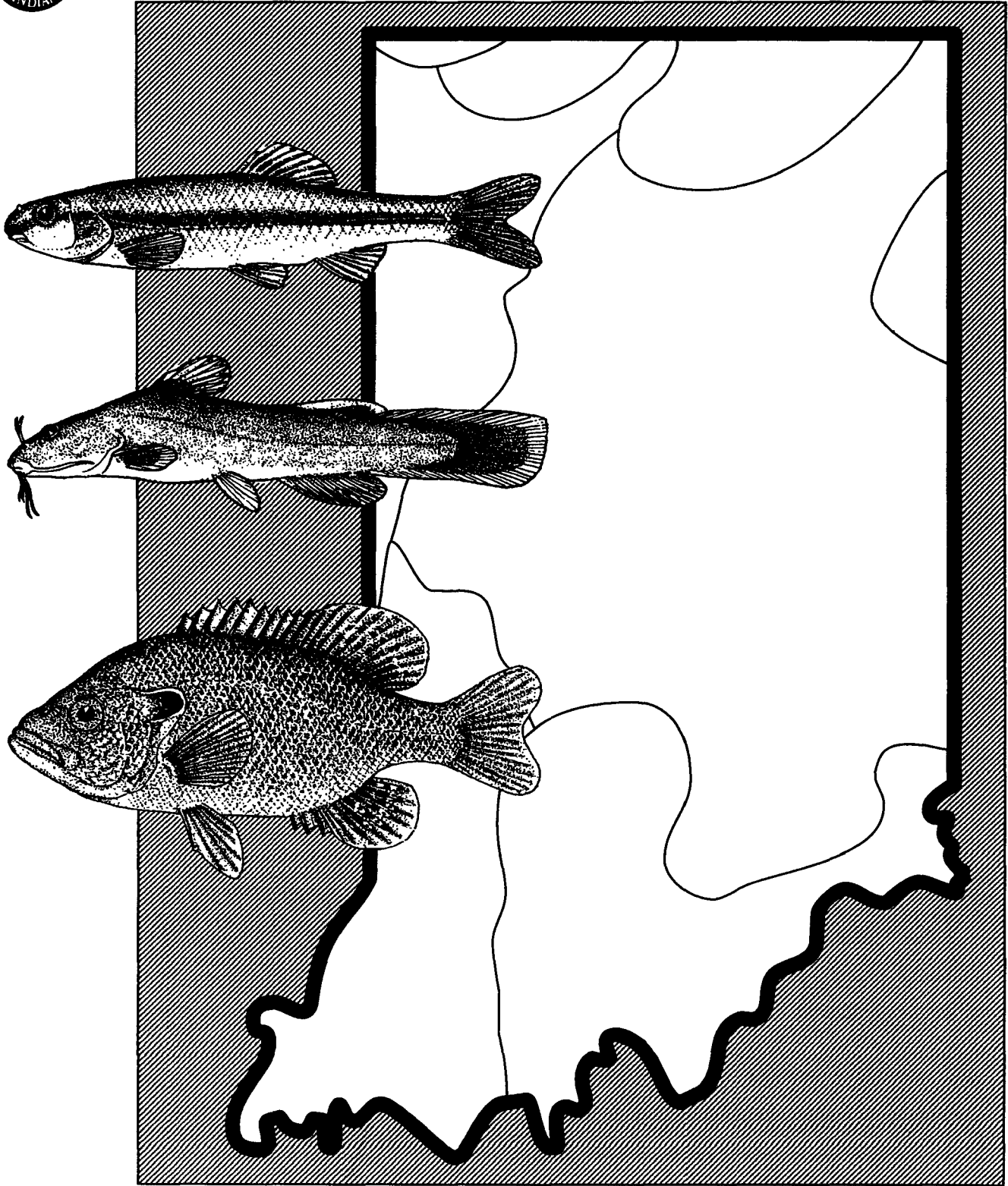




# Development of Index of Biotic Integrity Expectations For the Ecoregions of Indiana II. Huron-Erie Lake Plain



**Development of Index of Biotic Integrity Expectations  
for the Ecoregions of Indiana: II. Huron-Erie Lake Plain**

Thomas P. Simon  
U.S. Environmental Protection Agency  
Standards and Assessment Section  
77 West Jackson, WQS-16J  
Chicago, IL 60604

*In cooperation with:*  
Indiana Department of Environmental Management  
Water Quality Surveillance and Standards Branch  
100 North Senate Ave., P.O. Box 6015  
Indianapolis, IN 46206-6015

March 9, 1994

## NOTICE

Use of this document is intended for the objective facilitation of information exchange between the States and Federal Water Pollution Control Biologists for which it was intended. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

### When citing this document:

T.P. Simon. 1994. Development of Index of Biotic Integrity expectations for the Ecoregions of Indiana. II. Huron-Erie Lake Plain. U.S. Environmental Protection Agency, Region V, Water Division, Watershed and Non-Point Source Branch, Chicago, IL. EPA 905/R-92/007.

### If requesting copies of this document:

U.S. Environmental Protection Agency  
Publication Distribution Center, DDD  
11027 Kenwood Road, Bldg. 5 - Dock 63  
Cincinnati, OH 45242

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
i. List of Figures	iii
ii. List of Tables	v
iii. Executive Summary	vii
iv. Acknowledgements	ix
<b>1.0 INTRODUCTION</b>	<b>1</b>
Definition of Reference Conditions	1
Criteria for Selecting Reference Sites	2
<b>2.0 STUDY AREA</b>	<b>3</b>
Physiographic Provinces	3
Ecoregions	5
Eastern Corn Belt Plain	5
Huron-Erie Lake Plain	5
Natural Areas	7
Drainage Features	9
Maumee River	9
St. Joseph River	9
St. Marys River	10
Historical Maumee River data	10
<b>3.0 MATERIALS AND METHODS</b>	<b>10</b>
Sampling	10
Site Specific	10
Habitat	11
Community Analysis	11
Sampling Considerations	12
Sample Site Selection	12
Index of Biotic Integrity	14
Metrics	14
Scoring Modifications	49
<b>4.0 RESULTS AND DISCUSSION</b>	<b>50</b>
Maumee River Drainage	50
St. Joseph River Drainage	54
St. Mary's River Drainage	55
Reference Sites	56
Biocriteria Comparison of the Huron-Erie Lake Plain	58
<b>6.0 LITERATURE CITED</b>	<b>61</b>

## **7.0 APPENDICES**

- A. Tolerance, trophic, and reproductive guild classifications for computing the Index of Biotic Integrity for Indiana taxa.**
- B. Metric specific Index of Biotic Integrity scores for sites in the Maumee River drainage.**
- C. Fish nomenclature changes for the species of fish occurring within the political boundaries of Indiana.**

## LIST OF FIGURES

Figure Number		Page
1	Map of Indiana showing the major and minor drainage basins (after USGS drainage maps).	4
2	Map of Indiana showing the ecoregions designation of Omernik and Gallant (1988)	6
3	Map of Indiana indicating the natural areas designation of Homoya et al. (1985).	8
4	Maumee River drainage indicating the location of sampled locations during 1991.	12
5	Maximum species richness lines for determining trends in total number of species with increasing drainage area for the Maumee River drainage.	19
6	Maximum species richness lines for determining trends in number of darter/madtom/sculpin species with increasing drainage area for the Maumee River drainage.	22
7	Maximum species richness lines for determining trends in number of sunfish species with increasing drainage area for the Maumee River drainage.	24
8	Maximum species richness lines for determining trends in number of minnow species with increasing drainage area for the Maumee River drainage.	27
9	Maximum species richness lines for determining trends in number of sucker species with increasing drainage area for the Maumee River drainage.	28
10	Maximum species richness lines for determining trends in number of sensitive species with increasing drainage area for the Maumee River drainage.	31
11	Maximum species richness lines for determining trends in the proportion of tolerant species with increasing drainage area for the Maumee River drainage.	32
12	Maximum species richness lines for determining trends in the proportion of omnivores with increasing drainage area for the Maumee River drainage.	36

LIST OF FIGURES (CONTINUED)

Figure Number		Page
13	Maximum species richness lines for determining trends in the proportion of insectivores with increasing drainage area for the Maumee River drainage.	38
14	Maximum species richness lines for determining trends in the proportion of pioneer species with increasing drainage area for the Maumee River drainage.	40
15	Maximum species richness lines for determining trends in the proportion of carnivores with increasing drainage area for the Maumee River drainage.	41
16	Maximum species richness lines for determining trends in the catch per unit effort with increasing drainage area for the Maumee River drainage.	43
17	Maximum species richness lines for determining trends in the proportion of simple lithophil species with increasing drainage area for the Maumee River drainage.	46
18	Maximum species richness lines for determining trends in the proportion of diseased, eroded fins, lesions, and tumors (DELT) with increasing drainage area for the Maumee River drainage.	48

## LIST OF TABLES

Table Number		Page
1	Attributes of Index of Biotic Integrity (IBI) classification, total IBI scores, and integrity classes from Karr et al. (1986).	16
2	Index of Biotic Integrity metrics used to evaluate headwater streams (< 20 miles <sup>2</sup> drainage area) sites in the Maumee River drainage	17
3	Index of Biotic Integrity metrics used to evaluate wadable river (> 20-1,000 miles <sup>2</sup> drainage area) sites in the Maumee River drainage.	18
4	The distributional characteristics of Indiana darter ( <i>Etheostomatini</i> ), madtom ( <i>Noturus</i> ), and sculpin ( <i>Cottus</i> ) species.	23
5	List of Indiana sunfish species for evaluating quality pool habitats.	25
6	Distributional characteristics of Indiana sucker species (family Catostomidae) in the Maumee River drainage.	28
7	List of Indiana fish species considered to be sensitive to a wide variety of environmental disturbances including water quality and habitat degradation.	32
8	List of Indiana fish species considered to be highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation for headwater and wadable river sites.	35
9	List of Indiana fish species considered to be omnivores.	37
10	List of Indiana fish species considered to be indicators of temporally unavailable or stressed habitats (Larimore and Smith 1963; Smith 1971)	41
11	List of Indiana species considered to be simple lithophilic spawners.	47
12	Species list of taxa collected in the Maumee River drainage: Maumee St. Mary's, and St. Joseph River drainages, Indiana, during 1991.	53
13	Reference sites determined using fish community biotic integrity for the Maumee River drainage, Indiana.	59
14	Comparison of Ohio Environmental Protection Agency (1989) reference conditions derived from the Stream Regionalization Project with reference conditions developed from Indiana portions of the Huron-Erie Lake Plain (Ohio EPA 1989).	62



## EXECUTIVE SUMMARY

The Clean Water Act Amendments of 1987 suggest the development of biological criteria for evaluating the quality of the nation's surface waters. The Maumee River drainage was investigated in Indiana to determine water resource expectations for the Huron-Erie Lake Plain. A total of 77 sites were sampled in the Maumee River drainage in order to develop and calibrate an Index of Biotic Integrity for use in this region of Indiana. The Maumee basin crosses two ecoregions, based on anticipated variance, sub-drainages were established using natural divisions as recognized by Homoya et al. (1985).

Three sub-drainages are recognized and include the major drainage units of the Maumee River: Maumee River, St. Joseph River, and St. Mary's River drainages. Graphical analysis of the data enabled the construction of maximum species richness lines for calibrating the Index of Biotic Integrity for 12 metrics as modified for application to headwater and mid-sized wadable rivers in Indiana. Metrics were primarily based on the previous works of Karr (1981), Karr et al. (1986), Ohio EPA (1987), and Simon (1991). Metrics are similar to those developed for the Lake Michigan Division of the Central Corn Belt Plain. This includes the number of minnow and sunfish species, proportion of pioneer species, and a combination of sensitive benthic insectivores, e.g. darters, madtoms, and sculpins.

Separate metrics were developed for headwater streams (< 20 miles<sup>2</sup>) and wadable river (20-1000 miles<sup>2</sup>) drainage area. Scoring criteria modifications were instituted when less than 50 individuals were collected from a sampling location. This affected the trophic composition, tolerance, simple lithophil, and disease proportional metrics. Stations with drainage areas less than 20 miles<sup>2</sup> used a metric which included darters, madtoms, and sculpins (all benthic insectivores). These species are sensitive indicators of a high quality aquatic resource. In reaches with drainage areas greater than 20 miles<sup>2</sup> a metric evaluating only darter species was used following the original IBI. The proportion of pioneer species was substituted for the proportion of carnivores in small headwater streams. The number of sunfish species was retained for both categories of stream sizes. Indiana numerical criteria from the Huron-Erie Lake Plain is comparable to Ohio's statewide numerical expectations.

The distribution of IBI scores represented a normal curve for the Maumee and St. Joseph River subdrainages. Declining biological integrity was observed in the headwaters of the St. Mary's River subdrainage. This seemed to be the pattern for almost the entire Maumee River drainage. The trend was towards increasing biological integrity with increasing drainage area in all subdrainages. The only exception was the St. Joseph River which possessed considerably better fish community at the headwaters. A comparison of Huron-Erie Lake Plain numerical biocriteria was made between reference condition expectations for Indiana with statewide criteria for Ohio. Most metrics were statistically comparable including the number of species, number of minnow species, number of sucker species, proportion of tolerant species, proportion of carnivores, proportion of simple lithophils, and proportion of disease, eroded fins, lesions, and tumors (DELT). Metrics which were significantly different included proportion of omnivores and proportion of insectivores which are more stringent in Indiana criteria. However, six other metrics had more stringent expectations in Ohio's statewide numerical criteria than was observed in the Indiana portion of the Huron-Erie Lake Plain. Significantly different metrics included number of species in wadable rivers, number of darter species, proportion of tolerant species in headwater streams, number of sensitive species, proportion of omnivores, proportion of insectivores, proportion of pioneer species, and proportion of simple lithophils. Several plausible explanations suggest why these differences exist. The first is that the sites in the Huron-Erie Lake Plain are severely degraded due to the human modification of the landscape. A second explanation is a reflection of the historical vicariant events which occurred post-glaciation. A third explanation is the statewide criteria developed in Ohio should have a greater richness and composition because of the larger affected area.

## ACKNOWLEDGEMENTS

The U.S. Environmental Protection Agency wishes to express their appreciation to those individuals which enabled this study to be completed: Wayne Davis, Valerie Jones, and Boniface Thayil, USEPA-Region V, Ambient Monitoring Section, and John Winters, Dennis Clark, and Lee Bridges, Indiana Department of Environmental Management (IDEM) managed and facilitated logistics and sampling needs. Special thanks to Thomas Lauer, Fisheries Scientist, Indiana Department of Natural Resources who provided information from the Department's stream reports which enabled sampling at reference sites. Field assistance was provided by Andrew Ellis, Doug Campbell, and Gregory Nottingham, Steve Newhouse, James Stahl, and Stephen Wentz, IDEM biologists. We express our appreciation to all the Indiana landowners which allowed access across their property to facilitate River launching of gear. We are indebted to John Dustman, Indiana University-Northwest, for use of work space to process the large volume of samples. Metric expectation graphs were prepared by Beth Simon. Hydrologic unit and ecoregion maps were prepared by George Graettinger, USEPA, Water Division, GIS Section, while the Natural Regions of Indiana map was prepared by Mary Van Buren, GIS Laboratory, School of Public and Environmental Affairs, Indiana University, Bloomington. Shelby Gerking, Arizona State University, provided notes and copies of valuable information from his previous collection efforts in Indiana. Numerous professional courtesies were provided by colleagues which facilitated completion of this project: Chris Yoder, Marc Smith, and Ed Rankin, Ohio EPA, provided help in numerous aspects of this study. Much information was gained through conversations with colleagues concerning techniques and logistical aspects: William Matthews, Brooks Burr, Melvin Warren, Jr., Lawrence Page, John Lyons, Bob Hughes, Phil Larsen, and Jim Omernik. Historic records were provided by Susan Jewett, National Museum of Natural History; Douglas Nelson and Gerald Smith, University of Michigan Museum of Zoology; William Eschmeyer, California Academy of Science; and Ted Cavender, The Ohio State University. Special thanks to Wayne Davis, Lee Bridges, James Stahl, Rhonda Dufour, and Steve Newhouse for constructive review comments on a previous draft of the manuscript. The project manager, chief scientist, and author of this report was Thomas P. Simon, Regional Biocriteria Coordinator.

---

### Guest Reviewers:

Mr. Chris Yoder, Ohio Environmental Protection Agency  
Mr. Marc Smith, Ohio Environmental Protection Agency  
Dr. Lizhu Wang, Wisconsin Department of Natural Resources

# Development of Index of Biotic Integrity Expectations

## for the Ecoregions of Indiana. II. Huron-Erie Lake Plain

### 1.0 INTRODUCTION

The term "biological integrity" originated in the Water Pollution Control Act Amendments of 1972 (PL 92-500) and has likewise appeared in subsequent versions (PL 95-217; PL 100-1). Karr and Dudley (1981) defined biological integrity as, "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the best natural habitats within a region". The use of a biological component to evaluate the ambient lotic aquatic community of our nations surface waters has been well discussed elsewhere (Karr *et al.* 1986; Ohio EPA 1987; Whittier *et al.* 1987; Simon *et al.* 1988; Davis 1990; Fausch *et al.* 1990; Karr 1991).

An assessment of the Maumee River drainage enabled the objective evaluation of specific metrics performance and evaluation of reference conditions for the Huron-Erie Lake Plain. The Maumee River drainage has impacts associated with channelization, agriculture, and municipal and point source dischargers. The primary point sources are municipal facilities, chemical manufacturers, and electric power generating stations distributed in the main population centers of the basin. The effects of channelization and agriculture have been well documented (Raney and Menzel 1969; Brown 1976; Brungs and Jones 1977; Hokanson and Biesinger 1980; USEPA 1980; McCormick *et al.* 1981; EPRI 1981).

The objective of this study was to evaluate the biological integrity of Indiana water resources based on "least impacted" reference conditions for establishing baseline conditions (Hughes *et al.* 1986). Least impacted reference sites are representative of the subbasin under study and reflect the better sites with minimum anthropogenic change. Least impacted is not synonymous with pristine. Rather, sites are selected for their representativeness of the area. The Maumee River drainage and the historical

Black Swamp have been dramatically changed over the last 250 years with the draining of the wetland and the intensive ditching projects that completely changed the landscape. The following project goals were addressed during the Huron-Erie Lake Plain biological criteria project:

- o Develop biological criteria for headwater, mid-size, and large river reaches using the Index of Biotic Integrity and habitat classification;
- o Identify areas of least disturbance within the Huron-Erie Lake Plain for establishing reference condition;
- o Develop maximum species richness (MSR) lines from the reference database for each Index of Biotic Integrity metric as a function of drainage area;
- o Compare numerical biological criteria expectations between this study and the State of Ohio.

This technical report includes specific Index of Biotic Integrity criteria including the development of metrics and maximum species richness lines, to delineate areas of least disturbance in the Huron-Erie Lake Plain. The purpose of this study is not to verify ecoregion boundaries since additional study areas would need to be sampled to determine the heterogeneity of the "fuzzy border" areas. At the termination of the ecoregion effort a final report will examine the ecoregion concept for water resource management in Indiana.

### Definition of Reference Conditions

In order to make accurate evaluations of the biological condition of the region, various baseline geological, geographic, and climatic differences need to be assessed. The goal is not to provide a definition of pristine conditions,

## Indiana Ecoregion

---

since these types of conditions are either few in number or nonexistent in heavily populated states (Hughes *et al.* 1982; Whittier *et al.* 1987). Our expectations are based on fish community structure and function to define attainable natural conditions of "least impacted" or reference conditions. Assessment of these criteria need to be modified nationally, since regional differences can be attributed to the expectations determining distribution of fishes. The ecoregion concept is useful for clustering large homogeneous regions, since these areas are influenced by different physical processes (Omernik 1987).

In order to select stations for sampling it is necessary to know the geographical boundary of the "ecoregions" within the State of Indiana. A valid ecoregion has boundaries where ecosystem variables and patterns emerge (Hughes *et al.* 1986). Omernik (1987) mapped the ecoregions of the conterminous United States from maps of land-surface form, soil types, potential natural vegetation, and land use. Each ecoregion was then based on areas of regional homogeneity. Ecoregions became a very useful mechanism for determining community complexity and for establishing boundaries associated with various land forms.

Ecoregions provide a geographical framework for determining the appropriate response for streams of similar proportion and complexity. Reference sites are used for establishing the areas of "least impact", and will reveal the current conditions of the surface waters of Indiana. Once ecoregional expectations are determined it is important to consider that conditions do not remain static. On the contrary, repeat monitoring and sampling of stations, both reference and site specific will need to be conducted in order to document change over time and further refine the IBI.

Because of subregional differences, further demarcation was made by examining the role of the basin or the watersheds within natural areas. Natural areas are similar to ecoregions but are demarcated and established along biotic components. Fish composition and community

structure is determined, within a natural area by the availability of water of appropriate quality and quantity to ensure existence, provide routes of emigration, sustain growth, and increase fitness through reproduction. Likewise, species-specific differences exist in community structure which may not reveal differences in current water quality but may be determined by historical geomorphic (Leopold *et al.* 1964) or zoogeographic processes (Hocutt and Wiley 1986). Trends in Indiana water quality were therefore evaluated using a basin approach within an ecoregion framework.

### **Criteria for Selecting Reference Sites**

Several procedures are available for determining reference conditions. Larsen *et al.* (1986) and Whittier *et al.* (1987) chose sites after careful examination of aerial photographs, sub-basin specific information review, and on-site reconnaissance, and expert consultation. This procedure requires that a limited number of high-quality sites be sampled in order to predict regional expectations. The methods chosen for site selection were based on the evaluation of Regional Water Quality Planning Maps (USGS undated) which identified known impact sources and diffuse nonpoint sources which could potentially influence a site. A balanced distribution of sites within all parts of the Maumee River drainage was maintained against historic collections sites (Jordan 1877; Gerking 1945; IDEM 1990). All sites were rigorously sampled in order to get representative, distance specific, quantitative estimates of species richness and biomass. Maximum species richness lines were then compiled (see methods below), followed by calculations of the Index of Biotic Integrity values to reveal which stations were the "least impacted" stations for the Maumee River drainage.

Reference sites are defined as the stations which cumulatively define the 95th percentile line of the individual metrics. Evaluation of habitat and other physical parameters refined the final list of reference sites. Sites which had habitat or water quality deficiencies, but still

attained high index ratings would have been removed from the final list. This action was not required, since poor habitat and water quality affected various portions of the community resulting in a lowered index score. These sites are not pristine or undisturbed (few exist in Indiana), but they do represent the best conditions given the background activities (i.e. anthropogenic impacts; channelization; cultural eutrophication).

Sampling was conducted in all size classes of river reaches in the Maumee, St. Joseph, and St. Mary's Rivers from the headwater (<20 mile<sup>2</sup>) to the largest mainstem drainage area (ca. 1,000 mile<sup>2</sup>) in Indiana.

## 2.0 STUDY AREA

Indiana has an area of 36,291 square miles, and drains the Ohio, the upper Mississippi, and Great Lakes Regions (Seaber *et al.* 1984). These three regions were further subdivided into nine subregions (Fig. 1), five of which drain 86% of the State (USGS 1990). The State of Indiana lies within the limits of latitude 37° 46' 18" and 41° 45' 33" north, for an extreme length of 275.5 miles in a north-south direction; and between longitude 84° 47' 05" and 88° 05' 50" west with an extreme width in an east-west direction of 142.1 miles.

The State has a maximum topographic relief of about 900.9 ft, with elevations ranging from about 300.3 ft above mean sea level at the mouth of the Wabash River to slightly more than 1,201.2 ft in Randolph County in the east-central part of the state.

This report considers only the Maumee River drainage. The Maumee River drains an area of 6,608 mile<sup>2</sup> (Hoggatt 1975). It crosses two ecoregions and drains 5.5% of Indiana. The St. Joseph River drains the Eastern Corn Belt Plain while the Maumee and St. Mary's River drain the Huron-Erie Lake Plain ecoregions (Omernik and Gallant, 1988). The Maumee River is located in northeastern Indiana and drains in a northeastern direction into Ohio and then Lake

Erie. The Maumee River is the largest tributary of Lake Erie. Tributaries of the Maumee which drain the Eastern Corn Belt Plain include the St. Joseph River, Cedar Creek, Fish Creek, and Black River. The Huron-Erie Lake Plain in Indiana includes the upper Maumee and the St. Mary's Rivers.

## Physiographic Provinces

Fenneman (1946) divided the State into two physiographic provinces based on the maximum extent of glaciation. The glaciated portion of the State contains the Central Lowland province, which includes the majority of the Maumee River drainage, and the unglaciated portion is termed the Interior Low Plateaus province.

Schneider (1966) further divided Indiana into three broad physiographic areas that closely reflect the surface-water characteristics of the State. The Maumee River drains a portion of the Northern Lake and Moraine Region.

The Northern Lake and Moraine Region covers the northern one-fourth of the State and is of variable relief. Its characteristic deep peat deposits and small lakes are restricted to the rugged, terminal moraines. Numerous broad lacustrine and outwash plains occur, often marked by wide marshes (or marshes now drained) broken by low sand ridges or knolls. The northern section of the State was covered during the most recent Wisconsin glacial event.

The last major glaciation event dramatically altered northern Indiana during the Wisconsin period (14,000 to 22,000 years ago). As glaciers advanced and retreated, the land surface was dramatically altered as the landforms were either scoured by advancing glacial ice or the scoured materials were deposited by retreating glaciers. Two distinct glacial lobes are known to have advanced into Indiana, from the northeast out of Lake Erie and Saginaw Bay basins and from the north from the Lake Michigan basin.

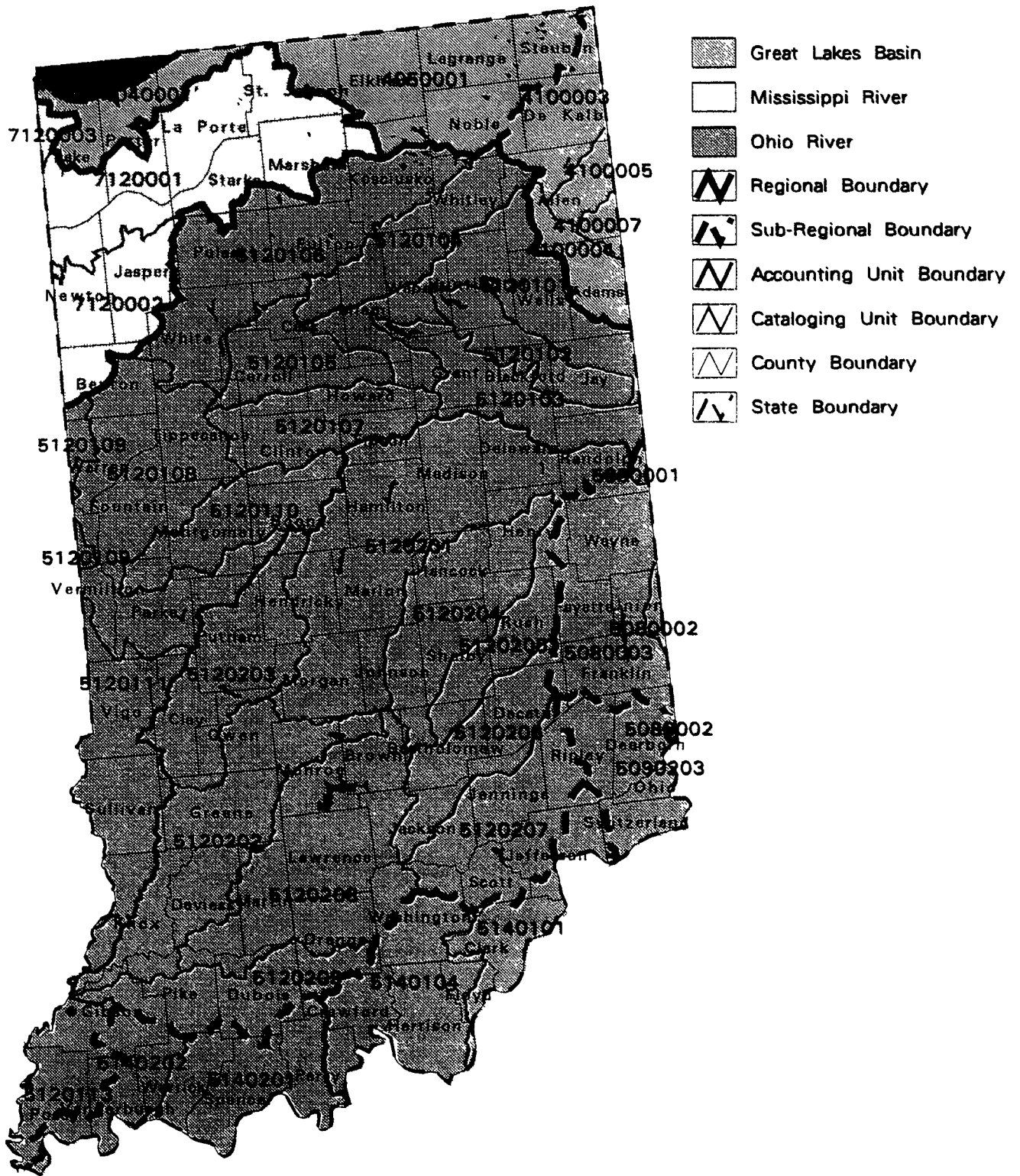


Figure 1. Map of Indiana showing Major and Minor drainage basins. (from USGS data).

## Ecoregions

Omernik and Gallant (1988) characterized the attributes of ecoregions of the midwestern states. Indiana has six recognized ecoregions: Central Corn Belt Plain, Huron-Erie Lake Plain, Southern Michigan-Northern Indiana Till Plain, Eastern Corn Belt Plain, Interior Plateau, and Interior River Lowland (Fig. 2). The Maumee River basin drains portions of the Eastern Corn Belt Plain and Huron-Erie Lake Plain ecoregions (Omernik and Gallant (1988).

### Eastern Corn Belt Plain

Much of the ecoregion consists of extensive cropland agriculture. It is distinguished from the western corn belt plains by the natural forest cover and associated soils. The gently rolling glacial tillplain is broken by moraines, kames, and outwash plains. Elevations range between 399.3 ft to greater than 1320 ft. The ecoregion is characterized by low relief, typically less than 66 ft; however, some morainal hills occur in the northern portion near Lake Erie. Stream valleys are long and sinuous and generally narrow and shallow throughout the 31,800 miles<sup>2</sup> of the ecoregion. Small streams have narrow valley floors; larger streams have broad valley floors. Elevation varies from about 399.3 ft, in the southern portion of the ecoregion, to over 999.9 ft on a few of the hills in the north. Precipitation occurs mainly during the growing season and averages from 35 to 40 inches annually. The ecoregion has few reservoirs or natural lakes.

Both perennial and intermittent streams are common in the ecoregion. Constructed drainage ditches and channelized streams further assist in soil drainage in flat, poorly drained areas. Stream density is approximately one half mile per square mile in the most typical portions of the ecoregion (Fig. 2).

The ecoregion is almost entirely farmland. The major crops produced are corn and soybeans. A total of 75% of the landuse is cropland, while the remaining 25% is permanent pasture, small woodlots, or urban. Emphasis on livestock

includes the growing of feed grains and hay. Swine, beef and dairy cattle, chickens, and turkey are raised.

Most of the soils were developed under the influence of deciduous forest vegetation. The soils are loamy calcareous glacial till, overlain by loess deposits. The soils are lighter in color and more acid than the adjacent Central Corn Belt Plain. Hapludolls and Ochraqualfs are the dominant soil groups on dry and wet upland sites, respectively. Argiaquolls, Haplaquolls, and Medisaprists have developed in flats and depressions. Hapludalfs and Fragiudalfs are common on well drained slopes of valleys. Shallow Hapludolls occur on some valley sides where erosion has removed the glacial material and exposed the underlying shale limestone. Udifluvents and Fluvaquents have derived from silty alluvium in narrow floodplains.

The natural vegetation of the area consists of diverse hardwood forests, predominantly American beech and sugar maple. However, a significant amount of white oak, black oak, northern red oak, yellow poplar, hickory, white ash, and black walnut exists. Many of the trees are common in adjacent ecoregions, but most are comprised of oak and hickory. Wetter sites include white oak, pin oak, northern red oak, yellow poplar, ash, and sweetgum primarily, and shingle oak, black oak, and hickory also occur. Silver maple, cottonwood, sycamore, pin oak, elm, and sweetgum grow along rivers and stream corridors.

