qual EPT: 10

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-079 RM: 0.70 Site: Little Walnut Creek

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
24900	*Gomphus sp*	+
52200	*Cheumatopsyche sp*	+
60900	*Peltodytes sp*	+
66500	*Enochrus sp*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
69400	*Stenelmis sp*	+
77500	*Conchapelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80440	*Cricotopus (C.) trifascia group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 20

No. Qualitative Taxa: 20 ICI:

Number of Organisms: 0 Qual EPT: 1

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-080 RM: 0.20 Site: Turkey Run

Taxa Code	Taxa	Quant/Qual
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11150	*Pseudocloeon propinquus*	+
11250	*Centroptilum sp (w/o hindwing pads)*	+
11651	*Procloeon sp (w/o hindwing pads)*	+
12200	*Isonychia sp*	+
13100	*Nixe sp*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
13521	*Stenonema femoratum*	+
13561	*Stenonema pulchellum*	+
13590	*Stenonema vicarium*	+
17200	*Caenis sp*	+
18700	*Hexagenia sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
24900	*Gomphus sp*	+
45300	*Sigara sp*	+
47600	*Sialis sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
52570	*Hydropsyche simulans*	+
59580	*Oecetis persimilis*	+
60300	*Dineutus sp*	+
63300	*Hydroporus sp*	+
63900	*Laccophilus sp*	+
64800	*Uvarus sp*	+
66500	*Enochrus sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
77500	*Conchapelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82820	*Cryptochironomus sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
86212	*Tabanus fairchildi*	+
87400	*Stratiomys sp*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

No. Quantitative Taxa: 0 Total Taxa: 60

No. Qualitative Taxa: 60 ICI:

Number of Organisms: 0 Qual EPT: 20

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/29/1996 River Code: 02-083 RM: 1.50 Site: Big Run

Taxa Code	Taxa	Quant/Qual
08255	*Orconectes rusticus x sanbornii*	+
08601	*Hydracarina*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
45300	*Sigara sp*	+
45900	*Notonecta sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52440	*Ceratopsyche slossonae*	+
52530	*Hydropsyche depravata group*	+
60900	*Peltodytes sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
67700	*Paracymus sp*	+
67811	*Staphylinidae*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
77355	*Clinotanypus pinguis*	+
77500	*Conchapelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83003	*Dicrotendipes fumidus*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84470	*Polypedilum (P.) illinoense*	+
85261	*Cladotanytarsus vanderwulpi group Type 1*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
87400	*Stratiomys sp*	+
95100	*Physella sp*	+
96264	*Planorbella (Pierosoma) pilsbryi*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 42
No. Qualitative Taxa: 42 ICI:
Number of Organisms: 0 Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-084 RM: 6.40 Site: Georges Creek

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
08255	*Orconectes rusticus x sanbornii*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporus sp*	+
67000	*Helophorus sp*	+
67500	*Laccobius sp*	+
67700	*Paracymus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
71900	*Tipula sp*	+
77500	*Conchapelopia sp*	+
78401	*Natarsia species A (sensu Roback, 1978)*	+
82200	*Tvetenia bavarica group*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84460	*Polypedilum (P.) fallax group*	+
84470	*Polypedilum (P.) illinoense*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+

No. Quantitative Taxa: 0   Total Taxa: 34

No. Qualitative Taxa: 34   ICI:

Number of Organisms: 0   Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-084 RM: 2.10 Site: Georges Creek

Taxa Code	Taxa	Quant/Qual
04666	*Helobdella triserialis*	+
04962	*Mooreobdella fervida*	+
06201	*Hyalella azteca*	+
08255	*Orconectes rusticus x sanbornii*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
42700	*Belostoma sp*	+
45300	*Sigara sp*	+
45400	*Trichocorixa sp*	+
47600	*Sialis sp*	+
60900	*Peltodytes sp*	+
63900	*Laccophilus sp*	+
64800	*Uvarus sp*	+
67000	*Helophorus sp*	+
67800	*Tropisternus sp*	+
67811	*Staphylinidae*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
78140	*Labrundinia pilosella*	+
78655	*Procladius (Holotanypus) sp*	+
84460	*Polypedilum (P.) fallax group*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 27

No. Qualitative Taxa: 27 ICI:

Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-084 RM: 0.10 Site: Georges Creek

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04962	*Mooreobdella fervida*	+
05800	*Caecidotea sp*	+
06700	*Crangonyx sp*	+
08255	*Orconectes rusticus x sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11430	*Diphetor hageni*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
21200	*Calopteryx sp*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
66500	*Enochrus sp*	+
68601	*Ancyronyx variegata*	+
68702	*Dubiraphia bivittata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83840	*Microtendipes pedellus group*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
84800	*Tribelos jucundum*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
97601	*Corbicula fluminea*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 46
No. Qualitative Taxa: 46 ICI:
Number of Organisms: 0 Qual EPT: 7

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/21/1996 River Code: 02-085 RM: 11.80 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03360	*Plumatella sp*	+
03600	*Oligochaeta*	+
04666	*Helobdella triserialis*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23618	*Aeshna umbrosa*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52570	*Hydropsyche simulans*	+
62202	*Copelatus glyphicus*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
66500	*Enochrus sp*	+
67000	*Helophorus sp*	+
67700	*Paracymus sp*	+
67800	*Tropisternus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78401	*Natarsia species A (sensu Roback, 1978)*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
82820	*Cryptochironomus sp*	+
84040	*Parachironomus frequens*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 45
Number of Organisms: 0
Total Taxa: 45
ICI:
Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/21/1996 River Code: 02-085 RM: 9.60 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
16700	*Tricorythodes sp*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
47600	*Sialis sp*	+
49400	*Sisyra sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
58505	*Helicopsyche borealis*	+
63300	*Hydroporus sp*	+
65800	*Berosus sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
69420	*Stenelmis sexlineata*	+
71100	*Hexatoma sp*	+
71700	*Pilaria sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
82820	*Cryptochironomus sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
86212	*Tabanus fairchildi*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98200	*Pisidium sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 50

No. Qualitative Taxa: 50 ICI:

Number of Organisms: 0 Qual EPT: 12

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-085 RM: 8.40 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03360	*Plumatella sp*	+
03600	*Oligochaeta*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
27500	*Somatochlora sp*	+
45300	*Sigara sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
52570	*Hydropsyche simulans*	+
58505	*Helicopsyche borealis*	+
60900	*Peltodytes sp*	+
63300	*Hydroporus sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
67000	*Helophorus sp*	+
67500	*Laccobius sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
69420	*Stenelmis sexlineata*	+
71100	*Hexatoma sp*	+
71900	*Tipula sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78650	*Procladius sp*	+
80430	*Cricotopus (C.) tremulus group*	+
81650	*Parametriocnemus sp*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
83840	*Microtendipes pedellus group*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85840	*Tanytarsus guerlus group*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+
95904	*Gyraulus (G.) deflectus*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 59

No. Qualitative Taxa: 59 ICI:

Number of Organisms: 0 Qual EPT: 12

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-085 RM: 6.10 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11250	*Centroptilum sp (w/o hindwing pads)*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
27500	*Somatochlora sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
53800	*Hydroptila sp*	+
58505	*Helicopsyche borealis*	+
59700	*Triaenodes sp*	+
60900	*Peltodytes sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
67000	*Helophorus sp*	+
67500	*Laccobius sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
69420	*Stenelmis sexlineata*	+
70600	*Antocha sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
81650	*Parametriocnemus sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
83840	*Microtendipes pedellus group*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
85840	*Tanytarsus guerlus group*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 60

No. Qualitative Taxa: 60 ICI:

Number of Organisms: 0 Qual EPT: 15

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-085 RM: 4.90 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	5	
01801	*Turbellaria*	19	+
03600	*Oligochaeta*	24	
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydracarina*	32	
11120	*Baetis flavistriga*	19	+
11130	*Baetis intercalaris*	17	+
12200	*Isonychia sp*	1	
13400	*Stenacron sp*	40	+
13510	*Stenonema exiguum*	4	
13521	*Stenonema femoratum*	6	+
13561	*Stenonema pulchellum*	2	
13590	*Stenonema vicarium*	2	
17200	*Caenis sp*		+
21200	*Calopteryx sp*	2	+
21300	*Hetaerina sp*	5	+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
47600	*Sialis sp*		+
50315	*Chimarra obscura*	8	+
52200	*Cheumatopsyche sp*	27	+
52430	*Ceratopsyche morosa group*	8	+
52530	*Hydropsyche depravata group*	31	+
53501	*Hydroptilidae*	1	
68075	*Psephenus herricki*	1	+
68601	*Ancyronyx variegata*	17	+
68901	*Macronychus glabratus*	2	+
69400	*Stenelmis sp*	24	+
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
74100	*Simulium sp*	16	+
77500	*Conchapelopia sp*	213	+
77800	*Helopelopia sp*		+
78450	*Nilotanypus fimbriatus*	192	
80370	*Corynoneura lobata*	373	
81270	*Nanocladius (N.) spiniplenus*	38	
81650	*Parametriocnemus sp*	25	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	8	
82101	*Thienemanniella taurocapita*	5	
82200	*Tvetenia bavarica group*	13	
82820	*Cryptochironomus sp*		+
84450	*Polypedilum (P.) flavum*	25	+
84460	*Polypedilum (P.) fallax group*	13	
84470	*Polypedilum (P.) illinoense*	13	+
84700	*Stenochironomus sp*	25	
85615	*Rheotanytarsus distinctissimus group*	100	
85625	*Rheotanytarsus exiguus group*	175	+
85800	*Tanytarsus sp*	38	
85814	*Tanytarsus glabrescens group*	63	
85840	*Tanytarsus guerlus group*	38	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*	31	+
95100	*Physella sp*	8	
96900	*Ferrissia sp*	29	+

No. Quantitative Taxa: 44 Total Taxa: 54

No. Qualitative Taxa: 34 ICI: **44**

Number of Organisms: 1738 Qual EPT: 9

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-085 RM: 4.30 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	19	+
03600	*Oligochaeta*	1984	+
04964	*Mooreobdella microstoma*		+
08601	*Hydracarina*	32	
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*		+
13400	*Stenacron sp*	45	+
13521	*Stenonema femoratum*	28	+
13590	*Stenonema vicarium*	33	+
17200	*Caenis sp*	5	
21200	*Calopteryx sp*	14	+
22001	*Coenagrionidae*		+
23909	*Boyeria vinosa*	2	+
45300	*Sigara sp*		+
52200	*Cheumatopsyche sp*	13	+
52430	*Ceratopsyche morosa group*	2	+
52530	*Hydropsyche depravata group*	2	+
66500	*Enochrus sp*		+
68075	*Psephenus herricki*		+
68601	*Ancyronyx variegata*	16	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	114	+
69400	*Stenelmis sp*	65	+
74100	*Simulium sp*	7	+
77500	*Conchapelopia sp*	732	+
77800	*Helopelopia sp*		+
78450	*Nilotanypus fimbriatus*	549	
78655	*Procladius (Holotanypus) sp*		+
80204	*Brillia flavifrons group*	61	+
80370	*Corynoneura lobata*	122	
80420	*Cricotopus (C.) bicinctus*	61	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	244	
81270	*Nanocladius (N.) spiniplenus*	122	
81825	*Rheocricotopus (Psilocricotopus) robacki*	122	+
82730	*Chironomus (C.) decorus group*	183	+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*		+
84210	*Paratendipes albimanus or P. duplicatus*	61	
84300	*Phaenopsectra obediens group*	61	+
84450	*Polypedilum (P.) flavum*	61	+
84460	*Polypedilum (P.) fallax group*	122	
84470	*Polypedilum (P.) illinoense*	122	+
84540	*Polypedilum (Tripodura) scalaenum group*	183	+
85500	*Paratanytarsus sp*	183	
85615	*Rheotanytarsus distinctissimus group*	549	
85625	*Rheotanytarsus exiguus group*	610	+
85800	*Tanytarsus sp*	61	
85814	*Tanytarsus glabrescens group*	1525	
85840	*Tanytarsus guerlus group*	122	+
87540	*Hemerodromia sp*	288	+
95100	*Physella sp*	2	
96900	*Ferrissia sp*	2	+

No. Quantitative Taxa: 40 Total Taxa: 52

No. Qualitative Taxa: 38 ICI: **36**

Number of Organisms: 8529 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-085 RM: 2.70 Site: Sycamore Creek

Taxa Code	Taxa	Quant	Qual
00401	*Spongillidae*		+
01320	*Hydra sp*	2	
01801	*Turbellaria*	10	+
03045	*Fredericella indica*		+
03600	*Oligochaeta*	98	
08255	*Orconectes rusticus x sanbornii*		+
08601	*Hydracarina*		+
11120	*Baetis flavistriga*	5	
11130	*Baetis intercalaris*	5	
12200	*Isonychia sp*	1	
13100	*Nixe sp*		+
13400	*Stenacron sp*	2	
13510	*Stenonema exiguum*	2	
13521	*Stenonema femoratum*	3	+
13590	*Stenonema vicarium*	1	
17200	*Caenis sp*	4	+
21200	*Calopteryx sp*	2	+
22300	*Argia sp*	3	+
23909	*Boyeria vinosa*		+
27500	*Somatochlora sp*		+
47600	*Sialis sp*		+
52200	*Cheumatopsyche sp*	237	+
52530	*Hydropsyche depravata group*	9	+
52540	*Hydropsyche dicantha*		+
66200	*Cymbiodyta sp*		+
67000	*Helophorus sp*		+
67700	*Paracymus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	1	+
68708	*Dubiraphia vittata group*	2	+
68901	*Macronychus glabratus*	2	+
69400	*Stenelmis sp*	32	+
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*	20	+
74501	*Ceratopogonidae*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	40	+
77800	*Helopelopia sp*	121	+
78401	*Natarsia species A (sensu Roback, 1978)*		+
78450	*Nilotanypus fimbriatus*	81	
78655	*Procladius (Holotanypus) sp*		+
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	36	
80370	*Corynoneura lobata*	312	
81240	*Nanocladius (N.) distinctus*	20	
81825	*Rheocricotopus (Psilocricotopus) robacki*	20	
82141	*Thienemanniella xena*	20	
83040	*Dicrotendipes neomodestus*		+
83840	*Microtendipes pedellus group*	20	
84210	*Paratendipes albimanus or P. duplicatus*	141	+
84300	*Phaenopsectra obediens group*	20	+
84450	*Polypedilum (P.) flavum*	40	+
84460	*Polypedilum (P.) fallax group*	40	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	20	+
85500	*Paratanytarsus sp*	24	
85615	*Rheotanytarsus distinctissimus group*	121	+
85625	*Rheotanytarsus exiguus group*	564	+
85814	*Tanytarsus glabrescens group*	302	
85840	*Tanytarsus guerlus group*	101	
87540	*Hemerodromia sp*	27	+
89570	*Ochthera sp*		+
96900	*Ferrissia sp*	440	+

No. Quantitative Taxa: 41   Total Taxa: 65

No. Qualitative Taxa: 46   ICI: **42**

Number of Organisms: 2951   Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-085 RM: 0.10 Site: Sycamore Creek

Taxa Code	Taxa	Quant/Qual	
03451	*Urnatella gracilis*	1	
03600	*Oligochaeta*	561	
08601	*Hydracarina*	48	
11120	*Baetis flavistriga*	6	+
11130	*Baetis intercalaris*	161	+
11150	*Pseudocloeon propinquus*		+
12200	*Isonychia sp*	47	+
13000	*Leucrocuta sp*	4	
13100	*Nixe sp*		+
13400	*Stenacron sp*	17	+
13521	*Stenonema femoratum*		+
13570	*Stenonema terminatum*	14	
16700	*Tricorythodes sp*	25	
21200	*Calopteryx sp*	1	+
21300	*Hetaerina sp*	2	+
22300	*Argia sp*		+
50315	*Chimarra obscura*		+
52200	*Cheumatopsyche sp*	26	+
52430	*Ceratopsyche morosa group*	30	+
52530	*Hydropsyche depravata group*	7	
52540	*Hydropsyche dicantha*	7	
52570	*Hydropsyche simulans*	2	
52801	*Potamyia flava*	2	
66500	*Enochrus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*		+
68901	*Macronychus glabratus*	5	+
69400	*Stenelmis sp*	5	+
71100	*Hexatoma sp*	4	+
74100	*Simulium sp*	29	+
77120	*Ablabesmyia mallochi*	42	+
77500	*Conchapelopia sp*	253	+
78450	*Nilotanypus fimbriatus*	128	
80370	*Corynoneura lobata*	224	
81650	*Parametriocnemus sp*	63	
81825	*Rheocricotopus (Psilocricotopus) robacki*	106	+
82820	*Cryptochironomus sp*	21	+
84210	*Paratendipes albimanus or P. duplicatus*	21	
84300	*Phaenopsectra obediens group*	21	
84450	*Polypedilum (P.) flavum*	21	+
84460	*Polypedilum (P.) fallax group*	169	
84470	*Polypedilum (P.) illinoense*		+
84520	*Polypedilum (Tripodura) halterale group*	42	
84540	*Polypedilum (Tripodura) scalaenum group*	190	
85261	*Cladotanytarsus vanderwulpi group Type 1*	21	
85500	*Paratanytarsus sp*	21	
85615	*Rheotanytarsus distinctissimus group*	63	
85625	*Rheotanytarsus exiguus group*	422	+
85800	*Tanytarsus sp*	63	
85802	*Tanytarsus curticornis group*	21	
85814	*Tanytarsus glabrescens group*	274	+
85840	*Tanytarsus guerlus group*	106	+
87540	*Hemerodromia sp*	200	
96900	*Ferrissia sp*	2	+

No. Quantitative Taxa: 45 Total Taxa: 54

No. Qualitative Taxa: 30 ICI: **40**

Number of Organisms: 3498 Qual EPT: 10

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/30/1996 River Code: 02-086 RM: 6.60 Site: Poplar Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
11250	*Centroptilum sp (w/o hindwing pads)*	+
11430	*Diphetor hageni*	+
11670	*Procloeon irrubrum*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
43300	*Ranatra sp*	+
43570	*Neoplea sp*	+
45300	*Sigara sp*	+
47600	*Sialis sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
53800	*Hydroptila sp*	+
58505	*Helicopsyche borealis*	+
59310	*Mystacides sepulchralis*	+
60900	*Peltodytes sp*	+
63300	*Hydroporus sp*	+
63900	*Laccophilus sp*	+
64050	*Liodessus sp*	+
66500	*Enochrus sp*	+
67000	*Helophorus sp*	+
67800	*Tropisternus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
71900	*Tipula sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82730	*Chironomus (C.) decorus group*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 57

No. Qualitative Taxa: 57 ICI:

Number of Organisms: 0 Qual EPT: 16

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/30/1996 River Code: 02-086 RM: 0.70 Site: Poplar Creek

Taxa Code	Taxa	Quant/Qual
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11651	*Procloeon sp (w/o hindwing pads)*	+
12200	*Isonychia sp*	+
13000	*Leucrocuta sp*	+
13120	*Nixe perfida*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80370	*Corynoneura lobata*	+
80420	*Cricotopus (C.) bicinctus*	+
81650	*Parametriocnemus sp*	+
83000	*Dicrotendipes sp*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 39

No. Qualitative Taxa: 39 ICI:

Number of Organisms: 0 Qual EPT: 12

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-087 RM: 1.40 Site: Pawpaw Creek

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
23618	*Aeshna umbrosa*	+
23909	*Boyeria vinosa*	+
27500	*Somatochlora sp*	+
47600	*Sialis sp*	+
50315	*Chimarra obscura*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporus sp*	+
63900	*Laccophilus sp*	+
67800	*Tropisternus sp*	+
67811	*Staphylinidae*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
71900	*Tipula sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78450	*Nilotanypus fimbriatus*	+
81650	*Parametriocnemus sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83840	*Microtendipes pedellus group*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	+
84470	*Polypedilum (P.) illinoense*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

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: 08/27/1996 River Code: 02-087 RM: 0.40 Site: Pawpaw Creek

Taxa Code	Taxa	Quant/Qual	
03600	*Oligochaeta*	345	+
04964	*Mooreobdella microstoma*		+
08601	*Hydracarina*		+
11018	*Acerpenna macdunnoughi*	2	
11120	*Baetis flavistriga*	11	+
11130	*Baetis intercalaris*	81	+
11250	*Centroptilum sp (w/o hindwing pads)*		+
13400	*Stenacron sp*	1	
13521	*Stenonema femoratum*	11	
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*	1	
22001	*Coenagrionidae*		+
23909	*Boyeria vinosa*		+
27500	*Somatochlora sp*		+
43570	*Neoplea sp*		+
45300	*Sigara sp*		+
52200	*Cheumatopsyche sp*	21	+
52430	*Ceratopsyche morosa group*		+
52530	*Hydropsyche depravata group*	8	+
62202	*Copelatus glyphicus*		+
67811	*Staphylinidae*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*		+
68708	*Dubiraphia vittata group*	8	+
69400	*Stenelmis sp*	13	+
74100	*Simulium sp*	21	+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	157	+
77750	*Hayesomyia senata or Thienemannimyia norena*	16	
77800	*Helopelopia sp*	47	+
78450	*Nilotanypus fimbriatus*	19	
78655	*Procladius (Holotanypus) sp*		+
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	8	
80370	*Corynoneura lobata*	19	+
80420	*Cricotopus (C.) bicinctus*	17	+
80430	*Cricotopus (C.) tremulus group*	16	
81240	*Nanocladius (N.) distinctus*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*	16	+
82141	*Thienemanniella xena*	8	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*	16	+
83040	*Dicrotendipes neomodestus*		+
84210	*Paratendipes albimanus or P. duplicatus*	79	+
84300	*Phaenopsectra obediens group*		+
84315	*Phaenopsectra flavipes*	16	+
84450	*Polypedilum (P.) flavum*	31	+
84460	*Polypedilum (P.) fallax group*	110	+
84470	*Polypedilum (P.) illinoense*		+
84520	*Polypedilum (Tripodura) halterale group*	31	
84540	*Polypedilum (Tripodura) scalaenum group*	204	+
84750	*Stictochironomus sp*		+
85500	*Paratanytarsus sp*	94	
85615	*Rheotanytarsus distinctissimus group*	31	
85625	*Rheotanytarsus exiguus group*	47	+
85800	*Tanytarsus sp*	79	
85802	*Tanytarsus curticornis group*	17	
85814	*Tanytarsus glabrescens group*	456	+
85840	*Tanytarsus guerlus group*	16	+
87540	*Hemerodromia sp*	55	+
95100	*Physella sp*	12	+
96900	*Ferrissia sp*	1	+
98600	*Sphaerium sp*		+

No. Quantitative Taxa: 39 Total Taxa: 63

No. Qualitative Taxa: 49 ICI: **36**

Number of Organisms: 2141 Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/23/1996 River Code: 02-198 RM: 0.70 Site: Mud Run

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
08255	*Orconectes rusticus x sanbornii*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
13510	*Stenonema exiguum*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
21200	*Calopteryx sp*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
27500	*Somatochlora sp*	+
27600	*Epitheca (Tetragoneuria) sp*	+
45300	*Sigara sp*	+
45400	*Trichocorixa sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
60900	*Peltodytes sp*	+
63300	*Hydroporus sp*	+
64800	*Uvarus sp*	+
67700	*Paracymus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
83840	*Microtendipes pedellus group*	+
84300	*Phaenopsectra obediens group*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
86100	*Chrysops sp*	+
86212	*Tabanus fairchildi*	+
87400	*Stratiomys sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 46
Number of Organisms: 0
Total Taxa: 46
ICI:
Qual EPT: 10

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-199 RM: 0.10 Site: Gillette Run

Taxa Code	Taxa	Quant/Qual
03360	*Plumatella sp*	+
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
06700	*Crangonyx sp*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11650	*Procloeon sp (w/ hindwing pads)*	+
13400	*Stenacron sp*	+
16700	*Tricorythodes sp*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
52570	*Hydropsyche simulans*	+
59700	*Triaenodes sp*	+
65800	*Berosus sp*	+
68601	*Ancyronyx variegata*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
82200	*Tvetenia bavarica group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84300	*Phaenopsectra obediens group*	+
85625	*Rheotanytarsus exiguus group*	+
85840	*Tanytarsus guerlus group*	+
86100	*Chrysops sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 42

No. Qualitative Taxa: 42 ICI:

Number of Organisms: 0 Qual EPT: 11

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-224 RM: 1.30 Site: Trib. to Pawpaw Creek (RM 0.55)

Taxa Code	Taxa	Quant/Qual
03360	*Plumatella sp*	+
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
08250	*Orconectes (Procericambarus) rusticus*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13590	*Stenonema vicarium*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
27500	*Somatochlora sp*	+
47600	*Sialis sp*	+
51400	*Nyctiophylax sp*	+
52200	*Cheumatopsyche sp*	+
63300	*Hydroporus sp*	+
67000	*Helophorus sp*	+
67811	*Staphylinidae*	+
68075	*Psephenus herricki*	+
68601	*Ancyronyx variegata*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
71100	*Hexatoma sp*	+
71900	*Tipula sp*	+
77500	*Conchapelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
79400	*Zavrelimyia sp*	+
83840	*Microtendipes pedellus group*	+
84450	*Polypedilum (P.) flavum*	+
84750	*Stictochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 39
No. Qualitative Taxa: 39 ICI:
Number of Organisms: 0 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-224 RM: 0.10 Site: Trib. to Pawpaw Creek (RM 0.55) St. Rt.

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
04935	*Erpobdella punctata punctata*	+
05800	*Caecidotea sp*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
27500	*Somatochlora sp*	+
45300	*Sigara sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporus sp*	+
67811	*Staphylinidae*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78401	*Natarsia species A (sensu Roback, 1978)*	+
78650	*Procladius sp*	+
80410	*Cricotopus (C.) sp*	+
80430	*Cricotopus (C.) tremulus group*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84450	*Polypedilum (P.) flavum*	+
84460	*Polypedilum (P.) fallax group*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 42

No. Qualitative Taxa: 42 ICI:

Number of Organisms: 0 Qual EPT: 7

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-225 RM: 0.80 Site: Trib. to Walnut Creek (RM 45.45)

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04666	*Helobdella triserialis*	+
08250	*Orconectes (Procericambarus) rusticus*	+
13400	*Stenacron sp*	+
13590	*Stenonema vicarium*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
64800	*Uvarus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80204	*Brillia flavifrons group*	+
82300	*Xylotopus par*	+
82820	*Cryptochironomus sp*	+
84460	*Polypedilum (P.) fallax group*	+
84700	*Stenochironomus sp*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 30

No. Qualitative Taxa: 30 ICI:

Number of Organisms: 0 Qual EPT: 4

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/27/1996 River Code: 02-225 RM: 0.60 Site: Trib. to Walnut Creek (RM 45.45)

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
05800	*Caecidotea sp*	+
06201	*Hyalella azteca*	+
08250	*Orconectes (Procericambarus) rusticus*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
24900	*Gomphus sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
68075	*Psephenus herricki*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84460	*Polypedilum (P.) fallax group*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 32
No. Qualitative Taxa: 32 ICI:
Number of Organisms: 0 Qual EPT: 4

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-226 RM: 0.40 Site: Tussing Ditch

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04664	*Helobdella stagnalis*	+
04935	*Erpobdella punctata punctata*	+
04964	*Mooreobdella microstoma*	+
05800	*Caecidotea sp*	+
06700	*Crangonyx sp*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
43300	*Ranatra sp*	+
45300	*Sigara sp*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
61400	*Agabus sp*	+
63900	*Laccophilus sp*	+
65800	*Berosus sp*	+
66500	*Enochrus sp*	+
67700	*Paracymus sp*	+
67800	*Tropisternus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71900	*Tipula sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78401	*Natarsia species A (sensu Roback, 1978)*	+
78655	*Procladius (Holotanypus) sp*	+
80420	*Cricotopus (C.) bicinctus*	+
80430	*Cricotopus (C.) tremulus group*	+
80440	*Cricotopus (C.) trifascia group*	+
80510	*Cricotopus (Isocladius) sylvestris group*	+
81650	*Parametriocnemus sp*	+
82710	*Chironomus (C.) sp*	+
82820	*Cryptochironomus sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
85625	*Rheotanytarsus exiguus group*	+
85840	*Tanytarsus guerlus group*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96264	*Planorbella (Pierosoma) pilsbryi*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 51

No. Qualitative Taxa: 51 ICI:

Number of Organisms: 0 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-231 RM: 6.00 Site: Trib. to Georges Creek (RM 2.00)

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	89	+
03600	*Oligochaeta*	50	
07701	*Cambaridae*	1	
08260	*Orconectes (Crokerinus) sanbornii sanbornii*		+
11120	*Baetis flavistriga*	39	+
11130	*Baetis intercalaris*	2	+
11430	*Diphetor hageni*	2	+
13400	*Stenacron sp*	12	+
13521	*Stenonema femoratum*	186	+
13590	*Stenonema vicarium*	30	
14950	*Leptophlebia sp or Paraleptophlebia sp*	1	+
16700	*Tricorythodes sp*	8	
17200	*Caenis sp*	11	
21200	*Calopteryx sp*	9	+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
47600	*Sialis sp*		+
52200	*Cheumatopsyche sp*	3	+
52530	*Hydropsyche depravata group*	8	+
52570	*Hydropsyche simulans*	3	
66500	*Enochrus sp*		+
67000	*Helophorus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	1	
68700	*Dubiraphia sp*	29	
68707	*Dubiraphia quadrinotata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	2	+
69400	*Stenelmis sp*	84	+
71900	*Tipula sp*	4	
74100	*Simulium sp*		+
77500	*Conchapelopia sp*	121	+
77800	*Helopelopia sp*	181	
78450	*Nilotanypus fimbriatus*	141	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	8	
80370	*Corynoneura lobata*	272	
80400	*Cricotopus sp*	20	
80430	*Cricotopus (C.) tremulus group*	20	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	20	
81650	*Parametriocnemus sp*		+
82200	*Tvetenia bavarica group*	20	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	20	
84210	*Paratendipes albimanus or P. duplicatus*	141	+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (P.) flavum*	40	
84460	*Polypedilum (P.) fallax group*	301	+
84540	*Polypedilum (Tripodura) scalaenum group*	100	
84750	*Stictochironomus sp*		+
85261	*Cladotanytarsus vanderwulpi group Type 1*	20	
85500	*Paratanytarsus sp*	121	
85615	*Rheotanytarsus distinctissimus group*	20	+
85625	*Rheotanytarsus exiguus group*	40	+
85720	*Stempellinella n.sp nr. flavidula*	20	
85800	*Tanytarsus sp*	20	
85814	*Tanytarsus glabrescens group*	342	
85840	*Tanytarsus guerlus group*	60	
87540	*Hemerodromia sp*	29	
95100	*Physella sp*		+
98600	*Sphaerium sp*	8	

