

ELKHART-SOUTH BEND FISH COMMUNITY MONITORING



**ANNUAL REPORT
2002**

City of Elkhart 

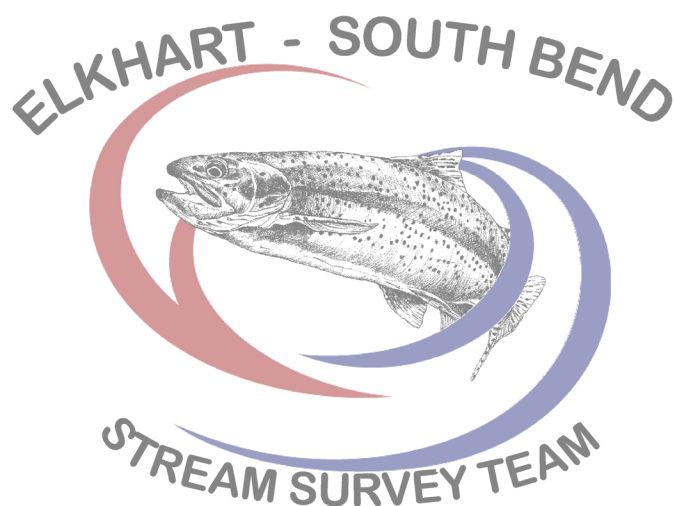
The city with a heart

David L. Miller, Mayor

Cover Photo: Public demonstration at Rhapsody in Green 2002

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FISH COMMUNITY MONITORING IN ELKHART AND ST. JOSEPH COUNTIES ON THE ST. JOSEPH RIVER AND SELECTED TRIBUTARIES, 2002



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May, 2003**

INTRODUCTION

The headwaters of the St. Joseph River originate at Baw Beese Lake in Hillsdale County, Michigan. As this river flows from Michigan into Indiana and then back into Michigan on its 210 mile journey to Lake Michigan, it has become a centerpiece for community development and recreation in most of the areas through which it flows. Over the years city and county parks have developed and prospered along its banks. A world-class trout and salmon fishery has evolved and walleye have become more abundant due to the tireless efforts of Michigan and Indiana natural resource professionals. Annual clean-up efforts by a multitude of local organizations along segments of the river are also slowly chipping away at the trash that has built up. After years of neglect, these organizations are working to keep the river an attractive place to visit. During this time, the cities of Elkhart and South Bend have also been monitoring the river's water in an effort to protect the public and the aquatic communities that inhabit this river (Foy 2002).

In 1972, the Clean Water Act was established to restore and maintain the physical, chemical and biological integrity of the nation's waters. At the time, there were acceptable methods to measure the physical and chemical components of water, but methods to measure the health of aquatic communities were not yet standardized. In an attempt to indirectly monitor the biological integrity of rivers and streams until an appropriate method could be designed, water chemistry results were used to determine if the water was safe for aquatic organisms.

For years now, ecologists and biologists have recognized the shortcomings of using chemical monitoring as a surrogate for monitoring the health and condition of aquatic species (Ohio 1988). While chemical monitoring is important and useful in identifying contaminants in the water being tested, its results provide limited information about the biological integrity of the aquatic species that are present. In short, to have an accurate understanding of the true condition of any aquatic community, that community should be directly sampled and analyzed. In 1998, Elkhart initiated a biological monitoring program to supplement its existing chemical and microbial monitoring. The results from this multi-faceted monitoring strategy will finally provide a way for Elkhart to accurately assess the chemical, physical and biological integrity of the rivers and streams in this area as the Clean Water Act had intended.

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 from the St. Joseph River would prove useful on future projects dealing with the river's watershed. Biologists know rivers and streams are not confined to one political boundary or area, but flow across several. Even with this knowledge, governmental agencies tend to study and monitor these rivers and streams within the confines of those established boundaries. In February of 2001, an interlocal agreement was signed between Elkhart and South Bend that erased one political boundary and finally allowed these municipalities a glimpse at the health of the fish communities throughout the entire stretch of the St. Joseph River as it flows through Indiana.

The biological monitoring strategy developed by Elkhart has established core stations on the St. Joseph River and its major tributaries in Elkhart and St. Joseph counties. Results obtained from 1998-2000 at stations in the Elkhart area have been used to create a baseline of information. This information has been used to reveal the impact that Elkhart's urban environment has on the receiving streams and will be used to document any changes in the fish communities over time. In the South Bend area, two years of information for the baseline has been collected and analyzed. In 2003, the third year's worth of information will be collected and added to the existing data to complete the baseline.

The Index of Biotic Integrity (IBI), as modified by Thomas Simon (1997) for use in the St. Joseph River basin, will be utilized to assess the fish community information. 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 based on their similarity to least impacted (reference) sites; 1 (not similar), 3 (somewhat similar), or 5 (very similar). The total score for a site will range from 12 to 60. These scores can then be graphed and placed into one of five categories (very poor, poor, fair, good, or excellent) which describes the overall condition of the fish community being sampled.

In addition to monitoring 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. Elkhart's aquatics staff continued tagging smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*) and walleye (*Stizostedion vitreum*) collected throughout the year. 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 wall-eye, 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 eleven species of fish was sampled and analyzed for mercury and PCB (polychlorinated biphenyl) content. This information was added to Elkhart and South Bend's existing tissue data from the St. Joseph and Elkhart Rivers and Juday Creek. At present, several species are on the Indiana Fish Consumption Advisory (FCA) (Table 1) for these streams and the cities want to contribute additional information to the state's fish tissue database so the most accurate and thorough advisory possible may 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 me-

Table 1: Fish consumption information taken from the 2002 Indiana Fish Consumption Advisory

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

O = 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.)

ters. 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.) 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 or individually measured at these sites. These 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 2002, 18 index and 23 investigative sites were sampled in Elkhart County and 8 index and 9 investigative sites were sampled in St. Joseph County (Figure 1 and Table 2). 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, 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

Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties, 2002

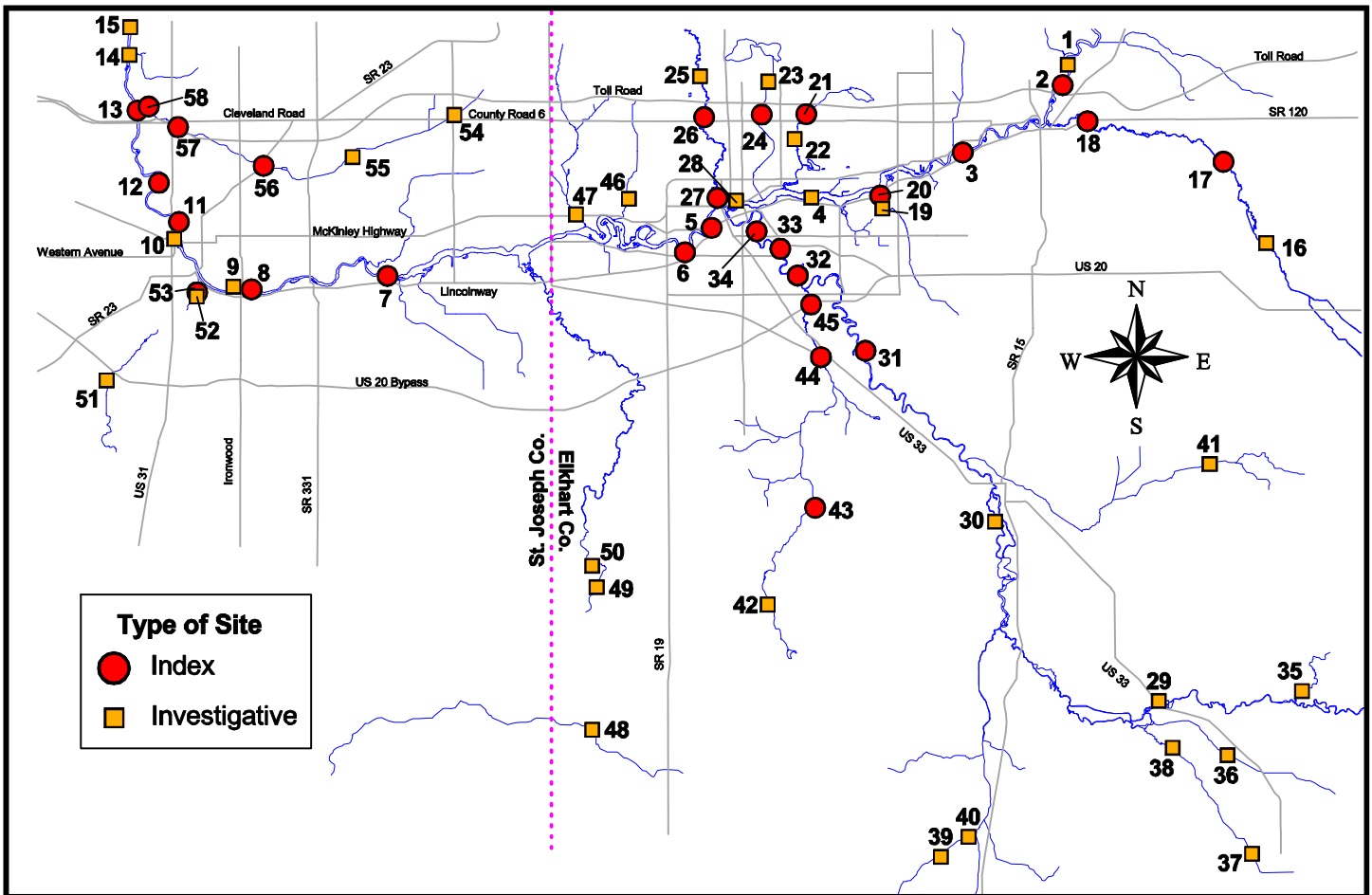


Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2002

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores	
				2001	2002
1	Mouth of Trout Creek St. Joseph River	Investigative Elkhart	Boat		
2	Toll Road (Bristol) St. Joseph River	Index Elkhart	Boat	47	50
3	Nibbyville (A) St. Joseph River	Index Elkhart	Boat	51	54
4	Homan Avenue St. Joseph River	Investigative Elkhart	Boat		
5	Lexington Avenue St. Joseph River	Index Elkhart	Boat	51	50
6	McNaughton Park St. Joseph River	Index Elkhart	Boat	44	51
7	Capital Avenue St. Joseph River	Index St. Joseph	Boat	43	45
8	Ironwood Drive St. Joseph River	Index St. Joseph	Boat	45	41
9	Veterans Park St. Joseph River	Investigative St. Joseph	Boat		
10	LaSalle Street St. Joseph River	Investigative St. Joseph	Boat		
11	Michigan Street St. Joseph River	Index St. Joseph	Boat	44	50
12	Keller Park St. Joseph River	Index St. Joseph	Boat	51	50
13	Darden Road St. Joseph River	Index St. Joseph	Boat	50	51
14	Auten Road St. Joseph River	Investigative St. Joseph	Boat		
15	St. Patrick's Park St. Joseph River	Investigative St. Joseph	Boat		
16*	State Road 13 Little Elkhart River	Investigative Elkhart	Tote Barge		
17*	County Road 35 Little Elkhart River	Index Elkhart	Tote Barge		44
18*	State Road 120 Little Elkhart River	Index Elkhart	Tote Barge		52
19*	Beck Drive Pine Creek	Elkhart Investigative	Tote Barge		
20*	State Road 120 Pine Creek	Index Elkhart	Tote Barge	38	48
21	Reedy Drive Puterbaugh Creek	Index Elkhart	Tote Barge	33	41
22	County Road 106 Puterbaugh Creek	Investigative Elkhart	Tote Barge		
23	County Road 4 Lily Creek	Investigative Elkhart	Back Pack		
24	Park Six Drive Lily Creek	Index Elkhart	BOTH		15

Table 2 (continued)

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores	
				2001	2002
25	County Road 4 Christiana Creek	Investigative Elkhart	Tote Barge		
26	County Road 6 Christiana Creek	Index Elkhart	Tote Barge	47	51
27	N. Main Well Field Christiana Creek	Index Elkhart	Tote Barge	44	47
28	High Dive Park Christiana Creek	Investigative Elkhart	Tote Barge		
29	Benton Elkhart River	Investigative Elkhart	Tote Barge		
30	Shanklin Park Elkhart River	Investigative Elkhart	Boat		
31	Oxbow Park (B) Elkhart River	Index Elkhart	Boat	51	52
32	Elkhart Environmental Center (A) Elkhart River	Index Elkhart	Boat	51	52
33	Studebaker Park (A) Elkhart River	Index Elkhart	Boat	46	46
34	Central High School Elkhart River	Index Elkhart	Boat	44	43
35	County Road 44 Stoney Creek	Investigative Elkhart	Tote Barge		
36	County Road 146 Dry Run Creek	Investigative Elkhart	Back Pack		
37*	US 6 Solomon Creek	Investigative Elkhart	Tote Barge		
38*	County Road 33 Solomon Creek	Investigative Elkhart	Tote Barge		
39*	US 6 Turkey Creek	Investigative Elkhart	Tote Barge		
40*	County Road 21 Turkey Creek	Investigative Elkhart	Tote Barge		
41	County Road 33 Rock Run Creek	Investigative Elkhart	Tote Barge		
42	County Road 138 Yellow Creek	Investigative Elkhart	Back Pack		
43	County Road 32 Yellow Creek	Index Elkhart	Tote Barge	36	37
44	Concord High School Yellow Creek	Index Elkhart	Tote Barge	32	36
45	US 20 Bypass Yellow Creek	Index Elkhart	Tote Barge	28	38
46	County Road 3 Manning Ditch	Investigative Elkhart	Back Pack		
47*	Old US 20 Cobus Creek	Investigative Elkhart	Tote Barge		
48	County Road 1 Lost Creek	Investigative Elkhart	Back Pack		

Table 2 (continued)

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores	
				2001	2002
49	County Road 38 Baugo Creek	Investigative Elkhart	Back Pack		
50	County Road 1 Baugo Creek	Investigative Elkhart	Tote Barge		
51	Locust Road Auten Ditch	Investigative St. Joseph	Back Pack		
52	Indiana Avenue Bowman Creek	Investigative St. Joseph	Back Pack		
53	Ravina Park Bowman Creek	Index St. Joseph	Back Pack	12	6
54*	Bittersweet Road Juday Creek	Investigative St. Joseph	Back Pack		
55*	Douglas Road Juday Creek	Investigative St. Joseph	Tote Barge		
56*	SR 23 Juday Creek	Index St. Joseph	Tote Barge	23	34
57*	Myrtle Street Juday Creek	Index St. Joseph	Tote Barge	19	23
58*	Izaak Walton League Juday Creek	Index St. Joseph	Tote Barge		26

* denotes a cool/cold water site

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 contained Elkhart Public Works & Utilities' phone number and a unique tag number. In addition to being tagged, the anal 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 anglers pursuing walleye in the area.

Tissue in the form of fillets was collected from common carp (*Cyprinus carpio*), smallmouth bass, largemouth bass, rock bass (*Ambloplites rupestris*), walleye, steelhead (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), golden redhorse (*Moxostoma erythrurum*), shorthead redhorse (*M. macrolepidotum*), quillback (*Carpionodes cyprinus*), and white sucker (*Catostomus commersoni*) from July through October. The tissue samples were collected from two sites on the Elkhart River, two areas on Juday Creek, and eleven

Figure 2: Location of tag on fish

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).

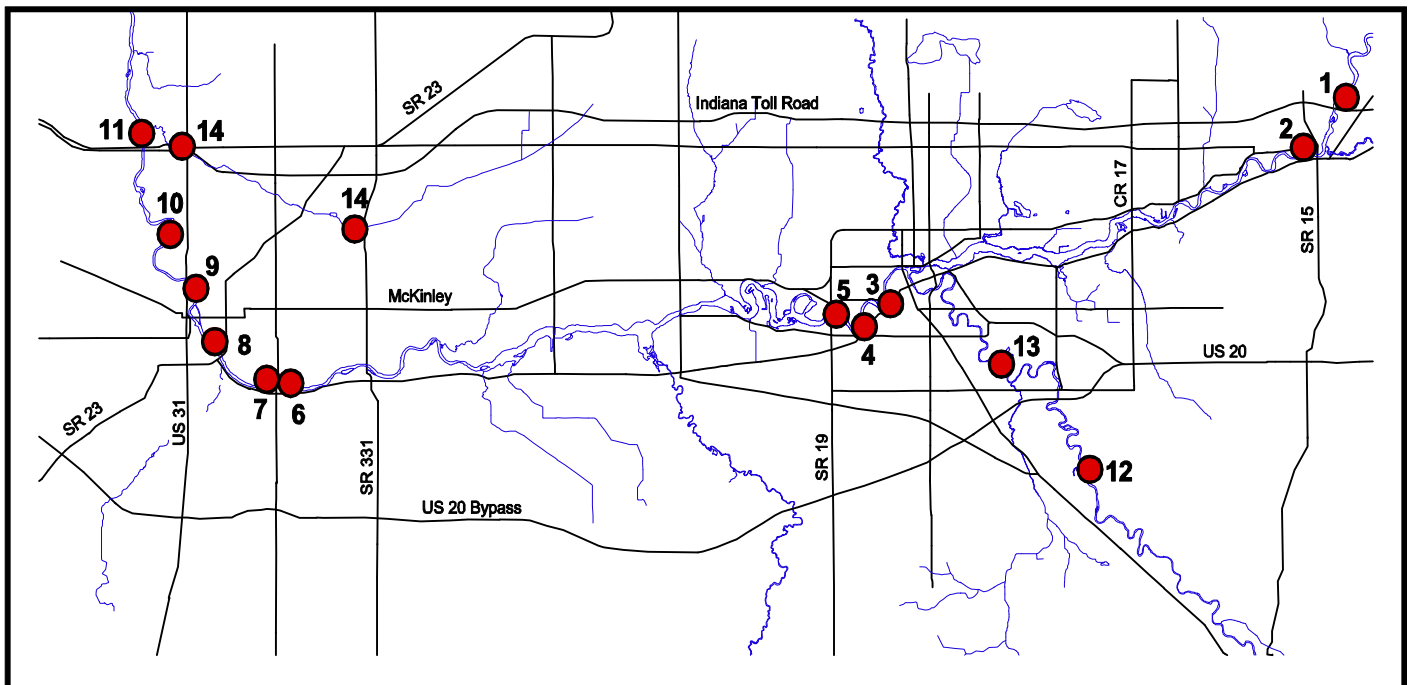
RESULTS & DISCUSSION

During the summer of 2002 a total of 21,909 fish were collected in Elkhart County and 6,413 fish were collected in St. Joseph County (Appendix C). In Elkhart County these fish represented 69 species in 16 families of fish and in St. Joseph County, the fish collected represented 54 species from 11 families. In all, 71 species were collected from the two counties and three additional species were added to the existing list of 77 species found to date. Creek chub (*Semotilus atromaculatus*), smallmouth bass, and golden redhorse were the top three species collected in St. Joseph County, while white sucker, creek chub (*Semotilus atromaculatus*), and mimic shiner (*Notropis volucellus*) were the top three species found in Elkhart County.

