

ELKHART-MISHAWAKA- SOUTH BEND AQUATIC COMMUNITY MONITORING



**ANNUAL REPORT
2009**



Stephen J. Luecke, Mayor

Cover Photo: Dave Huntington and Ben Martin with two nice northern pike at Keller Park on the St. Joseph River

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AQUATIC COMMUNITY MONITORING IN ELKHART AND ST. JOSEPH COUNTIES ON THE ST. JOSEPH RIVER AND SELECTED TRIBUTARIES 2009



Ben with a steelhead at Jefferson Boulevard

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INTRODUCTION

The St. Joseph River is a very beautiful complex system that for well over a century has been the lifeblood of the communities of Elkhart, Mishawaka and South Bend. The St. Joseph River originates near Baw Beese Lake in Hillsdale, Michigan. It meanders into Northern Indiana heading southwesterly through Elkhart and Mishawaka until making an abrupt northerly turn at "the Bend" towards Michigan. On the way, the St. Joe travels over 200 miles, draining approximately 4,685 square miles and 15 counties in Northern Indiana and Southern Michigan (Wesley & Duffy, 1999). Throughout its journey, the St. Joe encounters point and non-point source pollution from industrial, urban, and agricultural areas. The mighty Joe is also pressured by upstream disturbances from its delicate tributaries. Despite the water quality impacts, the St. Joe continues to flourish, hosting diverse wildlife communities and providing a multitude of recreational and aesthetic opportunities for its stakeholders. To maintain an understanding of the impacts our communities are having on this resource, and to determine where improvements can be made, the Cities of South Bend, Mishawaka, and Elkhart have entered into an interlocal agreement to monitor the rivers and streams of Elkhart and St. Joseph Counties.

In 2009, the Cities of Elkhart, Mishawaka, and South Bend, through the City of Elkhart's Aquatics Program, continued to monitor local fish populations in area rivers and streams. The information that was gathered has been integrated into an overall water quality program for each City. While the cities measure 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. Biological monitoring is beneficial in that the communities of aquatic organisms can tell us a lot about overall water quality and current and past disturbances to our streams. However, chemical and microbial testing, in most instances, is simply a snapshot of current conditions.

During the first six years (1998-2003), Elkhart's Aquatics Program established core fish sampling sites on the St. Joseph River and many of the primary tributaries in the Elkhart area. For three consecutive years, data were collected from these sites and a baseline of information was established for each stream. Baseline data are now used to compare with current monitoring results to determine if impairments or enhancements are taking place in Elkhart area streams.

In 2001, the City of South Bend combined forces with Elkhart's Aquatics Program, establishing a unique biological monitoring partnership between municipalities. As with the Elkhart area, core sampling sites were determined and similar baselines were obtained for the South Bend area for a six year period (2001-2006). This year (2009) was the third year that the initial sites had been sampled since the baseline period, providing the stakeholders of South Bend with data to determine whether water quality in their area is improving or diminishing.

In 2007, the City of Mishawaka signed on to partner with the interlocal aquatics team. This year (2009) marked the final year in which baseline data were collected in Mishawaka. Now that Mishawaka's first baseline is complete, this City can determine if the watershed is improving or degrading in their area.

This year the Aquatics Program also extended its services to the Elkhart River Restoration Association (ERRA) and conducted some stream assessment work in support of their EPA 319 Watershed Management Grant. This work included performing monitoring surveys at 7 additional sites on the Elkhart River and tributaries in and around Goshen.

The Aquatics Program consists of more than just traversing through local streams collecting fish data. A considerable portion of the Program is education. The biologist travels to local schools and watershed stakeholder group meetings, giving presentations and demonstrations, in an effort to increase awareness of, and promote conservation for, the bountiful aquatic resources we have in this area. The biologist also plays an active role in local conservation groups such as the Friends of the St. Joe River, the ERRA, and the Michiana Walleye Association.

The Index of Biotic Integrity (IBI) is the system that is used to assess the local fish communities. The IBI was developed by Dr. James Karr in 1981 as a tool for assessing water/stream quality based on the fish communities that are present. The IBI was modified by Dr. Thomas Simon in 1997 for use in the St. Joseph River Watershed. The IBI is a great tool in that complex biological information can be analyzed to provide measurements of stream quality for non-biologists and members of

Figure 1. MBI personnel retrieving a Hester-Dendy sampler from a stream.



the general public. 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 (see Appendix A). These metrics are given a score based on their similarity to least impacted (reference) sites. One of three scores can be given for each metric: 1 (not similar to reference conditions), 3 (somewhat similar to reference conditions), or 5 (very similar to reference conditions). In general, the total score for a site will range from 12 to 60, but in an instance where no fish are present at a site, a score of 0 is given. 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.

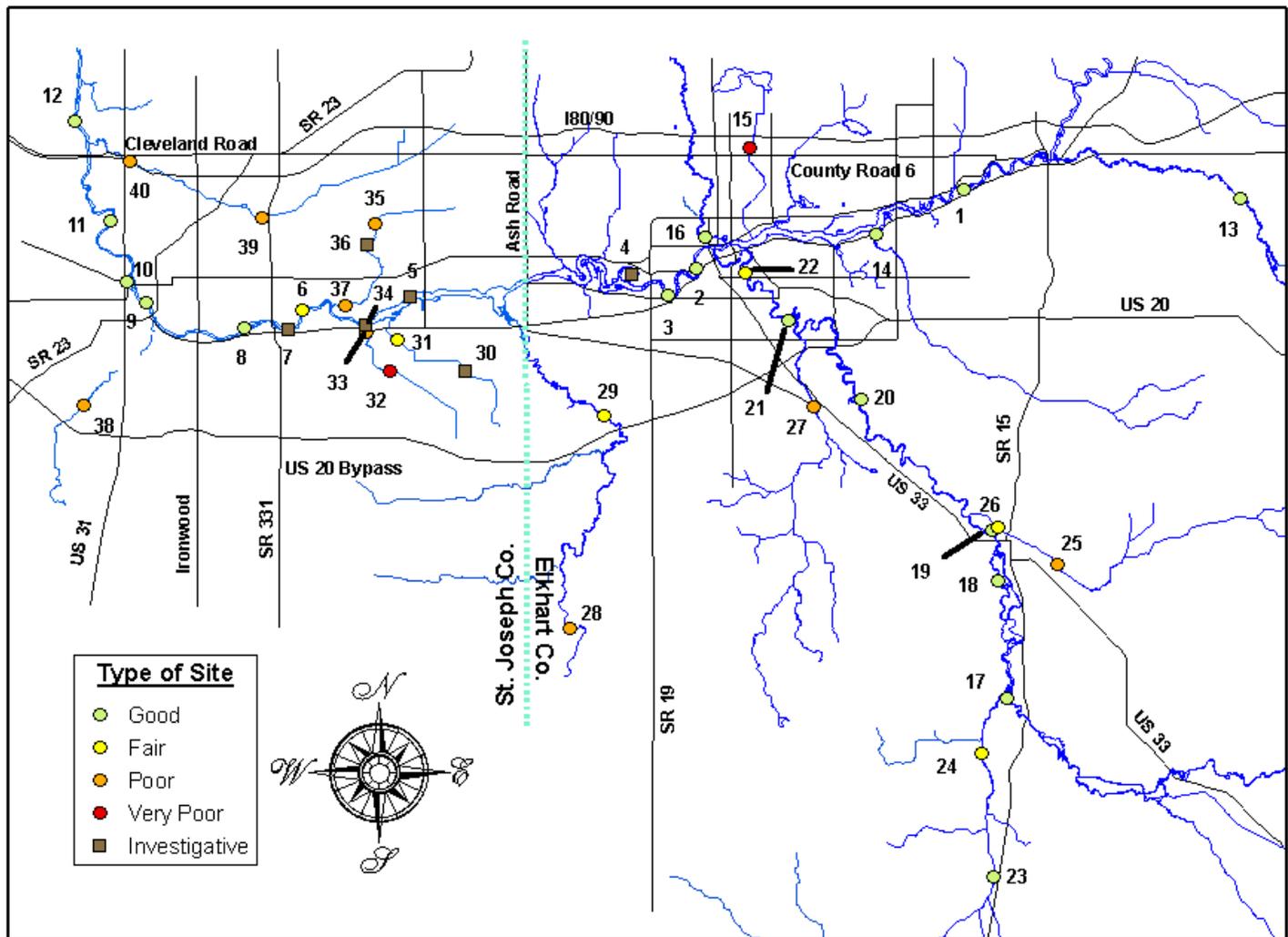
Fish are not the only aquatic organisms that can be monitored to determine overall health of rivers and streams. Through a sub-contract with the Midwest Biodiversity Institute (Figure 1) (MBI, Columbus, Ohio), the Aquatics Pro-

Table 1: Fish consumption information taken from the 2009 Indiana Fish Consumption Advisory

Location	Species	Fish Size (inches)	Contaminant	Group
Elkhart River <i>Elkhart County</i>	Rock Bass	9+	□	3
	Smallmouth Bass	17+	□	3
	White Sucker	16+	□	3
Christiana Creek <i>Elkhart County</i>	Northern Hogsucker	Up to 14		1
	Rock Bass	Up to 7		1
	Yellow Bullhead	Up to 9		1
St. Joseph River <i>Elkhart County</i>	Bluegill	Up to 8		1
	Channel Catfish	All	□	3
	Common Carp	Up to 25	□	3
		25+	□	4
	Northern Hogsucker	15+	□	3
	Rock Bass	Up to 7		1
	Redhorse Species	17+	□	3
	Walleye	25+	□	3
White Sucker	Up to 14		1	
St. Joseph River <i>St. Joseph County (Baugo Bay Area to Petro Park)</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
	Spotted Sucker	Up to 17		1
White Sucker	Up to 14		1	
St. Joseph River <i>St. Joseph County (Petro Park to Indiana State Line)</i>	Bluegill	7+	□	4
	Channel Catfish	All	□	4
	Common Carp	15-20	□	3
		20-25	□	4
		25+	□	5
	Chinook Salmon	28+	□	4
	Carp sucker species (Quilback)	Up to 19	□	4
		19+	□	5
	Rock Bass	Up to 7	□	2
	Smallmouth Bass	14+	□	4
Steelhead Trout	30+	□	4	
Yellow Bullhead	Up to 10	□	2	
Juday Creek	White Sucker	17+	□	3

○ = Mercury	Group 2 = 1 meal/week	Group 4 = 1 meal/2 months
□ = PCBs	Group 3 = 1 meal/month	Group 5 = DO NOT EAT

Figure 2: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community condition for 2009



gram is also monitoring benthic (bottom dwelling) macroinvertebrates (visible animals without backbones) at sites in all three cities. Twenty-one sites were sampled in 2009 and results were compared to their respective baseline values. The macroinvertebrate communities are assessed with 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 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 streams.

In addition to performing water quality monitoring in the St. Joseph River basin, fish collections are conducted to determine the overall species diversity throughout the watershed. Walleye (*Sander vitreus*) populations are monitored from previous tagging events in cooperation with the Indiana Department of Natural Resources (IDNR). Tissue from eight fish species was collected and analyzed for mercury and polychlorinated biphenyl (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

For the last twelve years, the Aquatics Program has used two collection protocols (investigative sampling and index sampling) to quickly catalog

Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2009

Site Number	Site Description	Type of Site (Index/Investigative) County	Method	IBI Scores	ICI Scores	QHEI Scores
				2009	2009	2009
1	Nibbyville (A) St. Joseph River	Index Elkhart	Boat	53		77
2	Lexington Ave. St. Joseph River	Index Elkhart	Boat	52	Good	77
3	McNaughton Park St. Joseph River	Index Elkhart	Boat	51	44	64
4	Lexington Landing (East) St. Joseph River	Investigative Elkhart	Boat			77
5	Bittersweet Road (B) St. Joseph River	Investigative St. Joseph	Boat			57
6	Merrifield Park St. Joseph River	Index St. Joseph	Boat	45		61
7	Cedar Street St. Joseph River	Investigative St. Joseph	Boat			68
8	Logan Street St. Joseph River	Index St. Joseph	Boat	50	56	67
9	Jefferson Blvd. St. Joseph River	Index St. Joseph	Boat	47		47
10	LaSalle Street St. Joseph River	Index St. Joseph	Boat	50		75
11	Keller Park St. Joseph River	Index St. Joseph	Boat	51	50	73
12	Brick Road St. Joseph River	Index St. Joseph	Boat	54	40	82
13	County Road 35* Little Elkhart River	Index Elkhart	Tote Barge	49	44	91
14	State Road 120* Pine Creek	Index Elkhart	Tote Barge	51	38	78
15	Park Six Drive Lily Creek	Index Elkhart	Tote Barge	15		47
16	North Main Wellfield Christiana Creek	Index Elkhart	Tote Barge	53	48	73
17	State Road 15 (B) Elkhart River	Index Elkhart	Boat	48	Attainment#	74
18	Shanklin Park Elkhart River	Index Elkhart	Boat	54		80
19	Rogers Park (B) Elkhart River	Index Elkhart	Boat	50	Impaired#	79
20	Oxbow Park (B) Elkhart River	Index Elkhart	Boat	52	52	80
21	Elkhart Environmental Center (A) Elkhart River	Index Elkhart	Boat	53		78
22	Central High School Elkhart River	Index Elkhart	Boat	45	54	73
23	County Road 50 Turkey Creek	Index Elkhart	Tote Barge	46		72
24	County Road 142 Turkey Creek	Index Elkhart	Tote Barge	40	Impaired#	59
25	Monroe Street Rock Run Creek	Index Elkhart	Tote Barge	35		64
26	1st Street Rock Run Creek	Index Elkhart	Tote Barge	42	Impaired#	55

* denotes a cool/cold water site

denotes a macroinvertebrate assessment that was conducted following the draft IDEM mIBI protocols

Table 2: Fish sampling sites in Elkhart and St. Joseph Counties, 2009 (continued)

Site Number	Site Description	Type of Site (Index/Investigative)	Method	IBI Scores	ICI Scores	QHEI Scores
		County		2009	2009	2009
27	Concord High School Yellow Creek	Index Elkhart	Tote Barge	33	34	57
28	County Road 1 (S) Baugo Creek	Index Elkhart	Tote Barge	36	36	68
29	County Road 3 (N) Baugo Creek	Index Elkhart	Tote Barge	42	38	71
30	Basswood Road* Woodward Ditch	Investigative St. Joseph	Back Pack			24
31	Oakside Avenue* Woodward Ditch	Index St. Joseph	Tote Barge	43	34	38
32	Bridgeton Drive* Eller Ditch	Index St. Joseph	Tote Barge	20	8	50
33	Lincolnway* Eller Ditch	Index St. Joseph	Back Pack	26	22	59
34	Frank Zappia Access* Eller Ditch	Investigative St. Joseph	Back Pack			
35	Day Road* Willow Creek	Index St. Joseph	Back Pack	34	34	69
36	Willow Creek Road* Willow Creek	Investigative St. Joseph	Back Pack		42	38
37	Estates Blvd* Willow Creek	Index St. Joseph	Back Pack	28		64
38	Chippewa Ave. Phillips Ditch	Index St. Joseph	Back Pack	25	28	62
39	Grape Road* Juday Creek	Index St. Joseph	Tote Barge	35		67
40	Myrtle Street* Juday Creek	Index St. Joseph	Tote Barge	35	46	56

* denotes a cool/cold water site

the major fish species and to quantify water quality in the St. Joseph River watershed. Investigative sites are sampled once during the season and the fish collected at these sites are identified to species, the largest and smallest specimens are measured to the nearest millimeter (mm), and all fish are counted and then released. Index sites are sampled twice during the season, with a minimum five week "rest" period between sampling events. Individual species maximum and minimum lengths are recorded, all fish are counted, and game fish are weighed and measured individually, while non-game fish are mass weighed. The length sampled at an index site is dependent on the wetted width of the stream. The length of sites is 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 spe-

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

In 2008, 12 index and 7 investigative sites were sampled in St. Joseph County and 20 index and 1 investigative sites were sampled in Elkhart County (Figure 2 and Table 2). Again, index sites were sampled twice and investigative sites were sampled once. As previously noted, 7 of the index sites in Elkhart County were for a unique, short-term project for the ERRA. 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

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



Table 3: Macroinvertebrate Sampling Sites, 2009

Site Number	Stream	Location	Site Number	Stream	Location
1	St. Joseph River	Lexington Ave.	14	Elkhart River	Central H.S.
2	St. Joseph River	McNaughton Park	15	Turkey Creek	CR 142
3	St. Joseph River	Logan Street	16	Rock Run Creek	1st Street
4	St. Joseph River	Keller Park	17	Baugo Creek	CR 1 (S)
5	St. Joseph River	Brick Road	18	Baugo Creek	CR 3 (N)
6	Little Elkhart River	CR 35	19	Woodward Ditch	Oakside Avenue
7	Pine Creek	SR 120 (Res)	20	Eller Ditch	Bridgeton Drive
8	Yellow Creek	Concord H.S.	21	Eller Ditch	Lincolnway
9	Christiana Creek	North Main Wellfield	22	Willow Creek	Day Road
10	Christiana Creek	High-Dive Park	23	Willow Creek	Estates Blvd
11	Elkhart River	SR 15 (B)	24	Phillips Ditch	Chippewa Ave.
12	Elkhart River	Rogers Park	25	Juday Creek	Myrtle Street
13	Elkhart River	Oxbow (B)			

Figure 4: Location of macroinvertebrate sampling sites for 2009

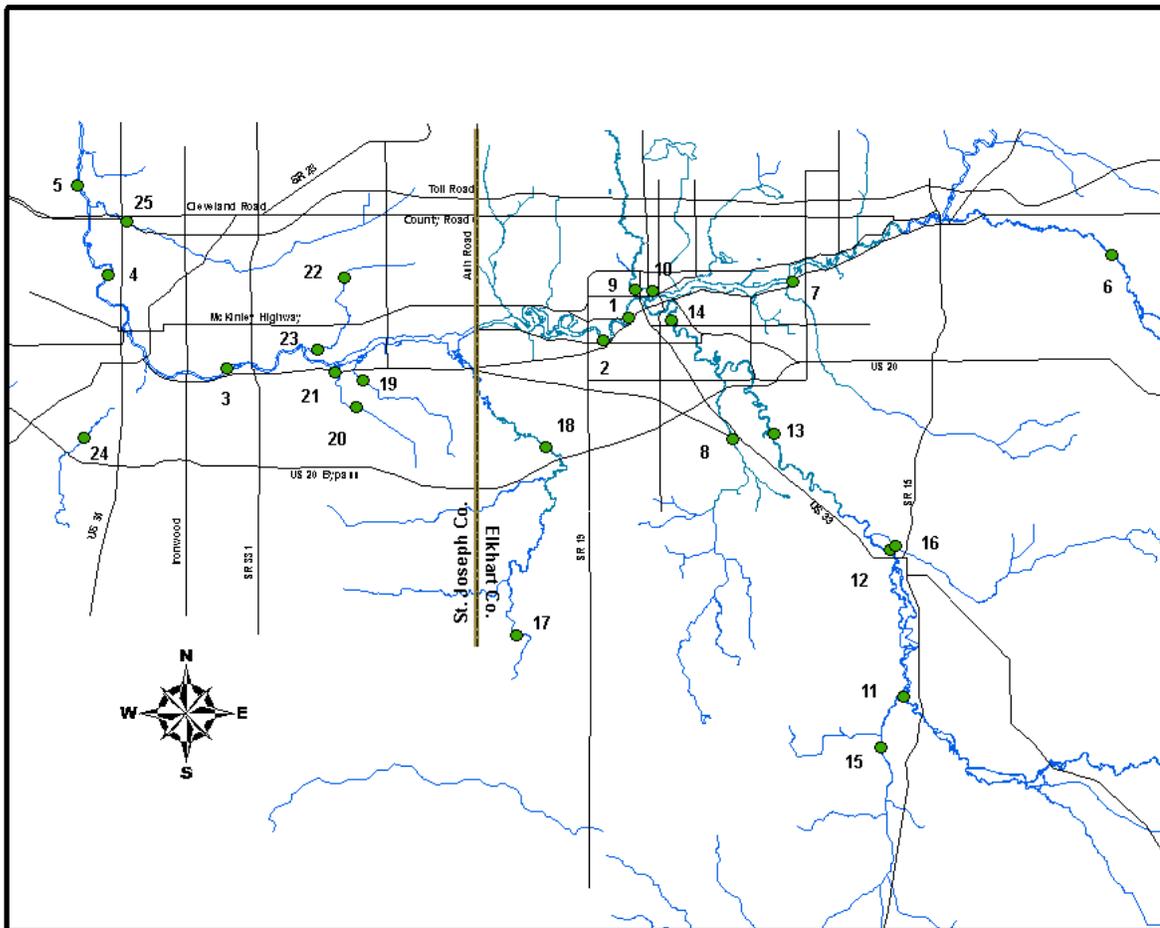


Figure 5: Location of fish tissue collection sites for 2009

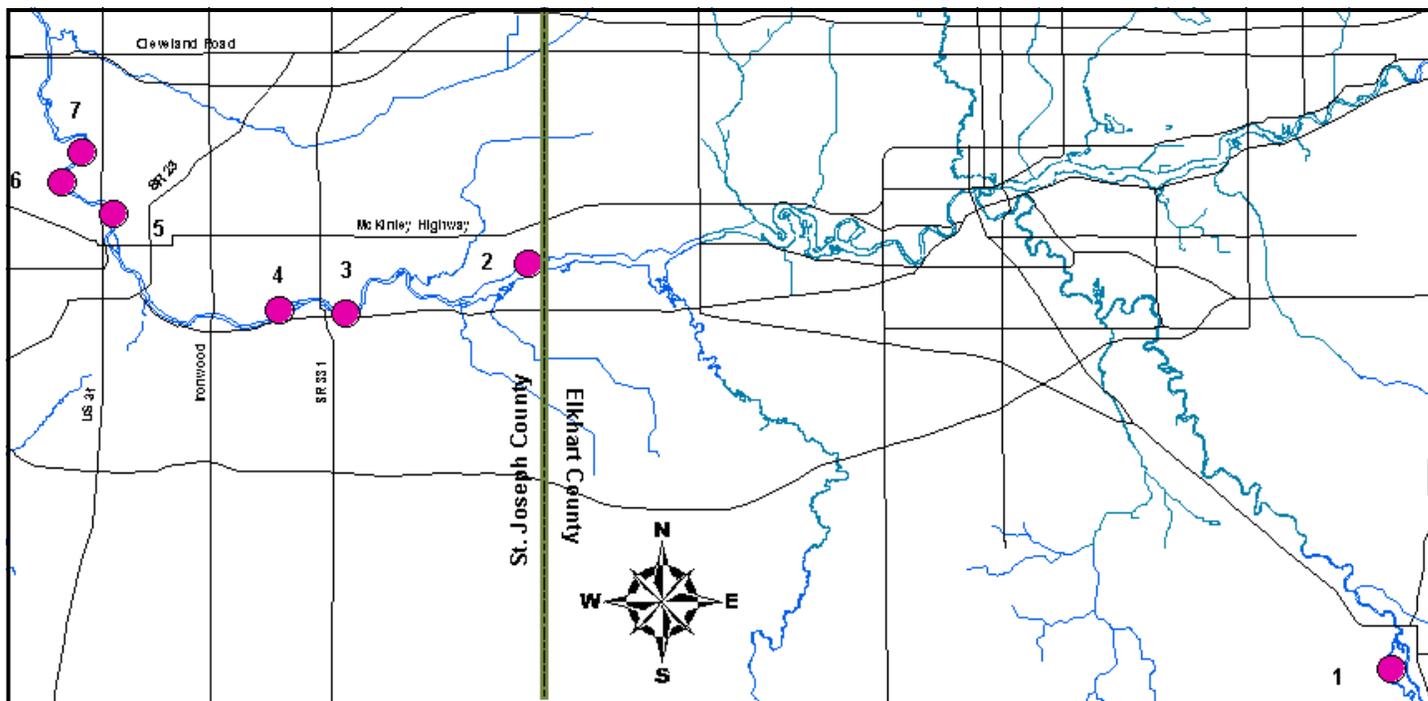


Table 4: Location of fish tissue collection sites for 2009

Site Number	Stream	Location
1	Elkhart River	Roger’s Park (B)
2	St. Joseph River	Bittersweet Road
3	St. Joseph River	Cedar Street
4	St. Joseph River	Logan Street
5	St. Joseph River	Michigan Ave.
6	St. Joseph River	Angela Blvd.
7	St. Joseph River	Keller Park

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 4-6 amperes, and the backpack was 0.5-1.5 amperes.

