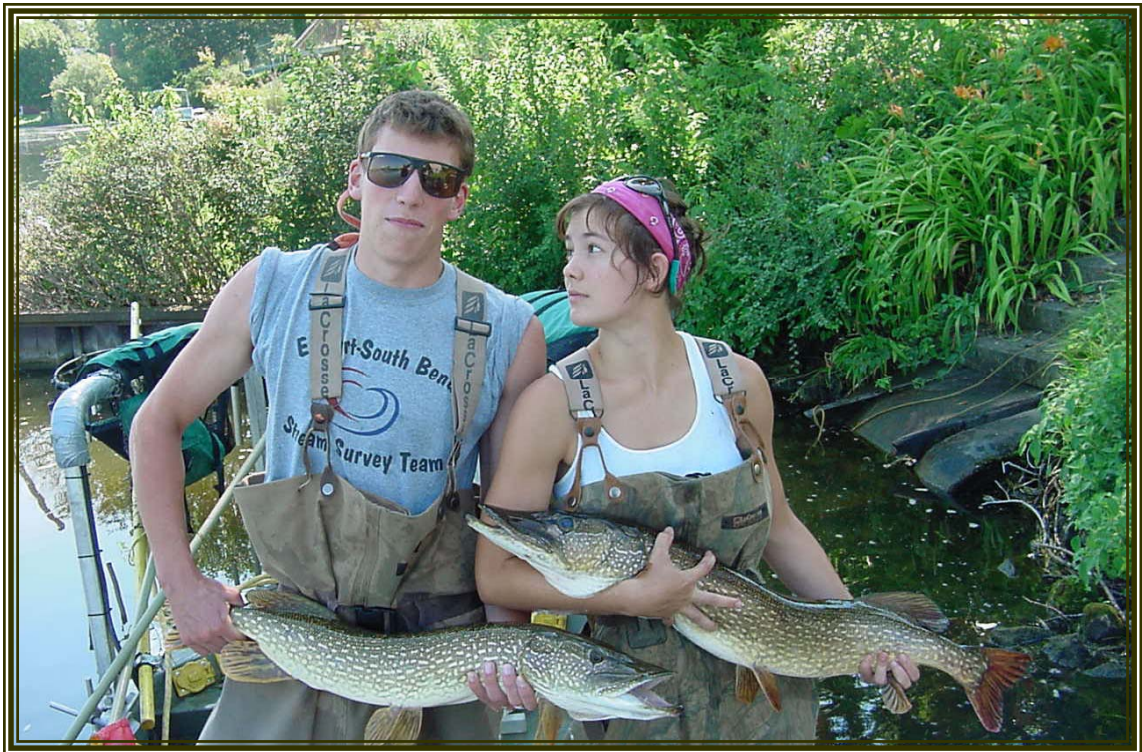


ELKHART-SOUTH BEND AQUATIC COMMUNITY MONITORING



**ANNUAL REPORT
2006**

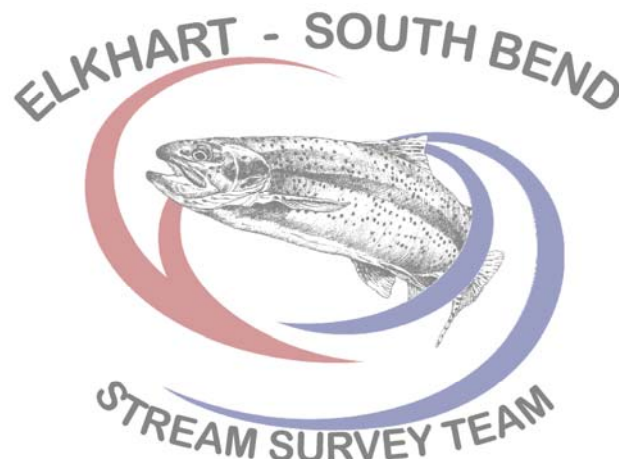
City of Elkhart 
The city with a heart

David L. Miller, Mayor

Cover Photo: Hannah Jantzi reminding Daniel Peterson that her northern pike was just a bit bigger than his. These fish weighed 9 and 10 lbs, respectively.

TABLE OF CONTENTS

INTRODUCTION.....	1
METHODS.....	4
RESULTS AND DISCUSSION	8
INDICIES	8
TAGGING AND MOVEMENT	16
FISH TISSUE	17
CONCLUSION.....	17
ACKNOWLEDGEMENTS	19
REFERENCES	20
SUMMER 2006 (Pictures)	21
APPENDICES	
APPENDIX A (Metrics for various indices)	
APPENDIX B (Fish tissue preparation and results)	
APPENDIX C (Summary of fish collected by county, 2006)	
APPENDIX D (Summary of fish collected by site, 2006)	
APPENDIX E (Summary of macroinvertebrates collected by site, 2006)	



AQUATIC COMMUNITY MONITORING IN ELKHART AND ST. JOSEPH COUNTIES ON THE ST. JOSEPH RIVER AND SELECTED TRIBUTARIES 2006



Prepared by
Len Kring
Aquatic Biologist
May, 2006

INTRODUCTION

From the origin of its headwaters in Hillsdale, MI near Baw Beese Lake, to its confluence with Lake Michigan in St. Joseph, MI, the St. Joseph River traverses 210 miles through Southern Michigan and North-Central Indiana. On this journey from east to west, the St. Joseph River drains approximately 4,685 square miles of land through an intricate network of smaller tributary streams (SJRBC website). As the river surges towards Lake Michigan it encounters wooded areas, wetlands, agricultural fields, and towns. All of these environments can have an effect on the quality of the water, and in turn, on the aquatic organisms that inhabit these waters. Since 1998, the City of Elkhart has monitored the fish communities in area streams in order to better understand the impact the city has on these streams. At that time, the city decided to take a proactive approach in helping protect the area rivers and streams. Elkhart will be ahead of most cities in Indiana in the event that biological monitoring becomes mandatory.

Chemical monitoring can only tell part of the story of what is happening to our streams. This type of monitoring alone only gives us a snapshot of what is in the stream at that time. The animals that live in the streams for all or part of their lives can give us an idea of what has happened, is happening or will happen based on the composition of their communities.

During the first 6 years of the program, the monitoring team established core sampling stations on the St. Joseph River and its primary tributaries. Data was collected from each station for three consecutive years in order to establish a baseline of information for all streams sampled. This baseline is used to assess the impacts urban areas are having on local streams. This baseline will also be used to assess any changes in the fish community structure over time.

The City of South Bend has been involved with the monitoring program since 2001. The addition of South Bend made this program more of a watershed project. The streams in the South Bend area are sampled in the same way as they are around Elkhart. This allows the data to be examined as a whole and not by segment. The 6 year baseline work was completed in 2006 for the South Bend area. Starting in 2007, the city will be able to examine closer its affect on the area streams.

The addition of South Bend to the program was just the first step in making this program truly watershed in scale. Elkhart hopes to enlist the cities of Goshen and Mishawaka in coming years to gain an even broader perception of the health of the St. Joseph River Watershed. In future years, Elkhart envisions adding Noble and La-Grange Counties into the plan, as these counties include the head waters of the Elkhart River, a major tributary of the St. Joe.

In 1996, the Environmental Protection Agency (EPA) declared a national goal for clean water stating that "America's rivers, lakes and coastal waters will support healthy communities of fish, plants and other aquatic life..." along with the objective to "conserve and enhance aquatic ecosystems." Biological integrity was chosen as the key indicator to reflect this goal and objective. In 1997, the EPA released it Strategic Plan from the Office of Chief Financial Officer, containing the measures that will be used to document environmental progress. With this plan, the EPA presented three key objectives to meet the goal

of clean and safe water, the second of which was to "conserve and enhance the ecological health of the nation's waters and aquatic ecosystems... so that 75% of waters will support healthy aquatic communities by 2005." Such measures of attainability can only be accurately determined through multimetric biological monitoring and assessment approaches (Davis 1999).

The Index of Biotic Integrity (IBI), as modified by Simon (1997) for use in the St. Joseph River basin, has been utilized to assess the fish community information. This index was developed by 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 classifications (very poor, poor, fair, good, or excellent) which describes the

Figure 1. MBI Personnel collecting macro-invertebrates with the use of kick-net



overall condition of the fish community being monitored.

Biologists recognize that fish community condition is a product of the water quality *and* the habitat that is available in any given area. Since 2003, Elkhart has been assessing available habitat at all sampling locations using the Qualitative Habitat Evaluation Index (QHEI) (Rankin 1989). This index is similar to the IBI in its structure. It has six broad categories which are broken down into 21 smaller categories or metrics (Appendix A). This index will have a final score of 0 to 100 and the scores will be classified as excellent, good, fair-good, poor, and very poor. This assessment will help determine to what extent the IBI scores are being affected by habitat and to begin cataloging the quality of available habitat in all the local rivers and streams.

The summer of 2006 signaled the end of the first phase of aquatic benthic macroinvertebrate (insect) community sampling. With the assistance of the Midwest Biodiversity Institute (Figure 1) (MBI, Columbus, Ohio), the City of Elkhart has collected macroinvertebrate samples from 20 sites for the last three years. This data will be used to establish a baseline similar to the ones established for the fish communities. Future data collected will then be compared to this baseline and will allow Elkhart and South Bend to further view the impacts the cities have on the receiving streams. These communities are assessed with the Invertebrate Community Index (ICI) developed by Ohio EPA (Ohio EPA 1987). This index is broken down into 10 metrics (Appendix A). Like the IBI metrics, the ICI metrics are given a score based on their similarity to relatively undisturbed sites; 6 (comparable to exceptional community), 4 (comparable to typical community), 2 (slightly different from the typical community), or 1 (very

Table 1: Fish consumption information taken from the 2006 Indiana Fish Consumption Advisory

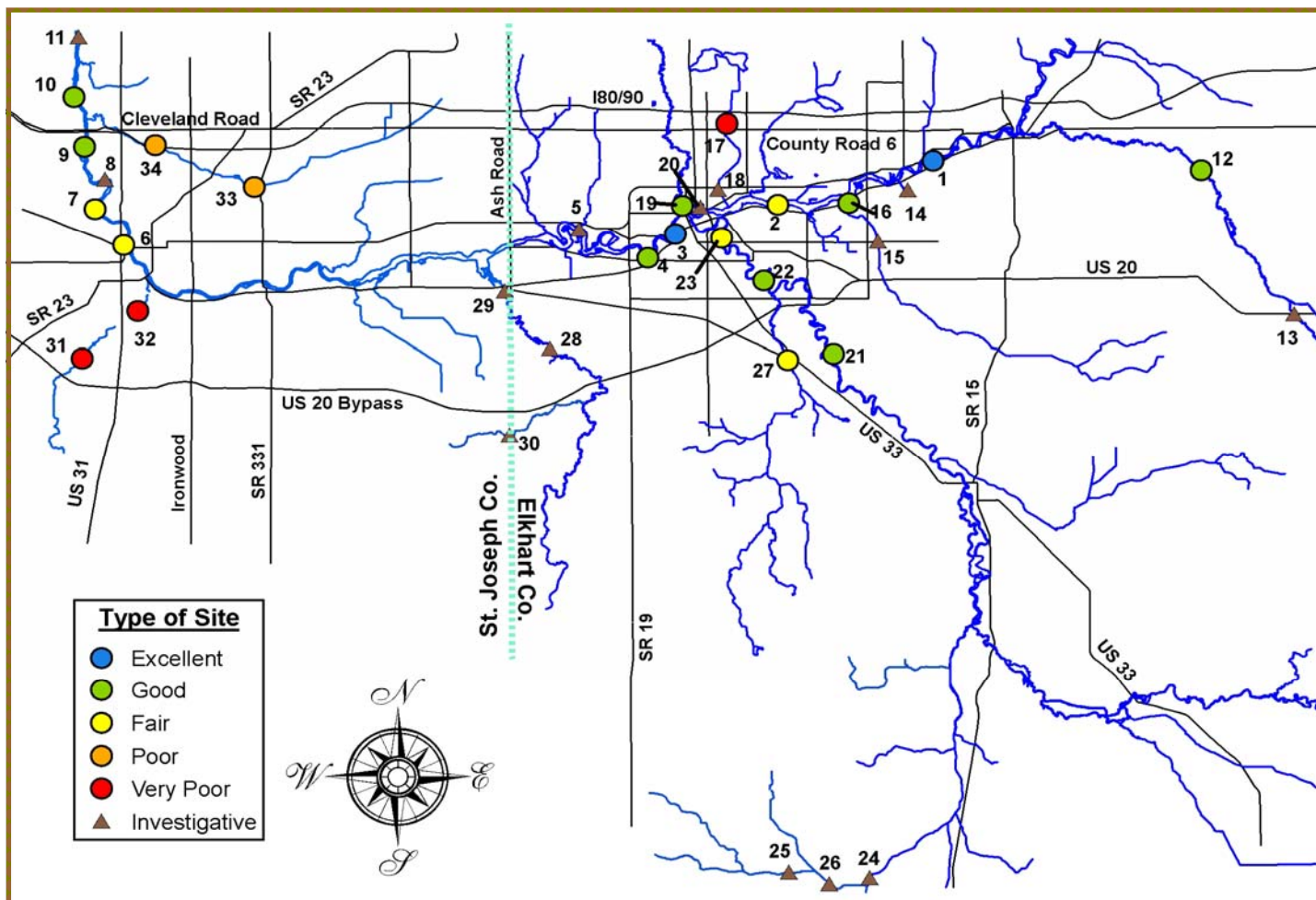
Location	Species	Fish Size (inches)	Contaminant	Group
Elkhart River <i>Elkhart County</i>	Rock Bass	9+	☐	3
	Smallmouth Bass	17+	☐	3
	White Sucker	16+	☐	3
St. Joseph River <i>Elkhart County</i>	Carp	25-28	☐	3
		28+	☐	4
	Channel Catfish	29+	☐	3
	Golden Redhorse	17+	☐	3
	Northern Hogsucker	15+	☐	3
	Shorthead Redhorse	15-17	☐	3
		17+	☐	4
	Smallmouth Bass	11+	☐	3
	Walleye	16+	☐	3
St. Joseph River <i>St. Joseph County</i>	Black Redhorse	16-18	☐	3
		18+	☐	4
	Carp	Up to 20	☐	4
		20+	☐	5
	Channel Catfish	22+	☐○	4
	Golden Redhorse	13-22	☐	3
		22+	☐	4
	Largemouth Bass	14+	☐	3
	Quillback	18+	☐	3
	Rainbow Trout (also known as Steelhead)	25-31	☐	3
		31+	☐	4
	Rock Bass	8+	☐	3
	Shorthead Redhorse	15-19	☐	3
		19+	☐	4
	Smallmouth Bass	9+	☐	3
White Sucker	14-16	☐	3	
Juday Creek	White Sucker	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.)

different from the typical community). The site scores range from 0 to 60 and are graphed and classified the same as the IBI scores. This combination of fish, habitat, and macroinvertebrate monitoring will provide Elkhart and South Bend with the most comprehensive view of our stream resources' health.

Besides water quality monitoring in the St. Joseph River basin, fish collections are conducted to determine the overall species diversity through out the area waterways. The aquatics staff continued to tag smallmouth bass (*Micropterus dolomieu*) and walleye (*Sander vitreus*) collected through the summer. Tissue

Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community condition for 2006



from 5 species of fish was collected and analyzed for mercury and PCB content. This information was added to the existing tissue data from the area. The current Indiana Fish Consumption Advisory (FCA) (Table 1) shows several species from the St. Joseph River watershed. The cities of Elkhart and South Bend feel it is their responsibility to provide the local citizens with the most accurate and up-to-date information on local fish consumption.

Methods

Over the last nine years, two collection methods have been utilized to quickly classify the major fish species and to quantify water quality throughout the Indiana portion of the St. Joseph River watershed. Investigative sites were generally sampled only once and the fish collected at these sites were identified to species, with the largest and smallest specimens measured to the nearest millimeter (mm), all fish were counted

and then released. Conversely, index sites were sampled twice during the season, with a five week interval between events. The length of index sites is dependent on the "wetted" width of the stream sampled, which is basically where the surface of the water meets the bank during average flow. The length of the sites was 15 times said width, with a minimum length of 50 meters and a maximum length of 500 meters. One investigative site was sampled twice; once during the day and then again at night. This approach gives the aquatics staff information as to how fish assemblages shift in a 24 hour period. Differences in sampling and processing (Foy 2004) have allowed multiple investigative sites to be sampled in a day versus one to two index sites. Every species collected at each site is verified either by retaining a small specimen for the Office of Public Works voucher museum or photographing a large specimen. This practice allows for the verification of the field and lab identifications if needed.

Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2006

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores		ICI Scores		QHEI Scores	
				2005	2006	2005	2006	2005	2006
1	Nibbyville (A) St. Joseph River	Index Elkhart	Boat		56				72
2	Homan Avenue St. Joseph River	Index Elkhart	Boat	42	42			60	55
3	Lexington Avenue St. Joseph River	Index Elkhart	Boat		56				70
4	McNaughton Park St. Joseph River	Index Elkhart	Boat		50				65
5	River Shores St. Joseph River	Investigative Elkhart	Boat						55
6	LaSalle Street St. Joseph River	Index St. Joseph	Boat	46	44	36	44	78	68
7	Angela Boulevard St. Joseph River	Index St. Joseph	Boat	50	43			84	75
8	Keller Park (B) St. Joseph River	Investigative St. Joseph	Boat						N/A
9	Pinhook Park (B) St. Joseph River	Index St. Joseph	Boat	52	52			73	73
10	Brick Road St. Joseph River	Index St. Joseph	Boat	44	48	44	48	82	73
11	St. Patrick's Park St. Joseph River	Investigative St. Joseph	Boat						N/A
12*	County Road 35 Little Elkhart River	Index Elkhart	Tote Barge		47				86
13*	US 20 Rowe-Eden Ditch	Investigative Elkhart	Tote Barge						47
14*	Timberbrook Sheep Creek	Investigative Elkhart	Tote Barge						39
15*	County Road 14 Pine Creek	Investigative Elkhart	Tote Barge						53
16*	State Road 120 Pine Creek	Index Elkhart	Tote Barge		50				70
17	Park-Six Drive Lily Creek	Index Elkhart	Back Pack		8				44
18	Baldwin Street Lily Creek	Investigative Elkhart	Back Pack						53
19	North Main Wellfield Christiana Creek	Index Elkhart	Tote Barge		52				75
20	High Dive Park Christiana Creek	Investigative Elkhart	Tote Barge						61
21	Oxbow Park (B) Elkhart River	Index Elkhart	Boat		52				76
22	Elkhart Environmental Center (A) Elkhart River	Index Elkhart	Boat		49				69
23	Central High School Elkhart River	Index Elkhart	Boat		46				69
24	County Road 17 Turkey Creek	Investigative Elkhart	Tote Barge						60
25	County Road 13 Berlin Court Ditch	Investigative Elkhart	Back Pack						47
26	County Road 15 Berlin Court Ditch	Investigative Elkhart	Tote Barge						37
27	Central High School Yellow Creek	Index Elkhart	Tote Barge	29	38				65

* denotes a cool/cold water site

Table 2 (continued)

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores		ICI Scores		QHEI Scores	
				2005	2006	2005	2006	2005	2006
28	County Road 1 (N) Baugo creek	Investigative Elkhart	Tote Barge						61
29	Washington Avenue Baugo creek	Investigative St. Joseph	Tote Barge						68
30	Ash Road Rogers Ditch	Investigative St. Joseph	Tote Barge						43
31	Chippewa Phillips Ditch	Index St. Joseph	Back Pack	17	6	10	16	50	52
32	Studebaker Golf Course Bowman Creek	Index St. Joseph	Back Pack	17	6			37	35
33*	Grape Road Juday Creek	Index St. Joseph	Tote Barge	27	33	28	32	57	58
34*	Kintz Avenue Juday Creek	Index St. Joseph	Tote Barge	22	30	42	52	62	55

* denotes a cool/cold water site

In 2006, 12 index and 12 investigative sites were sampled in Elkhart County and 8 index and 2 investigative sites were sampled in St. Joseph County (Figure 2 and Table 2). Index sites were sampled twice with at least a five week "rest" period between visits, and investigative sites were generally sampled once. IBI scores were calculated for each of the index sites and an average from the two visits was obtained to give 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.

Again in 2006, stream habitat information was systematically collected at all sites using the Qualitative Habitat Evaluation Index (QHEI) as developed by Ohio EPA (Rankin 1989). Multiple field personnel assessed the available habitat at all fish sampling sites each time the site was visited. All scores were then averaged to give one composite score (Table 2).

