ELKHART – SOUTH BEND AQUATIC COMMUNITY MONITORING

ANNUAL REPORT 2021

City of Elkhart

Rod Roberson, Mayor

Clean river Healthy neighborhoods

ELKHART ▪ SOUTH BEND

Cover Photo: Interns Simon Graber Miller, Hannah Simnick, and Owen Slater with some really nice Smallmouth Bass at the Benton Dam.

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Aquatic Community Monitoring on the St. Joseph River and Multiple Tributaries, Elkhart & St. Joseph Counties: 2021 Annual Report

A Flathead Catfish collected from the St. Joseph River. This species was collected for the first time in 2021 by the Aquatic Biology Program. This species is not considered native and while it has a strong reputation as a sport fish in north America, its presence in the St. Joseph River presents some concern

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.

In 2021, 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 young Bowfin collected from the Elkhart River. Note the prominent false eye spot on its tail

The Aquatics Program is a unique bi-community initiative that evaluates 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. The City of Goshen also sponsors educational activities in the Goshen area.

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.

A northern hogsucker collected from the Elkhart River

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.

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

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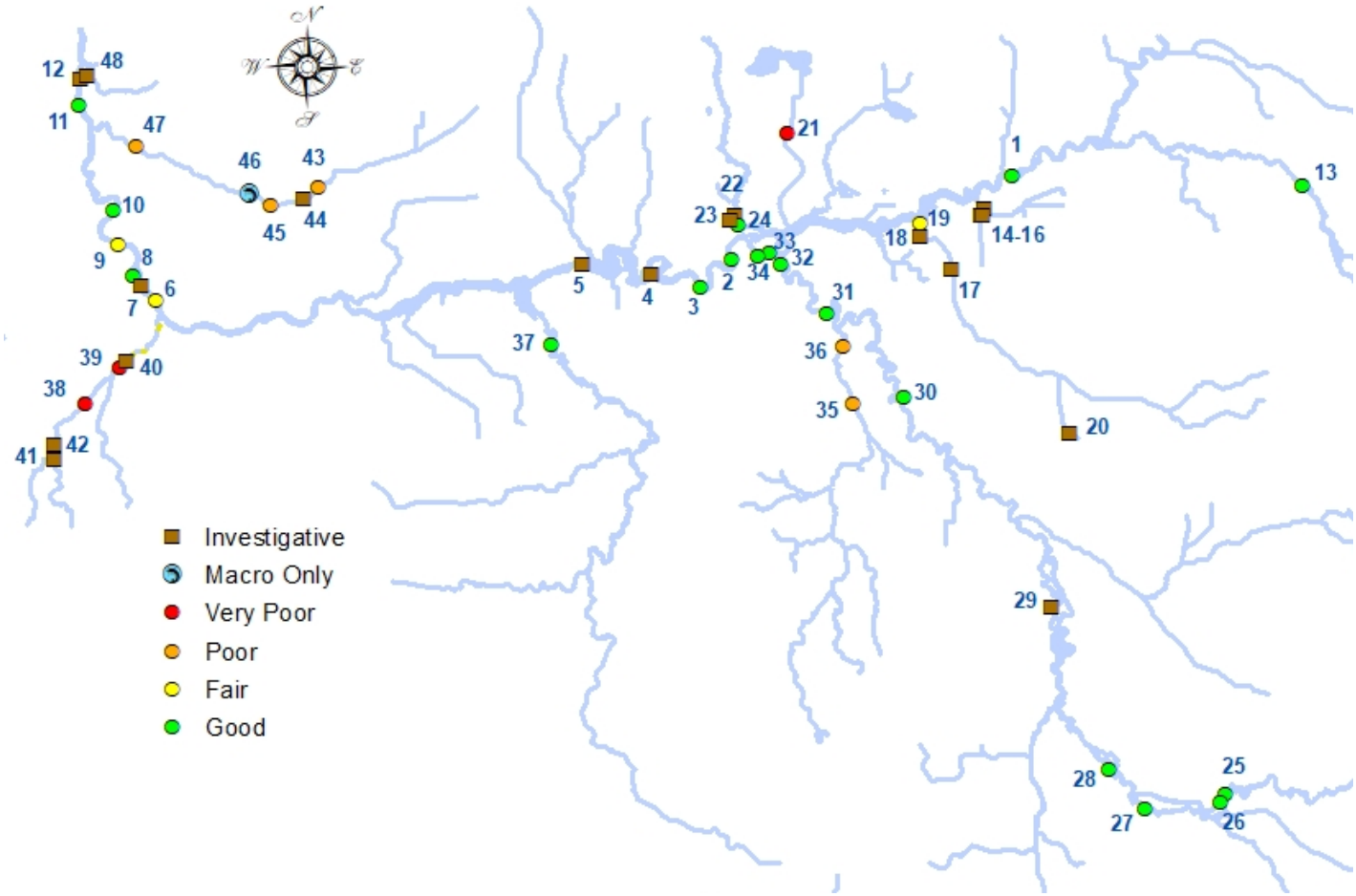
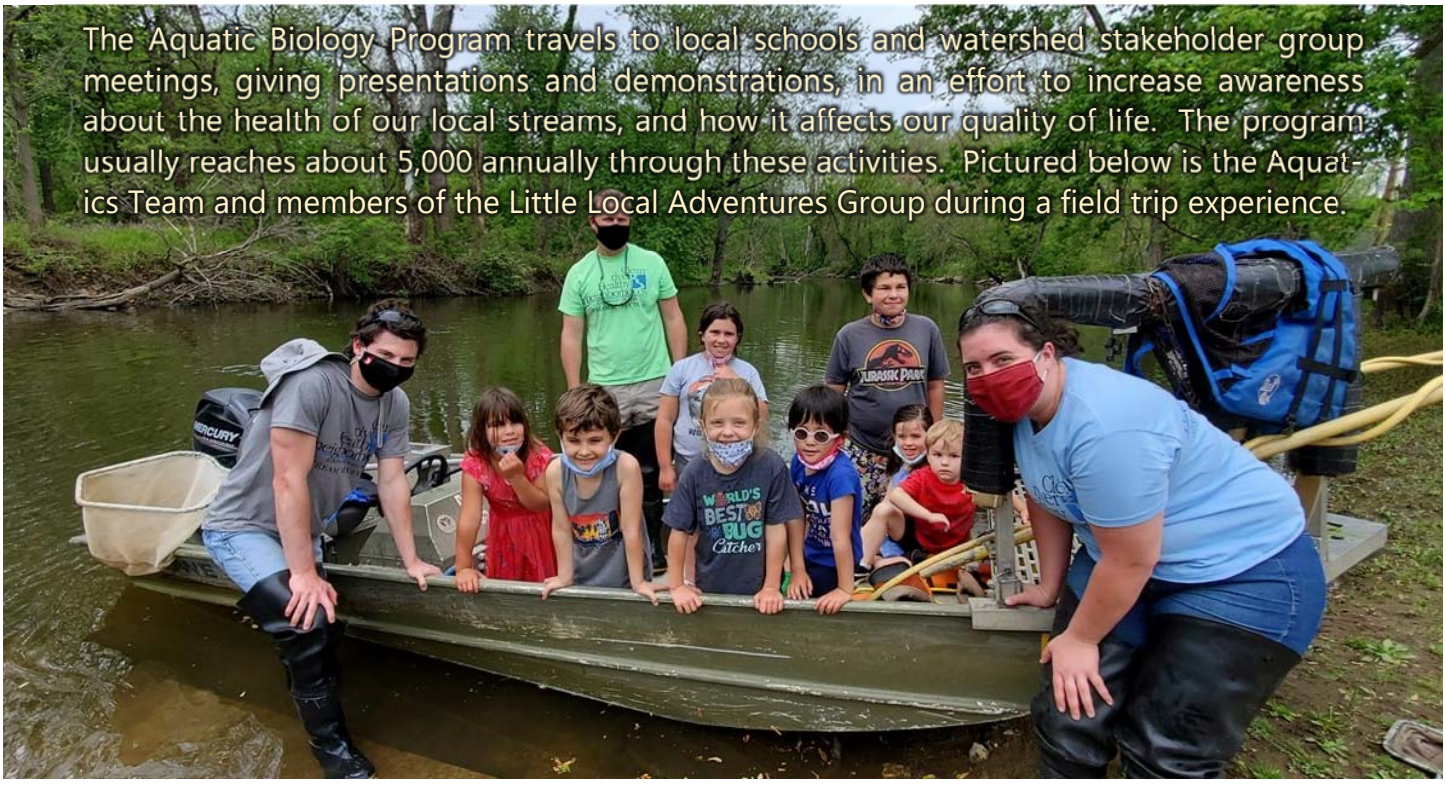
Figure 1: Fish sampling sites in Elkhart and St. Joseph Counties and associated fish community conditions for 2021 (see Table 11 for site information)





A White Sucker collected from the Elkhart River

Biological Survey Methods

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:

