Elkhart Public Works & Utilities
Fish Community Monitoring

Annual Report
2001

City of Elkhart
The city with a heart

David L. Miller, Mayor

Cover Photo: Taken during a public demonstration at Rhapsody in Green 2001 by Brett Cochran.

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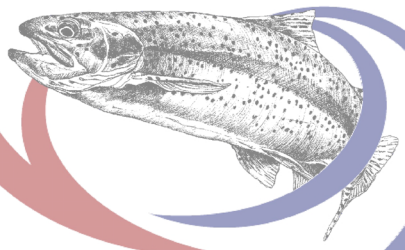
ELKHART - SOUTH BEND



STREAM SURVEY TEAM

ANNUAL REPORT

Fish Community Monitoring in Elkhart and St. Joseph Counties on the St. Joseph River and Selected Tributaries, 2001.

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INTRODUCTION

In 1972, the Clean Water Act was established with a primary objective, "to restore and maintain the chemical, physical and biological integrity of the nation's waters." Unfortunately, only chemical and physical studies were done until recently because they were easier to understand and measure (Davis 1999). Likewise, for many years municipalities such as Elkhart and South Bend have been required, through their NPDES (National Pollutant Discharge Elimination System) permits, to monitor chemical and microbiological levels of the rivers and streams to which they have any regulated discharges, but are not required to directly measure the integrity of the biological communities that inhabit the receiving waters. The chemical and microbiological monitoring is done in an effort to protect the public *and* the aquatic communities that inhabit these waters, to determine the water quality in these areas, and to document the chemical and microbial contributions these discharges make to these streams. While conventional monitoring is good at identifying the chemical and microbial components of the water being tested and may help protect the public, it provides little information about the condition of the aquatic communities that it is also intended to protect. Alone, chemical and microbial monitoring is not an effective indicator of aquatic community health and provides limited insight to overall water quality.

To get a better idea of the impacts discharges may have on a stream, or what impact various land uses have in a stream's watershed, a two-tiered sampling approach has been found to be most effective in monitoring and determining water quality in aquatic systems and protecting aquatic communities (Craddock 1990, Ohio EPA 1988). These approaches use conventional monitoring coupled with biological monitoring, sampling of the actual aquatic communities. It is important to remember that conventional monitoring can only reveal the chemical and microbial levels of the water at the time the sample is collected. The sporadic presence of a biologically harmful substance could easily go undetected by conventional monitoring alone. Since the aquatic communities are present 24 hours a day, seven days a week, they are the overall product of the chemical and physical interactions in these aquatic systems and, hence, are the best indicators of the water quality in a given area. The drawback to biological monitoring, however, is it merely indicates when there is a problem. Since conventional monitoring can identify any problem chemical(s) and help pinpoint sources of contamination, it is best to use both monitoring strategies to provide the greatest amount of protection for the public and aquatic communities.

With this knowledge, the City of Elkhart began the second step in its monitoring activities by sampling the fish communities of the St. Joseph and Elkhart Rivers and their tributaries in and around Elkhart during the summers of 1998-2000. Core (Index) stations were sampled annually in an effort to establish baseline information that will allow the City to document the condition of the fish communities over time. This baseline of information will also reveal what impact an urban environment like Elkhart has on the rivers and streams that flow through it, and should identify any problem areas. The tool that will be used to assess the water quality using the fish community information is the Index of Biotic Integrity (IBI) as modified by Thomas Simon (1997). This index was developed by James Karr (1981), and is most useful in translating complex fish community information into a more understandable format for non-biologists. In simplest terms, the IBI acts as a biological indicator much like the DOW Industrial Average acts as an economic indicator (Karr 1996) and it provides a method to track the trends in fish community condition over time. It is comprised of three broad categories (species composition, trophic composition, and fish condition) which are broken down into 12 smaller categories known as metrics (Appendix A) to assess fish communities. These metrics are each given a score of 1 (low), 3, or 5 (high), and the total score for a site is in the range of 12 to 60. These scores can then be graphed and placed into one of five categories which describes the overall condition of the fish communities. Since it is assumed that the condition of the fish communities is a reflection of the water quality in a given area, Elkhart will be able to effectively track water quality conditions over time.

In the fall of 2000, the City of South Bend expressed an interest in a cooperative fish community study on the St. Joseph River with the City of Elkhart. South Bend had observed how the 1998-2000 fish community information was being put to use by Elkhart and determined that similar information from their area would be helpful. Likewise, Elkhart felt additional biological information would prove useful on future projects dealing with the St. Joseph River watershed. In February of 2001, an interlocal agreement was signed between the two cities. This agreement established that the City of South Bend would compensate the City of Elkhart for collecting fish community information from the St. Joseph River and two of its tributaries in the South Bend area.

In addition to determining the water quality in the St. Joseph River and some of its tributaries, sampling was also conducted to determine the overall diversity of the fish species in the Elkhart and South Bend areas. A fish tagging program that included smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*) and walleye (*Stizostedion vitreum*) collected during biological monitoring activities was also continued. This tagging effort will assist the Indiana Department of Natural Resources (IDNR) in determining the movement patterns of walleye and alert anglers to Elkhart and South Bend's monitoring activities. Scale samples were also taken from all walleye, smallmouth and largemouth bass over 75 mm in length for age and growth analysis. The scale data will be made available as an additional report at a later date. Finally, tissue from twelve species of fish was sampled and analyzed for mercury and PCB (polychlorinated biphenyl) content. This information was added to the existing tissue data that Elkhart has collected to compare to the state's Fish Consumption Advisory (FCA) for the St. Joseph and Elkhart Rivers and Juday Creek. Presently several species are on this advisory (Table 1) and the cities want to contribute additional information to the existing state database so the most accurate and thorough advisory possible can be issued.

METHODS

To quickly identify the majority of fish species present and to determine water quality levels in the St. Joseph River and its tributaries, two sampling approaches were utilized. Investigative sites were sampled only once and all fish collected at these sites were identified to species, the largest and smallest of each species were measured to the nearest millimeter (mm), the fish were counted, and then released. Index sites, on the other hand, were sampled twice during the summer with a five-week interval between samples, and the length of the sample area was dependent on the stream's width. The length of these sites was 15 times the stream's width with a minimum length of 50 meters and a maximum length of 500 meters. Fish collected at index sites were studied more extensively. These fish were also identified to species and then processed in one of two ways. First, game fish (smallmouth bass, rock bass, bluegill, etc.)

Table 1: Fish consumption information taken from the 2001 Indiana Fish Consumption Advisory

Location	Species	Fish Size (inches)	Contaminant	Group
Elkhart River *Elkhart County*	Rock Bass	7-9	■○	2
		9+	■○	3
	Smallmouth Bass	12+	■○	2
	White Sucker	13-16	■○	2
St. Joseph River *Elkhart County*	Black Redhorse	13-17	○	2
		17+	○	3
	Channel Catfish	16-17	■	2
		20-24	■	3
		25-26	■	4
		26+	■	**5**
	Golden Redhorse	15-17	■○	2
		18-24	■○	3
		25+	■○	4
	Largemouth Bass	11-12	○	2
		12+	○	3
	Rock Bass	7-9	■	3
		9+	■	4
	Shorthead Redhorse	14-17	■	3
		17+	■○	4
	Smallmouth Bass	10+	■○	3
	Walleye	16-17	○	3
		17+	○	4
St. Joseph River *St. Joseph County*	Black Redhorse	14-17	■○	3
		17+	■○	4
	Carp	**20+**	■○	**5**
	Channel Catfish	22+	■○	4
	Golden Redhorse	13-22	■	3
		22+	■	4
	Largemouth Bass	15-16	■○	3
		16-18	■○	4
		18+	■○	**5**
	Shorthead Redhorse	15-19	■○	3
		19+	■○	4
	Smallmouth Bass	7-9	■○	2
		9+	■○	3
	Steelhead	25-26	■	3
		26+	■	4
	Quillback	18+	■	3
	White Sucker	14-16	■	3
		16+	■	4
Juday Creek *St. Joseph County*	White Sucker	12-17	■	2
		17+	■	3

○ = Mercury ■ = PCBs

Group 2 = 1 meal/week
Group 3 = 1 meal/month
Group 4 = 1 meal/2 months
Group 5 = DO NOT EAT

(Special restrictions apply to women and children. See advisory.)

Shaded areas denote changes from/additions to the 2000 Advisory

were measured by length to the nearest millimeter, individually weighed to the nearest gram (g), and then released. Non-game fish (suckers, darters, minnows, etc.) were counted, the largest and smallest of each species were measured to the nearest millimeter, species were mass weighed to the nearest gram, and then released. This index/investigative sampling strategy allows for the maximum number of streams and sites to be sampled in the limited amount of time available during the summer. Investigative sites were generally sampled for a shorter distance (less than 15 times the stream width) and game fish other than bass and walleye that were individually measured at index sites were not weighed at these sites. These two differences in sampling and processing allowed for two investigative sites to be sampled in a day versus one index site. Additionally, if a specimen of a species had not been previously retained from a site for the Public

Works & Utilities specimen museum, then a single specimen of the smaller species was retained and larger specimens were photographed. This practice allows for the verification of the field and lab identifications if needed.

In 2001, 18 index and 21 investigative sites were sampled in Elkhart County and 9 index and 7 investigative sites were sampled in St. Joseph County (Figure 1 and Table 2). Since a strong baseline of information had been established at the index sites that were sampled in Elkhart from 1998 to 2000, these sites were not revisited unless they had only been sampled for two consecutive years. New index and investigative sites were selected on most of the Elkhart streams to provide additional information on previously unsampled stretches of these streams. In South Bend, United States Geological Survey quadrangle maps and road maps were used to identify bridge crossings on Juday and Bowman Creeks. A visual survey of 15 locations on these creeks and a boat survey of the St. Joseph River throughout South Bend were then completed to identify the index and investigative sites to be sampled from 2001 to 2003. Index sites were sampled twice with at least a five week "rest" period between visits, and investigative sites were generally sampled only once. IBI scores were calculated for every index site visit and then the scores for the two visits at each site were averaged to calculate the annual score.