No. Quantitative Taxa: 45 Total Taxa: 62

No. Qualitative Taxa: 34 ICI: **46**

Number of Organisms: 2659 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/26/1996 River Code: 02-231 RM: 2.40 Site: Trib. to Georges Creek (RM 2.00)

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
08250	*Orconectes (Procericambarus) rusticus*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11430	*Diphetor hageni*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
45300	*Sigara sp*	+
45900	*Notonecta sp*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporus sp*	+
65800	*Berosus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68707	*Dubiraphia quadrinotata*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77800	*Helopelopia sp*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85814	*Tanytarsus glabrescens group*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 32
No. Qualitative Taxa: 32 ICI:
Number of Organisms: 0 Qual EPT: 7

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/13/1996 River Code: 02-277 RM: 0.10 A Site: Trib. to Walnut Creek (RM 15.54)

Taxa Code	Taxa	Quant/Qual
05900	*Lirceus sp*	+
07820	*Cambarus (Cambarus) sp A*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
45400	*Trichocorixa sp*	+
45900	*Notonecta sp*	+
60900	*Peltodytes sp*	+
63300	*Hydroporus sp*	+
67800	*Tropisternus sp*	+
77250	*Alotanypus venustus*	+
80204	*Brillia flavifrons group*	+
82770	*Chironomus (C.) riparius group*	+
84315	*Phaenopsectra flavipes*	+
95100	*Physella sp*	+

No. Quantitative Taxa: 0 Total Taxa: 14

No. Qualitative Taxa: 14 ICI:

Number of Organisms: 0 Qual EPT: 0

Collection Date: 08/22/1996 River Code: 02-277 RM: 0.10 B Site: Trib. to Walnut Creek (RM 15.54)

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+			
05900	*Lirceus sp*	+			
22001	*Coenagrionidae*	+			
23600	*Aeshna sp*	+			
23909	*Boyeria vinosa*	+			
45900	*Notonecta sp*	+			
68700	*Dubiraphia sp*	+			
77500	*Conchapelopia sp*	+			
78650	*Procladius sp*	+			
81825	*Rheocricotopus (Psilocricotopus) robacki*	+			
83040	*Dicrotendipes neomodestus*	+			
84210	*Paratendipes albimanus or P. duplicatus*	+			
95100	*Physella sp*	+			

No. Quantitative Taxa:	0	Total Taxa:	13
No. Qualitative Taxa:	13	ICI:	
Number of Organisms:	0	Qual EPT:	0

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/13/1996 River Code: 02-278 RM: 0.60 Site: Trib. to Walnut Creek (RM 15.64)

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
04962	*Mooreobdella fervida*	+
05900	*Lirceus sp*	+
06700	*Crangonyx sp*	+
08255	*Orconectes rusticus x sanbornii*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
13400	*Stenacron sp*	+
22001	*Coenagrionidae*	+
23704	*Anax junius*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
53800	*Hydroptila sp*	+
60900	*Peltodytes sp*	+
65800	*Berosus sp*	+
66500	*Enochrus sp*	+
67700	*Paracymus sp*	+
67800	*Tropisternus sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
80420	*Cricotopus (C.) bicinctus*	+
82730	*Chironomus (C.) decorus group*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
85800	*Tanytarsus sp*	+
87540	*Hemerodromia sp*	+
98200	*Pisidium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 29

No. Qualitative Taxa: 29 ICI:

Number of Organisms: 0 Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/22/1996 River Code: 02-278 RM: 0.20 Site: Trib. to Walnut Creek (RM 15.64)

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04960	*Mooreobdella sp*	+
05900	*Lirceus sp*	+
06700	*Crangonyx sp*	+
08255	*Orconectes rusticus x sanbornii*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23909	*Boyeria vinosa*	+
28955	*Libellula lydia*	+
42700	*Belostoma sp*	+
47600	*Sialis sp*	+
52200	*Cheumatopsyche sp*	+
65800	*Berosus sp*	+
67700	*Paracymus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
77500	*Conchapelopia sp*	+
78401	*Natarsia species A (sensu Roback, 1978)*	+
78655	*Procladius (Holotanypus) sp*	+
82820	*Cryptochironomus sp*	+
85625	*Rheotanytarsus exiguus group*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 31

No. Qualitative Taxa: 31 ICI:

Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/23/1996 River Code: 02-279 RM: 1.30 Site: Manns Run

Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	+
03600	*Oligochaeta*	+
04935	*Erpobdella punctata punctata*	+
06201	*Hyalella azteca*	+
08250	*Orconectes (Procericambarus) rusticus*	+
08601	*Hydracarina*	+
11130	*Baetis intercalaris*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
45300	*Sigara sp*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
67811	*Staphylinidae*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68601	*Ancyronyx variegata*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
71700	*Pilaria sp*	+
71900	*Tipula sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
84750	*Stictochironomus sp*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
94400	*Fossaria sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 35

No. Qualitative Taxa: 35 ICI:

Number of Organisms: 0 Qual EPT: 3

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/14/1996 River Code: 02-279 RM: 1.00 Site: Manns Run

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
06201	*Hyalella azteca*	+
07820	*Cambarus (Cambarus) sp A*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
74100	*Simulium sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84450	*Polypedilum (P.) flavum*	+
84520	*Polypedilum (Tripodura) halterale group*	+
98200	*Pisidium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 19

No. Qualitative Taxa: 19 ICI:

Number of Organisms: 0 Qual EPT: 4

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/14/1996 River Code: 02-279 RM: 0.30 A Site: Manns Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+			
04666	*Helobdella triserialis*	+			
04682	*Placobdella montifera*	+			
04962	*Mooreobdella fervida*	+			
21200	*Calopteryx sp*	+			
45300	*Sigara sp*	+			
52200	*Cheumatopsyche sp*	+			
52530	*Hydropsyche depravata group*	+			
68707	*Dubiraphia quadrinotata*	+			
71900	*Tipula sp*	+			
74100	*Simulium sp*	+			
81825	*Rheocricotopus (Psilocricotopus) robacki*	+			
85615	*Rheotanytarsus distinctissimus group*	+			
85800	*Tanytarsus sp*	+			
85814	*Tanytarsus glabrescens group*	+			
98200	*Pisidium sp*	+			

No. Quantitative Taxa: 0 Total Taxa: 16

No. Qualitative Taxa: 16 ICI:

Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 08/23/1996 River Code: 02-279 RM: 0.30 B Site: Manns Run

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
04664	*Helobdella stagnalis*	+
04666	*Helobdella triserialis*	+
04935	*Erpobdella punctata punctata*	+
04960	*Mooreobdella sp*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
08601	*Hydracarina*	+
11130	*Baetis intercalaris*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
21300	*Hetaerina sp*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	+
63300	*Hydroporus sp*	+
67700	*Paracymus sp*	+
68707	*Dubiraphia quadrinotata*	+
69200	*Optioservus sp*	+
69400	*Stenelmis sp*	+
74100	*Simulium sp*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
80370	*Corynoneura lobata*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84450	*Polypedilum (P.) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85615	*Rheotanytarsus distinctissimus group*	+
85625	*Rheotanytarsus exiguus group*	+
85814	*Tanytarsus glabrescens group*	+
87540	*Hemerodromia sp*	+
93900	*Elimia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 40

No. Qualitative Taxa: 40 ICI:

Number of Organisms: 0 Qual EPT: 4

Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Percent of Individuals: Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Walnut Creek - (02-078)																
Year: 1996																
53.00	D	07/23/1996	7.6	16(5)	9(5)	3(3)	3(3)	3(3)	6(5)	32(5)	9(5)	23(5)	44(5)	0.2(5)	712(3)	52
Little Walnut Creek - (02-079)																
Year: 1996																
4.90	D	08/22/1996	15.1	18(5)	8(5)	3(3)	5(3)	6(5)	7(5)	27(5)	6(5)	37(3)	58(5)	0.0(5)	518(3)	52
Turkey Run - (02-080)																
Year: 1996																
0.20	D	07/22/1996	15.5	20(5)	9(5)	4(5)	6(5)	7(5)	11(5)	30(5)	9(5)	39(3)	53(5)	0.0(5)	844(5)	58
Big Run - (02-083)																
Year: 1996																
1.60	E	09/06/1996	6.3	17(5)	8(5)	1(1)	3(3)	3(3)	7(5)	48(3)	20(3)	46(3)	53(5)	0.0(5)	1866(5)	46
George Creek - (02-084)																
Year: 1996																
4.30	E	07/11/1996	3.2	12(5)	6(5)	1(1)	1(1)	2(3)	4(5)	90(1)	19(3)	89(1)	14(1)	0.0(5)	148(3)	34
2.40	E	07/11/1996	4.4	10(3)	4(3)	2(3)	1(1)	2(3)	3(3)	96(1)	30(1)	72(1)	12(1)	1.7(3)	10(1)	24
0.10	D	07/11/1996	15.4	19(5)	9(5)	1(1)	5(3)	1(1)	6(3)	42(3)	35(1)	25(5)	58(5)	0.0(5)	213(3)	40
Sycamore Creek - (02-085)																
Year: 1996																
12.20	E	08/29/1996	4.6	12(5)	5(3)	2(3)	0(1)	2(3)	3(3)	72(1)	5(5)	72(1)	31(3)	0.0(5)	278(3)	36
9.50	E	08/29/1996	8.7	17(5)	7(5)	3(3)	3(3)	4(5)	5(3)	41(3)	8(5)	42(3)	29(3)	0.0(5)	1244(5)	48
8.50	E	08/29/1996	9.7	16(5)	8(5)	3(3)	3(3)	3(3)	6(5)	48(3)	8(5)	34(3)	37(3)	0.0(5)	908(5)	48
6.10	D	08/21/1996	14.8	18(5)	6(3)	2(3)	3(3)	3(3)	5(3)	55(1)	26(3)	33(3)	32(3)	0.0(5)	345(3)	38
4.70	D	08/21/1996	17.3	20(5)	10(5)	2(3)	4(3)	3(3)	7(5)	57(1)	16(5)	53(3)	38(3)	0.0(5)	461(3)	44
4.70	D	09/18/1996	17.3	20(5)	11(5)	2(3)	5(3)	4(3)	8(5)	36(3)	17(5)	25(5)	42(3)	0.0(5)	563(3)	48
4.20	D	08/21/1996	18.6	18(5)	8(5)	2(3)	3(1)	3(3)	6(3)	53(1)	22(3)	29(5)	40(3)	0.2(3)	294(3)	38
4.20	D	09/18/1996	18.6	23(5)	11(5)	2(3)	4(3)	4(3)	7(3)	43(3)	15(5)	32(3)	43(3)	0.0(5)	692(3)	44

▲ - 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-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

				Number of					Percent of Individuals								
River Mile	Type	Date	Drainage area (sq mi)	Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
Walnut Creek - (02078)																	
Year: 1996																	
47.00	D	07/23/1996	27	27(5)	5(5)	3(5)	1(1)	4(5)	46(5)	45(3)	13(5)	1.4(3)	54(5)	0.4(3)	461(3)	48	7.5
47.00	D	09/09/1996	27	25(5)	4(5)	2(3)	1(1)	4(5)	30(3)	60(1)	26(3)	1.9(3)	42(3)	0.0(5)	534(3)	40	8.0
42.60	D	07/24/1996	42	23(5)	3(3)	3(3)	2(1)	4(3)	43(5)	19(5)	14(5)	1.5(3)	55(5)	0.0(5)	564(3)	46	8.6
42.60	D	09/09/1996	42	26(5)	3(3)	3(3)	2(1)	5(5)	36(3)	35(3)	30(3)	0.2(1)	44(3)	0.0(5)	801(5)	40	9.0
41.30	D	07/24/1996	60	25(5)	3(3)	3(3)	2(1)	5(5)	52(5)	12(5)	9(5)	2.3(3)	63(5)	0.3(5)	411(3)	48	8.5
41.30	D	09/10/1996	60	31(5)	4(5)	5(5)	2(1)	5(5)	49(5)	29(3)	26(3)	3.3(3)	59(5)	0.3(3)	737(3)	46	10.2
40.00	D	07/29/1996	61	17(3)	4(5)	3(3)	1(1)	2(1)	59(5)	7(5)	5(5)	4.0(3)	90(5)	0.0(5)	558(3)	44	8.2
40.00	D	09/11/1996	61	13(3)	4(5)	3(3)	1(1)	0(1)	44(5)	34(3)	24(3)	10.0(5)	64(5)	0.0(5)	198(1)	40	6.8
39.70	D	07/29/1996	61	27(5)	4(5)	4(5)	3(3)	3(3)	30(3)	18(5)	13(5)	1.7(3)	37(3)	0.1(5)	1629(5)	50	9.5
39.70	D	09/11/1996	61	26(5)	4(5)	4(5)	2(1)	3(3)	26(3)	43(3)	37(1)	2.9(3)	31(3)	0.0(5)	1128(5)	42	9.6
37.00	D	07/29/1996	66	25(5)	4(5)	4(5)	3(3)	3(3)	46(5)	15(5)	13(5)	5.7(5)	74(5)	0.0(5)	585(3)	54	9.4
37.00	D	09/10/1996	66	26(5)	3(3)	6(5)	4(3)	2(1)	49(5)	23(5)	22(3)	5.0(5)	65(5)	0.0(5)	575(3)	48	9.8
34.50	D	07/29/1996	87	20(3)	3(3)	4(5)	2(1)	2(1)	39(5)	12(5)	12(5)	2.8(3)	75(5)	0.2(3)	603(3)	42	8.8
34.50	D	09/11/1996	87	29(5)	4(5)	6(5)	4(3)	2(1)	35(3)	27(3)	28(3)	3.6(3)	63(5)	0.1(5)	1055(5)	46	9.6
30.00	D	08/05/1996	114	17(3)	6(5)	5(5)	0(1)	0(1)	24(3)	14(5)	5(5)	12.6(5)	81(5)	0.8(3)	164(1)	* 42	7.6
30.00	D	09/11/1996	114	20(3)	3(3)	6(5)	1(1)	1(1)	63(5)	10(5)	15(5)	4.6(3)	78(5)	0.0(5)	239(3)	44	8.7
29.10	D	08/05/1996	138	21(3)	5(5)	6(5)	1(1)	0(1)	50(5)	26(3)	10(5)	4.3(3)	84(5)	1.1(3)	210(3)	42	8.7
29.10	D	09/12/1996	138	27(5)	4(5)	6(5)	2(1)	4(3)	53(5)	16(5)	12(5)	3.0(3)	83(5)	0.0(5)	542(3)	50	9.3
26.40	D	08/06/1996	146	23(5)	4(5)	4(3)	2(1)	3(3)	46(5)	14(5)	7(5)	4.1(3)	78(5)	0.3(5)	443(3)	48	9.2
26.40	D	09/12/1996	146	25(5)	4(5)	4(3)	2(1)	4(3)	34(3)	35(3)	22(3)	4.2(3)	67(5)	0.1(5)	701(3)	42	9.5
24.40	D	08/06/1996	151	27(5)	4(5)	6(5)	4(3)	4(3)	37(5)	13(5)	11(5)	6.0(5)	62(5)	0.0(5)	284(3)	54	8.9
24.40	D	09/12/1996	151	29(5)	4(5)	6(5)	3(3)	3(3)	50(5)	17(5)	13(5)	7.0(5)	75(5)	0.0(5)	537(3)	54	9.3
24.10	D	08/06/1996	152	20(3)	3(3)	5(5)	2(1)	2(1)	29(3)	36(3)	22(3)	1.7(3)	63(5)	0.6(5)	684(3)	38	9.4

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-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

				Number of					Percent of Individuals								
River Mile	Type	Date	Drainage area (sq mi)	Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni- vores	Top carnivores	Insect- ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
24.10	D	09/12/1996	152	5(1)	1(1)	0(1)	0(1)	0(1)	53(5)	87(1)	0(5)	0.0(1)	33(3)	0.0(5)	12(1)	* 26	3.8
24.05	D	09/12/1996	152	5(1)	0(1)	4(3)	0(1)	0(1)	89(5)	5(5)	16(5)	0.0(1)	84(5)	0.0(5)	540(3)	36	8.0
23.90	D	08/06/1996	152	27(5)	3(3)	7(5)	3(3)	3(3)	55(5)	16(5)	17(5)	5.8(5)	70(5)	0.0(5)	479(3)	52	9.8
23.90	D	09/12/1996	152	21(3)	4(5)	5(5)	2(1)	2(1)	58(5)	11(5)	11(5)	6.1(5)	73(5)	0.0(5)	524(3)	48	9.5
21.20	D	08/06/1996	177	23(5)	5(5)	6(5)	1(1)	2(1)	66(5)	12(5)	13(5)	5.0(3)	80(5)	0.5(3)	264(3)	46	8.4
21.20	D	09/13/1996	177	24(5)	5(5)	6(5)	1(1)	1(1)	51(5)	22(3)	25(3)	5.6(5)	69(5)	0.4(3)	294(3)	44	8.5
19.40	D	08/07/1996	182	18(3)	5(5)	5(5)	1(1)	1(1)	56(5)	21(3)	21(3)	3.5(3)	75(5)	0.8(3)	173(1)	38	8.1
19.40	D	09/16/1996	182	19(3)	4(5)	5(5)	1(1)	0(1)	59(5)	15(5)	17(5)	5.0(3)	75(5)	0.4(5)	309(3)	46	8.3
16.90	D	08/07/1996	188	19(3)	5(5)	5(5)	1(1)	1(1)	68(5)	14(5)	13(5)	3.5(3)	82(5)	0.9(3)	294(3)	44	8.3
16.90	D	09/16/1996	188	28(5)	5(5)	6(5)	1(1)	0(1)	35(3)	24(3)	34(3)	3.7(3)	59(5)	0.0(5)	624(3)	42	9.5
15.50	D	08/07/1996	195	21(3)	5(5)	4(3)	3(3)	3(3)	60(5)	8(5)	3(5)	2.6(3)	92(5)	0.6(3)	216(3)	46	7.9
15.50	D	09/19/1996	195	22(3)	5(5)	4(3)	2(1)	1(1)	43(5)	16(5)	9(5)	6.9(5)	83(5)	0.0(5)	384(3)	46	8.6
13.80	D	08/07/1996	198	21(3)	4(5)	5(5)	2(1)	2(1)	51(5)	8(5)	5(5)	5.4(5)	81(5)	0.0(5)	231(3)	48	8.2
13.80	D	09/19/1996	198	18(3)	4(5)	4(3)	2(1)	2(1)	49(5)	10(5)	7(5)	8.1(5)	80(5)	0.0(5)	284(3)	46	8.1
11.00	D	08/08/1996	206	26(5)	4(5)	3(3)	2(1)	5(3)	43(5)	18(5)	19(3)	2.3(3)	70(5)	0.0(5)	378(3)	46	8.4
11.00	D	09/19/1996	206	29(5)	4(5)	5(5)	3(3)	3(3)	32(3)	36(1)	36(1)	5.3(5)	50(3)	0.0(5)	366(3)	42	8.8
Little Walnut Creek - (02079)																	
Year: 1996																	
1.50	D	07/22/1996	39	23(5)	3(3)	3(3)	2(1)	6(5)	35(3)	16(5)	10(5)	2.1(3)	55(5)	0.2(5)	731(3)	46	8.8
1.50	D	09/17/1996	39	26(5)	3(3)	3(3)	2(1)	5(5)	47(5)	24(5)	19(3)	3.0(3)	56(5)	0.0(5)	729(3)	46	8.8
Sycamore Creek - (02085)																	
Year: 1996																	
2.60	D	08/22/1996	21	20(5)	3(3)	3(5)	1(1)	3(3)	46(5)	33(3)	16(5)	4.8(3)	59(5)	0.0(5)	186(1)	44	6.7
2.60	D	09/18/1996	21	21(5)	4(5)	3(5)	1(1)	2(3)	33(3)	35(3)	18(5)	3.6(3)	55(5)	0.3(3)	377(3)	44	7.0
0.30	D	09/18/1996	24	23(5)	3(3)	3(5)	1(1)	5(5)	26(3)	42(3)	18(5)	0.1(1)	39(3)	0.0(5)	1095(5)	44	9.1

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.

Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Percent of Individuals: Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
0.30	D	08/22/1996	24	24(5)	3(3)	2(3)	2(3)	5(5)	29(3)	23(5)	16(5)	0.8(1)	41(3)	0.0(5)	1184(5)	46	8.9

na - Qualitative data, Modified Iwb not applicable.

▲ - IBI is low end adjusted.

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** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Number of: Sunfish species	Number of: Sucker species	Number of: Intolerant species	Percent of Individuals: Rnd-bodied suckers	Percent of Individuals: Simple Lithophils	Percent of Individuals: Tolerant fishes	Percent of Individuals: Omni-vores	Percent of Individuals: Top carnivores	Percent of Individuals: Insect-ivores	Percent of Individuals: DELT anomalies	Rel.No. minus tolerants /(1.0 km)	IBI	Modified Iwb
Walnut Creek - (02-078)																	
Year: 1996																	
9.10	A	08/13/1996	212	23(5)	4(5)	6(5)	3(3)	42(5)	44(3)	14(5)	19(3)	5(3)	67(5)	1.1(3)	302(3)	48	9.4
9.10	A	10/15/1996	212	32(5)	4(5)	6(5)	2(3)	34(3)	43(3)	25(3)	25(3)	9(3)	58(5)	0.0(5)	434(5)	48	9.8
5.10	A	08/19/1996	272	20(3)	1(1)	6(5)	3(3)	51(5)	54(5)	10(5)	14(5)	7(3)	71(5)	0.0(5)	266(3)	48	9.3
5.10	A	09/17/1996	272	22(5)	3(3)	6(5)	2(3)	44(5)	51(5)	12(5)	25(3)	7(3)	64(5)	0.9(3)	192(1)	46	8.8
4.10	A	08/19/1996	273	22(5)	1(1)	8(5)	1(1)	49(5)	53(5)	5(5)	22(3)	5(1)	68(5)	0.0(5)	192(1)	42	9.6
4.10	A	09/17/1996	273	18(3)	1(1)	7(5)	1(1)	40(5)	42(3)	31(1)	35(1)	11(5)	51(3)	0.0(5)	170(1)	34	8.6
1.30	A	08/19/1996	285	22(5)	1(1)	8(5)	1(1)	28(3)	34(3)	16(3)	21(3)	9(3)	51(3)	0.0(5)	170(1)	36	9.1

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

				Number of						Percent of Individuals						
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Poplar Creek - (02-086)																
Year: 1996																
6.60	D	08/20/1996	8.1	18(5)	8(5)	3(3)	5(5)	4(5)	6(5)	19(5)	9(5)	15(5)	43(5)	0.0(5)	1125(5)	58
0.70	D	08/21/1996	17.5	20(5)	8(5)	2(3)	6(3)	5(5)	6(3)	66(1)	14(5)	56(1)	30(3)	0.0(5)	435(3)	42
Pawpaw Creek - (02-087)																
Year: 1996																
1.40	D	07/23/1996	10.5	17(5)	10(5)	3(3)	4(3)	3(3)	7(5)	74(1)	10(5)	61(1)	21(1)	0.0(5)	354(3)	40
0.30	D	08/20/1996	16.5	22(5)	10(5)	2(3)	5(3)	4(3)	8(5)	64(1)	36(1)	37(3)	29(3)	0.0(5)	503(3)	40
Mud Run - (02-198)																
Year: 1996																
0.70	E	09/10/1996	11.5	21(5)	8(5)	3(3)	5(3)	5(5)	8(5)	34(3)	20(3)	33(3)	29(3)	0.0(5)	825(5)	48
Gillette Run - (02-199)																
Year: 1996																
0.10	E	09/10/1996	6.1	17(5)	9(5)	2(3)	4(3)	4(5)	7(5)	63(1)	24(3)	60(1)	32(3)	0.0(5)	252(3)	42
Trib. to Pawpaw Cr. - (02-224)																
Year: 1996																
1.00	D	07/23/1996	5.1	18(5)	8(5)	3(3)	5(5)	4(5)	6(5)	63(1)	14(3)	54(3)	30(3)	0.0(5)	378(3)	46
0.10	D	07/24/1996	5.5	21(5)	10(5)	4(5)	3(3)	5(5)	8(5)	68(1)	28(1)	39(3)	14(1)	0.0(5)	742(5)	44
Pleasantville Trib. - (02-225)																
Year: 1996																
0.80	D	08/20/1996	11.2	16(5)	5(3)	0(1)	2(1)	3(3)	4(3)	62(1)	43(1)	54(3)	41(3)	0.3(3)	186(1)	28
0.70	D	08/20/1996	11.2	17(5)	8(5)	3(3)	2(1)	4(3)	6(3)	68(1)	38(1)	65(1)	32(3)	0.0(5)	167(1)	32

▲ - IBI is low end adjusted.

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Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

				Number of						Percent of Individuals					Rel.No.	
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	minus tolerants /(0.3km)	IBI
Tussing Ditch - (02-226)																
Year: 1996																
0.30	E	09/06/1996	4.0	17(5)	8(5)	2(3)	3(3)	3(5)	5(5)	69(1)	34(1)	39(3)	37(5)	0.0(5)	302(3)	44
Trib to George Creek - (02-231)																
Year: 1996																
6.00	D	07/10/1996	1.5	10(5)	5(5)	2(3)	0(1)	0(1)	3(5)	64(1)	9(5)	46(3)	3(1)	0.0(5)	560(5)	40
6.00	E	09/20/1996	1.5	11(5)	7(5)	2(3)	0(1)	0(1)	3(5)	65(1)	9(5)	44(3)	3(1)	0.0(5)	688(5)	40
2.40	D	07/11/1996	5.3	12(3)	8(5)	1(1)	2(1)	1(1)	5(5)	63(1)	11(5)	46(3)	34(3)	0.3(3)	326(3)	34
Trib to Walnut 15.54 - (02-277)																
Year: 1996																
0.10	E	08/13/1996	0.6	6(3)	3(3)	2(3)	0(1)	1(3)	1(3)	99(1)	64(1)	97(1)	22(5)	1.5(1)	4(1)	26
0.10	E	09/19/1996	0.6	8(5)	4(5)	2(3)	0(1)	1(3)	2(5)	98(1)	51(1)	91(1)	28(5)	1.1(5)	4(1) *	36
Trib to Walnut 15.64 - (02-278)																
Year: 1996																
0.60	E	08/13/1996	2.4	17(5)	9(5)	2(3)	1(1)	2(3)	5(5)	67(1)	36(1)	59(1)	36(5)	0.5(3)	658(5)	38
0.60	E	09/19/1996	2.4	16(5)	9(5)	2(3)	1(1)	3(5)	5(5)	74(1)	34(1)	69(1)	45(5)	0.2(3)	434(5)	40
Manns Run - (02-279)																
Year: 1996																
1.00	E	08/14/1996	3.8	19(5)	7(5)	3(3)	2(3)	7(5)	7(5)	36(3)	9(5)	60(1)	61(5)	0.5(3)	904(5)	48
1.00	E	09/19/1996	3.8	18(5)	8(5)	4(5)	1(1)	6(5)	7(5)	42(3)	15(3)	60(1)	49(5)	0.0(5)	729(5)	48
0.30	E	08/14/1996	4.7	16(5)	7(5)	3(3)	1(1)	5(5)	5(5)	45(3)	10(5)	79(1)	58(5)	0.3(5)	282(3)	46
0.30	E	09/19/1996	4.7	16(5)	7(5)	3(3)	2(3)	6(5)	6(5)	50(3)	11(5)	81(1)	54(5)	0.5(3)	287(3)	46

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Table A-9 Index of Biotic Integrity (IBI) scores for the Walnut Creek study area, 1996.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Percent of Individuals: Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
Tussing Ditch - (02226)																	
Year: 1996																	
0.30	E	09/06/1996	4	17(5)	2(0)	2(0)	0(3)	2(0)	46(5)	69(1)	34(1)	0.2(0)	37(5)	0.0(5)	302(3)	44	7.6
Trib to George Creek - (02231)																	
Year: 1996																	
6.00	D	07/10/1996	1	10(5)	4(0)	1(0)	0(1)	0(0)	18(5)	64(1)	9(5)	0.0(0)	3(1)	0.0(5)	560(5)	40	6.7
6.00	E	09/20/1996	1	11(5)	2(0)	1(0)	0(1)	0(0)	22(5)	65(1)	8(5)	0.9(0)	3(1)	0.0(5)	688(5)	40	7.0
2.40	D	07/11/1996	5	12(3)	2(0)	1(0)	0(1)	1(0)	43(5)	63(1)	11(5)	0.0(0)	34(3)	0.3(3)	326(3)	34	6.9
Trib to Walnut 15.54 - (02277)																	
Year: 1996																	
0.10	E	08/13/1996	0	6(3)	1(0)	0(0)	0(1)	0(0)	1(3)	99(1)	64(1)	0.0(0)	22(5)	1.5(1)	4(1)	26	na
0.10	E	09/19/1996	0	8(5)	1(0)	1(0)	0(1)	0(0)	3(5)	98(1)	51(1)	0.0(0)	28(5)	1.1(5)	4(1)	* 36	na
Trib to Walnut 15.64 - (02278)																	
Year: 1996																	
0.60	E	08/13/1996	2	17(5)	2(0)	1(0)	0(1)	2(0)	13(5)	67(1)	36(1)	0.3(0)	36(5)	0.5(3)	658(5)	38	na
0.60	E	09/19/1996	2	16(5)	2(0)	1(0)	0(1)	2(0)	11(5)	74(1)	34(1)	0.0(0)	45(5)	0.2(3)	434(5)	40	na
Manns Run - (02279)																	
Year: 1996																	
1.00	E	08/14/1996	3	19(5)	2(0)	1(0)	0(3)	6(0)	37(5)	36(3)	9(5)	0.1(0)	61(5)	0.5(3)	904(5)	48	na
1.00	E	09/19/1996	3	18(5)	2(0)	1(0)	0(1)	5(0)	28(5)	42(3)	15(3)	0.2(0)	49(5)	0.0(5)	729(5)	48	na
0.30	E	08/14/1996	4	16(5)	2(0)	1(0)	0(1)	4(0)	41(5)	45(3)	10(5)	0.6(0)	58(5)	0.3(5)	282(3)	46	na
0.30	E	09/19/1996	4	16(5)	2(0)	1(0)	0(3)	5(0)	33(5)	50(3)	10(5)	0.0(0)	54(5)	0.5(3)	287(3)	46	na

