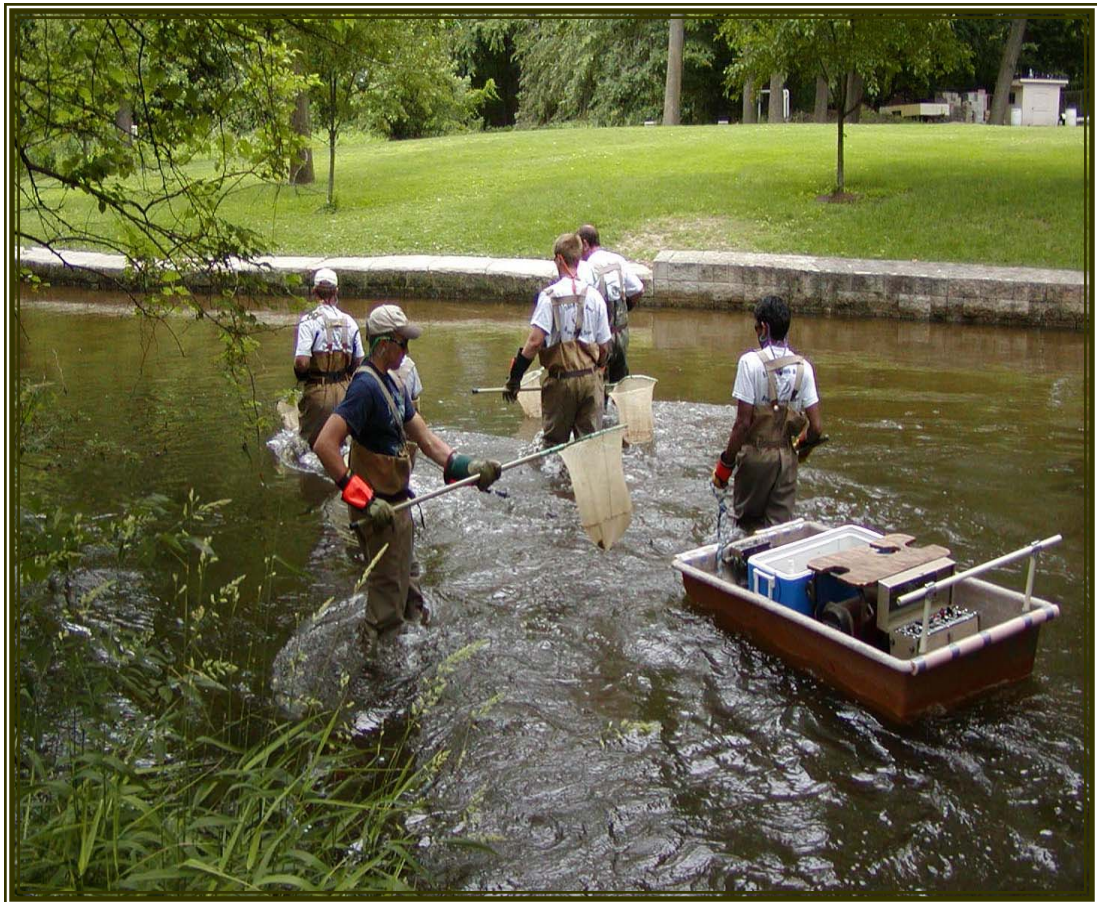


ELKHART-SOUTH BEND AQUATIC COMMUNITY MONITORING



**ANNUAL REPORT
2005**

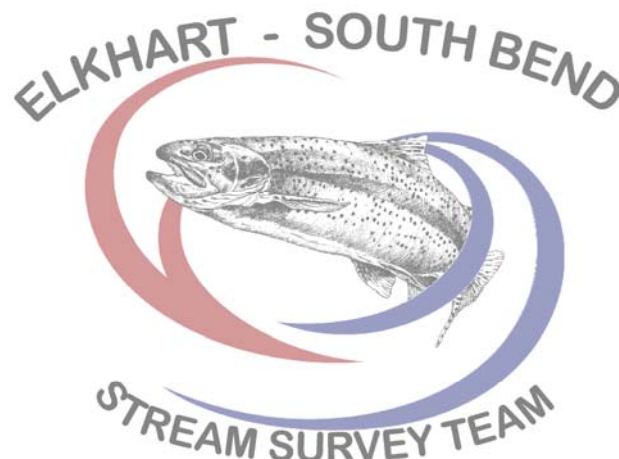
City of Elkhart 
The city with a heart

David L. Miller, Mayor

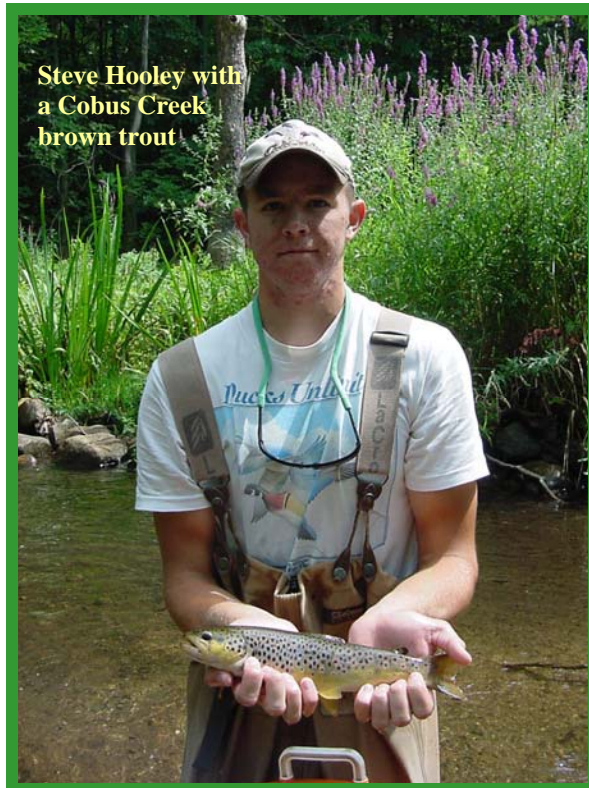
Cover Photo: 2005 crew tote barge sampling at Willowdale Park on Christiana Creek

TABLE OF CONTENTS

#	INTRODUCTION.....	1
#	METHODS.....	4
	RESULTS AND DISCUSSION	6
	INDICIES	6
	TAGGING AND MOVEMENT	15
	FISH TISSUE	16
	CONCLUSION.....	16
	ACKNOWLEDGEMENTS	18
	REFERENCES	19
	SUMMER 2005 (Pictures)	20
	APPENDICES	
	APPENDIX A (Metrics for various indices)	
	APPENDIX B (Fish tissue preparation and results)	
	APPENDIX C (Summary of fish collected by county, 2005)	
	APPENDIX D (Summary of fish collected by site, 2005)	
	APPENDIX E (Summary of macroinvertebrates collected by site, 2005)	



AQUATIC COMMUNITY MONITORING IN ELKHART AND ST. JOSEPH COUNTIES ON THE ST. JOSEPH RIVER AND SELECTED TRIBUTARIES, 2005



Prepared by
Len Kring
Aquatic Biologist
May, 2006

INTRODUCTION

From the origin of its headwaters in Hillsdale, MI near Baw Beese Lake, to its mouth to 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 urban areas. All of these environments can have an effect on the quality of the water, and in turn, on the animals that reside within this water. The City of Elkhart is one of the urban areas this water flows through, and in 1998 the City decided it was time to take a more proactive role in monitoring and protecting this important natural resource. At that time a monitoring program focused on fish communities was initiated to supplement the existing chemical and microbial monitoring the City already had in place (Foy 2001).

The decision by the City to monitor a biological community in conjunction with the existing monitoring programs made a lot of sense for several reasons. First, ecologists and biologists have known for years about the limitations of using only chemical monitoring to document the health of flowing waters and the biological communities that reside within them (Ohio EPA 1988). The City understood that the addition of biological monitoring was the next logical step in helping to protect and preserve our rivers and streams and the aquatic life within them. Second, in 1990 the state of Indiana began development of a sampling program aimed specifically at monitoring fish and macroinvertebrate (insect) communities in the rivers and streams of Indiana. This monitoring is done to provide biological community information on all waters of the state and their ability to support aquatic life (IDEM 1998). This type of statewide monitoring can also be seen as the first step in establishing regulations for municipalities and industries to conduct similar monitoring, so Elkhart felt it would be best to begin this type of monitoring voluntarily and work with the state on any regulatory developments in the future.

By the end of the summer of 2000, Elkhart had completed its first phase of monitoring at 17 sites on seven area streams (Foy 2001). The data gathered from this first phase was crucial to establishing a baseline of information on area streams. With this type of information in hand, Elkhart now had a better understanding of the health of these streams and also had information to compare to in future years.

In the fall of 2000, the City of South Bend expressed an interest in a cooperative fish community study on the St. Joseph River with the City of Elkhart. South Bend had observed how the initial fish community information was being put to use by Elkhart and determined that similar information from their area would be helpful. Elkhart quickly realized additional biological information from the St. Joseph River would prove useful on future projects dealing with the river's watershed. In the fall of 2000, Elkhart prepared and presented several possible monitoring programs to South Bend. South Bend then chose the monitoring program that best suited their needs. Since the spring of 2001, an interlocal agreement between Elkhart and South Bend has been in place. With this watershed approach, we have seen what the health of the fish communities are throughout the entire stretch of the St. Joseph River as it

flows through Indiana.

The biological monitoring strategy developed by Elkhart has established core stations on the St. Joseph River and its major tributaries in Elkhart and St. Joseph counties. Results obtained from 1998-2003 at these stations have been used to create a baseline of information for all of the streams sampled. To date, this baseline of information has been used to reveal what impact Elkhart and South Bend's urban environments have on the receiving streams and will be used to document any changes in the fish communities over time.

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 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. In 2003, Elkhart began 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.

In 2005, with assistance from the Midwest Biodiversity Institute (MBI, Columbus, Ohio), the second year of a pilot project involving macroinvertebrate (insect) community sampling was continued to compliment the fish community and habitat data that was being collected. This sampling was conducted at 20 previously sampled fish index sites, will be completed next year and will include St. Joseph River and tributary sites in Elkhart and St. Joseph counties. This community assessment will be done using 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 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.

In addition to monitoring the water quality in the St. Joseph River and some of its tributaries, sampling was also conducted to determine the overall diversity of the fish species in the Elkhart and South Bend areas. Elkhart's aquatics staff

Table 1: Fish consumption information taken from the 2005 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
	Carp	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	
	16+	☐	4	
Juday Creek	White Sucker	17+	☐	3

○ = Mercury
☐ = PCBs

Group 2 = 1 meal/week

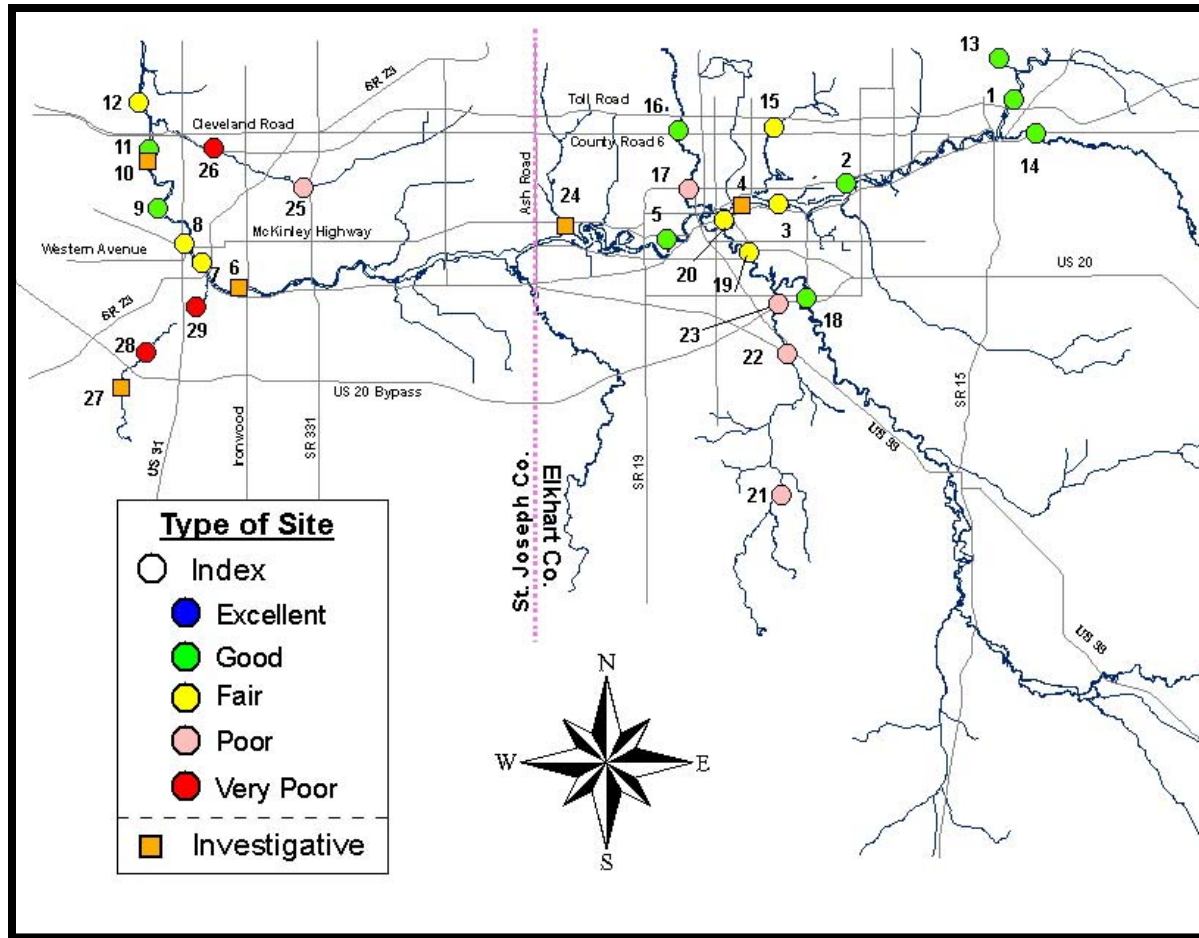
Group 3 = 1 meal/month

Group 4 = 1 meal/2 months

Group 5 = DO NOT

continued tagging smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*) and walleye (*Sander vitreus*) collected throughout the sampling year. Finally, tissue from seven species of fish was again sampled and analyzed for mercury and PCB (polychlorinated biphenyl) content. This information was added to Elkhart and South Bend's existing tissue data from the St. Joseph and Elkhart Rivers. At present, several species are on the Indiana Fish Consumption Advisory (FCA) (Table 1) for these streams and the cities want to contribute additional information to the state's

Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community condition for 2005



fish tissue database so the most accurate and thorough advisory possible may be issued.

METHODS

To quickly identify the majority of fish species present and to determine water quality levels in the St. Joseph River and its tributaries, two sampling approaches have been consistently used over the last eight years. Investigative sites were sampled only once and all fish collected at these sites were identified to species, the largest and smallest of each species were measured to the nearest millimeter (mm), the fish were counted, and then released. Index sites, on the other hand, were sampled twice during the summer with a five-week interval between samples, and the length of the sample area was dependent on the stream's width. The length of these sites was 15 times the stream's width with a minimum length of 50 meters and a maximum length of 500 meters. Differences in sampling and processing (Foy 2004) have allowed multiple investigative

sites to be sampled in a day versus one to two index sites. Additionally, if a specimen of a species had not been previously retained from a site for the Office of Public Works specimen museum, then a single specimen of the smaller species was retained and larger specimens were photographed. This practice allows for the verification of the field and lab identifications if needed.

In 2005, 17 index and 2 investigative sites were sampled in Elkhart County and 7 index and 3 investigative sites were sampled in St. Joseph County (Figure 1 and Table 2). Index sites were sampled twice with at least a five week "rest" period between visits, and investigative sites were generally sampled only once. Investigative sites may be sampled once at night and then again during the day to see if time has an effect on species composition and size of individual specimens collected. IBI scores were calculated for every index site visit, then the scores for the two visits at each site were averaged to calculate the annual score.

Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2005

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores		ICI Scores		QHEI Scores	
				2004	2005	2004	2005	2004	2005
1	Toll Road (Bristol) St. Joseph River	Index Elkhart	Boat		51	40			81
2	Six-Span (CR 17) St. Joseph River	Index Elkhart	Boat		51				65
3	Homan Avenue St. Joseph River	Index Elkhart	Boat		42				60
4	Lily Creek Mouth St. Joseph River	Investigative Elkhart	Boat					57	56
5	Bridge St. St. Joseph River	Index Elkhart	Boat		52				69
6	Veterans Park St. Joseph River	Investigative St. Joseph	Boat						67
7	Jefferson Boulevard St. Joseph River	Index St. Joseph	Boat		38			66	60
8	LaSalle Street St. Joseph River	Index St. Joseph	Boat	47	46	44	44	78	78
9	Angela Boulevard St. Joseph River	Index St. Joseph	Boat	45	50			84	84
10	Pinhook Park St. Joseph River	Investigative St. Joseph	Boat						84
11	Pinhook Park (B) St. Joseph River	Index Elkhart	Tote Barge	49	52			86	73
12	Brick Road St. Joseph River	Index Elkhart	Tote Barge	45	44	36	44	84	82
13	County Road 2 Trout Creek	Index Elkhart	Tote Barge		51				59
14*	State Road 120 Little Elkhart River	Index Elkhart	Tote Barge	55	49			79	82
15*	Reedy Drive Puterbaugh Creek	Index Elkhart	Tote Barge	26					50
16	County Road 6 Christiana Creek	Index Elkhart	Tote Barge		47				79
17	Willowdale Park Christiana Creek	Index Elkhart	Tote Barge	35	31	48	52	83	80
18	Hively Avenue Elkhart River	Index Elkhart	Boat		50				80
19	Studebaker Park (A) Elkhart River	Index Elkhart	Boat		44				80
20	American Park Elkhart River	Index Elkhart	Boat		46				66
21	County Road 32 Yellow Creek	Index Elkhart	Tote Barge	34	33	44	36	64	62
22	Concord High School Yellow Creek	Index Elkhart	Tote Barge		29				67
23	US 20 Bypass Yellow Creek	Index Elkhart	Tote Barge	37	34	38	44	70	70
24*	Elkhart Conservation Club Cobus Creek	Investigative Elkhart	Tote Barge						85
25*	Grape Road Juday creek	Index St. Joseph	Tote Barge	28	27	36	28	52	57
26*	Kintz Avenue Juday Creek	Index St. Joseph	Tote Barge	27	22	36	42	59	62
27	Jackson Road Auten Ditch	Investigative St. Joseph	Back Pack						36

* 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	
				2004	2005	2004	2005	2004	2005
28	Chippewa Avenue Phillips Ditch	Index St. Joseph	Back Pack	16	17	8	10	59	50
29	Studebaker Golf Course Bowman Creek	Index St. Joseph	Back Pack	14	17			52	37

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.

In 2005, as in 2003 and 2004, 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 habitat at all fish sites every time the sites were sampled. These multiple assessments were then averaged for each site (Table 2).

