

ELKHART-MISHAWAKA- SOUTH BEND AQUATIC COMMUNITY MONITORING



**ANNUAL REPORT
2008**



City of Elkhart
Public Works and Utilities
Dick Moore, Mayor

Cover Photo: Two longear sunfish from the Elkhart River, near County Road 18.

TABLE OF CONTENTS

INTRODUCTION.....	1
METHODS.....	4
RESULTS AND DISCUSSION	8
INDICIES	8
TAGGING AND MOVEMENT	17
FISH TISSUE	17
CONCLUSION.....	19
ACKNOWLEDGEMENTS	21
REFERENCES	22
SUMMER 2008 (Pictures)	23
APPENDICES	
APPENDIX A (Metrics for various indices)	
APPENDIX B (Fish tissue preparation and results)	
APPENDIX C (Summary of fish collected by county, 2008)	
APPENDIX D (Summary of fish collected by site, 2008)	
APPENDIX E (Summary of macroinvertebrates collected by site, 2008)	



AQUATIC COMMUNITY MONITORING IN ELKHART AND ST. JOSEPH COUNTIES ON THE ST. JOSEPH RIVER AND SELECTED TRIBUTARIES 2008



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April, 2009

INTRODUCTION

From the near 100-yr floods in early 2008, through the near record low flows in August, and then the after affects of Hurricane Ike, the St. Joseph River Watershed proved to everyone again just how unpredictable and dynamic she can be. Vegetation growth was slowed by the high spring currents and turbid water; but once the rains became non-existent and the water cleared in mid-summer, lush green vegetation became prominent through out the "Joe". Coupling these natural events with more and more encroachment by people, and it's easy to see that our precious aquatic resources our under fire. The St. Joseph River and it's intricate web of tributaries provides recreational and aesthetic opportunities far greater then any monetary value that could be placed on it. This natural treasure of winding streams and abundant wildlife deserves our respect and needs our protection. From its headwaters in Hillsdale, MI, along its quick sojourn into Indiana, to its confluence with Lake Michigan in St. Joseph, MI, The St. Joseph River is an integral part of the many communities it encounters.

For the past 11 years, the City of Elkhart has monitored local fish populations in area rivers and streams. This information has been integrated into an overall water quality program. While the city still measures the chemical and microbial composition of local stream water, having the additional biological data gives a more accurate representation of the overall health of each stream. Chemical and microbial testing, which is very important, may only give a snapshot of the current conditions of local waterways. Biological monitoring is an integral part of an overall water quality program, as the aquatic organisms can tell us about not only current and past conditions, but possibly give us a glimpse of future conditions.

During the first six years (1998-2003), the aquatics program established core sampling sites on the St. Joseph River and many of the primary tributaries. For three consecutive years data was collected from these sites and a baseline of information was established for each stream. The baselines are now used to compare and contrast current and future data collected to determine if there are impairments taking place in area streams.

The City of South Bend joined the program in 2001. This began a great partnership that continues to grow stronger as the years pass. Similar to the Elkhart area, core sampling sites were established over a six year period. Similar baselines were obtained for the South Bend area. 2008 was the second year that original sites had been sampled since the original baseline period, thus allowing South Bend to see if they are having any impacts on their area streams.

2008 marked the second year that the City of Mishawaka has been a partner in the monitoring program. Connections are starting to be made from upstream to downstream as far as overall health and diversity in the St. Joseph River. Baseline data collection will continue through 2009 on the St. Joseph River and three tributaries. The aquatics team is getting ever closer to having a true look into the biological integrity of the entire Indiana stretch of the St. Joseph River.

Baseline data work will continue on Baugo Creek in 2009. The aquatics team is always looking for ways to expand the program and integrate new partners into the process. Key areas of expansion still include the upper Elkhart River watershed in Elkhart and Noble Counties and possibly downstream areas of the St. Joseph River.

The aquatics program consists of more than just

traversing through local streams collecting fish data. The city's aquatic biologist is currently Vice President of the Indiana Chapter of the American Fisheries Society. The aquatic biologist is involved with many local groups including: The Elkhart River Alliance, St. Joseph River Basin Commission, Friends of the St. Joe, Michiana Walleye Association and the Indiana Bank Anglers club. The biologist also stays connected with local schools by giving demonstrations and presentations to classrooms to increase awareness about what wonderful aquatic resources we have in this area.

The Index of Biotic Integrity (IBI), as modified by Simon (1997) for use in the St. Joseph River watershed, is the tool utilized to assess the local fish communities. The IBI was developed by Karr (1981), and is most useful in deciphering complex fish community data into a more comprehensible 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 trends in fish community composition over

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



time. The IBI 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 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 (0 if no fish are present). 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. Since 2003, Elkhart has been assessing available habitat at all sampling locations using the Qualitative Habitat Evaluation Index (QHEI) (Rankin 1989). This index is similar to the IBI in its structure. It has six broad categories which are broken down into 21 smaller categories or metrics (Appendix A). This index will have a final score of 0 to 100 and the scores will be classified as excellent, good, fair-good, poor, and very poor. This assessment will help determine to what extent the IBI scores are being affected by habitat and will show where improvements to habitat may be needed to improve the overall health of our riverine systems.

Fish are not the only aquatic organisms that can be monitored to determine overall health of rivers and streams. Through a sub-contract with the Midwest Biodiversity Institute (Figure 1) (MBI, Columbus, Ohio), the City of Elkhart continues through its fifth year of benthic (bottom dwelling) macroinvertebrate (visible animals without backbones) monitoring. Twenty two sites were sampled in 2008 and results will be compared to baselines established from data collected from 2004 to 2006. The macroinvertebrate communities are assessed with

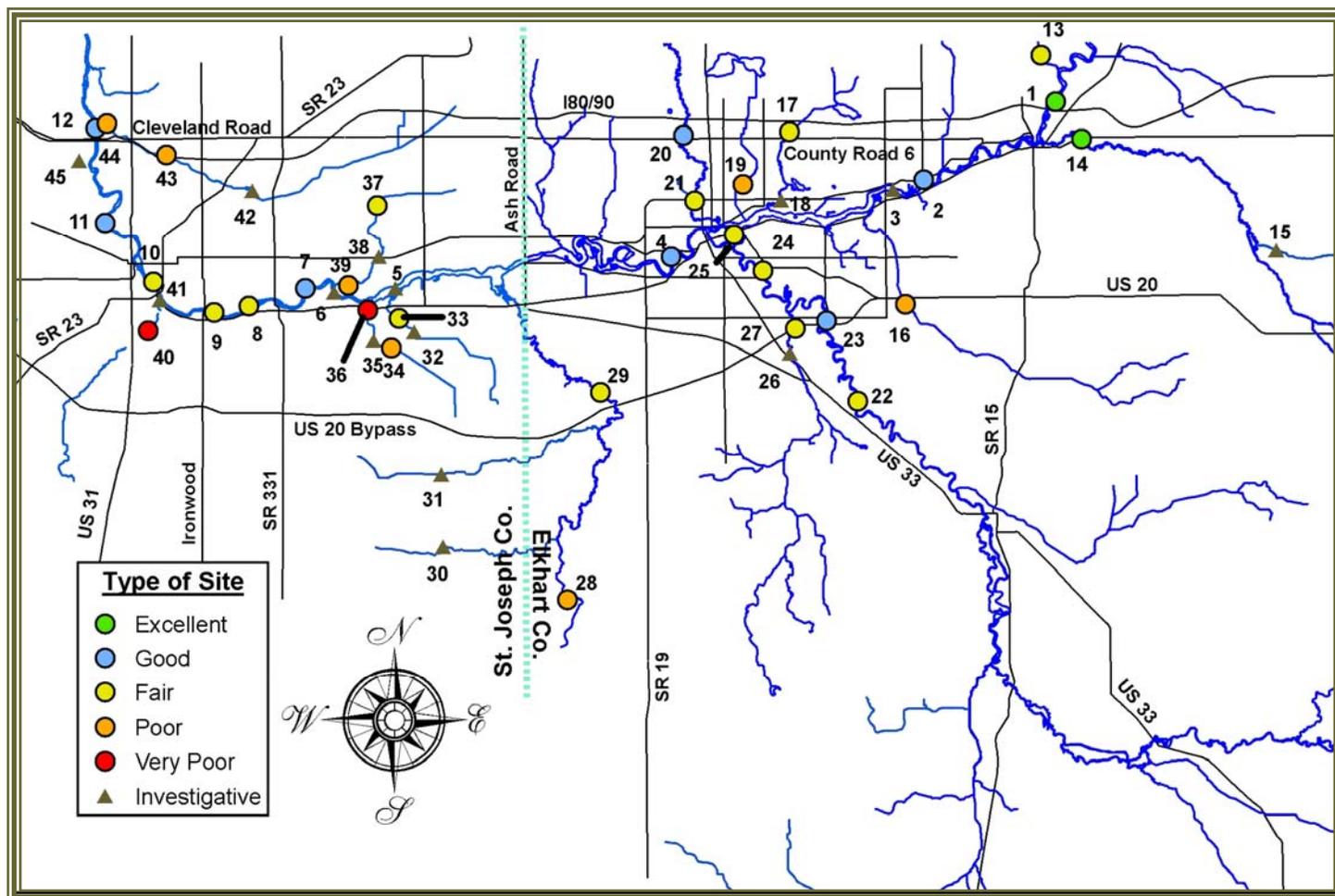
Table 1: Fish consumption information taken from the 2008 Indiana Fish Consumption Advisory

Location	Species	Fish Size (inches)	Contaminant	Group
Elkhart River <i>Elkhart River</i>	Rock Bass	9+	□	3
	Smallmouth Bass	17+	□	3
	White Sucker	16+	□	3
St. Joseph River <i>Elkhart County</i>	Bluegill	Up to 8		1
	Common Carp	25-28	□	3
		28+	□	4
	Channel Catfish	29+	□0	3
	Northern Hogsucker	15+	□	3
	Redhorse Species	17+	□	3
	Rock Bass	Up to 7		1
	Walleye	16+	□	3
White Sucker	Up to 14		1	
St. Joseph River <i>St. Joseph County (Baugo Bay)</i>	Bluegill	Up to 8		1
	Channel Catfish	Up to 22	□	3
		22+	□	4
	Largemouth Bass	Up to 13		1
	Rock Bass	Up to 8		1
White Sucker	Up to 14		1	
St. Joseph River <i>St. Joseph County</i>	Black Redhorse	16-18	□	3
		18+	□	4
	Bluegill	Up to 7	□	3
		7+	□	4
	Common Carp	Up to 20	□	4
	Channel Catfish	All	□0	4
	Golden Redhorse	All	□	5
	Largemouth Bass	14+	□	3
	Quillback	18+	□	3
	Rainbow Trout (also known as Steelhead)	25-31	□	3
		31+	□	4
	Shorthead Redhorse	15-19	□	3
		19+	□	4
	Smallmouth Bass	9+	□	3
White Sucker	14-16	□	3	
Yellow Bullhead	Up to 10	□	2	
Juday Creek	White Sucker	17+	□	3

○ = Mercury
 □ = PCBs
 Group 2 = 1 meal/week
 Group 3 = 1 meal/month
 Group 4 = 1 meal/2 months
 Group 5 = DO NOT EAT
 (Special restrictions apply to women and children. See advisory.)

the Invertebrate Community Index (ICI) developed by the Ohio Environmental Protection Agency (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

Figure 2: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community condition for 2008



range from 0 to 60 and are graphed and classified the same as the IBI scores. This combination of fish, habitat, and macroinvertebrate monitoring provides the cities of Elkhart, Mishawaka, and South Bend with the most comprehensive view of the health of our stream resources.

Besides water quality monitoring in the St. Joseph River basin, fish collections are conducted to determine the overall species diversity through out the watershed. Walleye (*Sander vitreus*) were tagged with the assistance of the Indiana Department of Natural Resources (IDNR). Tissue from eight fish species was collected and analyzed for mercury and PCB content. This information was added to the existing tissue database for the basin. The current Indiana Fish Consumption Advisory (FCA) (Table 1) displays many species from the Indiana portion of the St. Joseph River Watershed. The three cities involved in the program believe it is vital to continually provide local citizens with the most updated information on fish consumption.

Methods

Throughout the last eleven years, the City of Elkhart has used two collection protocols to quickly catalog the major fish species and to quantify water quality in the St. Joseph River watershed. Investigative sites were sampled once and the fish collected at these sites were identified to species, the largest and smallest specimens measured to the nearest millimeter (mm), all fish were counted and then released. Conversely, index sites were sampled twice during the season, with a minimum five week "rest" period between sampling events. Maximum and minimum lengths were recorded, all fish were counted, game fish were weighed and measured individually, and non-game fish were mass weighed. The length sampled at an index site was dependent on the wetted width of the stream. The length of sites was 15 times this width, with a minimum of 50 meters and a maximum of 500 meters. Differences in sampling and processing (Foy 2004) have allowed multiple investigative sites to be sampled in a day versus one or two index sites. Every species collected at

Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2008

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores	ICI Scores	QHEI Scores
				2008	2008	2008
1	Toll Road (Bristol) St. Joseph River	Index Elkhart	Boat	56		74
2	Six-Span St. Joseph River	Index Elkhart	Boat	53	52	68
3	County Road 17 St. Joseph River	Investigative Elkhart	Boat			63
4	Bridge Street St. Joseph River	Index Elkhart	Boat	53	40	70
5	Maggie's Landing St. Joseph River	Investigative St. Joseph	Boat			69
6	Petro-Eberhart Golf Course St. Joseph River	Investigative St. Joseph	Boat			66
7	Merrifield Park St. Joseph River	Index St. Joseph	Boat	47		68
8	Logan Street St. Joseph River	Index St. Joseph	Boat	42	40	70
9	Ironwood Drive St. Joseph River	Index St. Joseph	Boat	45		66
10	Jefferson Blvd St. Joseph River	Index St. Joseph	Boat	44		65
11	Angela Blvd St. Joseph River	Index St. Joseph	Boat	52	36	76
12	Darden Road St. Joseph River	Index St. Joseph	Boat	53	42	76
13	County Road 2 Trout Creek	Index Elkhart	Tote Barge	44	46	63
14	State Road 120* Little Elkhart River	Index Elkhart	Tote Barge	56	42	79
15	State Road 13 Mather Ditch	Investigative Elkhart	Tote Barge			55
16	US 20 Bypass Pine Creek	Index Elkhart	Tote Barge	30		74
17	Reedy Drive* Puterbaugh Creek	Index Elkhart	Tote Barge	40	Marginally Good	66
18	Bristol Street* Puterbaugh Creek	Investigative Elkhart	Tote Barge			NA
19	Reckell Avenue Lily Creek	Index Elkhart	Back Pack	28	22	55
20	County Road 6 Christiana Creek	Index Elkhart	Tote Barge	50	Excellent	75
21	Willowdale Park Christiana Creek	Index Elkhart	Tote Barge	45		67
22	Oxbow Park Elkhart River	Index Elkhart	Boat	41	Excellent	77
23	Hively Avenue Elkhart River	Index Elkhart	Boat	47	42	76
24	Studebaker Park (A) Elkhart River	Index Elkhart	Boat	44		75
25	American Park Elkhart River	Index Elkhart	Boat	46	42	70
26	County Road 45 Yellow Creek	Investigative Elkhart	Tote Barge			68

* 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
				2008	2008	2008
27	US 20 Bypass Yellow Creek	Index Elkhart	Tote Barge	42	42	74
28	County Road 1 (S) Baugo Creek	Index Elkhart	Tote Barge	28	30	66
29	County Road 3 (N) Baugo Creek	Index Elkhart	Tote Barge	41	20	76
30	Cedar Road Grimes Ditch	Investigative St. Joseph	Back Pack			71
31	Cedar Road Rogers Ditch	Investigative St. Joseph	Back Pack			29
32	Blackberry Road* Woodward Ditch	Investigative St. Joseph	Back Pack			41
33	Oakside Avenue* Woodward Ditch	Index St. Joseph	Tote Barge	42	32	43
34	Bridgeton Drive* Eller Ditch	Index St. Joseph	Tote Barge	26	Fair	57
35	Harrison Road* Eller Ditch	Investigative St. Joseph	Back Pack			46
36	Lincolnway* Eller Ditch	Index St. Joseph	Tote Barge	22	28	66
37	Day Road* Willow Creek	Index St. Joseph	Back Pack	38	18	61
38	McKinley Hwy* Willow Creek	Investigative St. Joseph	Back Pack			53
39	Estates Blvd* Willow Creek	Index St. Joseph	Back Pack	36	Marginally	57
40	Studebaker Golf Course Bowman Creek	Index St. Joseph	Back Pack	6		47
41	Lincolnway Bowman Creek	Investigative St. Joseph	Back Pack			52
42	Whiteshore Drive* Juday Creek	Investigative St. Joseph	Back Pack			64
43	Kintz Avenue* Juday Creek	Index St. Joseph	Tote Barge	34	42	70
44	Izaak Walton League* Juday Creek	Index St. Joseph	Tote Barge	27		75
45	Pinhook Park Pond	Investigative St. Joseph	Boat			NA

* denotes a cool/cold water site

each site is verified either by retaining a small specimen for the Public Works & Utilities voucher museum or photographing a large specimen. This practice allows for the verification of the field and lab identifications if needed.

In 2008, 14 index and 10 investigative sites were sampled in St. Joseph County and 17 index and 2 investigative sites were sampled in Elkhart County (Figure 2 and Table 2). Again, index sites were sampled twice and investigative sites were sampled once. IBI scores were calculated for each of the index sites and an average from the two visits was obtained to give the final score (Table 2).

Fish were collected from all sites using either boat mounted, tote barge, or backpack electrofishing equipment. The type of gear used depended on the size of the stream. The St. Joseph and Elkhart Rivers were sampled with the boat. Smaller, wadeable streams were sampled with the tote barge, unless the stream was extremely small and shallow, in which case, the backpack was used. Power output from the three devices differed. The boat output was 8-16 amperes, the tote barge was 406 amperes, and the backpack was 0.5-1.5 amperes.