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: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **53.00**	Location: Cattail Rd.	Date Range: 07/23/1996
Time Fished: 1928 sec	Drainage: 7.6 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	8.00	0.76	0.04	0.49	5.00
White Sucker	W	O	S	T	28	56.00	5.32	1.28	15.72	22.86
Blacknose Dace	N	G	S	T	36	72.00	6.84	0.16	1.97	2.22
Creek Chub	N	G	N	T	86	172.00	16.35	2.73	33.55	15.88
South. Redbelly Dace	N	H	S		23	46.00	4.37	0.07	0.86	1.52
Striped Shiner	N	I	S		123	246.00	23.38	1.72	21.07	6.97
Spotfin Shiner	N	I	M		2	4.00	0.38	0.01	0.10	2.00
Sand Shiner	N	I	M	M	10	20.00	1.90	0.03	0.42	1.70
Silverjaw Minnow	N	I	M		12	24.00	2.28	0.08	1.03	3.50
Bluntnose Minnow	N	O	C	T	20	40.00	3.80	0.14	1.67	3.40
Central Stoneroller	N	H	N		99	198.00	18.82	1.26	15.44	6.35
Trout-perch		I	M		7	14.00	1.33	0.14	1.72	10.00
Rock Bass	S	C	C		2	4.00	0.38	0.29	3.56	72.50
Johnny Darter	D	I	C		3	6.00	0.57	0.01	0.12	1.67
Greenside Darter	D	I	S	M	5	10.00	0.95	0.04	0.44	3.60
Fantail Darter	D	I	C		66	132.00	12.55	0.15	1.84	1.14
Mile Total					526	1,052.00		8.14		
Number of Species					16					
Number of Hybrids					0					

Species List

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **47.00**	Location: St. Rt. 256	Date Range: 07/23/1996
Time Fished: 4990 sec	Drainage: 27.0 sq mi	Thru: 09/09/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	9	6.75	0.62	0.25	1.16	36.67
Northern Hog Sucker	R	I	S	M	13	9.75	0.90	0.26	1.21	26.46
White Sucker	W	O	S	T	155	116.25	10.75	4.32	20.28	37.12
Common Carp	G	O	M	T	6	4.50	0.42	5.86	27.52	1,301.67
Golden Shiner	N	I	M	T	6	4.50	0.42	0.13	0.62	29.17
Creek Chub	N	G	N	T	429	321.75	29.75	5.77	27.10	17.93
Suckermouth Minnow	N	I	S		9	6.75	0.62	0.01	0.05	1.56
Silver Shiner	N	I	S	I	6	4.50	0.42	0.03	0.13	6.00
Rosefin Shiner	N	I	S	M	19	14.25	1.32	0.03	0.13	1.95
Striped Shiner	N	I	S		293	219.75	20.32	2.32	10.91	10.56
Steelcolor Shiner	N	I	M	P	2	1.50	0.14	0.01	0.04	5.00
Spotfin Shiner	N	I	M		40	30.00	2.77	0.12	0.55	3.88
Sand Shiner	N	I	M	M	57	42.75	3.95	0.06	0.26	1.28
Silverjaw Minnow	N	I	M		26	19.50	1.80	0.04	0.17	1.81
Bluntnose Minnow	N	O	C	T	142	106.50	9.85	0.12	0.54	1.08
Central Stoneroller	N	H	N		10	7.50	0.69	0.03	0.13	3.70
Yellow Bullhead		I	C	T	12	9.00	0.83	0.47	2.19	51.67
Blackstripe Topminnow		I	M		8	6.00	0.55	0.01	0.05	1.88
Trout-perch		I	M		7	5.25	0.49	0.05	0.22	8.86
White Crappie	S	I	C		1	0.75	0.07	0.06	0.28	80.00
Rock Bass	S	C	C		22	16.50	1.53	0.36	1.67	21.55
Spotted Bass	F	C	C		1	0.75	0.07	0.09	0.44	125.00
Largemouth Bass	F	C	C		2	1.50	0.14	0.01	0.05	7.50
Green Sunfish	S	I	C	T	29	21.75	2.01	0.29	1.37	13.41
Bluegill Sunfish	S	I	C	P	34	25.50	2.36	0.23	1.06	8.84
Longear Sunfish	S	I	C	M	56	42.00	3.88	0.27	1.28	6.46
Green Sf X Bluegill Sf					4	3.00	0.28	0.08	0.35	25.00
Blackside Darter	D	I	S		4	3.00	0.28	0.01	0.04	2.75
Johnny Darter	D	I	C		22	16.50	1.53	0.02	0.08	0.95
Greenside Darter	D	I	S	M	14	10.50	0.97	0.03	0.12	2.50
Fantail Darter	D	I	C		4	3.00	0.28	0.01	0.03	1.75
	Mile Total				1,442	1,081.50		21.28		
	Number of Species				30					
	Number of Hybrids				1					

River Code: 02-078	Stream: Walnut Creek	Sample Date: 1996
River Mile: 42.60	Location: St. Rt. 158	Date Range: 07/24/1996
Time Fished: 3413 sec	Drainage: 42.0 sq mi	Thru: 09/09/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	4	3.00	0.31	0.34	4.55	113.25
Northern Hog Sucker	R	I	S	M	35	26.25	2.71	1.61	21.55	61.40
White Sucker	W	O	S	T	65	48.75	5.03	1.28	17.05	26.15
Blacknose Dace	N	G	S	T	24	18.00	1.86	0.03	0.45	1.88
Creek Chub	N	G	N	T	39	29.25	3.02	0.28	3.80	9.72
Suckermouth Minnow	N	I	S		17	12.75	1.31	0.05	0.68	4.00
Silver Shiner	N	I	S	I	16	12.00	1.24	0.05	0.72	4.49
Rosefin Shiner	N	I	S	M	21	15.75	1.62	0.04	0.49	2.33
Striped Shiner	N	I	S		146	109.50	11.29	1.11	14.86	10.15
Spotfin Shiner	N	I	M		9	6.75	0.70	0.03	0.33	3.67
Sand Shiner	N	I	M	M	72	54.00	5.57	0.08	1.13	1.57
Silverjaw Minnow	N	I	M		55	41.25	4.25	0.13	1.77	3.21
Fathead Minnow	N	O	C	T	1	0.75	0.08	0.00	0.03	3.00
Bluntnose Minnow	N	O	C	T	247	185.25	19.10	0.39	5.26	2.12
Central Stoneroller	N	H	N		290	217.50	22.43	1.16	15.54	5.34
Yellow Bullhead		I	C	T	1	0.75	0.08	0.00	0.06	6.00
Trout-perch		I	M		8	6.00	0.62	0.06	0.77	9.50
Rock Bass	S	C	C		7	5.25	0.54	0.31	4.09	58.29
Spotted Bass	F	C	C		2	1.50	0.15	0.01	0.09	4.50
Green Sunfish	S	I	C	T	6	4.50	0.46	0.05	0.70	11.67
Bluegill Sunfish	S	I	C	P	4	3.00	0.31	0.01	0.19	4.75
Longear Sunfish	S	I	C	M	10	7.50	0.77	0.09	1.26	12.60
Blackside Darter	D	I	S		12	9.00	0.93	0.03	0.38	3.17
Johnny Darter	D	I	C		43	32.25	3.33	0.04	0.57	1.32
Greenside Darter	D	I	S	M	100	75.00	7.73	0.21	2.83	2.82
Banded Darter	D	I	S	I	55	41.25	4.25	0.06	0.74	1.33
Fantail Darter	D	I	C		2	1.50	0.15	0.00	0.04	2.00
Mottled Sculpin		I	C		2	1.50	0.15	0.01	0.07	3.50
	Mile Total				1,293	969.75		7.48		
	Number of Species				28					
	Number of Hybrids				0					