### Huron-Erie Lake Plain

The Huron-Erie Lake Plain is discontinuous and is primarily distinguished from surrounding ecoregions based on poor soil drainage. Most of the area was once covered by forested wetlands. Many wetlands are still present, but many have been drained and cleared for cropland. Diverse cash crops and livestock are principal land uses. The ecoregion consists of broad, nearly level lake plain crossed by beach ridges and low moraines. The ecoregion is characterized by areas around 600 ft rising to

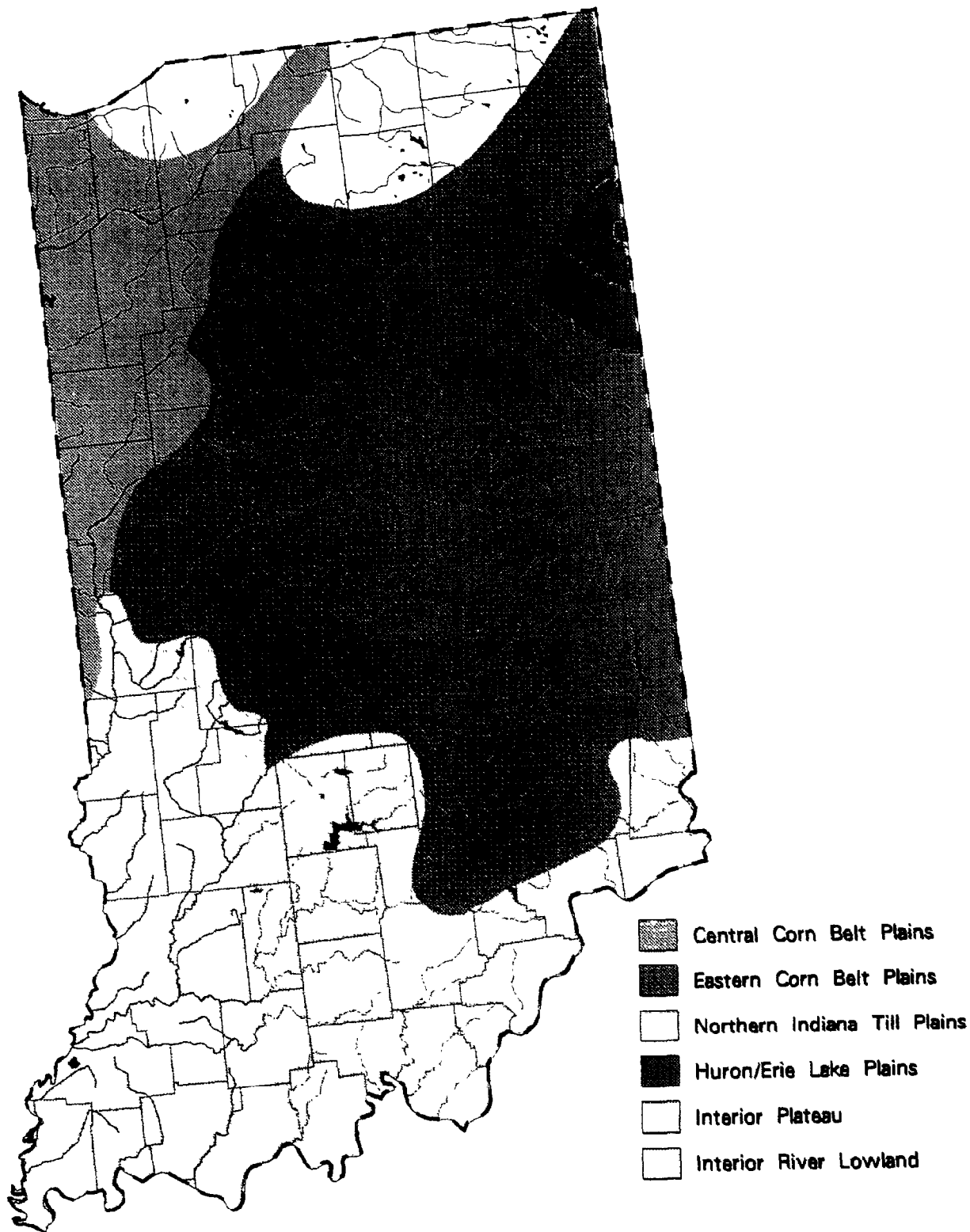


Figure 2. Map of Indiana showing the ecoregion designation from Omernik and Gallant (1988).



800 ft in elevation on some of the moraines. Local relief is usually only a few feet. Streams within the morainal hills and valleys are often intermittent becoming perennial when they reach the valley floors.

Large watersheds in the southern portion of the ecoregion often drain as much as 400-500 miles<sup>2</sup> in the overall 11,000 miles<sup>2</sup> of the ecoregion. The majority of streams drain less than 100 miles<sup>2</sup>. Precipitation is evenly distributed throughout the year and averages from 31 to 35 inches annually. The ecoregion has few lakes and reservoirs with those present usually being less than a quarter mile<sup>2</sup>.

Numerous drainage ditches have been constructed and many streams are extensively channelized allowing for quicker agricultural drainage in flat, poorly drained areas. More than half of the streams in the ecoregion are intermittent. These intermittent streams have a density of approximately one-half miles per mile<sup>2</sup> in the most typical portions of the ecoregion (Fig. 2).

The ecoregion has a broad range of land uses including farmland which is used for cash crops and hay for livestock. Corn, winter wheat, soybeans, and hay are principal crops. In addition, sugar beets, field and seed beans, and a variety of canning crops are also grown. Fruit and truck crops are grown on some coarse-textured soils. Some farmland is maintained in pasture and small woodlots. Livestock includes swine, dairy cattle, and chickens. Approximately 10% of the area is urbanized.

The extensive, nearly level plains and numerous depressions in morainal areas are responsible for the formation of poor and very poor drained soils. The poorly drained soils of the Huron-Erie Lake Plain support swamp forests. Ochraqualfs and Haplaquepts formed in lacustrine and glacial drift. Udipsamments and Hapludalfs are found on beach ridges and well drained sites. The natural climax vegetation of the area consists of American elm, red maple, and black ash. In parts of northern Ohio forest species include silver maple, swamp white oak,

sycamore, pin oak, blackgum, and eastern cottonwood.

### Natural Areas

A natural region is a major, generalized unit of the landscape where a distinctive assemblage of natural features is present (Homoya *et al.* 1985). It is similar to the ecoregion concept integrating several natural features, including climate, soils, glacial history, topography, exposed bedrock, presettlement vegetation, and physiography. It differs from the ecoregion concept in the utilization of biodiversity of the fauna and flora to delineate areas of relative homogeneity.

The Maumee River drainage incorporates the Black Swamp and Central Till Plain Natural Regions (Fig. 3). The Central Till Plain Natural Region is composed of three sections. The St. Joseph River drains the Bluffton Till Plain Section. Only the Bluffton Till Plain Section is appropriate for this discussion.

The Central Till Plain is the largest natural region in Indiana, formerly considered a part of the forested Wisconsin till in the central portion of the state. The Region is topographically homogeneous although glacial moraines are common. The region is a major divide between the biotic communities with a strong northern affinity and those with strong southern affinity. The Entrenched Valley is a concentrated continuum of northern, southern, eastern and western affinities. The Bluffton Till Plain subsection is the predominant subsection of the St. Joseph River drainage. The Bluffton Till Plain is characterized by clay rich soils on a relatively level till plain. This section in conjunction with the Black Swamp, Northern Lakes and Northwestern Morainal Natural Regions was one of the last areas covered by the Ontario-Erie Lobe of the Wisconsin ice sheet. A distinct series of moraines occurs with the southern border marked by the Union City Moraine.

The soils are predominantly clay till which provides poor drainage. The acid to neutral silty

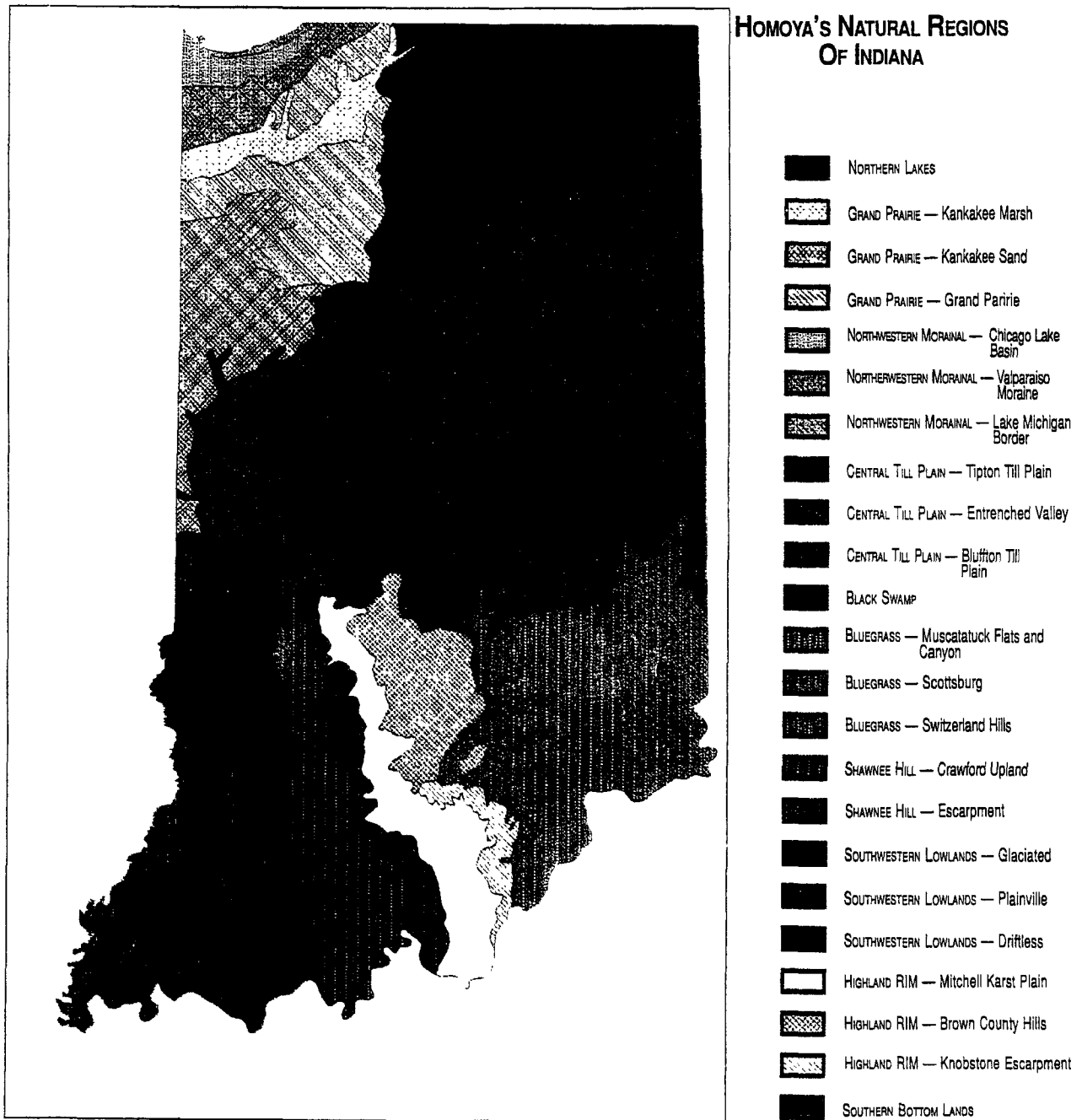


Figure 3: Map of Indiana indicating the natural areas designation of Homoya et al. (1985)

clay loams of the Blount-Pewano-Morley Associations characterize the region. The forested community associated with these poorly drained soils were ubiquitous but are now confined to the scattered woodlots within the region. A species common to the woodlots is swamp cottonwood. Minor areas of bog, prairie, fen, marsh, and lake communities are comprised of cottongrass, northern St. John's wort, pitcher plant, and sedges. Two southern swamp species are geographically restricted, including swamp St. John's wort and log sedge.

The Black Swamp Natural Region is the western lobe of a large lacustrine plain occupying ancient Lake Maumee. Lake Maumee, a predecessor to modern Lake Erie, was created when the meltwater of the Ontario-Erie Lobe of the Wisconsin ice sheet was dammed by the Fort Wayne Moraine. The Maumee and St. Mary's River drainages occur within this Natural Region. Much of the area is nearly level and poorly drained. Streams are low-gradient, silty and shallowly entrenched. This area is the same as Mallot's Maumee Lacustrine Section of the Northern Moraine and Lake Region. Early settlers named the Black Swamp because the natural communities included swamp forests dominated by American elm, black ash, and red maple. Additional species include bur oak, swamp white oak, white ash, shellbark hickory, pawpaw, and spicebush. These species have been virtually eliminated from this region in present day Indiana. The soils are typically deep, acidic to neutral clay and silt loams of the Hoytville-Nappanee Association.

### Drainage Features

Three major drainage units occur in the Huron-Erie Lake Plain of Indiana: the Maumee River, St. Joseph River, and the St. Mary's River drainages.

### Maumee River

The Maumee River begins at the junction of the

St. Joseph and St. Mary's Rivers and consists otherwise of only minor tributaries in Indiana. The Maumee River basin contains aquifers which provide significant ground-water contribution to streamflow. During dry years ground water contributes 27% of the stream flow, while direct surface runoff accounts for 73-92% of the stream flow (Indiana Department of Natural Resources 1980). The Maumee River drains 5.5% of the State. The Maumee River flows northeast as a major tributary of Lake Erie. Direct tributaries of the Maumee within Indiana include Gar Creek, Black Creek, Flatrock Creek, and Mars Ditch. The minor tributaries fluctuate with seasonal flows. The Maumee River varies dramatically with contributions from the St. Joseph and St. Mary's Rivers and baseflow from groundwater. Average discharge for the Maumee River during 1991, upstream of the Norfolk and Western railroad bridge, near New Haven, was 1,828 cfs. Flow ranged between 45.0 cfs during the 7 day, 10 year low flow to 26,600 cfs during maximum discharge during the period of record (Arvin, 1989).

### St. Joseph River

The St. Joseph River drainage is the major northern segment of the Maumee River (comprising 1,060 miles<sup>2</sup>) which joins with the St. Mary's River at Fort Wayne. The St. Joseph River has been impounded at numerous localities above Fort Wayne, and receives a substantial amount of its streamflow from surface water. Tributary segments of the St. Joseph River in Indiana includes Cedar Creek, Fish Creek, Bear Creek, and Yohe Ditch. The St. Joseph originates in a different ecoregion and natural area than the rest of the Maumee River drainage. The average discharge of the St. Joseph River near Fort Wayne (Allen County downstream from Ely Run) during 1991 was 1,019 cfs. Discharge ranged from 1.3 cfs during the 7 day, 10 year low flow to 13,200 cfs during maximum flow periods (Arvin, 1989).

## Indiana Ecoregion

---

### St. Mary's River

The St. Mary's River drainage is the major southeastern segment of the Maumee River (draining 762 miles<sup>2</sup>) which connects with the St. Joseph River near Fort Wayne, Allen County. The St. Mary's River has fewer impoundments, and receives a substantial amount of its streamflow from surface water. The River emanates southeast of Fort Wayne and is formed in the state of Ohio. Tributary segments of the St. Mary's River include Blue River, Little Blue River, Yellow Creek, and Holthouse ditch. The St. Mary's River lies solely within the Huron-Erie Lake Plain and Black Swamp natural area. The average discharge of the St. Mary's River near Ft. Wayne (Allen County downstream from Anthony Boulevard extension bridge) was 942 cfs during 1991. Discharge records ranged from 0.25 cfs during the 7 day, 10 year low flow to 13,600 cfs during maximum flow periods (Arvin, 1989).

### **Historical Maumee River Data**

The Maumee River is the largest tributary of Lake Erie and historically was stated to be one of Indiana's highest quality resources. The first use of the Maumee River was as a commercial connection for fur traders between the Great Lakes and the Mississippi River. Since then the Maumee River has been intensively examined including its importance as a trade route (Fatout 1985); hydrology (Pettijohn and Davis 1973; Hoggatt 1981); surficial geology and physiography (Leverett 1902; Pettijohn and Davis 1973); Paleozoic and Quarternary geology (Droste and Orr 1974; Doheny *et al.* 1975; Sunderman 1987); geomorphic contribution of the Maumee River during the draining of Lake Maumee (Bleuer 1989); groundwater flow (Pettijohn and Davis 1973); nutrient and sediment transport (Richards and Baker 1991); sediment contamination (Sobiech and Sparks 1992); agricultural nonpoint sources (Logan 1981; Antosh 1991; Baker 1991; Krieger 1991; Yoder 1991); pesticide toxicity (Biever and Giddings 1991; Dickson and Tierney 1991); and bioaccumulation (Sobiech and Sparks 1992).

The aquatic communities of the Maumee River have been correlated with water quality (Logan 1981). Various components of the aquatic community of Lake Erie tributaries have been studied including the microbial community (Pratt 1991), algal community (Lowe 1991), macroinvertebrates (Krieger and Deshon 1991), while the mussel fauna was studied by Clark and Wilson (1912) and Watters (1991). The fish community has also been well studied including distribution (Kirtland 1844, 1847; Meek 1889; Kirsch 1895; Gerking 1945; Van Meter and Trautman 1970; Pearson and Shipman 1978; Trautman 1981); population dynamics of stocked fish (Pearson and Shipman 1978; Pearson 1984); endangered species status (Simon 1993); and fisheries potential (Klippart 1877; Braun 1993).

The Maumee River possesses a highly diverse fish community. Previous studies have documented a total of 102 species of fish in the Maumee River basin (Simon *et al. in press*). The earliest records of Jordan (1877) suggest the river was abundant with both food and non-game species. The Maumee River received a large amount of collection effort by early ichthyologists.

Kirsch (1895) collected at five locations in the basin. Kirtland (1844, 1847) documented species assemblages in Ohio portions of the drainage. Gerking (1945) collected at 10 localities in the St. Marys', St. Joseph, and Maumee Rivers. Clark and Allison (1966) documented species trends in the Maumee and Auglaize Rivers of Ohio.

## **3.0 MATERIALS AND METHODS**

### **Sampling**

#### Site Specific

In order to answer basin-specific questions and to calibrate an IBI for evaluating ecosystem health, a sufficient number of samples were required from each of the various drainages. A total of 77 locations (Fig. 4) were surveyed during June through August 1991 in order to

compile the data needed to evaluate the maximum species richness lines for calibration of the Index of Biotic Integrity. Site and collection records are maintained within the State of Indiana files. Since the primary purpose of this study was to evaluate the water quality of Indiana using biological methodology, no further evaluation of site specific data (e.g. site specific taxonomic species lists) will be included other than an overall taxa list for each sub-drainage.

To ensure repeat sampling at the exact same site, all locations are based on latitude and longitude. Narrative descriptions for mileage are from the center point rather than the edge of the nearest town since the boundaries of many Indiana towns will change over the next century. All sites were evaluated based on drainage area, since this provides a reliable quantification (Hughes *et al.* 1986) of stream size. As drainage area increases fewer locations are available for comparative analysis.

### Habitat

The diversity of habitats sampled has a major effect on data collection. A representative sample always requires that the entire range of riffle, run, pool, and extra-channel habitat be sampled, especially when large rivers are surveyed. Atypical samples result when unrepresentative habitats are sampled adjacent to the sampling site. Species richness near bridges or near the mouths of tributaries entering large rivers, lakes, or reservoirs are more likely to be characteristic of large-order habitats than the one under consideration (Fausch *et al.* 1984).

A general site description of each established sampling location was conducted using the field observation procedure of Ohio EPA (1989) and Rankin (1989). The Quality Habitat Evaluation Index (QHEI) takes into account important attributes of the habitat which increases heterogeneity. Scoring incorporates information on substrate composition, instream cover, channel morphology, riparian zone and bank erosion, and pool and riffle quality.

Physical/chemical parameters were recorded for each sample site to assist in assessing the biological data further: dissolved oxygen, pH, temperature, and specific conductivity. Equipment utilized for physical water quality analysis was a Hydrolab SVR2-SU meter following the specifications of the manufacturer.

### Community Analysis

#### Sample Considerations

Only one electrofishing gear type need be used at each location to collect a representative sample (Jung and Libosvsky 1965; Ohio EPA 1989). A T&J pulsed-DC generator capable of 300 volt output was mounted in a Coleman Sport-canoe, floated in a Sport-Yak, or attached to a long-line. We collected by wading in shallow riffles and runs, and floated through pools and unwadeable habitat.

All fish encountered were collected at each site. Adult and juvenile specimens from each stream reach were identified to species utilizing the taxonomic keys of Gerking (1955), Trautman (1981), and Becker (1983). Cyprinid taxonomy follows Mayden (1989), changes in species nomenclature is listed in Appendix D for comparability with previous investigations. Generally, young-of-the-year fish less than 20 mm in length were not included in Index of Biotic Integrity or composite totals analysis. Early life stages exhibit high initial mortality (Simon 1989) and are difficult to collect with gear designed for larger fish (Angermeier and Karr 1986). Collection of fish from this category will be retained for possible future use in State water monitoring programs (e.g. ichthyoplankton index ( $I^2$ )).

The length of stream reach sampled is an important consideration. Karr *et al.* (1986) recommended in larger streams to select several contiguous riffle-pool sequences rather than relying on a standard length. When electrofishing equipment was employed in larger rivers (i.e. > 1,000 mi<sup>2</sup>), samples were taken in

## Indiana Ecoregion

---

units of 0.5 to 1.0 km (Gammon *et al.* 1981). The length of the sample reach was long enough to include all major habitat types. Distances of 11 to 15 stream widths were generally adequate to sample two cycles of habitat (Leopold *et al.* 1964). Ohio EPA (1989) suggested that after 150-200 m of stream length no significant increases in the IBI are observed, however species richness may still increase until 250-300 m. The additional increase in effort is not justified by the assessment capability of the index so the minimum distance of 15 times the mean stream width was adopted. Additional site information (e.g. photographs; latitude and longitude) were recorded on the data sheet.

Selecting the appropriate time of year for sampling is critical. Karr *et al.* (1986) found that periods of low-to moderate stream flow are preferred and the relatively variable flow conditions of early spring and late autumn/winter should be avoided. Species richness tends to be higher later in summer due to the presence of young-of-the-year of rare species, but this can be avoided if data analysis does not incorporate young-of-the-year species. Samples of limited area may be less variable in early summer than comparable samples taken later in the year. Each site was sampled for a single pass on both shorelines for nonwadeable locations.

### Sample Site Selection

Fish sample sites were selected based upon several factors:

- 1). Choosing stream reaches not affected by point source dischargers;
- 2). Stream use issues (i.e. municipal treatment works, non-point source, nutrient reduction);
- 3). Location of physical stream features (e.g. dams, changes in geology, changes in stream order, presence of stream confluence, etc.);

- 4). Location of non-point sources of pollution (e.g. urban areas or obvious farm runoff);
- 5). Variations in habitat suitability for fish;
- 6). Atypical habitat not representative of River reach or basin.

Whenever possible, sites were located upstream from pollution sources and adjacent tributaries (Gammon 1973). Stations were selected to include natural areas, parks (Federal, State, County, and Local), exceptional designated streams, and from historical sampling locations whenever available.

When non-impacted areas were not present, "least impacted" areas were selected based on the above criteria. Sites were chosen which indicated recovery from channelization or potential non-point source areas, and which had a suitable riparian buffer on the shoreline. When a series of point source dischargers were located on a river, every effort was made to sample upstream of the discharger or to search for areas of recovery between dischargers (Krumholz 1946).

When impoundments or other physical habitat alterations had been imposed on a river, sampling was conducted in the tailwaters of a dam (area immediately downstream). Tailwaters possess the greatest resemblance of the lotic habitat. The serial discontinuity concepts of Stanford *et al.* (1988) predicts that the thermal character of a stream below a dam will be "reset" toward that typical of the stream reaches above the dam. In areas where sampling could not be accomplished downstream of the physical structure due to lack of access, stream tributary segments were located upstream of the dam away from the immediate influence of the pooled portion. Likewise, bridges were always sampled on the upstream side, away from the immediate vicinity of the structure and latent bridge construction effects.

Fish from each location were identified to species and enumerated. Smaller and more

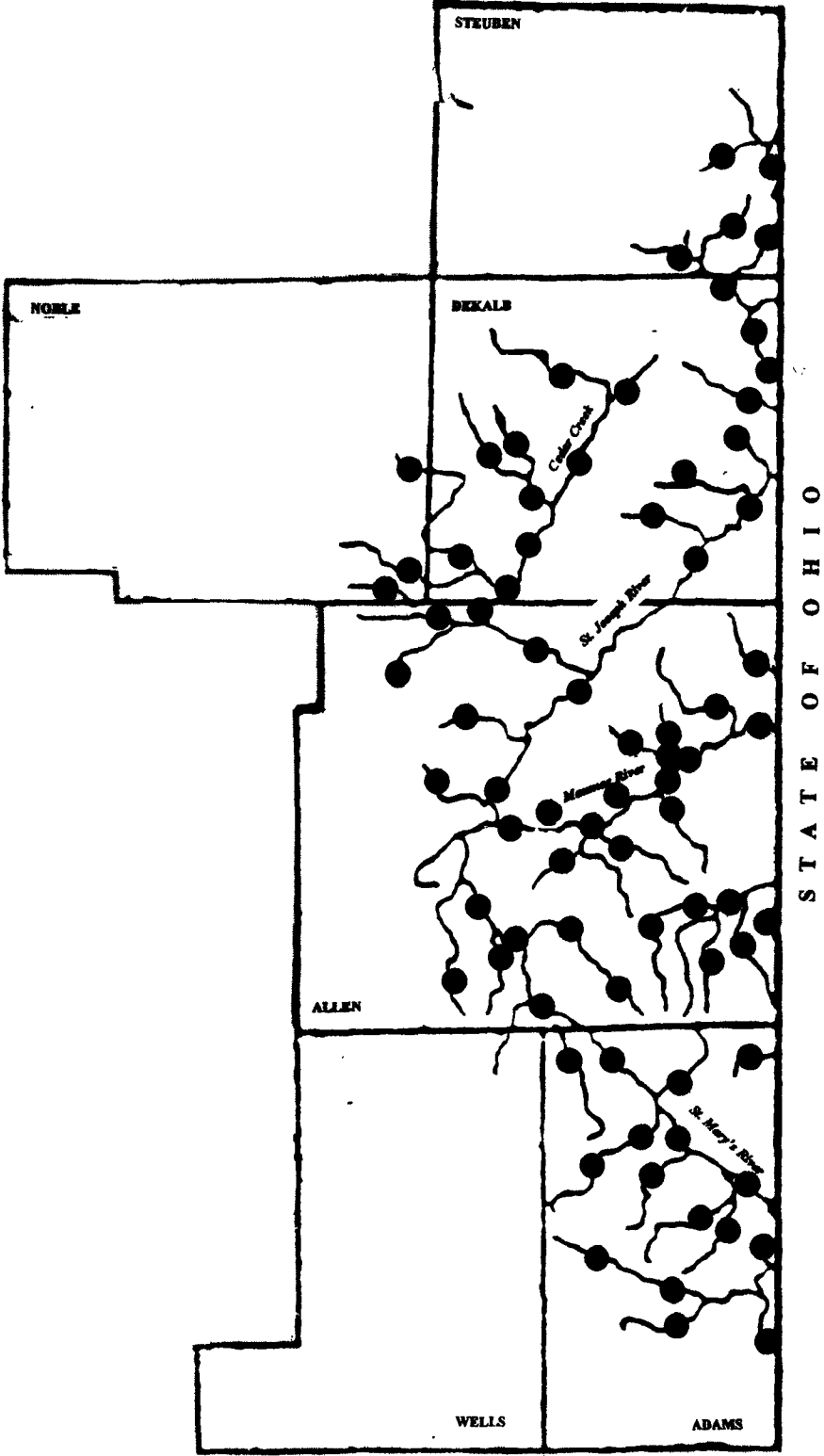


Figure 4 Maumee River drainage indicating the location of sampled locations during 1991.

## Indiana Ecoregion

---

difficult to identify taxa were preserved for later examination and identification in the laboratory. All fish were examined for the presence of gross external anomalies. Incidence of these anomalies was defined as the presence of externally visible morphological anomalies (i.e. deformities, erosion, lesions/ulcers). Specific anomalies include: anchor worms; leeches; pugheadedness; fin rot; Aeromonas (causes ulcers, lesions, and skin growth, and formation of pus-producing surface lesions accompanied by scale erosion); dropsy (puffy body); swollen eyes; fungus; ich; curved spine; and swollen-bleeding mandible or opercle. Incidence is expressed as percent of anomalous fish among all fish collected. Incidence of occurrence was computed for each species at each station.

Hybrid species encountered in the field (e.g. hybrid centrarchids, cyprinids) were recorded on the data sheet, and when possible, potential parental combinations recorded.

### Index of Biotic Integrity

The ambient environmental condition was evaluated using the Index of Biotic Integrity (Karr 1981; Karr *et al.* 1986). This index relies on multiple parameters (termed "metrics") based on community concepts, to evaluate a complex biotic system. It incorporates professional judgement in a systematic and sound manner, but sets quantitative criteria that enables determination of a continuum between very poor and excellent based on species richness and composition, trophic and reproductive constituents, and fish abundance and condition. The twelve original Index of Biotic Integrity metrics reflect insights from several perspectives and cumulatively are responsive to changes of relatively small magnitude, as well as broad ranges of environmental degradation.

Since the metrics are differentially sensitive to various perturbations (e.g. siltation or toxic chemicals), as well as various degrees or levels of change within the range of integrity, conditions at a site can be determined with considerable accuracy. The interpretation of the

index scoring is provided in six narrative categories which have been tested in the midwestern United States (Karr 1981; Table 1).

Several of the metrics are drainage size dependent and require calibration to determine numerical scores (Tables 2-3). The ecoregion approach developed by USEPA-Corvallis, Oregon, was utilized to compare "least impacted" zones within the region (Omernik 1987). Ohio EPA (1987), modified several of the original 12 metrics in order to make them more sensitive to environmental effects based on their experiences in Ohio and to account for stream and river size, faunal differences, and sampling gear selectivity. The current study utilizes the experiences of the Ohio EPA and Karr *et al.* (1986) in developing an IBI for Indiana streams and rivers.

### Metrics

In general, the metrics utilized for the current study are those developed by the State of Ohio (Ohio EPA 1989) for analysis of surface water designated use-attainment. This includes modification of several of the original Index of Biotic Integrity metrics as proposed by Karr (1981).

Although the methodology and application of the ecoregional expectations are similar in approach to Ohio and much of the information below is taken directly from the Ohio document (Ohio EPA 1989), a significant difference exists between the Indiana and Ohio reference conditions. This difference exists in how the metric expectations are developed. In Ohio, the ecoregional reference stations were combined into a single data set for the entire State, and later modifications were developed for the Huron-Erie Lake Plain. In Indiana, "least impacted" conditions are being developed on a regional basis, with *a priori* recognition of basin differences within ecoregion, based on the natural division classification of Homoya *et al.* (1985). Further evaluation at the completion of the



**Table 1. Attributes of Index of Biotic Integrity (IBI) classification, total IBI scores, and integrity classes from Karr *et al.* (1986).**

Total IBI score	Integrity Class	Attributes
58-60	Excellent	Comparable to the best situation without human disturbance; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with a full array of age (size) classes; balance trophic structure.
48-52	Good	Species richness somewhat below expectations, especially due to the loss of the most intolerant forms; some species are present with less than optimal abundances or size distributions; trophic structure shows some signs of stress.
40-44	Fair	Signs of additional deterioration include loss of intolerant forms, fewer species, highly skewed trophic structure (e.g. increasing frequency of omnivores and other tolerant species); older age classes of top predators may be rare.
28-34	Poor	Dominated by omnivores, tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present.
12-22	Very Poor	Few fish present, mostly introduced or tolerant forms; hybrids common; disease, parasites, fin damage, and other anomalies regular.
0	No Fish	Repeated sampling finds no fish.

of the study will determine if differential metric treatment is warranted for basin specific or larger scale criteria development.

The Index of Biotic Integrity is sensitive to differences in collection effort and gear type. In order to account for these inherent biases, separate expectations are developed for each of the two stream classification types utilized in the current study. Headwater stream sites (< 20 miles<sup>2</sup>) were primarily sampled for 50-100 m using wading techniques. These sites were sampled using a long-line configuration usually

off bridges, while larger wadable rivers (> 20-1000 miles<sup>2</sup>) were sampled using the sport-yak configuration. This technique requires a sampling distance of 100-300 m and wading in all available habitats.

Below is an explanation of each of the twelve metrics utilized for the calibration of the Indiana Index of Biotic Integrity for the Huron-Erie Lake Plain. Due to inherent differences at approximately 20 miles<sup>2</sup> drainage area, different metrics were necessary to evaluate both headwater (<20 miles<sup>2</sup> drainage area) and

**Table 3. Index of Biotic Integrity metrics used to evaluate wadable river (> 20-1,000 miles<sup>2</sup> drainage area) sites in the Maumee River drainage.**

Metric Category	Metric	Scoring Classification		
		5	3	1
<b>Species Composition</b>				
	Total Number of Species	> 23	16-23	< 16 (Fig. 5)
	Number of Darter Species	> 4	2-4	< 2 (Fig. 6)
	Number of Sunfish Species	> 4	2-4	< 2 (Fig. 7)
	Number of Sucker Species	> 4	2-4	< 2 (Fig. 9)
	Number of Sensitive Species	> 7	4-7	< 4 (Fig. 10)
	% Tolerant Species	< 15 %	15-30 %	> 30 % (Fig. 11)
<b>Trophic Composition</b>				
	% Omnivores <sup>1</sup> < 1,000 square miles	< 15 %	15-30 %	> 30 % (Fig. 12)
	% Insectivores <sup>1</sup> < 1,000 square miles	> 65 %	40-65 %	< 40 % (Fig. 13)
	% Carnivores <sup>1</sup>	Varies with drainage area (Fig. 15)		
<b>Fish Condition</b>				
	Catch per Unit Effort	Varies with drainage area (Fig. 16)		
	% Simple Lithophils	Varies with drainage area (Fig. 17)		
	% DELT anomalies <sup>1</sup>	< 0.1 %	0.1-1.3 %	> 1.3 % (Fig. 18)

<sup>1</sup> Special scoring procedures are required when less than 100 individual fish are collected.

observed within the three basin segments, the segments were pooled to reflect an ecoregional consensus. Likewise, if no relationship with increasing drainage area was observed, the maximum species richness lines either leveled off at the point where no additional increases were exhibited or horizontal plots were delineated indicating no increase with drainage area.

Differentiation between headwater and wadable stream and river sites are indicated on the

graphs by a vertical dashed line on the appropriate metrics. This relationship was determined by searching for bimodal patterns in the basin specific data set plots of species richness. A sixth order polynomial defined where a significant bimodal effect was evident for each of the drainage basins (Simon 1991). The tails of distribution of the data are not significant. However the point where the data differentiates into two distinct peaks suggest that the transition between headwater and wadable streams is at 20 miles<sup>2</sup> and between wadable and large rivers at 1,000 miles<sup>2</sup>.

