ELKHART – SOUTH BEND AQUATIC COMMUNITY MONITORING

ANNUAL REPORT 2020

City of Elkhart

Rod Roberson, Mayor

Cover Photo: Ryan Fawcett holds a large longnose gar that was collected upstream of the former dam located on the Elkhart River. Removal of the dam has allowed this species to recolonize the Elkhart River.

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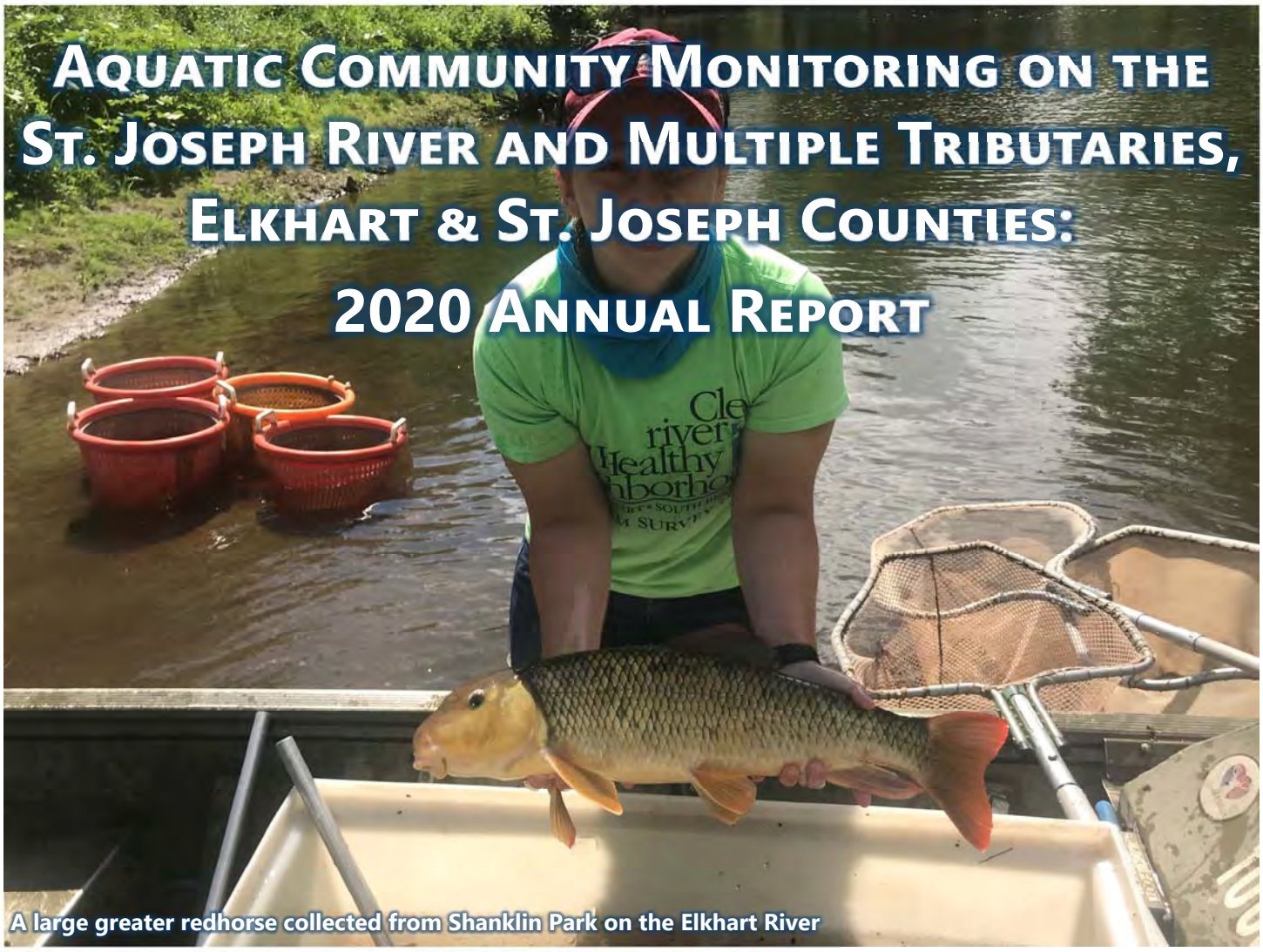
Aquatic Community Monitoring on the St. Joseph River and Multiple Tributaries, Elkhart & St. Joseph Counties: 2020 Annual Report



A large greater redhorse collected from Shanklin Park on the Elkhart River

Prepared By

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Aquatic Biologist

Introduction

For many years, the cities of South Bend and Elkhart have collected surface water samples from our local rivers to evaluate pollutant concentrations. In 1998, the City of Elkhart initiated biological community monitoring to compliment chemical and microbial sampling and to establish a long-term stream monitoring program. The City of South Bend joined forces with Elkhart in 2001, and since then both communities have gathered a great deal of information on the health of our local waterways. The year 2020, marked the 20th anniversary for biological monitoring in the South Bend area.

In 2020, the cities of South Bend and Elkhart, through the Aquatic Community Monitoring Program (Aquatics Program), continued to monitor local fish and macroinvertebrate communities in area rivers and streams. The information gathered was integrated into an overall water quality program for each city. While the cities measure the chemical and microbial composition of local stream water, the additional biological data provides a more accurate representation of the overall health of the stream. The way that biological communities are assembled can change as a result of a disturbance, such as a chemical spill or alteration of habitat. Chemical and microbial testing, which can play an important role in pinpointing contaminants, is simply a snapshot of current conditions. In many cases, having both sets of data can help determine the cause and effect of disturbances to our local streams.

A green sunfish collected from Bowman Creek on Green Tech Drive. Green sunfish have dark green colors, but the males often have bright turquoise streaks in their face along with light colors around the tips of their fins

The Aquatics Program is a unique bi-community initiative to evaluate the health of the St. Joseph River in Elkhart County and St Joseph County. While the Program operates out of the City of Elkhart, the City of South Bend co-sponsors the program.

Baseline fish community monitoring was conducted in Elkhart County from 1998 to 2003 and in St. Joseph County it was conducted from 2001 to 2006.

Other biological monitoring efforts in the area include:

- Sampling in the Mishawaka area from 2007 to 2009.
- Sampling in the Goshen area in 2009 and 2010.
- An in-depth sampling initiative in the Cobus Creek Watershed in 2016.
- An evaluation of aquatic plant communities in the St. Joseph River Watershed in 2017 and 2018.

The Index of Biotic Integrity (IBI) (Simon, 1997) is the system that is used to assess local fish communities. The IBI scores a stream based on a range of 0 to 60 with 0 being very poor and 60 being perfect. 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 the general public. The IBI is comprised of 12 different categories known as metrics, which are used to evaluate ecological balance within the fish communities. Examples of metrics include the number of species present in the sample or the % of the sample that are insectivores.

Fish are not the only animal that are used to evaluate stream health. The Aquatics Program also monitors macroinvertebrates as a secondary group that provides additional information on stream health. The Invertebrate Community Index (ICI) (Ohio EPA, 1987) is used to evaluate macroinvertebrates and is similar in structure to the IBI, with numerous metrics and a score range of 0 to 60.

Habitat is also evaluated at every site where a fish community survey is completed using the Qualitative Habitat Evaluation Index (QHEI) (Rankin, 1989).

The QHEI is structured similarly to the IBI in that it is comprised of numerous metrics that tally-up to provide a score ranging from 0-100.

A longnose dace collected from Baugo Creek. This species is a species of special concern in the State of Indiana

The Aquatics Program is comprised of a full-time biologist and college interns that help collect fish during the summer.

2020 Staff:

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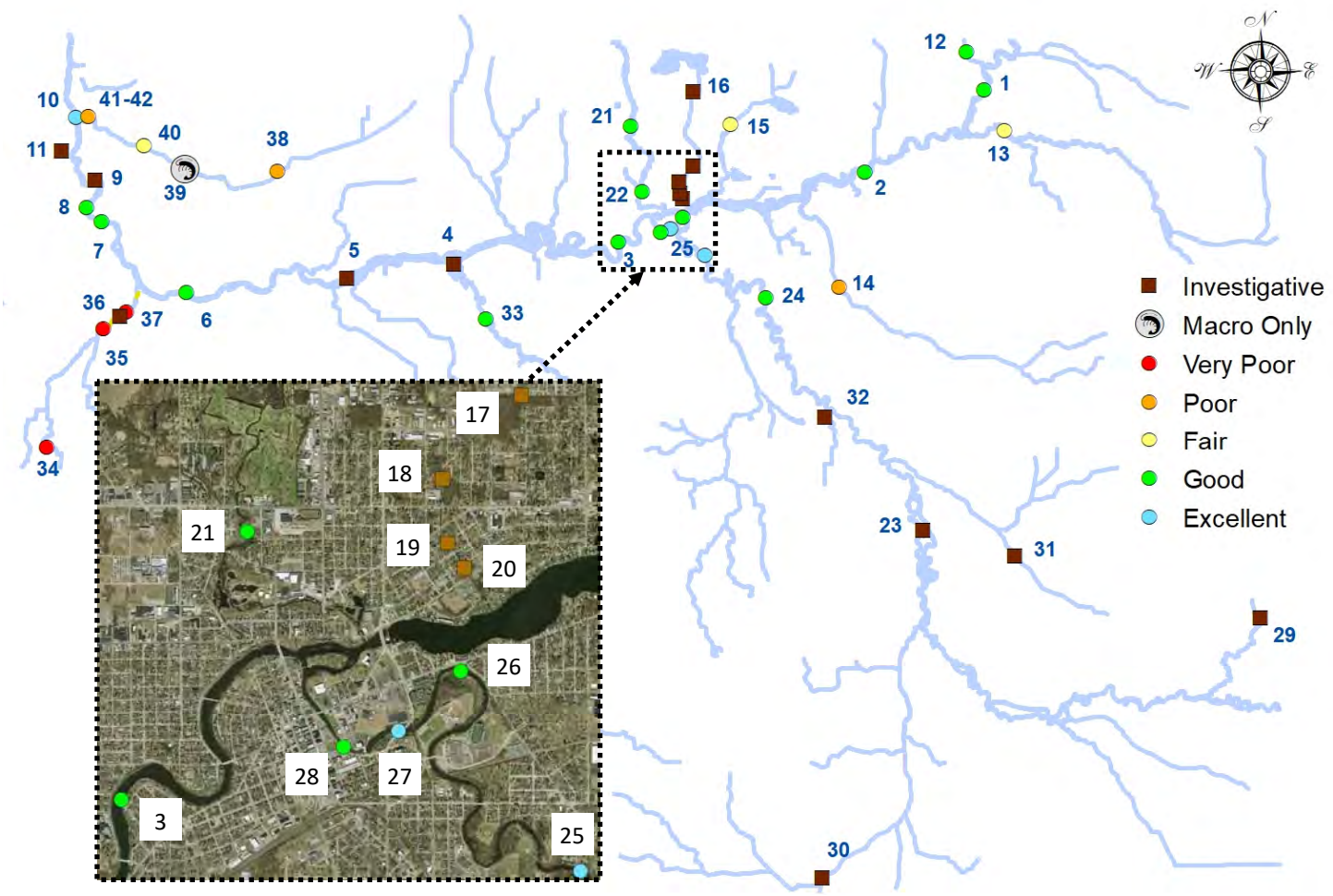
Interns: Hannah Simnick, Joshua Schwalm, Megan Ford, & Ryan Fawcett

Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community conditions for 2020 (see Table 11 for site information)



The Aquatic Biology Program travels to local schools and watershed stakeholder group meetings, giving presentations and demonstrations, in an effort to increase awareness about the health of our local streams, and how it affects our quality of life. While the program usually reaches about 5,000 every year, the amount of outreach activities in 2020 were scaled back due to COVID-19. Pictured is Aquatic Biologist Daragh Deegan showing, fish species to Goshen College students

Ryan with a big river redhorse from the St. Joseph River. This species uses its big sucker mouth to eat snails, clams and mussels from the bottom of the river

Sites were sampled using two basic methods: Index and Investigative sampling. Investigative samples are more exploratory in nature and are generally used to gauge species composition and general stream characteristics. Index evaluations are more thorough; the data from Index samples are used to complete stream health measurements. Index samples include:

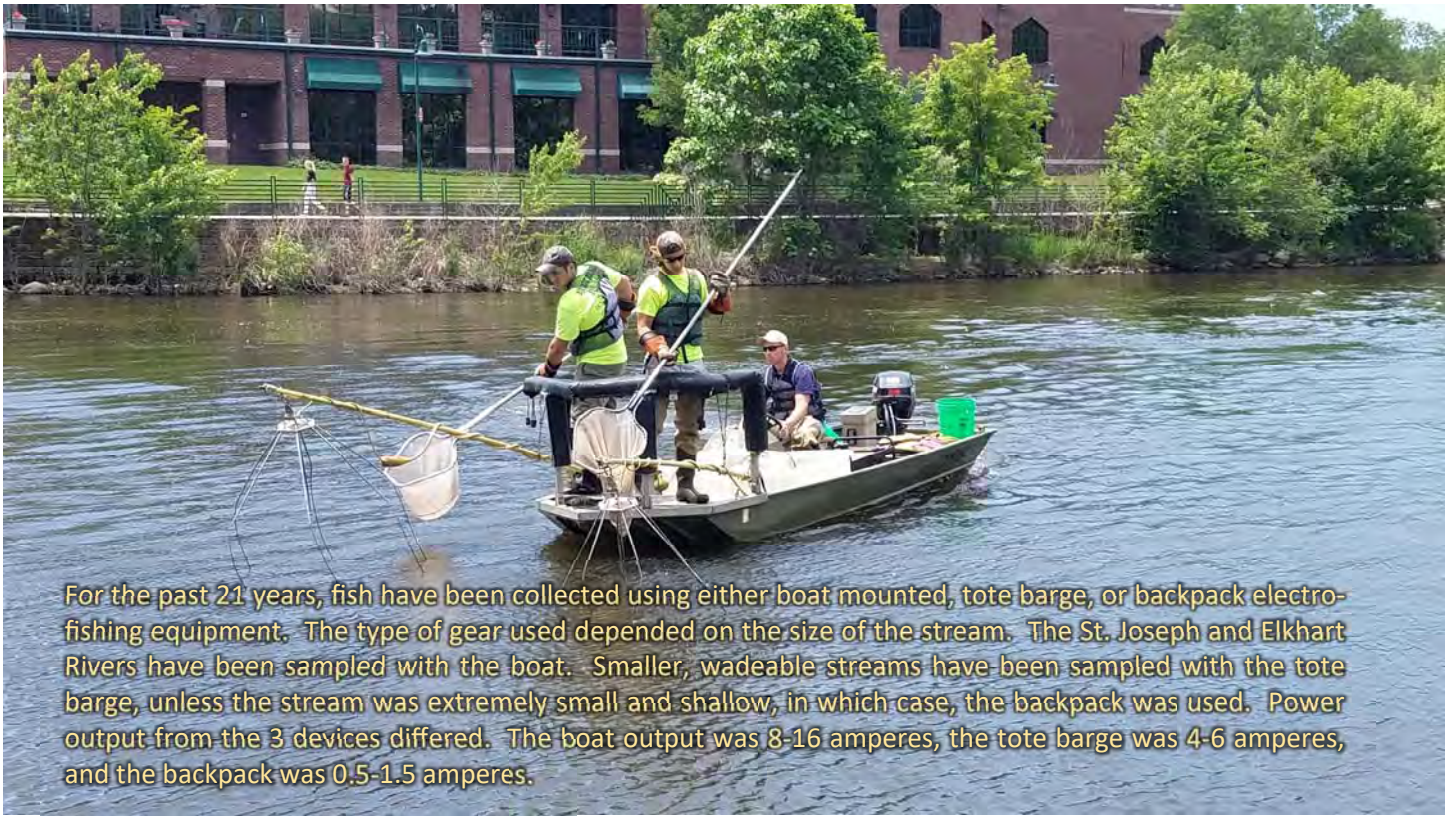
- Conducting electrofishing surveys on stream segments that are 15 times the width of the stream up to a maximum of 500 meters.
- Conducting 2 surveys on the same stream segment with a 5-week rest period (Index scores are averaged from the 2 surveys)
- Collecting length and weight data from each individual game fish
- Collecting the maximum and minimum length and combined weight of all non-game species

Macroinvertebrate sampling was also conducted at most Index sites. Hester-Dendy samplers (artificial substrates used to collect small aquatic organisms) (pictured below) were deployed at 22 Index sites in 2020. Additional sampling with a D-net is also conducted at each site for macroinvertebrates as a back-up for sites where Hester-Dendy samples are lost or disturbed.

Long-term Index monitoring consists of rotational sampling of sites. Each station is visited at least once every 3 years to gather biological and chemical data and to compare against previous sampling results, and baseline data.

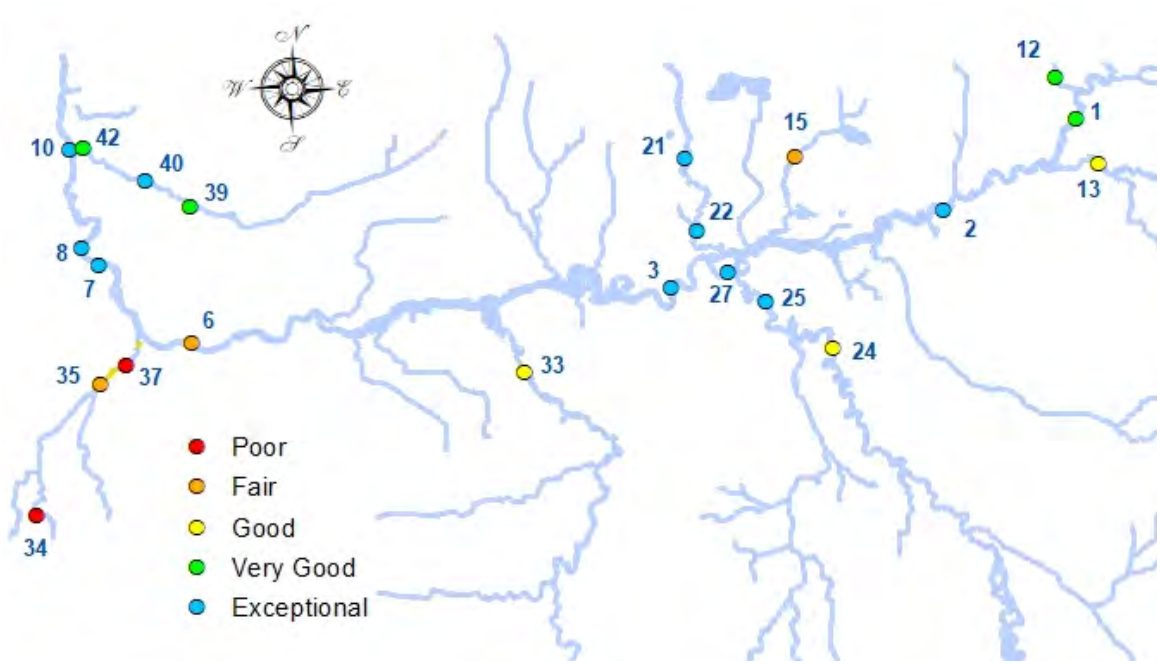
In 2020, 10 Index and 6 Investigative sites were sampled in St. Joseph County and 15 Index and 10 Investigative sites were sampled in Elkhart County. IBI scores were calculated for each of the Index sites and an average from the 2 visits was obtained to give the final score.

Hester-Dendy sampler placed into the stream bed



For the past 21 years, fish have been collected using either boat mounted, tote barge, or backpack electrofishing equipment. The type of gear used depended on the size of the stream. The St. Joseph and Elkhart Rivers have been sampled with the boat. Smaller, wadeable streams have been sampled with the tote barge, unless the stream was extremely small and shallow, in which case, the backpack was used. Power output from the 3 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.

Figure 2: Macroinvertebrate sampling sites and associated condition for 2020 (see Table 11 for site information)



2020 Results and Discussion

Fish community conditions at the Index sites ranged from very poor (14) at Green Tech Drive on Bowman Creek to excellent (56) at Prairie Street on the Elkhart River. Macroinvertebrate community scores ranged from poor at Studebaker Park on Bowman Creek and Locust Road (S) on Auten Ditch, to exceptional (54) at Darden Road on the St. Joseph River. Habitat quality ranged from poor (30) at Highland Mobile Home Park on Lily Creek to excellent (90) at SR 120 on the Little Elkhart River.

Fish by the Number

During the summer of 2020 a total of 18,837 fish, representing 16 families and 71 species, were collected in Elkhart County. In St. Joseph County, 7,867 fish, representing 16 families and 58 species were collected. In total, 74 different species were captured from the 2 counties.

Rock bass (*Ambloplites rupestris*), smallmouth bass (Micropterus dolomieu), and bluegill (*Lepomis macrochirus*) were the most abundant species collected in St. Joseph County, while rock bass, bluegill, and mimic shiner (Notrpis volucellus) were the most abundant in Elkhart County. For more detailed information on the number and types of fish species collected, see Appendix C.

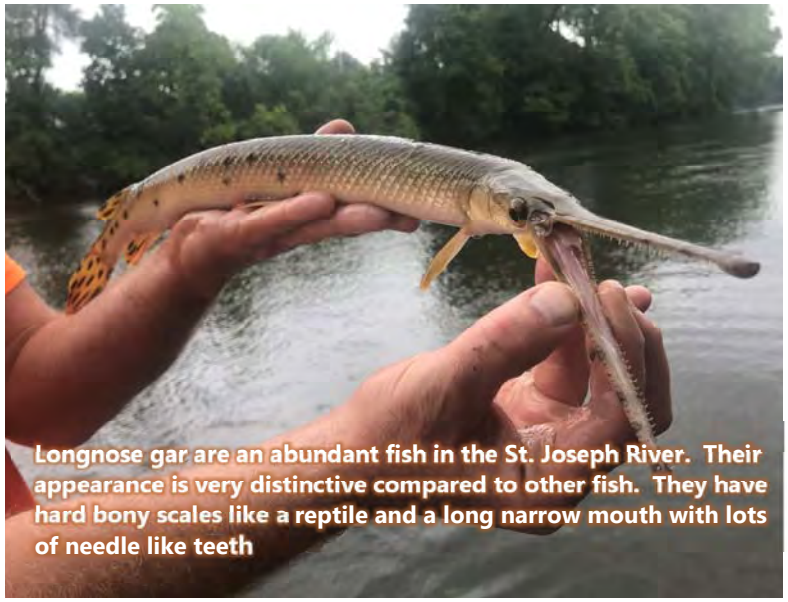


Table 1. Index scores for St. Joseph River sites, Elkhart and St. Joseph Counties

Station	County	River Mile	Fish IBI Scores				2020 Habitat Scores	(ICI) Macroinvertebrate Scores	
			Baseline	2014	2017	**2020**		Baseline/ Previous Score	**2020**
Toll Road (Bristol)	Elkhart	87.7	*50*	51	50	**53**	87	52	**42**
Six Span	Elkhart	82.7	*50*	52	50	**53**	82	40	**48**
Bridge Street	Elkhart	75	*49*	51	51	**52**	83	42	**48**
Ironwood Road	St. Joseph	59.9	*43*	44	48	**48**	57	40	**F***
Michigan St. (B)	St. Joseph	56.7				**47**	82	42	**48**
Angela Blvd.	St. Joseph	55.6	*46*	47	46	**47**	87	56	**52**
Darden Road	St. Joseph	52.4	*50*	50	50	**54**	86	38	**54**

F* - denotes a rating of "Fair" for this site based on the macroinvertebrates present with HD sampler lost

St. Joseph River

Fish, macroinvertebrate, and habitat index scores for the entire Indiana portion of the St. Joseph River are displayed in Table 1. Previous index scores are also included.

In 2020, IBI scores for the 3 sites in the Elkhart County section of the St. Joseph River were all in the good range. All scores also were also 3 points higher than their respective baselines and were higher than sampling events in 2014 and 2017. While IBI scores haven't changed much in the 20 years of sampling, the number of species across St. Joseph River sites appears to be increasing. At the Six Span site, for example, the average number of species collected during the baseline period (1998 to 2000) was 26; in 2020 the average number of species collected between both sampling passes was 37.5.

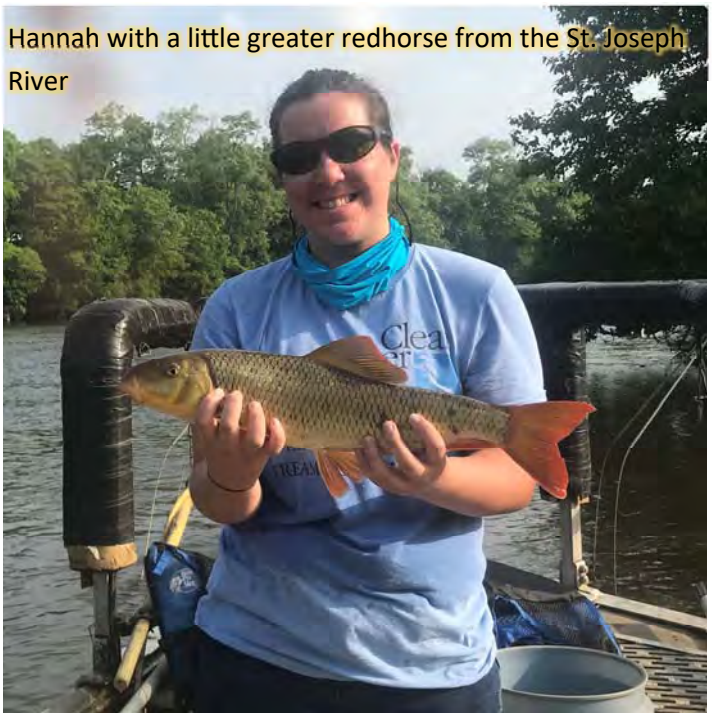
Macroinvertebrate community scores at Six Span and Bridge Street were significantly higher than their respective baselines values in 2020. The score at the Toll Road site was significantly lower in 2020 compared to 2017. The score for this site was also significantly lower in 2020 than the Six Span and Bridge Street sites suggesting some minor impact at this site in 2020. The St. Joseph River Watershed did experience moderate drought conditions in the summer of 2020, which may have had a negative influence at this and other sites with lower than normal scores. Numerous abnormally low ICI scores were also observed during the significant drought that occurred in 2012 (Deegan, 2013).

IBI Scores for the St. Joseph County section were either at

Megan with a nice big channel catfish collected from Angela Boulevard in South Bend.

or above baseline values. The Ironwood score was 48 in 2020, matching the score it received in 2017, which is well above its baseline value of 43. The score at Darden Road was 54, which is well above its baseline value of 50 and the scores it received in previous years. Trends at Darden Road have been interesting to watch. The number of species at the site has increased significantly since the baseline period, while the percent of tolerant fish and omnivores (omnivores are generally tolerant fish) have decreased (Figure 3). In 2019, we reported that there has been a general trend towards more sunfish species and less sucker species in the fish community in South Bend. In 2020, sunfish numbers were lower at Darden Road than they were in 2017 suggesting that the sunfish abundance may be trending down back towards what was observed in the past. We are planning to monitor sunfish and sucker abundance closely as there is a concern that changes in their populations reflect major food web changes in the watershed.

In 2020, the Michigan (B) site was sampled for the second consecutive year. The score received in 2020 of 47 was down slightly from the score of 49 it received in 2019. An additional round of sampling will be conducted at this site in 2021 to establish a baseline for future comparisons.



Hannah with a little greater redhorse from the St. Joseph River

Macroinvertebrate community scores at South Bend sites were in the exceptional range in 2020, with the exception of the Ironwood site. The score at Angela Boulevard of 52 was lower than its baseline of 56, but a score of 52 is still exceptional. The Darden Road score of 54 was significantly higher than its baseline value of 38 and similar to the score of 50 it received in 2017. Unfortunately, 2 sets of macroinvertebrate samplers were discovered by people and vandalized at the Ironwood site, The qualitative sample that was collected in lieu of quantitative sample, provided a "Fair" rating, which is far inferior to the previous score in 2017. This is likely another site where macroinvertebrates were affected by drought conditions in 2020.

Factors Influencing Fish Communities in the St. Joseph River Watershed

Interpreting changes in biological communities can be difficult because our rivers and streams are influenced by many factors. Change in water quality is only one reason for potential changes in the numbers and types of fish that we find. Other important factors include:

Habitat

Flooding, drought and climate effects

The influence of dams

How we manage and drain our land

Nutrient input and stream productivity

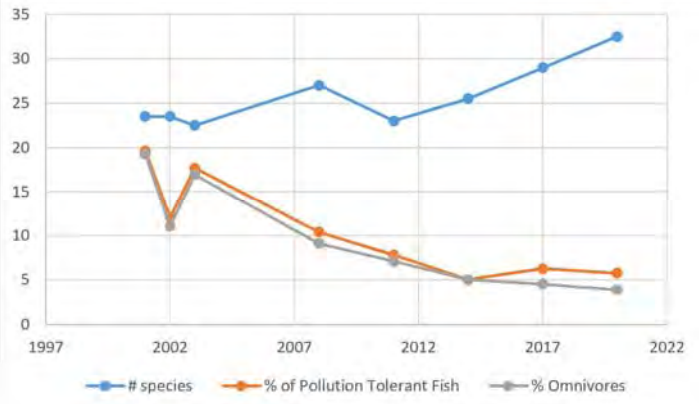


Figure 3: An increase in the number of species at Darden Road on the St. Joseph River. The % of tolerant fish and omnivores have also declined over the years suggesting promising long-term changes at this site in South Bend.

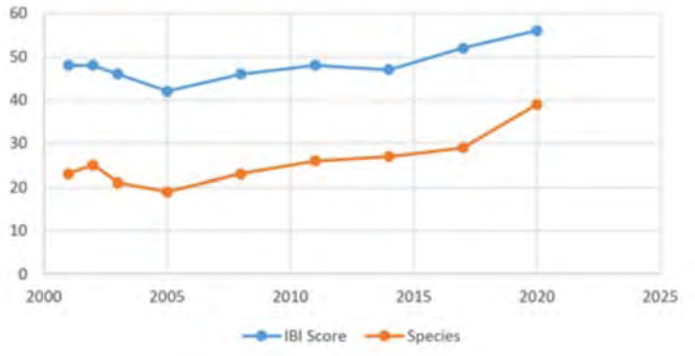


Figure 4: An increase in the number of fish species and IBI score at Studebaker Park (A) on the Elkhart River. Several new species were collected at this site following the removal of the Elkhart River dam in downtown Elkhart.

Table 2: Index scores for Elkhart River sites, Elkhart County

Station	River Mile	Fish IBI Scores				2020 Habitat Scores	(ICI) Macroinvertebrate Scores	
		Baseline	2014	2017	**2020**		2017	**2020**
CR 18 (Hively Ave)	7.3	*51*	50	50	**53**	84	48	38
Studebaker Park (A)	3.4	*47*	47	52	**56**	82	48	52
American Park	1.2	*46*	44	47	**49**	74		

Elkhart River

IBI scores for the Elkhart River in 2020 were very impressive (Table 2). All three long-term monitoring sites scored above their respective baseline values. The Studebaker Park (A) site had a particularly impressive score of 56, which was well above its baseline score of 47 and the highest score recorded of any site in 2020.

Elkhart River sites benefited from the removal of the Elkhart River Dam in downtown Elkhart. The removal of this dam has opened up approximately 20 miles of the Elkhart River to new species that have been present downstream of the dam but blocked from swimming upstream. Eight (8) new fish species were collected upstream of the dam at various Elkhart River sites in 2020. Some of these species helped add to fish community diversity at the long-term monitoring sites in 2020, boosting the IBI scores (Figure 4).