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

In mid to late July, 2009, MBI personnel placed Hester-Dendy samplers (artificial substrates used

to collect small aquatic organisms) (Figure 3) at 20 sites that were also sampled for fish (Table 3 and Figure 4) following Ohio EPA macroinvertebrate sampling procedures (Ohio EPA 1987, 1989). One Hester-Dendy sampler was also placed at High-Dive Park on Christiana Creek. Twenty (20) of the 21 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 of a lost sampler.

Macroinvertebrate community assessments were also performed at four of the seven ERRA sites. Hester-Dendy samplers were not set at these sites, but protocols similar to the qualitative sampling approach were used. At these sites, macroinvertebrate communities were assessed using the draft IDEM macroinvertebrate Index of Biotic Integrity (mIBI). Because these sites were investigated in cooperation with IDEM, it was necessary to assess the sites in accordance with draft IDEM protocols. Table 2 displays all ICI and mIBI scores or narrative ratings for 2009.

Fish tissue in the form of fillets was collected from bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), golden redhorse (*Moxostoma erythrurum*), rock bass (*Ambloplites rupestris*), steelhead (*Oncorhynchus mykiss*), smallmouth bass (*Micropterus dolomieu*), walleye (*Sander vitreus*), and white suckers (*Catostomus commersonii*). 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 2009, a total of 23,365 fish, representing 18 families and 71 species, were collected in Elkhart County. In St. Joseph County 9,374 fish, representing 14 families and 58 species, were collected. (See Appendix C for more information). In total, 72 different species were captured from the two counties. Rock bass, white suckers, and creek chubs were the most abundant species collected in Elkhart County, while longear sunfish (*Lepomis megalotis*), smallmouth bass, and rock bass were the most abundant in St. Joseph County.

Indices

The IBI, ICI, and QHEI scores for 2009 are summarized in Table 2. Throughout this report, these data will be presented in graphical form to illustrate longitudinal and temporal 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 (15) at Park Six Drive on Lily Creek to almost excellent (54) at both Brick Road on the St. Joseph River and Shanklin Park on the Elkhart River. Macroinvertebrate community scores ranged from poor (8) at Bridgeton Drive on Eller Ditch to excellent (56) at Logan Street on the St. Joseph River. Habitat quality at index sites ranged from poor (38) at Oakside Avenue on Woodward Ditch to excellent (91) at County Road 35 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, mIBI 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, mIBI and ICI scores are indicators of a stream with the ability to support aquatic life. QHEI scores of 51 or greater indicate enough quality habitat is available to support aquatic communities.

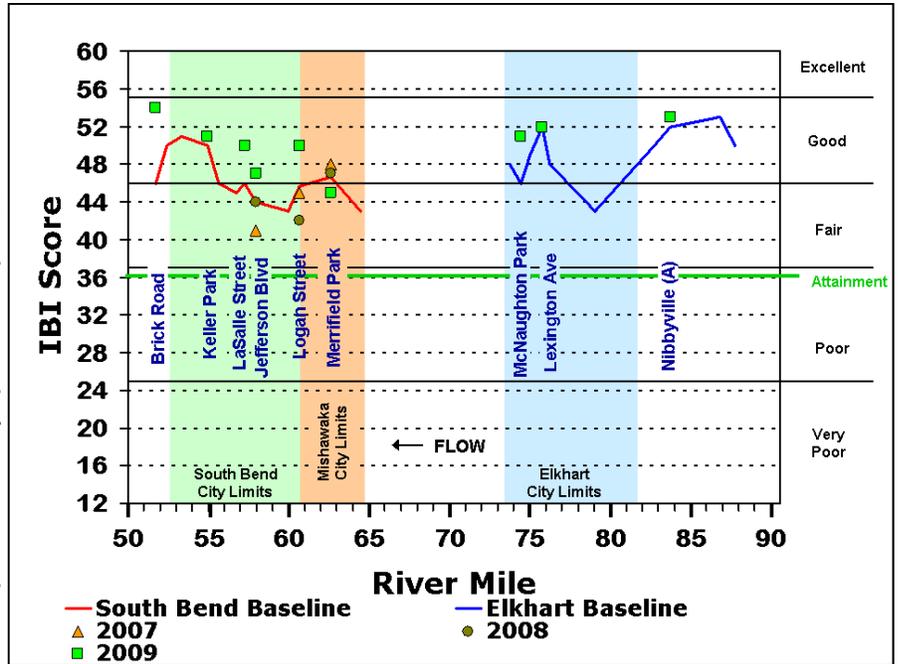
The longitudinal trends in fish community condition for the entire Indiana portion of the St. Joseph River are displayed in Figure 6. The Elkhart County portion of the river continues to support good fish communities. The most upstream site sampled in 2009, Nibbyville (A), had a fish IBI score of 53, which is almost excellent. The Nibbyville area which is upstream of Elkhart city limits is influenced by good water quality coming from upper reaches of the watershed. Nibbyville (A) and McNaughton Park scored above their respective baseline values in 2009, while Lexington Avenue had the same score as the baseline (52).

Two macroinvertebrate sampling sites were assessed in the Elkhart portion of the St. Joseph River in 2009 (Figure 7). At Lexington Avenue, the HD sampler was lost, but a qualitative sample showed the macroinvertebrate community to be in the good range. The ICI score for McNaughton Park was also in the good range and was generally consistent with baseline values established at upstream sites. Habitat scores for the Elkhart County portion of the St. Joseph River were good to excellent. The Lexington Avenue site had an excellent score (77) for the first time. The excellent habitat score is not surprising given the almost excellent fish community that is present at this site.

In 2009, sites in Mishawaka, Merrifield Park and Logan Street, where sampled for the third consecutive year allowing for the establishment of baseline scores. Baseline values are simply the average IBI scores from three yearly sampling events that provide a reference for future comparisons. Jefferson Boulevard in South Bend was also sampled for a third consecutive time to provide a more comprehensive baseline for St. Joseph County. Baseline scores had previously been established by the Aquatics Program at Capital Avenue in Mishawaka and at Ironwood Drive just downstream of Mishawaka. From Capital Avenue

on the east side of Mishawaka to Ironwood Drive, just to the west, IBI scores slightly rise as the river enters downtown, but slightly decrease as the river leaves town. This minor fluctuation in IBI scores is likely attributed to variability within the IBI methodology. Overall the baseline IBI values for the Mishawaka area indicate that the fish communities are in the fair to good range. The 2009 ICI score for the Logan Street (56) was surprisingly high, and significantly higher than 2007 and 2008. Macroinvertebrates were collected from Logan Street for the third time in 2009, also allowing for the establishment of a baseline value at this site (Figure 7). For future comparisons, the baseline value will be in the excellent range for macroinvertebrates and the fair to good range for fish.

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



IBI scores for the St. Joseph River in South Bend show a similar pattern to past years (Figure 6). As the river bends north and heads towards Michigan, fish community integrity appears to increase. All South Bend sites scored above the baseline in 2009. A surprising finding in 2009 was the high score (54) at the Brick Road site, which was well above the baseline value of 46. The Brick Road site has excellent habitat (Figure 8) which could be influencing the high IBI score. It will be interesting to see if the IBI score for this site remains as high when it is sampled again. The ICI score of 40 at Brick Road was slightly below the established baseline value of 43.

While this score was still considered good overall, there was an obvious difference in the quality of the fish community versus the macroinvertebrate

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

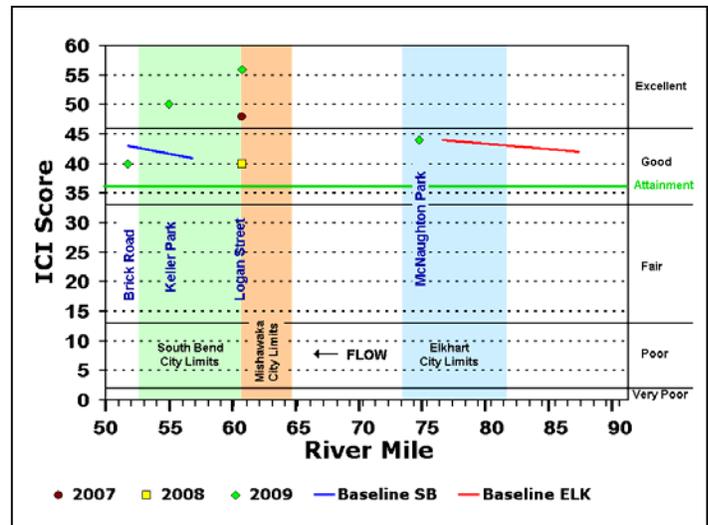
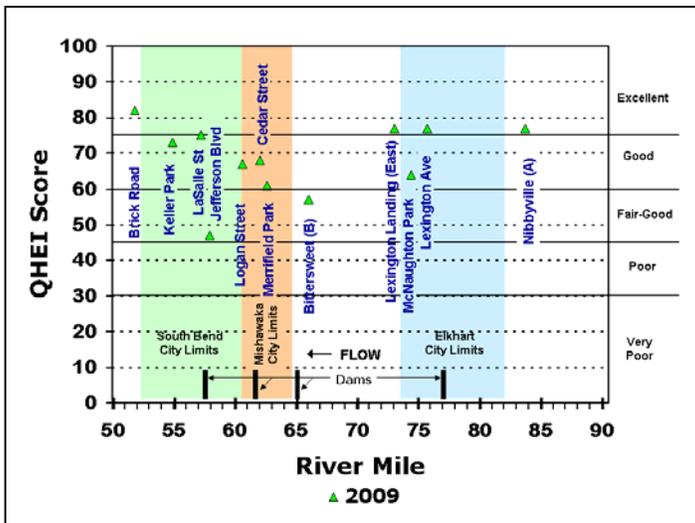
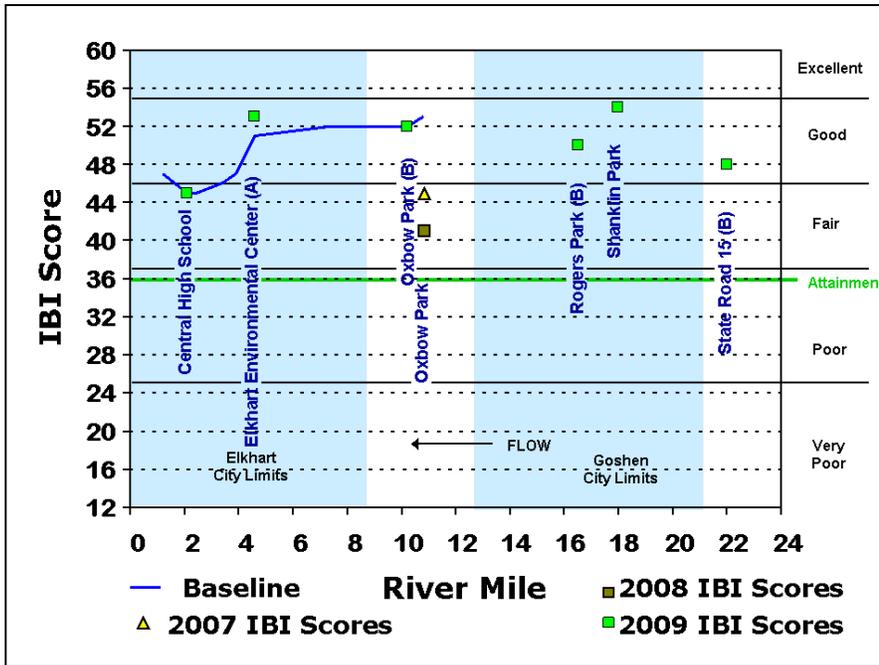


Figure 8: QHEI scores for the St. Joseph River, Elkhart and St. Joseph Counties



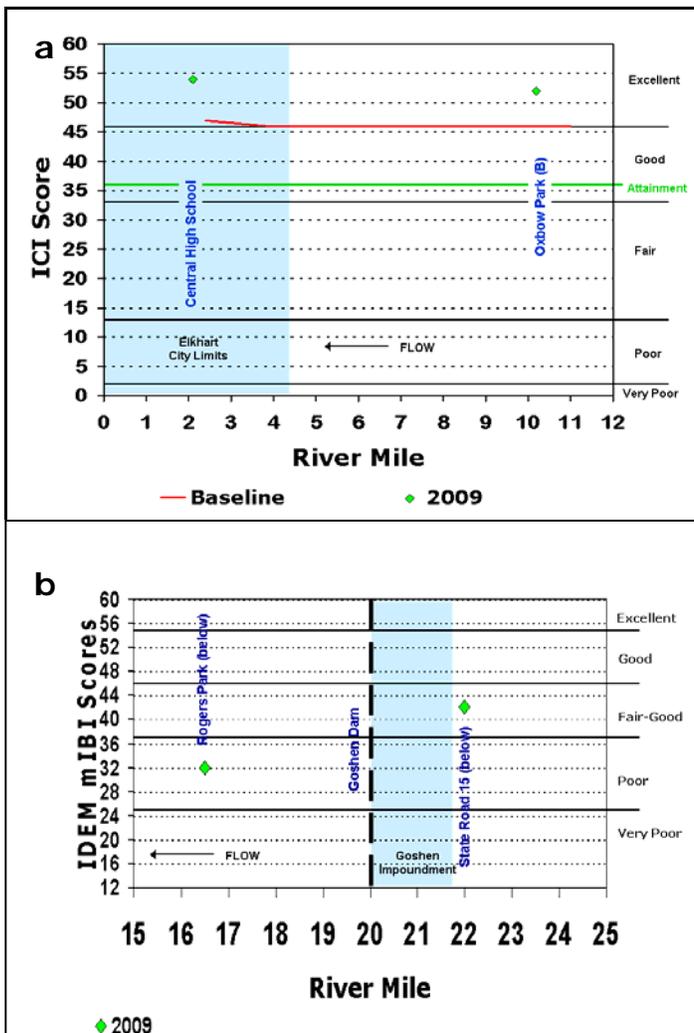
community. This is a perfect example of how different aquatic communities react to stressors and shows that performing concurrent assessments of more than one taxonomic group can provide a more thorough understanding of stream conditions. The 2009 ICI score for Keller Park (50) was above the established baseline and fell within the excellent range. This site continues to bolster adequate biological communities and in-stream habitat.

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



All of the 2009 IBI scores on the Elkhart River, in the Elkhart area, were either at or above the established baseline (Figure 9). It should be noted that an IBI calculation error in baseline values for Elkhart River sites was discovered in 2009. This calculation error has slightly modified the appearance of the baseline, but has not changed the baseline ratings given to the Elkhart River sites. In 2007 and 2008 a significant drop in IBI scores occurred at the Oxbow Park site. Kring (2009), attributed this drop to erosion and enrichment problems from upstream. In 2009, however, the Oxbow Park (B) site scored at the baseline suggesting a recovery of the Elkhart River in the Oxbow Park area. Oxbow Park (B) is another site that was established just downstream of Oxbow Park. Another year of sampling at the Oxbow Park site will be necessary to determine if this section of stream has recovered. The Environmental Center (A) site on the Elkhart River continues to maintain a healthy fish community, while the

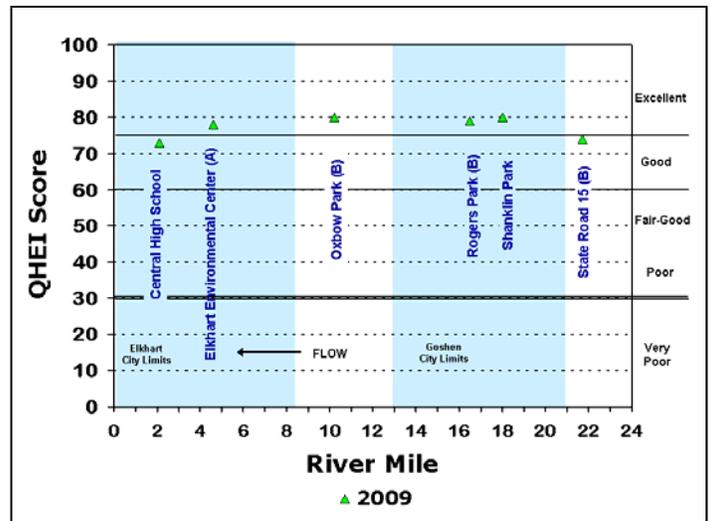
Figure 10a: ICI scores for the Elkhart River, Elkhart area
Figure 10b: mIBI for the Elkhart River, Goshen area



Elkhart Central High School site continues to be in the fair range. The health of the macroinvertebrate communities in the Elkhart area fell within the excellent range and were well above the established baseline (Figure 10a). Both sites, Central High School and Oxbow (B) had the highest diversity out of all the sites sampled in 2009, with respective collections of 54 and 52 different taxa.

Index sampling in the Goshen area was performed

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



for the first time in 2009 by the Aquatics Program. All of the Goshen sites had fish IBI scores within the good range and the Shanklin Park site had an IBI score of 54, which is almost excellent. In addition, 5 state endangered greater redhorse were collected from Rogers Park (B), which was a considerable finding. Macroinvertebrate community scores, however, were less than remarkable for both sites sampled (Figure 10b). The mIBI score for the Rogers Park (B) site, for example, was in the poor range, indicating that the macroinvertebrate community is impaired. The fish IBI score for this site fell within the good range, while the habitat score was excellent. The differences in fish and macroinvertebrate community scores is yet another good example of how different communities react to stressors. QHEI scores reveal that habitat along the Elkhart River from Goshen to Elkhart is in the good to excellent range (Figure 11). The Elkhart River continues to maintain above average habitat for streams in the greater St. Joseph River Watershed.

While it is important to monitor the main stem of the St. Joseph and Elkhart Rivers, it is also important to monitor the tributaries of these streams. Assessing the tributaries provides more information on the observed conditions within the larger streams. Similar longitudinal views are presented for area tributaries and current results can be compared against past conditions.