Species List

River Code: **02-078**	Stream: **Walnut Creek**		Sample Date: **1996**
River Mile: **41.30**	Location: upst. Basil St.		Date Range: 07/24/1996
Time Fished: 4321 sec	Drainage: 60.0 sq mi		Thru: 09/10/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Redhorse	R	I	S	M	8	6.00	0.80	1.66	6.07	276.86
Golden Redhorse	R	I	S	M	53	39.75	5.31	4.45	16.26	111.92
Northern Hog Sucker	R	I	S	M	78	58.50	7.81	4.23	15.45	72.24
White Sucker	W	O	S	T	71	53.25	7.11	5.02	18.34	94.23
Spotted Sucker	R	I	S		10	7.50	1.00	1.95	7.13	260.00
Common Carp	G	O	M	T	5	3.75	0.50	4.09	14.94	1,090.00
Blacknose Dace	N	G	S	T	1	0.75	0.10	0.00	0.01	2.00
Creek Chub	N	G	N	T	19	14.25	1.90	0.32	1.18	22.63
Suckermouth Minnow	N	I	S		19	14.25	1.90	0.03	0.10	1.79
Silver Shiner	N	I	S	I	23	17.25	2.30	0.08	0.31	4.83
Rosefin Shiner	N	I	S	M	14	10.50	1.40	0.02	0.07	1.71
Striped Shiner	N	I	S		133	99.75	13.31	1.47	5.37	14.72
Spotfin Shiner	N	I	M		25	18.75	2.50	0.06	0.23	3.28
Sand Shiner	N	I	M	M	43	32.25	4.30	0.06	0.21	1.78
Silverjaw Minnow	N	I	M		19	14.25	1.90	0.04	0.13	2.47
Bluntnose Minnow	N	O	C	T	132	99.00	13.21	0.27	0.97	2.68
Central Stoneroller	N	H	N		142	106.50	14.21	0.83	3.02	7.75
Yellow Bullhead		I	C	T	1	0.75	0.10	0.00	0.01	4.00
Trout-perch		I	M		5	3.75	0.50	0.01	0.04	3.00
Rock Bass	S	C	C		13	9.75	1.30	0.58	2.13	59.62
Smallmouth Bass	F	C	C	M	6	4.50	0.60	0.97	3.56	216.33
Spotted Bass	F	C	C		7	5.25	0.70	0.26	0.96	49.71
Largemouth Bass	F	C	C		4	3.00	0.40	0.25	0.90	81.75
Green Sunfish	S	I	C	T	5	3.75	0.50	0.04	0.13	9.60
Bluegill Sunfish	S	I	C	P	21	15.75	2.10	0.09	0.34	5.95
Longear Sunfish	S	I	C	M	18	13.50	1.80	0.31	1.13	22.96
Green Sf X Bluegill Sf					1	0.75	0.10	0.01	0.02	8.00
Blackside Darter	D	I	S		3	2.25	0.30	0.01	0.04	4.67
Johnny Darter	D	I	C		17	12.75	1.70	0.01	0.05	1.12
Greenside Darter	D	I	S	M	56	42.00	5.61	0.13	0.47	3.04
Banded Darter	D	I	S	I	28	21.00	2.80	0.03	0.11	1.47
Fantail Darter	D	I	C		2	1.50	0.20	0.00	0.01	2.50
Mottled Sculpin		I	C		17	12.75	1.70	0.10	0.35	7.53
Mile Total					999	749.25		27.36		
Number of Species					32					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **40.00**	Location: just dst. Baltimore WWTP	Date Range: 07/29/1996
Time Fished: 1310 sec	Drainage: 61.0 sq mi	Thru: 09/11/1996
Dist Fished: 0.10 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	5	15.00	3.33	1.78	3.17	118.40
Northern Hog Sucker	R	I	S	M	11	33.00	7.33	2.48	4.44	75.18
White Sucker	W	O	S	T	9	27.00	6.00	1.78	3.19	66.00
Common Carp	G	O	M	T	8	24.00	5.33	41.55	74.28	1,731.25
Creek Chub	N	G	N	T	1	3.00	0.67	0.01	0.01	2.00
Silver Shiner	N	I	S	I	12	36.00	8.00	0.17	0.30	4.67
Rosefin Shiner	N	I	S	M	4	12.00	2.67	0.03	0.05	2.25
Striped Shiner	N	I	S		39	117.00	26.00	2.09	3.73	17.85
Spotfin Shiner	N	I	M		16	48.00	10.67	0.18	0.32	3.69
Sand Shiner	N	I	M	M	6	18.00	4.00	0.04	0.06	2.00
Central Stoneroller	N	H	N		1	3.00	0.67	0.07	0.12	22.00
Trout-perch		I	M		2	6.00	1.33	0.07	0.12	11.00
Rock Bass	S	C	C		4	12.00	2.67	0.47	0.85	39.50
Smallmouth Bass	F	C	C	M	2	6.00	1.33	2.82	5.04	470.00
Spotted Bass	F	C	C		3	9.00	2.00	1.08	1.93	120.00
Green Sunfish	S	I	C	T	6	18.00	4.00	0.35	0.63	19.67
Bluegill Sunfish	S	I	C	P	4	12.00	2.67	0.10	0.17	8.00
Longear Sunfish	S	I	C	M	15	45.00	10.00	0.88	1.57	19.47
Blackside Darter	D	I	S		1	3.00	0.67	0.01	0.02	3.00
Johnny Darter	D	I	C		1	3.00	0.67	0.01	0.01	2.00
Mile Total					150	450.00		55.94		
Number of Species					20					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **39.70**	Location: dst. Baltimore WWTP	Date Range: 07/29/1996
Time Fished: 4624 sec	Drainage: 61.0 sq mi	Thru: 09/11/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Redhorse	R	I	S	M	5	3.75	0.19	0.23	0.74	60.00
Golden Redhorse	R	I	S	M	16	12.00	0.60	1.51	4.98	125.63
Northern Hog Sucker	R	I	S	M	153	114.75	5.78	5.78	19.11	50.39
White Sucker	W	O	S	T	198	148.50	7.48	8.79	29.03	59.16
Common Carp	G	O	M	T	5	3.75	0.19	0.19	0.63	50.80
Blacknose Dace	N	G	S	T	7	5.25	0.26	0.02	0.07	4.00
Creek Chub	N	G	N	T	138	103.50	5.22	1.82	6.02	17.59
Suckermouth Minnow	N	I	S		70	52.50	2.65	0.23	0.77	4.46
Silver Shiner	N	I	S	I	14	10.50	0.53	0.06	0.19	5.43
Rosefin Shiner	N	I	S	M	27	20.25	1.02	0.04	0.14	2.11
Striped Shiner	N	I	S		209	156.75	7.90	1.57	5.19	10.02
Spotfin Shiner	N	I	M		45	33.75	1.70	0.13	0.41	3.72
Sand Shiner	N	I	M	M	163	122.25	6.16	0.21	0.68	1.69
Silverjaw Minnow	N	I	M		66	49.50	2.49	0.11	0.37	2.27
Bluntnose Minnow	N	O	C	T	457	342.75	17.27	1.21	3.98	3.52
Central Stoneroller	N	H	N		872	654.00	32.96	3.08	10.18	4.71
Stonecat Madtom		I	C	I	1	0.75	0.04	0.05	0.16	65.00
Trout-perch		I	M		9	6.75	0.34	0.07	0.24	10.56
Rock Bass	S	C	C		29	21.75	1.10	1.85	6.12	85.17
Smallmouth Bass	F	C	C	M	14	10.50	0.53	2.18	7.21	207.86
Spotted Bass	F	C	C		17	12.75	0.64	0.49	1.61	38.17
Green Sunfish	S	I	C	T	3	2.25	0.11	0.02	0.06	8.00
Bluegill Sunfish	S	I	C	P	9	6.75	0.34	0.04	0.14	6.44
Longear Sunfish	S	I	C	M	23	17.25	0.87	0.32	1.07	18.76
Johnny Darter	D	I	C		15	11.25	0.57	0.01	0.05	1.27
Greenside Darter	D	I	S	M	33	24.75	1.25	0.10	0.31	3.82
Banded Darter	D	I	S	I	15	11.25	0.57	0.01	0.05	1.27
Mottled Sculpin		I	C		33	24.75	1.25	0.15	0.49	5.96
Mile Total					2,646	1,984.50		30.26		
Number of Species					28					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **37.00**	Location: upst. Bader Rd.	Date Range: 07/29/1996
Time Fished: 5004 sec	Drainage: 66.0 sq mi	Thru: 09/10/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Redhorse	R	I	S	M	28	21.00	2.93	3.09	8.83	147.00
Black Redhorse	R	I	S	I	2	1.50	0.21	0.50	1.44	335.00
Golden Redhorse	R	I	S	M	132	99.00	13.79	11.31	32.34	114.24
Northern Hog Sucker	R	I	S	M	111	83.25	11.60	4.99	14.27	59.96
White Sucker	W	O	S	T	52	39.00	5.43	3.69	10.55	94.58
Spotted Sucker	R	I	S		8	6.00	0.84	1.22	3.49	203.13
Common Carp	G	O	M	T	3	2.25	0.31	2.21	6.33	983.33
Creek Chub	N	G	N	T	11	8.25	1.15	0.05	0.15	6.45
Suckermouth Minnow	N	I	S		11	8.25	1.15	0.03	0.08	3.53
Silver Shiner	N	I	S	I	12	9.00	1.25	0.05	0.15	5.92
Rosyface Shiner	N	I	S	I	1	0.75	0.10	0.00	0.01	3.00
Rosefin Shiner	N	I	S	M	9	6.75	0.94	0.01	0.03	1.67
Striped Shiner	N	I	S		54	40.50	5.64	0.53	1.50	12.96
Spotfin Shiner	N	I	M		35	26.25	3.66	0.10	0.30	3.95
Sand Shiner	N	I	M	M	88	66.00	9.20	0.11	0.32	1.69
Silverjaw Minnow	N	I	M		3	2.25	0.31	0.00	0.01	2.00
Bluntnose Minnow	N	O	C	T	112	84.00	11.70	0.18	0.52	2.17
Central Stoneroller	N	H	N		66	49.50	6.90	0.53	1.51	10.64
Yellow Bullhead		I	C	T	1	0.75	0.10	0.11	0.30	140.00
Stonecat Madtom		I	C	I	1	0.75	0.10	0.00	0.01	3.00
Rock Bass	S	C	C		19	14.25	1.99	0.79	2.25	55.21
Smallmouth Bass	F	C	C	M	17	12.75	1.78	3.62	10.35	283.71
Spotted Bass	F	C	C		12	9.00	1.25	0.04	0.12	4.50
Largemouth Bass	F	C	C		3	2.25	0.31	0.03	0.07	11.33
Green Sunfish	S	I	C	T	5	3.75	0.52	0.05	0.13	12.00
Bluegill Sunfish	S	I	C	P	7	5.25	0.73	0.05	0.15	10.14
Longear Sunfish	S	I	C	M	95	71.25	9.93	1.52	4.34	21.31
Green Sf X Hybrid					1	0.75	0.10	0.01	0.02	10.00
Blackside Darter	D	I	S		2	1.50	0.21	0.00	0.01	3.00
Greenside Darter	D	I	S	M	23	17.25	2.40	0.06	0.17	3.48
Banded Darter	D	I	S	I	13	9.75	1.36	0.02	0.06	2.00
Mottled Sculpin		I	C		20	15.00	2.09	0.07	0.21	4.80
Mile Total					957	717.75		34.97		
Number of Species					31					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **34.50**	Location: Coakley Rd.	Date Range: 07/29/1996
Time Fished: 4400 sec	Drainage: 87.0 sq mi	Thru: 09/11/1996
Dist Fished: 0.40 km	Basin: Scioto 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		11	8.25	0.77	2.01	3.25	243.64
Silver Redhorse	R	I	S	M	12	9.00	0.84	2.48	4.00	275.00
Black Redhorse	R	I	S	I	1	0.75	0.07	0.08	0.13	105.00
Golden Redhorse	R	I	S	M	135	101.25	9.50	15.21	24.61	150.25
Northern Hog Sucker	R	I	S	M	123	92.25	8.66	4.97	8.04	53.88
White Sucker	W	O	S	T	5	3.75	0.35	0.59	0.95	156.20
Common Carp	G	O	M	T	27	20.25	1.90	26.66	43.13	1,316.70
Creek Chub	N	G	N	T	1	0.75	0.07	0.00	0.01	5.00
Suckermouth Minnow	N	I	S		36	27.00	2.53	0.11	0.18	4.17
Silver Shiner	N	I	S	I	10	7.50	0.70	0.05	0.08	6.40
Rosyface Shiner	N	I	S	I	1	0.75	0.07	0.00	0.00	2.00
Rosefin Shiner	N	I	S	M	10	7.50	0.70	0.01	0.02	1.88
Striped Shiner	N	I	S		158	118.50	11.12	1.06	1.72	8.95
Spotfin Shiner	N	I	M		103	77.25	7.25	0.30	0.48	3.82
Sand Shiner	N	I	M	M	205	153.75	14.43	0.30	0.48	1.92
Silverjaw Minnow	N	I	M		93	69.75	6.54	0.20	0.32	2.80
Fathead Minnow	N	O	C	T	1	0.75	0.07	0.00	0.00	3.00
Bluntnose Minnow	N	O	C	T	280	210.00	19.70	0.55	0.88	2.60
Central Stoneroller	N	H	N		92	69.00	6.47	0.78	1.26	11.25
Common Carp X Goldfish	G	O		T	1	0.75	0.07	0.99	1.61	1,325.00
Yellow Bullhead		I	C	T	1	0.75	0.07	0.26	0.41	340.00
White Crappie	S	I	C		1	0.75	0.07	0.11	0.17	144.00
Rock Bass	S	C	C		7	5.25	0.49	0.31	0.50	59.14
Smallmouth Bass	F	C	C	M	16	12.00	1.13	2.09	3.38	174.38
Spotted Bass	F	C	C		17	12.75	1.20	0.44	0.71	34.29
Largemouth Bass	F	C	C		8	6.00	0.56	1.91	3.09	318.75
Bluegill Sunfish	S	I	C	P	4	3.00	0.28	0.02	0.03	6.75
Longear Sunfish	S	I	C	M	30	22.50	2.11	0.28	0.45	12.33
Green Sf X Bluegill Sf					1	0.75	0.07	0.01	0.01	8.00
Johnny Darter	D	I	C		1	0.75	0.07	0.00	0.00	2.00
Greenside Darter	D	I	S	M	4	3.00	0.28	0.02	0.02	5.00
Banded Darter	D	I	S	I	17	12.75	1.20	0.01	0.02	0.87
Mottled Sculpin		I	C		9	6.75	0.63	0.03	0.05	4.78
	Mile Total				1,421	1,065.75		61.82		
	Number of Species				31					
	Number of Hybrids				2					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **30.00**	Location: upst. Pickerington Rd.	Date Range: 08/05/1996
Time Fished: 4425 sec	Drainage: 114.0 sq mi	Thru: 09/11/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Longnose Gar		P	M		1	0.75	0.33	0.01	0.02	10.00
Gizzard Shad		O	M		6	4.50	1.98	0.45	1.37	100.00
Quillback Carpsucker	C	O	M		9	6.75	2.97	1.94	5.91	287.78
Silver Redhorse	R	I	S	M	20	15.00	6.60	4.41	13.43	294.25
Golden Redhorse	R	I	S	M	86	64.50	28.38	6.48	19.71	100.43
Northern Hog Sucker	R	I	S	M	4	3.00	1.32	0.17	0.51	55.50
White Sucker	W	O	S	T	5	3.75	1.65	0.57	1.72	151.00
Spotted Sucker	R	I	S		7	5.25	2.31	1.24	3.76	235.71
Common Carp	G	O	M	T	11	8.25	3.63	11.61	35.31	1,406.82
Silver Shiner	N	I	S	I	12	9.00	3.96	0.08	0.25	9.09
Striped Shiner	N	I	S		7	5.25	2.31	0.10	0.31	19.43
Spotfin Shiner	N	I	M		11	8.25	3.63	0.02	0.07	2.91
Bluntnose Minnow	N	O	C	T	1	0.75	0.33	0.00	0.01	3.00
Common Carp X Goldfish	G	O		T	1	0.75	0.33	0.15	0.46	200.00
Channel Catfish	F		C		1	0.75	0.33	0.00	0.01	3.00
Yellow Bullhead		I	C	T	3	2.25	0.99	0.51	1.55	227.00
Trout-perch		I	M		3	2.25	0.99	0.01	0.02	2.67
White Crappie	S	I	C		2	1.50	0.66	0.08	0.24	52.50
Black Crappie	S	I	C		1	0.75	0.33	0.08	0.23	100.00
Rock Bass	S	C	C		3	2.25	0.99	0.15	0.45	65.00
Smallmouth Bass	F	C	C	M	5	3.75	1.65	0.45	1.38	121.00
Spotted Bass	F	C	C		14	10.50	4.62	1.79	5.44	170.36
Green Sunfish	S	I	C	T	14	10.50	4.62	0.10	0.29	9.14
Bluegill Sunfish	S	I	C	P	39	29.25	12.87	0.26	0.79	8.90
Longear Sunfish	S	I	C	M	31	23.25	10.23	0.39	1.18	16.61
Green Sf X Bluegill Sf					1	0.75	0.33	0.02	0.06	28.00
Longear Sf X Bluegill Sf					1	0.75	0.33	0.01	0.02	7.00
Green Sf X Longear Sf					1	0.75	0.33	0.08	0.24	105.00
Logperch	D	I	S	M	1	0.75	0.33	0.01	0.03	15.00
Sauger X Walleye	E	P			1	0.75	0.33	1.16	3.54	1,550.00
Freshwater Drum			M	P	1	0.75	0.33	0.56	1.71	750.00
Mile Total					303	227.25		32.87		
Number of Species					26					
Number of Hybrids					5					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **29.10**	Location: upst. Amanda-Northern Rd.	Date Range: 08/05/1996
Time Fished: 5441 sec	Drainage: 138.0 sq mi	Thru: 09/12/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Lamprey		P	N		1	0.75	0.16	0.03	0.06	34.00
Longnose Gar		P	M		1	0.75	0.16	0.02	0.04	20.00
Quillback Carpsucker	C	O	M		15	11.25	2.42	3.19	7.45	283.33
Silver Redhorse	R	I	S	M	42	31.50	6.77	5.92	13.82	187.82
Golden Redhorse	R	I	S	M	164	123.00	26.45	10.58	24.72	86.01
Northern Hog Sucker	R	I	S	M	32	24.00	5.16	1.38	3.23	57.69
White Sucker	W	O	S	T	28	21.00	4.52	3.84	8.97	182.86
Spotted Sucker	R	I	S		7	5.25	1.13	1.28	2.98	242.86
Common Carp	G	O	M	T	14	10.50	2.26	12.54	29.30	1,194.29
Suckermouth Minnow	N	I	S		4	3.00	0.65	0.01	0.02	2.25
Silver Shiner	N	I	S	I	14	10.50	2.26	0.06	0.15	6.14
Rosefin Shiner	N	I	S	M	1	0.75	0.16	0.00	0.00	2.00
Striped Shiner	N	I	S		21	15.75	3.39	0.35	0.81	22.05
Spotfin Shiner	N	I	M		72	54.00	11.61	0.21	0.49	3.90
Sand Shiner	N	I	M	M	10	7.50	1.61	0.01	0.03	1.70
Silverjaw Minnow	N	I	M		1	0.75	0.16	0.00	0.00	2.00
Fathead Minnow	N	O	C	T	1	0.75	0.16	0.00	0.01	4.00
Bluntnose Minnow	N	O	C	T	14	10.50	2.26	0.02	0.05	1.85
Central Stoneroller	N	H	N		2	1.50	0.32	0.00	0.01	2.00
White Crappie	S	I	C		1	0.75	0.16	0.00	0.01	4.00
Rock Bass	S	C	C		4	3.00	0.65	0.15	0.34	48.25
Smallmouth Bass	F	C	C	M	5	3.75	0.81	0.24	0.55	62.80
Spotted Bass	F	C	C		7	5.25	1.13	0.51	1.20	97.43
Largemouth Bass	F	C	C		3	2.25	0.48	0.86	2.02	383.33
Green Sunfish	S	I	C	T	62	46.50	10.00	0.27	0.62	5.69
Bluegill Sunfish	S	I	C	P	22	16.50	3.55	0.13	0.29	7.58
Longear Sunfish	S	I	C	M	52	39.00	8.39	0.89	2.08	22.81
Longear Sf X Bluegill Sf					6	4.50	0.97	0.20	0.47	45.00
Green Sf X Longear Sf					2	1.50	0.32	0.07	0.17	47.50
Logperch	D	I	S	M	3	2.25	0.48	0.05	0.12	22.00
Johnny Darter	D	I	C		4	3.00	0.65	0.00	0.01	1.00
Greenside Darter	D	I	S	M	2	1.50	0.32	0.00	0.01	2.50
Banded Darter	D	I	S	I	3	2.25	0.48	0.00	0.01	1.00
Mile Total					620	465.00		42.80		
Number of Species					31					
Number of Hybrids					2					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **26.40**	Location:	Date Range: 08/06/1996
Time Fished: 5409 sec	Drainage: 146.0 sq mi	Thru: 09/12/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Redhorse	R	I	S	M	14	10.50	1.33	5.35	11.34	509.29
Golden Redhorse	R	I	S	M	121	90.75	11.46	11.40	24.16	125.57
Northern Hog Sucker	R	I	S	M	124	93.00	11.74	5.49	11.65	59.07
White Sucker	W	O	S	T	20	15.00	1.89	1.31	2.78	87.50
Common Carp	G	O	M	T	18	13.50	1.70	16.13	34.20	1,195.00
Creek Chub	N	G	N	T	6	4.50	0.57	0.02	0.03	3.60
Suckermouth Minnow	N	I	S		16	12.00	1.52	0.03	0.06	2.38
Silver Shiner	N	I	S	I	16	12.00	1.52	0.09	0.19	7.50
Striped Shiner	N	I	S		74	55.50	7.01	0.65	1.37	11.62
Spotfin Shiner	N	I	M		106	79.50	10.04	0.23	0.49	2.90
Sand Shiner	N	I	M	M	91	68.25	8.62	0.12	0.26	1.81
Silverjaw Minnow	N	I	M		12	9.00	1.14	0.02	0.05	2.42
Bluntnose Minnow	N	O	C	T	142	106.50	13.45	0.24	0.50	2.23
Central Stoneroller	N	H	N		70	52.50	6.63	0.28	0.60	5.37
Channel Catfish	F		C		1	0.75	0.09	1.13	2.39	1,500.00
Yellow Bullhead		I	C	T	2	1.50	0.19	0.19	0.40	127.00
Rock Bass	S	C	C		10	7.50	0.95	0.63	1.34	84.50
Smallmouth Bass	F	C	C	M	13	9.75	1.23	1.79	3.79	183.46
Spotted Bass	F	C	C		20	15.00	1.89	0.95	2.02	63.50
Largemouth Bass	F	C	C		1	0.75	0.09	0.04	0.09	55.00
Green Sunfish	S	I	C	T	106	79.50	10.04	0.42	0.90	5.32
Bluegill Sunfish	S	I	C	P	27	20.25	2.56	0.17	0.37	8.52
Longear Sunfish	S	I	C	M	22	16.50	2.08	0.29	0.61	17.50
Green Sf X Bluegill Sf					5	3.75	0.47	0.11	0.24	30.00
Green Sf X Longear Sf					2	1.50	0.19	0.05	0.10	30.00
Blackside Darter	D	I	S		2	1.50	0.19	0.01	0.03	8.50
Johnny Darter	D	I	C		2	1.50	0.19	0.00	0.01	1.50
Greenside Darter	D	I	S	M	3	2.25	0.28	0.01	0.02	4.00
Banded Darter	D	I	S	I	9	6.75	0.85	0.01	0.02	1.44
Mottled Sculpin		I	C		1	0.75	0.09	0.00	0.01	3.00
Mile Total					1,056	792.00		47.17		
Number of Species					28					
Number of Hybrids					2					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **24.40**	Location: covered bridge	Date Range: 08/06/1996
Time Fished: 6090 sec	Drainage: 151.0 sq mi	Thru: 09/12/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		7	5.25	1.08	0.30	0.38	57.14
Quillback Carpsucker	C	O	M		2	1.50	0.31	0.42	0.53	280.00
Silver Redhorse	R	I	S	M	28	21.00	4.33	9.28	11.72	441.68
Black Redhorse	R	I	S	I	2	1.50	0.31	0.06	0.08	40.00
Golden Redhorse	R	I	S	M	86	64.50	13.31	10.44	13.19	161.88
Northern Hog Sucker	R	I	S	M	82	61.50	12.69	4.26	5.38	69.22
White Sucker	W	O	S	T	10	7.50	1.55	1.63	2.07	217.90
Spotted Sucker	R	I	S		7	5.25	1.08	0.60	0.76	114.57
Common Carp	G	O	M	T	32	24.00	4.95	43.55	55.02	1,814.60
Suckermouth Minnow	N	I	S		15	11.25	2.32	0.05	0.06	4.40
Silver Shiner	N	I	S	I	12	9.00	1.86	0.03	0.03	3.00
Striped Shiner	N	I	S		22	16.50	3.41	0.41	0.52	24.73
Spotfin Shiner	N	I	M		85	63.75	13.16	0.25	0.32	3.98
Sand Shiner	N	I	M	M	25	18.75	3.87	0.04	0.05	2.06
Silverjaw Minnow	N	I	M		2	1.50	0.31	0.00	0.01	2.50
Bluntnose Minnow	N	O	C	T	26	19.50	4.02	0.06	0.07	2.81
Central Stoneroller	N	H	N		64	48.00	9.91	0.54	0.68	11.22
Channel Catfish	F		C		1	0.75	0.15	0.64	0.81	850.00
Yellow Bullhead		I	C	T	3	2.25	0.46	1.57	1.98	697.00
Stonecat Madtom		I	C	I	3	2.25	0.46	0.04	0.05	18.33
Rock Bass	S	C	C		16	12.00	2.48	1.06	1.34	88.63
Smallmouth Bass	F	C	C	M	16	12.00	2.48	1.20	1.52	100.31
Spotted Bass	F	C	C		9	6.75	1.39	0.27	0.34	40.33
Largemouth Bass	F	C	C		2	1.50	0.31	0.01	0.01	7.50
Green Sunfish	S	I	C	T	28	21.00	4.33	0.21	0.27	10.14
Bluegill Sunfish	S	I	C	P	4	3.00	0.62	0.05	0.06	15.75
Longear Sunfish	S	I	C	M	20	15.00	3.10	0.45	0.57	30.10
Longear Sf X Bluegill Sf					1	0.75	0.15	0.02	0.03	32.00
Blackside Darter	D	I	S		3	2.25	0.46	0.01	0.02	6.00
Logperch	D	I	S	M	1	0.75	0.15	0.03	0.03	36.00
Greenside Darter	D	I	S	M	14	10.50	2.17	0.06	0.08	5.71
Banded Darter	D	I	S	I	14	10.50	2.17	0.01	0.02	1.21
Freshwater Drum			M	P	3	2.25	0.46	1.59	2.00	705.00
Mottled Sculpin		I	C		1	0.75	0.15	0.00	0.01	6.00
Mile Total					646	484.50		79.15		
Number of Species					33					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **24.10**	Location: dst Canal Winchester WWTP	Date Range: 08/06/1996
Time Fished: 897 sec	Drainage: 152.0 sq mi	Thru: 09/12/1996
Dist Fished: 0.10 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		1	3.00	0.52	0.61	3.24	204.00
Quillback Carpsucker	C	O	M		1	3.00	0.52	0.86	4.57	288.00
Silver Redhorse	R	I	S	M	1	3.00	0.52	3.90	20.62	1,300.00
Golden Redhorse	R	I	S	M	4	12.00	2.08	3.31	17.48	275.50
Northern Hog Sucker	R	I	S	M	4	12.00	2.08	0.42	2.20	34.67
White Sucker	W	O	S	T	16	48.00	8.33	5.68	30.04	118.33
Common Carp	G	O	M	T	2	6.00	1.04	1.38	7.30	230.00
Blacknose Dace	N	G	S	T	11	33.00	5.73	0.05	0.29	1.64
Creek Chub	N	G	N	T	4	12.00	2.08	0.03	0.14	2.25
Suckermouth Minnow	N	I	S		10	30.00	5.21	0.11	0.56	3.56
Striped Shiner	N	I	S		9	27.00	4.69	0.20	1.05	7.33
Spotfin Shiner	N	I	M		32	96.00	16.67	0.30	1.60	3.16
Sand Shiner	N	I	M	M	26	78.00	13.54	0.10	0.51	1.23
Bluntnose Minnow	N	O	C	T	19	57.00	9.90	0.14	0.76	2.53
Central Stoneroller	N	H	N		18	54.00	9.38	0.50	2.63	9.22
Stonecat Madtom		I	C	I	1	3.00	0.52	0.01	0.05	3.00
Rock Bass	S	C	C		3	9.00	1.56	0.76	4.03	84.67
Green Sunfish	S	I	C	T	24	72.00	12.50	0.47	2.47	6.50
Longear Sunfish	S	I	C	M	1	3.00	0.52	0.05	0.24	15.00
Greenside Darter	D	I	S	M	3	9.00	1.56	0.03	0.16	3.33
Banded Darter	D	I	S	I	2	6.00	1.04	0.01	0.06	2.00
Mile Total					192	576.00		18.91		
Number of Species					21					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **23.90**	Location: dst Canal Winchester WWTP	Date Range: 08/06/1996
Time Fished: 4820 sec	Drainage: 152.0 sq mi	Thru: 09/12/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		1	0.75	0.13	0.15	0.26	200.00
Quillback Carpsucker	C	O	M		23	17.25	2.98	8.77	15.06	508.26
Silver Redhorse	R	I	S	M	13	9.75	1.68	3.74	6.42	383.52
Golden Redhorse	R	I	S	M	168	126.00	21.76	20.34	34.93	161.41
Shorthead Redhorse	R	I	S	M	1	0.75	0.13	0.19	0.32	250.00
Northern Hog Sucker	R	I	S	M	152	114.00	19.69	7.15	12.27	62.68
White Sucker	W	O	S	T	8	6.00	1.04	1.28	2.19	212.50
Spotted Sucker	R	I	S		3	2.25	0.39	0.75	1.29	333.33
Common Carp	G	O	M	T	16	12.00	2.07	6.68	11.46	556.25
Suckermouth Minnow	N	I	S		16	12.00	2.07	0.05	0.08	3.75
Silver Shiner	N	I	S	I	10	7.50	1.30	0.04	0.07	5.80
Striped Shiner	N	I	S		19	14.25	2.46	0.35	0.60	24.63
Spotfin Shiner	N	I	M		56	42.00	7.25	0.14	0.23	3.22
Sand Shiner	N	I	M	M	16	12.00	2.07	0.02	0.03	1.63
Silverjaw Minnow	N	I	M		6	4.50	0.78	0.01	0.01	1.83
Bluntnose Minnow	N	O	C	T	59	44.25	7.64	0.09	0.15	1.98
Central Stoneroller	N	H	N		65	48.75	8.42	0.68	1.16	13.91
Channel Catfish	F		C		1	0.75	0.13	1.88	3.22	2,500.00
Yellow Bullhead		I	C	T	1	0.75	0.13	0.06	0.11	84.00
Stonecat Madtom		I	C	I	2	1.50	0.26	0.08	0.13	50.00
Rock Bass	S	C	C		9	6.75	1.17	0.33	0.57	49.22
Smallmouth Bass	F	C	C	M	27	20.25	3.50	4.08	7.01	201.56
Spotted Bass	F	C	C		9	6.75	1.17	0.10	0.17	15.00
Green Sunfish	S	I	C	T	20	15.00	2.59	0.11	0.19	7.30
Bluegill Sunfish	S	I	C	P	2	1.50	0.26	0.02	0.03	10.00
Longear Sunfish	S	I	C	M	22	16.50	2.85	0.36	0.63	22.09
Green Sf X Bluegill Sf					1	0.75	0.13	0.01	0.01	10.00
Sauger	F	P	S		1	0.75	0.13	0.21	0.36	280.00
Logperch	D	I	S	M	3	2.25	0.39	0.05	0.08	20.00
Greenside Darter	D	I	S	M	24	18.00	3.11	0.09	0.15	4.97
Banded Darter	D	I	S	I	17	12.75	2.20	0.01	0.02	1.12
Freshwater Drum			M	P	1	0.75	0.13	0.45	0.77	600.00
Mile Total					772	579.00		58.23		
Number of Species					31					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **21.20**	Location: end of lane, N of Lithoplis Rd	Date Range: 08/06/1996
Time Fished: 5098 sec	Drainage: 177.0 sq mi	Thru: 09/13/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Silver Lamprey		P	N		1	0.75	0.22	0.01	0.02	12.00
Gizzard Shad		O	M		11	8.25	2.43	0.37	0.65	45.09
Quillback Carpsucker	C	O	M		5	3.75	1.11	1.17	2.04	312.00
Silver Redhorse	R	I	S	M	30	22.50	6.64	5.70	9.96	253.33
Golden Redhorse	R	I	S	M	162	121.50	35.84	18.22	31.83	149.92
Northern Hog Sucker	R	I	S	M	41	30.75	9.07	2.72	4.76	88.52
White Sucker	W	O	S	T	7	5.25	1.55	0.53	0.92	100.00
Spotted Sucker	R	I	S		2	1.50	0.44	0.11	0.20	76.00
Common Carp	G	O	M	T	32	24.00	7.08	24.49	42.79	1,020.31
Suckermouth Minnow	N	I	S		1	0.75	0.22	0.00	0.01	5.00
Silver Shiner	N	I	S	I	3	2.25	0.66	0.02	0.04	9.00
Striped Shiner	N	I	S		6	4.50	1.33	0.07	0.12	15.83
Spotfin Shiner	N	I	M		32	24.00	7.08	0.10	0.17	4.13
Sand Shiner	N	I	M	M	7	5.25	1.55	0.02	0.03	2.86
Bluntnose Minnow	N	O	C	T	33	24.75	7.30	0.04	0.06	1.50
Central Stoneroller	N	H	N		2	1.50	0.44	0.01	0.01	5.50
Channel Catfish	F		C		1	0.75	0.22	0.71	1.24	950.00
Yellow Bullhead		I	C	T	1	0.75	0.22	0.14	0.24	180.00
Trout-perch		I	M		1	0.75	0.22	0.00	0.01	4.00
White Crappie	S	I	C		1	0.75	0.22	0.11	0.19	148.00
Black Crappie	S	I	C		1	0.75	0.22	0.02	0.03	20.00
Rock Bass	S	C	C		9	6.75	1.99	0.39	0.68	57.78
Smallmouth Bass	F	C	C	M	7	5.25	1.55	0.66	1.15	125.00
Spotted Bass	F	C	C		7	5.25	1.55	0.10	0.17	18.57
Green Sunfish	S	I	C	T	7	5.25	1.55	0.03	0.05	5.71
Bluegill Sunfish	S	I	C	P	17	12.75	3.76	0.14	0.25	11.12
Longear Sunfish	S	I	C	M	15	11.25	3.32	0.19	0.33	16.80
Logperch	D	I	S	M	6	4.50	1.33	0.09	0.16	20.17
Banded Darter	D	I	S	I	1	0.75	0.22	0.00	0.00	2.00
Freshwater Drum			M	P	3	2.25	0.66	1.09	1.90	483.33
Mile Total					452	339.00		57.23		
Number of Species					30					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **19.40**	Location: Richardson Rd.	Date Range: 08/07/1996
Time Fished: 5160 sec	Drainage: 182.0 sq mi	Thru: 09/16/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		7	5.25	1.81	0.38	0.51	71.43
Quillback Carpsucker	C	O	M		13	9.75	3.37	3.30	4.45	338.46
Silver Redhorse	R	I	S	M	30	22.50	7.77	6.96	9.39	309.17
Golden Redhorse	R	I	S	M	136	102.00	35.23	19.46	26.26	190.74
Northern Hog Sucker	R	I	S	M	47	35.25	12.18	2.29	3.09	64.89
White Sucker	W	O	S	T	1	0.75	0.26	0.06	0.09	85.00
Spotted Sucker	R	I	S		1	0.75	0.26	0.18	0.24	240.00
Common Carp	G	O	M	T	41	30.75	10.62	36.42	49.16	1,184.29
Silver Shiner	N	I	S	I	6	4.50	1.55	0.04	0.05	8.67
Spotfin Shiner	N	I	M		25	18.75	6.48	0.07	0.10	3.88
Sand Shiner	N	I	M	M	6	4.50	1.55	0.01	0.02	2.50
Fathead Minnow	N	O	C	T	1	0.75	0.26	0.00	0.00	3.00
Bluntnose Minnow	N	O	C	T	8	6.00	2.07	0.01	0.01	1.25
Channel Catfish	F		C		1	0.75	0.26	1.61	2.18	2,150.00
Yellow Bullhead		I	C	T	1	0.75	0.26	0.01	0.02	15.00
White Crappie	S	I	C		1	0.75	0.26	0.03	0.04	35.00
Rock Bass	S	C	C		3	2.25	0.78	0.23	0.31	101.67
Smallmouth Bass	F	C	C	M	7	5.25	1.81	0.83	1.12	158.00
Spotted Bass	F	C	C		7	5.25	1.81	0.69	0.93	130.57
Green Sunfish	S	I	C	T	13	9.75	3.37	0.08	0.11	8.38
Bluegill Sunfish	S	I	C	P	15	11.25	3.89	0.12	0.16	10.77
Longear Sunfish	S	I	C	M	8	6.00	2.07	0.12	0.17	20.63
Green Sf X Bluegill Sf					4	3.00	1.04	0.04	0.05	13.00
Greenside Darter	D	I	S	M	1	0.75	0.26	0.00	0.01	5.00
Freshwater Drum			M	P	3	2.25	0.78	1.16	1.56	513.33
Mile Total					386	289.50		74.09		
Number of Species					24					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **16.90**	Location: Hayes Rd.	Date Range: 08/07/1996
Time Fished: 2223 sec	Drainage: 188.0 sq mi	Thru: 09/16/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		73	54.75	9.43	0.31	0.35	5.62
Quillback Carpsucker	C	O	M		1	0.75	0.13	0.01	0.01	15.00
Silver Redhorse	R	I	S	M	50	37.50	6.46	16.43	18.67	438.08
Golden Redhorse	R	I	S	M	194	145.50	25.06	18.83	21.40	129.42
Shorthead Redhorse	R	I	S	M	3	2.25	0.39	0.90	1.02	400.00
Northern Hog Sucker	R	I	S	M	51	38.25	6.59	2.66	3.02	69.53
White Sucker	W	O	S	T	1	0.75	0.13	0.16	0.18	210.00
Spotted Sucker	R	I	S		4	3.00	0.52	0.67	0.76	223.75
Common Carp	G	O	M	T	33	24.75	4.26	39.19	44.54	1,583.25
Creek Chub	N	G	N	T	1	0.75	0.13	0.00	0.00	4.00
Suckermouth Minnow	N	I	S		3	2.25	0.39	0.01	0.01	2.33
Silver Shiner	N	I	S	I	3	2.25	0.39	0.02	0.02	9.00
Striped Shiner	N	I	S		33	24.75	4.26	0.08	0.09	3.33
Spotfin Shiner	N	I	M		93	69.75	12.02	0.25	0.29	3.60
Sand Shiner	N	I	M	M	12	9.00	1.55	0.01	0.02	1.58
Silverjaw Minnow	N	I	M		4	3.00	0.52	0.01	0.01	2.50
Fathead Minnow	N	O	C	T	4	3.00	0.52	0.01	0.01	2.25
Bluntnose Minnow	N	O	C	T	104	78.00	13.44	0.12	0.13	1.48
Central Stoneroller	N	H	N		10	7.50	1.29	0.03	0.04	4.40
Channel Catfish	F		C		3	2.25	0.39	3.57	4.05	1,585.00
Trout-perch		I	M		2	1.50	0.26	0.01	0.01	4.50
White Crappie	S	I	C		2	1.50	0.26	0.03	0.04	21.00
Rock Bass	S	C	C		3	2.25	0.39	0.24	0.28	108.33
Smallmouth Bass	F	C	C	M	12	9.00	1.55	1.60	1.82	178.17
Spotted Bass	F	C	C		12	9.00	1.55	0.65	0.74	72.00
Green Sunfish	S	I	C	T	19	14.25	2.45	0.09	0.10	6.19
Bluegill Sunfish	S	I	C	P	20	15.00	2.58	0.16	0.18	10.60
Longear Sunfish	S	I	C	M	16	12.00	2.07	0.23	0.26	18.75
Green Sf X Bluegill Sf					2	1.50	0.26	0.02	0.02	12.50
Longear Sf X Bluegill Sf					1	0.75	0.13	0.00	0.00	5.00
Sauger	F	P	S		1	0.75	0.13	0.21	0.24	280.00
Blackside Darter	D	I	S		1	0.75	0.13	0.00	0.00	5.00
Freshwater Drum			M	P	3	2.25	0.39	1.48	1.68	658.33
Mile Total					774	580.50		87.98		
Number of Species					31					
Number of Hybrids					2					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **15.50**	Location:	Date Range: 08/07/1996
Time Fished: 3943 sec	Drainage: 195.0 sq mi	Thru: 09/19/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Longnose Gar		P	M		1	0.75	0.22	0.01	0.04	12.00
Gizzard Shad		O	M		3	2.25	0.65	0.01	0.02	2.33
Quillback Carpsucker	C	O	M		1	0.75	0.22	0.49	2.00	650.00
Silver Redhorse	R	I	S	M	8	6.00	1.74	2.89	11.87	481.88
Golden Redhorse	R	I	S	M	146	109.50	31.67	12.31	50.54	112.40
Shorthead Redhorse	R	I	S	M	1	0.75	0.22	0.26	1.05	340.00
Northern Hog Sucker	R	I	S	M	52	39.00	11.28	2.38	9.78	61.06
Common Carp	G	O	M	T	2	1.50	0.43	1.90	7.79	1,264.50
Suckermouth Minnow	N	I	S		3	2.25	0.65	0.01	0.02	2.67
Silver Shiner	N	I	S	I	4	3.00	0.87	0.03	0.14	11.50
Spotfin Shiner	N	I	M		69	51.75	14.97	0.18	0.73	3.45
Sand Shiner	N	I	M	M	15	11.25	3.25	0.02	0.09	1.84
Fathead Minnow	N	O	C	T	1	0.75	0.22	0.00	0.01	2.00
Bluntnose Minnow	N	O	C	T	24	18.00	5.21	0.02	0.09	1.17
Channel Catfish	F		C		2	1.50	0.43	0.94	3.86	626.50
Stonecat Madtom		I	C	I	1	0.75	0.22	0.03	0.11	35.00
Trout-perch		I	M		1	0.75	0.22	0.00	0.01	4.00
White Crappie	S	I	C		1	0.75	0.22	0.01	0.04	12.00
Rock Bass	S	C	C		2	1.50	0.43	0.11	0.45	72.50
Smallmouth Bass	F	C	C	M	12	9.00	2.60	0.14	0.57	15.33
Spotted Bass	F	C	C		9	6.75	1.95	0.20	0.80	28.89
Largemouth Bass	F	C	C		1	0.75	0.22	0.05	0.18	60.00
Green Sunfish	S	I	C	T	34	25.50	7.38	0.26	1.06	10.14
Bluegill Sunfish	S	I	C	P	28	21.00	6.07	0.16	0.67	7.79
Longear Sunfish	S	I	C	M	20	15.00	4.34	0.28	1.16	18.90
Pumpkinseed Sunfish	S	I	C	P	1	0.75	0.22	0.00	0.02	5.00
Green Sf X Bluegill Sf					6	4.50	1.30	0.16	0.64	34.50
Logperch	D	I	S	M	3	2.25	0.65	0.03	0.14	15.00
Greenside Darter	D	I	S	M	6	4.50	1.30	0.03	0.11	5.83
Banded Darter	D	I	S	I	3	2.25	0.65	0.00	0.02	1.67
Freshwater Drum			M	P	1	0.75	0.22	1.46	6.01	1,950.00
	Mile Total				461	345.75		24.35		
	Number of Species				30					
	Number of Hybrids				1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **13.80**	Location:	Date Range: 08/07/1996
Time Fished: 3996 sec	Drainage: 198.0 sq mi	Thru: 09/19/1996
Dist Fished: 0.40 km	Basin: Scioto 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		3	2.25	0.80	0.90	5.48	400.00
Silver Redhorse	R	I	S	M	5	3.75	1.33	0.46	2.78	122.00
Black Redhorse	R	I	S	I	2	1.50	0.53	0.44	2.65	290.00
Golden Redhorse	R	I	S	M	76	57.00	20.16	8.23	50.08	144.40
Shorthead Redhorse	R	I	S	M	1	0.75	0.27	0.06	0.38	84.00
Northern Hog Sucker	R	I	S	M	50	37.50	13.26	4.33	26.36	115.53
Creek Chub	N	G	N	T	3	2.25	0.80	0.01	0.03	2.33
Suckermouth Minnow	N	I	S		32	24.00	8.49	0.12	0.74	5.04
Silver Shiner	N	I	S	I	2	1.50	0.53	0.02	0.09	10.00
Rosyface Shiner	N	I	S	I	1	0.75	0.27	0.00	0.01	2.00
Striped Shiner	N	I	S		1	0.75	0.27	0.00	0.02	5.00
Spotfin Shiner	N	I	M		50	37.50	13.26	0.15	0.90	3.94
Sand Shiner	N	I	M	M	20	15.00	5.31	0.03	0.19	2.05
Bluntnose Minnow	N	O	C	T	20	15.00	5.31	0.02	0.14	1.55
Central Stoneroller	N	H	N		21	15.75	5.57	0.14	0.85	8.81
Rock Bass	S	C	C		6	4.50	1.59	0.30	1.82	66.33
Smallmouth Bass	F	C	C	M	9	6.75	2.39	0.44	2.69	65.44
Spotted Bass	F	C	C		11	8.25	2.92	0.18	1.11	22.08
Green Sunfish	S	I	C	T	11	8.25	2.92	0.08	0.47	9.27
Bluegill Sunfish	S	I	C	P	25	18.75	6.63	0.36	2.18	19.12
Longear Sunfish	S	I	C	M	7	5.25	1.86	0.09	0.55	17.29
Logperch	D	I	S	M	3	2.25	0.80	0.06	0.34	25.00
Greenside Darter	D	I	S	M	3	2.25	0.80	0.01	0.04	3.00
Banded Darter	D	I	S	I	13	9.75	3.45	0.01	0.06	1.00
Mottled Sculpin		I	C		2	1.50	0.53	0.01	0.05	6.00
Mile Total					377	282.75		16.44		
Number of Species					25					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **11.00**	Location: Walnut Creek Pike	Date Range: 08/08/1996
Time Fished: 4919 sec	Drainage: 206.0 sq mi	Thru: 09/19/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		13	9.75	1.89	1.17	3.36	119.46
Quillback Carpsucker	C	O	M		2	1.50	0.29	0.75	2.17	500.00
Silver Redhorse	R	I	S	M	2	1.50	0.29	0.25	0.73	167.50
Golden Redhorse	R	I	S	M	82	61.50	11.90	6.81	19.67	110.79
Shorthead Redhorse	R	I	S	M	1	0.75	0.15	0.12	0.34	156.00
Northern Hog Sucker	R	I	S	M	57	42.75	8.27	3.19	9.20	74.56
White Sucker	W	O	S	T	27	20.25	3.92	1.39	4.01	68.52
Spotted Sucker	R	I	S		1	0.75	0.15	0.00	0.01	5.00
Common Carp	G	O	M	T	12	9.00	1.74	16.37	47.27	1,818.75
Blacknose Dace	N	G	S	T	2	1.50	0.29	0.00	0.01	2.00
Creek Chub	N	G	N	T	1	0.75	0.15	0.00	0.01	6.00
Suckermouth Minnow	N	I	S		33	24.75	4.79	0.06	0.18	2.48
Silver Shiner	N	I	S	I	4	3.00	0.58	0.05	0.13	15.00
Striped Shiner	N	I	S		5	3.75	0.73	0.01	0.03	2.50
Spotfin Shiner	N	I	M		125	93.75	18.14	0.32	0.92	3.41
Sand Shiner	N	I	M	M	26	19.50	3.77	0.03	0.09	1.65
Fathead Minnow	N	O	C	T	5	3.75	0.73	0.01	0.03	2.60
Bluntnose Minnow	N	O	C	T	138	103.50	20.03	0.17	0.49	1.64
Central Stoneroller	N	H	N		50	37.50	7.26	0.31	0.91	8.38
Channel Catfish	F		C		1	0.75	0.15	0.64	1.84	850.00
Flathead Catfish	F	P	C		1	0.75	0.15	0.02	0.04	20.00
Stonecat Madtom		I	C	I	2	1.50	0.29	0.04	0.13	29.50
Rock Bass	S	C	C		3	2.25	0.44	0.16	0.45	69.67
Smallmouth Bass	F	C	C	M	6	4.50	0.87	0.57	1.64	126.00
Spotted Bass	F	C	C		15	11.25	2.18	0.39	1.12	34.47
Largemouth Bass	F	C	C		2	1.50	0.29	0.01	0.03	8.00
Green Sunfish	S	I	C	T	8	6.00	1.16	0.04	0.12	6.75
Bluegill Sunfish	S	I	C	P	10	7.50	1.45	0.11	0.32	14.80
Longear Sunfish	S	I	C	M	10	7.50	1.45	0.09	0.26	12.20
Blackside Darter	D	I	S		5	3.75	0.73	0.03	0.07	6.80
Logperch	D	I	S	M	1	0.75	0.15	0.02	0.05	22.00
Greenside Darter	D	I	S	M	16	12.00	2.32	0.05	0.15	4.31
Banded Darter	D	I	S	I	16	12.00	2.32	0.01	0.04	1.19
Rainbow Darter	D	I	S	M	1	0.75	0.15	0.00	0.01	4.00
Freshwater Drum			M	P	3	2.25	0.44	1.42	4.09	629.67
Mottled Sculpin		I	C		3	2.25	0.44	0.03	0.08	11.67
Mile Total					689	516.75		34.63		
Number of Species					36					
Number of Hybrids					0					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **9.10**	Location: 0.3 mi. upst. St. Paul Rd.	Date Range: 08/13/1996
Time Fished: 5802 sec	Drainage: 212.0 sq mi	Thru: 10/15/1996
Dist Fished: 1.00 km	Basin: Scioto River No of Passes: 2	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		8	8.00	1.72	1.26	0.89	157.75
Quillback Carpsucker	C	O	M		3	3.00	0.64	0.92	0.65	306.67
River Carpsucker	C	O	M		3	3.00	0.64	2.99	2.11	995.00
Silver Redhorse	R	I	S	M	22	22.00	4.72	12.97	9.17	589.32
Golden Redhorse	R	I	S	M	109	109.00	23.39	23.64	16.72	216.84
Shorthead Redhorse	R	I	S	M	7	7.00	1.50	2.30	1.63	328.57
Northern Hog Sucker	R	I	S	M	33	33.00	7.08	4.63	3.28	140.37
Spotted Sucker	R	I	S		2	2.00	0.43	0.12	0.08	60.00
Common Carp	G	O	M	T	35	35.00	7.51	60.36	42.70	1,724.43
Creek Chub	N	G	N	T	1	1.00	0.21	0.01	0.00	5.00
Suckermouth Minnow	N	I	S		4	4.00	0.86	0.02	0.01	5.00
Silver Shiner	N	I	S	I	1	1.00	0.21	0.01	0.01	10.00
Rosyface Shiner	N	I	S	I	6	6.00	1.29	0.01	0.01	1.33
Striped Shiner	N	I	S		6	6.00	1.29	0.01	0.01	1.67
Spotfin Shiner	N	I	M		46	46.00	9.87	0.08	0.05	1.69
Sand Shiner	N	I	M	M	11	11.00	2.36	0.02	0.01	1.82
Silverjaw Minnow	N	I	M		1	1.00	0.21	0.00	0.00	3.00
Bluntnose Minnow	N	O	C	T	58	58.00	12.45	0.09	0.06	1.52
Central Stoneroller	N	H	N		15	15.00	3.22	0.37	0.26	24.33
Channel Catfish	F		C		16	16.00	3.43	20.70	14.65	1,293.75
Stonecat Madtom		I	C	I	1	1.00	0.21	0.00	0.00	3.00
Trout-perch		I	M		1	1.00	0.21	0.01	0.00	5.00
White Bass	F	P	M		1	1.00	0.21	0.50	0.35	500.00
Black Crappie	S	I	C		1	1.00	0.21	0.03	0.02	25.00
Rock Bass	S	C	C		2	2.00	0.43	0.11	0.08	56.00
Smallmouth Bass	F	C	C	M	8	8.00	1.72	2.31	1.63	288.50
Spotted Bass	F	C	C		17	17.00	3.65	2.14	1.51	125.66
Largemouth Bass	F	C	C		3	3.00	0.64	0.22	0.16	74.00
Green Sunfish	S	I	C	T	4	4.00	0.86	0.11	0.08	27.00
Bluegill Sunfish	S	I	C	P	9	9.00	1.93	0.12	0.08	13.00
Longear Sunfish	S	I	C	M	9	9.00	1.93	0.31	0.22	33.89
Sauger	F	P	S		1	1.00	0.21	1.05	0.74	1,050.00
Blackside Darter	D	I	S		2	2.00	0.43	0.02	0.01	9.00
Greenside Darter	D	I	S	M	2	2.00	0.43	0.01	0.01	5.50
Banded Darter	D	I	S	I	6	6.00	1.29	0.01	0.01	1.33
Rainbow Darter	D	I	S	M	1	1.00	0.21	0.00	0.00	2.00
Sauger X Walleye	E	P			4	4.00	0.86	1.66	1.17	415.00
Freshwater Drum			M	P	5	5.00	1.07	2.25	1.59	450.00
Mottled Sculpin		I	C		2	2.00	0.43	0.02	0.01	8.50
Mile Total					466	466.00		141.34		
Number of Species					38					
Number of Hybrids					1					