In August of 2005, MBI personnel placed Hester-Dendy samplers (artificial substrates used to collect insects and other macroinvertebrate organisms) at 20 previously sampled fish index sites (Table 3 & Figure 2) following Ohio EPA macroinvertebrate sampling procedures (Ohio EPA 1987, 1989). Seventeen of the twenty samplers were retrieved six weeks later and their contents were preserved in ethanol for later identification. The other three samplers had been vandalized and therefore were not included in the data. Qualitative sampling also takes place at the time of sampler retrieval. This extra sampling is performed with dip nets throughout all available habitat near the location of the macroinvertebrate samplers. Sites where the Hester-Dendy samplers were disturbed were evaluated solely on the qualitative sampling. Once the insects were identified, ICI scores were calculated for each site sampled (Table 2). Due to recent stream modifications in Yellow Creek, one sampler was placed upstream

of its corresponding fish site. The County Road 45 site was substituted for the US 20 Bypass site. Michigan Street was also substituted for LaSalle Street on the St. Joseph River for logistical reasons relating to the placement of the sampler.

Tagging of smallmouth bass, walleye and largemouth bass continued following the same procedure as past years (Foy 2004). An orange anchor tag applied under the left anterior edge of the dorsal fin (Figure 3) contained Elkhart Office of Public Works' phone number and a unique tag number. It was hoped that angler curiosity would be sufficient motivation to call the phone number listed on the tag, and thus gain additional movement information.

Tissue in the form of fillets was collected from smallmouth bass, common carp (*Cyprinus carpio*), rock bass (*Ambloplites rupestris*), northern hog sucker (*Hypentelium nigricans*), golden redhorse (*Moxostoma erythrurum*), black redhorse (*M. duquesnei*), and shorthead redhorse (*M. macrolepidotum*) from July through August. The tissue samples were collected from seven sites on the St. Joseph River (Table 4 & Figure 4). Each tissue sample sent in for analysis was a composite of tissue from three fish of the same species at the given site or area. The samples were collected following the procedures in Appendix B (this report) and Appendix III in "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (1993).

RESULTS & DISCUSSION

During the summer of 2005 a total of 14,174 fish were collected in Elkhart County and 6,161 fish were collected in St. Joseph County (Appendix C). In Elkhart County these fish represented 65 species in 16 families and in St. Joseph County, the fish collected represented 51 species from 14 families. In all, 67 species were collected from the two counties. Creek chub (*Semotilus atromaculatus*), smallmouth bass, and longear sunfish

Table 3: Macroinvertebrate sites, 2005

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 2: Location of macroinvertebrate sampling sites for 2005

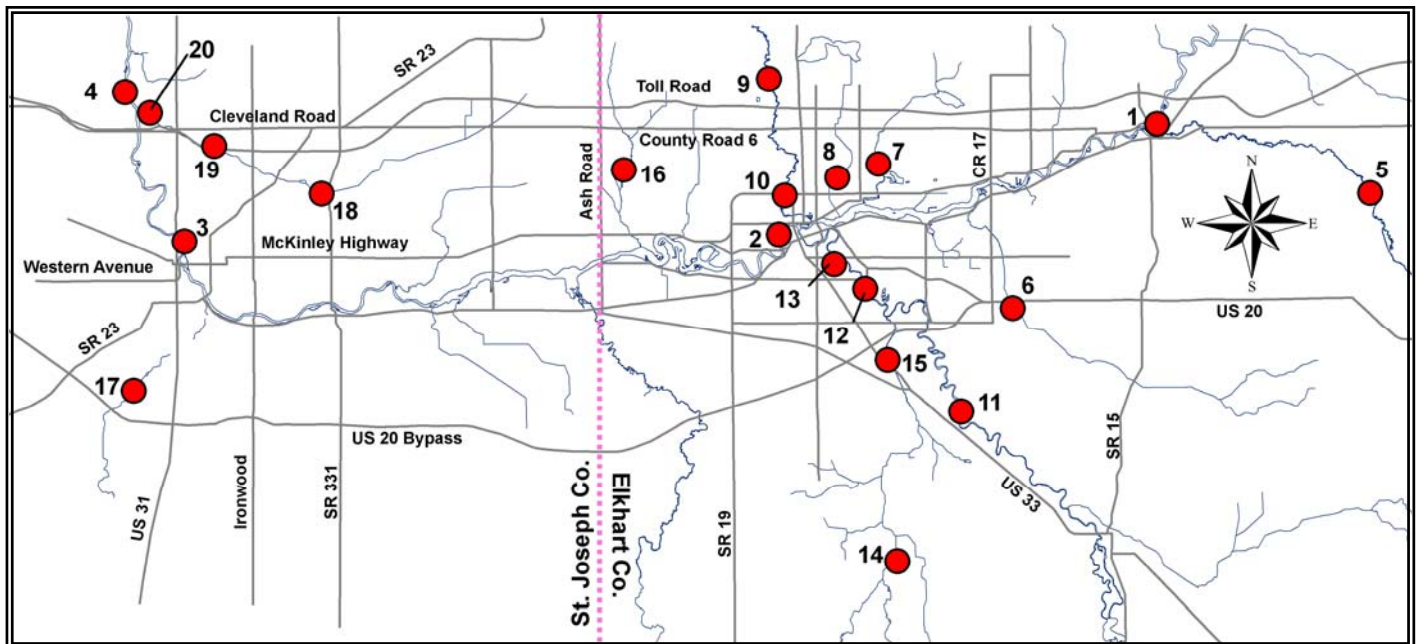


Figure 3: Location of tag on fish



Table 4: Fish tissue sites

Site Number	Stream	Station
1	St. Joseph River	Toll Road
2	St. Joseph River	Six-Span
3	St. Joseph River	Sherman Street
4	St. Joseph River	Bridge Street
5	St. Joseph River	LaSalle Street
6	St. Joseph River	Pinhook Park (B)
7	St. Joseph River	Brick Road

(*Lepomis megalotis*) were the top three species collected in St. Joseph County, while white sucker (*Catostomus commersonii*), mimic shiner (*Notropis volucellus*), and rock bass were the top three species found in Elkhart County.

INDICES

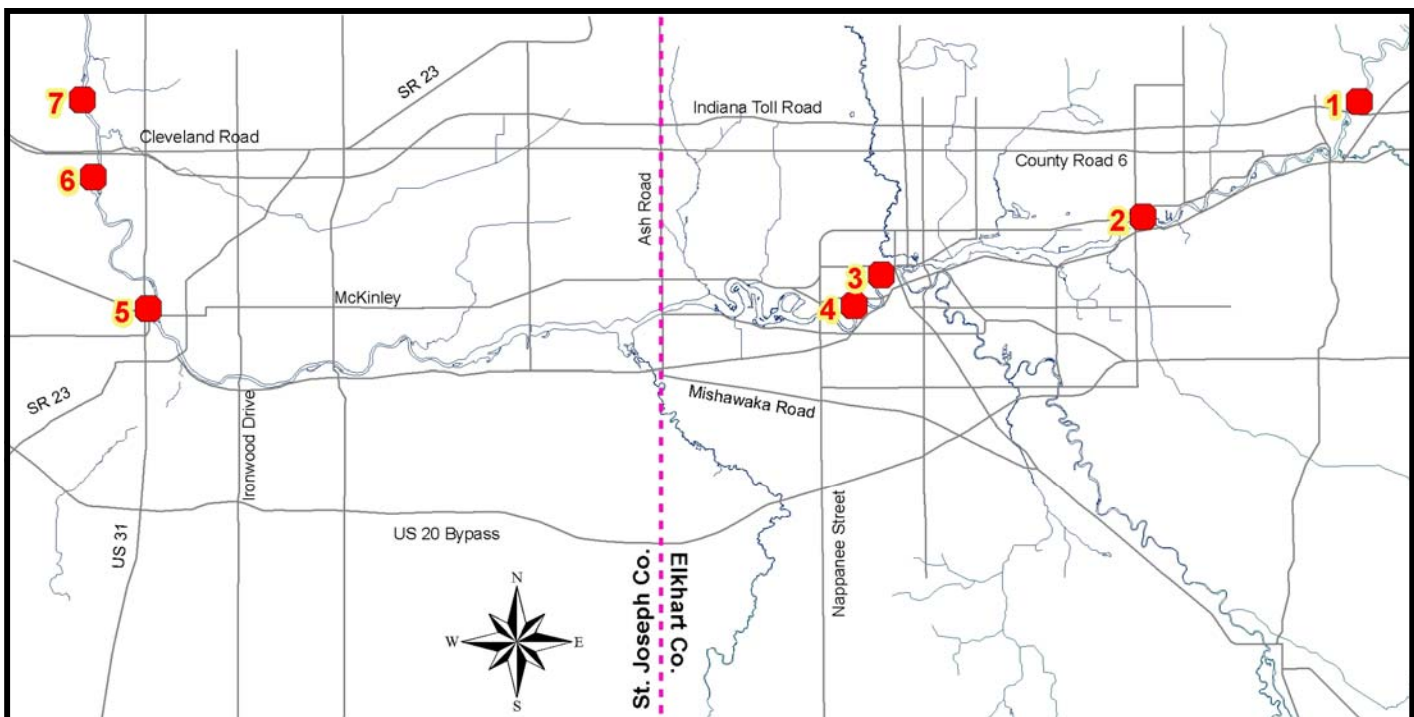
The IBI, ICI and QHEI scores for 2005 are summarized in Table 2. Throughout this report these scores will be graphed to show the longitudinal changes on the various streams. The ICI and IBI

graphs contain an attainment line. Fish and aquatic insect communities that score below this line are considered impaired. A variety of factors (low quality habitat, chemical contaminants, thermal effects, etc.) could be responsible for causing an impairment.

The condition of the fish communities at the index sites ranged from very poor (17) at Studebaker Golf Course on Bowman Creek to good (52) at Bridge St and below Pinhook Park on the St. Joseph River. The macroinvertebrate community condition at the pilot sites varied from poor (10) at Chippewa Avenue on Phillips Ditch and Reckell Avenue on Lily Creek to excellent (52) at Willowdale Park on Christiana Creek. The habitat quality at the index and investigative sites ranged from poor (36) at Jackson Road on Auten Ditch to excellent (85) at the Elkhart Conservation Club on Cobus Creek.

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 2004) for the IBI and QHEI. The ICI is not an index used by IDEM, but similar guideline values have been established by Ohio EPA for a nearby region, and those values will be used with the Elk-

Figure 4: Location of fish tissue collection sites for 2005



hart and South Bend data. The guidelines list IBI and ICI scores of 32 or greater as indicators of a stream with the ability to support aquatic life. QHEI values of 64 or greater 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 5. The Elkhart baseline was created with information collected from 1998 to 2003. The condition of the fish communities in the Elkhart area of the river continue to be good with only slight differences from the baseline. The exception to this is the Homan Avenue Site. This new index site was sampled to determine how the currently used IBI would score an area that more resembles a lake than a river. With only one year of information it is yet to be determined whether the IBI can be effectively utilized in these types of environments. The condition of the aquatic insect communities continued to be good at sites on the St. Joseph River (Figure 6) and closely followed the trend of the fish communities at those sites. The ICI score at Brick Rd increased slightly and scores at Michigan St. and Sherman St. did not change. The sampler placed at SR 15 in Bristol was tampered with so no ICI score was calculated; however MBI personnel classified the macroinvertebrate community as good based on

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

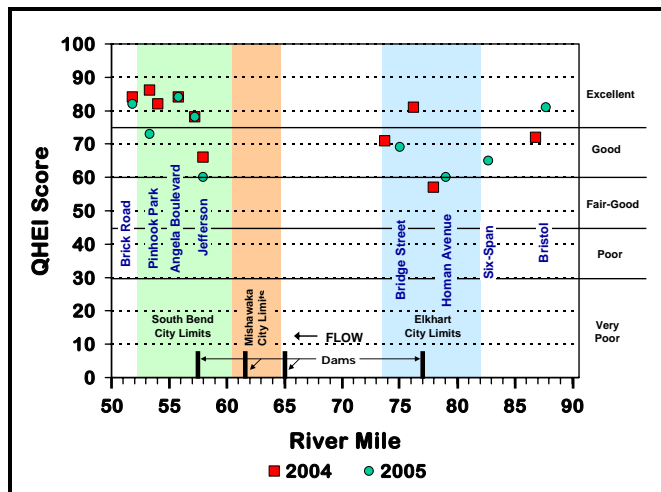


Figure 5: IBI scores for the St. Joseph River, Elkhart and St. Joseph Counties

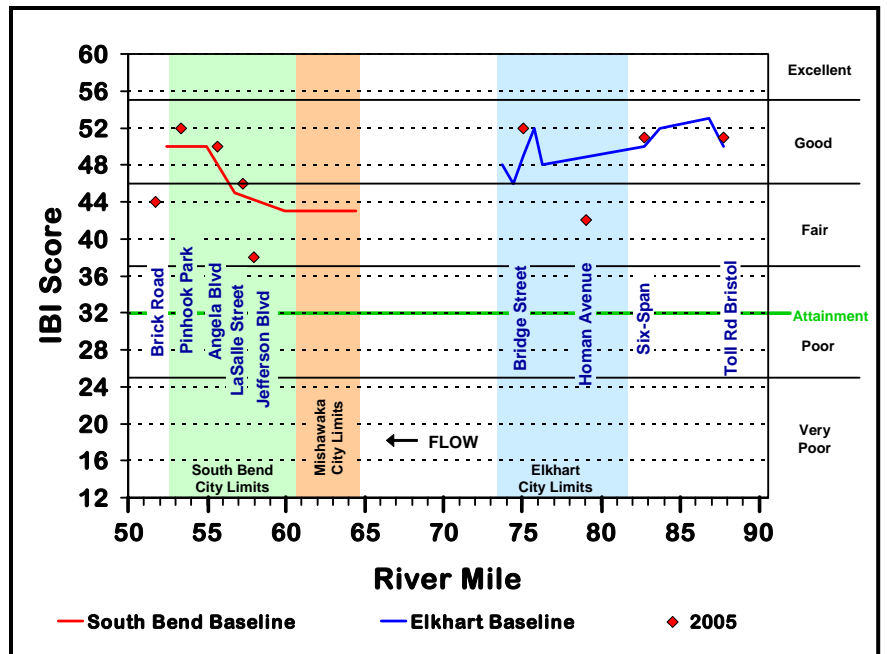
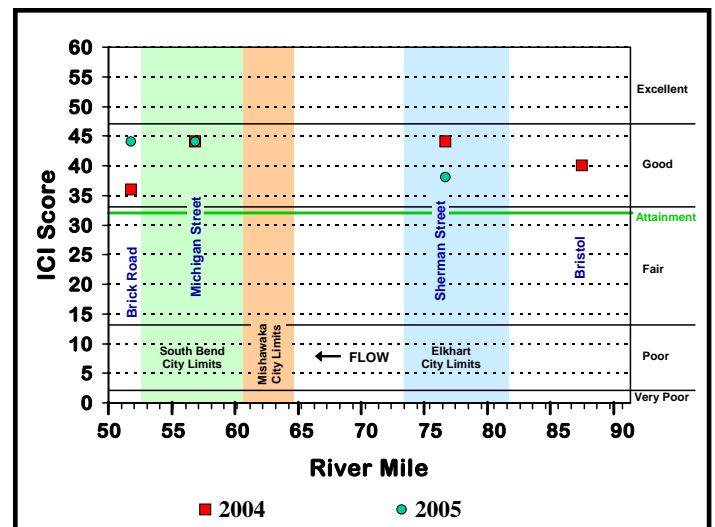


Figure 6: ICI scores for the St. Joseph River, Elkhart and St. Joseph Counties



the qualitative sample. Additional habitat information (Figure 7) continues to reflect poorer habitat in areas of low flow behind dams or in areas containing a lot of artificial shoreline, which may explain the lower IBI score for the Homan Avenue site. The lowest QHEI scores in the Elkhart area of the St. Joseph River occur immediately upstream of the hydroelectric dam or downstream of the city in the impoundment of the next dam. These lake-type environments have highly developed shorelines (sheet-driven or concrete sea-

walls) and little or no diversity in the type of habitat that is favored by stream-dwelling fish.

The first stage of developing a long-term baseline for South Bend was completed in 2003 with information collected at index sites from 2001 to 2003. In 2005, the second year of sampling in a three year cycle was completed at four sites in the area, as well as the first year of sampling at Jefferson Blvd (Figure 5). The information from these sites will help complete the South Bend IBI baseline on the St. Joseph River. The 2005 IBI scores here are similar to the existing baseline with a drop in fish community condition at Brick Road. This was the second consecutive year that IBI scores at Brick Road were lower than expected. The aquatic insect community condition increased slightly from the previous year (Figure 6). With habitat scores high as well, it is difficult to determine why fish community scores are lower at Brick Rd compared to other sites in South Bend. It will be interesting to see what the condition of the insect community will be next year. If the ICI score is high again, then there may be an un-determined problem impacting that area of the St. Joseph River. IBI scores at Jefferson Blvd were similar to those seen at Homan Avenue in Elkhart Co.