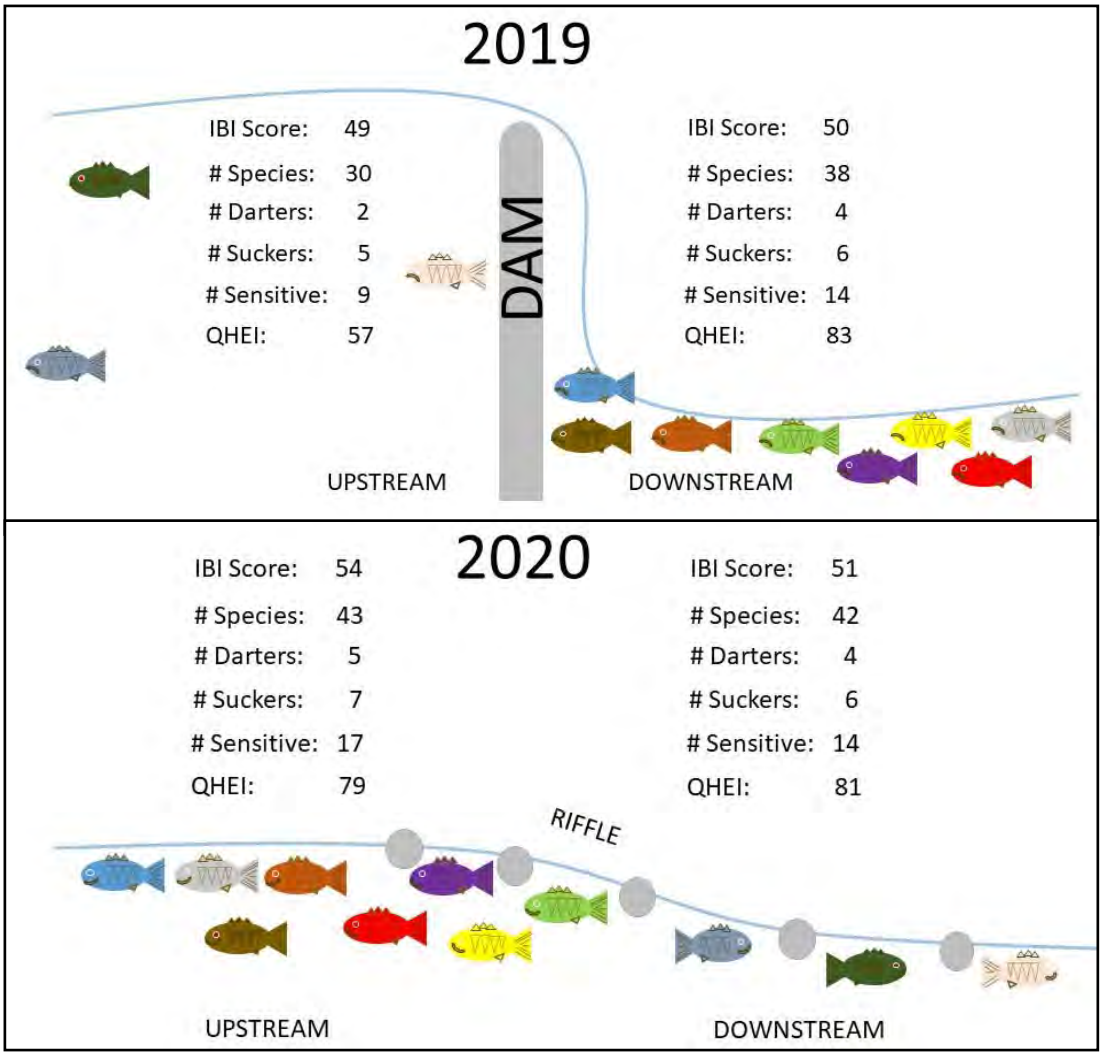


Figure 5: Changes in IBI scores and other metrics at sites directly upstream and downstream following the removal of the Elkhart River Dam in 2020

In 2018 and 2019, biological monitoring was initiated immediately upstream (Prairie Street) and immediately downstream (Elkhart Avenue). The monitoring in 2018 and 2019 was conducted to provide an analysis of the fish community prior to the removal of the dam. These sites were sampled again in 2020 to determine if there were changes in the fish communities above and below the dam site following its removal. Results from these pre and post monitoring events indicated substantial benefits to the fish community upstream of the dam (Figure 5). Not only did the IBI score increase significantly upstream of the dam, but the IBI score was superior upstream compared to downstream. Species numbers increased from 30 to 43 between 2019 and 2020 and several other metrics including the number of darter species,

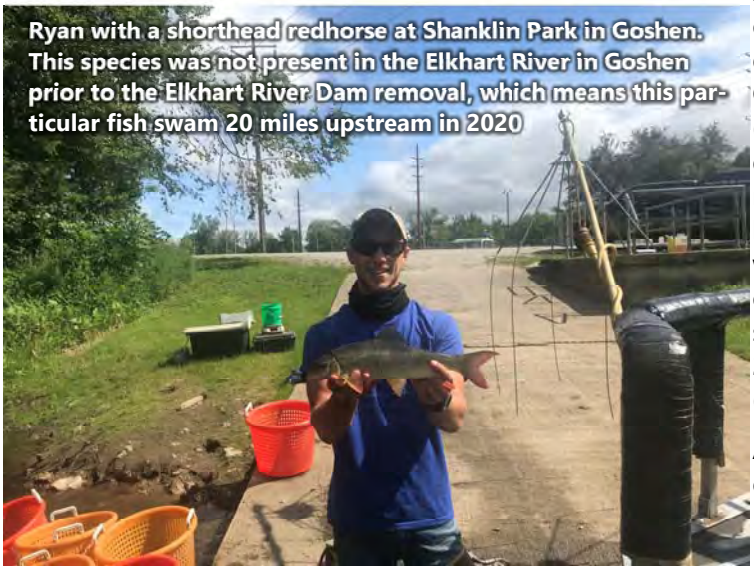
Table 3: Index scores for Auten Ditch, Bowman Creek and Juday Creek sites, St. Joseph County

Stream	Station	Stream Mile	Fish IBI Scores (Coolwater IBI Scores)						2020 Habitat Scores
			Baseline	2011	2014	2017	2019	**2020**	
Auten Ditch	Locust Road (S)	6	*17*		13			**18**	41
Bowman Creek	Green Tech Drive	2.0						**14**	59
Bowman Creek	Studebaker Golf Course	1.1	*12*	16	6	14		**16**	46
Juday Creek	Holy Cross Prkwy	6.6					31 (38)	**27 (31)**	55
Juday Creek	Kintz Ave.	2.5	*26 (26)*	30 (29)	32 (30)			**37 (32)**	69
Juday Creek	Izaak Walton League	0.5	*27 (26)*	22 (34)	27 (28)	26 (33)		**35 (39)**	81

the number of sucker species, and the number of sensitive species also increased significantly. Furthermore, the QHEI score also increased very significantly between 2019 and 2020. More details on the dam removal and species that benefited can be found in the Elkhart Dam Removal 2020 Fish Community Monitoring Report.

Macroinvertebrate scores varied significantly in the Elkhart River in 2020. The score at CR 18 was 38, which was significantly below the previous value of 48. The Studebaker Park site, on the other hand, had a higher value in 2020 of 52. In addition to CR 18, several other sites received abnormally low ICI scores in 2020 which is likely linked to drought conditions that occurred during the summer.

In 2020, macroinvertebrates were sampled at the Prairie Street site for the first time. It was decided to place the Hester Dendy samplers on the newly formed riffle, just upstream of the former dam. The ICI score was 48 putting it the exceptional category.



Ryan with a shorthead redhorse at Shanklin Park in Goshen. This species was not present in the Elkhart River in Goshen prior to the Elkhart River Dam removal, which means this particular fish swam 20 miles upstream in 2020

Bowman Creek

Bowman Creek at Studebaker Golf Course had an IBI score of 16 in 2020 (Table 3). This score is significantly higher than the initial baseline score it received, although still in the very poor range. As we have discussed in previous years, Bowman Creek often runs dry. By the second sample pass in 2020, Bowman Creek was dry at Studebaker Park with just a few deeper holes with water and trapped fish. The altered flow issues on Bowman Creek continues to be the biggest challenge for this stream. The macroinvertebrate community evaluation also suffered due to the loss of flow in 2020 (Table 4). Both sets of samplers were no longer submerged, and the qualitative sample that was collected as an alternative indicated a "Poor" macroinvertebrate community.

Bowman Creek was also sampled at Green Tech Drive in 2020. Two additional years of fish sampling will be conducted in 2021 and 2022 to establish a baseline at this site. The IBI score at Green Tech was 14 which is considered to be very poor (Table 3). While flow was lost at Studebaker Park, there was still very low flow present at Green Tech suggesting that Bowman Creek looses water (it enters the groundwater or underground infrastructure) downstream of Green Tech. The macroinvertebrate community score of 22 was higher than the fish community but still well within the impaired range. This year (2020) was the third year in which baseline samples were collected for macroinvertebrates at Green Tech Drive. Previous scores of 30 and 26 were obtained at this site in 2015 and 2018 respectively, providing a 3 year baseline score of 26 (Table 4).

Auten Ditch (a Bowman Creek tributary) had an IBI score of 18 in 2020, just slightly higher than its baseline value of 17. This site had very low flow during the second sam-

Table 4: Macroinvertebrate Scores for Auten Ditch, Bowman Creek, and Juday Creek Sites

Stream	Station	Stream Mile	2014	2015	2016	2017	2018	2019	2020
Auten Ditch	Locust Rd. (S)	6.0		28	18	34			P*
Bowman Creek	Green Tech Drive	2.0		30			26		22
Bowman Creek	Studebaker GC	1.1	34		34	40			P*
Juday Creek	Kintz Ave.	2.5	48			38			46
Juday Creek	Izaak Walton League	0.5	46			42			42
Juday Creek	Ponader Park	3.7					48	48	42

P* - denotes a rating of "Poor" for this site based on the macroinvertebrates present with HD sampler lost

pling pass in 2020 and eventually ran dry in August. Upon retrieval of the macroinvertebrate samplers at Locust Road South, the lack of flow resulted in an invalid sample. The qualitative sample that was collected as an alternative, provided a "Poor" rating for this site (Table 4). The baseline for this site is 27, which falls within the "Fair" category.

Juday Creek

Coolwater IBI scores at Kintz Avenue and at Izaak Walton League were well above their respective baseline values in 2020 (Table 3). Both sites also scored above the value of 31 that IDEM uses to determine if a coolwater stream is impaired. Because of its coolwater nature and complexities with the IBI, we believe the macroinvertebrates provide a more meaningful indication of water quality in this stream. The macroinvertebrate ICI scores were all in the "Very Good" range in 2020 (Table 4). The score of 46 at Kintz Avenue was up significantly from 2017, while the score of 42 at Izaak Walton League was the same as the 2017 score. In 2020, three successive years of macroinvertebrate sampling was completed at Ponader Park, establishing a baseline value at this site of 46 which will be used for future comparisons.

Holy Cross Parkway on Juday Creek was sampled for fish for the second consecutive year in 2020. This site will be sampled again in 2021 to establish a 3 year baseline. The score for this site in 2020 was 31, which was lower than the score it received in 2019 of 38. Macroinvertebrates were not sampled for this site in 2020, however, a baseline was previously established for this site (2016 to 2018). Future evaluations of this site will incorporate fish and macroinvertebrates.

Pine Creek

The IBI score at the US 20 Bypass was 26 in 2020, down from the baseline value of 31 (Table 5). This site has always fallen within the impaired range. In 2017, we reported that this site had declined since the initiation of baseline monitoring. Some negative changes occurred within the fish community, such as the percent of tolerant species and the percent of simple lithophils. In 2020, however, some of these aspects of the fish community rebounded close to what they were during the baseline period (see Appendix G for additional information). Furthermore, Pine Creek is also considered to be a coolwater stream, similar to Juday Creek in South Bend. An evaluation of the fish community using the coolwater IBI provides better scores for this site and suggests that it is not impaired.

Puterbaugh Creek

Puterbaugh Creek at Reedy Drive had an impressive IBI score of 43 in 2020 which was the same as when the site was sampled in 2017, but up significantly from the baseline value of 37 (Table 5). An evaluation of trends within

Table 5: Index scores for Pine Creek, Puterbaugh Creek, and Trout Creek, Elkhart County

Stream	Station	River Mile	Fish IBI Scores (Coolwater IBI Scores)				2020 Habitat Scores	ICI Macroinvertebrate Scores	
			Baseline	2014	2017	**2020**		2017	**2020**
Pine Creek	US 20 Bypass	3.0	*31 (39)*	*28 (32)*	*27 (30)*	***26 (39)***	75		
Puterbaugh Creek	Reedy Drive	2.3	*37*	40	43	**43**	66	46	**F***
Trout Creek	CR 2	0.7	*51*	45	49	**48**	71	50	**44**

F* - denotes a rating of "Fair" for this site based on the macroinvertebrates present with HD sampler lost

Table 6: Index scores for sites on the Little Elkhart, Christiana Creek and Baugo Creek, Elkhart County

Stream	Station	River Mile	Fish IBI Scores (Coolwater IBI Scores)				2020 Habitat Scores	ICI Macroinvertebrate Scores	
			Baseline	2014	2017	**2020**		Baseline/Previous Scores	**2020**
Little Elkhart River	SR 120	1.6	*53*	48	50	**44**	90	46	**36**
Christiana Creek	CR 6	4.0	*50*	50	46	**46**	83	44	**48**
Christiana Creek	Willowdale Park	1.4	*38*	50	49	**49**	83	46	**50**
Baugo Creek	Restoration Site	1.8	*43*	41	48	**49**	85	43	**36**

the fish community at this site suggest a long-term improvement, with the percent of omnivores and pioneer species (those that colonize a stream shortly after a disturbance) decreasing, and the percent of headwater species and insectivores increasing (see Appendix G for additional information). This site is located within an industrial park where significant land development has occurred adjacent to the stream within the last few years. Fortunately, the encroachment from the development appears to have had a minimal impact on the fish community but may have been a contributing factor to the "Fair" rating of the macroinvertebrate community in 2020. Similar to several other sites with low macroinvertebrate scores in 2020, drought conditions may have also been a factor.

Trout Creek

Although lower than the baseline value of 51, the IBI score in Trout Creek at CR 2 in 2020 of 48, still falls within the good range (Table 5). The fish community at this site has been relatively consistent over the years, although there has been a general increase in the number of fish collected. In 2020, the number of sunfish species increased and the percent of simple lithophils decreased, which are not positive signs for this site, but possibly just short term changes that will rebound in the upcoming years. In addition to fish community concerns, the macroinvertebrate ICI score of 44 was also significantly lower than the previous score of 50. Macroinvertebrates are an indicator of short term health in a waterbody, given that they have short life-cycles and can recolonize quickly following a disturbance. The lower score, however, could be related to drought conditions experienced during the summer of 2020, as previously discussed with other sites. The Aquatics Program will continue to monitor this site closely.

A hellgrammite (a.k.a a Dobson fly larvae) from Christiana Creek at Willowdale Park. These strange looking large bugs are an indicator of a high quality stream

Little Elkhart River

The IBI score at SR 120 of 44 was down significantly in 2020 relative to the baseline score of 53 and previous scores (Table 6). In our 2017 report, we reported that trends in fish community metrics at this site were generally negative, with an increase in the percent of tolerant fish and omnivores. These two metrics further increased since 2017 and were the reason for the drop in the IBI score. One particular species, the white sucker (a tolerant species and omnivore) is the reason in this shift, as their abundance has surged in recent years at SR 120. It is possible that their increase in abundance is a natural cyclical occurrence. It is worth mentioning that the other two Little Elkhart River long-term monitoring sites (CR 35 and CR 10) are trending in the opposite direction, with general improvements occurring. The macroinvertebrate community score of 36 in 2020 was down significantly from 2017 when the site scored 46. Furthermore, the score of 36 is just within the range that IDEM considers

to be non-impaired. These reduced fish and macroinvertebrate scores present some concern for the Little Elkhart River. The Aquatics Team will continue to monitor this site closely.

Christiana Creek

Christiana Creek at CR 6 had an IBI score of 46 in 2020, which was the same as when the site was last sampled in 2017 but down significantly from the baseline (Table 6). A review of IBI metrics indicates that the fish community has been relatively stable over time. The one major change, and likely the reason for the lower IBI score, is the explosion in the number of fish at this site (Figure 6). Prior to 2017, the average number of fish collected during sampling events was 479. In 2017 and 2020, the average was 1106. Sometimes an overabundance of fish can be a reflection of too much energy within an aquatic ecosystem which could result from high (unnatural) nutrient input. The increase in abundance is being observed at other sites on Christiana Creek. At CR 4, we observed this increase in abundance in 2019. At Willowdale Park, the other site sampled in 2020, this phenomenon was also observed. However, it appears to be positively impacting the IBI score at this site. Prior to 2017, the average number of fish collected at Willowdale Park was 119, which is very low for a stream as big as Christiana Creek. In 2017 and 2020, the average number was 278, which is more expected. The IBI scores at Willowdale Park have sky rocketed since baseline monitoring. The scores from 2014 to 2020 were between 49 and 50, while the baseline score is 38 (Table 6). The number of fish species has also increased significantly at this site since baseline monitoring.

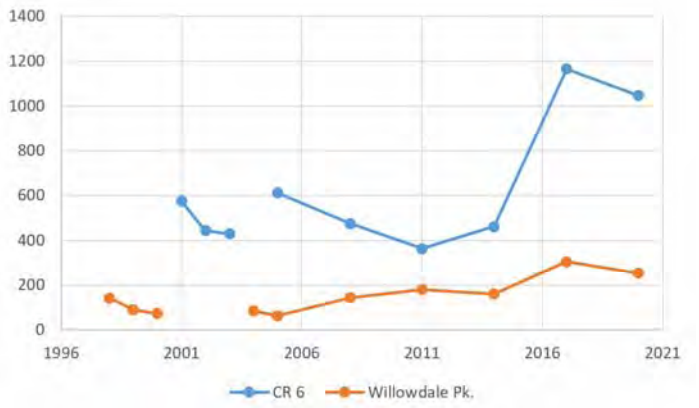
Macroinvertebrate ICI scores were 48 and 50 at CR 6 and Willowdale Park respectively. These scores are within the exceptional range for macroinvertebrates and both scores were up significantly from the last time these sites were sampled in 2017.

Baugo Creek

The IBI scores at the Restoration site on Baugo Creek have increased significantly since baseline monitoring when the IBI score was 43. The scores in 2017 and 2020 were 48 and 49 respectively (Table 6). This site is a location where the Elkhart County Drainage Board did instream restoration work in 2010. Several rock structures called "j hooks" were placed in the stream to help stabilize the instream habitat. Baseline monitoring was completed just after this work was completed. So far this project appears to have been a success for the fish community as indicated by the

A beautiful little hand sized longnose gar from Angela Boulevard on the St. Joseph River

Figure 6: Recent increases in the total number of fish collected from Christiana Creek

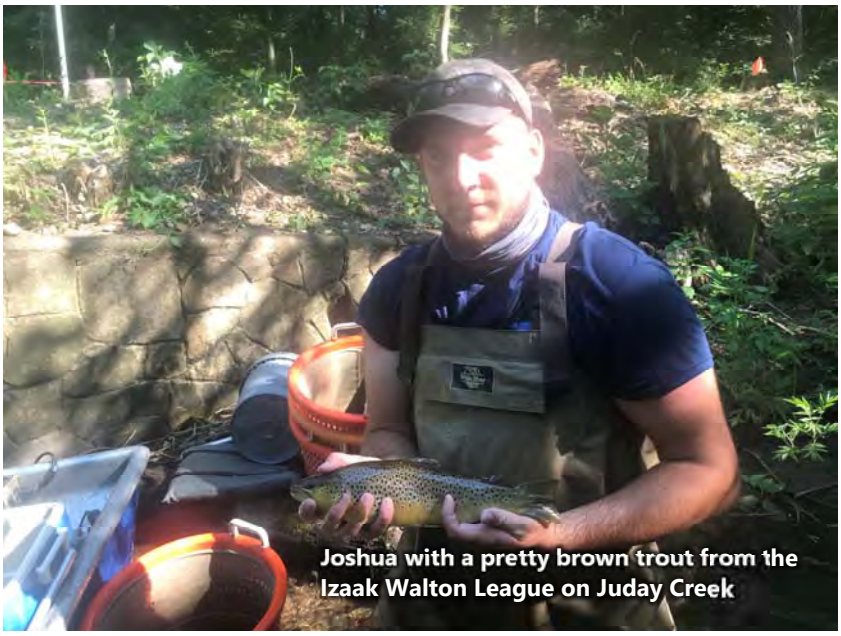


higher IBI scores.. The macroinvertebrate ICI score, on the other hand, was 36 in 2020, down from the baseline value of 43. Macroinvertebrate scores have fluctuated at this site over the years likely due to water quality and hydrology issues in the stream. It is also possible that the drought conditions in 2020 had an impact on the macroinvertebrates at this site.


Ryan with a nice northern pike from the St. Joseph River in Elkhart

Fish Tissue

In 2020, tissue was collected from fish in both Elkhart and St. Joseph Counties. Collections were based on the current Fish Consumption Advisory (FCA) for area streams and potential data gaps within the FCA. The FCA provides guidance on the rate of consumption of local wild fishes (Tables 7-10) based on the concentration of polychlorinated biphenyl (PCB) or mercury (Hg) concentrations in their tissue. It should be noted that the State FCA has more restrictive guidance for individuals that are considered to be part of the "sensitive population." Females under the age of 50 and males under the age of 18 are considered to be part of the sensitive population. For more information on local fish consumption, visit the Indiana State Department of Health's (DOH) website (http://www.in.gov/isdh/23650.htm). In 2020, the DOH released a new interactive web map that features easily accessible fish consumption information for the St. Joseph River Watershed.


Joshua with a pretty brown trout from the Izaak Walton League on Juday Creek

Many variables play a role in contaminant concentrations in fish. In general, larger fish will tend to have higher concentrations of contaminants in their tissue. Concentrations of contaminants can vary from one fish to another, so the methodology for collecting tissue samples requires collecting three fish and compositing all fish into one sample. Because of variability in concentrations, gathering multiple samples of the same species over the course of several years can provide a more accurate understanding of pollutant concentrations. The State of Indiana employs this idea and will average the concentrations of multiple samples to provide a more accurate representation of pollutant concentrations for that species. Given the high frequency in which samples are collected by the Aquatics Program, through collaboration with the State of Indiana, the FCA for the St. Joseph River is one of the most accurate of any water-

Table 7: Fish Consumption Advisory (Elkhart County)

Species	Fish Size (inches)	Contaminant	Consumption Guidance	***Sensitive Population Guidance***
Bluegill and other Sunfish	ALL	Hg	Unrestricted	1 meal/week
Bullhead Catfish	ALL	Hg	Unrestricted	Unrestricted
Channel Catfish	ALL	PCBs	1 meal/month	1 meal/month
Common Carp	ALL	PCBs	1 meal/month	1 meal/month
Crappie	All	Hg	Unrestricted	1 meal/week
Largemouth Bass	Up to 16	Hg	1 meal/week	1 meal/week
	16+	Hg	1 meal/week	1 meal/month
Northern Hogsucker	ALL	Hg	Unrestricted	1 meal/week
Northern Pike	Up to 30	Hg	1 meal/week	1 meal/week
	30+	Hg	1 meal/week	1 meal/month
Redhorse	ALL	PCBs/Hg	I meal/week	1 meal/week
Rock Bass	ALL	Hg	Unrestricted	1 meal/week
Smallmouth Bass	Up to 17	Hg	Unrestricted	1 meal/week
	17+	Hg	1 meal/week	1 meal/week
Walleye	ALL	PCBs/Hg	1 meal/week	1 meal/month
White Sucker	ALL	Hg	Unrestricted	Unrestricted

Table 8: Fish Consumption Advisory (St. Joseph County—Baugo Bay to Twin Branch Dam)

Species	Fish Size (inches)	Contaminant	Consumption Guidance	***Sensitive Population Guidance***
Bluegill and other Sunfish	ALL	Hg	Unrestricted	1 meal/week
Bullhead Catfish	ALL	Hg	1 meal/week	1 meal/week
Channel Catfish	Up to 20	PCBs	1 meal/month	1 meal/month
	20+	PCBs	1 meal/2 months	1 meal/2 months
Common Carp	ALL	PCBs	1 meal/month	1 meal/month
Crappie	ALL	PCBs	1 meal/week	1 meal/week
Largemouth Bass	Up to 13	PCBs/Hg	Unrestricted	1 meal/week
	13+	PCBs/Hg	1 meal/week	1 meal/week
Redhorse	ALL	PCBs/Hg	1 meal/week	1 meal/week
Rock Bass	ALL	Hg	Unrestricted	1 meal/week
Spotted Sucker	Up to 15		Unrestricted	Unrestricted
	15+	Hg	Unrestricted	1 meal/week
**Walleye*	ALL	PCBs/Hg	1 meal/week	1 meal/month
White Sucker	ALL	Hg	Unrestricted	1 meal/week

*Elkhart County data are included as this section of river is free flowing into Elkhart County and migratory behavior of walleye

*

Sensitive Population— *Females under the age of 50 and males under the age of 18*
1 Meal—*8oz. For adults, 3oz. for children ages 3 to 6*

Table 9: Fish Consumption Advisory (St. Joseph County—Twin Branch Dam to State Line)

Species	Fish Size (inches)	Contaminant	Consumption Guidance	***Sensitive Population Guidance***
Bluegill and other Sunfish	ALL	PCBs/Hg	*1 meal/week*	*1 meal/week*
Bullhead Catfish	ALL	PCBs/Hg	*Unrestricted*	*1 meal/week*
Channel Catfish	ALL	PCBs	*Do Not Eat*	*Do Not Eat*
Coho Salmon	Up to 24	PCBS	*1 meal/week*	*1 meal/week*
	24+	PCBS	*1 meal/month*	*1 meal/month*
Common Carp	ALL	PCBs	*Do Not Eat*	*Do Not Eat*
Crappie	ALL	Hg	*Unrestricted*	*1 meal/week*
Largemouth Bass	ALL	PCBs/Hg	*1 meal/week*	*1 meal/week*
Northern Hogsucker	ALL	PCBs	*1 meal/month*	*1 meal/month*
Northern Pike	ALL	PCBs	*1 meal/month*	*1 meal/month*
Quilback Carpsucker	ALL	PCBs/Hg	*1 meal/month*	*1 meal/month*
Redhorse	ALL	PCBs	*I meal/2 months*	*1 meal/2 months*
Rock Bass	ALL	PCBs/Hg	*1 meal/week*	*1 meal/week*
Smallmouth Bass	Up to 15	PCBs/Hg	*1 meal/week*	*1 meal/month*
	15+	PCBs/Hg	*1 meal/month*	*1 meal/month*
Steelhead	ALL	PCBs	*1 meal/week*	*1 meal/week*
Walleye	ALL	PCBs	*1 meal/month*	*1 meal/month*

Table 10: Fish Consumption Advisory (Elkhart River)

Species	Fish Size (inches)	Contaminant	Consumption Guidance	***Sensitive Population Guidance***
**Bluegill and other Sunfish*	ALL		Unrestricted	1 meal/week
**Bullhead Catfish*	ALL		Unrestricted	1 meal/week
Channel Catfish	Up to 20	PCBs	1 meal/month	1 meal/month
	20+	PCBs	1 meal/2 month	1 meal/2 month
Redhorse	ALL	Hg	1 meal/week	1 meal/month
Rock Bass	ALL	Hg	Unrestricted	1 meal/week
Smallmouth Bass	ALL	PCBs/Hg	1 meal/week	1 meal/week
Walleye	ALL	PCBs/Hg	1 meal/week	1 meal/week
White Sucker	Up to 16	Hg	1 meal/week	1 meal/week
	16+	Hg	1 meal/week	1 meal/month

*Tissue Samples for Bluegill, other sunfish and bullhead catfish are not covered in the FCA for the Elkhart River. Data presented are Indiana's general safe fish consumption guidelines

*

Sensitive Population— *Females under the age of 50 and males under the age of 18*
1 Meal—*8oz. For adults, 3oz. for children ages 3 to 6*

A green frog observes fish sorting at Kintz Avenue on Juday Creek

body in the State.

In 2020, 10 fish tissue samples were collected by the Aquatics Program. Tissue samples were collected for 3 species (common carp, walleye, smallmouth bass, largemouth bass and bluegill). Multiple samples of the same species were collected in different stretches of the St. Joseph River.

Mercury was detected in relatively low concentrations in all tissue samples. In the years of collecting tissue samples from the St. Joseph River Watershed, the Aquatics Program has rarely encountered high concentrations of mercury in fish tissue. PCBs, on the other hand are found in relatively high concentrations in some fish species in the St. Joseph River and PCBs generally drive the guidance for fish consumption for the St. Joseph River.

The following narrative describes results of the Aquatics Program's fish tissue collections from Elkhart and St. Joseph Counties in 2020 based on the concentration of PCBs and Hg:

Bluegill tissue samples were collected from 3 locations in 2020: Keller Park and Darden Road on the St. Joseph River and CR 18 on the Elkhart River. The Keller Park bluegill averaged 7.4 inches, the Darden Road bluegill averaged 7.8 inches and the CR 18 bluegill averaged 7.1 inches. The bluegill sample from CR 18 had slightly higher concentrations of PCBs than expected. Guidance based on this sample would be 1 meal per week for both the sensitive and general populations. Current guidance in the FCA is unlimited consumption for the general population and 1 meal per week for the sensitive population.

The Darden Road and Keller Park samples had relatively low concentrations of PCBs and unlimited consumption would be the guidance based on these samples. Bluegill samples (average size 7.0 inches) were also collected from two locations in St. Joseph County in 2019. Both samples had low concentrations of PCBs and were consistent with the current guidance in the FCA of 1 meal per week (Table 9). After numerous years of sampling bluegill in St. Joseph County, the concentrations of PCBs appears to have significantly reduced in this species. Not so long ago (2016), the guidance for bluegill was 1 meal every 2 months for general population and "DO NOT EAT" for the sensitive population.

Bluegill FCA Guidance over the years		
Year	General Population	Sensitive Population
2019-2020	1 meal/week	1 meal/week
2017-2018	1 meal/month	1 meal/month
2012-2016	1 meal/2 months	DO NOT EAT
2007-2011	1 meal/2 months	No guidance

Two different size ranges of common carp tissue samples were collected from Keller Park on the St. Joseph River. The smaller sample group averaged 25.5 inches, while the larger sample group averaged 33.0 inches. In 2019, the


Joshua with a big northern water snake from Trout Creek

A pretty pumpkinseed sunfish from the St. Joseph River in South Bend

Aquatics Program also collected carp tissue samples from Sample Street in St. Joseph County (average size 29.3 inches), which yielded high concentrations of PCBs. The current guidance for common carp consumption in the South Bend section of the St. Joseph River is "DO NOT EAT" (Table 9). The PCB results from 2020 were a little better, however, for both of the samples that were collected. Guidance for the 25.5 inch fish would be 1 meal per month, while guidance for the 33 inch fish would be one meal every 2 months.

Northern pike tissue samples were collected from 2 locations in 2020: Darden Road on the St. Joseph River and Shanklin Park on the Elkhart River. The Darden Road sample averaged 27.7 inches, while the Shanklin Park sample averaged 24.2 inches. Based on concentrations of PCBs and Hg, the guidance for the Darden Road sample would be 1 meal per week for both populations. The current guidance for northern pike from the South Bend section of the St. Joseph River is 1 meal per month for both the sensitive and general populations (Table 9).

Based on concentrations of PCBs and Hg, the guidance for the Elkhart River pike would be unlimited consumption of 24 inch fish for both populations, and one meal per week for fish 25 inches or larger. Samples from 2020 will be used to bring the FCA up to date. There is currently no direct guidance for northern pike in the Elkhart River (Table 10). The aquatics program had previously collected tissue samples for northern pike in 2013 (average size 23.4 inches), however, the DNR recently changed the harvestable size limit from 21 inches to 24 inches, making the previous sample invalid.