All sites were sampled utilizing either backpack, tote barge, or boat mounted electrofishing gear. The type of equipment used depended on the depth of the stream. For the smallest streams that would not accommodate the tote barge equipment, the battery powered backpack unit was used. If the stream was larger and wadeable for at least 80-90% of the area to be sampled, the tote barge equipment was used. All other areas were sampled utilizing the boat equipment. Power output of the three types of equipment varied. The backpack output was 0.5-1.5 amperes, the tote barge was 4-6 amperes, and the boat was 8-16 amperes.

Smallmouth bass greater than 10 inches, walleye greater than 12 inches and largemouth bass greater than 14 inches in length also had an anchor tag applied under the left anterior edge of the dorsal fin (Figure 2). This tag was yellow in color and contained Elkhart Public Works & Utilities' phone number and a unique tag number. In addition to being tagged, the right pelvic fin of these fish was clipped to alert Public Works personnel to fish that had been tagged, but had shed the tag. The biggest advantage of this tagging study is its ability to reveal important movement patterns of these fish and help the IDNR in its walleye stocking efforts on the St. Joseph River. If the success of this stocking program continues and grows, it could provide the local economy with additional revenue from non-local sport anglers pursuing walleye in the area.

Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties, 2001

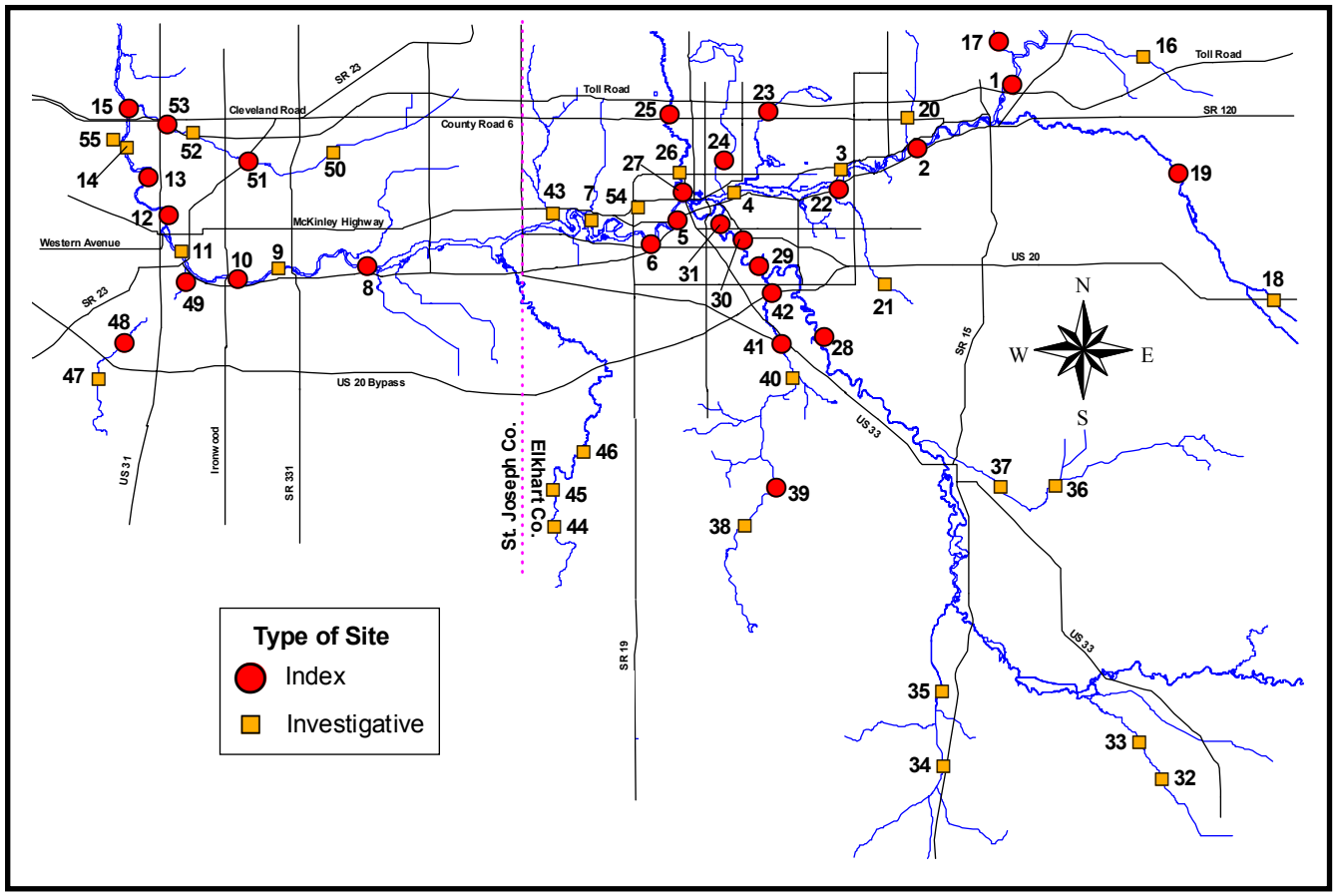


Table 2: Sites sampled, the method used to sample each, and their IBI score (index sites only)

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores 1999	2000	2001	Average
1	Toll Road (Bristol) St. Joseph River	Index Elkhart	Boat			47	
2	Nibbyville (A) St. Joseph River	Index Elkhart	Boat			51	
3	Six-Span (B) St. Joseph River	Investigative Elkhart	Boat				
4	Martin's Landing St. Joseph River	Investigative Elkhart	Boat				
5	Lexington Avenue St. Joseph River	Index Elkhart	Boat			51	
6	McNaughton Park St. Joseph River	Index Elkhart	Boat			44	
7	Riverdale-Oak Manor St. Joseph River	Investigative Elkhart	Boat				
8	Capital Avenue St. Joseph River	Index St. Joseph	Boat			43	
9	Kamm Island St. Joseph River	Investigative St. Joseph	Boat				
10	Ironwood Drive St. Joseph River	Index St. Joseph	Boat			45	
11	Jefferson Boulevard St. Joseph River	Investigative St. Joseph	Boat				
12	Michigan Street St. Joseph River	Index St. Joseph	Boat			44	
13	Keller Park St. Joseph River	Index St. Joseph	Boat			51	
14	Pinhook Park St. Joseph River	Investigative St. Joseph	Boat				
15	Darden Road St. Joseph River	Index St. Joseph	Boat			50	
16	County Road 35 York Township Ditch	Investigative Elkhart	Back Pack				
17	County Road 2 Trout Creek	Index Elkhart	Tote Barge	51	50	52	**51**
18*	US 20 Little Elkhart River	Investigative Elkhart	Tote Barge				
19*	County Road 10 Little Elkhart River	Index Elkhart	Tote Barge	43	38	42	**41**
20*	County Road 6 Washington Township Ditch	Investigative Elkhart	Tote Barge				
21*	County Road 18 Pine Creek	Investigative Elkhart	Tote Barge				
22*	SR 120 Pine Creek	Index Elkhart	Tote Barge			41	
23*	Reedy Drive Puterbaugh Creek	Index Elkhart	Tote Barge			33	
24	Reckell Avenue Lily Creek	Index Elkhart	Back Pack	32	38	33	**34**
25	County Road 6 Christiana Creek	Index Elkhart	Tote Barge			47	
26	Bristol St. (A) Christiana Creek	Investigative Elkhart	Tote Barge				
27	N. Main Well Field Christiana Creek	Index Elkhart	Tote Barge			43	
28	Oxbow Park (B) Elkhart River	Index Elkhart	Boat			51	
29	Elkhart Environmental Center (A) Elkhart River	Index Elkhart	Boat			51	
30	Studebaker Park (A) Elkhart River	Index Elkhart	Boat			46	

Table 2 (continued)

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores 1999	2000	2001	Average
31	Central High School Elkhart River	Index Elkhart	Boat			44	
32*	County Road 50 Solomon Creek	Investigative Elkhart	Tote Barge				
33*	County Road 48 Solomon Creek	Investigative Elkhart	Tote Barge				
34	County Road 50 Turkey Creek	Investigative Elkhart	Tote Barge				
35	County Road 46 Turkey Creek	Investigative Elkhart	Tote Barge				
36	County Road 34 Rock Run Creek	Investigative Elkhart	Tote Barge				
37	Monroe Street Rock Run Creek	Investigative Elkhart	Tote Barge				
38	County Road 36 Yellow Creek	Investigative Elkhart	Tote Barge				
39	County Road 32 Yellow Creek	Index Elkhart	Tote Barge	34	37	36	**36**
40	County Road 26 Yellow Creek	Investigative Elkhart	Tote Barge				
41	Concord High School Yellow Creek	Index Elkhart	Tote Barge			32	
42	US 20 Bypass Yellow Creek	Index Elkhart	Tote Barge	43	29	28	**36**
43*	Elkhart Conservation Club Cobus Creek	Investigative Elkhart	Tote Barge				
44	County Road 36 Baugo Creek	Investigative Elkhart	Tote Barge				
45	County Road 32 Baugo Creek	Investigative Elkhart	Tote Barge				
46	County Road 30 Baugo Creek	Investigative Elkhart	Tote Barge				
47	Jackson Road Bowman Creek	Investigative St. Joseph	Tote Barge				
48	Chippewa Bowman Creek	Index St. Joseph	Tote Barge			13	
49	Ravina Park Bowman Creek	Index St. Joseph	Back Pack			12	
50*	Douglas Road Juday Creek	Investigative St. Joseph	Tote Barge				
51*	SR 23 Juday Creek	Index St. Joseph	Tote Barge			27	
52*	Kintz Avenue Juday Creek	Investigative St. Joseph	Tote Barge				
53*	Myrtle Street Juday Creek	Index St. Joseph	Tote Barge			21	
54	Gravel Pit Hayden Park	Investigative Elkhart	Boat				
55	Pond Pinhook Park	Investigative St. Joseph	Boat				

Lastly, tissue in the form of fillets was collected from common carp (*Cyprinus carpio*), smallmouth bass, largemouth bass, bluegill (*Lepomis macrochirus*), rock bass (*Ambloplites rupestris*), walleye, steelhead (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), golden redhorse (*Moxostoma erythrurum*), black redhorse (M. *duquesnei*), shorthead redhorse (*M. macrolepidotum*), quillback (*Carpiodes cyprinus*), and white sucker (*Catostomus commersoni*) from July through September. The tissue samples were collected from three sites on the Elkhart River, one site on Juday Creek, one park pond, and nine sites on the St. Joseph River (Table 3 & Figure 3). Each tissue sample sent in for analysis was a composite of tissue from three fish of the same species at the given site or area. The samples were collected following the procedures in Appendix B (this report) and Appendix III in "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (1993).