Table 3: Fish tissue sites

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

Figure 3: Location of fish tissue collection sites for 2002



INDICES

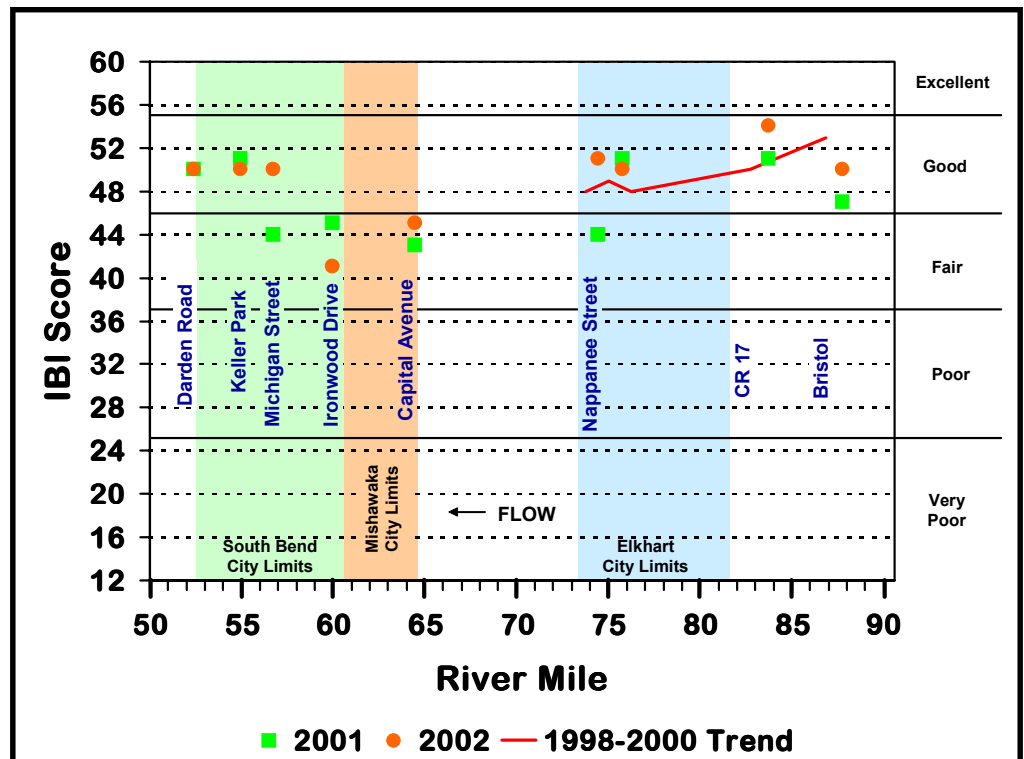
There are several points to keep in mind while looking at the IBI information in this report. First, water quality *and* available habitat can affect the condition of the fish communities. In an attempt to account for habitat effects on the fish communities, habitat assessments were conducted at most of the sample locations in 2002. Due to inconsistencies in data collection, however, this habitat data will not be discussed and more thorough training will be conducted in 2003 to avoid this error. Second, 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 with 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. Third, index sites could not be established in the impounded areas of the St. Joseph River because the IBI metrics used for calculating the scores 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.

The IBI scores for all of the sites sampled in 2002 are summarized in Table 2. The condition of the fish communities ranged from very poor (6) at Ravina Park on Bowman Creek to good (54), almost excellent, at the site upstream of Nibbyville on the St. Joseph River. Typically, IBI scores will fall between 12 and 60. However, if no fish are collected during a visit to one of the sites, then the site will score 0 (zero) for that visit. In the case of Ravina Park on Bowman Creek in 2002, the IBI score for the first site visit was 12 (very poor) and no fish were collected during the second visit. When the IBI

scores for the two visits were averaged, a result (6) occurred that fell outside of the normal range for the IBI.

The longitudinal trends in fish community condition are beginning to emerge for the entire St. Joseph River in Indiana (Figure 4). In the Elkhart area, data from 2001-2002 was compared to the baseline of information that was collected from 1998-2000. The baseline reveals a classic example of IBI trends as a river flows through an urban environment. The scores are higher at sites upstream of the urban area and begin to fall as the river flows through a populated zone. Many urban impacts (i.e. bridges, street run-off, combined sewer overflows, seawalls, lawn fertilizers, etc.) can affect this trend. The 2001-2002 information readily confirms Elkhart's baseline trend on the St. Joseph River with one exception. The IBI scores for the uppermost site (Toll Road – Bristol) reveal a fish community that is in good condition, but falls below the expectations established by the baseline. This could be due to a lack of diversity in the habitat that is present (personal observation) or it could truly be a water quality issue. When habitat information becomes available in 2003, the cause of this decline in IBI scoring should become more clear.

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



In the South Bend area, the first two years of data on the St. Joseph River show a trend in IBI scores just the opposite of what was seen in Elkhart (Figure 4). This reversal of scores could be due to a number of factors. First, many of the urban impacts previously mentioned are already affecting the river before it reaches the Capital Avenue site due to the number of residences and suburban neighborhoods located adjacent to the river between Elkhart and Mishawaka. Second, shoreline development (houses and/or seawalls) tends to decrease as the river flows through and out of South Bend, while this same development is lower upstream of Elkhart and increases as the river flows through the city. Interestingly, the locations of the lower scoring sites for both cities are in the areas that have undergone some type of shoreline development. The habitat evaluation information from 2003 should clarify the cause of these drops in fish community condition.

The IBI scores for the Elkhart River (Figure 5) continue to reflect Elkhart's urban impact. While there is some shoreline development along this river, it is much less than what has occurred along the St. Joseph River. Better land stewardship activities in the upstream areas of this river's watershed could lead to improvements in biological health throughout the river.

Multiple index sites have been sampled on eight of the other tributaries since 1998. Longitudinal views of these streams in the accompanying graphs will compare the results from baseline stations (3 years of data) to the recently sampled (2001-2002) sites.

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. Cool/cold water IBI's have been established for other areas, but are not appropriate for this region. For now, the currently used IBI modification will be used to document any drastic changes over time. Once an acceptable cool/cold water IBI is developed or

located, the data collected from Juday 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. It was also discovered in 2002 that the Ravina Park area of the stream periodically dries out (no flowing water). This, too, limits the number and types of fish found in this area. The Chippewa site, however, is upstream of the buried

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

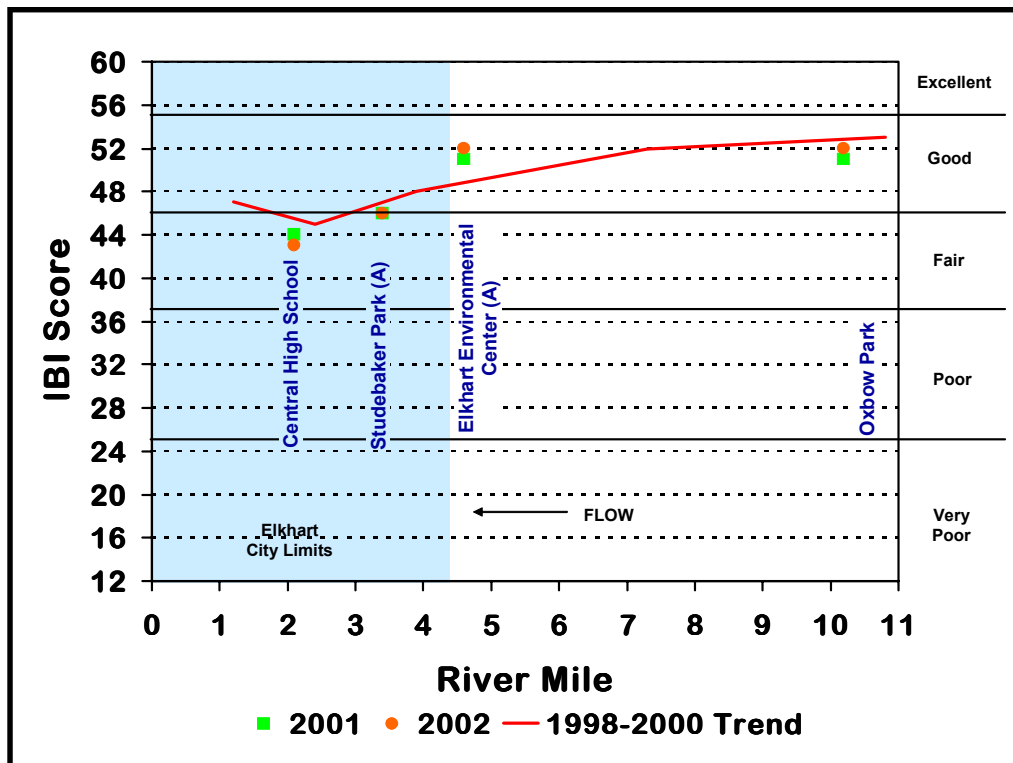
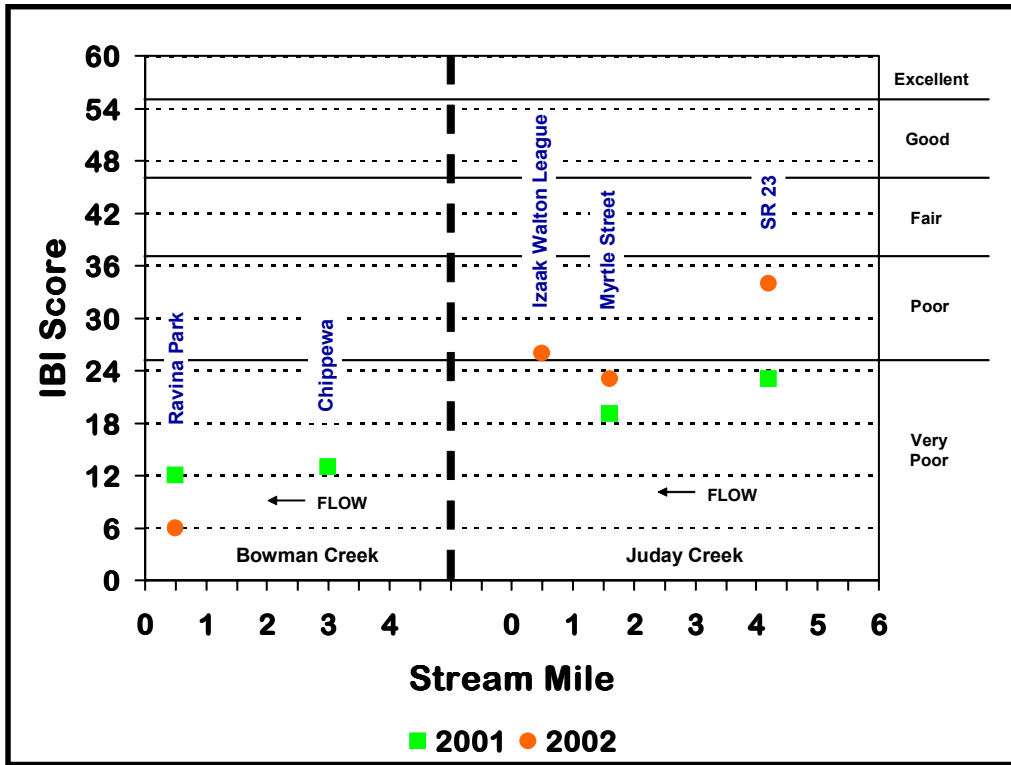


Figure 6: IBI scores for Bowman Creek and Juday Creek, St. Joseph County



baseline, however, is not so clear when comparing the new sites. Due to the variety of land uses (residential, agricultural, recreational) along this stream, the addition of habitat information may be very useful in explaining these variations. While Christiana Creek 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 fair to good biological integrity throughout the areas sampled.