During the first week of August, MBI personnel

placed Hester-Dendy samplers (artificial substrates used to collect small aquatic organisms) (Figure 3) at the same 20 sites that had been used in 2004 and 2005 (Table 3 and Figure 4) following Ohio EPA macroinvertebrate sampling procedures (Ohio EPA 1987, 1989). All twenty of the samplers were successfully retrieved six weeks later and their contents were preserved in alcohol for later identification. The data gathered from the samplers is considered a quantitative sample where species are identified and specimens are counted. This data is then used to calculate ICI scores for each site. Qualitative sampling also takes place at the time of sampler retrieval. This extra sampling was performed with kick nets through out all available habitat near the location of the macroinvertebrate samplers. Table 2 shows some of the ICI scores for sites that were also sampled for fish in 2006. All ICI scores are shown graphically through out the rest of this report.

Due to a request from the Indiana Department of Natural Resources (IDNR), procedures for fish tagging changed slightly in 2006. Largemouth bass (*Micropterus salmoides*) were not tagged this year. Only smallmouth bass 14 inches and over and walleye 15 inches and over were tagged. An orange anchor tag was inserted into the fish near the left anterior edge of the spinous dorsal fin (Figure 5). These tags display a unique number and have the phone number for the city's Office of Public Works. All anglers that catch a tagged fish are encouraged to contact the Office of Public Works regardless of whether they keep the fish or release it.

Figure 3: Hester-Dendy samplers newly placed into the stream bed.

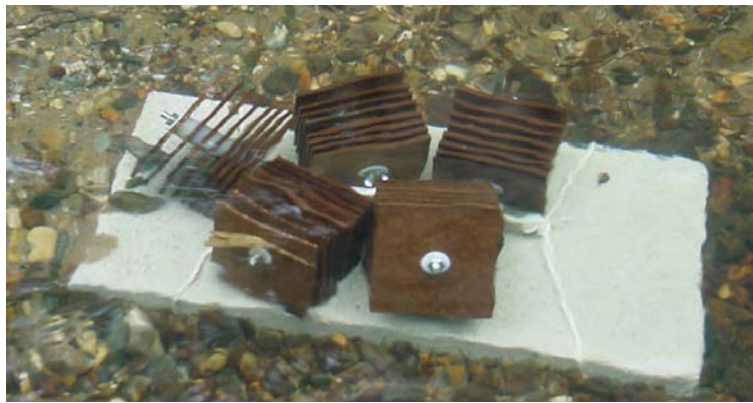


Table 3: Macroinvertebrate sites, 2006

Site Number	Stream	Station	Site Number	Stream	Station
1	St. Joseph River	State Road 15	11	Elkhart River	Oxbow Park
2	St. Joseph River	Sherman Street	12	Elkhart River	Indiana Avenue
3	St. Joseph River	Michigan Street	13	Elkhart River	Middlebury Street
4	St. Joseph River	Brick Road	14	Yellow Creek	County Road 32
5	Little Elkhart River	County Road 10	15	Yellow Creek	County Road 45
6	Pine Creek	US 20 Bypass	16	Cobus Creek	County Road 8
7	Puterbaugh Creek	County Road 8	17	Phillips Ditch	Chippewa Avenue
8	Lily Creek	Reckell Avenue	18	Juday Creek	Grape Road
9	Christiana Creek	County Road 4	19	Juday Creek	Kintz Avenue
10	Christiana Creek	Willowdale Park	20	Juday Creek	Izaak Walton League

Figure 4: Location of macroinvertebrate sampling sites for 2006

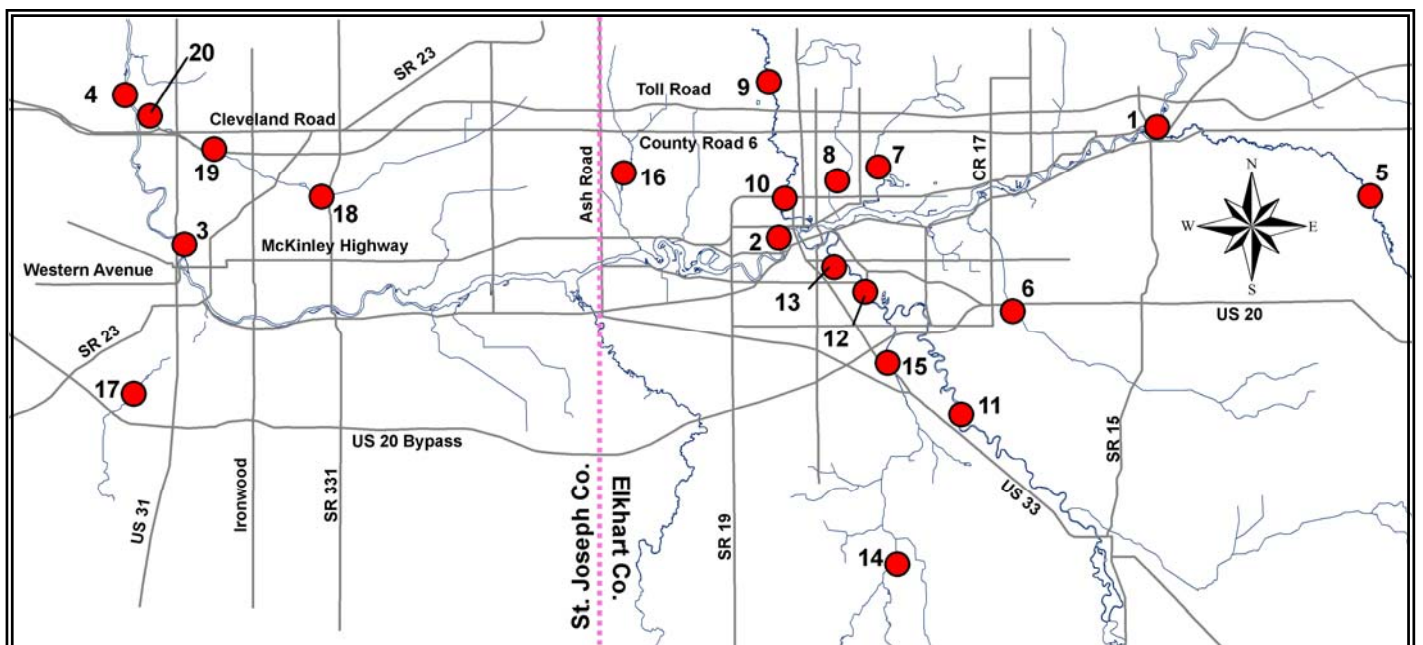
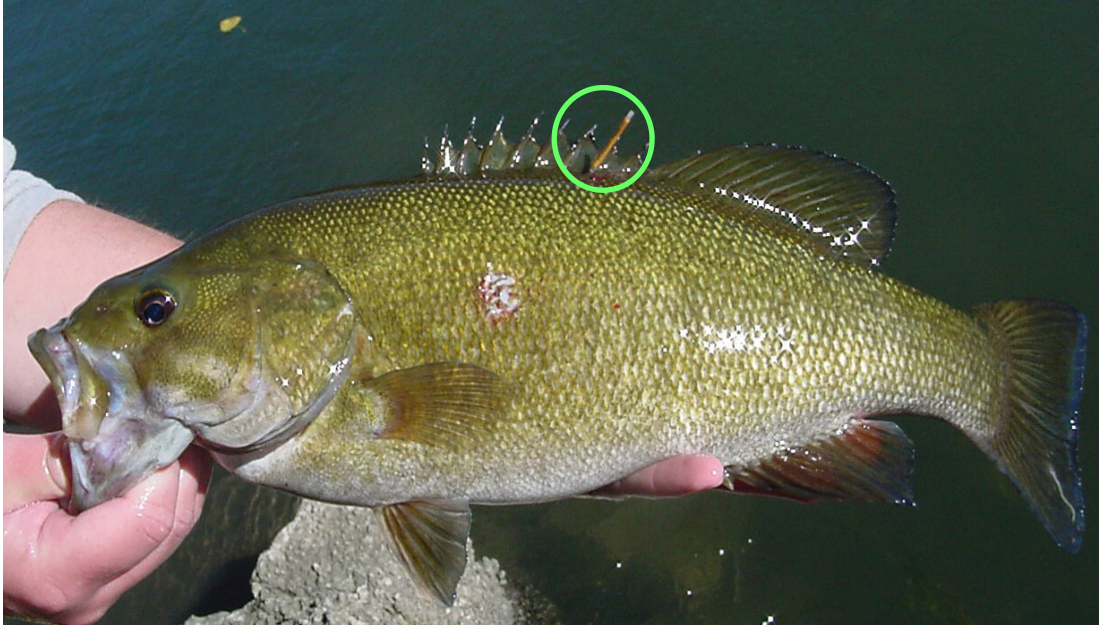


Figure 5: Placement of tag on smallmouth bass



Fish tissue in the form of fillets was collected from common carp (*Cyprinus carpio*), Chinook (king) salmon (*Onchorhynchus tshawytscha*), shorthead redhorse (*Moxostoma macrolepidotum*), quillback (*Carpoides cyprinus*) and white sucker (*Catostomus commersonii*) during the first week in October. All tissue samples were collected from the St. Joseph River in South Bend from the area just upstream of the wastewater treatment plant downstream to the IDNR boat ramp near Darden Road. Each tissue sample sent in for analysis was a composite of fillets from three fish of the same species from the sample region. The shortest specimen collected was within 90% of the length of the longest specimen. 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 AND DISCUSSION

During the summer of 2006, a total of 14,610 fish were collected in Elkhart County and 5,628 fish were collected in St. Joseph County (Appendix C). In St. Joseph County, these fish represented 53 species in 14 families and in Elkhart County, collected fish represented 66 species in 16 families. Overall, a total of 68 different species were captured from the two counties.

Bluegill (*Lepomis macrochirus*), rock bass (*Ambloplites rupestris*) and smallmouth bass were the top three species collected in Elkhart County, while longear sunfish (*Lepomis megalotis*), bluegill, and creek chub (*Semotilus atromaculatus*) were the top three species sampled in St. Joseph County.

INDICES

The IBI, ICI, and QHEI scores for 2006 are summarized in Table 2. Throughout this report these indices will be presented in graphical form to illustrate longitudinal changes on the different streams. The ICI and IBI graphs have an attainment line. Fish and aquatic macroinvertebrate communities that score below this mark are considered impaired. There is a myriad of reasons (poor habitat, thermal pollution, chemical contaminants, etc.) that could contribute to such impairment.

Fish community conditions at the index sites ranged from very poor (6) at Studebaker Golf Course on Bowman Creek and at Chippewa Avenue on Phillips Ditch to excellent (56) at Nibbyville (A) and Lexington Avenue on the St. Joseph River. The quality of the habitat at the index and investigative sites ranged from poor (35) at Studebaker Golf Course on Bowman Creek to excellent (86) at County Road 35 on the Little Elk-

hart River.

The Indiana Department of Environmental Management (IDEM) has established guidelines to determine if a river or stream is being impaired or if its condition is supportive of aquatic life (IDEM 2006) for the IBI and QHEI. The ICI is not an index used by IDEM, however similar guidelines have been established by OHIO EPA for a nearby region, and those values will be used with the Elkhart and South Bend data. Values of 36 or higher for IBI and ICI scores are indicators of a stream with the ability to support aquatic life. QHEI scores of 51 or larger indicate enough quality habitat is available to support aquatic communities.

The longitudinal trends in fish community condition for the entire St. Joseph River in Indiana can be seen in Figure 6. Data for the Elkhart baseline was gathered from 1998 to 2003. Fish community conditions continue to be good to excellent in the Elkhart area with the exception of the Homan Avenue site. The other three sites had not been sampled since 2003 and show a positive increase in community condition compared to the original baseline. Upon original scoring of the Lexington Avenue site, this area fell into the good range. However, after closer inspection of the data, a discussion between the city's aquatic biologist and Dr. Thomas Simon took place. Dr. Simon is the author and creator of the IBI used in the St. Joseph

Figure 6: IBI scores for the St. Joseph River, Elkhart and St. Joseph Counties

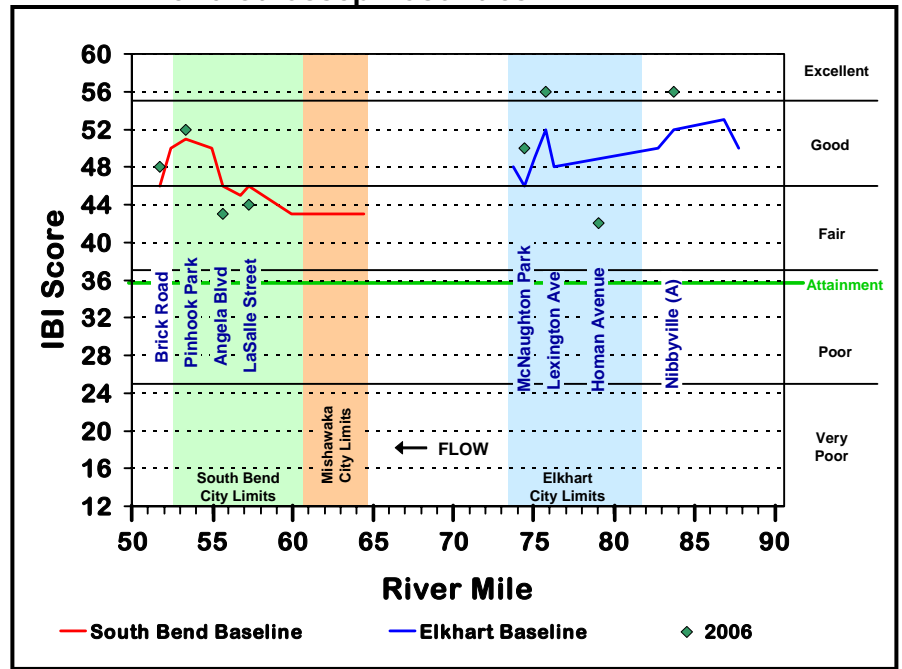


Figure 8: QHEI scores for the St. Joseph River, Elkhart and St. Joseph Counties

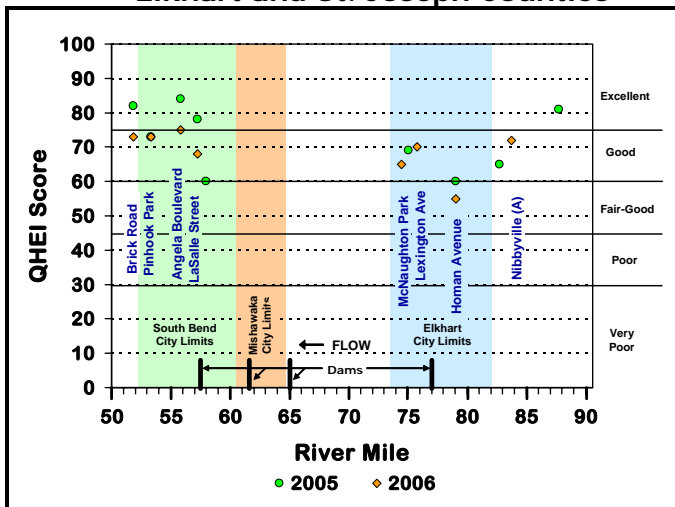
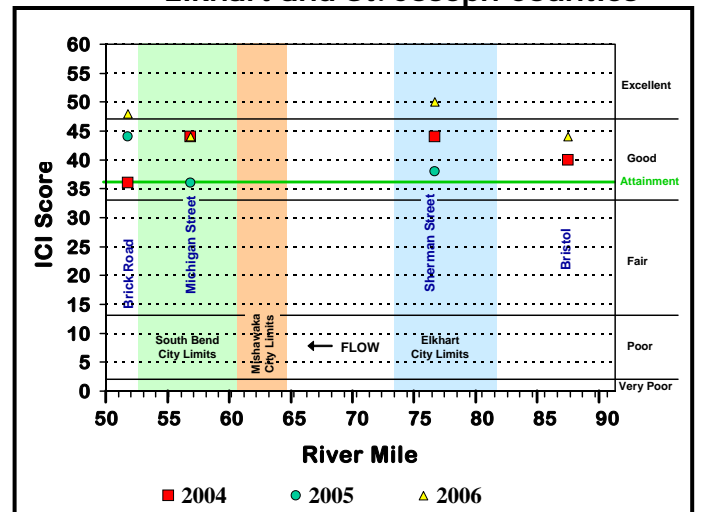


Figure 7: ICI scores for the St. Joseph River, Elkhart and St. Joseph Counties



River drainage. The area in question was metric 10 of the IBI (Appendix A) which deals with total number of fish collected. This metric can be scored low for having too few fish or too many fish. This metric was originally calibrated this way because many streams in our area are stocked with non-native trout and salmon. Dr. Simon suggested that best professional judgment can be used to score this metric based on numbers of stocked fish in the sample (personal communications, February 26, 2007).

There seems to not have been any severe nega-

tive impacts on this section of the stream in the past three years; while the health of the fish communities has increased. We continue to evaluate the Homan Avenue site even though the current IBI may not accurately portray the true condition at that location. This will at least give us a reference for future sampling at this site. The IBI currently used is calibrated to test true stream conditions, whereas areas located directly upstream of dams represent more of a lake-type environment. Data collected through habitat surveys in 2006 closely resembles the trend seen in the fish community data (Figure 8). The lowest habitat scores were seen in the impounded area around Homan Avenue. This area has a lot of shore-line development and very little diversity in habitat that is needed to support an array of different fish species. Figure 7 shows increases in ICI scores in the Elkhart area, with a significant increase in downtown Elkhart. This gives an indication as to why the Lexington Avenue site scored so well for the fish community. With both high ICI and QHEI scores, it is not a surprise that the fish communities in the Elkhart County portion of the St. Joseph River are doing fine; however there is still room for improvement.

The baseline for the South Bend portion of the St. Joseph River was updated and completed in 2006. Data collection for this baseline began in 2001. Figure 6 shows the newly constructed baseline that includes 2006 data. Sites sampled in the heart of South Bend in 2006 scored lower than the

Figure 9: IBI scores for the Elkhart River, Elkhart County

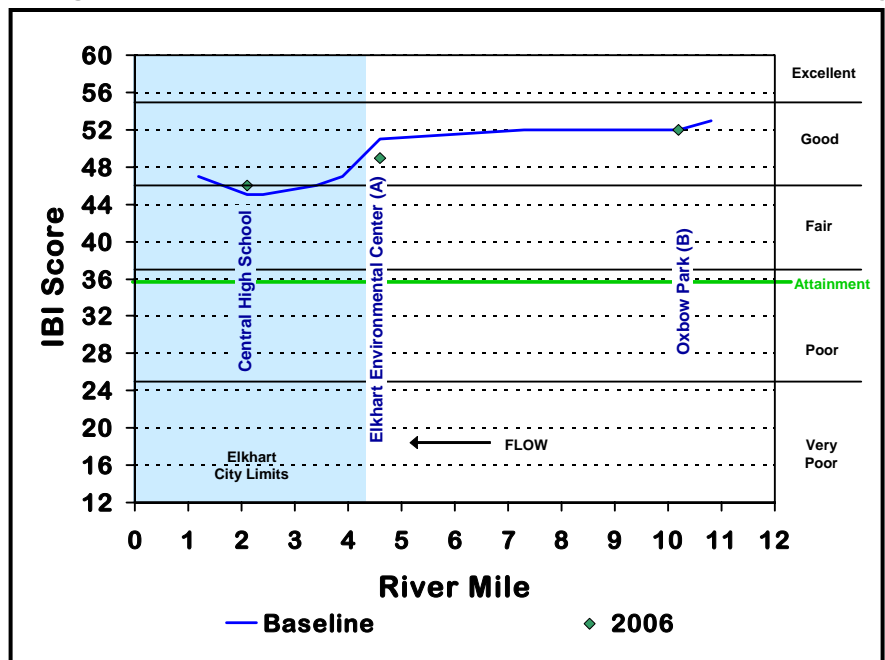


Figure 10: ICI scores for the Elkhart River, Elkhart County

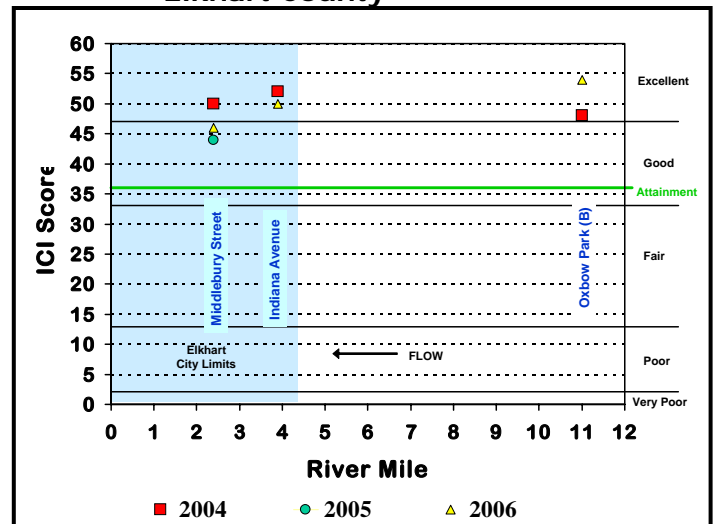
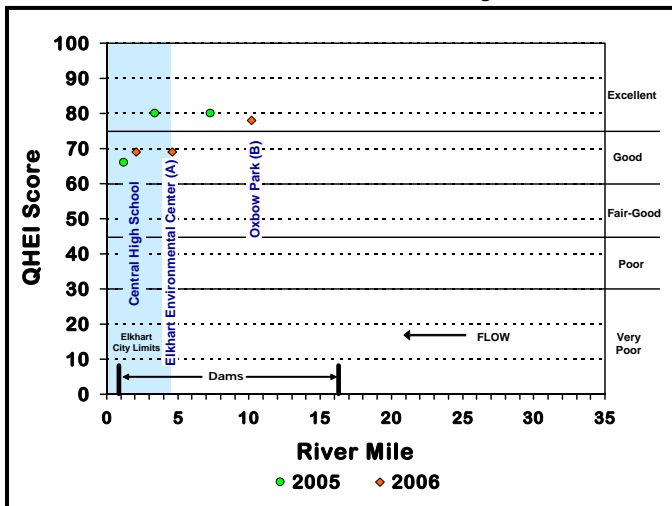


Figure 11: QHEI scores for the Elkhart River, Elkhart County



established baseline. This could be because of construction around the LaSalle and Michigan Street bridges having negative impacts on fish communities immediately downstream. The two downstream sites showed fish communities in the good range, with the area just below Pinhook Park having the best fish community condition in the South Bend area. The Brick Road area showed slight improvement over the previous two seasons, moving from the fair range into the good range. This section has more areas with seawalls and less woody debris in the river than other downstream sites, which may be cause for the negative dip in the baseline. However, the Brick Road site scored comparatively well with all other

St. Joseph River sites with regards to overall habitat quality (Figure 8). QHEI scores for South Bend show that there is good available habitat for fish communities. The aforementioned human disturbances could be the cause of lower fish scores at upstream sites and could have pushed a lot of fish downstream, possibly into the downstream sampling sites. Figure 7 indicates that the insect communities in South Bend are holding steady, with a slight increase at Brick Road. This may explain why there was an increase in the IBI score.