Smallmouth bass tissue samples (average size 10.5 inches) and largemouth bass samples (average size 11.5 inches) were collected from Baugo Bay on the St. Joseph River. Several years ago, the Indiana DNR implemented a slot size limit for black bass (largemouth and smallmouth bass). Under the slot limit, fish smaller than 12 inches and larger than 15 inches can be harvested by anglers, but fish between 12 and 15 inches must be released. Prior to this change, black bass over 12 inches could be harvested. In response to these changes, our sampling over the last few years has targeted harvestable size fish under the new regulations. Based on concentrations of Hg, the guidance for the largemouth bass sample would be unlimited for the general population and one meal per week for the sensitive population. The smallmouth bass sample had very low levels of PCBs and Hg and guidance would be unlimited. The current FCA guidance for largemouth bass is 1 meal per week for the sensitive population and general populations, with the exception of fish under 13 inches being unrestricted for the general population. There is currently no direct FCA guidance for smallmouth bass from this section of river, so the FCA will be updated soon based on these results (Table 8).

Walleye tissues samples (average size 19.3 inches) were collected from CR 18 on the Elkhart River. Current FCA

Table 11: Sampling sites and Index Scores in Elkhart and St. Joseph Counties, 2020

Stream	Site	Site Number	Type of Site	County	Method	IBI Scores	ICI Scores	QHEI Scores
						2020	2020	2020
St. Joseph River	Toll Road (Bristol)	1	Index	Elkhart	Boat	53	42	87
	Six Span	2	Index	Elkhart	Boat	53	48	82
	Bridge Street	3	Index	Elkhart	Boat	52	48	83
	Baugo Bay	4	Investigative	St. Joseph	Boat			53
	Twin Branch Dam (Above)	5	Investigative	St. Joseph	Boat			62
	Ironwood	6	Index	St. Joseph	Boat	48	Fair	57
	Michigan St. (Below)	7	Index	St. Joseph	Boat	47	48	82
	Angela Blvd.	8	Index	St. Joseph	Boat	47	52	87
	Keller Park (B)	9	Investigative	St. Joseph	Boat			82
	Darden Road	10	Index	St. Joseph	Boat	54	54	86
Pinhook Lagoon		11	Investigative	St. Joseph	Boat			
Trout Creek	CR 2	12	Index	Elkhart	Tote Barge	48	44	71
Little Elkhart River	SR 120	13	Index	Elkhart	Tote Barge	44	36	90
Pine Creek	US 20 Bypass	14	Index	Elkhart	Tote Barge	26 (39)		75
Puterbaugh Creek	Reedy Drive	15	Index	Elkhart	Tote Barge	43	Fair	66
Lily Creek	CR 4	16	Investigative	Elkhart	Back Pack			34
	Highland MHP	17	Investigative	Elkhart	Back Pack			30
	Sunset Ave.	18	Investigative	Elkhart	Back Pack			53
	McPherson St.	19	Investigative	Elkhart	Back Pack			68
	Erwin St.	20	Investigative	Elkhart	Back Pack			62
Christiana Creek	CR 6	21	Index	Elkhart	Tote Barge	46	48	83
	Willowdale Park	22	Index	Elkhart	Tote Barge	49	50	83
Elkhart River	Shanklin Park (Above)	23	Investigative	Elkhart	Boat			77
	Hively Ave (CR 18)	24	Index	Elkhart	Boat	53	38	84
	Studebaker Park (Above)	25	Index	Elkhart	Boat	56	52	82
	American Park	26	Index	Elkhart	Boat	49		74
	Prairie St.	27	Index	Elkhart	Boat	54	48	79
	Elkhart Ave.	28	Index	Elkhart	Boat	51		81

Table 11: Fish sampling sites and Index Scores in Elkhart and St. Joseph Counties, 2020(continued)

Stream	Site	Site Number	Type of Site	County	Method	IBI Scores 2020	ICI Scores 2020	QHEI Scores 2020
Stoney Creek	CR 40	29	Investigative	Elkhart	Back Pack			56
Turkey Creek	CR 17	30	Investigative	Elkhart	Tote Barge			63
Horn Ditch	Eisenhower Drive	31	Investigative	Elkhart	Back Pack			58
Leedy Ditch	CR 45	32	Investigative	Elkhart	Back Pack			67
Baugo Creek	Restoration Site	33	Index	Elkhart	Tote Barge	49	36	85
Auten Ditch	Locust Road (South)	34	Index	St. Joseph	Back Pack	18	Poor	41
Bowman Creek	Green Tech Drive	35	Index	St. Joseph	Back Pack	14	22	59
	St. Joseph Street	36	Investigative	St. Joseph	Back Pack			52
	Studebaker Golf Course	37	Index	St. Joseph	Back Pack	16	Poor	46
Juday Creek*	Holy Cross Parkway	38	Index	St. Joseph	Tote Barge	27 (31)		55
	Ponader Park	39	Macroinvertebrate Only	St. Joseph			42	
	Kintz Ave	40	Index	St. Joseph	Back Pack	37 (32)	46	69
	Izaak Walton League (Above)	41	Investigative	St. Joseph	Tote Barge			76
	Izaak Walton League	42	Index	St. Joseph	Tote Barge	35 (39)	42	81

*** denotes a cool/cold water stream**
Underlined values are indicative of an impairment
Coolwater scores are in (parenthesis) Juday Creek and Cobus Creek were analyzed using coolwater methods

guidance is 1 meal per week for both the sensitive and general populations (Table 10). This guidance is based on a similarly sized sample (average size 18.6 inches) that was collected by the Aquatics Program in 2015. The sample from 2020 yielded similar results to 2015 and is consistent with the FCA.

Conclusion

Long-term biological monitoring by the cities of Elkhart and South Bend is starting to provide a more thorough understanding of the health of our rivers and streams. Along with our rivers and streams, the Elkhart-South Bend Aquatics Program also continues to evolve by sampling more locations within the watershed, expanding our macroinvertebrate sampling program, sampling different aquatic communities and changing our techniques slightly to fill data gaps. Beginning in 2017 we started to apply more in-depth analyses of fish community data. In Juday Creek and other coolwater streams, more of an emphasis is now placed on macroinvertebrate monitoring.

When the Aquatics Program initiated monitoring in the St. Joseph River in 1998, IBI scores indicated that the river had good to excellent fish communities. IBI scores for the St. Joseph River have not shown much change in the past 20 years. However, a review of individual metrics, suggest that changes are occurring within the fish communities in the St. Joseph River. In 2020, sites like Darden Road on the St. Joseph River are experiencing record high numbers of species. While IBI score changes have been subtle, fish community surveys produced high IBI scores that exceeded baseline values at all St. Joseph River and Elkhart River sites in 2020.

In 2018 and 2019 we reported that the total number of fish collected per survey was increasing to record levels in many of the streams in the area including the St. Joseph River. In 2020, the number of fish collected began to drop

at many of our sites, but several streams like Christiana Creek and the Little Elkhart River continued to see growth in total fish abundance. An increase in total fish abundance can affect IBI scores (sometimes negatively) as it can influence IBI metrics that are based on proportions. The IBI score at CR 6 on Christiana Creek was lower in 2020 mostly due the overabundance of fish. SR 120 on the Little Elkhart River also had a reduced score, mostly because of an increase in the abundance of white suckers (a pollution tolerant species).

While drought conditions didn't make the headlines in 2020, the St. Joseph River and the Elkhart River receded to almost record low levels during the late summer and fall. These drought conditions appear to have had a negative impact on macroinvertebrate communities in several local streams. Bowman Creek in South Bend also ran dry during the late summer of 2020, isolating fish to small pools.

Juday Creek continues to support very strong macroinvertebrate communities, while the coolwater characteristics of this stream are a natural limitation on fish species diversity and the total abundance of fish.

Trout Creek in Elkhart County, which is generally considered to be one of the higher quality streams in the area, had reduced fish and macroinvertebrate community scores in 2020. Pine Creek at the US 20 Bypass and Puterbaugh Creek at Reedy Drive had increased IBI scores, although the macroinvertebrate score was down at Puterbaugh Creek, possibly due to drought conditions or recent development activities adjacent to the site.

IBI scores at the Baugo Creek Restoration site, where restoration work was completed in 2010, have been significantly higher than baseline values in the past two sampling events, suggesting that the restoration work was a success.

Fish community surveys, performed above and downstream of the former Elkhart River Dam in 2020, indicate some very positive changes as a result of the dam removal. IBI scores, and other fish community metrics, increased significantly at several upstream sites as a direct result of the project. Furthermore, 8 new species of fish have recolonized the river upstream of the former dam with several species being found almost 20 miles upstream in Goshen.

Acknowledgements

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APPENDICES

Appendix A

Biological Assessment Introduction and Methodology

In 2020, the cities of Elkhart and South Bend, through the Aquatic Community Monitoring Program (Aquatics Program), continued to monitor local fish and macroinvertebrate communities in area rivers and streams. The information gathered was integrated into an overall water quality program for each City. While the cities measure the chemical and microbial composition of local stream water, the additional biological data provides a more accurate representation of the overall health of each stream. The way that biological communities are assembled can change as a result of a disturbance, such as a chemical spill or alteration of habitat. Chemical and microbial testing, which can play an important role in pinpointing contaminants, is simply a snapshot of current conditions. In many cases, having both sets of data can help determine the cause and effect of disturbances to our local streams.

During the first 6 years (1998-2003), the Aquatics Program established core fish sampling sites on the St. Joseph River and many of its primary tributaries in the Elkhart area. For 3 consecutive years, data were collected from these sites and a baseline 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 the Aquatics Program, establishing a unique biological monitoring partnership between municipalities. As with the Elkhart area, core sampling sites were determined and similar baselines were established for South Bend over a 6 year period (2001-2006).

Other sampling efforts have been conducted in both Elkhart and St. Joseph Counties, offering a comprehensive view of stream conditions for the entire section of the St. Joseph River in Indiana. From 2007 to 2009, baseline monitoring was completed in the Mishawaka section of the St. Joseph River. Baseline monitoring was also conducted in the Goshen area of the Elkhart River in a partnership with the Elkhart River Restoration Association in 2009 and 2010. Additionally, in 2016 baseline monitoring was conducted on numerous sites in the Cobus Creek Watershed to support a watershed study being conducted by the St. Joseph River Basin Commission (this study is available on the St. Joseph River Basin Commission's website: http://www.sjrbc.com/). While monitoring will not continue in these areas, the baseline data that were gathered will serve as an important reference for future biological comparisons.

In 2018, the Aquatics Program also collaborated with Indiana University—South Bend to conduct aquatic plant surveys on the St. Joseph River. These surveys were investigative in nature, but were conducted to obtain a better understanding of all aquatic life in the St. Joseph River.

Indices

The Index of Biotic Integrity (IBI) is the system that is used to assess 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 the general public. The IBI is comprised of 3 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 3 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 1 to 5 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, the Aquatics Program 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 6 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 is used to determine to what extent the IBI scores are being affected by habitat. It may also show specific habitat degradation issues that need to be addressed.

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 (MBI, Columbus, Ohio), the Aquatics Program is also monitoring benthic (bottom dwelling) macroinvertebrates (visible animals without backbones). Twenty-two (22) sites were sampled in 2020 and results were compared to their respective baseline values or the value from the previous sampling event. 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 classified similar to IBI scores. This combination of fish, habitat, macroinvertebrate, and chemical monitoring provides the cities of Elkhart and South Bend with the most comprehensive view of stream health.

The Indiana Department of Environmental Management (IDEM) has established guidelines to determine if a body of water is impaired or if its condition is supportive of aquatic life for the IBI and QHEI (IDEM 2015). The ICI is not an index used by IDEM, however, similar guidelines have been established by OHIO EPA for a nearby region, and those values are being used with the Elkhart and St. Joseph County data. Values of 36 or higher for IBI and ICI scores are indicators of a stream with the ability to support aquatic life. IDEM refers to streams with a score of 36 or higher, as those that are "attaining" aquatic life standards. QHEI scores of 51 or greater indicate that enough quality habitat is available to support aquatic communities.

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*) and smallmouth bass (*Micropterus dolomieu*) populations are monitored from previous tagging events in cooperation with the Indiana Department of Natural Resources (IDNR). Tissue from 10 fish species was collected and analyzed for mercury and polychlorinated biphenyl (PCB) content. Current Indiana Fish Consumption Advisory data for the State of Indiana (Tables 7-10) include many species from the Indiana portion of the St. Joseph River Watershed. The cities involved in the Program believe it is vital to continually provide local citizens with the most updated and comprehensive information on local fish consumption.

Methods

For the past 22 years, the Aquatics staff has used 2 collection protocols (investigative sampling and index sampling) to quickly catalog the major fish species and to quantify stream 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 5 week "rest" period between sampling events. Individual species maximum and minimum lengths are recorded, all fish are counted, and game fish and are weighed and measured individually, while most non-game fish are mass weighed. Individual length and weight data are also collected for some of the important species like greater redhorse.

The length of stream 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 1 or 2 index sites. Every species 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 2020, 10 index and 6 investigative sites were sampled in St. Joseph County and 15 index and 10 investigative sites were sampled in Elkhart County. IBI scores were calculated for each of the index sites and an average from the 2 visits was obtained to give the final score.

Fish were collected using either boat mounted, tote barge, or backpack electrofishing equipment. The type of gear used depended on the size of the stream. The St. Joseph and Elkhart Rivers were sampled with the boat. Smaller, wadeable streams were sampled with the tote barge, unless the stream was extremely small and shallow, in which case, the backpack was used. Power output from the 3 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.

During each fish sampling event, stream habitat information was methodically collected using the QHEI as developed by Ohio EPA (Rankin 1989). Given that each index site was sampled twice, scores were averaged to give a final score.

In late June 2020, Aquatics personnel placed Hester-Dendy samplers (artificial substrates used to collect small aquatic organisms) at 22 sites following Ohio EPA macroinvertebrate sampling procedures (Ohio EPA 1987, 1989). 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 due to the loss or vandalism of a sampler.

Fish tissue in the form of fillets was collected from bluegill (*Lepomis macrochirus),* common carp *(Cyprinus carpio),* largemouth bass *(Micropterus salmoides),* northern pike *(Esox Lucius),* smallmouth bass *(Micropterus dolomieu)* and walleye (*Sander vitreus*). Data and location information are presented in Appendix B of this report. Each tissue sample sent in for laboratory analysis (Pace Analytical, Green Bay, WI) was a composite of fillets from 3 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 in "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory", Appendix III (1993).

Long-term index monitoring consists of rotational sampling of stream stations. Each station is visited at least once every 3 years to gather biological and chemical data and to compare against previous sampling results, and baseline data.

The Northern Indiana Till Plain 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

The Northern Indiana Till Plain 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

The Coolwater Index of Biotic Integrity metrics used to evaluate sites in Indiana with less than or equal to 100 square miles drainage area:

1. Number of Native Species
2. Number of darter/madtom/sculpin species
3. Percent headwater species
4. Percent coolwater species
5. Percent sensitive and intolerant Species
6. Percent tolerant
7. Percent detritivore
8. Percent invertivore
9. Percent pioneer species
10. Number of fish collected (minus tolerant individuals)
11. Percent simple lithophils
12. Percent DELT anomalies

The Coolwater Index of Biotic Integrity metrics used to evaluate sites in Indiana with greater than 100 square miles drainage area:

1. Number of Native Species
2. Number of darter/madtom/sculpin species
3. Percent catostomidae (sucker family)
4. Percent coolwater species
5. Percent sensitive and intolerant Species
6. Percent tolerant
7. Percent detritivore
8. Percent invertivore
9. Percent carnivore
10. Number of fish collected (minus tolerant individuals)
11. Percent simple lithophils
12. Percent DELT anomalies

Appendix B

Fish tissue preparation and results

Materials needed:

- Reynolds aluminum foil
- freezer wrap
- deionized (DI) water
- 1/2 gallon, 1 gallon, and jumbo size freezer bags w/write-on labels
- skinners
- stainless steel fillet knives
- knife sharpener
- scalers
- 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, scalers and skinners were cleaned and rinsed with DI water, and freezer wrap was placed where the fish were to be processed. The knives, scalers 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, Aquatics Program 2020

Station	Species	Length Range (in)	PCB Group General Population	Hg Group General Population	PCB Group Sensitive Population	Hg Group Sensitive Population
St. Joseph River Darden Road	Bluegill	7.5 to 8.2	1	1	1	1
St. Joseph River Keller Park	Bluegill	7.1 to 7.8	1	1	1	1
Elkhart River CR 18	Bluegill	7.0 to 7.3	2	1	2	1
Elkhart River Shanklin Park	Northern Pike	24.0 to 24.6	1	1	1	2
St. Joseph River Darden Road	Northern Pike	26.3 to 28.7	2	1	2	2
St. Joseph River Keller Park	Common Carp	24.5 to 26.1	3	1	3	1
St. Joseph River Keller Park	Common Carp	31.5 to 34.2	4	1	4	2
St. Joseph River Baugo Bay	Smallmouth Bass	10.0 to 10.8	1	1	1	1
St. Joseph River Baugo Bay	Largemouth Bass	11.3 to 11.7	1	1	1	2
Elkhart River CR 18	Walleye	18.3 to 20.2	2	1	2	2

Sensitive Population— *Females under the age of 50 and males under the age of 18*

1 Meal—*8oz. For adults, 3oz. for children ages 3 to 6*

Group 1—No restrictions

Group 2—1 Meal/week

Group 3—1 meal/month

Group 4—1 meal/2 months

Group 5—Do Not Eat

Appendix C

Summary of fish collected by county, 2020

Summary of species captured at index sites in Elkhart County, 2020

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Rock Bass	1,640	9.44	113,325	249.84	7.25
Bluegill	1,394	8.03	40,772	89.89	2.61
Mimic Shiner	1,342	7.73	1,979	4.36	0.13
Striped Shiner	1,265	7.29	11,653	25.69	0.75
Spotfin Shiner	1,261	7.26	4,066	8.96	0.26
Smallmouth Bass	1,148	6.61	134,653	296.86	8.62
Sand Shiner	962	5.54	1,501	3.31	0.10
Golden Redhorse	764	4.40	478,836	1055.65	30.65
White Sucker	720	4.15	110,945	244.59	7.10
Green Sunfish	615	3.54	9,994	22.03	0.64
Northern Hog Sucker	598	3.44	106,640	235.10	6.83
Longear Sunfish	502	2.89	17,433	38.43	1.12
Hornyhead Chub	491	2.83	6,954	15.33	0.45
Mottled Sculpin	477	2.75	2,237	4.93	0.14
Logperch	436	2.51	3,554	7.84	0.23
Rainbow Darter	426	2.45	669	1.47	0.04
Bluntnose Minnow	418	2.41	1,208	2.66	0.08
Largemouth Bass	333	1.92	54,795	120.80	3.51
Blackside Darter	332	1.91	752	1.66	0.05
Johnny Darter	282	1.62	455	1.00	0.03
Shorthead Redhorse	263	1.51	156,723	345.52	10.03
Rosyface Shiner	176	1.01	378	0.83	0.02
Central Mudminnow	143	0.82	451	0.99	0.03
Spotted Sucker	121	0.70	21,750	47.95	1.39
Greenside Darter	112	0.65	292	0.64	0.02
Grass Pickerel	87	0.50	2,078	4.58	0.13
Blacknose Dace	87	0.50	344	0.76	0.02
Yellow Bullhead	85	0.49	5,880	12.96	0.38
Silverjaw Minnow	71	0.41	84	0.19	0.01
River Chub	60	0.35	647	1.43	0.04
YOY Suckers (Unid.)	58	0.33	277	0.61	0.02
Chestnut Lamprey	57	0.33	486	1.07	0.03
American Brook Lamprey	56	0.32	304	0.67	0.02
Silver Redhorse	54	0.31	44,279	97.62	2.83
Creek Chub	50	0.29	685	1.51	0.04
Walleye	49	0.28	19,714	43.46	1.26
Banded Killifish	46	0.26	121	0.27	0.01
Stoneroller, Central	43	0.25	248	0.55	0.02
Common Carp	27	0.16	85,572	188.65	5.48
Silver Lamprey	26	0.15	108	0.24	0.01
River Redhorse	24	0.14	41,560	91.62	2.66
Black Redhorse	24	0.14	15,336	33.81	0.98
Common Shiner	22	0.13	204	0.45	0.01

Summary of species captured at index sites in Elkhart County, 2020 (continued)

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Longnose Dace	20	0.12	104	0.23	0.01
Gizzard Shad	19	0.11	5,801	12.79	0.37
Redear Sunfish	19	0.11	903	1.99	0.06
Northern Pike	15	0.09	8,325	18.35	0.53
Bowfin	14	0.08	12,268	27.05	0.79
Yellow Perch	14	0.08	222	0.49	0.01
Warmouth	12	0.07	194	0.43	0.01
Brown Trout	10	0.06	935	2.06	0.06
Stonecat	10	0.06	209	0.46	0.01
Blackstripe Topminnow	10	0.06	18	0.04	0.00
Channel Catfish	8	0.05	18,034	39.76	1.15
Pumpkinseed	8	0.05	259	0.57	0.02
Brook Silverside	8	0.05	14	0.03	0.00
Pirate Perch	7	0.04	70	0.15	0.00
Rainbow Trout	6	0.03	1,148	2.53	0.07
Hybrid Sunfish	5	0.03	90	0.20	0.01
Northern Brook Lamprey	5	0.03	15	0.03	0.00
Greater Redhorse	4	0.02	9,600	21.16	0.61
Brown Bullhead	4	0.02	780	1.72	0.05
Spotted Gar	4	0.02	494	1.09	0.03
Black Crappie	4	0.02	296	0.65	0.02
Longnose Gar	3	0.02	2,516	5.55	0.16
Quillback	3	0.02	2	0.00	0.00
Tadpole Madtom	2	0.01	20	0.04	0.00
Fathead Minnow	2	0.01	2	0.00	0.00
Black Bullhead	1	0.01	57	0.13	0.00
Total	**17,364**	**100.00**	**156,2318**	**3,444.32**	**100.00**

Summary of species captured at investigative sites in Elkhart County, 2020

COMMON NAME	Total Number	% by Number
Bluegill	253	17.18
White Sucker	221	15.00
Green Sunfish	107	7.26
Spotfin Shiner	97	6.59
Northern Hog Sucker	77	5.23
Rainbow Darter	73	4.96
Blacknose Dace	54	3.67
Golden Redhorse	50	3.39
Rock Bass	50	3.39
Mimic Shiner	41	2.78
Largemouth Bass	40	2.72
Johnny Darter	39	2.65
Bluntnose Minnow	35	2.38
Hornyhead Chub	32	2.17
Creek Chub	31	2.10
Central Mudminnow	30	2.04
Striped Shiner	30	2.04
Smallmouth Bass	28	1.90
Stoneroller, Central	20	1.36
Yellow Bullhead	19	1.29
Blackside Darter	18	1.22
Pirate Perch	16	1.09
Walleye	12	0.81
Grass Pickerel	11	0.75
Common Shiner	11	0.75
Spotted Sucker	10	0.68
Rosyface Shiner	9	0.61
Longear Sunfish	9	0.61
Yellow Perch	9	0.61
Common Carp	7	0.48
Tadpole Madtom	6	0.41
Northern Pike	4	0.27
Blackstripe Topminnow	3	0.20
Sand Shiner	3	0.20
Northern Brook Lamprey	2	0.14
Pumpkinseed	2	0.14
Logperch	2	0.14
Black Bullhead	1	0.07
Black Crappie	1	0.07
Silver Lamprey	1	0.07
Shorthead Redhorse	1	0.07
Fathead Minnow	1	0.07
American Brook Lamprey	1	0.07
Golden Shiner	1	0.07
Greater Redhorse	1	0.07
YOY Suckers (Unid.)	1	0.07
Hybrid Minnow	1	0.07
Iowa Darter	1	0.07
Redear Sunfish	1	0.07
Total	**1,473**	**100.00**

Index Sites	17,364
Investigative Sites	1,473
Elkhart County Total	18,837

Summary of species captured at investigative sites in St. Joseph County, 2020

COMMON NAME	Total Number	% by Number
Bluegill	568	26.35
Largemouth Bass	184	8.53
Spotfin Shiner	162	7.51
Redear Sunfish	149	6.91
Rock Bass	112	5.19
Bluntnose Minnow	93	4.31
Mimic Shiner	91	4.22
Longear Sunfish	88	4.08
Golden Redhorse	88	4.08
Smallmouth Bass	85	3.94
Creek Chub	78	3.62
Logperch	54	2.50
Pumpkinseed	50	2.32
Green Sunfish	42	1.95
Gizzard Shad	38	1.76
Spotted Sucker	24	1.11
Brook Silverside	20	0.93
Common Carp	17	0.79
Mottled Sculpin	17	0.79
Rainbow Trout	16	0.74
Black Redhorse	15	0.70
Quillback	14	0.65
Golden Shiner	13	0.60
Shorthead Redhorse	12	0.56
Yellow Bullhead	12	0.56
Northern Hog Sucker	11	0.51
Banded Killifish	10	0.46
Spottail Shiner	8	0.37
Silver Redhorse	8	0.37
Black Crappie	8	0.37
Blackside Darter	7	0.32
Yellow Perch	7	0.32
Blacknose Dace	6	0.28
White Sucker	6	0.28
Warmouth	6	0.28
Johnny Darter	5	0.23
Walleye	4	0.19
Longnose Gar	4	0.19
Sand Shiner	4	0.19
Spotted Gar	3	0.14
Channel Catfish	2	0.09
Rainbow Darter	2	0.09
Northern Pike	2	0.09
Striped Shiner	2	0.09
Brown Trout	1	0.05
Brown Bullhead	1	0.05
White Crappie	1	0.05
Bowfin	1	0.05
Greenside Darter	1	0.05
Hybrid Sunfish	1	0.05
River Redhorse	1	0.05
Pirate Perch	1	0.05
Total	**2,156**	**100.00**

Summary of species captured at index sites in St. Joseph County, 2020

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Rock Bass	931	16.30	63,966	141.02	7.40
Smallmouth Bass	707	12.38	82,599	182.10	9.56
Longear Sunfish	627	10.98	19,570	43.14	2.26
Creek Chub	431	7.55	6,509	14.35	0.75
Mottled Sculpin	408	7.14	2,263	4.99	0.26
Mimic Shiner	340	5.95	491	1.08	0.06
Spotfin Shiner	259	4.54	1,014	2.24	0.12
Bluegill	244	4.27	6,030	13.29	0.70
Blacknose Dace	223	3.90	1,044	2.30	0.12
Golden Redhorse	216	3.78	203,494	448.63	23.55
White Sucker	172	3.01	20,181	44.49	2.34
Rainbow Trout	153	2.68	3,826	8.43	0.44
Green Sunfish	129	2.26	2,365	5.21	0.27
Shorthead Redhorse	128	2.24	111,616	246.07	12.91
Black Redhorse	104	1.82	82,250	181.33	9.52
Bluntnose Minnow	75	1.31	195	0.43	0.02
Spotted Sucker	70	1.23	47,549	104.83	5.50
Northern Hog Sucker	59	1.03	23,938	52.77	2.77
Central Mudminnow	46	0.81	119	0.26	0.01
Sand Shiner	43	0.75	47	0.10	0.01
Walleye	37	0.65	24,406	53.81	2.82
Rainbow Darter	36	0.63	62	0.14	0.01
Johnny Darter	35	0.61	57	0.13	0.01
Quillback	33	0.58	47,000	103.62	5.44
Largemouth Bass	25	0.44	4,470	9.85	0.52
Blackside Darter	24	0.42	87	0.19	0.01
Yellow Bullhead	17	0.30	2,373	5.23	0.27
Banded Killifish	15	0.26	39	0.09	0.00
Redear Sunfish	12	0.21	718	1.58	0.08
Greenside Darter	12	0.21	45	0.10	0.01
Pumpkinseed	11	0.19	331	0.73	0.04
Brown Trout	10	0.18	3,330	7.34	0.39
YOY Suckers (Unid.)	9	0.16	67	0.15	0.01
Common Carp	8	0.14	35,769	78.86	4.14
Northern Pike	8	0.14	10,883	23.99	1.26
Longnose Gar	7	0.12	2,979	6.57	0.34
Logperch	7	0.12	122	0.27	0.01
Silver Redhorse	6	0.11	12,700	28.00	1.47
River Redhorse	5	0.09	18,200	40.12	2.11
Bowfin	4	0.07	9,000	19.84	1.04
Gizzard Shad	4	0.07	1,600	3.53	0.19

Summary of species captured at index sites in St. Joseph County, 2020 (continued)

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs)	% by Weight
Striped Shiner	4	0.07	108	0.24	0.01
Warmouth	4	0.07	37	0.08	0.00
Chestnut Lamprey	3	0.05	64	0.14	0.01
Hybrid Sunfish	3	0.05	24	0.05	0.00
Stonecat	2	0.04	79	0.17	0.01
Channel Catfish	1	0.02	6,900	15.21	0.80
Greater Redhorse	1	0.02	3,200	7.05	0.37
Spottail Shiner	1	0.02	1	0.00	0.00
Total	**5,711**	**100.00**	**864,248**	**1,905.34**	**100.00**

Index Sites	5,711
Investigative Sites	2,156
St. Joseph County Total	**7,867**

Appendix D

Summary of fish collected by site, 2020
(Reference Table 11 for site numbers and locations)

Stream	St. Joseph River, Elkhart County, 2020					
Site	Toll Road (Above)		Six Span		Bridge Street	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~American Brook Lamprey		X			X	
#Banded Killifish			X			X
Black Crappie					X	
Black Redhorse	X	X	X		X	X
Blackside Darter	X	X	X	X	X	X
Bluegill	X	X	X	X	X	X
#Bluntnose Minnow	X		X	X	X	
Bowfin	X	X	X	X		
~Brook Silverside	X	X	X	X		
#Brown Bullhead			X			
#Channel Catfish		X			X	
Chestnut Lamprey	X		X		X	
#Common Carp	X	X	X	X		
Common Shiner				X		
#Gizzard Shad				X		
~Golden Redhorse	X	X	X	X	X	X
Grass Pickerel	X	X	X	X		X
~Greater Redhorse					X	
#Green Sunfish			X	X	X	X
~Greenside Darter	X		X	X	X	X
~Hornyhead Chub	X	X	X	X		
Johnny Darter	X	X	X	X		
Largemouth Bass	X	X	X	X	X	X
~Logperch	X	X	X	X	X	X
~Longear Sunfish	X	X	X	X	X	
Longnose Gar				X		
~Mimic Shiner	X	X	X	X	X	X
~Northern Hog Sucker	X	X	X	X	X	X
Northern Pike			X	X	X	X
Pirate Perch	X					X
Pumpkinseed	X			X	X	X
~Rainbow Darter	X	X	X	X	X	X
Redear Sunfish			X		X	X
~River Redhorse			X	X	X	X
~Rock Bass	X	X	X	X	X	X
~Rosyface Shiner					X	
~Sand Shiner	X		X	X	X	X
~Shorthead Redhorse	X	X	X	X	X	X
Silver Lamprey	X					
~Silver Redhorse			X	X	X	X

Stream	St. Joseph River, Elkhart County, 2019					
Site	Toll Road (Above)		Six Span		Bridge Street	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~Smallmouth Bass	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X
Spotted Gar			X			
Spotted Sucker	X	X	X	X		
~Stonecat		X		X		
Stoneroller, Central			X	X		
Striped Shiner	X	X	X	X		
Walleye					X	X
#White Sucker	X	X	X	X	X	X
#Yellow Bullhead			X	X		X
Yellow Perch	X	X	X	X		