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



Table 3: Macroinvertebrate Sampling Sites, 2008

Site Number	Stream	Location	Site Number	Stream	Location
1	St. Joseph River	Six-Span	12	Elkhart River	Oxbow Park
2	St. Joseph River	Bridge St.	13	Elkhart River	Hively Ave. (CR 18)
3	St. Joseph River	Logan Street	14	Elkhart River	American Park
4	St. Joseph River	Angela Boulevard	15	Baugo Creek	County Road 1 (S)
5	St. Joseph River	Darden Road	16	Baugo Creek	County Road 3 (N)
6	Trout Creek	County Road 2	17	Woodward Ditch	Oakside Avenue
7	Little Elkhart River	SR 120	18	Eller Ditch	Bridgeton Drive
8	Puterbaugh Creek	Reedy Drive	19	Eller Ditch	Lincolnway
9	Lily Creek (OTD)	Reckell Ave.	20	Willow Creek	Day Road
10	Christiana Creek	County Road 6	21	Willow Creek	Estates Blvd
11	Yellow Creek	US 20 Bypass	22	Juday Creek	Kintz Avenue

Figure 4: Location of macroinvertebrate sampling sites for 2008

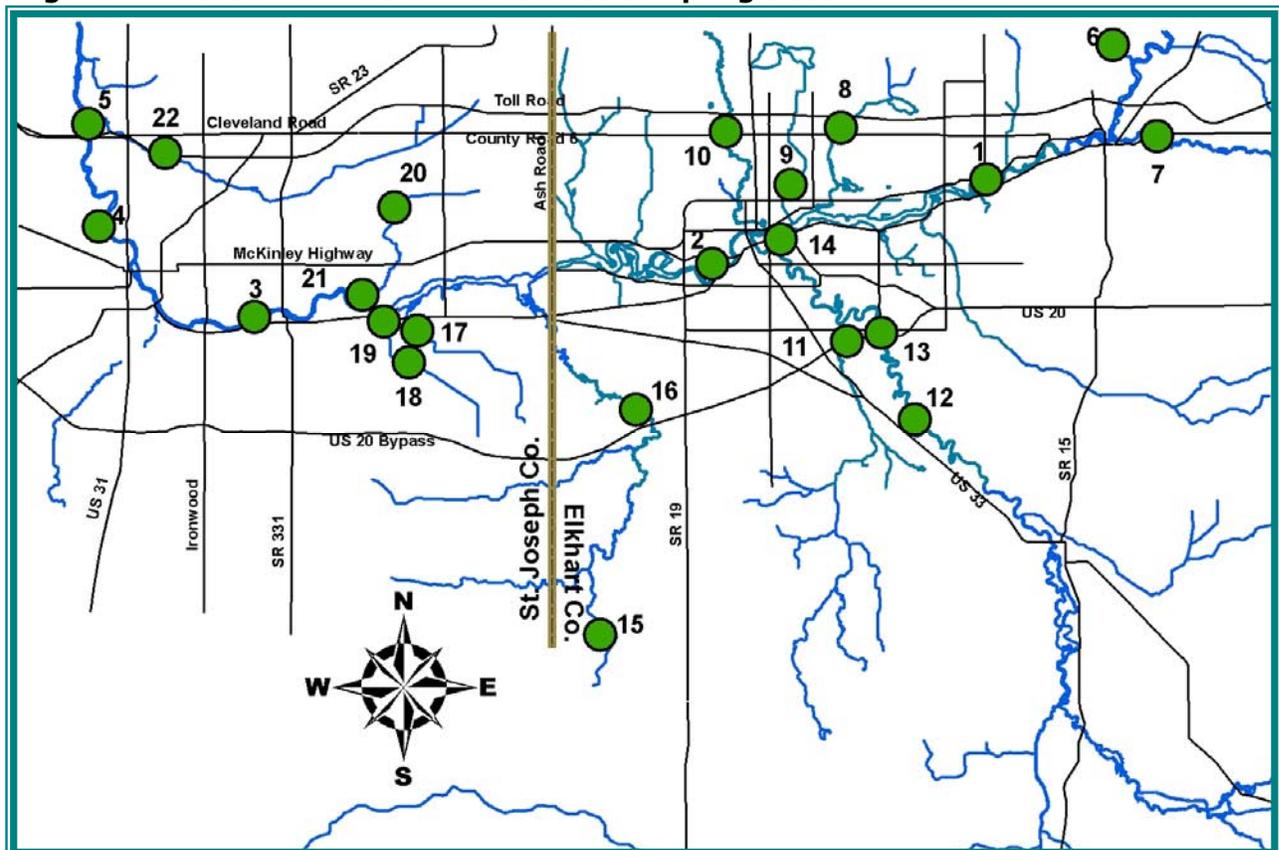


Figure 5: Location of fish tissue collection sites for 2008

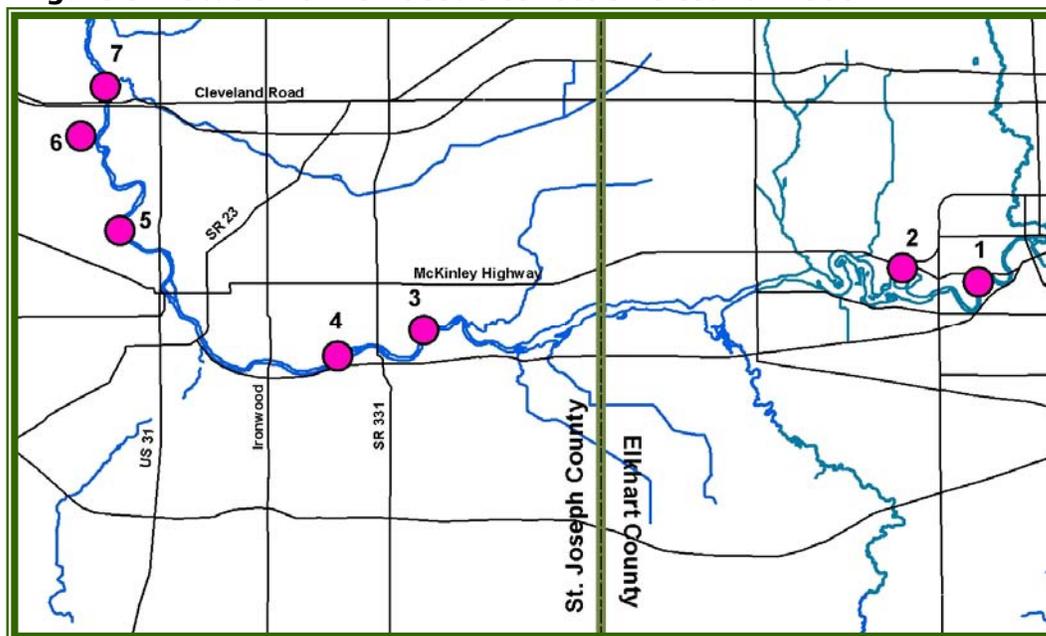


Table 4: Fish tissue sites, 2008

Site Number	Stream	Location
1	St. Joseph River	Bridge Street
2	St. Joseph River	Lexington Landing
3	St. Joseph River	Merrifield Park
4	St. Joseph River	Logan Street
5	St. Joseph River	Angela Boulevard
6	Pond	Pinhook Park
7	St. Joseph River	Darden Road

At all sites sampled (with a few exceptions), stream habitat information was methodically collected using the QHEI as developed by Ohio EPA (Rankin 1989). All field staff assess the available habitat at all fish sampling sites each time the site was visited. All scores were then averaged to give one final score (Table 2).

During the second week in August, MBI personnel placed Hester-Dendy samplers (artificial substrates used to collect small aquatic organisms) (Figure 3) at 22 sites that were also sampled for fish (Table 3 and Figure 4) following Ohio EPA macroinvertebrate sampling procedures (Ohio EPA 1987, 1989). Seventeen of the twenty two samplers were successfully retrieved approximately seven weeks after being set and their contents were preserved in alcohol for later identification. The data gathered from the samplers is considered a quantitative sample where species are identified and specimens are counted. This information was then used to calculate ICI scores for each site. Qualitative sampling also took place at each site with the use of a kick net through all available habitat near the location of the sampler. This extra sampling is used to capture additional

species as well as provide information to make an estimate of stream health in the case where an ICI score can not be calculated because a sampler was lost. Table 2 displays all ICI scores or narrative ratings for 2008.

Fish tissue in the form of fillets was collected from bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), golden redhorse (*Moxostoma erythrurum*), largemouth bass (*Micropterus salmoides*), rock bass (*Ambloplites rupestris*), steelhead (*Oncorhynchus mykiss*), smallmouth bass

(*Micropterus dolomieu*), and walleye. Table 4 and Figure 5 display the locations of tissue sample collection. Each tissue sample sent in for analysis (Pace Analytical, Green Bay, WI) was a composite of fillets from three fish of the same species from the sample reach. The shortest specimen was within 90% of the length of the longest specimen. The samples were collected following the procedures in Appendix B (this report) and Appendix III in "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (1993).

Results and Discussion

During the summer of 2008, a total of 20,473 fish were collected in Elkhart County and 9,615 fish were collected in St. Joseph County (Appendix C). In St. Joseph County, these fish represented 59 species in 16 families and in Elkhart County, collected fish represented 64 species in 14 families. In total, 71 different species were captured from the two counties.

White sucker (*Catostomus commersonii*), rock bass, and smallmouth bass were the top three species collected in Elkhart County, while longear sunfish (*Lepomis megalotis*), rock bass, and creek chub (*Semotilus atromaculatus*) were the top three species sampled in St. Joseph County.

Indices

The IBI, ICI, and QHEI scores for 2008 are summarized in Table 2. Throughout this report, this data will be presented in graphical form to illustrate longitudinal changes on the different

streams. The IBI and ICI graphs have an attainment line. Fish and benthic macroinvertebrate communities that score below this mark are considered impaired. There are many causes (thermal pollution, habitat degradation, chemical spills, etc.) that contribute to these impairments. Fish community conditions at the index sites ranged from very poor (6) at Studebaker Golf Course on Bowman Creek to excellent (56) at both State Road 120 on the Little Elkhart River and the Toll Road in Bristol on the St. Joseph River. Macroinvertebrate community scores ranged from fair (18) at Day Road on Willow Creek to excellent (52) at Six-Span on the St. Joseph River. The quality of the habitat at the index and investigative sites ranged from very poor (29) at Cedar Road on Rogers Ditch to excellent (79) at State Road 120 on the Little Elkhart River.

The Indiana Department of Environmental Management (IDEM) has established guidelines to determine if a body of water is being impaired or if its condition is supportive of aquatic life (IDEM 2008) for the IBI and QHEI. The ICI is not an index used by IDEM, however, similar guidelines have been established by OHIO EPA for a nearby region, and those values are being used with the Elkhart and St. Joseph County data. Values of 36 or higher for IBI and ICI scores are indicators of a stream with the ability to support aquatic life.

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

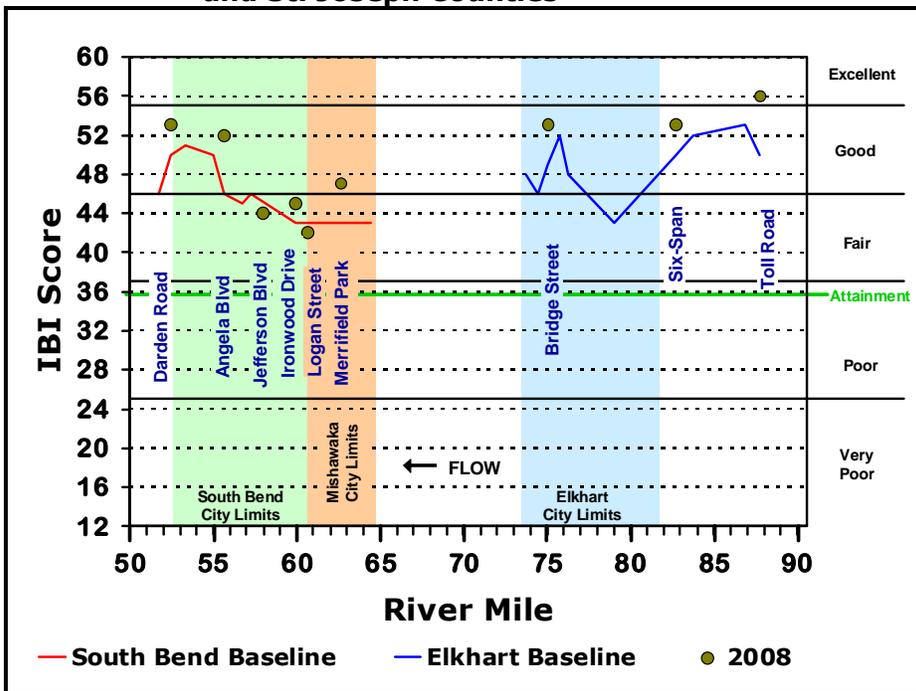


Figure 7: ICI scores for the St. Joseph River, Elkhart and St. Joseph Counties

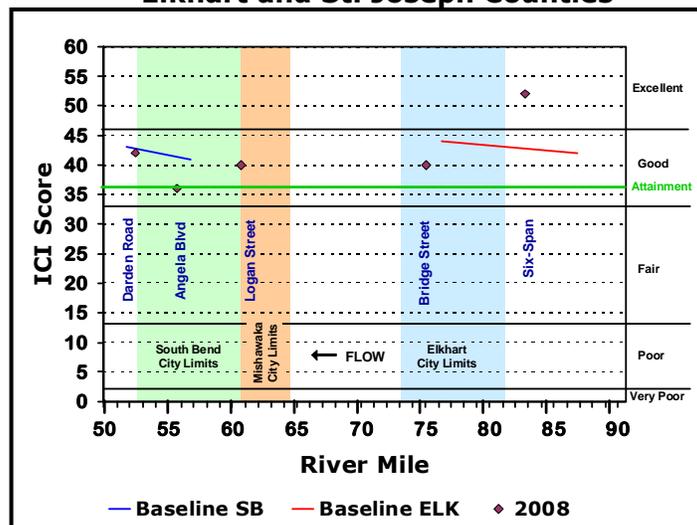
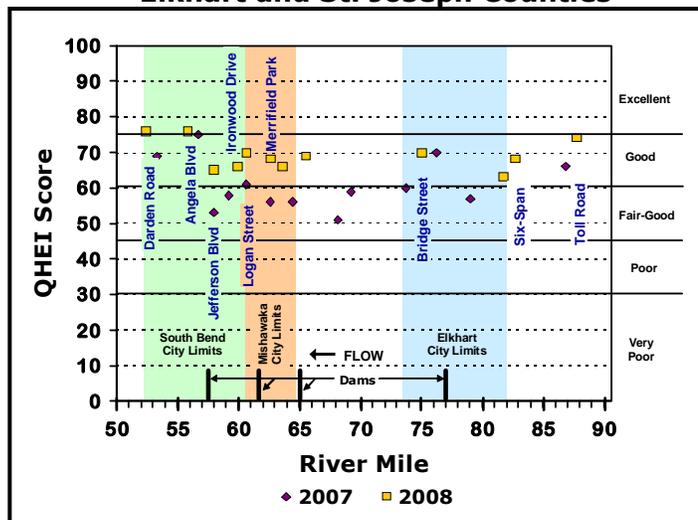


Figure 8: QHEI scores for the St. Joseph River, Elkhart and St. Joseph Counties



QHEI scores of 51 or larger indicate enough quality habitat is available to support aquatic communities.

The longitudinal trends in fish community condition for the entire Indiana portion of the St. Joseph River is displayed in Figure 6. The Elkhart County portion of the river continues to support good to excellent fish communities. The most upstream site, Toll Road, received its first excellent score in 2008. It is surprising that this site has not received an excellent score before since the majority of riparian habitat is forested and in stream cover consists of native vegetation, woody

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

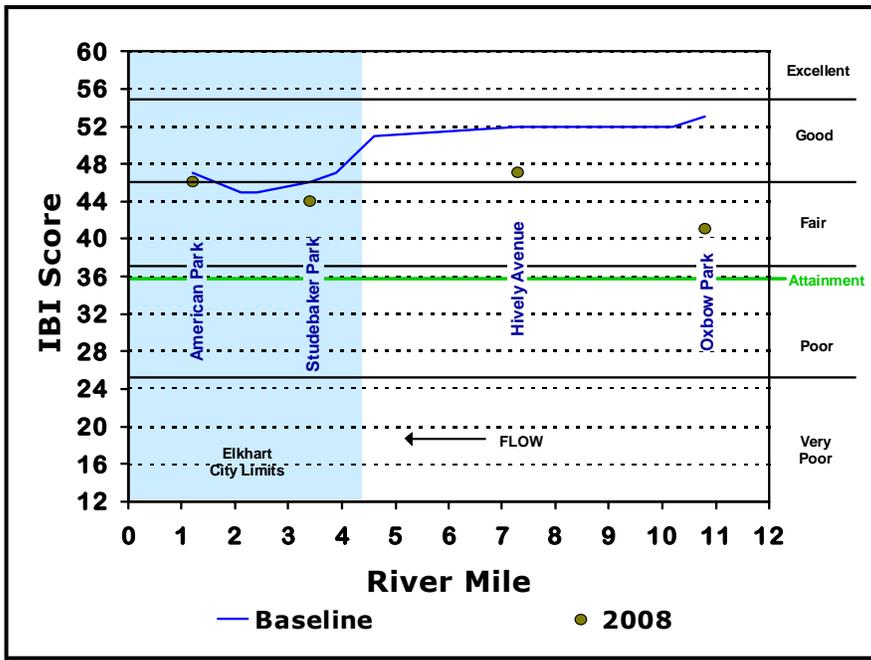
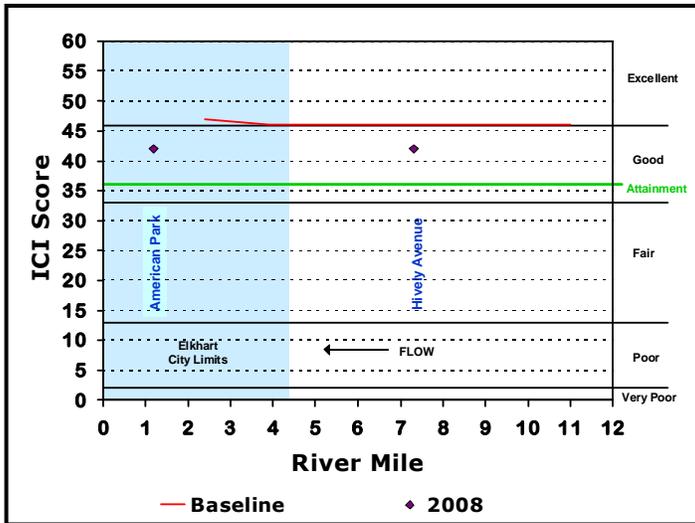


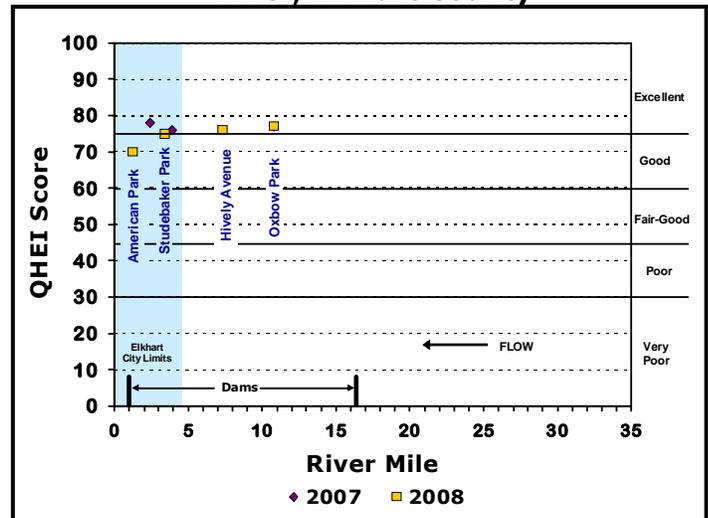
Figure 10: ICI scores for the Elkhart River, Elkhart County



debris and cobble substrate. All three sites scored above the baseline and had high diversities of fish species. This is an indication of the quality of water that is flowing downstream from upper reaches of the watershed. ICI scores in Elkhart portion of the St. Joseph River display the effects urbanization has on the macroinvertebrate communities (Figure 7). The downstream site had much higher diversity and overall individuals on the sampler; however, this led to a higher percentage of tolerant organisms. Both sites scored in the good or higher range. Habitat scores for the Elkhart County portion fell into the good range (Figure 8). Even the in town site had good in-stream cover and plenty of vegetation.

IBI scores for the St. Joseph River in St. Joseph County show a similar pattern to past years (Figure 6). As the river bends north and heads towards Michigan, fish community integrity seems to increase. Both of the downstream sites scored above the baseline in 2008. The Angela Blvd. site provided a perfect example as to why the aquatics program samples each index site twice during the season. The first time that site was sampled, 21 species were collected, only 258 total fish were collected and the IBI was calculated at 46. The second time the site was sampled, approximately six weeks later, 30 species were collected, 520 total fish were collected and the IBI calculated was 58. If the aquatics staff had only sampled this site once, the site would have either been classified as being fair or excellent. This shows us how dynamic our stream resources can be. The Logan Street and Merrifield Park sites in Mishawaka were sampled for the second of three consecutive years. The IBI scores for both of these sites fell slightly from 2007. The Jefferson Blvd. site was sampled for the second consecutive year and showed a slight improvement over 2007. This site is not expected to score high due to its proximity to the South Bend dam. Figure 7 shows that ICI scores for St. Joseph county were fairly consistent as all three sites fell within the good range. The Angela Blvd site was slightly lower than the other two because of a lack of mayfly diversity. The scores show that there is a sufficient food source for many of the fish spe-

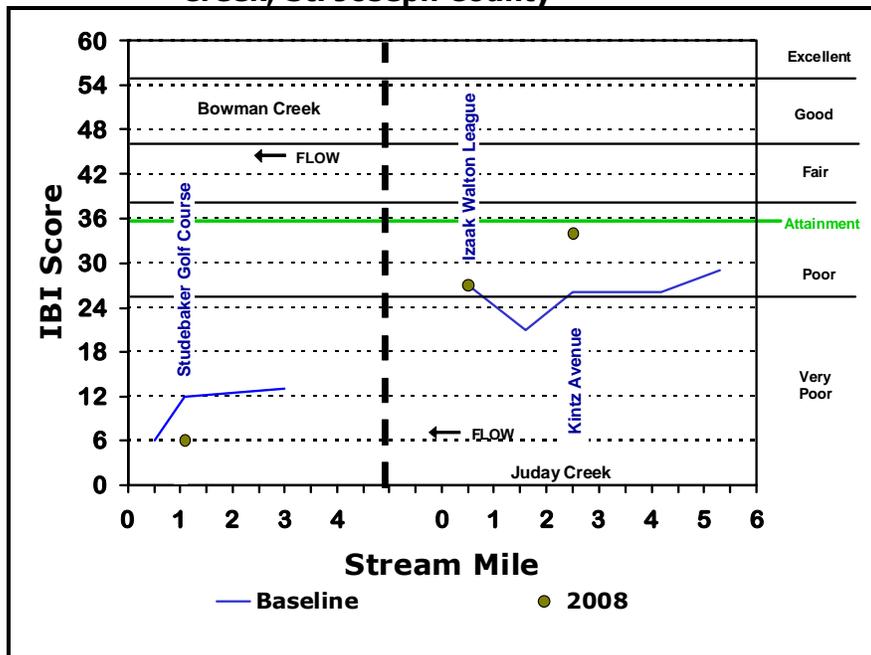
Figure 11: QHEI scores for the Elkhart River, Elkhart County



cies in the river. Figure 8 shows that habitat scores follow a similar trend to IBI scores. The lower reaches in South Bend have much more natural riparian habitat as opposed to areas of Mishawaka that are dominated by sea-walls.