As seen in 2005, IBI scores for the Elkhart River in 2006 (Figure 9) closely follow the baseline established for this stream. The three sites had not been sampled since 2003 and these scores show that lit-

Figure 12: IBI scores for Bowman Creek and Juday Creek, St. Joseph County

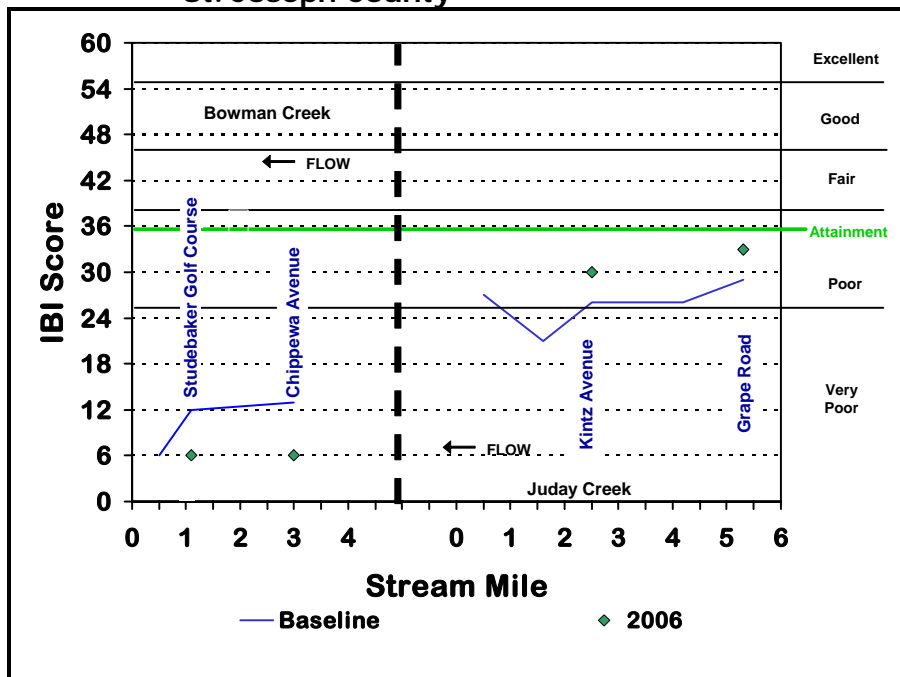
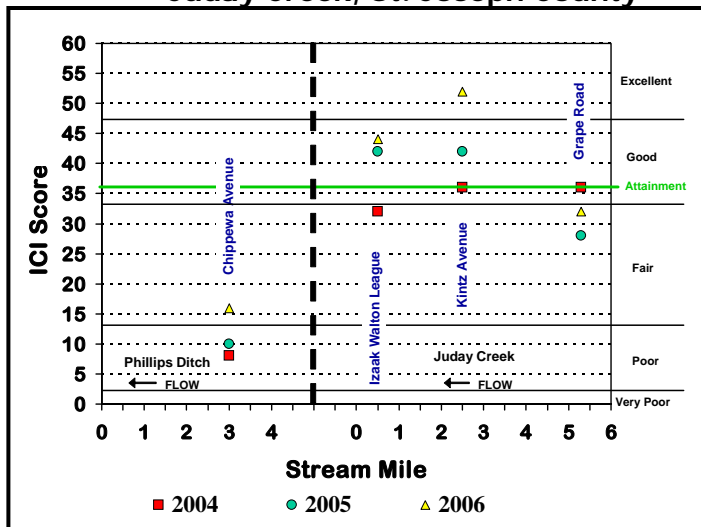


Figure 13: ICI scores for Bowman Creek and Juday Creek, St. Joseph County



tle to no detrimental impacts have adversely affected these areas of the Elkhart River over the last three years. While the lower Elkhart River does not support as wide an array of fish species as the St. Joseph River, it does continue to support an excellent population of smallmouth bass, the top predator by number in our area. QHEI evaluations continue to show that there is plenty of quality habitat in the Elkhart River available for use by fish communities (Figure 11), especially near the Oxbow Park area. There are many negative connotations about this stream, however, the Elkhart River continues to more than ade-

quately support aquatic life. ICI scores in the Elkhart River (Figure 10) continued to be high. The Oxbow Park and Indiana Avenue sites scored in the excellent range.

The Office of Public Works continues to monitor area tributaries of both the Elkhart and St. Joseph Rivers. Longitudinal views of area streams are compared to similarly constructed baselines so that fish communities and the overall biological health of all streams in this portion of the watershed can be monitored.

Juday Creek and Bowman Creek (Phillips Ditch

Figure 14: QHEI scores for Bowman Creek and Juday Creek, St. Joseph County

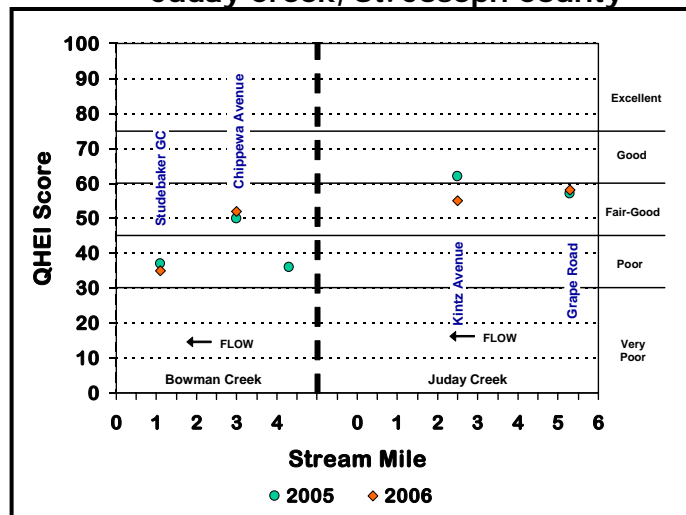


Figure 15: IBI scores for Lily Creek and Yellow Creek, Elkhart County

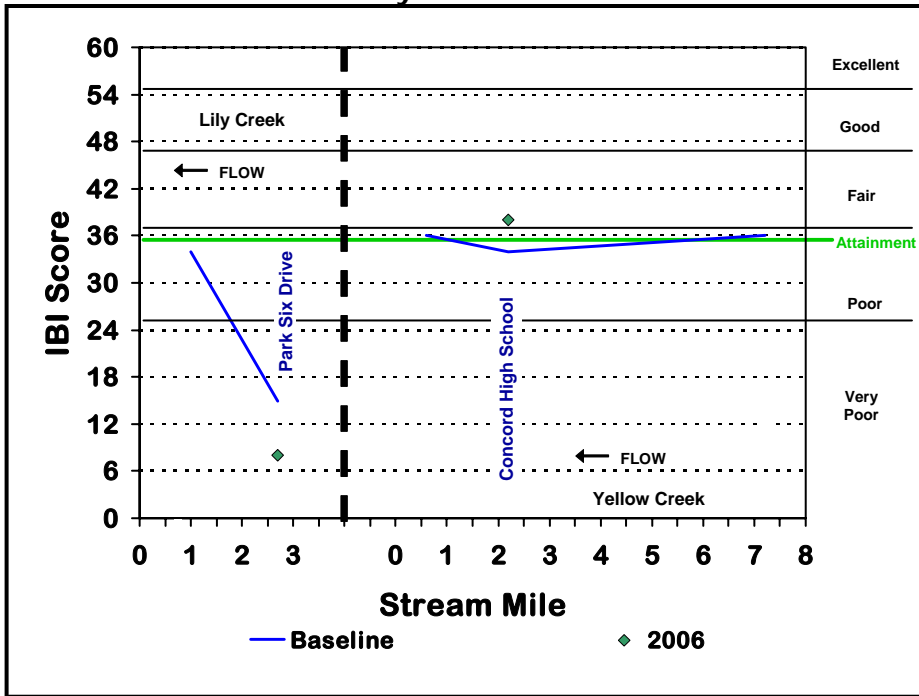
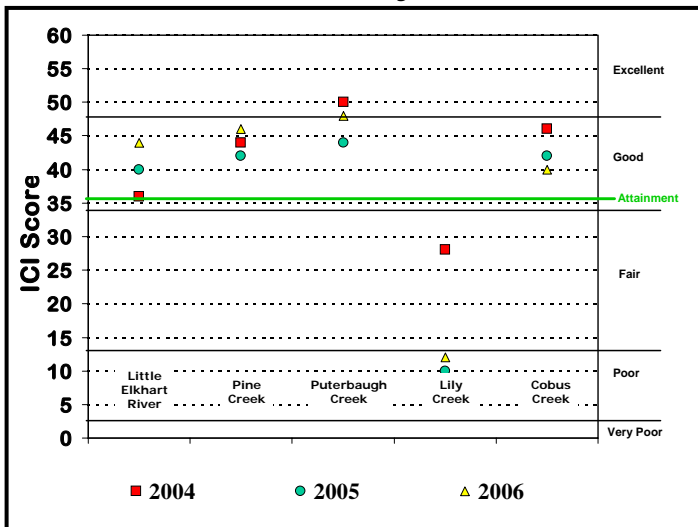


Figure 16: ICI scores for various streams in Elkhart County



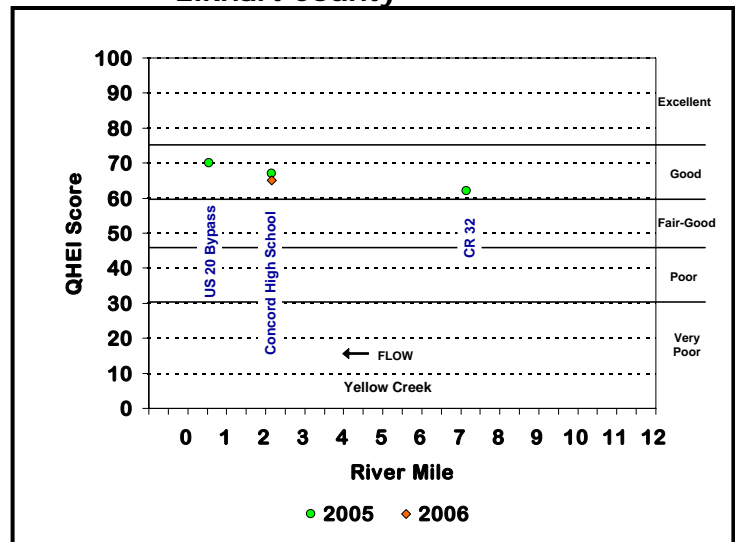
and Auten Ditch are extensions of this stream) are both tributaries of the St. Joseph River in St. Joseph County. This is where the similarities end. Although both streams are heavily affected by the urban environment in which they flow through, Juday Creek is a cold/cool water stream that can support trout, while Bowman Creek maintains much warmer temperatures and has severely impaired biological communities.

IBI scores for Bowman Creek were especially discouraging for the summer of 2006 (Figure 12). Both sites sampled fell below the already low

baseline. One major reason for the decline in scores is that during the second sampling period no fish were collected at either site. This automatically gives a score of zero for that sample. If at least one specimen would have been collected at each site the second time the scores would have been close to the baseline. During the first sampling event at Studebaker Golf Course there was no stream flow, just isolated pools. This section actually dried up before the second sampling run. Before the second sampling event there was a heavy rain event in early July. Water was flowing rapidly through the golf course and there were no places to hold fish. The section at Chippewa Avenue also had high flows, but there were still areas that could hold fish. This section was not completely devoid of life as crayfish were observed during the attempt to collect fish.

The ICI scores for Bowman Creek increased (Figure 13), however, the score still fell far below the attainment line. Although there was 1520 organisms collected from the sampler (Appendix E), over 1300 were the same species. This shows that there was not much diversity and why the ICI score was still low. Bowman Creek originates south of South Bend and flows northward towards the St. Joseph River. On this journey, the stream disappears underground as it has been buried in concrete pipes through out much of its course

Figure 17: QHEI scores for Yellow Creek, Elkhart County



within the city limits. This serious habitat modification is reflected in the QHEI scores in Figure 14. Although habitat scores at the Chip-pewa site were in the fair-good range, modifications downstream may limit recolonization of fish up-stream.

Although the IBI scores for Juday Creek improved slightly and were above the baseline (Figure 12), they still fell below the minimum standards set by IDEM. The temperature of Juday Creek may play a big role in its ability to support a diverse aquatic community, as cooler streams do not support as large of numbers or species as do warm-water streams. The IBI that has been calibrated for our area is for warm-water streams. This is currently the best tool we have to

Figure 18: IBI scores for Christiana Creek and the Little Elkhart River, Elkhart County

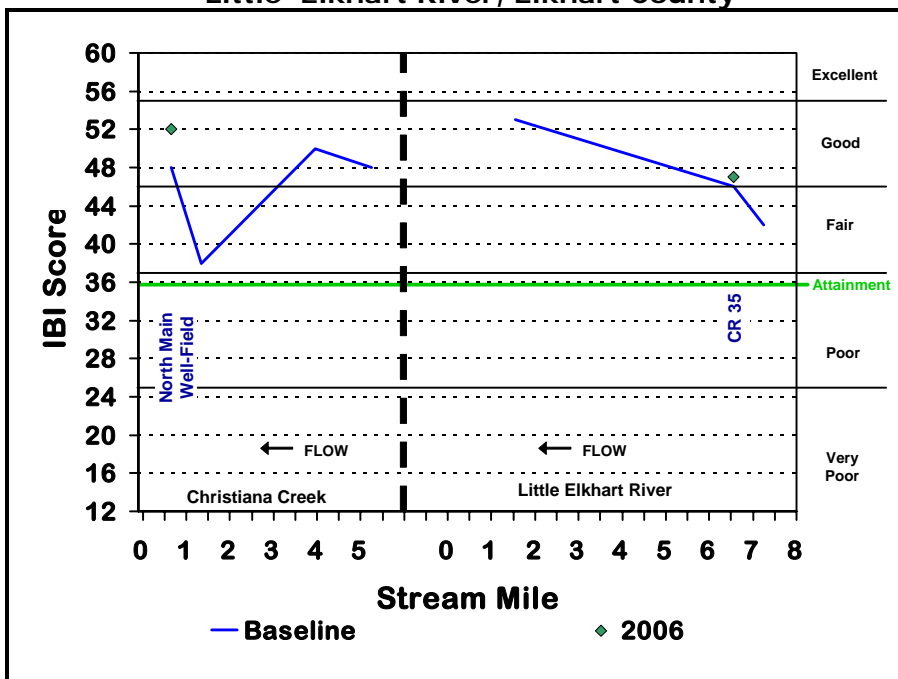
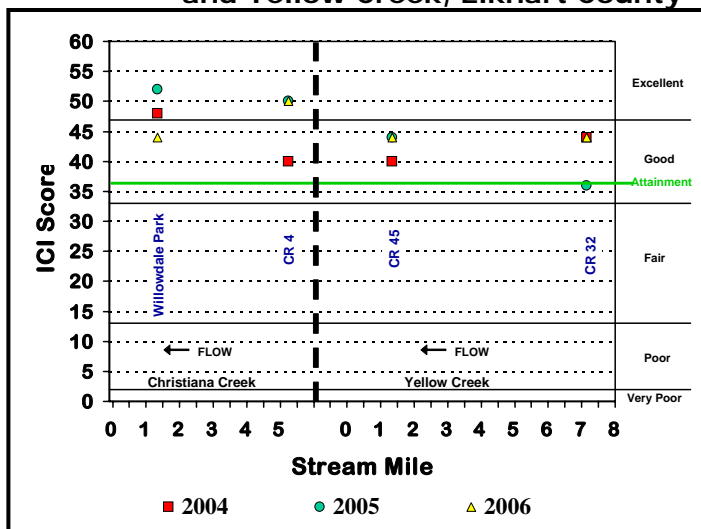


Figure 19: ICI scores for Christiana Creek and Yellow Creek, Elkhart County



measure stream health. Even though this may give artificially low scores for area cool-water streams, Juday Creek continues to score lower than other area streams that support trout and have lower temperatures. Representatives from the Aquatic Research Center of the Indiana Biological Survey and IDEM are working to develop a cool-water IBI for Indiana. The hope is that this new tool will allow biologists to more accurately report aquatic community supporting capacity of cool-water streams. ICI scores for Juday Creek increased in 2006 (Figure 13), including a remark-

able increase at Kintz Avenue. Again there could be a positive relationship between IBI and ICI scores. QHEI scores continue to be fair along the length of Juday Creek (Figure 14). There is so much influence on Juday Creek from the urban surroundings that it is remarkable that the habitat for this stream is that good.

Yellow Creek is one of many regulated drains in Elkhart County. In the past, this stream has been heavily modified by channelization and dredging activities and having much of the riparian vegeta-

Figure 20: QHEI scores for Christiana Creek and the Little Elkhart River, Elkhart County

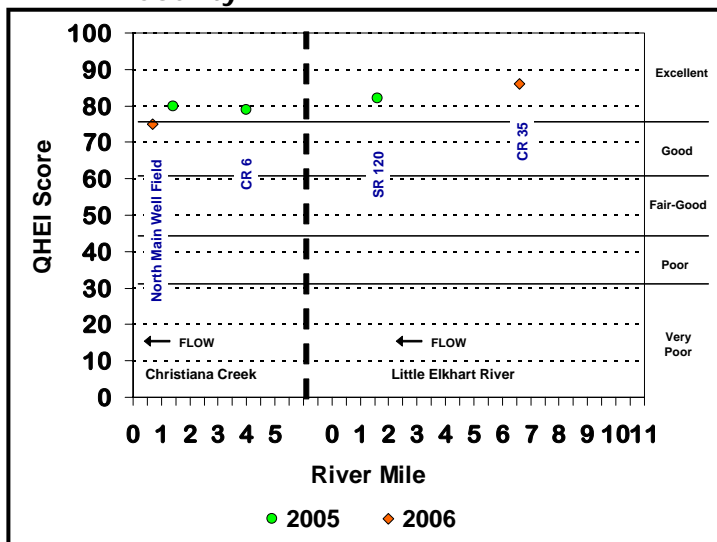
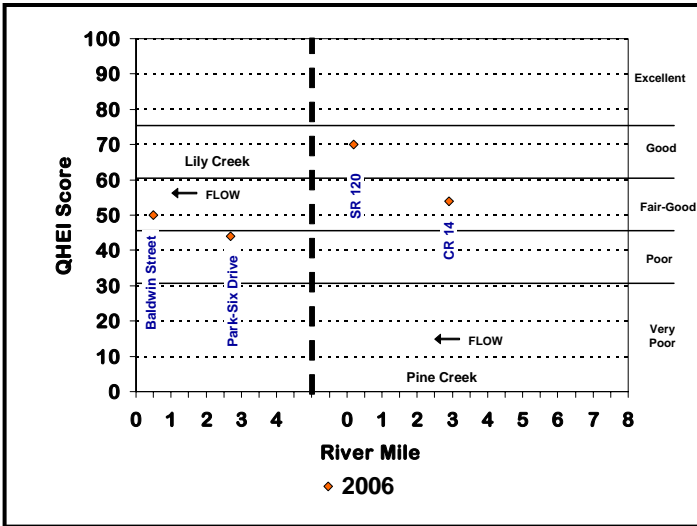


Figure 21: QHEI scores for Lily Creek and Pine Creek, Elkhart County



tion removed. Recent modifications including the removal of meanders and canopy near the US 20 bypass have caused a negative shift in stream fish assemblages. The habitat destruction in the US 20 Bypass area was documented by drastically reduced QHEI scores for the site from 2002 to 2003 (Figure 15, Foy 2005).