The IBI scores for the Elkhart River (Figure 8), fall slightly below the established baseline and show

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

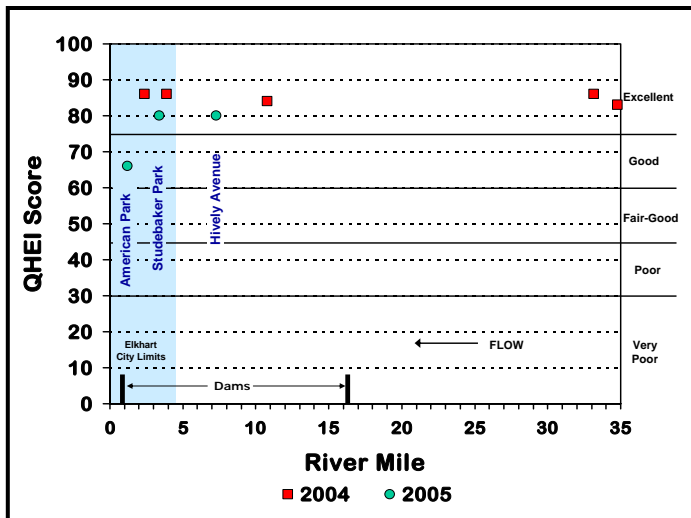


Figure 8: IBI scores for the Elkhart River, Elkhart County

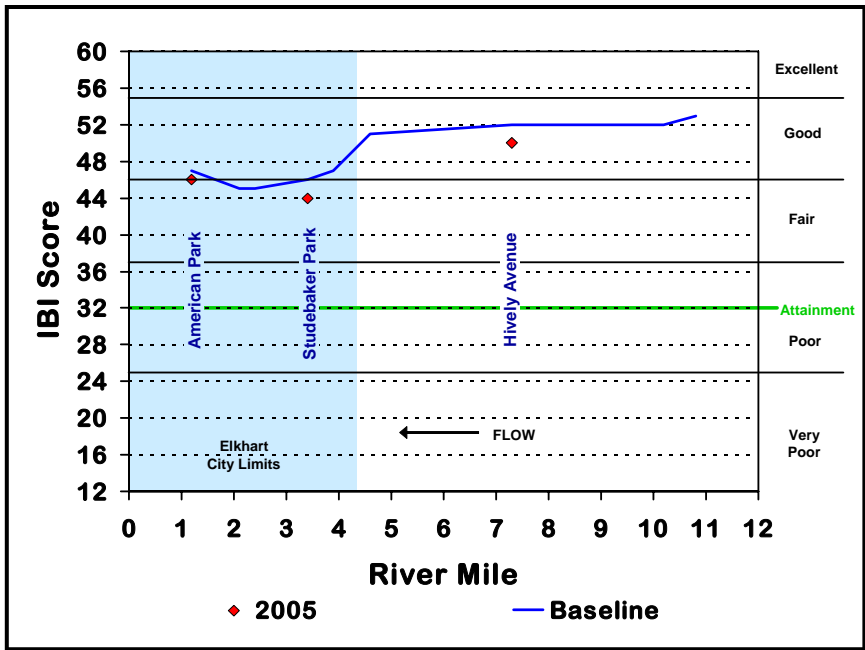
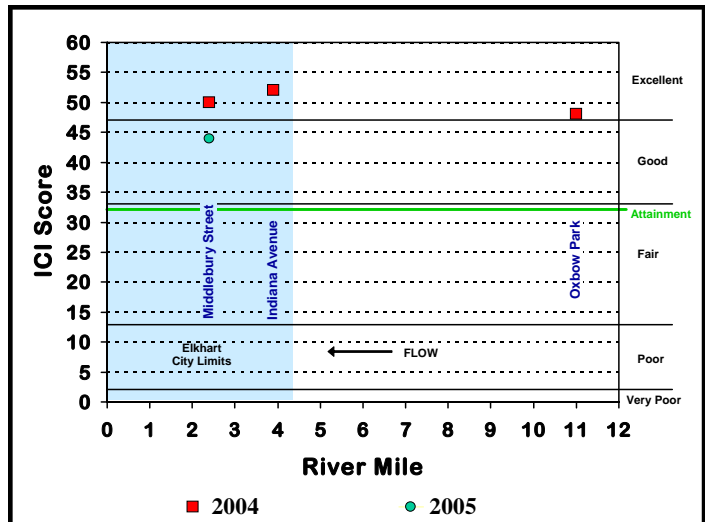


Figure 9: ICI scores for the Elkhart River, Elkhart County



no cause for immediate concern. Year-to-year IBI score fluctuations of 4-8 points are not unusual and are attributed to the natural variability of biological communities (Foy 2001) QHEI scores for two of the three sites sampled on the Elkhart River in 2005 fell within the excellent classification (Figure 10) with the third being in the good classification. In general, this river has some of the best habitat in the Elkhart area. Sites on the Elkhart River are now on a rotation where they are sampled once every three years. As long as IBI scores stay within natural fluctuations of the established baseline, there is no reason to sample

these sites in back to back years. Quantitative insect community condition data was only collected at one of the previously sampled three areas from 2004 (Figure 9). Hester-Dendy samplers placed near Indiana Avenue and at Oxbow Park were disturbed and therefore ICI scores could not be calculated for these sites. MBI personnel classified these two sites as very good based on the qualitative sampling. Data collected at the Middlebury St. site showed that the insect community condition fell from being excellent to good. It would have been interesting to see if the other two sites followed the same trend. These three sites will be sampled again in 2006.

Multiple index sites have now been sampled on most of the area tributaries. Longitudinal views of IBI scores at these sites will compare the results from baseline stations (3 years of data) to the recently sampled sites.

Juday Creek and Bowman Creek (Phillips Ditch and Auten Ditch are extensions of this creek) in St. Joseph County are very different from one another. Juday Creek is a cool/cold water stream that supports trout, while Bowman Creek is much warmer and heavily impacted by the urban environment it flows through. Both drain agricultural and urban lands. The IBI scores on these creeks (Figure 11) continue to closely follow the same trend as the QHEI scores (Figure 12). Juday Creek's water temperature also plays a big role in

Figure 11: IBI scores for Bowman Creek and Juday

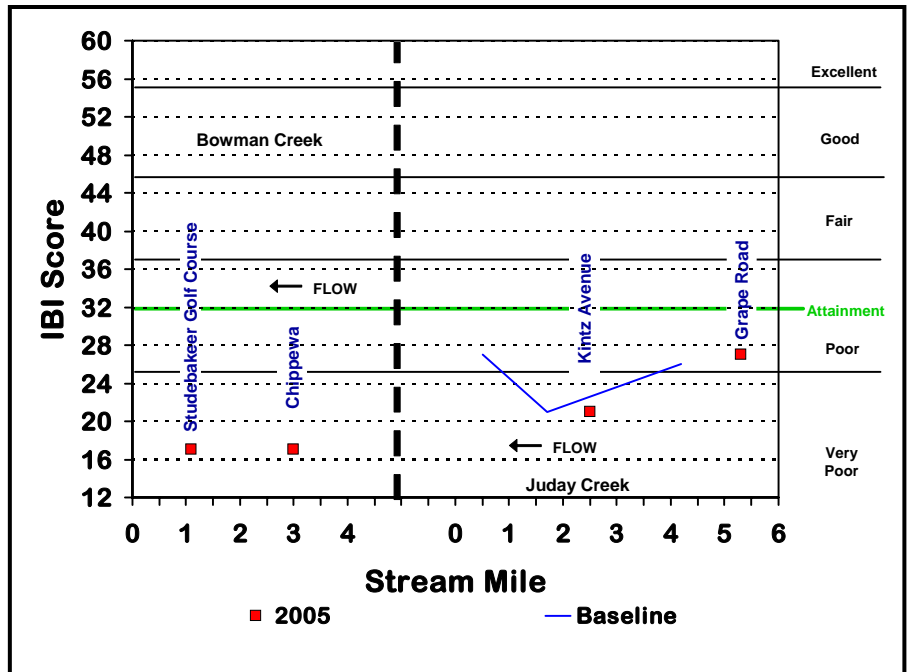


Figure 12: QHEI scores for Bowman Creek and Juday Creek, St. Joseph County

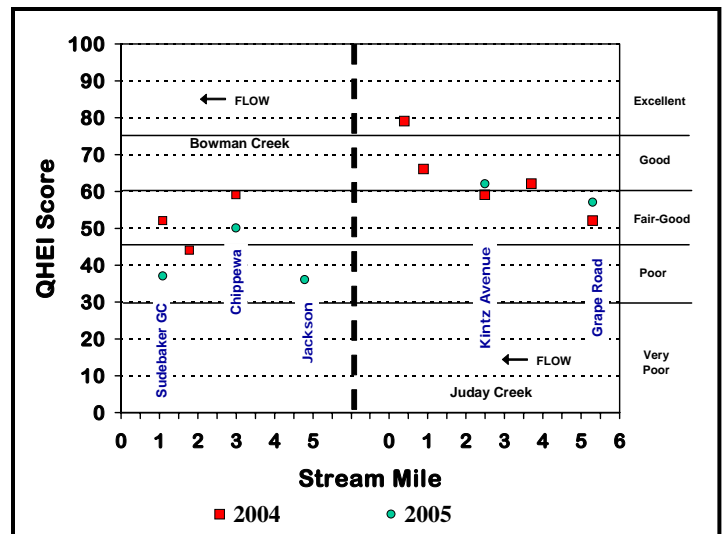
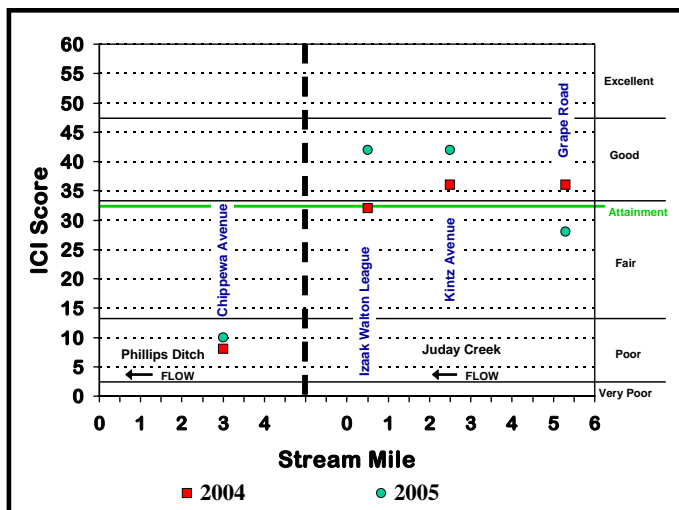


Figure 13: ICI scores for Bowman Creek and Juday Creek, St. Joseph County



its fish community condition falling below its potential because the IBI modification used to assess these sites was developed for warmwater streams. Cool/cold water streams tend to have fewer fish and not as many species as warmwater streams and thus generally score lower when assessed with a warmwater IBI. Cool/cold water IBI's have been established for other areas, but are not appropriate for this region. For now, the currently used IBI modification will be used to document any drastic changes over time. Cur-

Figure 14: IBI scores for Trout Creek and Yellow Creek,

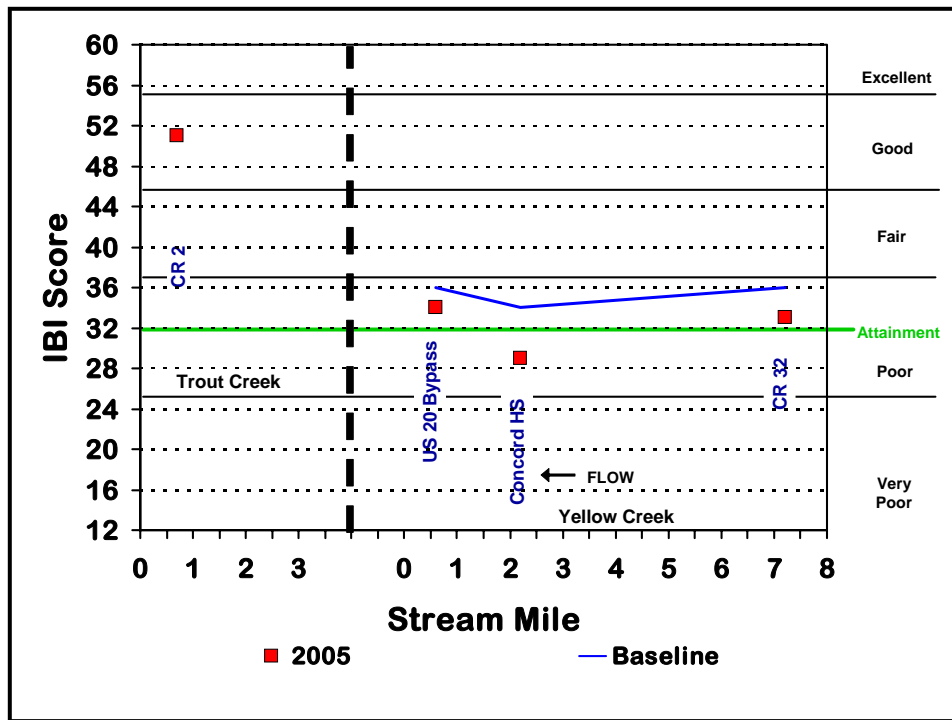
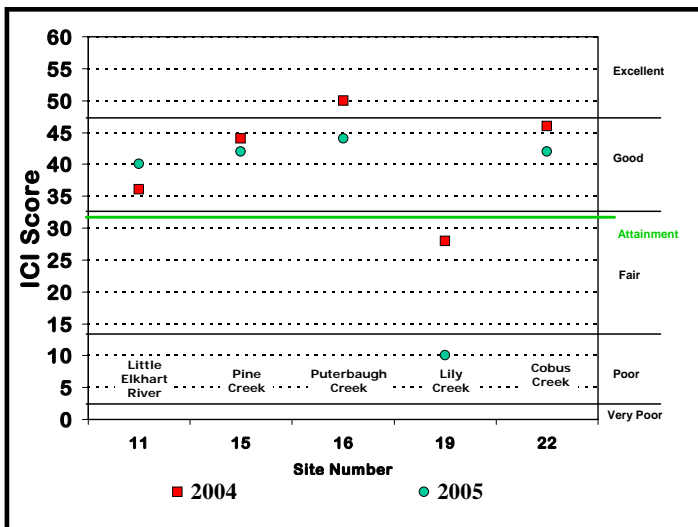


Figure 15: ICI scores for various streams in Elkhart County



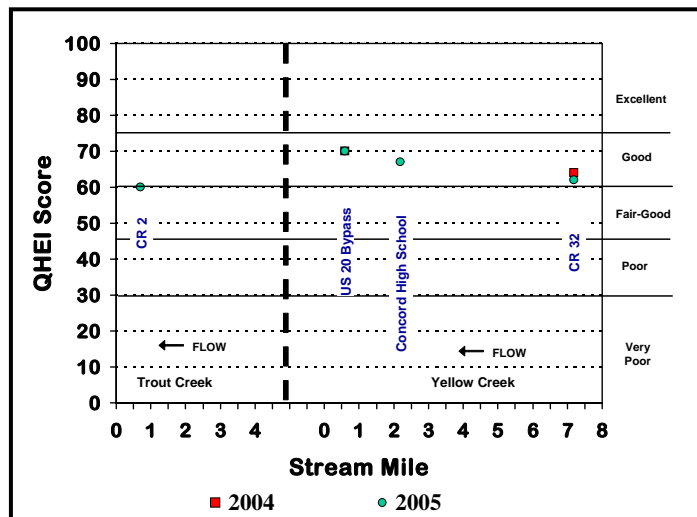
rently, Dr. Thomas Simon with the Aquatic Research Center of the Indiana Biological Survey is working on developing a coolwater IBI for Indiana. He fully expects to have this completed by June 2007. Once an acceptable cool/cold water IBI is developed, the data collected from Juday Creek will be used to recalculate a more accurate IBI score. The condition of the macroinvertebrate communities increased over 2004 results in the downstream sites (Figure 13). However, the condition of the macroinvertebrate communities was

diminished in the upper reaches of Juday Creek. The site at Grape Rd fell below the attainment line and will need to be monitored closely in the future. The drop in ICI scores at Grape Rd could be attributed to a dry season and low water and flow in the headwaters.

Bowman Creek is smaller than Juday Creek and has been buried in concrete pipes or tunnels for much of its length within the city limits of South Bend. This serious habitat modification is reflected in the QHEI scores (Figure 12) and greatly limits the fish species found in areas like the Studebaker Golf Course where the stream is above ground. During the course of this monitoring we also discovered that areas of the stream periodically dry out (no flowing water).

This, too, limits the number and types of fish found in this stream regardless of the habitat quality. The Chippewa Avenue site, however, is upstream of the buried sections in a wooded area and also had a very low IBI score in 2001, 2004 (Foy 2005) and 2005. Historical and current disturbances may have eliminated many of the fish from this area of the stream and recolonization would be very limited to nonexistent from a downstream direction due to the urban modifications just described. For two consecutive years, the ICI

Figure 16: QHEI scores for Trout Creek and Yellow Creek, Elkhart County



scores (Figure 13) have shown that the insect community in Bowman Creek is low as well. This, along with poor habitat contributes to poor fish communities.

Trout Creek is one of only a few streams in Elkhart County that is not a regulated drain. The Trout Creek watershed originates in lower Michigan and Trout Creek flows through a very small portion of Elkhart County. Because of this, there is currently only one sampling site on Trout Creek. This stream was sampled from 1999-2001 and then again in 2005. IBI scores (Figure 14) have remained constant as the average for the first three years of sampling was equal to the 2005 IBI. Trout Creek may be

Figure 17: IBI scores for Christiana Creek and the Little Elkhart River, Elkhart County

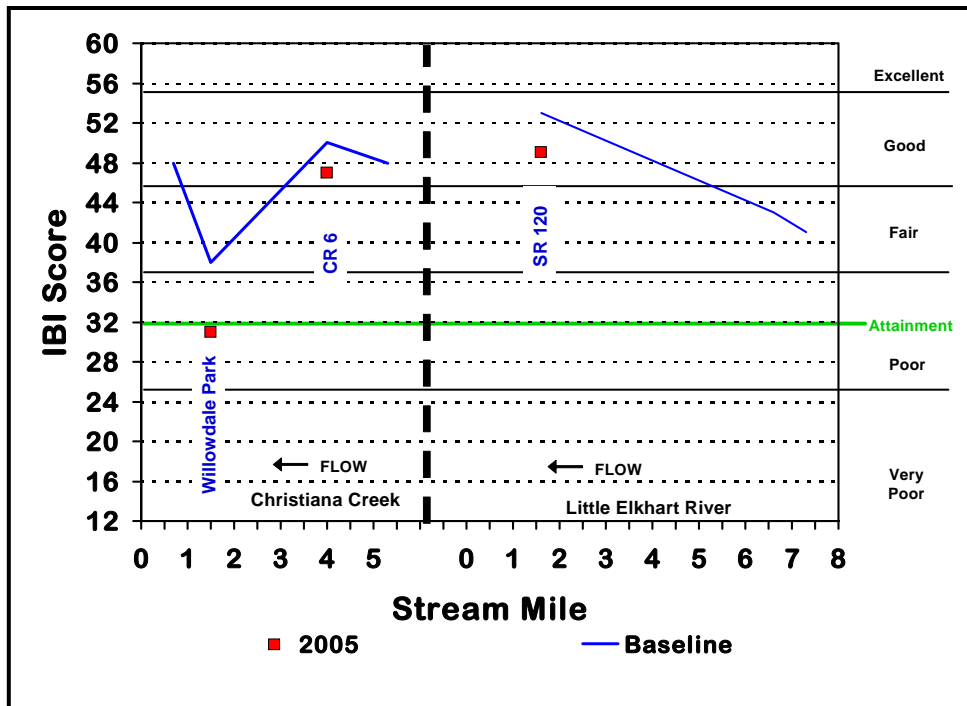
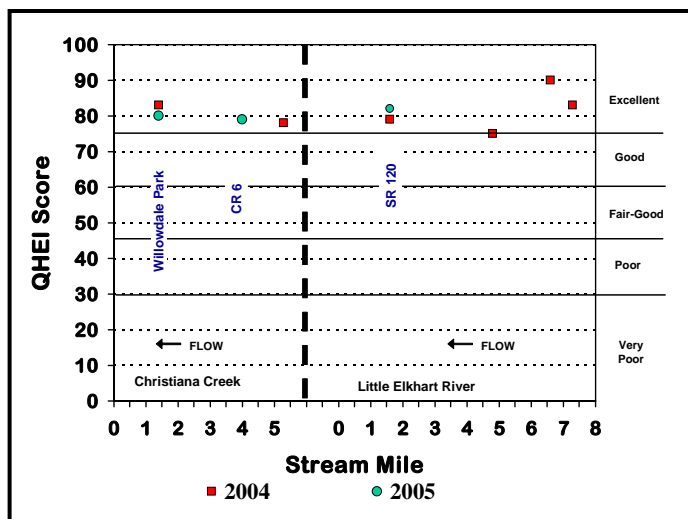


Figure 18: QHEI scores for Christiana Creek and the Little Elkhart River, Elkhart Co.



heavily influenced by the lake from which it originates as is shown by the many sunfish species present at this site. The presence of these species helps raise the IBI score even though QHEI scores (Figure 16) are not as high as may be expected. This section of Trout Creek is fairly straight and has a constant substrate composition.