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Stream	St. Joseph River, St. Joseph County , 2020—Table A					
Site	Baugo Bay	Twin Branch Dam (Above)	Ironwood		Michigan Street (Below)	
			1st Pass	2nd Pass	1st Pass	2nd Pass
#Banded Killifish	X	X	X	X		
~Black Redhorse					X	X
Black Crappie	X					
#Blacknose Dace						
Blackside Darter		X	X	X	X	X
Bluegill	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X
Bowfin	X					X
~Brook Silverside		X				
Brown Trout						
#Central Mudminnow						
#Channel Catfish	X	X				
Chestnut Lamprey					X	
#Common Carp	X	X	X	X		
#Creek Chub						
#Gizzard Shad	X	X				
~Golden Redhorse	X	X	X	X	X	X
#Golden Shiner		X				
Grass Pickerel						
~Greater Redhorse				X		
#Green Sunfish	X	X	X	X	X	X
~Greenside Darter					X	X
Hybrid Sunfish			X			
Johnny Darter	X	X				X
Largemouth Bass	X	X	X	X		X
~Logperch	X	X		X		X
~Longear Sunfish	X	X	X	X	X	X
Longnose Gar	X				X	X
~Mimic Shiner	X		X	X	X	X
~Northern Hog Sucker				X	X	
Northern Pike			X			
Pirate Perch		X				
Pumpkinseed	X	X	X			
#Quillback	X	X	X	X	X	
~Rainbow Darter		X	X	X	X	X
Rainbow Trout			X			
Redear Sunfish				X		
~River Redhorse			X			X

Stream	St. Joseph River, St. Joseph County , 2020—Table A (continued)					
Site	Baugo Bay	Twin Branch Dam (Above)	Ironwood		Michigan Street (Below)	
			1st Pass	2nd Pass	1st Pass	2nd Pass
~Rock Bass	X	X	X	X	X	X
~Sand Shiner			X			
~Shorthead Redhorse	X		X	X	X	X
~Silver Redhorse	X		X		X	
~Smallmouth Bass		X	X	X	X	X
~Spotfin Shiner	X	X	X	X	X	X
Spottail Shiner	X	X		X		
Spotted Sucker	X	X	X	X		
~Stonecat						X
Striped Shiner	X					
Walleye	X	X	X	X	X	X
White Crappie	X					
#White Sucker		X	X	X		
#Yellow Bullhead		X	X	X	X	X
Yellow Perch		X				

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Tributaries to the St. Joseph River, St. Joseph County, 2020								
Stream	Auten Ditch		Bowman Creek					Pinhook Lagoon
Site	Locust Road (S)		Green Tech Dr.		St. Joseph Street	Studebaker Golf Course		
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass	
Black Crappie								X
Bluegill								X
#Brown Bullhead								X
#Central Mudminnow	X	X						
#Creek Chub		X	X	X	X	X	X	
#Green Sunfish	X		X	X	X			
Hybrid Sunfish			X					
Largemouth Bass					X	X		X
Northern Pike								X
Redear Sunfish								X
Warmouth								X
#Yellow Bullhead								X
Yellow Perch								X

Stream	St. Joseph River, St. Joseph County , 2020—Table B				
Site	Angela Blvd		Keller Park (B)	Darden Road	
	1st Pass	2nd Pass		1st Pass	2nd Pass
#Banded Killifish	X	X		X	X
~Black Redhorse	X	X	X	X	X
Blackside Darter	X	X	X	X	X
Bluegill	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X
Bowfin				X	X
#Channel Catfish	X				
Chestnut Lamprey				X	X
#Common Carp				X	
#Creek Chub				X	
#Gizzard Shad	X		X		
~Golden Redhorse	X	X	X	X	X
#Green Sunfish	X	X	X	X	X
~Greenside Darter		X	X		X
Hybrid Sunfish			X		
Johnny Darter		X		X	X
Largemouth Bass	X		X	X	X
~Logperch			X	X	X
~Longear Sunfish	X	X	X		X
Longnose Gar	X		X	X	
~Mimic Shiner	X	X	X	X	X
Mottled Sculpin				X	
~Northern Hog Sucker	X	X	X	X	X
Northern Pike				X	X
Pumpkinseed	X				X
#Quillback	X	X	X	X	
~Rainbow Darter	X	X		X	X
Rainbow Trout			X	X	
Redear Sunfish				X	X
~River Redhorse	X	X	X		
~Rock Bass	X	X	X	X	X
~Sand Shiner	X		X	X	
~Shorthead Redhorse	X	X	X	X	X
~Silver Redhorse	X			X	
~Smallmouth Bass	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X
Spotted Sucker				X	X
~Stonecat					X
Striped Shiner	X	X	X	X	

Stream	St. Joseph River, St. Joseph County , 2020—Table B (continued)				
Site	Angela Blvd		Keller Park (B)	Darden Road	
	1st Pass	2nd Pass		1st Pass	2nd Pass
Walleye	X	X	X	X	X
Warmouth				X	
#White Sucker	X			X	X
#Yellow Bullhead	X	X	X	X	X

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Tributaries to the St. Joseph River, St. Joseph County, 2020							
Stream	Juday Creek						
Site	Holy Cross Parkway		Kintz Ave		Izaak Walton League (Above)	Izaak Walton League	
	1st Pass	2nd Pass	1st Pass	2nd Pass		1st Pass	2nd Pass
Blacknose Dace	X	X	X	X	X	X	X
Bluegill		X					
Brown Trout	X	X			X	X	X
Creek Chub	X	X	X	X	X	X	X
Green Sunfish	X	X	X	X			
Hybrid Sunfish				X			
Johnny Darter			X	X		X	X
Largemouth Bass		X		X			
Mottled Sculpin	X	X	X	X	X	X	X
Rainbow Darter			X	X			
Rainbow Trout			X	X	X	X	X
Rock Bass			X	X			X
Smallmouth Bass				X			
White Sucker	X	X	X	X		X	X

Tributaries to the St. Joseph River, Elkhart County, 2020											
Stream	**Elkhart River**										
Site	**Shanklin Park (Above)**	**Hively Ave (CR 18)**		**Studebaker Park (A)**		**American Park**		**Prairie St.**		**Elkhart Ave.**	
		1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
~American Brook Lamprey	X	X	X	X	X	X	X	X	X		
#Banded Killifish											X
#Black Bullhead										X	
Black Crappie	X	X	X								
#Blacknose Dace								X			
Blackside Darter	X	X	X	X	X		X	X		X	X
Blackstripe Topminnow	X										
Bluegill	X	X	X	X	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X			X	X	X	X	X	X
Bowfin			X							X	
~Brook Silverside										X	
#Brown Bullhead										X	X
Brown Trout							X	X			
~Central Mudminnow	X	X		X	X					X	
#Channel Catfish			X						X		X
Chestnut Lamprey		X	X	X	X	X	X	X	X		
#Common Carp	X	X	X		X	X		X	X		
Common Shiner	X			X	X						
#Creek Chub	X					X					
#Gizzard Shad						X		X	X	X	
~Golden Redhorse	X	X	X	X	X	X	X	X	X	X	X
#Golden Shiner											
Grass Pickerel		X	X	X	X		X	X		X	
~Greater Redhorse			X						X		
#Green Sunfish	X	X	X	X	X	X	X	X	X	X	X
~Greenside Darter								X			X
~Hornyhead Chub	X	X	X	X	X			X	X	X	X
Hybrid Minnow	X										
Hybrid Sunfish											X
Johnny Darter	X			X	X		X	X			
Largemouth Bass	X	X	X	X	X		X	X	X	X	X
~Logperch	X		X	X	X		X	X	X	X	X
~Longear Sunfish	X	X	X	X	X	X	X	X	X	X	X
Longnose Gar									X	X	
~Mimic Shiner	X		X	X	X		X	X	X	X	X
~Northern Brook Lamprey								X	X		
~Northern Hog Sucker	X	X	X	X	X	X	X	X	X	X	X
Northern Pike	X	X	X	X	X				X	X	

Tributaries to the St. Joseph River, Elkhart County, 2020 (continued)											
Stream	**Elkhart River**										
Site	**Shanklin Park (Above)**	**Hively Ave (CR 18)**		**Studebaker Park (A)**		**American Park**		**Prairie St.**		**Elkhart Ave.**	
		1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
Pirate Perch	X			X	X					X	X
Pumpkinseed	X							X			
~Rainbow Darter	X	X	X	X	X		X	X	X	X	X
Redear Sunfish	X			X	X						X
~River Redhorse		X	X		X		X	X			
~Rock Bass	X	X	X	X	X	X	X	X	X	X	X
`Rosyface Shiner	X	X	X	X	X	X	X	X		X	
~Sand Shiner	X	X		X	X	X		X	X	X	
~Shorthead Redhorse	X	X	X	X	X		X	X	X	X	X
Silver Lamprey		X									X
~Silver Redhorse			X	X		X		X		X	X
Silverjaw Minnow					X			X			
~Smallmouth Bass	X	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X	X	X	X	X	X
Spotted Gar										X	
Spotted Sucker	X	X	X	X	X	X		X	X	X	
~Stonecat					X						
Stoneroller, Central	X							X			
Striped Shiner	X	X		X	X	X	X	X	X	X	X
~Tadpole Madtom		X									
Walleye	X	X	X		X		X	X	X	X	X
Warmouth		X							X	X	X
#White Sucker	X	X	X	X	X	X	X	X	X	X	X
#Yellow Bullhead		X	X		X	X	X	X	X	X	X

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Tributaries to the St. Joseph River, Elkhart County, 2020										
Stream	**Trout Creek**		**Little Elkhart River**		**Baugo Creek**		**Christiana Creek**			
Site	**CR 2**		**SR 120**		**Restoration Site**		**CR 6**		**Willowdale Park**	
	1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
~American Brook Lamprey	X			X						
#Banded Killifish					X	X				
#Blacknose Dace					X	X				
Blackside Darter	X	X	X	X	X	X				
Blackstripe Topminnow							X	X		
Bluegill	X	X	X	X	X	X	X			X
#Bluntnose Minnow				X	X	X	X	X	X	X
Bowfin	X									X
#Brown Bullhead	X									
Brown Trout			X	X						
#Central Mudminnow	X		X	X						
#Channel Catfish								X		
Chestnut Lamprey			X	X			X	X		X
#Common Carp								X		
Common Shiner					X					
#Creek Chub			X	X	X	X	X	X		X
#Fathead Minnow					X					
~Golden Redhorse			X	X			X	X	X	X
Grass Pickerel			X	X				X	X	X
#Green Sunfish	X	X	X	X	X	X				
~Greenside Darter	X		X	X	X	X				
~Hornyhead Chub	X	X					X	X		X
Hybrid Sunfish						X				
Johnny Darter	X		X	X	X	X				
Largemouth Bass	X	X	X	X	X	X	X	X		X
~Logperch		X	X	X	X	X		X	X	X
~Longear Sunfish		X								
~Longnose Dace					X	X				
~Mimic Shiner					X	X				
Mottled Sculpin			X	X						
~Northern Brook Lamprey			X							
~Northern Hog Sucker	X	X	X	X	X		X	X	X	X
Pirate Perch			X							
Pumpkinseed	X	X			X					
#Quillback						X				
~Rainbow Darter	X	X	X	X	X	X	X	X	X	X
Rainbow Trout			X							
Redear Sunfish		X								X

Tributaries to the St. Joseph River, Elkhart County, 2020 (continued)										
Stream	**Trout Creek**		**Little Elkhart River**		**Baugo Creek**		**Christiana Creek**			
Site	**CR 2**		**SR 120**		**Restoration Site**		**CR 6**		**Willowdale Park**	
	1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
~River Chub							X	X		X
~Rock Bass	X	X	X	X	X	X	X	X	X	X
~Rosyface Shiner			X	X	X					
~Sand Shiner				X	X	X				
~Shorthead Redhorse		X	X	X					X	X
Silver Lamprey							X	X	X	
~Silver Redhorse					X		X			
Silverjaw Minnow					X	X				
~Smallmouth Bass	X	X	X	X	X	X	X	X	X	X
Spotfin Shiner	X	X	X	X	X	X	X	X	X	X
Spotted Gar							X			
Spotted Sucker			X							
~Stonecat	X	X					X	X	X	
Stoneroller, Central			X	X	X	X				
Striped Shiner		X	X	X	X	X	X	X	X	X
`Tadpole Madtom							X			
Walleye					X				X	
Warmouth									X	
#White Sucker		X	X	X	X	X	X	X	X	
#Yellow Bullhead	X	X					X	X	X	X
Yellow Perch	X	X								

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Tributaries to the St. Joseph River, Elkhart County, 2020													
Stream	**Stoney Creek**	**Turkey Creek**	**Horn Ditch**	**Leedy Ditch**	**Lily Creek**					**Pine Creek**		**Puterbaugh Creek**	
Site	**CR 40**	**CR 17**	**Eisen-hower Drive**	**CR 45**	**CR 4**	**High-land MHP**	**Sunset Ave.**	**McPher-son St.**	**Erwin St.**	**US 20 By-pass**		**Reedy Drive**	
										1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**
~American Brook Lamprey										X	X		
#Black Bullhead									X				
#Blacknose Dace	X		X	X						X	X		
Blackside Darter		X											
Blackstripe Topminnow		X											
Bluegill		X	X		X		X	X	X	X	X	X	X
#Bluntnose Minnow		X		X	X				X				
#Central Mudminnow	X	X					X	X		X	X	X	X
#Common Carp		X											
Common Shiner		X	X										
#Creek Chub	X		X	X		X		X	X	X	X		
#Fathead Minnow				X									
~Golden Redhorse		X											
Grass Pickerel	X	X								X	X	X	X
#Green Sunfish	X	X	X		X		X	X	X	X		X	X
~Hornyhead Chub				X									
Hybrid Sunfish												X	
Iowa Darter							X						
Johnny Darter	X	X	X				X	X	X	X		X	X
Largemouth Bass		X			X	X						X	X
~Longear Sunfish		X											
~Mimic Shiner		X											
Mottled Sculpin										X	X	X	X
~Northern Brook Lamprey		X											
~Northern Hog Sucker		X											
Pirate Perch		X						X	X				
~Rainbow Darter				X				X	X			X	X
Redear Sunfish												X	X
~Rock Bass		X							X				
~Rosyface Shiner		X											
Silver Lamprey		X											
Spotfin Shiner				X									
Spotted Sucker		X											
Stoneroller, Central			X					X					
Striped Shiner		X	X	X									
~Tadpole Madtom		X		X									

Tributaries to the St. Joseph River, Elkhart County, 2020													
Stream	**Stoney Creek**	**Turkey Creek**	**Horn Ditch**	**Leedy Ditch**	**Lily Creek**					**Pine Creek**		**Puterbaugh Creek**	
Site	**CR 40**	**CR 17**	**Eisen-hower Drive**	**CR 45**	**CR 4**	**High-land MHP**	**Sunset Ave.**	**McPher-son St.**	**Erwin St.**	**US 20 By-pass**		**Reedy Drive**	
										1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**
Warmouth												X	X
#White Sucker	X	X	X					X	X	X	X	X	
#Yellow Bullhead		X						X	X			X	
Yellow Perch					X	X	X		X				

Appendix E

Summary of macroinvertebrates (insects) collected by site, 2020

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). The following table displays the varioy sites sampled in 2020.

Site Number	Stream	Location	Site Number	Stream	Location
1	St. Joseph River	Toll Road (Bristol)	22	Christiana Creek	Willowdale Park
2	St. Joseph River	Six Span	24	Elkhart River	CR 18
3	St. Joseph River	Bridge Street	25	Elkhart River	Studebaker Park
6	St. Joseph River	Ironwood	27	Elkhart River	Prairie Ave.
7	St. Joseph River	Michigan St. (Below)	33	Baugo Creek	Restoration Site
8	St. Joseph River	Angela Blvd.	34	Auten Ditch	Locus Road (S)
10	St. Joseph River	Darden Road	35	Bowman Creek	Green Tech Drive
12	Trout Creek	CR 2	37	Bowman Creek	Studebaker Golf Course
13	Little Elkhart River	SR 120	39	Juday Creek	Ponader Park
15	Puterbaugh Creek	Reedy Drive	40	Juday Creek	Kintz Ave.
21	Christiana Creek	CR 6	42	Juday Creek	Izaak Walton Leauge

St. Joseph River - Toll Road (B)

Date Collected: 8/19/2020 Site #1

Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp		32	F
Turbellaria	+	604	F
Oligochaeta	+	0	T
Placobdella ornata	+	0	MT
Hyalella azteca	+	46	F
Gammarus fasciatus	+	37	F
Baetis intercalaris		4	F
Iswaeon anoka	+	1	MI
Procloeon sp (w/o hindwing pads)	+	0	MI
Isonychia sp	+	97	MI
Stenacron sp	+	52	F
Maccaffertium exiguum	+	173	MI
Maccaffertium mediopunctatum	+	155	MI
Maccaffertium pulchellum	+	86	MI
Maccaffertium terminatum		69	MI
Teloganopsis deficiens		63	I
Tricorythodes sp	+	236	MI
Caenis sp	+	8	F
Anthopotamus sp	+	9	MI
Coenagrionidae	+	0	T
Argia sp	+	0	F
Anax sp	+	0	MT
Nasiaeschna pentacantha	+	0	MT
Gomphidae	+	0	F
Pteronarcys sp	+	1	MI
Acroneuria abnormis	+	4	MI
Paragnetina sp		1	MI
Agnetina flavescens	+	5	I
Neoplea sp	+	1	F
Corydalus cornutus	+	9	MI
Neureclipsis sp		25	MI
Cheumatopsyche sp	+	124	F
Hydropsyche depravata group		3	F
Hydropsyche phalerata		13	MI
Macrostemum zebratum		51	I
Hydroptila sp		291	F
Oxyethira sp	+	0	F
Brachycentrus numerosus	+	17	MI
Neophylax sp	+	0	MI
Pycnopsyche sp	+	0	MI
Helicopsyche borealis		33	MI
Ceraclea sp		16	MI
Oecetis sp		41	F
Gyrinus sp		4	F
Peltodytes sp	+	0	MT
Psephenus herricki	+	0	MI
Macronychus glabratus	+	10	F
Stenelmis sp	+	3	F
Anopheles sp	+	0	F
Ablabesmyia mallochi	+	6	F
Labrundinia pilosella		12	F
Nilotanypus fimbriatus		24	F
Pentaneura inconspicua		6	F
Corynoneura lobata		107	F
Cricotopus (C.) bicinctus	+	64	T
Thienemanniella xena		32	F
Cryptochironomus sp	+	0	F
Dicrotendipes neomodestus	+	18	F
Phaenopsectra obediens group	+	0	F
Polypedilum flavum		334	F
Polypedilum (P.) fallax group		6	F
Polypedilum (P.) illinoense	+	18	T
Polypedilum (T.) scalaenum gp		6	F
Stenochironomus sp		6	F
Tanytarsus sp	+	0	F
Elimia sp	+	82	MI
Physella sp	+	1	T
Ferrissia sp		2	F
Corbicula fluminea	+	0	F

No. of Quantitative Taxa	51
No. of Qualitative Taxa	45
Total Taxa	69
No. Organisms	3048
Qualitative EPT	18
ICI	**42**

St. Joseph River - Six Span

Date Collected: 8/20/20 Site # 2

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	F	4		Oecetis avara	I	12	
Turbellaria	F	176		Oecetis persimilis	MI	20	
Nemertea	F	8		Petrophila sp	MI	1	
Hyalella azteca	F	1	+	Dineutus sp	F	2	+
Gammarus fasciatus	F	0	+	Macronychus glabratus	F	29	
Hydrachnidia	F	0	+	Stenelmis sp	F	0	+
Baetis intercalaris	F	1	+	Anopheles sp	F	0	+
Labiobaetis propinquus	MI	0	+	Ablabesmyia mallochi	F	39	+
Iswaeon anoka	MI	0	+	Larsia sp	MT	4	
Procloeon sp (w/o hindwing pads)	MI	0	+	Pentaneura sp	F	0	+
Isonychia sp	MI	36	+	Corynoneura sp		18	
Leucrocuta sp	MI	2	+	Cricotopus (C.) sp	F	4	
Stenacron sp	F	126	+	Cricotopus (C.) bicinctus	T	21	+
Maccaffertium exiguum	MI	241		Thienemanniella xena	F	4	
Maccaffertium mediopunctatum	MI	31		Dicrotendipes modestus	MT	0	+
Maccaffertium pulchellum	MI	58	+	Dicrotendipes neomodestus	F	218	+
Maccaffertium terminatum	MI	52	+	Polypedilum (U.) flavum	F	11	+
Teloganopsis deficiens	I	1	+	Polypedilum (P.) fallax group	F	7	
Tricorythodes sp	MI	1124	+	Polypedilum (P.) illinoense	T	0	+
Caenis sp	F	4		Stenochironomus sp	F	7	
Coenagrionidae	T	0	+	Tribelos jucundum	MT	0	+
Argia sp	F	2	+	Rheotanytarsus sp	F	7	
Acroneuria abnormis	MI	3		Tanytarsus sp	F	0	+
Perlinella sp	MI	1		Hemerodromia sp	F	2	
Neoplea sp	F	0	+	Elimia sp	MI	16	+
Corydalus cornutus	MI	0	+	Physella sp	T	0	+
Neureclipsis sp	MI	9		Ferrissia sp	F	2	
Polycentropus sp	MI	9		Corbicula fluminea	F	0	+
Cheumatopsyche sp	F	20	+	Villosa iris iris	MI	1	
Macrostemum zebratum	I	0	+	Lampsilis radiata luteola	MI	0	+
Hydroptila sp	F	90					
Oxyethira sp	F	2					
Brachycentrus numerosus	MI	3	+				
Neophylax sp	MI	0	+				
Pycnopsyche sp	MI	1					
Lepidostoma sp	MI	0	+				

No. of Quantitative Taxa	45
No. of Qualitative Taxa	39
Total Taxa	66
No. Organisms	2430
Qualitative EPT	16
ICI	**48**

St. Joseph River - Bridge Street

Date Collected: 8/20/20 Site #3

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	271	
Nemertea	F	8	
Placobdella ornata	MT	0	+
Caecidotea sp	T	0	+
Hyalella azteca	F	0	+
Gammarus fasciatus	F	3	+
Hydrachnidia	F	0	+
Plauditus dubius	MI	0	+
Baetis flavistriga	F	1	
Baetis intercalaris	F	0	+
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	1	+
Callibaetis sp	MT	0	+
Isonychia sp	MI	130	
Stenacron sp	F	16	+
Maccaffertium exiguum	MI	85	
Maccaffertium mediopunctatum	MI	26	
Maccaffertium pulchellum	MI	53	+
Maccaffertium terminatum	MI	26	+
Teloganopsis deficiens	I	35	+
Tricorythodes sp	MI	29	+
Caenis sp	F	2	
Anthopotamus sp	MI	0	+
Hexagenia sp	F	0	+
Ephoron sp	MI	0	+
Argia sp	F	0	+
Pteronarcys sp	MI	0	+
Acroneuria abnormis	MI	0	+
Paragnetina sp	MI	1	
Agnetina flavescens	I	19	
Neoplea sp	F	0	+
Corydalus cornutus	MI	1	
Polycentropus sp	MI	4	+
Cheumatopsyche sp	F	127	
Ceratopsyche sparna	F	2	
Hydropsyche aerata	MI	2	
Hydropsyche phalerata	MI	16	+
Macrostemum zebratum	I	59	
Hydroptila sp	F	2	
Ochrotrichia sp	MI	11	
Brachycentrus numerosus	MI	23	+
Pycnopsyche sp	MI	0	+
Petrophila sp	MI	2	
Dineutus sp	F	1	
Scirtidae	F	0	+
Macronychus glabratus	F	10	+
Stenelmis sp	F	0	+
Anopheles sp	F	0	+
Ablabesmyia mallochi	F	0	+
Ablabesmyia peleensis		1	+
Nilotanypus fimbriatus	F	4	
Corynoneura sp		3	
Cricotopus (C.) sp	F	4	
Cricotopus (C.) bicinctus	T	0	+
Thienemanniella xena	F	1	
Tvetenia discoloripes group	MI	1	
Cryptotendipes pseudotener	F	0	+
Dicrotendipes neomodestus	F	25	+
Dicrotendipes simpsoni	T	1	
Glyptotendipes (G.) sp	MT	3	
Polypedilum (U.) flavum	F	45	
Polypedilum (P.) fallax group	F	1	
Polypedilum (P.) illinoense	T	4	+
Stenochironomus sp	F	5	
Tribelos jucundum	MT	0	+
Rheotanytarsus sp	F	20	
Tanytarsus sepp	F	1	
Hemerodromia sp	F	1	
Hydrobiidae	F	11	
Elimia sp	MI	19	+
Physella sp	T	2	+
Planorbidae	MT	11	
Corbicula fluminea	F	0	+
Pleurobema sintoxia	MI	0	+
Villosa iris iris	MI	0	+
Lampsilis radiata luteola	MI	0	+

No. of Quantitative Taxa	49
No. of Qualitative Taxa	43
Total Taxa	76
No. Organisms	1129
Qualitative EPT	19
ICI	**48**

St. Joseph River - Irownwood

Date Collected: 8/17/20 Site # 6

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	0	+
Oligochaeta	T	0	+
Caecidotea sp	T	0	+
Hydrachnidia	F	0	+
Callibaetis sp	MT	0	+
Leucrocuta sp	MI	0	+
Stenacron sp	F	0	+
Maccaffertium pulchellum	MI	0	+
Maccaffertium terminatum	MI	0	+
Tricorythodes sp	MI	0	+
Coenagrionidae	T	0	+
Argia sp	F	0	+
Cheumatopsyche sp	F	0	+
Hydropsyche phalerata	MI	0	+
Macrostemum zebratum	I	0	+
Stenelmis sp	F	0	+
Anopheles sp	F	0	+
Ablabesmyia mallochi	F	0	+
Cryptochironomus sp	F	0	+
Dicrotendipes neomodestus	F	0	+
Polypedilum (P.) illinoense	T	0	+
Hydrobiidae	F	0	+
Elimia sp	MI	0	+
Physella sp	T	0	+
Corbicula fluminea	F	0	+
Dreissena polymorpha	F	0	+

No. of Quantitative Taxa	0
No. of Qualitative Taxa	26
Total Taxa	26
No. Organisms	0
Qualitative EPT	9
ICI	**Fair**

St. Jospeh River - Michigan (B)

Date Collected: 08/17/2020 Site #7

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	100	+	Brachycentrus numerosus	MI	29	+
Oligochaeta	T	0	+	Pycnopsyche sp	MI	0	+
Gammaridae		1	+	Oecetis persimilis	MI	7	
Hydrachnidia	F	2	+	Psephenus herricki	MI	0	+
Plauditus dubius	MI	9	+	Macronychus glabratus	F	3	+
Baetis intercalaris	F	75	+	Stenelmis sp	F	3	+
Labiobaetis propinquus	MI	0	+	Anopheles sp	F	0	+
Iswaeon anoka	MI	4	+	Simulium sp	F	0	+
Heterocloeon (H.) sp	I	0	+	Nilotanypus fimbriatus	F	3	
Isonychia sp	MI	106	+	Cricotopus (C.) bicinctus	T	1	+
Leucrocuta sp	MI	3	+	Eukiefferiella gracei group	MI	0	+
Stenacron sp	F	31	+	Thienemanniella xena	F	2	
Maccaffertium exiguum	MI	110	+	Tvetenia bavarica group	MI	18	
Maccaffertium mediopunctatum	MI	13		Polypedilum (U.) flavum	F	22	+
Maccaffertium pulchellum	MI	122		Polypedilum (P.) illinoense	T	0	+
Maccaffertium terminatum	MI	38		Stenochironomus sp	F	2	
Teloganopsis deficiens	I	62	+	Xenochironomus xenolabis	F	1	+
Tricorythodes sp	MI	267	+	Hemerodromia sp	F	1	
Argia sp	F	7	+	Elimia sp	MI	172	+
Agnetina flavescens	I	9		Physella sp	T	1	+
Chimarra obscura	MI	17		Corbicula fluminea	F	0	+
Cheumatopsyche sp	F	73	+	Actinonaias l. carinata	MI	0	+
Hydropsyche aerata	MI	5					
Hydropsyche phalerata	MI	34					
Hydropsyche phalerata	MI	34					
Hydropsyche simulans	MI	2					
Macrostemum zebratum	I	189					
Protoptila sp	I	33					

No. of Quantitative Taxa	39
No. of Qualitative Taxa	33
Total Taxa	50
No. Organisms	1611
Qualitative EPT	14
ICI	**48**

St. Joseph River - Angela Blvd.