Species List

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **5.10**	Location: Circleville-Lockbourne E. Rd.	Date Range: 08/19/1996
Time Fished: 7456 sec	Drainage: 272.0 sq mi	Thru: 10/16/1996
Dist Fished: 1.50 km	Basin: Scioto River — No of Passes: 3	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		15	10.00	3.95	1.20	1.45	119.60
Quillback Carpsucker	C	O	M		9	6.00	2.37	2.94	3.57	489.44
River Carpsucker	C	O	M		4	2.67	1.05	2.49	3.02	933.75
Silver Redhorse	R	I	S	M	24	16.00	6.32	9.27	11.25	579.17
Golden Redhorse	R	I	S	M	108	72.00	28.42	19.87	24.13	276.03
Shorthead Redhorse	R	I	S	M	7	4.67	1.84	1.63	1.98	350.00
Northern Hog Sucker	R	I	S	M	42	28.00	11.05	2.29	2.77	81.62
White Sucker	W	O	S	T	1	0.67	0.26	0.12	0.15	184.00
Common Carp	G	O	M	T	25	16.67	6.58	30.65	37.21	1,838.80
Suckermouth Minnow	N	I	S		2	1.33	0.53	0.00	0.01	3.50
Silver Shiner	N	I	S	I	2	1.33	0.53	0.01	0.01	6.50
Rosyface Shiner	N	I	S	I	5	3.33	1.32	0.01	0.01	2.40
Striped Shiner	N	I	S		3	2.00	0.79	0.00	0.00	1.67
Spotfin Shiner	N	I	M		33	22.00	8.68	0.07	0.08	2.99
Sand Shiner	N	I	M	M	10	6.67	2.63	0.01	0.02	2.10
Silverjaw Minnow	N	I	M		1	0.67	0.26	0.00	0.00	3.00
Fathead Minnow	N	O	C	T	1	0.67	0.26	0.00	0.00	2.00
Bluntnose Minnow	N	O	C	T	6	4.00	1.58	0.01	0.01	2.17
Channel Catfish	F		C		3	2.00	0.79	0.88	1.07	441.67
Rock Bass	S	C	C		1	0.67	0.26	0.03	0.03	42.00
Smallmouth Bass	F	C	C	M	29	19.33	7.63	1.88	2.29	97.41
Spotted Bass	F	C	C		11	7.33	2.89	1.16	1.40	157.73
Largemouth Bass	F	C	C		1	0.67	0.26	0.07	0.09	110.00
Green Sunfish	S	I	C	T	2	1.33	0.53	0.01	0.01	7.50
Bluegill Sunfish	S	I	C	P	7	4.67	1.84	0.06	0.07	12.57
Longear Sunfish	S	I	C	M	2	1.33	0.53	0.02	0.02	15.00
Sauger	F	P	S		1	0.67	0.26	0.26	0.32	394.00
Logperch	D	I	S	M	2	1.33	0.53	0.04	0.04	26.50
Greenside Darter	D	I	S	M	2	1.33	0.53	0.00	0.00	2.00
Banded Darter	D	I	S	I	5	3.33	1.32	0.01	0.01	1.60
Rainbow Darter	D	I	S	M	1	0.67	0.26	0.00	0.00	2.00
Sauger X Walleye	E	P			1	0.67	0.26	0.54	0.66	810.00
Freshwater Drum			M	P	13	8.67	3.42	6.82	8.29	787.39
Mottled Sculpin		I	C		1	0.67	0.26	0.01	0.01	18.00
Mile Total					380	253.33		82.36		
Number of Species					33					
Number of Hybrids					1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **4.10**	Location: dst Ashville WWTP	Date Range: 08/19/1996
Time Fished: 5191 sec	Drainage: 273.0 sq mi	Thru: 10/16/1996
Dist Fished: 1.50 km	Basin: Scioto River No of Passes: 3	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Silver Lamprey		P	N		1	0.67	0.25	0.04	0.03	55.00
Longnose Gar		P	M		1	0.67	0.25	0.01	0.01	22.00
Gizzard Shad		O	M		8	5.33	1.97	1.75	1.60	328.13
Smallmouth Buffalo	C	I	M		4	2.67	0.99	4.80	4.38	1,800.00
Quillback Carpsucker	C	O	M		26	17.33	6.40	9.98	9.11	575.96
River Carpsucker	C	O	M		12	8.00	2.96	7.47	6.82	933.33
Highfin Carpsucker	C	O	M		1	0.67	0.25	0.78	0.72	1,175.00
Silver Redhorse	R	I	S	M	39	26.00	9.61	16.59	15.15	638.19
Golden Redhorse	R	I	S	M	79	52.67	19.46	15.64	14.28	296.92
Shorthead Redhorse	R	I	S	M	6	4.00	1.48	1.27	1.16	318.33
Northern Hog Sucker	R	I	S	M	28	18.67	6.90	1.99	1.81	106.44
Spotted Sucker	R	I	S		1	0.67	0.25	0.27	0.25	412.00
Common Carp	G	O	M	T	23	15.33	5.67	38.37	35.03	2,502.17
Gravel Chub	N	I	S	M	1	0.67	0.25	0.01	0.01	10.00
Suckermouth Minnow	N	I	S		6	4.00	1.48	0.02	0.02	5.50
Emerald Shiner	N	I	S		1	0.67	0.25	0.01	0.00	8.00
Silver Shiner	N	I	S	I	19	12.67	4.68	0.06	0.06	4.79
Rosyface Shiner	N	I	S	I	2	1.33	0.49	0.00	0.00	2.00
Striped Shiner	N	I	S		1	0.67	0.25	0.00	0.00	2.00
Steelcolor Shiner	N	I	M	P	2	1.33	0.49	0.01	0.01	5.50
Spotfin Shiner	N	I	M		22	14.67	5.42	0.04	0.03	2.59
Sand Shiner	N	I	M	M	9	6.00	2.22	0.01	0.01	1.56
Silverjaw Minnow	N	I	M		3	2.00	0.74	0.00	0.00	2.00
Bluntnose Minnow	N	O	C	T	37	24.67	9.11	0.03	0.03	1.27
Central Stoneroller	N	H	N		8	5.33	1.97	0.04	0.04	8.00
Common Carp X Goldfish	G	O		T	1	0.67	0.25	0.49	0.45	736.00
Channel Catfish	F		C		3	2.00	0.74	1.79	1.63	895.00
Stonecat Madtom		I	C	I	1	0.67	0.25	0.03	0.03	47.00
White Crappie	S	I	C		1	0.67	0.25	0.09	0.08	136.00
Rock Bass	S	C	C		1	0.67	0.25	0.03	0.03	48.00
Smallmouth Bass	F	C	C	M	18	12.00	4.43	1.75	1.60	145.83
Spotted Bass	F	C	C		11	7.33	2.71	2.14	1.96	292.45
Largemouth Bass	F	C	C		1	0.67	0.25	0.10	0.09	150.00
Bluegill Sunfish	S	I	C	P	3	2.00	0.74	0.05	0.04	23.33
Longear Sunfish	S	I	C	M	4	2.67	0.99	0.08	0.08	31.50
Logperch	D	I	S	M	1	0.67	0.25	0.01	0.01	14.00
Johnny Darter	D	I	C		2	1.33	0.49	0.00	0.00	2.00
Greenside Darter	D	I	S	M	6	4.00	1.48	0.01	0.01	3.67
Banded Darter	D	I	S	I	3	2.00	0.74	0.00	0.00	2.00
Rainbow Darter	D	I	S	M	1	0.67	0.25	0.00	0.00	2.00
Freshwater Drum			M	P	9	6.00	2.22	3.75	3.42	625.00
	Mile Total				406	270.67		109.54		
	Number of Species				40					
	Number of Hybrids				1					

River Code: **02-078**	Stream: **Walnut Creek**	Sample Date: **1996**
River Mile: **1.30**	Location: upst. Little Walnut Rd.	Date Range: 08/19/1996
Time Fished: 4898 sec	Drainage: 285.0 sq mi	Thru: 10/16/1996
Dist Fished: 1.00 km	Basin: Scioto River No of Passes: 2	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		3	3.00	1.44	0.21	0.16	69.67
Smallmouth Buffalo	C	I	M		1	1.00	0.48	2.00	1.58	2,000.00
Quillback Carpsucker	C	O	M		3	3.00	1.44	2.18	1.72	726.67
River Carpsucker	C	O	M		1	1.00	0.48	0.87	0.69	870.00
Highfin Carpsucker	C	O	M		1	1.00	0.48	0.90	0.71	900.00
Silver Redhorse	R	I	S	M	7	7.00	3.35	7.28	5.73	1,039.29
Golden Redhorse	R	I	S	M	33	33.00	15.79	11.45	9.02	346.93
Shorthead Redhorse	R	I	S	M	2	2.00	0.96	0.73	0.58	365.00
Northern Hog Sucker	R	I	S	M	10	10.00	4.78	0.97	0.76	96.80
White Sucker	W	O	S	T	1	1.00	0.48	0.52	0.41	516.00
Common Carp	G	O	M	T	35	35.00	16.75	75.40	59.43	2,154.29
Gravel Chub	N	I	S	M	1	1.00	0.48	0.00	0.00	1.00
Suckermouth Minnow	N	I	S		3	3.00	1.44	0.01	0.00	2.00
Emerald Shiner	N	I	S		11	11.00	5.26	0.05	0.04	4.18
Silver Shiner	N	I	S	I	3	3.00	1.44	0.02	0.02	6.67
Steelcolor Shiner	N	I	M	P	3	3.00	1.44	0.01	0.01	3.33
Spotfin Shiner	N	I	M		23	23.00	11.00	0.05	0.04	2.22
Sand Shiner	N	I	M	M	18	18.00	8.61	0.03	0.02	1.50
Bluntnose Minnow	N	O	C	T	5	5.00	2.39	0.01	0.01	1.60
Central Stoneroller	N	H	N		1	1.00	0.48	0.00	0.00	3.00
Channel Catfish	F		C		13	13.00	6.22	11.13	8.77	855.77
Rock Bass	S	C	C		1	1.00	0.48	0.02	0.02	22.00
Smallmouth Bass	F	C	C	M	4	4.00	1.91	0.77	0.61	192.75
Spotted Bass	F	C	C		4	4.00	1.91	0.19	0.15	48.00
Sauger	F	P	S		4	4.00	1.91	2.43	1.91	606.25
Greenside Darter	D	I	S	M	1	1.00	0.48	0.01	0.01	10.00
Banded Darter	D	I	S	I	1	1.00	0.48	0.00	0.00	2.00
Sauger X Walleye	E	P			1	1.00	0.48	0.30	0.24	300.00
Freshwater Drum			M	P	15	15.00	7.18	9.36	7.38	624.00
	Mile Total				209	209.00		126.88		
	Number of Species				28					
	Number of Hybrids				1					

River Code: 02-078	Stream: Walnut Creek	River Segment Totals
Mile Range: 1.30		Date Range: 07/23/1996
Thru: 53.00		Thru: 10/16/1996
Dist Fished: 12.15 km	Basin: Scioto River No of Passes: 49	Sampler Type: A 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
Silver Lamprey		P	N		3	0.10	0.02	0.00	0.01	33.67
Longnose Gar		P	M		4	0.13	0.02	0.00	0.00	16.00
Gizzard Shad		O	M		156	5.21	0.88	0.39	0.70	65.77
Smallmouth Buffalo	C	I	M		5	0.20	0.03	0.38	0.67	1,840.00
Quillback Carpsucker	C	O	M		127	4.40	0.74	1.89	3.37	420.18
River Carpsucker	C	O	M		20	0.82	0.14	0.77	1.37	939.50
Highfin Carpsucker	C	O	M		2	0.08	0.01	0.08	0.15	1,037.50
Silver Redhorse	R	I	S	M	388	12.91	2.18	5.38	9.60	392.00
Black Redhorse	R	I	S	I	7	0.21	0.04	0.04	0.08	205.00
Golden Redhorse	R	I	S	M	2,108	68.71	11.62	11.00	19.63	154.13
Shorthead Redhorse	R	I	S	M	29	1.11	0.19	0.36	0.65	324.83
Northern Hog Sucker	R	I	S	M	1,337	43.50	7.36	2.97	5.30	67.42
White Sucker	W	O	S	T	708	24.28	4.11	1.76	3.15	70.24
Spotted Sucker	R	I	S		53	1.65	0.28	0.35	0.62	211.34
Common Carp	G	O	M	T	385	13.91	2.35	21.64	38.60	1,517.09
Golden Shiner	N	I	M	T	6	0.18	0.03	0.01	0.01	29.17
Gravel Chub	N	I	S	M	2	0.08	0.01	0.00	0.00	5.50
Blacknose Dace	N	G	S	T	81	3.86	0.65	0.01	0.01	2.19
Creek Chub	N	G	N	T	740	24.00	4.06	0.40	0.71	16.79
Suckermouth Minnow	N	I	S		310	10.56	1.79	0.04	0.07	3.73
South. Redbelly Dace	N	H	S		23	0.94	0.16	0.00	0.00	1.52
Emerald Shiner	N	I	S		12	0.49	0.08	0.00	0.00	4.50
Silver Shiner	N	I	S	I	204	7.60	1.29	0.05	0.08	6.18
Rosyface Shiner	N	I	S	I	16	0.62	0.11	0.00	0.00	1.94
Rosefin Shiner	N	I	S	M	105	3.58	0.61	0.01	0.01	2.02
Striped Shiner	N	I	S		1,362	47.46	8.03	0.54	0.96	11.07
Steelcolor Shiner	N	I	M	P	7	0.27	0.04	0.00	0.00	4.43
Spotfin Shiner	N	I	M		1,155	41.05	6.94	0.14	0.25	3.45
Sand Shiner	N	I	M	M	946	32.49	5.50	0.06	0.10	1.74
Silverjaw Minnow	N	I	M		304	9.48	1.60	0.03	0.04	2.62
Fathead Minnow	N	O	C	T	15	0.47	0.08	0.00	0.00	2.60
Bluntnose Minnow	N	O	C	T	2,084	66.83	11.30	0.16	0.28	2.36
Central Stoneroller	N	H	N		1,898	61.10	10.34	0.41	0.73	6.55
Common Carp X Goldfish	G	O		T	3	0.10	0.02	0.08	0.14	753.67
Channel Catfish	F		C		47	1.80	0.30	1.92	3.42	1,077.57
Yellow Bullhead		I	C	T	27	0.83	0.14	0.14	0.24	163.52
Flathead Catfish	F	P	C		1	0.03	0.01	0.00	0.00	20.00
Stonecat Madtom		I	C	I	13	0.51	0.09	0.01	0.02	28.46
Blackstripe Topminnow		I	M		8	0.24	0.04	0.00	0.00	1.88
Trout-perch		I	M		46	1.67	0.28	0.01	0.03	8.04
White Bass	F	P	M		1	0.04	0.01	0.02	0.04	500.00
White Crappie	S	I	C		11	0.35	0.06	0.02	0.04	64.18
Black Crappie	S	I	C		3	0.10	0.02	0.00	0.01	48.33
Rock Bass	S	C	C		179	6.19	1.05	0.39	0.70	63.50
Smallmouth Bass	F	C	C	M	233	7.92	1.34	1.31	2.35	160.04
Spotted Bass	F	C	C		222	7.51	1.27	0.63	1.13	77.35
Largemouth Bass	F	C	C		31	1.00	0.17	0.15	0.27	151.74

River: 02-078 Walnut 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
Green Sunfish	S	I	C	T	406	15.24	2.58	0.13	0.22	7.96
Bluegill Sunfish	S	I	C	P	311	10.08	1.71	0.10	0.18	10.10
Longear Sunfish	S	I	C	M	486	16.50	2.79	0.31	0.55	18.53
Pumpkinseed Sunfish	S	I	C	P	1	0.03	0.01	0.00	0.00	5.00
Green Sf X Bluegill Sf					25	0.77	0.13	0.02	0.03	23.52
Longear Sf X Bluegill Sf					9	0.28	0.05	0.01	0.02	34.89
Green Sf X Longear Sf					5	0.15	0.03	0.01	0.01	52.00
Green Sf X Hybrid					1	0.03	0.01	0.00	0.00	10.00
Sauger	F	P	S		8	0.31	0.05	0.18	0.31	553.63
Blackside Darter	D	I	S		35	1.18	0.20	0.01	0.01	4.69
Logperch	D	I	S	M	24	0.77	0.13	0.02	0.03	21.13
Johnny Darter	D	I	C		110	3.51	0.59	0.00	0.01	1.24
Greenside Darter	D	I	S	M	318	10.17	1.72	0.04	0.06	3.53
Banded Darter	D	I	S	I	221	7.10	1.20	0.01	0.02	1.33
Rainbow Darter	D	I	S	M	4	0.15	0.03	0.00	0.00	2.50
Fantail Darter	D	I	C		74	2.94	0.50	0.00	0.01	1.23
Sauger X Walleye	E	P			7	0.28	0.05	0.16	0.29	617.14
Freshwater Drum			M	P	60	2.27	0.38	1.50	2.67	662.34
Mottled Sculpin		I	C		91	2.82	0.48	0.02	0.03	6.17
	Stream Total				17,623	591.16		56.04		
	Number of Species				60					
	Number of Hybrids				6					

River Code: **02-079**	Stream: **Little Walnut Creek**	Sample Date: **1996**
River Mile: **4.90**	Location:	Date Range: 08/22/1996
Time Fished: 1801 sec	Drainage: 15.1 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	13	26.00	3.66	1.34	15.54	51.69
White Sucker	W	O	S	T	8	16.00	2.25	0.76	8.79	47.50
Blacknose Dace	N	G	S	T	2	4.00	0.56	0.01	0.09	2.00
Creek Chub	N	G	N	T	74	148.00	20.85	3.20	36.99	21.62
Striped Shiner	N	I	S		59	118.00	16.62	1.49	17.27	12.66
Spotfin Shiner	N	I	M		2	4.00	0.56	0.02	0.21	4.50
Sand Shiner	N	I	M	M	17	34.00	4.79	0.06	0.74	1.88
Silverjaw Minnow	N	I	M		40	80.00	11.27	0.06	0.72	0.78
Bluntnose Minnow	N	O	C	T	12	24.00	3.38	0.04	0.46	1.67
Central Stoneroller	N	H	N		37	74.00	10.42	0.71	8.21	9.59
Rock Bass	S	C	C		5	10.00	1.41	0.14	1.62	14.00
Smallmouth Bass	F	C	C	M	10	20.00	2.82	0.44	5.13	22.20
Johnny Darter	D	I	C		1	2.00	0.28	0.00	0.05	2.00
Greenside Darter	D	I	S	M	4	8.00	1.13	0.04	0.51	5.50
Rainbow Darter	D	I	S	M	53	106.00	14.93	0.19	2.20	1.79
Orangethroat Darter	D	I	S		3	6.00	0.85	0.01	0.14	2.00
Fantail Darter	D	I	C		12	24.00	3.38	0.04	0.51	1.83
Mottled Sculpin		I	C		3	6.00	0.85	0.07	0.83	12.00
Mile Total					355	710.00		8.65		
Number of Species					18					
Number of Hybrids					0					

River Code: **02-079**	Stream: **Little Walnut Creek**	Sample Date: **1996**
River Mile: **1.50**	Location:	Date Range: 07/22/1996
Time Fished: 4156 sec	Drainage: 39.0 sq mi	Thru: 09/17/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	7	5.25	0.58	0.31	2.79	58.57
Northern Hog Sucker	R	I	S	M	62	46.50	5.11	2.33	21.17	50.16
White Sucker	W	O	S	T	47	35.25	3.87	1.71	15.48	48.40
Blacknose Dace	N	G	S	T	6	4.50	0.49	0.01	0.06	1.50
Creek Chub	N	G	N	T	42	31.50	3.46	0.62	5.62	19.64
Suckermouth Minnow	N	I	S		1	0.75	0.08	0.00	0.02	3.00
Silver Shiner	N	I	S	I	14	10.50	1.15	0.06	0.51	5.36
Striped Shiner	N	I	S		261	195.75	21.50	2.62	23.79	13.39
Spotfin Shiner	N	I	M		12	9.00	0.99	0.02	0.18	2.22
Sand Shiner	N	I	M	M	131	98.25	10.79	0.19	1.76	1.97
Silverjaw Minnow	N	I	M		40	30.00	3.29	0.05	0.48	1.75
Fathead Minnow	N	O	C	T	1	0.75	0.08	0.00	0.01	2.00
Bluntnose Minnow	N	O	C	T	133	99.75	10.96	0.23	2.12	2.35
Central Stoneroller	N	H	N		281	210.75	23.15	1.91	17.33	9.06
Yellow Bullhead		I	C	T	2	1.50	0.16	0.11	0.99	72.50
Rock Bass	S	C	C		8	6.00	0.66	0.19	1.76	32.25
Smallmouth Bass	F	C	C	M	22	16.50	1.81	0.32	2.92	19.45
Largemouth Bass	F	C	C		1	0.75	0.08	0.04	0.37	54.00
Green Sunfish	S	I	C	T	10	7.50	0.82	0.05	0.44	6.50
Bluegill Sunfish	S	I	C	P	5	3.75	0.41	0.03	0.26	7.60
Johnny Darter	D	I	C		6	4.50	0.49	0.01	0.08	1.83
Greenside Darter	D	I	S	M	12	9.00	0.99	0.03	0.27	3.25
Banded Darter	D	I	S	I	4	3.00	0.33	0.01	0.05	2.00
Rainbow Darter	D	I	S	M	82	61.50	6.75	0.10	0.89	1.60
Orangethroat Darter	D	I	S		2	1.50	0.16	0.00	0.03	2.00
Fantail Darter	D	I	C		6	4.50	0.49	0.01	0.08	2.00
Mottled Sculpin		I	C		16	12.00	1.32	0.06	0.57	5.19
	Mile Total				1,214	910.50		11.02		
	Number of Species				27					
	Number of Hybrids				0					

River Code: **02-079**	Stream: **Little Walnut Creek**	River Segment Totals
Mile Range: **1.50**		Date Range: 07/22/1996
Thru: **4.90**		Thru: 09/17/1996
Dist Fished: 0.55 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	7	3.50	0.41	0.21	2.00	58.57
Northern Hog Sucker	R	I	S	M	75	39.67	4.70	2.00	19.58	50.43
White Sucker	W	O	S	T	55	28.83	3.42	1.39	13.60	48.27
Blacknose Dace	N	G	S	T	8	4.33	0.51	0.01	0.07	1.63
Creek Chub	N	G	N	T	116	70.33	8.34	1.48	14.46	20.91
Suckermouth Minnow	N	I	S		1	0.50	0.06	0.00	0.02	3.00
Silver Shiner	N	I	S	I	14	7.00	0.83	0.04	0.37	5.36
Striped Shiner	N	I	S		320	169.83	20.13	2.25	21.95	13.26
Spotfin Shiner	N	I	M		14	7.33	0.87	0.02	0.19	2.55
Sand Shiner	N	I	M	M	148	76.83	9.11	0.15	1.47	1.96
Silverjaw Minnow	N	I	M		80	46.67	5.53	0.06	0.54	1.26
Fathead Minnow	N	O	C	T	1	0.50	0.06	0.00	0.01	2.00
Bluntnose Minnow	N	O	C	T	145	74.50	8.83	0.17	1.66	2.29
Central Stoneroller	N	H	N		318	165.17	19.58	1.51	14.76	9.12
Yellow Bullhead		I	C	T	2	1.00	0.12	0.07	0.71	72.50
Rock Bass	S	C	C		13	7.33	0.87	0.18	1.72	25.23
Smallmouth Bass	F	C	C	M	32	17.67	2.09	0.36	3.54	20.31
Largemouth Bass	F	C	C		1	0.50	0.06	0.03	0.26	54.00
Green Sunfish	S	I	C	T	10	5.00	0.59	0.03	0.32	6.50
Bluegill Sunfish	S	I	C	P	5	2.50	0.30	0.02	0.19	7.60
Johnny Darter	D	I	C		7	3.67	0.43	0.01	0.07	1.86
Greenside Darter	D	I	S	M	16	8.67	1.03	0.03	0.34	3.81
Banded Darter	D	I	S	I	4	2.00	0.24	0.00	0.04	2.00
Rainbow Darter	D	I	S	M	135	76.33	9.05	0.13	1.26	1.68
Orangethroat Darter	D	I	S		5	3.00	0.36	0.01	0.06	2.00
Fantail Darter	D	I	C		18	11.00	1.30	0.02	0.20	1.89
Mottled Sculpin		I	C		19	10.00	1.19	0.07	0.64	6.26
	Stream Total				1,569	843.67		10.23		
	Number of Species				27					
	Number of Hybrids				0					

River Code: **02-080**	Stream: **Turkey Run**	Sample Date: **1996**
River Mile: **0.20**	Location:	Date Range: 07/22/1996
Time Fished: 1740 sec	Drainage: 15.5 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	2	4.00	0.33	0.14	1.73	35.00
Northern Hog Sucker	R	I	S	M	15	30.00	2.50	1.04	12.83	34.67
White Sucker	W	O	S	T	8	16.00	1.33	0.67	8.24	41.75
Blacknose Dace	N	G	S	T	40	80.00	6.66	0.14	1.75	1.78
Creek Chub	N	G	N	T	84	168.00	13.98	2.61	32.13	15.51
Suckermouth Minnow	N	I	S		2	4.00	0.33	0.01	0.10	2.00
South. Redbelly Dace	N	H	S		2	4.00	0.33	0.01	0.10	2.00
Striped Shiner	N	I	S		50	100.00	8.32	1.19	14.68	11.90
Sand Shiner	N	I	M	M	38	76.00	6.32	0.12	1.49	1.59
Silverjaw Minnow	N	I	M		92	184.00	15.31	0.27	3.28	1.45
Bluntnose Minnow	N	O	C	T	47	94.00	7.82	0.42	5.13	4.43
Central Stoneroller	N	H	N		99	198.00	16.47	0.86	10.66	4.36
Rock Bass	S	C	C		4	8.00	0.67	0.19	2.32	23.50
Johnny Darter	D	I	C		8	16.00	1.33	0.02	0.30	1.50
Greenside Darter	D	I	S	M	4	8.00	0.67	0.04	0.49	5.00
Banded Darter	D	I	S	I	3	6.00	0.50	0.01	0.17	2.33
Rainbow Darter	D	I	S	M	79	158.00	13.14	0.24	2.91	1.49
Orangethroat Darter	D	I	S		1	2.00	0.17	0.00	0.05	2.00
Fantail Darter	D	I	C		14	28.00	2.33	0.05	0.57	1.64
Mottled Sculpin		I	C		9	18.00	1.50	0.09	1.09	4.89
Mile Total					601	1,202.00		8.11		
Number of Species					20					
Number of Hybrids					0					