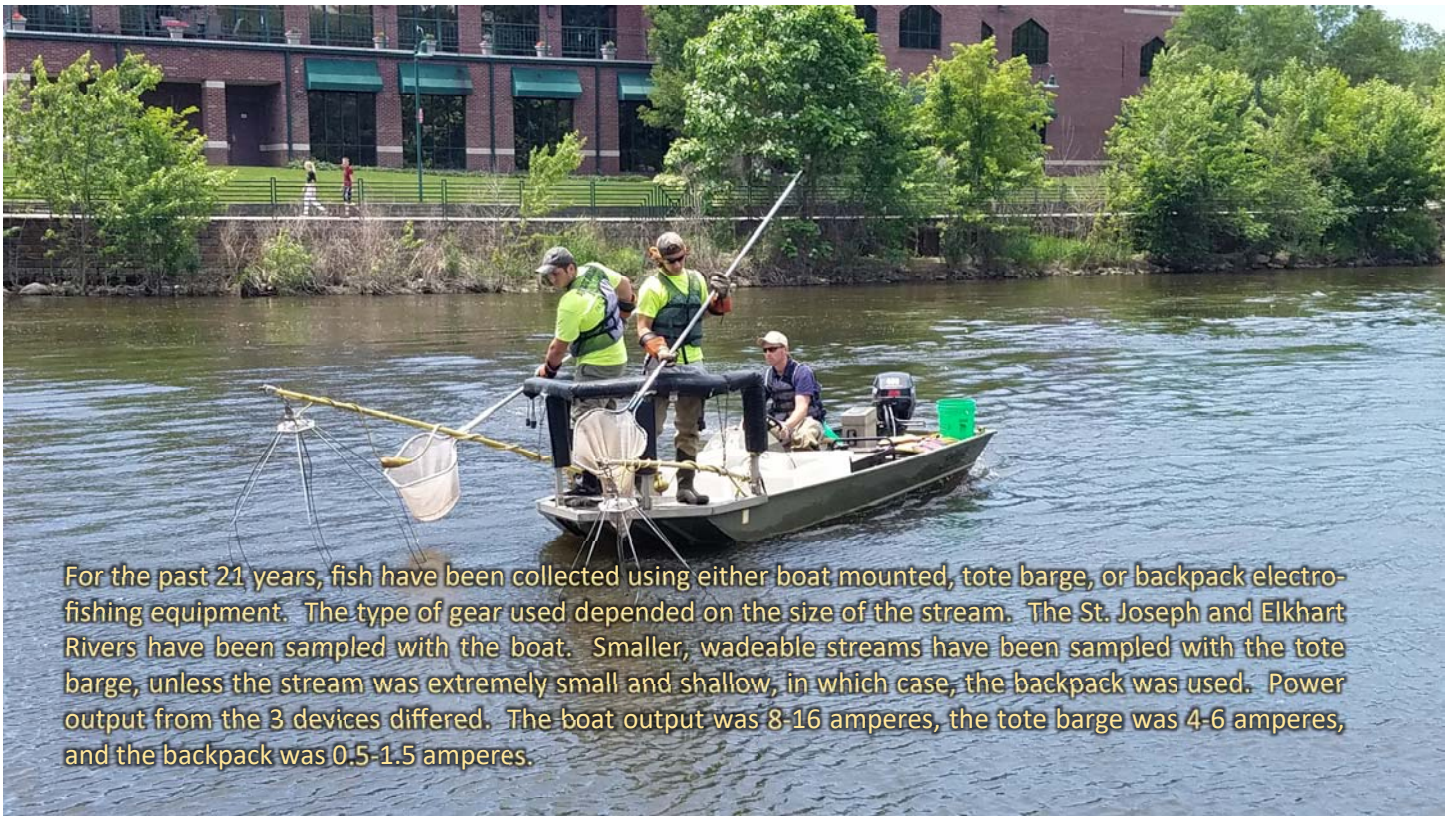
- Conducting electrofishing surveys on stream segments that are 15 times the width of the stream up to a maximum of 500 meters.
- Conducting 2 surveys on the same stream segment with a 5-week rest period (Index scores are averaged from the 2 surveys)
- Collecting length and weight data from each individual 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 2021. 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 2021, 10 Index and 7 Investigative sites were sampled in St. Joseph County and 14 Index and 11 Investigative sites were sampled in Elkhart County. Fish community parameters were calculated for Index sites and averaged between the 2 surveys.

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.

Fish Community Metrics Explained

- The # of species (species richness) is a powerful basic metric for evaluating the health of an ecosystem. Higher species richness reflects superior water quality and a higher diversity of habitats that supports more species.
- Sensitive species—sensitive species are those that cannot tolerate degraded water quality or habitat. Having a high number of sensitive species is a positive indication of stream health.
- Insectivores—insectivores are generally considered a sensitive group of fish. Their presence in high numbers suggests that there is an abundance of insects present in the stream as a forage base.
- Simple Lithophils—Fish that are simple lithophilic spawners are those that don't protect their nest and young. They require high quality, course substrate for reproduction. An increase in the % of simple lithophils at a site suggests an improvement. Sucker species are simple lithophils.
- Tolerant Species—Tolerant species are those that can survive in areas with degraded habitat or water quality. A decrease in the % of tolerant species collected suggests an improvement at a site.
- Omnivores—Omnivorous fish are generally those that are adaptable and usually tolerant. A decrease in the % of omnivores suggests an improvement at a site.

In the past few years, we have started to analyze various different aspects of the fish communities in addition to looking solely at IBI scores to describe fish community health. Some of these aspects are metrics that are included in the IBI. Additional information regarding some of these important metrics is presented in the table above.

2021 Results and Discussion

IBI scores at the Index sites ranged from very poor (8) at Park Six Drive on Lily Creek to excellent (53) at the Elkhart Environmental Center (EEC) on the Elkhart River. Fish species richness was also highest and lowest at these sites with 1 being present at Park Six Drive and 34 being present at the EEC. Macroinvertebrate community scores ranged from fair (22) at Green Tech Drive on Bowman Creek to exceptional (52) at Lexington Avenue on the St. Joseph River. Habitat quality ranged from poor (32) at Park 6 Drive to excellent (93) at CR 35 on the Little Elkhart River.

Fish by the Number

During the summer of 2021, a total of 25,058 fish, representing 16 families and 68 species, were collected in Elkhart County. In St. Joseph County, 7,392 fish, representing 15 families and 50 species were collected. In total, 69 different species were captured from the 2 counties.

Rock Bass (*Ambloplites rupestris*), Longear Sunfish (*Lepomis megalotis*), and Smallmouth Bass (*Micropterus dolomieu*) were the most abundant species collected in St. Joseph County, while Mimic Shiner (*Notropis volucellus*), Sand Shiner (*Notropis stramineus*) and Bluegill (*Lepomis macrochirus*), were the most abundant in Elkhart County. For more detailed information on the number and types of fish species collected, see Appendix C.

St. Joseph River

Fish, macroinvertebrate, and habitat index scores for the entire Indiana portion of the St. Joseph River are displayed in Table 1. The number of species collected (species richness) and the weight of all tolerant fish are also presented.

Fish IBI scores have remained pretty consistent for the St. Joseph River since the inception of monitoring. When the

2021 Interesting Fish

This Shorthead Redhorse had an abnormally large belly. We are unsurse of the exact cause of its swollen belly but this poor fish also appeared to have a spinal deformity

It's not uncommon for us to find larger predatory fish that are in the process of eating smaller fish. This Northern Pike may have had eyes too big for its stomach as it had a huge Redear Sunfish stuck in its mouth.

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

Station	River Mile	Fish IBI Score		# of Species		Tolerant Fish Weight (kg)		2021 Habitat Scores	(ICI) Macroinvertebrate	
		Baseline Average	**2021**	*Baseline Average*	**2021**	*Baseline Average*	**2021**		Baseline/ Previous	**2021**
Nibbyville (A)	83.7	*52*	**52**	*28*	**32**	*45.3*	**6.0**	83	50	**46**
Lexington Ave-	75.7	*52*	**48**	*26*	**32**	*33.8*	**3.1**	83	56	**52**
McNaughton	74.4	*46*	**49**	*22*	**26**	*33.2*	**2.7**	67	44	**48**
Jefferson Blvd.	57.9	*44*	**43**	*18*	**19**	*15.2*	**3.7**	61	32	**36**
LaSalle	57.2	*46*	**48**	*22*	**25**	*11.5*	**1.1**	86	50	**46**
Michigan St. (B)*	56.7	*47*	**44**	*23*	**24**	*3.8*	**2.0**	85	45	**46**
Keller Park	54.9	*50*	**51**	*26*	**27**	*79.6*	**4.9**	81	50	**46**
Brick Road	51.7	*46*	**48**	*23*	**25**	*31.5*	**0.7**	81	43	**46**

Michigan St. (B)* - Baseline Monitoring was completed from 2019-2021. It was completed at all other sites in the early 2000s

Aquatics Program started sampling in 1998, we found a healthy river, which was reflected by IBI scores in the good to excellent range. Those scores continue to fall in the same range. We have, however, noticed that there have been changes in the fish communities in the river over the past 20 years (Figure 4; Page 8). There have been significant changes in the abundances of certain species and a general trend in increased species richness is occurring (Deegan, 2020). Furthermore, the abundance of certain tolerant species (Common Carp in particular) has plummeted. While the IBI scores may not reflect changes, these other parameters (increased species richness and decreased tolerant species) are very positive signs.

Although modest at some sites, species richness has increased at all sites on the St. Joseph River (Table 1). While this is one of the most basic evaluation metrics that ecologists use, species richness provides a simple yet powerful measure of the health of an ecosystem, and more native species essentially mean that the ecosystem is improving. In addition to an increase in species richness, the total weight of tolerant fish has decreased significantly. The Keller Park site in particular has shown a substantial change in the total weight of tolerant fish. During baseline sampling (2001 to 2003), the average weight of tolerant fish in a sample was 79.6 kilograms (kg) at Keller Park; in 2021, the average weight per sample at Keller Park was 4.9 kg (Figure 2).

While some of these very positive changes are occurring, we are continuing to monitor other changes in the St. Joseph River. As discussed in previous reports, we are seeing a modest decline in sucker species (redhorse in particular) at some St. Joseph River sites, while there has been an explosion in sunfish species (Rockbass, Bluegill, and Longear Sunfish) (Figure 4; Page 8). These changes may be a reflection of alterations in the food web in the river.

In 2021, the Michigan (B) site was sampled for the third consecutive year to establish a baseline at this site for

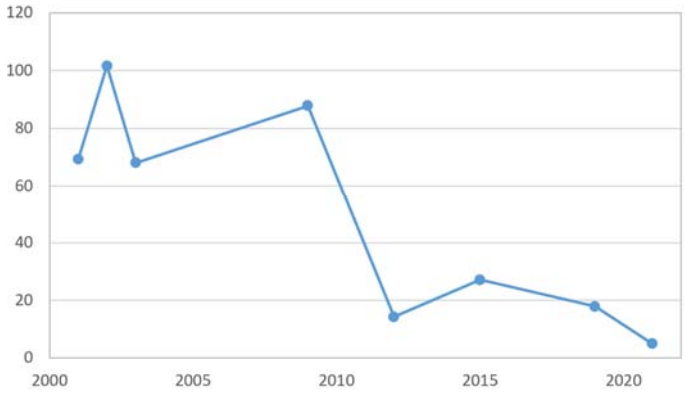


Figure 2: The decline in the weight (kg) of tolerant fish collected during fish surveys at the Keller Park site. This trend is also occurring at other St. Joseph River sites.

future comparisons. The IBI score it received in 2021 of 44 was down from the scores of 49 and 47 it received in 2019 and 2020 respectively. The average three year baseline score will be 47 for this site. The average three year macroinvertebrate scores will be 45.

Macroinvertebrate community scores in Elkhart County were down in 2021 at the Nibbyville (A) and Lexington Avenue sites. The McNaughton Park site had its highest score since the inception of monitoring, which may be related to the Elkhart's combined sewer mitigation efforts, as combined sewer discharges appear to have reduced significantly over the past decade in that area.