Figure 2: Location of tag on fish

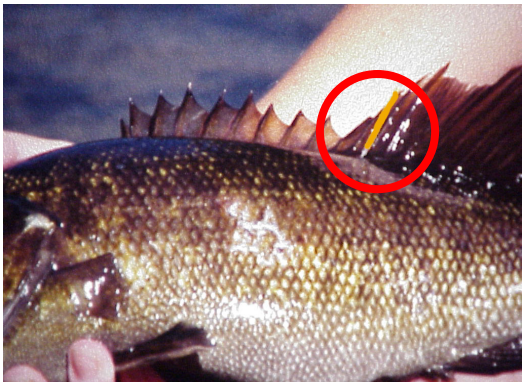
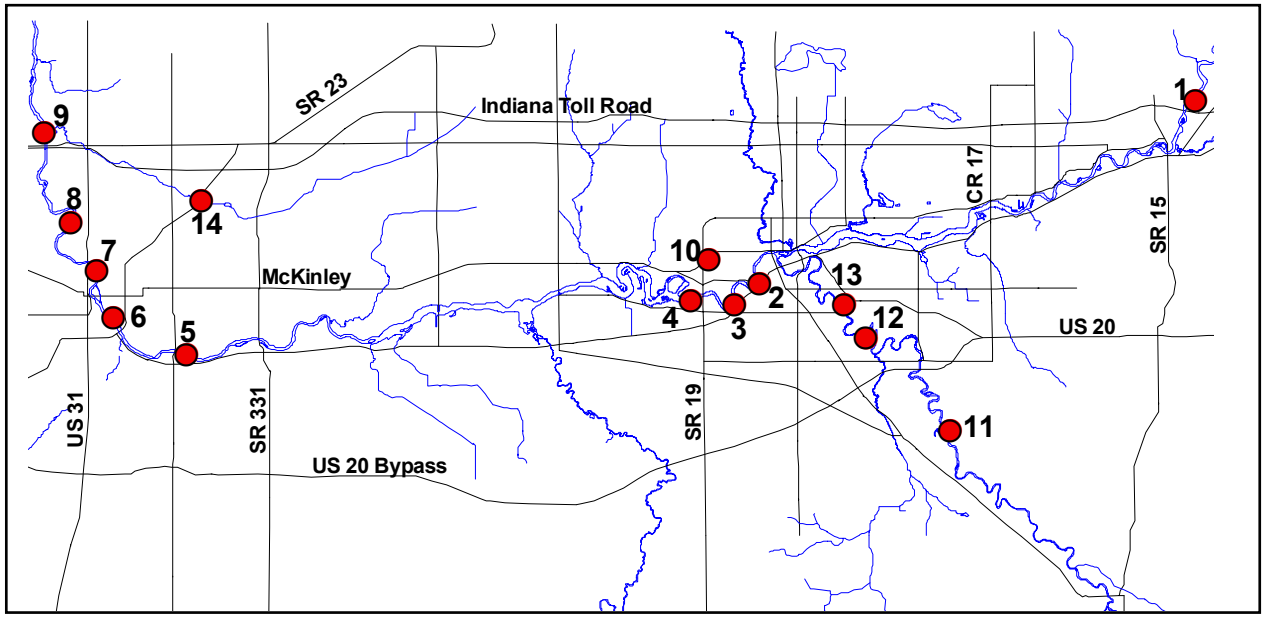


Table 3: Fish tissue sites

Site Number	Stream	Station
1	St. Joseph River	Toll Road (Bristol)
2	St. Joseph River	Lexington Avenue
3	St. Joseph River	McNaughton Park
4	St. Joseph River	Nappanee Street
5	St. Joseph River	Ironwood Drive
6	St. Joseph River	Jefferson Blvd.
7	St. Joseph River	Michigan Street
8	St. Joseph River	Keller Park
9	St. Joseph River	Darden Road
10	Hayden Park	Pond
11	Elkhart River	Oxbow Park (B)
12	Elkhart River	EEC (A)
13	Elkhart River	Studebaker Park
14	Juday Creek	SR 23

Figure 3: Location of fish tissue sites



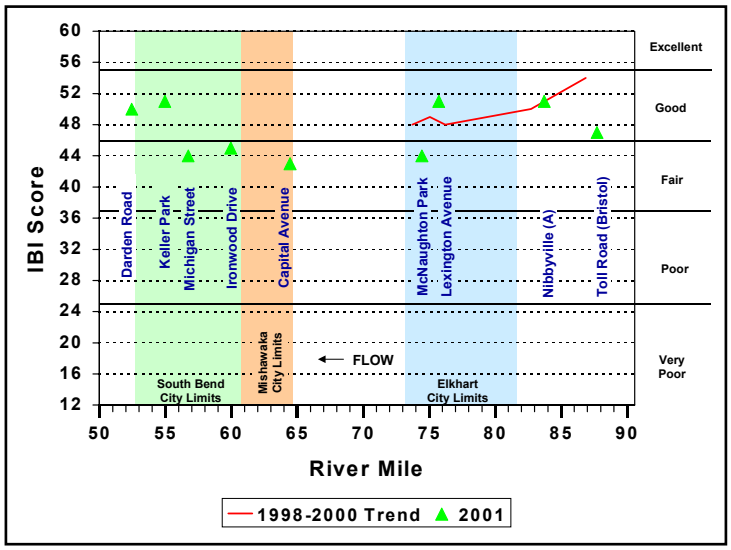
RESULTS & DISCUSSION

During the summer of 2001 a total of 25,655 fish were collected in Elkhart County and 6,430 fish were collected in St. Joseph County (Appendix C). In Elkhart County these fish represented 67 species in 15 families of fish and added no additional species to the list of 76 species found through 2000 in the county. In St. Joseph County, the fish collected represented 51 species from 12 families. In all, 69 species were collected from the two counties. Smallmouth bass, longear sunfish (*Lepomis megalotis*), and mimic shiner (*Notropis volucellus*) were the top three species collected in St. Joseph County, while white sucker, creek chub (*Semotilus atromaculatus*), and blacknose dace (*Rhinichthys atratulus*) were the top three species found in Elkhart County.

INDICIES

Table 2 summarizes the IBI scores for all the sites sampled in 2001. These scores ranged from a low of 12 (very poor) at Ravina Park on Bowman Creek to a high of 52 (good) at County Road 2 on Trout Creek. Keep in mind that water quality *and* available habitat affect the condition of the fish communities. To account for habitat effects on the fish communities, habitat will also be assessed at the index sites beginning in 2002. It is also important to note that the IBI scores for the St. Joseph River (drainage basin >2,000 square miles) are only approximate because the metrics that were used were developed for rivers and streams in this area that have a drainage basin <1,000 square miles. When metrics are developed for the larger St. Joseph River, all previously collected information will be used to recalculate a more accurate IBI score. Index sites also could not be established in the impounded areas of the St. Joseph River because the IBI metrics were developed for flowing waters. The fish communities found in impounded areas (more bass and sunfish, fewer suckers and redhorse) are more similar to what would be found in a lake than in a naturally flowing river.

Figure 4: IBI scores for the St. Joseph River, Elkhart and St. Joseph Counties



The longitudinal trends in IBI scores on the St. Joseph River (Figure 4) as it flows through Indiana are starting to unfold. A baseline for comparison has been established around Elkhart (1998-2000 trend line) and a single year's worth of information reveals an interesting pattern in St. Joseph County. In most instances IBI scores are higher at sites located above urban areas and begin to fall as a stream flows through these populated zones. The multitude of impacts (ie. bridges, street run-off, combined sewer overflows, seawalls, lawn fertilizers, etc.) that are found in urban areas creates this trend in IBI scores. In St. Joseph County just the opposite has occurred. Personal observations noted differences in available habitat at the lower scoring sites versus the higher scoring ones. Likewise, the new uppermost site in Elkhart County scored lower than expected, but had fairly uniform and less diverse habitat. If the habitat assessments in 2002 do not provide additional information to explain these unusual trends, then more intense water chemistry and sediment monitoring will be needed to determine if a contaminate is the cause. As improvements are also made in adjacent land-use practices and new technologies allow for cleaner effluents from all sources, ideally IBI scores at sites within and above our urban areas will become more equivalent and consistently reflect good to excellent fish community health.

The 2001 IBI scores for the Elkhart River closely follow the trend that was mapped from 1998-2000 (Figure 5). This typical urban impact trend does not reflect the fish communities are in trouble, but does reveal there is room for improvement. Better land stewardship activities and environmentally friendly approaches to stream bank stabilization will greatly help this river.

Juday Creek, Bowman Creek, Yellow Creek, and Christiana Creek each had 2 or more index sites sampled in 2001 so a longitudinal view of these streams will compare the results. Five additional streams in Elkhart County each had a single index site that was sampled (Table 2) and comparisons on these streams will address the stream as a whole.