River Code: **02-080**	Stream: **Turkey Run**	River Segment Totals
Mile Range: **0.20**		Date Range: 07/22/1996
Dist Fished: 0.15 km	Basin: Scioto 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	2	4.00	0.33	0.14	1.73	35.00
Northern Hog Sucker	R	I	S	M	15	30.00	2.50	1.04	12.83	34.67
White Sucker	W	O	S	T	8	16.00	1.33	0.67	8.24	41.75
Blacknose Dace	N	G	S	T	40	80.00	6.66	0.14	1.75	1.78
Creek Chub	N	G	N	T	84	168.00	13.98	2.61	32.13	15.51
Suckermouth Minnow	N	I	S		2	4.00	0.33	0.01	0.10	2.00
South. Redbelly Dace	N	H	S		2	4.00	0.33	0.01	0.10	2.00
Striped Shiner	N	I	S		50	100.00	8.32	1.19	14.68	11.90
Sand Shiner	N	I	M	M	38	76.00	6.32	0.12	1.49	1.59
Silverjaw Minnow	N	I	M		92	184.00	15.31	0.27	3.28	1.45
Bluntnose Minnow	N	O	C	T	47	94.00	7.82	0.42	5.13	4.43
Central Stoneroller	N	H	N		99	198.00	16.47	0.86	10.66	4.36
Rock Bass	S	C	C		4	8.00	0.67	0.19	2.32	23.50
Johnny Darter	D	I	C		8	16.00	1.33	0.02	0.30	1.50
Greenside Darter	D	I	S	M	4	8.00	0.67	0.04	0.49	5.00
Banded Darter	D	I	S	I	3	6.00	0.50	0.01	0.17	2.33
Rainbow Darter	D	I	S	M	79	158.00	13.14	0.24	2.91	1.49
Orangethroat Darter	D	I	S		1	2.00	0.17	0.00	0.05	2.00
Fantail Darter	D	I	C		14	28.00	2.33	0.05	0.57	1.64
Mottled Sculpin		I	C		9	18.00	1.50	0.09	1.09	4.89
Stream Total					601	1,202.00		8.11		
Number of Species					20					
Number of Hybrids					0					

River Code: **02-083**	Stream: **Big Run**	Sample Date: **1996**
River Mile: **1.60**	Location:	Date Range: 09/06/1996
Time Fished: 1321 sec	Drainage: 6.3 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	1	2.00	0.06	0.01	0.21	6.00
Northern Hog Sucker	R	I	S	M	2	4.00	0.11	0.02	0.42	6.00
White Sucker	W	O	S	T	1	2.00	0.06	0.04	0.78	22.00
Common Carp	G	O	M	T	12	24.00	0.67	0.24	4.17	9.83
Blacknose Dace	N	G	S	T	290	580.00	16.21	0.91	15.99	1.56
Creek Chub	N	G	N	T	179	358.00	10.01	1.22	21.50	3.40
Striped Shiner	N	I	S		600	1,200.00	33.54	0.86	15.27	0.72
Spotfin Shiner	N	I	M		2	4.00	0.11	0.01	0.25	3.50
Silverjaw Minnow	N	I	M		231	462.00	12.91	0.32	5.71	0.70
Fathead Minnow	N	O	C	T	142	284.00	7.94	0.51	9.03	1.80
Bluntnose Minnow	N	O	C	T	195	390.00	10.90	0.50	8.82	1.28
Central Stoneroller	N	H	N		30	60.00	1.68	0.34	6.04	5.70
Yellow Bullhead		I	C	T	3	6.00	0.17	0.01	0.21	2.00
Green Sunfish	S	I	C	T	34	68.00	1.90	0.36	6.36	5.29
Bluegill Sunfish	S	I	C	P	27	54.00	1.51	0.22	3.89	4.07
Johnny Darter	D	I	C		8	16.00	0.45	0.02	0.28	1.00
Rainbow Darter	D	I	S	M	2	4.00	0.11	0.01	0.14	2.00
Orangethroat Darter	D	I	S		30	60.00	1.68	0.05	0.92	0.87
Mile Total					1,789	3,578.00		5.66		
Number of Species					18					
Number of Hybrids					0					

River Code: **02-083**	Stream: **Big Run**	River Segment Totals
Mile Range: **1.60**		Date Range: 09/06/1996
Dist Fished: 0.15 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	1	2.00	0.06	0.01	0.21	6.00
Northern Hog Sucker	R	I	S	M	2	4.00	0.11	0.02	0.42	6.00
White Sucker	W	O	S	T	1	2.00	0.06	0.04	0.78	22.00
Common Carp	G	O	M	T	12	24.00	0.67	0.24	4.17	9.83
Blacknose Dace	N	G	S	T	290	580.00	16.21	0.91	15.99	1.56
Creek Chub	N	G	N	T	179	358.00	10.01	1.22	21.50	3.40
Striped Shiner	N	I	S		600	1,200.00	33.54	0.86	15.27	0.72
Spotfin Shiner	N	I	M		2	4.00	0.11	0.01	0.25	3.50
Silverjaw Minnow	N	I	M		231	462.00	12.91	0.32	5.71	0.70
Fathead Minnow	N	O	C	T	142	284.00	7.94	0.51	9.03	1.80
Bluntnose Minnow	N	O	C	T	195	390.00	10.90	0.50	8.82	1.28
Central Stoneroller	N	H	N		30	60.00	1.68	0.34	6.04	5.70
Yellow Bullhead		I	C	T	3	6.00	0.17	0.01	0.21	2.00
Green Sunfish	S	I	C	T	34	68.00	1.90	0.36	6.36	5.29
Bluegill Sunfish	S	I	C	P	27	54.00	1.51	0.22	3.89	4.07
Johnny Darter	D	I	C		8	16.00	0.45	0.02	0.28	1.00
Rainbow Darter	D	I	S	M	2	4.00	0.11	0.01	0.14	2.00
Orangethroat Darter	D	I	S		30	60.00	1.68	0.05	0.92	0.87
	Stream Total				1,789	3,578.00		5.66		
	Number of Species				18					
	Number of Hybrids				0					

River Code: **02-084**	Stream: **Georges Creek**	Sample Date: **1996**
River Mile: **4.30**	Location:	Date Range: 07/11/1996
Time Fished: 2115 sec	Drainage: 3.2 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	20	40.00	2.77	1.40	12.23	35.10
Common Carp	G	O	M	T	1	2.00	0.14	0.13	1.12	64.00
Blacknose Dace	N	G	S	T	33	66.00	4.56	0.22	1.92	3.33
Creek Chub	N	G	N	T	451	902.00	62.38	7.40	64.44	8.20
Striped Shiner	N	I	S		16	32.00	2.21	0.68	5.92	21.25
Fathead Minnow	N	O	C	T	2	4.00	0.28	0.01	0.07	2.00
Bluntnose Minnow	N	O	C	T	116	232.00	16.04	0.44	3.87	1.91
Central Stoneroller	N	H	N		1	2.00	0.14	0.32	2.79	160.00
Blackstripe Topminnow		I	M		2	4.00	0.28	0.01	0.09	2.50
Green Sunfish	S	I	C	T	26	52.00	3.60	0.61	5.30	11.69
Bluegill Sunfish	S	I	C	P	2	4.00	0.28	0.10	0.87	25.00
Johnny Darter	D	I	C		51	102.00	7.05	0.12	1.05	1.18
Greenside Darter	D	I	S	M	2	4.00	0.28	0.04	0.35	10.00
Mile Total					723	1,446.00		11.48		
Number of Species					13					
Number of Hybrids					0					

River Code: 02-084	Stream: Georges Creek	Sample Date: 1996
River Mile: 2.40	Location:	Date Range: 07/11/1996
Time Fished: 2162 sec	Drainage: 4.4 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	17	34.00	14.66	1.00	28.30	29.41
Common Carp	G	O	M	T	4	8.00	3.45	0.28	7.93	35.00
Blacknose Dace	N	G	S	T	5	10.00	4.31	0.06	1.70	6.00
Creek Chub	N	G	N	T	62	124.00	53.45	1.65	46.62	13.28
Fathead Minnow	N	O	C	T	4	8.00	3.45	0.03	0.76	3.33
Bluntnose Minnow	N	O	C	T	10	20.00	8.62	0.05	1.42	2.50
Yellow Bullhead		I	C	T	1	2.00	0.86	0.26	7.36	130.00
Green Sunfish	S	I	C	T	8	16.00	6.90	0.10	2.83	6.25
Bluegill Sunfish	S	I	C	P	3	6.00	2.59	0.07	1.98	11.67
Greenside Darter	D	I	S	M	1	2.00	0.86	0.02	0.57	10.00
Mottled Sculpin		I	C		1	2.00	0.86	0.02	0.57	10.00
Mile Total					116	232.00		3.53		
Number of Species					11					
Number of Hybrids					0					

River Code: **02-084**	Stream: **Georges Creek**	Sample Date: **1996**
River Mile: **0.10**	Location:	Date Range: 07/11/1996
Time Fished: 2366 sec	Drainage: 15.4 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	8	12.00	3.27	0.68	6.70	56.38
Northern Hog Sucker	R	I	S	M	19	28.50	7.76	3.20	31.71	112.37
White Sucker	W	O	S	T	23	34.50	9.39	1.35	13.37	39.13
Common Carp	G	O	M	T	17	25.50	6.94	1.04	10.31	40.82
Golden Shiner	N	I	M	T	1	1.50	0.41	0.01	0.05	3.00
Blacknose Dace	N	G	S	T	1	1.50	0.41	0.00	0.03	2.00
Creek Chub	N	G	N	T	3	4.50	1.22	0.02	0.15	3.33
Striped Shiner	N	I	S		61	91.50	24.90	1.16	11.43	12.62
Spotfin Shiner	N	I	M		23	34.50	9.39	0.09	0.89	2.61
Sand Shiner	N	I	M	M	6	9.00	2.45	0.02	0.20	2.17
Fathead Minnow	N	O	C	T	10	15.00	4.08	0.02	0.18	1.20
Bluntnose Minnow	N	O	C	T	35	52.50	14.29	0.14	1.39	2.66
Central Stoneroller	N	H	N		3	4.50	1.22	0.01	0.14	3.00
Yellow Bullhead		I	C	T	1	1.50	0.41	0.08	0.82	55.00
Rock Bass	S	C	C		4	6.00	1.63	0.58	5.72	96.25
Smallmouth Bass	F	C	C	M	2	3.00	0.82	0.94	9.35	314.50
Spotted Bass	F	C	C		4	6.00	1.63	0.57	5.64	95.00
Green Sunfish	S	I	C	T	12	18.00	4.90	0.13	1.27	7.08
Bluegill Sunfish	S	I	C	P	4	6.00	1.63	0.02	0.15	2.50
Greenside Darter	D	I	S	M	8	12.00	3.27	0.06	0.56	4.75
Mile Total					245	367.50		10.10		
Number of Species					20					
Number of Hybrids					0					

River Code: **02-084**	Stream: **Georges Creek**	River Segment Totals
Mile Range: **0.10**		Date Range: 07/11/1996
Thru: **4.30**		
Dist Fished: 0.50 km	Basin: Scioto River No of Passes: 3	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
Golden Redhorse	R	I	S	M	8	4.00	0.59	0.23	2.70	56.38
Northern Hog Sucker	R	I	S	M	19	9.50	1.39	1.07	12.75	112.37
White Sucker	W	O	S	T	60	36.17	5.30	1.25	14.95	35.03
Common Carp	G	O	M	T	22	11.83	1.74	0.48	5.77	40.82
Golden Shiner	N	I	M	T	1	0.50	0.07	0.00	0.02	3.00
Blacknose Dace	N	G	S	T	39	25.83	3.79	0.09	1.13	3.64
Creek Chub	N	G	N	T	516	343.50	50.38	3.02	36.07	8.78
Striped Shiner	N	I	S		77	41.17	6.04	0.61	7.31	14.42
Spotfin Shiner	N	I	M		23	11.50	1.69	0.03	0.36	2.61
Sand Shiner	N	I	M	M	6	3.00	0.44	0.01	0.08	2.17
Fathead Minnow	N	O	C	T	16	9.00	1.32	0.02	0.21	1.83
Bluntnose Minnow	N	O	C	T	161	101.50	14.89	0.21	2.52	2.11
Central Stoneroller	N	H	N		4	2.17	0.32	0.11	1.33	42.25
Yellow Bullhead		I	C	T	2	1.17	0.17	0.11	1.37	92.50
Blackstripe Topminnow		I	M		2	1.33	0.20	0.00	0.04	2.50
Rock Bass	S	C	C		4	2.00	0.29	0.19	2.30	96.25
Smallmouth Bass	F	C	C	M	2	1.00	0.15	0.31	3.76	314.50
Spotted Bass	F	C	C		4	2.00	0.29	0.19	2.27	95.00
Green Sunfish	S	I	C	T	46	28.67	4.20	0.28	3.33	9.54
Bluegill Sunfish	S	I	C	P	9	5.33	0.78	0.06	0.74	10.56
Johnny Darter	D	I	C		51	34.00	4.99	0.04	0.48	1.18
Greenside Darter	D	I	S	M	11	6.00	0.88	0.04	0.47	6.18
Mottled Sculpin		I	C		1	0.67	0.10	0.01	0.08	10.00
Stream Total					1,084	681.83		8.37		
Number of Species					23					
Number of Hybrids					0					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **12.20**	Location:	Date Range: 08/29/1996
Time Fished: 1729 sec	Drainage: 4.6 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	17	34.00	3.37	1.80	18.67	52.94
Blacknose Dace	N	G	S	T	4	8.00	0.79	0.02	0.17	2.00
Creek Chub	N	G	N	T	295	590.00	58.42	4.54	47.05	7.69
Striped Shiner	N	I	S		20	40.00	3.96	0.15	1.56	3.75
Bluntnose Minnow	N	O	C	T	9	18.00	1.78	0.05	0.52	2.78
Central Stoneroller	N	H	N		19	38.00	3.76	0.13	1.39	3.53
Yellow Bullhead		I	C	T	3	6.00	0.59	0.83	8.61	138.33
Rock Bass	S	C	C		2	4.00	0.40	0.20	2.03	49.00
Green Sunfish	S	I	C	T	38	76.00	7.52	1.10	11.37	14.42
Bluegill Sunfish	S	I	C	P	3	6.00	0.59	0.07	0.73	11.67
Green Sf X Bluegill Sf					5	10.00	0.99	0.21	2.21	21.25
Johnny Darter	D	I	C		21	42.00	4.16	0.05	0.52	1.19
Mottled Sculpin		I	C		69	138.00	13.66	0.50	5.19	3.62
Mile Total					505	1,010.00		9.64		
Number of Species					12					
Number of Hybrids					1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **9.50**	Location:	Date Range: 08/29/1996
Time Fished: 2446 sec	Drainage: 8.7 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	1	2.00	0.09	0.19	1.77	95.00
White Sucker	W	O	S	T	4	8.00	0.38	0.47	4.35	58.50
Common Carp	G	O	M	T	1	2.00	0.09	0.30	2.79	150.00
Blacknose Dace	N	G	S	T	42	84.00	3.97	0.20	1.86	2.38
Creek Chub	N	G	N	T	305	610.00	28.80	3.20	29.72	5.24
Striped Shiner	N	I	S		106	212.00	10.01	1.70	15.79	8.02
Sand Shiner	N	I	M	M	2	4.00	0.19	0.01	0.11	3.00
Silverjaw Minnow	N	I	M		5	10.00	0.47	0.03	0.32	3.40
Bluntnose Minnow	N	O	C	T	83	166.00	7.84	0.20	1.85	1.20
Central Stoneroller	N	H	N		308	616.00	29.08	2.89	26.81	4.68
Rock Bass	S	C	C		5	10.00	0.47	0.29	2.69	29.00
Largemouth Bass	F	C	C		1	2.00	0.09	0.03	0.26	14.00
Green Sunfish	S	I	C	T	2	4.00	0.19	0.04	0.35	9.50
Bluegill Sunfish	S	I	C	P	4	8.00	0.38	0.06	0.56	7.50
Johnny Darter	D	I	C		48	96.00	4.53	0.10	0.93	1.04
Greenside Darter	D	I	S	M	1	2.00	0.09	0.01	0.13	7.00
Fantail Darter	D	I	C		6	12.00	0.57	0.03	0.27	2.40
Mottled Sculpin		I	C		135	270.00	12.75	1.02	9.45	3.77
Mile Total					1,059	2,118.00		10.76		
Number of Species					18					
Number of Hybrids					0					

Species List

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **8.50**	Location:	Date Range: 08/29/1996
Time Fished: 1961 sec	Drainage: 9.7 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	7	14.00	0.81	1.19	6.13	85.00
White Sucker	W	O	S	T	56	112.00	6.44	3.87	19.93	34.55
Blacknose Dace	N	G	S	T	74	148.00	8.52	0.28	1.44	1.89
Creek Chub	N	G	N	T	259	518.00	29.80	7.40	38.12	14.29
South. Redbelly Dace	N	H	S		2	4.00	0.23	0.01	0.06	3.00
Silver Shiner	N	I	S	I	77	154.00	8.86	1.66	8.55	10.78
Spotfin Shiner	N	I	M		1	2.00	0.12	0.01	0.04	4.00
Silverjaw Minnow	N	I	M		2	4.00	0.23	0.02	0.10	5.00
Bluntnose Minnow	N	O	C	T	16	32.00	1.84	0.12	0.64	3.87
Central Stoneroller	N	H	N		138	276.00	15.88	2.49	12.84	9.03
Rock Bass	S	C	C		3	6.00	0.35	0.24	1.24	40.00
Green Sunfish	S	I	C	T	10	20.00	1.15	0.26	1.35	13.10
Bluegill Sunfish	S	I	C	P	13	26.00	1.50	0.18	0.93	6.92
Green Sf X Bluegill Sf					1	2.00	0.12	0.08	0.39	38.00
Johnny Darter	D	I	C		8	16.00	0.92	0.03	0.14	1.75
Greenside Darter	D	I	S	M	4	8.00	0.46	0.03	0.14	3.50
Mottled Sculpin		I	C		198	396.00	22.78	1.54	7.95	3.90
Mile Total					869	1,738.00		19.41		
Number of Species					16					
Number of Hybrids					1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **6.10**	Location:	Date Range: 08/21/1996
Time Fished: 3600 sec	Drainage: 14.8 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	5	7.50	0.98	0.68	3.10	90.00
White Sucker	W	O	S	T	122	183.00	23.83	5.82	26.71	31.82
Common Carp	G	O	M	T	2	3.00	0.39	7.20	33.03	2,400.00
Blacknose Dace	N	G	S	T	1	1.50	0.20	0.01	0.02	3.00
Creek Chub	N	G	N	T	127	190.50	24.80	3.37	15.47	17.71
Striped Shiner	N	I	S		39	58.50	7.62	0.78	3.58	13.33
Sand Shiner	N	I	M	M	1	1.50	0.20	0.01	0.02	3.00
Bluntnose Minnow	N	O	C	T	9	13.50	1.76	0.04	0.18	2.86
Central Stoneroller	N	H	N		67	100.50	13.09	1.05	4.80	10.42
Yellow Bullhead		I	C	T	1	1.50	0.20	0.05	0.21	30.00
Trout-perch		I	M		3	4.50	0.59	0.08	0.38	18.33
White Crappie	S	I	C		1	1.50	0.20	0.14	0.66	95.00
Rock Bass	S	C	C		4	6.00	0.78	0.83	3.78	137.50
Largemouth Bass	F	C	C		1	1.50	0.20	0.01	0.03	4.00
Green Sunfish	S	I	C	T	20	30.00	3.91	0.42	1.94	14.10
Bluegill Sunfish	S	I	C	P	15	22.50	2.93	0.24	1.10	10.67
Green Sf X Bluegill Sf					13	19.50	2.54	0.63	2.89	32.31
Johnny Darter	D	I	C		14	21.00	2.73	0.03	0.13	1.38
Greenside Darter	D	I	S	M	11	16.50	2.15	0.07	0.33	4.36
Mottled Sculpin		I	C		56	84.00	10.94	0.36	1.64	4.25
Mile Total					512	768.00		21.80		
Number of Species					19					
Number of Hybrids					1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **4.70**	Location:	Date Range: 08/21/1996
Time Fished: 5276 sec	Drainage: 17.3 sq mi	Thru: 09/18/1996
Dist Fished: 0.40 km	Basin: Scioto 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	21	15.75	1.62	1.46	11.87	92.62
White Sucker	W	O	S	T	125	93.75	9.65	3.32	27.03	35.42
Common Carp	G	O	M	T	2	1.50	0.15	0.07	0.56	45.50
Golden Shiner	N	I	M	T	1	0.75	0.08	0.00	0.02	3.00
Blacknose Dace	N	G	S	T	19	14.25	1.47	0.05	0.38	3.26
Creek Chub	N	G	N	T	358	268.50	27.62	3.20	26.08	11.93
Suckermouth Minnow	N	I	S		8	6.00	0.62	0.03	0.26	5.25
Silver Shiner	N	I	S	I	10	7.50	0.77	0.04	0.29	4.80
Striped Shiner	N	I	S		224	168.00	17.28	1.93	15.67	11.46
Spotfin Shiner	N	I	M		17	12.75	1.31	0.03	0.22	2.06
Sand Shiner	N	I	M	M	10	7.50	0.77	0.02	0.14	2.20
Silverjaw Minnow	N	I	M		6	4.50	0.46	0.01	0.09	2.50
Bluntnose Minnow	N	O	C	T	83	62.25	6.40	0.15	1.25	2.47
Central Stoneroller	N	H	N		169	126.75	13.04	0.80	6.48	6.29
Yellow Bullhead		I	C	T	1	0.75	0.08	0.02	0.12	20.00
Rock Bass	S	C	C		2	1.50	0.15	0.08	0.62	51.00
Largemouth Bass	F	C	C		8	6.00	0.62	0.02	0.19	3.88
Green Sunfish	S	I	C	T	25	18.75	1.93	0.15	1.21	7.94
Bluegill Sunfish	S	I	C	P	7	5.25	0.54	0.06	0.46	10.57
Green Sf X Bluegill Sf					12	9.00	0.93	0.36	2.90	39.58
Johnny Darter	D	I	C		50	37.50	3.86	0.05	0.37	1.22
Greenside Darter	D	I	S	M	22	16.50	1.70	0.05	0.43	3.18
Rainbow Darter	D	I	S	M	2	1.50	0.15	0.00	0.02	2.00
Mottled Sculpin		I	C		114	85.50	8.80	0.41	3.36	4.82
	Mile Total				1,296	972.00		12.29		
	Number of Species				23					
	Number of Hybrids				1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **4.20**	Location:	Date Range: 08/21/1996
Time Fished: 4950 sec	Drainage: 18.6 sq mi	Thru: 09/18/1996
Dist Fished: 0.40 km	Basin: Scioto 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		1	0.75	0.08	0.01	0.05	15.00
Northern Hog Sucker	R	I	S	M	29	21.75	2.36	1.90	7.65	87.41
White Sucker	W	O	S	T	159	119.25	12.92	6.12	24.60	51.29
Common Carp	G	O	M	T	12	9.00	0.97	9.22	37.07	1,024.00
Golden Shiner	N	I	M	T	4	3.00	0.32	0.02	0.10	8.00
Blacknose Dace	N	G	S	T	41	30.75	3.33	0.09	0.38	3.06
Creek Chub	N	G	N	T	246	184.50	19.98	2.04	8.20	11.05
Suckermouth Minnow	N	I	S		3	2.25	0.24	0.01	0.02	2.33
Silver Shiner	N	I	S	I	17	12.75	1.38	0.07	0.29	5.71
Striped Shiner	N	I	S		214	160.50	17.38	1.34	5.38	8.33
Spotfin Shiner	N	I	M		25	18.75	2.03	0.04	0.17	2.25
Sand Shiner	N	I	M	M	7	5.25	0.57	0.01	0.05	2.57
Silverjaw Minnow	N	I	M		5	3.75	0.41	0.01	0.05	3.00
Bluntnose Minnow	N	O	C	T	41	30.75	3.33	0.10	0.40	3.22
Central Stoneroller	N	H	N		147	110.25	11.94	0.71	2.84	6.40
Yellow Bullhead		I	C	T	13	9.75	1.06	0.28	1.13	28.85
Trout-perch		I	M		1	0.75	0.08	0.01	0.05	16.00
Rock Bass	S	C	C		9	6.75	0.73	0.23	0.91	33.56
Largemouth Bass	F	C	C		1	0.75	0.08	0.02	0.06	20.00
Green Sunfish	S	I	C	T	58	43.50	4.71	0.48	1.92	10.98
Bluegill Sunfish	S	I	C	P	24	18.00	1.95	0.18	0.73	10.00
Green Sf X Bluegill Sf					55	41.25	4.47	1.63	6.55	39.45
Blackside Darter	D	I	S		1	0.75	0.08	0.01	0.02	8.00
Johnny Darter	D	I	C		33	24.75	2.68	0.03	0.11	1.12
Greenside Darter	D	I	S	M	41	30.75	3.33	0.15	0.59	4.76
Mottled Sculpin		I	C		44	33.00	3.57	0.18	0.70	5.30
Mile Total					1,231	923.25		24.86		
Number of Species					25					
Number of Hybrids					1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **2.60**	Location:	Date Range: 08/22/1996
Time Fished: 5361 sec	Drainage: 21.6 sq mi	Thru: 09/18/1996
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		8	6.00	1.40	0.44	1.12	73.00
Golden Redhorse	R	I	S	M	2	1.50	0.35	0.19	0.47	124.00
Northern Hog Sucker	R	I	S	M	20	15.00	3.50	1.38	3.52	92.00
White Sucker	W	O	S	T	48	36.00	8.41	1.41	3.58	39.06
Spotted Sucker	R	I	S		1	0.75	0.18	0.02	0.05	25.00
Common Carp	G	O	M	T	35	26.25	6.13	29.40	74.88	1,119.86
Creek Chub	N	G	N	T	54	40.50	9.46	0.97	2.47	23.89
Silver Shiner	N	I	S	I	3	2.25	0.53	0.01	0.03	5.67
Rosefin Shiner	N	I	S	M	2	1.50	0.35	0.00	0.01	2.00
Striped Shiner	N	I	S		121	90.75	21.19	1.00	2.55	11.03
Spotfin Shiner	N	I	M		16	12.00	2.80	0.05	0.14	4.44
Sand Shiner	N	I	M	M	17	12.75	2.98	0.03	0.06	1.94
Silverjaw Minnow	N	I	M		2	1.50	0.35	0.00	0.01	3.00
Bluntnose Minnow	N	O	C	T	9	6.75	1.58	0.01	0.03	1.56
Central Stoneroller	N	H	N		12	9.00	2.10	0.04	0.09	4.00
Yellow Bullhead		I	C	T	8	6.00	1.40	0.42	1.07	70.25
White Crappie	S	I	C		1	0.75	0.18	0.01	0.02	10.00
Rock Bass	S	C	C		21	15.75	3.68	0.71	1.80	44.90
Smallmouth Bass	F	C	C	M	1	0.75	0.18	0.47	1.19	625.00
Largemouth Bass	F	C	C		1	0.75	0.18	0.00	0.01	5.00
Green Sunfish	S	I	C	T	42	31.50	7.36	0.47	1.20	14.91
Bluegill Sunfish	S	I	C	P	60	45.00	10.51	0.41	1.04	9.05
Green Sf X Bluegill Sf					63	47.25	11.03	1.78	4.54	37.75
Blackside Darter	D	I	S		1	0.75	0.18	0.00	0.01	5.00
Johnny Darter	D	I	C		7	5.25	1.23	0.01	0.02	1.14
Greenside Darter	D	I	S	M	14	10.50	2.45	0.04	0.09	3.43
Mottled Sculpin		I	C		2	1.50	0.35	0.00	0.01	2.50
Mile Total					571	428.25		39.26		
Number of Species					26					
Number of Hybrids					1					

River Code: **02-085**	Stream: **Sycamore Creek**	Sample Date: **1996**
River Mile: **0.30**	Location:	Date Range: 08/22/1996
Time Fished: 5851 sec	Drainage: 24.3 sq mi	Thru: 09/18/1996
Dist Fished: 0.40 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	11	8.25	0.48	0.73	4.98	88.45
Northern Hog Sucker	R	I	S	M	71	53.25	3.11	2.61	17.77	48.94
White Sucker	W	O	S	T	48	36.00	2.10	2.22	15.15	61.72
Common Carp	G	O	M	T	4	3.00	0.18	0.03	0.23	11.25
Blacknose Dace	N	G	S	T	17	12.75	0.74	0.03	0.18	2.06
Creek Chub	N	G	N	T	280	210.00	12.25	1.54	10.47	7.32
Suckermouth Minnow	N	I	S		82	61.50	3.59	0.13	0.90	2.15
Rosefin Shiner	N	I	S	M	3	2.25	0.13	0.01	0.05	3.00
Striped Shiner	N	I	S		209	156.75	9.15	1.01	6.89	6.45
Spotfin Shiner	N	I	M		10	7.50	0.44	0.02	0.14	2.70
Sand Shiner	N	I	M	M	182	136.50	7.96	0.22	1.50	1.61
Silverjaw Minnow	N	I	M		13	9.75	0.57	0.01	0.09	1.40
Fathead Minnow	N	O	C	T	2	1.50	0.09	0.00	0.02	2.00
Bluntnose Minnow	N	O	C	T	339	254.25	14.84	0.58	3.93	2.27
Central Stoneroller	N	H	N		569	426.75	24.90	3.34	22.77	7.83
Yellow Bullhead		I	C	T	5	3.75	0.22	0.13	0.88	34.40
Rock Bass	S	C	C		7	5.25	0.31	0.24	1.64	45.71
Smallmouth Bass	F	C	C	M	2	1.50	0.09	0.53	3.61	352.50
Green Sunfish	S	I	C	T	175	131.25	7.66	0.67	4.54	5.07
Bluegill Sunfish	S	I	C	P	6	4.50	0.26	0.03	0.19	6.33
Longear Sunfish	S	I	C	M	1	0.75	0.04	0.02	0.13	25.00
Green Sf X Bluegill Sf					4	3.00	0.18	0.07	0.51	24.75
Blackside Darter	D	I	S		1	0.75	0.04	0.00	0.02	4.00
Johnny Darter	D	I	C		45	33.75	1.97	0.05	0.31	1.34
Greenside Darter	D	I	S	M	91	68.25	3.98	0.27	1.81	3.89
Banded Darter	D	I	S	I	88	66.00	3.85	0.12	0.84	1.85
Rainbow Darter	D	I	S	M	8	6.00	0.35	0.02	0.11	2.50
Orangethroat Darter	D	I	S		1	0.75	0.04	0.00	0.02	4.00
Mottled Sculpin		I	C		11	8.25	0.48	0.05	0.36	6.36
	Mile Total				2,285	1,713.75		14.67		
	Number of Species				28					
	Number of Hybrids				1					