**Metric 1. Total Number of Fish Species (Headwater and Wadable Sites)**

---

**Impetus**

This metric is utilized for all of the stream classification types used for calibrating the Indiana Index of Biotic Integrity. Unlike the Ohio metric, exotic species are included in the total number of taxa. The premise behind this metric is based on the observation that the number of fish species increases directly with environmental complexity and quality of the aquatic resource (Karr 1981; Karr *et al.* 1986). Although the number of exotic or introduced species may be indicative of a loss of integrity (Karr *et al.* 1986; Ohio EPA 1989), the differences between lower levels of biotic integrity resolution may be due to colonization of habitats by pioneer or tolerant taxa which tend to incorporate exotic species.

This single metric is considered to be one of the most powerful metrics in resolving water resource issues since a direct correlation exists between high quality resources and the numbers of species for warmwater assemblages (Ohio EPA 1987; Davis and Lubin 1989; Plafkin *et al.* 1989; Simon, 1991). As total number of species increases, species become more

specialized and have narrower niche breadths, numerous higher level interactions occur and presumably enable greater efficiency in resource utilization. The delimitation between headwater and wadable Indiana streams in the Central Corn Belt Plain ecoregion was made primarily on the data from this metric. Headwater and wadable streams are differentiated at 20 miles<sup>2</sup> drainage area.

**Headwater and Wading Sites**

The number of species is strongly correlated with drainage area at headwater and wadable stream and river sites up to ca. 1,000 miles<sup>2</sup>. Determining the Index of Biotic Integrity scoring criteria for this metric did not require the recognition of basins. Comparison of maximum species richness lines for the appropriate basin and drainage area did not reveal any significant differences between ecoregion or subbasin (Fig. 5; headwater and wading sites).

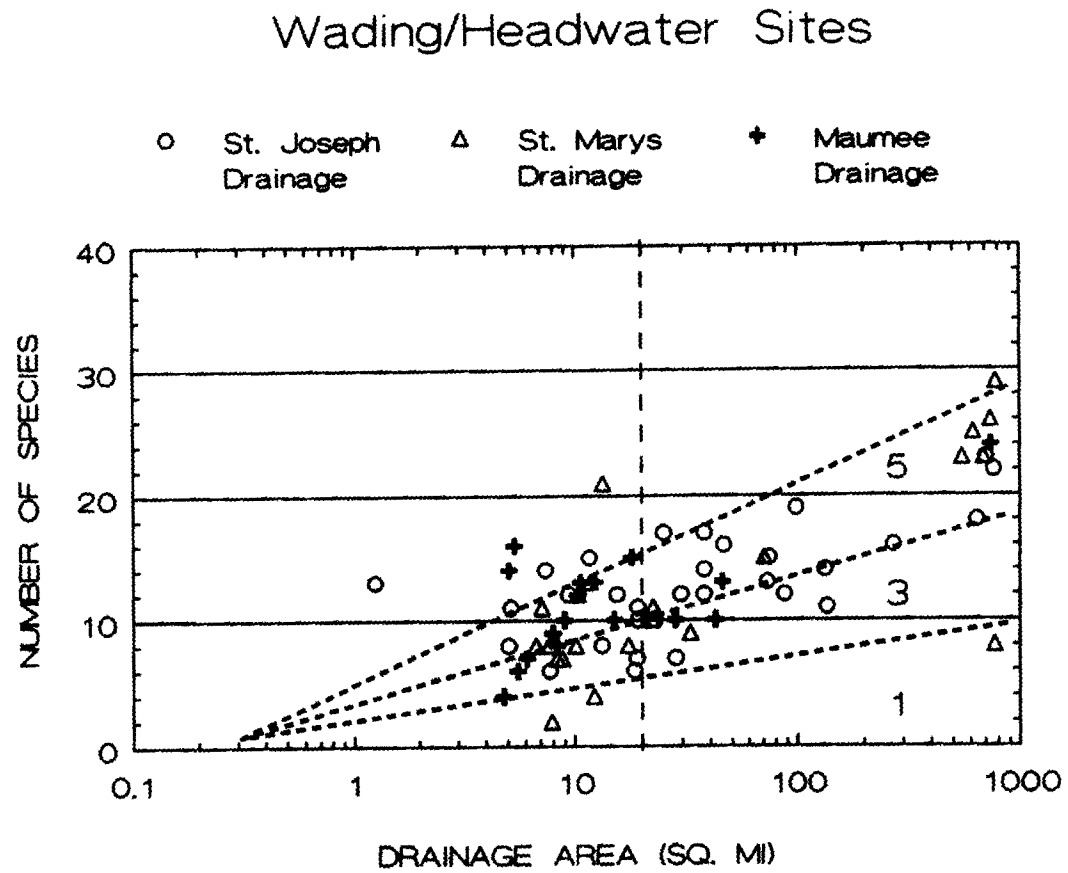


Figure 5. Maximum species richness lines for determining trends in total number of species with increasing drainage area for the Maumee River drainage.

**Metric 2. Number Darter, Madtom, & Sculpin Species (Headwater  $\leq 20$  miles<sup>2</sup>)  
Number of Darter Species (Wadable Rivers  $> 20$ -1,000 miles<sup>2</sup>)**

---

**Impetus**

Karr *et al.* (1986) indicated that the presence of members of the tribe Etheostomatini are indicative of a quality resource. Darters require high dissolved oxygen concentrations, are intolerant of toxicants and siltation, and thrive over clean substrates.

Life history information for all of the 28 Indiana species indicates darters are insectivorous, habitat specialists, and sensitive to physical and chemical environmental disturbances (Page 1983; Kuehne and Barbour 1983). Darters are excellent indicators of a quality resource, and are generally found in riffle habitats.

**Headwater Streams**

The darters include the genera: Ammocrypta, Crystallaria, Etheostoma, and Percina. Of the 28 species recorded from Indiana, six are commonly found throughout the State and are not restricted to a particular stream size (Gerking 1945). Thirteen of these 28 species are confined to the Ohio River basin; none of the species are restricted to the Mississippi River basin; and a single species occurs only in the Great Lakes drainage (Table 4).

For sites having drainage areas less than 20 miles<sup>2</sup>, this metric also includes members of the family Cottidae (sculpins) and Ictaluridae

(madtoms; genus Noturus). The sculpins and madtoms are benthic insectivores and functionally occupy the same type of niche as darters. Their inclusion enables a greater degree of sensitivity in evaluating streams that naturally have significantly fewer darter species. By adding madtoms and sculpins this metric asymptotes with increased drainage area (Fig. 6). The number of benthic insectivores was found to remain static with increasing drainage area for each of the three basins. In the Maumee River drainage, few darters occurred so this metric was estimated based on the total number of species which could be expected rather than observed during the current study. No differences in ecoregion expectations were observed between sites of the Huron-Erie Lake Plain and Eastern Corn Belt Plain.

**Wadable River Sites**

Due to a reduction of quality sites within greater drainage area categories for the Maumee River drainage the expected number of sculpin and madtom species declines. Thus, only the number of darter species are included in cumulative scoring for drainage areas greater than 20 miles<sup>2</sup> due to inconsistency in sampling and the patchy distribution of sculpins and madtoms in small rivers ( $> 20$ -1000 mi<sup>2</sup>). This conforms with the original IBI and is consistent with the Ohio metrics established for the Huron-Erie Lake Plain (Fig. 6).

Table 4. The distributional characteristics of Indiana darter (*Etheostomatini*), madtom (*Noturus*), and sculpin (*Cottus*) species.

Species	Distribution in Indiana Drainages			
	Statewide	Ohio River	Great Lakes	Mississippi River
<u><i>Ammocrypta pellucida</i></u>		X		
<u><i>A. clara</i></u>			X	X
<u><i>Crystallaria asprella</i></u>		X		
<u><i>Etheostoma asprigene</i></u>		X		
<u><i>E. blennioides</i></u>			X	
<u><i>E. caeruleum</i></u>		X		
<u><i>E. camurum</i></u>			X	
<u><i>E. chlorosoma</i></u>		X		
<u><i>E. exile</i></u>				X
<u><i>E. flabellare</i></u>		X		
<u><i>E. gracile</i></u>			X	
<u><i>E. histrio</i></u>			X	
<u><i>E. maculatum</i></u>			X	
<u><i>E. microperca</i><sup>1</sup></u>	X		X	X
<u><i>E. nigrum</i></u>		X		
<u><i>E. spectabile</i></u>			X	
<u><i>E. squamiceps</i></u>			X	
<u><i>E. tippecanoe</i></u>			X	
<u><i>E. variatum</i></u>			X	
<u><i>E. zonale</i></u>				X
<u><i>Percina caprodes</i></u>		X		
<u><i>P. copelandi</i></u>			X	
<u><i>P. evides</i></u>			X	
<u><i>P. maculata</i></u>		X		
<u><i>P. phoxocephala</i></u>				X
<u><i>P. sciera</i></u>			X	
<u><i>P. shumardi</i></u>			X	X
<u><i>P. vigil</i></u>		X		
<u><i>Noturus eleutherus</i></u>			X	
<u><i>N. flavus</i></u>		X		
<u><i>N. gyrinus</i></u>		X		
<u><i>N. insignis</i></u>			X	
<u><i>N. miurus</i></u>			X	X
<u><i>N. nocturnus</i></u>			X	
<u><i>N. stigmosus</i></u>		X		
<u><i>Cottus bairdi</i></u>		X		
<u><i>C. carolinae</i></u>			X	
<u><i>C. cognatus</i></u>				X

Restricted to northern portions of these drainages.

## Wading/Headwater Sites

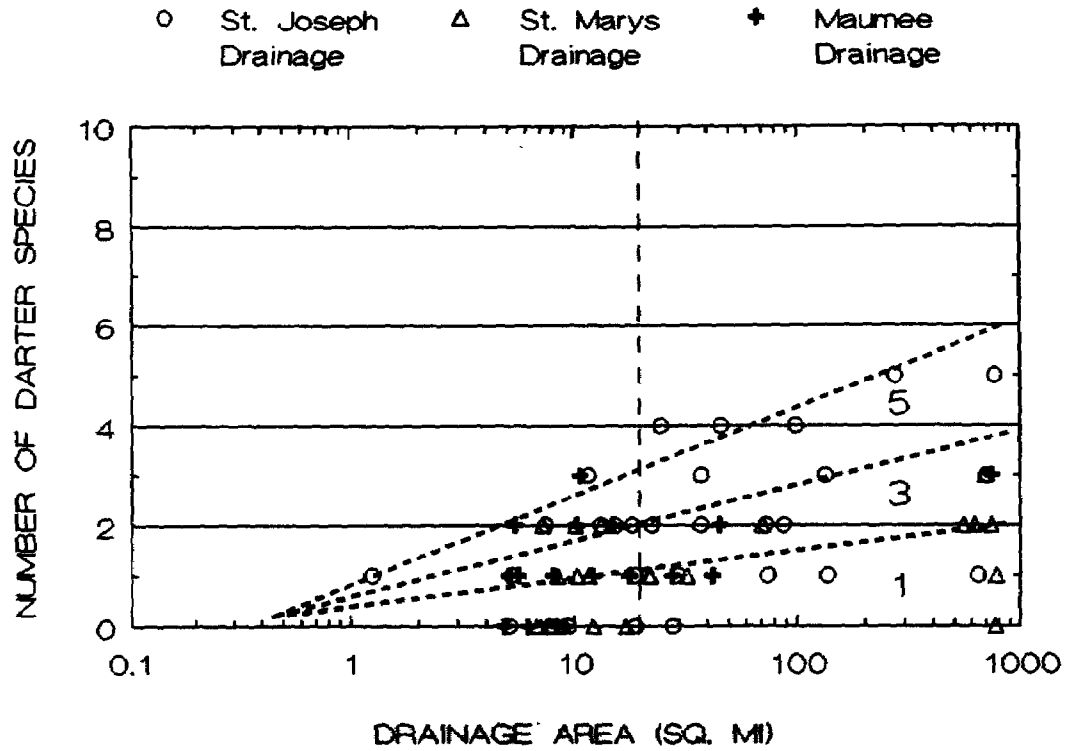


Figure 6. Maximum species richness lines for determining trends in number of darter/madtom/sculpin species with increasing drainage area for the Maumee River drainage.

---

**Metric 3. Number of Sunfish Species (Headwater and Wadable Sites)**


---

**Impetus**

This metric followed Karr (1981) and Karr *et al.* (1986) by including the number of sunfish species (family Centrarchidae) and excluding the black basses (Micropterus spp). Unlike the Ohio metric, the redear sunfish Lepomis microlophus is included because it is native to Indiana (Table 6). Hybrid sunfish are not included in this metric following Ohio EPA (1989).

This metric is an important measure of pool habitat quality. It includes all members of the sunfish genera Ambloplites (rock bass), Centrarchus (round sunfish), Lepomis (sunfish), and Pomoxis (crappies), as well as, the ecological equivalent Elasmomatidae (Elassoma zonatum). Sunfish normally occupy slower moving water which may act as "sinks" for the accumulation of toxins and siltation. This metric measures degradation of rock substrates (i.e. gravel and boulder) and instream cover (Pflieger 1975; Trautman 1981), and the associated aquatic macroinvertebrate community which are an important food resource for sunfish (Forbes and Richardson 1920; Becker 1983). Sunfish are important components of the aquatic community since they are wide ranging, and distributed in most streams and rivers of Indiana. They are also very susceptible to sampling using electrofishing gear. Karr *et al.* (1986) found sunfish to occupy the intermediate to upper ends of sensitivity of the index of biotic integrity (IBI).

**Headwater and Wadable Streams and Rivers**

Sunfish colonization is limited by the amount of pool habitat in many river reaches. This metric did not show any difference in scoring based on ecoregion or sub-basin. The number of sunfish species is not affected by increasing drainage area (Fig. 7).

Table 5. List of Indiana sunfish species for evaluating quality pool habitat.

Common Name	Scientific Name
Rock bass	<u>Ambloplites rupestris</u>
Flier	<u>Centrarchus macropterus</u>
Green sunfish	<u>Lepomis cyanellus</u>
Pumpkinseed	<u>L. gibbosus</u>
Warmouth	<u>L. gulosus</u>
Orangespotted sunfish	<u>L. humilis</u>
Bluegill	<u>L. macrochirus</u>
Longear sunfish	<u>L. megalotis</u>
Redear sunfish	<u>L. microlophus</u>
Spotted sunfish	<u>L. punctatus</u>
Bantam sunfish	<u>L. symmetricus</u>
White crappie	<u>Pomoxis annularis</u>
Black crappie	<u>P. nigromaculatus</u>
Banded pygmy sunfish	<u>Elassoma zonatum</u>

---



### Wading/Headwater Sites

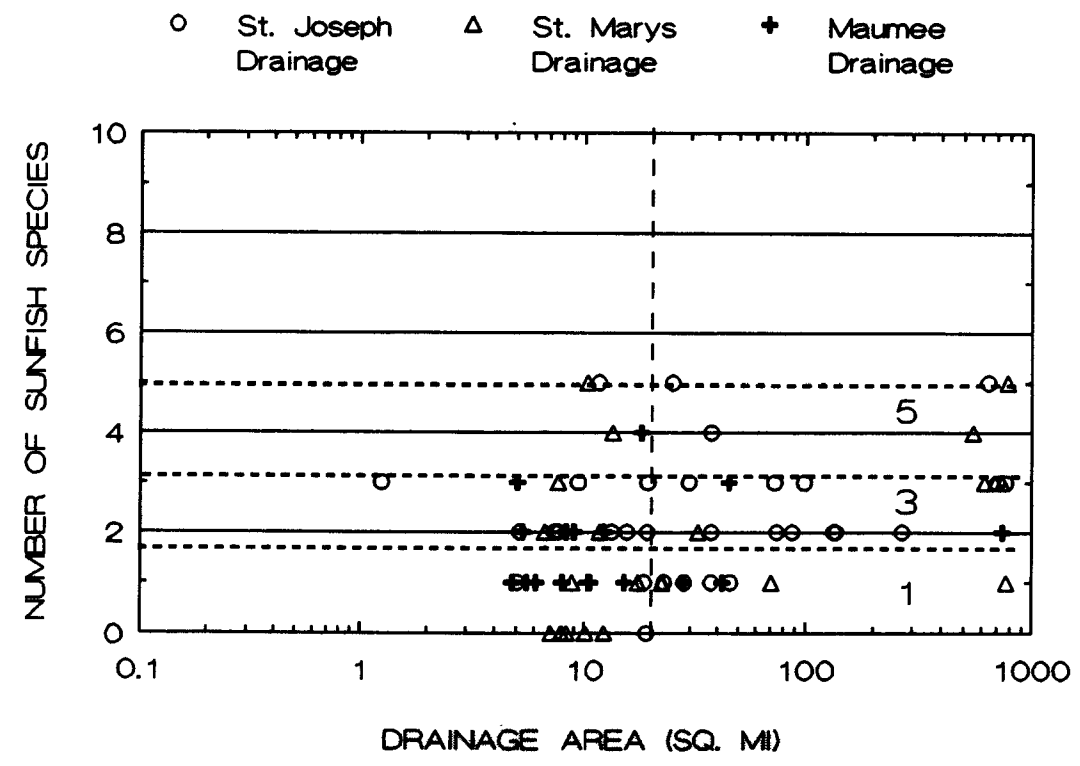


Figure 7. Maximum species richness lines for determining trends in number of sunfish species with increasing drainage area for the Maumee River drainage.

---

**Metric 4. Number of Minnow Species (Headwater Sites)  
Number of Sucker Species (Wadable Sites)**

---

**Impetus**

The original Index of Biotic Integrity metrics included the number of sucker species (Karr 1981; Karr *et al.* 1986). Suckers represent a major component of the Indiana fish fauna since their total biomass usually ranks them among the highest biomass contributors in the community. Most sucker species are intolerant to habitat and water quality degradation (Phillips and Underhill 1971; Karr *et al.* 1986; Trautman 1981; Becker 1983) and this results in metric sensitivity at the higher end of environmental quality. Suckers, due to their long life span (10-20 years), provide a long-term assessment of past environmental conditions. Of the 19 species historically found in Indiana, Lagochila lacera is considered extinct, seven species are widely distributed throughout the State (Table 6). Extant sucker genera include: Cycleptus, Carpionodes, Catostomus, Erimyzon, Hypentelium, Ictiobus, Minytrema, and Moxostoma.

**Headwater Sites**

The number of minnow species is substituted for the number of sucker species in headwater sites. The number of sucker species decreases rapidly with declining drainage area (Fig. 8). While as many as ten different minnow species have been observed at locations with drainage areas less than 20 miles<sup>2</sup>. The number of minnow species generally correlates with increased environmental quality.

Environmental tolerance is represented at both ends of the continuum. Sensitive species such as hornyhead chub (Nocomis biguttatus), bigeye chub (Hybopsis amblops), and rosyface shiners (Notropis rubellus) are examples of minnow species which occur in high quality headwater streams. Species such as creek chub (Semotilus atromaculatus) and fathead minnow (Pimephales promelas) are tolerant to both chemical degradation and stream intermittence. The number of minnow species increases with increasing drainage area (Fig. 8).

**Wadable River Sites**

The number of sucker species, with the exception of the Catostomus commersoni, Ictiobus and Carpionodes, represent sensitive species intolerant to thermal, siltation, and toxins stresses. The redhorses are particularly important indicator organisms in rivers. Round-bodied suckers include members of the genera Cycleptus, Hypentelium, Moxostoma, Minytrema, and Erimyzon. These species are effectively sampled with electrofishing gear and comprise a significant component of riverine fish faunas. Their feeding and reproductive requirements are sensitive to turbidity and marginal to poor water quality. The number of species were not significantly different among the two ecoregions or between the three sub-basins (Fig. 9).

**Indiana Ecoregion**

---

Table 6. Distribution characteristics of Indiana sucker species (family Catostomidae) in the Maumee River.

Species	Statewide	Large Rivers	Rare Taxa
<u>Cycleptus elongatus</u>		X	X
<u>Carpoides carpio</u>	X	X	
<u>C. cyprinus</u>	X		
<u>C. velifer</u>		X	X
<u>Catostomus commersoni</u>	X		
<u>Erimyzon oblongus</u>	X		
<u>Erimyzon sucetta</u>			X
<u>Hypentelium nigricans</u>	X	X	
<u>Ictiobus bubalus</u>	X	X	
<u>I. cyprinellus</u>	X	X	
<u>I. niger</u>		X	
<u>Lagochila lacera</u>	EXTINCT		
<u>Minytrema melanops</u>	X		
<u>Moxostoma anisurum</u>	X	X	
<u>M. carinatum</u>		X	X
<u>M. duquesnei</u>	X	X	
<u>M. erythrurum</u>	X	X	
<u>M. macrolepidotum</u>	X	X	
<u>M. valenciennesi</u>		X	X

---

### Wading/Headwater Sites

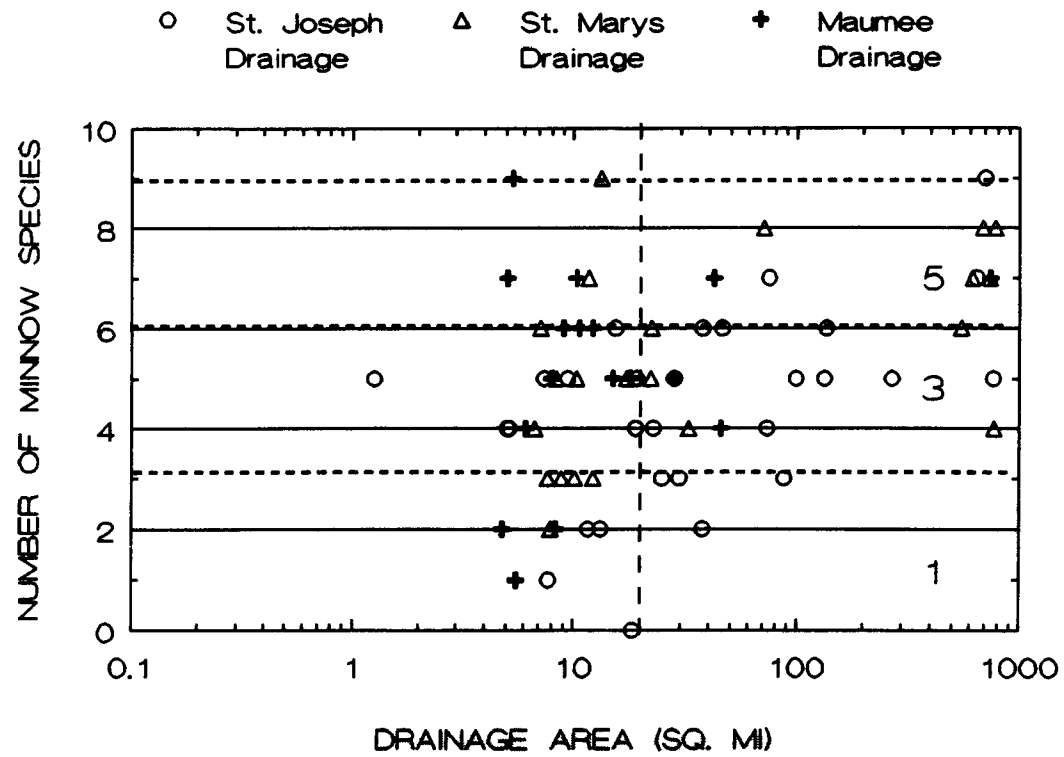


Figure 8. Maximum species richness lines for determining trends in number of minnow species with increasing drainage area for the Maumee River drainage.

### Wading/Headwater Sites

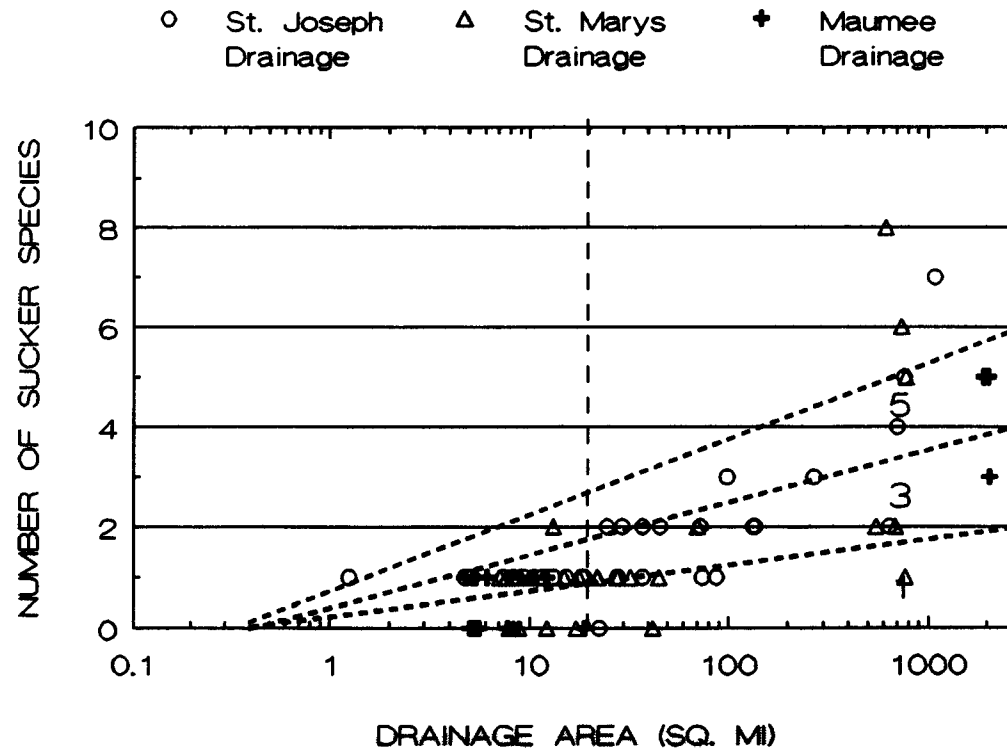


Figure 9. Maximum species richness lines for determining trends in number of sucker species with increasing drainage area for the Maumee River drainage.

---

## Metric 5. Number of Sensitive Species (Headwater and Wadable Sites)

---

### Impetus

The number of sensitive species metric distinguishes between streams of highest quality. Designation of too many species as intolerant will prevent this metric from discriminating among the highest quality resources. Only species that are highly intolerant to a variety of disturbances were included in this metric so it will respond to diverse types of perturbations (Table 7; see Appendix A for species-specific information).

The number of intolerant taxa is a modification of the original index developed by Ohio EPA (1987). The metric included moderately intolerant species when sampling at headwater sites. This combination is called sensitive species since few intolerant taxa are expected. The moderately intolerant species meet most of the established criteria of Ohio EPA (1987). An absence of these species would indicate a severe anthropogenic stress or loss of habitat.

The criteria for determining intolerance is based on the numerical and graphical analysis of Ohio's regional data base, Gerking's (1945) documentation of historical changes in the distribution of Indiana species, and supplemental information from regional ichthyofaunal texts (Pflieger 1975; Smith 1979; Trautman 1981; Becker 1983; Burr and Warren 1986). Intolerant taxa are those which decline with decreasing environmental quality and disappear, as viable populations, when the aquatic environment degrades to the "fair" category (Karr *et al.* 1986). The intolerant species list was divided into three categories, all are included in this metric for scoring:

- 1). common intolerant species (I): species which are intolerant, but are widely distributed in the best streams in Indiana;

- 2). uncommon or geographically restricted species (S): species that are infrequently captured or that have restricted ranges;

- 3). rare or possibly extirpated species (R): intolerant species that are rarely captured or which lack recent status data.

Commonly occurring intolerant species made up 5-10% of the common species in Indiana. This was a recommended guideline of Karr (1981) and Karr *et al.* (1986). Although the addition of species designated as uncommon or rare sensitive species (categories 2 and 3), inflates the number of intolerant species above the 10% guideline, nowhere in the State do all of the species coexist at the same time. In order to evaluate streams in the Large and Great river categories, only the sensitive species metric will be used until further resolution is possible with the addition of adjacent ecoregion sampling. Until more sampling is completed or improvements in water quality warrant it, the sensitive species metric (Ohio EPA 1987) will be used for all headwater streams and wadable river sites in Indiana.

### Headwater and Wadable Streams and Rivers

The number of intolerant species increases with drainage area among headwater and wading sites (Fig. 10). Intolerant taxa are scarce in the Huron-Erie Lake Plain and may even decrease at larger wading sites. In order to provide meaningful stream reach comparisons in Indiana, the sensitive species metric is currently retained until further evaluation can be completed.

Indiana Ecoregion

Table 7. List of Indiana fish species considered to be sensitive to a wide variety of environmental disturbances including water quality and habitat degradation.

Common Name	Scientific Name	Common Name	Scientific Name
Ohio lamprey	<u>Ichthyomyzon bdellium</u>	Mountain madtom	<u>Noturus eleutherus</u>
Northern brk lamprey	<u>I. fossor</u>	Slender madtom	<u>N. exilis</u>
Least brook lamprey	<u>Lampetra aepyptera</u>	Stonecat	<u>N. flavus</u>
American brk lamprey	<u>L. appendix</u>	Brindled madtom	<u>N. miurus</u>
Paddlefish	<u>Polyodon spathula</u>	Freckled madtom	<u>N. nocturnus</u>
Goldeye	<u>Hiodon alosoides</u>	Northern madtom	<u>N. stigmatosus</u>
Mooneye	<u>H. tergisus</u>	Northern cavefish	<u>Amblyopsis spelaea</u>
		Southern cavefish	<u>T. subterraneus</u>
		Northern studfish	<u>Fundulus catenatus</u>
Redside dace	<u>Clinostomus elongatus</u>	Starhead topminnow	<u>F. dispar</u>
Streamline chub	<u>Erimystax dissimilis</u>		
Gravel chub	<u>E. x-punctata</u>	Brook silverside	<u>Labidesthes sicculus</u>
Speckled chub	<u>Extrarius aestivalis</u>		
Bigeye chub	<u>Hybopsis amblops</u>	Rock bass	<u>Ambloplites rupestris</u>
Pallid shiner	<u>H. amnis</u>	Longear sunfish	<u>Lepomis megalotis</u>
Rosefin shiner	<u>Lythrurus ardens</u>	Smallmouth bass	<u>Micropterus dolomieu</u>
Hornyhead chub	<u>Nocomis biguttatus</u>		
River chub	<u>N. micropogon</u>	Western sand darter	<u>Ammocrypta clara</u>
Pugnose shiner	<u>Notropis anogenus</u>	Eastern sand darter	<u>A. pellucida</u>
Popeye shiner	<u>N. ariommus</u>	Greenside darter	<u>Etheostoma blennioides</u>
Bigeye shiner	<u>N. boops</u>	Rainbow darter	<u>E. caeruleum</u>
Ironcolor shiner	<u>N. chalybaeus</u>	Bluebreast darter	<u>E. camurum</u>
Blackchin shiner	<u>N. heterodon</u>	Harlequin darter	<u>E. histrio</u>
Blacknose shiner	<u>N. heterolepis</u>	Spotted darter	<u>E. maculatum</u>
Sand shiner	<u>N. ludibundis</u>	Spottail darter	<u>E. squamiceps</u>
Silver shiner	<u>N. photogenis</u>	Tippecanoe darter	<u>E. tippecanoe</u>
Rosyface shiner	<u>N. rubellus</u>	Variegate darter	<u>E. variatum</u>
Silverband shiner	<u>N. shumardi</u>	Banded darter	<u>E. zonale</u>
Weed shiner	<u>N. texanus</u>	Logperch	<u>Percina caprodes</u>
Mimic shiner	<u>N. volucellus</u>	Channel darter	<u>P. copelandi</u>
Pugnose minnow	<u>Opsopoeodus emiliae</u>	Gilt darter	<u>P. evides</u>
Longnose dace	<u>Rhinichthys cataractae</u>	Slenderhead darter	<u>P. phoxocephala</u>
Blue sucker	<u>Cycleptus elongatus</u>	Dusky darter	<u>P. sciera</u>
Highfin carpsucker	<u>Carpionodes velifer</u>	Saddleback darter	<u>P. vigil</u>
Northern hogsucker	<u>Hypentelium nigricans</u>		
Silver redhorse	<u>Moxostoma anisurum</u>		
River redhorse	<u>M. carinatum</u>		
Black redhorse	<u>M. duquesnei</u>		
Golden redhorse	<u>M. erythrum</u>		
Shorthead redhorse	<u>M. macrolepidotum</u>		
Greater redhorse	<u>M. valenciennesi</u>		

## Wading/Headwater Sites

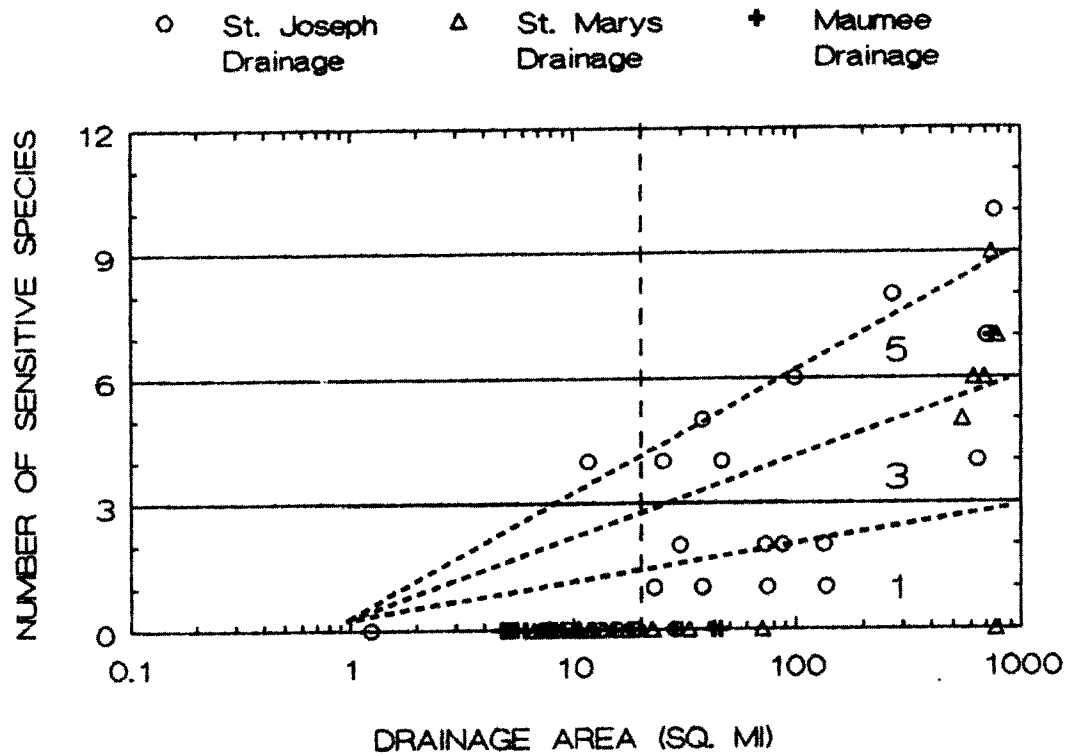


Figure 10. Maximum species richness lines for determining trends in number of sensitive species with increasing drainage area for the Maumee River drainage.