Juday Creek and Bowman Creek in St. Joseph County are very different from one another, yet reflect similar IBI scores (Figure 6). Juday Creek is a cool/cold water stream that supports trout, while Bowman Creek is much warmer and heavily impacted by the urban environment it flows through. Both drain agricultural and urban lands. The IBI scores on these creeks follow the typical trend of higher scores at sites above than at sites within the urban area. Juday Creek's water temperature plays a big role in its lower IBI scores, however, because the IBI modification used to assess these sites was developed for warmwater streams. Cool/cold water streams tend to have fewer fish and not as many species as warmwater streams and thus generally score lower when assessed with a warmwater IBI. For now, the currently used IBI modification will be used to document any drastic changes over time. Once a cool/cold water IBI is developed or located, the data collected from Juday

Figure 5: IBI scores for the Elkhart River, Elkhart County

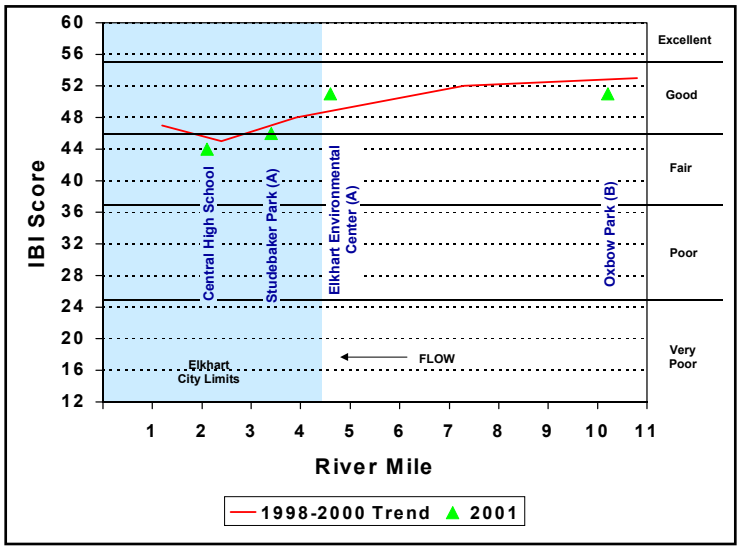
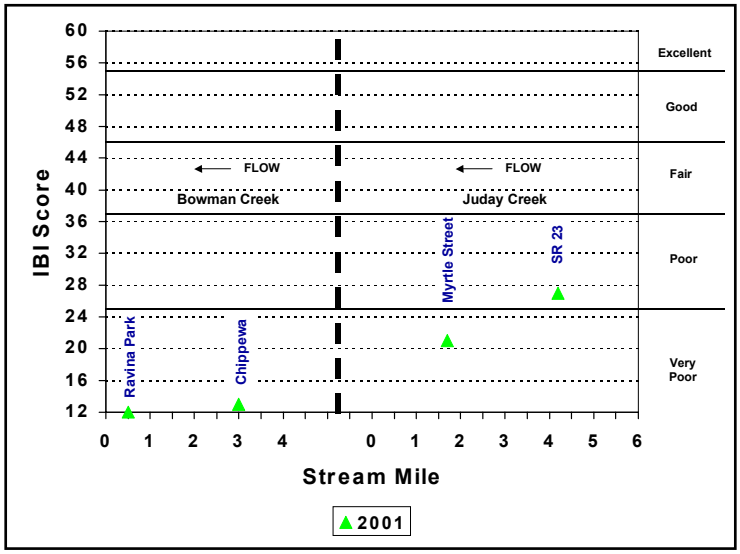


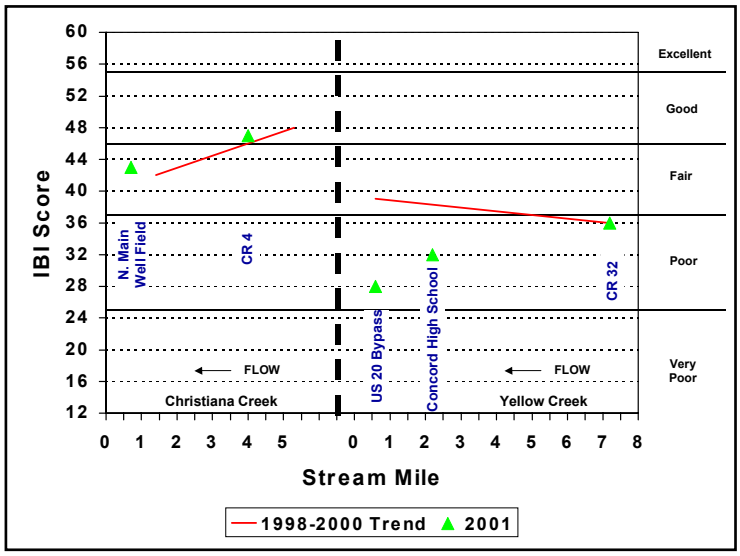
Figure 6: IBI scores for Bowman Creek and Juday Creek, St. Joseph County



Creek will be used to recalculate a more accurate IBI score. Bowman Creek is smaller than Juday Creek and has been buried in concrete pipes or tunnels for much of its length within the city limits of South Bend. This serious habitat modification greatly limits the fish species found in the areas like Ravina Park where the stream is above ground. The Chippewa site, however, is upstream of the buried sections in a wooded area and it also scores very low. Historical disturbances may have eliminated most of the fish from this area of the stream and recolonization would have been very limited to nonexistent from a downstream direction due to the urban modifications just described. Additional sampling will help determine if this year's data is a true reflection of the fish community in this stream.

The new index site scores on Christiana Creek followed the baseline trend quite well (Figure 7). The "signature" of the urban impact is easily seen as the creek flows into the city limits. This stream is impacted in general by the presence of seawalls and septic systems, absence of buffer zones (unmowed grass or uncut forest), and the application of lawn fertilizers up to its edge. The IBI scores continue to show good biological integrity in the upper reaches of Christiana Creek and only a slight decrease as the stream enters the city limits.

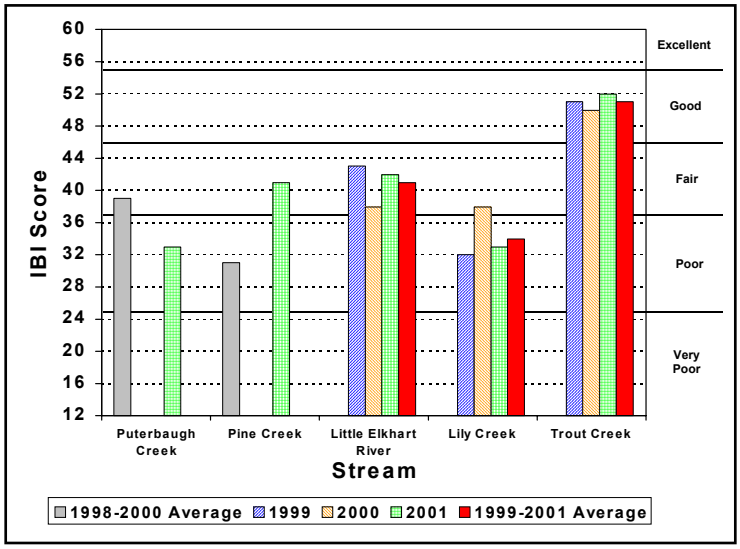
Figure 7: IBI scores for Christiana Creek and Yellow Creek, Elkhart County



In 2000, sampling in Yellow Creek revealed an impact had occurred at the US 20 Bypass site (Foy 2001). Water samples collected from the immediate area as well as from bridges upstream revealed nothing unusual. In 2001, the existing index sites as well as an additional index site were sampled. The IBI scores at the existing sites (US 20 Bypass and County Road 32) were almost identical to those found in 2000 (Table 2). The IBI score at the third site (Concord High School) was lower than the trend (Figure 7). It is important to note that the County Road 32 and Concord High School sites have been dredged in the past and have little or no buffer zone along their banks. The US 20 Bypass site, however, has a lot of natural meanders (bends) and a wooded buffer zone. Additional water samples and habitat data will be collected in 2002 in an effort to determine the cause of this decline in fish community integrity.

The IBI scores for the five remaining streams that had an index site are displayed in Figure 8. The sites sampled on Puterbaugh Creek and Pine Creek were not the same sites that were sampled from 1998-2000. The 1998-2000 averages for these streams were placed in the figure for a simple comparison.

Figure 8: IBI scores for various streams, Elkhart County



Puterbaugh Creek, Pine Creek and the Little Elkhart River are cool/cold water streams like Juday Creek and, therefore, have the same limitation in scoring using the warmwater IBI that was developed for this area. As explained earlier, the current IBI scoring system will be used to document any drastic changes in these streams until a new cool/cold water IBI is located or developed. At that time the data collected from these streams will be used to recalculate a more accurate score.

The 2001 Puterbaugh Creek site (Reedy Drive) was upstream of the previous site (County Road 8). While this creek flows from a lake, it maintains fairly cold water temperatures, especially in the lower, or downstream, segments due to groundwater inflow. The Reedy Drive site has less diverse habitat available and maintains lower oxygen levels. These two factors may explain the decrease in fish community integrity seen in Figure 8.

On Pine Creek, the 2001 site (State Road 120) is downstream of the previous site (US 20 Bypass), and is very close to the mouth of the stream on the St. Joseph River. The dramatic increase in IBI scores on Pine Creek are partly due to the location of the site in proximity to the river (river fish can use it as a refuge) and the habitat that is available. The US 20 Bypass site had strongly eroding banks and fairly homogeneous habitat while the State Road 120 site had stable banks, good canopy cover, and a variety of habitats available.

Table 4: Summary of tagged and recaptured fish

Species	Number Tagged		Recaptures (anglers)		Recaptures (PW&U)	
	Previous	2001	Previous	2001	Previous	2001
Smallmouth Bass	928	447	45	25	84	16
Walleye	119	95	16	8	3	0
Largemouth Bass	37	22	1	4	3	0

The Little Elkhart River, Lily Creek, and Trout Creek sites were sampled for the third consecutive year in 2001. This completes the baseline of information gathered for these streams and new index sites will be selected in 2002. While being a coldwater stream with scoring limitations, the Little Elkhart River IBI scores have still fallen in the fair range. When a properly modified IBI for cool/cold water streams is finally used, the true quality of this stream will be realized.