Figure 13: ICI Scores of Bowman Creek/Phillips Ditch and Juday Creek, St. Joseph County

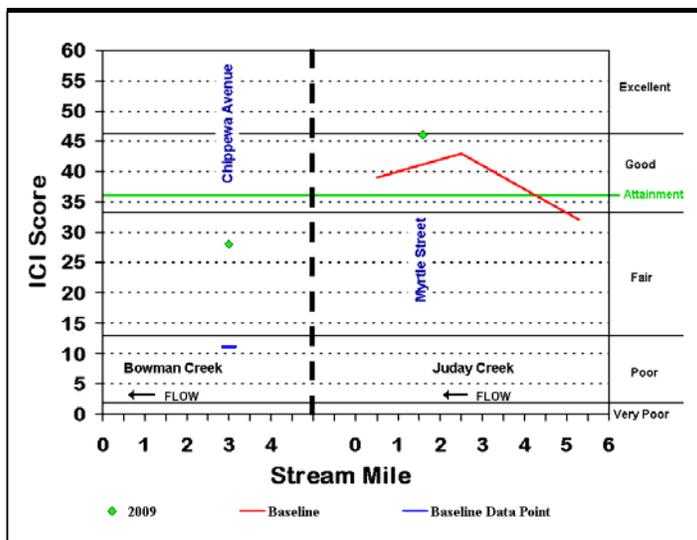
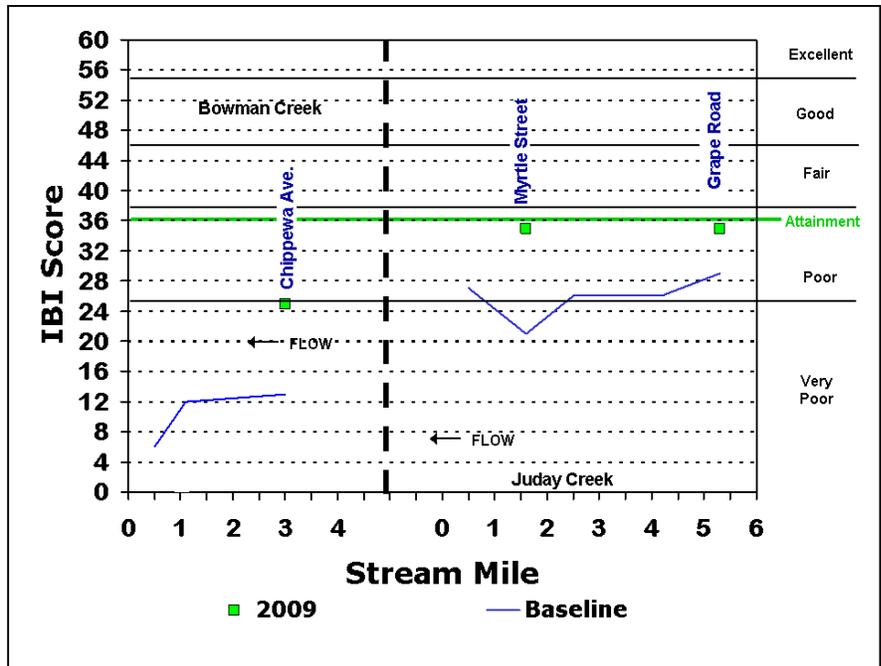


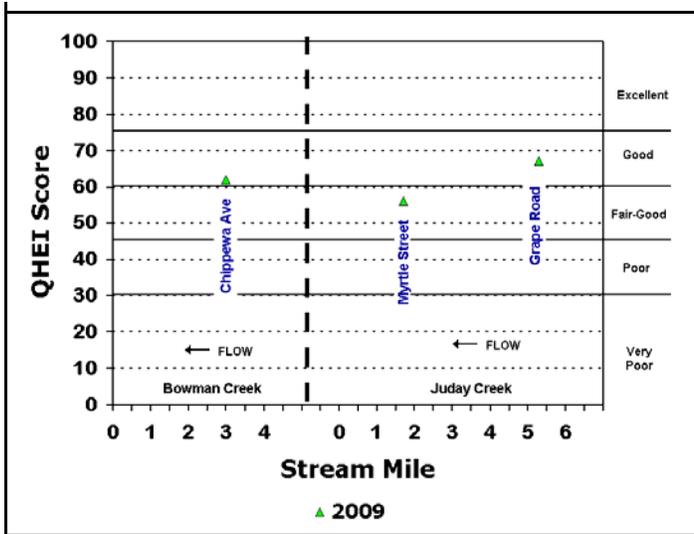
Figure 12: IBI scores for Bowman Creek and Juday Creek, St. Joseph County



Juday Creek and Bowman Creek are two tributaries of the St. Joseph River that flow through areas of South Bend (Phillips ditch is an extension of Bowman Creek). Both tributaries are heavily impacted by urban influences, but they are quite different from an ecological standpoint. Juday Creek is a cool/cold water stream that is capable of supporting trout, whereas Bowman Creek is much warmer with historically impaired biological communities.

Surprisingly, the IBI score at Chippewa Avenue on Phillips Ditch scored far higher in 2009 than it has in the past. (Figure 12). The 2009 score (25) was almost twice as high as the established baseline score of 13. The higher score is attributed to the amount of fish collected. In past years, the average number of fish collected from this site was 10 individuals, and in 2006 no fish were collected during the second sampling event. This year the average number of fish collected from both sampling events was 167 individuals (108 during the first event and 266 during the second). Although the fish community at this site is still considered poor, the results from this year indicate a significant improvement in stream quality from the past. Better yet, the ICI score for Chippewa Avenue (28) was also well above the established baseline value (11) (Figure 13). This significant increase was attributed to a higher percentage of more sensitive insects (caddisflies and midges) being present. These are very exciting results, and the Aquatics Program will closely

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



monitor this site to determine if these conditions remain stable into the future.

The IBI scores for Juday Creek continue to remain low, but appear to be improving over time (Figure 12). The Myrtle Street site in particular had a significant increase since it was sampled last in 2003. The baseline IBI for Myrtle Street is 21, but this site scored a 35 in 2009. With the exception of the Izaak Walton League site, all sites along Juday Creek have seen improvement above baseline scores in the last four years. QHEI scores for Juday Creek were fair to good at Myrtle Street and good at Grape Road in 2009 (Figure 14). Since the initial baseline sampling, habitat scores along Juday Creek have not changed as significantly as IBI scores. Even though IBI scores at both Juday Creek sites were slightly below the attainment level of 36, the increase that has been seen in this stream over the last four years is promising. ICI scores for 2009 also suggest an improvement in water quality in Juday Creek (Figure 13). At Myrtle Street, the macroinvertebrate community was within the good to excellent range.

Yellow Creek at Concord High School had a slightly lower IBI score (33) than the established baseline (34) (Figure 15). Kring (2007), observed a minor improvement in the IBI score during the 2006 collection season and suggested that water quality may be improving at Concord High School. However, 2009 results indicate that this site continues to suffer from water quality issues. Yellow Creek is one of many Elkhart County regulated drains that has been significantly modified and is highly influenced from agricultural runoff and significant fluctuations in water levels. It is not uncommon for water levels in this stream to jump over 5 feet

shortly following a heavy rain event. Approximately 66% of the fish collected from the Concord High School site are species that are tolerant to disturbance. The 2009 ICI score at Concord High School (34) further demonstrates the water quality issues in this stream (Figure 16).

The IBI score for Lily Creek at Park Six Drive (15) was the same as the 2004 established baseline indicating that there has been no long term improvement at this site (Figure 15). This score is an improvement, however, of the score that was given when the site was last sampled in 2006. Lily Creek has been known to have intermittent flow during the late summer months, and during the second sampling pass in 2006 there was no flowing water at the site (Kring, 2007). In 2009,

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

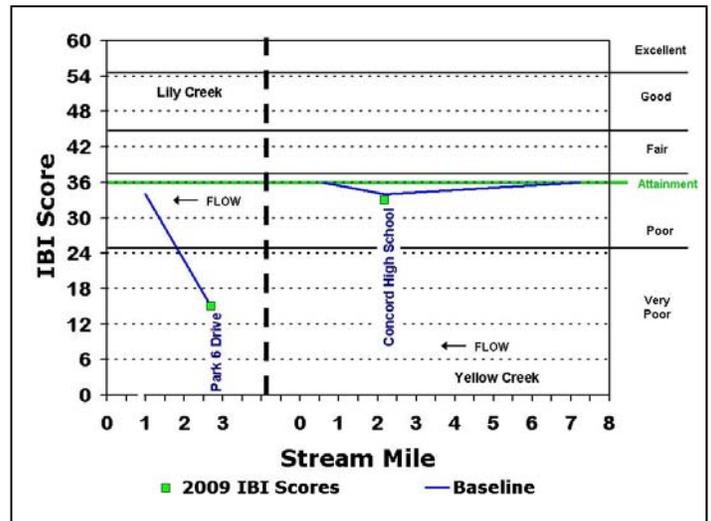


Figure 16: ICI scores for Yellow Creek, Elkhart County

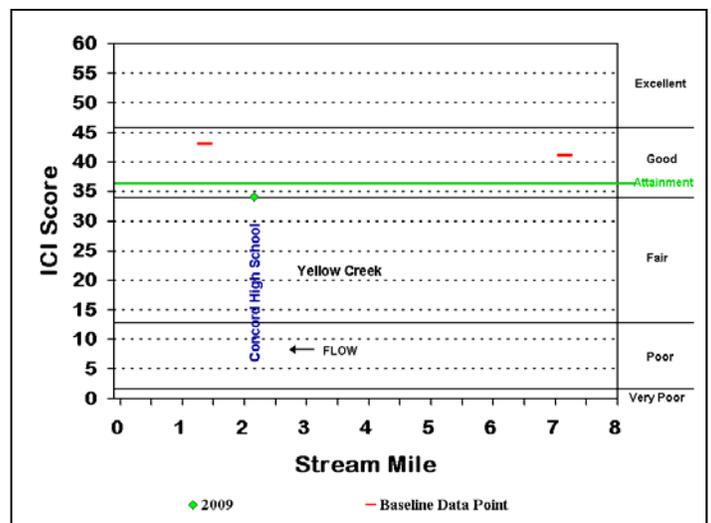
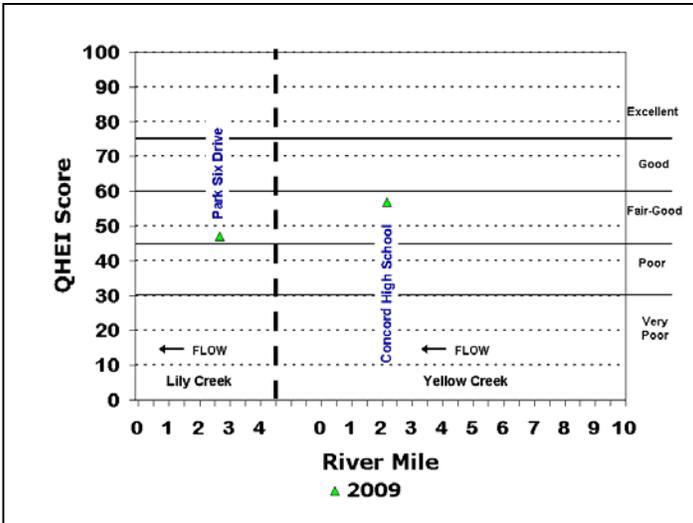


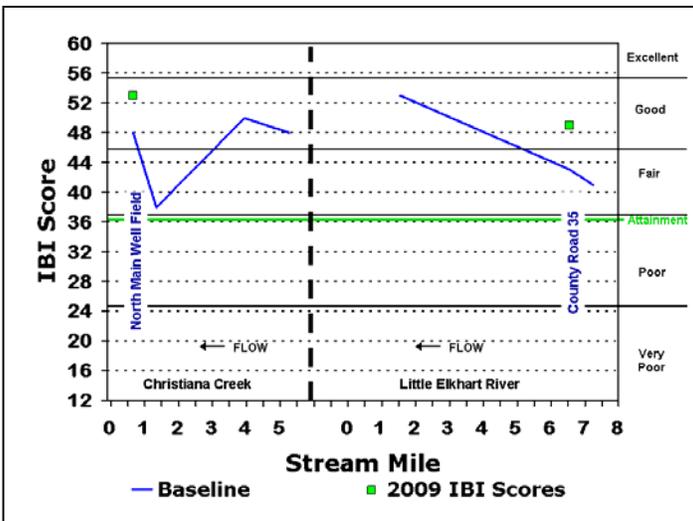
Figure 17: QHEI scores for Lily Creek and Yellow Creek, Elkhart County



there was water in the stream during both sampling events and fish were collected. The lack of flow during dry years has contributed to this sites inability to support aquatic life. The lack of sufficient habitat at this site also has an impact on the aquatic communities. In 2009, this site had a QHEI score of 47, which just falls into the fair to good range, and is the highest score that has been reported in the history of sampling this site (Figure 17). This score still falls below the attainment line and previous QHEI scores for this site have all been in the poor range.

Christiana Creek at the North Main Well Field continues to support a good fish community (Figure 18). The IBI score for this site was 53 in 2009, above the established baseline score of 48. This improvement has been since 2003. The rise in IBI scores does not coincide with development of

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



more sufficient habitat, as QHEI scores have not changed at this site over time. Therefore, the improvement in the fish community may be attributed to better water quality. ICI scores for 2009 show that Christiana Creek continues to support excellent macroinvertebrate communities (Figure 19).

In 2009, the Little Elkhart River at County Road 35 had the highest IBI score (49) in this history of sampling this site, and fell within the good range (Figure 18). This score was well above the established baseline score of 43. The increase this year is due to a more diverse assemblage of fishes than what has been observed in the past. Of all of the sites sampled in 2009, this site had the highest QHEI score which was 91 (Figure 20). This site is very sinuous, and has an almost perfect complex

Figure 19: ICI scores for Christiana Creek and the Little Elkhart River, Elkhart County

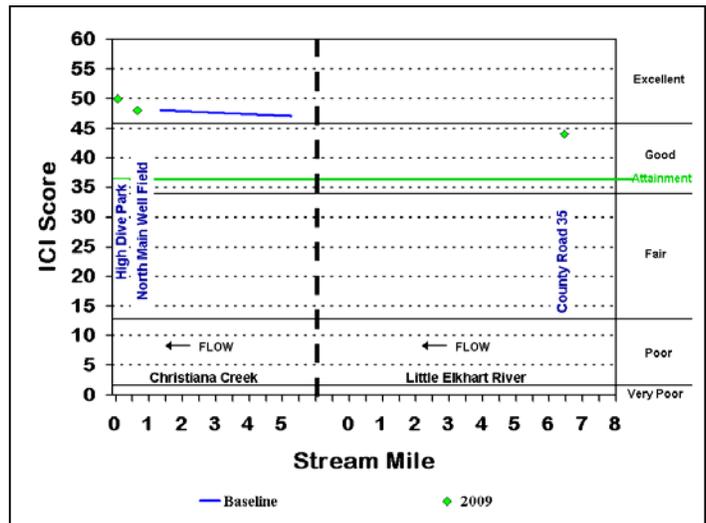
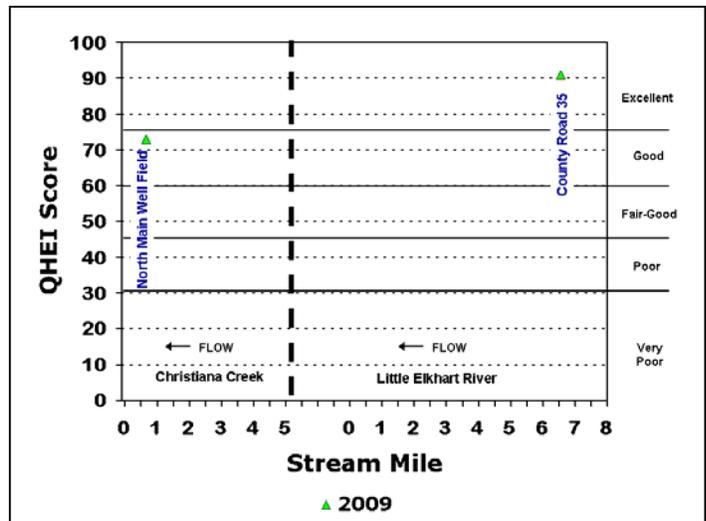


Figure 20: QHEI scores for Christiana Creek and the Little Elkhart River, Elkhart County



of riffles, runs, and pools. In addition to having a healthy fish community, the macroinvertebrate community was almost excellent (ICI: 44) (Figure 19). Although excellent habitat at this site likely contributes to the healthy biological communities, the QHEI scores have not changed as dramatically as the fish assemblage, suggesting a change in water quality. It will be interesting to see if this trend continues the next time this site is sampled.

The IBI score for Pine Creek at State Road 120 was well above the baseline in 2009 (Figure 21). In 2006, the last time this site was sampled, the IBI score was almost as high. These results are promising and suggest a long-term improvement in water quality. The 2009 ICI score for this site was also within the good range (Figure 22). The QHEI score was in the excellent range (Figure 23) indicating that habitat may be influencing the superior biological community scores. Pine Creek is highly influenced by agricultural activity and winds through industrial land on the east side of Elkhart. While headwater areas of Pine Creek may be more impacted (Kring 2009), improvements in stewardship close to State Road 120 may be the reason for improved water quality. There are also some other plausible explanations for the higher IBI scores observed at State Road 120: 1) State Road 120 is very close in proximity to the St. Joseph River, and recruitment of fish species from the St. Joe might be occurring at this location and, thus increasing the IBI score at the site; 2) Pine Creek is a cool-water stream and highly influenced by groundwater infiltration which may be diluting

Figure 21: IBI score for Pine Creek, Elkhart County

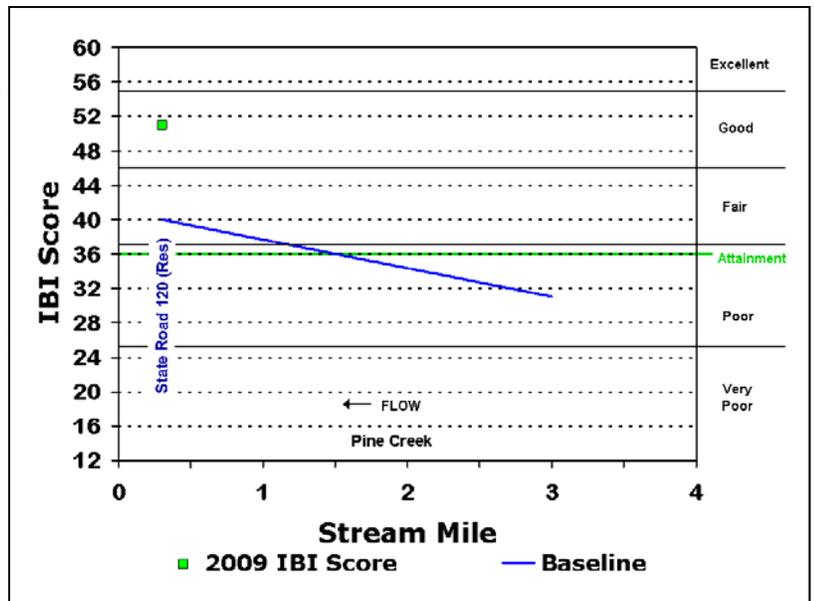


Figure 22: ICI score for Pine Creek, Elkhart County

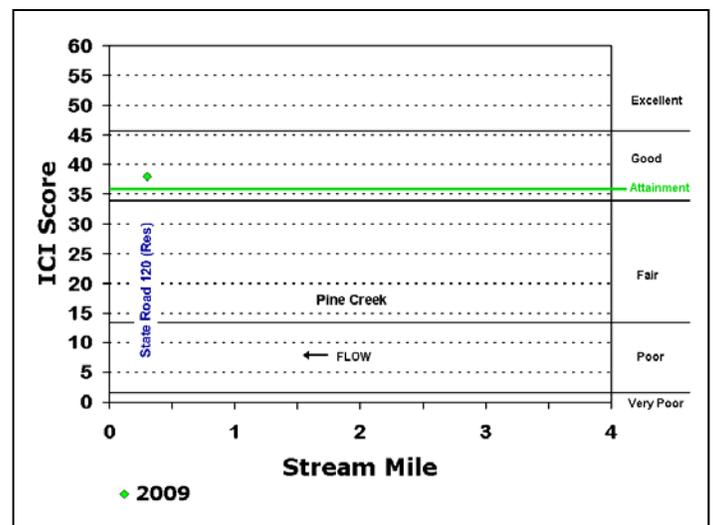
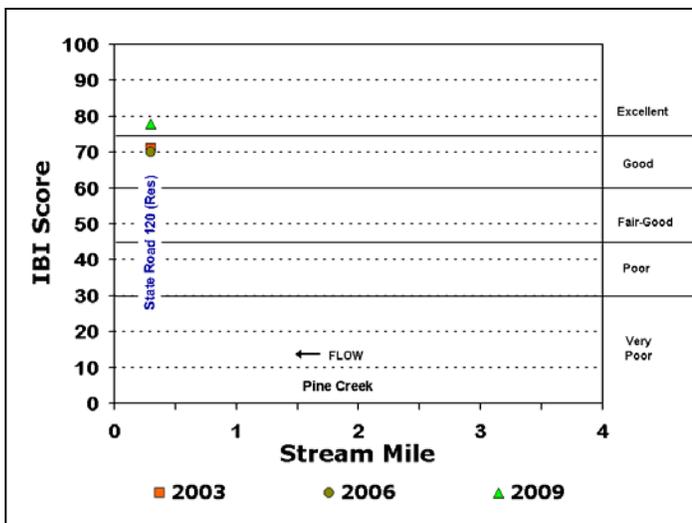


Figure 23: QHEI scores for Pine Creek, Elkhart County



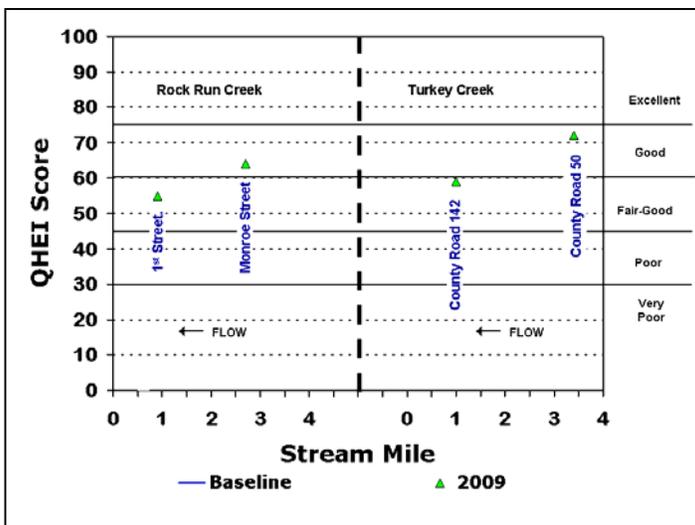
potential chemical inputs.

In 2009, two tributaries of the Elkhart River, Turkey Creek and Rock Run Creek, were sampled for the Elkhart River Restoration Association. Fish IBI, mIBI, and QHEI scores indicate that the tributaries entering the Elkhart River in the Goshen area are more impaired than the Elkhart River. Out of the four tributary sites sampled, the Turkey Creek County Road 50 site appears to be the least impacted (Figure 24). The fish IBI score for this site (46) fell within the good range. The higher score for the site is likely attributed to the QHEI score of 72, which is indicative of good habitat (Figure 26). Although Turkey Creek has been significantly straightened and modified for drainage purposes, the County Road 50 portion of Turkey Creek is a little less impacted and a little more

sinuous than other areas along this stream. The fish IBI score for the County Road 142 site (40) fell within the fair range, and the QHEI score (59) was within the fair to good range (Figure 26). This portion of Turkey Creek is more modified than the County Road 50 site. The mIBI score for County Road 142 was 30, indicating that the macroinvertebrate community is impaired according to draft IDEM guidelines (Figure 25). The impaired macroinvertebrate community is likely attributed to a combination of reduced habitat quality, as observed with the QHEI, and agricultural or suburban influences.