## Metric 6. Percent Abundance of Tolerant Species (Headwater and Wadable Sites)

---

### Impetus

This metric is a modification of the original index metric, the percentage of green sunfish (Karr *et al.* 1986), by Ohio EPA (1989). This metric detects a decline in stream quality from fair to poor categories. The green sunfish, Lepomis cyanellus, is a species that is often present in moderate numbers in many Midwest streams and can become a dominant member of the community in cases of degradation or poor water quality. Competitive advantage in disturbed environments enables the green sunfish to survive and reproduce even under perturbed conditions. Although the green sunfish is widely distributed in the Midwest, it is most commonly collected in headwater streams. This introduces an inherent bias for moderate to large rivers. Karr *et al.* (1986) suggested additional species could be substituted for the green sunfish if they responded in a similar manner. Several species in Indiana meet this criteria of increasing in proportion with increasing degradation of stream quality. This increase in the number of tolerant species increases the sensitivity of this metric for various sized streams and rivers. Since different species have habitat requirements that are correlated with stream size, compositional diversity of the tolerant species metric does not change with drainage area.

Indiana's tolerant species are listed in Table 8. This list is based on a numerical and graphical analysis of Indiana catch data and historical

changes in the distribution of fishes throughout Indiana (Gerking 1945). Species listed as tolerant taxa exhibit diverse tolerance to thermal loadings, siltation, habitat degradation, and certain toxins (Gammon 1983; Ohio EPA 1989). Tolerant species were selected based on the following criteria:

- 1) present at poor or fair sites: Based on our data base of Indiana collections these species are commonly collected at sites ranked either fair or poor.
- 2) historically increases in abundance: Based on historical collection information (Gerking 1945) these species increase in abundance and have not indicated any reduction in distribution.
- 3) increased tolerance to degraded conditions: these species increased in community dominance when environmental conditions shifted from good to fair or poor environmental quality.

### Headwater and Wadable Streams and Rivers

No relationship was evident for drainage areas between 20-1000 miles<sup>2</sup> (Fig. 11), nor was there any relationship with ecoregion or sub-basin apparent for the Maumee River drainage.

**Table 8. List of Indiana fish species considered to be highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation for Headwater and Wadable River sites.**

<b>Tolerant Species Common Name</b>	<b>Scientific Name</b>
Longnose gar	<u>Lepisosteus osseus</u>
Shortnose gar	<u>L. platostomus</u>
Gizzard shad	<u>Dorosoma cepedianum</u>
Central mudminnow	<u>Umbra limi</u>
Carp	<u>Cyprinus carpio</u>
Goldfish	<u>Carrasius auratus</u>
Red shiner	<u>Cyprinella lutrensis</u>
Golden shiner	<u>Notemigonus crysoleucas</u>
Bluntnose minnow	<u>Pimephales notatus</u>
Fathead minnow	<u>P. promelas</u>
Blacknose dace	<u>Rhinichthys atratulus</u>
Creek chub	<u>Semotilus atromaculatus</u>
River carpsucker	<u>Carpionodes cyprinus</u>
Quillback	<u>C. carpio</u>
Smallmouth buffalo	<u>Ictiobus bubalus</u>
Bigmouth buffalo	<u>I. cyprinellus</u>
White sucker	<u>Catostomus commersoni</u>
Channel catfish	<u>Ictalurus punctatus</u>
Flathead catfish	<u>Pylodictis olivaris</u>
Yellow bullhead	<u>Amieurus natalis</u>
Brown bullhead	<u>A. melas</u>
Eastern banded killifish	<u>Fundulus diaphanus diaphanus</u>
Freshwater drum	<u>Aplodinotus grunniens</u>
White bass	<u>Morone chrysops</u>
Green sunfish	<u>Lepomis cyanellus</u>

### Wading/Headwater Sites

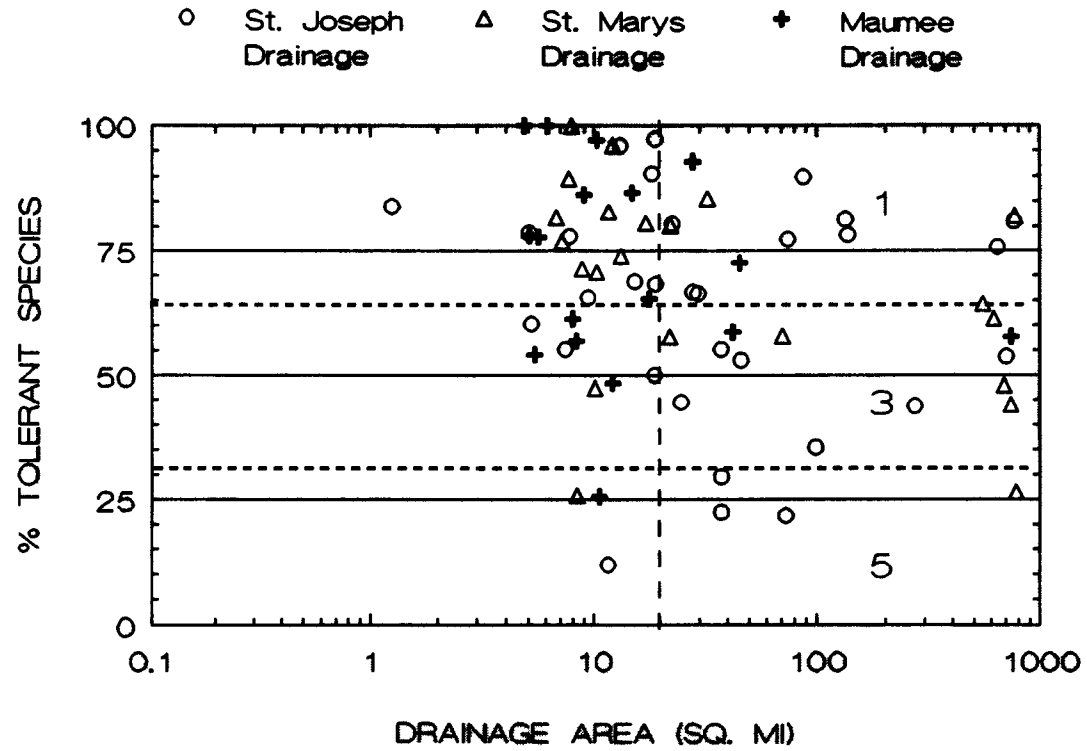


Figure 11. Maximum species richness lines for determining trends in the proportion of tolerant species with increasing drainage area for the Maumee River drainage.

**Metric 7. Proportion of Omnivores (Headwater and Wadable Rivers)**

**Impetus**

The definition of an omnivore follows that of Karr (1981) and Karr *et al.* (1986), which requires species to consume significant quantities of both plant and animal materials (including detritus) and have the ability (usually indicated by the presence of a long gut and dark peritoneum) to utilize both. Omnivores are species whose diets include at least 25% plant and 25% animal foods. Fishes which do not feed on plants but on a variety of animal material are not considered omnivores.

Dominance of omnivores suggests specific components of the food base are less reliable, increasing the success of more opportunistic species. Specialized filter-feeders are not included in this metric after Ohio EPA (1989) since these species are sensitive to environmental degradation, e.g. paddlefish, Polyodon spathula and lamprey ammocoetes, Lampetra and Ichthyomyzon. Facultative species which shift diet due to degraded environmental conditions are also not considered omnivores, e.g. Semotilus atromaculatus and Rhinichthys atratulus. This metric evaluates the intermediate to low categories of environmental quality (Table 9; see Appendix B for species-specific feeding guild classification).

**Headwater and Wadable Streams and Rivers**

Due to minor changes in omnivore classification, only those species which consistently feed as omnivores were included in our analysis. These values differ from the omnivore percentages of Karr *et al.* (1986) but resemble Ohio EPA's (1987) classification. No relationship with drainage area was found for headwater or wadable stream and river sites (Fig. 12). The lack of a drainage area pattern is anticipated since degraded habitats are not exclusive to any particular size waterbody.

**Table 9. List of Indiana fish species considered to be omnivores.**

Common Name	Scientific Name
Gizzard shad	<u>Dorosoma cepedianum</u>
Threadfin shad	<u>D. petenense</u>
Central mudminnow	<u>Umbra limi</u>
Goldfish	<u>Carassius auratus</u>
Grass carp	<u>Ctenopharyngodon idella</u>
Carp	<u>Cyprinus carpio</u>
Cypress minnow	<u>Hybognathus hayi</u>
Miss. silvery minnow	<u>H. nuchalis</u>
Silver carp	<u>Hypophthalmichthys molitrix</u>
Black carp	<u>Mylopharyngodon piceus</u>
Bluntnose minnow	<u>Pimephales notatus</u>
Fathead minnow	<u>P. promelas</u>
Bullhead minnow	<u>P. vigilax</u>
Rudd	<u>Scardinius erythrophthalmus</u>
River carpsucker	<u>Carpionodes carpio</u>
Quillback	<u>C. cyprinus</u>
Highfin carpsucker	<u>C. velifer</u>
White sucker	<u>Catostomus commersoni</u>

### Wading/Headwater Sites

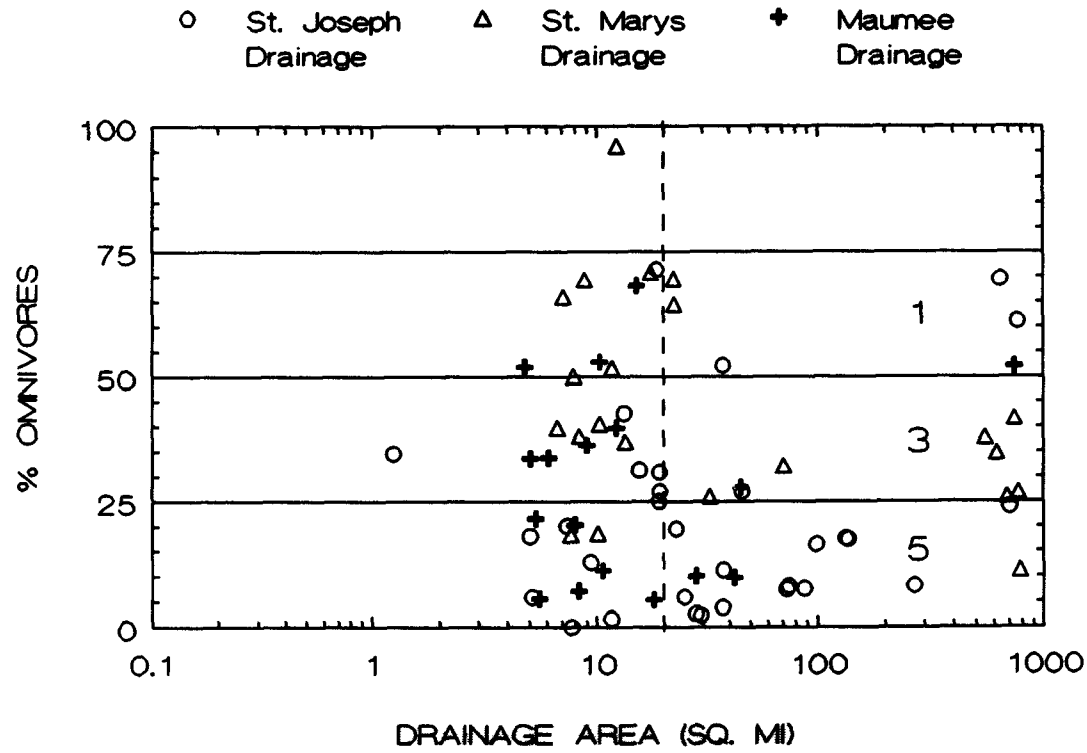


Figure 12. Maximum species richness lines for determining trends in the proportion of omnivores with increasing drainage area for the Maumee River drainage.

---

**Metric 8. Proportion of Insectivores (Headwater and Wadable Sites)**

---

**Impetus**

The proportion of insectivores is a modification of Karr *et al.*'s (1986) original metric, i.e. proportion of insectivorous cyprinidae. This metric is intended to respond to a depletion of the benthic macroinvertebrate community which comprises the primary food base for most insectivorous fishes. As disturbance increases, the diversity of insect larvae decreases, triggering an increase in the omnivorous trophic level. Thus, this metric varies inversely with metric 7 with increased environmental degradation. The inclusion of all insectivorous species was based on the observation that all regions of Indiana do not possess high proportions of insectivorous cyprinids in high quality streams, e.g. Central Corn Belt Plain and Interior Plateau ecoregions. This metric was recalibrated following the recommendation of Karr *et al.* (1986; see Appendix B for species-specific trophic level classifications).

**Headwater and Wadable Streams and Rivers**

Insectivorous species are an important link in transferring energy between lower trophic levels to keystone predator species. Species designations generally conforms to that provided in Karr *et al.* (1986), however, I concur with Ohio EPA in the elimination of the opportunistic feeding creek chub, Semotilus atromaculatus, and blacknose dace, Rhinichthys atratulus, from the insectivore designation. Leonard and Orth (1986) felt that the current trophic definitions of Karr *et al.* (1986) were rather arbitrary since they observed a negative correlation between insectivores and biotic integrity in a West Virginia stream. Plots of the MSR lines showed no relationship existed between drainage area and proportion of insectivorous fishes in either ecoregion or sub-basin in the Maumee River drainage (Fig. 13).

### Wading/Headwater Sites

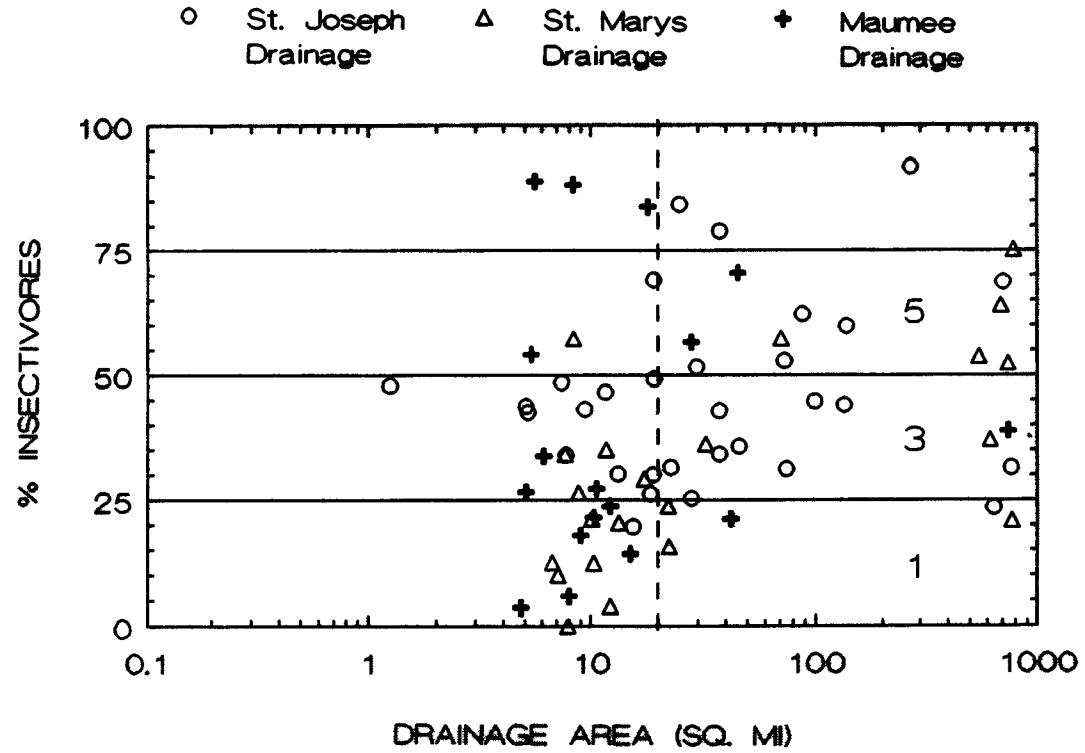


Figure 13. Maximum species richness lines for determining trends in the proportion of insectivores with increasing drainage area for the Maumee River drainage.

**Metric 9. Proportion of Pioneer Species (Headwater Streams)  
Proportion of Carnivores (Wadable Rivers)**

**Impetus**

Karr (1981) developed the carnivore metric to measure community integrity in the upper trophic levels of the fish community. It is only in high quality environments that upper trophic levels are able to flourish. This metric includes individuals of species in which the adults are predominantly piscivores, although some may feed on invertebrates and fish as larvae or juveniles. Species which are opportunistic do not fit into this metric, e.g. creek chub or channel catfish, *Ictalurus punctatus* (Karr *et al.* 1986; Ohio EPA 1987). Karr *et al.* (1986) suggest that some members of this group may feed extensively on crayfish and various vertebrates, e.g. frogs. Species-specific classifications are included in Appendix B and include piscivores (P) and carnivores (C).

**Headwater Streams**

Carnivores are generally not abundant in headwater streams. An alternate metric was developed by Ohio EPA (1987) to determine the permanence of the stream habitat. Smith (1971) identified a signature assemblage of small stream species which he termed "pioneer species" (Table 10). These are species which are the first to colonize sections of headwater streams after desiccation. These pioneer species predominate in unstable environments affected by anthropogenic stresses and temporal desiccation. A high proportion of pioneer species indicates an environment temporally unavailable or stressed. The metric does decrease with increases in drainage area (Fig. 14).

**Wadable Sites**

Karr (1981) suggested that the proportion of carnivores should be a reflection of drainage

**Table 10. List of Indiana fish species considered to be indicators of temporally unavailable or desiccated habitats (Larimore and Smith 1963; Smith 1971).**

<u>Pioneer Species</u>	<u>Scientific Name</u>
<u>Common Name</u>	
Central stoneroller	<u>Campostoma anomalum</u>
Largescale stoneroller	<u>Campostoma oligolepis</u>
Silverjaw minnow	<u>Ericymba buccata</u>
Bluntnose minnow	<u>Pimephales notatus</u>
Fathead minnow	<u>Pimephales promelas</u>
Creek chub	<u>Semotilus atromaculatus</u>
Creek chubsucker	<u>Erimyzon oblongus</u>
Lake chubsucker	<u>Erimyzon sucetta</u>
Green sunfish	<u>Lepomis cyanellus</u>
Johnny darter	<u>Etheostoma nigrum</u>
Orangethroat darter	<u>Etheostoma spectabile</u>

area. Such a correlation in streams greater than 20 miles<sup>2</sup> was not found by Ohio EPA or previous ecoregion studies (Simon, 1991). A drainage area relationship was observed between the sub-basins and increasing drainage area in the Maumee River drainage. The proportion of carnivores from the current data base was considerably higher than that approximated in Karr *et al.*'s (1986) original numbers (Fig. 15).





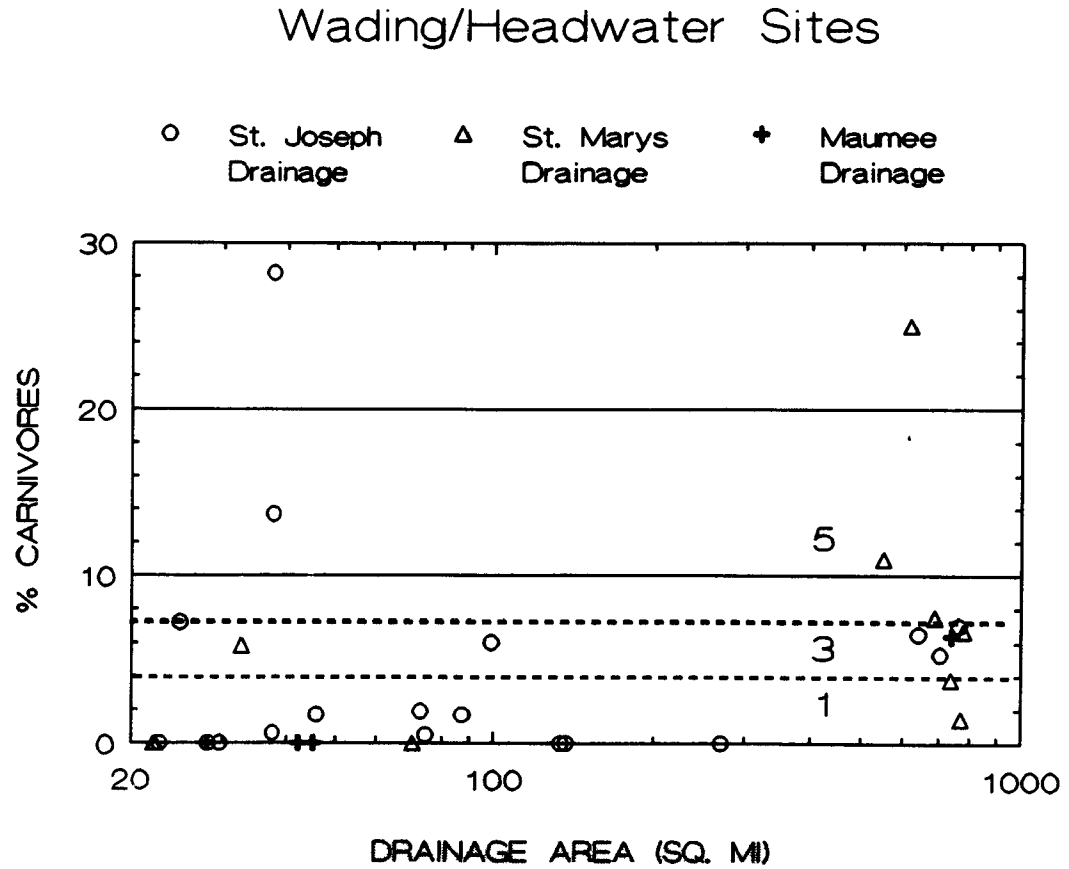


Figure 15. Maximum species richness lines for determining trends in the proportion of carnivores with increasing drainage area for the Maumee River drainage.

**Metric 10. Number of Individuals in a Sample (Headwater and Wadable Sites)**

---

**Impetus**

This metric evaluates population density and is expressed as catch per unit of effort. Effort is expressed by the relative number of individuals per length of reach sampled, per unit of area sampled, or per unit time spent depending on the gear used. Karr *et al.* (1986) suggest that this metric is most sensitive at intermediate to low ends of the sensitivity continuum. When low numbers of individuals are observed the normal trophic relationships are generally disturbed. Because of this effect, scoring adjustments are encouraged for sites in which less than 50 individuals are collected (see next section for details). As integrity increases, total abundance increases and becomes more variable only depending on the level of energy and other natural chemical factors limiting production. Under certain circumstances, *e.g.* channelization, increases in the abundance of tolerant fishes can be observed (Ohio EPA 1987). Lyons (1992) found that abundance, excluding tolerant species, was greatest at fair quality sites in Wisconsin warmwater streams and lower at sites classified as excellent. In this study, catch per unit effort was determined based

on the total number of individuals collected per 15 times the channel width without modification for tolerant taxa. The level of effort sampled within a reach was 50 m if the stream was < 3.4 m wide or 100 m minimum distance if the stream was > 3.4 m wide. A maximum distance of 1000 m was sampled for stream widths > 66.7 m. Each shocking run was conducted with a standardized effort of 30 minutes of sampling per shoreline in 1000 m sites and 15 minutes per shoreline at 500 m sites including both shorelines.

**Headwater and Wadable Streams and Rivers**

A drainage area-dependent relationship was observed for the Maumee River drainage (Fig. 16).

If fewer than 50 fish are collected during a sampling event, alternate scoring procedures are required (see next section for details). Even at the river reach with the smallest drainage area I was able to collect a minimum of 100 fish.

# Wading/Headwater Sites

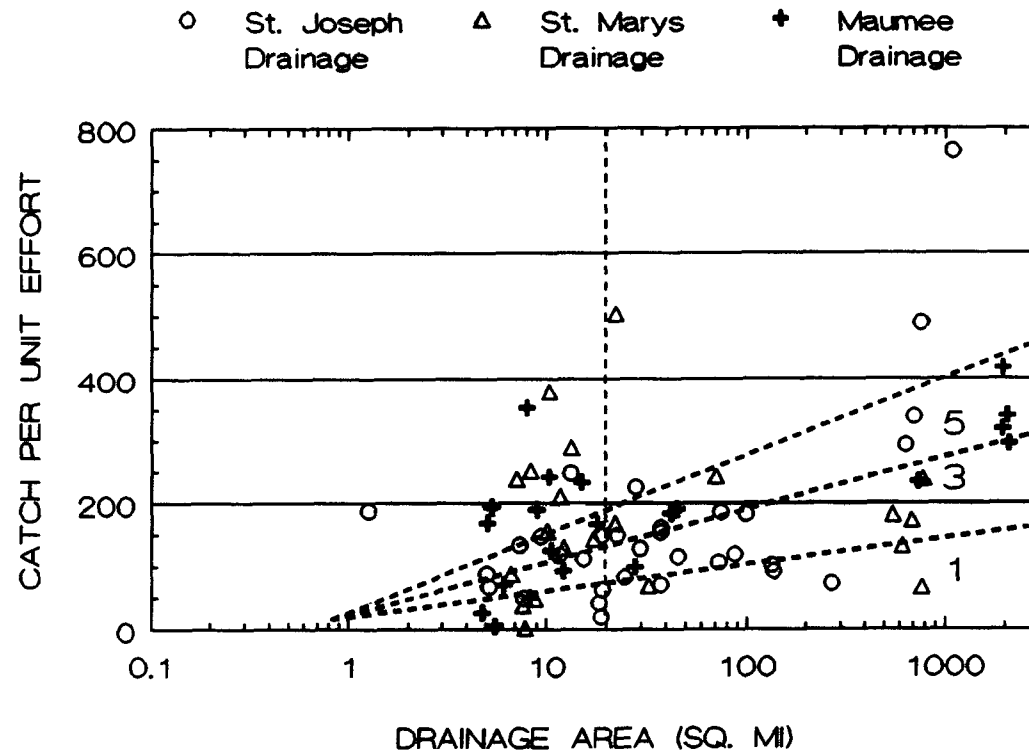


Figure 16. Maximum species richness lines for determining trends in the catch per unit of effort with increasing drainage area for the Maumee River drainage.

**Metric 11. Proportion of Individuals as Simple Lithophilic Spawners  
(Headwater and Wadable Rivers)**

---

**Impetus**

Ohio EPA (1987) replaced the original index metric, proportion of hybrids (Karr *et al.* 1986), with this metric. The hybrid metric was abandoned since the original intent of the metric was to assess the extent to which degradation has altered reproductive isolation among species. Difficulties of identification, lack of occurrence in headwater and impacted streams, and presence in high quality streams among certain taxa, e.g., cyprinids and centrarchids, caused a lack of sensitivity for the hybrid metric.

Spawning guilds have been shown to be affected by habitat quality (Balon 1975; Berkman and Rabeni 1987) and have been suggested as an alternative metric (Angermeier and Karr 1986). Reproductive attributes of simple spawning behavior requires clean gravel or cobble for success (i.e. lithophilous) and are the most environmentally sensitive (Ohio EPA 1987). Simple lithophils broadcast eggs which then come into contact with the substrate. Eggs develop in the interstitial spaces between sand, gravel, and cobble substrates without parental care. Berkman and Rabeni (1987) observed an inverse correlation between simple lithophilic spawners and the proportion of silt in streams. Historically, some simple lithophilic spawners have

experienced significant range reductions due to increased silt loads in streams. Some simple lithophils do not require clean substrates for reproduction. Larvae of these species are buoyant, adhesive, or possess fast developing eggs with phototactic larvae which have minimal contact with the substrate (Balon 1975) and are not included in the above designation. Simple lithophils are sensitive to environmental disturbance, particularly siltation. Designated lithophilic species are included in Table 11 (see Appendix C for species-specific ratings).

**Headwater and Wadable Streams and Rivers**

A relationship with drainage area was observed at stream and river sites for the proportion of lithophilic species in the Maumee River drainage (Fig. 17). Scoring was completed using the trisection method of Fausch *et al.* (1984). The lack of an increased relationship in the largest Maumee River drainage reaches was thought to be a reflection of degraded conditions. Best professional judgement was used in evaluating this metric. Simple lithophils are major components of fish communities indicating the importance of clean gravel and cobble substrates.

Table 11. List of Indiana species considered to be simple lithophilic spawners.

Simple Lithophils			
Common Name	Scientific name	Common Name	Scientific Name
Paddlefish	<u>Polyodon spatula</u>	Spotted sucker	<u>Minytrema melanops</u>
Lake sturgeon	<u>Acipenser fulvescens</u>	Silver redhorse	<u>Moxostoma anisurum</u>
Shovelnose sturgeon	<u>Scaphirhynchus platyrhynchus</u>	River redhorse	<u>M. carinatum</u>
		Black redhorse	<u>M. duquesnei</u>
Redside dace	<u>Clinostomus elongatus</u>	Golden redhorse	<u>M. erythrurum</u>
Lake chub	<u>Couesius plumbeus</u>	Shorthead redhorse	<u>M. macrolepidotum</u>
Streamline chub	<u>Erimystax dissimilis</u>	Greater redhorse	<u>M. valenciennesi</u>
Gravel chub	<u>E. x-punctata</u>		
Cypress minnow	<u>Hybognathus hayi</u>	Burbot	<u>Lota lota</u>
Mississippi silvery minnow	<u>H. nuchalis</u>		
Bigeye chub	<u>Hybopsis amblops</u>	Western sand darter	<u>Ammocrypta clara</u>
Pallid shiner	<u>H. amnis</u>	Eastern sand darter	<u>A. pellucida</u>
Striped shiner	<u>Luxilus chrysocephalus</u>	Rainbow darter	<u>Etheostoma caeruleum</u>
Common shiner	<u>L. cornutus</u>	Bluebreast darter	<u>E. camurum</u>
Rosefin shiner	<u>Lythrurus ardens</u>	Orangethroat darter	<u>E. spectabile</u>
Popeye shiner	<u>N. ariommus</u>	Tippecanoe darter	<u>E. tippecanoe</u>
River shiner	<u>N. blennius</u>	Variegate darter	<u>E. variatum</u>
Bigeye shiner	<u>N. boops</u>	Crystal darter	<u>Crystallaria asprella</u>
Silver shiner	<u>N. photogenis</u>	Logperch	<u>Percina caprodes</u>
Rosyface shiner	<u>N. rubellus</u>	Channel darter	<u>P. copelandi</u>
Silverband shiner	<u>N. shumardi</u>	Gilt darter	<u>P. evides</u>
Southn redbelly dace	<u>Phoxinus erythrogaster</u>	Blackside darter	<u>P. maculata</u>
Blacknose dace	<u>Rhinichthys atratulus</u>	Slenderhead darter	<u>P. phoxocephala</u>
Longnose dace	<u>R. cataractae</u>	Dusky darter	<u>P. sciera</u>
		River darter	<u>P. shumardi</u>
Blue sucker	<u>Cycleptus elongatus</u>	Saddleback darter	<u>P. vigil</u>
Longnose sucker	<u>Catostomus catostomus</u>	Sauger	<u>Stizostedion canadense</u>
White sucker	<u>C. commersoni</u>	Walleye	<u>S. vitreum</u>
Northern hogsucker	<u>Hypentilium nigricans</u>		

## Wading/Headwater Sites

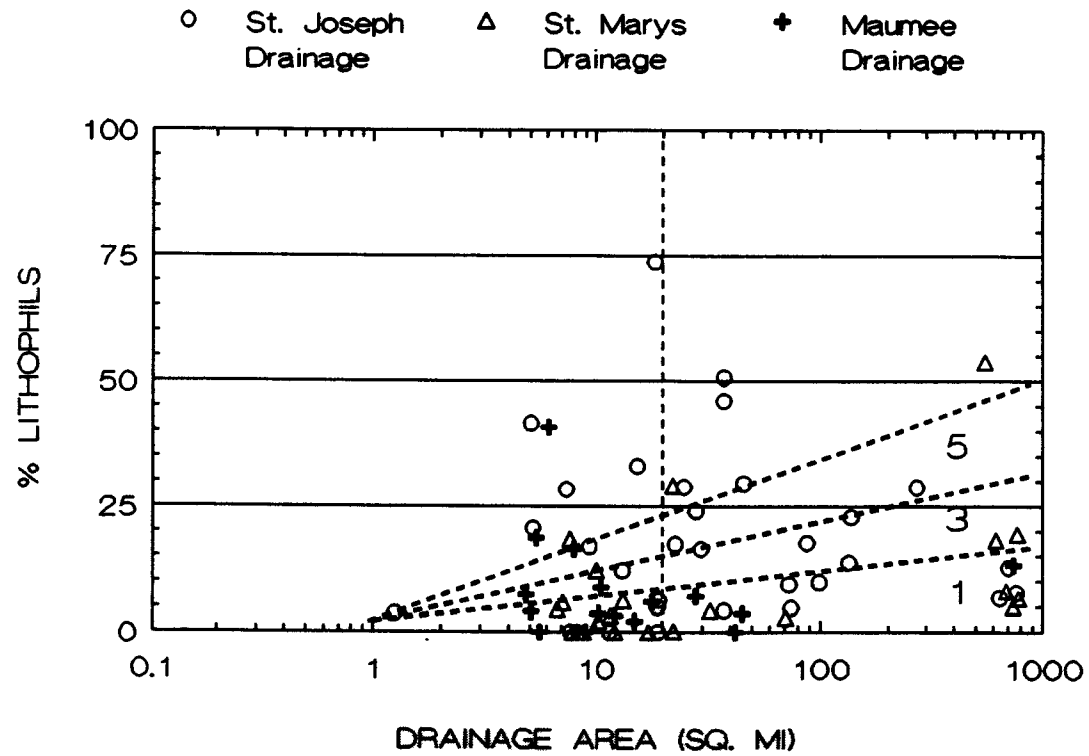


Figure 17. Maximum species richness lines for determining trends in the proportion of simple lithophil species with increasing drainage area for the Maumee River drainage.