The IBI score for Yellow Creek (Figure 15) shows fish community condition was in the fair range. This is a noteworthy improvement over 2005 at the Concord High School site. Of the three sites sampled in 2005, the Concord High School site scored the worst and fell below the attainment line (Figure 14, Kring 2006). This is the best IBI score reported for this site to date. Although scoring a 38 out of 60 is just above the attainment, seeing such improvement in a site gives hope that point and non-point pollution sources are being controlled and monitored more effectively. ICI scores at County Road 45 stayed the same and increased significantly at County Road 32 (Figure 19). This reinforces that pollution may be better controlled for this stream. QHEI scores for this site on Yellow Creek really did not change (Figure 17). This

shows that an improvement in water quality could be the driving force behind an improvement in the fish communities.

As good as it is to see the improvement in Yellow Creek, unfortunately, the same can not be said for Lily Creek. Figure 15 shows a dramatic drop in IBI scores at the Park-Six site compared to the baseline. Lily Creek is another regulated drain that originates in Simonton Lake and flows southward towards the St. Joseph River. The Park-Six section of the stream has a tendency to dry up during the summer and 2006 was no exception. The first sampling run found only a few specimens. The first attempt at a second collection was halted as there was no water in the creek channel. A second sampling was performed later after a rain event and no fish were collected. Like the Studebaker Golf Course site on Bowman Creek, it was not surprising that no fish were found after the stream had been completely void of water. There was just not enough time for fish to move back into this area. Unless there are constant flows in Lily Creek, this stream will never be able to support a consistent fish community. Figure 21 shows that there is poor habitat available for fish use. This poor habitat combined with intermittent flows provides no surprise as to why this stream has impaired fish communities. ICI scores for Lily Creek continue to be low (Figure

Figure 22: IBI scores for Pine Creek, Elkhart County

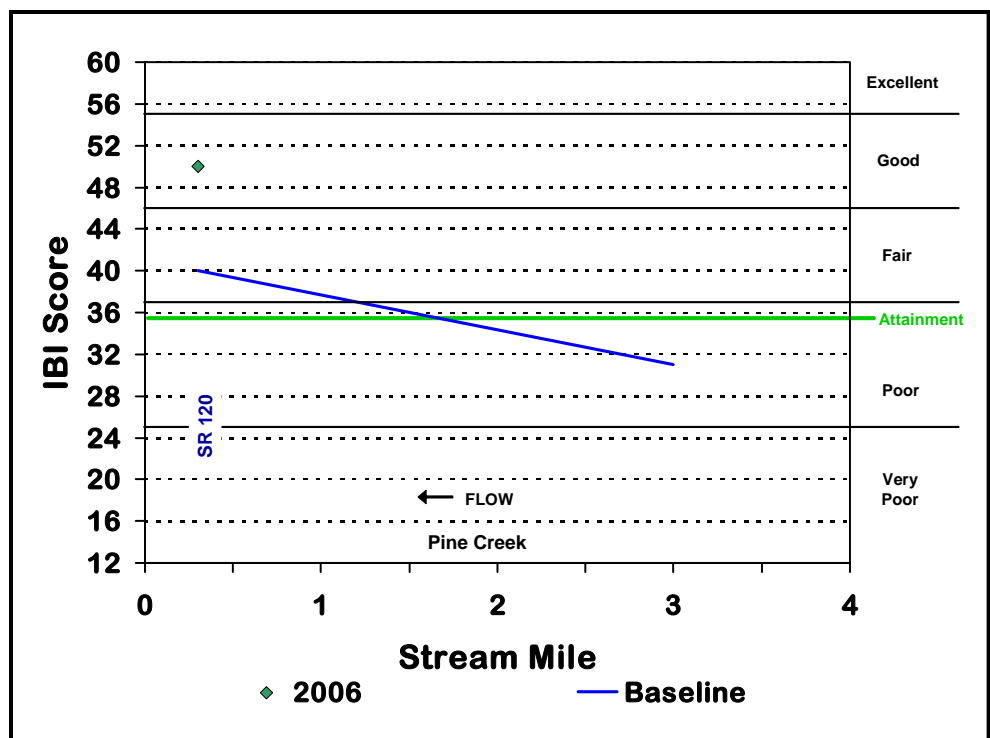


Table 5: Summary of tagged and recaptured fish

Species	Number Tagged		Recaptures (anglers)		Recaptures (PW&U)	
	Previous	2006	Previous	2006	Previous	2006
Smallmouth Bass	2,878	34	127	5	160	4
Walleye	755	64	106	6	16	2
Largemouth Bass	127	0	9	1	5	0

16), with the score falling well below the attainment line. As with fish, it's hard for animals such as snails and crayfish to re-colonize an area after it dries up or there are sustained periods of extremely low water.

Christiana Creek continues to support a diverse and healthy fish population through out much of its course in Indiana. Christiana Creek originates in southern Michigan and flows southward until its confluence with the St. Joseph River. Figure 18 shows that at the most downstream sampling site, fish community condition improved over the last three years. This site at North Main Well-field had not been sampled since 2003. Figure 20 shows that Christiana Creek continues to maintain good available habitat for fish communities. Figure 19 shows that the ICI score at County Road 4 stayed consistent, but that the ICI score dropped significantly at Willowdale Park. This was the only site in 2006 that had a significant decline. There is no fish data for this site in 2006 to compare to see if the fish communities were negatively affected as well.

The Little Elkhart River and Pine Creek are cool/cold water streams like Juday Creek and therefore, have the same limitations in scoring using the warm-water 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 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.

Although the Little Elkhart River is a cool-water

stream with scoring limitations, its IBI scores continue to be fair or better through out its reach in Elkhart County (Figure 18). The Little Elkhart River supports a more diverse population of fish species than other cool-water streams in the area. Originally, the County Road 35 site showed no changes in fish community health since being sampled in 2004. However, scoring modifications were made similar to the Lexington Avenue site on the St. Joseph River. While non-native brown and rainbow trout were collected at this site, these two species only accounted for less than three percent of the total catch. As before it was decided with Dr. Simon that best professional judgment could be used when scoring for metric 10 (Appendix A) (personal communications, February 26, 2007). The baseline was also modified for the CR 35 and CR 10 sites based on the above assumptions. Previous data was analyzed and it was noted that although trout were found during previous years, the percentage collected was similar to 2006. It will be three years until this site is sampled again. It will interesting to see if the trend stays the

same at this site. Sampling at the County Road 10 site, which is just upstream of County Road 35, will take place next summer and will allow us to see if this trend stays the same for this stretch of the stream. The Little Elkhart River contin-

ues to maintain excellent habitat quality along its length (Figure 20) in spite of large agricultural influences. This stream is not regulated in Elkhart County and should continue to support good aquatic communities and maintain above adequate available habitat. The ICI score for the Little Elkhart River (Figure 16) increased slightly in 2006 as it did in 2005.

Table 6: Summary of movement of recaptured fish

Direction Moved	Smallmouth Bass	Walleye	Largemouth Bass
No Movement	7	1	1
Upstream	2	1	0
Downstream	0	6	0

The fish community condition at State Road 120 on Pine Creek showed amazing improvement (Figure 22) since the last time this site was sampled three years ago. The IBI score fell within the good range, well above the established baseline. This site is near the mouth and IBI scores could have been influenced by this proximity to the St. Joseph River. There were a couple of new species collected at this site that may have come out of the river during the periods of high flow. The ICI score for Pine Creek increased slightly (Figure 15) and this site is just upstream of the fish site for 2006. This shows that there are not severe water quality issues in this section of the stream. Habitat scores for this site fell into the good range (Figure 21), showing that there is plenty of quality habitat to support a good fish community. Upstream of this site, Pine Creek is heavily impacted by both agricultural and industrial influences. Improvements in agricultural and industrial practices may be another reason why this site had such improved fish communities.

TAGGING AND MOVEMENT

In 2006, a total of 98 fish were tagged (Table 5) and 18 recapture events were recorded. The number of tagged fish is lower than in past years due to the fact that only larger fish were tagged in 2006. Recaptured fish numbers were also quite a bit lower than in 2005. Since 1998, a total of 439 fish have been recaptured in 468 events. Thanks to the continued support by many area fishermen who report landing tagged fish (Table 5), 11.4% of the tagged fish have provided movement information. This rate of recapture is very acceptable even though it is down slightly from 2005 (Kring 2006).

Beginning in 2002 and continuing annually since, Elkhart Office of Public Works' aquatics staff has assisted the Indiana Department of Natural Resources (IDNR) with spring walleye sampling below the Johnson Street Dam and in the Island Park area of the St. Joseph River. This sampling allows for age and growth information to be collected from a large number of adult walleye in a short period of time. Due to their annual spawning migration, many adult walleye congregate in this area and were easily captured. After collecting scales from these fish, tags were also placed on the larger individuals. This has led to a dramatic increase in the number of walleye tagged annually.

The longest time elapsed between tagging and recapture occurred for a smallmouth bass that was tagged in 2003 in the Elkhart River near the Elkhart Environmental Center. This fish was recaptured in 2006 within the same site where it originally was tagged. This is extremely important information that has been obtained as it shows that there is something significant in this stretch of river that keeps this fish either in the area year round or coming back annually to inhabit this stretch part of the year. As this fish is probably the apex predator of this section, it could be the fact that there is plenty of forage, ample shelter, or premier spawning habitat that attracts this fish to this area. It also signifies that this stretch of the stream maintains good water quality.

Even though tagging efforts were a lot less than in prior years, more recapture events were expected in 2006. Fourteen of the eighteen fish recaptured were tagged in previous years. So the fact that less fish were tagged in 2006 should not have had any affect on the number of fish recaptured. Of the 18 fish recaptured, 9 provided information on movement and the other 9 were recaptured near the site of tagging.

Movement of walleye was heavily dominated by fish moving in a downstream direction. Of the 8 walleye recaptured, 6 were located downstream of where they had been tagged. One walleye moved upstream and the other was recaptured near the same site that it had been tagged. The walleye that provided no movement information was tagged and later recaptured at the YMCA in Elkhart near the mouth of the Elkhart River. The walleye that was recaptured upstream went 1.7 miles from Angela Boulevard to Colfax Avenue in South Bend. Downstream movements averaged 6.1 miles with the longest trip being 10.2 miles from the Elkhart YMCA to Bittersweet Bridge in Mishawaka. The average move downstream is less than the previous year, however, they follow the pattern of walleye that travel downstream averaging a farther distance. This can be attributed to the fact that many of the walleye tagged were released below the Johnson Street Dam and could not travel any further upstream, so they merely redistributed themselves downstream of the Dam once the spawning season was over.

As in past years, there was not much movement by smallmouth bass and most were recaptured near the initial area of tagging. This species seem to remain in or at least utilize during parts of the year, the area where they are captured and

tagged. The two smallmouth bass that did move both moved upstream 1.9 miles from the Brick Road area to just downstream of Pinhook Park in South Bend, where they were caught by anglers. These two fish were tagged on the same day in 2005, but caught three months apart. The large-mouth bass recaptured was caught by a local fisherman near its original tagging location at Martin's Landing, upstream of the Johnson Street Dam in Elkhart.

The information collected with the tagging program is important as we are starting to pinpoint exact locations of the rivers and streams that large, quality predatory fish are utilizing. As with the case of the smallmouth bass that was recaptured in the Elkhart River, tagged in 2003, we find that there is a reason that this fish was still using this section of the river. Having this information allows the city to consider the detrimental impacts of development along this section of the river. If a large predator has found enough of what it needs in this section, it shows that this area is valuable to the continued success of not only this species but to the balance of the entire aquatic ecosystem. All the information gathered by tagging and recapturing fish allow all cities involved in this program to better protect precious habitat that allows for spawning, recruitment and growth of our native fish species.

FISH TISSUE

There were no modifications from the 2005 Indiana FCA to the 2006 FCA. Fish tissue collection in 2006 was scaled back to include only fish collected from one location in the South Bend area. The Aquatics staff hopes to again collect tissue samples from several locations on several streams in both counties in the years to come.

Five species were selected to be sampled from the Darden Road area of the St. Joseph River in South Bend (Appendix B). These species were Chinook salmon, common carp, quillback, shorthead redhorse, and white sucker. All of these species are currently on the FCA for St. Joseph County except Chinook salmon. Chinook salmon were making their spawning migration from Lake Michigan during the time of tissue collection and it was decided to include an extra species that is commonly sought after by local anglers. Tissue from the salmon came back as a group 1 for mercury and a group 3 for PCBs. The PCB levels warrant this species being on the FCA for St. Joseph County.

Composition of common carp tissue collected was

similar to tissue collected in 2005 and to what is reported in the FCA. However, while PCB levels put these fish into the DO NOT EAT category, mercury levels in these fish fell from a Group 2 to a Group 1 in 2006.

Quillback were not sampled in 2005, but were in 2004 at the same location as 2006. Results show that contaminant levels have remained the same over the last three years. A change may need to be made to the FCA as the Office of Public Works has reported PCB levels as group 4, while the FCA has this contaminant at a Group 3.

Similar to quillback, shorthead redhorse tissue was collected in 2004 at the same location. Fish collected in 2004 were of a smaller size range than the fish collected for 2006. However, the smaller fish in 2004 had the same level of contaminants as the larger fish collected in 2006. Shorthead redhorse tissue fell into group 2 for mercury and group 5 for PCBs. As noted by Foy (2004) shorthead redhorse consistently have higher PCB levels than are indicated on the current FCA and should be considered for a more restrictive consumption group.

White sucker tissue had not been collected in the South Bend area since 2003. In 2005, white suckers 16 inches and over were removed from the FCA. Although there is no listing for fish this size on the current FCA, the aquatics staff decided to take tissue samples from larger specimens as an all inclusive update for this species. Analysis revealed that contaminant levels have remained steady in white suckers with mercury levels at a group 1 and PCB levels at a group 3 (Appendix B).

CONCLUSION

Long-term biological monitoring on the St. Joseph River in Elkhart and St. Joseph counties continues to provide useful baseline information and current conditions of the biological communities for our watershed. IBI scores from 2006 for the St. Joseph River as it flows from Bristol through South Bend revealed fair to excellent fish community health. The Lexington Ave site received a score higher than originally thought. This is because of a scoring modification that was discussed with Dr. Thomas Simon, creator of the IBI used for the Indiana portion of the St. Joseph River watershed. The Homan Avenue site in Elkhart was once again sampled to observe how the current IBI calibration scores areas that more resemble a lake environment than a stream. This site is in the impounded

area above the Johnson Street Dam and once again scored in the fair range. Habitat evaluations show good habitat availability through out the river's entire Indiana stretch, with fair conditions immediately upstream of dams. ICI scores improved at all four St. Joseph River sites. Hopefully this is a sign of less pollution going into our river.

IBI scores for the Elkhart River again followed closely the established baseline. This shows that fish community conditions continue to remain stable through out the lower portion of the Elkhart River. The river continues to exhibit good to excellent habitat conditions. For the third straight year, ICI scores for the Elkhart River stayed in the good to excellent range for all three sites. Despite many negative perceptions about this stream, the Elkhart River continues to be very healthy and support an excellent smallmouth bass fishery.

Bowman Creek's fish community condition continues to be very poor, and the poor condition of the aquatic insect community confirms this stream is being seriously impacted. Although the ICI score was higher, it was still far below the attainment line. Poor to fair available habitat where the stream is above ground, coupled with the fact that this stream is piped underground and occasionally dries up are the main reasons biological communities do not do well here. Juday Creek's IBI scores, while artificially low due to its cooler water temperatures, continue to be lower than similar streams in the area (Pine Creek and the Little Elkhart River). In 2006 there was an increase in IBI scores at both index sites sampled, however both sites still fell below the attainment line set by IDEM. Fair to excellent habitat and ICI scores that show a mostly good aquatic insect community condition in Juday Creek indicate the limitations of the current IBI for use in cool/cold water streams.

Fish community condition showed a marked improvement at the Concord High School site on Yellow Creek in 2006 from 2005. This was the highest IBI score recorded for this site and moved from the poor category into the fair category. This could be a sign of improved water quality practices upstream of this site. ICI scores stayed the same at the downstream location and increased at the downstream site sampled in 2006. Habitat scores continued to be in the good range for this site. Next year's sampling site on Yellow Creek is further upstream and will show if water quality is improving throughout the stream.

While there was improvement in Yellow Creek, the

complete opposite took place in Lily Creek. Like Bowman Creek, Lily Creek has the tendency to dry up during the summer. The ICI score for Lily Creek was extremely low for the second consecutive year. QHEI scores continue to show poor habitat in this section of Lily Creek. Poor habitat coupled with periods of no flow makes it easy to understand why IBI scores are low for this stream.

Christiana Creek continues to support a very diverse and healthy fish population. IBI scores at the most downstream site reflect these high scores as 2006 data came in above the baseline in the good range. The only significant drop in ICI scores in 2006 took place in Christiana Creek at Willowdale Park. Macroinvertebrate scores for County Road 4 stayed the same. This stream continues to have good to excellent habitat available for fish communities. The furthest upstream site at County Road 4 will be monitored in 2007. There is proposed construction to take place on a bridge just downstream from the County Road 4 site in 2007. While this may not have any effect on upstream fish communities it may be reflected at downstream sites in 2008.

IBI scores for the Little Elkhart River continue to follow the trend set by the established baseline. The site sampled in 2006 was originally in the fair category and the limitations of the current IBI were thought to be why this site scored lower. From an observational point of view, it was expected that this site would have scored higher. After discussions with Dr. Thomas Simon it was noted that the metric that scored for total fish collected could be modified based on best professional judgment. This actually showed what is believed to be a more accurate representation of the quality of the fish communities in the Little Elkhart River. The ICI score for the Little Elkhart River increased for the second consecutive year. QHEI scores for this site were the highest of the summer and show that this stream can support a quality fish community based on available habitat.

One cool/cold water stream that overcame the scoring limitations of the current IBI was Pine Creek. Fish communities for this stream scored in the good range, well above the established baseline for the 2006 sample site. However, influences from the St. Joseph River could have had some effect, as typical warm-water species may have moved into Pine Creek during un-seasonably high water in mid-summer. The ICI score for Pine Creek increased slightly after falling in 2005. QHEI scores for this site show that Pine Creek is capable

of supporting a diverse fish community.

In 2006, 99 fish were tagged and 18 were recaptured by local anglers and Public Works' aquatics staff. Walleye continued to exhibit a lot of movement while smallmouth bass seemed to be utilizing the same areas to which they were originally tagged. The most exciting information gathered from the tagging effort in 2006 was a smallmouth bass that was recaptured after being tagged in 2003. This fish was tagged near the Elkhart Environmental Center on the Elkhart River. This fish was recaptured in virtually the same area. This information is important in that it supplies information that a large predator is utilizing a specific reach of the stream and that this particular stretch of river should be protected.