The Rock Run 1st Street site had comparable IBI scores to Turkey Creek County Road 142 (Figures 24 & 25). The fish IBI score for 1st Street (42) was within the fair range, while the mIBI (28) indicates that the macroinvertebrate community is impaired. The QHEI score for the 1st Street site (55) was the lowest of all Goshen sites, although it was still considered fair to good according to QHEI criteria. This portion of Rock Run has been significantly modified and straightened, and no riffle habitat was observed during sampling. The Rock Run Monroe Street site had the lowest fish IBI score (35), of all Goshen sites, falling within the poor category. The habitat score for this site, however, was 64, which is considered to be good according to QHEI

Figure 26: QHEI scores for Rock Run Creek and Turkey Creek, Elkhart County



criteria. A macroinvertebrate survey was not performed at this site. In this instance, the poor fish community cannot be attributed to poor habitat, and suggests a water quality issue at this site. This area of Rock Run is located on the eastern side of Goshen's city limits and could be influenced

Figure 24: IBI scores for Rock Run Creek and Turkey Creek, Elkhart County

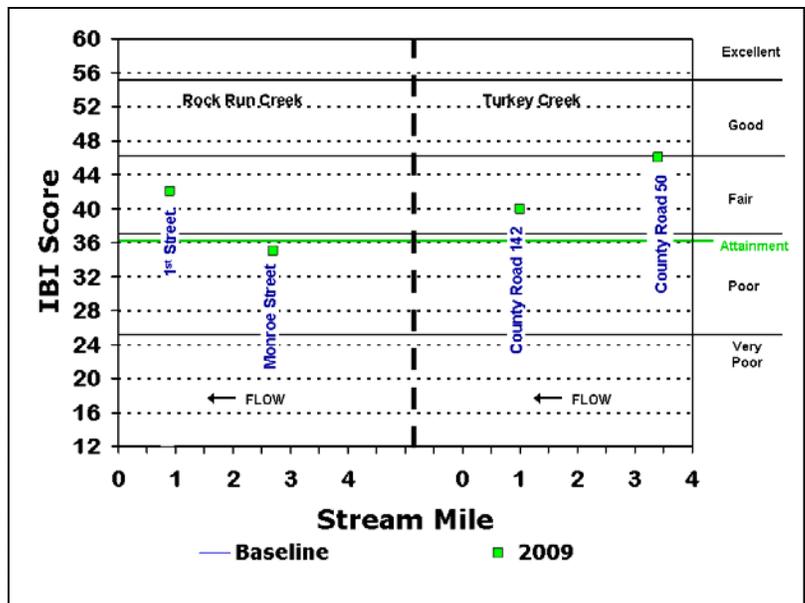
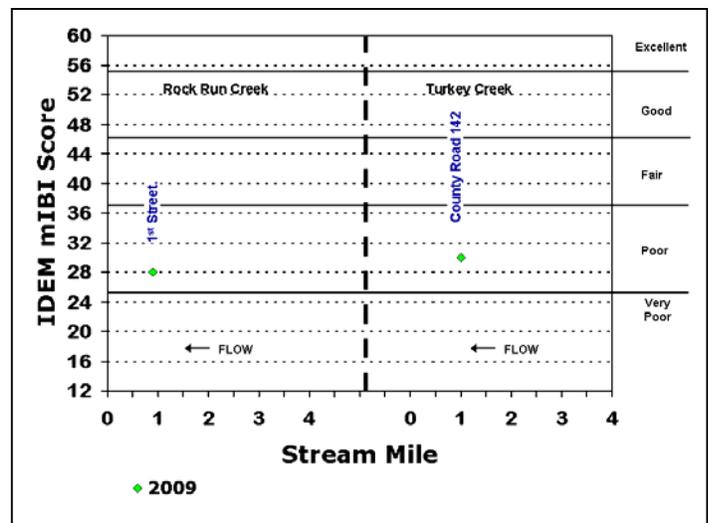


Figure 25: mIBI scores for Rock Run Creek and Turkey Creek, Elkhart County

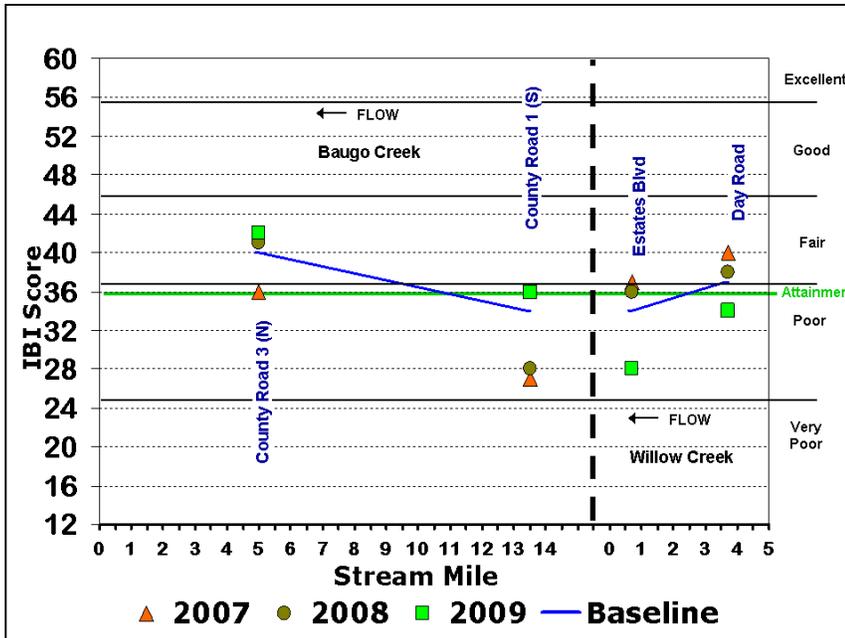


by intensive agricultural practices and associated surface water discharges.

Baseline work continued in 2009 on three streams in Mishawaka and one in the Elkhart area. These streams are Eller Ditch, Woodward Ditch, Willow Creek and Baugo Creek. This year was the third of three years of original baseline work on these four streams. Now that a baseline has been established, future monitoring will detect improvements or impairments in water quality in these streams.

IBI scores for Baugo Creek showed a somewhat similar pattern to 2008 (Figure 27). The downstream site at County Road 3 (N) showed slight improvement and was above the attainment line,

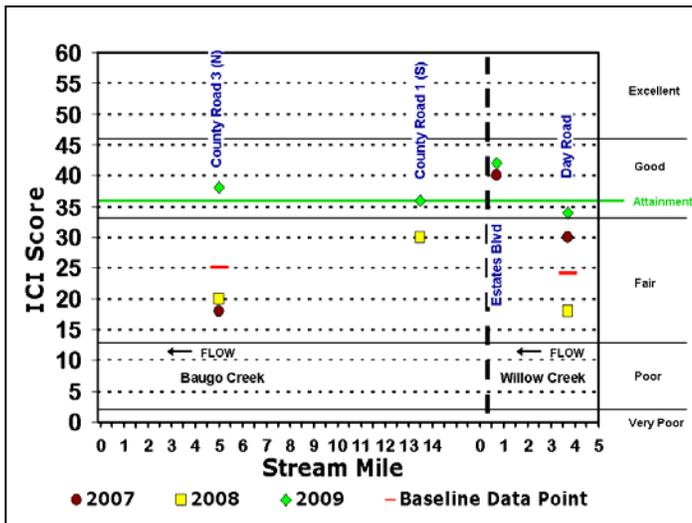
Figure 27: IBI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County



above the attainment line, while the County Road 1 (S) site was right on the attainment line. Results over the last three years, however, show opposite trends in ICI scores compared to IBI and QHEI scores; County Road 3 (N) has a more impaired macroinvertebrate community than County Road 1 (S). This is yet another example of how the different aquatic communities have varying reactions to stressors. Although the 2009 indices reflect positive results, the three year baseline average indicates that there is a lot of room for improvement in Baugo Creek. Sedimentation and bank erosion continue to be a serious problem throughout this watershed.

Willow Creek IBI scores fell significantly in 2009 from previous years (Figure 27). This was demonstrated more drastically at the Estates Boulevard site where IBI scores fell by a total of 8 points. The drop in scores was attributed to low numbers of fish being collected during the first sampling period at both Willow Creek sites. For example, only 42 fish were collected during the first sample at Day Road, and 125 fish were collected during the second sample resulting in respective IBI scores of 26 and 42. IBI scores between sample collection dates at the Estates Boulevard also varied as significantly. The reason for the low numbers of fish is unknown, but this indicates an impact to the water quality or some form of disturbance in the stream prior to or during May of 2009. IBI scores from the second round of sampling indicate that the fish community at both

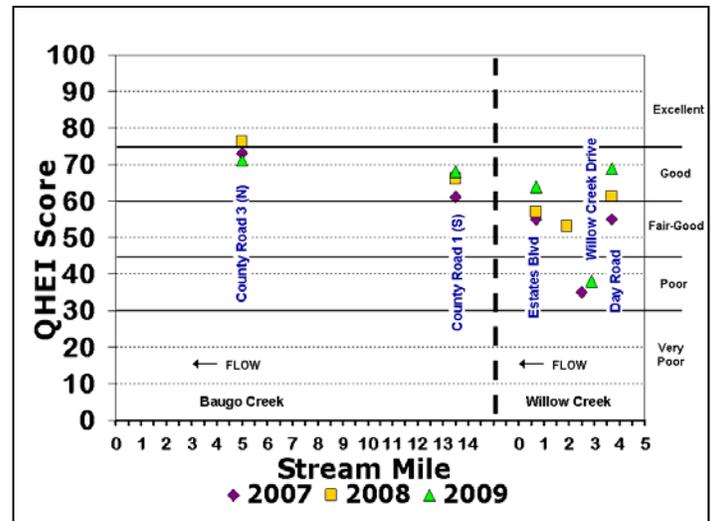
Figure 28: ICI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County



while the upstream site at County Road 1 (S) scored significantly higher (36) and fell just within attainment. Both sites have high numbers of tolerant species and individuals. The County Road 3 (N) 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. Figure 29 demonstrates that QHEI scores follow similar trends to the IBI scores indicating that habitat may have an influence on the fish communities in this stream. In 2009, a significant improvement in the ICI score was observed at County Road 3 (N) (Figure 28). The County Road 3 (N) site was slightly

numbers of fish being collected during the first sampling period at both Willow Creek sites. For example, only 42 fish were collected during the first sample at Day Road, and 125 fish were collected during the second sample resulting in respective IBI scores of 26 and 42. IBI scores between sample collection dates at the Estates Boulevard also varied as significantly. The reason for the low numbers of fish is unknown, but this indicates an impact to the water quality or some form of disturbance in the stream prior to or during May of 2009. IBI scores from the second round of sampling indicate that the fish community at both

Figure 29: QHEI scores for Baugo Creek, Elkhart County and Willow Creek, St. Joseph County



sites recovered, and the disturbance did not have a lasting impact on the fish community. IBI scores from this year also had an influence on the three year baseline for this stream pushing the Estates Boulevard site into the poor category and the Day Road site almost into the poor category.

In 2009, ICI scores were within the good range for both sites. However, based on three years of sampling, the baseline point for Willow Creek at Day Road indicates that the macroinvertebrate community is impaired. The ICI score at this site dropped sharply in 2008 from 2007, but increased again in 2009. Although the HD sampler was lost at Estates Boulevard in 2008, the results from 2009 and 2007 along with qualitative results from 2008 show the macroinvertebrate community to be in attainment. Habitat scores from 2007 to 2009 remained fairly consistent (Figure 29). The Day Road site contains abundant in-stream vegetation resulting in a higher QHEI score. Although, the downstream areas of this stream are heavily impacted by urban land use, this stream can support trout populations, including migrating steelhead.

Eller Ditch is a very cold stream that is influenced greatly by ground water infiltration. Figure 30 shows that the fish communities in this stream are very impaired, particularly at Lincolnway Avenue. Fish community trends for both Eller Ditch sites have been interesting since the inception of baseline monitoring in 2007. At Lincolnway, there has been a continual increase in IBI scores in the last

Figure 32: QHEI scores for Woodward Ditch and Eller Ditch, St. Joseph County

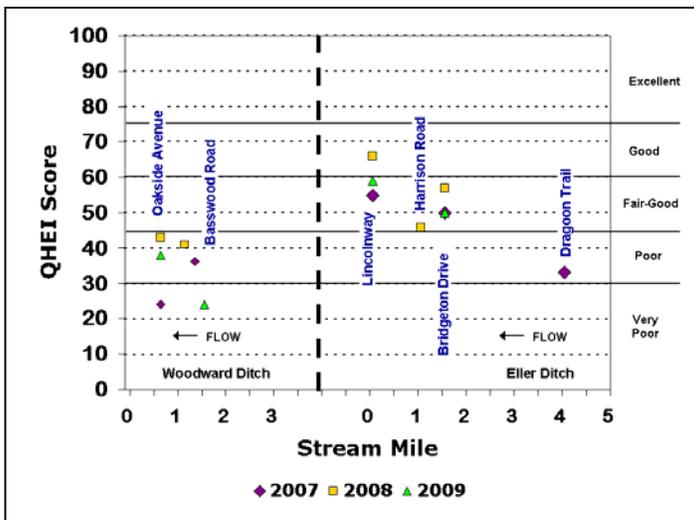


Figure 30: IBI scores for Woodward Ditch and Eller Ditch, St. Joseph County

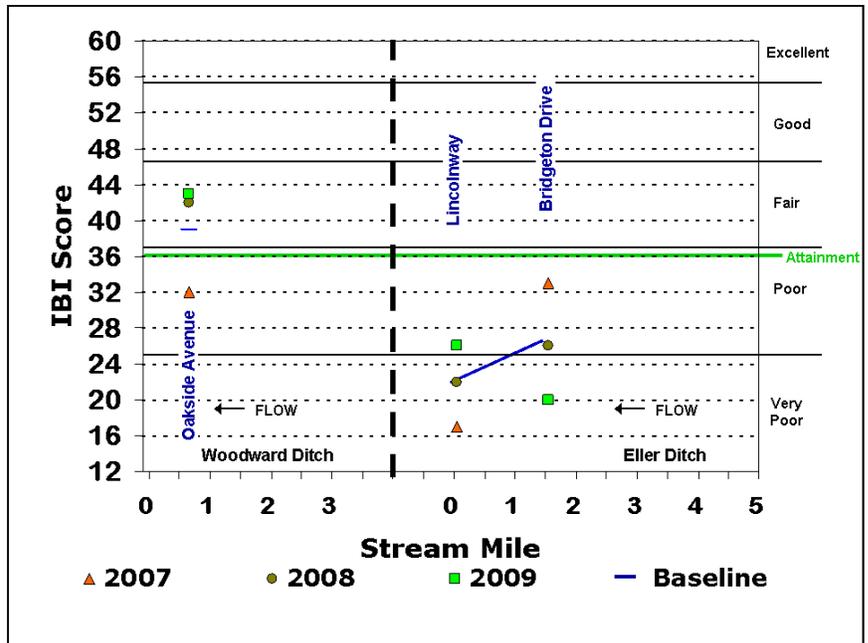
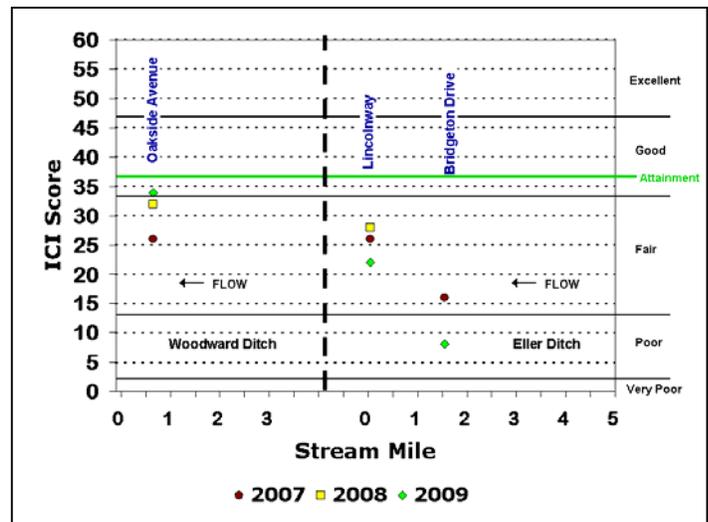


Figure 31: ICI scores for Woodward Ditch and Eller Ditch, St. Joseph County



three years. However, the IBI scores at Bridgeton Drive showed the exact opposite effect, with a continual decrease. Water temperatures run much cooler in Eller Ditch than in most streams in the area, and cold water temperatures are a limitation on ecological vibrance within a stream environment. Kring (2009) stressed that the current IBI may not be calibrated to accurately portray the integrity of fish communities in cool/cold water streams. This may be the case at Eller Ditch. ICI scores for both sites fell in 2009 providing baseline data points for both sites in the fair range (Figure 31). As with the fish community, the cold water may be influencing the assemblage of macroinvertebrates in this stream. QHEI scores remained

relatively consistent with previous years, with both sites falling in the fair to good range (Figure 32).

The IBI scores for Woodward Ditch continued to show remarkable improvement from when the site was first sampled in 2007. (Figure 30). The number of species collected doubled in 2008 compared to 2007 (Kring, 2009), and species diversity increased even more in 2009. The final baseline that has been established indicates that this site has a fair fish community. It is important to note that habitat quality is poor (Figure 32) indicating that habitat does not have a positive influence on the decent IBI scores for this site. This is a positive sign in that water quality may actually be better in this stream than what is reflected by the fish community. The ICI score for Woodward Ditch rose slightly in 2009 into the good range (Figure 31). Although the final baseline will reflect an impaired macroinvertebrate community, this site is not far from being within attainment.

Tagging and Movement

2009 marked the first year in which fish were not tagged by the Aquatics Program. The Aquatics Program initiated fish tagging in 1998, but the tagging permit was not granted by the DNR following 2006. Since 2002, the Aquatics Program has performed annual walleye sampling runs with the DNR near Johnson Street Dam and Island Park in Elkhart. During these occasions large numbers of walleye were tagged and recaptured. The annual sampling run was not completed in 2009 due to time constraints, but the Aquatics Program is hopeful that these events will continue into the future.

The tagging program has been very successful since its inception, and almost 12% of the fish have been recaptured either by the Aquatics staff or anglers. The information provided by anglers has been essential to the success of the tagging program. In 2009, five walleye, two largemouth bass, and one smallmouth bass were recaptured. All five walleye were tagged in the Johnson Street/Island Park area in Elkhart. Three of the five walleye were recaptured in the Johnson Street area; one was tagged in 2004, one was tagged in 2005, and one was tagged in 2008. The 2004 fish grew by 2.5 inches since it was tagged, and the 2005 fish grew almost 2 inches. Another walleye that was tagged at Johnson Street in 2008 was caught by an angler at the Central Park Dam in Mishawaka. This fish travelled approximately 15 river miles downstream in the space of one year.

One of the largemouth bass was originally tagged

by the Aquatics staff in 2003 at the Elkhart Environmental Center site. At that time the fish was 6 years old, was seventeen inches long and weighed 2.7 pounds. This fish was recaptured in the same area, and had grown significantly in the past six years by almost three inches and three pounds. This fish weighed slightly over 5.5 pounds, which is an impressive fish for the Elkhart River. The other largemouth bass was originally tagged at the mouth of Trout Creek on the St. Joseph River (north of Bristol) in 2002. This fish was caught by an angler at the Six Span Bridge almost six river miles from its original place of capture. Surprisingly, this fish only grew approximately 1 inch during the past seven years. The smallmouth bass that was recaptured was tagged in 2004 at Nappanee Street in Elkhart, and only moved approximately 0.5 river miles. This fish grew five inches in the past five years.

Fish Tissue

In 2009, fish tissue was collected from fish in both Elkhart and St. Joseph Counties. Collections were based on the current Indiana Fish Consumption Advisory (FCA), continuing baseline work for Mishawaka and updating game fish contaminant levels.

Walleye tissue was collected again 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 levels in this species. For the second straight year, mercury levels in the walleye were a group 2 and PCB levels were a group 3. As noted by Kring (2009), this species should be considered for the FCA in St. Joseph County. Based on the FCA grouping guidelines, it appears that a walleye meal can be eaten once a month from the South Bend area of the St. Joseph River.

As they are reported in the FCA, the PCB levels in bluegill seem rather high, as 7 inch bluegill have been placed in group 4. Bluegill were collected for the third straight year in South Bend by the Aquatics Program to gather more data on PCB concentrations. In 2007 and 2008, PCBs were in group 2, but our 2009 data puts bluegill in group 3 for PCBs. These results demonstrate the importance of performing multiple years of sampling. Although a PCB grouping lower than 4 may be appropriate for bluegill, our 2009 data suggest that PCBs are relatively high in bluegill from the South Bend area. Based on the FCA grouping guidelines, it appears that a bluegill

meal can be eaten once a month from the South Bend area of the St. Joseph River.

In 2009, common carp were collected in two locations in the Mishawaka area; Logan Street and Bittersweet Road. The FCA has placed 25 inch carp in the group 5 for PCBs in the downtown Mishawaka area. In 2007, our results showed carp being in group 3 at Logan Street, and in 2008, carp fell in the group 4 at Logan Street. However, in 2009 our results were consistent with the FCA, with carp in the 28 to 30 inch size range falling in group 5 for PCBs. Carp at Bittersweet Road were in the group 2 for Mercury and group 3 for PCBs. These results are consistent with 2007 results for carp that were collected just upstream in Baugo Bay. The FCA does not currently list common carp in the Baugo Bay area. Based on the FCA grouping guidelines, it appears that a carp meal can be eaten once a month from above the dam in Mishawaka, but should not be eaten from below the dam in Mishawaka.

Golden redhorse were also collected at the same two locations in the Mishawaka area in 2009. At Logan Street, this species fell in the group 2 for mercury and group 3 for PCBs. In 2007 and 2008, this species was in the group 2 for both contaminants types. Golden redhorse collected at Bittersweet Road fell in group 1 for mercury and group 3 for PCBs. This is a reversal of what was observed at Baugo Bay in 2007 with this species being in group 2 for mercury and group 1 for PCBs. The 2009 FCA does not report golden redhorse in St. Joseph County. However, in the 2008 FCA, golden redhorse were reported as group 5 for PCBs. Based on the last three years of data by the Aquatics Program, it appears that golden redhorse are safer to eat than what was previously reported in the FCA and can be eaten once a month from the Mishawaka area.

Rock bass were another species that were collected at Logan Street and Bittersweet Road in 2009. Fish collected at Logan Street fell into group 1 for mercury and group 2 for PCBs, while those collected from Bittersweet Road were in group 1 for both contaminant types. These results are consistent with previous years sampling results by the Aquatics Program and with the FCA. Based on the FCA grouping guidelines, it appears that unlimited rock bass can be eaten from above the dam in Mishawaka, and a rock bass meal can be eaten once a month from the downtown Mishawaka area.