Macorinvertebrate community scores in St. Joseph County were very interesting in 2021. With the exception of Jefferson Blvd., which had an improved score of 36, the remaining sites all had scores of 46. We have seen consistency in scores previously (Keller Park and LaSalle both score 50 in 2018) suggesting a consistency in water quality downstream of the South Bend Dam as the river travels through town.

Elkhart River

Fish community metrics for the Elkhart River suggest a lot of improvement in the fish communities since the inception of monitoring. As with St. Joseph River sites, IBI scores for the Oxbow (B) and EEC (A) sites have shown little change compared to their baselines; both sites had very good IBI scores during baseline monitoring (Table 2). The Central High School site, on the other hand, had a lower baseline score of 43, and has shown significant im-

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

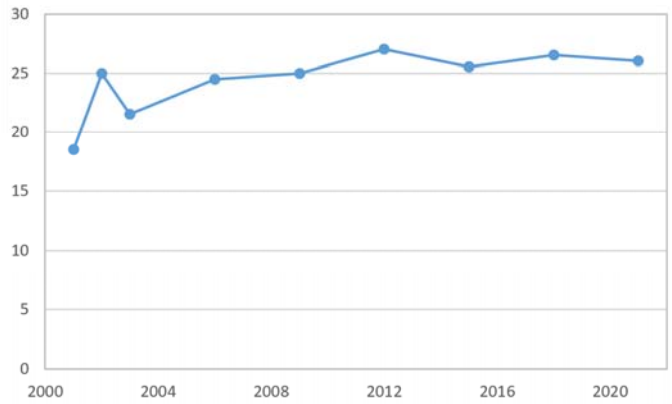


Figure 3: The number of species collected at McNaughton Park on the St. Joseph River has increased since the inception on monitoring. An increase in species richness is being observed at all St. Joseph River sites and some tributaries.

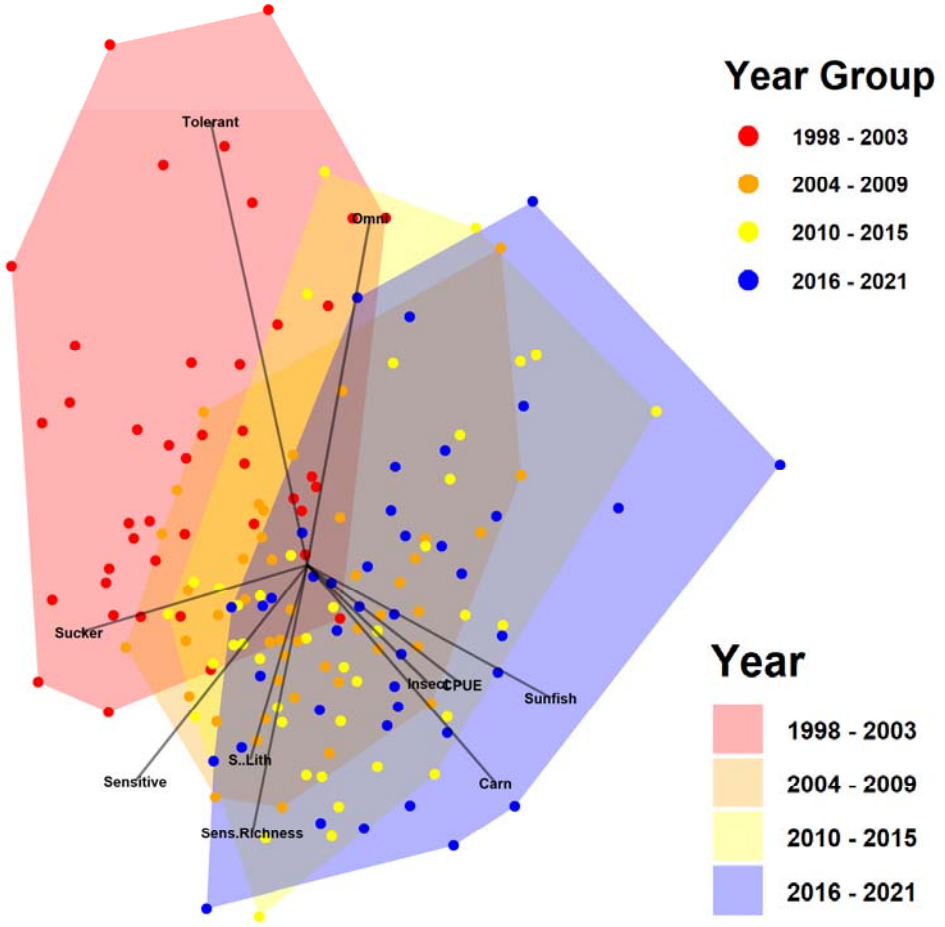


Figure 4: Non-metric multidimensional scaling (nMDS) ordination of fish community metrics from the St. Joseph River based on 6-year intervals (1998 to 2021).

This graph is a summary of fish community parameters that are derived from over 200,000 fish collected between the years of 1998 and 2021. Several metrics of the fish community are used to summarize the fish community changes over time. Each point in the graph represents a fish community at a site. The location of each point is determined by the level of influence that different metrics have on the fish community. The closer together the points are, the more similar fish communities are. The metrics that are depicted include the weight of tolerant fish, the weight of suckers, the weight of sunfish, the weight of sensitive fish, the # of sensitive species/richness, the # of omnivores, the # of insectivores, the # of carnivores, the # of simple lithophils, and the total # of fish (CPUE). This graph shows that the fish communities have changed in the St. Joseph River between 1998 and 2021. For example, between 1998 and 2003, the fish communities were highly influenced by suckers and tolerant fish but between 2016 and 2021 the # of sensitive species, insectivores, and carnivores; the weight of sunfish; and the total # of fish collected had a stronger influence on the fish communities. An analysis of similarities (ANOSIM) statistical test showed that the fish communities changed significantly over the years (*p = 0.001*). *The nMDs ordination and ANOSIM were conducted by Kate Barrett, Ph.D., St. Joseph River Basin Commission.*

provement in IBI scores during the most recent sampling events (2015 to 2021).

Other fish community metrics are demonstrating improvement: species richness has increased significantly at all 3 long-term monitoring sites and the weight of sensitive species collected during surveys has also increased in 2 of the 3 sites sampled in 2021 (Table 2). Species richness was generally increasing at Elkhart River sites over the last decade, but this metric was really bolstered by the influx of new species as a result of the Elkhart River Dam removal. Unlike St. Joseph River sites, the weight of tolerant species in the Elkhart River has not decreased, mostly because Common Carp (a species that has declined in the St. Joseph River) has never been found in abundance in the Elkhart River.

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 swim-

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

Station	River Mile	Fish IBI Score		# of Species		Sensitive Fish Weight (kg)		2021 Habitat Scores	(ICI) Macroinvertebrate Scores	
		Baseline	**2021**	*Baseline*	**2021**	*Baseline*	**2021**		2018	**2021**
Oxbow Park (B)	10.2	52	**49**	24	**32**	30.3	**55.3**	90	44	**46**
EEC (A)	4.6	50	**53**	21	**34**	43.7	**44.5**	80	54	44
Central High	2.1	43	**48**	16	**28**	49.8	**64.8**	78	38	**46**

Table 3: Index scores for sites above and below the former Elkhart River Dam

Station	River Mile	Fish IBI Scores				# of Species				Habitat Scores			
		2018	2019	2020	**2021**	2018	2019	2020	**2021**	2018	2019	2020	**2021**
Prairie Street	0.8	45	49	54	**52**	19	23	35	30	52	57	79	**80**
Elkhart Ave	0.5	51	50	51	**49**	33	31	33	33	78	83	81	**80**

ming upstream. Nine (9) new fish species were collected upstream of the dam at various Elkhart River sites in 2020 and 2021.

In 2018 and 2019, biological monitoring was initiated immediately upstream (Prairie Street) and immediately downstream (Elkhart Avenue) of the former dam. 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 and 2021 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 indicate substantial benefits to the fish community upstream of the dam (Table 3). Not only did the IBI score increase significantly upstream of the dam, but the IBI score was superior upstream compared to downstream in 2020 and 2021. The average species richness increased from 19 to 30 between 2018 and 2021 and several other metrics including the number of darter species, the number of sucker species, and the number of sensitive species also increased significantly. Furthermore, the habitat score also increased very significantly between 2018 and 2021.

Macroinvertebrate scores for the Elkhart River were similar to St. Joseph River scores in St. Joseph County in that they were very similar at the three sites sampled (46, 44, 46) in 2021. This may suggest consistency in water quality influences in recent years in the Elkhart River. The score at Central High School was up significantly from the last time it was sampled in 2018, although the score in 2018 was low relative to previous years. Conversely, the score at the EEC (A) site was down significantly from 2018, but more in line with previous scores at this site.

Bowman Creek

Bowman Creek at Chippewa Avenue had an IBI score of 12 in 2020 (Table 4; Page 10). This score was down significantly from the last two sampling events in 2015 and 2018. In 2021, the average species richness was 3 and the average number of fish collected per sampling event was 8. Species richness has always been low in this stream, although the number fish is down significantly from previous years.

Ben with a River Redhorse collected from the Elkhart River at Oxbow Park in 2021. This species is new to the Elkhart River and the fish Ben is holding was in spawning condition (breeding turbercles on its snout). Along with this specimen, we found several other River Redhorse in the same location indicating that this species is reproducing in the Elkhart River.