Lily Creek and Trout Creek drain lakes just as Puterbaugh Creek does, but they maintain water temperatures similar to the lakes they drain. While these two streams are considered warmwater, they are maintained very differently. Lily Creek is a regulated drain that has recently (1997) been dredged. This dredging activity was done in an effort to decrease flooding impacts to neighboring landowners. Streams of this type may never support a biologically diverse fish community, but that is to be expected due to the main function (agricultural drainage) of the stream. Trout Creek, however, is a naturally flowing stream that has not been impacted by dredging activities. The IBI scores for both sites (Table 2, Figure 8) quickly reveal that streams with few or no disturbances support a more diverse fish community.

TAGGING & MOVEMENT

In 2001, a total of 564 fish were tagged (Table 4) and 53 recapture events were recorded. A total of 188 fish have been recaptured since 1998, which reflects a recapture rate of 11.4% for all fish tagged to date. While this is a slight decrease from 2000 (13.0%), this recapture rate is still good and includes many recaptures reported by anglers (Table 4).

Fifteen of the 53 recapture events revealed fish movements (Table 5). Four of the movements were in an upstream direction while 11 were in a downstream direction. Walleye that moved still tended to go upstream and most of the smallmouth bass did not move at all. The recaptured largemouth bass were the most active with 3 out of 4 fish showing movement. The smallmouth bass that moved upstream averaged 3.5 miles and those that moved downstream averaged 2.0 miles. The upstream moving walleye averaged 3.3 miles, while the single fish that moved downstream only went 1.0 mile. The largemouth bass averaged 1.8 miles in an upstream direction to an interesting location.

Table 5: Summary of movement of recaptured fish

Direction Moved	Smallmouth Bass	Walleye	Largemouth Bass
No Movement	34	3	1
Upstream	4	4	3
Downstream	3	1	0

The three largemouth bass were all recaptured by a fisherman in Long Lake. Two of the fish were tagged in Trout Creek, which flows out of this lake. The third largemouth was tagged in the St. Joseph River near Bristol (downstream of Trout Creek) and traveled 3.6 miles to get into Long Lake. Two smallmouth bass also had interesting journeys. The first was tagged in the Little Elkhart River near State Road 120 in 1999. A fisherman reported catching the fish near the Mottville Dam in Michigan, 10.2 miles away as the water flows. The second smallmouth bass had been tagged in 2000 in Yellow Creek near the US 20 Bypass, and had been recaptured by Public Works and Utilities on 2 out of 3 revisits to the same location. In the fall of 2001, a fisherman reported catching this fish in the Elkhart River near Studebaker Park, nearly 2.7 miles downstream. This fish could have been feeding during the summer in this small tributary and then moving out into the larger river for the winter months.

FISH TISSUE

The fish tissue results from 1998-2000 were submitted to the Indiana Department of Environmental Management (IDEM) for inclusion with their data. The results of this effort produced an updated FCA (Fish Consumption Advisory) in 2001 for the Elkhart County portions of the St. Joseph and Elkhart Rivers (see shaded areas of Table 1). In 2001, additional tissue samples were again collected from the Elkhart and St. Joseph Rivers to help clarify previous results and tissue sampling was started on Juday Creek and the St. Joseph River in the South Bend area (appendix B).

Rock bass tissue was sampled from the Elkhart River again in 2001. Three new locations were used to try and help clarify at what level PCBs are present. The results contained fish from two sites that had group 1 PCB levels and fish from one site that had group 3 PCB levels. Previous samples contained group 1 or 2 PCB levels revealing a need for additional information.

Bluegill and largemouth bass tissue was sampled from an old gravel pit in Hayden Park in Elkhart for the Elkhart Parks and Recreation Department. Plans are being developed to make this gravel pit more accessible to fishing. Not knowing the complete history of the gravel pit, the Parks Department wanted to know if the fish were safe to eat. Initial results indicate the bluegill are safe and the largemouth bass have group 2 mercury levels. Additional sampling will be encouraged to confirm these results.

On the St. Joseph River in Elkhart County, tissue sampling focused on collecting larger channel catfish from Bristol, additional tissue samples of common carp and shorthead redhorse, and initial sampling of black redhorse and rock bass. The channel catfish results confirm the data from 2000. These fish have group 2 mercury levels and group 3 PCB levels. The common carp and shorthead redhorse tissue results are also consistent with past results. The rock bass and black redhorse results indicate changes may be warranted, but additional samples need to be collected to confirm this data.

The results for the St. Joseph River near South Bend revealed a large variety of PCB levels (group 1-5) in the present fish population and lower (group 1 or 2) mercury levels. All of the fish collected for tissue analysis fell within an FCA length range for their respective species. Channel catfish and largemouth bass were the only two species on the 2001 FCA that were not sampled due to their absence from the catch. Common carp and shorthead redhorse contained the highest PCB levels. Smallmouth bass and shorthead redhorse had the highest mercury levels. Most of the results were in agreement with the 2001 FCA (see Appendix B) except for black redhorse from the St. Joseph River and white suckers from Juday Creek. These two species exhibited lower levels than those listed on the FCA, but each species contained only one sample. Additional samples will be needed to confirm these results.

CONCLUSION

Continued biological monitoring on the St. Joseph River and its tributaries in Elkhart County is adding data to the baseline of information established while allowing comparisons to the same baseline to note any negative impacts. The recent initiation of biological monitoring in South Bend on the St. Joseph River and its tributaries will provide the citizens of this area with details on the condition and health of their aquatic resources while also broadening the current baseline of information on the watershed. Index of Biotic Integrity (IBI) scores on the St. Joseph River as it flows through Elkhart and South Bend reveal fair to good fish community health. The IBI scores on the Elkhart River and Christiana Creek closely follow the established trend while Yellow Creek scores remain indicative of an impact on the lower stretches of this stream. The initial year's data shows that Bowman Creek is seriously impacted by the land use practices within its watershed and the urban environment it flows through. Juday Creek's IBI scores, while artificially low due to its cooler water temperatures, are lower than similar streams in the area (Puterbaugh Creek, Pine Creek and the Little Elkhart River). These other cooler streams have poor to fair IBI scores, but once a cool/cold water IBI is located or developed, the IBI scores for all of these streams will be recalculated. The IBI scores of Lily Creek and Trout Creek are indicative of how they are maintained. Lily Creek is a regulated drain that is dredged on a regular basis while Trout Creek has no regular maintenance activities. Next year's habitat assessments will help to clarify whether lower IBI scores are due to water quality issues or simply due to habitat limitations. In the future, sampling an additional aquatic community, such as insects, would provide a complimentary view of the stream resource health and would substantiate the existing fish community information. By measuring the health of two aquatic communities and the habitat that is present, this biological monitoring program will provide us with the most comprehensive view of the health of these stream resources.

In the fourth year of tagging fish, over 500 fish were tagged and 47 fish were recaptured in 53 events. Recaptured largemouth bass showed an interesting behavior near Bristol. Several of these fish wanted to swim upstream into a local lake. Likewise, two smallmouth bass moved out of smaller tributary streams into the Elkhart and St. Joseph Rivers. While twice as many walleye were tagged in 2001 than in 2000, the distance the recaptured fish moved from where they were tagged was considerably less.

An updated Fish Consumption Advisory (FCA) was issued for the Elkhart and St. Joseph rivers in 2001. Additional information that was collected for Elkhart County as well as the first year's worth of St. Joseph County information was added to the database. Channel catfish in the St. Joseph River in Elkhart County have lower PCB levels than those reported in the FCA while rock bass PCB levels in the Elkhart River continue to fluctuate. In South Bend, common carp and shorthead redhorse contain the highest PCB levels while smallmouth bass and shorthead redhorse had the highest mercury levels. Additional sampling in South Bend will be needed to verify these initial results.

In 2001, an inter-local agreement between the cities of Elkhart and South Bend began the first local biological monitoring program to cross political boundaries in Indiana. This program will document the biological integrity of the St. Joseph River watershed in Indiana.

This agreement will also supply the citizens of these two communities with invaluable information on the health of the stream resources in their area, and will provide scientists and policy makers with facts to help them in their decision making. Local communities working for the betterment of the environment. That's what it is all about!

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Last, I would like to thank the administration and support staff of Elkhart Public Works and Utilities for their continued assistance and support of this program and their true dedication to the environment.

REFERENCES

Craddock, J.M. 1990. Bureau of Water Quality annual fish population report. Muncie, Indiana. Loose-leaf pub. n.p.

Davis, W.S. 1999. Foreword *in* T.P. Simon, editor. Assessing the sustainability and biological integrity of water resources using fish communities, CRC Press, Boca Raton, FL.

Foy, J. 2001. Fish community monitoring on the St. Joseph and Elkhart rivers and selected tributaries in Elkhart County, 2000. Loose-leaf pub. n.p.

Indiana State Department of Health, Indiana Department of Environmental Management, Indiana Department of Natural Resources. 2001. 2001 Indiana Fish Consumption Advisory. Indianapolis, Indiana.

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

Karr, J.R. 1996. Going beyond water quality to protect fish and aquatic ecosystems. Presentation at the 126th Annual Meeting of the American Fisheries Society, Dearborn, MI.

Ohio Environmental Protection Agency. 1988. Biological criteria for the protection of aquatic life. Volumes I, II, III. Division of Water Quality Monitoring and Assessment. Columbus, Ohio.

Simon, T.P. 1997. Development of Index of Biotic Integrity expectations for the Ecoregions of Indiana. III. Northern Indiana Till Plain. U.S. Environmental Protection Agency, Region V, Water Division, Watershed and Non-Point Source Branch, Chicago, IL. EPA 905/R-96/002.