The Indiana FCA was not modified from 2005 to 2006. Only fish from the South Bend area of the St. Joseph were collected for tissue analysis in 2006. Chinook salmon were collected for the first time by the Office of Public Works staff. These fish had low mercury levels and mid-range levels for PCBs. Common carp collected had low mercury levels, but extremely high levels of PCBs. Quillback collected had group 2 levels for mercury and group 4 levels for PCBs. This was a level higher than the current FCA shows. Shorthead redhorse had mercury levels in group 2 and, like common carp, extremely high levels of PCBs. Again the current FCA has PCB levels for shorthead redhorse in a group lower. White suckers had low levels of mercury and mid-range levels for PCBs. The aquatics staff hopes to add more game fish species to their list of fish collected for tissue analysis in future years.

The cities of Elkhart and South Bend continue to provide leadership in their role as environmental stewards with their forthright efforts in helping protect the St. Joseph River Watershed. Through a joint effort, these cities continue to annually monitor the health and condition of local rivers and streams. This is an excellent example of how local governments can form a unique and positive partnership towards the betterment of a shared natural resource. This makes the cities of South Bend and Elkhart a better place to live!

ACKNOWLEDGEMENTS

A special thanks is extended to the 2006 summer crew: Hannah Jantzi, Daniel Peterson, and Chris White. This was a smaller than normal crew and the sampling period was cut short because of heavy rains and high water, but they persevered and completed the task.

Thanks are also extended to the Michiana Walleye Association for the continued support and future commitment to provide continued financial help with the purchase of anchor tags used on the bass and walleye, and to the administration and support staff of Elkhart's Office of Public Works for their continued assistance and support of this program and their true dedication to the environment.

Thanks go to the cities of Elkhart and South Bend for their leadership in the area of aquatic resource protection. Through the establishment of an inter-local agreement between these cities, data is now being collected to help preserve and protect a shared resource, the St. Joseph River Watershed.

Again, I would like to sincerely thank Joe Foy. Although Joe has moved on in his new position with the City of Elkhart, he remains an integral part of this program. It's extremely comforting to know that I have a resource like Joe to help me answer questions and provide support when ever I need it. I will always be in Joe's debt for the wealth of knowledge and experience he has shared with me over the years.

REFERENCES

- Davis, W.S. 1999. Foreword *in* Thomas P. Simon, *Editor*, Assessing the sustainability and biological integrity of water resources using fish communities.
- Foy, J. 2004. Elkhart—South Bend fish community monitoring. Loose-leaf pub. n.p.
- Foy, J. 2005. Elkhart—South Bend fish community monitoring. Loose-leaf pub. n.p.
- Great Lakes Sport Fish Advisory Task Force. 1993. Appendix III, Species associated analysis and compositing of samples. *in* Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory.
- Indiana Department of Environmental Management (IDEM). 2006. Indiana's 303(d) Listing Methodology for Impaired Waterbodies and Total Maximum Daily Load for Listing Cycle 2006. Office of Water Quality. Indianapolis, IN.
- Indiana State Department of Health, Indiana Department of Environmental Management, Indiana Department of Natural Resources. 2004. 2006 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.
- Kring, L, 2006. Elkhart—South Bend aquatic community monitoring, Loose-leaf pub. n.p.
- Ohio Environmental Protection Agency. 1987. Biological criteria for the protection of aquatic life. Volumes I, II, III. Division of Water Quality Planning and Assessment, Surface Water Section. Columbus, Ohio.
- Ohio Environmental Protection Agency. 1989. Biological criteria for the protection of aquatic life. Volume III: Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Division of Water Quality Monitoring and Assessment. Columbus, Ohio.
- Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Ohio Environmental Protection Agency, Division of Water Quality Planning 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 2006



Hannah and Daniel with an impressive pair of Bowfin



Summer Crew (L-R): Chris, Hannah, Len, and Daniel



Chris with large Silver Redhorse



Chris with Turkey Creek Northern Pike



Len with 5.5 lb Largemouth Bass



Daniel with Juday Creek Brown Trout



Len with nice Chinook Salmon



Hannah and 22 lb Common Carp



Joe Foy with big Steelhead



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. Percent headwater species
4. Number of minnow species
5. Number of sensitive species
6. Percent tolerant
7. Percent omnivores
8. Percent insectivores
9. Percent pioneer species (individuals)
10. Number of fish collected
11. Percent simple lithophils
12. Percent 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. Percent tolerant
7. Percent omnivores
8. Percent insectivores
9. Percent carnivores
10. Number of fish collected
11. Percent simple lithophils
12. Percent DELT anomalies

Invertebrate Community Index categories and metrics used to evaluate sites in the St. Joseph River drainage:

1. Total number of taxa
2. Total number of mayfly taxa
3. Total number of caddisfly taxa
4. Total number of dipteran taxa
5. Percent mayfly composition
6. Percent caddisfly composition
7. Percent tribe Tanytarsini midge composition
8. Percent other dipteran and non-insect composition
9. Percent tolerant organisms
10. Total number of qualitative EPT (mayflies, stoneflies and caddisflies) taxa

Qualitative Habitat Evaluation Index categories and metrics used to evaluate sites in the St. Joseph River drainage:

1. Substrate
 - type
 - number of types present
 - origin
 - silt cover
 - extent of embeddedness

2. Instream Cover
 - type
 - amount

3. Channel Morphology
 - sinuosity
 - development
 - channelization
 - stability

4. Riparian Zone and Bank Erosion
 - riparian width
 - floodplain quality
 - bank erosion

5. Pool/Glide and Riffle/Run Quality
 - maximum pool depth
 - pool/riffle morphology
 - pool/riffle/run current velocity
 - riffle/run depth
 - riffle/run substrate
 - riffle/run embeddedness

6. Gradient



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	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)
	Year							
St. Joseph River, St. Joseph County								
Chinook Salmon								
	2006	Darden Road	26.3-28.3	NA	1	2	3	2
Common Carp								
	2003	Darden Road	28.3-31.0	20+	2	2	5	5
	2003	Ironwood Drive	29.7-32.4	20+	2	1	5	5
	2003	Keller Park	28.9-31.0	20+	1	1	5	5
	2005	Brick Road	23.0-24.7	20+	2	2	5	5
	2006	Darden Road	28.7-30.9	20+	1	2	5	5
Quillback								
	2003	Darden Road	18.8-19.6	18+	1	1	3	3
	2003	Ironwood Drive	19.3-19.5	18+	2	1	3	3
	2003	Keller Park	19.7-20.5	18+	1	1	3	3
	2003	Michigan Street	18.5-20.3	18+	2	1	4	3
	2004	Darden Road	18.3-19.5	18+	2	1	4	3
	2004	Jefferson Boulevard	19.7-20.1	18+	2	1	3	3
	2004	LaSalle Street	18.7-19.1	18+	2	1	3	3
	2006	Darden Road	18.2-19.4	18+	2	2	4	3
Shorthead Redhorse								
	2003	Darden Road	17.9-18.1	15-19	2	3	4	3
	2003	Michigan Street	17.6-18.4	15-19	2	3	5	3
	2003	Ironwood Drive	17.9-19.3	15-19	1	3	4	3
	2004	Darden Road	17.1-17.5	15-19	2	1	5	3
	2004	LaSalle Street	16.7-17.4	15-19	2	1	5	3
	2006	Darden Road	19.1-19.6	19+	2	2	5	4
White Sucker								
	2003	Darden Road	14.8-15.9	14-16	1	1	3	3
	2003	Darden Road	16.3-17.9	16+	1	1	3	4
	2003	Ironwood Drive	15.4-16.5	14-16	1	1	3	3
	2006	Darden Road	17.6	NA	1	2	3	2





Appendix C

Summary of fish collected by county, 2006

Summary of species captured at index sites in Elkhart County, 2006

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Rock Bass	1,128	10.41	81,790	179.9	8.34
Bluegill	1,015	9.36	31,481	69.3	3.21
Smallmouth Bass	882	8.14	83,995	184.8	8.57
Mimic Shiner	740	6.83	1,372	3.0	0.14
Logperch	660	6.09	5,022	11.0	0.51
Mottled Sculpin	625	5.77	3,128	6.9	0.32
White Sucker	597	5.51	93,035	204.7	9.49
Creek Chub	529	4.88	7,353	16.2	0.75
Longear Sunfish	523	4.82	13,690	30.1	1.40
Striped Shiner	436	4.02	10,885	23.9	1.11
Johnny Darter	426	3.93	567	1.2	0.06
Golden Redhorse	323	2.98	181,083	398.4	18.48
Bluntnose Minnow	314	2.90	919	2.0	0.09
Common Shiner	249	2.30	5,014	11.0	0.51
Blackside Darter	222	2.05	532	1.2	0.05
Northern Hog Sucker	186	1.72	30,401	66.9	3.10
Largemouth Bass	186	1.72	24,854	54.7	2.54
Blacknose Dace	185	1.71	951	2.1	0.10
Hornyhead Chub	165	1.52	5,650	12.4	0.58
Green Sunfish	138	1.27	3,116	6.9	0.32
Spotfin Shiner	117	1.08	815	1.8	0.08
Stoneroller, Central	112	1.03	1,202	2.6	0.12
Rosyface Shiner	109	1.01	187	0.4	0.02
Pumpkinseed	106	0.98	3,478	7.7	0.35
Hybrid Sunfish	100	0.92	3,035	6.7	0.31
Shorthead Redhorse	97	0.89	39,971	87.9	4.08
Rainbow Darter	88	0.81	136	0.3	0.01
Black Redhorse	67	0.62	26,657	58.6	2.72
Silver Redhorse	55	0.51	83,452	183.6	8.51
Redear Sunfish	41	0.38	5,093	11.2	0.52
Yellow Bullhead	40	0.37	4,269	9.4	0.44
Chestnut Lamprey	37	0.34	511	1.1	0.05
Orangethroat Darter	37	0.34	51	0.1	0.01
Common Carp	32	0.30	78,151	171.9	7.97
River Redhorse	31	0.29	86,447	190.2	8.82
Black Crappie	27	0.25	912	2.0	0.09
Spotted Sucker	26	0.24	5,567	12.2	0.57
Brown Trout	21	0.19	1,614	3.6	0.16
Steelcolor Shiner	19	0.18	85	0.2	0.01
Grass Pickerel	16	0.15	362	0.8	0.04
Northern Pike	15	0.14	14,744	32.4	1.50
Walleye	15	0.14	8,293	18.2	0.85
Pirate Perch	14	0.13	104	0.2	0.01
Sand Shiner	14	0.13	28	0.1	0.00
Silverjaw Minnow	13	0.12	48	0.1	0.00
Warmouth	11	0.10	600	1.3	0.06
Central Mudminnow	9	0.08	52	0.1	0.01
Greater Redhorse	7	0.06	13,842	30.5	1.41
Brook Silverside	5	0.05	18	0.0	0.00
Bowfin	4	0.04	7,356	16.2	0.75
American Brook Lamprey	4	0.04	37	0.1	0.00
Quillback	3	0.03	5,000	11.0	0.51
Rainbow Trout	3	0.03	831	1.8	0.08
Yellow Perch	3	0.03	31	0.1	0.00
Greenside Darter	3	0.03	12	0.0	0.00
Longnose Gar	2	0.02	38	0.1	0.00
Channel Catfish	1	0.01	2,013	4.4	0.21
Gizzard Shad	1	0.01	102	0.2	0.01
Black Bullhead	1	0.01	74	0.2	0.01
Stonecat	1	0.01	48	0.1	0.00
River Chub	1	0.01	18	0.0	0.00
Tadpole Madtom	1	0.01	13	0.0	0.00
Fathead Minnow	1	0.01	4	0.0	0.00
Blackstripe Topminnow	1	0.01	1	0.0	0.00
Sub-Total	10,840	100	980,140	2156.31	100

Summary of species captured at investigative sites in Elkhart County, 2006

COMMON NAME	Total Number	% by Number
Bluegill	430	11.41
Blacknose Dace	376	9.97
Stoneroller, Central	363	9.63
White Sucker	289	7.67
Creek Chub	274	7.27
Logperch	176	4.67
Longear Sunfish	161	4.27
Sand Shiner	127	3.37
Pumpkinseed	122	3.24
Mottled Sculpin	116	3.08
Spotfin Shiner	114	3.02
Largemouth Bass	106	2.81
Rock Bass	98	2.60
Mimic Shiner	83	2.20
Johnny Darter	75	1.99
Greenside Darter	67	1.78
Bluntnose Minnow	64	1.70
Gizzard Shad	64	1.70
Striped Shiner	63	1.67
Smallmouth Bass	58	1.54
Rainbow Darter	57	1.51
Silverjaw Minnow	56	1.49
Common Shiner	45	1.19
Common Carp	39	1.03
Golden Redhorse	38	1.01
Green Sunfish	35	0.93
Northern Hog Sucker	35	0.93
Central Mudminnow	31	0.82
Shorthead Redhorse	29	0.77
Rosyface Shiner	18	0.48
Warmouth	15	0.40
Black Redhorse	13	0.34
Yellow Bullhead	13	0.34
Orangethroat Darter	12	0.32
Black Crappie	11	0.29
Silver Redhorse	11	0.29
Spotted Sucker	10	0.27
Blackside Darter	10	0.27
Walleye	7	0.19
Yellow Perch	7	0.19
Steelcolor Shiner	6	0.16
Grass Pickerel	6	0.16
Redear Sunfish	5	0.13
Longnose Gar	5	0.13
Pirate Perch	4	0.11
Golden Shiner	4	0.11
Northern Pike	4	0.11
Channel Catfish	3	0.08
Brown Trout	3	0.08
Hornyhead Chub	2	0.05
Brook Silverside	2	0.05
Hybrid Sunfish	2	0.05
Quillback	2	0.05
Brown Bullhead	1	0.03
Bowfin	1	0.03
Tadpole Madtom	1	0.03
Black Bullhead	1	0.03
Sub-Total	3,770	100

Index Sites	10,840
Investigative Sites	3,770
Elkhart County Total	14,610

Summary of species captured at index sites in St. Joseph County, 2006

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Creek Chub	565	12.68	9,522	20.9	1.72
Longear Sunfish	558	12.52	20,328	44.7	3.67
Smallmouth Bass	515	11.55	64,706	142.4	11.67
Bluegill	355	7.96	4,299	9.5	0.78
Mottled Sculpin	299	6.71	1,214	2.7	0.22
Rock Bass	281	6.30	24,048	52.9	4.34
Golden Redhorse	251	5.63	112,212	246.9	20.23
White Sucker	200	4.49	23,034	50.7	4.15
Coho Salmon	198	4.44	1,638	3.6	0.30
Shorthead Redhorse	168	3.77	71,962	158.3	12.98
Black Redhorse	154	3.46	51,677	113.7	9.32
Blacknose Dace	152	3.41	638	1.4	0.12
Spotfin Shiner	90	2.02	500	1.1	0.09
Northern Hog Sucker	85	1.91	16,398	36.1	2.96
Pumpkinseed	66	1.48	981	2.2	0.18
Brown Trout	61	1.37	1,240	2.7	0.22
Green Sunfish	55	1.23	2,117	4.7	0.38
Mimic Shiner	51	1.14	117	0.3	0.02
Rainbow Trout	47	1.05	594	1.3	0.11
Johnny Darter	42	0.94	93	0.2	0.02
Largemouth Bass	34	0.76	3,126	6.9	0.56
Logperch	32	0.72	453	1.0	0.08
Quillback	26	0.58	36,255	79.8	6.54
Spotted Sucker	24	0.54	3,874	8.5	0.70
Blackside Darter	19	0.43	64	0.1	0.01
Warmouth	18	0.40	1,611	3.5	0.29
Common Carp	14	0.31	49,767	109.5	8.97
Chestnut Lamprey	14	0.31	161	0.4	0.03
Yellow Bullhead	13	0.29	3,432	7.6	0.62
Steelcolor Shiner	11	0.25	52	0.1	0.01
Walleye	10	0.22	9,879	21.7	1.78
Bluntnose Minnow	10	0.22	31	0.1	0.01
Silver Redhorse	8	0.18	16,900	37.2	3.05
Hybrid Sunfish	7	0.16	203	0.4	0.04
River Redhorse	5	0.11	14,850	32.7	2.68
Gizzard Shad	5	0.11	218	0.5	0.04
Greater Redhorse	3	0.07	124	0.3	0.02
Greenside Darter	3	0.07	9	0.0	0.00
Longnose Gar	2	0.04	2,150	4.7	0.39
Stonecat	2	0.04	85	0.2	0.02
Yellow Perch	2	0.04	28	0.1	0.01
Channel Catfish	1	0.02	4,000	8.8	0.72
Central Mudminnow	1	0.02	1	0.0	0.00
Sub-Total	4,457	100	554,591	1220.10	100

Summary of species captured at investigative sites in St. Joseph County, 2006

COMMON NAME	Total Number	% by Number
Bluegill	255	21.78
Longear Sunfish	158	13.49
Pumpkinseed	106	9.05
Rock Bass	88	7.51
Smallmouth Bass	77	6.58
Stoneroller, Central	68	5.81
Golden Redhorse	62	5.29
Bluntnose Minnow	54	4.61
Green Sunfish	36	3.07
Creek Chub	35	2.99
Hybrid Sunfish	30	2.56
Johnny Darter	26	2.22
Central Mudminnow	25	2.13
Largemouth Bass	24	2.05
White Sucker	24	2.05
Logperch	13	1.11
Yellow Bullhead	12	1.02
Shorthead Redhorse	12	1.02
Northern Hog Sucker	8	0.68
Black Redhorse	8	0.68
Blackside Darter	7	0.60
Spotted Sucker	6	0.51
Spotfin Shiner	5	0.43
Gizzard Shad	5	0.43
Common Carp	4	0.34
Chestnut Lamprey	3	0.26
Rainbow Darter	2	0.17
Pirate Perch	2	0.17
Greater Redhorse	2	0.17
Silver Redhorse	1	0.09
Blacknose Dace	1	0.09
Walleye	1	0.09
Brook Silverside	1	0.09
Stonecat	1	0.09
Chinook Salmon	1	0.09
Golden Shiner	1	0.09
Redear Sunfish	1	0.09
Common Shiner	1	0.09
Orangethroat Darter	1	0.09
Northern Pike	1	0.09
Rainbow Trout	1	0.09
Quillback	1	0.09
Channel Catfish	1	0.09
Sub-Total	1,171	100

Index Sites	4,457
Investigative Sites	1,171
St. Joseph County Total	5,628



Appendix D

Summary of fish collected by site, 2006

Stream	St. Joseph River, Elkhart County									
	1		2		3		4		5	
Site Number	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	Day	Night
‡ American Brook Lamprey								X		
Black Crappie	X	X		X	X	X		X	X	X
‡ Black Redhorse	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	X	X	X
¥ Bluntnose Minnow	X	X		X	X	X		X	X	X
Bowfin	X									
Brook Silverside		X				X	X			X
Brown Bullhead									X	
¥ Channel Catfish						X				X
Chestnut Lamprey	X	X	X	X	X		X			
¥ Common Carp		X	X	X	X	X		X	X	X
Common Shiner					X					X
¥ Gizzard Shad						X			X	X
Golden Redhorse	X	X	X	X	X	X	X	X	X	X
Golden Shiner										X
Grass Pickerel					X					
‡ Greater Redhorse	X			X		X		X		
¥ Green Sunfish	X	X	X	X	X	X	X	X	X	X
Greenside Darter					X	X		X		
‡ Hornyhead Chub		X				X		X		
Hybrid Sunfish					X	X	X	X	X	X
Johnny Darter					X			X		
Largemouth Bass	X	X	X	X	X	X	X	X	X	X
Logperch	X	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
‡ Mimic Shiner	X	X		X	X	X	X	X	X	X
Northern Hog Sucker	X	X			X	X				
Northern Pike	X	X	X	X		X				X
Orangethroat Darter	X					X				X
Pirate Perch		X								
Pumpkinseed	X	X			X	X		X	X	X
¥ Quillback					X		X			X
Rainbow Darter		X			X	X				X
Redear Sunfish			X						X	
‡ River Redhorse	X	X			X	X	X	X		
Rock Bass	X	X	X	X	X	X	X	X	X	X
‡ Rosyface Shiner		X			X	X				
Sand Shiner		X								X
Shorthead Redhorse	X	X		X	X	X	X	X	X	X
Silver Redhorse	X	X	X	X	X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X			X	X	X	X	X	X
Spotted Sucker					X	X		X	X	X
Steelcolor Shiner	X	X				X	X	X		
‡ Stonecat		X								
Striped Shiner		X			X	X				
Walleye		X			X	X		X	X	X
Warmouth					X	X		X	X	X
¥ White Sucker	X	X	X	X	X	X	X	X	X	X
Yellow Bullhead	X	X		X	X	X	X	X	X	X
Yellow Perch	X	X			X				X	X

‡ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
¥ - denotes a species that is TOLERANT of environmental disturbances such as degraded water quality or habitat