As we have discussed in previous years, Bowman Creek often runs dry in certain sections, some of the stream runs underground, and there are barriers impacting stream connectivity and migration of fish and other animals. These connectivity issues are a detriment to fish communities that depend on migration for reproduction and colonization of new areas. These stream connectivity issues are undoubtedly the biggest limitation for fish in this stream. Conversely, in 2021 we discovered that the connectivity issues in Bowman Creek appear to benefit a species of crayfish, the calico crayfish (*Orconectes immunis*) in this stream. We have found that an invasive species of crayfish, the rusty crayfish (*Orconectes rusticus*) has invaded and completely taken over most streams in Elkhart and St. Joseph County. We speculate that because of connectivity issues in Bowman Creek, the rusty crayfish has not been able to invade this stream, and the calico crayfish continues to thrive as a result. The macroinvertebrate community score at Chippewa Avenue of 32 was the same as when this sites was last sampled in 2015. While this site has had similar scores since 2009, the score in 2021 was significantly higher that the baseline score of 11 that

Table 3: Macroinvertebrate Scores for Bowman and Juday Creek Sites

Stream	Station	Stream Mile	2015	2016	2017	2018	2020	2021
Bowman Creek	Chippewa Ave	3.0	32					32
Bowman Creek	Green Tech Drive	2.0	30			26	22	22
Juday Creek	Holy Cross Pkwy	6.6		44	44	38		MG*
Juday Creek	Grape Road	5.3	40			40		38
Juday Creek	Driftwood Dr.	4.6		38	44	44		38
Juday Creek	Myrtle Street	1.7	50			46		42

MG* -Marginally Good score based on qualitative sample. (MG ICI scores are generally around 30)

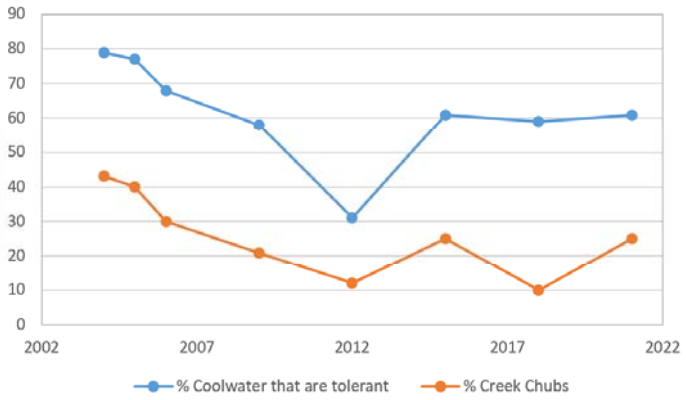


Figure 5: The decline in the % coolwater fish that are tolerant and % of creeks cubs from 2004 to 2021 at Grape Road on Juday Creek. Creek chubs are a coolwater, tolerant fish and their decline has led to fewer tolerant fish in Juday Creek

was established from 2004 to 2006.

A second year of fish community baseline sampling was conducted at Green Tech Drive on Bowman Creek in 2021. The IBI score in 2021 was 13, slightly lower than the score of 14 it received in 2020. An additional round of sampling will be conducted in 2022 to establish a 3 year baseline for this site. Macroinvertebrates were sampled for the 3rd consecutive year at this site, establishing a baseline score of 23. Based on these scores, this site appears to be more degraded than sites further upstream (Chippewa Avenue and Gertrude). This site also has a significant trash accumulation problem compared to other sites in the watershed.

Juday Creek

In 2021, coolwater IBI scores for Grape Road and Myrtle Street were similar to previous years, although the 2021 score at Myrtle Street was significantly higher than the baseline. As we have discussed in length over the years, the IBI system for Juday Creek, and other coolwater stream in the watershed, has limitations that we feel don't accurately represent the intengrity of these streams. However, by looking at certain aspects of the fish communities of Juday Creek over time, we are seeing some positive changes. For example, Creek Chub (*Semotilus atromaculatus*), a highly tolerant species, has declined at Juday Creek sites over the years, while the percentage of other native fish has increased.

Because of its coolwater nature and complexities with the

Table 4: Index scores for Bowman Creek and Juday Creek sites, St. Joseph County

Stream	Station	Stream Mile	Fish IBI Scores (Coolwater IBI Scores)						2021 Habitat Scores
			Baseline	2015	2018	2019	2020	2021	
Bowman Creek	Chippewa Avenue	3.0	13	25	25			12	71
Bowman Creek	Green Tech Drive						14	13	52
Juday Creek	Holy Cross Pkwy					31 (38)	27 (31)	28 (33)	63
Juday Creek	Grape Road	5.3	29 (31)	26 (33)	30 (36)			29 (33)	63
Juday Creek	Myrtle Street	1.7	21 (24)	24 (26)	30 (30)			31 (33)	49

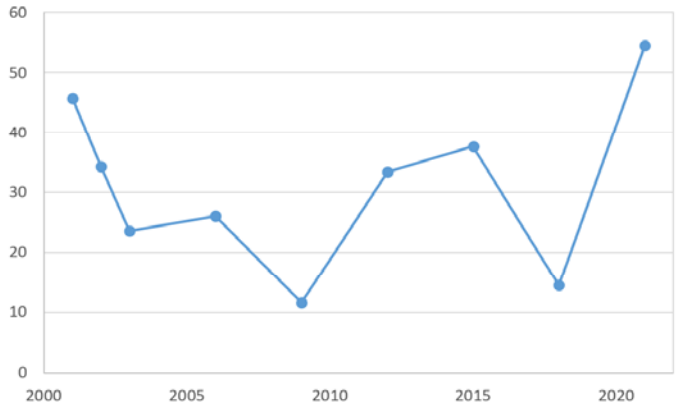


Figure 6: In 2021, the % of tolerant fish at SR 120 on Pine Creek reached its highest point. This and changes to other fish community metrics resulted in a significantly lower IBI score in 2021.

IBI, we believe that macroinvertebrates provide a more meaningful indication of water quality in this stream. In 2021, the macroinvertebrate scores were down significantly at all of the sites sampled. Following deployment of the Hester Dendy samplers (HDs) in Juday Creek in June of 2021, heavy rain events caused the stream flow to increase significantly. These events also contributed to significant sediment movement in the stream (particularly at the Holy Cross Parkway site where the HDs were partially buried in sand). While our program used to recognize Juday Creek as being a stable stream that didn't react much to heavy rain events, it appears to have changed in more recent years and moves more water and fine sand than it used to. These sedimentation issues contributed to the lower macroinvertebrate scores in 2021.

Pine Creek

Pine Creek at SR 120 had a very disappointing IBI score in 2021. Pine Creek is a small stream that has been highly altered for drainage. However, the SR 120 site has always stood out as having high species richness and other qualities of a superior fish community. Factors that influenced the lower score in 2021 were a higher percentage of tolerant species and omnivores, and a lower percentage of sensitive species, insectivores and simple lithophils (fish with sensitive spawning behavior). The macroinvertebrate community score (34) was also down significantly from when this site was last sampled in 2018 when it scored 50. The 2021 fish and macroinvertebrate scores are very disappointing considering it scored so well in 2018. The 2021 scores illustrate the fragility of this stream due to the impacts from drainage modification.

Yellow Creek

Yellow Creek was sampled at two locations for fish in 2021. Due to access issues in 2020, sampling at the US 20 Bypass site was pushed to 2021. Both sites had poor IBI scores in 2021 (Table 5). As discussed in detail previously, the Yellow Creek Watershed has been highly modified for drainage and water in this stream fluctuates considerably bringing heavy loads of sediment and other pollutants.

While the fish community usually falls within the impaired range (below 36), the macroinvertebrate score is usually a little higher. That was the case again in 2021 at Concord High School where the IBI score was 38.

Lily Creek

Of the streams monitored by the Aquatics Program in Elkhart County, Lily Creek has the most impaired fish communities (Table 5). Similar to Bowman Creek in South Bend, Lily Creek runs dry in sections and has barriers that prevent fish from migrating and colonizing. Similar to Bowman Creek, the connectivity issues on Bowman Creek appear to benefit a species of crayfish, the white river crayfish (*Procambarus acutus*) as we found this species in Lilly Creek in the year 2000 and again in 2021 while collecting crayfish.

Little Elkhart River

The IBI score at CR 35 of 49 was down slightly from 2018,

Table 5: Index scores for Yellow Creek, Pine Creek, and Lily Creek, Elkhart County

Stream	Station	River Mile	Fish IBI Scores				2021 Habitat Scores	ICI Macroinvertebrate Scores	
			Baseline	2015	2018	**2021**		2018	**2021**
Yellow Creek	Concord High	2.2	34	34	36	**32**	69	40	**38**
Yellow Creek	US 20 Bypass	0.6	39			**35**	76		
Pine Creek	State Road 120	0.2	40	45	52	**38**	80	50	**34**
Lily Creek	Park Six Drive	2.7	15	6	15	**8**	32		

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

Stream	Station	River Mile	Fish IBI Scores				2021 Habitat Scores	Macroinvertebrate scores (ICI)	
			Baseline	2015	2018	**2021**		2018	**2021**
Little Elkhart River	CR 35	6.5	43	46	51	**49**	92	52	**42**
Christiana Creek	North Main	0.7	48	57	55	**51**	84	54	**48**
Baugo Creek	Restoration (B)	1.4	43	48	48	**48**	85	44	**34**

but still up from the baseline score of 43. This site has had improvements in numerous metrics over the years; the number of species, the number of sensitive species, the number of darter species, the number of sunfish species, the percent of tolerant fish, the percent of insectivores, and the percent of carnivores have improved since the inception of monitoring at this site.

The macroinvertebrate score of 42 was down significantly from the last time this site was sampled in 2018. In 2020, we reported a decline in the fish and macroinvertebrate community at the SR 120 site which is in the downstream reaches of the watershed and close to the St. Joseph River. This lower score at CR 35 isn't cause for alarm as biological index scores can fluctuate, but we will continue to monitor CR 35 closely based on the decline at SR 120.

Christiana Creek

Christiana Creek at the North Main Wellfield (NMWF) had a very impressive IBI score of 51 in 2021, which was up

A aquatics team sampling below the Baintertown dam

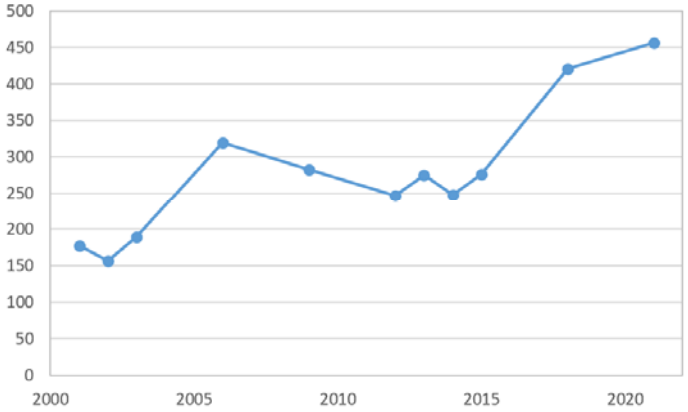


Figure 7: The average number of fish collected during surveys at the North Main Wellfield Christiana Creek has more than doubled since the inception of monitoring. This is occurring at other Christiana Creek sites.

from the baseline but down from the last 2 sampling events in 2015 and 2018 (Table 6). Prior to 2021, many of the metrics including the number of species, the number of sensitive species, the number of darters, and the number of suckers were steadily improving over time. This year (2021) provided a little bit of a check, as some of these metrics were reduced from previous years. As discussed in previous years, the number of individuals collected during fish surveys on Christiana Creek has exploded at all of the sites (Figure 7). This caused reductions in the IBI score at CR 6 in 2020, for example, as the IBI and many of its proportional metrics are influenced by the overall abundance of fish.