In 2000, sampling in Yellow Creek revealed an impact had occurred at the US 20 Bypass site

sections in a wooded area and also scored very low in 2001. Historical and current disturbances may have eliminated many of the fish from this area of the stream and recolonization would be very limited to nonexistent from a downstream direction due to the urban modifications just described. Due to difficulties in gaining access to the Chippewa site, it was not sampled in 2002 but attempts will be made to sample this site again in 2003.

The 2001-2002 index site scores on Christiana Creek followed the baseline trend (Figure 7). The "urban signature" that was reflected in the

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

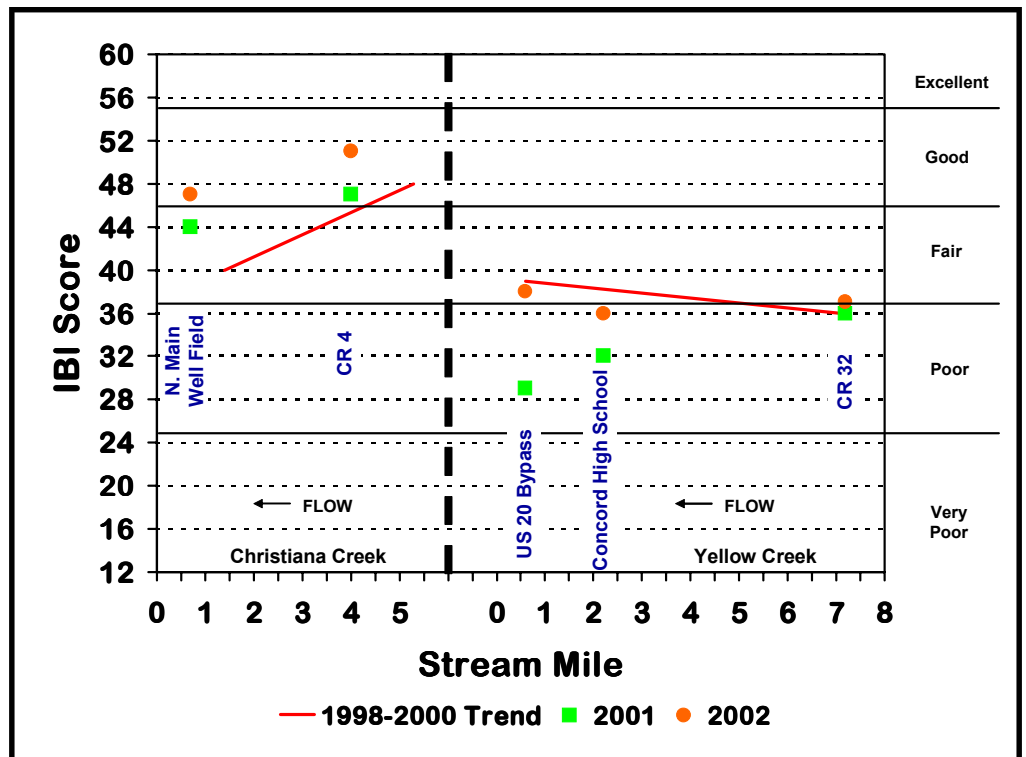
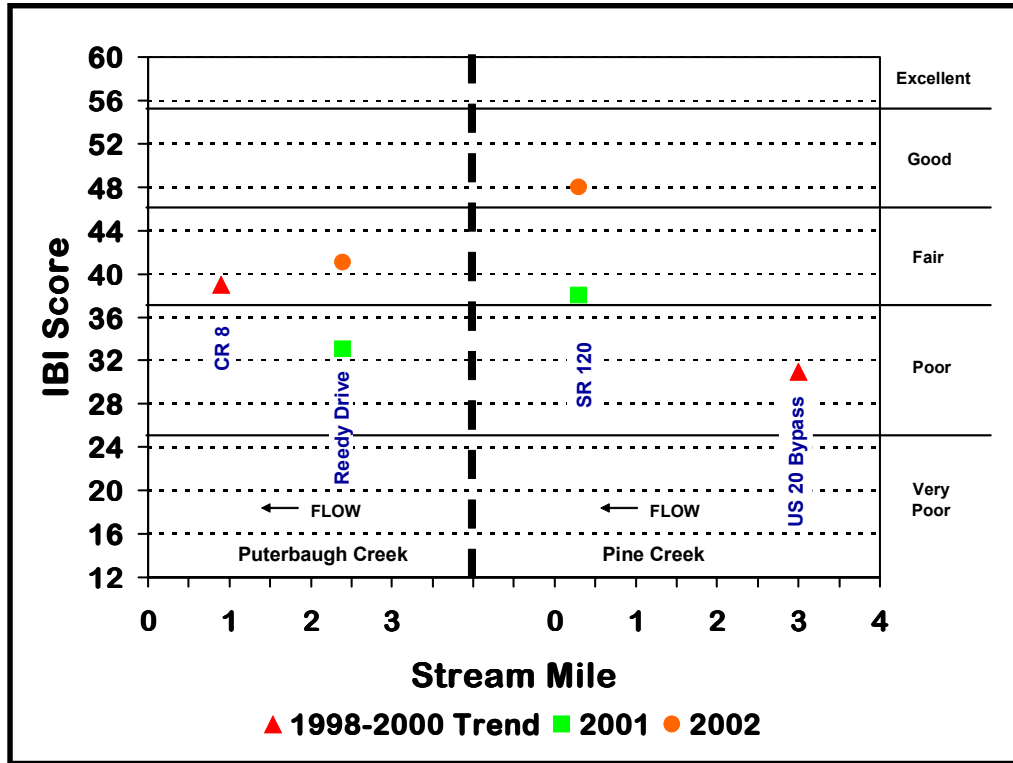


Figure 8: IBI scores for Puterbaugh Creek and Pine Creek,



(Foy 2001). Water samples collected from the immediate area as well as from bridges upstream have revealed nothing unusual. In 2001 and 2002, an additional index site (Concord High School) was sampled in addition to the existing index sites (County Road 32 and US 20 Bypass) in an attempt to locate the source of this impact. 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. The IBI scores at County Road 32 varied little (34-37) during the five years it was sampled. The IBI scores at the US 20 Bypass site, however, have varied from a high of 44 to a low of 29 in the same period of time. Fortunately, the 2002 results are positive for Yellow Creek (Figure 7). While the IBI score continued to be stable at the County Road 32 site, it increased slightly at the Concord High School site and rebounded significantly at the US 20 Bypass site.

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 cur-

rent IBI scoring system will be used to document any drastic changes in these streams until an acceptable 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.

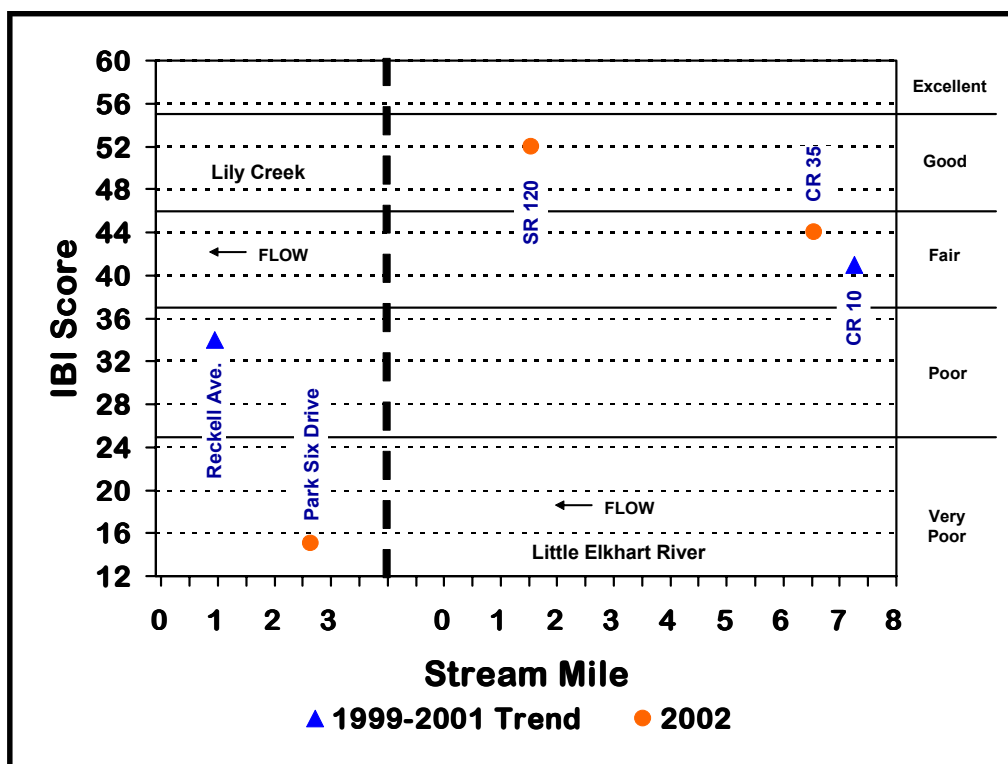
Puterbaugh Creek flows from a lake but maintains fairly cold water temperatures, especially in the lower, or downstream, segments due to groundwater inflow. There are numerous seeps and springs near the County Road 8 crossing. The fish community condition in this stream appears to be fairly stable from site to site (Figure 8).