---

**Metric 12. Proportion of Individuals with Deformities, Eroded Fins, Lesions, and Tumors (Headwater and Wadable Sites)**

---

**Impetus**

This metric evaluates the individual condition of fish based on the percent occurrence of external anomalies. DELT corresponds to the percent of diseased fish in Karr's (1981) original index. Studies of fish populations indicate that anomalies are either absent or occur at very low rates naturally, but reach higher percentages at impacted sites (Mills *et al.* 1966; Berra and Au 1981; Baumann *et al.* 1987). Common causes for deformities, eroded fins, lesions, and tumors are a result of bacterial, fungal, viral, and parasitic infections; neoplastic diseases; and chemicals (Allison *et al.* 1977; Post 1983; Ohio EPA 1987). An increase in the frequency of occurrence of these anomalies is an indication of physical stress due to environmental degradation, chemical pollutants, overcrowding, improper diet, excessive siltation, and other perturbations. The presence of black spot is not included in the above analyses since infestation varies in degree and is a function of the presence of snails, thus it is not solely related to environmental degradation (Allison *et al.* 1977; Berra and Au 1981). Whittier *et al.* (1987) showed no relationship between Ohio stream quality and black spot. Other parasites are also excluded due to the lack of a consistent relationship with environmental degradation.

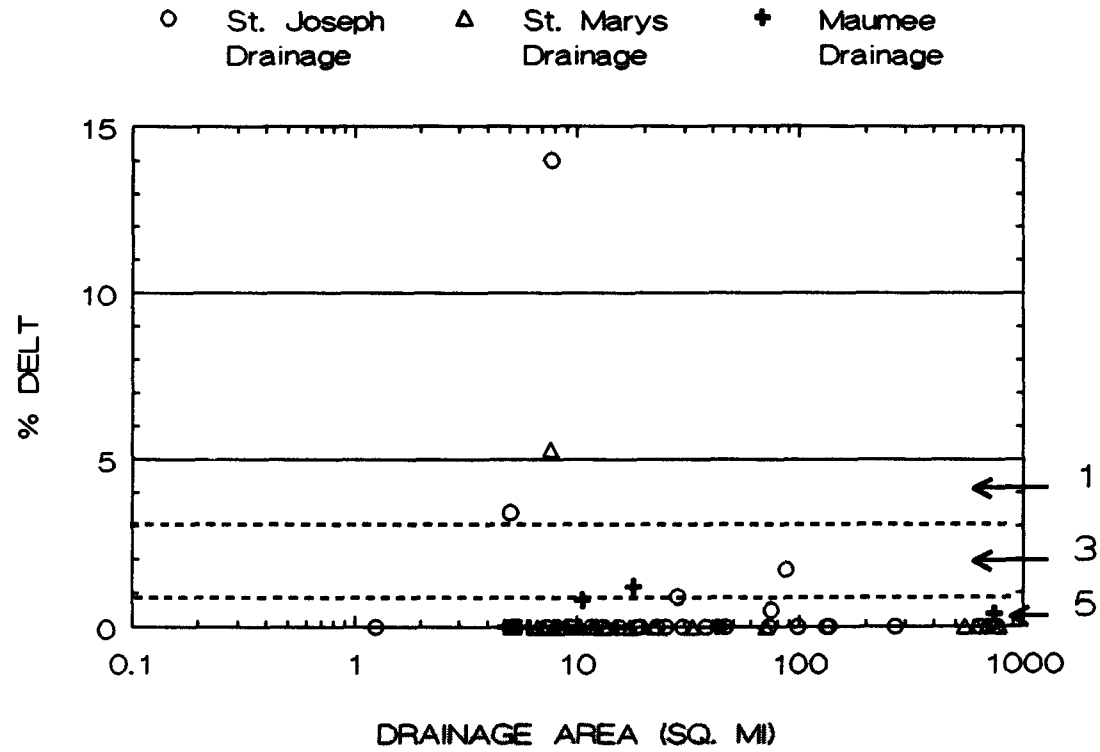
In Ohio and in the current study, the highest incidence of deformities, eroded fins, lesions, and tumors occurred in fish communities downstream from dischargers of industrial and municipal wastewater, and areas subjected to the intermittent stresses from combined sewers and urban runoff. Leonard and Orth (1986) found this metric to correspond to increased degradation in streams in West Virginia. Karr *et al.* (1986) observed this metric to be most sensitive at the lowest ranges of the Index of Biotic Integrity.

**Headwater and Wadable Streams and Rivers**

The scoring criteria used for this metric follows Ohio EPA (1987) and was developed by analyzing wading data. According to Ohio protocols, if a single fish in a sample of less than 200 fish was captured with anomalies this would have been enough to exceed the established criterion. Ohio EPA scoring modifications enable a single diseased fish to be present at a site to score a "5" and two fish at a site to score a "3" when less than 200 individuals are collected (Fig. 18).



### Wading/Headwater Sites



48

Figure 18. Maximum species richness lines for determining trends in the proportion of diseased, eroded fins, lesions, and tumors (DELT) with increasing drainage area for the Maumee River drainage.

## Scoring Modifications

Samples with extremely low numbers in the catch can present a scoring problem in some of the proportional metrics unless adjustments are made to reduce the possibility of bias towards higher scoring of degraded sites. Aquatic habitats impacted by anthropogenic disturbances may exhibit a disruption in the food base and the sample will reflect very few individuals. At such low population sizes the normal structure of the community is unpredictable (Ohio EPA 1987). Based on Ohio EPA experiences, the proportion of omnivores, insectivorous fishes, and percent individuals affected by anomalies do not always match expected trends at these sample sizes. Although scores are expected to deviate strongly from those of high quality areas, this is not always observed. Rather, at these times the opposite deviation of metric score is achieved due to low numbers of individuals or absence of certain taxa.

Scoring very degraded sites without modifying scoring criteria for the proportional metrics can overestimate the total index score for these sites. The following scoring modifications proposed by Ohio EPA (1987) were adopted for evaluating Indiana sites with low numbers of individuals.

Proportion of omnivores for headwater streams and wadable river sites a score of "1" is assigned if less than 50 total individuals are collected. When less than 150 individuals are collected, but are dominated (>50%) by such species as creek chub and blacknose dace, a "1" can be assigned when dominated by generalist feeders. This is left up to the biologist's best professional judgement.

Proportion of insectivores is scored a "1" when a high proportion of insectivores are observed and less than 50 individuals are collected. At sites with less than 150 individuals, this metric can be scored "1" if the community was dominated (>50%) by either striped shiner, common shiner, or spotfin shiner. These species can act as functional omnivores under certain conditions (Angermeier and Karr 1986).

Proportion of top carnivores metric should be scored a "1" when dominated by high numbers (>50%) of grass pickerel in impacted wading areas.

Proportion of simple lithophils always scores a "1" at sites with less than 50 total individuals. Based on Ohio EPA data (1987) this is rarely different from the metric score without the adjustment.

Proportion of individuals with deformities, erosion, lesions and tumor anomalies is scored a "1" when less than 50 individuals are collected. A high proportion of young fishes may also be sufficient reason to score a "1" since they will not have had sufficient time to develop anomalies from exposure to chemical contaminants.

Proportion of pioneer species is scored a "1" at headwater site if less than 50 individuals are collected at drainage areas greater than 8 miles<sup>2</sup> or 25 individuals at drainage areas less than 8 miles<sup>2</sup>.

No scoring adjustments are necessary for proportion of tolerant species.

## RESULTS AND DISCUSSION

### Maumee River Drainage

**Species Composition:** A total of 21 sites were sampled in the Maumee River drainage during 1991. A total of 54 species were collected (Table 12) and were numerically dominated by cyprinid, catostomid, and centrarchid species.

The fish assemblages of the Maumee River ranges from a low of no fish (score of 0; 1 site) to good-excellent (score of 55; 1 site) based on the Index of Biotic Integrity scoring criteria. Increasing biological integrity was observed from upstream to downstream, however, declining conditions were observed in the headwaters of the minor tributaries. The Index of Biotic Integrity scores of the sites approximated a normal curve with a mode classification of poor. The frequency distribution for each of the IBI community categories for the Maumee River drainage stations (21) follows: good-excellent 4.8% (1 station); good 9.5% (2 stations); fair-good 4.8% (1 station); fair 4.8% (1 station); poor-fair 19.0% (4 stations); poor 28.6% (6 stations); very poor-poor 9.5% (2 stations); very poor 14.3% (3 stations) and no fish 4.8% (1 station). The sites with low biological integrity were primarily headwater and mid-reach rivers. The highest biotic integrity was associated with the Maumee River, at the SR 24 bridge in New Haven (IBI = 55). This River segment deserves protection to ensure that the quality of the resource continues. Some of the northern tributaries are intermittent and were dry during our investigations in 1991.

Several species collected only in the Maumee River during this study included: emerald shiner Notropis atherinoides, river shiner Notropis blennioides, and flathead catfish Pylodictis olivaris. Of special interest was the collection of the river redhorse Moxostoma carinatum, largescale stoneroller Campostoma oligolepis, and

smallmouth bass Micropterus dolomieu. Moxostoma carinatum is considered state threatened. The capture of Campostoma oligolepis is the first record for northeastern Indiana. Species such as the emerald shiner and river shiner are considered large river species. Several Micropterus dolomieu (N = 3) were collected from the Maumee River at the upper two stations, however, none were observed at Bull Rapids and the Ohio state line.

**Species Trends:** Round-bodied suckers, minnows, and darters are good indicator taxa revealing good to exceptional biotic integrity. The Maumee River possessed a high number of round-bodied suckers, but limited numbers of minnows and darters.

Eight species of suckers were collected from the Maumee River drainage. Round-bodied suckers are considered the most sensitive of the Catostomidae species. A total of 5 species, excluding the species Catostomus commersoni which tends to be a ubiquitous species found in a variety of habitats, represented round-bodied suckers. Four species of redhorse and the northern hogsucker are regularly represented in catches from the Maumee River and the larger tributaries. These species are insectivores and are highly intolerant to thermal pollution (Gammon 1976).

The minnows are a diverse group of North American fish with close to 200 recognized species. Seventeen species of the family Cyprinidae were collected from the Maumee portion of the drainage. Less than half (45%) of the species are considered to represent good-fair biotic integrity (Karr *et al.* 1986). Many (40%) of the species are representative of pioneering taxa which colonize recently disturbed or water limited stations (Ohio EPA 1989). The trophic composition of the species showed 25% of the species are omnivores. Omnivores can utilize a greater proportion of the resource,

**Table 12. Species list of taxa collected in the Maumee River drainage: Maumee, St. Marys', and St. Joseph River drainages, Indiana, during 1991.**

	Drainage		
	St. Marys	St. Joseph	Maumee
<b>Lepisosteiformes - gars</b>			
<u>Lepisosteidae</u> - gars			
<u>L. osseus</u> Linnaeus, longnose gar		X	X
<b>Amiiformes - bowfin</b>			
<u>Amiidae</u> - bowfin			
<u>Amia calva</u> Linnaeus, bowfin		X	
<b>Clupeiformes - herring, shad</b>			
<u>Clupeidae</u> - herring			
<u>Dorosoma cepedianum</u> (Lesueur), gizzard shad	X	X	X
<b>Salmoniformes - pike and mudminnows</b>			
<u>Esocidae</u> - pikes			
<u>Esox americanus</u> Gmelin, grass pickerel	X	X	X
<u>E. lucius</u> Linnaeus, northern pike			X
<u>Umbridae</u> - mudminnows			
<u>Umbra limi</u> (Kirtland), central mudminnow		X	
<b>Cypriniformes - carps and minnows</b>			
<u>Cyprinidae</u> - carps and minnows			
<u>Campostoma anomulum</u> (Rafinesque), stoneroller	X	X	X
<u>C. oligolepis</u> Hubbs and Greene, largescale stoneroller	X	X	X
<u>Carassius auratus</u> (Linnaeus), goldfish	X		
<u>Cyprinella spiloptera</u> Cope, spotfin shiner	X	X	X
<u>C. whipplei</u> (Girard), steelcolor shiner		X	
<u>Cyprinus carpio</u> Linnaeus, carp	X	X	X
<u>Ericymba buccata</u> Cope, silverjaw minnow	X	X	X
<u>Luxilus chrysocephalus</u> (Rafinesque), striped shiner	X	X	X
<u>L. cornutus</u> (Mitchill), common shiner	X	X	
<u>Lythrurus umbratilis</u> (Girard), redfin shiner	X		X
<u>Nocomis biguttatus</u> (Kirtland), hornyhead chub	X		
<u>Nocomis micropogon</u> (Cope), river chub		X	X
<u>Notemigonus crysoleucus</u> (Mitchill), golden shiner	X	X	
<u>Notropis anogenus</u> Forbes, pugnose shiner		X	
<u>N. atherinoides</u> Rafinesque, emerald shiner			X
<u>N. blennioides</u> (Girard), river shiner			X
<u>N. ludibundus</u> Cope, sand shiner	X	X	X
<u>N. rubellus</u> (Agassiz), rosyface shiner	X		
<u>Phenacobius mirabilis</u> (Girard), suckermouth minnow	X	X	X
<u>Pimephales notatus</u> (Rafinesque), bluntnose minnow	X	X	X
<u>P. promelas</u> Rafinesque, fathead minnow	X	X	X

**Indiana Ecoregion**

**Table 12. (Continued).**

	Drainage		
	St. Marys	St. Joseph	Maumee
<u>Rhinichthys atratulus</u> (Agassiz), blacknose dace	X	X	
<u>Semotilus atromaculatus</u> (Mitchill), creek chub	X	X	X
<b>Catostomidae - suckers and buffalo</b>			
<u>Carpionodes carpio</u> (Rafinesque), river carpsucker	X		
<u>C. cyprinus</u> (Lesueur), quillback	X	X	X
<u>C. velifer</u> (Rafinesque), highfin carpsucker	X	X	X
<u>Catostomus commersoni</u> Lacepede, white sucker	X	X	X
<u>Hypentelium nigricans</u> (Lesueur), northern hogsucker	X	X	
<u>Ictiobus bubalus</u> (Rafinesque), smallmouth buffalo	X	X	
<u>Minytrema melanops</u> (Rafinesque), spotted sucker		X	
<u>Moxostoma anisurum</u> (Rafinesque), silver redhorse	X	X	
<u>M. carinatum</u> (Cope), river redhorse	X		X
<u>M. duquesnei</u> (Lesueur), black redhorse		X	X
<u>M. erythrum</u> (Rafinesque), golden redhorse	X	X	X
<u>M. macrolepidotum</u> (Lesueur), shorthead redhorse	X		X
<u>M. valenciennesi</u> Jordan, greater redhorse	X	X	
<b>Siluriformes - bullhead and catfish</b>			
<b>Ictaluridae - bullhead and catfish</b>			
<u>Ameiurus melas</u> (Rafinesque), black bullhead		X	X
<u>A. natalis</u> (Lesueur), yellow bullhead	X	X	X
<u>Ictalurus punctatus</u> (Rafinesque), channel catfish	X	X	X
<u>Noturus flavus</u> Rafinesque, stonecat	X	X	X
<u>N. gyrinus</u> (Mitchill), tadpole madtom	X		X
<u>N. miurus</u> Jordan, brindled madtom		X	X
<u>Pylodictis olivaris</u> (Rafinesque), flathead catfish			X
<b>Atheriniformes - topminnows, silversides</b>			
<b>Fundulidae - topminnows</b>			
<u>Fundulus notatus</u> (Rafinesque), blackstripe topminnow	X		X
<b>Atherinidae - silversides</b>			
<u>Labidesthes sicculus</u> (Cope), brook silverside		X	
<b>Perciformes - basses, sunfish, perch, darters</b>			
<b>Centrarchidae - black bass and sunfish</b>			
<u>Ambloplites rupestris</u> (Rafinesque), rock bass		X	X
<u>Lepomis cyanellus</u> Rafinesque, green sunfish	X	X	X
<u>L. gibbosus</u> (Linnaeus), pumpkinseed	X	X	X
<u>L. gulosus</u> (Cuvier), warmouth		X	
<u>L. humilis</u> (Girard), orangespotted sunfish	X		X
<u>L. macrochirus</u> Rafinesque, bluegill	X	X	X
<u>L. megalotis</u> (Rafinesque), longear sunfish	X	X	X
<u>L. microlophus</u> (Gunther), redear sunfish	X		

Table 12. (Continued)

	Drainage		
	St. Marys	St. Joseph	Maumee
<b>Centrarchidae - black bass and sunfish (continued)</b>			
<u>Micropterus dolomieu</u> Lacepede, smallmouth bass	X	X	X
<u>M. salmoides</u> (Lacepede), largemouth bass	X	X	X
<u>Pomoxis annularis</u> Rafinesque, white crappie		X	X
<u>P. nigromaculatus</u> (Lesueur), black crappie	X	X	X
<b>Percidae - perch and darters</b>			
<u>Ammocrypta pellucida</u> Agassiz, eastern sand darter		X	
<u>Etheostoma blenniodes</u> Rafinesque, greenside darter		X	X
<u>E. flabellare</u> Rafinesque, fantail darter		X	X
<u>E. nigrum</u> Rafinesque, johnny darter	X	X	X
<u>E. spectabile</u> (Agassiz), orangethroat darter	X		X
<u>Percina caprodes</u> (Rafinesque), logperch	X	X	X
<u>P. maculata</u> (Girard), blackside darter	X	X	X
<u>P. phoxocephala</u> (Nelson), slenderhead darter		X	
<u>Stizostedion canadense</u> (Smith), sauger	X		X
<u>S. vitreum</u> (Mitchill), walleye	X		
<b>Sciaenidae - drum</b>			
<u>Aplodinotus grunniens</u> Rafinesque, freshwater drum	X		X
<b>Cottidae - sculpins</b>			
<u>Cottus bairdi</u> Girard, mottled sculpin		X	
<b>Total Number of Species</b>	<b>48</b>	<b>58</b>	<b>54 = 75</b>

however, tend to dominate when the habitat is degraded and resources are unpredictable.

The darters are a group of small, benthic insectivores which require high dissolved oxygen conditions and clean substrates for reproduction (Page 1983; Kuehne and Barbour 1983). The darters have close to 150 recognized species. Many of the species exhibit simple lithophilic modes of reproduction, while a few species have evolved more complex reproductive behaviors. A total of 6 darter species were collected from the Maumee River basin. This is significantly below what is expected for the mainstem of the River based on historical data, however, may be representative of the tributaries. The eastern

sand darter Ammocrypta pellucida was once found in the basin (Kirsch 1895; Gerking 1945) but has been extirpated from the Maumee River in Indiana (Simon 1993). No specimens were collected from the Maumee River or minor tributaries during the current investigation. The darter species collected from the Maumee River represent the least reproductively specialized species of the 28 species of darters found within Indiana and are typical of the fair category of biotic integrity.

An important consideration when evaluating trends in the Maumee River is to recognize that virtually no ideal reference sites exist. Even the best site immediately upstream of the Fort Wayne outfall was perturbed by diffuse nonpoint

## Indiana Ecoregion

---

source impacts from the city and was not truly representative of unimpacted conditions. Thus, none of the sites in the Maumee River were considered excellent resource waters.

### St. Joseph River Drainage

**Species Composition:** A total of 33 wading and boat sites were sampled in the St. Joseph River drainage during 1991. This drainage possessed the most diverse fish community with 58 species (Table 12). Numerically the subdrainage was dominated by cyprinids, centrarchid, and catostomid species. The tributaries of the St. Joseph River, including Fish Creek and Cedar Creek have extremely diverse fish communities composed of cyprinids, darters, and catostomids. The mainstem St. Joseph River scored the highest IBI at Johnny Appleseed park of all sites sampled during 1991.

The fish community assemblage of the St. Joseph River drainage ranged from a low of very poor (score of 14; 3 stations) to good-excellent (score of 57; 1 station) based on IBI scoring criteria. The biotic integrity of the St. Joseph River varied with increasing drainage area. Stations above Fort Wayne scored considerably poorer than the furthest downstream site at Johnny Appleseed park. Like the Maumee River, the IBI scores of the St. Joseph River drainage approximated a normal distribution with respect to biotic integrity classification. The biological integrity rating had a mode classification of poor. The frequency distribution for the St. Joseph River stations (33) within each IBI classification follows: good-excellent 3.0% (1 station); good 6.1% (2 stations); fair-good 6.1% (2 stations); fair 12.1% (4 stations); fair-poor 18.2% (6 stations); poor 39.4% (12 stations); poor-very poor 6.1% (2 station); very poor 9.1% (3 stations).

Fish were collected at all sites in the St. Joseph River drainage. Sites which had low index values were primarily attributed to non-point sources (e.g., agriculture). Exceptional streams sites in the St. Joseph River drainage include the St. Joseph River at Johnny Appleseed park

(IBI=57) and below Cedarville Reservoir (IBI=45), and direct tributaries such as Fish Creek and Cedar Creek. Stations sampled in the lower portions of each of these tributaries had good biological integrity, however, the headwaters of these streams are degraded and need remediation to preserve biodiversity and biological integrity.

Unique species collected in the St. Joseph River include bowfin Amia calva, northern pike Esox lucius, steelcolor shiner Cyprinella whipplei, hornyhead chub Nocomis biguttatus, pugnose shiner Notropis anogenus, rosyface shiner Notropis rubellus, spotted sucker Minytrema melanops, brook silverside Labidesthes sicculus, warmouth Lepomis gulosus, eastern sand darter Ammocrypta pellucida, slenderhead darter Percina phoxocephala, and mottled sculpin Cottus bairdi. Many of these species are sensitive to low dissolved oxygen, siltation, and degraded habitat. This study indicated that they may have been reduced to low population densities or extirpated from the remainder of the Maumee River drainage. In addition, three State threatened species were collected during the study. The greater redhorse Moxostoma valenciennesi, a state threatened species, was captured at several stations. The eastern sand darter was collected at a single location immediately adjacent to Johnny Appleseed park (Simon 1993). This station is immediately below the last of a series of dams which serve as sediment traps removing much of the sediment bedload from the water column. Although the species benefits from the presence of the dam, the dam also blocks any future migration potential upstream. The pugnose shiner was also collected from a single location. This species typically inhabits lakes and is rarely collected from riverine sites. This is the first collection of this species from northeastern Indiana in over 50 years (Gerking 1945). Previously, the species was only known from Hamilton Lake, Steuben County, in the St. Joseph drainage. The largescale stoneroller was also documented from the St. Joseph River. This is the first collection of the species from this drainage.

***Species Trends:*** The St. Joseph River had the greatest species richness and highest biotic integrity among the Maumee River drainage subdrainages. The series of dams have reduced biological integrity in the upstream portions of the drainage by reducing migration potential and decreasing dissolved oxygen levels. The lowermost sections of the tributaries had the best biological integrity among any of the subdrainages. The quality of the riparian zones and reduced channelization was considered a significant benefit for the preservation of biological integrity. It should be noted that the system recovers immediately downstream of the hydroelectric dams with the best station located below the tailwaters of the lowermost dam.

The number of sensitive species also paralleled the IBI trend with reductions in sensitive species richness above the dams. Nineteen species of Cyprinidae were collected from the St. Joseph River drainage. Both species of Campostoma and Luxilus were collected from the drainage, likewise two species of Cyprinella were documented for the first time in the basin. The minnow species collected from the St. Joseph River drainage are mostly insectivores (63.1%), high pioneering tendencies (42.1%), and only a few (26.3%) of the species being sensitive to low dissolved oxygen, toxic chemicals, and degraded habitat.

Nine sucker species were collected during the current investigation. A large proportion of the species are considered sensitive to thermal and other habitat modifications. The redhorses are a significant part of the community (44.4%) represented by 4 species. Other sensitive round-bodied suckers include spotted sucker Minytrema melanops and northern hogsucker.

The number of benthic insectivore species include 7 species of darters, 2 species of madtoms, and a single sculpin species. The rediscovery of the eastern sand darter was an important collection from the current study. Simon (1993) documented the species historical presence in the St. Joseph, St. Mary's and Maumee Rivers. The species requires clean sand and fine gravel substrates for feeding and

reproduction. The number of darter species present in the St. Joseph River was probably typical of the Maumee River drainage before the extensive landuse modifications. The stonecat Noturus flavus and brindled madtom N. miurus were found in the only the highest quality tributary and mainstem sites.

A saugeye fishery has been developed in the St. Joseph River perpetuated by the stocking of juveniles (E. Braun, IDNR, pers. comm.). No saugeyes were collected in our collections, however, some populations had been collected in the St. Mary's River and Maumee River below the junction of the St. Joseph and St. Mary's Rivers (Pearson and Shipman 1978). Several large individual sauger and a few walleye were collected from the Maumee River. A large proportion of young-of-the-year were either stocked or indicated a successful spawn in the St. Mary's River near Decatur.

#### St. Marys' River Drainage

***Species Composition:*** A total of 23 sites were sampled in the St. Mary's River. A total of 47 species were collected (Table 12) and were numerically dominated by centrarchid, cyprinid, and catostomid species.

The fish community assemblage of the St. Mary's River ranged from a low of very poor (score of 12; 6 stations) to a high of good (score of 49; 1 station) based on IBI classification criteria. The biotic integrity of the St. Mary's River increased with increasing drainage area. Stations in the headwaters of the tributaries were generally degraded. IBI scores within the St. Mary's drainage were skewed towards lower water resource quality. Among the 23 stations 4.3% (1) were classified as good; good-fair 8.7% (2 stations); fair 13.0% (3 stations); fair-poor 13.0% (3 stations); poor 21.7% (5 stations); poor-very poor 13.0% (3 stations); and very poor 26.1 (6 stations). Fish were collected at all sites in the St. Mary's River drainage. Visually it appeared sites which had low IBI values were affected by significant nutrient input.



## Indiana Ecoregion

---

Species collected only in the St. Mary's River include river carpsucker Carpionodes carpio, redear sunfish Lepomis microlophus, and walleye Stizostedion vitreum. Semotilus atromaculatus, white sucker Catostomus commersoni, fathead minnow Pimephales promelas, bluntnose minnow Pimephales notatus, and green sunfish Lepomis cyanellus were the dominant species in the drainage. Several threatened and endangered species were documented from the St. Mary's subdrainage including river redhorse Moxostoma carinatum and greater redhorse M. valenciennesi. The majority of sites are dominated by omnivorous, pioneering, tolerant species.

**Population Attributes:** Longitudinal trends show declining biological integrity in the headwaters of the subdrainage. Headwaters are highly impacted by agricultural runoff and nutrient input which results in reduced biological diversity. It should be noted that the St. Mary's River drainage exhibited declining biotic integrity upstream of Decatur caused from agricultural loss of highly erosional soils and input of nutrients from fertilizers.

The number of indicator species also paralleled the IBI longitudinal trends with reductions in species richness of minnows, suckers, and darters. Species richness was the lowest observed among the three subdrainages.

Only 14 species of minnow were collected usually representing the most tolerant (50%), omnivorous (50%), pioneering (64.3%) species. Only the largescale stoneroller was a new record for the subdrainage of any significance. Both species of Campostoma were collected from the drainage.

Ten species of Catostomidae were found during this investigation. Trophic arrangement of the

species showed equal distribution between omnivores and the more sensitive round-bodied insectivores. The greater redhorse and river redhorse were found at several stations. These are new records for the drainage with the greater redhorse never being documented from the drainage.

The number of darter species was significantly reduced being represented by only 4 species. The darter species observed reflected the moderate ranges of biological integrity (Table 12). Two species of madtoms were collected including stonecat and tadpole madtom. Thus, a total of 6 benthic insectivore species were collected from the St. Mary's subdrainage. More sensitive members of the guild have been extirpated (Kirsch 1895; Gerking 1945). Species such as blackside darter, logperch, greenside darter, and eastern sand darter had been collected historically.

### Reference Sites

Reference sites are localities which best represent the regional framework under study. Reference sites define the "reference condition" or "least impacted" condition which are used to define the Maximum Species Richness line based on the 95th percentile. Subsequent recalibration of the individual IBI metrics can concentrate on these sites during future monitoring efforts. Few natural areas remain in the Maumee River drainage. The list of candidate sites are based on superior IBI scores, typical habitat for the ecoregion, and professional judgement (Table 13). The reference sites listed are those which achieved the highest biotic integrity based on species composition, trophic and reproductive guilds, catch per unit effort, and disease factors.

**Table 13. Reference<sup>1</sup> sites used to determine fish community biotic integrity for the Maumee River drainage, Indiana.**

<b>Maumee River Drainage</b>	<p><b>Maumee River:</b> Allen County: at Anthony Road bridge, Ft. Wayne, St. Joseph Twp., T 30N R 13E S 06 long. 85° 06' 52" lat. 41° 04' 56" (site: 91-80).</p> <p><b>Maumee River:</b> Allen County, at SR 24 bridge, New Haven, Adams Twp., T 30N R 13E S 2/1 long. 85° 01' 11" lat. 41° 05' 04" (site: 91-127).</p> <p><b>Maumee River:</b> Allen County, at Bull Rapids Road bridge, 4 mi NE New Haven, Milan Twp. T 31N R 14E S 22 long. 84° 52' 41" lat. 41° 09' 02" (site: 91-64).</p> <p><b>Maumee River:</b> Allen County, at old Scipio Road bridge, 0.5 mi W Ohio State line. T 31N R 15E S 10. long. 84° 48' 42" lat. 41° 09' 48" (site: 91-63).</p>
<b>St. Joseph River Drainage</b>	<p><b>Fish Creek:</b> Steuben County: at 210A bridge, 1.5 mi W Hamilton, Otsego Twp., T 36N R 14E S 32. long. 84° 56' 07" lat. 41° 32' 06" (site: 91-22).</p> <p><b>St. Joseph River:</b> Allen County: at SR 24/30/14, adjacent to Johnny Applesseed Park, Ft. Wayne, Wayne Twp., T 31N R 12E S 25 long. 85° 07' 02" lat. 41° 06' 45" (site: 91-139).</p> <p><b>Fish Creek:</b> Steuben County: at CR 850E bridge, 4.5 mi NE Hamilton, Richland Twp., T 36N R 15E S 20. long. 84° 50' 25" lat. 41° 35' 04" (site: 91-24).</p> <p><b>Cedar Creek:</b> Dekalb County: at CR 27 Road bridge, 2.25 mi NW Waterloo, Smithfield Twp., T 35N R 12E S 31. long. 85° 03' 48" lat. 41° 26' 51" (site: 91-100).</p> <p><b>St. Joseph River:</b> Allen County: at Main Road bridge, below Cedarville Reservoir, 0.5 mi S Cedarville, Cedar Creek Twp. T 32N R 13E S 28 long. 85° 01' 30" lat. 41° 11' 51" (site: 91-129).</p>
<b>St. Marys' River Drainage</b>	<p><b>St. Mary's River:</b> Allen County: at SR 1 bridge, Fort Wayne, Wayne Twp. T 30N R 12E S 26. long. 85° 08' 52" lat. 41° 01' 45" (site: 91-138).</p> <p><b>St. Mary's River:</b> Adams County: at SR 224 bridge, Decatur, Washington and Root Twp., T 27/28N R 14E S 34/3. long. 84° 55' 19" lat. 40° 50' 00" (site: 91-130).</p> <p><b>St. Mary's River:</b> Allen County: at Hoagland Road bridge, Poe, Marion Twp. T 29N R 13E S 29. long. 85° 05' 11" lat. 40° 56' 14" (site: 91-132).</p>

Reference sites in this drainage represent "least impacted" sites and do not reflect conditions comparable to excellent resource waters of the state.

## Indiana Ecoregion

---

### **Biocriteria Comparison of the Huron-Erie Lake Plain**

The States of Ohio and Michigan share the Huron-Erie Lake Plain ecoregion with Indiana. Ohio in an attempt to develop the most stringent biological criteria evaluated statewide biological criteria for the ecoregions and sampled extensively in Michigan during the late 1980's in an attempt to find additional reference stations (Simon, personal observation). It has been well-known that the Huron-Erie Lake Plain has been severely degraded by the actions of humans (Ohio EPA 1989). It was a primary goal of this study to determine if reference condition expectations developed from the Indiana portion of the ecoregion could advance biological criteria expectations for this region.

The U.S. Environmental Protection Agency, Environmental Research Laboratory-Corvallis and Ohio EPA collaborated on a project to determine reference conditions for the state. The Stream Regionalization Project culminated in the development of statewide reference condition expectations for Ohio (Whittier *et al.* 1987; Ohio EPA 1989). The Huron-Erie Lake Plain was recognized as having limitations for warmwater habitat designations as defined by Ohio Water Quality Standards (Ohio EPA 1989). Ohio EPA biologists determined that none of the wading and headwater sites sampled in this ecoregion reflected "least impacted" conditions relative to reference sites from the remainder of the State. The Huron-Erie Lake Plain is distinguished from the other ecoregions by the wide-scale macrohabitat alterations within the headwaters and small rivers. Intensive rowcrop agriculture and drainage practices (i.e. channel modifications to increase subsurface drainage) have preserved few streams. As a result the IBI reflects this lowered biological integrity. In order to determine warmwater habitat criteria for headwater and mid-sized streams and rivers the Ohio EPA examined results from all sites sampled between 1979 and 1986. The criteria was derived from metric values which delineated the upper 10% of all sites sampled. They also reviewed historical literature to determine expectations for this region.