The macroinvertebrate community score of 48 was down significantly from 2018 when this site had a record high score of 54. The 2021 score still falls into the exceptional range, however.

Baugo Creek

The IBI score for the Restoration (B) site on Baugo Creek was 48 which is the same as the last two times it was sampled and up significantly from the baseline value of 43. This site was initially sampled to gauge the benefits of instream restoration work that was completed by the Elkhart County Drainage Board. The Aquatics Program also samples another site just upstream of this site, which has seen similar improvements in the fish community since the completion of baseline sampling. The macroinvertebrate community score of 34 in 2021 was down significantly from the last time it was sampled in 2018 (score of 44) but up significantly from the first time it was sampled in 2015 when the score was 25. The instream restoration work appears to have benefited the fish community through improved habitat, but the macroinvertebrate score demonstrates there is a lot of room for improvement in water quality.


A juvenile Longnose Gar collected from the St. Joseph River in South Bend.


A Blackside Darter collected from the Elkhart river

Fish Tissue

In 2021, 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

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*

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.

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 waterbody in the State.

In 2021, 10 fish tissue samples were collected by the Aquatics Program. Tissue samples were collected for 8 species (Common Carp, Black Crappie, Quilback, White Sucker, Smallmouth Bass, Largemouth Bass and Northern Pike). 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 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 2021 based on the concentration of PCBs and Hg:

Two different size ranges of Common Carp tissue samples were collected from the Ironwood site on the St. Joseph River. The smaller sample group averaged 24.4 inches, while the larger sample group averaged 30.0 inches. Based on the levels of PCBs found in these samples, the guidance for consumption would be 1 meal per month for fish less than 24 inches, 1 meal every 2 months for fish between 24 and 30 inches, and "DO NOT EAT" for fish greater than 30 inches. In 2019, the Aquatics Program also collected carp tissue samples from Sample Street which is close the Ironwood site (average size 29.3 inches). The 2019 results were consistent with the samples collected in 2021. The current FCA guidance for the St. Joseph River in St. Joseph County is "DO NOT EAT" for all size ranges.

Black Crappie (average size 11.7 inches) were collected from Treasure Island on the St. Joseph River in Elkhart County. These samples contained relatively low levels of PCBs and mercury, but enough PCBs that would warrant restricting consumption to 1 meal every week. A black crappie sample (approximately 8.3 inches long) was collected from the same section of river in 2015 which yielded lower levels of PCBs. The current FCA guidance for Elkhart County is unrestricted consumption for the general population. That may change soon based on our results from 2021

Quilback Carpsuckers (average size 20.1 inches) were collected from Treasure Island Park on the St. Joseph River. Based on the concentrations of PCBs, consumption guidance would be 1 meal per month for both the general and sensitive populations. There is currently not any guidance for Quillback for the Elkhart County section of the St. Joseph River.

Two White Sucker samples, with respective lengths of 17.5 and 17.2 inches, were collected from Treasure Island Park in Elkhart County and Sample Street in St. Joseph County.

A mossy snapping turtle collected from the Elkhart River

The 2021 intern crew of Hannah, Ben, Own and Simon show off some big River Redhorse from the South Bend Section of the St. Joe

Both samples had similar concentrations of PCBs and Hg and based on PCBs guidance would be 1 meal per week for both the general and sensitive populations. Current guidance in the FCA is unrestricted for Elkhart County and there is no guidance for St. Joseph County.

Silver Redhorse (average size 20.0 inches) were collected from Treasure Island Park in Elkhart County, Based on the concentration of PCBs and Hg, consumption guidance would be 1 meal per week for both the general and sensitive populations. This is consistent with guidance in the FCA, although the FCA guidance is for all redhorse species and isn't specific to Silver Redhorse.

Smallmouth Bass (average size 11.5) were collected from Central High School on the Elkhart River. Based on the concentrations of PCBs and Hg, consumption guidance would be 1 meal per week for both the sensitive and general populations. This is consistent with the current FCA for the Elkhart River.

Largemouth Bass (average size 10.5) were collected from the EEC (A) site on the Elkhart River. Based on concentrations of PCBs, Largemouth under 10 inches long would have unrestricted consumption, and Largemouth 10 inches or longer would have guidance of 1 meal per week. There is currently no guidance for Largemouth Bass on the Elkhart River.

Northern Pike (average 24.1 inches) were collected from the EEC (A) site on the Elkhart River in 2021. In 2020, Northern Pike (average size 24.2) were collected from Shanklin Park in Goshen. The sample collected in 2021 had higher concentrations of PCBs but similar concentrations of Hg. Based on the levels of PCBs in 2021, consumption guidance would be 1 meal per week. There currently is no direct guidance in the FCA for consumption of Northern Pike in the Elkhart River. The 2020 and 2021 samples will be used to update the FCA in the coming years.

Conclusion

Long-term biological monitoring by the cities of Elkhart and South Bend is starting to provide a more thorough

Table 11: Sampling sites and Index Scores in Elkhart and St. Joseph Counties, 2021

Stream	Site	Site Number	Type of Site	County	Method	IBI Scores 2021	ICI Scores 2021	QHEI Scores 2021
St. Joseph River	Nibbyville (A)	1	Index	Elkhart	Boat	52	46	83
	Lexington Ave.	2	Index	Elkhart	Boat	48	52	83
	McNaughton Park	3	Index	Elkhart	Boat	49	48	67
	Treasure Island Park	4	Investigative	Elkhart	Boat			62
	Mouth of Cobus Creek	5	Investigative	Elkhart	Boat			59
	Jefferson Boulevard	6	Index	St. Joseph	Boat	43	36	61
	Howard Park	7	Investigative	St. Joseph	Boat			54
	LaSalle Street	8	Index	St. Joseph	Boat	48	46	86
	Michigan Street (Below)	9	Index	St. Joseph	Boat	44	46	85
	Keller Park	10	Index	St. Joseph	Boat	51	46	81
	Brick Road	11	Index	St. Joseph	Boat	48	46	81
	Auten Road (A)	12	Investigative	St. Joseph	Boat			80
Little Elkhart River*	CR 35	13	Index	Elkhart	Tote Barge	49	42	92
Sheep Creek	Timberbrook	14	Investigative	Elkhart	Back Pack			62
	Timberbrook (B)	15	Investigative	Elkhart	Back Pack			67
Menges Ditch	Mark Street	16	Investigative	Elkhart	Back Pack			53
Pine Creek*	CR 14	17	Investigative	Elkhart	Tote Barge			56
	Roske Drive	18	Investigative	Elkhart	Tote Barge			69
	SR 120 Residence	19	Index	Elkhart	Tote Barge	38	34	80
Wolf Lake Drain	SR 15	20	Investigative	Elkhart	Back Pack			35
Lily Creek	Park Six Drive	21	Index	Elkhart	Back Pack	8		32
Christiana Creek	Simonton Street	22	Investigative	Elkhart	Tote Barge			68
	Wellfield Above	23	Investigative	Elkhart	Tote Barge			75
	North Main Wellfield	24	Index	Elkhart	Tote Barge	51	48	84
Elkhart River	US 33 (Benton)	25	Special	Elkhart	Boat	52		76
	Benton Dam (B)	26	Special	Elkhart	Tote Barge	52		90
	Defries Gardens	27	Special	Elkhart	Boat	50		84
	Baintertown (B)	28	Special	Elkhart	Tote Barge	52		83

Table 11: Fish sampling sites and Index Scores in Elkhart and St. Joseph Counties, 2021(continued)

Stream	Site	Site Number	Type of Site	County	Method	IBI Scores 2021	ICI Scores 2021	QHEI Scores 2021
Elkhart River	Goshen Dam (B)	29	Investigative	Elkhart	Boat			79
	Oxbow Park (B)	30	Index	Elkhart	Boat	49	46	90
	EEC (A)	31	Index	Elkhart	Boat	53	44	80
	Central H.S.	32	Index	Elkhart	Boat	48	46	78
	Prairie Street	33	Index	Elkhart	Boat	52		80
	Elkhart Avenue	34	Index	Elkhart	Boat	49		80
Yellow Creek	Concord H.S.	35	Index	Elkhart	Tote Barge	32	38	69
	US 20 Bypass	36	Index	Elkhart	Tote Barge	35		76
Baugo Creek	Restoration (B)	37	Index	Elkhart	Tote Barge	48	34	85
Bowman Creek	Chippewa Ave.	38	Index	St. Joseph	Back Pack	12	32	71
	Green Tech Drive	39	Index	St. Joseph	Back Pack	13	22	52
	Michigan Street	40	Investigative	St. Joseph	Back Pack			61
Auten Ditch	Jackson Road	41	Investigative	St. Joseph	Back Pack			37
Eberly Ditch	Locust Road	42	Investigative	St. Joseph	Back Pack			29
Juday Creek*	Holy Cross Parkway	43	Index	St. Joseph	Tote Barge	28 (33)	MG	63
	Winding Brook Drive	44	Investigative	St. Joseph	Back Pack			52
	Grape Road	45	Index	St. Joseph	Tote Barge	29 (33)	38	63
	Driftwood	46	Macroinvertebrate Only	St. Joseph	Tote Barge		38	
	Myrtle Street	47	Index	St. Joseph	Tote Barge	31 (33)	42	49
Keifer Ditch	SJR Mouth	48	Investigative	St. Joseph	Back Pack			49

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

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. In general there has been a

significant increase in the number of species collected during fish community surveys. A dramatic reduction in the biomass (weight) of tolerant fish has also occurred which is related to a significant reduction in the abundance of Common Carp in the St. Joseph River. Furthermore an indepth analysis has revealed that the fish communities in the St. Joseph River have changed from ones that were heavily dominated by tolerant fish and sucker species to those that are more influenced by sunfish, insectivores and carnivores. Some of these changes are likely influenced by changes in the food web in the river.

In 2018, 2019, and 2020 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. This general trend also continued into 2021 and is particularly evident in Christiana Creek where fish abundance has exploded in the last several years. An increase in total fish abundance can affect IBI scores (sometimes negatively) as it can influence IBI metrics that are based on proportions.

The macroinvertebrate community scores in Juday Creek were down in 2021 from what appears to be increased sedimentation in this stream. This stream appears to be less stable and more influenced from rain events in the watershed than it used to be.

Bowman Creek and Lily Creek continue to host impaired aquatic communities due to loss of flow and poor habitat. Despite these issues, however, both streams support species of crayfish that are not found in other area streams.