The dramatic increase in IBI scores on Pine Creek (Figure 8) may be partly due to the proximity of the downstream site (State Road 120) to the river and the habitat that is available. Small tributaries often act as a refuge for some fish from the larger river that they flow into. In areas like this, a mix of stream and river fish may artificially increase the IBI score due to an increase in the number and types of species present. The US 20 Bypass site also 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.

While being a coldwater stream with scoring limitations, the Little Elkhart River IBI scores have still fallen in the fair to good range (Figure 9). The increase in IBI scores from the upstream sites to the State Road 120 site could be due to the proximity of this site to the St. Joseph River. This tributary stream may act as a refuge, like Pine Creek, and a mix of warmwater stream species will be present with the usual cool/cold water species. When a properly modified IBI for cool/cold water streams is located, the true quality of this stream will be realized.

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. The fish community condition at sites located on Lily Creek has been found to be poor to very poor (Figure 9). 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. The Park Six Drive site on this stream is very uniform in depth (<12 inches) due to the recent dredging activities and is located in an area of the stream that periodically dries out. The Reckell Avenue site, on the other hand, is also modified, but is located in a groundwater recharge zone and still contains one moderately deep (about 2 ½ feet) pool that may provide temporary refuge for the local fish community when water levels are low. These factors may be the driving force behind the variation in IBI scores between these two sites.

Figure 9: IBI scores for Lily Creek and the Little Elkhart River, Elkhart County



The Reckell Avenue site, on the other hand, is also modified, but is located in a groundwater recharge zone and still contains one moderately deep (about 2 ½ feet) pool that may provide temporary refuge for the local fish community when water levels are low. These factors may be the driving force behind the variation in IBI scores between these two sites.

TAGGING & MOVEMENT

A total of 524 fish were tagged (Table 4) in 2002 and 45 recapture events were recorded. Since 1998, a total of 229 fish have been recaptured in 249 events. This reflects a recapture rate of

10.5% for all fish tagged to date, and anglers continued to report about half of the recaptures (Table 4). The number of smallmouth bass that were recaptured decreased from the previous year while the number of recaptured walleye increased.

In the spring of 2002, Elkhart Public Works' aquatics staff assisted the Indiana Department of Natural Resources (IDNR) with walleye sampling below the Johnson Street Dam and in the Island Park area of the St. Joseph River. This sampling was done in an effort to get age and growth information from a large number of adult walleye in a short period of time. Due to their annual spawn-

Table 4: Summary of tagged and recaptured fish

Species	Number Tagged		Recaptures (anglers)		Recaptures (PW&U)	
	Previous	2002	Previous	2002	Previous	2002
Smallmouth Bass	1,376	366	69	7	101	16
Walleye	215	136	24	14	3	6
Largemouth Bass	60	22	5	1	3	1

Table 5: Summary of movement of recaptured fish

Direction Moved	Smallmouth Bass	Walleye	Largemouth Bass
No Movement	20	9	1
Upstream	2	8	1
Downstream	1	3	0

ing migration, many adult walleye congregate in this area and were easily collected. While collecting scales from these fish, tags were placed in the larger individuals and this led to an increase in the number of walleye tagged for the year.

Of the 45 recapture events, fifteen revealed fish movements (Table 5). Four of the movements were in a downstream direction while eleven were in an upstream direction. As in previous years, walleye that moved still tended to go upstream and most of the smallmouth bass did not move at all. The smallmouth bass that moved upstream averaged 0.7 miles and those that moved downstream averaged 0.5 miles. The upstream moving walleye averaged 4.7 miles, while the fish moving downstream averaged 11.5 miles. The single largemouth bass only moved 0.6 miles upstream from where it was released.

The average distance that walleye moved upstream and downstream increased from 2001. This was due in part to a few far ranging fish. Of the fish moving upstream, one was tagged above the Johnson Street Dam at Martin's Landing and was recaptured by a fisherman 17.4 miles away at the Mottville Dam in Michigan. The fish that moved the farthest, however, was tagged near the YMCA in Elkhart on the St. Joseph River and was recaptured 23.9 miles downstream by a fisherman near the Darden Road bridge in South Bend. While downstream movements like this are not unheard of, they are uncommon because of the presence of multiple dams on the St. Joseph River between the release and recapture sites.

FISH TISSUE

In 2002, additional tissue samples were again collected from the Elkhart and St. Joseph Rivers to help clarify previous results. The second year of tissue sampling was also completed for Juday Creek and the St. Joseph River in the South Bend

area (Appendix B).

In 2001, rock bass tissue collected from one of three newly established sites along the Elkhart River had group 3 PCB levels. This was higher than any of the eleven other rock bass samples that had been collected from the Elkhart River, so samples were again collected in 2002 from this site and one site upstream. These samples both contained group 1 PCB levels. Golden redhorse tissue was collected for the first time from two lo-

cations on the Elkhart River in an attempt to expand the information that is available for the fish species in this river. These samples had group 2 PCB levels. Additional sampling will be done to confirm the results from both of these species.

On the St. Joseph River in Elkhart County, tissue sampling focused on collecting larger channel catfish (26+ inches) and walleye (17+ inches) from the Bristol area and getting additional tissue samples from common carp, largemouth bass and rock bass. The channel catfish sample contained group 2 mercury levels and group 3 PCB levels while the walleye sample had group 2 mercury and PCB levels. These findings did not vary from previous results for these fish (Foy 2001). The 2002 tissue results for the common carp, largemouth bass and rock bass were also consistent with past results (Foy 1999, Foy 2000) and indicate changes to the FCA may be needed for all five of these species.

The results for the St. Joseph River near South Bend revealed a large variety of PCB levels (group 2-5) in the present fish population and lower (group 1 or 2) mercury levels. Black redhorse, channel catfish and largemouth bass were the only species on the 2002 FCA that were not sampled due to their absence from the catch. Common carp, quillback and shorthead redhorse contained the highest PCB levels while golden and shorthead redhorse had the highest mercury levels. Most of the results were in agreement with the 2002 FCA (see Appendix B) except for white suckers from Juday Creek and shorthead redhorse and white suckers from the St. Joseph River. The results from the white sucker samples have revealed group 1 mercury and PCB levels for the Juday Creek fish and group 3 PCB and group 1 or 2 mercury levels for the St. Joseph River fish. The shorthead redhorse results indicate higher levels of PCBs are now present in these fish. The results from the South Bend area indicate that

white suckers in Juday Creek could be removed from the FCA and the advisory may need to be modified for white suckers and shorthead redhorse in the St. Joseph River.

CONCLUSION

Continued biological monitoring on the St. Joseph River and its tributaries in Elkhart County has added data to the established baseline of information while allowing comparisons to the same baseline to note any negative impacts. The addition of biological monitoring in South Bend on the St. Joseph River and its tributaries is also providing the citizens of this area with details on the condition and health of their aquatic resources while broadening the current baseline of information for the entire St. Joseph River 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. Habitat evaluations in 2003 should reveal whether these IBI fluctuations are due to habitat limitations or water quality issues. The IBI scores on the Elkhart River closely follow the established trend while Bowman Creek continues to be seriously impacted by the land use practices within its watershed, the urban environment it flows through and periods of no water flow. 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). Once a cool/cold water IBI is located or developed, the IBI scores for all of these streams will be recalculated. Yellow Creek scores indicate the stream is successfully recovering from an unknown impact that occurred two years ago on the lower stretches of this stream and the fish community condition in Puterbaugh Creek appears to be stable from site to site. Pine Creek and the Little Elkhart River both have increasing IBI scores as these streams approach the St. Joseph River. The sites on these streams that are closest to the river may have artificially higher IBI scores due to the mix of warmwater and cool/cold water fish that occurs in these confluence areas. The IBI scores of Lily Creek are indicative of a stream that is categorized as a regulated drain and is dredged on a regular basis. Habitat assessments in the future 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 fifth year of sampling, over 500 fish were tagged and 41 fish were recaptured in 45 events. The number of smallmouth bass that were recaptured decreased from the previous year while the number of recaptured walleye increased. More walleye were also tagged this year than any other year due to an extra sampling event in the spring that targeted these fish. Walleye movements were also on the rise this year with one fish moving 17.4 miles upstream and another fish moving 23.9 miles downstream.

In 2002, additional fish tissue information was collected for inclusion in the Fish Consumption Advisory database for Elkhart and St. Joseph counties. Golden redhorse tissue was initially sampled from the Elkhart River and rock bass tissue from this river again had group 1 PCB levels. Juday Creek white sucker tissue also continued to have group 1 PCB and mercury levels indicating this species may be a candidate for removal from the FCA. The results for fish from the St. Joseph River in Elkhart County continue to indicate modifications in the FCA are needed while only the results from white suckers and shorthead redhorse in the St. Joseph County area of the river indicate a change is needed there. The fish tissue results to date for the St. Joseph River reveal a pattern of increasing PCB levels as the river flows through Indiana.

The cities of South Bend and Elkhart will continue in their joint effort to document the condition and integrity of the fish communities in the St. Joseph River watershed. This effort will 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!

ACKNOWLEDGEMENTS

A special thanks is extended to the 2002 summer staff (Len Kring, Erica Amt, Daragh Deegan, Justin Shoemaker, Chris Bowman, and Jordan DeHaven) for their efforts to collect and record the vast amount of information that we do in so short a period of time. This year provided new challenges due to a shortage in staffing, but this group adapted and got the work done!

Thanks are also extended to the Michiana Walleye Association for financial assistance with the purchase of the anchor tags used on the walleye and bass, and to 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.

Last, I would like to thank the cities of Elkhart and South Bend for their leadership in the area of aquatic resource protection. Through the establishment of an interlocal agreement between these two cities, information is now being collected to help preserve and protect a shared aquatic resource, the St. Joseph River.