Summer 2001

Summer Crew: (front L-R) Joe, Brett, Dan
(back L-R) Erica, Greg, Jered, Andrew, Len

Dan with a 17 inch smallmouth bass

Len with a somewhat scaleless carp

Brett with a northern pike

Redear sunfish from Pinhook Park pond

Seven pound walleye caught near Keller Park

Greg with a Juday Creek brown trout

Longnose gar

APPENDICES

Appendix A

Index of Biotic Integrity metrics

Index of Biotic Integrity metrics used to evaluate headwater stream (<20 square miles drainage area) sites in the St. Joseph River drainage:

1. Total number of species
2. Number of darter/madtom/sculpin species
3. % Headwater species
4. Number of minnow species
5. Number of sensitive species
6. % Tolerant
7. % Omnivores
8. % Insectivores
9. % Pioneer species (individuals)
10. Number of fish collected
11. % Simple lithophils
12. % DELT anomalies

Index of Biotic Integrity metrics used to evaluate wadeable stream (>20-<1,000 square miles drainage area) sites in the St. Joseph River drainage:

1. Total number of species
2. Number of darter species
3. Number of sunfish species
4. Number of sucker species
5. Number of sensitive species
6. % Tolerant
7. % Omnivores
8. % Insectivores
9. % Carnivores
10. Number of fish collected
11. % Simple lithophils
12. % DELT anomalies

Appendix B

Fish tissue preparation and results

Materials needed:

- Reynolds aluminum foil
- freezer wrap
- deionized (DI) water
- 1/2 gallon, 1 gallon, and jumbo size freezer bags w/write-on labels
- skinners
- stainless steel fillet knives
- knife sharpener
- scalers
- ice
- cooler

A group of three fish per species was selected based on size. The smallest fish in each group was greater than or equal to 90% of the length of the largest fish in that group. The largest fish or fish that fell into a length range for species on the advisory were selected. The fish were kept as close in size as possible within a group because the tissue from the three fish in each group was composited (mixed together) before the analyses were completed.

All of the tissue was in the form of boneless fillets taken from the fish. All of the fish, except the channel catfish, had skin-on fillets taken. Before the tissue was removed, the fillet knives, scalers and skinners were cleaned and rinsed with DI water, and freezer wrap was placed where the fish were to be processed. The knives, scalers and skinners were washed in river water and rinsed with DI water after each species was processed and new freezer wrap was placed before another species was processed. For skin-on samples, the scales were removed before the fillet was taken. For skin-off samples, the skin was scored around the edge of the fillet and then removed before the fillet was taken. It was important to be consistent with where the cut of the fillet ended and to not include any of the body cavity or viscera. Once the fillets were removed, they were rinsed in river water and then rinsed with DI water before being placed on aluminum foil. The foil was large enough to hold the three fillets for each species at a site. When all three fillets were placed on the foil, it was then wrapped and placed in a labeled freezer bag and placed on ice in a cooler. The fish tissue was placed in a freezer upon returning to the lab, and kept frozen until sent to the contract lab for analyses.

Elkhart County tissue results

Stream	Species	Station	Length Range (PW&U)	Advisory Length Range (State)	Mercury Group (PW&U)	Advisory Mercury Group (State)	PCB Group (PW&U)	Advisory PCB Group (State)
Elkhart River, Elkhart County								
	Rock Bass							
		Oxbow Park (Below)	7.0-7.6	7-9	NA		1	2
		EEC (Above)	7.0-7.6	7-9	NA		3	2
		Studebaker Park	7.1-7.8	7-9	NA		1	2
Hayden Park, Elkhart County								
	Bluegill		7.5-8.0		1		1	
	Largemouth Bass		12.4-13.1		2		1	
St. Joseph River, Elkhart County								
	Black Redhorse							
		Toll Road (Bristol)	17.8-17.9	17+	2	3	2	1
		Lexington Avenue	17.6-18.2	17+	1	3	3	1
	Channel Catfish							
		Toll Road (Bristol)	26.6-28.7	26+	2	1	3	5
	Common Carp							
		Nappanee Street	26.6-27.1	25+	1	5	3	5
	Rock Bass							
		Toll Road (Bristol)	8.0-8.8	7-9	1	1	1	3
		Lexington Avenue	7.4-8.0	7-9	1	1	2	3
		McNaughton Park	7.4-7.8	7-9	1	1	1	3
	Shorthead Redhorse							
		Lexington Avenue	16.1-16.5	14-17	1	1	3	3

St. Joseph County tissue results

Stream	Species	Station	Length Range (PW&U)	Advisory Length Range (State)	Mercury Group (PW&U)	Advisory Mercury Group (State)	PCB Group (PW&U)	Advisory PCB Group (State)
Juday Creek, St. Joseph County								
	White Sucker							
		State Road 23	14.4-14.8	12-17	1	1	1	2
St. Joseph River, St. Joseph County								
	Black Redhorse							
		Keller Park	15.9-16.6	14-17	1	2	1	1
	Common Carp							
		Ironwood Drive	31.9-33.1	20+	1	2	5	5
		Jefferson Boulevard	30.4-32.4	20+	1	2	3	5
		Keller Park	29.1-31.0	20+	1	2	4	5
		Darden Road	25.7-27.8	20+	2	2	4	5
	Golden Redhorse							
		Ironwood Drive	15.4-16.1	13-22	1	1	3	3
		Michigan Street	16.2-17.5	13-22	2	1	2	3
		Darden Road	15.2-16.2	13-22	1	1	3	3
	Quillback							
		Darden Road	19.7-20.0	18+	1	1	3	3
	Shorthead Redhorse							
		Michigan Street	16.5-17.3	15-19	2	2	4	3
		Darden Road	17.3-18.1	15-19	2	2	4	3
	Smallmouth Bass							
		Ironwood Drive	10.0-10.9	9+	1	2	3	3
		Keller Park	10.3-10.8	9+	1	2	2	3
		Darden Road	12.9-13.7	9+	2	2	1	3
	Steelhead							
		Darden Road	26.3-28.6	26+	1	1	3	4
	White Sucker							
		Jefferson Boulevard	14.8-15.1	14-16	1	1	3	3
		Jefferson Boulevard	16.6-17.8	16+	1	1	3	4
		Darden Road	16.9-17.9	16+	1	1	3	4

Appendix C

Summary of fish collected by county, 2001

Appendix C

Summary of species captured at index sites in Elkhart County

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
White Sucker	2,268	13.76	153,200	337.44	7.76
Mimic Shiner	1,787	10.84	2,891	6.37	0.15
Creek Chub	1,451	8.80	16,608	36.58	0.84
Striped Shiner	1,007	6.11	18,710	41.21	0.95
Smallmouth Bass	977	5.93	142,546	313.98	7.22
Hornyhead Chub	938	5.69	17,130	37.73	0.87
Common Shiner	861	5.22	15,007	33.06	0.76
Bluegill	844	5.12	23,880	52.60	1.21
Rock Bass	807	4.90	51,800	114.10	2.62
Golden Redhorse	804	4.88	537,516	1,183.96	27.23
Bluntnose Minnow	627	3.80	2,190	4.82	0.11
Blacknose Dace	585	3.55	1,579	3.48	0.08
Johnny Darter	541	3.28	688	1.52	0.03
Spotfin Shiner	495	3.00	2,292	5.05	0.12
Northern Hog Sucker	416	2.52	88,984	196.00	4.51
Stoneroller	249	1.51	2,448	5.39	0.12
Mottled Sculpin	165	1.00	743	1.64	0.04
Shorthead Redhorse	137	0.83	91,980	202.60	4.66
Silverjaw Minnow	118	0.72	309	0.68	0.02
Logperch	108	0.66	696	1.53	0.04
Rainbow Darter	107	0.65	167	0.37	0.01
Central Mudminnow	98	0.59	686	1.51	0.03
River Redhorse	94	0.57	206,950	455.84	10.48
Common Carp	83	0.50	349,591	770.02	17.71
Yellow Bullhead	72	0.44	4,866	10.72	0.25
Longear Sunfish	69	0.42	1,841	4.06	0.09
Rosyface Shiner	69	0.42	139	0.31	0.01
Largemouth Bass	62	0.38	19,554	43.07	0.99
Chestnut Lamprey	61	0.37	796	1.75	0.04
Brown Trout	54	0.33	6,260	13.79	0.32
Green Sunfish	48	0.29	1,168	2.57	0.06
Spotted Sucker	37	0.22	12,010	26.45	0.61
Redear Sunfish	34	0.21	3,499	7.71	0.18
Sand Shiner	34	0.21	58	0.13	0.00
Silver Redhorse	33	0.20	56,956	125.45	2.89
Grass Pickerel	31	0.19	492	1.08	0.02
Black Redhorse	30	0.18	27,195	59.90	1.38
Blackside Darter	29	0.18	92	0.20	0.00
Walleye	25	0.15	9,047	19.93	0.46
American Brook Lamprey	25	0.15	255	0.56	0.01
Orangethroat Darter	23	0.14	39	0.09	0.00
Channel Catfish	22	0.13	44,114	97.17	2.23
Tadpole Madtom	22	0.13	132	0.29	0.01
Steelcolor Shiner	18	0.11	110	0.24	0.01
Yellow Perch	17	0.10	357	0.79	0.02
Black Crappie	13	0.08	1,817	4.00	0.09
Longnose Gar	11	0.07	5,828	12.84	0.30
Greater Redhorse	10	0.06	17,078	37.62	0.87
Hybrid Sunfish	10	0.06	727	1.60	0.04
Bowfin	9	0.05	13,582	29.92	0.69
Fathead Minnow	9	0.05	28	0.06	0.00
Stonecat	8	0.05	256	0.56	0.01
Quillback	7	0.04	12,235	26.95	0.62
Pumpkinseed	6	0.04	200	0.44	0.01
Rainbow Trout	4	0.02	978	2.15	0.05
Brook Stickleback	3	0.02	3	0.01	0.00
Northern Pike	2	0.01	2,332	5.14	0.12
Brown Bullhead	2	0.01	711	1.57	0.04
Spotted Gar	1	0.01	750	1.65	0.04
River Chub	1	0.01	100	0.22	0.01
Pirate Perch	1	0.01	8	0.02	0.00
Brook Silverside	1	0.01	1	0.00	0.00
Sub-total	**16,480**	**100.00**	**1,974,205**	**4,348.47**	**100.00**