Yellow Creek is one of many regulated drains in Elkhart County. In the past, most of this stream, except for the area near the US 20 Bypass, was

regularly dredged and had little or no buffer zone (unmowed grass or uncut forest) along its banks. The US 20 Bypass site was untouched and contained a lot of natural meanders (bends) and a wooded buffer zone. During the winter of 2002, however, this site was severely impacted by channel maintenance activities. 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). This decrease in available habitat in turn lead to a de-

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

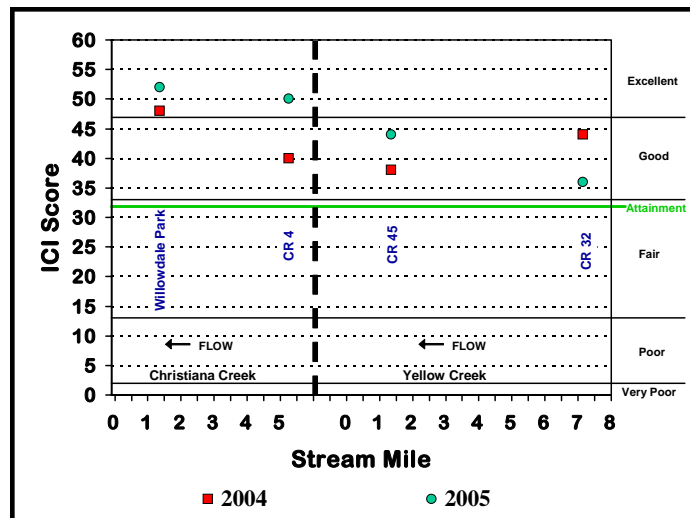
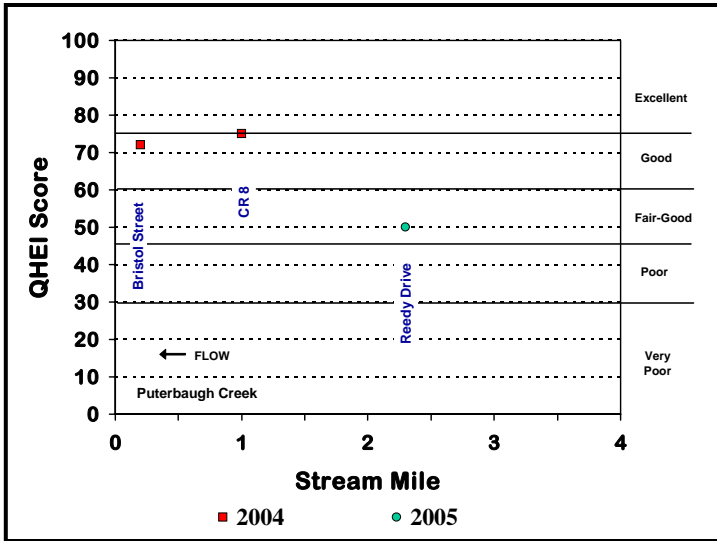


Figure 20: QHEI scores for Puterbaugh Creek, Elkhart County



crease in the fish community condition (Table 2, Foy 2005).

In August of 2004, a County project to restore some of the lost habitat in this section of Yellow Creek was completed. The fish community sampling and habitat evaluations from 2004 occurred before the restoration project and are reflective of the creek's natural ability to recover from such an impact.

Sampling from 2005 showed that even though Yellow Creek maintained itself in terms of habitat (Figure 16), as the two sites sampled in 2004 remained virtually the same, the quality of the fish communities fell below the baseline at all three sites sampled in 2005. This may just be natural fluctuation, however the Concord High School site fell below the attainment line. This site falls into rotation this season and will be sampled again in 2006. These consecutive years of sampling will allow us to closely examine this site to help determine if there is a serious problem. ICI scores for Yellow Creek at the two sites sampled remained in the good category (Figure 19), although the downstream site increased as the upstream site decreased. Both of these changes were sig-

nificant. An additional year of sampling will allow us to determine which values are more indicative of the insect communities found throughout Yellow Creek.

The fish community condition at County Road 4 on Christiana Creek did not drastically vary from the baseline, however condition of the fish communities at Willowdale Park fell drastically (Figure 17). Habitat quality of sites in this stream continued to be excellent (Figure 18) which raised questions about the decreased IBI scores at the Willowdale Park site. ICI scores for both sites fell into the excellent category, (Figure 19) raising further questions about the IBI scores at Willowdale Park. The ICI scores would not be high if a chemical contaminant were involved. One possible cause for the drop in IBI scores at the Willowdale Park site could be the amount of human activity in the creek. Situated in the middle of a city park, this section of the creek is a favorite swimming and wading area. The abundance of human activity in this area may be the principal reason this site does not meet minimum requirements for sustaining fish populations. It is also important to note that low numbers of fish in the samples from this site greatly reduce the IBI score.

The Little Elkhart River and Puterbaugh Creek are cool/cold water streams like Juday Creek and, therefore, have the same limitation in scoring us-

Figure 21: IBI scores for Puterbaugh Creek, Elkhart County

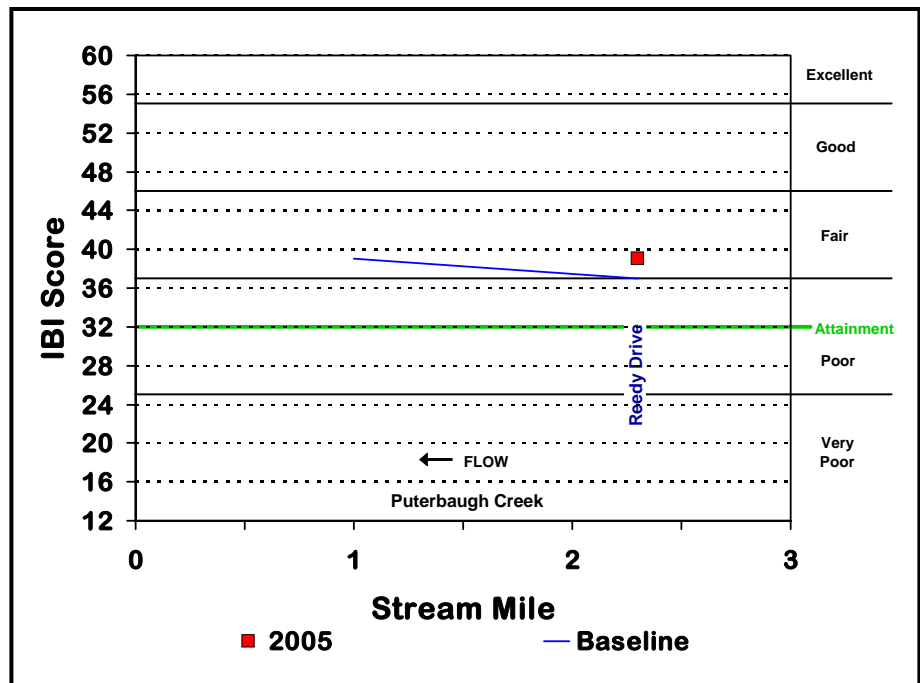


Table 5: Summary of tagged and recaptured fish

Species	Number Tagged		Recaptures (anglers)		Recaptures (PW&U)	
	Previous	2005	Previous	2005	Previous	2005
Smallmouth Bass	2,571	307	109	18	160	21
Walleye	656	99	96	10	16	4
Largemouth Bass	115	12	9	0	5	2

ing the warmwater IBI that was developed for this area. As explained earlier, the current IBI scoring system will be used to document any drastic changes in these streams until 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.

While the Little Elkhart River is a coldwater stream with scoring limitations, its IBI scores have remained in the fair to excellent range (Figure 17) and its aquatic insect community condition (ICI) was good with an increase from 36 to 40 in 2005 (Figure 14). The increase in IBI scores from the upstream sites to the State Road 120 site does not appear to be affected by the available habitat (Figure 18), but could be due to the proximity of this site to the St. Joseph River. Some fish from larger rivers use the lower portion of small tributaries as a refuge for feeding or to just escape increased water temperatures during the summer. In areas like this, a mix of stream and river fish may artificially increase the IBI score due to an increase in the number and types of species present.

Puterbaugh Creek flows from a lake but maintains fairly cold water temperatures, especially in the lower, or downstream, segments. Groundwater inflow through numerous seeps and springs, especially near the County Road 8 crossing, cause this shift in water temperatures. The small size of this stream and the changing water temperature limit the types of fish that will inhabit this stream. The good to excellent habitat (Figure 20) that is present at the downstream sites helps offset these limitations and allows the fish community condition in Puterbaugh Creek to be fair and basically

stable from site to site (Figure 21). The IBI for the Reedy Drive site was higher than the baseline in 2005. The aquatic insect community condition at the County Road 8 site (Figure 14) fell into the good category in 2005 after being in the excellent category in 2004. Downstream reaches of Puterbaugh Creek have the insect and habitat requirements needed to maintain a healthy fish population; it's the cooler temperatures that limit this potential.

In 2005, no fish community sampling took place on Pine Creek, Lily Creek or Cobus Creek; however, data on insect community condition was once again collected (Figure 15). Results from Pine Creek were very similar to what was reported in 2004 with scores being in the good category. The same can not be said for Lily Creek. Results for 2005 were extremely low, placing the ICI for Lily Creek into the poor region. This could have been a result of low water level and flow. ICI scores for Cobus Creek stayed fairly consistent with a slight drop in 2005 and remained in the good category.

Table 6: Summary of movement of recaptured fish

Direction Moved	Smallmouth Bass	Walleye	Largemouth Bass
No Movement	33	7	2
Upstream	5	4	0
Downstream	2	3	0

TAGGING & MOVEMENT

In 2005 a total of 418 fish were tagged (Table 5) and 55 recapture events were recorded. Since 1998, a total of 423 fish have been recaptured in 450

events. Thanks to the continued support by many anglers who reported catching tagged fish (Table 5), 12.0% of the tagged fish have supplied movement information. This rate of recapture is very acceptable even though it is down slightly from 2004 (Foy 2005). The number of fish that were recaptured in 2005 decreased slightly from the previous year and the number of fish tagged during the year also decreased.

Beginning in 2002 and annually since then, Elkhart Public Works' aquatics staff have 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.

One of the 14 fish that moved in 2005 traveled downstream in the stream it was in and then upstream into another stream. This was a smallmouth bass that was tagged in Puterbaugh Creek, near County Road 8. This bass traveled downstream 1.35 miles to the St. Joseph River, then traveled upstream in the St. Joseph River an additional 2.64 miles. The number of movements, however, do not equal the number of fish that moved. So, of the 55 recapture events, 14 revealed fish movements (5 downstream, 9 upstream) with an even mix of smallmouth bass and walleye (Table 6).

Walleye movement was evenly split between no movement and either downstream or upstream, with 7 fish staying at home and 7 moving from where they were originally tagged. Two of the four walleye moving upstream traveled less than a mile with the third traveling 1.2 miles. The longest move upstream for a walleye was 4.25 miles from Jefferson Blvd in South Bend to Central Park in Mishawaka. Two of the three walleye moving downstream went just under 4 miles from the YMCA in downtown Elkhart to the Lexington Landing area just downstream from the SR 19 bridge. The other walleye moving downstream went 14.6 miles from the YMCA to Central Park. This means this fish somehow negotiated its way around, over or through the Twin Branch Dam and possibly through the fish ladder at Central Park. It's a possibility that someone caught this fish above the Twin Branch Dam and then released it downstream of the dam. The upstream moving walleye averaged 1.60 miles, while the fish moving downstream averaged 7.49 miles. The averages are less than the previous year, however, they follow the same 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 move any farther upstream, so they merely redistributed themselves downstream of the dam once the spawning season was over.

As in the past, there was very little movement by the smallmouth bass and most were recaptured near their release point. These fish tend to remain in the areas where they are captured and released. The smallmouth bass that did move averaged 1.03 miles upstream and 1.16 miles downstream. The two largemouth bass recaptured were collected by Office of Public Works at the same site for which they were originally tagged.

The information gathered with the tagging program is important as we are starting learn exactly what parts of the rivers and streams large, quality fish are utilizing. It allows the cities to better protect precious habitat that allows for spawning, recruitment and growth of fishes.

FISH TISSUE

The Indiana fish consumption advisory (FCA) was slightly modified in 2005 for the St. Joseph County portion of the St. Joseph River. There was one addition and one deletion. The addition was common carp up to 20 inches. These fish were classified as group 4 PCB contaminants. The deletion was white sucker 16 inches and over. These fish were group 4 PCB contaminants and it is puzzling as to why they were taken off the FCA. In 2004 all Group 2 fish were removed from the tables to allow for the booklet to be condensed. For the St. Joseph and Elkhart Rivers and Juday Creek this modification removed a few fish from the advisory and eliminated mercury as a contaminant from all previously listed species except channel catfish in St. Joseph County.

In 2005, fish tissue samples were only taken from the St. Joseph River in Elkhart and St. Joseph Counties (Appendix B). Tissue collected in Elkhart County included black redhorse, golden redhorse, northern hogsucker, and shorthead redhorse. Black redhorse were in group 1 for Mercury and group 2 for PCBs. This indicates that the black redhorse should be kept off of the FCA for Elkhart County. Golden redhorse tissue sampled in 2005 was similar to tissue sampled in 2004. The tissue was a group 2 for mercury and groups 1 and 2 for PCBs. The mercury data is the same as the FCA and PCB data is a group lower than reported in

the FCA. Northern hogsucker data was again collected. Contaminant levels were lower in 2005 than in hogsucker tissue collected in 2004. This tissue fell in the group 1 for mercury and groups 1 and 2 for PCBs, compared to group 2 mercury and group 3 PCBs in the FCA, making this fish eligible to be taken off of the FCA in Elkhart county. Shorthead redhorse tissue was in the lowest group (1) for mercury, but fell into group 3 for PCB contamination, which is similar to what is reported in the FCA.

Black redhorse, common carp, rock bass, and smallmouth bass tissue was collected in St. Joseph County. Black redhorse tissue has been collected for the last 3 years and has remained fairly consistent (Appendix B). While the mercury level remained low (group 1), the PCB level was high (group 4-group 5). The FCA reports black redhorse at group 3 or 4 depending on the size of fish sampled. With our data staying fairly consistent over the last 3 years, a change to the FCA may be warranted. Common carp tissue continued to show moderate levels of mercury (group 2) and high levels of PCBs (group 5). These numbers closely mirror what is published in the FCA. Rock bass were sampled for the second year and results were virtually the same as 2004. Mercury levels were in group 1 and PCB levels were in group 2. Smallmouth bass tissue stayed consistent with a group 2 mercury level and a group 3 PCB level. These groupings were also the same as the FCA.

CONCLUSION

Long-term biological monitoring on the St. Joseph River in Elkhart and St. Joseph counties provides useful baseline information and current conditions of the biological communities for this watershed. Index of Biotic Integrity (IBI) scores on the St. Joseph River as it flows through Elkhart and South Bend continue to reveal fair to good fish community health. Two additional index sites were added in 2005 to observe how the current IBI would score areas that more resembled a lake than a stream. One site each in Elkhart and St. Joseph Counties was located just upstream of a dam. These sites had low IBI scores and will be monitored for the next 2 years so that an accurate decision can be made on the effectiveness of the available IBI in these environments. The second year of Invertebrate Community Index (ICI) scores reveal good aquatic insect community health throughout most of the streams in our area. Habitat evaluations show variable habitat

conditions in Elkhart County and increasing habitat quality in the South Bend area as the river flows through and past the urbanized areas.

The IBI scores on the Elkhart River follow the established baseline for this river. Although the IBI scores all fall slightly below the baseline, at this time there is no need for concern. These slight fluctuations are part of a natural cycle. Excellent aquatic insect community condition and predominantly excellent habitat coupled with the fish community information reveal the overall good quality of this river.

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. 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 (Puterbaugh Creek and the Little Elkhart River). 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.

While the pattern of IBI scores for Christiana Creek appear to show an impact occurring to the stream somewhere between County Road 6 and Willowdale Park, the ICI and QHEI values show no impact. The lower IBI scores at Willowdale Park could simply be the result of increased swimming and wading activities throughout this site. These activities could be scaring the fish away, which leads to fewer fish in the sample and lower IBI scores.

The IBI score for Trout Creek in 2005 was identical to the average score obtained from 1999-2001. However, the QHEI score is lower than would be expected for a site with such a high IBI score. The IBI score may be a little inflated due to the influence of the lake from which Trout Creek originates. There are large numbers of sunfish in Trout Creek that are not normally seen in other area streams.

Yellow Creek continues to exhibit poor IBI scores, even though QHEI scores fell in the good range. IBI scores from all three site followed the pattern established with the initial baseline, however, all

scores fell below said baseline. ICI scores changed significantly at both sampling sites, with insect communities improving downstream while they declined upstream. Fish communities at the Concord High School site will be sampled again in 2006, in order to keep a constant watch on the health of Yellow Creek.

The increased IBI scores at the most downstream site on the Little Elkhart River may be due to the mix of warmwater river fish and cool/cold water stream fish that occurs in these confluence areas. This increase in IBI scores as a stream approaches a larger river has also been observed in Pine Creek in the past.

Puterbaugh Creek IBI scores at Reedy Drive were slightly higher than the baseline. Habitat scores were fair, so any increase in IBI scores is a welcome site. However, this again may be just part of a natural fluctuation.

Pine Creek and Cobus Creek again exhibited good aquatic insect community conditions. ICI scores plummeted in Lily Creek, possibly due to low water level and flow

In 2005, 418 fish were tagged and 55 fish were recaptured. Walleye continued to exhibit a lot of movement while smallmouth bass stayed where they were. One smallmouth bass did however move over a mile downstream in a tributary and then upstream over two miles in the St. Joseph River.

The Fish Consumption Advisory (FCA) for the entire state was modified in 2004 and excluded all Group 2 fish from the tables to allow for the booklet to be condensed. This removed several fish from the advisory for our area and eliminated mercury as a contaminant from all of the previously listed species except channel catfish in St. Joseph County. In Elkhart County, most analyses fell below what is in the FCA. Northern hogsucker could probably be taken off the FCA, with a group 1 mercury and group 2 PCB. In the South Bend area of the St. Joseph River, black redhorse tissue samples continue to have higher PCB levels than those listed in the FCA and that document should probably be changed to reflect the higher values. Rock bass tissue fell into group 1 for mercury and group 2 for PCB. These fish can probably be removed from the FCA as well. The fish tissue results for the St. Joseph River continue to show a pattern of increasing PCB levels as the river flows through Indiana.

The cities of South Bend and Elkhart continue to be proactive in their role in helping to protect and preserve their natural aquatic resources. Through their joint effort to annually document the condition and integrity of the biological communities in the St. Joseph River watershed, they are demonstrating how local governments can work together for the betterment of a shared resource. That's what it is all about!

ACKNOWLEDGEMENTS

A special thanks is extended to the 2005 summer staff: Erica Saginus, Steve Hooley, Ruchin Patel, and Mike Pillow. There was a lot of hard work and data collection to be done in sometimes less than ideal conditions, but they were up to it and completed the task.

Thanks are also extended to the Michiana Walleye Association for financial assistance with the purchase of the anchor tags used on the walleye and bass, and to the administration and support staff of Elkhart'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 interlocal agreement between these two cities, information is now being collected to help preserve and protect a shared aquatic resource, the St. Joseph River.