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SUMMER 2002



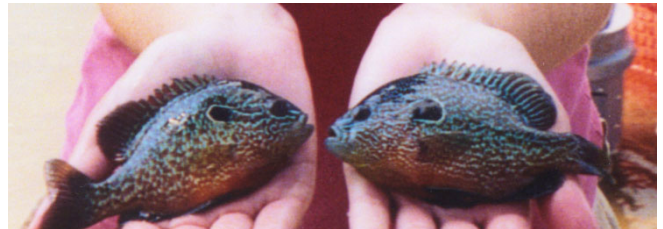
Summer Crew: (front L-R): Jordan, Len, Joe
(back L-R) Chris, Erica, Daragh, Justin



Erica & Justin with a 14 & 15 lbs. northern pike



Chris with a nice smallmouth
bass at Ironwood Drive



Two beautiful longear sunfish from the
South Bend area of the St. Joseph River



Our first muskie collected from the Elkhart River



Len with a 20+ lb. carp



A greater redhorse from the Elkhart River

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
- scalars
- 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, scalars and skinners were cleaned and rinsed with DI water, and freezer wrap was placed where the fish were to be processed. The knives, scalars 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.

Fish Tissue Results

Stream	Species Year	Station	Length Range (inches, 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								
Golden Redhorse								
	2002	Oxbow Park (Below)	15.2-15.8	NONE	1	1	2	1
	2002	EEC (Above)	15.2-16.1	NONE	1	1	2	1
Rock Bass								
	2001	Oxbow Park (Below)	7.0-7.6	7-9	---	2	1	2
	2002	Oxbow Park (Below)	7.1-7.8	7-9	1	2	1	2
	2001	EEC (Above)	7.0-7.6	7-9	---	2	3	2
	2002	EEC (Above)	7.7-8.3	7-9	1	2	1	2
	2001	Studebaker Park (Above)	7.1-7.8	7-9	---	2	1	2
St. Joseph River, Elkhart County								
Channel Catfish								
	2001	Toll Road (Bristol)	26.6-28.7	26+	2	1	3	5
	2002	Bristol Area	27.0-29.6	26+	2	1	3	5
Common Carp								
	2002	Toll Road (Bristol)	30.5-32.9	25+	2	5	3	5
	2002	Lexington Avenue	29.4-31.1	25+	1	5	3	5
	2002	McNaughton Park	27.0-28.5	25+	1	5	3	5
	2001	Nappanee Street	26.6-27.1	25+	1	5	3	5
Largemouth Bass								
	2002	Nappanee Street	12.5-13.6	12+	2	3	1	1
Rock Bass								
	2001	Toll Road (Bristol)	8.0-8.8	7-9	1	1	1	3
	2002	Toll Road (Bristol)	7.1-7.3	7-9	1	1	1	3
	2001	Lexington Avenue	7.4-8.0	7-9	1	1	2	3
	2002	Lexington Avenue	7.9-8.1	7-9	1	1	1	3
	2001	McNaughton Park	7.4-7.8	7-9	1	1	1	3
	2002	McNaughton Park	7.3-7.4	7-9	1	1	2	3
Walleye								
	2000	Elkhart Area	17.4-18.7	17+	2	4	2	1
	2002	Bristol Area	17.2-17.9	17+	2	4	1	1
Juday Creek, St. Joseph County								
White Sucker								
	2001	SR 23	14.4-14.8	12-17	1	1	1	2
	2002	Douglas Road	12.9-14.2	12-17	1	1	1	2

Fish Tissue Results

Stream	Species Year	Station	Length Range (inches, PW&U)	Advisory Length Range (State)	Mercury Group (PW&U)	Advisory Mercury Group (State)	PCB Group (PW&U)	Advisory PCB Group (State)
St. Joseph River, St. Joseph County								
Common Carp								
	2001	Ironwood Drive	31.9-33.1	20+	1	2	5	5
	2002	Ironwood Drive	31.6-32.6	20+	2	2	5	5
	2001	Jefferson Blvd.	30.4-32.4	20+	1	2	3	5
	2002	Veterans Park	29.9-30.9	20+	2	2	5	5
	2001	Keller Park	29.1-31.0	20+	1	2	4	5
	2002	Keller Park	30.9-31.4	20+	1	2	4	5
	2001	Darden Road	25.7-27.8	20+	2	2	4	5
	2002	Darden Road	29.9-31.5	20+	2	2	5	5
Golden Redhorse								
	2001	Ironwood Drive	15.4-16.1	13-22	1	1	3	3
	2001	Michigan Street	16.2-17.5	13-22	2	1	2	3
	2002	Michigan Street	17.6-17.8	13-22	2	1	3	3
	2001	Darden Road	15.2-16.2	13-22	1	1	3	3
	2002	Darden Road	17.0-17.9	13-22	2	1	3	3
Quillback								
	2002	Ironwood Drive	18.6-19.4	18+	2	1	4	3
	2002	Keller Park	19.0-20.2	18+	1	1	3	3
	2001	Darden Road	19.7-20.0	18+	1	1	3	3
	2002	Darden Road	18.3-19.1	18+	2	1	3	3
Shorthead Redhorse								
	2002	Ironwood Drive	17.5-18.0	15-19	2	2	4	3
	2001	Michigan Street	16.5-17.3	15-19	2	2	4	3
	2002	Michigan Street	16.5-17.6	15-19	2	2	3	3
	2001	Darden Road	17.3-18.1	15-19	2	2	4	3
	2002	Darden Road	17.6-18.2	15-19	2	2	3	3
Smallmouth Bass								
	2001	Ironwood Drive	10.0-10.9	9+	1	2	3	3
	2002	Ironwood Drive	9.6-10.6	9+	1	2	3	3
	2001	Keller Park	10.3-10.8	9+	1	2	2	3
	2002	Keller Park	11.1-11.5	9+	1	2	3	3
	2001	Darden Road	12.9-13.7	9+	2	2	1	3
	2002	Darden Road	10.7-11.3	9+	2	2	2	3
Steelhead								
	2001	Darden Road	26.3-28.6	26+	1	1	3	4
	2002	Darden Road	27.6-28.1	26+	2	1	3	4
White Sucker								
	2002	Veterans Park	15.9-17.4	16+	2	1	3	4
	2001	Jefferson Boulevard	14.8-15.1	14-16	1	1	3	3
	2001	Jefferson Boulevard	16.6-17.8	16+	1	1	3	4
	2002	Jefferson Boulevard	14.3-14.8	14-16	1	1	3	3
	2001	Darden Road	16.9-17.9	16+	1	1	3	4
	2002	Darden Road	16.5-17.6	16+	2	1	3	4

Appendix C

Summary of fish collected by county, 2002

Summary of species captured at index sites in Elkhart County, 2002

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
White Sucker	1,687	12.13	144,478	318.23	9.38
Mimic Shiner	1,318	9.48	1,995	4.39	0.13
Rock Bass	1,148	8.26	80,087	176.40	5.20
Creek Chub	905	6.51	15,429	33.98	1.00
Smallmouth Bass	847	6.09	118,573	261.17	7.70
Striped Shiner	720	5.18	12,278	27.04	0.80
Bluegill	666	4.79	18,131	39.94	1.18
Blacknose Dace	619	4.45	2,827	6.23	0.18
Hornyhead Chub	597	4.29	14,600	32.16	0.95
Common Shiner	492	3.54	6,115	13.47	0.40
Spotfin Shiner	483	3.47	2,324	5.12	0.15
Johnny Darter	480	3.45	710	1.56	0.05
Golden Redhorse	467	3.36	280,969	618.87	18.25
Mottled Sculpin	464	3.34	3,062	6.74	0.20
Northern Hog Sucker	395	2.84	73,055	160.91	4.74
Logperch	341	2.45	2,538	5.59	0.16
Bluntnose Minnow	279	2.01	1,238	2.73	0.08
Stoneroller	144	1.04	2,182	4.81	0.14
Green Sunfish	110	0.79	1,618	3.56	0.11
Rosyface Shiner	109	0.78	218	0.48	0.01
Yellow Bullhead	103	0.74	8,096	17.83	0.53
Silverjaw Minnow	101	0.73	336	0.74	0.02
Common Carp	94	0.68	381,497	840.30	24.78
Blackside Darter	92	0.66	215	0.47	0.01
Rainbow Darter	92	0.66	155	0.34	0.01
Largemouth Bass	88	0.63	20,956	46.16	1.36
River Chub	83	0.60	1,607	3.54	0.10
Shorthead Redhorse	75	0.54	47,492	104.61	3.08
Fathead Minnow	68	0.49	151	0.33	0.01
Steelcolor Shiner	66	0.47	350	0.77	0.02
River Redhorse	56	0.40	143,050	315.09	9.29
Chestnut Lamprey	55	0.40	679	1.50	0.04
Grass Pickerel	50	0.36	1,463	3.22	0.10
Pumpkinseed	47	0.34	832	1.83	0.05
Orangethroat Darter	44	0.32	54	0.12	0.00
Stonecat	43	0.31	1,007	2.22	0.07
Sand Shiner	43	0.31	68	0.15	0.00
Longear Sunfish	40	0.29	1,143	2.52	0.07
Yellow Perch	36	0.26	352	0.78	0.02
Brown Trout	35	0.25	4,615	10.17	0.30
Redear Sunfish	35	0.25	4,405	9.70	0.29
Central Mudminnow	33	0.24	195	0.43	0.01
Silver Redhorse	28	0.20	47,889	105.48	3.11
Spotted Sucker	28	0.20	8,177	18.01	0.53
Hybrid Sunfish	28	0.20	2,562	5.64	0.17
Channel Catfish	23	0.17	17,664	38.91	1.15
Black Crappie	23	0.17	3,002	6.61	0.19
Tadpole Madtom	23	0.17	223	0.49	0.01
Longnose Gar	15	0.11	7,049	15.53	0.46
Walleye	13	0.09	3,478	7.66	0.23
American Brook Lamprey	11	0.08	119	0.26	0.01
YOY Redhorse (Unidentified)	11	0.08	107	0.24	0.01
Black Redhorse	10	0.07	8,561	18.86	0.56
Greater Redhorse	7	0.05	14,900	32.82	0.97
Warmouth	7	0.05	81	0.18	0.01
Quillback	6	0.04	9,276	20.43	0.60
Bowfin	6	0.04	8,590	18.92	0.56
Golden Shiner	6	0.04	68	0.15	0.00
Rainbow Trout	2	0.01	618	1.36	0.04
Black Bullhead	2	0.01	162	0.36	0.01
Brook Stickleback	2	0.01	3	0.01	0.00
Muskellunge	1	0.01	4,800	10.57	0.31
Northern Pike	1	0.01	804	1.77	0.05
Brown Bullhead	1	0.01	502	1.11	0.03
White Crappie	1	0.01	8	0.02	0.00
Greenside Darter	1	0.01	1	0.00	0.00
Sub-Total	13,906	100.00	1,539,789	3,392	100.00