In 2009, smallmouth bass in the 14 to 16 inch size range were collected at Logan Street and Cedar

Street in Mishawaka. This species fell within group 1 for mercury and group 2 for PCBs at Logan Street and group 2 for both contaminant types at Cedar Street. The FCA currently lists smallmouth bass as group 4 for PCBs in the Mishawaka area. Our data suggests that a smallmouth bass meal can be eaten once a week from the downtown Mishawaka area.

Steelhead trout were collected at the Logan Street site in 2009. Analytical results place steelhead in the group 1 for mercury and group 3 for PCBs. These results are consistent with previous samples collected by the Aquatics Program in 2007 and 2008. The FCA currently places steelhead in group 4 for PCBs. It should be noted that the FCA fish were 30 inches or larger, while the fish collected by the Aquatics Program were between 26 and 28 inches. The size difference is likely reason for the results reported in the FCA, as a higher bioaccumulation of contaminants is expected in larger fish. Based on the FCA grouping guidelines, it appears that a steelhead trout meal can be eaten once a month from St. Joseph County.

In 2009, the Aquatics Program collected tissue samples from rock bass, white suckers, golden redhorse and smallmouth bass on the Elkhart River. These fish were collected just downstream of downtown Goshen. All fish with the exception of golden redhorse fell in group 1 for both contaminant types. Golden redhorse fell in group 1 for PCBs, but were group 2 for mercury. The FCA currently places smallmouth bass, white suckers and rock bass in group 3 for PCBs. Golden redhorse are not reported in the FCA. These results are promising and suggest that contaminant accumulation in fishes in the Goshen area are low and the frequent consumption of fish is relatively safe.

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. In 2009, baseline work was completed in and around the City of Mishawaka, and on Baugo Creek, providing reference information on stream integrity for the entire Indiana section of the St. Joseph River.

Interesting results were observed in the St. Joseph River Watershed in 2009. Aquatic community indices demonstrated a long-term improvement in several streams, such as Christiana Creek, Juday Creek, and Pine Creek. Improvements in 2009 were also observed in Bowman

Creek, the Little Elkhart River, and at Brick Road on the St. Joseph River. Several streams showed varying results with respect to community integrity for fish versus macroinvertebrates. For example, at Rogers Park (B) on the Elkhart River the fish community was in the good range, while the macroinvertebrate community was in the poor range. Other sites where similar differences were observed include Brick Road on the St. Joseph River, Central High School on the Elkhart River, and at both sites on Baugo Creek. While these findings may appear contradictory, they demonstrate the importance of performing concurrent assessments of the two groups, as fish react differently than macroinvertebrates to stressors.

IBI scores for the St. Joseph River showed improvements in Elkhart and South Bend. Mishawaka sites remained fairly consistent with previous years. All sites along the St. Joseph River had good fish communities with the exception of the Merrifield Park site in Mishawaka, which was almost good. Based on three years of sampling at Merrifield Park, the baseline for this site is just slightly outside the good range. Macroinvertebrate communities along the entire stretch of the St. Joseph River scored within the good to excellent range. Based on the data collected in 2009, the St. Joseph River appears to be doing well.

The Elkhart River in the Elkhart area also showed promising results in 2009. In previous years, the Aquatics Program noted a severe drop in IBI scores upstream of Elkhart at Oxbow Park. However in 2009, results indicate that a recovery may have occurred in this area. Macroinvertebrate scores were surprisingly good in the Elkhart area, particularly at Central High School, where the ICI score was in the excellent range. The fish community in the Goshen area appears to be very strong, although results from macroinvertebrate sampling are not as encouraging. The Aquatics Program plans to perform a follow up round of sampling in Goshen for the ERRA in 2010 to get a more thorough understanding of stream integrity in that area.

Sampling on Bowman Creek (Phillips Ditch) at Chippewa Avenue showed promising results in 2009. Although fish and macroinvertebrate communities continue to be impaired at this site, a significant improvement in both taxonomic groups was observed. The Aquatics Program does witness significant short-term fluctuations in biological integrity on occasion in our area streams, and cannot accurately say, at this point, if this stream is recovering. Future sampling at this site may provide confirmation that this stream is in fact im-

proving.

Juday Creek continues to show improvement in fish and macroinvertebrate assemblages. In 2009, this stream was almost within attainment for fish, and was almost in the excellent range for macroinvertebrates. The Aquatics Program has observed an increase in fish community integrity in this stream for the last four years despite significant land development in this watershed in the last decade.

Lily Creek and Yellow Creek did not show any improvement above fish community baseline values in 2009. Lily Creek continues to be very impaired, while Yellow Creek continues to be slightly below the attainment line for fish and macroinvertebrate communities. Limitations on aquatic integrity in Lily Creek include intermittent flow and lack of sufficient habitat. Yellow Creek is a fragile sub-watershed that has been drastically manipulated for drainage purposes.

Christiana Creek at the North Main Well Field continues to demonstrate a long-term improvement. Fish community scores were above baseline values and macroinvertebrate scores were within the excellent range. On top of having good to excellent biological communities, this stream also maintains low *E. Coli* levels year round compared with other streams in Elkhart County (Pfaff, 2009) making it a very important ecological and recreational asset.

The Little Elkhart River at County Road 35 showed improvement in fish integrity in 2009. Fish and macroinvertebrate scores for this site fell within the good range. This site also had an excellent habitat score, which likely contributes to the overall health of the biological communities.

The IBI score at Pine Creek at State Road 120 in 2009 was significantly higher than the baseline. This finding is consistent with the results from when the site was previously sampled suggesting a long-term improvement in stream integrity. The ICI score for this site was also within the good range. The Aquatics Program will closely monitor this stream in the future to determine if these improvements remain stable.

Index sampling was performed on Rock Run Creek and Turkey Creek for the first time in 2009. Both streams appear to have impaired biological communities, which is not surprising given the amount of channelization and modification in both streams. These streams are also heavily influenced by agricultural and suburban influences. The Aquatics Program will be performing a second round of

sampling on both streams in 2010 to gain a more complete understanding of stream integrity.

Baseline monitoring was completed on Baugo Creek, Willow Creek, Woodward Ditch, and Eller Ditch in 2009. Baseline values for Baugo Creek show the fish communities to be in the poor category at the upstream site (CR 1 South) and in the fair category at the downstream site (CR 3 North). Macroinvertebrate communities are within the fair range for both sites. This stream is another regulated drain that has been highly modified for drainage and demonstrates erratic flow patterns and poor stability. Along with the Elkhart River, this stream is a significant contributor of sediment to the St. Joseph River.

Baseline values for Willow Creek show the fish communities to be poor at Estates Boulevard and fair at Day Road. A reversal is observed with macroinvertebrates, with Estates Boulevard falling in the good category and Day Road falling in the fair category. Although this stream appears to suffer from water quality issues, it is not far from being within attainment for fish and macroinvertebrates.

Woodward Ditch baseline values are fair for both fish and macroinvertebrates. These values indicate that the fish community is attaining, but the macroinvertebrate community is impaired. It should be noted, however, the macroinvertebrate community is only slightly below the attainment line.

Eller Ditch baseline values are below the attainment line for fish and macroinvertebrates. The fish community is very impaired, while the macroinvertebrate community does show some promise at the Lincolnway Avenue site. Kring, 2009 stressed that the current IBI may not be calibrated to accurately portray the integrity of fish communities in cool/cold water streams. Eller Ditch is a very cold running stream and the baseline values may be an artifact of the limitations of the current IBI. The same could also be said for other cool running streams in the area such as the Little Elkhart River, Willow Creek, Juday Creek, and Pine Creek.

In 2009, no fish were tagged by the Aquatics staff. However, several tagged fish were recaptured either by anglers or during sampling events. Five walleye, two largemouth bass, and one smallmouth bass were recaptured. The movement highlight of 2009 was a walleye that travelled all of the way from downtown Elkhart to the Central Park Dam in Mishawaka in the space of one year.

The growth highlight was a largemouth bass that was tagged on the Elkhart River in 2004 and had grown by almost three pounds since it was tagged. This fish weight almost 5.5 pounds, which is a very impressive fish for the Elkhart River.

Tissue samples were collected from eight species of fish in 2009 and analyzed for PCBs and mercury. This information is used to supplement the Indiana FCA. Out of the two contaminant types (mercury and PCBs) PCBs appear to be of greater concern and concentration in fishes in the St. Joseph River Watershed. In St. Joseph County, walleye, steelhead, golden redhorse and bluegill were all within group 3 for PCBs. Carp collected at Logan Street and Bittersweet Road in Mishawaka were in group 5 and group 3 respectively for PCBs. Smallmouth bass collected at Logan Street and Bittersweet Road were in group 2 for PCBs at both locations. Finally, rock bass collected at Logan Street and Bittersweet Road were in group 2 and group 1 respectively for PCBs. Rock bass, white suckers, golden redhorse, and smallmouth bass were also collected at Rogers Park in Goshen. All species in the Goshen area were in group 1 for both contaminant types with the exception of golden redhorse, which was in group 2 for mercury.

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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 the three Cities, baseline data on aquatic community integrity has been gathered across the entire Indiana section of the St. Joseph River Watershed.

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SUMMER 2009



Dave & Len with two nice Greater Redhorse at Jefferson Blvd. in South Bend



Justin with a Steelhead at Merrifield Park in Mishawaka



A non-native Convict Cichlid captured in Lily Creek



Len with a huge Longnose Gar at Keller Park in South Bend



Ben has his hands full with four big Bass at Keller Park



Len with a large Bowfin at Nibbyville on the St. Joe River



Daragh with a giant Muskie on the Elkhart River in Goshen

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 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. 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							
2009	Keller Park	7.2-7.7	7+	1	2	3	4
Common Carp							
2009	Bitterswee Road (B)	27.4-29.0		2		3	
2009	Logan Street	27.8-30.0	25+	2	2	5	5
Golden Redhorse							
2009	Bitterswee Road (B)	14.3-14.5	NA	2		2	
2009	Logan Street	17.6-18.7	All	2	3	3	3
2009	Rogers Park	16.7-17.1	NA	2		1	
Rock Bass							
2009	Bitterswee Road (B)	7.4-7.9	Up to 8	1	1	1	1
2009	Logan Street	7.8-8.3	Up to 7	1	2	2	2
2009	Rogers Park	6.8-7.2	9+	1	2	1	3
Smallmouth Bass							
2009	Cedar Street	15.1 - 16.6	14+	2	2	2	4
2009	Logan Street	14.6 - 15.4	14+	1	2	2	4
2009	Rogers Park	11.0 - 12.3	17+	1	2	1	3
Steelhead (Lake Michigan run Rainbow Trout)							
2009	Logan Street	26.3 - 28.8	25 - 31	1	1	3	3
Walleye							
2009	Michigan/Angela	19.8 - 20.4	NA	2		3	
White Sucker							

Appendix C

Summary of fish collected by county, 2009

Summary of species captured at index sites in Elkhart County, 2009

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by weight
Rock Bass	2304	10.76	142402	313.94	8.52
White Sucker	1797	8.39	217639	479.81	13.02
Creek Chub	1463	6.83	19211	42.35	1.15
Striped Shiner	1305	6.09	20805	45.87	1.24
Johnny Darter	1252	5.85	1710	3.77	0.10
Smallmouth Bass	1208	5.64	141274	311.46	8.45
Mimic Shiner	1168	5.45	1918	4.23	0.11
Common Shiner	957	4.47	12048	26.56	0.72
Bluntnose Minnow	861	4.02	3026	6.67	0.18
Bluegill	817	3.81	25628	56.50	1.53
Stoneroller, Central	812	3.79	6364	14.03	0.38
Blacknose Dace	760	3.55	2075	4.57	0.12
Longear Sunfish	699	3.26	22061	48.64	1.32
Spotfin Shiner	681	3.18	2578	5.68	0.15
Golden Redhorse	648	3.03	292950	645.84	17.52
Logperch	504	2.35	2862	6.31	0.17
Northern Hog Sucker	414	1.93	91392	201.48	5.47
Hornyhead Chub	398	1.86	10257	22.61	0.61
Green Sunfish	332	1.55	4327	9.54	0.26
Rosyface Shiner	288	1.34	666	1.47	0.04
Rainbow Darter	278	1.30	383	0.84	0.02
Silverjaw Minnow	265	1.24	681	1.50	0.04
Mottled Sculpin	259	1.21	1234	2.72	0.07
Sand Shiner	240	1.12	556	1.23	0.03
Shorthead Redhorse	189	0.88	81306	179.25	4.86
Blackside Darter	181	0.85	537	1.18	0.03
Longnose Dace	174	0.81	676	1.49	0.04
Largemouth Bass	157	0.73	34649	76.39	2.07
Central Mudminnow	153	0.71	1039	2.29	0.06
Grass Pickerel	104	0.49	1887	4.16	0.11
Northern Pike	74	0.35	14751	32.52	0.88
Common Carp	69	0.32	239974	529.05	14.35
Chestnut Lamprey	64	0.30	659	1.45	0.04
Pirate Perch	64	0.30	625	1.38	0.04
Spotted Sucker	53	0.25	14708	32.43	0.88
River Redhorse	46	0.21	136266	300.42	8.15
Yellow Bullhead	40	0.19	4590	10.12	0.27
Redear Sunfish	35	0.16	4983	10.99	0.30
American Brook Lamprey	35	0.16	214	0.47	0.01
Silver Redhorse	31	0.14	44432	97.96	2.66
Black Crappie	29	0.14	2601	5.73	0.16
Steelcolor Shiner	28	0.13	130	0.29	0.01
Pumpkinseed	27	0.13	581	1.28	0.03
Orangethroat Darter	17	0.08	24	0.05	0.00
Brown Trout	16	0.07	2291	5.05	0.14
Brook Stickleback	16	0.07	6	0.01	0.00
Bowfin	12	0.06	22367	49.31	1.34

Summary of species captured at index sites in Elkhart County, 2009 (continued)

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by weight
Hybrid Sunfish	12	0.06	805	1.77	0.05
Greenside Darter	11	0.05	34	0.07	0.00
Warmouth	10	0.05	250	0.55	0.01
Fathead Minnow	10	0.05	22	0.05	0.00
Walleye	9	0.04	6630	14.62	0.40
Greater Redhorse	8	0.04	17540	38.67	1.05
Blackstripe Topminnow	7	0.03	11	0.02	0.00
Channel Catfish	5	0.02	7251	15.99	0.43
Quillback	2	0.01	2150	4.74	0.13
Longnose Gar	2	0.01	421	0.93	0.03
Stonecat	2	0.01	158	0.35	0.01
Brook Silverside	2	0.01	6	0.01	0.00
Black Redhorse	1	0.00	1200	2.65	0.07
Rainbow Trout	1	0.00	386	0.85	0.02
Brown Bullhead	1	0.00	315	0.69	0.02
Black Bullhead	1	0.00	178	0.39	0.01
Hybrid Minnow	1	0.00	32	0.07	0.00
Convict Cichlid	1	0.00	26	0.06	0.00
Yellow Perch	1	0.00	1	0.00	0.00
Blackchin Shiner	1	0.00	1	0.00	0.00
Spotted Gar	1	0.00	600	1.32	0.04
Total	21413	100	1671805	3686	100

Summary of species captured at investigative sites in Elkhart County, 2009

Common Name	Total Number	% by Number
White Sucker	283	14.50
Creek Chub	246	12.60
Bluegill	164	8.40
Smallmouth Bass	122	6.25
Johnny Darter	121	6.20
Golden Redhorse	121	6.20
Mimic Shiner	84	4.30
Bluntnose Minnow	83	4.25
Largemouth Bass	82	4.20
Rock Bass	78	4.00
Common Shiner	77	3.94
Gizzard Shad	62	3.18
Stoneroller, Central	45	2.31
Longear Sunfish	36	1.84
Striped Shiner	29	1.49
Spotted Sucker	28	1.43
Pumpkinseed	25	1.28
Central Mudminnow	24	1.23
Common Carp	23	1.18
Hornyhead Chub	18	0.92
Shorthead Redhorse	17	0.87
Green Sunfish	17	0.87
Silver Redhorse	16	0.82
Warmouth	16	0.82
Yellow Perch	14	0.72
Chestnut Lamprey	13	0.67
Yellow Bullhead	13	0.67
Logperch	11	0.56
Longnose Gar	10	0.51
Black Crappie	9	0.46
Mottled Sculpin	9	0.46
Quillback	6	0.31
Silverjaw Minnow	5	0.26
Spotfin Shiner	5	0.26
Rainbow Darter	5	0.26
Grass Pickerel	5	0.26
Bowfin	4	0.20
Redear Sunfish	3	0.15
Hybrid Sunfish	3	0.15
Northern Pike	2	0.10
American Brook Lamprey	2	0.10
Black Redhorse	2	0.10
Blackside Darter	2	0.10
Steelcolor Shiner	2	0.10
Black Bullhead	1	0.05

Common Name	Total Number	% by Number
Blacknose Dace	1	0.05
Walleye	1	0.05
Spottail Shiner	1	0.05
Brown Bullhead	1	0.05
Golden Shiner	1	0.05
Spotted Gar	1	0.05
Northern Hog Sucker	1	0.05
Orangethroat Darter	1	0.05
Brook Silverside	1	0.05
Total	1952	100

Index Sites	21,413
Investigative Sites	1,952
Elkhart County Total	23,365

Summary of species captured at investigative sites in St. Joseph County, 2009

Common Name	Total Number	% by Number
Longear Sunfish	307	25.91
Bluegill	138	11.65
Golden Redhorse	105	8.86
Mottled Sculpin	100	8.44
Smallmouth Bass	73	6.16
Rock Bass	64	5.40
Largemouth Bass	47	3.97
Blacknose Dace	46	3.88
Common Carp	40	3.38
White Sucker	38	3.21
Logperch	38	3.21
Pumpkinseed	34	2.87
Spotfin Shiner	29	2.45
Spotted Sucker	20	1.69
Quillback	16	1.35
Gizzard Shad	11	0.93
Rainbow Trout	10	0.84
Bluntnose Minnow	9	0.76
Green Sunfish	9	0.76
Creek Chub	7	0.59
Silver Redhorse	7	0.59
Johnny Darter	6	0.51
Blackside Darter	5	0.42
Yellow Bullhead	4	0.34
Hybrid Sunfish	3	0.25
Shorthead Redhorse	3	0.25
Golden Shiner	3	0.25
Redear Sunfish	2	0.17
Yellow Perch	2	0.17
Black Crappie	2	0.17
River Redhorse	1	0.08
Central Mudminnow	1	0.08
Orangethroat Darter	1	0.08
Northern Pike	1	0.08
Goldfish	1	0.08
Warmouth	1	0.08
Common Shiner	1	0.08
Total	1185	100.00

Summary of species captured at index sites in St. Joseph County, 2009

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by weight
Longear Sunfish	1288	15.07	39457	86.99	2.79
Smallmouth Bass	914	10.69	124390	274.23	8.81
Mimic Shiner	835	9.77	1212	2.67	0.09
Rock Bass	777	9.09	59254	130.63	4.20
Golden Redhorse	532	6.22	315094	694.66	22.31
Mottled Sculpin	424	4.96	2269	5.00	0.16
Creek Chub	409	4.78	10746	23.69	0.76
Bluegill	385	4.50	10385	22.90	0.74
Johnny Darter	275	3.22	419	0.92	0.03
Green Sunfish	263	3.08	3027	6.67	0.21
Bluntnose Minnow	223	2.61	608	1.34	0.04
Blacknose Dace	205	2.40	1292	2.85	0.09
Spotfin Shiner	200	2.34	741	1.63	0.05
Shorthead Redhorse	191	2.23	127464	281.01	9.03
White Sucker	178	2.08	30035	66.22	2.13
Logperch	159	1.86	1689	3.72	0.12
Northern Hog Sucker	154	1.80	36534	80.54	2.59
Rainbow Trout	152	1.78	33779	74.47	2.39
Steelcolor Shiner	138	1.61	580	1.28	0.04
Black Redhorse	118	1.38	55884	123.20	3.96
Central Mudminnow	78	0.91	406	0.90	0.03
Quillback	70	0.82	88450	195.00	6.26
Spotted Sucker	69	0.81	29613	65.29	2.10
Largemouth Bass	58	0.68	25759	56.79	1.82
Yellow Bullhead	52	0.61	7829	17.26	0.55
Common Carp	46	0.54	238300	525.36	16.87
Pumpkinseed	45	0.53	1560	3.44	0.11
Blackside Darter	43	0.50	121	0.27	0.01
Silver Redhorse	39	0.46	74236	163.66	5.26
Rainbow Darter	36	0.42	44	0.10	0.00
Longnose Gar	21	0.25	17363	38.28	1.23
Hybrid Sunfish	20	0.23	682	1.50	0.05
Chestnut Lamprey	18	0.21	215	0.47	0.02
Fathead Minnow	18	0.21	30	0.07	0.00
Redear Sunfish	16	0.19	934	2.06	0.07
Walleye	15	0.18	15218	33.55	1.08
Greenside Darter	12	0.14	50	0.11	0.00
Greater Redhorse	10	0.12	16887	37.23	1.20
Northern Pike	9	0.11	11153	24.59	0.79
River Redhorse	8	0.09	19506	43.00	1.38
Brown Bullhead	8	0.09	3733	8.23	0.26
Grass Pickerel	7	0.08	67	0.15	0.00
Orangethroat Darter	6	0.07	12	0.03	0.00
Gizzard Shad	4	0.05	1752	3.86	0.12
Black Crappie	3	0.04	717	1.58	0.05
Brook Silverside	3	0.04	10	0.02	0.00
Sand Shiner	3	0.04	4	0.01	0.00

Summary of species captured at investigative sites in St. Joseph County, 2009

Common Name	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by weight
Common Shiner	2	0.02	14	0.03	0.00
Spottail Shiner	2	0.02	9	0.02	0.00
Brown Trout	1	0.01	1578	3.48	0.11
Bowfin	1	0.01	936	2.06	0.07
Warmouth	1	0.01	58	0.13	0.00
Black Bullhead	1	0.01	56	0.12	0.00
Golden Shiner	1	0.01	30	0.07	0.00
Goldfish	1	0.01	24	0.05	0.00
Silverjaw Minnow	1	0.01	4	0.01	0.00
Striped Shiner	1	0.01	1	0.00	0.00
Total	8549	100	1412220	3113	100