All of the 2008 IBI scores for the Elkhart River fell below the established baseline (Figure 9). Sites at American Park and Studebaker Park were just below the baseline and are not a cause for concern. However, the sites at Hively Avenue and Oxbow Park fell well below the baseline with both having their lowest IBI scores in 11 years. The site of most concern is Oxbow Park. Figure 9 shows that when the baseline was established this was the best site on the Elkhart River. Now, the current condition equals the worst seen in this stretch in 11 years. There seems to be a problem with sediment and silt from activities upstream of the park. This is seen in the IBI, as there are less individual fish that need silt free areas for spawning. There also seems to be an issue with increased enrichment, as there has been an increase in fish collected, yet the scores have gone down. Species diversity is less at this site than it has been in past years. Sites downstream of Oxbow Park are being affected as well. Not only did the Hively Avenue site receive its lowest score in 2008, but the site at Middlebury Street received its lowest score of 41 in 2007 (Kring 2008). The health of the macroinvertebrate communities in the Elkhart River fell within the good range (Figure 10). Both down-

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



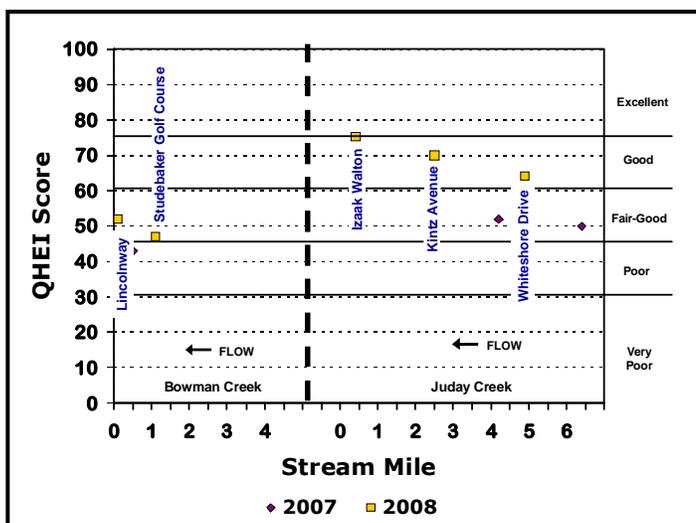
stream sites had good diversity. The sampler set at Oxbow Park was missing upon retrieval, so a narrative assessment was given for this site based on the qualitative sample. Based on the composition of the taxa collected with the dipnet, an excellent rating was given to this site. Twenty five species out of the 44 collected were indicators of good water quality. Figure 11 shows that overall habitat is not the cause of the lower IBI scores. Habitat in the Elkhart River continues to be some of the best in the watershed.

While it is important to monitor the main stem of the St. Joseph and Elkhart Rivers, it is as important to monitor the tributaries of these streams. This gives the aquatics staff an idea as to why conditions are the way they are in the larger streams. Similar longitudinal views are presented for area tributaries and they can be compared against past conditions.

Juday Creek and Bowman Creek are two tributaries of the St. Joseph River that flow through areas of South Bend. Other than the fact that both streams are heavily impacted by urban influences, these tributaries are quite different. Juday Creek is a cool/cold water stream that is capable of supporting trout, whereas Bowman Creek is much warmer and has severely impaired biological communities.

It was no surprise that the IBI scores for Bowman creek in 2008 were very poor (Figure 12). One of the main causes of the low scores is the fact that

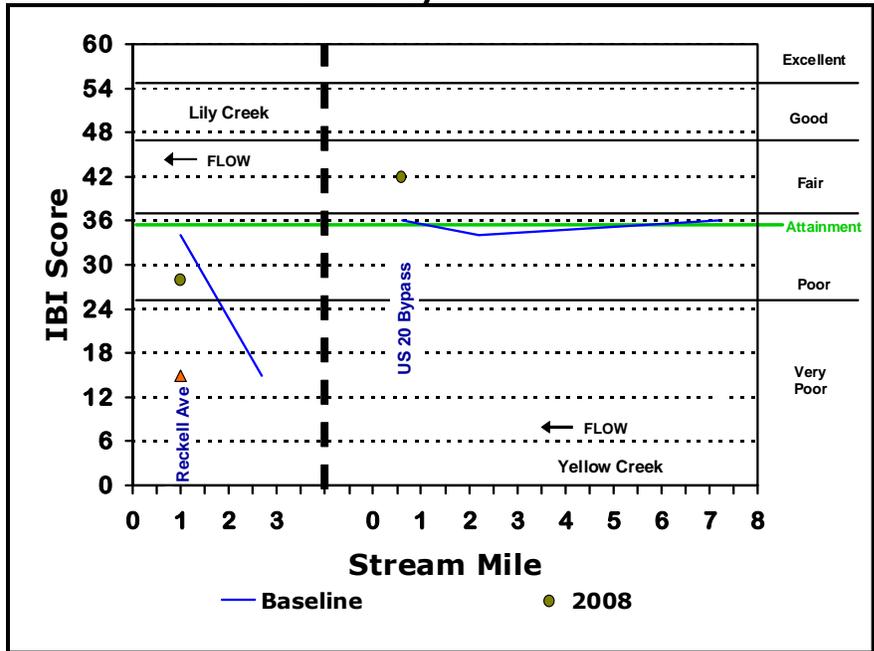
Figure 13: QHEI scores for Bowman Creek and Juday Creek, St. Joseph County



Bowman Creek is a losing stream. This means that the stream loses water as it flows downstream. It is still a mystery as to where all the water goes, although it is believed that some of the flow goes into a storm sewer. Unlike 2007 however, there was adequate flow in Bowman Creek throughout the sampling season. The increased flow did not have an immediate impact on the health of the fish communities. In two sampling events at Studebaker Golf Course, only three fish were collected, resulting in the very low score. The City of South Bend is hoping to improve the flow conditions in Bowman Creek in the future. Having a stable flow regime would allow fish and other aquatic organisms to successfully colonize more sections of the stream. Habitat is also a limiting factor in Bowman Creek (Figure 13). This aspect will need to be enhanced as well, in order to see a positive increase in overall aquatic community health.

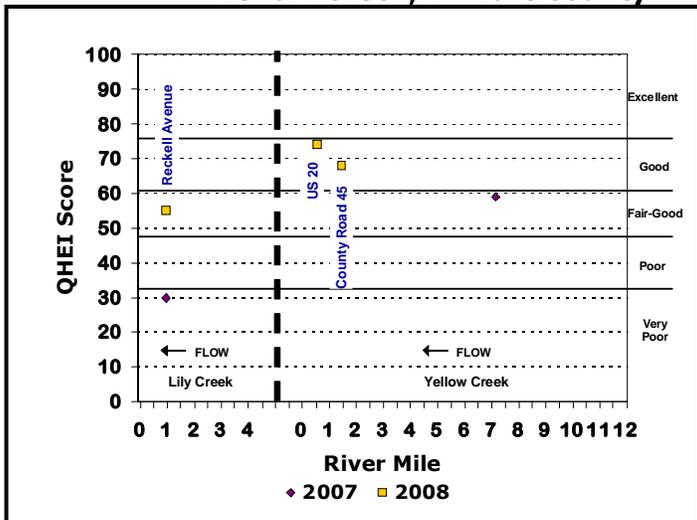
The IBI scores for Juday Creek continued to remain low (Figure 12). However, a positive increase was seen at the Kintz Avenue site. This was the highest score recorded for this site in four sampling years. There is concern from the local property owner at this site that a large hybrid seed corn operation in the headwaters will have an impact on the stream. It may be some time before an impact can be documented. The site at Izaak Walton showed virtually no change since last being sampled 5 years ago. As mentioned in Kring (2008), the current IBI calibration may not

Figure 14: IBI scores for Lily Creek and Yellow Creek, Elkhart County



be the most accurate way to estimate aquatic health in cool/cold water streams. However, when last year's site was scored with a modified cool-water IBI the scores were not significantly different. The original cool-water calibration scored the Kintz Avenue site lower than what was presented in 2007. This shows that Juday Creek may be more impaired than originally thought. Figure 19 shows that the ICI score for Kintz Avenue was in the good range. This score is consistent with the average of the first three years of macroinvertebrate sampling at this site. Figure 13 shows that habitat tends to increase as drainage area increases. The very end of the watershed is within the Izaak Walton reserve and is well protected, thus having the highest QHEI scores.

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



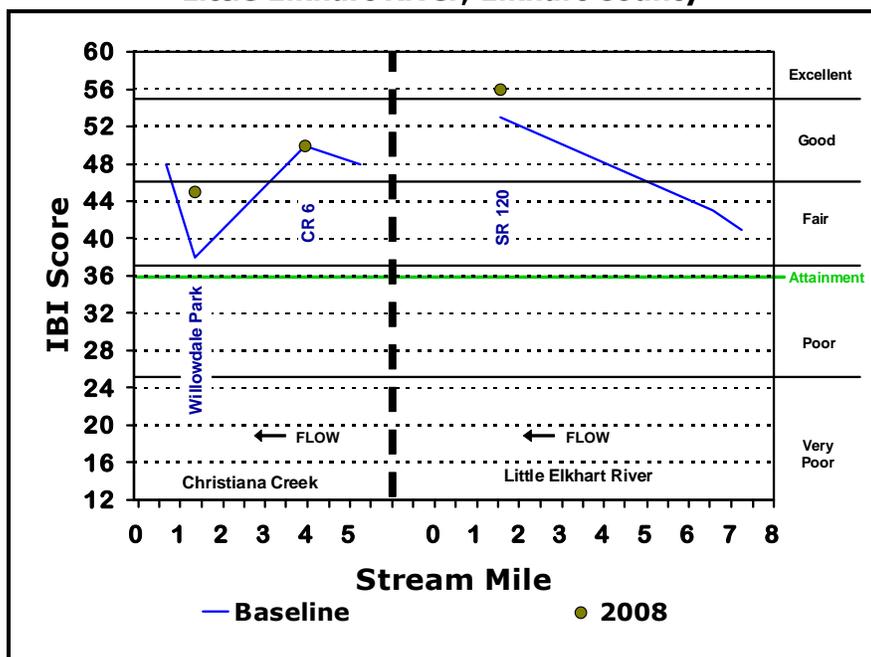
2008 was a positive year for the fish communities in Yellow Creek. Foy (2004) mentioned a major disturbance that took place at the US 20 Bypass site on Yellow Creek. Subsequent sampling at this site showed decreased IBI and QHEI scores attributed to this event (Foy 2004, Foy 2005). Figure 16 shows that IBI scores improved for Yellow Creek in 2008. This was the highest score recorded at this site since 1999. This section of the stream seems to be recuperating from the damage inflicted a few years back. More intolerant species were seen and a more balanced food web was observed. Smallmouth bass are re-colonizing the area, as this species was absent from this site immediately after the disturbance. The ICI score for this site was in the good range for 2008 (Figure 19). Macroinvertebrate monitoring in conjunction with this site was performed upstream at

CR 45 while this site was recuperating from the disturbances. The 2008 score shows no change from those prior samples, but caution must be taken as direct comparisons can not be made since the first three samples were taken slightly upstream. QHEI scores indicate that there is sufficient habitat to support the improving fish populations (Figure 15).

Kring (2008) described the disturbances that have taken place in Lily Creek especially at Reckell Avenue. Figure 14 shows that IBI scores increased in 2008 compared to 2007. Although the IBI increased, it still falls below the established baseline and more importantly the attainment line. It may be unrealistic to hope that this stream can reach its aquatic life use, as this stream is a regulated drain and can be modified at any time. The fact that there was more flow in this stream during the sampling period may have led to increased fish abundance at the Reckell Avenue site. As with the IBI scores, ICI scores for this site remain low (Figure 19). There was an increase in 2008 from 2006 when the ICI score was 12 and improved from poor to fair. As previously mentioned, expectations for this stream are low and the biological indices confirm these expectations. QHEI scores increased in 2008 (Figure 15) as a result of the higher water, allowing more habitat to be accessed by fish.

As usual, Christiana Creek continues to support

Figure 16: IBI scores for Christiana Creek and the Little Elkhart River, Elkhart County



good fish communities (Figure 16). As can be seen in the baseline in Figure 16, the Willowdale Park site has scored quite a bit lower than the other sites. This was due to low numbers of fish collected at the site. In 2008, the highest number of fish were collected at the park since the original sampling in 1998. Although the IBI score at Willowdale Park is still in the fair range, the 2008 average shows a positive increase compared to the original baseline. The fish community at the County Road 6 site has stayed very consistent since original sampling in 2001. An ICI score for the County Road 6 site could not be calculated because the Hester-Dendy sampler was missing. A narrative rating of excellent was given for this site based on the qualitative sample. Twenty of forty taxa collected during the qualitative sampling were intolerant specimens indicating good water quality. As one of only a few un-regulated drains in Elkhart County, Christiana Creek continues to have more than adequate habitat attributes to support successful fish populations (Figure 17). This stream is well buffered from detrimental impacts, especially in the upper parts of the watershed.

The Little Elkhart River supports a good fish community and sampling in 2008 confirmed that fact. Figure 16 reveals that the most downstream site on the Little Elkhart River had excellent fish community conditions. Kring (2006) mentioned that the proximity of this site to the confluence of the Little Elkhart River with the St. Joseph River may have a positive impact on the IBI score due to the influx of large river fish mixing with a more tradi-

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

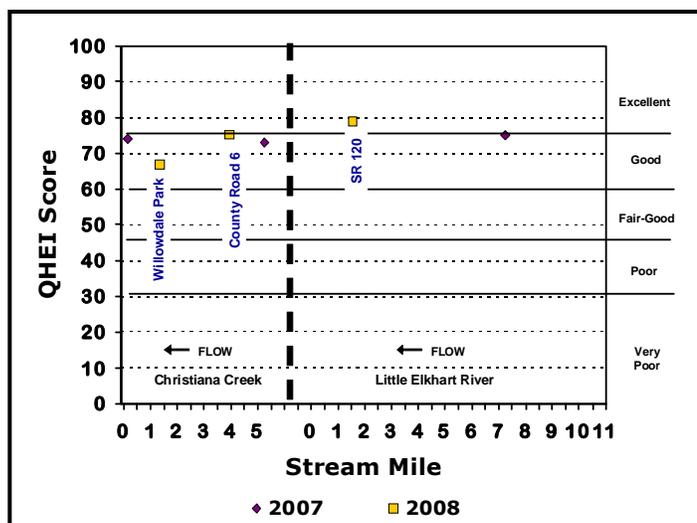
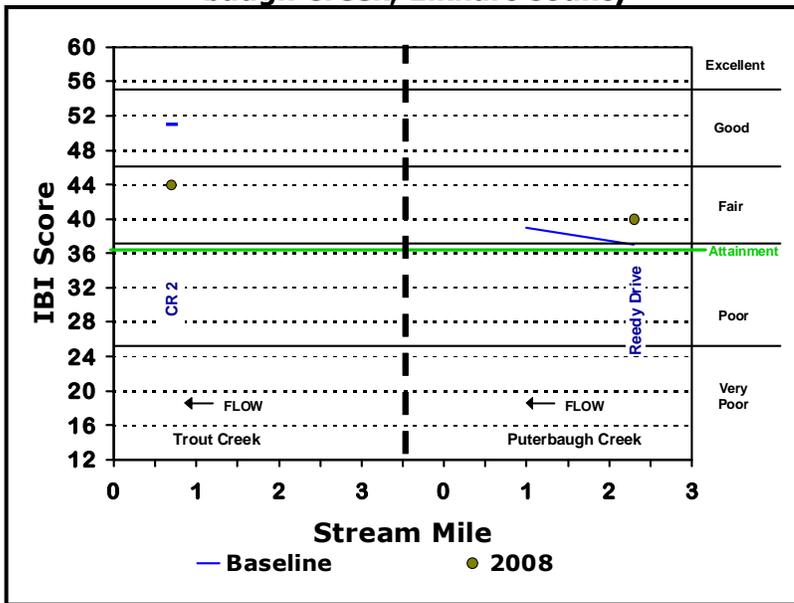


Figure 18: IBI scores for Trout Creek and Puterbaugh Creek, Elkhart County



tional cool-water stream community. As the current IBI calibration is geared more toward warmer streams this may give a slightly inflated integrity score. However, this should not be misconstrued as the only reason that an excellent score was obtained at the SR 120 site. The ICI score for this site was in the good range (Figure 19). This is no surprise because of the substrate and other habitat available where the Hester-Dendy sampler was placed. Seventy five percent of the taxa on the sampler were either mayflies or caddisflies, which are good indicators of water quality. Figure 17 shows that there is more than adequate habitat available at this site to support excellent fish communities.

Trout Creek originates in Michigan and flows south towards the St. Joseph River. The diversity of the fish communities in this stream is influenced by the lakes in which the stream drains. Large numbers of sunfish are found in this stream. Figure 18 shows that the IBI for Trout Creek dips below the baseline. One metric that scored low was number of fish collected. As mentioned, sunfish, bluegill in particular, dominated the catch and accounted for 74% of the fish collected at this site. Although good diversity was observed as far as number of species collected, dominance by one species can lead to low scores for many other IBI metrics. Trout Creek exhibited one of the two excellent ICI scores for 2008 (Figure 19). Fifty-two different taxa colonized the Hester-Dendy sampler and 63 total taxa were collected including the qualitative sample. Only 12 percent of the organisms collected were tolerant individuals showing that the quality of water is high and supports a large diversity of intolerant organisms. The average QHEI

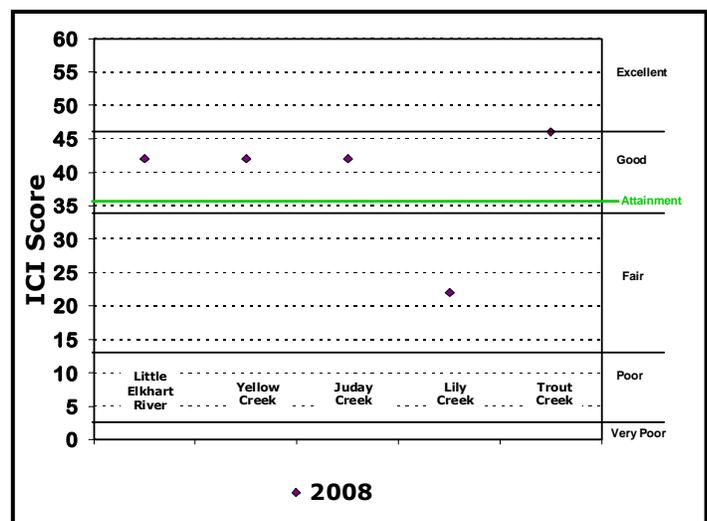
score for Trout Creek was 63 which corresponds to good habitat quality. While the IBI score fell into the fair range, at this time it is not believed to be an immediate cause of concern.

Puterbaugh Creek is another cool-water stream that feeds and then drains Heaton Lake, north of Elkhart. In the lower section, the stream is recharged by ground water springs, keeping the stream consistently cool. Figure 18 shows that the IBI calculated in 2008 for Puterbaugh Creek was just above the established baseline. This is one site in 2008 that scored higher than expected from field observations. The second time this site was sampled there was barely enough water to cover most of the channel. However, Figure 23 displays the fact that there was still enough quality habitat to be used by fish. While the IBI score for 2008

was low, the stream still meets its aquatic life use and maintains fish communities that are not considered impaired. An ICI score for this site was not calculated because the Hester-Dendy sampler was buried in the sediment. A narrative assessment of marginally good was given to this site based on the qualitative sample. One species of interest found at this site was the Chinese Mystery Snail (*Cipangopaludina chinensis malleata*), which is exotic. One specimen was also collected in the Elkhart River.