Ohio EPA developed a "modified warmwater habitat" designation for streams in the Huron-Erie Lake Plain in order to properly characterize the extensive landscape modifications, yet protect the chemical, physical, and biological integrity of these streams. The modified designation is used to protect streams and rivers which function as warmwater fish communities but because of structural and functional modifications of these communities caused by human induced practices the community cannot fully attain warmwater status. The return of biological integrity to sufficient levels representative of "least impacted" conditions are not expected in the near future due to the physical modification of the stream channel and substrate. Recovery of such areas to "least impacted" conditions is not possible without some recovery of the stream channel and an increase in gradient to a pre-modified condition or extensive landuse changes within the drainage.

Two possibilities exist for explaining the structural and functional attributes of the Huron-Erie Lake Plain. First, the altered community attributes are a direct result of macrohabitat degradation. These communities are characterized by a predominance of tolerant species, generalists and omnivores, and only moderately reduced biological diversity. Abundance and biomass can increase as a result of nutrient enrichment which cascades into increased productivity for those tolerant, generalist or omnivorous species able to endure the impact.

A second compounding reason for reduced structural and functional complexity in the Huron-Erie Lake Plain community may be a function of zoogeography. The reduction of available dispersal routes post-glaciation required many species to reinvade the area only after the glaciers receded some 10,000 years ago (Underhill 1986). Species recolonization of the Lake Plain was aided by the glacial connection between the Wabash and Maumee Rivers by the Little Wabash River and by the Grand River connection across Michigan. As the Saginaw lobe retreated across Michigan a large

pool of water remained which was the precursor of Lake Erie. Species capable of tolerating lentic, turbid, cold water were able to reinvade the system first. Many species were unable to disperse into the Great Lakes, thus, the Great Lakes as a whole are biologically limited in comparison to riverine systems such as the Mississippi and Ohio River systems. A study by Smith *et al.* (1981) in the Raisin River system demonstrates this effect with the headwaters of the system reflecting more structural and functional attributes of the Eastern Corn Belt Plain fish community, while lower sections of the river were dominated by the most tolerant species. The lack of riffles and other macrohabitat features would not have been present even during pre-Columbian "pristine" conditions. The predominance of wetlands, low-gradient, seiche directed streams and rivers of this region would have precluded the majority of sensitive species. Thus, reference conditions need to reflect not only high gradient "least impacted" streams but also the typical low-gradient types of habitats which occurred along the Great Lakes.

In order to compare the criteria and direction of the individual metrics to determine if Ohio EPA biological criteria could benefit from the effort conducted in Indiana it is necessary to compare the associated variance of the reference conditions. The State of Ohio developed biological criteria from the analysis of over 300 reference sites statewide. After careful analysis of the results, the Huron-Erie Lake Plain was separately scored using a 90th percentile objective. In order to compare metric expectations, datasets from each of the 12 metrics was compared from Ohio EPA (1989) to the current metric criteria. The Indiana dataset is based on a 95th percentile of the reference condition. Results are summarized in Table 14 between Ohio Statewide criteria and Indiana Huron-Erie Lake Plain expectations.

In a comparison (student t-test,  $\alpha = 0.05$ ) between the two reference conditions equal amounts of similarities and differences exist. Metrics which did not differ statistically between Ohio Statewide criteria and Indiana Huron-Erie

Lake Plain expectations include total number of species for headwater sites, number of sunfish species, number of minnow species, number of sucker species, proportion of tolerant species at wadable sites, proportion of carnivores, proportion of simple lithophils for wadable sites, and proportion of disease, eroded fins, lesions, and tumors.

Metrics which exhibited a statistical difference between Ohio statewide criteria and Indiana Huron-Erie Lake Plain expectations included total number of species at wadable sites, number of darter species, proportion of tolerant species at headwater sites, number of sensitive species, proportion of omnivores, proportion of insectivores, proportion of pioneer species, and proportion of simple lithophils at headwater sites. Of the eight metrics which have significant differences, 6 (75%) of the metrics were more stringent when using Ohio EPA's statewide criteria. Only the proportion of omnivores and insectivores were more stringent using Indiana's Huron-Erie Lake Plain criteria. The number of species metric showed differences in wadable sites. This may have been a function of more speciose areas such as the Eastern Corn Belt Plain or Interior Plateau skewing results because of the increased species richness of these areas. This would have been exaggerated at larger drainage areas where more habitat complexity would have been exhibited. The number of darter species and number of sensitive species showed similar trends with Ohio statewide criteria exhibiting greater biodiversity than the Lake Plain. The proportion of tolerant species, pioneer species, and simple lithophils (headwater sites) all reflected more stringent expectations using Ohio statewide criteria than the ecoregion specific criteria from Indiana. This was anticipated since these characteristics are exhibited in the structural and functional attributes of the community. The specific expectations would have to be modified either through lowered expectations or by adjusting the warmwater habitat attainment criteria as developed by Ohio EPA.

**Indiana Ecoregion**

**Table 14. Comparison of Ohio EPA (1989) reference conditions derived from the Stream Regionalization Project with reference conditions developed from Indiana portions of the Huron-Erie Lake Plain.**

Metric	Reference Conditions			
	Ohio EPA (1989) Statewide		Indiana Huron-Erie Lake Plain	
	<u>Headwater<sup>(a)</sup></u>	<u>Wadable Stream<sup>(b)</sup></u>	<u>Headwater</u>	<u>Wadable Stream</u>
1. Total Number of Species	21	34	18	19
2. Number of darter species	7	7-8	3	4
3. Number of Sunfish species	6	6	5	5
4. Number of Minnow species	10	--	9	--
Number of Sucker species	6	--	7	
5. Number of Sensitive species	9	--	4	6
6. Proportion Tolerant species	80%	60%	50%	50%
7. Proportion of Omnivores	43%	44%	25%	25%
8. Proportion of Insectivores	74%	80%	50%	50%
9. Proportion Pioneer species	30%	--	50%	--
Proportion of Carnivores	--	5%	--	5%
10. Catch per unit of effort	--	--	300	400
11. % Simple Lithophils	11%	54%	45%	45%
12. Proportion of DELT	<0.1	<0.1	<0.1	<0.1

<sup>(a)</sup> Maximum value from 95th percentile of Maximum Species Richness lines at 20 mi<sup>2</sup>;

<sup>(b)</sup> Maximum value from 95th percentile of Maximum Species Richness lines at 100 mi<sup>2</sup>.

Only two metrics were collected differently prohibiting further comparison. The catch per unit of effort was expressed as the number of fish per 300 m. Samples from this collection included 15x the stream width with a minimum of 50 m sampled and the longest distance sampled was 500 m. The number of sensitive species at wadable sites also deviated in collection and categorizing strategy. Ohio EPA uses the sensitive species designation only at headwater sites. At larger wadable sites, Ohio uses an intolerant species metric which reduces the number of recognized sensitive species from the headwater category. This makes the criteria inherently more stringent and prohibits comparison of reference conditions between the two datasets.

The result of this comparison suggests that the Huron-Erie Lake Plain criteria developed during this study can be either directly comparable to statewide biological criteria developed for the Ohio State Water Quality Standards or more stringent in the protection of surface waters for many metrics. It must be mentioned that differences in regional framework approaches may be the difference between these two State strategies. In only 37.5% of the metrics did the existing Ohio statewide criteria provide more stringent expectations than what was observed from the Indiana portion of the Huron-Erie Lake Plain. This shows that "least impacted" conditions can be estimated for the Huron-Erie Lake Plain based on reference conditions developed across political boundaries. Further evaluation of the Ohio Huron-Erie Lake Plain dataset is necessary to evaluate the exact deviations from the Indiana expectations.

## LITERATURE CITED

- Allison, L.N., J.G. Hnath, and W.G. Yoder. 1977. Manual of common diseases, parasites, and anomalies of Michigan fishes. Michigan Department of Natural Resources, Lansing. Fisheries Management Report No. 8. 132 pp.
- Angermeier, P.L. and J.R. Karr. 1986. Applying an index of biotic integrity based on stream fish communities: considerations in sampling and interpretation. *N. Am. J. Fish. Man.* 6: 418-429.
- Antosh, L.M. 1991. NPS assessment by the State of Ohio. p. 53 p. 9-13. In K.A. Krieger (ed.) *Bi indicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.*
- Arvin, D.V. 1989. Statistical summary of streamflow data for Indiana. U.S. Geological Survey, Indianapolis, IN. Open File Report 89-62. 964 pp.
- Balon, E.K. 1975. Reproductive guilds of fishes: a proposal and definition. *J. Fish. Res. Board Can.* 32: 821-864.
- Baker, D.B. 1991. Agricultural pollution abatement research in the Lake Erie basin: an overview. p. 9-13. In K.A. Krieger (ed.) *Bi indicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.*
- Bauman, P.C., W.D. Smith, and W.K. Parland. 1987. Tumor frequencies and contaminant concentrations in brown bullhead from an industrialized river and a recreational lake. *Trans. Am. Fish. Soc.* 116: 79-86.
- Becker, G.C. 1983. *Fishes of Wisconsin.* University of Wisconsin Press: Madison. 1052 p.

## Indiana Ecoregion

---

- Berkman, H.E. and C.F. Rabeni. 1987. Effect of siltation on stream fish communities. *Env. Biol. Fishes* 18: 285-294.
- Berra, T.M. and R. Au. 1981. Incidence of teratological fishes from Cedar Fork Creek, Ohio. *Ohio J. Sci.* 81: 225.
- Biever, R.C. and J.M. Giddings. 1991. The ecotoxicity of insecticides. p. 21 In K.A. Krieger (ed.) **Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.**
- Bleuer, N.K. 1989. Historical and geomorphic concepts of the Lafayette bedrock valley system (So-called Teays Valley) in Indiana. **Indiana Geological Survey, Geological Surv. Spec. Rept. 46.** 11 pp.
- Braun, E.R. 1993. A fisheries survey of the St. Mary's River, Adams and Allen Counties, Indiana, 1992. **Unpubl. Rept., Indiana Dept. Nat. Resources, Fisheries Section, Division of Fish and Wildlife, Indianapolis, IN.** 29 pp.
- Brown, H.W. 1976. Handbook of the effects of temperature on some North American fishes. American Electric Power Corporation, Canton, OH. 524 pp + appendices.
- Brungs, W.A. and B.R. Jones. 1977. Temperature criteria for freshwater fish: protocol and procedures. U.S. Environmental Protection Agency, Env. Res. Lab.-Duluth, MN. EPA 600/3-77/061. 130 pp.
- Burr, B.M. and M.L. Warren, Jr. 1986. **A distributional atlas of Kentucky fishes.** Kentucky Nature Preserves Commission Scientific and Technical Series No. 4. Frankfort.
- Clark, C.F. and D. Allison. 1966. Fish population trends in the Maumee and Auglaize Rivers. **Ohio Department of Natural Resources, Division of Wildlife.** 51 p.
- Clark, H.W. and C.B. Wilson. 1912. The mussel fauna of the Maumee River. **Department of Commerce and Labor, Bureau of Fisheries Document 757, Washington, D.C.** 72 p., pls. 2.
- Davis, W.S. (ed.) 1990. **Proceedings of the 1990 Midwest Pollution Control Biologists Meeting.** U.S. Environmental Protection Agency, Region V, Environmental Sciences Division, Chicago, IL. EPA 905/9-90/005.
- Davis, W.S. and A. Lubin. 1989. Statistical validation of Ohio EPA's invertebrate community index. p. 23-32. In W.S. Davis and T.P. Simon (eds). **Proceedings of the 1989 Midwest Pollution Control Biologists Meeting, Chicago, Illinois.** U.S. Environmental Protection Agency, Region V, Chicago, IL. EPA 905/9-89-007.
- Dickson, G. and D.P. Tierney. 1991. Evaluation of selected agricultural herbicide (Atrazine) acute and chronic ecotoxicity in two types of freshwater systems: rivers and lakes. p. 17-19 In K.A. Krieger (ed.) **Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.**
- Doheny, E.J., J.R. Droste, and R.H. Shaver. 1975. Stratigraphy of the Detroit River formation (Middle Devonian) of northern Indiana. **Indiana Geological Survey, Geological Surv. Bull. 53.** 86 pp.
- Droste J.B. and R.W. Orr. 1974. Age of the Detroit River formation in Indiana. **Indiana Geological Survey, Geological Surv. Occ. Pap. 5.** 5 pp.
- Fatout, P. 1985. **Indiana Canals.** Purdue University Press: West Lafayette, Indiana. 216 p.
- Fausch, K.D., J.R. Karr, and P.R. Yant. 1984. Regional application of an index of biotic integrity based on stream-fish communities. *Trans. Am. Fish. Soc.* 113: 39-55.

- Fausch, K.D., J. Lyons, J.R. Karr, and P.L. Angermeier. 1990. Fish communities as indicators of environmental degradation. *Am Fish. Soc. Symposium* 8: 123-144.
- Fenneman, N.M. 1946. Physical division of the United States: Washington D.C., U.S. Geological Survey Special Map.
- Forbes, S.A and R.E. Richardson. 1920. The fishes of Illinois. (2nd edition). State Natural History Survey of Illinois 3: 1-357.
- Gammon, J.R. 1973. The effects of thermal input on the populations of fish and macroinvertebrates in the Wabash River. Purdue University Water Resources Research Center Tech. Rept. 32. 106 pp.
- Gammon, J.R. 1976. The fish populations of the middle 340 km of the Wabash River. Purdue Univ. Water Resources Research Center Technical Report 86. 73 pp.
- Gammon, J.R. 1983. Changes in the fish community of the Wabash River following power plant start-up: projected and observed. pp. 350-366. *in* W.E. Bishop, R.D. Cardwell, and B.B. Heidolph (eds). *Aquatic Toxicology and Hazard Assessment: Sixth Symposium*. ASTM STP 802.
- Gammon, J.R., A. Spacie, J.L. Hamelink, and R.L. Kaesler. 1981. Role of electrofishing in assessing environmental quality of the Wabash River. p. 307-324. *in* J.M. Bates and C.I. Weber (eds.). *Ecological Assessments of Effluent Impacts on Communities of Indigenous Aquatic Organisms*. Am. Soc. Test. Materials, STP 730, Phil., PA.
- Gerking, S.D. 1945. Distribution of the fishes of Indiana. *Inv. Ind. Lakes and Streams* 3: 1-137.
- Gerking, S.D. 1955. Key to the fishes of Indiana. *Inv. Ind. Lakes and Streams* 4: 49-86.
- Hocutt, C.H. and E.O. Wiley. 1986. *Zoogeography of North American freshwater fishes*. John Wiley and Sons Press: New York.
- Hoggatt, R.E. 1975. *Drainage Areas of Indiana Streams*. U.S. Geological Survey, Indianapolis, IN. 231 pp.
- Hoggatt, R.E. 1981. Floods of March 1978 in the Maumee River basin, northeastern Indiana. U.S. Geological Survey Open File Report 81-695.
- Hokanson, K.E.F. and K.E. Biesinger. 1980. A national compendium of freshwater fish and water temperature requirements. U.S. Environmental Protection Agency, Env. Res. Lab., Duluth, MN. 142 pp.
- Homoya, M.A., D.B. Abrell, J.R. Aldrich, and T.W. Post. 1985. The natural regions of Indiana. *Proc. Indiana Acad. Sci.* 94: 245-268.
- Hughes, R.M., J.H. Gakstatter, M.A. Shirazi, and J.M. Omernik. 1982. An approach for determining biological integrity in flowing waters. pp. 877-888. *in* T.B. Braun (ed.). *Inplace resource inventories: principles and practices, a National Workshop*. Soc. Am. Foresters, Bethesda, MD.
- Hughes, R.M., D.P. Larsen, and J.M. Omernik. 1986. Regional reference sites: a method for assessing stream pollution. *Env. Mgmt.* 10: 629-635.
- Indiana Department of Environmental Management (IDEM). 1990. Indiana 305(b) report 1988-89. Indiana Department of Environmental Management, Indianapolis.
- Indiana Department of Natural Resources (IDNR). 1980. The Indiana water resource: availability, uses, and needs. Indiana Department of Natural Resources, Indianapolis. 508 pp.
- Jordan, D.S. 1877. On the fishes of northern Indiana. *Proc. Acad. Nat. Sci., Phil.* 29: 42-104.



## Indiana Ecoregion

---

- Jordan, D.S. 1890. Report of explorations made during the summer and autumn of 1888, in the Allegheny region of Virginia, North Carolina, and Tennessee, and in western Indiana, with an account of the fishes found in each of the river basins of those regions. *Bull. U.S. Fish. Comm.* 1888, 8:97-173.
- Jung, C.O. and J. Libovarsky. 1965. Effect of size selectivity on population estimates based on successive removals with electrofishing gear. *Zoologica Listy* 14: 171-178.
- Karr, J.R. 1981. Assessment of biotic integrity using fish communities. *Fisheries* 6:21-27.
- Karr, J.R. 1991. Biological integrity: a long-neglected aspect of water resource management. *Ecological Applications* 1: 66-84.
- Karr, J.R. and D.R. Dudley. 1981. Ecological perspective on water quality goals. *Env. Mgmt.* 5: 55-68.
- Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. *Ill. Nat. Hist. Surv. Sp. Publ.* 5. 28 pp.
- Kirsch, P.H. 1895. Reports upon investigations in the Maumee River basin during the summer of 1893. *Bull. U.S. Comm.* 1895, 14: 134-171.
- Kirtland, J.P. 1844. Descriptions of fishes of Lake Erie, the Ohio River and its tributaries. *Boston Journal of Natural History* 4: 16-26.
- Kirtland, J.P. 1847. Descriptions of fishes of Lake Erie, the Ohio River and its tributaries. *Boston Journal of Natural History* 5: 265-276, 330-340.
- Klippart, J.H. 1877. History of Toledo and Sandusky fisheries. 1st Annual Report Ohio State Fisheries Commission, years 1875-1876. Nivins and Myers, Columbus: 31-42.
- Krieger, K.A.(ed). 1991. Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- Krieger, K.A. and J. Deshon. 1991. Comparison of invertebrate community sampling methods in Sugar Creek, Seneca County, Ohio. p. 33-36 In K.A. Krieger (ed.) Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- Krumholz, L.A. 1946. Repopulation of the West Fork. *Outdoor Indiana* 13(2): 12.
- Kuehne, R.A. and R.W. Barbour. 1983. The American darters. University of Kentucky Press: Lexington.
- Larimore, R.W. and P.W. Smith. 1963. The fishes of Champaign County, Illinois, as affected by 60 years of stream changes. *Ill. Nat. Hist. Surv. Bull.* 28: 299-382.
- Larsen, D.P., J.M. Omernik, R.M. Hughes, C.M. Rohm, T.R. Whittier, A.J. Kinney, A.L. Gallant, and D.R. Dudley. 1986. Correspondence between spatial patterns in fish assemblages in Ohio streams and aquatic ecoregions. *Env. Man.* 10: 815-828.
- Leonard, P.M. and D.J. Orth. 1986. Application and testing of an Index of Biotic Integrity in small, cool water streams. *Trans. Am. Fish. Soc.* 115: 401-414.
- Leopold, L.B., M.G. Woolman, and J.P. Miller. 1964. Fluvial processes in geomorphology. W.H. Freeman, San Francisco, CA.
- Leverett, F. 1902. Glacial formations and drainage features of the Erie and Ohio basins. U.S. Geological Survey 1-802, pls. 26.

- Logan, T.J. 1981. **Maumee River Pilot Watershed Study, Continued watershed monitoring (1978-80). Volume III.** U.S. Environmental Protection Agency, Great Lakes National Program Office. EPA 905/9-79/005C.
- Lowe, R.L. 1991. Algal communities as biological monitors. p. 29-30 In K.A. Krieger (ed.) **Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies.** Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- Lyons, J. 1992. Using the Index of Biotic Integrity (IBI) to measure environmental quality in warmwater streams of Wisconsin. U.S. Dept. Agriculture, Forest Service, General Technical Report NC-149.
- Mayden, R.L. 1989. Phylogenetic studies of North American minnows, with emphasis on the genus *Cyprinella* (Teleostei: Cypriniformes). *Misc. Publ. Univ. Kans. Mus. Nat. Hist. No. 80.* 189 pp.
- McCormick, J.H., M.J. Ross, and D.B. Siniff. 1981. Where do yellow perch (*Perca flavescens*) go in winter when given the option between ice covered waters or a heated discharge. *Can. Tech. Rept. Fish. Aquat. Sci.* 990: 33-45.
- Meek, S.E. 1889. Notes on a collection of fishes from the Maumee Valley, Ohio. *Proceedings of the United States National Museum* 2: 435-440.
- Mills, H.B., W.C. Starrett, and F.C. Bellrose. 1966. Man's effect on the fish and wildlife of the Illinois River. *Ill. Nat. Hist. Surv. Biol. Notes* 57. 27 pp.
- Ohio Environmental Protection Agency (OEPA). 1987. **Water Quality implementation manual. QA Manual (3rd update).** Fish. Ohio Environmental Protection Agency, Columbus.
- Ohio Environmental Protection Agency (OEPA). 1987. **Biological criteria for the protection of aquatic life. Volume II. Users Manual for Biological field assessment of Ohio surface waters.** Ohio Environmental Protection Agency, Columbus.
- Ohio Environmental Protection Agency (OEPA). 1989. **Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities.** Ohio Environmental Protection Agency, Columbus.
- Omernik, J.M. 1987. Ecoregions of the conterminous United States. *Ann. Ass. Am. Geo.* 77:118-125.
- Omernik, J.M. and A.L. Gallant. 1988. **Ecoregions of the upper Midwest States.** USEPA, ERL, Corvallis, OR. EPA/600/3-88/037.
- Page, L.M. 1983. **Handbook of Darters.** TFH Publications, Neptune, NJ.
- Pearson, J. 1984. **St. Joseph River, Johnny Appleseed Park, Fort Wayne, 1983. Unpubl. Rept., Indiana Dept. Nat. Resources, Fisheries Section, Div. Fish and Wildlife, Indianapolis, IN.** 9 pp.
- Pearson, J. and S.T. Shipman. 1978. **Fishery investigation in the Maumee River basin. Unpubl. Rept., Indiana Dept. Nat. Resources, Fisheries Section, Indianapolis, IN.** 36 pp.
- Pettijohn, R.A. and L.G. Davis. 1973. **Water resources of the Maumee River basin, northeastern Indiana. U.S. Geological Survey, Water Resources Division, Indianapolis, IN. Hydrologic Investigations Atlas HA-493.**
- Pflieger, W.L. 1975. **The Fishes of Missouri.** Mo. Dept. Conserv.: Columbia. 343 pp.

## Indiana Ecoregion

---

- Phillips, G.L. and J.C. Underhill. 1971. Distribution and variation of the Catostomidae of Minnesota. *Bell Mus. Nat. Hist. Univ. Minn., Occ. Pap. No. 10*. 45 pp.
- Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates. U.S. Environmental Protection Agency, Monitoring and Data Support Division, Washington, D.C. EPA 444/4-89-001.
- Post, G. 1983. Textbook of fish health. TFH Publications, Neptune, NJ.
- Pratt, J.R. 1991. Biological monitoring of microbial communities: effects of nonpoint source pollutants. p. 25-27 In K.A. Krieger (ed.) *Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies*. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- Raney, E.C. and B.W. Menzel. 1969. Heated effluents and effects on aquatic life with emphasis on fishes. *Ichthyological Associates Bulletin* 2., 468 pp.
- Rankin, E.T. 1989. The use of the qualitative habitat evaluation index for use attainability studies in streams and rivers in Ohio. Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessments, Columbus, Ohio.
- Richards, R.P. and D.B. Baker. 1991. Trends in nutrient and sediment concentrations in Lake Erie tributaries, 1975-1990. p. 15-16. In K.A. Krieger (ed.) *Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies*. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- Seaber, P.R., S.P. Kapinost, and G.L. Knapp. 1984. State hydrologic unit maps. U.S. Geol. Survey Open-file report. 84-708. 198 pp.
- Schneider, A.F. 1966. Physiography, pp. 40-56, In A.A. Lindsey (ed). *Natural Features of Indiana*. Univ. Notre Dame Press: Notre Dame, IN.
- Simon, T.P. 1989. Rationale for a family-level ichthyoplankton index for use in evaluating water quality. pp. 41-65 + appendix. In Davis, W.S. and T.P. Simon. *Proceedings of the 1989 Midwest Pollution Control Biologists Meeting, Chicago, Illinois, February 14-17, 1989*. U.S. Environmental Protection Agency, Chicago, IL. EPA 905/9-89-007.
- Simon, T.P. 1991. Development of Index of Biotic Integrity expectations for the ecoregions of Indiana. I. Central Corn Belt Plain. U.S. Environmental Protection Agency, Region V, Chicago, IL. EPA 905/9-91/025.
- Simon, T.P. 1993. Assessment of the range of the threatened darter, *Ammocrypta pellucida* (Putnam) from the Maumee River basin, Indiana. *Proc. Ind. Acad. Sci.* 102: 139-145.
- Simon, T.P., L.L. Holst, and L.J. Shepard. 1988. *Proceedings of the First National Workshop on Biological Criteria, Lincolnwood, Illinois, December 2-4, 1987*. U.S. Environmental Protection Agency, Region V, Chicago. EPA 905/9-89/003.
- Simon, T.P., B. Alsdorf, and C.O. Yoder. *in preparation*. New distributional records of rare fishes from the Maumee River Estuary, Ohio. *Ohio Journal of Science*.
- Smith, G.R., J.N. Taylor, and T.W. Grimshaw. 1981. Ecological survey of fishes in the Raisin River drainage, Michigan. *Michigan Academician* 13: 275-305.
- Smith, P.W. 1979. *The Fishes of Illinois*. University of Illinois Press: Champaign, IL.

- Smith, P.W. 1971. Illinois streams: a classification based on their fishes and an analysis of factors responsible for the disappearance of native species. *Ill. Nat. Hist. Surv. Biol. Notes* 76.
- Sobiech, S.A. and D.W. Sparks. 1992. Contaminant study of the sediments and fish of the St. Mary's, St. Joseph, and Maumee rivers of the Maumee River watershed, Allen County, Indiana. U.S. Fish Wildl. Serv., Bloomington Field Office, Bloomington. 131 pp.
- Stansford, J.A., F.A. Hauer, and J.V. Ward. 1988. Serial discontinuity in a large river system. *Verhandlungen International Vereinigung für Theoretische und Angewandte Limnologie* 23: 114-118.
- Steedman, R.J. 1988. Modification and assessment of an Index of Biotic Integrity to quantify stream quality in southern Ontario. *Canadian Journal of Fisheries and Aquatic Sciences* 45: 492-501.
- Sunderman, J.A. 1987. Fort Wayne, Indiana: Paleozoic and Quaternary geology. pp. 325-332. In D.L. Biggs. *Centennial Field Guide Vol. 3, North Central Section of the Geological Society of America*. Geological Society of America: Boulder, CO. 442 pp.
- Trautman, M.B. 1981. *The Fishes of Ohio*. The Ohio State University Press: Columbus, OH. 782
- Underhill, J.C. 1986. The fish fauna of the Laurentian Great Lakes, the St. Lawrence lowlands, Newfoundland and Labrador. p. 105-136 In C.H. Hocutt and E.O. Wiley (eds.). *The Zoogeography of North American Freshwater Fishes*. John Wiley & Sons, Interscience, New York.
- U.S. Geological Survey (USGS). undated. *Indiana State 208 Water Quality Management Planning Maps. Region 1B*. U.S. Geological Survey, Indianapolis, IN.
- U.S. Geological Survey (USGS). 1990. *National Water Summary*. U.S. Geological Survey, Resnick, VA.
- U.S. Environmental Protection Agency (USEPA). 1980. *Spatial distribution and temperature selection of fish near the thermal outfall of a power plant during fall, winter, and spring*. USEPA, Env. Res. Lab.-Duluth, MN. EA 600/3-80/009.
- U.S. Environmental Protection Agency (USEPA). 1988. *Standard Operating Procedures for conducting rapid assessment of ambient surface water quality using fish*. USEPA, Region V, Central Regional Laboratory, Chicago, IL.
- Van Meter, H.D. and M.B. Trautman. 1970. An annotated list of fishes of Lake Erie and its tributary waters exclusive of the Detroit River. *Ohio Journal of Science* 70: 65-78.
- Watters, G.T. 1991. Biomonitoring approaches: molluscan communities. p. 31 In K.A. Krieger (ed.) *Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies*. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.
- 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*. USEPA, Environmental Research Laboratory, Corvallis, OR.
- Yoder, C.O. 1991. Using biocriteria to evaluate nonpoint source pollution impacts in the Lake Erie basin rivers and streams of Ohio. p. 49-52. In K.A. Krieger (ed.) *Bioindicators of rural nonpoint source pollution in Lake Erie tributaries: measuring responses to improved management technologies*. Proceedings of a Workshop, Heidelberg College, Tiffin, Ohio.

**APPENDICES**

- A. Tolerance, trophic, and reproductive guild classifications for computing the Index of Biotic Integrity for Indiana taxa.
- B. Metric specific Index of Biotic Integrity scores for sites in the Maumee River drainage.
- C. Fish nomenclature changes for the species of fish occurring within the political boundaries of Indiana.

APPENDIX A. Tolerance, trophic, and reproductive guild classifications for computing the Index of Biotic Integrity for Indiana taxa.

VOUCHERCD	GENUS	SPECIES	COMMON NAM	FEED GUILD	REPR GUILD	TOLERANCE
1.00	Lampetra	aepyptera	LEAST BROOK LAMPREY	F	N	R
2.00	Lampetra	appendix	AMERICAN BROOK LAMPREY	F	N	R
3.00	Petromyzon	marinus	SEA LAMPREY	P	N	-
4.00	Ichthyomyzon	bdellium	OHIO LAMPREY	P	N	S
5.00	Ichthyomyzon	castaneus	CHESTNUT LAMPREY	P	N	-
6.00	Ichthyomyzon	fossor	NORTHERN BROOK LAMP	F	N	S
7.00	Ichthyomyzon	unicuspis	SILVER LAMPREY	P	N	-
8.00	Acipenser	fulvescens	LAKE STURGEON	V	S	-
9.00	Scaphirhynchus	platyrhynchus	SHOVELNOSE STURGEON	I	S	-
10.00	Polyodon	spathula	PADDLEFISH	F	S	S
11.00	Lepisosteus	osseus	LONGNOSE GAR	P	M	-
12.00	Lepisosteus	oculatus	SPOTTED GAR	P	M	-
13.00	Lepisosteus	platostomus	SHORTNOSE GAR	P	M	-
14.00	Atractosteus	spatula	ALLIGATOR GAR	P	M	-
15.00	Amia	calva	BOWFIN	P	C	-
16.00	Anguilla	rostrata	AMERICAN EEL	C	-	T
17.00	Alosa	alabamae	ALABAMA SHAD	-	N	-
18.00	Alosa	pseudoharengus	ALEWIFE	F	M	-
19.00	Dorosoma	cepedianum	GIZZARD SHAD	O	M	-
20.00	Alosa	chrysochloris	SKIPJACK HERRING	P	M	-
21.00	Dorosoma	petenense	THREADFIN SHAD	O	M	-
22.00	Hiodon	alosoides	GOLDEYE	I	M	R
23.00	Hiodon	tergisus	MOONEYE	I	M	R
24.00	Coregonus	clupeaformis	LAKE WHITEFISH	V	M	-
25.00	Coregonus	artedi	CISCO OR LAKE HERRING	F	M	-
26.00	Coregonus	hoi	BLOATER	-	M	-
27.00	Coregonus	nigripinnis	BLACKFIN CISCO	-	N	-
28.00	Coregonus	reighardi	SHORTNOSE CISCO	-	N	-
29.00	Coregonus	zenithicus	SHORTJAW CISCO	-	M	-
30.00	Oncorhynchus	kisutch	COHO SALMON	P	N	M
31.00	Oncorhynchus	tshawytscha	CHINOOK SALMON	P	N	M
32.00	Oncorhynchus	mykiss	RAINBOW TROUT	P	N	M
33.00	Salmo	salar	ATLANTIC SALMON	P	N	M
34.00	Salmo	trutta	BROWN TROUT	P	N	M
35.00	Salvelinus	namaycush	LAKE TROUT	P	N	M
36.00	Salvelinus	fontinalis	BROOK TROUT	P	N	M
37.00	Osmerus	mordax	RAINBOW SMELT	V	M	-
38.00	Esox	lucius	NORTHERN PIKE	P	M	-
39.00	Esox	americanus	GRASS PICKEREL	P	M	P
40.00	Esox	ohioensis	MUSKELLUNGE	P	M	-
41.00	Esox	masquinongy	GREAT LAKES MUSKELLU	P	M	-
42.00	Umbra	limi	CENTRAL MUDMINNOW	O	C	T
43.00	Cyprinus	carpio	CARP	O	M	T
44.00	Carassius	auratus	GOLDFISH	O	M	T
46.00	Hybognathus	nuchalis	MISSISSIPPI SILVERY MINN	O	S	-
47.00	Hybognathus	hankinsoni	BRASSY MINNOW	O	-	-
48.00	Hybognathus	hayi	CYPRESS MINNOW	O	M	-
49.00	Notemigonus	crysoleucus	GOLDEN SHINER	I	M	T

VOUCHERCD	GENUS	SPECIES	COMMON NAM	FEED GUILD	REPR GUILD	TOLERANCE
52.00	Rhinichthys	atratus	BLACKNOSE DACE	G	S	T
53.00	Rhinichthys	cataractae	LONGNOSE DACE		S	R
54.00	Nocomis	micropogon	RIVER CHUB		N	I
55.00	Nocomis	biguttatus	HORNYHEAD CHUB		N	I
56.00	Notropis	chalybaeus	IRONCOLOR SHINER		M	I
57.00	Notropis	hudsonius	SPOTTAIL SHINER		M	P
58.00	Notropis	rubellus	ROSYFACE SHINER		S	I
59.00	Notropis	atherinoides	EMERALD SHINER		M	I
60.00	Notropis	buchanani	GHOST SHINER		M	I
61.00	Notropis	shumardi	SILVERBAND SHINER		S	I
62.00	Notropis	ludibundus	SAND SHINER		M	M
63.00	Notropis	texanus	WEED SHINER		M	R
64.00	Notropis	volucellus	MIMIC SHINER		M	I
65.00	Notropis	anogenus	PUGNOSE SHINER		M	S
66.00	Notropis	ariommus	POPEYE SHINER		S	S
67.00	Notropis	blennius	RIVER SHINER		S	I
68.00	Notropis	boops	BIGEYE SHINER		S	I
69.00	Notropis	dorsalis	BIGMOUTH SHINER		M	I
70.00	Notropis	heterodon	BLACKCHIN SHINER		M	R
71.00	Notropis	heterolepis	BLACKNOSE SHINER		M	R
72.00	Notropis	photogenis	SILVER SHINER		S	R
73.00	Euricymba	buccata	SILVERJAW MINNOW		M	I
74.00	Hybopsis	amblops	BIGEYE CHUB		S	R
75.00	Hybopsis	amnis	PALLID SHINER		S	R
76.00	Phenacobius	mirabilis	SUCKERMOUTH MINNOW		S	I
77.00	Campostoma	anomalum	CENTRAL STONEROLLER	H	N	I
78.00	Campostoma	oligolepis	LARGESCALE STONEROLL	H	N	I
79.00	Pimephales	notatus	BLUNTNOSE MINNOW	O	C	T
80.00	Pimephales	promelas	FATHEAD MINNOW	O	C	T
81.00	Pimephales	vigilax	BULLHEAD MINNOW	O	C	T
82.00	Couesius	plumbeus	LAKE CHUB	O	S	T
83.00	Ctenopharyngodon	idella	GRASS CARP	O	S	T
84.00	Phoxinus	erythrogaster	SOUTHERN REDBELLY DA	H	S	T
85.00	Scardinius	erythrophthalmus	RUDD	O	M	T
86.00	Hypophthalmichthys	molitrix	SILVER CARP	O	M	T
87.00	Cyprinella	lutrensis	RED SHINER		N	T
88.00	Cyprinella	spiloptera	SPOTFIN SHINER		M	T
89.00	Cyprinella	whipplei	STEELCOLOR SHINER		M	T
90.00	Erimystax	dissimilis	STREAMLINE CHUB		S	R
91.00	Erimystax	x-punctatus	GRAVEL CHUB		S	M
92.00	Luxilus	chrysocephalus	STRIPED SHINER		S	M
93.00	Luxilus	cornutus	COMMON SHINER		S	M
94.00	Lythrurus	ardens	ROSEFIN SHINER		S	M
95.00	Lythrurus	fumeus	RIBBON SHINER		M	I
96.00	Lythrurus	umbratilis	REDFIN SHINER		N	I
97.00	Macrhybopsis	storeriana	SILVER CHUB		M	I
98.00	Opsopoeodus	emiliae	PUGNOSE MINNOW		M	R
99.00	Extrarius	aestivalis	SPECKLED CHUB		M	R
100.00	Catostomus	catostomus	LONGNOSE SUCKER		S	T
101.00	Catostomus	commersoni	WHITE SUCKER	O	S	T

APPENDIX A.