Index Sites	8,549
Investigative Sites	1,185
St. Joseph County Total	9,374



Appendix D

**Summary of fish collected by site, 2009
(Reference Table 2 for site numbers and locations)**

STREAM	St. Joseph River, Elkhart County						
	Nibbyville		Lexington Ave		McNaughton Park		Lexington Landing (E)
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	Investigative
~American Brook Lamprey				X	X	X	
#Black Bullhead							X
Black Crappie	X		X		X		X
~Black Redhorse			X				
Blackside Darter	X	X	X		X	X	
Blackchin Shiner				X			
Blackside Darter			X	X			
Bluegill	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X		X	X
Bowfin	X	X					X
Brook Silverside		X					X
Brown Bullhead							X
Central Stoneroller				X			
#Channel Catfish					X	X	
Chestnut Lamprey	X	X	X	X			X
#Common Carp	X	X		X	X	X	X
Common Shiner				X			
#Gizzard Shad							X
Golden Redhorse	X	X	X	X	X	X	X
Golden Shiner							X
Grass Pickerel		X	X	X			
~Greater Redhorse				X			
#Green Sunfish		X	X	X	X	X	
Greenside Darter		X					
~Hornyhead Chub				X			
Hybrid Sunfish		X					X
Johnny Darter		X		X			
Largemouth Bass	X	X	X	X	X	X	X
Logperch	X	X	X	X	X	X	
Longear Sunfish	X	X	X	X	X	X	X
#Longnose Gar	X			X			X
~Mimic Shiner	X	X	X	X	X	X	X
Northern Hog Sucker	X	X	X	X		X	
Northern Pike	X	X	X	X			X
Pirate Perch		X				X	
Pumpkinseed		X	X	X			X
#Quillback			X		X		X
Rainbow Darter		X		X		X	
Redear Sunfish	X						
~River Redhorse	X	X	X	X	X	X	
Rock Bass	X	X	X	X	X	X	X
~Rosyface Shiner	X		X	X		X	
Sand Shiner			X				
Shorthead Redhorse	X	X	X	X	X	X	X
Silver Redhorse	X	X	X	X	X	X	X

~ - denotes a species that is INTOLERANT of environmental disturbances such as degraded water quality or habitat
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STREAM	St. Joseph River, Elkhart County (Continued)						
Site	Nibbyville		Lexington Ave		McNaughton Park		Lexington Landing (E)
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	Investigative
Smallmouth Bass	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X	
Spottail Shiner							X
#Spotted Gar							X
Spotted Sucker	X		X				X
Steelcolor Shiner					X	X	X
Striped Shiner		X	X	X	X		X
Walleye			X	X	X	X	
Warmouth							
#White Sucker	X		X	X	X	X	X
Yellow Bullhead	X	X	X	X	X	X	X
Yellow Perch		X					X

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STREAM	St. Joseph River, Mishawaka Area					
	Bittersweet (B)	Merrifield Park		Cedar Street	Logan Street	
	Site	1st Pass	2nd Pass		1st Pass	2nd Pass
Black Crappie	X					X
Blackside Darter			X	X		X
Bluegill	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X
Brook Silverside					X	
Brown Bullhead		X				
Chestnut Lamprey						X
#Common Carp	X	X		X	X	X
Common Shiner	X					
#Gizzard Shad	X		X			
Golden Redhorse	X	X	X	X	X	X
#Goldfish				X		
#Golden Shiner	X					
#Green Sunfish			X	X	X	X
Greenside Darter			X			X
Hybrid Sunfish			X		X	X
Johnny Darter	X	X	X	X	X	X
Largemouth Bass						X
Logperch	X	X	X	X		X
Longear Sunfish	X	X	X	X	X	X
~Mimic Shiner			X		X	X
Northern Hog Sucker			X		X	X
Northern Pike	X					
Orangethroat Darter				X		
Pumpkinseed	X	X	X	X		X
#Quillback	X	X	X	X	X	X
Rainbow Darter			X			
Rainbow Trout		X	X	X	X	X
Redear Sunfish	X			X		
~River Redhorse	X	X	X	X	X	X
Rock Bass				X	X	X
Sand Shiner						X
Shorthead Redhorse	X	X	X	X	X	X
Silver Redhorse	X	X	X	X	X	X
Smallmouth Bass	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X
Spotted Sucker	X			X	X	X
Steelcolor Shiner			X			
Walleye					X	X
Warmouth	X					
#White Sucker	X	X	X	X	X	X
Yellow Bullhead	X		X	X	X	X
Yellow Perch	X			X		

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STREAM	St. Joseph River, South Bend Area							
Site	Jefferson Blvd		LaSalle Street		Keller Park		Brick Road	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
Black Crappie				X		X		
~Black Redhorse			X	X	X	X	X	X
Blackside Darter		X	X	X		X	X	X
Bluegill	X	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X	X	
Bowfin								X
Brook Silverside						X		
Brown Bullhead	X	X						
Chestnut Lamprey	X			X	X	X	X	X
#Common Carp	X				X	X	X	X
Common Shiner	X							X
Creek Chub				X	X			
#Gizzard Shad			X	X				
Golden Redhorse	X	X	X	X	X	X	X	X
Golden Shiner		X						
#Goldfish		X						
~Greater Redhorse	X	X	X				X	
#Green Sunfish	X	X	X	X			X	X
Greenside Darter				X		X		
Hybrid Sunfish	X	X	X	X				
Johnny Darter				X			X	X
Largemouth Bass	X	X	X		X	X	X	X
Logperch		X		X	X	X		X
Longear Sunfish	X	X	X	X	X	X	X	X
#Longnose Gar			X	X	X	X		
~Mimic Shiner		X	X	X	X	X	X	X
Northern Hog Sucker	X	X	X	X	X	X	X	X
Northern Pike		X			X	X	X	X
Pumpkinseed	X	X		X	X	X	X	
#Quillback	X	X	X	X	X	X	X	
Rainbow Darter		X		X		X	X	X
Rainbow Trout	X	X	X		X	X		
Redear Sunfish		X	X			X	X	X
~River Redhorse				X		X		
Rock Bass	X	X	X	X	X	X	X	X
Shorthead Redhorse	X	X	X	X	X		X	X
Silver Redhorse		X	X	X	X	X		X
Smallmouth Bass	X	X	X	X	X	X	X	X

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STREAM	St. Joseph River, South Bend Area (Continued)							
Site	Jefferson Blvd		LaSalle Street		Keller Park		Brick Road	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
Spotfin Shiner			X		X	X	X	X
Spottail Shiner		X	X					
Spotted Sucker	X	X			X	X	X	X
Steelcolor Shiner			X	X				
Striped Shiner							X	
Walleye			X	X		X	X	X
Warmouth							X	
#White Sucker	X	X	X		X	X	X	X
Yellow Bullhead	X	X	X	X	X		X	X

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STREAM	Little Elkhart		Pine Creek		Lily Creek		Christiana	
Site	CR 35		SR 120		Park 6 Drive		NMWF	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~American Brook Lamprey	X	X						X
#Blacknose Dace	X	X	X					
Blackside Darter	X	X	X	X				
Bluegill	X	X	X	X		X	X	X
#Bluntnose Minnow	X	X	X				X	X
Bowfin						X		
Brown Trout	X	X						
#Central Mudminnow	X	X						X
Chestnut Lamprey	X	X					X	X
Common Carp								X
Common Shiner	X	X	X					
Convict Cichlid						X		
#Creek Chub	X	X	X	X	X			X
Fathead Minnow	X							
Golden Redhorse							X	X
Grass Pickerel	X	X	X			X	X	
#Green Sunfish		X					X	
~Hornyhead Chub	X						X	X
Hybrid Sunfish								X
Johnny Darter	X	X	X	X				X
Largemouth Bass		X					X	
Logperch	X	X	X	X			X	X
Longear Sunfish			X	X				X
Mottled Sculpin	X	X	X	X				
Northern Hog Sucker	X	X					X	X
Orangethroat Darter		X					X	X
Pumpkinseed		X						
Rainbow Darter	X	X	X	X			X	X
Rainbow Trout		X						
Redear Sunfish						X		
Rock Bass	X		X	X			X	X
Shorthead Redhorse	X	X					X	X
Silver Redhorse	X						X	X
Smallmouth Bass	X	X	X	X			X	X
Spotfin Shiner							X	X
Steelcolor Shiner							X	X
Stoneroller, Central			X	X				
Striped Shiner		X	X	X			X	X
Walleye							X	
#White Sucker	X	X	X	X	X	X	X	X
Yellow Bullhead								X

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Stream	Turkey Creek				Rock Run Creek			
	CR 50		CR 142		Monroe Street		1st Street	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~ American Brook Lam-	X							
Black Crappie						X		
# Blacknose Dace	X				X	X	X	
Blackside Darter	X	X	X	X				
Bluegill	X	X	X	X	X		X	
# Bluntnose Minnow	X				X			
Brook Stickleback					X	X		
# Central Mudminnow	X	X	X	X	X	X	X	X
Chestnut Lamprey							X	X
# Common Carp	X		X					
Common Shiner	X	X			X			
# Creek Chub	X	X	X	X	X	X	X	X
# Fathead Minnow					X			
Golden Redhorse	X	X	X					
Grass Pickerel	X	X	X	X				
# Green Sunfish	X	X	X	X	X	X	X	X
~ Hornyhead Chub	X	X		X			X	X
Hybrid Sunfish			X		X	X		
Johnny Darter	X	X	X	X	X	X	X	X
Largemouth Bass			X	X	X	X	X	X
Northern Hog Sucker	X	X	X	X				X
Northern Pike	X	X	X					
Orangethroat Darter		X				X		
Pirate Perch	X	X	X	X				
Rainbow Darter	X	X	X	X	X	X	X	X
Rock Bass	X	X	X	X	X		X	X
Sand Shiner	X							
Silverjaw Minnow	X				X			
Smallmouth Bass		X			X	X	X	X
Striped Shiner		X			X			
# White Sucker	X	X	X	X	X	X	X	X

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Stream	Elkhart River—Goshen Area					
Site Number	State Road 15 (below)		Shanklin Park		Rogers Park (below)	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~ Am. Brook Lamprey		X		X	X	
Black Crappie		X	X	X	X	X
# Black Bullhead	X					
Blackside Darter	X	X	X	X		
Blackstripe Topminnow	X	X		X	X	
Bluegill	X	X	X	X	X	X
# Bluntnose Minnow	X	X	X	X	X	X
Bowfin	X	X	X			
# Brown Bullhead		X	X			
Central Mudminnow		X	X	X		X
~ Chestnut Lamprey		X	X	X	X	
# Common Carp	X	X				X
Common Shiner	X	X	X		X	
# Creek Chub	X			X	X	
Golden Redhorse	X	X	X	X	X	X
Grass Pickerel	X	X	X	X		X
~ Greater Redhorse			X			X
# Green Sunfish	X	X		X		X
~ Hornyhead Chub	X	X	X	X	X	X
Hybrid Sunfish			X	X		
Johnny Darter	X	X		X		
Largemouth Bass	X	X	X	X	X	X
Longear Sunfish	X	X	X	X	X	X
~ Mimic Shiner	X	X				
Northern Hog Sucker	X	X	X	X	X	X
Northern Pike	X	X	X	X	X	X
Pirate Perch	X	X		X		
Pumpkinseed		X	X	X		
Rainbow Darter		X	X	X		
Redear Sunfish				X		
Rock Bass	X	X	X	X	X	X
Rosyface Shiner	X	X	X	X	X	X
Sand Shiner	X	X		X		
Silverjaw Minnow		X				
Smallmouth Bass	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	
Spotted Sucker	X	X	X	X	X	X
Steelcolor Shiner	X					
~ Stonecat						X
Striped Shiner		X	X	X	X	X
Walleye					X	
Warmouth				X		
# White Sucker	X	X	X	X	X	X
Yellow Bullhead				X		X

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Stream	Elkhart River—Elkhart Area					
	Oxbow Park (B)		Elkhart Environmental Center (A)		Elkhart Central H.S.	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~ Am. Brook Lamprey	X	X			X	X
Black Crappie	X	X		X	X	X
# Black Bullhead						
Blackside Darter		X				X
Bluegill	X	X	X	X	X	X
# Bluntnose Minnow		X	X	X		X
~ Chestnut Lamprey	X	X	X	X	X	X
Common Shiner		X	X	X		X
# Creek Chub		X	X			
Golden Redhorse	X	X	X	X	X	X
Grass Pickerel		X		X		X
~ Greater Redhorse		X				
# Green Sunfish	X	X	X	X	X	X
~ Hornyhead Chub	X	X	X	X	X	X
Hybrid Minnow					X	
Hybrid Sunfish	X			X		X
Johnny Darter			X	X		
Largemouth Bass	X	X	X	X	X	X
Longear Sunfish	X	X	X	X	X	X
~ Mimic Shiner		X	X			
Northern Hog Sucker	X	X	X	X	X	X
Northern Pike		X				X
Pirate Perch		X				
Pumpkinseed	X				X	
Rainbow Darter	X	X		X	X	X
Redear Sunfish		X	X	X		X
Rock Bass	X	X	X	X	X	X
Rosyface Shiner	X	X	X	X	X	X
Sand Shiner		X		X		
Smallmouth Bass	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X
Spotted Sucker	X	X	X		X	
Steelcolor Shiner		X		X		
~ Stonecat	X				X	
Stoneroller, Central	X				X	
Striped Shiner	X	X	X	X	X	X
Warmouth			X	X		X
# White Sucker	X	X	X	X	X	X
Yellow Bullhead		X		X		X

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STREAM	Yellow Creek		Baugo Creek			
Site	Concord High School		County Road 3 (N)		County Road 1 (S)	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
#Blacknose Dace	X	X	X	X	X	X
Bluegill	X	X		X	X	X
#Bluntnose Minnow	X	X	X	X	X	X
#Central Mudminnow	X				X	
Central Stoneroller	X	X	X	X	X	X
Channel Catfish			X			
Chestnut Lamprey		X				
Common Shiner	X	X	X	X	X	X
#Creek Chub	X	X	X	X	X	X
#Fathead Minnow				X		
Golden Redhorse			X	X	X	
#Green Sunfish	X	X	X	X	X	X
Greenside Darter			X	X		
Hybrid Sunfish						
Johnny Darter	X	X	X	X	X	X
Largemouth Bass	X	X		X		X
Logperch			X	X		
~Longnose Dace	X		X	X		
Pirate Perch			X			
Pumpkinseed				X	X	X
Rainbow Darter	X	X	X	X		
Rock Bass			X			
Sand Shiner			X	X	X	X
Shorthead Redhorse			X	X		
Silver Redhorse			X			X
Silverjaw Minnow	X	X		X	X	X
Smallmouth Bass	X		X	X		
Spotfin Shiner				X		
Striped Shiner	X	X		X		X
#White Sucker	X	X	X	X	X	X
Yellow Bullhead	X	X			X	

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STREAM	Woodward Ditch			Eller Ditch				
	Basswood Road	Oaks Avenue		Bridgeton Drive		Lincolnway		Frank Zappia
	Investigative	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	Investigative
#Blacknose Dace	X	X	X	X	X		X	
Blackside Darter						X		
Bluegill		X	X	X	X	X	X	
Bluntnose Minnow		X	X					
#Creek Chub		X	X	X	X			X
Grass Pickerel		X	X					
#Green Sunfish		X						X
Johnny Darter	X	X	X		X	X	X	X
Logperch			X				X	
Longear Sunfish		X						
Orangethroat Darter			X				X	
Pumpkinseed		X	X					
Rainbow Darter		X				X	X	
Rainbow Trout						X	X	X
Rock Bass								
Silverjaw Minnow				X				
Smallmouth Bass						X		X
#White Sucker	X	X	X	X		X	X	
Yellow Bullhead							X	

STREAM	Willow Creek					Phillips Ditch	
	Day Road		Willow Creek Road	Estates Blvd		Chippewa Ave	
	1st Pass	2nd Pass	Investigative	1st Pass	2nd Pass	1st Pass	2nd Pass
#Black Bullhead							X
#Blacknose Dace	X	X	X	X	X		
Bluegill						X	X
#Central Mudminnow		X	X	X	X	X	X
#Creek Chub			X	X	X	X	X
Fathead Minnow						X	X
#Green Sunfish	X	X	X			X	X
Hybrid Sunfish		X	X	X			
Mottled Sculpin	X	X	X	X	X		
Pumpkinseed				X			
Rainbow Trout					X		
#White Sucker			X	X	X		

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STREAM	Juday Creek			
	Grape Road		Myrtle Street	
	1st Pass	2nd Pass	1st Pass	2nd Pass
#Blacknose Dace	X	X	X	X
Bluegill	X	X		
Brown Trout	X			
#Creek Chub	X	X	X	X
#Green Sunfish	X	X	X	X
Johnny Darter	X	X	X	X
Mottled Sculpin	X	X	X	X
Orangethroat Darter			X	X
Rainbow Darter			X	X
Rainbow Trout	X	X	X	X
Rock Bass			X	X
Smallmouth Bass			X	
#White Sucker	X	X	X	X

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Appendix E

Summary of macroinvertebrates (insects) collected by site, 2009

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 (HD 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 HD samplers. Macroinvertebrates collected in this way were identified and simply counted as being present (Qualitative column).

In 2009, the Aquatics Program performed macroinvertebrate sampling for the Elkhart River Restoration Association (ERRA) at four sites in the Elkhart River Watershed (Elkhart River SR 15 (B), Elkhart River Rogers Park (B), Turkey Creek CR142, and Rock Run Creek 1st Street). The work performed for the ERRA was funded through a Section 319 Grant, which is administered by IDEM. Based on IDEM's oversight of the ERRA project, sampling and analysis protocols followed the draft Indiana macroinvertebrate Index of Biological Integrity. In accordance with these protocols, a HD sampler was not used, and the sampling approach was very similar to the qualitative approach described above. However, macroinvertebrates collected using this approach were analyzed in a quantitative manner. Therefore, for these sites, results appear in the Quantitative Column, but do not appear in the Qualitative Column.

Site: St. Joseph River, Lexington Avenue

Collection Date:

08/28/2009

Site Number: 1

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	0	+
<i>Hyalella azteca</i>	0	+
<i>Gammarus sp</i>	0	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Isonychia sp</i>	0	+
<i>Stenacron sp</i>	0	+
<i>Stenonema terminatum</i>	0	+
<i>Tricorythodes sp</i>	0	+
<i>Caenis sp</i>	0	+
<i>Neoplea sp</i>	0	+
<i>Chimarra sp</i>	0	+
<i>Cheumatopsyche sp</i>	0	+
<i>Macrostemum sp</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Stenelmis sp</i>	0	+
<i>Cricotopus (C.) bicinctus</i>	0	+
<i>Nanocladius sp</i>	0	+
<i>Dicrotendipes neomodestus</i>	0	+
<i>Polypedilum (P.) illinoense</i>	0	+
<i>Stictochironomus sp</i>	0	+
<i>Tanytarsus curticornis group</i>	0	+
<i>Elimia sp</i>	0	+

No. Quantitative Taxa: 0
 No. Qualitative Taxa: 22
 Total No. Taxa: 22
 Number of Organisms: 0
 ICI: N/A
 Qualitative Category: Good

Site: St. Joseph River, McNaughton Park

Collection Date: 08/28/2009

Site Number: 2

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	154	
<i>Oligochaeta</i>	9	
<i>Caecidotea sp</i>	1	
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Hydracarina</i>	8	
<i>Plauditus sp</i>	14	
<i>Baetis intercalaris</i>	4	
<i>Isonychia sp</i>	191	+
<i>Stenacron sp</i>	38	
<i>Stenonema exiguum</i>	114	+
<i>Stenonema terminatum</i>	210	
<i>Ephemerella sp</i>	2	+
<i>Tricorythodes sp</i>	59	+
<i>Paragnetina sp</i>	2	
<i>Corydalus cornutus</i>	1	
<i>Chimarra obscura</i>	21	+
<i>Neureclipsis sp</i>	3	+
<i>Nyctiophylax sp</i>	3	+
<i>Cheumatopsyche sp</i>	49	+
<i>Ceratopsyche morosa group</i>	1	
<i>Hydropsyche phalerata</i>	4	+
<i>Macrostemum sp</i>	53	
<i>Hydroptila sp</i>	94	
<i>Brachycentrus sp</i>	0	+
<i>Leptoceridae</i>	1	
<i>Nectopsyche diarina</i>	1	
<i>Petrophila sp</i>	9	
<i>Macronychus glabratus</i>	20	
<i>Stenelmis sp</i>	0	+
<i>Antocha sp</i>	24	
<i>Nilotanypus fimbriatus</i>	15	
<i>Pentaneura sp</i>	30	
<i>Cricotopus (C.) bicinctus</i>	30	
<i>Paratrichocladius sp</i>	15	
<i>Thienemanniella taurocapita</i>	24	
<i>Tvetenia sp</i>	60	
<i>Dicrotendipes neomodestus</i>	298	
<i>Polypedilum (Uresipedilum) flavum</i>	537	
<i>Polypedilum (P.) illinoense</i>	60	+
<i>Stelechomyia perpulchra</i>	30	

Taxa Name	Quantitative	Qualitative
<i>Rheotanytarsus sp</i>	492	+
<i>Sublettea coffmani</i>	15	
<i>Hemerodromia sp</i>	56	

No. Quantitative Taxa: 41
 No. Qualitative Taxa: 14
 Total No. Taxa: 43
 Number of Organisms: 2189
 ICI: 44