Stream	St. Joseph River, St. Joseph County									
	6		7		8	9		10		11
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	
‡ Black Redhorse	X	X	X	X	X	X	X	X	X	X
Blackside Darter		X		X	X		X	X	X	X
Bluegill	X	X	X	X	X	X	X	X	X	X
¥ Bluntnose Minnow			X	X			X	X	X	X
Brook Silverside					X					
¥ Channel Catfish			X							X
Chestnut Lamprey	X		X			X		X		X
Chinook Salmon										X
¥ Common Carp	X		X		X	X	X	X	X	X
¥ Gizzard Shad	X				X				X	
Golden Redhorse	X	X	X	X	X	X	X	X	X	X
‡ Greater Redhorse					X	X		X		X
¥ Green Sunfish					X	X	X		X	X
Greenside Darter		X					X			
Hybrid Sunfish			X	X	X		X	X		X
Johnny Darter					X					
Largemouth Bass	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						
‡ Mimic Shiner			X			X	X	X	X	
Northern Hog Sucker	X	X	X	X	X	X	X	X	X	X
Northern Pike										X
Pumpkinseed	X	X	X	X	X	X	X	X	X	X
¥ Quillback			X				X	X	X	X
Rainbow Trout	X		X							X
Redear Sunfish										X
‡ River Redhorse		X		X		X				
Rock Bass	X	X	X	X	X	X	X	X	X	X
Shorthead Redhorse	X	X	X	X	X	X	X	X	X	X
Silver Redhorse		X	X		X	X	X	X		
Smallmouth Bass	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
Steelcolor Shiner	X	X					X		X	
‡ Stonecat					X	X				
Walleye	X			X	X	X	X	X		
Warmouth				X		X	X	X		
¥ White Sucker	X	X	X	X	X	X	X	X	X	X
Yellow Bullhead			X		X	X	X	X	X	X
Yellow Perch						X	X			

‡ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
 ¥ - denotes a species that is TOLERANT of environmental disturbances such as degraded water quality or habitat

Stream	Little Elkhart River		Rowe-Eden Ditch	Sheep Creek	Pine Creek		Lily Creek			
	12		13	14	15	16		17		18
Site Number	1st Pass	2nd Pass				1st Pass	2nd Pass	1st Pass	2nd Pass	
‡ American Brook Lamprey		X								
¥ Black Bullhead							X			
Black Crappie	X									
‡ Black Redhorse	X								N	
¥ Blacknose Dace	X	X	X	X	X	X	X		O	
Blackside Darter	X	X				X	X			
Bluegill	X	X			X	X	X	X		X
¥ Bluntnose Minnow	X	X					X		F	
Brown Trout	X	X	X	X					I	
¥ Central Mudminnow	X	X		X	X	X			S	
Chestnut Lamprey	X	X							H	
Common Shiner	X	X	X							
¥ Creek Chub	X	X	X	X	X	X	X			X
Golden Redhorse							X		C	
Golden Shiner									O	
Grass Pickerel	X	X	X	X		X		X	L	X
¥ Green Sunfish	X	X		X	X	X	X		L	X
‡ Hornyhead Chub	X	X							E	
Hybrid Sunfish						X			C	
Johnny Darter	X	X				X	X		T	
Largemouth Bass	X	X				X			E	
Logperch	X	X				X	X		D	
Longear Sunfish						X				
Mottled Sculpin	X	X	X		X	X	X			
Northern Hog Sucker	X	X	X							
Orangethroat Darter	X					X				X
Pumpkinseed	X					X	X			
Rainbow Darter	X	X		X		X	X			X
Rainbow Trout	X									
Redear Sunfish	X									
Rock Bass	X	X				X	X			
‡ Rosyface Shiner							X			
Sand Shiner							X			
Shorthead Redhorse						X				
Silver Redhorse		X								
Smallmouth Bass		X		X		X	X			
Spotfin Shiner		X				X	X			
Stoneroller, Central			X							
Striped Shiner	X	X	X			X				
¥ White Sucker	X	X	X	X	X	X	X	X		X
Yellow Bullhead							X			

‡ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
¥ - denotes a species that is TOLERANT of environmental disturbances such as degraded water quality or habitat

Stream	Christiana Creek			Elkhart River						Turkey Creek	Berlin Court Ditch	
	19		20	21		22		23		24	25	26
	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass			
‡ American Brook Lamprey				X								
Black Crappie					X					X		X
‡ Black Redhorse		X		X	X	X	X	X	X			
¥ Blacknose Dace											X	
Blackside Darter			X	X					X	X		
Blackstripe Topminnow				X								
Bluegill	X	X	X	X	X	X	X	X	X	X		X
¥ Bluntnose Minnow			X		X	X	X		X	X	X	X
Bowfin			X	X		X						
¥ Central Mudminnow												X
Chestnut Lamprey	X			X	X	X	X	X				
¥ Common Carp	X	X		X						X		X
Common Shiner	X		X	X	X	X	X	X		X		X
¥ Creek Chub			X	X	X					X	X	X
Golden Redhorse	X		X	X	X	X	X	X	X			
Grass Pickerel	X		X							X		
‡ Greater Redhorse				X				X				
¥ Green Sunfish	X	X	X	X	X	X	X	X	X	X		
Greenside Darter			X									
‡ Hornyhead Chub	X	X	X	X	X	X	X	X	X	X		
Hybrid Sunfish	X	X							X			
Johnny Darter				X						X		
Largemouth Bass			X	X	X	X	X	X	X	X		X
Logperch	X	X	X									
Longear Sunfish	X		X	X	X	X	X	X	X	X		
Longnose Gar			X									
Northern Hog Sucker	X	X	X	X	X	X	X	X	X	X		
Northern Pike										X		
Orangethroat Darter	X	X	X									
Pirate Perch				X	X					X		
Pumpkinseed	X	X		X	X		X					
Rainbow Darter	X	X	X		X							
Redear Sunfish				X	X	X	X		X			
‡ River Chub	X											
‡ River Redhorse						X						
Rock Bass	X	X	X	X	X	X	X	X	X	X		
Rosyface Shiner			X	X	X	X	X	X	X			
‡ Sand Shiner			X				X					
Shorthead Redhorse			X									
Silver Redhorse		X	X									
Smallmouth Bass	X	X	X	X	X	X	X	X	X			
Spotfin Shiner	X		X				X	X	X			
Spotted Sucker				X		X	X			X		
Steelcolor Shiner			X									
Stoneroller, Central			X								X	X
Striped Shiner	X	X	X	X	X	X	X	X	X	X		X
Tadpole Madtom						X				X		
Warmouth				X			X					
¥ White Sucker	X	X	X	X	X	X	X	X	X	X	X	X
Yellow Bullhead	X	X		X	X		X	X	X	X	X	X

‡ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
¥ - denotes a species that is TOLERANT of environmental disturbances such as degraded water quality or habitat

STREAM	Yellow Creek		Baugo Creek		Rogers Ditch	Phillips Ditch		Bowman Creek		Juday Creek			
	27		28	29	30	31		32		33		33	
	1st Pass	2nd Pass				1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
¥ Black Bullhead			X										
Black Crappie	X	X											
¥ Blacknose Dace	X	X	X		X					X	X	X	X
Blackside Darter				X									
Bluegill	X	X	X	X	X					X		X	X
¥ Bluntnose Minnow	X	X	X		X		N		N				
Brown Trout							O		O	X		X	
¥ Central Mudminnow				X	X	X							
Chestnut Lamprey	X												
Coho Salmon							F		F	X	X		
¥ Common Carp			X	X	X		I		I				
Common Shiner	X	X	X		X		S		S				
¥ Creek Chub	X	X	X		X	X	H	X	H	X	X	X	X
¥ Fathead Minnow	X												
¥ Golden Shiner					X								
¥ Green Sunfish	X	X	X	X	X		C		C	X	X		
‡ Hornyhead Chub	X	X					O		O				
Hybrid Sunfish		X		X			L		L				
Johnny Darter	X	X	X	X	X		L		L	X	X	X	X
Largemouth Bass	X	X	X	X	X	X	E		E		X		X
Logperch				X			C		C				
Longear Sunfish	X						T		T	X			
Mottled Sculpin							E		E	X	X	X	X
Northern Hog Sucker		X					D		D				
Orangethroat Darter	X			X									
Pirate Perch					X								
Pumpkinseed			X	X	X								
Rainbow Darter	X			X									
Rainbow Trout										X	X	X	X
Rock Bass			X	X								X	
Sand Shiner			X										
Silverjaw Minnow	X	X	X										
Smallmouth Bass		X	X	X									X
Spotted Sucker	X												
Stoneroller, Central	X	X	X		X								
Striped Shiner	X	X	X										
¥ White Sucker	X	X	X	X	X					X	X	X	X
Yellow Bullhead	X	X	X		X								

‡ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
¥ - denotes a species that is TOLERANT of environmental disturbances such as degraded water quality or habitat





Appendix E

Summary of macroinvertebrates (insects) collected by site, 2006

Macroinvertebrates were collected in two ways to calculate the Invertebrate Community Index (ICI). The first method employed a sampling device known as a Hester-Dendy multi-plate sampler. Macroinvertebrates collected using this method were identified and counted (Quantitative column in the following tables). The second method was a sweep with a net of all the available habitat types in the area of the Hester-Dendy in an effort to identify other macroinvertebrates in the stream that may not colonize the Hester-Dendy samplers. Macroinvertebrates collected in this way were identified and simply counted as being present (Qualitative column).

Site: St. Joseph River, State Road 15 (Bristol)

Collection Date: 9/18/2006

Site Number: 1

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	16		<i>Parametriocnemus sp</i>	3	
<i>Turbellaria</i>	58		<i>Rheocricotopus (Psilocricotopus)</i>	3	
<i>Hyaella azteca</i>	1	+	<i>Thienemanniella xena</i>	6	
<i>Gammarus sp</i>	25	+	<i>Polypedilum (Uresipedilum) flavum</i>	18	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Polypedilum (P.) fallax group</i>	2	
<i>Baetis intercalaris</i>	3	+	<i>Polypedilum (P.) illinoense</i>	28	+
<i>Pseudocloeon propinquum</i>	0	+	<i>Rheotanytarsus sp</i>	9	
<i>Plauditus punctiventris</i>	27	+	<i>Chrysops sp</i>	0	+
<i>Isonychia sp</i>	421	+	<i>Elimia sp</i>	0	+
<i>Nixe sp</i>	0	+	<i>Physella sp</i>	28	+
<i>Stenacron sp</i>	46		<i>Planorbella (Pierosoma) pilsbryi</i>	0	+
<i>Stenonema exiguum</i>	232	+	<i>Ferrissia sp</i>	3	+
<i>Stenonema terminatum</i>	201		<i>Corbicula fluminea</i>	0	+
<i>Ephemerellidae</i>	2		<i>Dreissena polymorpha</i>	0	+
<i>Tricorythodes sp</i>	35	+	<i>Sphaerium sp</i>	0	+
<i>Caenis sp</i>	8	+			
<i>Anthopotamus sp</i>	4	+			
<i>Ephemera sp</i>	0	+	No. Quantitative Taxa:	46	
<i>Hetaerina sp</i>	4	+	No. Qualitative Taxa:	43	
<i>Coenagrionidae</i>	2	+	Total No. Taxa	65	
<i>Argia sp</i>	9	+	Number of Organisms	1,563	
<i>Basiaeschna janata</i>	0	+			
<i>Boyeria vinosa</i>	0	+			
<i>Nasiaeschna pentacantha</i>	0	+			
<i>Acroneuria internata</i>	7	+			
<i>Paragnetina sp</i>	0	+			
<i>Notonecta sp</i>	0	+			
<i>Corydalis cornutus</i>	1	+			
<i>Chimarra obscura</i>	1				
<i>Neureclipsis sp</i>	8				
<i>Cheumatopsyche sp</i>	84	+			
<i>Hydropsyche frisoni</i>	78	+			
<i>Hydropsyche venularis</i>	7				
<i>Macrostemum sp</i>	3				
<i>Hydroptilidae</i>	1				
<i>Brachycentrus numerosus</i>	5	+			
<i>Helicopsyche borealis</i>	4				
<i>Oecetis persimilis</i>	16	+			
<i>Petrophila sp</i>	2	+			
<i>Dineutus sp</i>	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Macronychus glabratus</i>	33	+			
<i>Stenelmis sp</i>	0	+			
<i>Anopheles sp</i>	0	+			
<i>Simulium sp</i>	8	+			
<i>Ablabesmyia mallochi</i>	2				
<i>Nilotanytus fimbriatus</i>	3				
<i>Pentaneura inconspicua</i>	14				
<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	1				
<i>Corynoneura lobata</i>	91				

Site: St. Joseph River, Sherman Street

Collection Date: 9/18/2006

Site Number: 2

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	159	+
<i>Oligochaeta</i>	0	+
<i>Caecidotea sp</i>	0	+
<i>Plauditus dubius or P. virilis</i>	0	+
<i>Baetis flavistriga</i>	1	
<i>Baetis intercalaris</i>	212	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Plauditus punctiventris</i>	1	
<i>Isonychia sp</i>	163	+
<i>Stenacron sp</i>	149	+
<i>Stenonema exiguum</i>	268	+
<i>Stenonema mediopunctatum</i>	88	+
<i>Stenonema terminatum</i>	118	
<i>Ephemerellidae</i>	72	
<i>Tricorythodes sp</i>	29	+
<i>Hetaerina sp</i>	2	
<i>Argia sp</i>	8	+
<i>Chimarra obscura</i>	32	
<i>Polycentropodidae</i>	1	
<i>Cheumatopsyche sp</i>	297	+
<i>Hydropsyche aerata</i>	26	
<i>Hydropsyche depravata group</i>	0	+
<i>Hydropsyche frisoni</i>	24	+
<i>Macrostemum sp</i>	43	+
<i>Hydroptilidae</i>	2	
<i>Oecetis persimilis</i>	8	
<i>Petrophila sp</i>	0	+
<i>Macronychus glabratus</i>	8	
<i>Simulium sp</i>	18	
<i>Pentaneura inconspicua</i>	3	
<i>Corynoneura lobata</i>	33	
<i>Parametriocnemus sp</i>	3	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	2	
<i>Thienemanniella xena</i>	6	
<i>Tvetenia discoloripes group</i>	9	
<i>Polypedilum (Uresipedilum) flavum</i>	12	
<i>Polypedilum (P.) illinoense</i>	2	
<i>Stenochironomus sp</i>	2	
<i>Rheotanytarsus sp</i>	61	
<i>Hemerodromia sp</i>	12	
<i>Elimia sp</i>	29	+
<i>Ferrissia sp</i>	12	
<i>Corbicula fluminea</i>	0	+
<i>Dreissena polymorpha</i>	0	+

No. Quantitative Taxa: 36
 No. Qualitative Taxa: 20
 Total No. Taxa: 44
 Number of Organisms: 1,915

Site: St. Joseph River, Michigan Street

Collection Date: 9/21/2006 Site Number: 3

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	322	
<i>Oligochaeta</i>	32	+
<i>Gammarus sp</i>	17	+
<i>Hydracarina</i>	16	
<i>Baetis intercalaris</i>	435	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Plauditus punctiventris</i>	18	
<i>Callibaetis sp</i>	0	+
<i>Isonychia sp</i>	624	+
<i>Stenacron sp</i>	57	
<i>Stenonema exiguum</i>	173	+
<i>Stenonema terminatum</i>	35	
<i>Ephemerellidae</i>	17	
<i>Tricorythodes sp</i>	391	
<i>Hetaerina sp</i>	0	+
<i>Argia sp</i>	0	+
<i>Chimarra obscura</i>	47	
<i>Cheumatopsyche sp</i>	1007	+
<i>Hydropsyche aerata</i>	26	
<i>Hydropsyche frisoni</i>	93	+
<i>Hydropsyche orris</i>	17	
<i>Macrostemum sp</i>	101	+
<i>Hydroptila sp</i>	75	
<i>Brachycentrus numerosus</i>	32	
<i>Petrophila sp</i>	14	+
<i>Macronychus glabratus</i>	16	
<i>Stenelmis sp</i>	0	+
<i>Simulium sp</i>	40	
<i>Cardiocladius obscurus</i>	12	
<i>Cricotopus (C.) sp</i>	12	
<i>Cricotopus (C.) bicinctus</i>	37	+
<i>Thienemanniella xena</i>	48	
<i>Tvetenia discoloripes group</i>	173	
<i>Dicrotendipes neomodestus</i>	0	+
<i>Polypedilum (Uresipedilum) flavum</i>	136	
<i>Polypedilum (P.) illinoense</i>	25	+
<i>Polypedilum (P.) ophioides</i>	12	
<i>Rheotanytarsus sp</i>	641	
<i>Tanytarsus sepp</i>	0	+
<i>Hemerodromia sp</i>	32	
<i>Elimia sp</i>	3	+
<i>Physella sp</i>	17	+
<i>Ferrissia sp</i>	34	+
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 36
 No. Qualitative Taxa: 22
 Total No. Taxa 44
 Number of Organisms 4,787

Site: St. Joseph River, Brick Road

Collection Date: 9/21/2006

Site Number: 4

Taxa Name	Quantitative	Qualitative		
<i>Hydra sp</i>	8		No. Quantitative Taxa:	30
<i>Turbellaria</i>	883		No. Qualitative Taxa:	30
<i>Oligochaeta</i>	8	+	Total No. Taxa	48
<i>Crangonyx sp</i>	0	+	Number of Organisms	6,330
<i>Gammarus sp</i>	0	+		
<i>Orconectes (Procericambarus) rusticus</i>	0	+		
<i>Baetis flavistriga</i>	310			
<i>Baetis intercalaris</i>	0	+		
<i>Plauditus punctiventris</i>	0	+		
<i>Isonychia sp</i>	1210	+		
<i>Stenacron sp</i>	353	+		
<i>Stenonema exiguum</i>	209	+		
<i>Stenonema terminatum</i>	111			
<i>Ephemerellidae</i>	48			
<i>Tricorythodes sp</i>	32	+		
<i>Caenis sp</i>	0	+		
<i>Hetaerina sp</i>	1			
<i>Coenagrionidae</i>	0	+		
<i>Argia sp</i>	0	+		
<i>Boyeria vinosa</i>	0	+		
<i>Chimarra sp</i>	8			
<i>Neureclipsis sp</i>	9	+		
<i>Cheumatopsyche sp</i>	2279	+		
<i>Hydropsyche aerata</i>	1			
<i>Hydropsyche frisoni</i>	174	+		
<i>Macrostemum sp</i>	8			
<i>Brachycentrus numerosus</i>	13	+		
<i>Neophylax sp</i>	0	+		
<i>Pycnopsyche sp</i>	0	+		
<i>Helicopsyche borealis</i>	0	+		
<i>Nectopsyche sp</i>	0	+		
<i>Oecetis persimilis</i>	4			
<i>Psephenus herricki</i>	0	+		
<i>Ancyronyx variegata</i>	8			
<i>Macronychus glabratus</i>	16			
<i>Stenelmis sp</i>	0	+		
<i>Simulium sp</i>	25			
<i>Corynoneura lobata</i>	8			
<i>Cricotopus (Isocladius) sylvestris group</i>	6			
<i>Tvetenia discoloripes group</i>	97			
<i>Chironomus (C.) sp</i>	0	+		
<i>Polypedilum (Uresipedilum) flavum</i>	245	+		
<i>Polypedilum (P.) illinoense</i>	6			
<i>Rheotanytarsus sp</i>	234	+		
<i>Hemerodromia sp</i>	8			
<i>Elimia sp</i>	8	+		
<i>Planorbella (Pierosoma) pilsbryi</i>	0	+		
<i>Corbicula fluminea</i>	0	+		