Lastly, I would like to thank Joe Foy. Joe was integral in the formation of this monitoring program. This program has been so successful because of the passion and leadership Joe displayed throughout his tenure as aquatic biologist. Joe is now the pre-treatment coordinator for Elkhart. I personally thank Joe for being a mentor and guiding me in my career path. I only hope I can live up to the standards Joe has set and guide this program successfully into the future.

REFERENCES

- Foy, J. 2001. Fish community monitoring on the St. Joseph and Elkhart rivers and selected tributaries in Elkhart County, 2000. Loose-leaf pub. n.p.
- Foy, J. 2004. Fish community monitoring in Elkhart and St. Joseph counties on the St. Joseph River and selected tributaries, 2003. Loose-leaf pub. n.p.
- Foy, J. 2005. Fish community monitoring in Elkhart and St. Joseph counties on the St. Joseph River and selected tributaries, 2004. 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). 1998. Watershed Monitoring Program Fact Sheet. Office of Water Quality, Assessment Branch. Indianapolis, IN. IDEM 32/01/001/1998
- Indiana Department of Environmental Management (IDEM). 2004. Indiana's 303(d) Listing Methodology for Impaired Waterbodies and Total Maximum Daily Load for Listing Cycle 2004. Office of Water Quality. Indianapolis, IN.
- Indiana State Department of Health, Indiana Department of Environmental Management, Indiana Department of Natural Resources. 2004. 2004 Indiana Fish Consumption Advisory. Indianapolis, Indiana.
- Karr, J.R. 1981. Assessment of biotic integrity using fish communities. *Fisheries* 6 (6): 21-27.
- Karr, J.R. 1996. Going beyond water quality to protect fish and aquatic ecosystems. Presentation at the 126th Annual Meeting of the American Fisheries Society, Dearborn, MI.
- Ohio Environmental Protection Agency. 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 2005



Mike with an 11", 1.1 lb rock bass from the Little Elkhart River



Summer crew: (Clockwise from left) Ruchin, Steve, Mike, Erica , Joe



Erica with a 1.5 lb black crappie



Steve with 41", 15 lb northern pike



Ruchin with 3.1 lb smallmouth bass



A western banded killifish



A male river chub in spawning mode



A quillback

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, Elkhart County								
Black Redhorse								
	2003	Lexington Avenue	17.8-18.1	17+	1	3	3	1
	2005	Bridge Street	15.5-17.1	NA	1	2	2	2
Golden Redhorse								
	2004	Nappanee Street	15.9-16.8	<17	2	1	3	3
	2004	Sherman Street	17.1-17.7	17+	2	1	3	3
	2005	Bridge Street	17.5-17.8	17+	2	2	2	3
	2005	Six-Span	18.2-18.9	17+	2	2	1	3
Northern Hogsucker								
	2004	Below Bristol	13.9-14.6	<15	1	1	2	3
	2004	Nappanee Street	13.9-15.4	<15	2	1	3	3
	2005	Sherman Street	15.3-15.7	15+	1	2	2	3
	2005	Toll Road (Bristol)	15.3-16.2	15+	1	2	1	3
Shorthead Redhorse								
	2005	Bridge Street	16.7-17.3	17+	1	2	3	4
St. Joseph River, St. Joseph County								
Black Redhorse								
	2003	Darden Road	16.1-16.6	16-18	1	1	4	3
	2003	Keller Park	17.2-18.1	16-18	1	1	4	3
	2004	Angela Boulevard	16.5-17.1	16-18	2	1	5	3
	2004	Pinhook Park (B)	17.0-17.5	16-18	1	1	5	3
	2004	LaSalle Street	17.1-17.4	16-18	1	2	4	3
	2005	Pinhook Park (B)	17.1-17.8	16-18	1	2	4	3
	2005	LaSalle Street	17.6-18.8	18+	1	2	5	4
Common Carp								
	2002	Veterans Park	29.9-30.9	20+	2	2	5	5
	2002	Darden Road	29.9-31.5	20+	2	2	5	5
	2002	Keller Park	30.9-31.4	20+	1	2	4	5
	2002	Ironwood Drive	31.6-32.6	20+	2	2	5	5
	2003	Darden Road	28.3-30.1	20+	1	1	5	5
	2003	Keller Park	28.9-31.0	20+	1	1	5	5
	2003	Ironwood Drive	29.7-32.4	20+	2	1	5	5
	2005	Brick Road	23.0-24.7	20+	2	2	5	5
Rock Bass								
	2004	LaSalle Street	7.5-8.0	<8	1	1	3	3
	2004	Brick Road	7.6-8.0	<8	1	1	2	3
	2005	LaSalle Street	7.8-8.1	8+	1	2	2	3
	2005	Brick Road	7.7-8.1	8+	1	2	2	3
Smallmouth Bass								
	2002	Darden Road	10.7-11.3	9+	2	2	2	3
	2002	Keller Park	11.1-11.5	9+	1	2	3	3
	2002	Ironwood Drive	9.6-10.6	9+	1	2	3	3
	2003	Keller Park	11.3-12.4	9+	1	2	3	3
	2003	Ironwood Drive	10.6-11.8	9+	1	2	2	3
	2003	Brick Road	11.4-11.9	9+	1	2	3	3
	2005	Brick Road	12.6-14.0	9+	2	2	3	3



Appendix C

Summary of fish collected by county, 2005

Summary of species captured at index sites in Elkhart County, 2005

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
White Sucker	1,628	12.50	139,059	305.9	10.01
Mimic Shiner	1,362	10.46	2,571	5.7	0.19
Rock Bass	1,219	9.36	91,509	201.3	6.59
Bluegill	975	7.48	26,638	58.6	1.92
Creek Chub	884	6.79	12,579	27.7	0.91
Smallmouth Bass	729	5.60	90,567	199.2	6.52
Striped Shiner	649	4.98	12,211	26.9	0.88
Johnny Darter	532	4.08	866	1.9	0.06
Golden Redhorse	500	3.84	336,764	740.9	24.24
Hornyhead Chub	478	3.67	12,298	27.1	0.89
Common Shiner	477	3.66	11,887	26.2	0.86
Blacknose Dace	339	2.60	1,245	2.7	0.09
Northern Hog Sucker	323	2.48	70,512	155.1	5.07
Bluntnose Minnow	321	2.46	1,586	3.5	0.11
Logperch	278	2.13	1,942	4.3	0.14
Stoneroller, Central	270	2.07	3,574	7.9	0.26
Longear Sunfish	197	1.51	6,238	13.7	0.45
Rainbow Darter	190	1.46	335	0.7	0.02
Mottled Sculpin	189	1.45	953	2.1	0.07
Green Sunfish	188	1.44	2,143	4.7	0.15
Largemouth Bass	136	1.04	21,590	47.5	1.55
Spotfin Shiner	122	0.94	645	1.4	0.05
Chestnut Lamprey	105	0.81	936	2.1	0.07
River Chub	91	0.70	1,351	3.0	0.10
Shorthead Redhorse	81	0.62	50,911	112.0	3.66
Fathead Mnnow	78	0.60	286	0.6	0.02
Silverjaw Mnnow	72	0.55	287	0.6	0.02
Sand Shiner	69	0.53	131	0.3	0.01
Yellow Bullhead	65	0.50	6,668	14.7	0.48
Silver Redhorse	55	0.42	100,481	221.1	7.23
River Redhorse	51	0.39	133,900	294.6	9.64
Blackside Darter	51	0.39	177	0.4	0.01
Grass Pickerel	41	0.31	668	1.5	0.05
Common Carp	36	0.28	153,960	338.7	11.08
Central Mudminnow	33	0.25	199	0.4	0.01
Spotted Sucker	31	0.24	11,007	24.2	0.79
Orangethroat Darter	29	0.22	28	0.1	0.00
Pumpkinseed	19	0.15	1,061	2.3	0.08
Steelcolor Shiner	15	0.12	73	0.2	0.01
Hybrid Sunfish	13	0.10	1,004	2.2	0.07
Channel Catfish	12	0.09	14,462	31.8	1.04
Rosyface Shiner	12	0.09	32	0.1	0.00
Yellow Perch	10	0.08	221	0.5	0.02
Bow fin	8	0.06	14,060	30.9	1.01
Black Redhorse	8	0.06	5,767	12.7	0.42
Longnose Gar	8	0.06	4,628	10.2	0.33
Northern Pike	6	0.05	22,630	49.8	1.63
Black Crappie	6	0.05	1,212	2.7	0.09
Redear Sunfish	6	0.05	741	1.6	0.05
Greater Redhorse	5	0.04	11,650	25.6	0.84
Stonecat	4	0.03	122	0.3	0.01
Walleye	3	0.02	557	1.2	0.04
Warmouth	3	0.02	153	0.3	0.01
Prate Perch	3	0.02	37	0.1	0.00
American Brook Lamprey	3	0.02	22	0.0	0.00
Tadpole Madtom	2	0.02	14	0.0	0.00
Greenside Darter	2	0.02	7	0.0	0.00
Quillback	1	0.01	1,100	2.4	0.08
Spotted Gar	1	0.01	1,021	2.2	0.07
Rainbow Trout	1	0.01	212	0.5	0.02
Black Bullhead	1	0.01	37	0.1	0.00
Banded Killifish	1	0.01	6	0.0	0.00
Sub-Total	13,027	100	1,389,531	3056.9682	100

Summary of species captured at investigative sites in Elkhart County, 2005

COMMON NAME	Total Number	% by Number
Smallmouth Bass	140	12.21
Brown Trout	128	11.16
Mottled Sculpin	110	9.59
White Sucker	91	7.93
Logperch	86	7.50
Golden Redhorse	78	6.80
Bluegill	74	6.45
Johnny Darter	66	5.75
Largemouth Bass	61	5.32
Striped Shiner	42	3.66
Rainbow Darter	33	2.88
Rock Bass	28	2.44
Gizzard Shad	26	2.27
Creek Chub	25	2.18
Longear Sunfish	21	1.83
Grass Pickerel	17	1.48
Walleye	16	1.39
Green Sunfish	10	0.87
Silver Redhorse	9	0.78
Pumpkinseed	8	0.70
Blacknose Dace	8	0.70
Bluntnose Minnow	8	0.70
Central Mudminnow	7	0.61
Blackside Darter	5	0.44
Common Carp	5	0.44
Orangethroat Darter	5	0.44
Common Shiner	4	0.35
Brook Silverside	4	0.35
Northern Pike	3	0.26
Brown Bullhead	3	0.26
Chestnut Lamprey	3	0.26
American Brook Lamprey	3	0.26
Stoneroller, Central	3	0.26
Spotted Sucker	3	0.26
Hybrid Sunfish	2	0.17
Greenside Darter	2	0.17
Yellow Perch	2	0.17
Yellow Bullhead	2	0.17
Banded Killifish	1	0.09
Black Crappie	1	0.09
Bow fin	1	0.09
Channel Catfish	1	0.09
Shorthead Redhorse	1	0.09
Longnose Gar	1	0.09
Sub-Total	1147	100

Index Sites	13,027
Investigative Sites	1,147
Elkhart County Total	14,174

Summary of species captured at index sites in St. Joseph County, 2005

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Creek Chub	981	18.30	11,562	25.44	1.23
Smallmouth Bass	688	12.84	91,985	202.37	9.78
Longear Sunfish	654	12.20	23,109	50.84	2.46
Rock Bass	541	10.09	36,931	81.25	3.93
Golden Redhorse	398	7.43	290,320	638.70	30.88
Rainbow Trout	247	4.61	3,228	7.10	0.34
Mimic Shiner	247	4.61	459	1.01	0.05
Mottled Sculpin	235	4.38	1,398	3.08	0.15
Blacknose Dace	192	3.58	802	1.76	0.09
White Sucker	168	3.13	38,499	84.70	4.09
Bluegill	162	3.02	5,720	12.58	0.61
Shorthead Redhorse	151	2.82	120,745	265.64	12.84
Spottfin Shiner	112	2.09	657	1.45	0.07
Green Sunfish	72	1.34	2,229	4.90	0.24
Northern Hog Sucker	65	1.21	22,897	50.37	2.44
Largemouth Bass	59	1.10	3,147	6.92	0.33
Logperch	48	0.90	783	1.72	0.08
Johnny Darter	43	0.80	99	0.22	0.01
Quillback	40	0.75	58,250	128.15	6.20
Walleye	37	0.69	26,572	58.46	2.83
Black Redhorse	28	0.52	20,275	44.61	2.16
Chestnut Lamprey	28	0.52	302	0.66	0.03
Yellow Bullhead	27	0.50	4,639	10.21	0.49
Common Carp	22	0.41	90,515	199.13	9.63
Pumpkinseed	22	0.41	879	1.93	0.09
Spotted Sucker	17	0.32	9,588	21.09	1.02
River Redhorse	13	0.24	44,600	98.12	4.74
Silver Redhorse	10	0.19	22,600	49.72	2.40
Greenside Darter	8	0.15	33	0.07	0.00
Bluntnose Minnow	8	0.15	12	0.03	0.00
Steelcolor Shiner	6	0.11	36	0.08	0.00
Blackside Darter	6	0.11	19	0.04	0.00
Longnose Gar	4	0.07	1,218	2.68	0.13
Black Bullhead	4	0.07	824	1.81	0.09
Warmouth	3	0.06	156	0.34	0.02
Brown Trout	3	0.06	33	0.07	0.00
Brown Bullhead	2	0.04	1,053	2.32	0.11
Redear Sunfish	2	0.04	82	0.18	0.01
Channel Catfish	1	0.02	2,053	4.52	0.22
Bowfin	1	0.02	1,700	3.74	0.18
Hybrid Sunfish	1	0.02	85	0.19	0.01
Stonecat	1	0.02	59	0.13	0.01
Central Mudminnow	1	0.02	7	0.02	0.00
Orangethroat Darter	1	0.02	1	0.00	0.00
Rainbow Darter	1	0.02	1	0.00	0.00
Sub-Total	5,360	100	940,162	2,068.36	100

Summary of species captured at investigative sites in St. Joseph County, 2005

Common Name	Total Number	% by Number
Smallmouth Bass	229	28.59
Longear Sunfish	117	14.61
Rock Bass	94	11.74
Golden Redhorse	59	7.37
Bluegill	42	5.24
Spotfin Shiner	30	3.75
Central Mudminnow	26	3.25
White Sucker	25	3.12
Pumpkinseed	24	3.00
Largemouth Bass	24	3.00
Shorthead Redhorse	19	2.37
Mimic Shiner	18	2.25
Northern Hog Sucker	13	1.62
Logperch	13	1.62
Quillback	9	1.12
Green Sunfish	9	1.12
Walleye	7	0.87
Common Carp	6	0.75
Black Redhorse	6	0.75
Silver Redhorse	5	0.62
Yellow Bullhead	4	0.50
Gizzard Shad	3	0.37
Warmouth	3	0.37
Spotted Sucker	3	0.37
Longnose Gar	2	0.25
Chestnut Lamprey	2	0.25
River Redhorse	2	0.25
Grass Pickerel	1	0.12
Bluntnose Minnow	1	0.12
Brook Silverside	1	0.12
Hybrid Sunfish	1	0.12
Johnny Darter	1	0.12
Blackside Darter	1	0.12
Emerald Shiner	1	0.12
Sub-Total	801	100