Pine Creek is yet another cool-water stream in Elkhart County. Figure 20 shows that the IBI score for 2008 is right in line with the baseline, but this value falls below the attainment line. It's possible that the current IBI calculation does not

Figure 19: ICI scores for various streams in the St. Joseph River Watershed

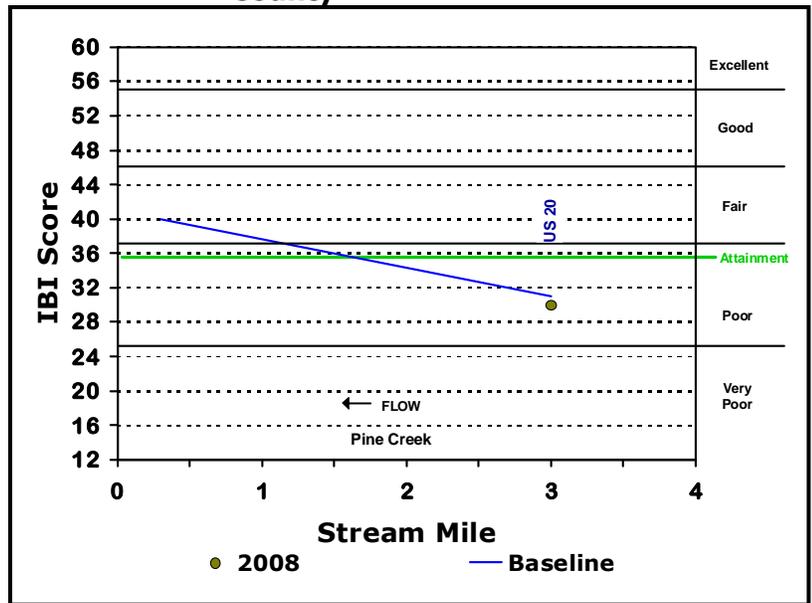


accurately portray the conditions in this stream. The majority of species and total individuals collected at this site are considered cool-water species. The newly calibrated cool-water IBI may reflect a more accurate prediction of fish community condition in this and other small, cooler streams in our area. However, until this new index is formally recognized by IDEM, those scores will not be presented in this report. Figure 21 shows that this section of Pine Creek has very good habitat and can support a diverse fish community. Other water quality variables may be playing a role in the lower IBI scores or it could simply be the fact that the index currently used again, does not reflect accurately the true conditions of the stream.

Baseline work continued in 2008 on three streams in Mishawaka and one in Elkhart. These streams are Eller Ditch, Woodward Ditch, Willow Creek and Baugo Creek. 2008 was the second of three years of original baseline work on these four streams.

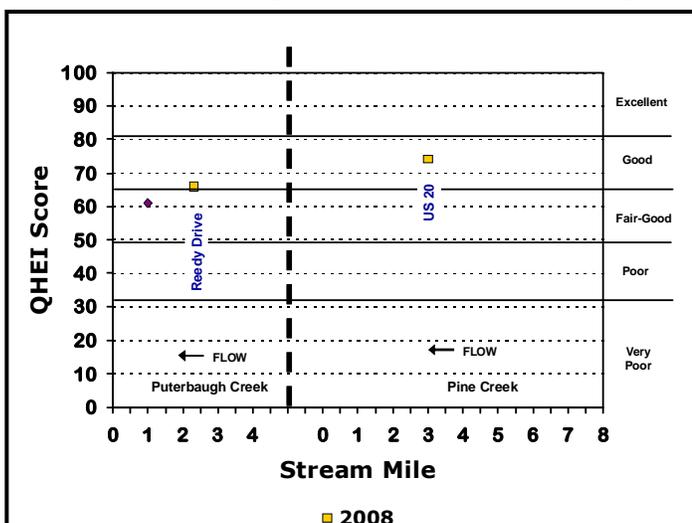
IBI scores for Baugo Creek showed a similar pattern to 2007 (Figure 22). The downstream site at County Road 3 showed slight improvement and was above the attainment line, while the downstream site at County Road 1 again fell below the attainment line. Both sites have large numbers of tolerant species and individuals. The County Road 3 site exhibits slightly more diversity as is to be expected in larger portions of the watershed. There are many rural impacts to this stream especially in the headwater areas. A slight positive sign is that the conditions seem stable for the first

Figure 20: IBI scores for Pine Creek, Elkhart County



two years of intense sampling in this system. Figure 24 shows that QHEI scores follow the same trend that the IBI scores show. This tells us that habitat may be a major influence on the aquatic communities in this stream. Sediment and bank erosion is a problem through out this watershed. ICI scores follow an opposite pattern from the IBI and QHEI scores (Figure 23). Scores for both sites fell below the attainment line and further exemplify that the biotic communities in this stream are severely impaired. This may signal higher chemical inputs downstream in the watershed that would negatively impact the macroinvertebrate community.

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



Willow Creek IBI scores followed the trend set in 2007 (Figure 22). Unlike Baugo Creek however, scores fall from upstream to downstream. Both sites scored nearly the same in 2008 as they did in 2007. While more diversity was seen at the Estates Blvd site, most of the species were tolerant individuals. At Day Road, the majority of individuals collected are not considered to be tolerant. The fish communities in the headwaters of this stream are typical of cool headwater streams in the Midwest (Personal Communications, Dr. Thomas Simon). Figure 23 shows that ICI scores for Willow Creek are low. The sampler set at the Estates Blvd site was buried in the substrate and was not colonized. This site was given a rating of marginally good based on the qualitative sample, falling slightly from the 2007 ICI score. The upstream ICI score fell dramatically from a 30 in 2007 to 18 in 2008. Currently there is no explanation for the fall. Sampling in 2009 may give the aquatics staff a better idea as to which is the true characterization of the macroinvertebrate commu-

Figure 22: IBI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County

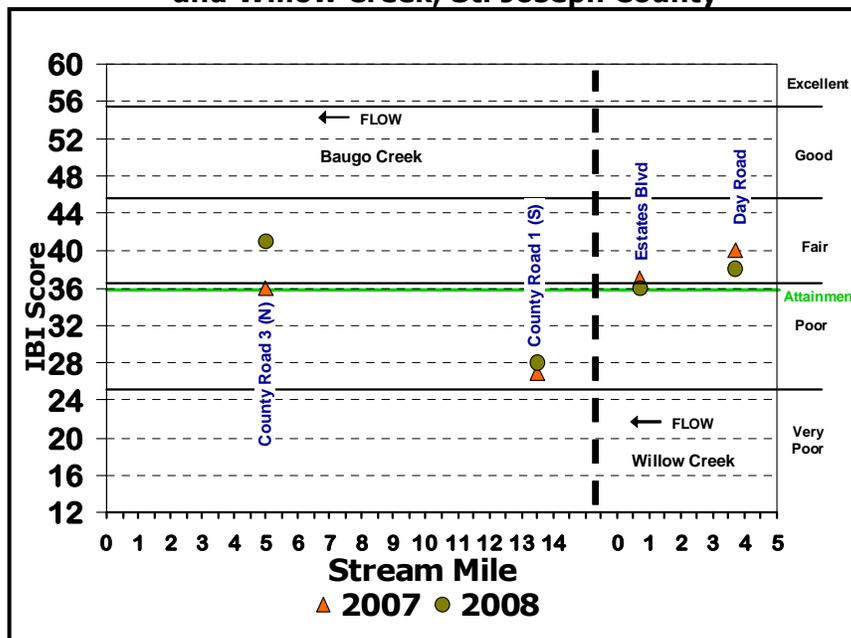
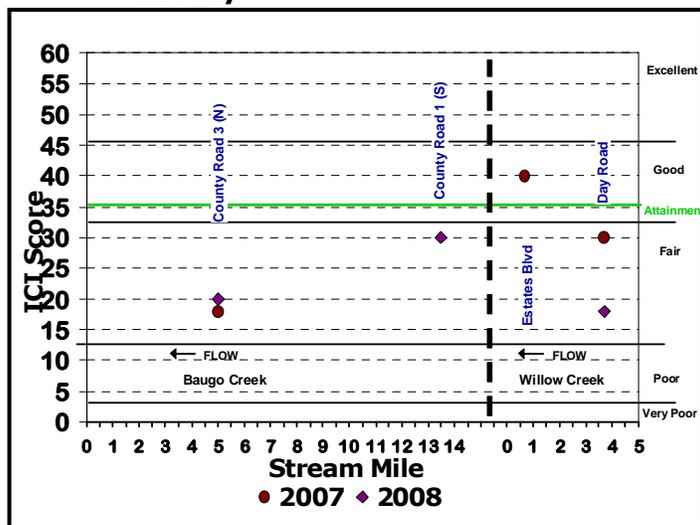


Figure 23: ICI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County



nity. The large presence of in stream vegetation may have provided additional habitat for drifting insects to colonize, thus not colonizing the Hester-Dendy sampler. Habitat scores were similar in 2008 to 2007 (Figure 24). One difference at the Day Road site was the large amount of in stream vegetation. The downstream areas of this stream are heavily impacted by urban disturbances including storm water runoff. This stream can support trout populations, as young trout are frequently captured and adult steelhead are observed migrating up this stream.

Eller Ditch is an extremely cold stream that is influenced greatly by ground water inputs. Figure

25 shows that the fish communities in this stream are extremely impaired. The Lincolnway site saw a slight increase. However, the Bridgeton Drive site fell considerably. Neither site has been above the attainment line in the last two years. As cold as this stream is, it is not expected to support a very diverse fish community. The lower stretches support a resident rainbow trout population. The aquatics staff regularly captures rainbow trout at the Lincolnway site. ICI scores for Eller ditch continue to be low (Figure 26) The sampler at the Bridgeton Drive site was buried in the sand and irretrievable. This site was assigned a rating of fair from the dip net sample. Only 11 taxa were collected from this site. The ICI score at Lincolnway fell slightly and may be attributed to high water and the fact that the sampler was moved downstream

and tipped on its side. QHEI scores improved slightly (Figure 27). Water levels seemed to be higher in 2008, making more habitat available to the fish, although that did not equate to higher IBI scores.

The IBI scores for Woodward Ditch had a remarkable increase in 2008 (Figure 25). The number of species collected doubled in 2008 compared to 2007. It was originally thought that this stream would never have an IBI score above the attainment line. 2009 will prove interesting as to see if this positive increase continues. The ICI score for Woodward Ditch rose slightly and is within insignificant departure from attainment (Figure 26).

Figure 24: QHEI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County

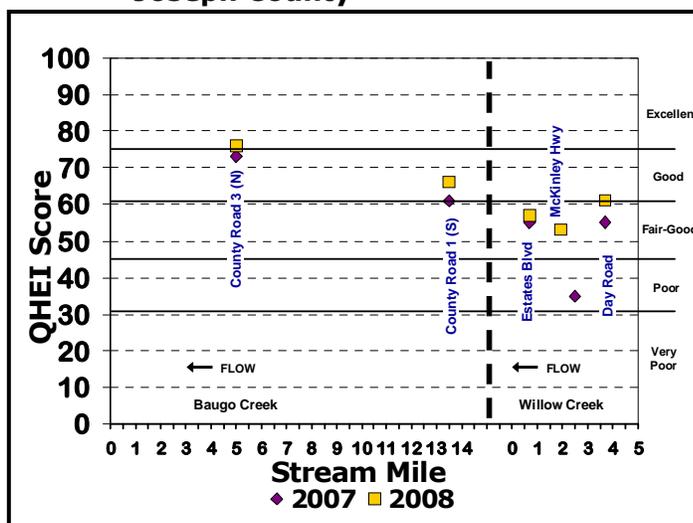
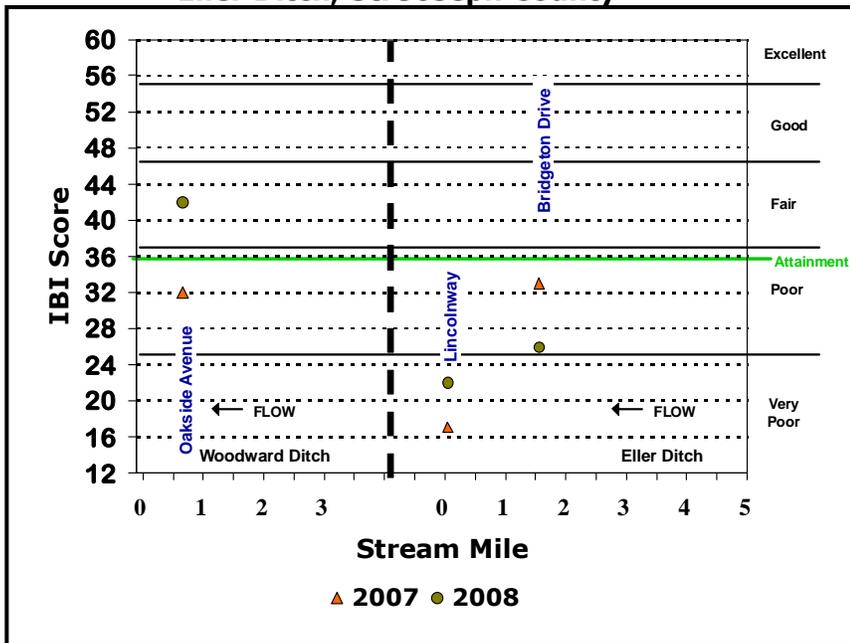


Figure 25: IBI scores for Woodward Ditch and Eller Ditch, St. Joseph County



were tagged during these outings with the largest fish tagged being an 8.5 lb female. Twenty two fish were re-captured in 2008, which more than doubled the number of fish recaptured in 2007.

Four smallmouth bass and one largemouth bass were recaptured in 2008. All four of the smallmouth bass were recaptured at the location that they were originally tagged. One of the smallmouth bass was tagged during the summer of 2005 near Bridge Street in Elkhart and was recaptured 3 years and one day later in the same 500 meter stretch of the St. Joseph River. Two of the four smallmouth bass were recaptured in the Little Elkhart River. One was tagged four years earlier from the same site. The other was originally

QHEI scores were higher in 2008 (Figure 27), again because of higher water levels. There also were lower silt levels in this stream. Woodward Ditch was used to drain retention ponds in late-winter/early-spring and this activity seemed to flush out a lot of the built up sediment in this stream.

Tagging and Movement

Tagging in 2008 only took place during walleye sampling runs with the IDNR. These events happened in the spring through two separate sampling trips near the Johnson Street Dam and Island Park in Elkhart. A total of 29 adult walleye

Figure 27: QHEI scores for Woodward Ditch and Eller Ditch, St. Joseph County

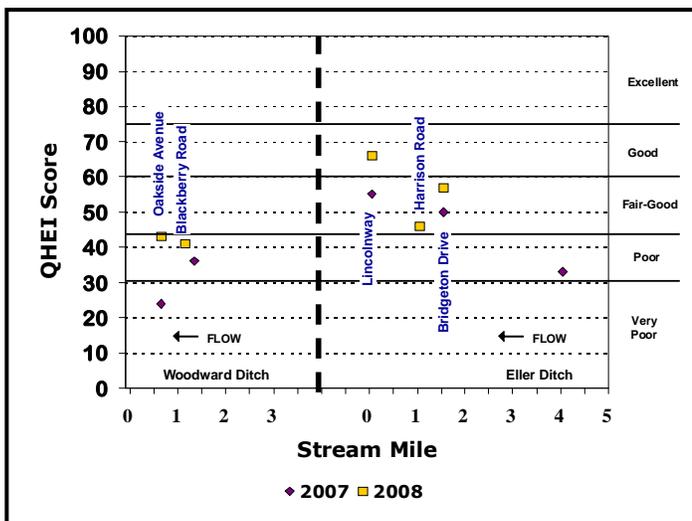
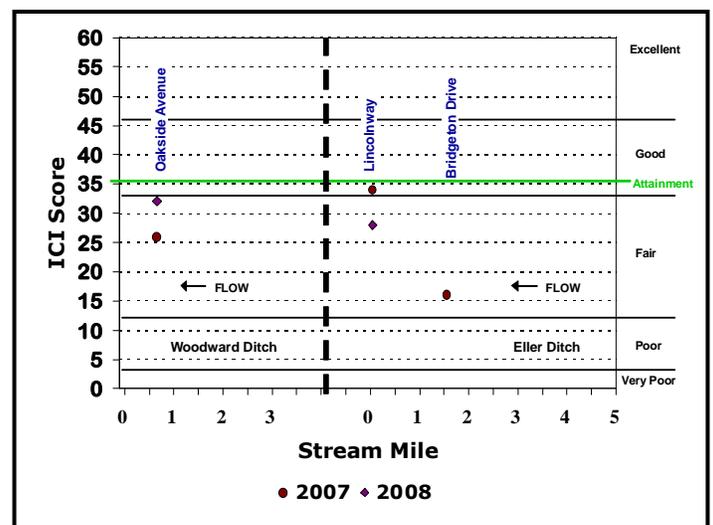


Figure 26: ICI scores for Woodward Ditch and Eller Ditch, St. Joseph County



tagged in 2002 and this was the third time the aquatics staff has recaptured this fish; every time being in the same stretch of the Little Elkhart River. The fourth smallmouth bass recaptured was a most unlikely find. This fish was originally tagged during the summer of 2000 at Willowdale park on Christiana Creek. Eight years later this fish was recaptured at the same location. This fish grew nearly 7 inches and almost quadrupled its weight. This is the greatest time between tagging and recapture recorded by the aquatics staff. The largemouth bass recaptured moved upstream from its tagging location nearly 2 miles. The bass was tagged in 2002 near the Trout Creek mouth on the St. Joseph River north of Bristol. This bass

swam up Trout Creek and was caught by a fisherman in Long Lake in Michigan 6 years after being tagged.

Seventeen walleye were recaptured in 2008. Most of the recaptures occurred at or near the place of tag insertion. However, this does not mean that walleye do not move through out the river system. One walleye that was tagged in late September, 2007, was caught twice in an 11 day span in May, 2008. This fish was tagged near Baugo Bay, caught and released near Johnson Street in Elkhart, then caught again 11 days later at Baugo Bay, completing a near 18 mile round trip in 8 months. Another walleye that was tagged near Johnson Street in March 2008, was recaptured in September 2008, 10.5 miles downstream near the Bittersweet Bridge. One walleye was trying to get away from Elkhart. This fish was tagged near the YMCA in Elkhart and was recaptured nearly 20 miles downstream in South Bend at LaSalle Street. It is unknown how this fish got passed the Twin Branch Dam. One other amazing piece of information from 2008 in regards to recaptured fish happened on April 21st. An area angler caught five of our tagged walleyes during one outing that day. This was the most recaptured fish by one angler in the history of the program.

Fish Tissue

The Indiana FCA for 2008 was similar to the FCA for 2007. In 2008, tissue was collected from fish in both Elkhart and St. Joseph Counties. Collections were based on the current FCA, continuing baseline work for Mishawaka and updating game fish contaminant levels.

As in 2007, 8 species were selected to be sampled for tissue analysis (Appendix B). Four of the eight species were collected at two sites and one species was collected at three sites. Species sampled were bluegill, common carp, golden redhorse, largemouth bass, rock bass, smallmouth bass, steelhead, and walleye. All of these species are on the FCA for the St. Joseph River, but may not be on it for both counties.

Walleye tissue was again collected in St. Joseph County even though it is not on the FCA. Since this species is a well sought after sport fish, the aquatics staff feels it's important to keep anglers informed on the contaminant level in this species. Mercury levels in the walleye were a group 2 and PCB levels were a group 3. As noted by Kring (2008), this species needs to be added to the FCA for St. Joseph County.

Bluegill were also collected for the second straight year in South Bend. The impetus for collecting bluegill was that the grouping of bluegill on the FCA seemed high for PCB levels. Mercury levels for bluegill fell into group 1 and PCB levels into group 2. The FCA has bluegill under 7 inches as a group 3 for PCBs. In 2007, bluegill collected by the aquatics staff were a group 1 for PCBs. Bluegill will again be collected in 2009 to gain more certainty on the actual PCB level.

Common carp were collected from two locations in Mishawaka, at Logan Street and Merrifield Park. Mercury levels fell into group 1 for both samples. PCB levels were a group 3 at Merrifield Park and group 4 at Logan Street. The carp collected at Logan Street averaged six inches longer than the fish collected at Merrifield Park. This could be the reason for higher PCB concentrations. The FCA has carp PCB levels as a group 4.

Golden redhorse tissue was collected at the same two sites that carp tissue was collected. The FCA reports that all sizes of golden redhorse are in the "Do Not Eat" group 5 for PCBs for areas below Twin Branch Dam; however, the results for tissue collected by Elkhart fell into group 2 at Merrifield Park and group 3 at Logan Street. This is the second consecutive year that PCB levels in golden redhorse were well below what is reported in the FCA. Both tissue samples fell into group 2 for mercury.

Largemouth bass tissue was collected from two locations, Pinhook Lagoon in South Bend and Lexington Landing near Elkhart. Mercury and PCB levels for the Elkhart County fish both fell into the group 1 category. For the St. Joseph County fish, mercury was a group 2 and PCBs were a group 1.

Rock bass tissue was collected at both Logan Street and Merrifield Park. Rock bass are not currently on the FCA for areas below Twin Branch Dam. The reason could be that contaminant levels in these fish are low. As in 2007, tissue from both locations were in group 1 from both mercury and PCBs.

Smallmouth bass were collected from three sites; Logan Street and Merrifield Park in Mishawaka and near Bridge Street in Elkhart. Mercury levels were group 1 for both samples from Mishawaka and group 2 for the Elkhart sample. PCB levels differed across all three samples and increased in samples collected further downstream. PCB levels were in group 1 for the Elkhart fish, group 2 for the fish collected at Merrifield Park, and group 3 for the fish collected at Logan Street.