Site: Little Elkhart River, County Road 10

Collection Date: 9/19/2006

Site Number: 5

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	1	
<i>Oligochaeta</i>	12	
<i>Caecidotea sp</i>	20	+
<i>Gammarus sp</i>	14	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Baetis tricaudatus</i>	0	+
<i>Baetis flavistriga</i>	6	+
<i>Baetis intercalaris</i>	0	+
<i>Stenacron sp</i>	29	+
<i>Stenonema exiguum</i>	4	+
<i>Stenonema mexicanum integrum</i>	2	
<i>Stenonema pulchellum</i>	2	
<i>Stenonema vicarium</i>	99	+
<i>Tricorythodes sp</i>	1	
<i>Calopteryx sp</i>	3	+
<i>Pteronarcys sp</i>	0	+
<i>Perlesta placida complex</i>	1	
<i>Lype diversa</i>	4	
<i>Nyctiophylax sp</i>	1	
<i>Polycentropus sp</i>	1	
<i>Cheumatopsyche sp</i>	61	+
<i>Ceratopsyche morosa group</i>	0	+
<i>Ceratopsyche sparna</i>	0	+
<i>Hydropsyche depravata group</i>	4	+
<i>Brachycentrus sp</i>	6	
<i>Pycnopsyche sp</i>	0	+
<i>Macronychus glabratus</i>	6	+
<i>Stenelmis sp</i>	0	+
<i>Simulium sp</i>	2	+
<i>Conchapelopia sp</i>	14	
<i>Helopelopia sp</i>	14	
<i>Corynoneura lobata</i>	16	
<i>Parakiefferiella n.sp 1</i>	7	
<i>Parametriocnemus sp</i>	55	+
<i>Paratrichocladius sp</i>	7	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	55	+
<i>Thienemanniella xena</i>	7	
<i>Microtendipes pedellus group</i>	7	
<i>Polypedilum (P.) fallax group</i>	7	
<i>Paratanytarsus sp</i>	68	
<i>Rheotanytarsus pellucidus</i>	55	
<i>Rheotanytarsus sp</i>	513	
<i>Tanytarsus sp</i>	0	+
<i>Chrysops sp</i>	0	+
<i>Elimia sp</i>	3	+
<i>Laevapex fuscus</i>	5	
<i>Corbicula fluminea</i>	0	+
<i>Pisidium sp</i>	0	+
<i>Sphaerium sp</i>	0	+

No. Quantitative Taxa: 36

No. Qualitative Taxa: 27

Total No. Taxa 49

Number of Organisms 1,112

Site: Pine Creek, US 20 Bypass

Collection Date: 9/19/2006

Site Number: 6

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Gammarus sp</i>	7	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Hydracarina</i>	5	
<i>Baetis tricaudatus</i>	25	+
<i>Plauditus dubius or P. virilis</i>	3	+
<i>Baetis flavistriga</i>	126	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Stenacron sp</i>	9	+
<i>Stenonema vicarium</i>	47	+
<i>Calopteryx sp</i>	17	+
<i>Boyeria vinosa</i>	0	+
<i>Neoplea sp.</i>	0	+
<i>Lype diversa</i>	40	
<i>Cheumatopsyche sp</i>	829	+
<i>Ceratopsyche morosa group</i>	23	
<i>Ceratopsyche slossonae</i>	389	+
<i>Ceratopsyche sparna</i>	581	+
<i>Hydropsyche depravata group</i>	138	
<i>Glossosoma sp</i>	0	+
<i>Hydroptilidae</i>	18	+
<i>Nectopsyche sp</i>	0	+
<i>Pyralidae</i>	1	
<i>Peltodytes sp</i>	0	+
<i>Laccophilus sp</i>	0	+
<i>Dubiraphia vittata group</i>	1	
<i>Macronychus glabratus</i>	14	+
<i>Optioservus sp</i>	0	+
<i>Stenelmis sp</i>	0	+
<i>Tipulidae</i>	4	
<i>Antocha sp</i>	56	
<i>Simulium sp</i>	36	
<i>Thienemannimyia group</i>	0	+
<i>Corynoneura lobata</i>	112	+
<i>Cricotopus (C.) bicinctus</i>	21	
<i>Cricotopus (C.) trifascia</i>	47	+
<i>Orthocladius (O.) sp</i>	0	+
<i>Parametrioctenus sp</i>	47	
<i>Paratrichocladius sp</i>	119	+
<i>Thienemanniella lobapodema</i>	16	
<i>Thienemanniella xena</i>	16	
<i>Tvetenia bavarica group</i>	878	
<i>Polypedilum (Uresipedilum) aviceps</i>	546	+
<i>Polypedilum (P.) ophioides</i>	24	+
<i>Rheotanytarsus pellucidus</i>	736	
<i>Rheotanytarsus sp</i>	142	
<i>Tanytarsus glabrescens group sp 7</i>	24	
<i>Tanytarsus sepp</i>	0	+
<i>Hemerodromia sp</i>	48	
<i>Physella sp</i>	0	+
<i>Ferrissia sp</i>	1	+
<i>Sphaerium sp</i>	0	+

No. Quantitative Taxa: 36
 No. Qualitative Taxa: 34
 Total No. Taxa 52
 Number of Organisms 5,146

Site: Puterbaugh Creek, County Road 8

Collection Date: 9/20/2006

Site Number: 7

Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	4	
<i>Turbellaria</i>	9	
<i>Oligochaeta</i>	4	+
<i>Hyalella azteca</i>	1	+
<i>Gammarus sp</i>	19	+
<i>Hydracarina</i>	1	+
<i>Baetis tricaudatus</i>	6	
<i>Baetis flavistriga</i>	23	
<i>Pseudocloeon propinquum</i>	0	+
<i>Plauditus punctiventris</i>	0	+
<i>Stenacron sp</i>	6	
<i>Stenonema vicarium</i>	51	+
<i>Leptophlebia sp or Paraleptophlebia sp</i>	20	+
<i>Caenis sp</i>	20	+
<i>Calopteryx sp</i>	3	+
<i>Boyeria vinosa</i>	1	
<i>Lype diversa</i>	1	
<i>Cheumatopsyche sp</i>	290	+
<i>Hydropsyche depravata group</i>	55	+
<i>Hydroptila sp</i>	9	
<i>Ptilostomis sp</i>	0	+
<i>Brachycentrus numerosus</i>	50	+
<i>Helicopsyche borealis</i>	22	
<i>Mystacides sp</i>	2	
<i>Nectopsyche sp</i>	0	+
<i>Peltodytes sp</i>	0	+
<i>Macronychus glabratus</i>	2	
<i>Optioservus sp</i>	32	+
<i>Stenelmis sp</i>	0	+
<i>Simulium sp</i>	0	+
<i>Ablabesmyia mallochi</i>	12	
<i>Conchapelopia sp</i>	35	
<i>Meropelopia sp</i>	47	
<i>Corynoneura lobata</i>	92	
<i>Cricotopus (C.) bicinctus</i>	35	
<i>Parametrioctonus sp</i>	292	+
<i>Paratrichocladius sp</i>	12	
<i>Thienemanniella taurocapita</i>	12	
<i>Thienemanniella xena</i>	24	
<i>Tvetenia bavarica group</i>	94	+
<i>Microtendipes rydalensis</i>	12	
<i>Polypedilum (Uresipedilum) aviceps</i>	210	+
<i>Polypedilum (P.) fallax group</i>	12	
<i>Micropsectra sp</i>	35	
<i>Paratanytarsus sp</i>	12	
<i>Rheotanytarsus pellucidus</i>	362	+
<i>Rheotanytarsus sp</i>	59	
<i>Stempellinella n.sp nr. flavidula</i>	105	
<i>Tanytarsus sp</i>	35	+
<i>Chrysops sp</i>	0	+

Taxa Name	Quantitative	Qualitative
<i>Elimia sp</i>	33	+
<i>Physella sp</i>	25	
<i>Gyraulus (Torquis) parvus</i>	6	
<i>Planorbella (Pierosoma) pilsbryi</i>	2	
<i>Ferrissia sp</i>	22	
<i>Laevapex fuscus</i>	1	
<i>Corbicula fluminea</i>	0	+
<i>Sphaeriidae</i>	4	

No. Quantitative Taxa: 49
 No. Qualitative Taxa: 27
 Total No. Taxa: 58
 Number of Organisms: 2,221

Site: Lily Creek, Reckell Avenue

Collection Date: 9/20/2006

Site Number: 8

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	116	+
<i>Oligochaeta</i>	622	
<i>Caecidotea sp</i>	0	+
<i>Crangonyx sp</i>	70	+
<i>Pseudocloeon propinquum</i>	6	+
<i>Centropilum sp (w/o hindwing pads)</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Sigara sp</i>	0	+
<i>Notonecta sp</i>	0	+
<i>Peltodytes sp</i>	0	+
<i>Agabus sp</i>	0	+
<i>Hydroporus sp</i>	0	+
<i>Tipula sp</i>	2	+
<i>Ceratopogonidae</i>	28	+
<i>Conchapelopia sp</i>	96	
<i>Helopelopia sp</i>	3	
<i>Meropelopia sp</i>	69	
<i>Natarsia species A (sensu Roback, 1978)</i>	3	
<i>Procladius (Holotanypus) sp</i>	0	+
<i>Zavrelimyia sp</i>	18	
<i>Prodiamesa olivacea</i>	0	+
<i>Corynoneura lobata</i>	3	
<i>Cricotopus (C.) bicinctus</i>	3	
<i>Hydrobaenus sp</i>	3	
<i>Parametriocnemus sp</i>	66	
<i>Phaenopsectra flavipes</i>	3	+
<i>Polypedilum (P.) sp</i>	6	+
<i>Polypedilum (P.) illinoense</i>	9	+
<i>Stictochironomus sp</i>	0	+
<i>Tanytarsus sp</i>	3	
<i>Tanytarsus sepp</i>	3	
<i>Stagnicola sp</i>	4	+
<i>Physella sp</i>	1	+
<i>Menetus (Micromenetus) dilatatus</i>	8	
<i>Planorbella (Pierosoma) pilsbryi</i>	1	
<i>Pisidium sp</i>	89	

No. Quantitative Taxa: 25
 No. Qualitative Taxa: 21
 Total No. Taxa: 36
 Number of Organisms: 1,235

Site: Christiana Creek, County Road 4

Collection Date: 9/20/2006 Site Number: 9

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	4	
<i>Helobdella stagnalis</i>	0	+
<i>Hyalella azteca</i>	61	+
<i>Gammarus sp</i>	1	+
<i>Orconectes (Crockerinus) propinquus</i>	0	+
<i>Baetis flavistriga</i>	20	
<i>Baetis intercalaris</i>	96	
<i>Pseudocloeon propinquum</i>	0	+
<i>Plauditus punctiventris</i>	21	
<i>Centroptilum sp (w/o hindwing pads)</i>	0	+
<i>Isonychia sp</i>	1	
<i>Stenacron sp</i>	0	+
<i>Stenonema mediopunctatum</i>	162	+
<i>Stenonema pulchellum</i>	419	+
<i>Stenonema terminatum</i>	5	+
<i>Ephemerella sp</i>	156	
<i>Tricorythodes sp</i>	8	+
<i>Anthopotamus sp</i>	0	+
<i>Hexagenia sp</i>	0	+
<i>Hetaerina sp</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Boyeria vinosa</i>	0	+
<i>Ophiogomphus sp</i>	0	+
<i>Macromia sp</i>	0	+
<i>Acroneuria internata</i>	6	+
<i>Belostoma sp</i>	0	+
<i>Ranatra sp</i>	0	+
<i>Palmacorixa sp</i>	0	+
<i>Trichocorixa sp</i>	0	+
<i>Corydalus cornutus</i>	3	
<i>Chimarra obscura</i>	11	
<i>Neureclipsis sp</i>	2	
<i>Cheumatopsyche sp</i>	215	+
<i>Ceratopsyche morosa group</i>	30	
<i>Hydropsyche frisoni</i>	80	+
<i>Macrostemum zebratum</i>	2	
<i>Neophylax sp</i>	0	+
<i>Helicopsyche borealis</i>	11	+
<i>Oecetis sp</i>	9	+
<i>Oecetis persimilis</i>	10	
<i>Dineutus sp</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Macronychus glabratus</i>	5	+
<i>Stenelmis sp</i>	8	+
<i>Simulium sp</i>	34	+
<i>Hayesomyia senata or Thienemannimyia</i>	2	
<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	4	
<i>Hydrobaenus sp</i>	31	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	8	
<i>Thienemanniella lobapodema</i>	12	

Taxa Name	Quantitative	Qualitative
<i>Thienemanniella xena</i>	22	
<i>Tvetenia discoloripes group</i>	57	
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	0	+
<i>Polypedilum (Uresipedilum) flavum</i>	80	+
<i>Rheotanytarsus sp</i>	8	+
<i>Elimia sp</i>	6	+
<i>Ferrissia sp</i>	14	+
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 37
 No. Qualitative Taxa: 39
 Total No. Taxa: 58
 Number of Organisms: 1,624

Site: Christiana Creek, Willowdale Park

Collection Date: 9/18/2006

Site Number: 10

Taxa Name	Quantitative	Qualitative
<i>Gammarus sp</i>	8	+
<i>Baetis flavistriga</i>	5	
<i>Baetis intercalaris</i>	119	+
<i>Leucrocuta sp</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Stenonema exiguum</i>	5	
<i>Stenonema mediopunctatum</i>	38	+
<i>Stenonema pulchellum</i>	201	
<i>Ephemerella sp</i>	46	
<i>Hetaerina sp</i>	1	+
<i>Coenagrionidae</i>	0	+
<i>Ophiogomphus sp</i>	0	+
<i>Acroneuria internata</i>	6	+
<i>Corydalus cornutus</i>	5	
<i>Chimarra obscura</i>	28	
<i>Cheumatopsyche sp</i>	43	
<i>Ceratopsyche morosa group</i>	7	
<i>Ceratopsyche sparna</i>	23	+
<i>Hydropsyche depravata group</i>	25	
<i>Hydropsyche frisoni</i>	95	+
<i>Macrostemum sp</i>	3	
<i>Brachycentrus numerosus</i>	3	+
<i>Neophylax sp</i>	0	+
<i>Helicopsyche borealis</i>	0	+
<i>Oecetis persimilis</i>	4	
<i>Psephenus herricki</i>	0	+
<i>Macronychus glabratus</i>	9	+
<i>Optioservus sp</i>	0	+
<i>Stenelmis sp</i>	0	+
<i>Simulium sp</i>	9	
<i>Pentaneura inconspicua</i>	0	+
<i>Corynoneura lobata</i>	12	
<i>Parametriocnemus sp</i>	25	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	16	
<i>Thienemanniella taurocapita</i>	18	
<i>Thienemanniella xena</i>	28	
<i>Tvetenia discoloripes group</i>	53	
<i>Polypedilum (Uresipedilum) flavum</i>	106	+
<i>Rheotanytarsus sp</i>	168	
<i>Hemerodromia sp</i>	24	
<i>Elimia sp</i>	10	+
<i>Ferrissia sp</i>	18	
<i>Laevapex fuscus</i>	17	
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 33
 No. Qualitative Taxa: 22
 Total No. Taxa: 44
 Number of Organisms: 1,178

Site: Elkhart River, Oxbow Park

Collection Date: 9/19/2006

Site Number: 11

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	94	+	<i>Rheotanytarsus sp</i>	53	+
<i>Erpobdella punctata punctata</i>	0	+	<i>Atherix lantha</i>	1	
<i>Gammarus sp</i>	4	+	<i>Elimia sp</i>	14	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Ferrissia sp</i>	12	
<i>Hydracarina</i>	1		<i>Corbicula fluminea</i>	0	+
<i>Baetis flavistriga</i>	78	+	<i>Pisidium sp</i>	0	+
<i>Baetis intercalaris</i>	104	+	<i>Sphaerium sp</i>	0	+
<i>Plauditus punctiventris</i>	8	+			
<i>Isonychia sp</i>	19	+			
<i>Leucrocuta sp</i>	6	+	No. Quantitative Taxa: 42		
<i>Stenacron sp</i>	3	+	No. Qualitative Taxa: 38		
<i>Stenonema exiguum</i>	64	+	Total No. Taxa 57		
<i>Stenonema terminatum</i>	7	+	Number of Organisms 939		
<i>Ephemerella sp</i>	24				
<i>Tricorythodes sp</i>	12	+			
<i>Caenis sp</i>	0	+			
<i>Calopteryx sp</i>	0	+			
<i>Argia sp</i>	0	+			
<i>Boyeria vinosa</i>	0	+			
<i>Paragnetina sp</i>	0	+			
<i>Aagnetina capitata complex</i>	6	+			
<i>Chimarra obscura</i>	62	+			
<i>Lype diversa</i>	4				
<i>Polycentropus sp</i>	1				
<i>Cheumatopsyche sp</i>	94	+			
<i>Ceratopsyche morosa group</i>	88	+			
<i>Ceratopsyche sparna</i>	21	+			
<i>Hydropsyche depravata group</i>	18	+			
<i>Hydropsyche frisoni</i>	31	+			
<i>Brachycentrus sp</i>	4				
<i>Neophylax sp</i>	0	+			
<i>Pycnopsyche sp</i>	0	+			
<i>Petrophila sp</i>	4	+			
<i>Dineutus sp</i>	1				
<i>Berosus sp</i>	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Macronychus glabratus</i>	13	+			
<i>Stenelmis sp</i>	0	+			
<i>Simulium sp</i>	4	+			
<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	1				
<i>Corynoneura lobata</i>	15				
<i>Nanocladius (N.) spiniplenus</i>	2				
<i>Parametriocnemus sp</i>	2				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	14				
<i>Thienemanniella taurocapita</i>	2				
<i>Thienemanniella xena</i>	4				
<i>Tvetenia discoloripes group</i>	29				
<i>Polypedilum (Uresipedilum) flavum</i>	13				
<i>Polypedilum (Tripodura) scalaenum group</i>	1				
<i>Rheotanytarsus pellucidus</i>	1				

Site: Elkhart River, Indiana Avenue

Collection Date: 9/19/2006

Site Number: 12

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	8		<i>Polypedilum (Tripodura) scalaenum</i>	3	
<i>Turbellaria</i>	8		<i>Stenochironomus sp</i>	166	
<i>Gammarus sp</i>	8	+	<i>Rheotanytarsus pellucidus</i>	11	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Rheotanytarsus sp</i>	65	+
<i>Hydracarina</i>	5		<i>Tanytarsus glabrescens group sp 7</i>	3	
<i>Baetis flavistriga</i>	15	+	<i>Hemerodromia sp</i>	20	
<i>Baetis intercalaris</i>	10		<i>Elimia sp</i>	58	+
<i>Plauditus punctiventris</i>	8	+	<i>Physella sp</i>	1	
<i>Isonychia sp</i>	29	+	<i>Ferrissia sp</i>	4	+
<i>Leucrocuta sp</i>	56	+	<i>Corbicula fluminea</i>	0	+
<i>Stenacron sp</i>	142	+	<i>Sphaerium sp</i>	6	+
<i>Stenonema exiguum</i>	85				
<i>Stenonema terminatum</i>	56		No. Quantitative Taxa:	50	
<i>Ephemerella sp</i>	42		No. Qualitative Taxa:	28	
<i>Tricorythodes sp</i>	50	+	Total No. Taxa	61	
<i>Caenis sp</i>	5		Number of Organisms	1,357	
<i>Argia sp</i>	0	+			
<i>Gomphidae</i>	0	+			
<i>Macromia sp</i>	0	+			
<i>Pteronarcys sp</i>	0	+			
<i>Acroneuria internata</i>	0	+			
<i>Paragnetina sp</i>	5				
<i>Agnatina capitata complex</i>	4	+			
<i>Chimarra obscura</i>	3				
<i>Lype diversa</i>	8				
<i>Neureclipsis sp</i>	45	+			
<i>Cheumatopsyche sp</i>	95				
<i>Ceratopsyche morosa group</i>	120				
<i>Ceratopsyche sparna</i>	3				
<i>Hydropsyche depravata group</i>	3				
<i>Hydropsyche frisoni</i>	42	+			
<i>Brachycentrus sp</i>	7				
<i>Limnephilidae</i>	0	+			
<i>Lepidostoma sp</i>	0	+			
<i>Oecetis persimilis</i>	4				
<i>Triaenodes sp</i>	4				
<i>Psephenus herricki</i>	0	+			
<i>Macronychus glabratus</i>	21				
<i>Optioservus sp</i>	0	+			
<i>Stenelmis sp</i>	5	+			
<i>Hayesomyia senata or Thienemannimyia</i>	3				
<i>Corynoneura lobata</i>	12				
<i>Cricotopus (C.) or Paratrichocladus sp</i>	3				
<i>Eukiefferiella brehmi group</i>	6	+			
<i>Parametriocnemus sp</i>	17				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	51				
<i>Thienemanniella taurocapita</i>	3				
<i>Tvetenia discoloripes group</i>	3				
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	3				
<i>Polypedilum (Uresipedilum) flavum</i>	23	+			