Fish community surveys, performed above and downstream of the former Elkhart River Dam in 2020 and 2021, 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, 9 new species of fish have recolonized the river upstream of the former dam with several species being found almost 20 miles upstream in Goshen. In 2021, the Aquatics Program documented spawning River Redhorse in the Elkhart River at Oxbow Park. This species was impacted by the presence of the former dam and is now reproducing in the Elkhart River.

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APPENDICES

Appendix A

Biological Assessment Introduction and Methodology

In 2021, 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 24 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 2021, 10 Index and 7 Investigative sites were sampled in St. Joseph County and 14 Index and 11 Investigative sites were sampled in Elkhart County. Fish community parameters were calculated for Index sites and averaged to between the 2 surveys. Index sites are those that are part of the Aquatics Programs long-term monitoring network and are sampled every 3 years.

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 2021, 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 Common Carp *(Cyprinus carpio),* Largemouth Bass *(Micropterus salmoides),* Northern Pike *(Esox Lucius),* Smallmouth Bass *(Micropterus dolomieu),* Black Crappie *(Pomoxis nigromaculatus),* Quillback *(Carpiodes cyprinus),* White Sucker *(Catostomus commersoni), and* Silver Redhorse *(Moxostoma anisurum).* 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).

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 2021

Station	Species	Length Range (in)	Hg Group General Population	Hg Group Sensitive Population	PCB Group General Population	PCB Group Sensitive Population
St. Joseph River Ironwood Drive	Common Carp	30	5	5	1	2
St. Joseph River Ironwood Drive	Common Carp	< 24	3	3	1	2
		24 +	4	4		
St. Joseph River Treasure Island	Black Crappie	11.7	2	2	1	2
St. Joseph River Treasure Island	Quillback	< 20	1	2	3	3
		20 +	2	2		
St. Joseph River Treasure Island	White Sucker	17.0 to 18.0	1	2	2	2
St. Joseph River Treasure Island	Silver Redhorse	< 20	1	1	2	2
		20 +	1	2		
Elkhart River Central H.S.	Smallmouth Bass	11.2 to 11.9	1	2	2	2
Elkhart River EEC (A)	Largemouth Bass	< 10	1	1	1	1
		10 +			2	2
Elkhart River EEC (A)	Northern Pike	< 24	1	2	2	2
		24 +	2	2		
St. Joseph River Sample Street	White Sucker	16.5 to 17.9	1	2	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, 2021

Summary of species captured at index sites in Elkhart County, 2021

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Mimic Shiner	3345	14.64	5262	11.60	0.38
Sand Shiner	2675	11.71	4381	9.65	0.32
Spotfin Shiner	1611	7.05	6687	14.74	0.48
Bluegill	1531	6.70	39569	87.23	2.89
Rock Bass	1422	6.22	84044	185.28	6.14
Bluntnose Minnow	1254	5.49	2868	6.32	0.20
White Sucker	1007	4.40	77088	169.95	5.63
Smallmouth Bass	977	4.27	139823	308.25	10.22
Creek Chub	842	3.68	5983	13.19	0.43
Striped Shiner	809	3.54	11321	24.95	0.82
Longear Sunfish	792	3.46	16103	35.50	1.17
Golden Redhorse	788	3.45	405014	892.90	29.60
Green Sunfish	581	2.54	13160	29.01	0.96
Northern Hog Sucker	422	1.84	63923	140.92	4.67
Blacknose Dace	406	1.77	1302	2.87	0.09
Hornyhead Chub	386	1.69	2191	4.83	0.16
Logperch	358	1.56	2713	5.98	0.19
Rainbow Darter	331	1.44	370	0.81	0.02
Stoneroller, Central	320	1.40	2416	5.32	0.17
Largemouth Bass	283	1.23	34228	75.45	2.50
Blackside Darter	273	1.19	577	1.27	0.04
Mottled Sculpin	262	1.14	1454	3.20	0.10
Common Shiner	259	1.13	2409	5.31	0.17
Rosyface Shiner	247	1.08	271	0.59	0.01
Silverjaw Minnow	244	1.06	585	1.28	0.04
Johnny Darter	233	1.02	315	0.69	0.02
Shorthead Redhorse	222	0.97	150245	331.23	10.98
Brown Trout	94	0.41	7292	16.07	0.53
Banded Killifish	78	0.34	239	0.52	0.01
Chestnut Lamprey	75	0.32	501	1.10	0.03
Walleye	68	0.29	37604	82.90	2.74
Greenside Darter	64	0.28	174	0.38	0.01
Common Carp	60	0.26	53676	118.33	3.92
Grass Pickerel	54	0.23	679	1.49	0.04
Pirate Perch	54	0.23	93	0.20	0.006
Spotted Sucker	53	0.23	11081	24.42	0.81
Longnose Dace	44	0.19	158	0.34	0.01
River Redhorse	35	0.15	88250	194.55	6.45
Silver Redhorse	32	0.14	45912	101.21	3.35
Central Mudminnow	32	0.14	180	0.39	0.01
Yellow Bullhead	24	0.10	2190	4.82	0.16

Summary of species captured at index sites in Elkhart County, 2021 (continued)

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Northern Pike	23	0.10	11717	25.83	0.85
Redear Sunfish	22	0.09	3228	7.11	0.23
Yellow Perch	18	0.07	246	0.54	0.01
Pumpkinseed	16	0.07	403	0.88	0.02
American Brook Lamprey	14	0.06	96	0.21	0.007
Brook Silverside	10	0.04	14	0.03	0.001
Bowfin	9	0.03	9000	19.84	0.65
Black Crappie	9	0.03	1087	2.39	0.07
Warmouth	9	0.03	112	0.24	0.008
Gizzard Shad	8	0.03	1704	3.75	0.12
Stonecat	8	0.03	148	0.32	0.01
Quillback	5	0.02	6600	14.55	0.48
Northern Brook Lamprey	5	0.02	16	0.03	0.001
Blackstripe Topminnow	5	0.02	2	0.004	0.0001
Longnose Gar	4	0.01	922	2.03	0.06
YOY Suckers (Unid.)	4	0.01	7	0.01	0.0005
Greater Redhorse	3	0.01	6352	14.00	0.46
Hybrid Sunfish	3	0.01	196	0.43	0.01
Silver Lamprey	3	0.01	17	0.03	0.001
Channel Catfish	2	0.008	1530	3.37	0.11
Flathead Catfish	2	0.008	206	0.45	0.01
Golden Shiner	2	0.008	19	0.04	0.001
Fathead Minnow	2	0.008	3	0.006	0.0002
Black Bullhead	1	0.004	828	1.82	0.06
Black Redhorse	1	0.004	800	1.76	0.05
Rainbow Trout	1	0.004	252	0.55	0.01
Tadpole Madtom	1	0.004	0	0	0
Total	**22,837**	**100**	**1,367,836**	**3,015.564648**	**100**

Summary of species captured at investigative sites in Elkhart County, 2021

COMMON NAME	Total Number	% by Number
Spotfin Shiner	347	15.62
Bluegill	281	12.65
Bluntnose Minnow	227	10.22
Mimic Shiner	187	8.41
Golden Redhorse	173	7.78
Smallmouth Bass	138	6.21
Largemouth Bass	94	4.23
Rock Bass	93	4.18
Longear Sunfish	93	4.18
Sand Shiner	83	3.73
Northern Hog Sucker	76	3.42
Mottled Sculpin	51	2.29
White Sucker	34	1.53
Striped Shiner	32	1.44
Logperch	28	1.26
Creek Chub	28	1.26
Common Carp	24	1.08
Blacknose Dace	24	1.08
Hornyhead Chub	22	0.99
Shorthead Redhorse	17	0.76
Spotted Sucker	17	0.76
Silver Redhorse	15	0.67
Walleye	13	0.58
Rainbow Darter	13	0.58
Central Mudminnow	11	0.49
Pumpkinseed	9	0.40
Black Crappie	7	0.31
Banded Killifish	7	0.31
Quillback	6	0.27
Northern Brook Lamprey	6	0.27
Johnny Darter	6	0.27
Gizzard Shad	5	0.22
Brown Trout	5	0.22
Grass Pickerel	5	0.22
Green Sunfish	5	0.22
Chestnut Lamprey	5	0.22
Yellow Bullhead	4	0.18
Blackside Darter	4	0.18
Rosyface Shiner	4	0.18
River Redhorse	3	0.13
Bowfin	3	0.13
Northern Pike	3	0.13
Redear Sunfish	2	0.09
Common Shiner	2	0.09
Brook Silverside	2	0.09
Channel Catfish	1	0.04
Greater Redhorse	1	0.04
Black Bullhead	1	0.04
Spotted Gar	1	0.04
Blackstripe Topminnow	1	0.04
Longnose Gar	1	0.04
Greenside Darter	1	0.04
Total	**2,221**	**100**

Index Sites	22,837
Investigative Sites	2,221
Elkhart County Total	**25,058**

Summary of species captured at investigative sites in St. Joseph County, 2021

COMMON NAME	Total Number	% by Number
Longear Sunfish	170	21.96
Rock Bass	118	15.24
Spotfin Shiner	98	12.66
Smallmouth Bass	77	9.94
Creek Chub	46	5.94
Golden Redhorse	45	5.81
Largemouth Bass	23	2.97
White Sucker	23	2.97
Bluegill	22	2.84
Mottled Sculpin	22	2.84
Central Mudminnow	19	2.45
Northern Hog Sucker	15	1.93
Mimic Shiner	15	1.93
Blacknose Dace	13	1.67
Bluntnose Minnow	12	1.55
Yellow Bullhead	10	1.29
Black Redhorse	6	0.77
Sand Shiner	6	0.77
Banded Killifish	5	0.64
Spotted Sucker	4	0.51
Redear Sunfish	3	0.38
Green Sunfish	3	0.38
YOY Suckers (Unid.)	3	0.38
Common Carp	2	0.25
Shorthead Redhorse	2	0.25
Warmouth	2	0.25
Johnny Darter	2	0.25
Rainbow Darter	2	0.25
Walleye	1	0.12
Longnose Gar	1	0.12
Fathead Minnow	1	0.12
Logperch	1	0.12
Brook Silverside	1	0.12
Blackside Darter	1	0.12
Total	**774**	**100**