Steelhead were collected near the I80/I90 Toll Road in South Bend. Results for these fish were similar to 2007. Mercury levels were group 1 and PCB levels were in group 3. PCB levels are the same on the FCA.

Conclusion

Long-term biological monitoring in the Indiana portion of the St. Joseph River watershed continues to provide us with valuable information on the condition of the aquatic communities inhabiting our area waterways. 2008 marked the second year of sampling in and around the City of Mishawaka. Baseline work for this area will continue in 2009, as will baseline work on Baugo Creek.

IBI scores for the St. Joseph River ranged from fair to excellent in 2008 and closely followed the established baselines. The Toll Road site north of Bristol received an excellent rating. IBI scores for sites sampled in Mishawaka dropped slightly. Downstream areas in South Bend continue to show the fish community condition improves as the river heads north towards Michigan. QHEI scores follow a similar trend that the IBI scores do throughout the watershed. ICI scores for the St. Joseph River were either good or excellent and generally follow the IBI trend through out the Indiana stretch of the river.

In 2008, IBI scores for the Elkhart showed a decline throughout the sample area. In town sites had just a slight decrease from the baseline, while upstream sites showed a more severe drop. The Oxbow Park site has continued to fall the past two years. Activities upstream of the park may be the cause for this drop in biological integrity. These upstream activities seem to be having detrimental impacts further downstream as both the Oxbow Park and Hively Avenue site received their lowest IBI scores since the beginning of the program. Overall habitat scores remained good; however, sedimentation seems to be an issue in this stretch of the stream. ICI scores improved in the Elkhart River from 2007. One sampler was lost and an excellent rating was given to the site. The other sites where an ICI was calculated received good evaluations.

Sampling for 2008 in Bowman Creek continued to be disappointing as IBI scores stayed in the very poor range. The first of two sampling runs at Studebaker Golf Course yielded no fish and only three individuals were collected during the second. This streams loses water as it flows downstream and is heavily impacted by urban influences including flowing underground. Habitat scores re-

main low and contribute to the low fish diversity.

Sites sampled in Juday Creek for 2008 showed quite different results. The most downstream site showed virtually no change since being sampled five years ago. The other site sampled showed a dramatic increase in IBI score and nearly reached the attainment line. This was the highest recorded IBI for this site in the four years it has been sampled. QHEI scores fell into the good range, showing that there is adequate habitat to support healthy aquatic communities. The ICI score at Kintz Avenue was very good and did not change from the baseline data collected from 2004-2006.

IBI scores for Yellow Creek are becoming increasingly unpredictable. In 2006, scores were up, in 2007 scores were down, and in 2008 scores were up again. The site sampled in 2008 had its highest IBI scores since 1999. A major disturbance took place at this site five years ago and the site finally seems to be recovering. More intolerant species are being captured and there is a more balanced food chain being observed. The ICI score for 2008 was very good and shows that the downstream section of Yellow Creek is continuing to recover. Habitat scores indicate that there is plenty of quality habitat to support good fish communities.

In 2008, a positive increase in IBI score was seen for Lily Creek. The site sampled in 2007, was sampled in 2008. The IBI increased by 13 points in 2008. Water levels were higher in 2008 and a more diverse fish community was sampled. While the scores are still low, the site is close to original baseline levels. The ICI score for the Reckell Avenue site increased over very low scores in 2005 and 2006. Habitat scores increased as more habitat was available due to the higher water levels.

Two sites were sampled in Christiana Creek in 2008. IBI scores for the upstream site maintained the status quo and the downstream site saw a large increase from the baseline score. Number of individuals collected at the downstream site was the largest ever recorded for the site. No ICI was calculated for the County Road 6 site because the sampler was missing; however a rating of excellent was given based on the qualitative sample taken. This stream continues to maintain a very high quality in our area. Habitat in Christiana Creek is some of the best in the watershed.

The Little Elkhart River continues to shine as one

of the best quality tributary streams in the St. Joseph River watershed. The site sampled in 2008 received an excellent rating, the second such rating giving to this site in the last five years. The fish community at this site is heavily influenced by its proximity to the St. Joseph River. A cool-water index may score this site a bit lower because of the number of warm-water species. A very good ICI score was calculated for the Little Elkhart River in 2008. This was not a surprise based on fish and habitat scores. QHEI scores for this stream continue to be good and there is plenty of habitat available to support a diverse aquatic community.

The IBI for Trout Creek fell in 2008. This is not a cause for concern as diversity was very high. The overall catch was dominated by bluegill and dominance by one species will lower certain metrics. This stream does not seem to have any major impacts other than good recruitment by bluegill and possibly a lack of predators. ICI scores for Trout Creek were high and in the excellent range. There was a very high diversity of quality macroinvertebrates. Habitat scores were again high for this stream with a lot of in-stream cover for sunfish to hide.

IBI scores for Puterbaugh Creek showed a slight increase in 2008. This was a bit surprising because water levels were low in the headwaters of this stream. This section of the stream is well buffered with a wide, forested riparian zone. An ICI score was not calculated for this stream because the Hester-Dendy sampler was buried. A rating of marginally good was given for the macroinvertebrate community. Habitat scores fell into the good range even with low water levels.

The Pine Creek IBI score fell just below the baseline in 2008. This site routinely scores below the attainment line. The current IBI may not accurately portray the true biological integrity of this stream. Most species are considered cool-water in this stream. Habitat scores were very good for this section of Pine Creek, showing that this stream can support diverse fish communities.

Two sites were again sampled in Baugo Creek in 2008. There was a slight jump in the IBI score at the upstream site and a larger jump at the downstream site. The upstream site is still below the attainment line. The majority of the fish species collected are tolerant. ICI scores for Baugo Creek are higher in the upstream section compared to the downstream section. Both scores fall below the attainment line. Habitat scores remain in the good range, but sediment and siltation is still a problem in this stream.

Willow Creek was sampled at two sites in 2008. IBI scores for both sites remained virtually the same as 2007. This stream is cool and does not support as diverse a community as warmer streams do. Only one ICI score was calculated in 2008. The sampler set at the downstream site was buried and the site received marginally good rating. The ICI score at the upstream site fell drastically and may be a cause for concern. QHEI scores remained in the fair-good range, adequate enough to support a healthy fish community.

IBI scores for both sites on Eller Ditch fell well below the attainment line in 2008. The downstream site increased slightly while the upstream site fell even lower than 2007. This stream is extremely cold and is not expected to have much diversity. However, a different index would not show improved scores because there just are not many fish in this stream. ICI scores were low for Eller Ditch. The sampler at the upstream site was buried and a rating of fair was given to that site. The ICI at the downstream site fell slightly. Habitat scores suggest there is enough habitat to sustain fish populations.

The IBI score for Woodward Ditch surprisingly increased in 2008. The stream is now currently meeting its aquatic life usage standard as the IBI score was above attainment line. The ICI score for Woodward Ditch improved and is also considered to be within attainment. Habitat scores also rose, but are still low.

In 2008, a total of 29 walleye were tagged and 22 fish were recaptured including 17 walleye, 4 smallmouth bass and 1 largemouth bass. None of the smallmouth bass showed any movement, however, one of the bass was recaptured 8 years after being tagged. The lone largemouth bass recaptured swam out of the St. Joseph River, up Trout Creek and was caught by a fisherman in Long Lake in Michigan. Most of the walleye were recaptured at the location they were tagged. One walleye made a round trip of 18 miles from Baugo Bay to Johnson Street in Elkhart and back again. Another walleye was tagged near the YMCA in Elkhart and traveled almost 20 miles downstream to South Bend before being caught near LaSalle Street.

Tissue samples were collected from 8 species of fish in 2008 to be analyzed for PCBs and mercury. This information is used to supplement to Indiana FCA. Bluegill were collected near Angela Blvd in South Bend and were in group 1 for mercury and group 2 for PCBs. Common carp were collected at Logan Street and Merrifield Park in Mishawaka.

Carp at both locations were in group 1 for Mercury, while the Logan Street fish were group 4 for PCBs and the Merrifield Park fish were group 3 for PCBs. Golden redhorse were collected from the same sites as the carp. Both samples of golden redhorse were group 2 for mercury. The Logan Street redhorse were group 3 for PCBs and the Merrifield Park redhorse were group 2. Large-mouth bass were collected from Pinhook Lagoon in South Bend and Lexington Landing near Elkhart. Both sets of tissue were group 1 for PCBs. The Elkhart fish were group 1 for mercury and the South Bend fish were group 2. Rock bass were collected from the same sites as the carp and redhorse. Both sets were group 1 for both mercury and PCBs. Smallmouth bass were also collected at the same sites as the rock bass and also near Bridge Street in Elkhart. The bass collected in Mishawaka were group 1 for mercury, while the Elkhart bass were group 2. PCB levels for smallmouth bass were group 1 for the Elkhart fish, group 2 for fish at Merrifield Park and group 3 for fish at Logan Street. Steelhead were collected near Darden Road in South Bend. These fish were group 1 for mercury and group 3 for PCBs. Walleye tissue was collected near Angela Blvd in South Bend. Mercury levels were group 2 and PCB levels were group 3.

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

A special thanks go to the administration and support staff of Elkhart's Public Works & Utilities for their continued assistance and support of this program and their true dedication to the environment. Individuals that made a significant contribution to the program are: Lynn Brabec, Joe Foy, Laura Kolo, Mark Salee, Sarah Hudson, Barry Abell, Jason Able, Matt Heineman, Travis Meyer, Ronda DeCaire, Megan Kolaczyk, and Angie Banet.

Thanks are also extended to local groups such as the Michiana Walleye Association, the Indiana Bank Anglers Club, The Elkhart River Alliance, and The Friends of the St. Joe River. These groups help reinforce the fact that our aquatic resources are worth preserving.

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SUMMER 2008



A Goldfish



Summer Crew (L-R): Andrew, Aaron, Matt and Len
Not pictured: Nick



A Greater Redhorse



Andrew with Channel Catfish and
Len with dogfish (bowfin)



Matt with Longnose Gar



Andrew with large Northern Pike



Len with big Largemouth Bass

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

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							
Bluegill							
2008	Angela Blvd	6.4 - 6.8	Up to 7	1	2	2	3
Common Carp							
2008	Merrifield Park	22.4 - 24.9	< 20	1	2	3	4
2008	Logan Street	28.7 - 29.7	≤ 20	1	2	4	4
Golden Redhorse							
2008	Merrifield Park	17.9 - 19.1	All	2	2	2	5
2008	Logan Street	17.2 - 18.0	All	2	2	3	5
Largemouth Bass							
2008	Lexington Landing	11.6 - 12.6	NA	1	2	1	2
2008	Pinhook Lagoon	14.2 - 15.2	NA	2	2	1	2
Rock Bass							
2008	Merrifield Park	7.8 - 8.2	NA	1	2	1	2
2008	Logan Street	6.2 - 6.5	NA	1	2	1	2
Smallmouth Bass							
2008	Bridge Street	11.1 - 12.2	NA	2	2	1	2
2008	Merrifield Park	13.8 - 14.9	9+	1	2	2	3
2008	Logan Street	12.8 - 14.2	9+	1	2	3	3
Steelhead (Lake Michigan run Rainbow Trout)							
2008	Darden Road	28.9 - 31.2	25 - 31	1	2	3	3
Walleye							
2008	Angela Blvd	16.5 - 17.1	NA	2	2	3	2

Appendix C

Summary of fish collected by county, 2008

Summary of species captured at index sites in Elkhart County, 2008

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
White Sucker	2,007	10.53	193,438	426.5	13.20
Rock Bass	1,853	9.72	129,051	284.5	8.81
Stoneroller, Central	1,462	7.67	10,812	23.8	0.74
Smallmouth Bass	1,422	7.46	145,738	321.3	9.95
Bluegill	1,279	6.71	34,507	76.1	2.36
Mimic Shiner	1,138	5.97	1,876	4.1	0.13
Creek Chub	1,079	5.66	19,362	42.7	1.32
Striped Shiner	1,042	5.47	18,293	40.3	1.25
Bluntnose Minnow	861	4.52	3,436	7.6	0.23
Hornyhead Chub	856	4.49	26,904	59.3	1.84
Common Shiner	626	3.28	9,068	20.0	0.62
Longear Sunfish	616	3.23	24,024	53.0	1.64
Blacknose Dace	552	2.90	2,397	5.3	0.16
Johnny Darter	498	2.61	693	1.5	0.05
Northern Hog Sucker	495	2.60	113,733	250.7	7.76
Golden Redhorse	448	2.35	234,748	517.5	16.02
Mottled Sculpin	309	1.62	1,173	2.6	0.08
Spotfin Shiner	258	1.35	928	2.0	0.06
Logperch	230	1.21	2,117	4.7	0.14
Green Sunfish	177	0.93	3,320	7.3	0.23
Shorthead Redhorse	170	0.89	84,076	185.4	5.74
Longnose Dace	152	0.80	640	1.4	0.04
Sand Shiner	142	0.74	417	0.9	0.03
Rainbow Darter	138	0.72	246	0.5	0.02
Largemouth Bass	119	0.62	28,356	62.5	1.94
Silverjaw Minnow	112	0.59	356	0.8	0.02
Rosyface Shiner	111	0.58	139	0.3	0.01
Yellow Bullhead	100	0.52	9,197	20.3	0.63
Grass Pickerel	82	0.43	2,058	4.5	0.14
River Chub	81	0.42	1,466	3.2	0.10
Steelcolor Shiner	79	0.41	284	0.6	0.02
Central Mudminnow	71	0.37	303	0.7	0.02
Chestnut Lamprey	62	0.33	686	1.5	0.05
Blackside Darter	62	0.33	197	0.4	0.01
Silver Redhorse	45	0.24	69,548	153.3	4.75
River Redhorse	40	0.21	108,596	239.4	7.41
Pumpkinseed	39	0.20	986	2.2	0.07
Black Crappie	27	0.14	3,774	8.3	0.26
Common Carp	26	0.14	105,486	232.6	7.20
Redear Sunfish	24	0.13	1,173	2.6	0.08
Spotted Sucker	22	0.12	8,874	19.6	0.61
American Brook Lamprey	19	0.10	109	0.2	0.01
Orangethroat Darter	18	0.09	23	0.1	0.00
Fathead Minnow	15	0.08	43	0.1	0.00
Black Redhorse	13	0.07	11,902	26.2	0.81
Bowfin	11	0.06	16,536	36.5	1.13
Hybrid Sunfish	11	0.06	746	1.6	0.05
Greater Redhorse	10	0.05	15,835	34.9	1.08
Stonecat	7	0.04	297	0.7	0.02
Longnose Gar	6	0.03	1,733	3.8	0.12
Channel Catfish	4	0.02	5,963	13.1	0.41
Northern Pike	4	0.02	2,382	5.3	0.16
Yellow Perch	4	0.02	145	0.3	0.01
Greenside Darter	4	0.02	16	0.0	0.00
Brook Silverside	4	0.02	10	0.0	0.00
Gizzard Shad	3	0.02	972	2.1	0.07
Black Bullhead	3	0.02	410	0.9	0.03
Warmouth	3	0.02	69	0.2	0.00
Quillback	2	0.01	3,200	7.1	0.22
Walleye	2	0.01	892	2.0	0.06
Brown Bullhead	2	0.01	730	1.6	0.05
Tadpole Madtom	2	0.01	22	0.0	0.00
Spotted Gar	1	0.01	600	1.3	0.04
Brown Trout	1	0.01	80	0.2	0.01
Sub-Total	19,061	100	1,465,191	3,230.1	100

Summary of species captured at investigative sites in Elkhart County, 2008

Common Name	Total Number	% by Number
White Sucker	262	18.56
Creek Chub	246	17.42
Johnny Darter	121	8.57
Smallmouth Bass	107	7.58
Golden Redhorse	85	6.02
Common Shiner	77	5.45
Rock Bass	75	5.31
Bluegill	72	5.10
Bluntnose Minnow	47	3.33
Stoneroller, Central	45	3.19
Mimic Shiner	35	2.48
Striped Shiner	28	1.98
Largemouth Bass	27	1.91
Central Mudminnow	24	1.70
Hornyhead Chub	18	1.27
Green Sunfish	17	1.20
Spotted Sucker	15	1.06
Logperch	11	0.78
Longear Sunfish	10	0.71
Yellow Bullhead	9	0.64
Mottled Sculpin	9	0.64
Silver Redhorse	9	0.64
Shorthead Redhorse	7	0.50
Common Carp	6	0.42
Chestnut Lamprey	6	0.42
Silverjaw Minnow	5	0.35
Grass Pickerel	5	0.35
Rainbow Darter	5	0.35
Spotfin Shiner	5	0.35
Yellow Perch	4	0.28
Pumpkinseed	3	0.21
Redear Sunfish	3	0.21
Black Redhorse	2	0.14
American Brook Lamprey	2	0.14
Blackside Darter	2	0.14
Steelcolor Shiner	1	0.07
Black Crappie	1	0.07
Blacknose Dace	1	0.07
Bowfin	1	0.07
Northern Pike	1	0.07
Orangethroat Darter	1	0.07
Northern Hog Sucker	1	0.07
Walleye	1	0.07
Sub-Total	1,412	100

Index Sites	19,061
Investigative Sites	1,412
Elkhart County Total	20,473

Summary of species captured at index sites in St. Joseph County, 2008

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Longear Sunfish	1,435	19.27	48,894	107.8	3.73
Smallmouth Bass	803	10.78	103,860	229.0	7.92
Rock Bass	770	10.34	48,964	107.9	3.73
Creek Chub	690	9.27	8,633	19.0	0.66
Golden Redhorse	507	6.81	280,385	618.1	21.38
Blacknose Dace	495	6.65	2,435	5.4	0.19
Mottled Sculpin	344	4.62	1,992	4.4	0.15
White Sucker	309	4.15	62,468	137.7	4.76
Johnny Darter	303	4.07	444	1.0	0.03
Rainbow Trout	220	2.95	27,873	61.4	2.13
Bluegill	189	2.54	5,134	11.3	0.39
Shorthead Redhorse	164	2.20	113,936	251.2	8.69
Mimic Shiner	159	2.14	301	0.7	0.02
Bluntnose Minnow	144	1.93	339	0.7	0.03
Spotted Sucker	89	1.20	34,552	76.2	2.63
Northern Hog Sucker	72	0.97	23,675	52.2	1.81
Quillback	69	0.93	91,600	201.9	6.98
Spotfin Shiner	68	0.91	275	0.6	0.02
Pumpkinseed	67	0.90	3,178	7.0	0.24
Green Sunfish	58	0.78	801	1.8	0.06
Common Carp	55	0.74	262,740	579.2	20.03
Logperch	51	0.68	801	1.8	0.06
Largemouth Bass	46	0.62	15,071	33.2	1.15
Yellow Bullhead	43	0.58	6,042	13.3	0.46
Black Redhorse	37	0.50	22,624	49.9	1.73
Silver Redhorse	31	0.42	63,850	140.8	4.87
Rainbow Darter	27	0.36	81	0.2	0.01
Brown Bullhead	25	0.34	7,676	16.9	0.59
Hybrid Sunfish	24	0.32	514	1.1	0.04
Spottail Shiner	22	0.30	27	0.1	0.00
Walleye	20	0.27	23,620	52.1	1.80
Blackside Darter	19	0.26	27	0.1	0.00
River Redhorse	13	0.17	26,510	58.4	2.02
Greater Redhorse	11	0.15	8,597	19.0	0.66
Chestnut Lamprey	11	0.15	146	0.3	0.01
Brown Trout	10	0.13	152	0.3	0.01
Central Mudminnow	10	0.13	68	0.1	0.01
Longnose Gar	7	0.09	993	2.2	0.08
Steelcolor Shiner	6	0.08	17	0.0	0.00
Redear Sunfish	5	0.07	244	0.5	0.02
Greenside Darter	5	0.07	3	0.0	0.00
Warmouth	3	0.04	74	0.2	0.01
Channel Catfish	2	0.03	8,161	18.0	0.62
Northern Pike	2	0.03	1,843	4.1	0.14
Gizzard Shad	2	0.03	1,100	2.4	0.08
Black Crappie	2	0.03	382	0.8	0.03
Goldfish	1	0.01	328	0.7	0.03
Striped Shiner	1	0.01	22	0.0	0.00
Grass Pickerel	1	0.01	4	0.0	0.00
Sub-Total	7,447	100	1,311,456	2,891.2	100