Site: St. Joseph River, Logan Street

Collection Date: 09/05/2009

Site Number: 3

Taxa Name	Quantitative	Qualitative
<i>Spongillidae</i>	0	+
<i>Turbellaria</i>	93	+
<i>Ectoprocta</i>	22	
<i>Oligochaeta</i>	4	+
<i>Gammarus sp</i>	5	
<i>Baetis intercalaris</i>	120	+
<i>Isonychia sp</i>	17	
<i>Stenacron sp</i>	178	+
<i>Stenonema exiguum</i>	70	+
<i>Stenonema mediopunctatum</i>	5	+
<i>Stenonema mexicanum integrum</i>	3	+
<i>Stenonema terminatum</i>	45	+
<i>Tricorythodes sp</i>	9	+
<i>Baetisca sp</i>	0	+
<i>Chimarra obscura</i>	1	
<i>Neureclipsis sp</i>	13	+
<i>Nyctiophylax sp</i>	9	
<i>Cheumatopsyche sp</i>	364	+
<i>Hydropsyche aerata</i>	0	+
<i>Hydropsyche orris</i>	7	+
<i>Hydropsyche phalerata</i>	61	+
<i>Hydroptila sp</i>	16	
<i>Brachycentrus sp</i>	2	+
<i>Macronychus glabratus</i>	8	+
<i>Ablabesmyia peleensis</i>	4	
<i>Conchapelopia sp</i>	4	
<i>Corynoneura "celeripes" (sensu Simpson & Bode, 1980)</i>	4	
<i>Corynoneura lobata</i>	4	
<i>Cricotopus (C.) bicinctus</i>	8	
<i>Paratrichocladius sp</i>	4	
<i>Thienemanniella xena</i>	2	
<i>Cryptotendipes sp</i>	0	+
<i>Dicrotendipes neomodestus</i>	8	
<i>Polypedilum (Uresipedilum) flavum</i>	27	
<i>Rheotanytarsus sp</i>	287	+
<i>Hemerodromia sp</i>	12	
<i>Pleuroceridae</i>	2	+
<i>Elimia sp</i>	5	+
<i>Ferrissia sp</i>	1	
<i>Corbicula fluminea</i>	0	+
<i>Sphaerium sp</i>	0	+

No. Quantitative Taxa: 35
 No. Qualitative Taxa: 24
 Total No. Taxa: 41
 Number of Organisms: 1424
 ICI: 56

Site: St. Joseph River, Keller Park

Collection Date: 08/28/2009

Site Number: 4

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	178	+	
<i>Oligochaeta</i>	12	+	
<i>Gammarus sp</i>	5	+	
<i>Orconectes (Procericambarus) rusticus</i>	0	+	
<i>Plauditus sp</i>	8	+	No. Quantitative Taxa: 31
<i>Baetis intercalaris</i>	272	+	No. Qualitative Taxa: 30
<i>Isonychia sp</i>	15	+	Total No. Taxa: 40
<i>Stenacron sp</i>	16		Number of Organisms: 1871
<i>Stenonema exiguum</i>	39	+	ICI: 50
<i>Stenonema mexicanum integrum</i>	13		
<i>Stenonema terminatum</i>	55	+	
<i>Tricorythodes sp</i>	9	+	
<i>Argia sp</i>	0	+	
<i>Chimarra obscura</i>	11	+	
<i>Neureclipsis sp</i>	6	+	
<i>Cheumatopsyche sp</i>	112	+	
<i>Ceratopsyche sparna</i>	2		
<i>Hydropsyche aerata</i>	0	+	
<i>Hydropsyche orris</i>	5	+	
<i>Hydropsyche phalerata</i>	127	+	
<i>Macrostemum sp</i>	33	+	
<i>Hydroptilidae</i>	10		
<i>Macronychus glabratus</i>	8	+	
<i>Stenelmis sp</i>	0	+	
<i>Simulium sp</i>	35		
<i>Pentaneura sp</i>	8		
<i>Cricotopus (C.) bicinctus</i>	0	+	
<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	8		
<i>Orthocladius (O.) sp</i>	8		
<i>Tvetenia sp</i>	16		
<i>Dicrotendipes neomodestus</i>	0	+	
<i>Polypedilum (Uresipedilum) flavum</i>	24		
<i>Polypedilum (P.) illinoense</i>	8	+	
<i>Rheotanytarsus sp</i>	796	+	
<i>Muscidae</i>	0	+	
<i>Pleuroceridae</i>	0	+	
<i>Elimia sp</i>	30	+	
<i>Fossaria sp</i>	0	+	
<i>Physella sp</i>	2	+	
<i>Sphaerium sp</i>	0	+	

Site: St. Joseph River, Brick Road

Collection Date: 08/28/2009

Site Number: 5

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	19	+
<i>Oligochaeta</i>	4	+
<i>Gammarus sp</i>	4	+
<i>Orconectes (Procericambarus) rusticus</i>	0	+
<i>Baetis intercalaris</i>	57	+
<i>Isonychia sp</i>	5	+
<i>Stenacron sp</i>	16	+
<i>Stenonema exiguum</i>	5	
<i>Stenonema mexicanum integrum</i>	8	
<i>Stenonema terminatum</i>	23	
<i>Paragnetina sp</i>	1	
<i>Chimarra obscura</i>	1	
<i>Neureclipsis sp</i>	4	
<i>Cheumatopsyche sp</i>	46	+
<i>Hydropsyche phalerata</i>	40	+
<i>Macrostemum sp</i>	26	+
<i>Brachycentrus sp</i>	6	
<i>Macronychus glabratus</i>	8	+
<i>Stenelmis sp</i>	0	+
<i>Simulium sp</i>	57	+
<i>Cricotopus (C.) bicinctus</i>	7	+
<i>Thienemanniella xena</i>	4	
<i>Tvetenia sp</i>	14	
<i>Polypedilum (Uresipedilum) flavum</i>	24	+
<i>Polypedilum (P.) illinoense</i>	3	
<i>Rheotanytarsus sp</i>	314	+
<i>Tanytarsus curticornis group</i>	0	+
<i>Hemerodromia sp</i>	2	
<i>Elimia sp</i>	2	+
<i>Physella sp</i>	0	+
<i>Ferrissia sp</i>	3	

No. Quantitative Taxa: 27
 No. Qualitative Taxa: 19
 Total No. Taxa: 31
 Number of Organisms: 703
 ICI: 40

Site: Little Elkhart River, CR 35

Collection Date: 08/27/2009

Site Number: 6

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	2			
<i>Caecidotea sp</i>	0	+		
<i>Gammarus sp</i>	8	+		
<i>Orconectes sp</i>	0	+		
<i>Baetis tricaudatus</i>	11		No. Quantitative Taxa:	30
<i>Baetis flavistriga</i>	171	+	No. Qualitative Taxa:	27
<i>Baetis intercalaris</i>	46		Total No. Taxa:	47
<i>Pseudocloeon propinquum</i>	0	+	Number of Organisms:	6367
<i>Isonychia sp</i>	17		ICI:	44
<i>Leucrocuta sp</i>	0	+		
<i>Stenacron sp</i>	0	+		
<i>Stenonema exiguum</i>	6			
<i>Stenonema terminatum</i>	42			
<i>Stenonema vicarium</i>	367	+		
<i>Paragnetina sp</i>	1			
<i>Chimarra obscura</i>	1			
<i>Lype diversa</i>	40			
<i>Cheumatopsyche sp</i>	1244	+		
<i>Ceratopsyche morosa group</i>	714	+		
<i>Ceratopsyche sparna</i>	459	+		
<i>Hydropsyche depravata group</i>	441	+		
<i>Glossosoma sp</i>	0	+		
<i>Hydroptila sp</i>	89			
<i>Brachycentrus sp</i>	131	+		
<i>Neophylax sp</i>	0	+		
<i>Pycnopsyche sp</i>	0	+		
<i>Macronychus glabratus</i>	2			
<i>Stenelmis sp</i>	0	+		
<i>Antocha sp</i>	10			
<i>Simulium sp</i>	286	+		
<i>Procladius (Holotanypus) sp</i>	0	+		
<i>Pagastia sp</i>	0	+		
<i>Eukiefferiella sp</i>	108			
<i>Orthocladius (O.) sp</i>	189			
<i>Parametriocnemus sp</i>	81			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	81			
<i>Tvetenia sp</i>	487	+		
<i>Microtendipes pedellus group</i>	0	+		
<i>Paratendipes albimanus or P. duplicatus</i>	0	+		
<i>Polypedilum (Uresipedilum) aviceps</i>	81			
<i>Polypedilum (Uresipedilum) flavum</i>	54			
<i>Saetheria tylus</i>	0	+		
<i>Stictochironomus sp</i>	0	+		
<i>Cladotanytarsus sp</i>	0	+		
<i>Rheotanytarsus sp</i>	1190			
<i>Empididae</i>	8			
<i>Elimia sp</i>	0	+		

Site: Pine Creek, SR120 Res

Collection Date: 08/20/2009

Site Number: 7

Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	4	
<i>Turbellaria</i>	4	+
<i>Oligochaeta</i>	32	
<i>Caecidotea sp</i>	14	+
<i>Gammarus sp</i>	56	+
<i>Baetis tricaudatus</i>	5	
<i>Baetis flavistriga</i>	0	+
<i>Baetis intercalaris</i>	3	
<i>Stenonema mexicanum integrum</i>	0	+
<i>Stenonema pulchellum</i>	3	
<i>Stenonema terminatum</i>	0	+
<i>Stenonema vicarium</i>	0	+
<i>Tricorythodes sp</i>	0	+
<i>Calopteryx sp</i>	0	+
<i>Lype diversa</i>	4	
<i>Cheumatopsyche sp</i>	41	+
<i>Ceratopsyche morosa group</i>	45	+
<i>Ceratopsyche slossonae</i>	41	+
<i>Ceratopsyche sparna</i>	29	+
<i>Hydropsyche depravata group</i>	41	+
<i>Hydroptila sp</i>	0	+
<i>Brachycentrus sp</i>	8	+
<i>Dubiraphia vittata group</i>	2	+
<i>Macronychus glabratus</i>	0	+
<i>Optioservus sp</i>	3	
<i>Simulium sp</i>	6	+
<i>Thienemannimyia group</i>	9	
<i>Corynoneura lobata</i>	10	
<i>Eukiefferiella sp</i>	47	
<i>Orthocladus (O.) sp</i>	4	
<i>Parametriocnemus sp</i>	34	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	21	
<i>Thienemanniella xena</i>	38	
<i>Tvetenia sp</i>	26	+
<i>Microtendipes pedellus group</i>	9	+
<i>Paratendipes albimanus or P. duplicatus</i>	13	
<i>Polypedilum (Uresipedilum) aviceps</i>	60	+
<i>Polypedilum (Uresipedilum) flavum</i>	4	+
<i>Stictochironomus sp</i>	0	+
<i>Cladotanytarsus sp</i>	21	+
<i>Rheotanytarsus sp</i>	13	+
<i>Sublettea coffmani</i>	9	
<i>Hemerodromia sp</i>	14	

No. Quantitative Taxa: 34
 No. Qualitative Taxa: 26
 Total No. Taxa: 43
 Number of Organisms: 673
 ICI: 38

Site: Yellow Creek, Concord High School

Collection Date: 09/05/2009

Site Number: 8

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	20	+		
<i>Oligochaeta</i>	129	+		
<i>Caecidotea sp</i>	1	+		
<i>Gammarus sp</i>	18	+		
<i>Orconectes sp</i>	0	+	No. Quantitative Taxa:	29
<i>Baetis tricaudatus</i>	33	+	No. Qualitative Taxa:	26
<i>Baetis intercalaris</i>	13		Total No. Taxa:	41
<i>Stenacron sp</i>	3	+	Number of Organisms:	1675
<i>Tricorythodes sp</i>	0	+	ICI:	34
<i>Calopteryx sp</i>	0	+		
<i>Coenagrionidae</i>	0	+		
<i>Boyeria vinosa</i>	1			
<i>Cheumatopsyche sp</i>	135	+		
<i>Ceratopsyche morosa group</i>	198	+		
<i>Ceratopsyche sparna</i>	49			
<i>Hydropsyche depravata group</i>	277	+		
<i>Peltodytes sp</i>	0	+		
<i>Ancyronyx variegata</i>	4			
<i>Dubiraphia sp</i>	0	+		
<i>Macronychus glabratus</i>	18			
<i>Optioservus sp</i>	10			
<i>Stenelmis sp</i>	11	+		
<i>Antocha sp</i>	8			
<i>Simulium sp</i>	8	+		
<i>Conchapelopia sp</i>	44			
<i>Cricotopus (C.) bicinctus</i>	0	+		
<i>Parametriocnemus sp</i>	35			
<i>Tvetenia sp</i>	18			
<i>Dicrotendipes neomodestus</i>	9			
<i>Microtendipes pedellus group</i>	202	+		
<i>Paratendipes albimanus or P. duplicatus</i>	0	+		
<i>Polypedilum (Uresipedilum) aviceps</i>	123	+		
<i>Polypedilum (Uresipedilum) flavum</i>	79			
<i>Polypedilum (P.) fallax group</i>	9			
<i>Polypedilum (Tripodura) scalaenum group</i>	0	+		
<i>Saetheria tylus</i>	0	+		
<i>Stictochironomus sp</i>	0	+		
<i>Paratanytarsus sp</i>	53	+		
<i>Rheotanytarsus sp</i>	97	+		
<i>Tanytarsus glabrescens group sp 7</i>	53			
<i>Ferrissia sp</i>	17			

Site: Christiana Creek, North Main Wellfield

Collection Date: 08/20/2009

Site Number: 9

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	5	
<i>Gammarus sp</i>	7	+
<i>Hydracarina</i>	0	+
<i>Plauditus sp</i>	1	+
<i>Baetis flavistriga</i>	13	
<i>Baetis intercalaris</i>	66	+
<i>Pseudocloeon propinquum</i>	0	+
<i>Isonychia sp</i>	2	
<i>Stenonema exiguum</i>	104	+
<i>Stenonema mediopunctatum</i>	52	
<i>Stenonema terminatum</i>	76	+
<i>Ephemerella sp</i>	128	+
<i>Acroneuria sp</i>	0	+
<i>Chimarra obscura</i>	311	+
<i>Neureclipsis sp</i>	1	+
<i>Cheumatopsyche sp</i>	104	
<i>Ceratopsyche morosa group</i>	6	
<i>Ceratopsyche sparna</i>	32	+
<i>Hydropsyche depravata group</i>	405	+
<i>Hydropsyche phalerata</i>	6	+
<i>Hydroptila sp</i>	2	
<i>Leucotrichia pictipes</i>	1	
<i>Brachycentrus sp</i>	50	+
<i>Neophylax sp</i>	0	+
<i>Helicopsyche borealis</i>	0	+
<i>Nectopsyche diarina</i>	0	+
<i>Psephenus herricki</i>	0	+
<i>Macronychus glabratus</i>	10	
<i>Stenelmis sp</i>	0	+
<i>Antocha sp</i>	1	
<i>Dixella sp</i>	0	+
<i>Simulium sp</i>	10	+
<i>Conchapelopia sp</i>	10	
<i>Eukiefferiella sp</i>	24	+
<i>Orthocladius (O.) sp</i>	5	
<i>Parametriocnemus sp</i>	19	
<i>Thienemanniella taurocapita</i>	14	
<i>Tvetenia sp</i>	29	
<i>Microtendipes pedellus group</i>	10	
<i>Phaenopsectra obediens group</i>	5	
<i>Polypedilum (Uresipedilum) flavum</i>	33	
<i>Rheotanytarsus sp</i>	320	
<i>Tanytarsus glabrescens group sp 7</i>	5	
<i>Hemerodromia sp</i>	24	
<i>Ferrissia sp</i>	0	+

No. Quantitative Taxa: 35
 No. Qualitative Taxa: 24
 Total No. Taxa: 45
 Number of Organisms: 1891
 ICI: 48

Site: Christiana Creek, High Dive Park

Collection Date: 08/20/2009

Site Number: 10

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	1			
<i>Gammarus sp</i>	18	+		
<i>Plauditus sp</i>	0	+		
<i>Baetis flavistriga</i>	9	+		
<i>Baetis intercalaris</i>	58	+	No. Quantitative Taxa:	41
<i>Pseudocloeon propinquum</i>	0	+	No. Qualitative Taxa:	26
<i>Stenacron sp</i>	3	+	Total No. Taxa:	48
<i>Stenonema exiguum</i>	12	+	Number of Organisms:	1445
<i>Stenonema mediopunctatum</i>	0	+	ICI:	50
<i>Stenonema pulchellum</i>	0	+		
<i>Stenonema terminatum</i>	76	+		
<i>Ephemerella sp</i>	65	+		
<i>Tricorythodes sp</i>	25	+		
<i>Corydalus cornutus</i>	1	+		
<i>Chimarra aterrima</i>	2			
<i>Chimarra obscura</i>	118	+		
<i>Psychomyia flavida</i>	8			
<i>Neureclipsis sp</i>	4	+		
<i>Cheumatopsyche sp</i>	108	+		
<i>Ceratopsyche morosa group</i>	83	+		
<i>Ceratopsyche sparna</i>	65	+		
<i>Hydropsyche depravata group</i>	162	+		
<i>Hydropsyche phalerata</i>	18	+		
<i>Macrostemum sp</i>	13			
<i>Leucotrichia pictipes</i>	20			
<i>Brachycentrus sp</i>	27	+		
<i>Neophylax sp</i>	0	+		
<i>Helicopsyche borealis</i>	0	+		
<i>Macronychus glabratus</i>	13	+		
<i>Stenelmis sp</i>	0	+		
<i>Simulium sp</i>	6			
<i>Cricotopus (C.) bicinctus</i>	21			
<i>Cricotopus (C.) trifascia</i>	5			
<i>Eukiefferiella sp</i>	72			
<i>Nanocladius sp</i>	10			
<i>Orthocladius (O.) sp</i>	15			
<i>Parametriocnemus sp</i>	87			
<i>Paratrichocladius sp</i>	5			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	5			
<i>Thienemanniella taurocapita</i>	18			
<i>Dicrotendipes neomodestus</i>	5			
<i>Microtendipes pedellus group</i>	5			
<i>Polypedilum (Uresipedilum) flavum</i>	21			
<i>Polypedilum (P.) fallax group</i>	5			
<i>Rheotanytarsus sp</i>	226	+		
<i>Sublettea coffmani</i>	10			
<i>Hemerodromia sp</i>	12			
<i>Ferrissia sp</i>	8			

Site: Elkhart River, SR 15 (B)

Collection Date: 09/04/2009

Site Number: 11

Taxa Name	Quantitative	Qualitative
<i>Gammarus sp</i>	17	
<i>Cambaridae</i>	1	
<i>Pseudocloeon propinquum</i>	2	
<i>Plauditus punctiventris</i>	1	
<i>Stenonema exiguum</i>	6	
<i>Leptophlebiidae</i>	1	
<i>Coenagrionidae</i>	2	
<i>Gomphus sp</i>	2	
<i>Pteronarcys sp</i>	2	
<i>Leuctra sp</i>	1	
<i>Acroneuria sp</i>	1	
<i>Agnatina capitata complex</i>	1	
<i>Hemiptera</i>	1	
<i>Sigara sp</i>	1	
<i>Neureclipsis sp</i>	1	
<i>Cheumatopsyche sp</i>	1	
<i>Ceratopsyche morosa group</i>	8	
<i>Brachycentrus sp</i>	3	
<i>Oecetis sp</i>	1	
<i>Macronychus glabratus</i>	2	
<i>Simulium sp</i>	8	
<i>Ablabesmyia sp</i>	1	
<i>Hayesomyia senata or Thienemannimyia norena</i>	1	
<i>Dicrotendipes sp</i>	1	
<i>Polypedilum (P.) illinoense</i>	3	
<i>Polypedilum (Tripodura) scalaenum group</i>	1	
<i>Rheotanytarsus sp</i>	1	
<i>Physella sp</i>	1	
<i>Ferrissia sp</i>	1	
<i>Corbicula fluminea</i>	2	
<i>Sphaerium sp</i>	2	

No. Quantitative Taxa: 31
No. Qualitative Taxa: 0
Total No. Taxa: 31
Number of Organisms: 77
draft IDEM mIBI: 42

Site: Elkhart River, Rogers Park (B)

Collection Date: 09/04/2009

Site Number: 12

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	1	
<i>Nematomorpha</i>	1	
<i>Oligochaeta</i>	1	
<i>Gammarus sp</i>	30	
<i>Pseudocloeon propinquum</i>	3	
<i>Plauditus punctiventris</i>	1	
<i>Leucrocuta sp</i>	1	
<i>Stenonema terminatum</i>	2	
<i>Caenis sp</i>	2	
<i>Coenagrionidae</i>	1	
<i>Hemiptera</i>	1	
<i>Cheumatopsyche sp</i>	1	
<i>Ceratopsyche morosa group</i>	1	
<i>Brachycentrus sp</i>	2	
<i>Nectopsyche diarina</i>	1	
<i>Stenelmis sp</i>	3	
<i>Tipulidae</i>	3	
<i>Simulium sp</i>	4	
<i>Hayesomyia senata</i>	1	
<i>Chironomus (C.) sp</i>	1	
<i>Phaenopsectra obediens group</i>	1	
<i>Polypedilum (Tripodura) scalaenum group</i>	2	
<i>Stenochironomus sp</i>	1	
<i>Rheotanytarsus sp</i>	2	
<i>Tanytarsus sp</i>	2	
<i>Tabanidae</i>	3	
<i>Corbicula fluminea</i>	3	
<i>Sphaerium sp</i>	20	

No. Quantitative Taxa: 28
 No. Qualitative Taxa: 0
 Total No. Taxa: 28
 Number of Organisms: 95
 draft IDEM mIBI: 32

Site: Elkhart River, Oxbow Park (B)