Continued

VOUCHERCD	GENUS	SPECIES	COMMON NAM	FEED GUILD	REPR GUILD	TOLERANCE
102.00	Carpiodes	cyprinus	QUILLBACK	O	M	-
103.00	Carpiodes	carpio	RIVER CARPSUCKER	OO	MM	-
104.00	Carpiodes	velifer	HIGHFIN CARPSUCKER	O	MM	S
105.00	Erismyzon	sucetta	LAKE CHUBSUCKER	I	MM	-
106.00	Erismyzon	oblongus	CREEK CHUBSUCKER	I	MM	-
107.00	Moxostoma	macrolepidotum	SHORTHEAD REDHORSE	I	SS	M
108.00	Moxostoma	anisurum	SILVER REDHORSE	I	SS	M
109.00	Moxostoma	carinatum	RIVER REDHORSE	I	SS	M
110.00	Moxostoma	duquesnei	BLACK REDHORSE	I	SS	M
111.00	Moxostoma	erythrurum	GOLDEN REDHORSE	I	SS	M
112.00	Moxostoma	valenciennesi	GREATER REDHORSE	I	SS	M
113.00	Hypentilium	nigricans	NORTHERN HOGSUCKER	I	SS	M
114.00	Cycleptus	elongatus	BLUE SUCKER	I	SS	M
115.00	Ictiobus	bubalus	SMALLMOUTH BUFFALO	I	MM	-
116.00	Ictiobus	cyprinellus	BIGMOUTH BUFFALO	I	MM	-
117.00	Ictiobus	niger	BLACK BUFFALO	I	MM	-
118.00	Minytrema	melanops	SPOTTED SUCKER	I	S	-
119.00	Lagochila	lacera	HARELIP SUCKER	-	-	S
120.00	Ictalurus	furcatus	BLUE CATFISH	C	C	-
121.00	Ictalurus	punctatus	CHANNEL CATFISH	C	C	-
122.00	Noturus	gyrinus	TADPOLE MADTOM	I	C	-
123.00	Noturus	nocturnus	FRECKLED MADTOM	I	C	R
124.00	Noturus	eleutherus	MOUNTAIN MADTOM	I	C	R
125.00	Noturus	exilis	SLENDER MADTOM	I	C	R
126.00	Noturus	flavus	STONECAT	I	C	R
127.00	Noturus	miurus	BRINDLED MADTOM	I	C	R
128.00	Noturus	stigmosus	NORTHERN MADTOM	I	C	R
129.00	Pylodictus	olivaris	FLATHEAD CATFISH	P	C	-
130.00	Ameiurus	catus	WHITE CATFISH	-	C	-
131.00	Ameiurus	melas	BLACK BULLHEAD	I	C	T
132.00	Ameiurus	natalis	YELLOW BULLHEAD	I	C	P
133.00	Ameiurus	nebulosus	BROWN BULLHEAD	I	C	P
134.00	Amblyopsis	spelaea	NORTHERN CAVEFISH	I	C	S
135.00	Typhlichthys	subterraneus	SOUTHERN CAVEFISH	G	C	S
136.00	Aphredoderus	sayanus	PIRATE PERCH	I	MM	-
137.00	Percopsis	omniscomaycus	TROUT-PERCH	I	MM	-
138.00	Lota	lota	BURBOT	I	SM	-
139.00	Fundulus	diaphanus	BANDED KILLIFISH	I	MM	-
140.00	Fundulus	olivaceus	BLACKSPOTTED TOPMINN	I	MM	-
141.00	Fundulus	catenatus	NORTHERN STUDFISH	I	MM	R
142.00	Fundulus	notatus	BLACKSTRIPE TOPMINNO	I	MM	-
143.00	Fundulus	dispar	STARHEAD TOPMINNOW	I	MM	R
144.00	Gambusia	affinis	WESTERN MOSQUITOFISH	I	N	-
145.00	Labidesthes	sicculus	BROOK SILVERSIDE	I	M	M
146.00	Pungitius	pungitius	NINE SPINE STICKLEBACK	I	CC	-
147.00	Culaea	inconstans	BROOK STICKLEBACK	I	CC	-
148.00	Cottus	cognatus	SLIMY SCULPIN	I	CC	-
149.00	Cottus	bairdi	MOTTLED SCULPIN	I	CC	-



VOUCHERCD	GENUS	SPECIES	COMMON NAM	FEED GUILD	REPR GUILD	TOLERANCE
152.00	Myoxocephalus	thompsoni	DEEPWATER SCULPIN	-	C	-
153.00	Morone	saxatilis	STRIPED BASS	P	M	-
154.00	Morone	chrysops	WHITE BASS	P	M	-
155.00	Morone	mississippiensis	YELLOW BASS	P	M	-
156.00	Ambloplites	rupestris	ROCK BASS	C	C	M
157.00	Centrarchus	macropterus	FLIER	I	C	-
158.00	Lepomis	cyanellus	GREEN SUNFISH	I	C	T
159.00	Lepomis	gulosus	WARMOUTH	C	C	-
160.00	Lepomis	macrochirus	BLUEGILL	I	C	P
161.00	Lepomis	gibbosus	PUMPKINSEED	I	C	-
162.00	Lepomis	humilis	ORANGESPOTTED SUNFIS	I	C	-
163.00	Lepomis	megalotis	LONGEAR SUNFISH	I	C	M
164.00	Lepomis	microlophus	REDEAR SUNFISH	I	C	-
165.00	Lepomis	punctatus	SPOTTED SUNFISH	I	C	-
166.00	Lepomis	symmetricus	BANTAM SUNFISH	I	C	-
167.00	Micropterus	dolomieu	SMALLMOUTH BASS	C	C	M
168.00	Micropterus	salmoides	LARGEMOUTH BASS	C	C	-
169.00	Micropterus	punctulatus	SPOTTED BASS	C	C	-
170.00	Pomoxis	annularis	WHITE CRAPPIE	-	C	-
171.00	Pomoxis	nigromaculatus	BLACK CRAPPIE	-	C	-
172.00	Etheostoma	chlorosomum	BLUNTNOSE DARTER	I	M	-
173.00	Etheostoma	gracile	SLOUGH DARTER	I	N	-
174.00	Etheostoma	spectabile	ORANGETHROAT DARTER	I	S	-
175.00	Etheostoma	nigrum	JOHNNY DARTER	I	C	-
176.00	Etheostoma	asprigene	MUD DARTER	I	M	-
177.00	Etheostoma	blennioides	GREENSIDE DARTER	I	M	M
178.00	Etheostoma	caeruleum	RAINBOW DARTER	I	S	R
179.00	Etheostoma	camurum	BLUEBREAST DARTER	I	S	-
180.00	Etheostoma	exile	IOWA DARTER	I	M	-
181.00	Etheostoma	flabellare	FANTAIL DARTER	I	C	-
182.00	Etheostoma	histrion	HARLEQUIN DARTER	I	M	S
184.00	Etheostoma	maculatum	SPOTTED DARTER	I	S	R
185.00	Etheostoma	microperca	LEAST DARTER	I	N	-
186.00	Etheostoma	squamiceps	SPOTTAIL DARTER	I	C	-
187.00	Etheostoma	tippecanoe	TIPPECANOE DARTER	I	S	R
188.00	Etheostoma	variatum	VARIEGATE DARTER	I	S	M
189.00	Etheostoma	zonale	BANDED DARTER	I	S	-
190.00	Perca	flavescens	YELLOW PERCH	-	M	-
191.00	Percina	caprodes	LOGPERCH	I	S	M
192.00	Percina	sciera	DUSKY DARTER	I	S	R
193.00	Percina	evides	GILT DARTER	I	S	-
194.00	Percina	maculata	BLACKSIDE DARTER	I	S	-
195.00	Percina	phoxocephala	SLENDERHEAD DARTER	I	S	I
196.00	Percina	shumardi	RIVER DARTER	I	S	-
197.00	Percina	uranidea	STARGAZING DARTER	I	S	S
198.00	Percina	vigil	SADDLEBACK DARTER	I	S	M
199.00	Stizostedion	vitreum	WALLEYE	P	S	-
200.00	Stizostedion	canadense	SAUGER	P	S	-
201.00	Percina	copelandi	CHANNEL DARTER	I	S	S
202.00	Ammocrypta	clara	WESTERN SAND DARTER	I	S	R

APPENDIX A.

Continued

VOUCHERCD	GENUS	SPECIES	COMMON NAM	FEED GUILD	REPR GUILD	TOLERANCE
203.00	Ammocrypta	pellucida	EASTERN SAND DARTER	I	S	R
204.00	Crystallaria	asprella	CRYSTAL DARTER	I	S	S
205.00	Aplodinotus	grunniens	FRESHWATER DRUM	-	M	P
206.00	Elassoma	zonatum	BANDED PYGMY SUNFISH	I	C	-
207.00	Notropis	wickliffi	CHANNEL SHINER	I	M	I
208.00	Esox	lucius x maspuinogy	TIGER MUSKIE	P	M	-
209.00	Morone	chrysops x saxatilis	WIPER	P	M	-
210.00	Stizostedion	canadense x vitreum	SAUGEYE	P	S	M
211.00	Lepomis	x-hybrid	SUNFISH HYBRID			
212.00	Gymnocephalus	cernuus	RUFFE	C	S	-
213.00	Mylopharyngodon	piceus	BLACK CARP	O	M	T
214.00	Hypophthalmichthys	nobilis	BIGHEAD CARP	H	M	T
215.00	Neogobius	malanostomus	ROUND GOBY	I	C	M
216.00	Proterorhinus	marmoratus	TUBE NOSE GOBY			
217.00	Morone	americana	WHITE PERCH	P	M	-
218.00	Moxostoma	m. breviceps	OHIO REDHORSE	I	S	M
219.00	Menidia	beryllina	INLAND SILVERSIDE	I	M	P
220.00	Gasterosteus	aculeatus	THREESPIKE STICKLEBAC	I	C	-

**Feeding Guild:** C = carnivore; F = filter feeder; G = generalist feeder; H = herbivore; I = insectivore; O = omnivore; P = piscivore; Pa = Parasite; V = invertivore; -- = feeding guild behaviorally plastic.

**Reproductive Guild:** C = complex with parental care; M = simple, miscellaneous; N = complex, no parental care; S = simple lithophil.

**Tolerance/Sensitivity:** I = common intolerant; M = moderately intolerant; P = moderately tolerant; R = rare intolerant; S = special intolerant; T = highly tolerant; -- = tolerance classification moderate.

# APPENDIX B. Metric specific Index of Biotic Integrity scores for sites in the Maumee River drainage.

## FISH COMMUNITY IBI DEVELOPMENT DATA HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91011 IDEM #: 91011.0

WILLOW CREEK COUNTY: ALLEN LOCATION: LIMA RD. BRIDGE COLLECTION DATE: 17-Jun-1991  
1300hr LATITUDE/LONGITUDE: 41° 14' 55.0"/85° 10' 47.0" DRAINAGE: 19.0sq. miles  
 INT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
 VAP: HUNTERTOWN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
 VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 6.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>149</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>97.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>30.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>55.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>63.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>20.8%</u>
PERCENT D.E.L.T ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91012 IDEM #: 91012.0

SITE: LITTLE CEDAR CREEK COUNTY: ALLEN LOCATION: FITCH RD. BRIDGE (D/S) COLLECTION DATE: 17-Jun-1991  
TIME: 1410hr LATITUDE/LONGITUDE: 41' 15" 40.5°/85' 8" 30.0° DRAINAGE: 72.8sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 11.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>76</u>
TOTAL NUMBER OF TAXA PRESENT	<u>13</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>3</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>2</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>26.3%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>39.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>10.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>73.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>39.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>21.1%</u>
PERCENT DELT ANOMALIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91013 IDEM #: 91013.0

SITE: GELLER DITCH COUNTY: ALLEN LOCATION: S.R. 3 BRIDGE (U/S) COLLECTION DATE: 17-Jun-1991  
TIME: 1510hr LATITUDE/LONGITUDE: 41' 12" 7.0°/85' 10" 14.0° DRAINAGE: 9.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: HUNTERTOWN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 2.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>29</u>
TOTAL NUMBER OF TAXA PRESENT	<u>1</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>0</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>1</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91014 IDEM #: 91014.0

SITE: BECKETT RUN COUNTY: ALLEN LOCATION: AUBURN RD. BRIDGE (U/S) COLLECTION DATE: 17-Jun-199  
TIME: 1600hr LATITUDE/LONGITUDE: 41' 9" 17.0°/85' 7" 3.0° DRAINAGE: 9.4sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: CEDARVILLE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 3.1meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>148</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>7.4%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>69.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>12.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>35.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.1%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>73.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>16.9%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #:TS91015 IDEM #:91015.0

SITE:SPY RUN COUNTY:ALLEN LOCATION:S.R. 30/33/14/24 BRIDGE (U/S) COLLECTION DATE:17-Jun-1991  
TIME:1630hr LATITUDE/LONGITUDE:41' 7" 5.0°/85' 9" 44.0° DRAINAGE:7.7sq. miles  
SEGMENT:19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE:5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE WEST HYDROLOGIC UNIT:4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR:LONGLINE NET MESH:0.318cm SAMPLING DISTANCE:100meters  
VOLTS:300 DC CAPTURE DEPTH:< 0.80meters DISTANCE TO SHORE:3.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>38</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>89.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>26.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>34.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>68.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>18.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91016 IDEM #: 91016.0

SITE: CLEAR LAKE CREEK COUNTY: STUBEN LOCATION: C.R. 500N BRIDGE (D/S) COLLECTION DATE: 18-Jun-199  
TIME: 915hr LATITUDE/LONGITUDE: 41' 43" 1.0°/84' 50" 42.0° DRAINAGE: 4.8sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: CLEAR LAKE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.10meters DISTANCE TO SHORE: 1.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>33</u>
TOTAL NUMBER OF TAXA PRESENT	<u>1</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>0</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>1</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>100.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91019 IDEM #: 91019.0

SITE: FISH CREEK COUNTY: STUBEN LOCATION: C.R. 200 S Bridge (u/s) COLLECTION DATE: 18-Jun-1991  
TIME: 1105hr LATITUDE/LONGITUDE: 41' 37" 33.0°/84' 49" 39.0° DRAINAGE: 29.6sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: CLEAR LAKE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.00meters DISTANCE TO SHORE: 5.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>98</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>4</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>2</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>1.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>86.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>19.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>67.3%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>68.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>21.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91020 IDEM #: 91020.0

SITE: UN-NAMED TRIB. W. BRANCH COUNTY: STUBEN LOCATION: CR 200 S Bridge (d/s) COLLECTION DATE: 18-Jun-19'  
TIME: 1200hr LATITUDE/LONGITUDE: 41' 36" 56.0°/84' 52" 1.0° DRAINAGE: 1.2sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: EDON HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 1.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>187</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>84.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>34.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>47.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>63.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>3.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91022 IDEM #: 91022.0

SITE: FISH CREEK COUNTY: STROUBEN LOCATION: BALL LAKE LANE BRIDGE (D/S) COLLECTION DATE: 18-Jun-1991  
TIME: 1452hr LATITUDE/LONGITUDE: 41' 32" 10.0°/84' 56" 12.0° DRAINAGE: 11.6sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: HAMILTON HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 3.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>118</u>
TOTAL NUMBER OF TAXA PRESENT	<u>15</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>5</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>5</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>12.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>1.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>45.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>49.2%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>16.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>1.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91023 IDEM #: 91023.0

SITE: BLACK CREEK COUNTY: STUBEN LOCATION: C.R. 550E BRIDGE (U/S) COLLECTION DATE: 18-Jun-19  
TIME: 1538hr LATITUDE/LONGITUDE: 41' 33" 22.0°/84' 53" 2.0° DRAINAGE: 8.3sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: HAMILTON HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 2.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>141</u>
TOTAL NUMBER OF TAXA PRESENT	<u>9</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>90.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>71.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>2.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>89.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>6.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91024 IDEM #: 91024.0

SITE: FISH CREEK COUNTY: STROUBEN LOCATION: 850E BRIDGE (U/S) COLLECTION DATE: 18-Jun-1991  
TIME: 1610hr LATITUDE/LONGITUDE: 41' 35" 7.0°/84' 50" 41.0° DRAINAGE: 37.5sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: EDON HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 7.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>71</u>
TOTAL NUMBER OF TAXA PRESENT	<u>14</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>5</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>11.3%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>29.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>11.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>78.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>28.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>53.5%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91042 IDEM #: 91042.0

SITE: WANN DITCH COUNTY: ALLEN LOCATION: SCIPPIO RD. BRIDGE (U/S) COLLECTION DATE: 24-Jun-199  
TIME: 1400hr LATITUDE/LONGITUDE: 41' 12" 33.0°/84' 49" 34.0° DRAINAGE: 5.3sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: WOODBURN NORTH HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 2.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>194</u>
TOTAL NUMBER OF TAXA PRESENT	<u>16</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>9</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>54.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>21.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>54.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>62.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>18.6%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91043 IDEM #: 91043.0

SITE: BLACK CREEK COUNTY: ALLEN LOCATION: SCHAFFER RD. BRIDGE (U/S) COLLECTION DATE: 24-Jun-1991  
TIME: 1430hr LATITUDE/LONGITUDE: 41' 11" 0.0°/84' 52" 10.0° DRAINAGE: 12.2sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: WOODBURN NORTH HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 4.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>63</u>
TOTAL NUMBER OF TAXA PRESENT	<u>13</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>74.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>58.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>34.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>76.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>14.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91044 IDEM #: 91044.0

SITE: GAR CREEK COUNTY: ALLEN LOCATION: BERTHAUD RD. BRIDGE (U/S) COLLECTION DATE: 24-Jun-199  
TIME: 1515hr LATITUDE/LONGITUDE: 41' 5" 50.5°/84' 56" 34.0° DRAINAGE: 10.6sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: MAPLES HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 3.7meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>125</u>
TOTAL NUMBER OF TAXA PRESENT	<u>13</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>29.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>11.2%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>27.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>79.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>12.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91045 IDEM #: 91045.0

SITE: CACHEIT DITCH COUNTY: ALLEN LOCATION: GREEN ROAD BRIDGE (U/S) COLLECTION DATE: 24-Jun-1991  
TIME: 1605hr LATITUDE/LONGITUDE: 41' 3" 22.0°/85' 0" 40.5° DRAINAGE: 6.1sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE EAST HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 4.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>71</u>
TOTAL NUMBER OF TAXA PRESENT	<u>7</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>56.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>33.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>47.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>40.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91046 IDEM #: 91046.0

SITE: TRIER DITCH COUNTY: ALLEN LOCATION: ADAMS CENTER RD. BRIDGE (D/S) COLLECTION DATE: 24-Jun-199  
TIME: 1645hr LATITUDE/LONGITUDE: 41' 3" 3.0°/85' 3" 30.0° DRAINAGE: 9.0sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE EAST HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>190</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>86.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>38.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>17.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>90.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>4.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91060 IDEM #: 91060.0

SITE: LITTLE CEDAR CREEK COUNTY: NOBLE LOCATION: 1150E (D/S) COLLECTION DATE: 26-Sep-1991  
TIME: hr LATITUDE/LONGITUDE: 41' 16" 34.0°/85' 13" 40.0° DRAINAGE: 5.0sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>89</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>14.6%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>78.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>18.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>33.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>51.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>41.6%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91061 IDEM #: 91061.0

SITE: BLACK CREEK COUNTY: NOBLE LOCATION: C.R. 450S (U/S) COLLECTION DATE: 26-Jun-195  
TIME: 1514hr LATITUDE/LONGITUDE: 45' 17" 8.0°/85' 12" 30.0° DRAINAGE: 19.1sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 5.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>63</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>68.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>27.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>49.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>3.2%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>81.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>6.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91062 IDEM #: 91062.0

SITE: WILLOW CREEK COUNTY: NOBLE LOCATION: C.R. 1000M (D/S) COLLECTION DATE: 26-Jun-1991  
TIME: 1548hr LATITUDE/LONGITUDE: 41' 16" 32.0°/85' 13" 9.0° DRAINAGE: 7.7sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 2.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>50</u>
TOTAL NUMBER OF TAXA PRESENT	<u>6</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>1</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>34.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>8.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>70.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91063 IDEM #: 91063.0

SITE: MAUMEE RIVER COUNTY: ALLEN LOCATION: OLD SCIPPIO RD (D/S) COLLECTION DATE: 27-Jun-199  
TIME: 1500hr LATITUDE/LONGITUDE: 41' 9" 48.0°/84' 48" 42.0° DRAINAGE: \*\*\*.sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: WOODBURN NORTH HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 500meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.10meters DISTANCE TO SHORE: 57.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>280</u>
TOTAL NUMBER OF TAXA PRESENT	<u>28</u>
NUMBER OF LARGE RIVER SPECIES	<u>4</u>
NUMBER OF DARTER SPECIES	<u>5</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>6</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>8</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>3</u>
NUMBER OF SENSITIVE SPECIES	<u>7</u>
NUMBER OF TOLERANT SPECIES	<u>11</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>5.4%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>47.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>12.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>70.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>40.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>26.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91064 IDEM #: 91064.0

SITE: MAUMEE RIVER COUNTY: ALLEN LOCATION: BULL RAPIDS RD. (D/S) COLLECTION DATE: 27-Jun-1991  
TIME: 910hr LATITUDE/LONGITUDE: 41' 9" 26.0°/84' 52" 39.0° DRAINAGE: \*\*\*.sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: GRABIL HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 500meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.10meters DISTANCE TO SHORE: 73.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>340</u>
TOTAL NUMBER OF TAXA PRESENT	<u>24</u>
NUMBER OF LARGE RIVER SPECIES	<u>3</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>9</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>4</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>5</u>
NUMBER OF SENSITIVE SPECIES	<u>8</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>11.5%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>28.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>12.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>80.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.7%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>13.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>29.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91065 IDEM #: 91065.0

SITE: SORGKN DITCH COUNTY: ALLEN LOCATION: MORGAN RD. (U/S) COLLECTION DATE: 01-Jul-199  
TIME: 1310hr LATITUDE/LONGITUDE: 41' 0" 42.0°/84' 49" 25.0° DRAINAGE: 8.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: WOODBURN SOUTH HYDROLOGIC UNIT: 4100007-FLATROCK CREEK BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.10meters DISTANCE TO SHORE: 0.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>51</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>66.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>7.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>88.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>3.9%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>7.8%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91066 IDEM #: 91066.0

SITE: HOFFMAN CREEK COUNTY: ALLEN LOCATION: LORTIE RD. (U/S) COLLECTION DATE: 01-Jul-1991  
TIME: 1345hr LATITUDE/LONGITUDE: 41' 1" 50.0°/84' 50" 38.0° DRAINAGE: 45.2sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: WOODBURN SOUTH HYDROLOGIC UNIT: 4100007-FLATROCK CREEK BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 6.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>190</u>
TOTAL NUMBER OF TAXA PRESENT	<u>13</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>72.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>27.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>70.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>55.8%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>3.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91067 IDEM #: 91067.0

SITE: FLATROCK CREEK COUNTY: ALLEN LOCATION: HOFFMAN RD. BRIDGE (U/S) COLLECTION DATE: 01-Jul-199  
TIME: 1430hr LATITUDE/LONGITUDE: 40' 59" 36.0°/84' 51" 48.0° DRAINAGE: 42.2sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: DIXON HYDROLOGIC UNIT: 4100007-FLATROCK CREEK BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>134</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>13.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>29.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>85.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>3.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91068 IDEM #: 91068.0

SITE: BOHNCE DITCH COUNTY: ALLEN LOCATION: MONROEVILLE RD. COLLECTION DATE: 01-Jul-1991  
TIME: 1517hr LATITUDE/LONGITUDE: 40' 58" 41.0°/84' 53" 58.0° DRAINAGE: 10.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: HOAGLAND HYDROLOGIC UNIT: 4100007-FLATROCK CREEK BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 3.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>242</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>92.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>52.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>21.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>79.8%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>3.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91069 IDEM #: 91069.0

SITE: HOFFMAN DITCH COUNTY: ALLEN LOCATION: MAPLES RD. (D/S) COLLECTION DATE: 01-Jul-199  
TIME: 1552hr LATITUDE/LONGITUDE: 41' 0" 23.0°/84' 57" 2.0° DRAINAGE: sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: MAPLES HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 5.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>233</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>85.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>68.2%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>14.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>90.6%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>2.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91070 IDEM #: 91070.0

SITE: HOFFMAN CREEK COUNTY: ALLEN LOCATION: TERNET RD. (D/S) COLLECTION DATE: 01-Jul-1991  
TIME: 1623hr LATITUDE/LONGITUDE: 41° 1' 0.0" / 84° 53' 30.0" DRAINAGE: 17.9sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: MAPLES HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 4.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>167</u>
TOTAL NUMBER OF TAXA PRESENT	<u>15</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>70.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>7.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>82.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>31.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>6.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91071 IDEM #: 91071.0

SITE: LITTLE BLUE CREEK COUNTY: ADAMS LOCATION: C.R. 600E COLLECTION DATE: 02-Jul-19  
TIME: 1102hr LATITUDE/LONGITUDE: 40' 39" 21.0°/84' 49" 14.0° DRAINAGE: 8.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WILLSHIRE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>252</u>
TOTAL NUMBER OF TAXA PRESENT	<u>7</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>42.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>38.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>57.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>82.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>6.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91072 IDEM #: 91072.0

SITE: BLUE CREEK COUNTY: ADAMS LOCATION: C.R. 200S (U/S) COLLECTION DATE: 18-Jul-1991  
TIME: 1015hr LATITUDE/LONGITUDE: 40' 43" 5.0°/84' 49" 37.0° DRAINAGE: 70.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WILLSHIRE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 3.9meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>242</u>
TOTAL NUMBER OF TAXA PRESENT	<u>15</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>8</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>58.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>32.2%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>52.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>59.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>19.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91073 IDEM #: 91073.0

SITE: BLUE CREEK COUNTY: ADAMS LOCATION: 100E (U/S) COLLECTION DATE: 02-Jul-199  
TIME: 1146hr LATITUDE/LONGITUDE: 40' 41" 50.0°/84' 55" 2.0° DRAINAGE: 22.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: BERNE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 4.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>503</u>
TOTAL NUMBER OF TAXA PRESENT	<u>11</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>64.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>15.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>85.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>12.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91074 IDEM #: 91074.0

SITE: HABEGGER DITCH COUNTY: ADAMS LOCATION: C.R. 100E (U/S) COLLECTION DATE: 02-Jul-1991  
TIME: 1208hr LATITUDE/LONGITUDE: 40' 40" 30.0°/84' 55" 2.0° DRAINAGE: 7.9sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: BERNE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 3.9meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>2</u>
TOTAL NUMBER OF TAXA PRESENT	<u>2</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>2</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>50.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>50.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91075 IDEM #: 91075.0

SITE: BLUE CREEK COUNTY: ADAMS LOCATION: C.R. 100S (U/S) COLLECTION DATE: 02-Jul-199  
TIME: 1239hr LATITUDE/LONGITUDE: 40' 43" 32.0°/85' 2" 6.0° DRAINAGE: 17.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: LINN GROVE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 4.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>144</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>70.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>29.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>59.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
**HURON-ERIE LAKE PLAIN ECOREGION**

TPS SAMPLE #:TS91076 IDEM #:91076.0

SITE:MARTZ CREEK COUNTY:ADAMS LOCATION:C.R. 100N (U/S) COLLECTION DATE:02-Jul-1991  
TIME:1416hr LATITUDE/LONGITUDE:40' 45" 40.0°/84' 52" 21.0° DRAINAGE:8.8sq. miles  
SEGMENT:21-ST. MARYS RIVER NATURAL REGION CODE:5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WREN HYDROLOGIC UNIT:4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR:LONGLINE NET MESH:0.318cm SAMPLING DISTANCE:50meters  
VOLTS:300 DC CAPTURE DEPTH:< 0.30meters DISTANCE TO SHORE:2.3meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>49</u>
TOTAL NUMBER OF TAXA PRESENT	<u>7</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>85.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>69.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>26.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>81.6%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91077 IDEM #: 91077.0

SITE: YELLOW CREEK COUNTY: ADAMS LOCATION: C.R. 100N (U/S) COLLECTION DATE: 02-Jul-199  
TIME: 1419hr LATITUDE/LONGITUDE: 40' 45" 34.0°/84' 55" 54.0° DRAINAGE: 12.2sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: DECATUR HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 4.9meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>129</u>
TOTAL NUMBER OF TAXA PRESENT	<u>4</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>2</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>96.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>96.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>3.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>96.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91078 IDEM #: 91078.0

SITE: HOLTHOUSE DITCHE COUNTY: ADAMS LOCATION: C.R. 400N (D/S) COLLECTION DATE: 02-Jul-1991  
TIME: 1550hr LATITUDE/LONGITUDE: 40' 48" 6.0°/85' 2" 7.0° DRAINAGE: 22.1sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: PREBLE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 2.6meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>166</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>81.9%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>70.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>24.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>58.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>30.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN SCOREGION

TPS SAMPLE #: TS91079 IDEM #: 91079.0

SITE: BORUM RUN COUNTY: ADAMS LOCATION: C.R. 400M COLLECTION DATE: 02-Jul-199  
TIME: 1624hr LATITUDE/LONGITUDE: 40' 48" 10.0°/84' 56" 24.0° DRAINAGE: 7.1sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: DECATUR HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 2.4meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>238</u>
TOTAL NUMBER OF TAXA PRESENT	<u>11</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>69.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>10.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>90.3%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>8.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91080 IDEM #: 91080.0

SITE: MAUMEE RIVER COUNTY: ALLEN LOCATION: 2.5 mi N FT. WAYNE COLLECTION DATE: 03-Jul-1991  
TIME: 900hr LATITUDE/LONGITUDE: 41' 4" 56.0°/85' 6" 52.0° DRAINAGE: \*\*\*.sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE EAST HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 400meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.30meters DISTANCE TO SHORE: 79.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>319</u>
TOTAL NUMBER OF TAXA PRESENT	<u>33</u>
NUMBER OF LARGE RIVER SPECIES	<u>5</u>
NUMBER OF DARTER SPECIES	<u>4</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>5</u>
NUMBER OF SUNFISH SPECIES	<u>6</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>10</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>5</u>
NUMBER OF SENSITIVE SPECIES	<u>10</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>17.9%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.9%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>55.2%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>48.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>42.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>19.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>8.2%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91081 IDEM #: 91081.0

SITE: HOUK DITCH COUNTY: ALLEN LOCATION: FLATROCK ROAD BRIDGE COLLECTION DATE: 08-Jul-198  
TIME: 1400hr LATITUDE/LONGITUDE: 40' 57" 44.0°/85' 0" 25.0° DRAINAGE: 10.3sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: POE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 1.9meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>379</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>72.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>40.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>12.4%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.3%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>93.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>2.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91082 IDEM #: 91082.0