Date Collected: 08/17/20 Site #8

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	F	0	+
Turbellaria	F	18	
Helobdella papillata	MT	0	+
Hyalella azteca	F	0	+
Gammarus sp	F	2	+
Hydrachnidia	F	0	+
Plauditus dubius	MI	8	
Baetis intercalaris	F	37	
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	0	+
Isonychia sp	MI	10	+
Leucrocuta sp	MI	4	+
Stenacron sp	F	98	+
Maccaffertium exiguum	MI	43	+
Maccaffertium pulchellum	MI	35	
Maccaffertium terminatum	MI	8	+
Teloganopsis deficiens	I	15	+
Tricorythodes sp	MI	157	+
Caenis sp	F	0	+
Baetisca sp	MI	0	+
Hetaerina sp	F	0	+
Coenagrionidae	T	0	+
Argia sp	F	1	+
Agnetina flavescens	I	1	
Climacia sp	F	0	+
Polycentropus sp	MI	2	
Cheumatopsyche sp	F	118	+
Hydropsyche sp or Ceratopsyche sp		2	
Hydropsyche phalerata	MI	13	
Hydropsyche venularis	MI	2	

Taxa Name	Qualitative	Quantitative	Tolerance
Macrostemum zebratum	I	0	+
Hydroptilidae	F	2	
Ochrotrichia sp	MI	1	
Brachycentrus numerosus	MI	1	+
Neophylax sp	MI	0	+
Nectopsyche exquisita	MI	0	+
Oecetis persimilis	MI	2	
Psephenus herricki	MI	0	+
Helichus sp	F	0	+
Macronychus glabratus	F	3	+
Stenelmis sp	F	8	+
Anopheles sp	F	0	+
Ablabesmyia mallochi	F	2	
Thienemanniella xena	F	14	
Dicrotendipes simpsoni	T	2	
Glyptotendipes (G.) sp	MT	3	
Polypedilum (U.) flavum	F	13	+
Polypedilum (P.) illinoense	T	0	+
Stenochironomus sp	F	3	
Rheotanytarsus sp	F	1	+
Hemerodromia sp	F	1	
Elimia sp	MI	64	+
Physella sp	T	0	+

No. of Quantitative Taxa	34
No. of Qualitative Taxa	35
Total Taxa	53
No. Organisms	694
Qualitative EPT	16
ICI	**52**

St. Joseph River - Darden Road

Date Collected: 08/17/20 Site # 10

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	F	1		Triaenodes injustus	MI	0	+
Turbellaria	F	45	+	Peltodytes sp	MT	0	+
Gammarus fasciatus	F	0	+	Psephenus herricki	MI	0	+
Hydrachnidia	F	0	+	Ancyronyx variegata	F	4	
Plauditus dubius	MI	0	+	Macronychus glabratus	F	25	
Baetis intercalaris	F	23	+	Stenelmis sp	F	2	+
Labiobaetis propinquus	MI	0	+	Anopheles sp	F	0	+
Iswaeon anoka	MI	0	+	Simulium sp	F	2	+
Isonychia sp	MI	25	+	Nilotanypus fimbriatus	F	1	
Leucrocuta sp	MI	0	+	Pentaneura inconspicua	F	2	
Stenacron sp	F	19	+	Corynoneura lobata	F	4	
Maccaffertium exiguum	MI	86		Cricotopus (C.) bicinctus	T	0	+
Maccaffertium mediopunctatum	MI	26		Cricotopus (I.) sylvestris group	T	0	+
Maccaffertium pulchellum	MI	2		Thienemanniella xena	F	11	+
Maccaffertium terminatum	MI	10		Tvetenia discoloripes group	MI	24	
Teloganopsis deficiens	I	127		Polypedilum (U.) flavum	F	42	
Tricorythodes sp	MI	15	+	Polypedilum (P.) illinoense	T	0	+
Coenagrionidae	T	0	+	Stenochironomus sp	F	2	
Argia sp	F	7	+	Tribelos fuscicorne	F	1	
Agnetina flavescens	I	2		Rheotanytarsus sp	F	2	
Belostoma sp	T	0	+	Hemerodromia sp	F	1	
Ranatra sp	F	0	+	Ephydridae	F	0	+
Chimarra obscura	MI	34		Hydrobiidae	F	0	+
Neureclipsis sp	MI	16		Elimia sp	MI	37	+
Cheumatopsyche sp	F	154		Physella sp	T	0	+
Ceratopsyche morosa group	MI	11		Gyraulus sp	MT	0	+
Hydropsyche phalerata	MI	108	+	Planorbella (Pierosoma) pilsbryi	T	0	+
Macrostemum zebratum	I	138		Corbicula fluminea	F	0	+
Hydroptila sp	F	0	+	No. of Quantitative Taxa	38		
Ochrotrichia sp	MI	11		No. of Qualitative Taxa	38		
Brachycentrus numerosus	MI	21	+	Total Taxa	62		
Neophylax sp	MI	0	+	No. Organisms	1046		
Lepidostoma sp	MI	4	+	Qualitative EPT	15		
Leptoceridae		1	+	**ICI**	**54**		

Trout Creek - CR 2

Date Collected: 8/24/2020 Site # 12

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	15	+
Gammarus sp	F	0	+
Orconectes sp	F	0	+
Hydrachnidia	F	0	+
Baetidae		3	
Acerpenna pygmaea	MI	0	+
Baetis tricaudatus	MI	0	+
Baetis flavistriga	F	0	+
Baetis intercalaris	F	0	+
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	0	+
Stenacron sp	F	27	+
Maccaffertium exiguum	MI	36	+
Maccaffertium terminatum	MI	12	
Maccaffertium vicarium	MI	0	+
Tricorythodes sp	MI	2	+
Caenis sp	F	0	+
Calopteryx sp	F	0	+
Hetaerina sp	F	0	+
Coenagrionidae	T	0	+
Argia sp	F	3	+
Ophiogomphus sp	MI	0	+
Corduliidae		0	+
Acroneuria abnormis	MI	2	
Agnetina flavescens	I	1	+
Corydalus cornutus	MI	9	+
Chimarra obscura	MI	2	
Neureclipsis sp	MI	3	+
Cheumatopsyche sp	F	3	
Hydropsyche depravata group	F	7	+
Hydropsyche venularis	MI	1	+
Macrostemum zebratum	I	10	+
Neophylax sp	MI	0	+
Pycnopsyche sp	MI	0	+
Lepidostoma sp	MI	0	+
Helicopsyche borealis	MI	2	+
Dineutus sp	F	0	+
Psephenus herricki	MI	0	+
Macronychus glabratus	F	18	+
Stenelmis sp	F	1	+
Simulium sp	F	0	+
Pentaneura inconspicua	F	3	+
Chironominae		1	
Polypedilum (U.) flavum	F	22	+
Stenochironomus sp	F	1	
Chrysops sp	F	0	+
Elimia sp	MI	1	+
Ferrissia sp	F	1	+
Corbicula fluminea	F	0	+
Dreissena polymorpha	F	0	+

No. of Quantitative Taxa	25
No. of Qualitative Taxa	43
Total Taxa	50
No. Organisms	186
Qualitative EPT	20
ICI	**44**

Little Elkhart River - SR120

Date Collected: 08/24/2020 Site # 13

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	0	+
Oligochaeta	T	9	
Caecidotea sp	T	0	+
Hyalella azteca	F	0	+
Gammarus pseudolimnaeus	F	0	+
Orconectes (Crokerinus) propinquus	F	0	+
Hydrachnidia	F	0	+
Baetis flavistriga	F	19	+
Baetis intercalaris	F	3	
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	0	+
Paracloeodes minutus	MI	0	+
Isonychia sp	MI	0	+
Stenacron sp	F	2	+
Maccaffertium exiguum	MI	47	+
Maccaffertium mediopunctatum	MI	2	+
Baetisca sp	MI	0	+
Calopteryx sp	F	0	+
Boyeria vinosa	F	0	+
Ophiogomphus sp	MI	0	+
Pteronarcys sp	MI	0	+
Acroneuria internata	MI	2	
Paragnetina media	MI	9	
Ranatra sp	F	0	+
Neoplea sp	F	0	+
Corydalus cornutus	MI	1	
Lype diversa	MI	3	
Cheumatopsyche sp	F	15	+
Ceratopsyche morosa group	MI	0	+
Ceratopsyche sparna	F	10	
Hydroptila sp	F	4	
Brachycentrus numerosus	MI	1	+
Neophylax sp	MI	0	+
Helicopsyche borealis	MI	0	+
Gyrinus sp	F	0	+
Ancyronyx variegata	F	0	+
Macronychus glabratus	F	16	+
Optioservus trivittatus	MI	0	+
Stenelmis sp	F	0	+
Antocha sp	MI	1	
Nilotanypus fimbriatus	F	2	
Corynoneura lobata	F	6	
Cricotopus (C.) sp	F	114	+
Cricotopus (C.) bicinctus	T	18	
Orthocladius (O.) sp	F	4	
Paratrichocladius sp	MI	9	
Thienemanniella similis	MI	4	
Thienemanniella xena	F	66	
Tvetenia bavarica group	MI	22	
Dicrotendipes neomodestus	F	18	+
Glyptotendipes (G.) sp	MT	13	
Microtendipes pedellus group	F	4	+
Paratendipes albimanus	F	0	+
Polypedilum (U.) aviceps	MI	4	
Polypedilum (U.) flavum	F	9	
Polypedilum (Tripodura) scalaenum group	F	4	
Paratanytarsus sp	F	4	
Rheotanytarsus pellucidus	MI	4	
Rheotanytarsus sp	F	31	
Chrysops sp	F	0	+
Neoplasta sp	MI	3	
Hemerodromia sp	F	3	
Elimia sp	MI	1	+
Physella sp	T	0	+
Ancylidae	F	1	
Corbicula fluminea	F	0	+

No. of Quantitative Taxa	38
No. of Qualitative Taxa	39
Total Taxa	66
No. Organisms	488
Qualitative EPT	15
ICI	**36**

Puterbaugh Creek - Reedy Drive

Date Collected: 8/17/20 Site # 15

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	2	
Oligochaeta	T	3	
Helobdella stagnalis	T	0	+
Erpobdella punctata punctata	MT	0	+
Amphipoda		2	
Gammarus sp	F	0	+
Orconectes sp	F	0	+
Hydrachnidia	F	1	+
Stenacron sp	F	10	+
Calopteryx sp	F	3	+
Coenagrionidae	T	0	+
Boyeria vinosa	F	0	+
Belostoma sp	T	0	+
Notonecta sp	T	0	+
Corydalus cornutus	MI	1	
Cheumatopsyche sp	F	3	
Hydropsyche depravata group	F	0	+
Pycnopsyche sp	MI	0	+
Helicopsyche borealis	MI	0	+
Peltodytes sp	MT	0	+
Dubiraphia sp	F	0	+
Macronychus glabratus	F	10	+
Stenelmis sp	F	0	+
Anopheles sp	F	0	+
Ablabesmyia mallochi	F	6	
Ablabesmyia rhamphe group	MT	6	
Conchapelopia sp	F	32	+
Pentaneura inconspicua	F	3	+
Thienemannimyia group	F	3	
Brillia flavifrons group	F	3	
Corynoneura sp 12	MI	6	
Cryptochironomus sp	F	0	+
Microtendipes	MI	3	
Microtendipes pedellus gp.	F	60	
Polypedilum (U.) flavum	F	19	
Polypedilum (P.) fallax group	F	16	
Polypedilum (T.) halterale gp.	MT	0	+
Polypedilum (T.) scalaenum gp.	F	6	+
Rheotanytarsus sp	F	38	+
Tanytarsus glabrescens gp. sp 7	F	3	
Tanytarsus sepp	F	0	+
Hemerodromia sp	F	3	
Viviparidae		0	+
Elimia sp	MI	32	+
Lymnaeidae		0	+
Physella sp	T	0	+
Planorbella (Pierosoma) pilsbryi	T	0	+
Ferrissia sp	F	56	+
Corbicula fluminea	F	0	+

No. of Quantitative Taxa	26
No. of Qualitative Taxa	33
Total Taxa	49
No. Organisms	330
Qualitative EPT	4
ICI	**Fair**

Christiana Creek - CR 6

Date Collected: 8/17/20 Site # 21

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	21	
Oligochaeta	T	1	
Gammaridae		3	
Orconectes sp	F	0	+
Hydrachnidia	F	0	+
Plauditus dubius	MI	0	+
Baetis flavistriga	F	0	+
Baetis intercalaris	F	130	+
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	1	+
Isonychia sp	MI	2	
Leucrocuta sp	MI	0	+
Stenacron sp	F	0	+
Maccaffertium exiguum	MI	91	+
Maccaffertium terminatum	MI	73	+
Teloganopsis deficiens	I	56	+
Tricorythodes sp	MI	26	+
Hetaerina sp	F	8	+
Argia sp	F	0	+
Acroneuria abnormis	MI	7	+
Acroneuria internata	MI	1	
Belostoma sp	T	0	+
Ranatra sp	F	0	+
Sialis sp	MT	0	+
Corydalus cornutus	MI	3	+
Chimarra obscura	MI	1	
Cheumatopsyche sp	F	12	+
Ceratopsyche sparna	F	2	+
Hydropsyche phalerata	MI	7	+
Hydroptilidae	F	1	
Neophylax sp	MI	0	+
Pycnopsyche sp	MI	0	+
Lepidostoma sp	MI	1	
Helicopsyche borealis	MI	0	+
Oecetis persimilis	MI	2	
Triaenodes sp	MI	0	+
Psephenus herricki	MI	1	+
Macronychus glabratus	F	2	+
Stenelmis sp	F	1	+
Simulium sp	F	3	+
Conchapelopia sp	F	1	
Hayesomyia senata	F	1	
Nilotanypus fimbriatus	F	1	
Pentaneura inconspicua	F	8	
Rheopelopia paramaculipennis	MI	1	
Corynoneura lobata	F	35	
Cricotopus (C.) bicinctus	T	1	
Nanocladius (N.) crassicornus	F	1	
Rheocricotopus (P.) robacki	F	1	
Thienemanniella taurocapita	MI	7	
Tvetenia sp	MI	3	
Cryptochironomus sp	F	0	+
Dicrotendipes neomodestus	F	1	
Microtendipes rydalensis	MI	1	
Polypedilum (U.) flavum	F	3	
Polypedilum (P.) illinoense	T	0	+
Polypedilum (Tripodura) sc. gp.	F	0	+
Rheotanytarsus sp	F	4	
Hemerodromia sp	F	4	
Elimia sp	MI	14	+
Ferrissia sp	F	3	
Corbicula fluminea	F	0	+
Dreissena polymorpha	F	0	+

No. of Quantitative Taxa	43
No. of Qualitative Taxa	37
Total Taxa	63
No. Organisms	546
Qualitative EPT	19
ICI	**48**

Christiana Creek - Willowdale Park

Date Collected: 08/17/20 Site # 22

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	F	1		Haliplus sp	MT	0	+
Turbellaria	F	0	+	Psephenus herricki	MI	0	+
Nemertea	F	2		Macronychus glabratus	F	11	+
Gammarus sp	F	2		Optioservus sp	MI	0	+
Gammarus fasciatus	F	0	+	Stenelmis sp	F	1	+
Hydrachnidia	F	0	+	Simulium sp	F	0	+
Baetis flavistriga	F	0	+	Ablabesmyia mallochi	F	1	
Baetis intercalaris	F	0	+	Conchapelopia sp	F	2	
Labiobaetis propinquus	MI	0	+	Pentaneura inconspicua	F	9	
Iswaeon anoka	MI	0	+	Corynoneura lobata	F	23	
Pseudocentroptiloides sp.	MI	0	+	Cricotopus (C.) bicinctus	T	0	+
Isonychia sp	MI	11	+	Thienemanniella taurocapita	MI	1	
Leucrocuta sp	MI	0	+	Tvetenia discoloripes group	MI	1	
Stenacron sp	F	76		Endochironomus nigricans	MT	0	+
Maccaffertium exiguum	MI	199	+	Microtendipes pedellus group	F	1	
Maccaffertium mediopunctatum	MI	52	+	Phaenopsectra obediens group	F	2	
Maccaffertium terminatum	MI	71		Polypedilum (U.) flavum	F	2	
Teloganopsis deficiens	I	42	+	Polypedilum (P.) fallax group	F	1	
Tricorythodes sp	MI	1	+	Polypedilum (P.) illinoense	T	1	+
Hetaerina sp	F	2	+	Polypedilum (Tripodura) sc. Grp.	F	2	+
Coenagrionidae	T	0	+	Stenochironomus sp	F	1	
Argia sp	F	2	+	Stelechomyia sp	F	1	
Acroneuria abnormis	MI	2		Tribelos jucundum	MT	3	
Corydalus cornutus	MI	3	+	Rheotanytarsus sp	F	2	
Chimarra obscura	MI	2	+	Hemerodromia sp	F	1	
Neureclipsis sp	MI	2	+	Elimia sp	MI	34	+
Polycentropus sp	MI	2	+	Physella sp	T	0	+
Cheumatopsyche sp	F	35		Ferrissia sp	F	3	+
Ceratopsyche sparna	F	0	+	Dreissena polymorpha	F	0	+
Hydropsyche depravata group	F	5	+	Pisidiidae		0	+
Hydropsyche phalerata	MI	15	+				
Macrostemum zebratum	I	3					
Hydroptila sp	F	0	+				
Brachycentrus numerosus	MI	4	+				
Helicopsyche borealis	MI	0	+				
Oecetis persimilis	MI	3	+				

No. of Quantitative Taxa	44
No. of Qualitative Taxa	43
Total Taxa	66
No. Organisms	640
Qualitative EPT	21
ICI	**50**

Elkhart River - CR 18

Date Collected: 08/17/20 Site #24

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	F	0	+
Turbellaria	F	3	+
Oligochaeta	T	3	+
Caecidotea sp	T	0	+
Gammarus pseudolimnaeus	F	4	+
Cambarus sp		0	+
Hydrachnidia	F	0	+
Baetis flavistriga	F	7	+
Baetis intercalaris	F	4	+
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	0	+
Isonychia sp	MI	4	
Leucrocuta sp	MI	0	+
Stenacron sp	F	34	+
Maccaffertium exiguum	MI	21	+
Maccaffertium mediopunctatum	MI	24	+
Maccaffertium pulchellum	MI	3	
Maccaffertium terminatum	MI	9	
Teloganopsis deficiens	I	4	
Tricorythodes sp	MI	2	+
Ephemera sp	MI	1	
Calopteryx sp	F	0	+
Coenagrionidae	T	0	+
Argia sp	F	1	+
Pteronarcys sp	MI	1	+
Agnetina flavescens	I	2	+
Corydalus cornutus	MI	0	+
Sisyra sp	F	0	+
Cheumatopsyche sp	F	51	
Ceratopsyche morosa group	MI	16	
Hydropsyche phalerata	MI	0	+
Hydroptila sp	F	7	
Brachycentrus numerosus	MI	10	+
Pycnopsyche sp	MI	0	+
Nectopsyche diarina	MI	0	+
Psephenus herricki	MI	0	+
Macronychus glabratus	F	2	
Optioservus trivittatus	MI	0	+
Stenelmis sp	F	0	+
Antocha sp	MI	0	+
Anopheles sp	F	0	+
Simulium sp	F	0	+
Nilotanypus fimbriatus	F	2	
Corynoneura lobata	F	2	
Thienemanniella xena	F	1	
Cryptochironomus sp	F	0	+
Dicrotendipes neomodestus	F	9	
Paratendipes albimanus	F	0	+
Polypedilum (U.) flavum	F	9	
Polypedilum (P.) fallax group	F	4	
Polypedilum (P.) illinoense	T	0	+
Polypedilum (T.) scalaenum grp	F	0	+
Rheotanytarsus sp	F	7	+
Hemerodromia sp	F	0	+
Elimia sp	MI	144	+
Physella sp	T	1	
Ferrissia sp	F	0	+
Sphaerium sp	F	0	+

No. of Quantitative Taxa	31
No. of Qualitative Taxa	42
Total Taxa	58
No. Organisms	392
Qualitative EPT	15
ICI	**38**

Elkhart River - Studebaker Park

Date Collected: 08/17/20 Site #25

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	F	0	+
Turbellaria	F	6	+
Oligochaeta	T	0	+
Caecidotea sp	T	0	+
Hyalella azteca	F	0	+
Gammarus pseudolimnaeus	F	0	+
Orconectes sp	F	0	+
Hydrachnidia	F	0	+
Baetis flavistriga	F	4	+
Baetis intercalaris	F	50	+
Labiobaetis propinquus	MI	0	+
Iswaeon anoka	MI	0	+
Callibaetis sp	MT	0	+
Paracloeodes minutus	MI	0	+
Isonychia sp	MI	1	
Leucrocuta sp	MI	1	+
Stenacron sp	F	1	+
Maccaffertium exiguum	MI	22	
Maccaffertium mediopunctatum	MI	9	+
Maccaffertium pulchellum	MI	1	
Maccaffertium terminatum	MI	7	+
Teloganopsis deficiens	I	7	
Tricorythodes sp	MI	1	+
Calopteryx sp	F	0	+
Coenagrionidae	T	0	+
Macromia sp	MI	0	+
Pteronarcys sp	MI	0	+
Perlinella sp	MI	0	+
Agnetina flavescens	I	3	+
Belostoma sp	T	0	+
Pelocoris sp	MT	0	+
Corydalus cornutus	MI	1	+
Lype diversa	MI	1	
Nyctiophylax sp	MI	1	
Polycentropus sp	MI	0	+
Cheumatopsyche sp	F	20	
Ceratopsyche morosa group	MI	12	
Ceratopsyche sparna	F	15	

Taxa Name	Qualitative	Quantitative	Tolerance
Hydropsyche phalerata	MI	20	+
Hydropsyche venularis	MI	3	
Ochrotrichia sp	MI	2	
Brachycentrus numerosus	MI	6	+
Helicopsyche borealis	MI	0	+
Nectopsyche diarina	MI	0	+
Peltodytes sp	MT	0	+
Psephenus herricki	MI	0	+
Ancyronyx variegata	F	1	+
Macronychus glabratus	F	55	+
Stenelmis sp	F	0	+
Anopheles sp	F	0	+
Simulium sp	F	0	+
Nilotanypus fimbriatus	F	2	
Corynoneura lobata	F	2	
Thienemanniella xena	F	8	
Tvetenia discoloripes group	MI	5	
Dicrotendipes neomodestus	F	0	+
Polypedilum (U.) flavum	F	5	
Polypedilum (P.) illinoense	T	2	+
Polypedilum (P.) laetum group	MI	2	
Polypedilum (T.) scalaenum grp	F	0	+
Stictochironomus sp	F	0	+
Rheotanytarsus pellucidus	MI	2	
Rheotanytarsus sp	F	11	
Tanytarsus sp	F	0	+
Hemerodromia sp	F	2	
Elimia sp	MI	22	+
Physella sp	T	0	+
Ferrissia sp	F	0	+
Sphaerium sp	F	0	+
Actinonaias ligamentina carinata	MI	0	+

No. of Quantitative Taxa	36
No. of Qualitative Taxa	50
Total Taxa	70
No. Organisms	313
Qualitative EPT	19
ICI	**52**

Elkhart River - Prairie St.

Date Collected: 08/17/20 Site #27

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	109	+
Caecidotea sp	T	0	+
Gammarus pseudolimnaeus	F	0	+
Orconectes (P.) rusticus	F	0	+
Hydrachnidia	F	0	+
Plauditus dubius	MI	60	+
Baetis flavistriga	F	210	+
Baetis intercalaris	F	222	+
Iswaeon anoka	MI	60	+
Paracloeodes minutus	MI	0	+
Isonychia sp	MI	289	+
Leucrocuta sp	MI	0	+
Stenacron sp	F	0	+
Maccaffertium exiguum	MI	268	+
Maccaffertium mediopunctatum	MI	115	+
Maccaffertium pulchellum	MI	7	
Maccaffertium terminatum	MI	113	
Teloganopsis deficiens	I	83	
Tricorythodes sp	MI	82	+
Calopteryx sp	F	0	+
Macromia sp	MI	0	+
Pteronarcys sp	MI	0	+
Acroneuria lycorias	I	0	+
Paragnetina sp	MI	1	+
Agnetina flavescens	I	6	+
Corydalus cornutus	MI	4	
Cheumatopsyche sp	F	215	+
Ceratopsyche morosa group	MI	15	+
Ceratopsyche sparna	F	15	
Hydropsyche aerata	MI	32	
Hydropsyche depravata group	F	0	+
Hydropsyche phalerata	MI	232	
Hydropsyche venularis	MI	34	
Hydroptila sp	F	58	
Brachycentrus numerosus	MI	61	
Pycnopsyche sp	MI	0	+
Leptoceridae		0	+
Petrophila sp	MI	2	
Psephenus herricki	MI	0	+
Macronychus glabratus	F	10	+
Stenelmis sp	F	0	+
Ceratopogonidae	T	0	+
Ablabesmyia mallochi	F	11	
Nilotanypus fimbriatus	F	23	
Cardiocladius obscurus	MI	23	+
Cricotopus sp	F	8	
Cricotopus (C.) bicinctus	T	68	
Cricotopus (C.) tremulus grp.	MT	23	
Cricotopus (C) or Orthocladius sp		23	
Parakiefferiella sp	F	23	
Rheocricotopus (P.) robacki	F	11	
Thienemanniella xena	F	70	
Tvetenia discoloripes group	MI	102	
Cryptotendipes sp	F	0	+
Dicrotendipes neomodestus	F	114	+
Paratendipes albimanus	F	0	+
Polypedilum (U.) flavum	F	466	
Polypedilum (P.) fallax group	F	11	
Polypedilum (T.) scalaenum grp	F	0	+
Rheotanytarsus sp	F	11	
Hemerodromia sp	F	16	
Hydrobiidae	F	0	+
Elimia sp	MI	2	+
Physella sp	T	0	+
Ferrissia sp	F	0	+
Corbicula fluminea	F	0	+

No. of Quantitative Taxa	42
No. of Qualitative Taxa	41
Total Taxa	66
No. Organisms	3308
Qualitative EPT	20
ICI	**48**

Baugo Creek - Restoration Site

Date Collected: 8/21/20 Site #33

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	F	2		Parametriocnemus sp	F	2	
Turbellaria	F	1	+	Rheocricotopus (P.) robacki	F	2	
Oligochaeta	T	0	+	Tvetenia bavarica group	MI	42	+
Erpobdellidae	MT	0	+	Chironomus (C.) decorus group	T	0	+
Caecidotea sp	T	0	+	Cryptochironomus sp	F	0	+
Hyalella azteca	F	0	+	Cryptotendipes sp	F	0	+
Gammarus sp	F	0	+	Dicrotendipes neomodestus	F	0	+
Orconectes sp	F	0	+	Microtendipes "caelum"	MI	0	+
Hydrachnidia	F	0	+	Paratendipes albimanus	F	0	+
Baetis flavistriga	F	177	+	Polypedilum (U.) flavum	F	74	+
Baetis intercalaris	F	51	+	Polypedilum (P.) fallax group	F	9	
Stenacron sp	F	0	+	Polypedilum (T.) scalaenum grp.	F	0	+
Maccaffertium exiguum	MI	9	+	Cladotanytarsus sp		0	+
Calopterygidae	F	1		Cladotanytarsus mancus group	F	0	+
Calopteryx sp	F	0	+	Paratanytarsus sp	F	2	
Hetaerina sp	F	0	+	Rheotanytarsus sp	F	60	
Coenagrionidae	T	0	+	Tanytarsus sp	F	0	+
Boyeria vinosa	F	0	+	Hemerodromia sp	F	2	
Corixidae	F	0	+	Physella sp	T	0	+
Cheumatopsyche sp	F	19		Ferrissia sp	F	0	+
Ceratopsyche morosa group	MI	363	+	Corbicula fluminea	F	8	+
Berosus sp	MT	0	+				
Ancyronyx variegata	F	0	+				
Stenelmis sp	F	0	+				
Simulium sp	F	0	+				
Ablabesmyia peleensis		0	+				
Conchapelopia sp	F	5	+				
Hayesomyia senata or T. norena	F	0	+				
Nilotanypus fimbriatus	F	2					
Procladius (Holotanypus) sp	MT	0	+				
Cricotopus sp	F	2					

No. of Quantitative Taxa	20
No. of Qualitative Taxa	41
Total Taxa	52
No. Organisms	833
Qualitative EPT	5
ICI	**36**

Auten Ditch - Locust Road (S)
Date Collected: 8/21/2020 Site #34

Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	F	8	
Turbellaria	F	1	
Oligochaeta	T	63	+
Helobdella stagnalis	T	1	+
Erpobdella punctata punctata	MT	0	+
Gammarus pseudolimnaeus	F	8	
Orconectes sp	F	3	
Calopteryx sp	F	3	+
Macronychus glabratus	F	18	
Procladius (Holotanypus) sp	MT	0	+
Chironomus (C.) decorus group	T	0	+
Dicrotendipes neomodestus	F	61	
Microtendipes pedellus group	F	1195	
Paralauterborniella nigrohalteralis	F	0	+
Paratendipes albimanus or P. duplicatus	F	466	+
Phaenopsectra flavipes	MT	41	
Polypedilum (Uresipedilum) flavum	F	20	
Polypedilum (P.) fallax group	F	203	
Paratanytarsus sp	F	182	
Pisidiidae		4	

No. of Quantitative Taxa	16
No. of Qualitative Taxa	8
Total Taxa	20
No. Organisms	2277
Qualitative EPT	0
ICI	**Poor**

Bowman Creek - Green Tech Drive

Date Collected: 8/21/2020 Site # 35

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	F	0	+
Hydra sp	F	18	
Turbellaria	F	648	+
Fredericella sp	F	1	
Plumatella sp	F	1	
Oligochaeta	T	287	+
Helobdella stagnalis	T	1	+
Helobdella papillata	MT	31	+
Erpobdella punctata punctata	MT	2	+
Caecidotea sp	T	0	+
Hyalella azteca	F	13	+
Orconectes (G.) immunis	T	1	
Hydrachnidia	F	0	+
Stenacron sp	F	1	
Caenis sp	F	0	+
Calopteryx sp	F	0	+
Coenagrionidae	T	19	+
Boyeria vinosa	F	1	
Corduliidae		0	+
Erythemis simplicicollis	MT	1	+
Neoplea sp	F	0	+
Sialis sp	MT	0	+
Cheumatopsyche sp	F	1	
Oecetis sp	F	8	
Oecetis inconspicua complex	F	4	+
Berosus sp	MT	1	
Macronychus glabratus	F	26	
Optioservus sp	MI	1	
Stenelmis sp	F	28	+
Ablabesmyia mallochi	F	2	
Helopelopia sp	F	34	
Larsia sp	MT	8	
Dicrotendipes modestus	MT	2	
Glyptotendipes (G.) sp	MT	2	
Paratendipes albimanus or P. duplicatus	F	0	+
Phaenopsectra flavipes	MT	73	
Polypedilum (Uresipedilum) flavum	F	11	
Polypedilum (Tripodura) halterale group	MT	2	+
Physella sp	T	1	+
Helisoma anceps anceps	F	4	+
Planorbella (Pierosoma) trivolvis	MT	0	+
Sphaerium sp	F	1	

No. of Quantitative Taxa	32
No. of Qualitative Taxa	23
Total Taxa	42
No. Organisms	1234
Qualitative EPT	2
ICI	**22**

Bowman Creek - Studebaker Park

Date Collected: 8/21/2020 Site #37

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	0	+
Oligochaeta	T	0	+
Erpobdella punctata punctata	MT	0	+
Hyalella azteca	F	0	+
Gammarus pseudolimnaeus	F	0	+
Gammarus pseudolimnaeus	F	0	+
Hydrachnidia	F	0	+
Stenacron sp	F	0	+
Calopterygidae	F	0	+
Coenagrionidae	T	0	+
Notonecta sp	T	0	+
Helicopsyche borealis	MI	0	+
Optioservus sp	MI	0	+
Stenelmis sp	F	0	+
Anopheles sp	F	0	+
Helopelopia sp	F	0	+
Microtendipes "caelum" (sensu Simpson & Bode, 1980)	MI	0	+
Microtendipes rydalensis	MI	0	+
Paratendipes albimanus or P. duplicatus	F	0	+
Polypedilum (Tripodura) scalaenum group	F	0	+
Physella sp	T	0	+
Planorbidae	MT	0	+
Ferrissia sp	F	0	+

No. of Quantitative Taxa	0
No. of Qualitative Taxa	23
Total Taxa	23
No. Organisms	0
Qualitative EPT	2
ICI	**Poor**

Juday Creek - Ponader Park

Date Collected: 08/17/20 Site # 39

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	5	+
Oligochaeta	T	8	+
Gammarus pseudolimnaeus	F	9	+
Hydrachnidia	F	32	+
Baetis flavistriga	F	0	+
Baetis intercalaris	F	107	
Iswaeon anoka	MI	0	+
Callibaetis sp	MT	0	+
Stenacron sp	F	72	+
Maccaffertium sp	MI	1	
Maccaffertium terminatum	MI	2	
Coenagrionidae	T	0	+
Boyeria vinosa	F	0	+
Cheumatopsyche sp	F	95	+
Ceratopsyche morosa group	MI	478	+
Ceratopsyche sparna	F	2	
Hydropsyche depravata group	F	558	
Hydroptilidae	F	3	
Pycnopsyche sp	MI	0	+
Nectopsyche diarina	MI	0	+
Dubiraphia sp	F	0	+
Macronychus glabratus	F	20	+
Stenelmis sp	F	1	+
Tipula sp	F	2	
Ceratopogonidae	T	0	+
Conchapelopia sp	F	63	
Procladius (Holotanypus) sp	MT	13	+
Thienemannimyia group	F	25	
Corynoneura lobata	F	24	
Cricotopus (C.) bicinctus	T	0	+
Cricotopus (I.) intersectus group	MT	13	
Parametriocnemus sp	F	13	
Rheocricotopus (P.) robacki	F	329	
Thienemanniella xena	F	24	
Tvetenia bavarica group	MI	76	
Tvetenia discoloripes group	MI	13	
Chironomus (C.) sp	MT	0	+
Cryptochironomus sp	F	0	+
Cryptotendipes sp	F	0	+
Microtendipes "caelum"	MI	0	+
Microtendipes pedellus group	F	13	+
Phaenopsectra obediens group	F	0	+
Polypedilum (U.) aviceps	MI	25	
Polypedilum (U.) flavum	F	25	+
Polypedilum (P.) fallax group	F	0	+
Polypedilum (P.) illinoense	T	0	+
Rheotanytarsus pellucidus	MI	25	
Rheotanytarsus sp	F	443	+
Tanytarsus glabrescens gp sp 7	F	13	
Neoplasta sp	MI	16	
Hemerodromia sp	F	1	
Physella sp	T	0	+
Planorbidae	MT	0	+
Ferrissia sp	F	20	+
Corbicula fluminea	F	0	+

No. of Quantitative Taxa	35
No. of Qualitative Taxa	34
Total Taxa	55
No. Organisms	2569
Qualitative EPT	8
ICI	**42**

Juday Creek - Kintz Ave.