Appendix C

Summary of species captured at investigative sites in Elkhart County

Common Name	Total Number	% by Number
Blacknose Dace	2,054	22.39
White Sucker	1,368	14.91
Creek Chub	1,219	13.29
Bluntnose Minnow	614	6.69
Silverjaw Minnow	427	4.65
Johnny Darter	416	4.53
Common Shiner	407	4.44
Bluegill	380	4.14
Smallmouth Bass	240	2.62
Striped Shiner	213	2.32
Largemouth Bass	198	2.16
Brown Trout	197	2.15
Stoneroller	194	2.11
Golden Redhorse	191	2.08
Hornyhead Chub	96	1.05
Rock Bass	90	0.98
Rainbow Darter	67	0.73
Northern Hog Sucker	64	0.70
Spotfin Shiner	63	0.69
Blackside Darter	58	0.63
Logperch	53	0.58
Central Mudminnow	49	0.53
Green Sunfish	47	0.51
Yellow Perch	45	0.49
Silver Redhorse	42	0.46
Spotted Sucker	42	0.46
Common Carp	35	0.38
Longear Sunfish	35	0.38
Orangethroat Darter	31	0.34
Grass Pickerel	28	0.31
Mottled Sculpin	26	0.28
Sand Shiner	21	0.23
Black Crappie	19	0.21
Walleye	16	0.17
Rainbow Trout	12	0.13
American Brook Lamprey	11	0.12
Mimic Shiner	11	0.12
Yellow Bullhead	11	0.12
Pirate Perch	10	0.11
Fathead Minnow	9	0.10
Channel Catfish	7	0.08
Shorthead Redhorse	7	0.08
Pumpkinseed	6	0.07
Brook Stickleback	5	0.05
Redear Sunfish	5	0.05
Chestnut Lamprey	4	0.04
Longnose Gar	4	0.04
Spottail Shiner	4	0.04
Bowfin	3	0.03
Hybrid Sunfish	3	0.03
Northern Pike	3	0.03
Steelcolor Shiner	3	0.03
Golden Shiner	2	0.02
Tadpole Madtom	2	0.02
Warmouth	2	0.02
Greater Redhorse	1	0.01
Lake Chubsucker	1	0.01
Longnose Dace	1	0.01
Quillback	1	0.01
River Redhorse	1	0.01
White Crappie	1	0.01
Sub-total	**9,175**	**100.00**

Index Sites	16,480
Investigative Sites	9,175
Elkhart County Total	25,655

Appendix C

Summary of species captured at index sites in St. Joseph County

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Mimic Shiner	576	13.27	867	1.91	0.04
Spotfin Shiner	547	12.60	1,365	3.01	0.07
Smallmouth Bass	448	10.32	66,332	146.11	3.20
Golden Redhorse	425	9.79	330,204	727.32	15.92
Shorthead Redhorse	316	7.28	245,513	540.78	11.84
Longear Sunfish	269	6.20	8,267	18.21	0.40
Creek Chub	226	5.21	2,638	5.81	0.13
Rock Bass	209	4.81	17,361	38.24	0.84
Quillback	160	3.69	240,103	528.86	11.58
Common Carp	157	3.62	875,150	1,927.64	42.19
White Sucker	124	2.86	54,551	120.16	2.63
Green Sunfish	100	2.30	3,562	7.85	0.17
Mottled Sculpin	85	1.96	513	1.13	0.02
Rainbow Trout	83	1.91	9,419	20.75	0.45
Logperch	65	1.50	890	1.96	0.04
Bluntnose Minnow	63	1.45	201	0.44	0.01
Bluegill	60	1.38	2,508	5.52	0.12
Silver Redhorse	50	1.15	87,838	193.48	4.23
Spotted Sucker	48	1.11	24,118	53.12	1.16
Northern Hog Sucker	41	0.94	18,875	41.57	0.91
Walleye	37	0.85	12,131	26.72	0.58
Black Redhorse	35	0.81	22,989	50.64	1.11
Steelcolor Shiner	31	0.71	86	0.19	0.00
Pumpkinseed	30	0.69	1,025	2.26	0.05
Johnny Darter	28	0.65	28	0.06	0.00
Hybrid Sunfish	16	0.37	1,437	3.17	0.07
Spottail Shiner	15	0.35	53	0.12	0.00
Sand Shiner	15	0.35	26	0.06	0.00
Largemouth Bass	13	0.30	4,598	10.13	0.22
Yellow Bullhead	11	0.25	1,753	3.86	0.08
Longnose Gar	9	0.21	5,173	11.39	0.25
Chestnut Lamprey	7	0.16	94	0.21	0.00
River Redhorse	6	0.14	16,900	37.22	0.81
Blackside Darter	5	0.12	16	0.04	0.00
Brown Bullhead	3	0.07	1,307	2.88	0.06
Black Crappie	3	0.07	379	0.83	0.02
Redear Sunfish	3	0.07	156	0.34	0.01
Central Mudminnow	3	0.07	27	0.06	0.00
Blacknose Dace	3	0.07	13	0.03	0.00
Greater Redhorse	2	0.05	4,200	9.25	0.20
Bowfin	2	0.05	2,042	4.50	0.10
Brown Trout	2	0.05	864	1.90	0.04
Golden Shiner	2	0.05	15	0.03	0.00
Orangethroat Darter	2	0.05	2	0.00	0.00
Northern Pike	1	0.02	6,450	14.21	0.31
Channel Catfish	1	0.02	2,111	4.65	0.10
Yellow Perch	1	0.02	57	0.13	0.00
Goldfish	1	0.02	15	0.03	0.00
Emerald Shiner	1	0.02	1	0.00	0.00
Striped Shiner	1	0.02	1	0.00	0.00
Sub-total	**4,341**	**100.00**	**2,074,224**	**4,568.78**	**100.00**

Summary of species captured at investigative sites in St. Joseph County

Common Name	Total Number	% by Number
Bluegill	415	19.87
Longear Sunfish	339	16.23
Smallmouth Bass	280	13.40
Shorthead Redhorse	163	7.80
Rock Bass	123	5.89
Golden Redhorse	106	5.07
Largemouth Bass	87	4.16
Mottled Sculpin	80	3.83
Rainbow Trout	56	2.68
Creek Chub	47	2.25
Spotted Sucker	42	2.01
White Sucker	42	2.01
Northern Hog Sucker	27	1.29
Quillback	26	1.24
Common Carp	25	1.20
Redear Sunfish	25	1.20
Yellow Perch	25	1.20
Spotfin Shiner	21	1.01
Walleye	19	0.91
Warmouth	18	0.86
Yellow Bullhead	12	0.57
River Redhorse	11	0.53
Silver Redhorse	11	0.53
Blacknose Dace	10	0.48
Brown Bullhead	9	0.43
Brown Trout	9	0.43
Black Crappie	8	0.38
Central Mudminnow	7	0.34
Green Sunfish	6	0.29
Johnny Darter	5	0.24
Black Redhorse	4	0.19
Bluntnose Minnow	4	0.19
Logperch	4	0.19
Grass Pickerel	3	0.14
Hybrid Sunfish	3	0.14
Pumpkinseed	3	0.14
Steelcolor Shiner	3	0.14
Blackside Darter	2	0.10
Channel Catfish	2	0.10
Goldfish	2	0.10
Longnose Gar	2	0.10
Mimic Shiner	2	0.10
Northern Pike	1	0.05
Sub-total	**2,089**	**100.00**

Index Sites	4,341
Investigative Sites	2,089
St. Joseph County Total	6,430

Appendix D

Summary of fish collected by site, 2001

Appendix D

Stream	St. Joseph River, Elkhart County											
Site Number	1		2		3		4	5		6		7
	1st Pass	2nd Pass	1st Pass	2nd Pass	Day	Night		1st Pass	2nd Pass	1st Pass	2nd Pass	
American Brook Lamprey				X								
Black Crappie			X		X	X	X					
Black Redhorse	X	X	X	X				X	X			
Blackside Darter			X	X		X			X	X		
Bluegill	X	X	X	X	X	X	X	X	X	X	X	X
Bluntnose Minnow	X	X	X	X		X	X					X
Bowfin	X	X	X	X			X					
Brown Bullhead		X						X				
Channel Catfish		X		X	X			X	X	X	X	X
Chestnut Lamprey	X	X	X	X	X			X				
Common Carp	X	X	X	X	X		X	X	X	X	X	X
Common Shiner			X									
Fathead Minnow			X									
Golden Redhorse	X	X	X	X	X	X	X	X	X	X	X	X
Golden Shiner					X							
Grass Pickerel							X		X			
Greater Redhorse	X	X								X		
Green Sunfish			X	X			X	X			X	X
Hornyhead Chub												
Hybrid Sunfish						X	X	X		X	X	
Johnny Darter							X					
Largemouth Bass	X	X	X	X	X	X	X		X		X	X
Logperch		X		X		X	X	X	X	X	X	
Longear Sunfish	X		X	X		X	X	X	X	X	X	X
Longnose Gar	X	X	X	X		X	X	X				X
Mimic Shiner	X	X	X	X	X	X		X	X	X	X	X
Northern Hog Sucker	X	X	X	X	X	X		X	X		X	
Northern Pike	X					X	X					
Orangethroat Darter						X						
Pumpkinseed									X			X
Quillback								X		X		X
Redear Sunfish					X	X			X			
River Redhorse	X	X	X	X				X	X	X	X	X
Rock Bass	X	X	X	X	X	X	X	X	X	X	X	X
Rosyface Shiner	X		X					X				
Sand Shiner		X		X		X						
Shorthead Redhorse	X	X	X	X	X	X	X	X	X	X	X	
Silver Redhorse	X	X	X	X	X	X	X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X	X	X	X	X	X	X
Spottail Shiner							X					
Spotted Gar			X									
Spotted Sucker	X	X		X	X	X	X		X			X
Steelcolor Shiner			X		X	X						
Walleye	X	X	X	X	X	X	X	X	X	X	X	X
Warmouth						X						
White Crappie						X						
White Sucker			X	X	X	X	X	X	X	X	X	
Yellow Bullhead		X	X	X		X			X		X	X
Yellow Perch	X	X	X			X	X		X			X