River Code: **02-085**	Stream: **Sycamore Creek**	River Segment Totals
Mile Range: **0.30**		Date Range: 08/21/1996
Thru: **12.20**		Thru: 09/18/1996
Dist Fished: 2.25 km	Basin: Scioto River No of Passes: 12	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
Gizzard Shad		O	M		8	1.00	0.09	0.07	0.36	73.00
Quillback Carpsucker	C	O	M		1	0.13	0.01	0.00	0.01	15.00
Golden Redhorse	R	I	S	M	13	1.63	0.14	0.15	0.75	93.92
Northern Hog Sucker	R	I	S	M	154	19.58	1.71	1.40	6.87	71.01
White Sucker	W	O	S	T	579	75.58	6.62	3.17	15.63	42.09
Spotted Sucker	R	I	S		1	0.13	0.01	0.00	0.02	25.00
Common Carp	G	O	M	T	56	7.04	0.62	7.08	34.84	1,010.16
Golden Shiner	N	I	M	T	5	0.63	0.05	0.00	0.02	7.00
Blacknose Dace	N	G	S	T	198	29.75	2.60	0.07	0.34	2.39
Creek Chub	N	G	N	T	1,924	276.29	24.19	2.83	13.95	10.47
Suckermouth Minnow	N	I	S		93	11.63	1.02	0.03	0.14	2.43
South. Redbelly Dace	N	H	S		2	0.33	0.03	0.00	0.00	3.00
Silver Shiner	N	I	S	I	107	16.58	1.45	0.16	0.78	9.27
Rosefin Shiner	N	I	S	M	5	0.63	0.05	0.00	0.01	2.60
Striped Shiner	N	I	S		933	121.88	10.67	1.10	5.41	9.09
Spotfin Shiner	N	I	M		69	8.67	0.76	0.02	0.12	2.80
Sand Shiner	N	I	M	M	219	27.46	2.40	0.05	0.23	1.71
Silverjaw Minnow	N	I	M		33	4.42	0.39	0.01	0.06	2.46
Fathead Minnow	N	O	C	T	2	0.25	0.02	0.00	0.00	2.00
Bluntnose Minnow	N	O	C	T	589	78.13	6.84	0.17	0.86	2.26
Central Stoneroller	N	H	N		1,429	198.00	17.33	1.36	6.69	6.97
Yellow Bullhead		I	C	T	31	4.00	0.35	0.21	1.05	50.77
Trout-perch		I	M		4	0.50	0.04	0.01	0.04	17.75
White Crappie	S	I	C		2	0.25	0.02	0.01	0.06	52.50
Rock Bass	S	C	C		53	7.04	0.62	0.34	1.66	48.68
Smallmouth Bass	F	C	C	M	3	0.38	0.03	0.17	0.82	443.33
Largemouth Bass	F	C	C		12	1.54	0.13	0.01	0.05	6.17
Green Sunfish	S	I	C	T	370	48.33	4.23	0.45	2.19	9.00
Bluegill Sunfish	S	I	C	P	132	17.33	1.52	0.16	0.78	9.17
Longear Sunfish	S	I	C	M	1	0.13	0.01	0.00	0.02	25.00
Green Sf X Bluegill Sf					153	19.38	1.70	0.72	3.53	37.17
Blackside Darter	D	I	S		3	0.38	0.03	0.00	0.01	5.67
Johnny Darter	D	I	C		226	31.46	2.75	0.04	0.19	1.21
Greenside Darter	D	I	S	M	184	23.21	2.03	0.09	0.46	4.00
Banded Darter	D	I	S	I	88	11.00	0.96	0.02	0.10	1.85
Rainbow Darter	D	I	S	M	10	1.25	0.11	0.00	0.02	2.40
Orangethroat Darter	D	I	S		1	0.13	0.01	0.00	0.00	4.00
Fantail Darter	D	I	C		6	1.00	0.09	0.00	0.01	2.40
Mottled Sculpin		I	C		629	95.38	8.35	0.39	1.93	4.18
Stream Total					8,328	1,142.38		20.31		
Number of Species					38					
Number of Hybrids					1					

Species List

River Code: **02-086**	Stream: **Poplar Creek**	Sample Date: **1996**
River Mile: **6.60**	Location:	Date Range: 08/20/1996
Time Fished: 2188 sec	Drainage: 8.1 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	15	22.50	1.62	1.35	7.84	60.00
White Sucker	W	O	S	T	57	85.50	6.15	2.91	16.89	34.04
Blacknose Dace	N	G	S	T	12	18.00	1.29	0.02	0.09	0.83
Creek Chub	N	G	N	T	76	114.00	8.20	1.61	9.36	14.14
Silver Shiner	N	I	S	I	14	21.00	1.51	0.08	0.46	3.79
Striped Shiner	N	I	S		230	345.00	24.81	4.55	26.43	13.20
Sand Shiner	N	I	M	M	6	9.00	0.65	0.03	0.17	3.17
Silverjaw Minnow	N	I	M		17	25.50	1.83	0.10	0.57	3.82
Bluntnose Minnow	N	O	C	T	23	34.50	2.48	0.14	0.82	4.09
Central Stoneroller	N	H	N		358	537.00	38.62	5.76	33.42	10.72
Smallmouth Bass	F	C	C	M	1	1.50	0.11	0.01	0.03	4.00
Largemouth Bass	F	C	C		1	1.50	0.11	0.01	0.05	5.00
Green Sunfish	S	I	C	T	9	13.50	0.97	0.11	0.62	7.86
Bluegill Sunfish	S	I	C	P	1	1.50	0.11	0.03	0.17	20.00
Johnny Darter	D	I	C		17	25.50	1.83	0.04	0.21	1.41
Greenside Darter	D	I	S	M	10	15.00	1.08	0.08	0.47	5.40
Fantail Darter	D	I	C		18	27.00	1.94	0.03	0.17	1.11
Mottled Sculpin		I	C		62	93.00	6.69	0.39	2.25	4.16
Mile Total					927	1,390.50		17.23		
Number of Species					18					
Number of Hybrids					0					

River Code: **02-086**	Stream: **Poplar Creek**	Sample Date: **1996**
River Mile: **0.70**	Location:	Date Range: 08/21/1996
Time Fished: 2984 sec	Drainage: 17.5 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	17	25.50	1.98	1.84	15.33	72.06
White Sucker	W	O	S	T	86	129.00	10.01	4.50	37.52	34.88
Common Carp	G	O	M	T	5	7.50	0.58	0.14	1.19	19.00
Creek Chub	N	G	N	T	442	663.00	51.46	1.40	11.64	2.11
Rosefin Shiner	N	I	S	M	1	1.50	0.12	0.01	0.04	3.00
Striped Shiner	N	I	S		148	222.00	17.23	2.25	18.77	10.14
Spotfin Shiner	N	I	M		4	6.00	0.47	0.02	0.15	3.00
Sand Shiner	N	I	M	M	11	16.50	1.28	0.03	0.25	1.82
Fathead Minnow	N	O	C	T	1	1.50	0.12	0.01	0.04	3.00
Bluntnose Minnow	N	O	C	T	26	39.00	3.03	0.14	1.18	3.62
Central Stoneroller	N	H	N		29	43.50	3.38	0.29	2.38	6.55
Yellow Bullhead		I	C	T	2	3.00	0.23	0.01	0.07	2.50
Rock Bass	S	C	C		10	15.00	1.16	0.60	4.99	39.90
Smallmouth Bass	F	C	C	M	2	3.00	0.23	0.25	2.05	82.00
Green Sunfish	S	I	C	T	7	10.50	0.81	0.10	0.82	9.29
Bluegill Sunfish	S	I	C	P	3	4.50	0.35	0.05	0.44	11.67
Johnny Darter	D	I	C		1	1.50	0.12	0.00	0.03	2.00
Greenside Darter	D	I	S	M	13	19.50	1.51	0.07	0.55	3.38
Banded Darter	D	I	S	I	8	12.00	0.93	0.02	0.20	2.00
Fantail Darter	D	I	C		1	1.50	0.12	0.01	0.05	4.00
Mottled Sculpin		I	C		42	63.00	4.89	0.28	2.35	4.48
Mile Total					859	1,288.50		11.99		
Number of Species					21					
Number of Hybrids					0					

River Code: 02-086	Stream: Poplar Creek	River Segment Totals
Mile Range: 0.70		Date Range: 08/20/1996
Thru: 6.60		Thru: 08/21/1996
Dist Fished: 0.40 km	Basin: Scioto 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	32	24.00	1.79	1.59	10.91	66.41
White Sucker	W	O	S	T	143	107.25	8.01	3.71	25.36	34.55
Common Carp	G	O	M	T	5	3.75	0.28	0.07	0.49	19.00
Blacknose Dace	N	G	S	T	12	9.00	0.67	0.01	0.05	0.83
Creek Chub	N	G	N	T	518	388.50	29.00	1.50	10.30	3.87
Silver Shiner	N	I	S	I	14	10.50	0.78	0.04	0.27	3.79
Rosefin Shiner	N	I	S	M	1	0.75	0.06	0.00	0.02	3.00
Striped Shiner	N	I	S		378	283.50	21.16	3.40	23.29	12.00
Spotfin Shiner	N	I	M		4	3.00	0.22	0.01	0.06	3.00
Sand Shiner	N	I	M	M	17	12.75	0.95	0.03	0.20	2.29
Silverjaw Minnow	N	I	M		17	12.75	0.95	0.05	0.34	3.82
Fathead Minnow	N	O	C	T	1	0.75	0.06	0.00	0.02	3.00
Bluntnose Minnow	N	O	C	T	49	36.75	2.74	0.14	0.97	3.84
Central Stoneroller	N	H	N		387	290.25	21.67	3.02	20.68	10.41
Yellow Bullhead		I	C	T	2	1.50	0.11	0.00	0.03	2.50
Rock Bass	S	C	C		10	7.50	0.56	0.30	2.05	39.90
Smallmouth Bass	F	C	C	M	3	2.25	0.17	0.13	0.86	56.00
Largemouth Bass	F	C	C		1	0.75	0.06	0.00	0.03	5.00
Green Sunfish	S	I	C	T	16	12.00	0.90	0.10	0.70	8.48
Bluegill Sunfish	S	I	C	P	4	3.00	0.22	0.04	0.28	13.75
Johnny Darter	D	I	C		18	13.50	1.01	0.02	0.13	1.44
Greenside Darter	D	I	S	M	23	17.25	1.29	0.07	0.50	4.26
Banded Darter	D	I	S	I	8	6.00	0.45	0.01	0.08	2.00
Fantail Darter	D	I	C		19	14.25	1.06	0.02	0.12	1.26
Mottled Sculpin		I	C		104	78.00	5.82	0.33	2.29	4.29
	Stream Total				1,786	1,339.50		14.61		
	Number of Species				25					
	Number of Hybrids				0					

Species List

River Code: **02-087**	Stream: **Pawpaw Creek**	Sample Date: **1996**
River Mile: **1.40**	Location:	Date Range: 07/23/1996
Time Fished: 2090 sec	Drainage: 10.5 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	7	14.00	1.02	0.66	4.85	47.14
White Sucker	W	O	S	T	59	118.00	8.64	1.89	13.91	16.05
Blacknose Dace	N	G	S	T	34	68.00	4.98	0.16	1.18	2.35
Creek Chub	N	G	N	T	396	792.00	57.98	8.58	63.02	10.83
South. Redbelly Dace	N	H	S		1	2.00	0.15	0.00	0.03	2.00
Rosefin Shiner	N	I	S	M	1	2.00	0.15	0.00	0.03	2.00
Striped Shiner	N	I	S		88	176.00	12.88	1.41	10.39	8.04
Spotfin Shiner	N	I	M		1	2.00	0.15	0.01	0.04	3.00
Sand Shiner	N	I	M	M	1	2.00	0.15	0.01	0.04	3.00
Silverjaw Minnow	N	I	M		2	4.00	0.29	0.01	0.06	2.00
Bluntnose Minnow	N	O	C	T	10	20.00	1.46	0.06	0.41	2.78
Central Stoneroller	N	H	N		40	80.00	5.86	0.33	2.42	4.11
Trout-perch		I	M		13	26.00	1.90	0.25	1.84	9.62
Green Sunfish	S	I	C	T	7	14.00	1.02	0.17	1.23	12.00
Johnny Darter	D	I	C		1	2.00	0.15	0.00	0.03	2.00
Greenside Darter	D	I	S	M	6	12.00	0.88	0.03	0.19	2.17
Fantail Darter	D	I	C		16	32.00	2.34	0.05	0.34	1.44
	Mile Total				683	1,366.00		13.62		
	Number of Species				17					
	Number of Hybrids				0					

Species List

River Code: **02-087**	Stream: **Pawpaw Creek**	Sample Date: **1996**
River Mile: **0.30**	Location:	Date Range: 08/20/1996
Time Fished: 2793 sec	Drainage: 16.5 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	0.42	0.69	2.83	115.00
White Sucker	W	O	S	T	264	396.00	28.03	13.59	55.71	34.32
Common Carp	G	O	M	T	1	1.50	0.11	0.23	0.92	150.00
Blacknose Dace	N	G	S	T	17	25.50	1.80	0.05	0.22	2.13
Creek Chub	N	G	N	T	246	369.00	26.11	5.31	21.77	14.40
Suckermouth Minnow	N	I	S		4	6.00	0.42	0.03	0.12	5.00
Rosefin Shiner	N	I	S	M	2	3.00	0.21	0.01	0.03	2.50
Striped Shiner	N	I	S		124	186.00	13.16	1.95	7.99	10.48
Spotfin Shiner	N	I	M		16	24.00	1.70	0.06	0.25	2.50
Sand Shiner	N	I	M	M	20	30.00	2.12	0.05	0.18	1.50
Silverjaw Minnow	N	I	M		15	22.50	1.59	0.07	0.30	3.20
Bluntnose Minnow	N	O	C	T	73	109.50	7.75	0.38	1.57	3.49
Central Stoneroller	N	H	N		69	103.50	7.32	0.81	3.32	7.83
Trout-perch		I	M		25	37.50	2.65	0.51	2.09	13.60
Rock Bass	S	C	C		3	4.50	0.32	0.04	0.16	8.33
Largemouth Bass	F	C	C		1	1.50	0.11	0.01	0.03	5.00
Green Sunfish	S	I	C	T	6	9.00	0.64	0.14	0.55	15.00
Bluegill Sunfish	S	I	C	P	10	15.00	1.06	0.11	0.45	7.40
Longear Sunfish	S	I	C	M	4	6.00	0.42	0.14	0.55	22.50
Blackside Darter	D	I	S		2	3.00	0.21	0.02	0.10	8.00
Johnny Darter	D	I	C		7	10.50	0.74	0.02	0.06	1.43
Greenside Darter	D	I	S	M	21	31.50	2.23	0.15	0.60	4.67
Mottled Sculpin		I	C		8	12.00	0.85	0.05	0.18	3.75
Mile Total					942	1,413.00		24.40		
Number of Species					23					
Number of Hybrids					0					

River Code: **02-087**	Stream: **Pawpaw Creek**	River Segment Totals
Mile Range: **0.30**		Date Range: 07/23/1996
Thru: **1.40**		Thru: 08/20/1996
Dist Fished: 0.35 km	Basin: Scioto 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	11	10.00	0.72	0.68	3.55	71.82
White Sucker	W	O	S	T	323	257.00	18.50	7.74	40.74	30.98
Common Carp	G	O	M	T	1	0.75	0.05	0.11	0.59	150.00
Blacknose Dace	N	G	S	T	51	46.75	3.36	0.11	0.56	2.28
Creek Chub	N	G	N	T	642	580.50	41.78	6.95	36.55	12.20
Suckermouth Minnow	N	I	S		4	3.00	0.22	0.02	0.08	5.00
South. Redbelly Dace	N	H	S		1	1.00	0.07	0.00	0.01	2.00
Rosefin Shiner	N	I	S	M	3	2.50	0.18	0.01	0.03	2.33
Striped Shiner	N	I	S		212	181.00	13.03	1.68	8.85	9.46
Spotfin Shiner	N	I	M		17	13.00	0.94	0.03	0.17	2.53
Sand Shiner	N	I	M	M	21	16.00	1.15	0.03	0.13	1.57
Silverjaw Minnow	N	I	M		17	13.25	0.95	0.04	0.21	3.06
Bluntnose Minnow	N	O	C	T	83	64.75	4.66	0.22	1.15	3.41
Central Stoneroller	N	H	N		109	91.75	6.60	0.57	3.00	6.46
Trout-perch		I	M		38	31.75	2.28	0.38	2.00	12.24
Rock Bass	S	C	C		3	2.25	0.16	0.02	0.10	8.33
Largemouth Bass	F	C	C		1	0.75	0.05	0.00	0.02	5.00
Green Sunfish	S	I	C	T	13	11.50	0.83	0.15	0.80	13.38
Bluegill Sunfish	S	I	C	P	10	7.50	0.54	0.06	0.29	7.40
Longear Sunfish	S	I	C	M	4	3.00	0.22	0.07	0.36	22.50
Blackside Darter	D	I	S		2	1.50	0.11	0.01	0.06	8.00
Johnny Darter	D	I	C		8	6.25	0.45	0.01	0.05	1.50
Greenside Darter	D	I	S	M	27	21.75	1.57	0.09	0.46	4.11
Fantail Darter	D	I	C		16	16.00	1.15	0.02	0.12	1.44
Mottled Sculpin		I	C		8	6.00	0.43	0.02	0.12	3.75
Stream Total					1,625	1,389.50		19.01		
Number of Species					25					
Number of Hybrids					0					

River Code: **02-198**	Stream: **Mud Run**	Sample Date: **1996**
River Mile: **0.70**	Location:	Date Range: 09/10/1996
Time Fished: 1620 sec	Drainage: 11.5 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	1	1.50	0.12	0.01	0.11	5.00
Northern Hog Sucker	R	I	S	M	1	1.50	0.12	0.13	1.68	84.00
White Sucker	W	O	S	T	4	6.00	0.48	0.14	1.91	23.75
Common Carp	G	O	M	T	2	3.00	0.24	0.05	0.67	16.50
Blacknose Dace	N	G	S	T	47	70.50	5.66	0.10	1.33	1.41
Creek Chub	N	G	N	T	65	97.50	7.83	0.92	12.27	9.44
Suckermouth Minnow	N	I	S		4	6.00	0.48	0.01	0.07	0.75
Striped Shiner	N	I	S		47	70.50	5.66	0.23	3.08	3.28
Spotfin Shiner	N	I	M		26	39.00	3.13	0.16	2.11	4.05
Fathead Minnow	N	O	C	T	6	9.00	0.72	0.03	0.39	3.17
Bluntnose Minnow	N	O	C	T	150	225.00	18.07	0.76	10.19	3.39
Central Stoneroller	N	H	N		311	466.50	37.47	4.24	56.54	9.09
Rock Bass	S	C	C		1	1.50	0.12	0.00	0.04	2.00
Largemouth Bass	F	C	C		1	1.50	0.12	0.01	0.08	4.00
Green Sunfish	S	I	C	T	6	9.00	0.72	0.09	1.16	9.67
Bluegill Sunfish	S	I	C	P	1	1.50	0.12	0.02	0.20	10.00
Longear Sunfish	S	I	C	M	1	1.50	0.12	0.02	0.27	13.00
Johnny Darter	D	I	C		45	67.50	5.42	0.06	0.80	0.89
Greenside Darter	D	I	S	M	4	6.00	0.48	0.05	0.63	7.75
Rainbow Darter	D	I	S	M	73	109.50	8.80	0.21	2.79	1.90
Fantail Darter	D	I	C		17	25.50	2.05	0.06	0.80	2.35
Mottled Sculpin		I	C		17	25.50	2.05	0.22	2.99	8.76
Mile Total					830	1,245.00		7.50		
Number of Species					22					
Number of Hybrids					0					

River Code: **02-198**	Stream: **Mud Run**	River Segment Totals
Mile Range: **0.70**		Date Range: 09/10/1996
Dist Fished: 0.20 km	Basin: Scioto 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
Golden Redhorse	R	I	S	M	1	1.50	0.12	0.01	0.11	5.00
Northern Hog Sucker	R	I	S	M	1	1.50	0.12	0.13	1.68	84.00
White Sucker	W	O	S	T	4	6.00	0.48	0.14	1.91	23.75
Common Carp	G	O	M	T	2	3.00	0.24	0.05	0.67	16.50
Blacknose Dace	N	G	S	T	47	70.50	5.66	0.10	1.33	1.41
Creek Chub	N	G	N	T	65	97.50	7.83	0.92	12.27	9.44
Suckermouth Minnow	N	I	S		4	6.00	0.48	0.01	0.07	0.75
Striped Shiner	N	I	S		47	70.50	5.66	0.23	3.08	3.28
Spotfin Shiner	N	I	M		26	39.00	3.13	0.16	2.11	4.05
Fathead Minnow	N	O	C	T	6	9.00	0.72	0.03	0.39	3.17
Bluntnose Minnow	N	O	C	T	150	225.00	18.07	0.76	10.19	3.39
Central Stoneroller	N	H	N		311	466.50	37.47	4.24	56.54	9.09
Rock Bass	S	C	C		1	1.50	0.12	0.00	0.04	2.00
Largemouth Bass	F	C	C		1	1.50	0.12	0.01	0.08	4.00
Green Sunfish	S	I	C	T	6	9.00	0.72	0.09	1.16	9.67
Bluegill Sunfish	S	I	C	P	1	1.50	0.12	0.02	0.20	10.00
Longear Sunfish	S	I	C	M	1	1.50	0.12	0.02	0.27	13.00
Johnny Darter	D	I	C		45	67.50	5.42	0.06	0.80	0.89
Greenside Darter	D	I	S	M	4	6.00	0.48	0.05	0.63	7.75
Rainbow Darter	D	I	S	M	73	109.50	8.80	0.21	2.79	1.90
Fantail Darter	D	I	C		17	25.50	2.05	0.06	0.80	2.35
Mottled Sculpin		I	C		17	25.50	2.05	0.22	2.99	8.76
Stream Total					830	1,245.00		7.50		
Number of Species					22					
Number of Hybrids					0					

Species List

River Code: **02-199**	Stream: **Gillette Run**	Sample Date: **1996**
River Mile: **0.10**	Location:	Date Range: 09/10/1996
Time Fished: 2040 sec	Drainage: 6.1 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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
Quillback Carpsucker	C	O	M		1	1.50	0.22	0.02	0.24	10.00
Northern Hog Sucker	R	I	S	M	4	6.00	0.88	0.33	5.35	55.50
White Sucker	W	O	S	T	18	27.00	3.94	1.35	21.67	50.00
Common Carp	G	O	M	T	5	7.50	1.09	0.10	1.62	13.40
Blacknose Dace	N	G	S	T	8	12.00	1.75	0.01	0.13	0.63
Creek Chub	N	G	N	T	172	258.00	37.64	2.43	38.98	9.41
Suckermouth Minnow	N	I	S		5	7.50	1.09	0.02	0.37	3.00
Striped Shiner	N	I	S		55	82.50	12.04	1.01	16.15	12.19
Spotfin Shiner	N	I	M		8	12.00	1.75	0.02	0.39	2.00
Sand Shiner	N	I	M	M	33	49.50	7.22	0.09	1.49	1.88
Silverjaw Minnow	N	I	M		14	21.00	3.06	0.06	0.90	2.64
Bluntnose Minnow	N	O	C	T	86	129.00	18.82	0.34	5.41	2.61
Central Stoneroller	N	H	N		23	34.50	5.03	0.28	4.51	8.16
Bluegill Sunfish	S	I	C	P	4	6.00	0.88	0.01	0.13	1.25
Johnny Darter	D	I	C		3	4.50	0.66	0.01	0.10	1.33
Greenside Darter	D	I	S	M	1	1.50	0.22	0.00	0.05	2.00
Rainbow Darter	D	I	S	M	1	1.50	0.22	0.00	0.03	1.00
Mottled Sculpin		I	C		16	24.00	3.50	0.16	2.54	6.56
	Mile Total				457	685.50		6.23		
	Number of Species				18					
	Number of Hybrids				0					

River Code: **02-199**	Stream: **Gillette Run**	River Segment Totals
Mile Range: **0.10**		Date Range: 09/10/1996
Dist Fished: 0.20 km	Basin: Scioto 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
Quillback Carpsucker	C	O	M		1	1.50	0.22	0.02	0.24	10.00
Northern Hog Sucker	R	I	S	M	4	6.00	0.88	0.33	5.35	55.50
White Sucker	W	O	S	T	18	27.00	3.94	1.35	21.67	50.00
Common Carp	G	O	M	T	5	7.50	1.09	0.10	1.62	13.40
Blacknose Dace	N	G	S	T	8	12.00	1.75	0.01	0.13	0.63
Creek Chub	N	G	N	T	172	258.00	37.64	2.43	38.98	9.41
Suckermouth Minnow	N	I	S		5	7.50	1.09	0.02	0.37	3.00
Striped Shiner	N	I	S		55	82.50	12.04	1.01	16.15	12.19
Spotfin Shiner	N	I	M		8	12.00	1.75	0.02	0.39	2.00
Sand Shiner	N	I	M	M	33	49.50	7.22	0.09	1.49	1.88
Silverjaw Minnow	N	I	M		14	21.00	3.06	0.06	0.90	2.64
Bluntnose Minnow	N	O	C	T	86	129.00	18.82	0.34	5.41	2.61
Central Stoneroller	N	H	N		23	34.50	5.03	0.28	4.51	8.16
Bluegill Sunfish	S	I	C	P	4	6.00	0.88	0.01	0.13	1.25
Johnny Darter	D	I	C		3	4.50	0.66	0.01	0.10	1.33
Greenside Darter	D	I	S	M	1	1.50	0.22	0.00	0.05	2.00
Rainbow Darter	D	I	S	M	1	1.50	0.22	0.00	0.03	1.00
Mottled Sculpin		I	C		16	24.00	3.50	0.16	2.54	6.56
	Stream Total				457	685.50		6.23		
	Number of Species				18					
	Number of Hybrids				0					

River Code: **02-224**	Stream: **Trib. to Pawpaw Creek (RM 0.55)**	Sample Date: **1996**
River Mile: **1.00**	Location:	Date Range: 07/23/1996
Time Fished: 2402 sec	Drainage: 5.1 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	2	4.00	0.39	0.18	1.90	46.00
White Sucker	W	O	S	T	47	94.00	9.14	2.65	27.33	28.19
Blacknose Dace	N	G	S	T	34	68.00	6.61	0.16	1.65	2.35
Creek Chub	N	G	N	T	212	424.00	41.25	4.76	49.11	11.23
Silver Shiner	N	I	S	I	1	2.00	0.19	0.01	0.06	3.00
Striped Shiner	N	I	S		55	110.00	10.70	1.04	10.72	9.45
Sand Shiner	N	I	M	M	4	8.00	0.78	0.02	0.16	2.00
Silverjaw Minnow	N	I	M		8	16.00	1.56	0.07	0.68	4.13
Bluntnose Minnow	N	O	C	T	26	52.00	5.06	0.16	1.65	3.08
Central Stoneroller	N	H	N		35	70.00	6.81	0.14	1.48	2.06
Largemouth Bass	F	C	C		4	8.00	0.78	0.09	0.95	11.50
Green Sunfish	S	I	C	T	6	12.00	1.17	0.14	1.48	12.00
Bluegill Sunfish	S	I	C	P	6	12.00	1.17	0.04	0.41	3.33
Longear Sunfish	S	I	C	M	1	2.00	0.19	0.02	0.21	10.00
Johnny Darter	D	I	C		24	48.00	4.67	0.06	0.58	1.17
Greenside Darter	D	I	S	M	8	16.00	1.56	0.04	0.45	2.75
Fantail Darter	D	I	C		40	80.00	7.78	0.10	1.06	1.28
Mottled Sculpin		I	C		1	2.00	0.19	0.01	0.10	5.00
Mile Total					514	1,028.00		9.70		
Number of Species					18					
Number of Hybrids					0					

River Code: **02-224**	Stream: **Trib. to Pawpaw Creek (RM 0.55)**	Sample Date: **1996**
River Mile: **0.10**	Location: St. Rt. 256	Date Range: 07/24/1996
Time Fished: 1998 sec	Drainage: 5.5 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	21	42.00	1.82	2.25	7.03	53.57
White Sucker	W	O	S	T	262	524.00	22.76	15.82	49.41	30.19
Blacknose Dace	N	G	S	T	104	208.00	9.04	0.64	2.00	3.08
Creek Chub	N	G	N	T	359	718.00	31.19	8.28	25.86	11.53
Suckermouth Minnow	N	I	S		4	8.00	0.35	0.04	0.11	4.33
South. Redbelly Dace	N	H	S		2	4.00	0.17	0.01	0.02	2.00
Striped Shiner	N	I	S		41	82.00	3.56	0.61	1.90	7.44
Spotfin Shiner	N	I	M		4	8.00	0.35	0.01	0.04	1.75
Sand Shiner	N	I	M	M	4	8.00	0.35	0.02	0.05	2.00
Silverjaw Minnow	N	I	M		5	10.00	0.43	0.04	0.11	3.60
Bluntnose Minnow	N	O	C	T	54	108.00	4.69	0.44	1.36	4.04
Central Stoneroller	N	H	N		205	410.00	17.81	3.00	9.36	7.31
Trout-perch		I	M		12	24.00	1.04	0.32	1.00	13.33
Largemouth Bass	F	C	C		1	2.00	0.09	0.01	0.02	4.00
Green Sunfish	S	I	C	T	1	2.00	0.09	0.04	0.12	20.00
Bluegill Sunfish	S	I	C	P	2	4.00	0.17	0.02	0.05	4.00
Blackside Darter	D	I	S		4	8.00	0.35	0.04	0.11	4.33
Johnny Darter	D	I	C		26	52.00	2.26	0.08	0.24	1.50
Greenside Darter	D	I	S	M	23	46.00	2.00	0.18	0.57	4.00
Fantail Darter	D	I	C		4	8.00	0.35	0.02	0.06	2.25
Mottled Sculpin		I	C		13	26.00	1.13	0.18	0.56	6.92
Mile Total					1,151	2,302.00		32.02		
Number of Species					21					
Number of Hybrids					0					