Summary of species captured at investigative sites in Elkhart County, 2002

Common Name	Total Number	% by Number
White Sucker	822	10.27
Creek Chub	806	10.07
Bluegill	601	7.51
Blacknose Dace	433	5.41
Johnny Darter	433	5.41
Mimic Shiner	390	4.87
Striped Shiner	388	4.85
Bluntnose Minnow	343	4.29
Golden Redhorse	318	3.97
Stoneroller	279	3.49
Smallmouth Bass	254	3.17
Rock Bass	250	3.12
Common Shiner	235	2.94
Mottled Sculpin	189	2.36
Spotfin Shiner	170	2.12
Fathead Minnow	165	2.06
Loggerhead	159	1.99
Longear Sunfish	146	1.82
Green Sunfish	143	1.79
Hornyhead Chub	142	1.77
Sand Shiner	139	1.74
Northern Hog Sucker	118	1.47
Rainbow Darter	111	1.39
Central Mudminnow	100	1.25
Silverjaw Minnow	93	1.16
Largemouth Bass	91	1.14
Common Carp	89	1.11
Brown Trout	85	1.06
Blackside Darter	49	0.61
Pirate Perch	49	0.61
Silver Redhorse	40	0.50
Grass Pickerel	38	0.47
Steelcolor Shiner	28	0.35
Rosyface Shiner	27	0.34
Spotted Sucker	27	0.34
Yellow Bullhead	27	0.34
Warmouth	26	0.32
Orangethroat Darter	24	0.30
Walleye	16	0.20
Brook Silverside	15	0.19
Yellow Perch	13	0.16
Hybrid Sunfish	12	0.15
Longnose Gar	11	0.14
Brook Stickleback	10	0.12
Shorthead Redhorse	10	0.12
Channel Catfish	9	0.11
Redear Sunfish	9	0.11
Black Crappie	8	0.10
Pumpkinseed	7	0.09
Tadpole Madtom	7	0.09
American Brook Lamprey	6	0.07
Black Bullhead	6	0.07
Bowfin	6	0.07
Northern Pike	6	0.07
Greater Redhorse	4	0.05
Greenside Darter	4	0.05
Spotted Gar	3	0.04
Black Redhorse	2	0.02
Chestnut Lamprey	2	0.02
Golden Shiner	2	0.02
Rainbow Trout	2	0.02
Brown Bullhead	1	0.01
Redfin Shiner	1	0.01
River Redhorse	1	0.01
Starhead Topminnow	1	0.01
Stonecat	1	0.01
White Crappie	1	0.01
Sub-total	8,003	100.00

Index Sites	13,906
Investigative Sites	<u>8,003</u>
Elkhart County Total	21,909

Summary of species captured at index sites in St. Joseph County, 2002

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Creek Chub	1,022	21.09	11,333	24.96	0.67
Smallmouth Bass	497	10.25	70,149	154.51	4.13
Golden Redhorse	472	9.74	312,340	687.97	18.39
Shorthead Redhorse	356	7.34	240,216	529.11	14.14
Longear Sunfish	305	6.29	12,952	28.53	0.76
Rock Bass	285	5.88	24,225	53.36	1.43
White Sucker	245	5.05	45,787	100.85	2.70
Spotfin Shiner	200	4.13	574	1.26	0.03
Mottled Sculpin	164	3.38	933	2.06	0.05
Mimic Shiner	162	3.34	235	0.52	0.01
Common Carp	118	2.43	597,750	1,316.63	35.19
Blacknose Dace	118	2.43	519	1.14	0.03
Bluegill	115	2.37	2,819	6.21	0.17
Quillback	111	2.29	145,686	320.89	8.58
Green Sunfish	97	2.00	3,500	7.71	0.21
Logperch	92	1.90	1,155	2.54	0.07
Northern Hog Sucker	58	1.20	13,669	30.11	0.80
Silver Redhorse	42	0.87	77,804	171.37	4.58
Pumpkinseed	41	0.85	1,668	3.67	0.10
Walleye	39	0.80	19,191	42.27	1.13
Johnny Darter	37	0.76	60	0.13	0.00
Rainbow Trout	32	0.66	19,620	43.22	1.16
Black Redhorse	27	0.56	14,184	31.24	0.84
Yellow Bullhead	26	0.54	4,432	9.76	0.26
Steelcolor Shiner	26	0.54	74	0.16	0.00
Brown Trout	24	0.50	547	1.20	0.03
Hybrid Sunfish	20	0.41	1,527	3.36	0.09
Largemouth Bass	17	0.35	3,794	8.36	0.22
Spotted Sucker	16	0.33	6,217	13.69	0.37
Bluntnose Minnow	15	0.31	38	0.08	0.00
Longnose Gar	8	0.17	10,914	24.04	0.64
River Redhorse	7	0.14	19,750	43.50	1.16
Redear Sunfish	7	0.14	393	0.87	0.02
Black Crappie	6	0.12	1,313	2.89	0.08
Blackside Darter	6	0.12	16	0.04	0.00
Rainbow Darter	5	0.10	10	0.02	0.00
Northern Pike	4	0.08	20,550	45.26	1.21
Channel Catfish	4	0.08	4,496	9.90	0.26
Chestnut Lamprey	3	0.06	42	0.09	0.00
Golden Shiner	3	0.06	19	0.04	0.00
Greater Redhorse	2	0.04	4,300	9.47	0.25
Spotted Gar	2	0.04	3,100	6.83	0.18
White Crappie	2	0.04	384	0.85	0.02
Ohio Lamprey	2	0.04	32	0.07	0.00
Brown Bullhead	1	0.02	272	0.60	0.02
Stonecat	1	0.02	46	0.10	0.00
Greenside Darter	1	0.02	3	0.01	0.00
Sand Shiner	1	0.02	3	0.01	0.00
Common Shiner	1	0.02	1	0.00	0.00
Rosyface Shiner	1	0.02	1	0.00	0.00
Spottail Shiner	1	0.02	1	0.00	0.00
Sub-Total	4,847	100.00	1,698,644	3741.46	100.00

Summary of species captured at investigative sites in St. Joseph County, 2002

Common Name	Total Number	% by Number
Smallmouth Bass	278	17.75
Longear Sunfish	203	12.96
Golden Redhorse	185	11.81
Rock Bass	152	9.71
Creek Chub	95	6.07
Mottled Sculpin	89	5.68
Mimic Shiner	63	4.02
Common Carp	57	3.64
Bluegill	46	2.94
White Sucker	46	2.94
Spotfin Shiner	39	2.49
Logperch	38	2.43
Shorthead Redhorse	38	2.43
Central Mudminnow	29	1.85
Walleye	28	1.79
Quillback	21	1.34
Rainbow Trout	18	1.15
Yellow Bullhead	16	1.02
Blackside Darter	15	0.96
Spotted Sucker	14	0.89
Bluntnose Minnow	12	0.77
Silver Redhorse	11	0.70
Green Sunfish	10	0.64
Pumpkinseed	9	0.57
Blacknose Dace	8	0.51
Johnny Darter	6	0.38
Sand Shiner	6	0.38
Channel Catfish	5	0.32
Largemouth Bass	5	0.32
Northern Hog Sucker	5	0.32
Longnose Gar	3	0.19
River Redhorse	3	0.19
Brown Trout	2	0.13
Chestnut Lamprey	2	0.13
Spottail Shiner	2	0.13
Black Bullhead	1	0.06
Brown Bullhead	1	0.06
Golden Shiner	1	0.06
Grass Pickerel	1	0.06
Hybrid Sunfish	1	0.06
Orangethroat Darter	1	0.06
Redear Sunfish	1	0.06
Sub-total	1,566	100.00

Index Sites	4,847
Investigative Sites	<u>1,566</u>
St. Joseph County Total	6,413

Appendix D

Summary of fish collected by site, 2002

Stream Site Number	St. Joseph River, Elkhart County										
	1	2		3		4		5		6	
		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	X		X		
Black Redhorse		X	X	X				X			
Blackside Darter	X	X	X	X	X		X			X	X
Bluegill	X	X	X	X	X	X	X	X	X	X	X
Bluntnose Minnow	X	X		X	X		X				
Bowfin		X	X	X	X						
Brook Silverside	X						X				
Brown Bullhead					X						
Brown Trout										X	
Channel Catfish		X				X	X	X		X	X
Chestnut Lamprey		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
Grass Pickerel	X				X	X	X				
Greater Redhorse							X				
Green Sunfish				X	X		X	X	X	X	X
Greenside Darter							X		X		
Hybrid Sunfish	X		X	X	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		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									
Pirate Perch	X										
Pumpkinseed							X	X	X		X
Quillback								X		X	
Rainbow Darter		X	X	X					X	X	X
Redear Sunfish	X										
Redfin Shiner	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
Rosyface Shiner				X				X	X	X	
Sand Shiner	X						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
Silverjaw Minnow											
Smallmouth Bass	X	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X	X	X	X	X	X
Spotted Gar						X					
Spotted Sucker	X	X		X	X	X	X				
Steelcolor Shiner	X	X			X		X			X	X
Stonecat			X								
Striped Shiner								X	X		X
Tadpole Madtom	X										
Walleye		X		X		X	X	X		X	X
Warmouth	X										
White Crappie											
White Sucker	X	X		X		X	X		X	X	X
Yellow Bullhead	X	X	X		X		X	X	X		X
Yellow Perch	X	X			X	X	X				
YOY Redhorse		X									