Summary of species captured at index sites in St. Joseph County, 2021

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Rock Bass	1303	19.69	76583	168.84	12.48
Longear Sunfish	1096	16.56	29069	64.09	4.74
Smallmouth Bass	920	13.90	73008	160.96	11.90
Mimic Shiner	619	9.35	937	2.07	0.15
Spotfin Shiner	556	8.40	2002	4.41	0.33
Creek Chub	215	3.25	2884	6.36	0.47
Sand Shiner	180	2.72	267	0.59	0.04
White Sucker	178	2.69	4205	9.27	0.69
Mottled Sculpin	172	2.60	882	1.94	0.14
Bluntnose Minnow	158	2.39	426	0.94	0.07
Golden Redhorse	144	2.18	129315	285.09	21.07
Bluegill	122	1.84	4491	9.90	0.73
Northern Hog Sucker	101	1.53	20860	45.99	3.40
Banded Killifish	84	1.27	271	0.60	0.04
Blacknose Dace	83	1.25	315	0.69	0.05
Largemouth Bass	73	1.10	7335	16.17	1.20
Shorthead Redhorse	66	1.00	64400	141.98	10.49
Green Sunfish	65	0.98	1702	3.75	0.28
Black Redhorse	57	0.86	50990	112.41	8.31
Johnny Darter	51	0.77	97	0.21	0.02
Spotted Sucker	44	0.66	28692	63.26	4.68
Logperch	36	0.54	175	0.39	0.03
Brook Silverside	33	0.50	22	0.05	0.00
Yellow Bullhead	32	0.48	3922	8.65	0.64
YOY Suckers (Unid.)	32	0.48	46	0.10	0.01
Blackside Darter	30	0.45	100	0.22	0.02
Rainbow Darter	24	0.36	42	0.09	0.01
Walleye	20	0.30	17925	39.52	2.92
Longnose Gar	19	0.29	4791	10.56	0.78
Redear Sunfish	16	0.24	474	1.04	0.08
Greenside Darter	10	0.15	23	0.05	0.00
Pumpkinseed	8	0.12	994	2.19	0.16
River Redhorse	7	0.11	30700	67.68	5.00
Brown Trout	7	0.11	5651	12.46	0.92
Bowfin	6	0.09	10800	23.81	1.76
Quillback	6	0.09	9800	21.61	1.60
Rainbow Trout	6	0.09	5455	12.03	0.89
Common Carp	6	0.09	3963	8.74	0.65
Silver Redhorse	5	0.08	11500	25.35	1.87
Chestnut Lamprey	5	0.08	42	0.09	0.01
Northern Pike	3	0.05	3373	7.44	0.55
Spotted Gar	3	0.05	600	1.32	0.10

Summary of species captured at index sites in St. Joseph County, 2021 (continued)

COMMON NAME	Total Number	% by Number	Total Weight (g)	Total Weight (lbs.)	% by Weight
Hybrid Sunfish	3	0.05	68	0.15	0.01
Central Mudminnow	3	0.05	13	0.03	0.00
Spottail Shiner	3	0.05	4	0.01	0.00
Gizzard Shad	2	0.03	457	1.01	0.07
Stonecat	2	0.03	97	0.21	0.02
Warmouth	2	0.03	19	0.04	0.00
Greater Redhorse	1	0.02	3800	8.38	0.62
Yellow Perch	1	0.02	48	0.11	0.01
Total	**6,618**	**100**	**61,3635.00**	**1,352.83**	**100.00**

Index Sites	6,618
Investigative Sites	774
St. Joseph County Total	**7,392**

Appendix D

Summary of fish collected by site, 2021
(Reference Table 11 for site numbers and locations)

Stream	St. Joseph River, Elkhart County, 2021 —Table A					
Site	Nibbyville (Above)		Lexington Ave		McNaughton Park	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
#Banded Killifish	X	X	X	X		
Black Crappie		X	X		X	
Black Redhorse			X			
Blackside Darter	X	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			X	X	X
#Channel Catfish				X		
Chestnut Lamprey	X		X		X	
#Common Carp		X				
#Creek Chub	X				X	
Flathead Catfish			X			X
#Gizzard Shad		X				X
~Golden Redhorse	X	X	X	X	X	X
Grass Pickerel		X				X
~Greater Redhorse					X	
#Green Sunfish	X	X	X	X	X	X
~Greenside Darter				X		
~Hornyhead Chub				X		
Johnny Darter		X		X		
Largemouth Bass	X	X	X	X	X	X
~Logperch	X	X	X	X	X	X
~Longear Sunfish	X	X	X	X	X	X
~Longnose Gar	X	X		X		
~Mimic Shiner	X	X	X	X	X	X
~Northern Hog Sucker	X	X	X	X	X	
Northern Pike		X	X			
Pirate Perch	X	X	X			
Pumpkinseed				X	X	X
#Quillback				X		
~Rainbow Darter	X	X	X	X	X	X
Redear Sunfish		X		X		
River Redhorse		X	X	X	X	X
~Rock Bass	X	X	X	X	X	X
~Rosyface Shiner		X		X		
~Sand Shiner	X	X	X	X	X	X
~Shorthead Redhorse	X	X	X	X	X	X
~Silver Redhorse	X	X	X	X	X	X
~Smallmouth Bass	X	X	X	X	X	X

Stream	St. Joseph River, Elkhart County, 2021 —Table A (continued)					
Site	Nibbyville (Above)		Lexington Ave		McNaughton Park	
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
~Spotfin Shiner	X	X	X	X	X	X
Spotted Sucker	X	X	X			
Stoneroller, Central		X		X		
Striped Shiner		X		X		
Walleye			X	X	X	X
#White Sucker	X	X	X	X	X	X
#Yellow Bullhead	X	X	X	X		X
Yellow Perch		X			X	

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Stream	St. Joseph River, Elkhart County, 2021 —Table B	
Site	Treasure Island Park	Lexington Ave
#Banded Killifish	X	X
#Black Bullhead	X	
Black Crappie	X	X
Blackside Darter	X	X
Bluegill	X	X
#Bluntnose Minnow	X	X
Bowfin	X	
~Brook Silverside	X	X
#Channel Catfish		X
Chestnut Lamprey	X	
#Common Carp	X	X
#Gizzard Shad		X
~Golden Redhorse	X	X
#Green Sunfish	X	
~Greenside Darter		X
Johnny Darter		X
Largemouth Bass	X	X
~Logperch	X	X
~Longear Sunfish	X	X
~Longnose Gar		X
~Mimic Shiner	X	X
Pumpkinseed	X	X
#Quillback	X	X
~Rainbow Darter		X
Redear Sunfish		X
River Redhorse	X	
~Rock Bass	X	X
~Sand Shiner	X	X
~Shorthead Redhorse	X	X
~Silver Redhorse	X	X
~Smallmouth Bass	X	X
~Spotfin Shiner	X	X
Spotted Sucker	X	
Striped Shiner	X	
Walleye	X	X
#White Sucker	X	X

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Stream	St. Joseph River, St. Joseph County , 2021—Table A						
Site	Jefferson Boulevard		Howard Park	LaSalle Street		Michigan Street (Below)	
	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass
#Banded Killifish	X	X		X	X		X
Black Redhorse				X	X	X	X
Blackside Darter		X			X		X
Bluegill	X	X	X	X	X	X	X
#Bluntnose Minnow	X	X		X	X	X	X
Bowfin					X	X	
~Brook Silverside		X	X	X	X		X
Chestnut Lamprey				X		X	
#Common Carp	X	X	X				
#Gizzard Shad		X					
~Golden Redhorse	X			X	X	X	X
~Greater Redhorse						X	
#Green Sunfish	X	X	X	X	X		
~Greenside Darter		X		X	X		X
Hybrid Sunfish				X			
Johnny Darter		X			X	X	X
Largemouth Bass	X	X	X				X
~Logperch		X	X		X		X
~Longear Sunfish	X	X	X	X	X	X	X
~Longnose Gar		X					X
~Mimic Shiner		X		X	X	X	X
~Northern Hog Sucker		X		X	X	X	X
Northern Pike		X					
Pumpkinseed				X			
#Quillback				X		X	
~Rainbow Darter	X			X	X	X	X
Rainbow Trout				X		X	
Redear Sunfish					X		X
River Redhorse						X	
~Rock Bass	X	X	X	X	X	X	X
~Sand Shiner				X	X	X	
~Shorthead Redhorse				X	X	X	X
Silver Redhorse						X	
~Smallmouth Bass	X	X	X	X	X	X	X
~Spotfin Shiner		X		X	X	X	X
Spottail Shiner		X					
Spotted Sucker	X	X	X		X		

Stream	St. Joseph River, St. Joseph County , 2021—Table A (continued)						
Site	Jefferson Boulevard		Howard Park	LaSalle Street		Michigan Street (Below)	
	1st Pass	2nd Pass		1st Pass	2nd Pass	1st Pass	2nd Pass
~Stonecat					X		
Walleye		X		X	X	X	X
#White Sucker		X	X		X		X
#Yellow Bullhead	X	X	X			X	X

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Tributaries to the St. Joseph River, St. Joseph County, 2021 —Table A								
Stream	Bowman Creek					Auten Ditch	Eberly Ditch	Keifer Ditch
Site	Chippewa Ave		Green Tech Dr.		Michigan Street	Jackson Road	Locust Road	SJR Mouth
	1st Pass	2nd Pass	1st Pass	2nd Pass				
#Blacknose Dace								X
Bluegill		X		X				
Central Mudminnow		X				X	X	
#Creek Chub	X	X	X	X	X			
#Green Sunfish	X	X	X	X				
Hybrid Sunfish			X					
Largemouth Bass			X	X				
Warmouth				X				

Stream	St. Joseph River, St. Joseph County , 2021—Table B				
Site	Keller Park		Brick Road		Auten Road (Above)
	1st Pass	2nd Pass	1st Pass	2nd Pass	
#Banded Killifish	X	X	X	X	X
Black Redhorse	X	X	X	X	X
Blackside Darter	X	X		X	X
Bluegill	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X
Bowfin	X			X	
~Brook Silverside		X			
Chestnut Lamprey	X			X	
#Common Carp				X	X
#Creek Chub				X	
#Fathead Minnow					X
~Golden Redhorse	X	X	X	X	X
#Green Sunfish				X	X
~Greenside Darter		X		X	
Johnny Darter	X	X	X	X	X
Largemouth Bass		X	X	X	X
~Logperch		X		X	
~Longear Sunfish	X	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				
~Rainbow Darter	X	X	X	X	X
Rainbow Trout	X		X		
Redear Sunfish		X		X	X
River Redhorse		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 Gar		X			
Spotted Sucker	X	X	X	X	X
Walleye		X			X