Date Collected: 08/17/20 Site # 40

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	0	+	Helopelopia sp	F	4	
Nemertea	F	2		Nilotanypus fimbriatus	F	1	
Oligochaeta	T	2	+	Pagastia sp	F	3	
Gammarus pseudolimnaeus	F	7		Corynoneura lobata	F	3	
Orconectes sp	F	0	+	Cricotopus (C.) sp	F	0	+
Hydrachnidia	F	2	+	Cricotopus (C.) bicinctus	T	1	
Baetis flavistriga	F	0	+	Parametriocnemus sp	F	4	
Baetis intercalaris	F	0	+	Rheocricotopus (P.) robacki	F	4	
Stenacron sp	F	119	+	Tvetenia bavarica group	MI	13	
Maccaffertium exiguum	MI	83		Tvetenia discoloripes group	MI	3	
Maccaffertium terminatum	MI	57		Microtendipes "caelum"	MI	0	+
Maccaffertium vicarium	MI	19	+	Microtendipes pedellus group	F	3	+
Teloganopsis deficiens	I	1		Paratendipes albimanus	F	3	
Ephemera simulans	MI	1		Polypedilum (U.) aviceps	MI	3	
Calopterygidae	F	1		Polypedilum (U.) flavum	F	9	
Calopteryx sp	F	0	+	Polypedilum (T.) scalaenum grp.	F	0	+
Boyeria vinosa	F	0	+	Rheotanytarsus pellucidus	MI	9	
Corixidae	F	0	+	Rheotanytarsus sp	F	36	
Cheumatopsyche sp	F	44		Neoplasta sp	MI	5	
Ceratopsyche morosa group	MI	60	+	Elimia sp	MI	3	
Ceratopsyche sparna	F	1		Ferrissia sp	F	30	
Brachycentrus numerosus	MI	13	+	Corbicula fluminea	F	0	+
Pycnopsyche sp	MI	0	+	No. of Quantitative Taxa	37		
Nectopsyche diarina	MI	0	+	No. of Qualitative Taxa	22		
Oecetis persimilis	MI	2		Total Taxa	50		
Macronychus glabratus	F	29		No. Organisms	591		
Stenelmis sp	F	2	+	Qualitative EPT	8		
Conchapelopia sp	F	9	+	**ICI**	**46**		

Juday Creek - Izaak Walton League

Date Collected: 08/17/20 Site # 42

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	F	7	+	Diamesa sp	F	0	+
Oligochaeta	T	0	+	Pagastia sp	F	0	+
Gammarus pseudolimnaeus	F	0	+	Cardiocladius obscurus	MI	3	
Orconectes sp	F	0	+	Cricotopus (C.) sp	F	3	
Baetis tricaudatus	MI	2		Cricotopus (C.) bicinctus	T	3	
Baetis flavistriga	F	6		Eukiefferiella claripennis grp.	MT	6	
Baetis intercalaris	F	11		Eukiefferiella devonica grp.	F	12	
Stenacron sp	F	0	+	Parametriocnemus sp	F	42	
Maccaffertium exiguum	MI	61	+	Paratrichocladius sp	MI	6	
Maccaffertium terminatum	MI	19		Thienemanniella xena	F	4	
Maccaffertium vicarium	MI	11	+	Tvetenia bavarica group	MI	115	
Calopteryx sp	F	0	+	Tvetenia discoloripes group	MI	15	
Boyeria vinosa	F	0	+	Polypedilum (U.) aviceps	MI	3	
Chimarra obscura	MI	17	+	Polypedilum (U.) flavum	F	3	
Lype diversa	MI	1		Stenochironomus sp	F	9	
Cheumatopsyche sp	F	87		Rheotanytarsus pellucidus	MI	27	
Ceratopsyche morosa group	MI	30		Rheotanytarsus sp	F	45	
Ceratopsyche sparna	F	515	+	Ferrissia sp	F	4	
Brachycentrus numerosus	MI	3	+				
Pycnopsyche sp	MI	0	+				
Nectopsyche diarina	MI	0	+				
Triaenodes sp	MI	0	+				
Macronychus glabratus	F	11	+				
Optioservus sp	MI	0	+				
Stenelmis sp	F	1	+				
Simulium sp	F	286	+				

No. of Quantitative Taxa	32
No. of Qualitative Taxa	21
Total Taxa	44
No. Organisms	1368
Qualitative EPT	9
ICI	**42**

Appendix F

Aerial Site Location Maps

Site #1: St. Joseph Toll Road (Bristol)

Site #2: St. Joseph River Six Span

Site #3: St. Joseph River Bridge Street

Site #4: St. Joseph River Baugo Bay

Site #5: St. Joseph River Twin Branch Dam (above)

Site #6: St. Joseph River Ironwood

Site #7: St. Joseph River Michigan Street (Below)

Site #8: St. Joseph River Angela Blvd.

Site #9: St. Joseph River Keller Park (Below)

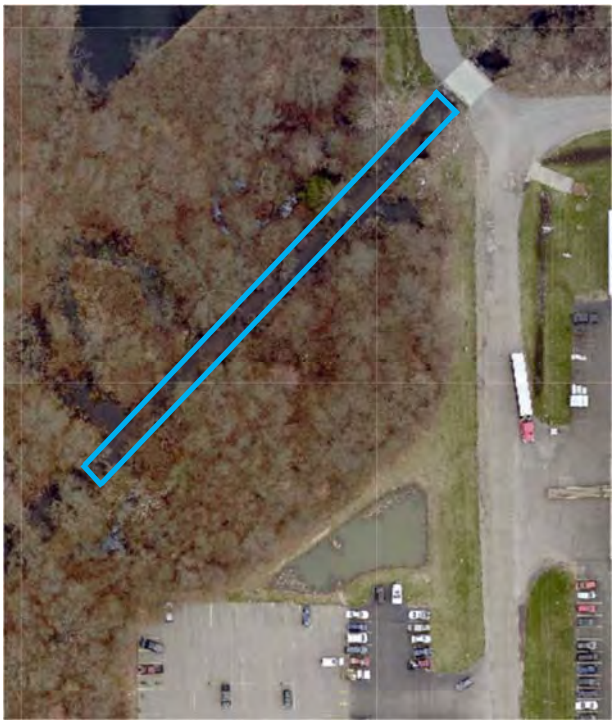
Site #10: St. Joseph River Darden Road

Site #11: Pinhook Lagoon

Site #12: Trout Creek CR 2

Site #13: Little Elkhart River SR 120

Site #14: Pine Creek US 20 Bypass



Site #15: Puterbaugh Creek Reedy Drive

Site #16: Lily Creek CR 4

Site #17: Lily Creek Highland MHP

Site #18: Lily Creek Sunset Ave.

Site #19: Lily Creek McPherson St.

Site #20: Lily Creek Erwin St.

Site #21: Christiana Creek CR 6

Site #22: Christiana Creek Willowdale Park

Site #23: Elkhart River Shanklin Park (Above)

Site #24: Elkhart River Hively Ave (CR 18)

Site #25: Elkhart River Studebaker Park (Above)

Site #26: Elkhart River American Park

Site #28: Elkhart River Elkhart Ave.

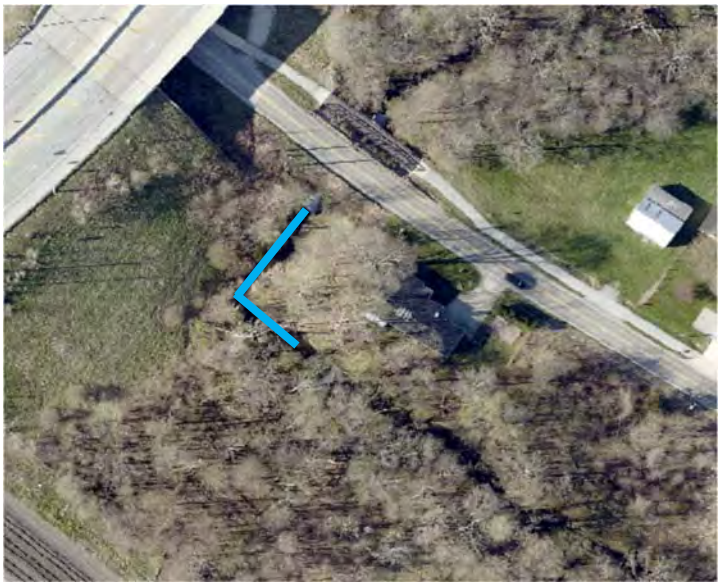
Old Elkhart Dam

Site #27: Elkhart River Prairie St.

Site #29: Stoney Creek CR 40

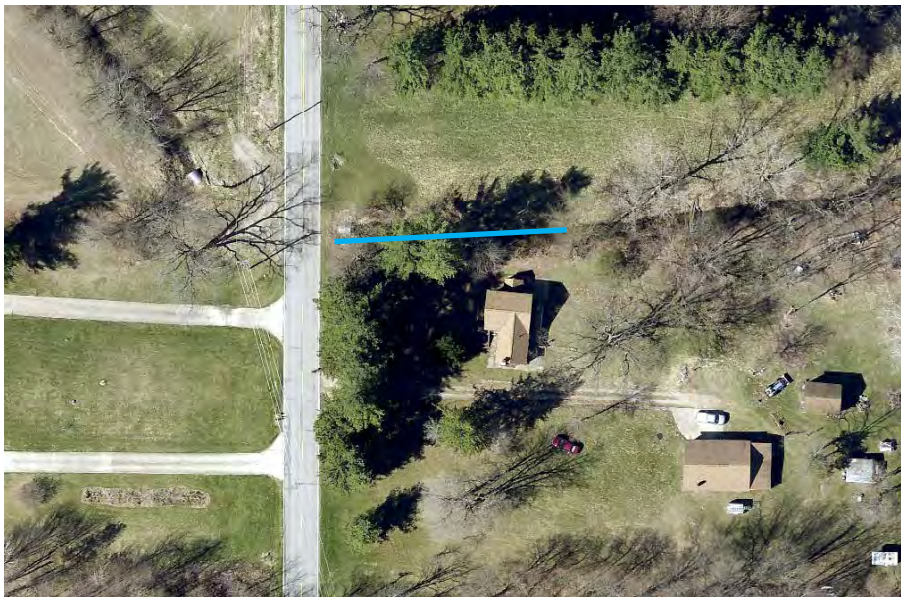
Site # 30: Turkey Creek CR 17

Site #31: Horn Ditch Eisenhower Drive



Site #32: Leedy Ditch CR 45

Site #33 Baugo Creek Restoration Site



Site #34: Auten Ditch Locust Road (South)

Site # 35: Bowman Creek Green Tech

Site #36: Bowman Creek St. Joseph Street

Site #37: Bowman Creek Studebaker Golf Course

Site # 38: Juday Creek Holy Cross Pathway

Site #39: Juday Creek Kintz Ave

Site #40: Izaak Walton League (Above)

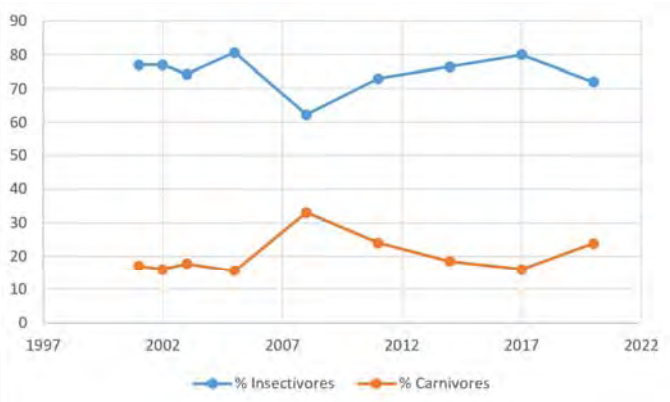
Site #41: Izaak Walton League

Appendix G

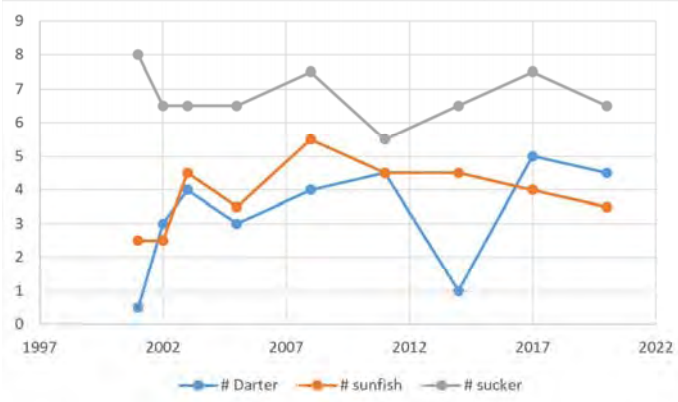
In-depth Metric Analysis

The following is an analysis of metrics contained within the IBI comparing changes to the fish communities since the inception of monitoring on the St. Joseph River and its tributaries. Graphs along with very brief interpretations will be presented for individual sites.

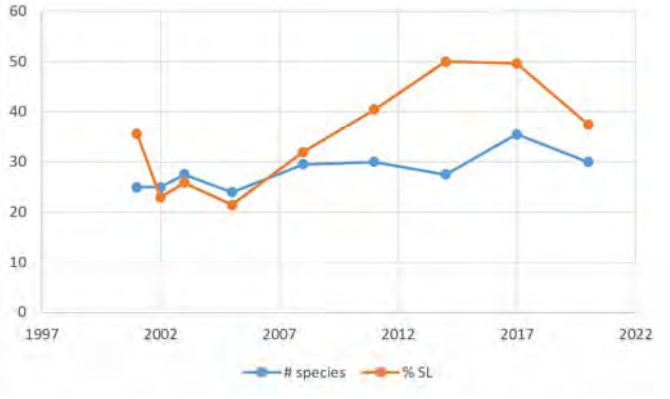
Site 1: St. Joseph River—Toll Road



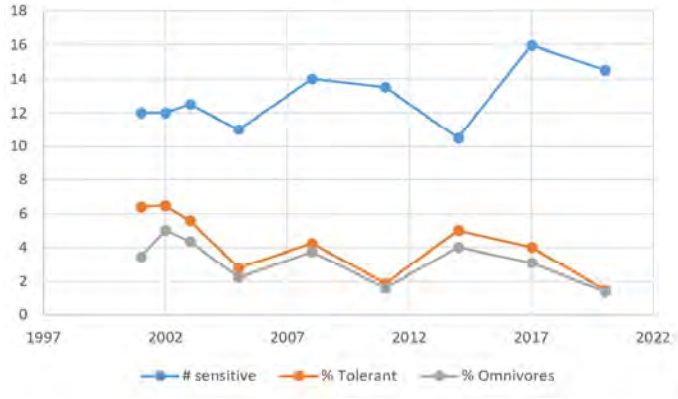
Since the inception of monitoring, the % of insectivores has remained high and relatively consistent, while the % of carnivores has been relatively consistent and adequate for what is generally expected for carnivores. Note how both of these metrics are negatively related (as one increases the other decreases).



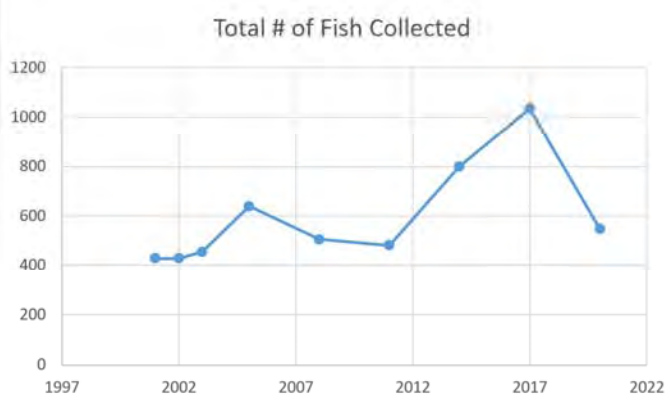
Since the inception of monitoring, the # of darters, suckers and sunfish have been relatively inconsistent. The # of sucker species has remained high, while the # of darters has fluctuated significantly.



Since the inception of monitoring, the # of species has increased. After baseline monitoring, the % of simple lithophils increased, although results from 2020 suggest a potential decline back to initial results.



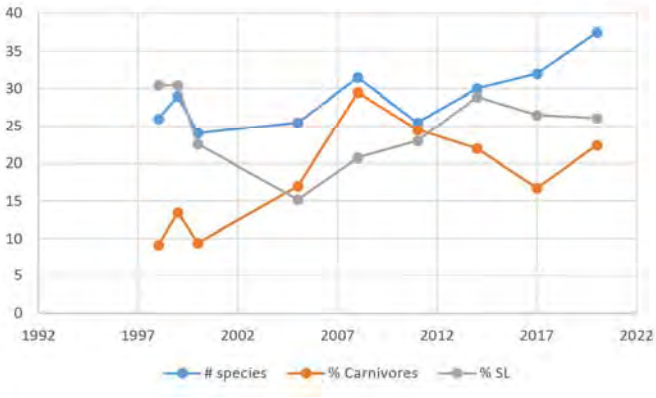
Since the inception of monitoring, the # of sensitive species has fluctuated but has increased in recent monitoring events. The % of tolerant fish and % of omnivores have always been low, but both metrics have generally declined over time.



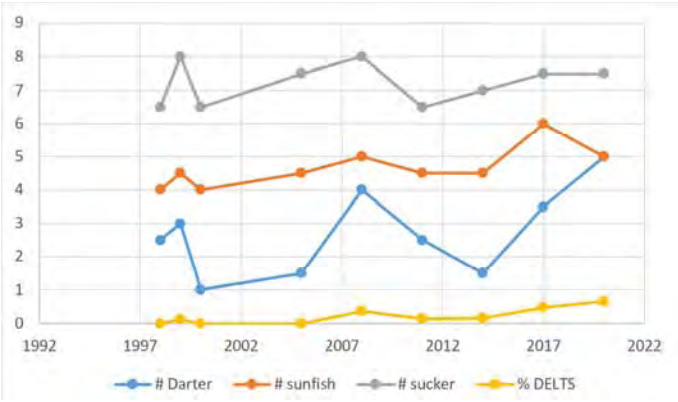
The total # of fish increased in significantly from 2014 to 2017, but reduced closer the #s founds in previous years.

**Note that the % of tolerant individuals and omnivores are generally related. As one increases or decreases over the years, the other will follow the same pattern. In general, omnivores are tolerant species; hence the relationship.*

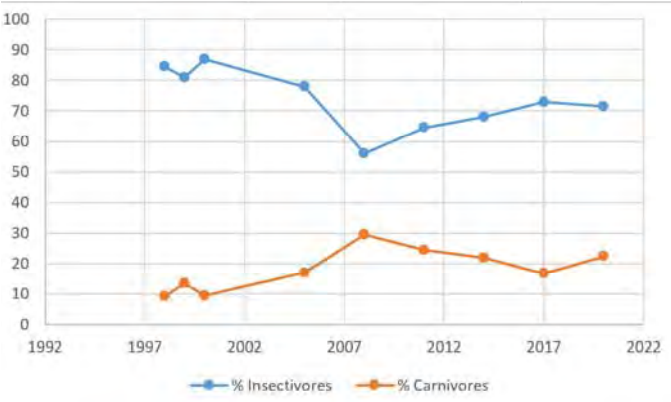
Site 2: St. Joseph River—Six Span



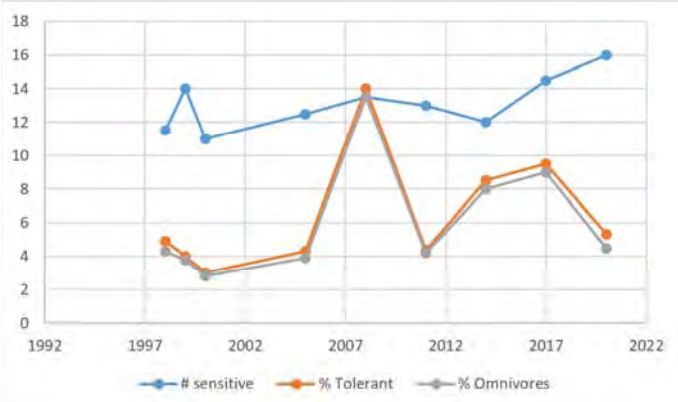
Since the inception of monitoring, the # of species has increased significantly. The % of simple lithophils has generally remained the same, while the % of carnivores has generally increased.



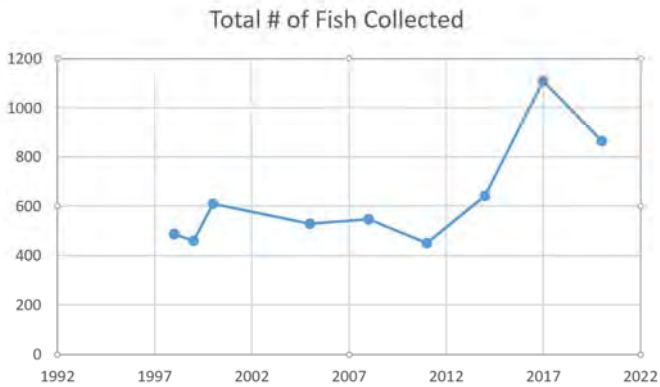
Since the inception of monitoring, the # of darters species, sunfish species and sucker species has remained relatively similar. The % of DELTs has increased slightly.



Since the inception of monitoring, the % of insectivores has reduced over time, however, the % still remains very high. The % of carnivores has increased since the inception of monitoring.

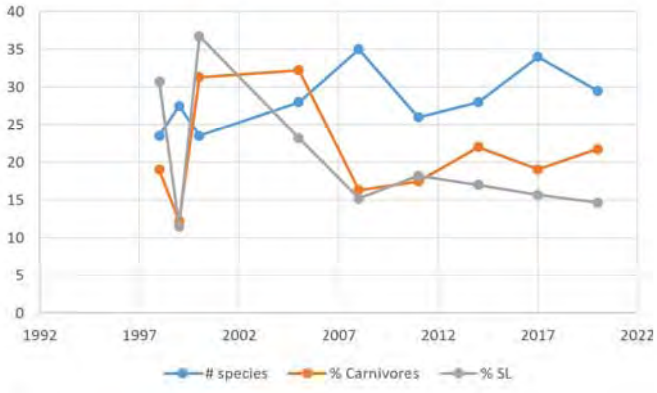


Since the inception of monitoring, the # of species has increased. The % of tolerant individuals and omnivores have fluctuated, but both metrics have always been very low.

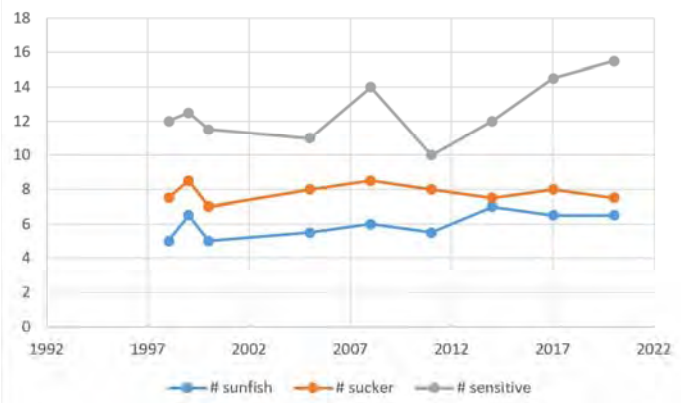


The total # of individuals increased significantly in 2017, and although the # dropped in 2020, it was still very high relative to the #s prior to 2017.

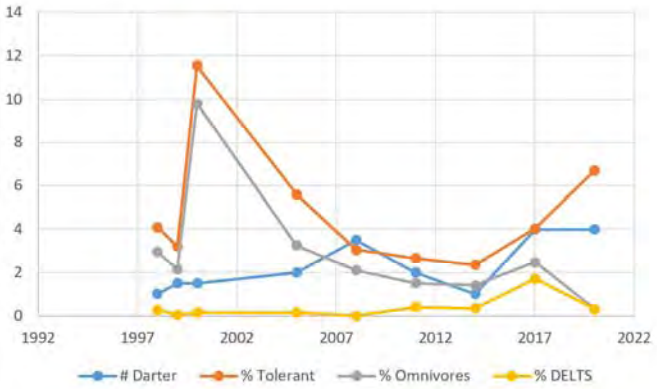
Site 3: St. Joseph River—Bridge Street



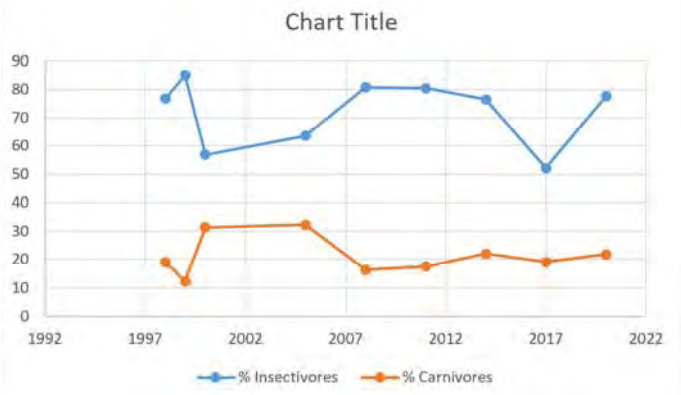
The # of species has increased significantly since the inception of monitoring, while the % of carnivores and simple lithophils have fluctuated.



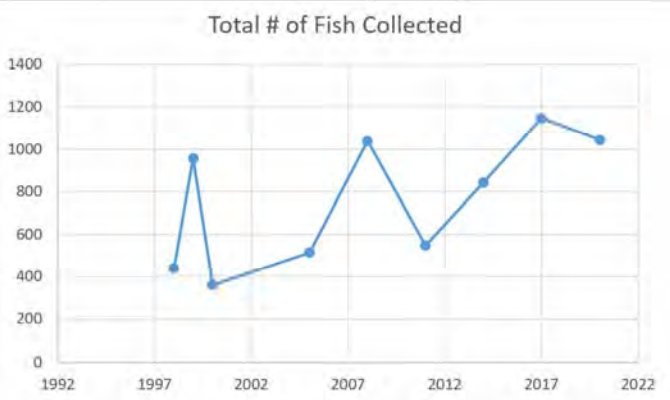
The # of sunfish and sucker species have remained the same over time, while the # of sensitive species has increased since the inception of monitoring.



The % of tolerant individuals and omnivores have decreased since the inception of monitoring, while the # of darters has increased and the % of DELTs has remained low.

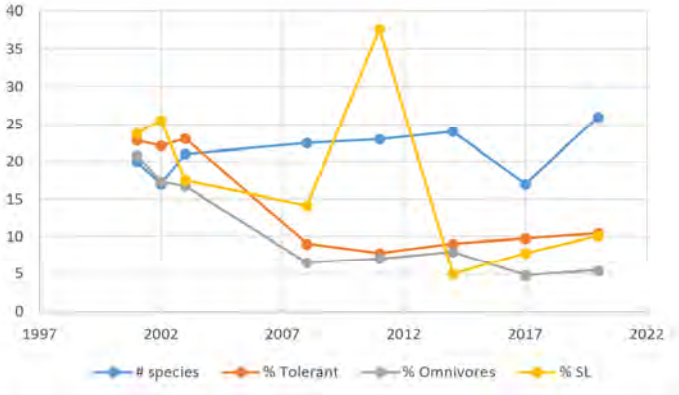


The % of insectivores and carnivores have been high since the inception of monitoring with minor fluctuations.



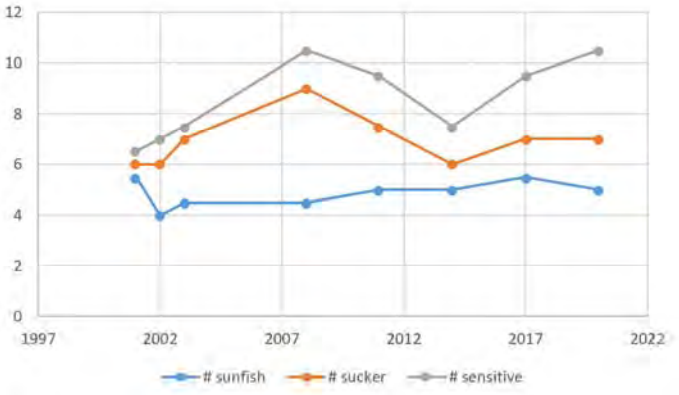
The total # of fish collected has fluctuated since the inception of monitoring with the number of fish being very high from 2017 to 2020.

Site 6: St. Joseph River—Ironwood

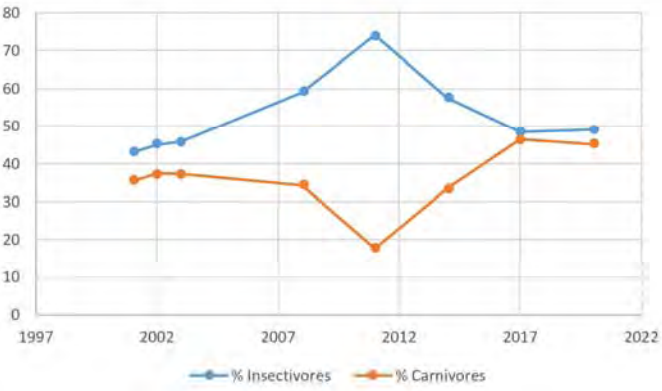


The % of tolerant individuals and omnivores has decreased since the inception of monitoring, while the number of species has generally increased. The % of simple lithophils has also decreased with a huge increase occurring in 2011.

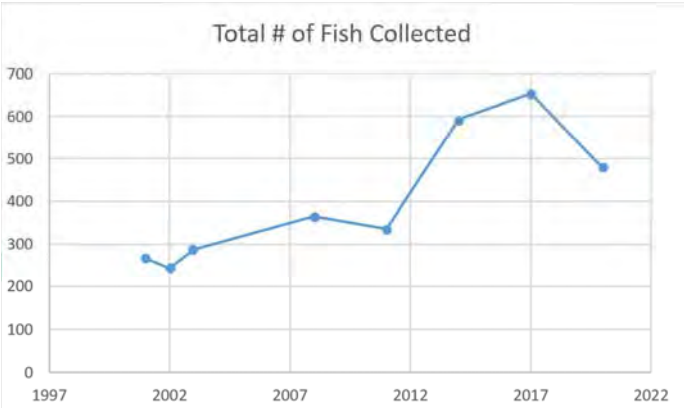
The # of darter species and DELTs have generally increased since the inception of monitoring.



Since the inception of monitoring, the # of sucker species and sensitive species have fluctuated, while the # of sunfish species have remained relatively consistent.

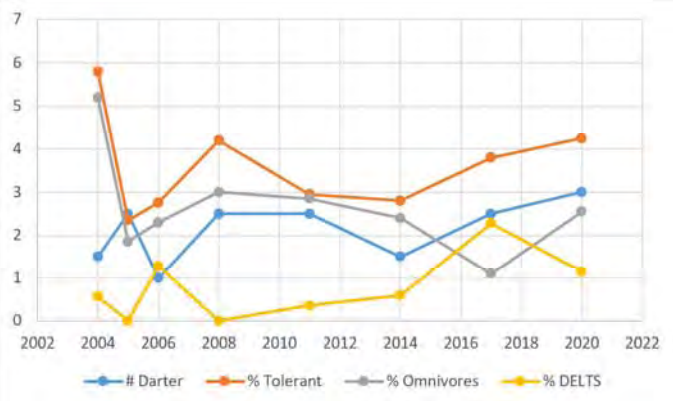


Since the inception of monitoring, the % of carnivores and insectivores has increased slightly, although a large deviation occurred in 2011, when a significant increase in insectivores occurred and a significant decrease in carnivores occurred.