Stream	St. Joseph River, St. Joseph County													
Site Number	8		9	10		11		12		13		14	15	
	1st Pass	2nd Pass		1st Pass	2nd Pass	Night	Day	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass
Black Crappie				X			X			X	X			
Black Redhorse						X		X	X	X	X	X	X	
Blackside Darter		X			X		X				X			X
Bluegill	X	X			X	X	X	X	X	X	X	X	X	X
Bluntnose Minnow	X	X		X	X	X	X		X	X	X			X
Bowfin										X	X			
Brown Bullhead							X			X	X			
Channel Catfish			X		X							X		
Chestnut Lamprey				X				X		X	X		X	X
Common Carp	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Emerald Shiner	X													
Golden Redhorse	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Golden Shiner										X				X
Goldfish						X								
Grass Pickerel						X	X							
Greater Redhorse													X	
Green Sunfish	X	X	X	X	X		X						X	
Hybrid Sunfish	X	X			X						X			
Johnny Darter		X									X			X
Largemouth Bass	X	X				X	X			X	X			X
Logperch		X			X		X	X	X		X	X		X
Longear Sunfish	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Longnose Gar				X			X	X	X	X		X		
Mimic Shiner	X	X	X					X	X	X	X	X	X	X
Northern Hog Sucker			X					X	X	X	X	X	X	X
Northern Pike										X				
Orangethroat Darter											X			X
Pumpkinseed	X	X			X		X							
Quillback	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rainbow Darter														
Rainbow Trout	X		X	X	X	X		X		X			X	X
Redear Sunfish				X	X					X				
River Redhorse			X			X	X	X	X	X	X	X		
Rock Bass	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sand Shiner													X	X
Shorthead Redhorse	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Silver Redhorse	X		X	X	X		X	X	X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X		X	X		X	X	X	X	X	X	X
Spottail Shiner		X							X		X			
Spotted Sucker	X	X		X	X	X	X			X	X		X	X
Steelcolor Shiner	X		X	X					X			X		
Striped Shiner	X													
Walleye	X		X	X		X		X	X	X	X	X	X	X
Warmouth							X							
White Sucker	X	X	X	X	X	X	X			X	X	X	X	X
Yellow Bullhead		X			X	X	X			X		X		X
Yellow Perch	X													

Stream	York Township Ditch	Trout Creek		Little Elkhart River			Washington Township Ditch	Pine Creek			Puterbaugh Creek	
Site Number	16	17		18	19		20	21	22		23	
		1st Pass	2nd Pass		1st Pass	2nd Pass			1st Pass	2nd Pass	1st Pass	2nd Pass
American Brook Lamprey				X	X	X					X	
Black Crappie		X										
Blacknose Dace				X	X	X		X		X		
Blackside Darter									X	X		
Bluegill		X	X	X	X	X			X	X	X	X
Bluntnose Minnow		X		X	X	X						
Bowfin			X									
Brook Silverside												X
Brown Trout				X	X	X	X		X	X		
Central Mudminnow	X				X	X		X		X	X	X
Chestnut Lamprey		X		X		X			X			
Common Carp					X							
Common Shiner				X	X	X						
Creek Chub	X			X	X	X		X	X	X	X	X
Golden Redhorse				X					X	X	X	
Grass Pickerel	X			X		X		X			X	X
Green Sunfish					X	X				X	X	
Hornyhead Chub				X	X	X						
Johnny Darter		X	X	X	X	X		X	X	X	X	X
Lake Chubsucker	X											
Largemouth Bass		X	X			X						X
Logperch		X	X						X	X		
Mottled Sculpin				X	X	X		X	X	X	X	X
Northern Hog Sucker		X	X	X	X	X						
Orangethroat Darter			X	X	X	X			X	X	X	
Rainbow Darter		X	X	X					X	X	X	
Rainbow Trout				X	X	X						
Redear Sunfish		X	X		X							
Rock Bass		X	X	X	X							
Sand Shiner												
Shorthead Redhorse		X							X			
Silver Redhorse			X									
Smallmouth Bass									X	X		
Spotfin Shiner		X	X									
Stoneroller, Central				X							X	
Striped Shiner		X	X	X	X	X						
Tadpole Madtom		X	X									
White Sucker	X		X	X	X	X	X	X	X	X	X	X
Yellow Bullhead			X									X
Yellow Perch		X	X									

Stream	Lily Creek		Christiana Creek					Elkhart River							
Site Number	24		25		26	27		28		29		30		31	
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
American Brook Lamprey									X				X		
Black Crappie			X					X	X	X	X		X		
Blacknose Dace		X										X			
Blackside Darter								X	X			X	X		
Bluegill	X	X	X			X	X	X	X	X	X	X	X	X	X
Bluntnose Minnow	X	X		X	X	X	X	X	X	X	X	X	X		X
Central Mudminnow			X												
Chestnut Lamprey				X		X		X		X		X	X	X	
Common Carp			X	X		X	X			X					
Common Shiner			X			X		X	X	X	X	X	X		
Creek Chub	X	X													
Golden Redhorse			X		X	X		X	X	X	X	X	X	X	X
Grass Pickerel							X	X	X						
Greater Redhorse					X			X	X				X	X	
Green Sunfish							X	X	X						X
Hornyhead Chub			X	X		X	X	X	X	X	X	X	X	X	X
Hybrid Sunfish							X		X		X		X		
Johnny Darter	X	X													
Largemouth Bass							X	X	X	X	X	X	X	X	X
Longear Sunfish				X		X			X		X			X	X
Mimic Shiner								X							
Northern Hog Sucker			X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Pike								X							
Orangethroat Darter			X												
Pumpkinseed									X	X					
Rainbow Darter	X		X	X		X	X								
Redear Sunfish										X	X	X			
River Chub			X												
Rock Bass			X	X	X	X	X	X	X	X	X	X	X	X	X
Rosyface Shiner								X	X	X	X	X	X		
Sand Shiner	X	X						X			X				
Shorthead Redhorse					X	X									
Silver Redhorse				X		X	X								
Smallmouth Bass		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner						X	X	X	X	X	X	X	X	X	X
Spotted Sucker								X	X	X	X	X	X	X	X
Steelcolor Shiner								X		X	X				
Stonecat			X	X			X	X							X
Stoneroller	X														
Striped Shiner			X	X		X	X	X	X	X	X	X	X	X	X
Tadpole Madtom			X	X											
White Sucker		X	X	X	X	X		X	X	X	X	X	X	X	X
Yellow Bullhead			X	X	X		X		X		X		X		X

Stream	Solomon Creek		Turkey Creek		Rock Run Creek		Yellow Creek								Cobus Creek
Site Number	32	33	34	35	36	37	38	39		40	41		42		43
								1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	
American Brook Lamprey															X
Black Crappie							X								
Blacknose Dace	X	X	X	X	X	X		X	X	X	X	X	X	X	
Blackside Darter	X	X	X	X									X		X
Bluegill							X	X	X		X		X		X
Bluntnose Minnow	X	X	X	X	X	X		X	X	X	X	X	X	X	
Brook Stickleback					X				X					X	
Brown Trout	X														X
Central Mudminnow	X	X	X	X		X	X	X	X	X	X	X	X	X	
Chestnut Lamprey										X	X		X	X	
Common Carp	X		X												X
Common Shiner			X		X	X	X	X	X	X		X	X	X	
Creek Chub	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fathead Minnow						X		X	X						
Golden Redhorse	X	X		X											
Golden Shiner							X								
Grass Pickerel	X	X	X	X			X		X						
Green Sunfish			X	X		X	X	X	X		X	X	X	X	
Hornyhead Chub					X		X	X	X	X	X	X	X	X	
Johnny Darter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Largemouth Bass			X	X				X	X				X		
Longear Sunfish				X											X
Mimic Shiner				X								X			
Mottled Sculpin															X
Northern Hog Sucker	X	X	X	X											
Orangethroat Darter	X				X	X					X				X
Pirate Perch		X		X					X						
Pumpkinseed									X						
Rainbow Darter	X	X	X		X	X									X
Rainbow Trout	X	X													X
Redear Sunfish															X
Rock Bass			X												
Silverjaw Minnow					X	X		X	X		X	X			
Smallmouth Bass													X	X	X
Spotfin Shiner													X		
Stoneroller, Central		X			X	X	X	X	X	X	X	X		X	
Striped Shiner					X	X		X	X	X	X	X	X	X	
Tadpole Madtom			X	X											
White Sucker	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Yellow Bullhead							X	X	X		X				

Appendix D

Stream	Baugo Creek			Bowman Creek					Juday Creek						Hayden Park		Pinhook Park
Site Number	44	45	46	47	48		49		50	51		52	53		54		55
					1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass		1st Pass	2nd Pass	Day	Night	
Black Crappie															X	X	X
Blacknose Dace	X	X	X									X	X	X			
Bluegill					X					X	X	X			X	X	X
Bluntnose Minnow	X	X	X														
Brown Trout									X		X	X					
Central Mudminnow				X	X	X											
Common Carp															X		
Common Shiner	X	X	X														
Creek Chub	X	X	X				X	X	X	X	X	X	X	X			
Fathead Minnow	X	X	X														
Golden Redhorse	X																
Goldfish						X											
Green Sunfish	X		X							X	X	X	X			X	
Hybrid Sunfish											X	X					X
Johnny Darter	X	X	X						X	X	X	X	X	X			
Largemouth Bass										X					X	X	X
Longnose Dace	X																
Mottled Sculpin									X	X	X	X	X	X			
Northern Pike																	X
Pumpkinseed															X	X	X
Rainbow Trout												X					
Redear Sunfish																	X
Rock Bass			X								X	X	X	X			
Sand Shiner	X		X														
Silverjaw Minnow	X	X	X														
Smallmouth Bass										X	X						
Stoneroller	X	X	X														
Striped Shiner		X															
Warmouth																	X
White Sucker	X	X	X						X	X	X	X	X	X			
Yellow Bullhead		X	X								X						
Yellow Perch																	X