Summary of species captured at investigative sites in St. Joseph County, 2008

Common Name	Total Number	% by Number
Creek Chub	337	15.54
White Sucker	218	10.06
Blacknose Dace	192	8.86
Common Carp	169	7.80
Longear Sunfish	145	6.69
Rock Bass	132	6.09
Bluegill	116	5.35
Stoneroller, Central	100	4.61
Smallmouth Bass	82	3.78
Mottled Sculpin	70	3.23
Largemouth Bass	68	3.14
Common Shiner	59	2.72
Golden Redhorse	50	2.31
Spotfin Shiner	43	1.98
Fathead Minnow	38	1.75
Johnny Darter	37	1.71
Green Sunfish	35	1.61
Gizzard Shad	34	1.57
Pumpkinseed	33	1.52
Bluntnose Minnow	30	1.38
Redear Sunfish	24	1.11
Logperch	18	0.83
Rainbow Trout	17	0.78
Hybrid Sunfish	16	0.74
Striped Shiner	15	0.69
Silverjaw Minnow	12	0.55
Spotted Sucker	12	0.55
Yellow Bullhead	10	0.46
Warmouth	8	0.37
Steelcolor Shiner	8	0.37
Quillback	7	0.32
Shorthead Redhorse	7	0.32
Silver Redhorse	5	0.23
Central Mudminnow	3	0.14
Pirate Perch	3	0.14
Brown Bullhead	2	0.09
Banded Killifish	2	0.09
Black Crappie	2	0.09
Emerald Shiner	2	0.09
Golden Shiner	1	0.05
Greenside Darter	1	0.05
Brown Trout	1	0.05
Brook Silverside	1	0.05
Bowfin	1	0.05
Northern Pike	1	0.05
Blackside Darter	1	0.05
Sub-Total	2,168	100

Index Sites	7,447
Investigative Sites	2,168
St. Joseph County Total	9,615



Appendix D

**Summary of fish collected by site, 2008
(Reference Table 2 for site numbers and locations)**

STREAM	St. Joseph River, Elkhart County						
	1		2		3	4	
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass
~American Brook Lamprey			X	X			X
#Black Bullhead						X	X
Black Crappie	X	X	X	X	X	X	X
~Black Redhorse	X	X	X	X	X		
Blackside Darter	X	X	X	X	X	X	X
Bluegill	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X	X
Bowfin	X	X	X	X		X	
Brook Silverside							X
Brown Bullhead			X				X
#Channel Catfish				X		X	
Chestnut Lamprey	X	X	X	X	X		
#Common Carp				X	X	X	X
Common Shiner		X	X	X		X	
#Gizzard Shad							X
Golden Redhorse	X	X	X	X	X	X	X
Grass Pickerel				X		X	X
~Greater Redhorse						X	X
#Green Sunfish	X			X		X	X
Greenside Darter	X	X					X
~Hornyhead Chub	X	X		X			X
Hybrid Sunfish			X			X	
Johnny Darter	X		X	X			X
Largemouth Bass	X	X	X	X	X	X	X
Logperch	X	X	X	X	X	X	X
Longear Sunfish	X	X	X	X	X	X	X
#Longnose Gar				X		X	
~Mimic Shiner	X	X	X	X	X	X	X
Northern Hog Sucker	X	X	X	X	X	X	X
Northern Pike	X			X			
Orangethroat Darter			X				
Pumpkinseed	X				X	X	X
#Quillback						X	
Rainbow Darter	X		X			X	
Redear Sunfish		X		X	X		
~River Redhorse	X	X	X	X		X	X
Rock Bass	X	X	X	X	X	X	X
~Rosyface Shiner	X		X			X	
Shorthead Redhorse	X	X	X	X	X	X	X
Silver Redhorse	X	X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X		X	X	X
Spotted Sucker	X	X	X	X	X	X	X
Steelcolor Shiner	X			X	X	X	X
Striped Shiner	X	X	X	X	X	X	X
Walleye		X			X	X	
#White Sucker		X	X	X	X	X	X
Yellow Bullhead	X	X		X	X	X	X
Yellow Perch					X	X	

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STREAM	St. Joseph River, Mishawaka Area					
	5	6	7		8	
			1st Pass	2nd Pass	1st Pass	2nd Pass
Site Number						
Banded Killifish	X					
Black Crappie		X	X			
Blackside Darter		X		X		
Bluegill	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X		
Bowfin	X					
Brook Silverside		X				
Brown Bullhead	X				X	
Chestnut Lamprey					X	
#Common Carp	X	X	X	X	X	X
Common Shiner	X	X				
Emerald Shiner		X				
#Gizzard Shad	X					
Golden Redhorse	X	X	X	X	X	X
~Greater Redhorse						X
#Green Sunfish		X	X		X	X
Greenside Darter		X		X		
Hybrid Sunfish		X	X			X
Johnny Darter				X		
Largemouth Bass	X	X	X	X	X	X
Logperch	X	X		X		
Longear Sunfish	X	X	X	X	X	X
Northern Hog Sucker				X	X	
Pumpkinseed	X	X	X	X	X	
#Quillback	X	X	X	X	X	X
Rainbow Darter				X		
Rainbow Trout			X		X	X
~River Redhorse			X		X	X
Rock Bass	X	X	X	X	X	X
Shorthead Redhorse		X	X	X	X	X
Silver Redhorse	X		X		X	
Smallmouth Bass	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X		X
Spottail Shiner				X		
Spotted Sucker	X				X	X
Steelcolor Shiner		X	X	X		
Striped Shiner		X				
Walleye					X	X
#White Sucker	X	X	X	X	X	X
Yellow Bullhead		X	X	X		X

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STREAM	St. Joseph River, South Bend Area							
	9		10		11		12	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
Black Crappie						X		
~Black Redhorse	X				X	X	X	X
Blackside Darter				X		X		X
Bluegill	X	X	X	X	X	X	X	X
#Bluntnose Minnow	X			X	X	X	X	X
Brown Bullhead	X	X	X	X				
#Channel Catfish					X	X		
Chestnut Lamprey						X	X	X
#Common Carp	X	X			X		X	X
#Gizzard Shad		X						
Golden Redhorse	X	X	X	X	X	X	X	X
#Goldfish							X	
~Greater Redhorse	X	X	X	X				X
#Green Sunfish		X	X	X		X	X	
Greenside Darter				X		X		
Hybrid Sunfish		X		X			X	
Largemouth Bass		X	X	X		X	X	X
Logperch		X			X	X	X	X
Longear Sunfish	X	X	X	X	X	X	X	X
#Longnose Gar				X	X		X	
~Mimic Shiner	X					X		X
Northern Hog Sucker	X	X			X	X	X	X
Northern Pike	X				X			
Pumpkinseed	X	X	X	X		X	X	X
#Quillback	X	X	X	X	X	X	X	X
Rainbow Darter		X				X		X
Rainbow Trout	X				X		X	X
Redear Sunfish						X	X	X
~River Redhorse		X			X	X		
Rock Bass	X	X	X	X	X	X	X	X
Shorthead Redhorse	X	X			X	X	X	X
Silver Redhorse	X	X	X	X	X	X	X	
Smallmouth Bass	X	X	X	X	X	X	X	X
Spotfin Shiner	X				X	X		X
Spottail Shiner				X		X		
Spotted Sucker	X	X	X	X	X	X	X	X
Steelcolor Shiner						X		
Striped Shiner								X
Walleye		X			X	X	X	X
Warmouth							X	X
#White Sucker	X	X	X	X			X	X
Yellow Bullhead	X	X	X	X		X	X	X

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STREAM	Trout Creek		Little Elkhart River		Mather Ditch	Pine Creek	
Site Number	13		14		15	16	
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass
~American Brook Lamprey				X			
~Black Redhorse			X				
#Blacknose Dace					X	X	X
Blackside Darter			X	X			
Bluegill	X	X	X	X		X	
#Bluntnose Minnow					X		
Bowfin	X	X					
Brown Trout			X				
#Central Mudminnow			X	X	X	X	X
Chestnut Lamprey	X		X	X			
Common Shiner	X	X	X		X		
#Creek Chub		X	X	X	X	X	X
Golden Redhorse			X	X			
Grass Pickerel			X	X		X	X
#Green Sunfish			X	X	X		X
~Hornyhead Chub	X	X			X		
Johnny Darter	X	X	X	X	X		
Largemouth Bass	X	X	X	X	X		X
Logperch	X	X	X	X			
Longear Sunfish		X		X			
~Mimic Shiner	X						
Mottled Sculpin			X	X		X	X
Northern Hog Sucker	X	X	X	X			
Orangethroat Darter				X	X		
Pumpkinseed		X		X		X	
Rainbow Darter		X	X	X			
Redear Sunfish	X	X					
Rock Bass	X	X	X	X			
~Rosyface Shiner			X	X			
Shorthead Redhorse		X	X	X			
Smallmouth Bass	X	X	X	X	X		
Spotfin Shiner	X	X					
Spotted Gar		X					
Stoneroller, Central					X	X	X
Striped Shiner	X	X	X	X	X		
Tadpole Madtom	X						
Warmouth		X					
#White Sucker			X	X	X	X	X
Yellow Bullhead	X	X			X		

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STREAM	Puterbaugh Creek		Lily Creek		Christiana Creek				
	17		18	19		20		21	
	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~American Brook Lamprey	X		X			X	X	X	X
Blackside Darter			X						
Bluegill	X	X	X		X	X	X	X	X
#Bluntnose Minnow						X	X	X	X
Bowfin			X						
#Central Mudminnow	X	X	X		X	X			
Chestnut Lamprey						X			
#Common Carp			X			X		X	X
Common Shiner				X			X		
#Creek Chub	X	X		X	X				
Golden Redhorse			X			X	X	X	X
Grass Pickerel	X	X	X	X	X	X	X	X	X
#Green Sunfish	X	X	X					X	
~Hornyhead Chub						X	X		
Johnny Darter	X	X	X	X	X				
Largemouth Bass		X	X					X	X
Logperch			X			X		X	X
Longear Sunfish			X						
Mottled Sculpin	X	X	X						
Northern Hog Sucker						X	X	X	X
Northern Pike			X	X					
Orangethroat Darter							X	X	X
Rainbow Darter	X		X			X	X	X	X
Redear Sunfish		X							
~River Chub						X	X		
Rock Bass			X			X	X	X	X
Shorthead Redhorse								X	X
Silver Redhorse			X			X	X	X	
Smallmouth Bass			X			X	X	X	X
Spotfin Shiner						X	X	X	
Spotted Sucker								X	
Steelcolor Shiner							X		
~Stonecat						X			X
Stoneroller, Central				X	X				
Striped Shiner						X		X	X
#White Sucker		X	X	X	X	X	X	X	
Yellow Bullhead		X	X			X	X	X	X
Yellow Perch	X	X	X						

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STREAM	Elkhart River							
	22		23		24		25	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~American Brook Lamprey			X		X	X	X	
Black Crappie			X	X	X			
Bluegill	X	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X		X	X	X	
Chestnut Lamprey	X	X	X	X	X	X	X	X
Common Shiner	X	X		X	X	X		
#Creek Chub			X				X	
Golden Redhorse	X	X	X	X	X	X	X	X
~Greater Redhorse		X	X	X				X
#Green Sunfish	X	X	X	X	X	X	X	X
~Hornyhead Chub	X	X	X	X	X	X	X	X
Hybrid Sunfish	X	X	X					
Johnny Darter					X			
Largemouth Bass	X	X	X	X		X	X	X
Longear Sunfish	X	X	X	X	X	X	X	X
Northern Hog Sucker	X	X	X	X	X	X	X	X
Pumpkinseed					X		X	
Rainbow Darter	X							
Redear Sunfish			X		X		X	
~River Redhorse			X	X			X	X
Rock Bass	X	X	X	X	X	X	X	X
~Rosyface Shiner		X	X		X		X	X
Smallmouth Bass	X	X	X	X	X	X	X	X
Spotfin Shiner	X		X	X	X	X	X	
Spotted Sucker		X					X	
~Stonecat	X		X					
Striped Shiner	X	X	X	X	X	X	X	X
Warmouth					X			
#White Sucker	X	X	X	X	X	X	X	X
Yellow Bullhead		X	X	X	X	X		X

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STREAM	Yellow Creek			Baugo Creek				Grimes Ditch	Rogers Ditch
	26	27		28		29			
Site Number		1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass		
Banded Killifish								X	
#Blacknose Dace		X	X	X	X	X	X	X	X
Blackside Darter		X							
Bluegill	X	X	X		X	X		X	
#Bluntnose Minnow	X	X	X	X	X	X	X	X	X
#Central Mudminnow	X		X	X				X	
Chestnut Lamprey		X							
#Common Carp					X				X
Common Shiner	X	X	X	X	X	X	X	X	
#Creek Chub	X	X	X	X	X	X	X	X	X
#Fathead Minnow		X	X	X	X		X		X
Golden Redhorse		X	X			X	X		
#Golden Shiner								X	
#Green Sunfish	X	X	X	X	X	X	X	X	X
~Hornyhead Chub	X	X	X						
Hybrid Sunfish			X		X	X			
Johnny Darter	X	X	X	X	X	X	X	X	X
Largemouth Bass	X		X		X			X	
Loggerch							X		
~Longnose Dace			X	X	X	X	X		
Northern Hog Sucker		X	X						
Pirate Perch								X	
Pumpkinseed						X			
Rainbow Darter	X		X			X	X		
Rock Bass			X		X	X	X		
Sand Shiner				X	X	X	X		
Shorthead Redhorse						X	X		
Silver Redhorse						X			
Silverjaw Minnow	X			X	X	X	X	X	
Smallmouth Bass	X	X	X			X	X		
Spotfin Shiner					X	X	X		
~Stonecat							X		
Stoneroller, Central	X	X	X	X	X	X	X	X	X
Striped Shiner	X	X	X		X	X	X	X	
#White Sucker	X	X	X	X	X	X	X	X	X
Yellow Bullhead	X			X					X

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STREAM	Woodward Ditch			Eller Ditch				
	32	33		34		35	36	
Site Number		1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass
#Blacknose Dace	X	X	X	X	X	X		
Bluegill							X	X
#Creek Chub		X	X			X		X
Grass Pickerel			X					
#Green Sunfish	X	X	X					
Johnny Darter	X	X	X					X
Logperch			X					
Pumpkinseed		X						
Rainbow Darter		X	X					
Rainbow Trout				X	X		X	X
Rock Bass							X	
Smallmouth Bass			X					
#White Sucker	X	X	X		X	X		X

STREAM	Willow Creek				Bowman Creek			
	37		38	39		40		41
Site Number	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass	
#Blacknose Dace	X	X	X	X	X			
Bluegill	X	X		X		N		
Brown Trout			X	X		O		
#Central Mudminnow	X	X	X		X			
#Creek Chub	X		X	X	X	F	X	X
#Green Sunfish			X	X	X	I		X
Hybrid Sunfish	X	X	X	X	X	S		
Longear Sunfish						H		X
Mottled Sculpin	X	X	X	X	X			
Rainbow Trout			X		X			X
Smallmouth Bass								X
#White Sucker			X	X	X			X

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STREAM	Juday Creek					Pinhook Park
	42	43		44		
Site Number		1st Pass	2nd Pass	1st Pass	2nd Pass	
#Blacknose Dace	X	X	X	X	X	
Bluegill		X	X	X		X
Brown Bullhead						X
Brown Trout		X		X		
#Creek Chub	X	X	X	X	X	
#Green Sunfish	X	X	X			X
Hybrid Sunfish						X
Johnny Darter	X	X	X			
Largemouth Bass						X
Mottled Sculpin	X	X	X	X	X	
Northern Pike						X
Rainbow Darter				X	X	
Rainbow Trout	X	X	X	X	X	
Redear Sunfish						X
Rock Bass		X	X			
Spotted Sucker						X
Warmouth						X
#White Sucker	X	X	X	X	X	
Yellow Bullhead						X

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Appendix E

Summary of macroinvertebrates (insects) collected by site, 2008

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, Six-Span

Collection Date: Site Number: 1

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	2	
<i>Oligochaeta</i>	0	+
<i>Gammarus sp</i>	4	+
<i>Hyalella azteca</i>	1	+
<i>Stenacron sp</i>	6	+
<i>Anthopotamus sp</i>	0	+
<i>Isonychia sp</i>	73	+
<i>Tricorythodes sp</i>	30	+
<i>Stenonema pulchellum group</i>	180	+
<i>Ephemerellidae</i>	24	+
<i>Stenonema mediopunctatum</i>	0	+
<i>Paraleptophlebia sp</i>	2	
<i>Plautitus dubius or P. virilis</i>	6	
<i>Baetis intercalaris</i>	19	
<i>Stenonema exiguum</i>	216	+
<i>Coenagrionidae</i>	0	+
<i>Argia sp</i>	1	
<i>Acroneuria abnormis</i>	10	+
<i>Agnatina capitata complex</i>	2	
<i>Pycnopsyche sp</i>	0	+
<i>Brachycentrus numerosus</i>	13	+
<i>Hydropsyche simulans</i>	17	+
<i>Helicopsyche borealis</i>	0	+
<i>Cheumatopsyche sp</i>	198	+
<i>Triaenodes ignitus</i>	0	+
<i>Neureclipsis sp</i>	21	
<i>Polycentropus sp</i>	1	
<i>Chimarra obscura</i>	2	
<i>Oecetis persimilis</i>	2	
<i>Oecetis avara</i>	1	
<i>Ceratopsyche sparna</i>	1	
<i>Hydropsyche venularis</i>	4	
<i>Petrophila sp</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Stenelmis sp</i>	3	
<i>Stenelmis sp</i>	3	
<i>Macronychus glabratus</i>	5	
<i>Simulium sp</i>	31	+
<i>Thienemanniella xena</i>	4	+
<i>Hemerodromia sp</i>	1	
<i>Rheotanytarsus sp</i>	64	
<i>Tvetenia bavarica group</i>	14	
<i>Microtendipes pedellus group</i>	6	
<i>Polypedilum (Uresipedilum)</i>	2	
<i>Nanocladius (N.) distinctus</i>	2	
<i>Corbicula fluminea</i>	0	+
<i>Elimia sp</i>	1	
<i>Physella sp</i>	1	
<i>Ferrissia sp</i>	6	

No. Quantitative Taxa: 39

No. Qualitative Taxa: 24

Total No. Taxa: 49

Number of Organisms: 979

ICI: 52

Site: St. Joseph River, Bridge Street

Collection Date: 9/29/2008

Site Number: 2

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	7		<i>Polypedilum (Uresipedilum) flavum</i>	2	
<i>Oligochaeta</i>	24	+	<i>Dicrotendipes neomodestus</i>	8	
<i>Caecidotea sp</i>	2	+	<i>Thienemanniella xena</i>	4	
<i>Gammarus sp</i>	44	+	<i>Thienemanniella lobapodema</i>	4	
<i>Hydracarina</i>	0	+	<i>Corynoneura lobata</i>	4	
<i>Stenacron sp</i>	45	+	<i>Elimia sp</i>	79	+
<i>Tricorythodes sp</i>	62	+	<i>Corbicula fluminea</i>	26	+
<i>Stenonema pulchellum group</i>	94	+	<i>Unionidae</i>	4	
<i>Baetisca sp</i>	0	+	<i>Physella sp</i>	27	
<i>Plauditus dubius or P. virilis</i>	26	+	<i>Ferrissia sp</i>	11	
<i>Paraleptophlebia sp</i>	4	+	<i>Ephemerellidae</i>	4	
<i>Baetis intercalaris</i>	4		<i>Caenis sp</i>	4	
<i>Baetis flavistriga</i>	4		<i>Nemertea</i>	43	
<i>Stenonema terminatum</i>	10				
<i>Isonychia sp</i>	10				
<i>Anthopotamus sp</i>	1		No. Quantitative Taxa:	53	
<i>Hexagenia sp</i>	1		No. Qualitative Taxa:	24	
<i>Stenonema mediopunctatum</i>	10		Total No. Taxa:	63	
<i>Macromia sp</i>	0	+	Number of Organisms:	1172	
<i>Coenagrionidae</i>	0	+	ICI:	40	
<i>Hetaerina sp</i>	0	+			
<i>Argia sp</i>	5	+			
<i>Ranatra sp</i>	0	+			
<i>Sialis sp</i>	1				
<i>Triaenodes ignitus</i>	0	+			
<i>Nectopsyche exquisita</i>	0	+			
<i>Oecetis persimilis</i>	8	+			
<i>Hydropsyche simulans</i>	14	+			
<i>Cheumatopsyche sp</i>	307	+			
<i>Nectopsyche candida</i>	0	+			
<i>Hydropsyche venularis</i>	2				
<i>Ceratopsyche sparna</i>	4				
<i>Brachycentrus numerosus</i>	6				
<i>Macrostemum zebratum</i>	7				
<i>Chimarra obscura</i>	9				
<i>Polycentropus sp</i>	75				
<i>Hydropsyche aerata</i>	6				
<i>Neureclipsis sp</i>	16				
<i>Petrophila sp</i>	2				
<i>Psephenus herricki</i>	0	+			
<i>Macronychus glabratus</i>	32				
<i>Stenelmis sp</i>	2				
<i>Simulium sp</i>	4				
<i>Thienemannimyia group</i>	4				
<i>Ablabesmyia janta</i>	14				
<i>Phaenopsectra obediens group</i>	24				
<i>Chironomus sp</i>	6				
<i>Rheotanytarsus sp</i>	46				
<i>Microtendipes pedellus group</i>	8				
<i>Tanytarsus sp</i>	2				