SITE: HARBER DITCH COUNTY: ALLEN LOCATION: HAMILTON RD. (D/S) COLLECTION DATE: 08-Jul-1991  
TIME: 1500hr LATITUDE/LONGITUDE: 40' 56" 44.0°/85' 10" 53.0° DRAINAGE: 771.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: OSSIAN HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.00meters DISTANCE TO SHORE: 2.4meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>67</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>82.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>26.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>20.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>74.6%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>19.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91084 IDEM #: 91084.0

SITE: HOUK DITCH COUNTY: ALLEN LOCATION: MARION CENTER RD. (U/S) COLLECTION DATE: 08-Jul-199  
TIME: 1616hr LATITUDE/LONGITUDE: 40' 59" 55.0°/85' 3" 23.0° DRAINAGE: 13.2sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: POE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>289</u>
TOTAL NUMBER OF TAXA PRESENT	<u>21</u>
NUMBER OF LARGE RIVER SPECIES	<u>1</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>4</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>9</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.3%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>74.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>37.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>20.4%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.7%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>76.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>9.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91100 IDEM #: 91100.0

SITE: CEDAR CREEK COUNTY: DEKALB LOCATION: C.R. 27 (U/S) COLLECTION DATE: 11-Jul-1991  
TIME: 840hr LATITUDE/LONGITUDE: 41' 26" 51.0°/85' 3" 48.0° DRAINAGE: 24.8sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WATERLOO HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 5.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>83</u>
TOTAL NUMBER OF TAXA PRESENT	<u>17</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>4</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>5</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>4</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>44.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>6.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>83.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>10.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>37.3%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>28.9%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91101 IDEM #: 91101.0

SITE: MATSAN DITCH COUNTY: DEKALB LOCATION: S.R. 6 (D/S) COLLECTION DATE: 11-Jul-199  
TIME: 930hr LATITUDE/LONGITUDE: 41' 25" 52.0°/84' 59" 50.0° DRAINAGE: 15.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WATERLOO HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.00meters DISTANCE TO SHORE: 5.3meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>111</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>11.7%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>80.2%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>31.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>18.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>51.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>44.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91102 IDEM #: 91102.0

SITE: FISH CREEK COUNTY: STROUBEN LOCATION: CR 775 S COLLECTION DATE: 11-Jul-1991  
TIME: 1005hr LATITUDE/LONGITUDE: 41' 31" 55.0°/84' 54" 9.0° DRAINAGE: 37.5sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: HAMILTON HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 5.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>161</u>
TOTAL NUMBER OF TAXA PRESENT	<u>17</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>4</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>2</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>2</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>68.9%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>52.2%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>31.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>14.9%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>18.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>4.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91103 IDEM #: 91103.0

SITE: FISH CREEK COUNTY: DEKALB LOCATION: CR 16 COLLECTION DATE: 11-Jul-199  
TIME: 1045hr LATITUDE/LONGITUDE: 41' 28" 25.0°/84' 49" 34.0° DRAINAGE: 98.8sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: BUTLER EAST HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.90meters DISTANCE TO SHORE: 7.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>183</u>
TOTAL NUMBER OF TAXA PRESENT	<u>19</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>4</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>5</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>2</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>3</u>
NUMBER OF SENSITIVE SPECIES	<u>6</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>1.1%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>48.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>29.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>50.3%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>10.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>43.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>12.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91104 IDEM #: 91104.0

SITE: BIG RUN COUNTY: DEKALE LOCATION: C.R. 75 (U/S) COLLECTION DATE: 11-Jul-1991  
TIME: 1143hr LATITUDE/LONGITUDE: 41' 25" 48.0°/84' 50" 37.0° DRAINAGE: 28.1sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: BUTLER EAST HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 5.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>215</u>
TOTAL NUMBER OF TAXA PRESENT	<u>7</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>20.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>89.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>2.8%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>26.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>74.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>25.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91105 IDEM #: 91105.0

SITE: BUCK CREEK COUNTY: DEKALB LOCATION: C.R. 40 (D/S) COLLECTION DATE: 11-Jul-199  
TIME: 1313hr LATITUDE/LONGITUDE: 41' 23" 10.0°/84' 50" 47.0° DRAINAGE: 13.2sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: BUTLER EAST HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 5.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>248</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>1.2%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>96.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>42.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>30.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>54.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>12.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN SCOREGION

TPS SAMPLE #: TS91106 IDEM #: 91106.0

SITE: SAL SHANK DITCH COUNTY: DEKALB LOCATION: C.R. 59 (U/S) COLLECTION DATE: 11-Jul-1991  
TIME: 1408hr LATITUDE/LONGITUDE: 41' 21" 43.0°/84' 54" 25.0° DRAINAGE: 18.4sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: SAINT JOE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>42</u>
TOTAL NUMBER OF TAXA PRESENT	<u>6</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>0</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>3</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>90.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>71.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>26.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>21.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>73.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91107 IDEM #: 91107.0

SITE: BEAR CREEK COUNTY: DEKALB LOCATION: C.R. 56 (U/S) COLLECTION DATE: 11-Jul-199  
TIME: 1500hr LATITUDE/LONGITUDE: 41' 19" 41.0°/84' 55" 33.0° DRAINAGE: 22.7sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: SAINT JOE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>149</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>20.1%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>81.2%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>19.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>31.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>75.8%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>17.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91109 IDEM #: 91109.0

SITE: ROBINSON CREEK COUNTY: ALLEN LOCATION: COVERDALE RD. (U/S) COLLECTION DATE: 15-Jul-1991  
TIME: 1430hr LATITUDE/LONGITUDE: 40' 59" 40.0°/85' 13" 33.0° DRAINAGE: 7.2sq. miles  
SEGMENT: 35-LITTLE WABASH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>10</u>
TOTAL NUMBER OF TAXA PRESENT	<u>3</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>0</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>1</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>30.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>40.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>60.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>40.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91110 IDEM #: 91110.0

SITE: LITTLE RIVER COUNTY: ALLEN LOCATION: SMITH RD. (U/S) COLLECTION DATE: 15-Jul-1995  
TIME: 1507hr LATITUDE/LONGITUDE: 41' 1" 12.0°/85' 12" 29.0° DRAINAGE: 2.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE WEST HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 2.9meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>57</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>49.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>12.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>22.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>71.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>1.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91111 IDEM #: 91111.0

SITE: GRAHAM MCCULLOCH DITCH 1 COUNTY: ALLEN LOCATION: SOUTH BEND RD. (U/S) COLLECTION DATE: 15-Jul-1991  
TIME: 1538hr LATITUDE/LONGITUDE: 41' 3" 1.0°/85' 13" 56.0° DRAINAGE: 10.4sq. miles  
SEGMENT: 35-LITTLE WABASH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE WEST HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 3.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>293</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>17.1%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>44.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>6.5%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>18.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>61.8%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>37.5%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91112 IDEM #: 91112.0

SITE: JOHN DIEHL DITCH COUNTY: DEKALB LOCATION: S.R. 327 (U/S) COLLECTION DATE: 16-Jul-199  
TIME: 840hr LATITUDE/LONGITUDE: 41' 23" 17.0°/85' 8" 11.0° DRAINAGE: 7.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: CORUNNA HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 3.1meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>133</u>
TOTAL NUMBER OF TAXA PRESENT	<u>14</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>24.8%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>56.4%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>20.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>48.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.3%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>40.6%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>28.6%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91113 IDEM #: 91113.0

SITE: OBER DITCH COUNTY: DEKALB LOCATION: C.R. 19 (U/S) BRIDGE COLLECTION DATE: 16-Jul-1991  
TIME: 912hr LATITUDE/LONGITUDE: 41' 23" 44.0°/85' 6" 52.0° DRAINAGE: 7.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 4-NORTHERN LAKES NATURAL REGION  
TOPOMAP: WATERLOO HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 2.3meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>68</u>
TOTAL NUMBER OF TAXA PRESENT	<u>11</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>60.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>5.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>42.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>66.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>20.6%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91114 IDEM #: 91114.0

SITE: CEDAR CREEK COUNTY: DEKALB LOCATION: C.R. 35 (D/S) COLLECTION DATE: 16-Jul-199  
TIME: 954hr LATITUDE/LONGITUDE: 41' 23" 5.0°/85' 1" 24.0° DRAINAGE: 74.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WATERLOO HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>187</u>
TOTAL NUMBER OF TAXA PRESENT	<u>15</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>3</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>5.9%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>77.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>8.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>31.0%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>77.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>8.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91115 IDEM #: 91115.0

SITE: CEDAR CREEK COUNTY: DEKALB LOCATION: S.R. 8 (U/S) COLLECTION DATE: 16-Jul-1991  
TIME: 1047hr LATITUDE/LONGITUDE: 41' 22" 2.0°/85' 3" 3.0° DRAINAGE: 87.3sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: AUBURN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>105</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>3</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>20.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>88.6%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>8.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>53.3%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.9%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>65.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>20.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91116 IDEM #: 91116.0

SITE: JOHN DIEHL DITCH COUNTY: DEKALB LOCATION: AUBURN DR. (C.R. 48) (D/S) COLLECTION DATE: 16-Jul-199  
TIME: 1127hr LATITUDE/LONGITUDE: 41' 21" 7.0°/85' 4" 48.0° DRAINAGE: 37.4sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: AUBURN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.70meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>155</u>
TOTAL NUMBER OF TAXA PRESENT	<u>12</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>3</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>71.6%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>54.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>3.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>42.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>19.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>45.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91117 IDEM #: 91117.0

SITE: CEDAR CREEK COUNTY: DEKALB LOCATION: S.R. 427 (D/S) COLLECTION DATE: 16-Jul-1991  
TIME: 1407hr LATITUDE/LONGITUDE: 41' 19" 17.0°/85' 4" 39.0° DRAINAGE: 133.6sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: AUBURN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.00meters DISTANCE TO SHORE: 6.4meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>102</u>
TOTAL NUMBER OF TAXA PRESENT	<u>14</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>3</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>4.9%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>84.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>17.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>44.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>76.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>13.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91118 IDEM #: 91118.0

SITE: LITTLE CEDAR CREEK COUNTY: DEKALB LOCATION: C.R. 64 (D/S) COLLECTION DATE: 16-Jul-199  
TIME: 1522hr LATITUDE/LONGITUDE: 41° 17' 37.0°/85° 8' 26.0° DRAINAGE: 45.8sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: GARRETT HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 8.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>115</u>
TOTAL NUMBER OF TAXA PRESENT	<u>16</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>4</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>1</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>5</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>3</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>9.6%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>53.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>27.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>35.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>1.7%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>41.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>29.6%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91119 IDEM #: 91119.0

SITE: CEDAR CREEK COUNTY: DEKALB LOCATION: C.R. 68 (D/S) COLLECTION DATE: 16-Jul-1991  
TIME: 1445hr LATITUDE/LONGITUDE: 41' 16" 47.0°/85' 5" 38.0° DRAINAGE: 136.8sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
COPMAP: AUBURN HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 100meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.00meters DISTANCE TO SHORE: 6.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>92</u>
TOTAL NUMBER OF TAXA PRESENT	<u>11</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>1</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>14.1%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>79.3%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>17.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>59.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>66.3%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>22.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91120 IDEM #: 91120.0

SITE: ST. JOSEPH RIVER COUNTY: DEKALB LOCATION: S.R. 8 (D/S) COLLECTION DATE: 17-Jul-199  
TIME: 1040hr LATITUDE/LONGITUDE: 41' 20" 51.0°/84' 50" 40.0° DRAINAGE: 641.0sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: HICKSVILLE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 41.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>293</u>
TOTAL NUMBER OF TAXA PRESENT	<u>18</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>5</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>2</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>5</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>75.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>69.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>23.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>6.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>10.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>6.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91121 IDEM #: 91121.0

SITE: ST. JOSEPH RIVER COUNTY: DEKALB LOCATION: C.R. 64 (U/S) COLLECTION DATE: 17-Jul-1991  
TIME: 1420hr LATITUDE/LONGITUDE: 41' 17" 54.0°/84' 53" 58.0° DRAINAGE: 703.5sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
OPOMAP: SAINT JOE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 22.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>339</u>
TOTAL NUMBER OF TAXA PRESENT	<u>23</u>
NUMBER OF LARGE RIVER SPECIES	<u>2</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>2</u>
NUMBER OF MINNOW SPECIES	<u>9</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>4</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>4</u>
NUMBER OF SENSITIVE SPECIES	<u>9</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>3.5%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>10.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>50.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>23.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>68.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>5.3%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>40.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>14.5%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91122 IDEM #: 91122.0

SITE: ST. MARY'S RIVER COUNTY: ADAMS LOCATION: S.R. 101 (U/S) COLLECTION DATE: 18-Jul-199  
TIME: 915hr LATITUDE/LONGITUDE: 40' 46" 45.0°/84' 50" 31.0° DRAINAGE: 550.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: WREN HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 19.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>188</u>
TOTAL NUMBER OF TAXA PRESENT	<u>23</u>
NUMBER OF LARGE RIVER SPECIES	<u>4</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>2</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>4</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>3</u>
NUMBER OF TOLERANT SPECIES	<u>10</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>10.1%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>62.2%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>36.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>52.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>10.1%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>17.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>29.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91123 IDEM #: 91123.0

SITE: HOLTHOUSE DITCH COUNTY: ADAMS LOCATION: S.R. 224 (U/S) COLLECTION DATE: 18-Jul-1991  
TIME: 1140hr LATITUDE/LONGITUDE: 40' 49" 56.0°/84' 57" 22.0° DRAINAGE: 32.5sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
FOPOMAP: DECATUR HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 3.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>69</u>
TOTAL NUMBER OF TAXA PRESENT	<u>9</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>5</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>85.5%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>26.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>36.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>5.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>87.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>4.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91124 IDEM #: 91124.0

SITE: GERKE DITCH COUNTY: ADAMS LOCATION: 100E (U/S) COLLECTION DATE: 18-Jul-199  
TIME: 1324hr LATITUDE/LONGITUDE: 40' 52" 27.0°/84' 55" 12.0° DRAINAGE: 10.1sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: DECATUR HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.50meters DISTANCE TO SHORE: 4.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>156</u>
TOTAL NUMBER OF TAXA PRESENT	<u>8</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>0</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>4</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>47.4%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>18.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>21.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>89.7%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>21.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91125 IDEM #: 91125.0

SITE: UNTRIB. FLATROCK CREEK COUNTY: ADAMS LOCATION: C.R. 1100N (U/S) COLLECTION DATE: 18-Jul-1991  
TIME: 1400hr LATITUDE/LONGITUDE: 40' 54" 26.0°/84' 48" 44.0° DRAINAGE: 28.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: DIXON HYDROLOGIC UNIT: 4100007-FLATROCK CREEK BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 3.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>99</u>
TOTAL NUMBER OF TAXA PRESENT	<u>10</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>92.9%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>10.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>56.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>39.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>7.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91126 IDEM #: 91126.0

SITE: NICKELSEN CREEK COUNTY: ADAMS LOCATION: C.R. 550W (U/S) COLLECTION DATE: 18-Jul-199  
TIME: 1455hr LATITUDE/LONGITUDE: 40' 53" 32.0°/85' 2" 39.0° DRAINAGE: 11.7sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPONAP: POE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.30meters DISTANCE TO SHORE: 3.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>211</u>
TOTAL NUMBER OF TAXA PRESENT	<u>13</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>82.9%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>51.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>35.1%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>71.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>3.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91127 IDEM #: 91127.0

SITE: MAUMEE RIVER COUNTY: ALLEN LOCATION: S.R. 24 (AT JOYCKES PARK) COLLECTION DATE: 19-Jul-1991  
TIME: 902hr LATITUDE/LONGITUDE: 41° 5' 4.0"/85° 1' 11.0" DRAINAGE: \*\*\*.sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE EAST HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 400meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 34.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>416</u>
TOTAL NUMBER OF TAXA PRESENT	<u>31</u>
NUMBER OF LARGE RIVER SPECIES	<u>3</u>
NUMBER OF DARTER SPECIES	<u>4</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>7</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>8</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>4</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>5</u>
NUMBER OF SENSITIVE SPECIES	<u>10</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>10.3%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>41.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>25.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>64.2%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>10.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>30.5%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>19.7%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91128 IDEM #: 91128.0

SITE: CEDAR CREEK COUNTY: ALLEN LOCATION: TOMKEL RD. (U/S & D/S) COLLECTION DATE: 22-Jul-199  
TIME: 1341hr LATITUDE/LONGITUDE: 41' 13" 11.0°/85' 4" 32.0° DRAINAGE: 270.0sq. miles  
SEGMENT: 18-CEDAR CREEK NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: CEDARVILLE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 200meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.60meters DISTANCE TO SHORE: 23.8meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>73</u>
TOTAL NUMBER OF TAXA PRESENT	<u>16</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>5</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>5</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>5</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>3</u>
NUMBER OF SENSITIVE SPECIES	<u>7</u>
NUMBER OF TOLERANT SPECIES	<u>3</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>1.4%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>43.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>8.2%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>91.8%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>37.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>28.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91129 IDEM #: 91129.0

SITE: ST. JOSEPH RIVER COUNTY: ALLEN LOCATION: MAIN RD. (D/S) COLLECTION DATE: 22-Jul-1991  
TIME: 1500hr LATITUDE/LONGITUDE: 41' 11" 51.0°/85' 1" 30.0° DRAINAGE: 763.5sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
COPMAP: CEDARVILLE HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 400meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 27.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>489</u>
TOTAL NUMBER OF TAXA PRESENT	<u>22</u>
NUMBER OF LARGE RIVER SPECIES	<u>2</u>
NUMBER OF DARTER SPECIES	<u>5</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>5</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>1</u>
NUMBER OF MINNOW SPECIES	<u>6</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>5</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>5</u>
NUMBER OF SENSITIVE SPECIES	<u>8</u>
NUMBER OF TOLERANT SPECIES	<u>6</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>4.7%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.2%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>81.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>61.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>31.5%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>7.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>17.4%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>11.5%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91130 IDEM #: 91130.0

SITE: ST. MARY'S RIVER COUNTY: ADAMS LOCATION: S.R. 224 (D/S & U/S) COLLECTION DATE: 23-Jul-199  
TIME: 900hr LATITUDE/LONGITUDE: 40' 50" 0.0°/84' 55" 19.0° DRAINAGE: 616.5sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: DECATUR HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 400meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 29.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>132</u>
TOTAL NUMBER OF TAXA PRESENT	<u>25</u>
NUMBER OF LARGE RIVER SPECIES	<u>4</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>8</u>
NUMBER OF SENSITIVE SPECIES	<u>5</u>
NUMBER OF TOLERANT SPECIES	<u>11</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>24.2%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>61.4%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>33.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>38.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>22.7%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>22.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>25.8%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91131 IDEM #: 91131.0

ITE: ST. MARY'S RIVER COUNTY: ADAMS LOCATION: C.R. 350W (U/S) COLLECTION DATE: 23-Jul-1991  
IME: 1105hr LATITUDE/LONGITUDE: 40' 53" 40.0°/95' 0" 30.0° DRAINAGE: 687.0sq. miles  
EGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
OPOMAP: FOE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 27.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>173</u>
TOTAL NUMBER OF TAXA PRESENT	<u>23</u>
NUMBER OF LARGE RIVER SPECIES	<u>3</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>4</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>8</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>1</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>2</u>
NUMBER OF SENSITIVE SPECIES	<u>4</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>4.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>48.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>26.0%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>63.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>7.5%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>37.0%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>21.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91132 IDEM #: 91132.0

SITE: ST. MARY'S RIVER COUNTY: ALLEN LOCATION: HOAGLAND ROAD (D/S) COLLECTION DATE: 23-Jul-199  
TIME: 1348hr LATITUDE/LONGITUDE: 40' 56" 14.0°/85' 5" 11.0° DRAINAGE: 738.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: POE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.10meters DISTANCE TO SHORE: 29.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>929</u>
TOTAL NUMBER OF TAXA PRESENT	<u>26</u>
NUMBER OF LARGE RIVER SPECIES	<u>4</u>
NUMBER OF DARTER SPECIES	<u>2</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>4</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>6</u>
NUMBER OF SENSITIVE SPECIES	<u>7</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>2.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>44.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>41.4%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>52.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>3.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>7.3%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>41.2%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN Ecoregion

TPS SAMPLE #: TS91133 IDEM #: 91133.0

SITE: WILBUR DITCH COUNTY: ALLEN LOCATION: KHLE ROAD (U/S) COLLECTION DATE: 24-Jul-1991  
TIME: 930hr LATITUDE/LONGITUDE: 41° 9' 34.0"/84° 54' 55.0" DRAINAGE: 5.1sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: GRAB1 HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.40meters DISTANCE TO SHORE: 3.5meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>169</u>
TOTAL NUMBER OF TAXA PRESENT	<u>14</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>3</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>7</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>78.1%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>33.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>26.6%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>2.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>76.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>4.1%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91134 IDEM #: 91134.0

SITE: BETTERN DITCH COUNTY: ALLEN LOCATION: EHLE ROAD (U/S) COLLECTION DATE: 24-Jul-199  
TIME: 1033hr LATITUDE/LONGITUDE: 41' 9" 29.0°/84' 57" 39.0° DRAINAGE: 4.8sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 6-BLACK SWAMP NATURAL REGION  
TOPOMAP: GRABII HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 50meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.10meters DISTANCE TO SHORE: 1.2meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>27</u>
TOTAL NUMBER OF TAXA PRESENT	<u>4</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>0</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>0</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>2</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>1</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>4</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>100.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>51.9%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>3.7%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>92.6%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>7.4%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91135 IDEM #: 91135.0

SITE: SIXMILE CREEK COUNTY: ALLEN LOCATION: PARENT ROAD BRIDGE (U/S) COLLECTION DATE: 24-Jul-1991  
TIME: 1111hr LATITUDE/LONGITUDE: 41° 6' 26.0"/84° 52' 33.0" DRAINAGE: 5.6sq. miles  
SEGMENT: 19-MAUMEE RIVER (MAIN STEM) NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: MAPLES HYDROLOGIC UNIT: 4100005-MAUMEE RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: LONGLINE NET MESH: 0.318cm SAMPLING DISTANCE: 65meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.20meters DISTANCE TO SHORE: 2.7meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>18</u>
TOTAL NUMBER OF TAXA PRESENT	<u>6</u>
NUMBER OF LARGE RIVER SPECIES	<u>0</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>1</u>
NUMBER OF SUNFISH SPECIES	<u>1</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>1</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>0</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>0</u>
NUMBER OF SENSITIVE SPECIES	<u>0</u>
NUMBER OF TOLERANT SPECIES	<u>3</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>77.8%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>5.6%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>88.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>5.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>72.2%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>0.0%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91137 IDEM #: 91137.0

SITE: ST. MARY'S RIVER COUNTY: ALLEN LOCATION: S.R. 469 (D/S) COLLECTION DATE: 25-Jul-199  
TIME: 840hr LATITUDE/LONGITUDE: 40° 59' 4.0°/85' 5" 45.0° DRAINAGE: 740.5sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: POE HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 300meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.80meters DISTANCE TO SHORE: 21.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>234</u>
TOTAL NUMBER OF TAXA PRESENT	<u>24</u>
NUMBER OF LARGE RIVER SPECIES	<u>3</u>
NUMBER OF DARTER SPECIES	<u>3</u>
NUMBER OF MADTOM SPECIES	<u>0</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>3</u>
NUMBER OF SUNFISH SPECIES	<u>2</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>6</u>
NUMBER OF SENSITIVE SPECIES	<u>5</u>
NUMBER OF TOLERANT SPECIES	<u>9</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>2.6%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>57.7%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>52.1%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>38.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>5.6%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>23.9%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>33.3%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91138 IDEM #: 91138.0

SITE: ST. MARY'S RIVER COUNTY: ALLEN LOCATION: S.R. 1 (D/S) COLLECTION DATE: 25-Jul-1991  
TIME: 1103hr LATITUDE/LONGITUDE: 41' 1" 45.0°/85' 8" 52.0° DRAINAGE: 780.0sq. miles  
SEGMENT: 21-ST. MARYS RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE WEST HYDROLOGIC UNIT: 4100004-ST. MARY'S RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 500meters  
VOLTS: 300 DC CAPTURE DEPTH: < 0.90meters DISTANCE TO SHORE: 34.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>239</u>
TOTAL NUMBER OF TAXA PRESENT	<u>30</u>
NUMBER OF LARGE RIVER SPECIES	<u>3</u>
NUMBER OF DARTER SPECIES	<u>1</u>
NUMBER OF MADTOM SPECIES	<u>1</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>2</u>
NUMBER OF SUNFISH SPECIES	<u>6</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>8</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>3</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>5</u>
NUMBER OF SENSITIVE SPECIES	<u>8</u>
NUMBER OF TOLERANT SPECIES	<u>10</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>5.4%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>23.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>11.3%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>74.9%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>8.8%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>12.1%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>51.5%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
OFFICE OF WATER MANAGEMENT  
BIOLOGICAL STUDIES SECTION

FISH COMMUNITY IBI DEVELOPMENT DATA  
HURON-ERIE LAKE PLAIN ECOREGION

TPS SAMPLE #: TS91139 IDEM #: 91139.0

SITE: ST. JOSEPH RIVER COUNTY: ALLEN LOCATION: JOHNNY APPLESEED PARK COLLECTION DATE: 25-Jul-199  
TIME: 1345hr LATITUDE/LONGITUDE: 41' 6" 45.0°/85' 7" 2.0° DRAINAGE: \*\*\*.sq. miles  
SEGMENT: 20-ST. JOSEPH RIVER NATURAL REGION CODE: 5C-BLUFFTON TILL PLAIN SECTION  
TOPOMAP: FORT WAYNE EAST HYDROLOGIC UNIT: 4100003-ST. JOSEPH RIVER BASIN (MAUMEE RIVER BASIN)

GEAR: SPORT YAK II NET MESH: 0.318cm SAMPLING DISTANCE: 500meters  
VOLTS: 300 DC CAPTURE DEPTH: < 1.20meters DISTANCE TO SHORE: 38.0meters

TOTAL NUMBER OF INDIVIDUALS COUNTED	<u>730</u>
TOTAL NUMBER OF TAXA PRESENT	<u>33</u>
NUMBER OF LARGE RIVER SPECIES	<u>4</u>
NUMBER OF DARTER SPECIES	<u>5</u>
NUMBER OF MADTOM SPECIES	<u>2</u>
NUMBER OF SCULPIN SPECIES	<u>0</u>
NUMBER OF DARTER/MADTOM/SCULPIN SPECIES	<u>7</u>
NUMBER OF SUNFISH SPECIES	<u>4</u>
NUMBER OF HEADWATER SPECIES	<u>0</u>
NUMBER OF MINNOW SPECIES	<u>7</u>
NUMBER OF ROUND BODY SUCKER SPECIES	<u>5</u>
NUMBER OF SUCKER FAMILY SPECIES	<u>7</u>
NUMBER OF SENSITIVE SPECIES	<u>15</u>
NUMBER OF TOLERANT SPECIES	<u>8</u>
PROPORTION OF LARGE RIVER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.8%</u>
PROPORTION OF HEADWATER SPECIES INDIVIDUALS TO TOTAL COUNT	<u>0.0%</u>
PROPORTION OF TOLERANTS TO TOTAL COUNT	<u>43.0%</u>
PROPORTION OF OMNIVORES TO TOTAL COUNT	<u>39.7%</u>
PROPORTION OF INSECTIVORES TO TOTAL COUNT	<u>55.3%</u>
PROPORTION OF CARNIVORES TO TOTAL COUNT	<u>4.4%</u>
PROPORTION OF PIONEERS TO TOTAL COUNT	<u>10.3%</u>
PROPORTION OF SIMPLE LITHOPHILS TO TOTAL COUNT	<u>46.2%</u>
PERCENT D.E.L.T. ANOMOLIES	<u>0.0%</u>



**APPENDIX C. Fish nomenclature changes for the species of fish occurring within the political boundaries of Indiana.**

	<b>Previous Nomenclature</b>
<b>Petromyzontiformes - lampreys</b>	
<b>Petromyzontidae - lamprey</b>	
<i>Lampetra appendix</i> (DeKay), American brook lamprey	<i>Lampetra lamottei</i>
<b>Lepisosteiformes - gars</b>	
<b>Lepisosteidae - gars</b>	
<i>Atractosteus spatula</i> (Lacepede), alligator gar	<i>Lepisosteus spatula</i>
<b>Salmoniformes - trout, salmon, whitefish</b>	
<b>Salmonidae - trout, salmon, whitefish</b>	
<i>Oncorhynchus mykiss</i> Walbaum, rainbow trout	<i>Salmo gairdneri</i>
<b>Cypriniformes - carps and minnows</b>	
<b>Cyprinidae -carps and minnows</b>	
<i>Campostoma oligolepis</i> Hubbs and Greene, largescale stoneroller	previously considered <i>Campostoma anomalum pullum</i>
<i>Cyprinella lutrensis</i> (Baird and Girard), red shiner	<i>Notropis lutrensis</i>
<i>Cyprinella spiloptera</i> Cope, spotfin shiner	<i>Notropis spiloptera</i>
<i>Cyprinella whipplei</i> (Girard), steelcolor shiner	<i>Notropis whipplei</i>
<i>Erimystax dissimilis</i> Kirtland, streamline chub	<i>Hybopsis dissimilis</i>
<i>Erimystax x-punctata</i> Hubbs and Crowe, gravel chub	<i>Hybopsis x-punctata</i>
<i>Extrarius aestivalis</i> Girard, speckled chub	<i>Hybopsis aestivalis</i>
<i>Hybopsis amnis</i> Hubbs and Greene, pallid shiner	<i>Notropis amnis</i>
<i>Luxilus chrysocephalus</i> (Rafinesque), striped shiner	<i>Notropis chrysocephalus</i>
<i>Luxilus cornutus</i> (Mitchell), common shiner	<i>Notropis cornutus</i>
<i>Lythrurus ardens</i> (Cope), rosefin shiner	<i>Notropis ardens</i>
<i>Lythrurus fumeus</i> Evermann, ribbon shiner	<i>Notropis fumeus</i>
<i>Lythrurus umbratilis</i> (Girard), redfin shiner	<i>Notropis umbratilis</i>
<i>Macrhybopsis storeriana</i> (Kirkland), silver chub	<i>Hybopsis storeriana</i>
<i>Notropis ludibuundus</i> Cope, sand shiner	<i>Notropis stramineus</i>
<i>Opsopoeodus emiliae</i> Hay, pugnose minnow	<i>Notropis emiliae</i>
<b>Siluriformes - bullhead and catfish</b>	
<b>Ictaluridae - bullhead and catfish</b>	
<i>Ameiurus catus</i> (Linnaeus), white catfish	<i>Ictalurus catus</i>
<i>Ameiurus melas</i> (Rafinesque), black bullhead	<i>Ictalurus melas</i>
<i>Ameiurus natalis</i> (Lesueur), yellow bullhead	<i>Ictalurus natalis</i>
<i>Ameiurus nebulosus</i> (Lesueur), brown bullhead	<i>Ictalurus nebulosus</i>
<b>Atheriniformes - topminnows, silversides</b>	
<b>Fundulidae - topminnows</b>	
<b>Perciformes - basses, sunfish, perch, darters</b>	previously Cyprinodontidae
<b>Moronidae - temperate basses</b>	previously Percichthyidae
<i>Morone chrysops</i> (Rafinesque), white bass	
<i>Morone mississippiensis</i> Jordan and Eigenmann, yellow bass	
<i>Morone saxatilis</i> (Walbaum), striped bass	
<b>Elassomatidae - pygmy sunfish</b>	previously Centrarchidae
<i>Elassoma zonatum</i> Jordan, banded pygmy sunfish	
<b>Percidae - perches and darters</b>	
<i>Crystallaria asprella</i> Jordan, crystal darter	<i>Ammocrypta asprella</i>

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

<b>1. AGENCY USE ONLY (Leave blank)</b>	<b>2. REPORT DATE</b> December 1994	<b>3. REPORT TYPE AND DATES COVERED</b> Final	
<b>4. TITLE AND SUBTITLE</b> Development of Index of Biotic Integrity Expectations for the Ecoregions of Indiana. II. Huron-Erie Lake Plain		<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> Thomas P. Simon		<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> EPA 905/R-92-007	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> U.S. Environmental Protection Agency, Region 5 Water Division Watershed and Non-Point Source Branch 77 West Jackson Boulevard, WW-16J Chicago, Illinois 60604		<b>10. SPONSORING / MONITORING AGENCY REPORT NUMBER</b>	
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> same as # 7		<b>11. SUPPLEMENTARY NOTES</b> Prepared in cooperation with the Indiana Department of Environmental Management, Surveillance and Standards Branch	
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b>  UNLIMITED		<b>12b. DISTRIBUTION CODE</b>  UNLIMITED	
<b>13. ABSTRACT (Maximum 200 words)</b> The Maumee River drainage was investigated during 1992 to determine water resource expectations for headwater and wadable streams. A total of 77 sites were sampled within three watersheds to develop and calibrate an Index of Biotic Integrity for use in the Indiana portion of the watershed. Maximum species richness lines were developed for streams less than 2000 mi <sup>2</sup> drainage area. The Maumee River possesses a highly skewed IBI indicating lower extremes in water resource integrity in the headwater streams. The St. Joseph River draiange had the highest integrity of the three watersheds. Site specific data including an evaluation of fish community trends, tolerance, classifications, trophic and reproductive guilds are included.			
<b>14. SUBJECT TERMS</b> Maumee River, St. Joseph River, St. Marys River, biological criteria, IBI, fish community structure, Indiana			<b>15. NUMBER OF PAGES</b> 68 + appendices
			<b>16. PRICE CODE</b>
<b>17. SECURITY CLASSIFICATION OF REPORT</b> UNCLASSIFIED	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> UNCLASSIFIED	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> UNCLASSIFIED	<b>20. LIMITATION OF ABSTRACT</b> SAR