Stream Site Number	St. Joseph River, St. Joseph County														
	7		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					
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	X
Brown Bullhead				X										X	
Channel Catfish	X				X		X				X				X
Chestnut Lamprey										X		X		X	X
Common Carp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Common Shiner		1													
Golden Redhorse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Golden Shiner	1														
Greater Redhorse								X							
Green Sunfish	X	X	X	X	X	X					X		X		X
Greenside Darter											X				
Hybrid Sunfish	X	X		X					X	X	X				X
Largemouth Bass	X	X					X			X	X		X	X	
Logperch	X	X		X	X		X	X	X		X	X	X	X	X
Longear Sunfish	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Longnose Gar					X			X						X	
Mimic Shiner	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					
Ohio Lamprey								X							
Orangethroat Darter					X										
Pumpkinseed	X	X	X	X	X		X	X	X	X			X	X	X
Quillback	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rainbow Darter								X							
Rainbow Trout	X		X		X			X		X		X	X		
Redear Sunfish												X	X	X	
River Redhorse						X	X		X			X	X		
Rock Bass	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rosyface Shiner	X														
Sand Shiner												X			X
Shorthead Redhorse	X	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	X	X
Smallmouth Bass	X	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	X	X
Spottail Shiner		X				X									
Spotted Gar								X							
Spotted Sucker	X		X	X	X	X				X		X	X	X	X
Steelcolor Shiner	X								X		X		X		
Stonecat									X						
Walleye	X		X		X	X	X	X	X	X	X	X	X	X	X
White Crappie										X					
White Sucker	X	X	X	X	X	X					X	X	X	X	X
Yellow Bullhead	X	X	X	X	X	X	X	X					X	X	X

Stream Site Number	Little Elkhart River					Pine Creek			Puterbaugh Creek			Lily Creek (OTD)		
	16	17		18		19	20		21		22	23	24	
		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				X	X			X			
Blacknose Dace	X	X	X			X	X	X						
Blackside Darter				X	X		X	X						
Bluegill	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bluntnose Minnow		X	X									X		
Bowfin												X		
Brown Trout	X	X	X	X	X	X								
Central Mudminnow	X	X	X	X	X	X			X	X	X			
Chestnut Lamprey	X	X			X		X							
Common Carp	X													
Common Shiner	X		X											
Creek Chub	X	X	X	X	X	X	X	X	X	X	X			X
Golden Redhorse	X	X		X			X							
Golden Shiner								X						
Grass Pickerel			X	X		X		X	X	X	X			
Green Sunfish	X		X		X				X	X	X			
Hornyhead Chub		X	X											
Hybrid Sunfish			X											
Johnny Darter	X	X	X	X	X	X	X	X	X	X	X			
Largemouth Bass		X	X	X	X					X		X		X
Logperch		X	X	X	X		X	X						
Longear Sunfish							X							
Mimic Shiner					X							X		
Mottled Sculpin	X	X	X	X	X	X	X	X	X	X	X			
Northern Hog Sucker		X	X	X	X		X	X						
Orangethroat Darter							X	X						
Pumpkinseed			X								X			
Rainbow Darter		X	X	X	X			X	X		X			
Rainbow Trout	X			X	X	X								
Redear Sunfish									X	X		X	X	
River Redhorse				X										
Rock Bass				X	X									
Rosyface Shiner					X									
Sand Shiner												X		
Shorthead Redhorse			X	X	X		X							
Silver Redhorse				X										
Smallmouth Bass				X	X		X	X						
Spotfin Shiner	X	X		X	X			X						
Starhead Topminnow												X		
Stoneroller		X	X						X	X	X			
Striped Shiner		X	X		X									
Walleye				X										
Warmouth									X	X	X	X		
White Sucker	X	X	X	X	X	X	X	X	X	X	X			
Yellow Bullhead							X			X				
Yellow Perch									X	X	X			

Stream Site Number	Christiana Creek						Elkhart River									
	25	26		27		28	29	30	31		32		33		34	
		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					X			
Black Bullhead						X										
Black Crappie						X		X	X	X	X	X	X			
Black Redhorse						X										
Blackside Darter						X	X	X	X	X		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	
Bowfin	X						X				X					
Central Mudminnow	X												X			
Channel Catfish						X									X	
Chestnut Lamprey		X	X	X	X				X	X	X		X	X	X	
Common Carp	X		X	X	X		X					X				
Common Shiner							X	X	X		X	X	X			
Creek Chub									X							
Golden Redhorse			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Golden Shiner						X										
Grass Pickerel	X	X	X	X	X	X	X	X	X	X						
Greater Redhorse								X	X	X						
Green Sunfish				X	X	X	X	X	X	X	X				X	
Greenside Darter						X										
Hornyhead Chub	X	X	X	X	X		X		X	X	X	X	X	X	X	X
Hybrid Sunfish				X				X	X		X	X	X		X	
Johnny Darter							X									
Largemouth Bass	X		X		X	X	X	X	X	X	X	X	X	X		X
Logperch	X		X	X	X	X										
Longear Sunfish			X			X	X	X			X			X	X	X
Longnose Gar						X										
Mimic Shiner										X						
Muskellunge									X							
Northern Hog Sucker	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Pike							X	X								
Orangethroat Darter		X	X				X									
Pirate Perch							X	X								
Pumpkinseed					X	X		X	X	X		X				
Rainbow Darter	X	X	X		X	X	X									
Redear Sunfish								X		X	X	X	X	X		
River Chub		X	X													
Rock Bass	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rosyface Shiner							X	X	X	X	X		X	X	X	X
Sand Shiner	X					X	X			X	X		X		X	
Shorthead Redhorse				X												
Silver Redhorse		X	X	X		X										
Smallmouth Bass	X	X	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 Gar						X										
Spotted Sucker								X	X	X	X	X	X	X		
Steelcolor Shiner				X	X							X				
Stonecat			X			X			X	X						X
Striped Shiner	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
Tadpole Madtom	X	X	X													
Warmouth							X	X	X							
White Crappie							X		X							
White Sucker	X	X	X	X		X		X	X	X	X	X	X	X	X	X
Yellow Bullhead	X	X	X	X	X	X	X	X	X	X				X		X
Yellow Perch						X						X				

Stream	Stoney Creek	Dry Run Creek	Solomon Creek		Turkey Creek		Rock Run Creek	Yellow Creek						
	35	36	37	38	39	40	41	42	43		44		45	
									1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
Black Bullhead								X		X		X		
Black Crappie					X	X				X	X	X	X	X
Blacknose Dace	X	X	X	X	X		X	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
Bluntnose Minnow	X			X	X	X	X		X	X	X	X	X	X
Brook Stickleback							X				X			
Brown Bullhead					X									
Brown Trout			X											
Central Mudminnow	X	X		X	X	X	X			X	X	X		X
Chestnut Lamprey											X			X
Common Carp		X	X		X	X							X	X
Common Shiner	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
Fathead Minnow			X	X			X	X	X	X	X	X	X	
Golden Redhorse				X	X	X							X	X
Golden Shiner					X					X	X	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	X
Hybrid Sunfish					X							X		X
Johnny Darter	X		X	X	X	X	X	X	X	X	X	X	X	X
Largemouth Bass	X			X		X	X		X					X
Longear Sunfish					X									
Northern Hog Sucker				X	X	X							X	
Orangethroat Darter				X								X		
Pirate Perch	X				X	X								
Pumpkinseed										X	X	X	X	X
Rainbow Darter	X		X	X	X		X							
Rock Bass					X	X								
Rosyface Shiner					X									
Sand Shiner					X								X	
Silverjaw Minnow							X		X	X	X	X		
Smallmouth Bass					X	X							X	X
Spotfin Shiner					X									
Spotted Sucker					X									
Stoneroller	X			X			X		X	X	X	X	X	X
Striped Shiner	X				X		X		X	X	X	X	X	X
White Sucker	X	X	X	X	X	X	X		X	X	X	X	X	X
Yellow Bullhead						X						X		
Yellow Perch									X	X	X	X		

Stream	Manning Ditch	Cobus Creek	Lost Creek	Baugo Creek	Auten Ditch	Bowman Creek		Juday Creek									
	46	47	48	49	50	51	52	53	54	55	56		57		58		
								1st Pass	2nd Pass			1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
Black Bullhead						X											
Blacknose Dace	X		X	X	X					X	X		X	X	X	X	
Bluegill	X		X		X	X				X		X	X				
Bluntnose Minnow			X	X	X												
Brown Trout		X									X	X	X	X	X	X	
Central Mudminnow						X				X							
Common Carp				X	X												
Common Shiner				X	X												
Creek Chub	X	X	X	X	X		X	X			X	X	X	X	X	X	
Fathead Minnow				X	X												
Golden Shiner						X		X									
Grass Pickerel					X	X											
Green Sunfish	X		X	X	X					X	X	X	X				
Hornyhead Chub			X														
Hybrid Sunfish	X										X	X					
Johnny Darter			X	X	X						X	X	X	X	X		
Largemouth Bass										X		X	X				
Logperch					X												
Mottled Sculpin		X								X	X	X	X	X	X	X	
Rainbow Darter															X	X	
Rainbow Trout															X	X	
Rock Bass											X	X	X	X			
Silverjaw Minnow			X	X	X												
Smallmouth Bass												X					
Spotfin Shiner					X												
Stoneroller	X		X	X	X												
Striped Shiner	X		X														
Tadpole Madtom			X														
White Sucker	X		X	X	X						X	X	X	X	X	X	
Yellow Bullhead			X		X												

COLLECTED

FISH

NO