Collection Date: 08/27/2009

Site Number: 13

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	16		<i>Polypedilum (Uresipedilum) flavum</i>	13	
<i>Caecidotea sp</i>	4		<i>Polypedilum (P.) fallax group</i>	4	
<i>Gammarus sp</i>	46	+	<i>Rheotanytarsus sp</i>	28	
<i>Baetis intercalaris</i>	17	+	<i>Tanytarsus sp</i>	32	
<i>Pseudocloeon propinquum</i>	0	+	<i>Tanytarsus sepp</i>	6	+
<i>Isonychia sp</i>	10		<i>Hydrobiidae</i>	8	
<i>Leucrocuta sp</i>	1	+	<i>Elimia sp</i>	6	+
<i>Stenacron sp</i>	47	+	<i>Pisidium sp</i>	0	+
<i>Stenonema exiguum</i>	23		<i>Sphaerium sp</i>	0	+
<i>Stenonema terminatum</i>	115	+			
<i>Ephemerellidae</i>	24				
<i>Tricorythodes sp</i>	11	+			
<i>Caenis sp</i>	16				
<i>Coenagrionidae</i>	0	+			
<i>Agnatina capitata complex</i>	3		No. Quantitative Taxa:	49	
<i>Corydalus cornutus</i>	8		No. Qualitative Taxa:	22	
<i>Chimarra obscura</i>	291		Total No. Taxa:	54	
<i>Psychomyia flavida</i>	2		Number of Organisms:	911	
<i>Neureclipsis sp</i>	32	+	ICI:	52	
<i>Nyctiophylax sp</i>	24	+			
<i>Polycentropus sp</i>	24				
<i>Cheumatopsyche sp</i>	59	+			
<i>Ceratopsyche morosa group</i>	0	+			
<i>Ceratopsyche sparna</i>	3				
<i>Hydropsyche phalerata</i>	26	+			
<i>Hydropsyche venularis</i>	3				
<i>Hydroptila sp</i>	10				
<i>Brachycentrus sp</i>	2	+			
<i>Pycnopsyche sp</i>	2				
<i>Lepidostoma sp</i>	2				
<i>Nectopsyche diarina</i>	1	+			
<i>Oecetis sp</i>	2				
<i>Macronychus glabratus</i>	16	+			
<i>Stenelmis sp</i>	3	+			
<i>Conchapelopia sp</i>	11				
<i>Nilotanytus fimbriatus</i>	9				
<i>Pentaneura sp</i>	2				
<i>Corynoneura lobata</i>	10				
<i>Eukiefferiella sp</i>	2				
<i>Nanocladius (N.) crassicornus</i> or <i>N. (N.) "rectinervis"</i>	2				
<i>Parametriocnemus sp</i>	2				
<i>Rheocricotopus (Psilocricotopus) robacki</i>	4				
<i>Tvetenia sp</i>	13				
<i>Microtendipes pedellus group</i>	9	+			
<i>Microtendipes rydalensis</i>	4				

Site: Elkhart River, Central High School

Collection Date: 09/05/2009

Site Number: 14

Taxa Name	Quantitative	Qualitative	Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	16		<i>Microtendipes pedellus</i> group	4	
<i>Gammarus</i> sp	20	+	<i>Polypedilum (Uresipedilum) aviceps</i>	7	
<i>Baetis flavistriga</i>	0	+	<i>Polypedilum (Uresipedilum) flavum</i>	46	+
<i>Baetis intercalaris</i>	17	+	<i>Polypedilum (P.) illinoense</i>	14	
<i>Pseudocloeon propinquum</i>	0	+	<i>Polypedilum (P.) laetum</i> group	4	
<i>Isonychia</i> sp	80		<i>Stictochironomus</i> sp	0	+
<i>Leucrocota</i> sp	0	+	<i>Rheotanytarsus</i> sp	146	+
<i>Stenacron</i> sp	9	+	<i>Sublettea coffmani</i>	7	
<i>Stenonema exiguum</i>	77	+	<i>Tanytarsus sepp</i>	0	+
<i>Stenonema terminatum</i>	66	+	<i>Elimia</i> sp	8	+
Ephemerellidae	4		<i>Ferrissia</i> sp	8	
<i>Tricorythodes</i> sp	32	+			
<i>Caenis</i> sp	8				
Coenagrionidae	0	+			
<i>Pteronarcys</i> sp	0	+	No. Quantitative Taxa:	43	
<i>Paragnetina</i> sp	1		No. Qualitative Taxa:	33	
<i>Aagnetina capitata</i> complex	3	+	Total No. Taxa:	56	
<i>Chimarra obscura</i>	39		Number of Organisms:	818	
<i>Neureclipsis</i> sp	28	+	ICI:	54	
<i>Nyctiophylax</i> sp	0	+			
<i>Polycentropus</i> sp	22	+			
<i>Cheumatopsyche</i> sp	91	+			
<i>Ceratopsyche morosa</i> group	55	+			
<i>Ceratopsyche sparna</i>	17	+			
<i>Hydropsyche depravata</i> group	25				
<i>Hydropsyche phalerata</i>	72	+			
<i>Hydroptila</i> sp	13				
<i>Brachycentrus</i> sp	9	+			
<i>Pycnopsyche</i> sp	1				
<i>Lepidostoma</i> sp	1				
Leptoceridae	0	+			
<i>Oecetis</i> sp	2				
<i>Petrophila</i> sp	2				
<i>Peltodytes</i> sp	0	+			
<i>Psephenus herricki</i>	0	+			
<i>Macronychus glabratus</i>	28	+			
<i>Stenelmis</i> sp	0	+			
<i>Antocha</i> sp	14				
<i>Meropelopia</i> sp	14				
<i>Nilotanytus fimbriatus</i>	4				
<i>Brillia flavifrons</i> group	4				
<i>Corynoneura "celeripes"</i> (sensu Simpson & Bode, 1980)	8				
<i>Tvetenia</i> sp	36	+			
<i>Cryptochironomus</i> sp	0	+			
<i>Dicrotendipes neomodestus</i>	0	+			

Site: Turkey Creek, CR 142

Collection Date: 09/05/2009

Site Number: 15

Taxa Name	Quantitative	Qualitative
<i>Boyeria vinosa</i>	1	
<i>Brachycentrus sp</i>	3	
<i>Caecidotea sp</i>	5	
<i>Ceratopsyche morosa group</i>	1	
<i>Cheumatopsyche sp</i>	1	
<i>Coenagrionidae</i>	1	
<i>Corbicula fluminea</i>	2	
<i>Empididae</i>	1	
<i>Gammarus sp</i>	14	
<i>Microtendipes pedellus group</i>	1	
<i>Peltodytes sp</i>	1	
<i>Polypedilum (Uresipedilum) flavum</i>	2	
<i>Pseudocloeon propinquum</i>	2	
<i>Pycnopsyche sp</i>	1	
<i>Saetheria sp</i>	1	
<i>Simulium sp</i>	4	
<i>Stenacron sp</i>	1	
<i>Xylotopus par</i>	1	

No. Quantitative Taxa: 18
No. Qualitative Taxa: 0
Total No. Taxa: 18
Number of Organisms: 43
draft IDEM mIBI: 30

Site: Rock Run Creek, 1st Street

Collection Date: 09/04/2009

Site Number: 16

Taxa Name	Quantitative	Qualitative
<i>Boyeria vinosa</i>	1	
<i>Brachycentrus sp</i>	4	
<i>Caecidotea sp</i>	10	
<i>Calopteryx sp</i>	1	
Cambaridae	1	No. Quantitative Taxa: 19
<i>Ceratopsyche morosa group</i>	1	No. Qualitative Taxa: 0
<i>Cheumatopsyche sp</i>	1	Total No. Taxa: 19
<i>Corbicula fluminea</i>	6	Number of Organisms: 71
<i>Gammarus sp</i>	31	draft IDEM mIBI: 28
<i>Gomphus sp</i>	1	
<i>Hydropsyche depravata group</i>	1	
<i>Oligochaeta</i>	2	
<i>Orthocladius (O.) sp</i>	1	
<i>Paratanytarsus sp</i>	1	
<i>Polypedilum (Uresipedilum) flavum</i>	2	
<i>Simulium sp</i>	4	
<i>Stenacron sp</i>	1	
<i>Tricorythodes sp</i>	1	
<i>Turbellaria</i>	1	

Site: Baugo Creek, CR 1 (S)

Collection Date: 08/21/2009

Site Number: 17

Taxa Name	Quantitative	Qualitative	
<i>Turbellaria</i>	14	+	
<i>Oligochaeta</i>	0	+	
<i>Erpobdella punctata punctata</i>	0	+	
<i>Caecidotea sp</i>	13	+	
<i>Gammarus sp</i>	4	+	No. Quantitative Taxa: 25
<i>Orconectes sp</i>	0	+	No. Qualitative Taxa: 24
<i>Baetis tricaudatus</i>	0	+	Total No. Taxa: 35
<i>Baetis flavistriga</i>	19		Number of Organisms: 2016
<i>Stenacron sp</i>	66	+	ICI: 36
<i>Coenagrionidae</i>	0	+	
<i>Cheumatopsyche sp</i>	79	+	
<i>Ceratopsyche morosa group</i>	5		
<i>Hydropsyche depravata group</i>	13	+	
<i>Peltodytes sp</i>	0	+	
<i>Berosus sp</i>	9		
<i>Dubiraphia sp</i>	8	+	
<i>Diptera</i>	0	+	
<i>Antocha sp</i>	8		
<i>Conchapelopia sp</i>	33		
<i>Thienemannimyia group</i>	65	+	
<i>Corynoneura lobata</i>	48		
<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	50		
<i>Nanocladius (N.) spinipennis</i>	50		
<i>Thienemanniella xena</i>	8		
<i>Dicrotendipes neomodestus</i>	294	+	
<i>Microtendipes pedellus group</i>	179	+	
<i>Phaenopsectra obediens group</i>	0	+	
<i>Polypedilum (Uresipedilum) flavum</i>	130	+	
<i>Polypedilum (P.) fallax group</i>	65	+	
<i>Stictochironomus sp</i>	0	+	
<i>Rheotanytarsus sp</i>	228		
<i>Tanytarsus sp</i>	16		
<i>Tanytarsus glabrescens group sp 7</i>	571	+	
<i>Physella sp</i>	0	+	
<i>Ferrissia sp</i>	41	+	

Site: Baugo Creek, CR 3 (N)

Collection Date: 08/21/2009

Site Number: 18

Taxa Name	Quantitative	Qualitative		
<i>Turbellaria</i>	2	+		
<i>Oligochaeta</i>	24			
<i>Baetis tricaudatus</i>	11	+		
<i>Sigara sp</i>	0	+		
<i>Cheumatopsyche sp</i>	577	+	No. Quantitative Taxa:	28
<i>Ceratopsyche morosa group</i>	203	+	No. Qualitative Taxa:	18
<i>Hydropsyche depravata group</i>	110	+	Total No. Taxa:	31
<i>Hydroptila sp</i>	4	+	Number of Organisms:	3880
<i>Tipula sp</i>	1		ICI:	38
<i>Simulium sp</i>	34			
<i>Conchapelopia sp</i>	0	+		
<i>Thienemannimyia group</i>	116			
<i>Corynoneura lobata</i>	24			
<i>Nanocladius sp</i>	29			
<i>Orthocladius (O.) sp</i>	29	+		
<i>Parametriocnemus sp</i>	29			
<i>Paratrichocladius sp</i>	29			
<i>Thienemanniella xena</i>	8			
<i>Dicrotendipes neomodestus</i>	291			
<i>Microtendipes pedellus group</i>	0	+		
<i>Polypedilum (Uresipedilum) flavum</i>	699	+		
<i>Polypedilum (P.) fallax group</i>	116			
<i>Polypedilum (P.) illinoense</i>	0	+		
<i>Polypedilum (Tripodura) scalaenum group</i>	0	+		
<i>Stictochironomus sp</i>	0	+		
<i>Paratanytarsus sp</i>	58	+		
<i>Rheotanytarsus sp</i>	437			
<i>Tanytarsus glabrescens group sp 7</i>	1020	+		
<i>Empididae</i>	16			
<i>Physella sp</i>	0	+		
<i>Ferrissia sp</i>	13	+		

Site: Woodward Ditch, Oakeside Avenue

Collection Date: 08/20/2009

Site Number: 19

Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	2	
<i>Turbellaria</i>	1	
<i>Oligochaeta</i>	1	
<i>Caecidotea sp</i>	0	+
<i>Gammarus sp</i>	69	+
<i>Baetidae</i>	2	
<i>Heptageniidae</i>	10	
<i>Calopteryx sp</i>	1	
<i>Lype diversa</i>	12	
<i>Cheumatopsyche sp</i>	7	+
<i>Hydropsyche depravata group</i>	2	
<i>Optioservus sp</i>	1	
<i>Conchapelopia sp</i>	3	+
<i>Meropelopia sp</i>	14	
<i>Brillia flavifrons group</i>	3	+
<i>Corynoneura lobata</i>	151	
<i>Cricotopus (C.) bicinctus</i>	3	
<i>Nanocladius sp</i>	10	
<i>Orthocladius (O.) sp</i>	3	
<i>Parametriocnemus sp</i>	20	
<i>Thienemanniella xena</i>	42	
<i>Tvetenia bavarica group</i>	3	
<i>Paratendipes albimanus or P. duplicatus</i>	0	+
<i>Polypedilum (P.) albicorne</i>	7	
<i>Polypedilum (Uresipedilum) flavum</i>	0	+
<i>Polypedilum (P.) fallax group</i>	3	+
<i>Polypedilum (P.) illinoense</i>	3	
<i>Polypedilum (Tripodura) scalaenum group</i>	0	+
<i>Rheotanytarsus sp</i>	108	
<i>Tanytarsus sp</i>	10	
<i>Tanytarsus glabrescens group sp 7</i>	7	
<i>Empididae</i>	19	
<i>Physella sp</i>	29	
<i>Pisidium sp</i>	0	+

No. Quantitative Taxa: 29
 No. Qualitative Taxa: 10
 Total No. Taxa: 34
 Number of Organisms: 546
 ICI: 34

Site: Eller Ditch, Bridgeton Drive

Collection Date: 08/20/2009

Site Number: 20

Taxa Name	Quantitative	Qualitative		
<i>Hydra sp</i>	8			
<i>Turbellaria</i>	8	+		
<i>Oligochaeta</i>	301			
<i>Caecidotea sp</i>	2	+		
<i>Gammarus sp</i>	78	+	No. Quantitative Taxa:	21
<i>Baetis tricaudatus</i>	2	+	No. Qualitative Taxa:	6
<i>Lepidoptera</i>	1		Total No. Taxa:	21
<i>Prodiamesa olivacea</i>	2		Number of Organisms:	459
<i>Corynoneura lobata</i>	13		ICI:	8
<i>Nanocladius sp</i>	1			
<i>Paratrichocladius sp</i>	1			
<i>Rheocricotopus (Psilocricotopus) robacki</i>	1			
<i>Tvetenia bavarica group</i>	16	+		
<i>Paratendipes albimanus or P. duplicatus</i>	7	+		
<i>Polypedilum (Uresipedilum) aviceps</i>	2			
<i>Polypedilum (Uresipedilum) flavum</i>	2			
<i>Stictochironomus sp</i>	1			
<i>Rheotanytarsus sp</i>	3			
<i>Tanytarsus sp</i>	1			
<i>Hemerodromia sp</i>	1			
<i>Physella sp</i>	8			

Site: Eller Ditch, Lincolnway Ave

Collection Date: 08/20/2009

Site Number: 21

Taxa Name	Quantitative	Qualitative
<i>Hydra sp</i>	7	
<i>Turbellaria</i>	1	
<i>Oligochaeta</i>	43	+
<i>Gammarus sp</i>	45	+
<i>Baetis tricaudatus</i>	4	
<i>Cheumatopsyche sp</i>	12	+
<i>Hydropsyche depravata group</i>	6	
<i>Antocha sp</i>	0	+
<i>Dicranota sp</i>	0	+
<i>Simulium sp</i>	0	+
<i>Diamesa sp</i>	0	+
<i>Brillia flavifrons group</i>	2	
<i>Corynoneura lobata</i>	4	
<i>Cricotopus (C.) bicinctus</i>	2	
<i>Eukiefferiella sp</i>	60	+
<i>Nanocladius sp</i>	6	
<i>Paratrichocladius sp</i>	2	
<i>Thienemanniella xena</i>	1	
<i>Tvetenia bavarica group</i>	2	+
<i>Paratendipes albimanus or P. duplicatus</i>	36	+
<i>Polypedilum (Uresipedilum) aviceps</i>	2	
<i>Paratanytarsus sp</i>	6	
<i>Rheotanytarsus sp</i>	30	
<i>Tanytarsus sp</i>	4	
<i>Hemerodromia sp</i>	1	
<i>Physella sp</i>	68	+
<i>Sphaeriidae</i>	1	

No. Quantitative Taxa: 23
 No. Qualitative Taxa: 11
 Total No. Taxa: 27
 Number of Organisms: 345
 ICI: 22

Site: Willow Creek, Day Road

Collection Date: 08/19/2009

Site Number: 22

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	2	+
<i>Oligochaeta</i>	14	
<i>Copepoda</i>	6	
<i>Caecidotea sp</i>	4	
<i>Gammarus sp</i>	31	+
<i>Hydracarina</i>	0	+
<i>Baetis tricaudatus</i>	3	+
<i>Boyeria vinosa</i>	0	+
<i>Sigara sp</i>	0	+
<i>Cheumatopsyche sp</i>	7	
<i>Ceratopsyche morosa group</i>	4	
<i>Ceratopsyche slossonae</i>	23	+
<i>Ceratopsyche sparna</i>	0	+
<i>Hydropsyche depravata group</i>	23	+
<i>Hydroptila sp</i>	1	+
<i>Peltodytes sp</i>	0	+
<i>Simulium sp</i>	2	+
<i>Conchapelopia sp</i>	90	
<i>Meropelopia sp</i>	8	
<i>Paramerina fragilis</i>	8	
<i>Psectrotanypus dyari</i>	0	+
<i>Zavreliomyia sp</i>	5	+
<i>Prodiamesa olivacea</i>	0	+
<i>Corynoneura lobata</i>	34	
<i>Parametriocnemus sp</i>	60	
<i>Tvetenia sp</i>	18	
<i>Polypedilum (Uresipedilum) aviceps</i>	37	
<i>Micropsectra sp</i>	18	
<i>Rheotanytarsus sp</i>	151	
<i>Hemerodromia sp</i>	3	
<i>Physella sp</i>	7	+

No. Quantitative Taxa: 24
 No. Qualitative Taxa: 16
 Total No. Taxa: 31
 Number of Organisms: 559
 ICI: 34

Site: Willow Creek, Estates Blvd.

Collection Date: 08/19/2009

Site Number: 23

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	6	
<i>Oligochaeta</i>	6	
<i>Gammarus sp</i>	51	+
<i>Hydracarina</i>	5	
<i>Baetis tricaudatus</i>	6	
<i>Baetis flavistriga</i>	6	
<i>Stenacron sp</i>	18	
<i>Stenonema vicarium</i>	134	+
<i>Calopteryx sp</i>	1	
<i>Boyeria vinosa</i>	0	+
<i>Plecoptera</i>	4	
<i>Cheumatopsyche sp</i>	41	+
<i>Ceratopsyche slossonae</i>	69	+
<i>Ceratopsyche sparna</i>	23	+
<i>Hydropsyche depravata group</i>	18	
<i>Brachycentrus sp</i>	13	+
<i>Dubiraphia sp</i>	0	+
<i>Macronychus glabratus</i>	22	+
<i>Optioservus sp</i>	30	
<i>Simulium sp</i>	47	
<i>Ceratopogonidae</i>	4	
<i>Meropelopia sp</i>	75	
<i>Pagastia sp</i>	30	+
<i>Corynoneura lobata</i>	8	
<i>Parametrioctenemus sp</i>	60	
<i>Thienemanniella xena</i>	7	
<i>Tvetenia sp</i>	22	
<i>Polypedilum (Uresipedilum) aviceps</i>	134	
<i>Rheotanytarsus sp</i>	350	
<i>Hemerodromia sp</i>	5	
<i>Physella sp</i>	1	
<i>Corbicula fluminea</i>	0	+

No. Quantitative Taxa: 29
 No. Qualitative Taxa: 11
 Total No. Taxa: 32
 Number of Organisms: 1196
 ICI: 42

Site: Phillips Ditch, Chippewa

Collection Date: 08/19/2009

Site Number: 24

Taxa Name	Quantitative	Qualitative
<i>Oligochaeta</i>	4	
<i>Gammarus sp</i>	154	+
<i>Orconectes sp</i>	0	+
<i>Baetis tricaudatus</i>	37	+
<i>Hetaerina sp</i>	1	
<i>Boyeria vinosa</i>	0	+
<i>Hydropsychidae</i>	0	+
<i>Cheumatopsyche sp</i>	31	
<i>Hydropsyche depravata group</i>	53	
<i>Macronychus glabratus</i>	14	+
<i>Simulium sp</i>	10	
<i>Brillia flavifrons group</i>	7	
<i>Corynoneura lobata</i>	247	
<i>Thienemanniella xena</i>	12	
<i>Tvetenia bavarica group</i>	23	
<i>Polypedilum (Uresipedilum) aviceps</i>	366	
<i>Rheotanytarsus sp</i>	306	+

No. Quantitative Taxa: 14
 No. Qualitative Taxa: 7
 Total No. Taxa: 17
 Number of Organisms: 1265
 ICI: 28

Site: Juday Creek, Myrtle Street

Collection Date: 08/21/2009

Site Number: 25

Taxa Name	Quantitative	Qualitative
<i>Turbellaria</i>	8	
<i>Oligochaeta</i>	8	
<i>Orconectes sp</i>	0	+
<i>Baetis flavistriga</i>	31	+
<i>Baetis intercalaris</i>	19	
<i>Stenacron sp</i>	30	+
<i>Stenonema exiguum</i>	13	+
<i>Stenonema terminatum</i>	35	+
<i>Stenonema vicarium</i>	2	+
<i>Ephemerella sp</i>	1	
<i>Calopteryx sp</i>	0	+
<i>Cheumatopsyche sp</i>	329	+
<i>Ceratopsyche morosa group</i>	8	
<i>Ceratopsyche sparna</i>	67	+
<i>Hydropsyche depravata group</i>	395	+
<i>Brachycentrus sp</i>	8	+
<i>Leptoceridae</i>	3	
<i>Nectopsyche diarina</i>	0	+
<i>Macronychus glabratus</i>	4	
<i>Stenelmis sp</i>	6	+
<i>Simulium sp</i>	8	+
<i>Meropelopia sp</i>	93	
<i>Nilotanytus fimbriatus</i>	0	+
<i>Thienemannimyia group</i>	56	
<i>Corynoneura lobata</i>	32	
<i>Eukiefferiella sp</i>	0	+
<i>Parametriocnemus sp</i>	74	
<i>Rheocricotopus (Psilocricotopus) robacki</i>	37	
<i>Thienemanniella xena</i>	8	
<i>Tvetenia sp</i>	74	
<i>Cryptotendipes sp</i>	0	+
<i>Microtendipes pedellus group</i>	56	
<i>Rheotanytarsus sp</i>	1443	
<i>Hemerodromia sp</i>	8	

No. Quantitative Taxa: 29
 No. Qualitative Taxa: 17
 Total No. Taxa: 34
 Number of Organisms: 2856
 ICI: 46