River Code: **02-224**	Stream: **Trib. to Pawpaw Creek (RM 0.55)**	River Segment Totals
Mile Range: **0.10**		Date Range: 07/23/1996
Thru: **1.00**		Thru: 07/24/1996
Dist Fished: 0.30 km	Basin: Scioto 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	23	23.00	1.38	1.22	5.83	52.91
White Sucker	W	O	S	T	309	309.00	18.56	9.24	44.28	29.89
Blacknose Dace	N	G	S	T	138	138.00	8.29	0.40	1.92	2.90
Creek Chub	N	G	N	T	571	571.00	34.29	6.52	31.26	11.42
Suckermouth Minnow	N	I	S		4	4.00	0.24	0.02	0.08	4.33
South. Redbelly Dace	N	H	S		2	2.00	0.12	0.00	0.02	2.00
Silver Shiner	N	I	S	I	1	1.00	0.06	0.00	0.01	3.00
Striped Shiner	N	I	S		96	96.00	5.77	0.83	3.95	8.59
Spotfin Shiner	N	I	M		4	4.00	0.24	0.01	0.03	1.75
Sand Shiner	N	I	M	M	8	8.00	0.48	0.02	0.08	2.00
Silverjaw Minnow	N	I	M		13	13.00	0.78	0.05	0.24	3.92
Bluntnose Minnow	N	O	C	T	80	80.00	4.80	0.30	1.43	3.73
Central Stoneroller	N	H	N		240	240.00	14.41	1.57	7.53	6.55
Trout-perch		I	M		12	12.00	0.72	0.16	0.77	13.33
Largemouth Bass	F	C	C		5	5.00	0.30	0.05	0.24	10.00
Green Sunfish	S	I	C	T	7	7.00	0.42	0.09	0.44	13.14
Bluegill Sunfish	S	I	C	P	8	8.00	0.48	0.03	0.13	3.50
Longear Sunfish	S	I	C	M	1	1.00	0.06	0.01	0.05	10.00
Blackside Darter	D	I	S		4	4.00	0.24	0.02	0.08	4.33
Johnny Darter	D	I	C		50	50.00	3.00	0.07	0.32	1.34
Greenside Darter	D	I	S	M	31	31.00	1.86	0.11	0.55	3.68
Fantail Darter	D	I	C		44	44.00	2.64	0.06	0.29	1.37
Mottled Sculpin		I	C		14	14.00	0.84	0.10	0.46	6.79
	Stream Total				1,665	1,665.00		20.86		
	Number of Species				23					
	Number of Hybrids				0					

River Code: **02-225**	Stream: **Trib. to Walnut Creek (RM 45.45)**	Sample Date: **1996**
River Mile: **0.80**	Location:	Date Range: 08/20/1996
Time Fished: 2153 sec	Drainage: 11.2 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	43	64.50	13.27	2.40	37.18	37.21
Common Carp	G	O	M	T	3	4.50	0.93	0.67	10.41	149.33
Creek Chub	N	G	N	T	41	61.50	12.65	1.41	21.89	22.97
Striped Shiner	N	I	S		67	100.50	20.68	0.77	11.85	7.61
Sand Shiner	N	I	M	M	2	3.00	0.62	0.01	0.09	2.00
Bluntnose Minnow	N	O	C	T	94	141.00	29.01	0.35	5.39	2.47
Central Stoneroller	N	H	N		1	1.50	0.31	0.01	0.12	5.00
Yellow Bullhead		I	C	T	3	4.50	0.93	0.23	3.63	52.00
Blackstripe Topminnow		I	M		1	1.50	0.31	0.01	0.09	4.00
Trout-perch		I	M		1	1.50	0.31	0.01	0.14	6.00
Rock Bass	S	C	C		5	7.50	1.54	0.16	2.51	21.60
Largemouth Bass	F	C	C		2	3.00	0.62	0.02	0.37	8.00
Green Sunfish	S	I	C	T	16	24.00	4.94	0.19	2.87	7.71
Bluegill Sunfish	S	I	C	P	13	19.50	4.01	0.11	1.67	5.54
Green Sf X Bluegill Sf					2	3.00	0.62	0.04	0.65	14.00
Blackside Darter	D	I	S		3	4.50	0.93	0.02	0.33	4.67
Johnny Darter	D	I	C		25	37.50	7.72	0.04	0.68	1.17
Greenside Darter	D	I	S	M	2	3.00	0.62	0.01	0.14	3.00
Mile Total					324	486.00		6.46		
Number of Species					17					
Number of Hybrids					1					

River Code: **02-225**	Stream: **Trib. to Walnut Creek (RM 45.45)**	Sample Date: **1996**
River Mile: **0.70**	Location:	Date Range: 08/20/1996
Time Fished: 2253 sec	Drainage: 11.2 sq mi	
Dist Fished: 0.20 km	Basin: Scioto 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	46	69.00	13.33	2.96	50.00	42.93
Blacknose Dace	N	G	S	T	5	7.50	1.45	0.02	0.30	2.40
Creek Chub	N	G	N	T	97	145.50	28.12	1.91	32.15	13.10
South. Redbelly Dace	N	H	S		1	1.50	0.29	0.00	0.05	2.00
Striped Shiner	N	I	S		49	73.50	14.20	0.53	8.86	7.14
Spotfin Shiner	N	I	M		1	1.50	0.29	0.01	0.13	5.00
Silverjaw Minnow	N	I	M		4	6.00	1.16	0.01	0.17	1.67
Bluntnose Minnow	N	O	C	T	84	126.00	24.35	0.22	3.64	1.71
Central Stoneroller	N	H	N		2	3.00	0.58	0.02	0.29	5.50
Trout-perch		I	M		1	1.50	0.29	0.02	0.39	15.00
Green Sunfish	S	I	C	T	2	3.00	0.58	0.09	1.47	29.00
Bluegill Sunfish	S	I	C	P	2	3.00	0.58	0.02	0.25	5.00
Longear Sunfish	S	I	C	M	1	1.50	0.29	0.02	0.25	10.00
Johnny Darter	D	I	C		32	48.00	9.28	0.05	0.89	1.09
Greenside Darter	D	I	S	M	12	18.00	3.48	0.05	0.84	2.75
Orangethroat Darter	D	I	S		4	6.00	1.16	0.01	0.20	2.00
Fantail Darter	D	I	C		2	3.00	0.58	0.01	0.15	3.00
Mile Total					345	517.50		5.93		
Number of Species					17					
Number of Hybrids					0					

River Code: **02-225**	Stream: **Trib. to Walnut Creek (RM 45.45)**	River Segment Totals
Mile Range: **0.70**		Date Range: 08/20/1996
Thru: **0.80**		
Dist Fished: 0.40 km	Basin: Scioto 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
White Sucker	W	O	S	T	89	66.75	13.30	2.68	43.31	40.17
Common Carp	G	O	M	T	3	2.25	0.45	0.34	5.43	149.33
Blacknose Dace	N	G	S	T	5	3.75	0.75	0.01	0.15	2.40
Creek Chub	N	G	N	T	138	103.50	20.63	1.66	26.80	16.03
South. Redbelly Dace	N	H	S		1	0.75	0.15	0.00	0.02	2.00
Striped Shiner	N	I	S		116	87.00	17.34	0.65	10.42	7.41
Spotfin Shiner	N	I	M		1	0.75	0.15	0.00	0.06	5.00
Sand Shiner	N	I	M	M	2	1.50	0.30	0.00	0.05	2.00
Silverjaw Minnow	N	I	M		4	3.00	0.60	0.01	0.08	1.67
Bluntnose Minnow	N	O	C	T	178	133.50	26.61	0.28	4.55	2.11
Central Stoneroller	N	H	N		3	2.25	0.45	0.01	0.20	5.33
Yellow Bullhead		I	C	T	3	2.25	0.45	0.12	1.89	52.00
Blackstripe Topminnow		I	M		1	0.75	0.15	0.00	0.05	4.00
Trout-perch		I	M		2	1.50	0.30	0.02	0.26	10.50
Rock Bass	S	C	C		5	3.75	0.75	0.08	1.31	21.60
Largemouth Bass	F	C	C		2	1.50	0.30	0.01	0.19	8.00
Green Sunfish	S	I	C	T	18	13.50	2.69	0.14	2.20	10.08
Bluegill Sunfish	S	I	C	P	15	11.25	2.24	0.06	0.99	5.47
Longear Sunfish	S	I	C	M	1	0.75	0.15	0.01	0.12	10.00
Green Sf X Bluegill Sf					2	1.50	0.30	0.02	0.34	14.00
Blackside Darter	D	I	S		3	2.25	0.45	0.01	0.17	4.67
Johnny Darter	D	I	C		57	42.75	8.52	0.05	0.78	1.13
Greenside Darter	D	I	S	M	14	10.50	2.09	0.03	0.48	2.79
Orangethroat Darter	D	I	S		4	3.00	0.60	0.01	0.10	2.00
Fantail Darter	D	I	C		2	1.50	0.30	0.00	0.07	3.00
	Stream Total				669	501.75		6.19		
	Number of Species				24					
	Number of Hybrids				1					

Species List

River Code: **02-226**	Stream: **Tussing Ditch**	Sample Date: **1996**
River Mile: **0.30**	Location:	Date Range: 09/06/1996
Time Fished: 2520 sec	Drainage: 4.0 sq mi	
Dist Fished: 0.15 km	Basin: Scioto 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	12	24.00	2.43	1.80	8.73	75.00
White Sucker	W	O	S	T	120	240.00	24.29	8.20	39.78	34.17
Common Carp	G	O	M	T	10	20.00	2.02	1.32	6.40	66.00
Blacknose Dace	N	G	S	T	12	24.00	2.43	0.11	0.51	4.36
Creek Chub	N	G	N	T	107	214.00	21.66	4.82	23.36	22.50
Striped Shiner	N	I	S		83	166.00	16.80	2.21	10.74	13.33
Spotfin Shiner	N	I	M		23	46.00	4.66	0.12	0.60	2.70
Sand Shiner	N	I	M	M	1	2.00	0.20	0.02	0.08	8.00
Fathead Minnow	N	O	C	T	2	4.00	0.40	0.01	0.04	2.00
Bluntnose Minnow	N	O	C	T	38	76.00	7.69	0.20	0.95	2.57
Central Stoneroller	N	H	N		22	44.00	4.45	0.60	2.91	13.64
Yellow Bullhead		I	C	T	8	16.00	1.62	0.51	2.47	31.88
Largemouth Bass	F	C	C		1	2.00	0.20	0.02	0.09	9.00
Green Sunfish	S	I	C	T	46	92.00	9.31	0.42	2.04	4.57
Bluegill Sunfish	S	I	C	P	5	10.00	1.01	0.12	0.58	12.00
Redear Sunfish	E	I	C		1	2.00	0.20	0.09	0.44	45.00
Johnny Darter	D	I	C		1	2.00	0.20	0.01	0.07	7.00
Greenside Darter	D	I	S	M	1	2.00	0.20	0.01	0.05	5.00
Mottled Sculpin		I	C		1	2.00	0.20	0.04	0.17	18.00
Mile Total					494	988.00		20.61		
Number of Species					19					
Number of Hybrids					0					

Species List

River Code: **02-226**	Stream: **Tussing Ditch**	River Segment Totals
Mile Range: **0.30**		Date Range: 09/06/1996
Dist Fished: 0.15 km	Basin: Scioto 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	12	24.00	2.43	1.80	8.73	75.00
White Sucker	W	O	S	T	120	240.00	24.29	8.20	39.78	34.17
Common Carp	G	O	M	T	10	20.00	2.02	1.32	6.40	66.00
Blacknose Dace	N	G	S	T	12	24.00	2.43	0.11	0.51	4.36
Creek Chub	N	G	N	T	107	214.00	21.66	4.82	23.36	22.50
Striped Shiner	N	I	S		83	166.00	16.80	2.21	10.74	13.33
Spotfin Shiner	N	I	M		23	46.00	4.66	0.12	0.60	2.70
Sand Shiner	N	I	M	M	1	2.00	0.20	0.02	0.08	8.00
Fathead Minnow	N	O	C	T	2	4.00	0.40	0.01	0.04	2.00
Bluntnose Minnow	N	O	C	T	38	76.00	7.69	0.20	0.95	2.57
Central Stoneroller	N	H	N		22	44.00	4.45	0.60	2.91	13.64
Yellow Bullhead		I	C	T	8	16.00	1.62	0.51	2.47	31.88
Largemouth Bass	F	C	C		1	2.00	0.20	0.02	0.09	9.00
Green Sunfish	S	I	C	T	46	92.00	9.31	0.42	2.04	4.57
Bluegill Sunfish	S	I	C	P	5	10.00	1.01	0.12	0.58	12.00
Redear Sunfish	E	I	C		1	2.00	0.20	0.09	0.44	45.00
Johnny Darter	D	I	C		1	2.00	0.20	0.01	0.07	7.00
Greenside Darter	D	I	S	M	1	2.00	0.20	0.01	0.05	5.00
Mottled Sculpin		I	C		1	2.00	0.20	0.04	0.17	18.00
Stream Total					494	988.00		20.61		
Number of Species					19					
Number of Hybrids					0					

River Code: **02-231**	Stream: **Trib. to Georges Creek (RM 2.00)**	Sample Date: **1996**
River Mile: **6.00**	Location:	Date Range: 07/10/1996
Time Fished: 4560 sec	Drainage: 1.5 sq mi	Thru: 09/20/1996
Dist Fished: 0.30 km	Basin: Scioto River No of Passes: 2	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
White Sucker	W	O	S	T	121	121.00	6.87	4.77	28.07	39.45
Common Carp	G	O	M	T	1	1.00	0.06	0.20	1.15	195.00
Blacknose Dace	N	G	S	T	229	229.00	13.00	0.93	5.45	4.04
Creek Chub	N	G	N	T	733	733.00	41.62	6.16	36.22	8.40
South. Redbelly Dace	N	H	S		4	4.00	0.23	0.01	0.08	3.25
Silverjaw Minnow	N	I	M		1	1.00	0.06	0.00	0.02	4.00
Fathead Minnow	N	O	C	T	1	1.00	0.06	0.00	0.02	3.00
Bluntnose Minnow	N	O	C	T	31	31.00	1.76	0.12	0.73	4.00
Central Stoneroller	N	H	N		579	579.00	32.88	4.26	25.03	7.35
White Crappie	S	I	C		1	1.00	0.06	0.01	0.03	5.00
Largemouth Bass	F	C	C		9	9.00	0.51	0.05	0.28	5.33
Green Sunfish	S	I	C	T	21	21.00	1.19	0.23	1.34	10.86
Bluegill Sunfish	S	I	C	P	26	26.00	1.48	0.23	1.36	8.92
Orangespotted Sunfish	S	I	C		3	3.00	0.17	0.01	0.05	2.67
Green Sf X Bluegill Sf					1	1.00	0.06	0.03	0.18	30.00
Mile Total					1,761	1,761.00		17.00		
Number of Species					14					
Number of Hybrids					1					

River Code: **02-231**	Stream: **Trib. to Georges Creek (RM 2.00)**	Sample Date: **1996**
River Mile: **2.40**	Location:	Date Range: 07/11/1996
Time Fished: 1824 sec	Drainage: 5.3 sq mi	
Dist Fished: 0.14 km	Basin: Scioto 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	21	45.00	5.16	1.40	20.72	31.14
Blacknose Dace	N	G	S	T	66	141.43	16.22	0.44	6.49	3.11
Creek Chub	N	G	N	T	134	287.14	32.92	2.56	37.81	8.90
Suckermouth Minnow	N	I	S		2	4.29	0.49	0.02	0.31	5.00
Striped Shiner	N	I	S		82	175.71	20.15	1.44	21.30	8.20
Sand Shiner	N	I	M	M	15	32.14	3.69	0.09	1.33	2.80
Silverjaw Minnow	N	I	M		17	36.43	4.18	0.13	1.94	3.59
Bluntnose Minnow	N	O	C	T	24	51.43	5.90	0.17	2.53	3.33
Central Stoneroller	N	H	N		22	47.14	5.41	0.22	3.24	4.64
Green Sunfish	S	I	C	T	10	21.43	2.46	0.20	2.97	9.40
Bluegill Sunfish	S	I	C	P	8	17.14	1.97	0.04	0.55	2.14
Greenside Darter	D	I	S	M	6	12.86	1.47	0.05	0.80	4.17
Mile Total					407	872.14		6.76		
Number of Species					12					
Number of Hybrids					0					

River Code: 02-231	Stream: Trib. to Georges Creek (RM 2.00)	River Segment Totals
Mile Range: 2.40		Date Range: 07/10/1996
Thru: 6.00		Thru: 09/20/1996
Dist Fished: 0.44 km	Basin: Scioto River No of Passes: 3	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
White Sucker	W	O	S	T	142	95.67	6.53	3.65	26.86	38.22
Common Carp	G	O	M	T	1	0.67	0.05	0.13	0.96	195.00
Blacknose Dace	N	G	S	T	295	199.81	13.64	0.76	5.62	3.83
Creek Chub	N	G	N	T	867	584.38	39.90	4.96	36.48	8.48
Suckermouth Minnow	N	I	S		2	1.43	0.10	0.01	0.05	5.00
South. Redbelly Dace	N	H	S		4	2.67	0.18	0.01	0.06	3.25
Striped Shiner	N	I	S		82	58.57	4.00	0.48	3.53	8.20
Sand Shiner	N	I	M	M	15	10.71	0.73	0.03	0.22	2.80
Silverjaw Minnow	N	I	M		18	12.81	0.87	0.05	0.34	3.61
Fathead Minnow	N	O	C	T	1	0.67	0.05	0.00	0.01	3.00
Bluntnose Minnow	N	O	C	T	55	37.81	2.58	0.14	1.03	3.71
Central Stoneroller	N	H	N		601	401.71	27.43	2.91	21.41	7.25
White Crappie	S	I	C		1	0.67	0.05	0.00	0.02	5.00
Largemouth Bass	F	C	C		9	6.00	0.41	0.03	0.24	5.33
Green Sunfish	S	I	C	T	31	21.14	1.44	0.22	1.61	10.39
Bluegill Sunfish	S	I	C	P	34	23.05	1.57	0.17	1.23	7.33
Orangespotted Sunfish	S	I	C		3	2.00	0.14	0.01	0.04	2.67
Green Sf X Bluegill Sf					1	0.67	0.05	0.02	0.15	30.00
Greenside Darter	D	I	S	M	6	4.29	0.29	0.02	0.13	4.17
Stream Total					2,168	1,464.71		13.59		
Number of Species					18					
Number of Hybrids					1					

River Code: **02-277**	Stream: **Trib. to Walnut Creek (RM 15.54)**	Sample Date: **1996**
River Mile: **0.10**	Location:	Date Range: 08/13/1996
Time Fished: 4027 sec	Drainage: 0.6 sq mi	Thru: 09/19/1996
Dist Fished: 0.30 km	Basin: Scioto 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
White Sucker	W	O	S	T	1	1.00	0.45			
Blacknose Dace	N	G	S	T	3	3.00	1.34			
Creek Chub	N	G	N	T	35	35.00	15.63			
Fathead Minnow	N	O	C	T	130	130.00	58.04			
Central Stoneroller	N	H	N		1	1.00	0.45			
Yellow Bullhead		I	C	T	4	4.00	1.79			
Green Sunfish	S	I	C	T	47	47.00	20.98			
Mottled Sculpin		I	C		3	3.00	1.34			
Mile Total					224	224.00				
Number of Species					8					
Number of Hybrids					0					

River Code: **02-277** Mile Range: **0.10** Dist Fished: 0.30 km	Stream: **Trib. to Walnut Creek (RM 15.54)** Basin: Scioto River No of Passes: 2	River Segment Totals Date Range: 08/13/1996 Thru: 09/19/1996 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	1	1.00	0.45			
Blacknose Dace	N	G	S	T	3	3.00	1.34			
Creek Chub	N	G	N	T	35	35.00	15.63			
Fathead Minnow	N	O	C	T	130	130.00	58.04			
Central Stoneroller	N	H	N		1	1.00	0.45			
Yellow Bullhead		I	C	T	4	4.00	1.79			
Green Sunfish	S	I	C	T	47	47.00	20.98			
Mottled Sculpin		I	C		3	3.00	1.34			
	Stream Total				224	224.00				
	Number of Species				8					
	Number of Hybrids				0					

River Code: **02-278**	Stream: **Trib. to Walnut Creek (RM 15.64)**	Sample Date: **1996**
River Mile: **0.60**	Location:	Date Range: 08/13/1996
Time Fished: 8768 sec	Drainage: 2.4 sq mi	Thru: 09/19/1996
Dist Fished: 0.34 km	Basin: Scioto 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
White Sucker	W	O	S	T	83	73.24	3.97			
Common Carp	G	O	M	T	39	34.41	1.87			
Golden Shiner	N	I	M	T	3	2.65	0.14			
Blacknose Dace	N	G	S	T	58	51.18	2.78			
Creek Chub	N	G	N	T	255	225.00	12.20			
South. Redbelly Dace	N	H	S		1	0.88	0.05			
Rosefin Shiner	N	I	S	M	1	0.88	0.05			
Striped Shiner	N	I	S		99	87.35	4.74			
Spotfin Shiner	N	I	M		88	77.65	4.21			
Sand Shiner	N	I	M	M	1	0.88	0.05			
Fathead Minnow	N	O	C	T	121	106.76	5.79			
Bluntnose Minnow	N	O	C	T	491	433.24	23.49			
Central Stoneroller	N	H	N		187	165.00	8.95			
Yellow Bullhead		I	C	T	14	12.35	0.67			
Black Bullhead		I	C	P	1	0.88	0.05			
Largemouth Bass	F	C	C		3	2.65	0.14			
Green Sunfish	S	I	C	T	407	359.12	19.47			
Bluegill Sunfish	S	I	C	P	166	146.47	7.94			
Green Sf X Bluegill Sf					15	13.24	0.72			
Johnny Darter	D	I	C		46	40.59	2.20			
Orangethroat Darter	D	I	S		10	8.82	0.48			
Mottled Sculpin		I	C		1	0.88	0.05			
Mile Total					2,090	1,844.12				
Number of Species					21					
Number of Hybrids					1					

River Code: **02-278**	Stream: **Trib. to Walnut Creek (RM 15.64)**	River Segment Totals
Mile Range: **0.60**		Date Range: 08/13/1996
		Thru: 09/19/1996
Dist Fished: 0.34 km	Basin: Scioto 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
White Sucker	W	O	S	T	83	73.24	3.97			
Common Carp	G	O	M	T	39	34.41	1.87			
Golden Shiner	N	I	M	T	3	2.65	0.14			
Blacknose Dace	N	G	S	T	58	51.18	2.78			
Creek Chub	N	G	N	T	255	225.00	12.20			
South. Redbelly Dace	N	H	S		1	0.88	0.05			
Rosefin Shiner	N	I	S	M	1	0.88	0.05			
Striped Shiner	N	I	S		99	87.35	4.74			
Spotfin Shiner	N	I	M		88	77.65	4.21			
Sand Shiner	N	I	M	M	1	0.88	0.05			
Fathead Minnow	N	O	C	T	121	106.76	5.79			
Bluntnose Minnow	N	O	C	T	491	433.24	23.49			
Central Stoneroller	N	H	N		187	165.00	8.95			
Yellow Bullhead		I	C	T	14	12.35	0.67			
Black Bullhead		I	C	P	1	0.88	0.05			
Largemouth Bass	F	C	C		3	2.65	0.14			
Green Sunfish	S	I	C	T	407	359.12	19.47			
Bluegill Sunfish	S	I	C	P	166	146.47	7.94			
Green Sf X Bluegill Sf					15	13.24	0.72			
Johnny Darter	D	I	C		46	40.59	2.20			
Orangethroat Darter	D	I	S		10	8.82	0.48			
Mottled Sculpin		I	C		1	0.88	0.05			
	Stream Total				2,090	1,844.12				
	Number of Species				21					
	Number of Hybrids				1					

River Code: **02-279**	Stream: **Manns Run**	Sample Date: **1996**
River Mile: **1.00**	Location:	Date Range: 08/14/1996
Time Fished: 7562 sec	Drainage: 3.8 sq mi	Thru: 09/19/1996
Dist Fished: 0.32 km	Basin: Scioto 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
White Sucker	W	O	S	T	7	6.56	0.49			
Common Carp	G	O	M	T	1	0.94	0.07			
Blacknose Dace	N	G	S	T	27	25.31	1.89			
Creek Chub	N	G	N	T	288	270.00	20.18			
South. Redbelly Dace	N	H	S		1	0.94	0.07			
Striped Shiner	N	I	S		92	86.25	6.45			
Spotfin Shiner	N	I	M		22	20.63	1.54			
Fathead Minnow	N	O	C	T	5	4.69	0.35			
Bluntnose Minnow	N	O	C	T	152	142.50	10.65			
Central Stoneroller	N	H	N		158	148.13	11.07			
Yellow Bullhead		I	C	T	1	0.94	0.07			
Largemouth Bass	F	C	C		2	1.88	0.14			
Green Sunfish	S	I	C	T	75	70.31	5.26			
Bluegill Sunfish	S	I	C	P	30	28.13	2.10			
Green Sf X Bluegill Sf					1	0.94	0.07			
Blackside Darter	D	I	S		4	3.75	0.28			
Johnny Darter	D	I	C		41	38.44	2.87			
Greenside Darter	D	I	S	M	2	1.88	0.14			
Rainbow Darter	D	I	S	M	42	39.38	2.94			
Orangethroat Darter	D	I	S		292	273.75	20.46			
Fantail Darter	D	I	C		165	154.69	11.56			
Mottled Sculpin		I	C		19	17.81	1.33			
Mile Total					1,427	1,337.81				
Number of Species					21					
Number of Hybrids					1					

River Code: **02-279**	Stream: **Manns Run**	Sample Date: **1996**
River Mile: **0.30**	Location:	Date Range: 08/14/1996
Time Fished: 5848 sec	Drainage: 4.7 sq mi	Thru: 09/19/1996
Dist Fished: 0.40 km	Basin: Scioto 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
White Sucker	W	O	S	T	6	4.50	0.83			
Common Carp	G	O	M	T	5	3.75	0.69			
Blacknose Dace	N	G	S	T	18	13.50	2.49			
Creek Chub	N	G	N	T	212	159.00	29.36			
Striped Shiner	N	I	S		5	3.75	0.69			
Spotfin Shiner	N	I	M		9	6.75	1.25			
Silverjaw Minnow	N	I	M		6	4.50	0.83			
Bluntnose Minnow	N	O	C	T	63	47.25	8.73			
Central Stoneroller	N	H	N		13	9.75	1.80			
Largemouth Bass	F	C	C		2	1.50	0.28			
Green Sunfish	S	I	C	T	39	29.25	5.40			
Bluegill Sunfish	S	I	C	P	4	3.00	0.55			
Johnny Darter	D	I	C		69	51.75	9.56			
Greenside Darter	D	I	S	M	3	2.25	0.42			
Rainbow Darter	D	I	S	M	44	33.00	6.09			
Orangethroat Darter	D	I	S		190	142.50	26.32			
Fantail Darter	D	I	C		19	14.25	2.63			
Mottled Sculpin		I	C		15	11.25	2.08			
	Mile Total				722	541.50				
	Number of Species				18					
	Number of Hybrids				0					

Species List

River Code: **02-279**	Stream: **Manns Run**	River Segment Totals
Mile Range: **0.30**		Date Range: 08/14/1996
Thru: **1.00**		Thru: 09/19/1996
Dist Fished: 0.72 km	Basin: Scioto 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
White Sucker	W	O	S	T	13	5.53	0.59			
Common Carp	G	O	M	T	6	2.34	0.25			
Blacknose Dace	N	G	S	T	45	19.41	2.07			
Creek Chub	N	G	N	T	500	214.50	22.83			
South. Redbelly Dace	N	H	S		1	0.47	0.05			
Striped Shiner	N	I	S		97	45.00	4.79			
Spotfin Shiner	N	I	M		31	13.69	1.46			
Silverjaw Minnow	N	I	M		6	2.25	0.24			
Fathead Minnow	N	O	C	T	5	2.34	0.25			
Bluntnose Minnow	N	O	C	T	215	94.88	10.10			
Central Stoneroller	N	H	N		171	78.94	8.40			
Yellow Bullhead		I	C	T	1	0.47	0.05			
Largemouth Bass	F	C	C		4	1.69	0.18			
Green Sunfish	S	I	C	T	114	49.78	5.30			
Bluegill Sunfish	S	I	C	P	34	15.56	1.66			
Green Sf X Bluegill Sf					1	0.47	0.05			
Blackside Darter	D	I	S		4	1.88	0.20			
Johnny Darter	D	I	C		110	45.09	4.80			
Greenside Darter	D	I	S	M	5	2.06	0.22			
Rainbow Darter	D	I	S	M	86	36.19	3.85			
Orangethroat Darter	D	I	S		482	208.13	22.15			
Fantail Darter	D	I	C		184	84.47	8.99			
Mottled Sculpin		I	C		34	14.53	1.55			
	Stream Total				2,149	939.66				
	Number of Species				22					
	Number of Hybrids				1					