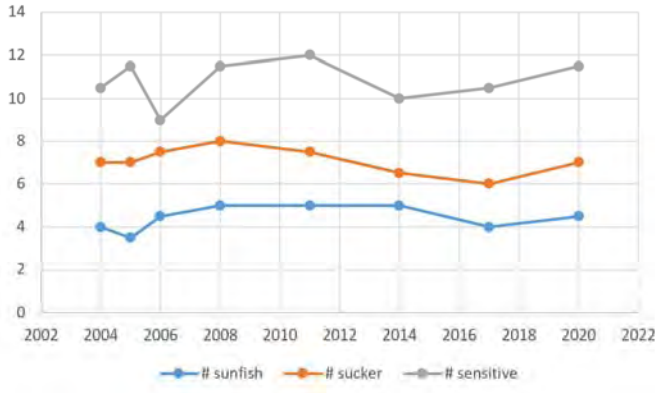


Since the inception of monitoring, the total # of fish has increased, although the # did drop from 2017 to 2020.

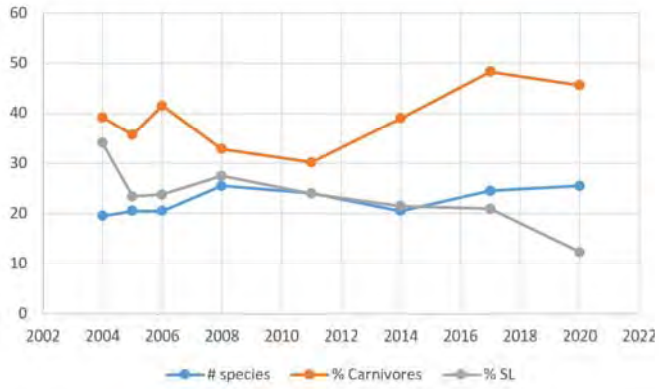
Site 8: St. Joseph River—Angela Boulevard



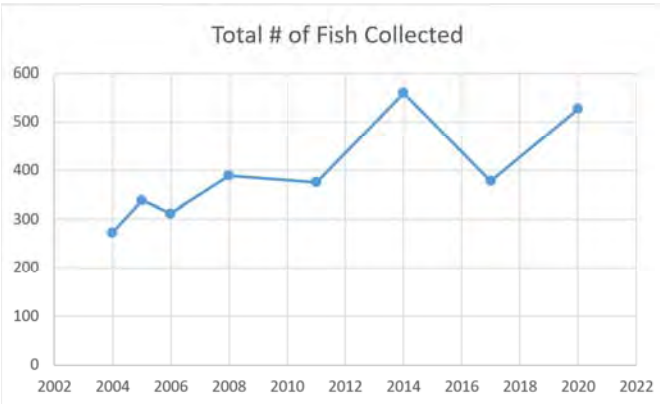
Since the inception of monitoring, the % of tolerant individuals and omnivores has always been low. The # of darters has remained consistent, while the % of DELTs has increased slightly.



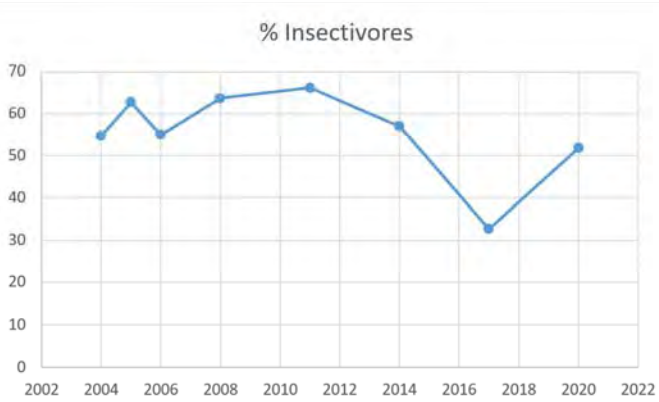
Since the inception of monitoring, the # of sunfish species, suckers species and sensitive species has been relatively consistent.



Since the inception of monitoring, the % of carnivores has increased, while the % of simple lithophils has decreased. The # of species has remained relatively consistent.

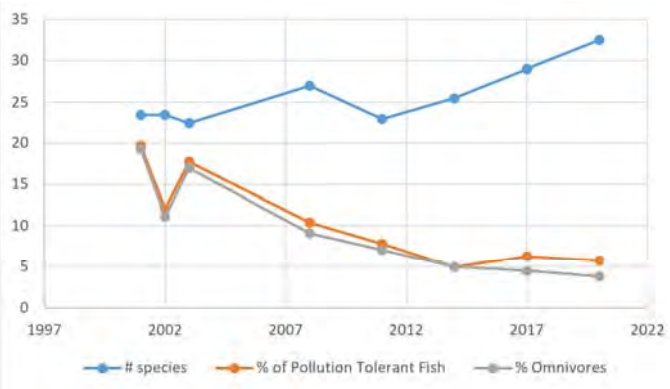


Since the inception of monitoring the total # of fish has increased over time.

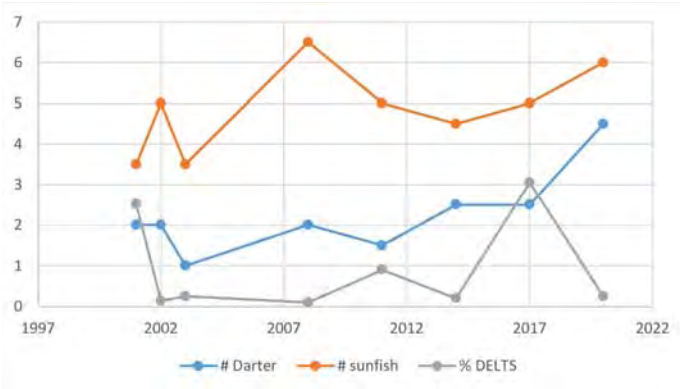


While relatively consistent from 2004 to 2014, the % of insectivores plummeted in 2017, but increased again in 2017.

Site 10: St. Joseph River—Darden Road

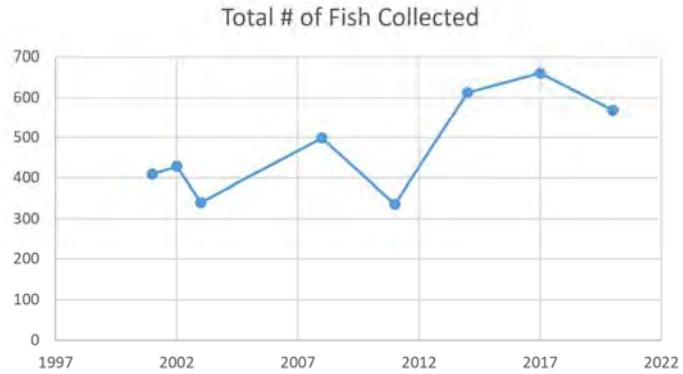


Since the inception of monitoring, the # of species has increased significantly. The % of tolerant individuals and the % of omnivores have plummeted.

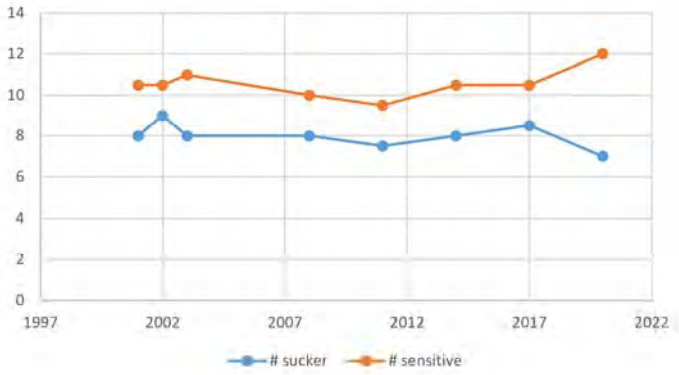


Since the inception of monitoring, the # of darter species and sunfish species appear to have increased slightly. The % of DELTs has fluctuated.

Since the inception of monitoring, the % of simple lithophils has decreased significantly, while the % of insectivores has fluctuated slightly but always been high.

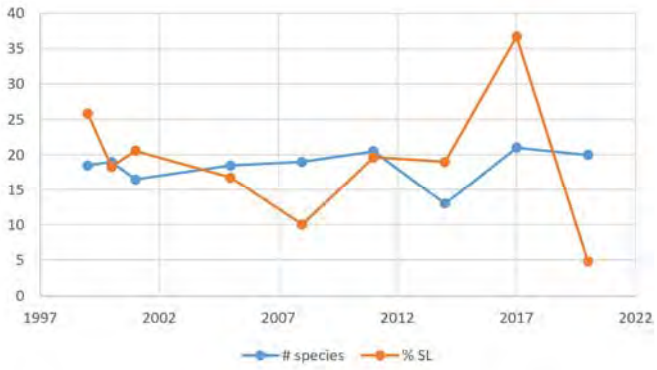


Since the inception of monitoring, the total # of fish has increased significantly.

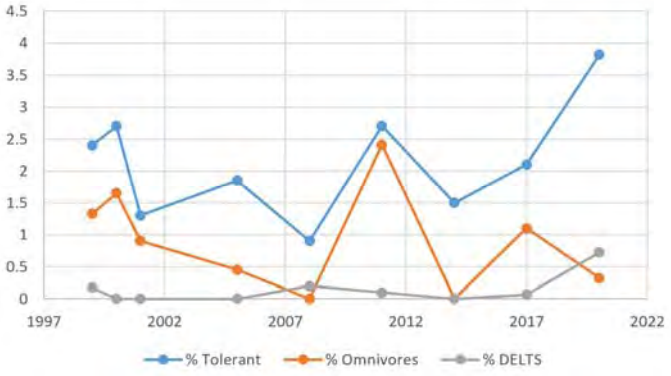


Since the inception of monitoring, the # of sucker species and sensitive species have remained relatively similar over time.

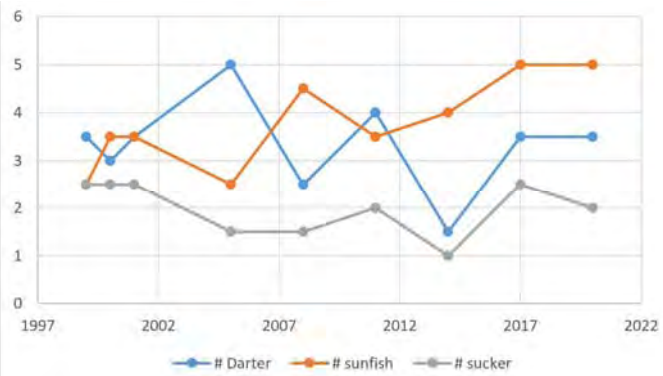
Site 12: Trout Creek—CR 2



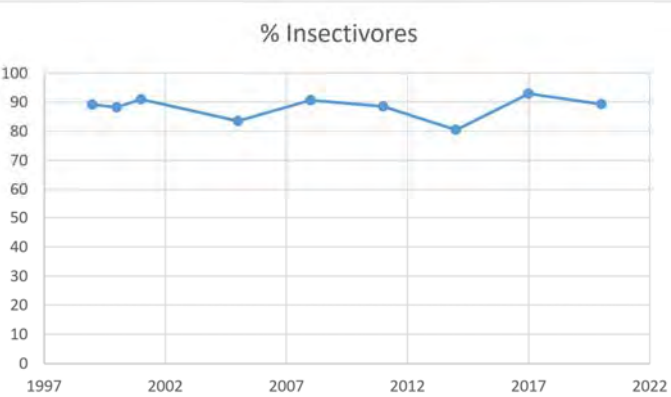
Since the inception of monitoring, the # of species has remained relatively similar. The % of simple lithophils has fluctuated, but decreased dramatically in 2020.



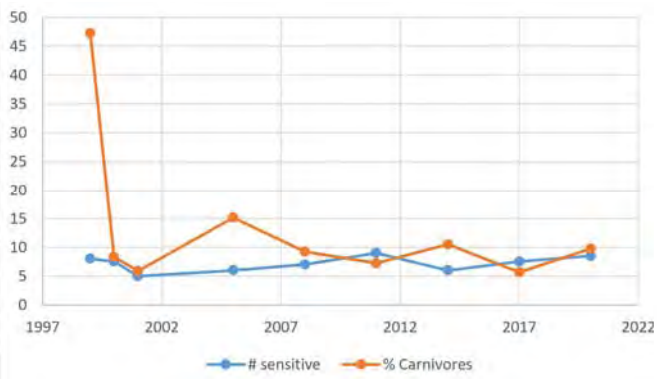
The % of tolerant individuals and omnivores has plummeted since the inception of monitoring. The % of DELTs has always been very low with a slight increase in 2020.



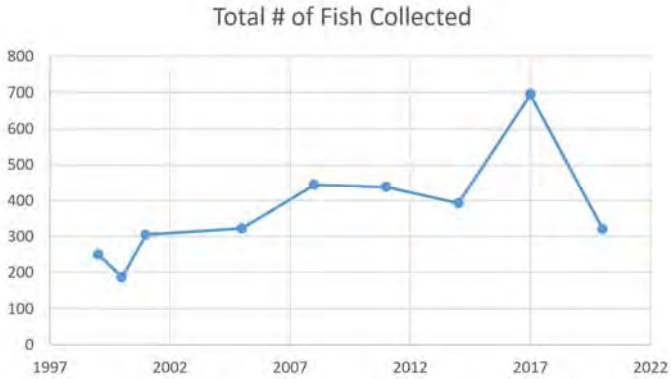
The # of darter and sucker species have fluctuated since the inception of monitoring, while the # of sunfish species has increased slightly.



The % of insectivores has always been very high at this site.

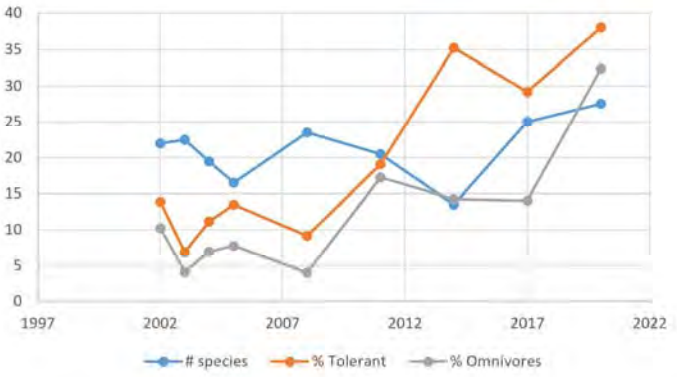


The % of carnivores was extremely high in 1998 when this site was first sampled, but it plummeted to less than 10% and has remained low since. The number of sensitive species has been consistent over time.

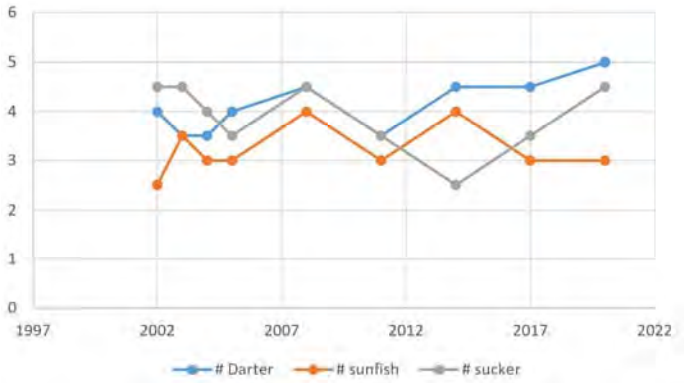


The total # of fish has been relatively consistent over time with the exception of 2017, when the # almost doubled.

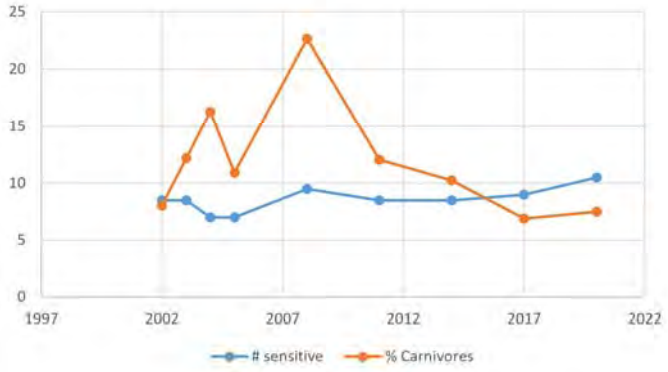
Site 13: Little Elkhart River—SR 120



The % of tolerant individuals and omnivores have increased significantly since the inception of monitoring. The # of species has fluctuated but increased in recent years.

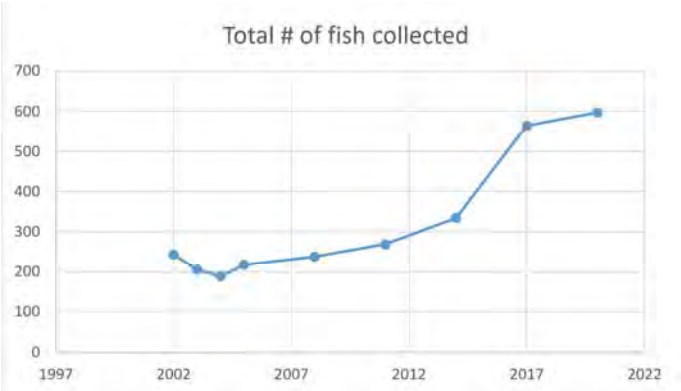


The # of sucker and darter species have fluctuated since the inception of monitoring while the # of darters has increased slightly.



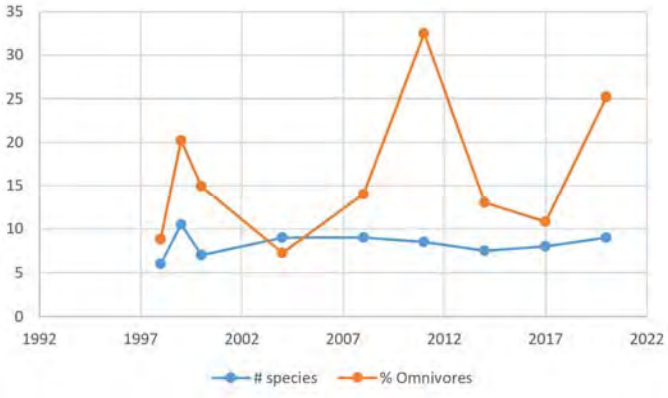
The % of carnivores fluctuated considerably in the early days of monitoring, but appears to have declined in recent years. The # of sensitive species has increased slightly in recent years.

The % of insectivores has dropped since the inception of monitoring, although the % is still considered adequate. The % of simple lithophils has fluctuated since the inception of monitoring.

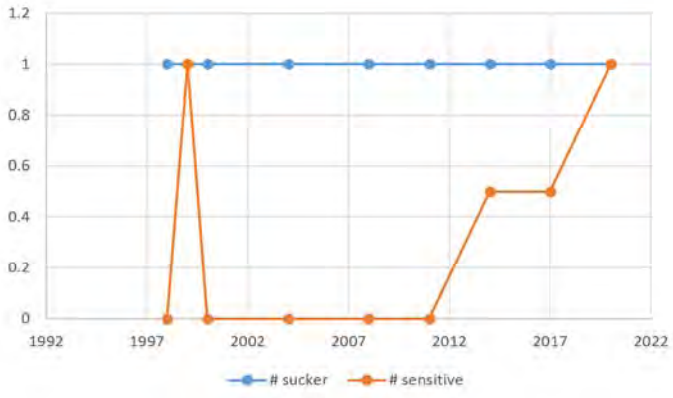


The total # of fish has increased substantially since the inception of monitoring, particularly in the past 2 sampling events

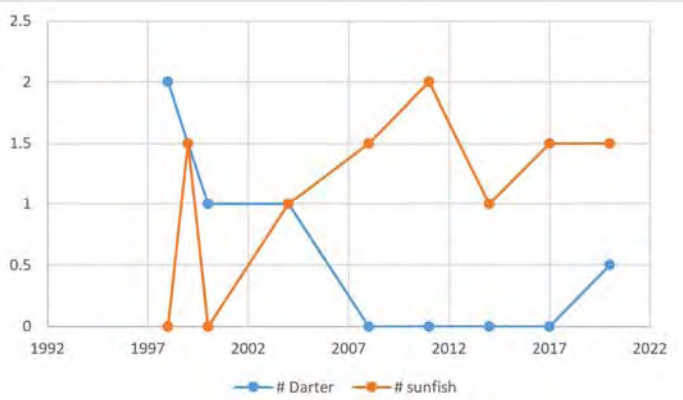
Site 14: Pine Creek—US 20 Bypass



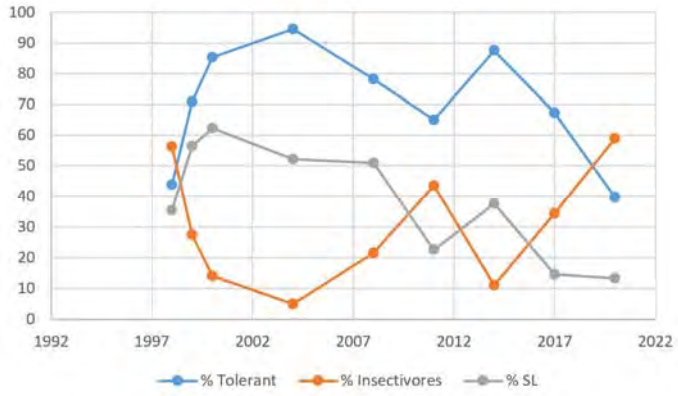
The # of species has always been low at this site. The % of omnivores as fluctuated considerably.



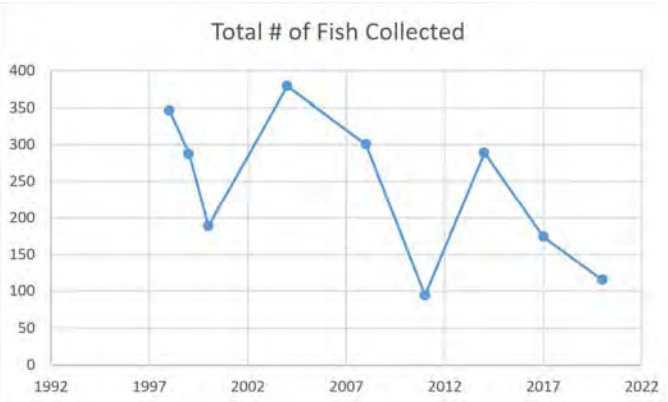
The # of sucker species and sensitive species have always been low at this site.



The number of sunfish and darter species have always been low at this site.

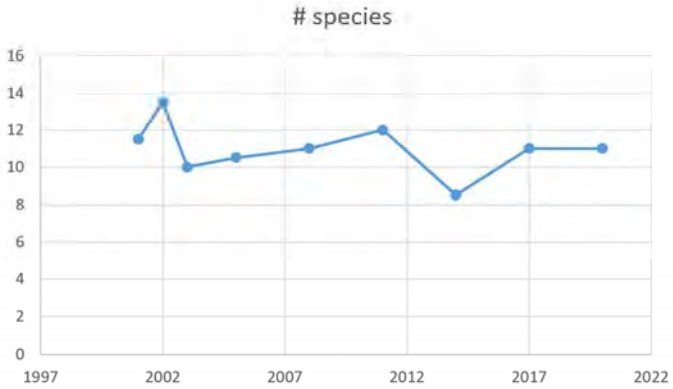


The % of tolerant individuals and insectivores have fluctuated considerable at this site, while the % of simple lithophils has decreased.

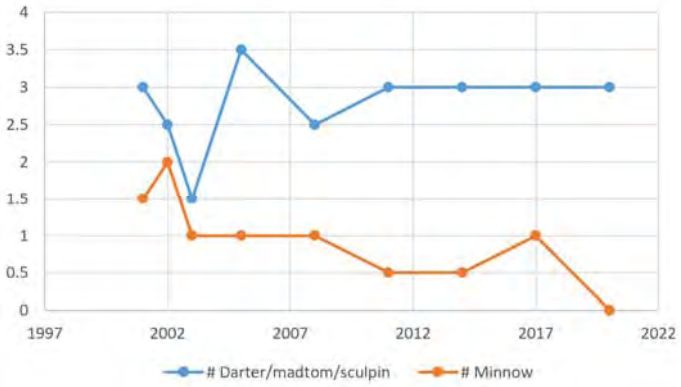


The total # of fish has fluctuated at this site, but the #s have generally decreased over time.

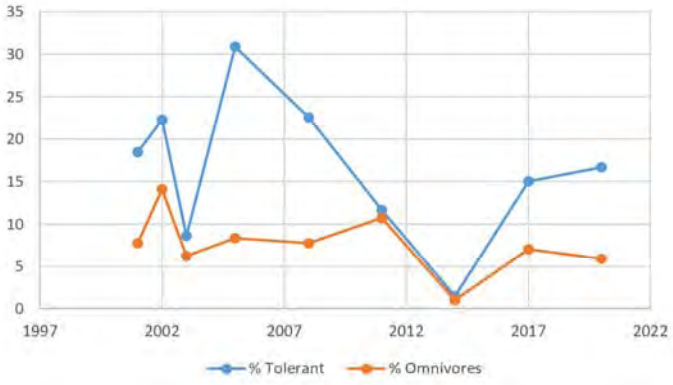
Site 15: Puterbaugh Creek—Reedy Drive



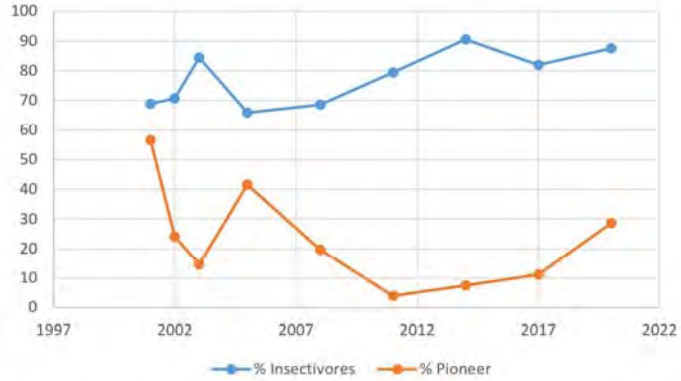
The # of species has reduced slightly since the inception of monitoring.



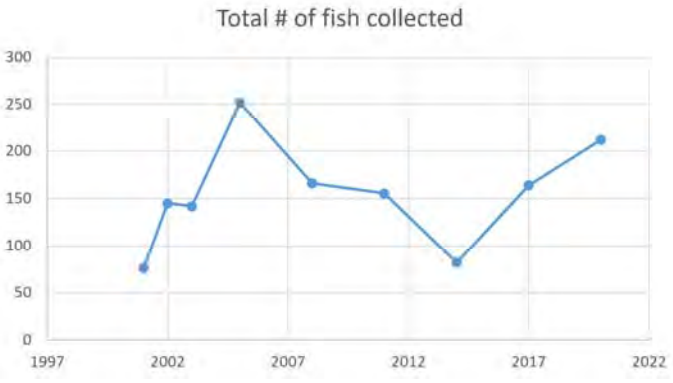
The # of minnow species has reduced since the inception of monitoring, while the number of darter/madtom/ sculpin species has fluctuated but generally remained the same.



The % of tolerant individuals have fluctuated over time, while the % of omnivores has dropped slightly.

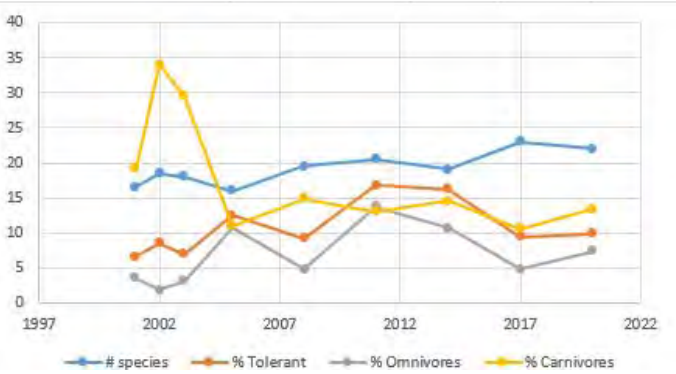


The % of pioneering species has dropped since the inception of monitoring, while the % of insectivores has increased.

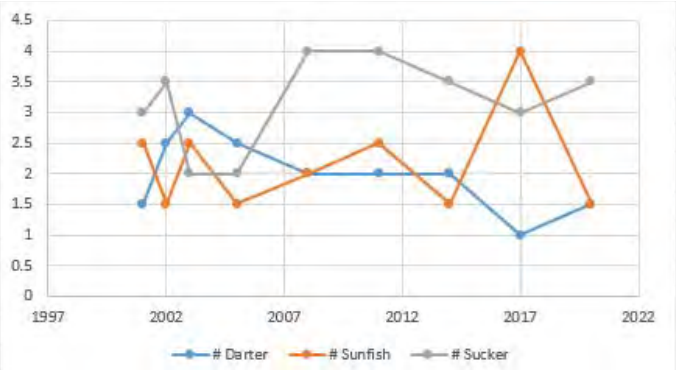


The total # of fish has fluctuated over time.

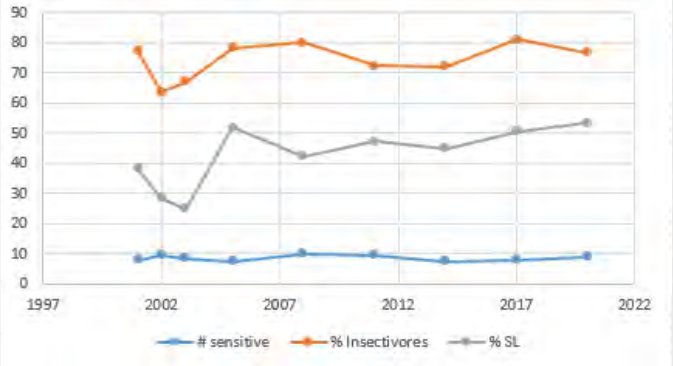
Site 21: Christiana Creek—CR 6



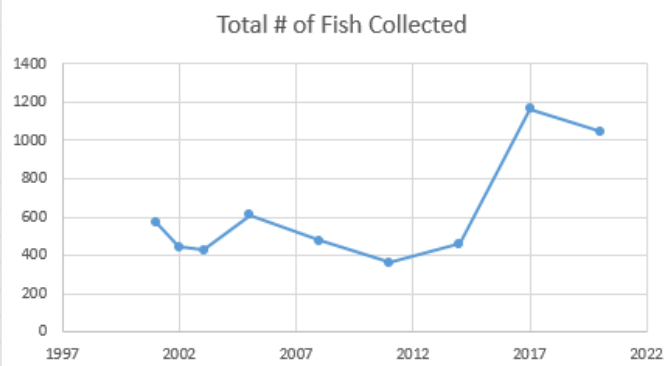
The # of species has increased since the inception of monitoring as have the % of tolerant fish and omnivores. The % of carnivores has decreased significantly.



The # of darter species, sunfish species and sucker species have fluctuated since the inception of monitoring.

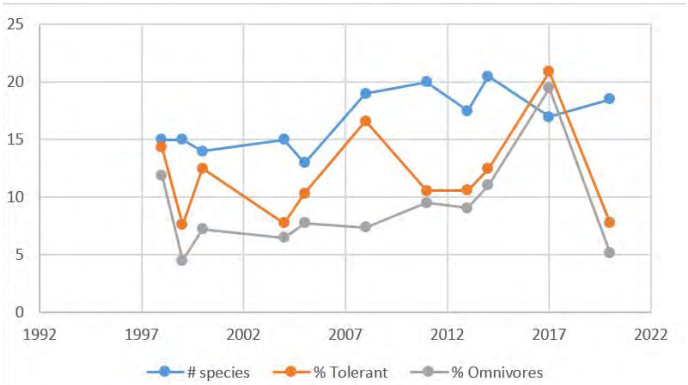


The # of species species, % of insectivores, and % of simple lithophils have generally been the same over time.