Site: St. Joseph River, Logan Street

Collection Date: 10/01/2008

Site Number: 3

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	497	+
<i>Oligochaeta</i>	8	+
<i>Hyalella azteca</i>	0	+
<i>Gammarus sp</i>	12	+
<i>Isonychia sp</i>	129	+
<i>Baetis intercalaris</i>	8	+
<i>Baetisca sp</i>	0	+
<i>Stenacron sp</i>	109	+
<i>Stenonema exiguum</i>	83	+
<i>Plauditus dubius or P. virilis</i>	0	+
<i>Stenonema pulchellum group</i>	102	
<i>Tricorythodes sp</i>	12	
Coenagrionidae	0	+
<i>Argia sp</i>	9	+
<i>Macromia sp</i>	0	+
<i>Acroneuria sp</i>	1	
<i>Neoplea sp</i>	0	+
Corixidae	0	+
<i>Hydropsyche simulans</i>	143	+
<i>Hydropsyche depravata group</i>	0	+
<i>Cheumatopsyche sp</i>	2577	+
<i>Oecetis persimilis</i>	0	+
<i>Hydropsyche aerata</i>	84	+
<i>Hydropsyche orris</i>	0	+
<i>Potamyia flava</i>	4	
<i>Neureclipsis sp</i>	12	
<i>Macrostemum zebratum</i>	9	
<i>Macronychus glabratus</i>	4	+
<i>Simulium sp</i>	9	+
<i>Rheotanytarsus sp</i>	4	
<i>Tanytarsus sp</i>	1	
<i>Polypedilum (Uresipedilum) flavum</i>	1	
<i>Corbicula fluminea</i>	64	+
<i>Elimia sp</i>	21	+
<i>Physella sp</i>	0	+
Hydrobiidae	0	+
<i>Pisidium sp</i>	0	+
Unionidae	8	
Nemertea	64	

No. Quantitative Taxa: 26

No. Qualitative Taxa: 28

Total No. Taxa: 39

Number of Organisms: 3975

ICI: 40

Site: St. Joseph River, Angela Blvd

Collection Date: 10/01/2008

Site Number: 4

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	230		
<i>Oligochaeta</i>	12		
<i>Gammarus sp</i>	4	+	
<i>Caecidotea sp</i>	8		
<i>Orconectes (Procericambarus) rusticus</i>	2		No. Quantitative Taxa: 28
<i>Baetis intercalaris</i>	4	+	No. Qualitative Taxa: 25
<i>Isonychia sp</i>	105	+	Total No. Taxa: 37
<i>Tricorythodes sp</i>	0	+	Number of Organisms: 2336
<i>Stenacron sp</i>	0	+	ICI: 36
<i>Stenonema exiguum</i>	36	+	
<i>Pseudocloeon propinquum</i>	0	+	
<i>Stenonema pulchellum group</i>	25	+	
<i>Plauditus dubius or P. virilis</i>	0	+	
<i>Coenagrionidae</i>	0	+	
<i>Cheumatopsyche sp</i>	1127	+	
<i>Brachycentrus numerosus</i>	3	+	
<i>Hydropsyche simulans</i>	116	+	
<i>Glossosoma sp</i>	8	+	
<i>Macrostemum zebratum</i>	104	+	
<i>Pycnopsyche sp</i>	0	+	
<i>Hydropsyche aerata</i>	275	+	
<i>Hydroptila sp</i>	5		
<i>Hydropsyche orris</i>	4		
<i>Psephenus herricki</i>	0	+	
<i>Stenelmis sp</i>	4	+	
<i>Macronychus glabratus</i>	4	+	
<i>Simulium sp</i>	4	+	
<i>Tvetenia bavarica group</i>	5		
<i>Rheotanytarsus sp</i>	1		
<i>Dreissena polymorpha</i>	0	+	
<i>Elimia sp</i>	59	+	
<i>Physella sp</i>	0	+	
<i>Corbicula fluminea</i>	2	+	
<i>Hydrobiidae</i>	25		
<i>Sphaerium sp</i>	18		
<i>Ferrissia sp</i>	38		
<i>Nemertea</i>	108		

Site: St. Joseph River, Darden Road

Collection Date: 10/01/2008

Site Number: 5

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Spongillidae</i>	0	+	<i>Helisoma anceps anceps</i>	0	+
<i>Turbellaria</i>	990	+	<i>Nemertea</i>	4	+
<i>Oligochaeta</i>	0	+	<i>Corbicula fluminea</i>	3	
<i>Erpobdella punctata punctata</i>	0	+			
<i>Orconectes (Procericambarus) rusticus</i>	1	+			
<i>Gammarus sp</i>	2	+			
<i>Isonychia sp</i>	190	+			
<i>Baetis intercalaris</i>	20	+	No. Quantitative Taxa: 38		
<i>Stenacron sp</i>	52	+	No. Qualitative Taxa: 40		
<i>Stenonema exiguum</i>	100	+	Total No. Taxa: 53		
<i>Plauditus dubius or P. virilis</i>	0	+	Number of Organisms: 3743		
<i>Ephemerellidae</i>	4		ICI: 42		
<i>Tricorythodes sp</i>	18				
<i>Stenonema pulchellum group</i>	30				
<i>Boyeria vinosa</i>	0	+			
<i>Coenagrionidae</i>	0	+			
<i>Argia sp</i>	6	+			
<i>Hetaerina sp</i>	6	+			
<i>Hydropsyche simulans</i>	177	+			
<i>Brachycentrus numerosus</i>	26	+			
<i>Cheumatopsyche sp</i>	1382	+			
<i>Oecetis persimilis</i>	6	+			
<i>Neureclipsis sp</i>	16	+			
<i>Trienodes injustus</i>	0	+			
<i>Nectopsyche exquisita</i>	0	+			
<i>Hydropsyche aerata</i>	32	+			
<i>Hydropsyche venularis</i>	0	+			
<i>Hydropsyche orris</i>	2				
<i>Ceratopsyche sparna</i>	2				
<i>Chimarra obscura</i>	9				
<i>Macrostemum zebratum</i>	53				
<i>Petrophila sp</i>	12	+			
<i>Macronychus glabratus</i>	16	+			
<i>Stenelmis sp</i>	8	+			
<i>Dubiraphia sp</i>	2				
<i>Simulium sp</i>	16	+			
<i>Tipula sp</i>	0	+			
<i>Chironomus (C.) sp</i>	0	+			
<i>Ablabesmyia mallochi</i>	0	+			
<i>Rheotanytarsus sp</i>	8				
<i>Tvetenia bavarica group</i>	2				
<i>Hemerodromia sp</i>	2				
<i>Antocha sp</i>	4				
<i>Hydrobiidae</i>	4	+			
<i>Ferrissia sp</i>	24	+			
<i>Pisidium sp</i>	26	+			
<i>Physella sp</i>	35	+			
<i>Elimia sp</i>	453	+			
<i>Fossaria sp</i>	0	+			
<i>Planorbella sp</i>	0	+			

Site: Trout Creek, County Road 2

Collection Date: 10/03/2008

Site Number: 6

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	1		<i>Helopelopia sp</i>	21	
<i>Turbellaria</i>	19	+	<i>Microtendipes pedellus group</i>	12	
<i>Oligochaeta</i>	71	+	<i>Tanytarsus glabrescens group sp</i>	12	
<i>Gammarus sp</i>	25	+	<i>Corynoneura lobata</i>	9	
<i>Hyalella azteca</i>	2		<i>Dreissena polymorpha</i>	0	+
<i>Stenacron sp</i>	4	+	<i>Elimia sp</i>	25	+
<i>Anthopotamus sp</i>	0	+	<i>Physella sp</i>	4	+
<i>Stenonema mediopunctatum</i>	7	+	<i>Pisidium sp</i>	4	+
<i>Stenonema exiguum</i>	140		<i>Sphaerium sp</i>	0	+
<i>Stenonema pulchellum group</i>	22		<i>Ferrissia sp</i>	51	+
<i>Tricorythodes sp</i>	3		<i>Hydrobiidae</i>	1	+
<i>Argia sp</i>	0	+	<i>Nemertea</i>	6	
<i>Hetaerina sp</i>	1	+			
<i>Ophiogomphus sp</i>	0	+			
<i>Gomphus sp</i>	0	+			
<i>Acroneuria abnormis</i>	3	+	No. Quantitative Taxa:	52	
<i>Agnatina capitata complex</i>	19	+	No. Qualitative Taxa:	35	
<i>Corydalus cornutus</i>	2		Total No. Taxa:	62	
<i>Macrostemum zebratum</i>	7	+	Number of Organisms:	997	
<i>Neureclipsis sp</i>	72	+	ICI:	46	
<i>Cheumatopsyche sp</i>	186	+			
<i>Helicopsyche borealis</i>	26	+			
<i>Hydropsyche depravata group</i>	60	+			
<i>Oecetis persimilis</i>	21	+			
<i>Chimarra obscura</i>	33	+			
<i>Glossosoma sp</i>	0	+			
<i>Nectopsyche exquisita</i>	0	+			
<i>Hydropsyche dicantha</i>	0	+			
<i>Hydropsyche venularis</i>	5				
<i>Ceratopsyche sparna</i>	4				
<i>Polycentropus sp</i>	1				
<i>Oecetis avara</i>	5				
<i>Lepidostoma sp</i>	8				
<i>Stenelmis sp</i>	25	+			
<i>Psephenus herricki</i>	1	+			
<i>Optioservus sp</i>	1	+			
<i>Macronychus glabratus</i>	2	+			
<i>Tabanus sp</i>	0	+			
<i>Simulium sp</i>	10	+			
<i>Hemerodromia sp</i>	6				
<i>Polypedilum (Uresipedilum) aviceps</i>	3				
<i>Pentaneura sp</i>	3				
<i>Polypedilum (Tripodura) scalaenum</i>	3				
<i>Tanytarsus curticornis group</i>	3				
<i>Parachironomus frequens group</i>	3				
<i>Microtendipes rydalensis</i>	3				
<i>Ablabesmyia janta</i>	3				
<i>Rheotanytarsus sp</i>	3				
<i>Polypedilum (Uresipedilum) flavum</i>	18				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	18				

Site: Little Elkhart River, State Road 120

Collection Date: 10/03/2008

Site Number: 7

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Oligochaeta</i>	8	
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Gammarus sp</i>	1	+
<i>Caecidotea sp</i>	0	+
<i>Hydracarina</i>	2	
<i>Stenonema vicarium</i>	50	+
<i>Baetis flavistriga</i>	16	+
<i>Baetisca sp</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Stenonema exiguum</i>	184	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Isonychia sp</i>	2	
<i>Baetis intercalaris</i>	6	
<i>Coenagrionidae</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Gomphus sp</i>	0	+
<i>Boyeria vinosa</i>	1	+
<i>Paragnetina sp</i>	0	+
<i>Acroneuria abnormis</i>	10	
<i>Plecoptera</i>	48	
<i>Belostoma sp</i>	0	+
<i>Brachycentrus numerosus</i>	22	+
<i>Cheumatopsyche sp</i>	128	+
<i>Hydropsyche simulans</i>	0	+
<i>Lype diversa</i>	4	+
<i>Triaenodes ignitus</i>	0	+
<i>Hydropsyche depravata group</i>	34	+
<i>Nectopsyche diarina</i>	0	+
<i>Ceratopsyche sparna</i>	800	+
<i>Ceratopsyche morosa group</i>	28	
<i>Stenelmis sp</i>	0	+
<i>Dubiraphia sp</i>	0	+
<i>Macronychus glabratus</i>	17	+
<i>Optioservus sp</i>	0	+
<i>Chrysops sp</i>	0	+
<i>Tabanus sp</i>	0	+
<i>Antocha sp</i>	2	
<i>Hemerodromia sp</i>	14	
<i>Rheotanytarsus sp</i>	153	
<i>Tvetenia bavarica group</i>	127	
<i>Brillia flavifrons group</i>	4	
<i>Parametriocnemus sp</i>	4	
<i>Orthocladus (O.) sp</i>	4	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	11	
<i>Physella sp</i>	0	+
<i>Elimia sp</i>	0	+
<i>Ferrissia sp</i>	8	+
<i>Pisidium sp</i>	0	+
<i>Nemertea</i>	0	+

No. Quantitative Taxa: 27
 No. Qualitative Taxa: 35
 Total No. Taxa: 50
 Number of Organisms: 1688
 ICI: 42

Site: Puterbaugh Creek, Reedy Drive

Collection Date: 10/02/2008

Site Number: 8

Taxa Name	Quantitative	Qualitative
<i>Gammarus sp</i>	0	+
<i>Orconectes sp</i>	0	+
<i>Baetis flavistriga</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Baetis intercalaris</i>	0	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Belostoma sp</i>	0	+
<i>Brachycentrus numerosi</i>	0	+
<i>Ptilostomis sp</i>	0	+
<i>Hydropsyche depravata group</i>	0	+
<i>Cheumatopsyche sp</i>	0	+
<i>Macronychus glabratus</i>	0	+
<i>Peltodytes sp</i>	0	+
<i>Simulium sp</i>	0	+
<i>Tipula sp</i>	0	+
<i>Ceratopogonidae</i>	0	+
<i>Cipangopaludina chinensis malleata</i>	0	+
<i>Elimia sp</i>	0	+
<i>Hydrobiidae</i>	0	+
<i>Physella sp</i>	0	+
<i>Planorbella sp</i>	0	+
<i>Ferrissia sp</i>	0	+
<i>Pisidium sp</i>	0	+
<i>Fossaria sp</i>	0	+

No. Quantitative Taxa: 0

No. Qualitative Taxa: 25

Total No. Taxa: 25

Number of Organisms: 0

ICI: MG

Site: Lily Creek, Reckell Avenue

Collection Date: 10/02/2008

Site Number: 9

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	28	+
<i>Oligochaeta</i>	894	+
<i>Erpobdella punctata punctata</i>	0	+
<i>Orconectes sp</i>	0	+
<i>Gammarus sp</i>	37	+
<i>Caecidotea sp</i>	0	+
<i>Baetis intercalaris</i>	56	+
<i>Pseudocloeon propinquum</i>	1	
<i>Coenagrionidae</i>	0	+
<i>Belostoma sp</i>	0	+
<i>Ptilostomis sp</i>	0	+
<i>Hydroptila sp</i>	6	
<i>Hydropsyche depravata group</i>	2	
<i>Cheumatopsyche sp</i>	4	
<i>Peltodytes sp</i>	0	+
<i>Agabus sp</i>	0	+
<i>Stenelmis sp</i>	3	
<i>Tipula sp</i>	2	
<i>Odontomyia (Odontomyiina) sp</i>	2	
<i>Simulium sp</i>	4	
<i>Thienemannimyia group</i>	47	
<i>Chironomus (C.) sp</i>	12	
<i>Stictochironomus sp</i>	24	
<i>Orthocladus sp</i>	105	
<i>Cricotopus sp</i>	29	
<i>Micropsectra sp</i>	12	
<i>Cricotopus (C.) bicinctus</i>	211	
<i>Glyptotendipes (G.) sp</i>	12	
<i>Psectrocladius sp</i>	47	
<i>Hydrobaenus sp</i>	24	
<i>Tanytarsus sp</i>	94	
<i>Paratanytarsus sp</i>	12	
<i>Pisidium sp</i>	2	+
<i>Pseudosuccinea columella</i>	0	+
<i>Gyraulus sp</i>	0	+
<i>Fossaria sp</i>	2	

No. Quantitative Taxa: 26

No. Qualitative Taxa: 15

Total No. Taxa: 36

Number of Organisms: 1672

ICI: 22

Site: Christiana Creek, County Road 6

Collection Date: 10/02/2008

Site Number: 10

Taxa Name	Quantitative	Qualitative
<i>Gammarus sp</i>	0	+
<i>Orconectes sp</i>	0	+
<i>Stenonema mediopunctatum</i>	0	+
<i>Anthopotamus sp</i>	0	+
<i>Tricorythodes sp</i>	0	+
<i>Caenis sp</i>	0	+
<i>Baetis intercalaris</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Baetisca sp</i>	0	+
<i>Stenonema pulchellum group</i>	0	+
<i>Hetaerina sp</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Argia sp</i>	0	+
<i>Nasiaeschna pentacantha</i>	0	+
<i>Acroneuria abnormis</i>	0	+
<i>Ranatra sp</i>	0	+
<i>Notonecta sp</i>	0	+
<i>Corydalus cornutus</i>	0	+
<i>Brachycentrus numerosus</i>	0	+
<i>Neophylax sp</i>	0	+
<i>Oecetis persimilis</i>	0	+
<i>Triaenodes ignitus</i>	0	+
<i>Hydropsyche simulans</i>	0	+
<i>Ceratopsyche morosa group</i>	0	+
<i>Glossosoma sp</i>	0	+
<i>Neureclipsis sp</i>	0	+
<i>Pycnopsyche sp</i>	0	+
<i>Triaenodes melaca</i>	0	+
<i>Helicopsyche borealis</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Stenelmis sp</i>	0	+
<i>Macronychus glabratus</i>	0	+
<i>Peltodytes sp</i>	0	+
<i>Laccophilus sp</i>	0	+
<i>Tabanus sp</i>	0	+
<i>Dixella sp</i>	0	+
<i>Tipula sp</i>	0	+
<i>Physella sp</i>	0	+
<i>Hydrobiidae</i>	0	+
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 0
 No. Qualitative Taxa: 40
 Total No. Taxa: 40
 Number of Organisms: 0
 ICI: E

Site: Yellow Creek, US 20 Bypass

Collection Date: 9/30/2008

Site Number: 11

Taxa Name	Quantitative	Qualitative
<i>Oligochaeta</i>	36	+
<i>Caecidotea sp</i>	27	+
<i>Gammarus sp</i>	83	+
<i>Hyalella azteca</i>	0	+
<i>Hydracarina</i>	2	
<i>Baetis flavistriga</i>	11	+
<i>Baetis tricaudatus</i>	0	+
<i>Stenacron sp</i>	29	+
<i>Baetis intercalaris</i>	9	+
<i>Stenonema sp</i>	1	
Ephemerellidae	1	
<i>Boyeria vinosa</i>	1	+
<i>Calopteryx sp</i>	1	+
<i>Argia sp</i>	0	+
<i>Trichocorixa sp</i>	0	+
<i>Sigara sp</i>	0	+
<i>Ceratopsyche morosa group</i>	245	+
<i>Hydropsyche depravata group</i>	210	+
<i>Triaenodes ignitus</i>	0	+
<i>Polycentropus sp</i>	1	
<i>Ceratopsyche sparna</i>	99	
<i>Glossosoma sp</i>	1	
<i>Cheumatopsyche sp</i>	305	
<i>Chimarra obscura</i>	1	
<i>Laccophilus sp</i>	0	+
<i>Stenelmis sp</i>	2	+
<i>Peltodytes sp</i>	0	+
<i>Macronychus glabratus</i>	18	
<i>Ancyronyx variegata</i>	10	
<i>Optioservus sp</i>	2	
<i>Dubiraphia sp</i>	2	
<i>Simulium sp</i>	6	+
<i>Tipula sp</i>	0	+
<i>Hemerodromia sp</i>	8	
<i>Thienemanniella xena</i>	2	
<i>Tvetenia bavarica group</i>	2	
<i>Brillia flavifrons group</i>	2	
<i>Chironomus (C.) sp</i>	2	
<i>Parametriocnemus sp</i>	6	
<i>Rheotanytarsus sp</i>	20	
<i>Tanytarsus glabrescens group sp 7</i>	30	
<i>Microtendipes pedellus group</i>	10	
<i>Paratanytarsus sp</i>	22	
<i>Cricotopus (Isocladius) sylvestris group</i>	12	
<i>Thienemannimyia group</i>	34	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	10	
<i>Nanocladius (N.) distinctus</i>	4	
<i>Polypedilum (Uresipedilum) flavum</i>	2	
<i>Ferrissia sp</i>	58	+
<i>Physella sp</i>	2	+

No. Quantitative Taxa: 41
 No. Qualitative Taxa: 23
 Total No. Taxa: 50
 Number of Organisms: 1329
 ICI: 42