Site: Elkhart River, Middlebury Street

Collection Date: 9/19/2006

Site Number: 13

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	20		<i>Thienemanniella taurocapita</i>	9	
<i>Oligochaeta</i>	29	+	<i>Tvetenia discoloripes</i> group	10	
<i>Caecidotea</i> sp	46	+	<i>Cryptochironomus</i> sp	0	+
<i>Gammarus</i> sp	56	+	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	14	
<i>Hydracarina</i>	2		<i>Phaenopsectra obediens</i> group	0	+
<i>Baetis flavistriga</i>	36	+	<i>Polypedilum (Uresipedilum) flavum</i>	10	
<i>Baetis intercalaris</i>	44	+	<i>Polypedilum (P.) fallax</i> group	10	
<i>Plauditus punctiventris</i>	16	+	<i>Polypedilum (Tripodura) halterale</i>	2	
<i>Isonychia</i> sp	38	+	<i>Stenochironomus</i> sp	5	
<i>Leucrocota</i> sp	14	+	<i>Tribelos fuscicorne</i>	2	
<i>Nixe</i> sp	0	+	<i>Cladotanytarsus vanderwulpi</i> group	2	
<i>Stenacron</i> sp	12	+	<i>Rheotanytarsus</i> sp	7	
<i>Stenonema exiguum</i>	32		<i>Tanytarsus</i> sp	5	
<i>Stenonema pulchellum</i>	47	+	<i>Hemerodromia</i> sp	14	
<i>Stenonema terminatum</i>	24		<i>Hydrobiidae</i>	2	+
<i>Ephemerella</i> sp	8		<i>Elimia</i> sp	73	+
<i>Tricorythodes</i> sp	56		<i>Ferrissia</i> sp	3	
<i>Caenis</i> sp	14	+	<i>Laevapex fuscus</i>	10	
<i>Calopteryx</i> sp	0	+	<i>Corbicula fluminea</i>	0	+
<i>Coenagrionidae</i>	0	+	<i>Pisidium</i> sp	1	+
<i>Argia</i> sp	0	+	<i>Sphaerium</i> sp	1	
<i>Arigomphus</i> sp	0	+			
<i>Pteronarcys</i> sp	1	+			
<i>Agnatina capitata</i> complex	1		No. Quantitative Taxa:	60	
<i>Chimarra obscura</i>	20		No. Qualitative Taxa:	31	
<i>Neureclipsis</i> sp	2		Total No. Taxa	71	
<i>Polycentropus</i> sp	2		Number of Organisms	1,028	
<i>Cheumatopsyche</i> sp	59				
<i>Ceratopsyche morosa</i> group	28	+			
<i>Ceratopsyche sparna</i>	33				
<i>Hydropsyche frisoni</i>	57	+			
<i>Macrostemum zebratum</i>	3				
<i>Agraylea</i> sp	9				
<i>Brachycentrus</i> sp	17	+			
<i>Psilotreta indecisa</i>	14	+			
<i>Helicopsyche borealis</i>	1				
<i>Nectopsyche diarina</i>	0	+			
<i>Gyrinus</i> sp	0	+			
<i>Hydrophilidae</i>	1				
<i>Macronychus glabratus</i>	10				
<i>Stenelmis</i> sp	65	+			
<i>Antocha</i> sp	1				
<i>Simulium</i> sp	0	+			
<i>Ceratopogonidae</i>	2				
<i>Cardiocladius obscurus</i>	5				
<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	4				
<i>Corynoneura lobata</i>	3				
<i>Cricotopus (C.) bicinctus</i>	2				
<i>Cricotopus (C.) tremulus</i> group	2				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	12				

Site: Yellow Creek, County Road 32

Collection Date: 9/19/2006

Site Number: 14

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	116	+
<i>Oligochaeta</i>	1	+
<i>Helobdella stagnalis</i>	1	
<i>Gammarus sp</i>	25	+
<i>Baetis tricaudatus</i>	29	+
<i>Baetis flavistriga</i>	76	+
<i>Stenacron sp</i>	93	+
<i>Caenis sp</i>	17	
<i>Calopteryx sp</i>	24	+
<i>Coenagrionidae</i>	2	+
<i>Argia sp</i>	0	+
<i>Boyeria vinosa</i>	0	+
<i>Cheumatopsyche sp</i>	408	+
<i>Hydropsyche depravata group</i>	55	+
<i>Limnephilidae</i>	1	
<i>Tropisternus sp</i>	0	+
<i>Ancyronyx variegata</i>	0	+
<i>Dubiraphia quadrinotata</i>	10	+
<i>Macronychus glabratus</i>	1	
<i>Optioservus fastiditus</i>	0	+
<i>Stenelmis sp</i>	10	+
<i>Tipula abdominalis</i>	0	+
<i>Anopheles sp</i>	0	+
<i>Simulium sp</i>	16	
<i>Conchapelopia sp</i>	165	+
<i>Hayesomyia senata or Thienemannimyia norena</i>	132	
<i>Helopelopia sp</i>	165	
<i>Procladius (Holotanypus) sp</i>	0	+
<i>Corynoneura n.sp 1</i>	40	
<i>Corynoneura lobata</i>	312	
<i>Nanocladius (N.) spiniplenus</i>	66	
<i>Parakiefferiella n.sp 2</i>	33	
<i>Parametrioctenemus sp</i>	66	
<i>Thienemanniella taurocapita</i>	16	
<i>Thienemanniella xena</i>	8	
<i>Dicrotendipes neomodestus</i>	33	
<i>Microtendipes pedellus group</i>	892	+
<i>Phaenopsectra obediens group</i>	33	
<i>Polypedilum (Uresipedilum) flavum</i>	33	
<i>Polypedilum (P.) fallax group</i>	33	
<i>Polypedilum (P.) illinoense</i>	0	+
<i>Stictochironomus sp</i>	0	+
<i>Paratanytarsus sp</i>	429	
<i>Rheotanytarsus pellucidus</i>	66	
<i>Rheotanytarsus sp</i>	99	
<i>Tanytarsus sp</i>	66	
<i>Tanytarsus glabrescens group sp 7</i>	297	
<i>Hemerodromia sp</i>	16	
<i>Physella sp</i>	10	+
<i>Ferrissia sp</i>	59	
<i>Sphaerium sp</i>	16	+

No. Quantitative Taxa:	41
No. Qualitative Taxa:	26
Total No. Taxa	51
Number of Organisms	3,970

Site: Yellow Creek, County Road 45

Collection Date: 9/19/2006

Site Number: 15

Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	32	
<i>Turbellaria</i>	32	
<i>Oligochaeta</i>	96	
<i>Caecidotea sp</i>	1	+
<i>Gammarus sp</i>	10	+
<i>Orconectes sp</i>	1	
<i>Baetis tricaudatus</i>	0	+
<i>Baetis flavistriga</i>	156	+
<i>Baetis intercalaris</i>	1	+
<i>Stenacron sp</i>	248	
<i>Caenis sp</i>	0	+
<i>Calopteryx sp</i>	1	+
<i>Coenagrionidae</i>	0	+
<i>Belostoma sp</i>	0	+
<i>Cheumatopsyche sp</i>	748	+
<i>Ceratopsyche morosa group</i>	666	+
<i>Ceratopsyche sparna</i>	1	
<i>Hydropsyche depravata group</i>	180	+
<i>Hydroptila sp</i>	64	
<i>Nectopsyche sp</i>	1	
<i>Peltodytes sp</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Helichus sp</i>	0	+
<i>Dubiraphia vittata group</i>	0	+
<i>Macronychus glabratus</i>	2	+
<i>Stenelmis sp</i>	0	+
<i>Tipula abdominalis</i>	0	+
<i>Conchapelopia sp</i>	181	
<i>Cricotopus (C.) bicinctus</i>	30	
<i>Cricotopus (C.) tremulus group</i>	363	
<i>Nanocladius (N.) minimus</i>	60	
<i>Parametriochnemus sp</i>	30	
<i>Paratrichocladius sp</i>	30	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	30	
<i>Chironomus (C.) decorus group</i>	0	+
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	0	+
<i>Microtendipes pedellus group</i>	60	
<i>Paratendipes albimanus or P. duplicatus</i>	0	+
<i>Phaenopsectra obediens group</i>	0	+
<i>Polypedilum (Uresipedilum) flavum</i>	181	
<i>Stictochironomus sp</i>	0	+
<i>Tribelos fuscicorne</i>	0	+
<i>Paratanytarsus sp</i>	212	
<i>Rheotanytarsus pellucidus</i>	30	
<i>Rheotanytarsus sp</i>	2027	
<i>Tanytarsus glabrescens group sp 7</i>	91	
<i>Hemerodromia sp</i>	41	
<i>Physella sp</i>	0	+
<i>Ferrissia sp</i>	27	
<i>Laevapex fuscus</i>	106	+

Taxa Name	Quantitative	Qualitative
<i>Sphaerium sp</i>	1	+
<i>Gerridae</i>	0	+

No. Quantitative Taxa: 34
 No. Qualitative Taxa: 29
 Total No. Taxa 52
 Number of Organisms 5,740

Site: Cobus Creek, County Road 8

Collection Date: 9/20/2006

Site Number: 16

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	1	
<i>Oligochaeta</i>	22	+
<i>Caecidotea sp</i>	2	
<i>Gammarus sp</i>	64	+
<i>Hydracarina</i>	4	
<i>Baetis tricaudatus</i>	10	+
<i>Baetis flavistriga</i>	1	
<i>Plauditus punctiventris</i>	5	
<i>Stenacron sp</i>	74	
<i>Stenonema exiguum</i>	2	
<i>Stenonema vicarium</i>	26	+
<i>Leptophlebia sp or Paraleptophlebia sp</i>	15	
<i>Calopteryx sp</i>	10	+
<i>Boyeria vinosa</i>	0	+
<i>Sialis sp</i>	1	
<i>Lype diversa</i>	5	
<i>Cheumatopsyche sp</i>	21	+
<i>Ceratopsyche slossonae</i>	0	+
<i>Ceratopsyche sparna</i>	0	+
<i>Ptilostomis sp</i>	0	+
<i>Brachycentrus numerosus</i>	10	+
<i>Pycnopsyche sp</i>	1	
<i>Molanna sp</i>	0	+
<i>Helicopsyche borealis</i>	40	+
<i>Mystacides sp</i>	1	
<i>Nectopsyche sp</i>	0	+
<i>Oecetis sp</i>	0	+
<i>Triaenodes sp</i>	0	+
<i>Gyrinus sp</i>	0	+
<i>Macronychus glabratus</i>	14	
<i>Stenelmis sp</i>	0	+
<i>Tipula sp</i>	0	+
<i>Conchapelopia sp</i>	9	
<i>Meropelopia sp</i>	0	+
<i>Corynoneura lobata</i>	156	
<i>Cricotopus (C.) sp</i>	27	
<i>Parakiefferiella n.sp 1</i>	180	
<i>Parametriocnemus sp</i>	117	+
<i>Thienemanniella taurocapita</i>	2	
<i>Thienemanniella lobapodema</i>	8	
<i>Thienemanniella xena</i>	26	
<i>Tvetenia bavarica group</i>	54	+
<i>Paracladopelma nereis</i>	0	+
<i>Polypedilum (P.) fallax group</i>	18	
<i>Paratanytarsus sp</i>	27	
<i>Rheotanytarsus pellucidus</i>	18	
<i>Rheotanytarsus sp</i>	144	
<i>Stempellinella n.sp nr. flavidula</i>	9	
<i>Tanytarsus sp</i>	9	
<i>Tanytarsus glabrescens group sp 7</i>	27	

Taxa Name	Quantitative	Qualitative
<i>Tanytarsus sepp</i>	9	
<i>Chrysops sp</i>	0	+
<i>Fossaria sp</i>	13	
<i>Physella sp</i>	225	+
<i>Planorbella (Pierosoma) pilsbryi</i>	1	+
<i>Planorbella (Pierosoma) trivolvis</i>	20	+
<i>Ferrissia sp</i>	51	+
<i>Corbicula fluminea</i>	0	+
<i>Collembolla</i>	0	+
<i>Microvelia sp</i>	0	+
<i>Lepidostoma sp</i>	0	+

No. Quantitative Taxa: 43
 No. Qualitative Taxa: 32
 Total No. Taxa: 61
 Number of Organisms: 1,479

Site: Phillips Ditch, Chippewa Avenue

Collection Date: 9/21/2006

Site Number: 17

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	1		No. Quantitative Taxa: 22
<i>Oligochaeta</i>	0	+	No. Qualitative Taxa: 19
<i>Gammarus sp</i>	51	+	Total No. Taxa 33
<i>Fallicambarus (Creaserinus) fodiens</i>	1	+	Number of Organisms 1,520
<i>Baetis tricaudatus</i>	1	+	
<i>Heptageniidae</i>	2		
<i>Ephemerellidae</i>	1		
<i>Calopteryx sp</i>	4	+	
<i>Boyeria vinosa</i>	0	+	
<i>Hydropsyche depravata group</i>	0	+	
<i>Hydropsyche simulans</i>	0	+	
<i>Helichus sp</i>	0	+	
<i>Macronychus glabratus</i>	3	+	
<i>Optioservus sp</i>	0	+	
<i>Stenelmis sp</i>	0	+	
<i>Paramerina fragilis</i>	4		
<i>Corynoneura lobata</i>	1333		
<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	4		
<i>Nanocladius (N.) spinipennis</i>	11		
<i>Parakiefferiella n.sp 1</i>	4		
<i>Parametriocnemus sp</i>	22	+	
<i>Thienemanniella similis</i>	4		
<i>Microtendipes pedellus group</i>	47		
<i>Polypedilum (Uresipedilum) aviceps</i>	4	+	
<i>Stictochironomus sp</i>	0	+	
<i>Paratanytarsus n.sp 1</i>	4		
<i>Rheotanytarsus sp</i>	4		
<i>Chrysops sp</i>	0	+	
<i>Elimia sp</i>	0	+	
<i>Stagnicola sp</i>	1	+	
<i>Planorbella (Pterosoma) pilsbryi</i>	6		
<i>Ferrissia sp</i>	8		
<i>Sphaerium sp</i>	0	+	

Site: Juday Creek, Grape Road

Collection Date: 9/20/2006

Site Number: 18

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	72	+	No. Quantitative Taxa: 33
<i>Caecidotea sp</i>	1	+	No. Qualitative Taxa: 14
<i>Gammarus sp</i>	94	+	Total No. Taxa 39
<i>Orconectes sp</i>	0	+	Number of Organisms 1,021
<i>Stenacron sp</i>	22	+	
<i>Stenonema vicarium</i>	2	+	
<i>Calopteryx sp</i>	0	+	
<i>Lype diversa</i>	4		
<i>Cheumatopsyche sp</i>	56	+	
<i>Ceratopsyche sparna</i>	4	+	
<i>Hydropsyche depravata group</i>	1		
<i>Hydroptila sp</i>	4		
<i>Triaenodes ignitus</i>	0	+	
<i>Hydroporus sp</i>	0	+	
<i>Dubiraphia sp</i>	79		
<i>Optioservus sp</i>	5		
<i>Tipula abdominalis</i>	3		
<i>Simulium sp</i>	2	+	
<i>Ceratopogonidae</i>	2		
<i>Hayesomyia senata or Thienemannimyia norena</i>	8		
<i>Corynoneura lobata</i>	10		
<i>Cricotopus (C.) bicinctus</i>	0	+	
<i>Parakiefferiella n.sp 2</i>	25		
<i>Parametriocnemus sp</i>	125		
<i>Rheocricotopus (Psilocricotopus) robacki</i>	158		
<i>Thienemanniella xena</i>	2		
<i>Tvetenia bavarica group</i>	66		
<i>Phaenopsectra obediens group</i>	17		
<i>Polypedilum (Uresipedilum) aviceps</i>	75		
<i>Polypedilum (P.) fallax group</i>	8		
<i>Polypedilum (P.) illinoense</i>	8		
<i>Polypedilum (Tripodura) scalaenum group</i>	8		
<i>Stictochironomus sp</i>	0		
<i>Rheotanytarsus pellucidus</i>	25		
<i>Rheotanytarsus sp</i>	33		
<i>Stempellinella n.sp nr. flavidula</i>	50		
<i>Tanytarsus sp</i>	42		
<i>Tanytarsus curticornis group</i>	8		
<i>Hemerodromia sp</i>	2		
<i>Physella sp</i>	0	+	

Site: Juday Creek, Kintz Avenue

Collection Date: 9/20/2006

Site Number: 19

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	2	+	No. Quantitative Taxa:	41
<i>Oligochaeta</i>	0	+	No. Qualitative Taxa:	26
<i>Orconectes sp</i>	0	+	Total No. Taxa	48
<i>Hydracarina</i>	25		Number of Organisms	3,904
<i>Baetis flavistriga</i>	28	+		
<i>Pseudocloeon frondale</i>	0	+		
<i>Pseudocloeon propinquum</i>	0	+		
<i>Plauditus punctiventris</i>	17	+		
<i>Stenacron sp</i>	76	+		
<i>Stenonema exiguum</i>	309			
<i>Stenonema pulchellum</i>	101			
<i>Stenonema vicarium</i>	23	+		
<i>Tricorythodes sp</i>	1	+		
<i>Caenis sp</i>	40	+		
<i>Ephemera sp</i>	1			
<i>Calopteryx sp</i>	9	+		
<i>Boyeria vinosa</i>	5	+		
<i>Chimarra aterrima</i>	0	+		
<i>Chimarra obscura</i>	14	+		
<i>Cheumatopsyche sp</i>	331	+		
<i>Ceratopsyche morosa group</i>	189	+		
<i>Ceratopsyche sparna</i>	25			
<i>Hydropsyche depravata group</i>	59	+		
<i>Nectopsyche diarina</i>	0	+		
<i>Dubiraphia quadrinotata</i>	0	+		
<i>Macronychus glabratus</i>	42	+		
<i>Optioservus fastiditus</i>	28	+		
<i>Stenelmis sp</i>	6	+		
<i>Antocha sp</i>	104	+		
<i>Simulium sp</i>	16			
<i>Helopelopia sp</i>	28			
<i>Corynoneura n.sp 1</i>	16			
<i>Corynoneura lobata</i>	192			
<i>Cricotopus (C.) bicinctus</i>	85			
<i>Parakiefferiella n.sp 1</i>	28			
<i>Parakiefferiella n.sp 2</i>	28			
<i>Parametriocnemus sp</i>	597			
<i>Paratrichocladius sp</i>	114			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	57			
<i>Thienemanniella taurocapita</i>	16			
<i>Thienemanniella xena</i>	8			
<i>Tvetenia discoloripes group</i>	227	+		
<i>Microtendipes pedellus group</i>	57	+		
<i>Rheotanytarsus pellucidus</i>	28			
<i>Rheotanytarsus sp</i>	682			
<i>Tanytarsus glabrescens group sp 7</i>	170			
<i>Hemerodromia sp</i>	32			
<i>Ferrissia sp</i>	88			

Site: Juday Creek, Izaak Walton League

Collection Date: 9/20/2006

Site Number: 20

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	38	+	No. Quantitative Taxa:	37
<i>Oligochaeta</i>	1	+	No. Qualitative Taxa:	17
<i>Caecidotea sp</i>	9		Total No. Taxa	40
<i>Gammarus sp</i>	8		Number of Organisms	1,965
<i>Hydracarina</i>	4			
<i>Baetis flavistriga</i>	5	+		
<i>Stenacron sp</i>	82	+		
<i>Stenonema pulchellum</i>	79	+		
<i>Stenonema vicarium</i>	78	+		
<i>Tricorythodes sp</i>	0	+		
<i>Calopteryx sp</i>	10	+		
<i>Gomphus sp</i>	0	+		
<i>Cheumatopsyche sp</i>	131	+		
<i>Ceratopsyche morosa group</i>	6	+		
<i>Hydropsyche depravata group</i>	53	+		
<i>Brachycentrus sp</i>	1			
<i>Oecetis persimilis</i>	9			
<i>Macronychus glabratus</i>	50			
<i>Optioservus fastiditus</i>	0	+		
<i>Stenelmis sp</i>	97	+		
<i>Antocha sp</i>	12			
<i>Tipula abdominalis</i>	1	+		
<i>Simulium sp</i>	4	+		
<i>Nilotanypus fimbriatus</i>	8			
<i>Thienemannimyia group</i>	53			
<i>Corynoneura lobata</i>	44			
<i>Cricotopus (C.) tremulus group</i>	13			
<i>Cricotopus (C.) trifascia</i>	13			
<i>Parametriocnemus sp</i>	477	+		
<i>Thienemanniella similis</i>	16			
<i>Thienemanniella xena</i>	12			
<i>Tvetenia bavarica group</i>	13			
<i>Polypedilum (P.) fallax group</i>	26			
<i>Polypedilum (P.) laetum group</i>	26			
<i>Rheotanytarsus pellucidus</i>	40			
<i>Rheotanytarsus sp</i>	318			
<i>Tanytarsus sp</i>	13			
<i>Tanytarsus glabrescens group sp 7</i>	199			
<i>Atherix lantha</i>	8			
<i>Hemerodromia sp</i>	8			