Index Sites	5,360
Investigative Sites	801
St. Joseph County Total	6,161

Appendix D

Summary of fish collected by site, 2005

Stream	St. Joseph River, Elkhart County								
	1		2		3		4	5	
	1st	2nd	1st	2nd	1st	2nd		1st	2nd
▲ American Brook Lamprey			X						
Black Crappie						X	X		
▲ Black Redhorse		X	X	X				X	X
Blackside Darter		X		X		X		X	X
Bluegill	X	X	X	X	X	X	X	X	X
● Bluntnose Minnow	X	X	X	X		X	X		X
Bowfin	X		X	X			X		
Brook Silverside							X		
Brown Bullhead							X		
● Channel Catfish			X				X	X	X
Chestnut Lamprey	X	X	X	X	X		X	X	
● Common Carp	X	X	X	X		X	X	X	X
Common Shiner									X
Gizzard Shad							X		
Golden Redhorse	X	X	X	X	X	X	X	X	X
Grass Pickerel				X				X	X
● Green Sunfish				X			X	X	X
Greenside Darter						X			
Hybrid Sunfish			X	X		X	X	X	
Johnny Darter	X	X							
Largemouth Bass	X	X	X	X	X	X	X	X	X
Logperch	X	X	X	X		X	X	X	X
Longear Sunfish	X	X	X	X	X	X	X	X	X
● Longnose Gar	X	X				X	X	X	X
▲ Mimic Shiner	X	X	X	X	X			X	X
Northern Hog Sucker	X	X	X	X				X	X
Northern Pike				X	X	X	X		
Pumpkinseed			X		X		X	X	X
● Quillback								X	
Rainbow Darter		X							
Redear Sunfish	X			X					
▲ River Redhorse	X	X	X	X				X	X
Rock Bass	X	X	X	X	X	X	X	X	X
▲ Rosyface Shiner				X					
Sand Shiner				X					
Shorthead Redhorse	X	X	X	X		X		X	X
Silver Redhorse	X	X	X	X	X	X	X	X	X
Smallmouth Bass	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
Striped Shiner									X
Walleye							X	X	
Warmouth									X
Western Banded Killifish		X					X		
● White Sucker		X		X	X	X	X	X	X
Yellow Bullhead	X	X	X			X	X	X	X
Yellow Perch	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														
	Site Number	6		7		8		9		10		11		12	
			1st	2nd	1st	2nd	1st	2nd		1st	2nd	1st	2nd		
			Pass	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass		
▲ Black Redhorse				X	X	X	X	X	X	X	X	X			
Blackside Darter							X	X							
Bluegill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
● Bluntnose Minnow	X		X		X										
Bowfin						X									
Brook Silverside	X														
Brown Bullhead		X	X												
● Channel Catfish														X	
Chestnut Lamprey				X				X	X	X	X	X	X	X	
● Common Carp	X	X						X	X	X	X	X	X	X	
Emerald Shiner	X														
Gizzard Shad	X														
Golden Redhorse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
● Green Sunfish	X		X	X	X		X	X	X	X	X			X	
Greenside Darter					X	X	X				X				
Hybrid Sunfish	X				X										
Johnny Darter	X				X										
Largemouth Bass	X	X	X	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	X	X	X	X	
● Longnose Gar				X	X		X	X							
▲ Mimic Shiner				X	X	X	X	X	X	X	X	X	X	X	
Northern Hog Sucker	X			X	X	X	X	X	X	X	X	X	X	X	
Orangethroat Darter											X				
Pumpkinseed	X	X	X	X				X			X	X	X	X	
● Quillback	X	X		X	X	X	X	X	X	X	X	X	X	X	
Rainbow Darter											X				
Rainbow Trout				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	X	X	X	X	
Shorthead Redhorse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Silver Redhorse	X			X		X		X	X				X		
Smallmouth Bass	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Spotfin Shiner	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Spotted Sucker	X	X	X					X					X	X	
Steelcolor Shiner							X						X		
▲ Stonecat							X								
Walleye	X		X	X	X	X	X	X	X	X	X	X	X	X	
Warmouth								X	X	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 Site Number	Trout Creek		Little Elkhart River		Puterbaugh Creek		Christiana Creek			
	13		14		15		16		17	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
▲ American Brook Lamprey			X							
Blackside Darter		X	X	X						
Bluegill	X	X	X	X	X	X	X			X
● Bluntnose Minnow							X	X		X
Bowfin	X	X						X		
● Central Mudminnow				X	X	X				
Chestnut Lamprey			X	X				X		X
● Creek Chub	X		X	X	X	X				
● Common Carp								X	X	X
Golden Redhorse			X							X
Grass Pickerel	X				X	X			X	X
● Green Sunfish			X	X	X	X				
Greenside Darter	X									
Hybrid Sunfish		X			X					
▲ Hornyhead Chub							X	X	X	X
Johnny Darter	X	X	X	X	X	X				
Largemouth Bass	X	X				X				
Logperch	X	X	X	X				X	X	
Mottled Sculpin			X	X	X	X				
Northern Hog Sucker		X	X	X			X	X	X	X
Orangethroat Darter	X	X			X		X	X		
Rainbow Darter	X	X	X	X	X	X	X	X	X	X
Rainbow Trout			X							
Redear Sunfish									X	X
▲ River Chub							X	X		
Rock Bass	X	X	X	X			X	X	X	X
Sand Shiner							X			
Shorthead Redhorse			X						X	
Silver Redhorse			X							X
Smallmouth Bass	X	X	X	X			X	X	X	X
Spotfin Shiner	X	X					X			
Spotted Gar	X									
Steelcolor Shiner		X					X			
▲ Stonecat		X						X		
Stoneroller, Central				X						
Striped Shiner	X	X					X	X	X	
Tadpole Madtom								X		
Warmouth						X				
● White Sucker	X	X	X	X	X	X	X	X		
Yellow Bullhead	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 Site Number	Elkhart River						Yellow Creek					
	18		19		20		21		22		23	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
▲ American Brook Lamprey					X							
● Black Bullhead									X			
Black Crappie	X	X										
● Blacknose Dace							X	X	X	X	X	X
Blackside Darter			X	X								
Bluegill	X	X	X	X	X	X	X	X	X	X	X	X
● Bluntnose Minnow			X				X	X	X	X	X	X
● Central Mudminnow							X	X				
● Channel Catfish					X	X						
Chestnut Lamprey	X	X	X	X	X	X			X		X	
Common Shiner	X	X	X	X			X	X	X	X	X	X
● Creek Chub		X					X	X	X	X	X	X
● Fathead Minnow							X	X	X	X	X	X
Golden Redhorse	X	X	X	X	X	X						
▲ Greater Redhorse	X	X			X	X						
● Green Sunfish	X	X	X	X	X	X	X	X	X	X	X	X
▲ Hornyhead Chub	X	X	X	X	X	X	X		X	X	X	X
Hybrid Sunfish	X			X		X						X
Johnny Darter							X	X	X	X	X	X
Largemouth Bass		X		X	X	X	X	X				X
Longear Sunfish	X	X	X	X	X	X						
Northern Hog Sucker	X	X	X	X	X	X						
Pirate Perch						X						
Pumpkinseed		X				X						
Rainbow Darter									X	X		X
Redear Sunfish					X							
Rock Bass	X	X	X	X	X	X						
▲ Rosyface Shiner			X	X								
Silverjaw Minnow							X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X						X
Spotfin Shiner			X	X		X						
Spotted Sucker	X	X			X							
▲ Stonecat	X	X										
Stoneroller, Central							X	X	X	X	X	X
Striped Shiner	X	X	X	X			X	X	X		X	X
● White Sucker	X	X	X	X	X	X	X	X	X	X	X	X
Yellow bullhead	X	X		X	X	X			X	X		
Yellow Perch	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	Cobus Creek	Juday Creek				Auten Ditch	Phillips Ditch		Bowman Creek	
Site Number	24	25		26		27	28		29	
		1st	2nd	1st	2nd		1st	2nd	1st	2nd
		Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass
▲ American Brook Lamprey	X									
● Black Bullhead							X	X	X	
● Blacknose Dace	X	X	X	X	X				X	X
Blackside Darter	X				X					
Bluegill							X	X		
● Bluntnose Minnow	X									
Brown Trout	X									
● Central Mudminnow	X					X	X			
Chestnut Lamprey	X						X			
Common Shiner	X									
● Creek Chub	X	X	X	X	X					
Golden Redhorse	X									
Grass Pickerel	X					X				
● Green Sunfish	X	X	X	X						
Greenside Darter	X									
Johnny Darter	X	X	X	X	X					
Largemouth Bass					X		X	X		
Logperch	X									
Longear Sunfish	X									
Mottled Sculpin	X	X	X	X	X					
Orangethroat Darter	X									
Rainbow Darter	X									
Rainbow Trout		X	X	X	X					
Rock Bass	X									
Shorthead Redhorse	X									
Stoneroller, Central	X									
Striped Shiner	X									
● White Sucker	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



Appendix E

Summary of macroinvertebrates (insects) collected by site, 2005

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: 9/21/2005

Site Number: 1

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	0	+	No. Quantitative Taxa: 0
<i>Helobdella stagnalis</i>	0	+	No. Qualitative Taxa: 35
<i>Caecidotea sp</i>	0	+	
<i>Hyalella azteca</i>	0	+	
<i>Plauditus punctiventris</i>	0	+	
<i>Isonychia sp</i>	0	+	
<i>Leucrocuta sp</i>	0	+	
<i>Stenacron sp</i>	0	+	
<i>Stenonema pulchellum</i>	0	+	
<i>Stenonema terminatum</i>	0	+	
<i>Anthopotamus sp</i>	0	+	
<i>Hetaerina sp</i>	0	+	
<i>Coenagrionidae</i>	0	+	
<i>Argia sp</i>	0	+	
<i>Pteronarcys sp</i>	0	+	
<i>Acroneuria internata</i>	0	+	
<i>Corydalis cornutus</i>	0	+	
<i>Cheumatopsyche sp</i>	0	+	
<i>Hydropsyche frisoni</i>	0	+	
<i>Macrostemum zebratum</i>	0	+	
<i>Brachycentrus numerosus</i>	0	+	
<i>Pycnopsyche sp</i>	0	+	
<i>Helicopsyche borealis</i>	0	+	
<i>Mystacides sepulchralis</i>	0	+	
<i>Psephenus herricki</i>	0	+	
<i>Macronychus glabratus</i>	0	+	
<i>Stenelmis sp</i>	0	+	
<i>Simulium sp</i>	0	+	
<i>Tanytarsus sepp</i>	0	+	
<i>Chrysops sp</i>	0	+	
<i>Elimia sp</i>	0	+	
<i>Physella sp</i>	0	+	
<i>Dreissena polymorpha</i>	0	+	
<i>Sphaerium sp</i>	0	+	
<i>Elliptio dilatata</i>	0	+	

Site: St. Joseph River, Sherman Street

Collection Date: 9/21/2005 Site Number: 2

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Spongillidae</i>	0	+	<i>Corbicula fluminea</i>	0	+
<i>Turbellaria</i>	435	+	<i>Dreissena polymorpha</i>	0	+
<i>Oligochaeta</i>	14	+			
<i>Hyalella azteca</i>	17				
<i>Gammarus sp</i>	0	+	No. Quantitative Taxa: 39		
<i>Plauditus dubius</i> or <i>P. virilis</i>	56	+	No. Qualitative Taxa: 31		
<i>Baetis flavistriga</i>	2		Total No. Taxa 52		
<i>Baetis intercalaris</i>	10		Number of Organisms 2,132		
<i>Pseudocloeon propinquum</i>	0	+			
<i>Isonychia sp</i>	236	+			
<i>Stenacron sp</i>	540	+			
<i>Stenonema exiguum</i>	33				
<i>Stenonema mediopunctatum</i>	11				
<i>Stenonema mexicanum integrum</i>	1				
<i>Ephemerellidae</i>	42	+			
<i>Tricorythodes sp</i>	269	+			
<i>Ephemera sp</i>	0	+			
<i>Hetaerina sp</i>	1	+			
<i>Coenagrionidae</i>	0	+			
<i>Argia sp</i>	2	+			
<i>Corydalus cornutus</i>	2	+			
<i>Climacia sp</i>	0	+			
<i>Polycentropus sp</i>	10				
<i>Cheumatopsyche sp</i>	5	+			
<i>Hydropsyche aerata</i>	7				
<i>Hydropsyche frisoni</i>	7	+			
<i>Macrostemum sp</i>	61	+			
<i>Hydroptilidae</i>	8				
<i>Neophylax sp</i>	0	+			
<i>Oecetis sp</i>	24				
<i>Petrophila sp</i>	16	+			
<i>Gyrinus sp</i>	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Stenelmis sp</i>	4	+			
<i>Simulium sp</i>	1				
<i>Ablabesmyia sp</i>	2				
<i>Corynoneura lobata</i>	16				
<i>Cricotopus (C.) bicinctus</i>	7				
<i>Parakiefferiella n.sp 2</i>	2				
<i>Thienemanniella xena</i>	9				
<i>Dicrotendipes neomodestus</i>	28				
<i>Polypedilum (Uresipedilum) flavum</i>	1				
<i>Polypedilum (P.) illinoense</i>	0	+			
<i>Tribelos jucundum</i>	1				
<i>Rheotanytarsus sp</i>	23	+			
<i>Empididae</i>	5				
<i>Elimia sp</i>	168	+			
<i>Physella sp</i>	0	+			
<i>Gyraulus sp</i>	1	+			
<i>Ferrissia sp</i>	55				

Site: St. Joseph River, Michigan Street

Collection Date: 9/22/2005

Site Number: 3

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	233	+	<i>Elimia sp</i>	29	+
<i>Oligochaeta</i>	0	+	<i>Physella sp</i>	16	+
<i>Helobdella stagnalis</i>	0	+	<i>Ferrissia sp</i>	9	
<i>Crangonyx sp</i>	0	+	<i>Corbicula fluminea</i>	0	+
<i>Gammarus sp</i>	1	+	<i>Dreissena polymorpha</i>	0	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Metrobutes</i>	0	+
<i>Hydracarina</i>	1	+	<i>Rhagovelia sp.</i>	0	+
<i>Baetis flavistriga</i>	1				
<i>Baetis intercalaris</i>	119	+			
<i>Plauditus punctiventris</i>	82	+	No. Quantitative Taxa:	39	
<i>Heterocloeon curiosum</i>	0	+	No. Qualitative Taxa:	39	
<i>Isonychia sp</i>	1102	+	Total No. Taxa	55	
<i>Stenacron sp</i>	235	+	Number of Organisms	4,867	
<i>Stenonema exiguum</i>	306				
<i>Stenonema pulchellum</i>	29				
<i>Stenonema terminatum</i>	574	+			
<i>Ephemerella sp</i>	1				
<i>Tricorythodes sp</i>	84	+			
<i>Hetaerina sp</i>	4	+			
<i>Coenagrionidae</i>	0	+			
<i>Argia sp</i>	1	+			
<i>Aeshnidae</i>	1				
<i>Neoplea sp</i>	0	+			
<i>Cheumatopsyche sp</i>	606	+			
<i>Hydropsyche aerata</i>	112				
<i>Hydropsyche depravata group</i>	0	+			
<i>Hydropsyche frisoni</i>	272	+			
<i>Macrostemum sp</i>	26	+			
<i>Hydroptila sp</i>	130	+			
<i>Brachycentrus sp</i>	2				
<i>Limnephilidae</i>	0	+			
<i>Oecetis persimilis</i>	17	+			
<i>Petrophila sp</i>	0	+			
<i>Macronychus glabratus</i>	32	+			
<i>Stenelmis sp</i>	0	+			
<i>Simulium sp</i>	67	+			
<i>Hayesomyia senata or</i>	11				
<i>Thienemannimyia norena</i>					
<i>Corynoneura "celeripes"</i>	11				
(sensu Simpson & Bode, 1980)					
<i>Corynoneura lobata</i>	23				
<i>Cricotopus (C.) bicinctus</i>	69	+			
<i>Cricotopus (C.) trifascia</i>	11				
<i>Thienemanniella xena</i>	91				
<i>Tvetenia discoloripes group</i>	46				
<i>Dicrotendipes neomodestus</i>	11				
<i>Polypedilum (Uresipedilum) flavum</i>	354				
<i>Polypedilum (P.) illinoense</i>	34	+			
<i>Polypedilum (Tripodura) halterale group</i>	0	+			
<i>Rheotanytarsus sp</i>	114	+			

Site: St. Joseph River, Brick Road

Collection Date: 9/22/2005

Site Number: 4

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	548	+	No. Quantitative Taxa: 29
<i>Oligochaeta</i>	4	+	No. Qualitative Taxa: 29
<i>Caecidotea sp</i>	1	+	Total No. Taxa 41
<i>Crangonyx sp</i>	0	+	Number of Organisms 4,894
<i>Orconectes (Procericambarus) rusticus</i>	0	+	
<i>Hydracarina</i>	8	+	
<i>Baetis intercalaris</i>	280	+	
<i>Isonychia sp</i>	264	+	
<i>Stenacron sp</i>	16	+	
<i>Stenonema exiguum</i>	139	+	
<i>Stenonema mediopunctatum</i>	8		
<i>Stenonema pulchellum</i>	69		
<i>Tricorythodes sp</i>	293	+	
<i>Coenagrionidae</i>	0	+	
<i>Argia sp</i>	0	+	
<i>Cheumatopsyche sp</i>	918	+	
<i>Hydropsyche aerata</i>	549		
<i>Hydropsyche frisoni</i>	668		
<i>Hydropsyche orris</i>	25		
<i>Macrostemum sp</i>	67		
<i>Hydroptila sp</i>	85		
<i>Petrophila sp</i>	33	+	
<i>Peltodytes sp</i>	0	+	
<i>Psephenus herricki</i>	0	+	
<i>Macronychus glabratus</i>	0	+	
<i>Optioservus sp</i>	0	+	
<i>Antocha sp</i>	0	+	
<i>Simulium sp</i>	12	+	
<i>Cricotopus (C.) bicinctus</i>	57	+	
<i>Nanocladius sp</i>	11		
<i>Tvetenia discoloripes group</i>	340		
<i>Dicrotendipes neomodestus</i>	11	+	
<i>Polypedilum (Uresipedilum) flavum</i>	170		
<i>Polypedilum (P.) illinoense</i>	227		
<i>Rheotanytarsus sp</i>	79	+	
<i>Empididae</i>	8		
<i>Limnophora sp</i>	0	+	
<i>Elimia sp</i>	3	+	
<i>Stagnicola sp</i>	0	+	
<i>Physella sp</i>	1	+	
<i>Corbicula fluminea</i>	0	+	

Site: Little Elkhart River, County Road 10

Collection Date: 9/21/2005

Site Number: 5

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	8		No. Quantitative Taxa: 28
<i>Caecidotea sp</i>	9	+	No. Qualitative Taxa: 29
<i>Gammarus sp</i>	18	+	Total No. Taxa 48
<i>Orconectes (Procericambarus) rusticus</i>	2	+	Number of Organisms 1,143
<i>Baetis flavistriga</i>	15		
<i>Baetis intercalaris</i>	17		
<i>Stenacron sp</i>	59	+	
<i>Stenonema vicarium</i>	119	+	
<i>Calopteryx sp</i>	0	+	
<i>Belostoma sp</i>	0	+	
<i>Sialis sp</i>	0	+	
<i>Lype diversa</i>	16		
<i>Polycentropus sp</i>	0	+	
<i>Cheumatopsyche sp</i>	102	+	
<i>Ceratopsyche morosa group</i>	7		
<i>Ceratopsyche slossonae</i>	0	+	
<i>Ceratopsyche sparna</i>	4		
<i>Hydropsyche depravata group</i>	9		
<i>Brachycentrus sp</i>	2		
<i>Neophylax sp</i>	0	+	
<i>Pycnopsyche sp</i>	0	+	
<i>Mystacides sp</i>	0	+	
<i>Triaenodes sp</i>	0	+	
<i>Ancyronyx variegata</i>	0	+	
<i>Dubiraphia vittata group</i>	0	+	
<i>Macronychus glabratus</i>	14	+	
<i>Stenelmis sp</i>	0	+	
<i>Antocha sp</i>	0	+	
<i>Simulium sp</i>	1		
<i>Natarsia species A (sensu Roback, 1978)</i>	0	+	
<i>Thienemannimyia group</i>	7		
<i>Corynoneura lobata</i>	45		
<i>Parametriocnemus sp</i>	24	+	
<i>Paratrichocladus sp</i>	7		
<i>Rheocricotopus (Psilocricotopus) robacki</i>	78		
<i>Thienemanniella xena</i>	13		
<i>Tvetenia bavarica group</i>	64		
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	21		
<i>Microtendipes pedellus group</i>	0	+	
<i>Polypedilum (P.) illinoense</i>	0	+	
<i>Paratanytarsus sp</i>	0	+	
<i>Rheotanytarsus pellucidus</i>	42		
<i>Rheotanytarsus sp</i>	403		
<i>Elimia sp</i>	0	+	
<i>Physella sp</i>	0	+	
<i>Ferrissia sp</i>	29		
<i>Corbicula fluminea</i>	0	+	
<i>Sphaerium sp</i>	8	+	

Site: Pine Creek, US 20 Bypass

Collection Date: 9/21/2005

Site Number: 6

Taxa Name	Quantitative	Qualitative		
<i>Oligochaeta</i>	0	+	No. Quantitative Taxa:	29
<i>Caecidotea sp</i>	0	+	No. Qualitative Taxa:	26
<i>Gammarus sp</i>	57	+	Total No. Taxa	42
<i>Hydracarina</i>	4		Number of Organisms	1,673
<i>Baetis tricaudatus</i>	23			
<i>Baetis flavistriga</i>	17	+		
<i>Stenacron sp</i>	25	+		
<i>Stenonema vicarium</i>	47	+		
<i>Anthopotamus sp</i>	0	+		
<i>Calopteryx sp</i>	8	+		
<i>Boyeria sp</i>	1	+		
<i>Neoplea sp</i>	0	+		
<i>Sigara sp</i>	0	+		
<i>Lype diversa</i>	24			
<i>Cheumatopsyche sp</i>	156	+		
<i>Ceratopsyche morosa group</i>	94	+		
<i>Ceratopsyche slossonae</i>	96	+		
<i>Ceratopsyche sparna</i>	596			
<i>Hydropsyche depravata group</i>	7	+		
<i>Nectopsyche sp</i>	0	+		
<i>Dubiraphia vittata group</i>	0	+		
<i>Macronychus glabratus</i>	4			
<i>Optioservus sp</i>	1	+		
<i>Stenelmis sp</i>	0	+		
<i>Tipula sp</i>	8	+		
<i>Simulium sp</i>	5			
<i>Ceratopogonidae</i>	0	+		
<i>Corynoneura lobata</i>	26			
<i>Orthocladius sp</i>	0	+		
<i>Parametriocnemus sp</i>	5			
<i>Thienemanniella similis</i>	22			
<i>Tvetenia bavarica group</i>	38			
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	16			
<i>Polypedilum (Uresipedilum) aviceps</i>	146	+		
<i>Rheotanytarsus pellucidus</i>	5			
<i>Rheotanytarsus sp</i>	210			
<i>Tanytarsus sp</i>	5			
<i>Tanytarsus glabrescens group sp 7</i>	11			
<i>Chrysops sp</i>	0	+		
<i>Physella sp</i>	0	+		
<i>Ferrissia sp</i>	16			
<i>Limoporus</i>	0	+		