Site: Elkhart River, Oxbow Park

Collection Date: 9/30/2008

Site Number: 12

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	0	+	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	
<i>Caecidotea sp</i>	0	+	
<i>Gammarus sp</i>	0	+	
<i>Stenacron sp</i>	0	+	No. Quantitative Taxa: 0
<i>Isonychia sp</i>	0	+	No. Qualitative Taxa: 44
<i>Tricorythodes sp</i>	0	+	Total No. Taxa: 44
<i>Baetis flavistriga</i>	0	+	Number of Organisms: 0
<i>Baetis intercalaris</i>	0	+	ICI: E
<i>Leucrocuta sp</i>	0	+	
<i>Stenonema exiguum</i>	0	+	
<i>Caenis sp</i>	0	+	
<i>Stenonema pulchellum group</i>	0	+	
<i>Pseudocloeon propinquum</i>	0	+	
<i>Plauditus dubius or P. virilis</i>	0	+	
<i>Hetaerina sp</i>	0	+	
<i>Coenagrionidae</i>	0	+	
<i>Gomphus sp</i>	0	+	
<i>Pteronarcys sp</i>	0	+	
<i>Agneta capitata complex</i>	0	+	
<i>Corydalus cornutus</i>	0	+	
<i>Chimarra obscura</i>	0	+	
<i>Helicopsyche borealis</i>	0	+	
<i>Hydropsyche simulans</i>	0	+	
<i>Brachycentrus numerosus</i>	0	+	
<i>Cheumatopsyche sp</i>	0	+	
<i>Ceratopsyche morosa group</i>	0	+	
<i>Neophylax sp</i>	0	+	
<i>Neureclipsis sp</i>	0	+	
<i>Ptilostomis sp</i>	0	+	
<i>Glossosoma sp</i>	0	+	
<i>Hydropsyche venularis</i>	0	+	
<i>Triaenodes injustus</i>	0	+	
<i>Psephenus herricki</i>	0	+	
<i>Stenelmis sp</i>	0	+	
<i>Macronychus glabratus</i>	0	+	
<i>Optioservus sp</i>	0	+	
<i>Simulium sp</i>	0	+	
<i>Tipula sp</i>	0	+	
<i>Corbicula fluminea</i>	0	+	
<i>Sphaerium sp</i>	0	+	
<i>Pisidium sp</i>	0	+	
<i>Hydrobiidae</i>	0	+	
<i>Elimia sp</i>	0	+	

Site: Elkhart River, Hively Avenue

Collection Date: 9/30/2008 Site Number: 13

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	2		<i>Thienemannimyia</i> group	6	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	<i>Pentaneura</i> sp	2	
<i>Gammarus</i> sp	89	+	<i>Polypedilum (P.) illinoense</i> group	2	
<i>Hyalella azteca</i>	1		<i>Cipangopaludina chinensis malleata</i>	0	+
<i>Caecidotea</i> sp	2		<i>Pisidium</i> sp	0	+
<i>Baetisca</i> sp	0	+	<i>Hydrobiidae</i>	12	+
<i>Isonychia</i> sp	4	+	<i>Elimia</i> sp	28	+
<i>Tricorythodes</i> sp	0	+	<i>Sphaerium</i> sp	13	+
<i>Baetis flavistriga</i>	0	+	<i>Corbicula fluminea</i>	1	+
<i>Stenacron</i> sp	39	+	<i>Physella</i> sp	1	
<i>Pseudocloeon propinquum</i>	0	+	<i>Ferrissia</i> sp	12	
<i>Stenonema exiguum</i>	15	+	<i>Nemertea</i>	1	
<i>Stenonema pulchellum</i> group	77	+			
<i>Argia</i> sp	3	+	No. Quantitative Taxa:	48	
<i>Calopteryx</i> sp	4	+	No. Qualitative Taxa:	39	
<i>Hetaerina</i> sp	0	+	Total No. Taxa:	62	
<i>Coenagrionidae</i>	1	+	Number of Organisms:	649	
<i>Pteronarcys</i> sp	1	+	ICI:	42	
<i>Agetina capitata</i> complex	2	+			
<i>Brachycentrus numerosus</i>	8	+			
<i>Hydropsyche simulans</i>	11	+			
<i>Chimarra obscura</i>	5	+			
<i>Helicopsyche borealis</i>	4	+			
<i>Triaenodes injustus</i>	0	+			
<i>Neureclipsis</i> sp	49	+			
<i>Mystacides sepulchralis</i>	0	+			
<i>Polycentropus</i> sp	62	+			
<i>Lype diversa</i>	7	+			
<i>Cheumatopsyche</i> sp	16	+			
<i>Ceratopsyche sparna</i>	1	+			
<i>Oecetis persimilis</i>	5				
<i>Lepidostoma</i> sp	1				
<i>Ceratopsyche morosa</i> group	2				
<i>Stenelmis</i> sp	74	+			
<i>Macronychus glabratus</i>	25	+			
<i>Laccophilus</i> sp	0	+			
<i>Optioservus</i> sp	0	+			
<i>Simulium</i> sp	0	+			
<i>Tipula</i> sp	0	+			
<i>Hemerodromia</i> sp	1				
<i>Microtendipes pedellus</i> group	22				
<i>Tanytarsus</i> sp	10				
<i>Phaenopsectra obediens</i> group	2				
<i>Rheotanytarsus</i> sp	6				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	2				
<i>Nanocladius (N.) distinctus</i>	6				
<i>Thienemanniella xena</i>	2				
<i>Polypedilum (Uresipedilum) flavum</i>	2				
<i>Ablabesmyia mallochi</i>	2				
<i>Corynoneura lobata</i>	6				

Site: Elkhart River, American Park

Collection Date: 9/30/2008 Site Number: 14

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Spongillidae</i>	0	+	<i>Nanocladius (N.) distinctus</i>	10	
<i>Turbellaria</i>	8	+	<i>Tvetenia bavarica group</i>	10	
<i>Oligochaeta</i>	0	+	<i>Rheotanytarsus sp</i>	468	
<i>Caecidotea sp</i>	0	+	<i>Orthocladius (O.) sp</i>	78	
<i>Hyalella azteca</i>	8	+	<i>Dicrotendipes neomodestus</i>	58	
<i>Gammarus sp</i>	23	+	<i>Parakiefferiella sp</i>	29	
<i>Orconectes sp</i>	0	+	<i>Physella sp</i>	0	+
<i>Hydracarina</i>	8		<i>Corbicula fluminea</i>	4	+
<i>Stenacron sp</i>	80	+	<i>Pisidium sp</i>	0	+
<i>Tricorythodes sp</i>	24	+	<i>Ferrissia sp</i>	303	+
<i>Stenonema pulchellum group</i>	215	+	<i>Elimia sp</i>	5	
<i>Isonychia sp</i>	63	+	<i>Nemertea</i>	52	
<i>Baetis intercalaris</i>	30	+			
<i>Pseudocloeon propinquum</i>	0	+			
<i>Hexagenia sp</i>	0	+			
<i>Baetis flavistriga</i>	12		No. Quantitative Taxa: 47		
<i>Ephemerellidae</i>	34		No. Qualitative Taxa: 33		
<i>Stenonema exiguum</i>	80		Total No. Taxa: 62		
<i>Argia sp</i>	0	+	Number of Organisms: 2196		
<i>Coenagrionidae</i>	0	+	ICI: 42		
<i>Hetaerina sp</i>	1				
<i>Acroneuria sp</i>	1				
<i>Neoplea sp</i>	0	+			
<i>Climacia sp</i>	0	+			
<i>Polycentropus sp</i>	42	+			
<i>Cheumatopsyche sp</i>	284	+			
<i>Hydropsyche simulans</i>	24	+			
<i>Oecetis persimilis</i>	24	+			
<i>Triaenodes ignitus</i>	0	+			
<i>Neureclipsis sp</i>	14	+			
<i>Ceratopsyche sparna</i>	12				
<i>Hydropsyche venularis</i>	4				
<i>Ceratopsyche morosa group</i>	20				
<i>Hydropsyche aerata</i>	16				
<i>Brachycentrus numerosus</i>	1				
<i>Chimarra obscura</i>	6				
<i>Stenelmis sp</i>	1	+			
<i>Macronychus glabratus</i>	12	+			
<i>Psephenus herricki</i>	0	+			
<i>Dubiraphia sp</i>	0	+			
<i>Simulium sp</i>	18	+			
<i>Antocha sp</i>	4				
<i>Hemerodromia sp</i>	4				
<i>Pentaneura sp</i>	19				
<i>Microtendipes pedellus group</i>	19				
<i>Cricotopus (Isocladius) sylvestris group</i>	19				
<i>Thienemannimyia group</i>	19				
<i>Ablabesmyia mallochi</i>	10				
<i>Thienemanniella xena</i>	10				
<i>Thienemanniella lobapodema</i>	10				

Site: Baugo Creek, County Road 1 (S)

Collection Date: 9/30/2008

Site Number: 15

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	16	+
<i>Oligochaeta</i>	184	+
<i>Orconectes sp</i>	0	+
<i>Caecidotea sp</i>	0	+
<i>Gammarus sp</i>	1	+
<i>Baetis flavistriga</i>	12	+
<i>Baetis intercalaris</i>	0	+
<i>Stenacron sp</i>	85	+
<i>Caenis sp</i>	4	
<i>Coenagrionidae</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Boyeria vinosa</i>	1	
<i>Ranatra sp</i>	0	+
<i>Belostoma sp</i>	1	+
<i>Cheumatopsyche sp</i>	284	+
<i>Ceratopsyche morosa group</i>	20	+
<i>Hydropsyche depravata group</i>	100	
<i>Stenelmis sp</i>	12	+
<i>Dubiraphia sp</i>	4	+
<i>Odontomyia (Odontomyiina) sp</i>	0	+
<i>Simulium sp</i>	0	+
<i>Tipula sp</i>	0	+
<i>Hemerodromia sp</i>	16	
<i>Antocha sp</i>	12	
<i>Thienemannimyia group</i>	270	
<i>Microtendipes pedellus group</i>	644	
<i>Dicrotendipes neomodestus</i>	47	
<i>Tanytarsus sp</i>	54	
<i>Tanytarsus glabrescens group sp 7</i>	54	
<i>Cricotopus (C.) tremulus group</i>	7	
<i>Nanocladius (N.) distinctus</i>	7	
<i>Paratanytarsus sp</i>	27	
<i>Rheotanytarsus sp</i>	61	
<i>Thienemanniella xena</i>	4	
<i>Corynoneura lobata</i>	2	
<i>Physella sp</i>	0	+
<i>Ferrissia sp</i>	37	+
<i>Pisidium sp</i>	4	+
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 28

No. Qualitative Taxa: 23

Total No. Taxa: 39

Number of Organisms: 1970

ICI: 30

Site: Baugo Creek, County Road 3 (N)

Collection Date: 9/30/2008

Site Number: 16

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Oligochaeta</i>	356	+
<i>Calopteryx sp</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Hydropsyche depravata group</i>	180	+
<i>Cheumatopsyche sp</i>	906	+
<i>Ceratopsyche morosa group</i>	12	
<i>Staphylinidae</i>	0	+
<i>Tipula sp</i>	0	+
<i>Simulium sp</i>	4	+
<i>Hemerodromia sp</i>	24	
<i>Tanytarsus glabrescens group sp 7</i>	19	
<i>Stictochironomus sp</i>	7	
<i>Microtendipes pedellus group</i>	7	
<i>Phaenopsectra obediens group</i>	7	
<i>Phaenopsectra punctipes</i>	7	
<i>Rheotanytarsus sp</i>	7	
<i>Polypedilum (P.) fallax group</i>	13	
<i>Tanytarsus sp</i>	13	
<i>Polypedilum (Tripodura) scalaenum</i>	13	
<i>Paratanytarsus sp</i>	13	
<i>Dicrotendipes neomodestus</i>	278	
<i>Thienemannimyia group</i>	265	
<i>Glyptotendipes (G.) sp</i>	38	
<i>Cricotopus (C.) sp</i>	38	
<i>Physella sp</i>	2	+
<i>Ferrissia sp</i>	32	+
<i>Nemertea</i>	8	

No. Quantitative Taxa: 23
 No. Qualitative Taxa: 11
 Total No. Taxa: 28
 Number of Organisms: 2249
 ICI: 20

Site: Woodward Ditch, Oakeside Avenue

Collection Date: 10/02/2008

Site Number: 17

Taxa Name	Quantitative	Qualitative
<i>Oligochaeta</i>	98	
<i>Caecidotea sp</i>	3	+
<i>Gammarus sp</i>	44	+
<i>Orconectes sp</i>	1	
<i>Stenacron sp</i>	34	+
<i>Baetis tricaudatus</i>	0	+
<i>Coenagrionidae</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Pycnopsyche sp</i>	0	+
<i>Cheumatopsyche sp</i>	11	+
<i>Ptilostomis sp</i>	0	+
<i>Trienodes ignitus</i>	0	+
<i>Hydropsyche depravata group</i>	20	
<i>Lype diversa</i>	22	
<i>Ceratopsyche slossonae</i>	1	
<i>Dubiraphia sp</i>	9	+
<i>Optioservus sp</i>	9	
<i>Tabanus sp</i>	0	+
<i>Simulium sp</i>	0	+
<i>Corynoneura lobata</i>	35	+
<i>Hemerodromia sp</i>	1	
<i>Chironomus (C.) sp</i>	15	
<i>Odontomesa ferringtoni</i>	5	
<i>Stictochironomus sp</i>	10	+
<i>Microtendipes pedellus group</i>	75	
<i>Paratanytarsus sp</i>	15	
<i>Rheotanytarsus sp</i>	60	
<i>Parametriocnemus sp</i>	5	
<i>Polypedilum (Uresipedilum) flavum</i>	10	
<i>Paratendipes albimanus or P. duplicatus</i>	5	
<i>Tanytarsus sp</i>	20	
<i>Dicrotendipes neomodestus</i>	10	
<i>Micropsectra sp</i>	10	
<i>Polypedilum (Tripodura) scalaenum group</i>	5	
<i>Tvetenia bavarica group</i>	35	
<i>Nanocladius (N.) distinctus</i>	5	
<i>Phaenopsectra obediens group</i>	5	
<i>Thienemanniella xena</i>	10	
<i>Cricotopus (C.) bicinctus</i>	5	
<i>Thienemannimyia group</i>	5	
<i>Physella sp</i>	0	+
<i>Pisidium sp</i>	4	+

No. Quantitative Taxa: 33
 No. Qualitative Taxa: 17
 Total No. Taxa: 42
 Number of Organisms: 602
 ICI: 32

Site: Eller Ditch, Bridgeton Drive

Collection Date: 10/02/2008

Site Number: 18

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Oligochaeta</i>	0	+
<i>Gammarus sp</i>	0	+
<i>Caecidotea sp</i>	0	+
<i>Baetis intercalaris</i>	0	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Sigara sp</i>	0	+
<i>Hydropsyche depravata group</i>	0	+
<i>Ptilostomis sp</i>	0	+
<i>Dubiraphia sp</i>	0	+
<i>Physella sp</i>	0	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 11
Total No. Taxa: 11
Number of Organisms: 0
ICI: F

Site: Eller Ditch, Lincolnway

Collection Date: 10/02/2008

Site Number: 19

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Oligochaeta</i>	7	
<i>Gammarus sp</i>	24	+
<i>Hyalella azteca</i>	0	+
<i>Hydracarina</i>	0	+
<i>Baetis tricaudatus</i>	9	+
<i>Stenacron sp</i>	2	
<i>Coenagrionidae</i>	0	+
<i>Hydropsyche depravata group</i>	78	+
<i>Cheumatopsyche sp</i>	46	+
<i>Chironomus (C.) sp</i>	4	+
<i>Parametriocnemus sp</i>	8	+
<i>Tanytarsus sp</i>	8	+
<i>Orthocladius (O.) sp</i>	0	+
<i>Polypedilum (Uresipedilum) aviceps</i>	4	+
<i>Tvetenia bavarica group</i>	64	+
<i>Simulium sp</i>	2	
<i>Limnophora sp</i>	1	
<i>Brillia flavifrons group</i>	6	
<i>Rheotanytarsus sp</i>	14	
<i>Eukiefferiella sp</i>	12	
<i>Micropsectra sp</i>	4	
<i>Thienemanniella xena</i>	2	
<i>Microtendipes pedellus group</i>	2	
<i>Physella sp</i>	0	+

No. Quantitative Taxa: 19
 No. Qualitative Taxa: 15
 Total No. Taxa: 25
 Number of Organisms: 297
 ICI: 28

Site: Willow Creek, Day Road

Collection Date: 10/01/2008

Site Number: 20

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	1		
<i>Oligochaeta</i>	260		
<i>Gammarus sp</i>	71	+	
<i>Hydracarina</i>	42	+	
<i>Baetis tricaudatus</i>	6	+	No. Quantitative Taxa: 21
<i>Cheumatopsyche sp</i>	9	+	No. Qualitative Taxa: 9
<i>Hypopsyche depravata group</i>	4	+	Total No. Taxa: 22
<i>Tipula sp</i>	0	+	Number of Organisms: 569
<i>Simulium sp</i>	2		ICI: 18
<i>Odontomyia (Odontomyiina) sp</i>	2		
<i>Parametriocnemus sp</i>	30		
<i>Polypedilum (Uresipedilum) aviceps</i>	3		
<i>Tanytarsus sp</i>	18		
<i>Rheocricotopus (Psilocricotopus) robacki</i>	2		
<i>Rheotanytarsus sp</i>	10		
<i>Thienemanniella xena</i>	2		
<i>Thienemannimyia group</i>	25		
<i>Stictochironomus sp</i>	6		
<i>Pisidium sp</i>	1	+	
<i>Gyraulus sp</i>	28	+	
<i>Physella sp</i>	45	+	
<i>Fossaria sp</i>	2		

Site: Willow Creek, Estates Blvd

Collection Date: 10/01/2008

Site Number: 21

Taxa Name	Quantitative	Qualitative
<i>Oligochaeta</i>	0	+
<i>Stenonema vicarium</i>	0	+
<i>Boyeria vinosa</i>	0	+
Coenagrionidae	0	+
<i>Hetaerina sp</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Brachycentrus numerosus</i>	0	+
<i>Ptilostomis sp</i>	0	+
<i>Pycnopsyche sp</i>	0	+
<i>Hydropsyche simulans</i>	0	+
<i>Cheumatopsyche sp</i>	0	+
<i>Hydropsyche depravata group</i>	0	+
<i>Ceratopsyche slossonae</i>	0	+
<i>Optioservus sp</i>	0	+
<i>Tipula sp</i>	0	+
<i>Tabanus sp</i>	0	+
<i>Corbicula fluminea</i>	0	+
<i>Physella sp</i>	0	+
<i>Fossaria sp</i>	0	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 19
Total No. Taxa: 0
Number of Organisms: 0
ICI: MG

Site: Juday Creek, Kintz Avenue

Collection Date: 10/01/2008

Site Number: 22

Taxa Name	Quantitative	Qualitative	
<i>Oligochaeta</i>	2	+	
<i>Orconectes sp</i>	0	+	
<i>Gammarus sp</i>	0	+	
<i>Hydracarina</i>	2		
<i>Stenacron sp</i>	12	+	No. Quantitative Taxa: 37
<i>Stenonema vicarium</i>	17	+	No. Qualitative Taxa: 21
<i>Baetis intercalaris</i>	6	+	Total No. Taxa: 47
<i>Stenonema exiguum</i>	47	+	Number of Organisms: 525
<i>Tricorythodes sp</i>	0	+	ICI: 42
<i>Caenis sp</i>	4		
<i>Boyeria vinosa</i>	0	+	
<i>Calopteryx sp</i>	0	+	
<i>Belostoma sp</i>	0	+	
<i>Sialis sp</i>	0	+	
<i>Cheumatopsyche sp</i>	12	+	
<i>Hydropsyche depravata group</i>	13	+	
<i>Mystacides sepulchralis</i>	0	+	
<i>Pycnopsyche sp</i>	0	+	
<i>Glossosoma sp</i>	2		
<i>Lype diversa</i>	2		
<i>Chimarra obscura</i>	10		
<i>Ceratopsyche sparna</i>	11		
<i>Ceratopsyche morosa group</i>	2		
<i>Stenelmis sp</i>	34	+	
<i>Macronychus glabratus</i>	12	+	
<i>Optioservus sp</i>	10		
<i>Tipula sp</i>	0	+	
<i>Antocha sp</i>	2		
<i>Simulium sp</i>	6		
<i>Hemerodromia sp</i>	2		
<i>Microtendipes pedellus group</i>	4		
<i>Cardiocladius albiplumus</i>	4		
<i>Hydrobaenus sp</i>	4		
<i>Polypedilum (P.) fallax group</i>	4		
<i>Cricotopus (C.) sp</i>	4		
<i>Parametriocnemus sp</i>	74		
<i>Paratanytarsus sp</i>	9		
<i>Cricotopus (Isocladius) sylvestris group</i>	13		
<i>Rheocricotopus (Psilocricotopus) robacki</i>	13		
<i>Orthocladius (O.) sp</i>	26		
<i>Rheotanytarsus sp</i>	78		
<i>Cricotopus (C.) bicinctus</i>	30		
<i>Tvetenia bavarica group</i>	9		
<i>Corbicula fluminea</i>	1	+	
<i>Ferrissia sp</i>	10		