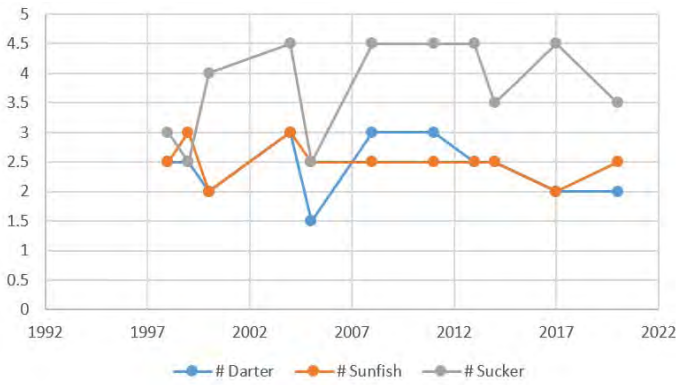


The total # of fish collected increased significantly from 2017 to 2020.

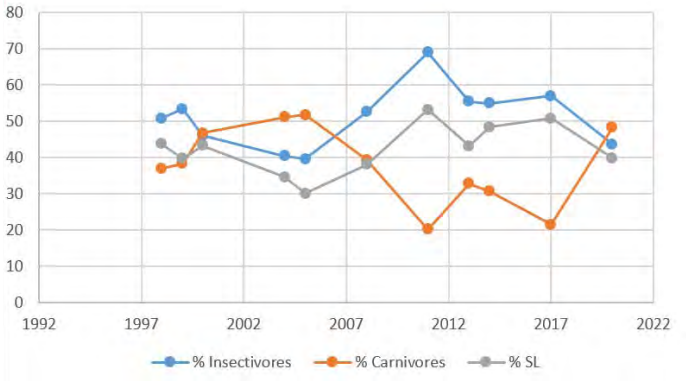
Site 22: Christiana Creek—Willowdale Park



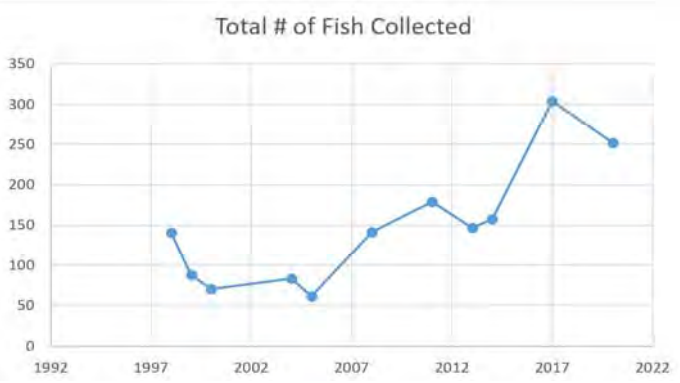
The # of species has increased at this site since the inception of monitoring, while the % of tolerant individuals and omnivores have fluctuated but have always been low.



The number of darter species, sunfish species, and sucker species have fluctuated at this site since the inception of monitoring.

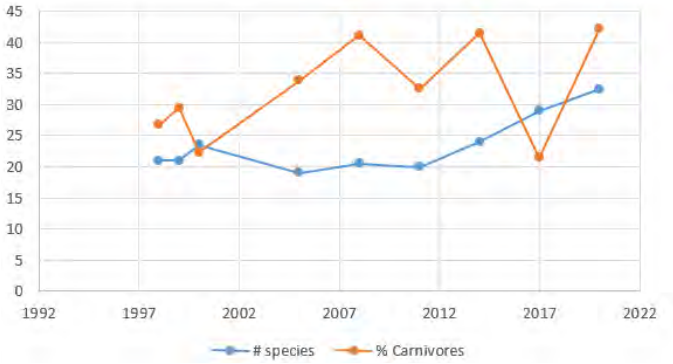


The % of insectivores and simple lithophils have fluctuated at this site since the inception of monitoring, while the % of carnivores decreased from 2011 to 2017 but increased back to earlier levels in 2020.

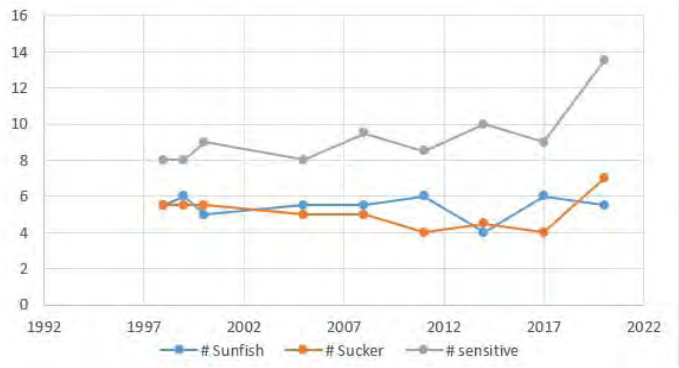


The total # of fish has increased significantly since the inception of monitoring.

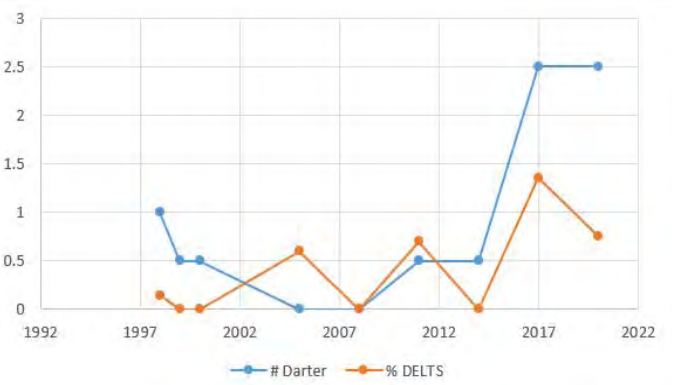
Site 24: Elkhart River—CR 18 (Hively Ave)



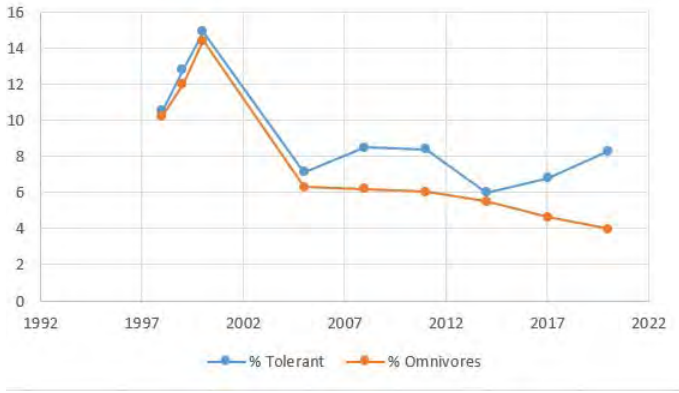
The # of species has increased significantly at this site since the inception of monitoring. The % of carnivores has fluctuated considerably over time.



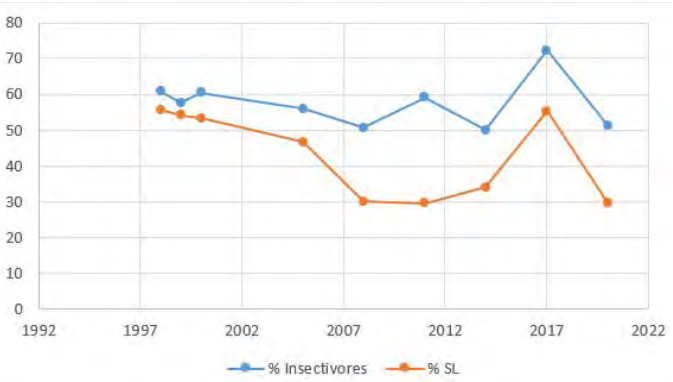
The # of sunfish and sucker species have generally been the same over time, while the # of sensitive species have increased, particularly in 2020.



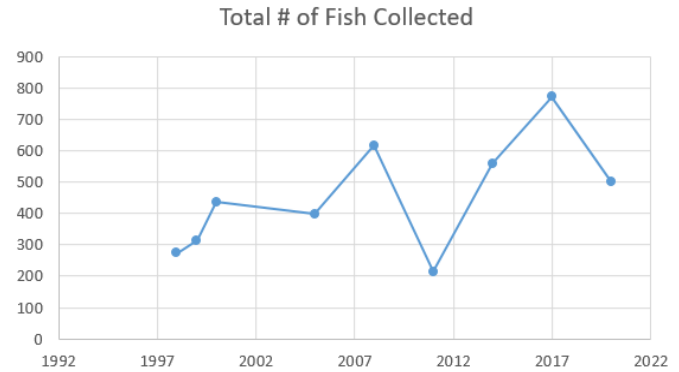
The % of DELTs has fluctuated since the inception of monitoring, while the # of darter species has increased.



The % of tolerant individuals and omnivores have decreased since the inception of monitoring, although both metrics have always been low.

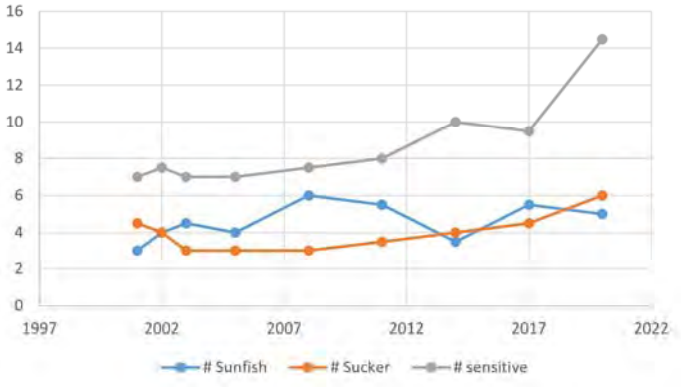


The % of insectivores and simple lithophils have declined slowly since the inception of monitoring, although both metrics increased briefly in 2017.



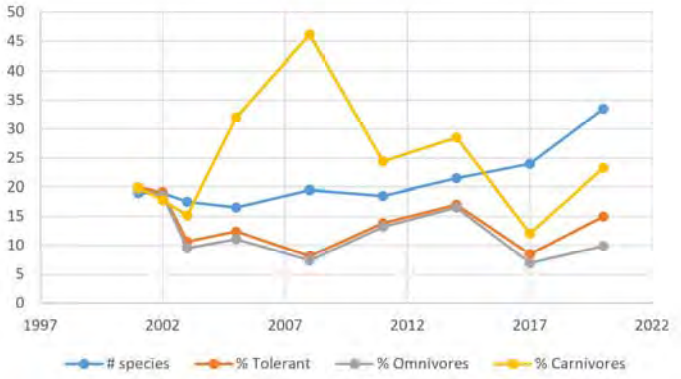
The total number of fish has generally increased since the inception of monitoring.

Site 25: Elkhart River—Studebaker Park (A)



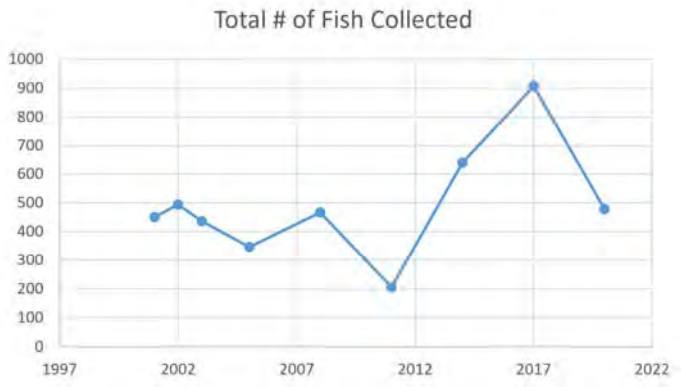
Since the inception of monitoring, the # of suckers and sunfish have remained relatively similar. The # of sensitive species have increased significantly since the inception of monitoring, particularly in 2020.

Since the inception of monitoring, the % of insectivores and simple lithophils have fluctuated significantly.



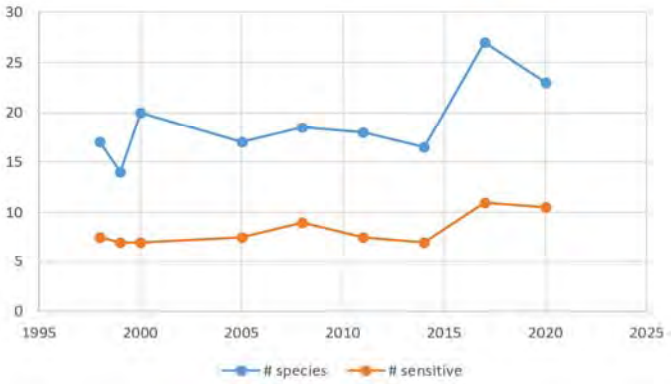
Since the inception of monitoring, the % of tolerant individuals and omnivores have been relatively low and stable. The % of carnivores has fluctuated significantly, while the # of species has increased significantly.

Since the inception of monitoring the # of darters has increased significantly, while the % of DELTs has remained low.

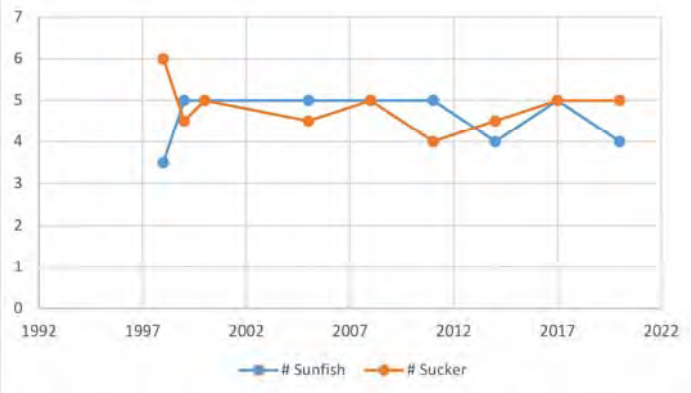


The total # of fish collected has fluctuated since the inception of monitoring and was very high from 2014 to 2017.

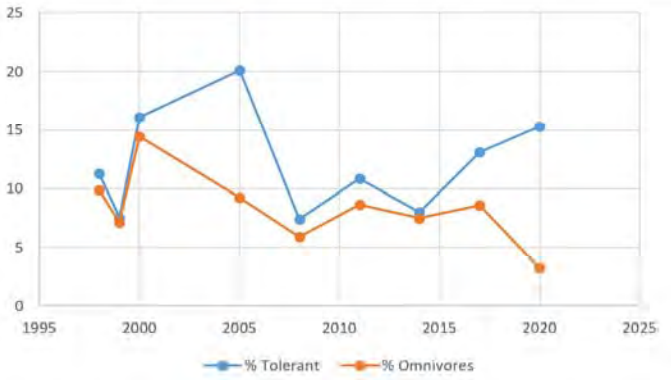
Site 26: Elkhart River—American Park



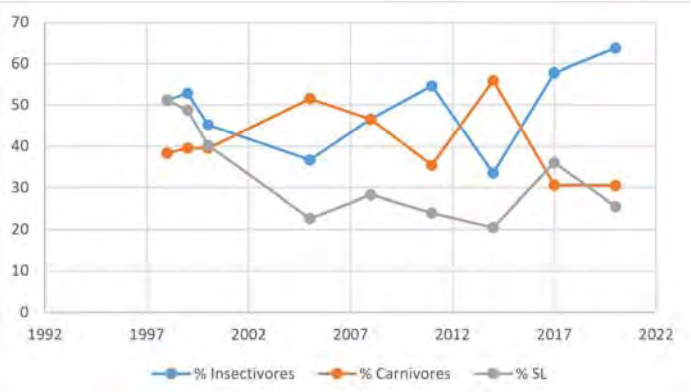
The # of species at this site was relatively low from 1998 to 2011, but increased significantly from 2017 to 2020.



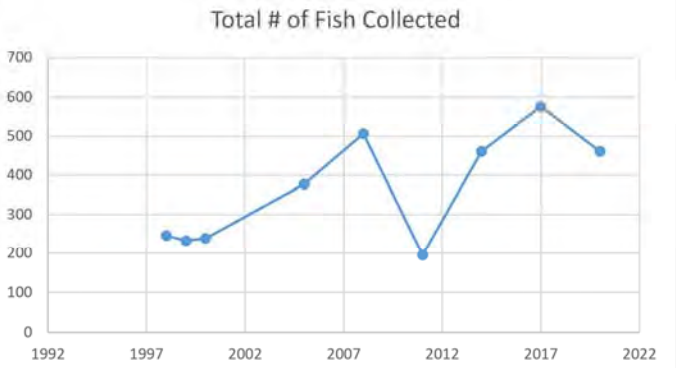
The # of sunfish species and suckers has been consistent at this site since the inception of monitoring.



The % of tolerant individuals and omnivores has fluctuated at this site since the inception of monitoring, but both metrics have always been low.

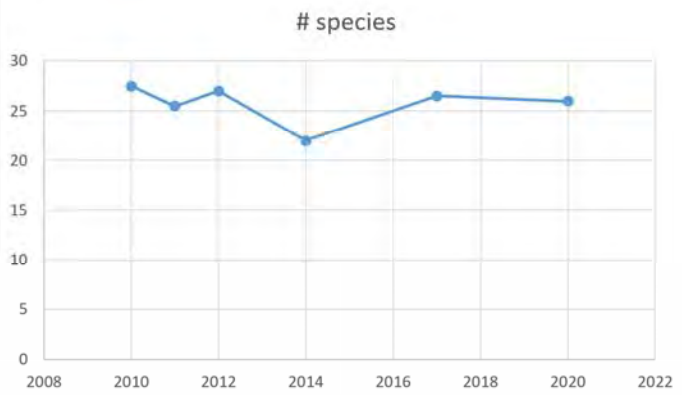


The % of simple lithophils appears to have declined at this site, while the % of insectivores and carnivores have fluctuated over time.

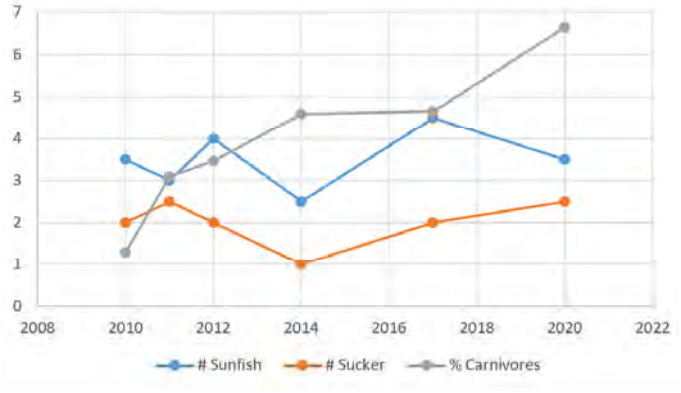


The total # of fish collected has fluctuated at this site, although the general trend suggest that the total # of fish has increased.

Site 33: Baugo Creek—Restoration Site

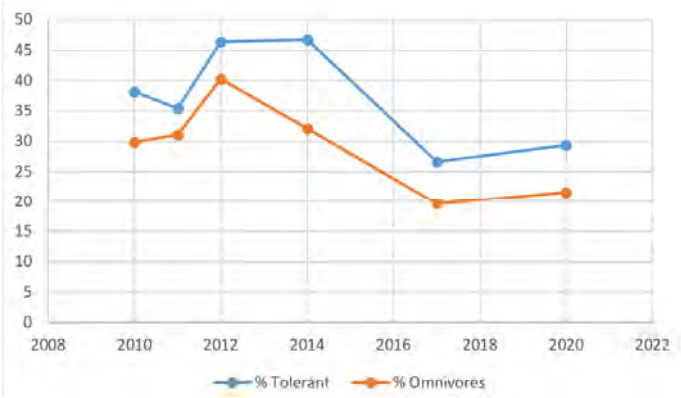


The # of species at this site has remained relatively similar since the inception of monitoring.

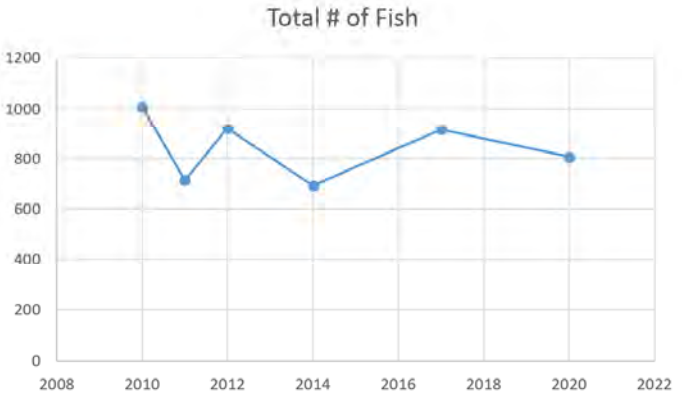


The % of carnivores has increased at this site since the inception of monitoring, although this metric has always been low. The # of sunfish species and sucker species has remained relatively similar.

The % of simple lithophils has increased at this site since the inception of monitoring. The % of insectivores has fluctuated.

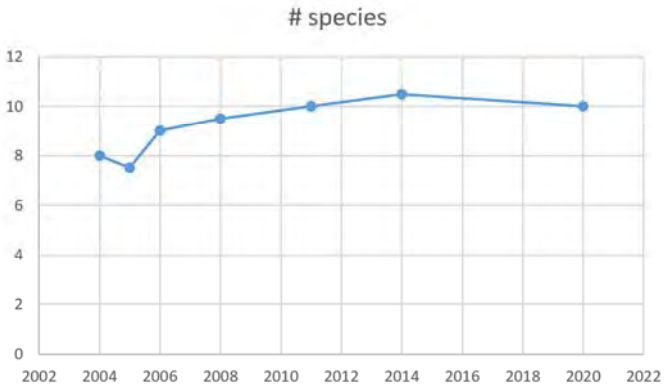


The % of tolerant individuals and omnivores has reduced at this site since the inception of monitoring.

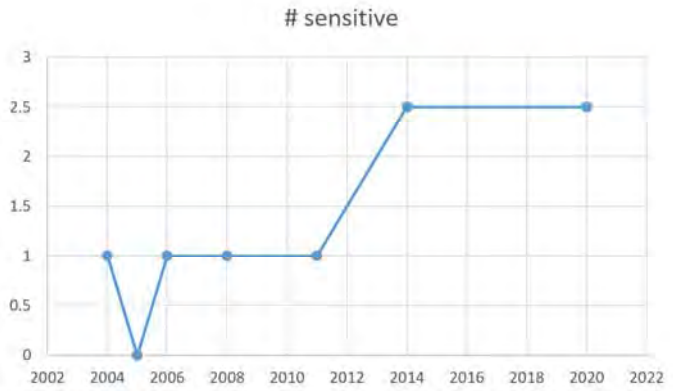


The total # of fish has remained relatively consistent at this site since the inception of monitoring.

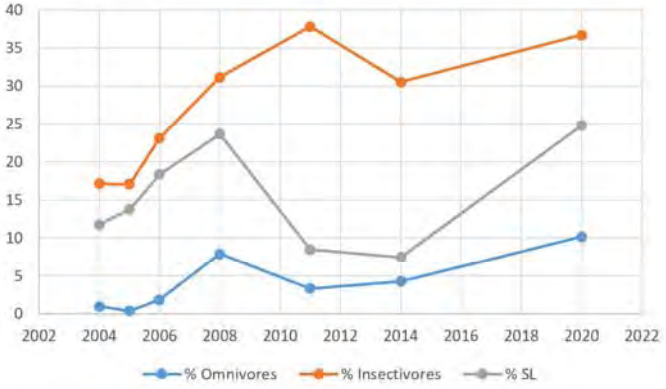
Site 40: Juday Creek—Kintz Ave



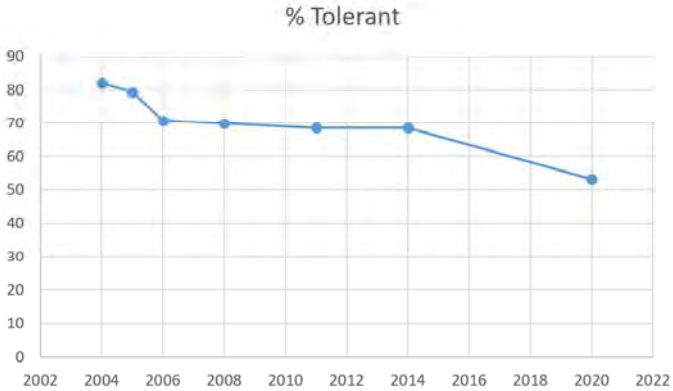
The # of species at this site has been relatively consistent over time.



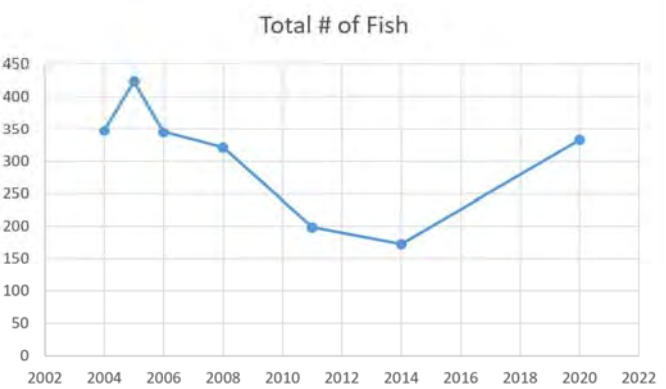
The number of sensitive species has increased at this site since the exception of monitoring.



The % of insectivores has increased significantly at this site since the inception of monitoring. The % of simple lithophils has fluctuated, while the percent of omnivores appears to have also increased.

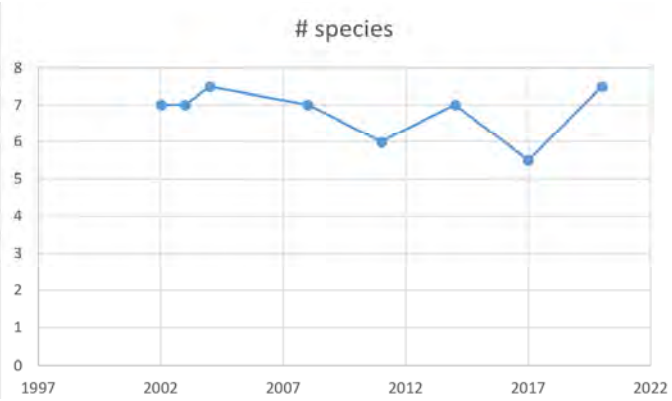


The % of tolerant individuals has decreased at this site since the inception of monitoring, although this metric is still pretty high.

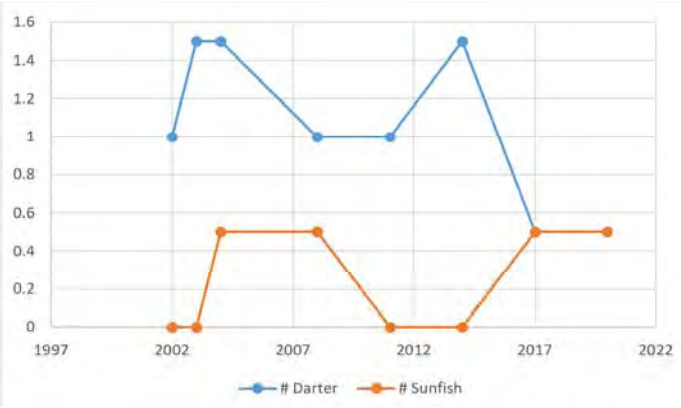


The total # of fish collected dropped significantly from 2011 to 2014, but increased back towards normal levels in 2020.

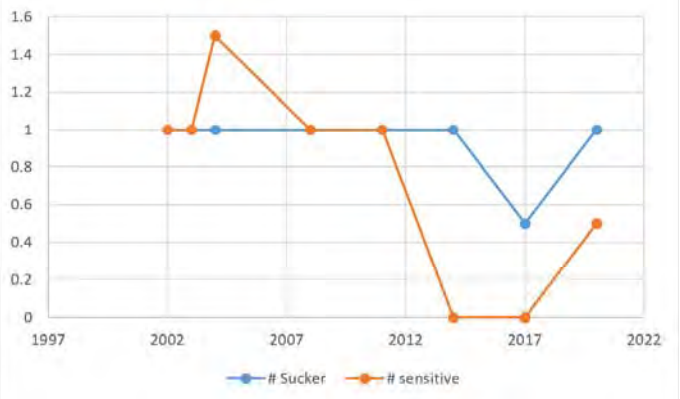
Site 42: Juday Creek—Izaak Walton League



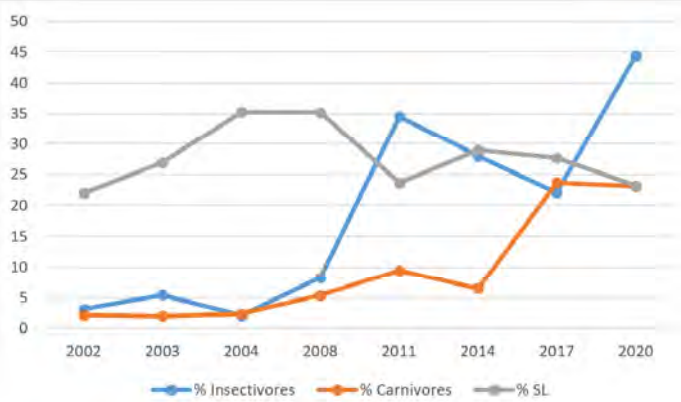
The # of species has fluctuated at this site since the inception of monitoring.



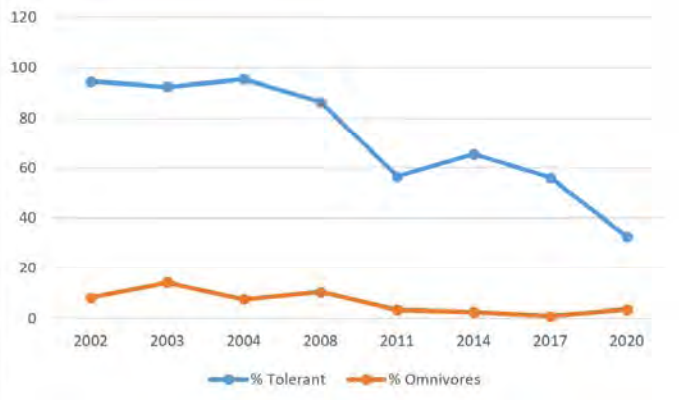
The # of darters and sunfish have always been very low at this site.



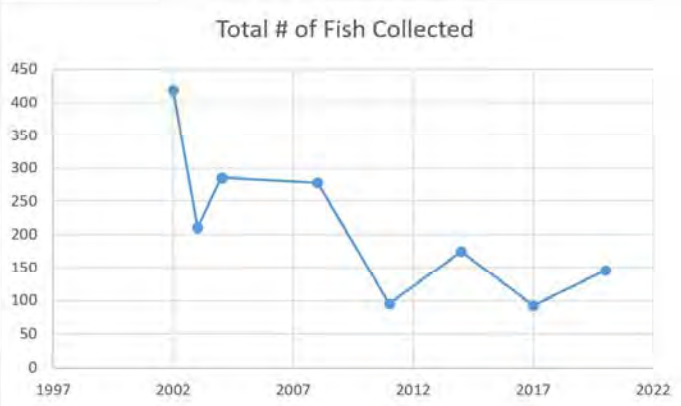
The # of suckers and sensitive species have always been very low at this site.



The % of insectivores and carnivores have increased significantly at this site, while the % of simple lithophils has remained relatively similar over time.



The % of tolerant individuals has decreased very significantly since the inception of monitoring while the % of simple lithophils has been consistent over time.



The total # of fish collected has decreased very significantly since the inception of monitoring.