Site: Puterbaugh Creek, County Road 8

Collection Date: 9/21/2005

Site Number: 7

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Oligochaeta</i>	8		<i>Rheotanytarsus pellucidus</i>	89	
<i>Erpobdellidae</i>	0	+	<i>Stempellinella n.sp nr. flavidula</i>	18	
<i>Gammarus sp</i>	26	+	<i>Tanytarsus sp</i>	35	+
<i>Hydracarina</i>	4		<i>Tanytarsus glabrescens group sp 7</i>	35	
<i>Baetis tricaudatus</i>	0	+	<i>Tanytarsus sepp</i>	35	
<i>Baetis flavistriga</i>	8		<i>Chrysops sp</i>	0	+
<i>Pseudocloeon propinquum</i>	0	+	<i>Elimia sp</i>	4	+
<i>Stenacron sp</i>	4		<i>Physella sp</i>	24	
<i>Stenonema vicarium</i>	37	+	<i>Helisoma anceps anceps</i>	0	+
<i>Leptophlebia sp or Paraleptophlebia sp</i>	17		<i>Planorbella (Pierosoma) pilsbryi</i>	1	
<i>Ephemerella sp</i>	4		<i>Planorbella (Pierosoma) trivolvis</i>	0	+
<i>Tricorythodes sp</i>	8		<i>Ferrissia sp</i>	72	+
<i>Caenis sp</i>	0	+	<i>Corbicula fluminea</i>	0	+
<i>Calopteryx sp</i>	4	+	<i>Sphaeriidae</i>	8	
<i>Boyeria vinosa</i>	0	+	<i>Pisidium sp</i>	0	+
<i>Belostoma sp</i>	0	+			
<i>Lype diversa</i>	1				
<i>Polycentropus sp</i>	8	+	No. Quantitative Taxa:	44	
<i>Cheumatopsyche sp</i>	75	+	No. Qualitative Taxa:	34	
<i>Hydropsyche depravata group</i>	18	+	Total No. Taxa	65	
<i>Hydroptila sp</i>	8		Number of Organisms	1,923	
<i>Ptilostomis sp</i>	0	+			
<i>Brachycentrus sp</i>	59	+			
<i>Neophylax sp</i>	0	+			
<i>Helicopsyche borealis</i>	39				
<i>Mystacides sp</i>	0	+			
<i>Haliplus sp</i>	0	+			
<i>Hydroporus sp</i>	0	+			
<i>Cyphon sp</i>	0	+			
<i>Macronychus glabratus</i>	20	+			
<i>Optioservus sp</i>	0	+			
<i>Tipulidae</i>	0	+			
<i>Antocha sp</i>	4				
<i>Culicidae</i>	0	+			
<i>Simulium sp</i>	4	+			
<i>Conchapelopia sp</i>	141				
<i>Meropelopia sp</i>	53				
<i>Procladius (Holotanypus) sp</i>	0	+			
<i>Corynoneura lobata</i>	180				
<i>Cricotopus (C.) bicinctus</i>	35				
<i>Cricotopus (C.) tremulus group</i>	18				
<i>Parakiefferiella sp</i>	35				
<i>Parametriocnemus sp</i>	284	+			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	18				
<i>Thienemanniella xena</i>	181				
<i>Tvetenia bavarica group</i>	89				
<i>Microtendipes rydalensis</i>	53				
<i>Polypedilum (Uresipedilum) aviceps</i>	89				
<i>Polypedilum (P.) fallax group</i>	35				
<i>Paratanytarsus sp</i>	35				

Site: Lily Creek, Reckell Avenue

Collection Date: 9/23/2005

Site Number: 8

Taxa Name	Quantitative	Qualitative	
Turbellaria	28		No. Quantitative Taxa: 19
Oligochaeta	266		No. Qualitative Taxa: 21
Helobdella stagnalis	8		Total No. Taxa 33
Erpobdella punctata punctata	2		Number of Organisms 1,510
Caecidotea sp	0	+	
Baetis tricaudatus	0	+	
Stenacron sp	4	+	
Coenagrionidae	0	+	
Aeshna sp	0	+	
Belostoma sp	0	+	
Sigara sp	0	+	
Notonecta sp	0	+	
Sialis sp	16		
Ochrotrichia sp	0	+	
Peltodytes sp	0	+	
Pilaria sp	8		
Tipula sp	0	+	
Anopheles sp	0	+	
Ceratopogonidae	16		
Conchapelopia sp	85		
Zavrelimyia sp	0	+	
Odontomesa ferringtoni	0	+	
Prodiamesa olivacea	12	+	
Cricotopus (C.) bicinctus	12	+	
Parametrioctenemus sp	12		
Cryptochironomus sp	12		
Dicrotendipes fumidus	49	+	
Stictochironomus sp	842	+	
Tanytarsus curticornis group	12		
Fossaria sp	18		
Physella sp	0	+	
Gyraulus (Torquis) parvus	1	+	
Pisidium sp	107	+	

Site: Christiana Creek, County Road 4

Collection Date: 9/21/2005 Site Number: 9

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	2		<i>Corynoneura lobata</i>	101	
<i>Oligochaeta</i>	1	+	<i>Cricotopus (C.) sp</i>	0	+
<i>Placobdella ornata</i>	0	+	<i>Nanocladius sp</i>	3	
<i>Erpobdella punctata punctata</i>	0	+	<i>Parametriocnemus sp</i>	3	
<i>Hyalella azteca</i>	0	+	<i>Rheocricotopus (Psilocricotopus) robacki</i>	9	
<i>Gammarus sp</i>	37	+	<i>Cryptochironomus sp</i>	3	
<i>Hydracarina</i>	0	+	<i>Paratendipes albimanus or P. duplicatus</i>	3	
<i>Pseudocloeon propinquum</i>	0	+	<i>Polypedilum (Uresipedilum) flavum</i>	50	
<i>Plauditus punctiventris</i>	0	+	<i>Polypedilum (P.) fallax group</i>	3	
<i>Proclaeon irrubrum</i>	0	+	<i>Polypedilum (P.) illinoense</i>	3	+
<i>Isonychia sp</i>	17		<i>Stictochironomus sp</i>	0	+
<i>Stenacron sp</i>	76	+	<i>Cladotanytarsus mancus group</i>	0	+
<i>Stenonema mediopunctatum</i>	4		<i>Tanytarsus sp</i>	6	+
<i>Stenonema pulchellum</i>	295		<i>Tanytarsus sepp</i>	9	
<i>Stenonema terminatum</i>	17	+	<i>Chrysops sp</i>	0	
<i>Ephemerella sp</i>	197		<i>Hemerodromia sp</i>	17	
<i>Tricorythodes sp</i>	22	+	<i>Elimia sp</i>	6	
<i>Caenis sp</i>	0	+	<i>Physella sp</i>	18	+
<i>Anthopotamus sp</i>	0	+	<i>Ferrissia sp</i>	20	+
<i>Hexagenia sp</i>	0	+	<i>Corbicula fluminea</i>	0	+
<i>Hetaerina sp</i>	0	+	<i>Metrobutes</i>	0	+
<i>Coenagrionidae</i>	0	+	<i>Optioservus ovalis</i>	8	+
<i>Argia sp</i>	8				
<i>Gomphidae</i>	0	+			
<i>Ophiogomphus sp</i>	0	+	No. Quantitative Taxa:	38	
<i>Plathemis lydia</i>	0	+	No. Qualitative Taxa:	51	
<i>Acroneuria internata</i>	13	+	Total No. Taxa	72	
<i>Belostoma sp</i>	0	+	Number of Organisms	1,155	
<i>Neoplea sp</i>	0	+			
<i>Palmacorixa sp</i>	0	+			
<i>Trichocorixa sp</i>	0	+			
<i>Corydalus cornutus</i>	0	+			
<i>Neureclipsis sp</i>	16				
<i>Polycentropus sp</i>	0	+			
<i>Cheumatopsyche sp</i>	87				
<i>Ceratopsyche morosa group</i>	20	+			
<i>Hydropsyche frisoni</i>	28	+			
<i>Neophylax sp</i>	0	+			
<i>Helicopsyche borealis</i>	5	+			
<i>Mystacides sp</i>	0	+			
<i>Nectopsyche diarina</i>	2	+			
<i>Oecetis persimilis</i>	1	+			
<i>Triaenodes ignitus</i>	0	+			
<i>Triaenodes injustus</i>	0	+			
<i>Dineutus sp</i>	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Scirtidae</i>	0	+			
<i>Macronychus glabratus</i>	0	+			
<i>Stenelmis sp</i>	8	+			
<i>Simulium sp</i>	4				
<i>Hayesomyia senata or</i>	33				
<i>Thienemannimyia norena</i>					

Site: Christiana Creek, Willowdale Park

Collection Date: 9/21/2005 Site Number: 10

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0		<i>Corynoneura lobata</i>	276	
<i>Oligochaeta</i>	16	+	<i>Cricotopus (C.) sp</i>	9	
<i>Hyalella azteca</i>	0	+	<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	9	
<i>Gammarus sp</i>	22	+	<i>Parametriocnemus sp</i>	37	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Rheocricotopus (Psilocricotopus) robacki</i>	64	
<i>Plauditus dubius</i>	0	+	<i>Thienemanniella similis</i>	18	
<i>Baetis flavistriga</i>	0	+	<i>Thienemanniella xena</i>	55	+
<i>Baetis intercalaris</i>	83	+	<i>Tvetenia bavarica group</i>	9	+
<i>Plauditus punctiventris</i>	0	+	<i>Tvetenia discoloripes group</i>	9	
<i>Heterocloeon curiosum</i>	0	+	<i>Microtendipes rydalensis</i>	9	
<i>Procloeon irrubrum</i>	0	+	<i>Polypedilum (Uresipedilum) flavum</i>	18	
<i>Isonychia sp</i>	27	+	<i>Polypedilum (P.) illinoense</i>	46	
<i>Stenacron sp</i>	4	+	<i>Polypedilum (Tripodura) scalaenum group</i>	0	+
<i>Stenonema exiguum</i>	194	+	<i>Rheotanytarsus pellucidus</i>	9	
<i>Stenonema mediopunctatum</i>	57	+	<i>Rheotanytarsus sp</i>	92	+
<i>Stenonema pulchellum</i>	267	+	<i>Tanytarsus sp</i>	0	+
<i>Ephemerella sp</i>	76		<i>Tanytarsus glabrescens group sp 7</i>	9	
<i>Tricorythodes sp</i>	0	+	<i>Tanytarsus sepp</i>	64	+
<i>Caenis sp</i>	0	+	<i>Hemerodromia sp</i>	64	
<i>Baetisca sp</i>	0	+	<i>Elimia sp</i>	0	+
<i>Hetaerina sp</i>	19	+	<i>Lymnaeidae</i>	0	+
<i>Coenagrionidae</i>	0	+	<i>Ferrissia sp</i>	36	+
<i>Argia sp</i>	1	+			
<i>Acroneuria internata</i>	9	+			
<i>Corixidae</i>	0	+	No. Quantitative Taxa:	43	
<i>Corydalus cornutus</i>	1	+	No. Qualitative Taxa:	53	
<i>Chimarra obscura</i>	195	+	Total No. Taxa	71	
<i>Neureclipsis sp</i>	27		Number of Organisms	2,232	
<i>Polycentropus sp</i>	0	+			
<i>Cheumatopsyche sp</i>	89	+			
<i>Ceratopsyche morosa group</i>	0	+			
<i>Ceratopsyche sparna</i>	83	+			
<i>Hydropsyche depravata group</i>	13				
<i>Hydropsyche frisoni</i>	116	+			
<i>Neophylax sp</i>	0	+			
<i>Pycnopsyche sp</i>	0	+			
<i>Helicopsyche borealis</i>	0	+			
<i>Mystacides sepulchralis</i>	0	+			
<i>Oecetis persimilis</i>	29	+			
<i>Petrophila sp</i>	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Ancyronyx variegata</i>	0	+			
<i>Macronychus glabratus</i>	29	+			
<i>Optioservus sp</i>	0	+			
<i>Stenelmis sp</i>	1	+			
<i>Tipula sp</i>	0	+			
<i>Anopheles sp</i>	0	+			
<i>Simulium sp</i>	14	+			
<i>Conchapelopia sp</i>	9				
<i>Natarsia baltimoreus</i>	18				

Site: Elkhart River, Oxbow Park

Collection Date: 9/23/2005

Site Number: 11

Taxa Name	Quantitative	Qualitative	No. Quantitative Taxa:	No. Qualitative Taxa:
Spongillidae	0	+	0	48
Turbellaria	0	+		
Oligochaeta	0	+		
Caecidotea sp	0	+		
Gammarus sp	0	+		
Orconectes (Procericambarus) rusticus	0	+		
Baetis flavistriga	0	+		
Pseudocloeon frondale	0	+		
Plauditus punctiventris	0	+		
Isonychia sp	0	+		
Leucrocuta sp	0	+		
Stenacron sp	0	+		
Stenonema pulchellum	0	+		
Ephemerella sp	0	+		
Tricorythodes sp	0	+		
Calopteryx sp	0	+		
Hetaerina sp	0	+		
Coenagrionidae	0	+		
Argia sp	0	+		
Pteronarcys sp	0	+		
Agnatina capitata complex	0	+		
Corydalus cornutus	0	+		
Chimarra obscura	0	+		
Polycentropus sp	0	+		
Cheumatopsyche sp	0	+		
Ceratopsyche morosa group	0	+		
Ceratopsyche sparna	0	+		
Hydropsyche depravata group	0	+		
Hydropsyche frisoni	0	+		
Hydropsyche hageni	0	+		
Protoptila sp	0	+		
Brachycentrus sp	0	+		
Oecetis persimilis	0	+		
Hydroporus sp	0	+		
Psephenus herricki	0	+		
Macronychus glabratus	0	+		
Stenelmis sp	0	+		
Simulium sp	0	+		
Corynoneura sp	0	+		
Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	0	+		
Polypedilum (Tripodura) scalaenum group	0	+		
Stenochironomus sp	0	+		
Tanytarsus glabrescens group sp 7	0	+		
Chrysops sp	0	+		
Elimia sp	0	+		
Dreissena polymorpha	0	+		
Sphaerium sp	0	+		
Elliptio dilatata	0	+		

Site: Elkhart River, Indiana Avenue

Collection Date: 9/21/2005

Site Number: 12

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Helobdella stagnalis</i>	0	+
<i>Erpobdella punctata punctata</i>	0	+
<i>Caecidotea sp</i>	0	+
<i>Gammarus sp</i>	0	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Plauditus sp</i>	0	+
<i>Baetis flavistriga</i>	0	+
<i>Pseudocloeon frondale</i>	0	+
<i>Plauditus punctiventris</i>	0	+
<i>Isonychia sp</i>	0	+
<i>Heptagenia sp</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Stenonema pulchellum</i>	0	+
<i>Stenonema terminatum</i>	0	+
<i>Tricorythodes sp</i>	0	+
<i>Caenis sp</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Argia sp</i>	0	+
<i>Boyeria vinosa</i>	0	+
<i>Pteronarcys sp</i>	0	+
<i>Paragnetina media</i>	0	+
<i>Agnatina capitata complex</i>	0	+
<i>Corydalus cornutus</i>	0	+
<i>Neureclipsis sp</i>	0	+
<i>Nyctiophylax sp</i>	0	+
<i>Cheumatopsyche sp</i>	0	+
<i>Ceratopsyche morosa group</i>	0	+
<i>Hydropsyche depravata group</i>	0	+
<i>Hydropsyche frisoni</i>	0	+
<i>Proptila sp</i>	0	+
<i>Brachycentrus sp</i>	0	+
<i>Pycnopsyche sp</i>	0	+
<i>Oecetis persimilis</i>	0	+
<i>Triaenodes injustus</i>	0	+
<i>Petrophila sp</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Dubiraphia vittata group</i>	0	+
<i>Macronychus glabratus</i>	0	+
<i>Stenelmis sp</i>	0	+
<i>Clinotanypus pinguis</i>	0	+
<i>Cricotopus (C.) bicinctus</i>	0	+
<i>Elimia sp</i>	0	+
<i>Ferrissia sp</i>	0	+
<i>Sphaerium sp</i>	0	+
<i>Actinonaias ligamentina carinata</i>	0	+
<i>Villosa iris iris</i>	0	+

No. Quantitative Taxa: 0

No. Qualitative Taxa: 47

Site: Elkhart River, Middlebury Street

Collection Date: 9/23/2005

Site Number: 13

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	24	+	<i>Thienemanniella xena</i>	170	
<i>Caecidotea sp</i>	1	+	<i>Tvetenia discoloripes group</i>	6	
<i>Gammarus sp</i>	6	+	<i>Polypedilum (P.) fallax group</i>	6	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Rheotanytarsus sp</i>	77	
<i>Hydracarina</i>	2		<i>Tanytarsus sepp</i>	6	
<i>Baetis flavistriga</i>	120	+	<i>Hemerodromia sp</i>	28	+
<i>Baetis intercalaris</i>	74	+	<i>Hydrobiidae</i>	0	+
<i>Pseudocloeon propinquum</i>	10	+	<i>Elimia sp</i>	32	+
<i>Plauditus punctiventris</i>	34	+	<i>Physella sp</i>	1	+
<i>Isonychia sp</i>	104	+	<i>Ferrissia sp</i>	64	+
<i>Heptagenia sp</i>	0	+	<i>Laevapex fuscus</i>	2	
<i>Stenacron sp</i>	91	+	<i>Corbicula fluminea</i>	0	+
<i>Stenonema femoratum</i>	12		<i>Anodontoides ferussacianus</i>	0	+
<i>Stenonema pulchellum</i>	148	+	<i>Fusconaia flava</i>	0	+
<i>Ephemerella sp</i>	162		<i>Pleurobema sintoxia</i>	0	+
<i>Tricorythodes sp</i>	20	+	<i>Actinonaias ligamentina carinata</i>	0	+
<i>Baetisca sp</i>	0	+			
<i>Calopteryx sp</i>	0	+			
<i>Coenagrionidae</i>	0	+	No. Quantitative Taxa:	46	
<i>Argia sp</i>	0	+	No. Qualitative Taxa:	44	
<i>Boyeria vinosa</i>	0	+	Total No. Taxa	66	
<i>Macromia sp</i>	0	+	Number of Organisms	1,905	
<i>Pteronarcys sp</i>	1	+			
<i>Paragnetina sp</i>	0	+			
<i>Agneta capitata complex</i>	10				
<i>Chimarra obscura</i>	35	+			
<i>Lype diversa</i>	5				
<i>Psychomyia flavida</i>	4				
<i>Neureclipsis sp</i>	40	+			
<i>Cheumatopsyche sp</i>	262				
<i>Ceratopsyche morosa group</i>	92	+			
<i>Hydropsyche depravata group</i>	0	+			
<i>Hydropsyche frisoni</i>	31	+			
<i>Hydroptila sp</i>	1				
<i>Brachycentrus sp</i>	0	+			
<i>Helicopsyche borealis</i>	0	+			
<i>Nectopsyche sp</i>	1				
<i>Oecetis persimilis</i>	2				
<i>Petrophila sp</i>	0	+			
<i>Dubiraphia vittata group</i>	4				
<i>Macronychus glabratus</i>	8	+			
<i>Stenelmis sp</i>	8	+			
<i>Antocha sp</i>	4	+			
<i>Simulium sp</i>	6	+			
<i>Clinotanypus pinguis</i>	0	+			
<i>Rheopelopia paramaculipennis</i>	6				
<i>Corynoneura lobata</i>	65				
<i>Cricotopus (C.) bicinctus</i>	61				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	22				
<i>Thienemanniella similis</i>	37				

Site: Yellow Creek, County Road 32

Collection Date: 9/23/2005

Site Number: 14

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	22	+	<i>Paratanytarsus sp</i>	35	+
<i>Oligochaeta</i>	88		<i>Rheotanytarsus sp</i>	17	
<i>Helobdella fusca</i>	1		<i>Tanytarsus sp</i>	35	
<i>Helobdella stagnalis</i>	0	+	<i>Tanytarsus glabrescens group sp 7</i>	35	
<i>Erpobdella punctata punctata</i>	2		<i>Tanytarsus sepp</i>	17	
<i>Caecidotea sp</i>	0	+	<i>Hemerodromia sp</i>	24	
<i>Gammarus sp</i>	6	+	<i>Sciomyzidae</i>	0	+
<i>Orconectes sp</i>	0	+	<i>Physella sp</i>	23	+
<i>Baetis tricaudatus</i>	150	+	<i>Ferrissia sp</i>	77	+
<i>Baetis flavistriga</i>	75	+	<i>Sphaerium sp</i>	1	+
<i>Baetis intercalaris</i>	1	+	<i>Limoporus</i>	0	+
<i>Stenacron sp</i>	23	+			
<i>Calopteryx sp</i>	22	+			
<i>Coenagrionidae</i>	17	+	No. Quantitative Taxa:	40	
<i>Argia sp</i>	0	+	No. Qualitative Taxa:	38	
<i>Aeshna sp</i>	0	+	Total No. Taxa	61	
<i>Boyeria vinosa</i>	0	+	Number of Organisms	2,610	
<i>Neoplea sp</i>	0	+			
<i>Trichocorixa sp</i>	0	+			
<i>Notonecta sp</i>	0	+			
<i>Cheumatopsyche sp</i>	85	+			
<i>Ceratopsyche morosa group</i>	0	+			
<i>Hydropsyche depravata group</i>	49	+			
<i>Laccobius sp</i>	0	+			
<i>Scirtidae</i>	0	+			
<i>Optioservus fastiditus</i>	0	+			
<i>Stenelmis sp</i>	9	+			
<i>Tipula sp</i>	0	+			
<i>Dixella sp</i>	0	+			
<i>Anopheles sp</i>	0	+			
<i>Simulium sp</i>	0	+			
<i>Ceratopogonidae</i>	8				
<i>Thienemannimyia group</i>	174				
<i>Corynoneura n.sp 1</i>	35				
<i>Corynoneura lobata</i>	69				
<i>Cricotopus (C.) bicinctus</i>	17				
<i>Nanocladius (N.) spiniplenus</i>	52				
<i>Parakiefferiella n.sp 2</i>	87				
<i>Parametriocnemus sp</i>	52				
<i>Paratrichocladius sp</i>	52	+			
<i>Thienemanniella xena</i>	52				
<i>Dicrotendipes neomodestus</i>	35				
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	17				
<i>Microtendipes pedellus group</i>	903				
<i>Phaenopsectra punctipes</i>	17				
<i>Polypedilum (Uresipedilum) flavum</i>	0	+			
<i>Polypedilum (P.) fallax group</i>	87				
<i>Polypedilum (P.) illinoense</i>	0	+			
<i>Polypedilum (P.) laetum group</i>	17				
<i>Stictochironomus sp</i>	122	+			

Site: Yellow Creek, County Road 45

Collection Date: 9/23/2005

Site Number: 15

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+	<i>Planorbella (Pierosoma) trivolvis</i>	1	+
<i>Oligochaeta</i>	40	+	<i>Ferrissia sp</i>	52	+
<i>Erpobdella punctata punctata</i>	0	+	<i>Sphaerium sp</i>	0	+
<i>Caecidotea sp</i>	2	+	<i>Hydrachnidia</i>	16	
<i>Gammarus sp</i>	43	+			
<i>Orconectes sp</i>	0	+			
<i>Baetis tricaudatus</i>	4	+	No. Quantitative Taxa: 37		
<i>Baetis flavistriga</i>	137	+	No. Qualitative Taxa: 33		
<i>Plauditus punctiventris</i>	1		Total No. Taxa 54		
<i>Stenacron sp</i>	27	+	Number of Organisms 3,127		
<i>Calopteryx sp</i>	1	+			
<i>Coenagrionidae</i>	0	+			
<i>Palmacorixa sp</i>	0	+			
<i>Sigara sp</i>	0	+			
<i>Trichocorixa sp</i>	0	+			
<i>Cheumatopsyche sp</i>	220	+			
<i>Ceratopsyche morosa group</i>	1156	+			
<i>Hydropsyche depravata group</i>	65	+			
<i>Hydropsyche frisoni</i>	0	+			
<i>Hydroptilidae</i>	16				
<i>Nectopsyche diarina</i>	0	+			
<i>Oecetis cinerascens</i>	0	+			
<i>Peltodytes sp</i>	0	+			
<i>Dubiraphia quadrinotata</i>	0	+			
<i>Macronychus glabratus</i>	16				
<i>Optioservus sp</i>	1				
<i>Stenelmis sp</i>	20	+			
<i>Tipula sp</i>	0	+			
<i>Anopheles sp</i>	0	+			
<i>Conchapelopia sp</i>	42				
<i>Helopelopia sp</i>	56				
<i>Procladius (Holotanypus) sp</i>	14				
<i>Cricotopus (C.) bicinctus</i>	28				
<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	14				
<i>Nanocladius (N.) distinctus</i>	14				
<i>Parametrioctenemus sp</i>	98				
<i>Paratrichocladius sp</i>	154				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	42				
<i>Thienemanniella xena</i>	14				
<i>Dicrotendipes neomodestus</i>	14				
<i>Microtendipes pedellus group</i>	28				
<i>Stictochironomus sp</i>	28	+			
<i>Paratanytarsus sp</i>	573	+			
<i>Rheotanytarsus sp</i>	14				
<i>Tanytarsus sp</i>	14				
<i>Tanytarsus glabrescens group sp 7</i>	112				
<i>Tanytarsus sepp</i>	14	+			
<i>Hemerodromia sp</i>	36				
<i>Physella sp</i>	0	+			
<i>Helisoma anceps anceps</i>	0	+			

Site: Cobus Creek, County Road 8

Collection Date: 9/22/2005

Site Number: 16

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	1		<i>Physella sp</i>	18	+
<i>Oligochaeta</i>	1		<i>Planorbella (Pierosoma) trivolvis</i>	1	+
<i>Erpobdellidae</i>	0	+	<i>Ferrissia sp</i>	52	+
<i>Gammarus sp</i>	5	+	<i>Corbicula fluminea</i>	0	+
<i>Orconectes sp</i>	1	+	<i>Pisidium sp</i>	0	+
<i>Hydracarina</i>	32				
<i>Baetis tricaudatus</i>	183	+			
<i>Baetis flavistriga</i>	16		No. Quantitative Taxa: 37		
<i>Baetis intercalaris</i>	15		No. Qualitative Taxa: 36		
<i>Pseudocloeon propinquum</i>	0	+	Total No. Taxa 55		
<i>Stenacron sp</i>	51		Number of Organisms 2,124		
<i>Stenonema exiguum</i>	32				
<i>Stenonema terminatum</i>	44				
<i>Stenonema vicarium</i>	40	+			
<i>Leptophlebia sp or Paraleptophlebia sp</i>	8				
<i>Calopteryx sp</i>	0	+			
<i>Boyeria vinosa</i>	1	+			
<i>Belostoma sp</i>	0	+			
<i>Sialis sp</i>	0	+			
<i>Cheumatopsyche sp</i>	189	+			
<i>Ceratopsyche morosa group</i>	19				
<i>Ceratopsyche slossonae</i>	81	+			
<i>Ceratopsyche sparna</i>	26				
<i>Brachycentrus sp</i>	0	+			
<i>Molanna sp</i>	0	+			
<i>Helicopsyche borealis</i>	32	+			
<i>Mystacides sp</i>	0	+			
<i>Nectopsyche sp</i>	1				
<i>Hydrobius sp</i>	0	+			
<i>Paracymus sp</i>	0	+			
<i>Helichus sp</i>	0	+			
<i>Dubiraphia sp</i>	0	+			
<i>Macronychus glabratus</i>	16	+			
<i>Optioservus sp</i>	0	+			
<i>Stenelmis sp</i>	0	+			
<i>Tipulidae</i>	8	+			
<i>Simulium sp</i>	32	+			
<i>Hayesomyia senata or Thienemannimyia norena</i>	26				
<i>Brillia flavifrons group</i>	26				
<i>Corynoneura lobata</i>	220	+			
<i>Parametrioctenus sp</i>	304	+			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	53				
<i>Thienemanniella xena</i>	62				
<i>Tvetenia bavarica group</i>	304	+			
<i>Polypedilum (P.) fallax group</i>	13				
<i>Rheotanytarsus pellucidus</i>	79				
<i>Rheotanytarsus sp</i>	119	+			
<i>Tanytarsus glabrescens group sp 7</i>	13				
<i>Chrysops sp</i>	0	+			
<i>Fossaria sp</i>	0	+			

Site: Phillips Ditch, Chippewa Avenue

Collection Date: 9/22/2005

Site Number: 17

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	12		No. Quantitative Taxa: 18
<i>Erpobdella punctata punctata</i>	2		No. Qualitative Taxa: 12
<i>Caecidotea sp</i>	1		Total No. Taxa 25
<i>Gammarus sp</i>	71	+	Number of Organisms 911
<i>Orconectes sp</i>	2		
<i>Calopteryx sp</i>	4	+	
<i>Boyeria vinosa</i>	0	+	
<i>Cheumatopsyche sp</i>	0	+	
<i>Ceratopsyche sparna</i>	0	+	
<i>Dubiraphia vittata group</i>	4	+	
<i>Macronychus glabratus</i>	4	+	
<i>Optioservus sp</i>	0	+	
<i>Stenelmis sp</i>	0	+	
<i>Dixella sp</i>	0	+	
<i>Corynoneura lobata</i>	223		
<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	6		
<i>Nanocladius (N.) spiniplenus</i>	64		
<i>Parakiefferiella n.sp 1</i>	25		
<i>Microtendipes pedellus group</i>	451		
<i>Microtendipes rydalensis</i>	13		
<i>Paratendipes albimanus</i> or <i>P. duplicatus</i>	6		
<i>Polypedilum (P.) fallax group</i>	6		
<i>Stictochironomus sp</i>	13		
<i>Physella sp</i>	4	+	
<i>Sphaerium sp</i>	0	+	

Site: Juday Creek, Grape Road

Collection Date: 9/22/2005

Site Number: 18

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	102	+	No. Quantitative Taxa: 28
<i>Caecidotea sp</i>	0	+	No. Qualitative Taxa: 24
<i>Gammarus sp</i>	46	+	Total No. Taxa 43
<i>Orconectes (Procericambarus) rusticus</i>	0	+	Number of Organisms 486
<i>Baetis tricaudatus</i>	2		
<i>Stenacron sp</i>	2	+	
<i>Stenonema vicarium</i>	2		
<i>Calopteryx sp</i>	0	+	
<i>Boyeria vinosa</i>	0	+	
<i>Cheumatopsyche sp</i>	11	+	
<i>Ceratopsyche slossonae</i>	0	+	
<i>Ceratopsyche sparna</i>	0	+	
<i>Hydropsyche depravata group</i>	16	+	
<i>Ptilostomis sp</i>	0	+	
<i>Brachycentrus sp</i>	0	+	
<i>Nectopsyche sp</i>	0	+	
<i>Anacaena sp</i>	0	+	
<i>Dubiraphia vittata group</i>	12	+	
<i>Tipula sp</i>	5	+	
<i>Tipula abdominalis</i>	0	+	
<i>Ceratopogonidae</i>	10		
<i>Conchapelopia sp</i>	21		
<i>Meropelopia sp</i>	12		
<i>Prodiamesa olivacea</i>	0	+	
<i>Cricotopus (C.) bicinctus</i>	15		
<i>Orthocladius (O.) sp</i>	3		
<i>Parakiefferiella n.sp 2</i>	36		
<i>Parametriocnemus sp</i>	45		
<i>Rheocricotopus (Psilocricotopus) robacki</i>	36		
<i>Tvetenia bavarica group</i>	3		
<i>Dicrotendipes neomodestus</i>	9		
<i>Phaenopsectra obediens group</i>	0	+	
<i>Polypedilum (Uresipedilum) aviceps</i>	3		
<i>Polypedilum (P.) fallax group</i>	15		
<i>Stictochironomus sp</i>	3	+	
<i>Tribelos jucundum</i>	3	+	
<i>Paratanytarsus sp</i>	3		
<i>Rheotanytarsus pellucidus</i>	15		
<i>Stempellinella n.sp nr. flavidula</i>	12		
<i>Tanytarsus sp</i>	42		
<i>Fossaria sp</i>	2		
<i>Physella sp</i>	0	+	
<i>Pisidium sp</i>	0	+	

Site: Juday Creek, Kintz Avenue

Collection Date: 9/22/2005

Site Number: 19

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+	<i>Polypedilum (P.) fallax group</i>	35	
<i>Oligochaeta</i>	4	+	<i>Rheotanytarsus pellucidus</i>	35	
<i>Gammarus sp</i>	12	+	<i>Rheotanytarsus sp</i>	26	
<i>Cambarus sp</i>	0	+	<i>Tanytarsus glabrescens group sp 7</i>	35	
<i>Orconectes (Crockerinus) propinquus</i>	1		<i>Tanytarsus sepp</i>	4	
<i>Hydracarina</i>	0	+	<i>Hemerodromia sp</i>	1	
<i>Baetis flavistriga</i>	19	+	<i>Physella sp</i>	59	+
<i>Baetis intercalaris</i>	3		<i>Planorbidae</i>	2	
<i>Plauditus punctiventris</i>	0	+	<i>Planorbella (Pierosoma) trivolvis</i>	0	+
<i>Stenacron sp</i>	13	+	<i>Ferrissia sp</i>	115	+
<i>Stenonema terminatum</i>	64		<i>Corbicula fluminea</i>	0	+
<i>Stenonema vicarium</i>	5	+	<i>Sphaeriidae</i>	21	
<i>Tricorythodes sp</i>	6	+	<i>Cirulionidae sp</i>	0	+
<i>Caenis sp</i>	28	+			
<i>Ephemera sp</i>	4	+			
<i>Calopteryx sp</i>	1	+	No. Quantitative Taxa:	50	
<i>Coenagrionidae</i>	0	+	No. Qualitative Taxa:	33	
<i>Belostoma sp</i>	0	+	Total No. Taxa	63	
<i>Notonecta sp</i>	0	+	Number of Organisms	1,040	
<i>Chimarra obscura</i>	2				
<i>Cheumatopsyche sp</i>	30	+			
<i>Ceratopsyche morosa group</i>	22	+			
<i>Ceratopsyche slossonae</i>	2	+			
<i>Ceratopsyche sparna</i>	10				
<i>Hydropsyche depravata group</i>	15				
<i>Brachycentrus sp</i>	18	+			
<i>Mystacides sp</i>	8	+			
<i>Oecetis persimilis</i>	4				
<i>Dubiraphia vittata group</i>	4	+			
<i>Macronychus glabratus</i>	28				
<i>Optioservus sp</i>	16	+			
<i>Stenelmis sp</i>	33	+			
<i>Antocha sp</i>	21				
<i>Tipula sp</i>	1	+			
<i>Anopheles sp</i>	0	+			
<i>Simulium sp</i>	0	+			
<i>Helopelopia sp</i>	39				
<i>Corynoneura lobata</i>	19				
<i>Cricotopus (C.) bicinctus</i>	26				
<i>Parakiefferiella n.sp 2</i>	35				
<i>Parametriocnemus sp</i>	92				
<i>Paratrichocladius sp</i>	26				
<i>Psectrocladius (Allopsectrocladius) sp</i>	0	+			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	26				
<i>Thienemanniella xena</i>	5				
<i>Cryptochironomus sp</i>	4				
<i>Dicrotendipes neomodestus</i>	4				
<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	26				
<i>Microtendipes pedellus group</i>	9				
<i>Phaenopsectra obediens group</i>	22				

Site: Juday Creek, Izaak Walton League

Collection Date: 9/22/2005

Site Number: 20

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	14	+	No. Quantitative Taxa: 36
<i>Oligochaeta</i>	9	+	No. Qualitative Taxa: 21
<i>Gammarus sp</i>	4		Total No. Taxa 42
<i>Orconectes sp</i>	1	+	Number of Organisms 722
<i>Baetis flavistriga</i>	6		
<i>Baetis intercalaris</i>	6	+	
<i>Stenacron sp</i>	54	+	
<i>Stenonema terminatum</i>	53	+	
<i>Stenonema vicarium</i>	5	+	
<i>Caenis sp</i>	4		
<i>Calopteryx sp</i>	2	+	
<i>Argia sp</i>	0	+	
<i>Lype diversa</i>	4		
<i>Cheumatopsyche sp</i>	44	+	
<i>Ceratopsyche sparna</i>	4		
<i>Hydropsyche depravata group</i>	2	+	
<i>Petrophila sp</i>	0	+	
<i>Dubiraphia sp</i>	2		
<i>Optioservus sp</i>	12	+	
<i>Stenelmis sp</i>	83	+	
<i>Tipula sp</i>	2	+	
<i>Tipula abdominalis</i>	0	+	
<i>Simulium sp</i>	8	+	
<i>Ceratopogonidae</i>	10		
<i>Helopelopia sp</i>	32		
<i>Diamesa sp</i>	0	+	
<i>Pagastia sp</i>	0	+	
<i>Corynoneura lobata</i>	14		
<i>Cricotopus (C.) bicinctus</i>	4		
<i>Parametriocnemus sp</i>	126	+	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	7		
<i>Thienemanniella similis</i>	4		
<i>Microtendipes pedellus group</i>	4		
<i>Polypedilum (P.) fallax group</i>	11		
<i>Polypedilum (Tripodura) scalaenum group</i>	4		
<i>Stenochironomus sp</i>	4		
<i>Stictochironomus sp</i>	4		
<i>Tribelos atrum</i>	4		
<i>Rheotanytarsus sp</i>	108		
<i>Tanytarsus glabrescens group sp 7</i>	65		
<i>Hemerodromia sp</i>	2		
<i>Corbicula fluminea</i>	0	+	