Stream	St. Joseph River, St. Joseph County , 2021—Table B (continued)				
Site	Keller Park		Brick Road		Auten Road (Above)
	1st Pass	2nd Pass	1st Pass	2nd Pass	
Warmouth				X	X
#White Sucker			X	X	X
#Yellow Bullhead		X	X	X	X
Yellow Perch		X			
YOY Suckers (Unid.)		X		X	X

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Tributaries to the St. Joseph River, St. Joseph County, 2021 —Table B							
Stream	Juday Creek						
Site	Holy Cross Parkway		Grape Road		Myrtle Street		Winding Brook Drive
	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	
#Blacknose Dace	X	X	X	X	X	X	X
Brown Trout			X	X			
Central Mudminnow	X	X					
#Creek Chub	X	X	X	X	X	X	X
#Green Sunfish	X	X	X	X	X		X
Hybrid Sunfish					X		
Johnny Darter	X	X	X	X	X	X	
Mottled Sculpin	X	X	X	X	X	X	X
~Rainbow Darter						X	
Rainbow Trout			X			X	
~Rock Bass					X	X	
~Smallmouth Bass						X	
#White Sucker	X	X	X	X	X	X	

Tributaries to the St. Joseph River, Elkhart County, 2021 —Table A									
Stream	Elkhart River								
Site	US 33 (Benton)	Benton Dam (Below)	Defries Gardens	Bainertown (Below)	Goshen Dam (Below)	Oxbow Park (Below)		EEC (Above)	
						1st Pass	2nd Pass	1st Pass	2nd Pass
~American Brook Lamprey						X		X	
Black Crappie					X				X
Blackside Darter	X	X	X	X	X	X	X	X	X
Blackstripe Topminnow	X				X		X		
Bluegill		X		X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X	X	X	X
Bowfin		X						X	X
~Brook Silverside		X							
Central Mudminnow		X				X	X		
Chestnut Lamprey						X	X	X	
#Common Carp		X	X				X	X	X
Common Shiner	X	X	X	X	X		X		X
#Creek Chub			X	X				X	X
#Fathead Minnow						X			
#Gizzard Shad								X	
~Golden Redhorse	X	X	X	X	X	X	X	X	X
#Golden Shiner							X		
Grass Pickerel	X	X	X	X	X	X	X		
~Greater Redhorse					X		X		
#Green Sunfish	X	X			X	X	X	X	X
~Hornyhead Chub	X	X	X	X	X	X	X	X	X
Hybrid Sunfish						X		X	
Johnny Darter	X	X	X	X	X	X		X	X
Largemouth Bass	X	X	X	X	X	X	X	X	X
~Logperch									X
~Longear Sunfish	X	X	X	X	X	X	X	X	X
~Longnose Gar								X	
~Mimic Shiner					X		X	X	X
~Northern Brook Lamprey			X	X					
~Northern Hog Sucker	X	X	X	X	X	X	X	X	X
Northern Pike	X	X			X	X	X	X	X
Pirate Perch	X	X	X	X		X		X	X
Pumpkinseed						X		X	
~Rainbow Darter	X	X							
Rainbow Trout						X			
Redear Sunfish								X	X
River Redhorse						X	X	X	
~Rock Bass	X	X	X	X	X	X	X	X	X

Tributaries to the St. Joseph River, Elkhart County, 2021 —Table A (continued)									
Stream	**Elkhart River**								
Site	**US 33 (Benton)**	**Benton Dam (Below)**	**Defries Gardens**	**Bainertown (Below)**	**Goshen Dam (Below)**	**Oxbow Park (Below)**		**EEC (Above)**	
						1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**
~Rosyface Shiner	X	X	X	X	X	X	X	X	X
~Sand Shiner		X		X	X	X	X	X	X
~Shorthead Redhorse					X	X	X	X	X
Silver Lamprey		X						X	
~Silver Redhorse							X	X	X
Silverjaw Minnow							X		
~Smallmouth Bass	X	X	X	X	X	X	X	X	X
~Spotfin Shiner	X	X	X	X	X	X	X	X	X
Spotted Sucker		X	X		X	X	X	X	X
~Stonecat		X		X					
Stoneroller, Central		X		X					
Striped Shiner		X	X	X	X	X	X	X	X
~Tadpole Madtom				X					
Walleye			X		X	X	X	X	X
Warmouth		X		X			X		X
#White Sucker	X	X	X	X	X	X	X	X	X
#Yellow Bullhead	X		X						
Yellow Perch		X		X					
YOY Suckers (Unid.)									X

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Tributaries to the St. Joseph River, Elkhart County, 2021 —Table B						
Stream	**Elkhart River**					
Site	**Central H.S.**		**Elkhart Avenue**		**Prairie Street**	
	1st Pass	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
~American Brook Lamprey	X				X	X
#Banded Killifish			X	X		X
#Black Bullhead				X		
Black Crappie			X			
Blackside Darter	X	X	X	X	X	X
Bluegill	X	X	X	X	X	X
#Bluntnose Minnow	X	X	X	X	X	X
~Brook Silverside			X	X		
Brown Trout						X
#Channel Catfish				X		
Chestnut Lamprey	X	X	X		X	X
#Common Carp	X			X	X	X
#Creek Chub	X	X				X
#Fathead Minnow				X		
#Gizzard Shad					X	
~Golden Redhorse	X	X	X	X	X	X
Grass Pickerel			X			
#Green Sunfish	X	X	X	X	X	X
~Greenside Darter			X	X	X	
~Hornyhead Chub	X	X		X	X	X
Johnny Darter	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	X
~Mimic Shiner	X	X	X	X	X	X
~Northern Brook Lamprey	X					
~Northern Hog Sucker	X	X	X	X	X	X
Pumpkinseed			X	X		X
#Quillback					X	
~Rainbow Darter	X		X	X	X	X
Redear Sunfish	X		X			
River Redhorse			X			
~Rock Bass	X	X	X	X	X	X
~Rosyface Shiner	X	X	X	X		X
~Sand Shiner	X	X	X	X	X	X
~Shorthead Redhorse	X	X	X	X	X	X
~Silver Redhorse			X	X	X	
Silverjaw Minnow		X		X		X

Tributaries to the St. Joseph River, Elkhart County, 2021 —Table B (continued)						
Stream	**Elkhart River**					
Site	**Central H.S.**		**Elkhart Avenue**		**Prairie 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 Sucker	X	X			X	
~Stonecat			X			
Striped Shiner	X	X	X		X	X
Walleye	X	X	X	X	X	X
Warmouth			X	X		
#White Sucker	X	X		X		X
#Yellow Bullhead	X	X	X			X
Yellow Perch			X	X		

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Tributaries to the St. Joseph River, Elkhart County, 2021 —Table A									
Stream	Little Elkhart River		Sheep Creek		Menges Ditch	Pine Creek			
Site	CR 35		Timberbrook	Timberbrook (Below)	Mark Street	CR 14	Roske Drive	SR 120 Residence	
	1st Pass	2nd Pass						1st Pass	2nd Pass
~American Brook Lamprey								X	
#Banded Killifish								X	
#Blacknose Dace	X	X	X	X	X				
Blackside Darter	X	X						X	X
Bluegill	X	X					X	X	X
#Bluntnose Minnow	X							X	X
Brown Trout	X	X	X	X			X	X	X
Central Mudminnow	X		X	X	X	X	X	X	X
Chestnut Lamprey	X	X							X
Common Shiner	X	X							
#Creek Chub	X	X	X	X	X	X	X	X	X
Grass Pickerel	X	X						X	
#Green Sunfish	X	X						X	X
~Greenside Darter	X	X							
Johnny Darter	X	X						X	X
Largemouth Bass	X	X				X			X
~Logperch		X						X	X
~Longear Sunfish									X
~Mimic Shiner									X
Mottled Sculpin	X	X				X	X	X	X
~Northern Hog Sucker	X	X							
Pirate Perch								X	
Pumpkinseed		X							
~Rainbow Darter	X	X	X	X				X	X
~Rock Bass	X	X						X	X
~Rosyface Shiner		X							
~Sand Shiner									X
~Shorthead Redhorse		X							
~Smallmouth Bass	X	X							X
~Spotfin Shiner	X							X	X
Stoneroller, Central	X							X	X
Striped Shiner	X	X						X	X
#White Sucker	X	X	X	X		X	X	X	X
#Yellow Bullhead								X	X

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Tributaries to the St. Joseph River, Elkhart County, 2021 —Table B													
Stream	Wolf Lake Drain	Lily Creek		Christiana Creek				Yellow Creek				Baugo Creek	
Site	SR 15	Park Six Drive		Simon-ton Street	Well-field (Above)	North Main Wellfield		Concord H.S.		US 20 Bypass		Restoration (Below)	
		1st Pass	2nd Pass			1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass	1st Pass	2nd Pass
#Banded Killifish												X	X
Black Crappie									X				
Blacknose Dace								X	X	X	X	X	X
Blackside Darter										X	X	X	X
Bluegill			X	X	X	X	X	X	X	X	X	X	X
#Bluntnose Minnow				X	X	X	X	X	X	X	X	X	X
Bowfin				X									
Central Mudminnow							X	X	X		X	X	X
Chestnut Lamprey					X	X	X			X		X	
#Common Carp					X		X				X	X	
Common Shiner										X	X	X	X
#Creek Chub						X	X	X	X	X	X	X	X
~Golden Redhorse				X	X	X	X						X
Grass Pickerel				X				X			X		
#Green Sunfish					X	X		X	X	X	X	X	X
~Greenside Darter												X	X
~Hornyhead Chub						X	X	X	X	X	X		
Johnny Darter								X	X	X	X	X	X
Largemouth Bass				X	X	X	X	X	X		X	X	X
~Logperch				X	X	X	X					X	X
~Longear Sunfish												X	X
~Longnose Dace												X	X
~Mimic Shiner											X		X
~Northern Brook Lamprey				X									
~Northern Hog Sucker				X	X	X	X						
Pumpkinseed						X						X	
~Rainbow Darter					X	X	X			X	X	X	X
~Rock Bass				X	X	X	X					X	X
~Rosyface Shiner											X		
~Sand Shiner												X	X
~Shorthead Redhorse						X							X
Silver Redhorse					X							X	
Silverjaw Minnow								X	X	X		X	X
~Smallmouth Bass				X	X	X	X		X	X	X	X	X
~Spotfin Shiner				X	X	X	X				X	X	X

Tributaries to the St. Joseph River, Elkhart County, 2021 —Table B (continued)													
Stream	**Wolf Lake Drain**	**Lily Creek**		**Christiana Creek**				**Yellow Creek**				**Baugo Creek**	
Site	**SR 15**	**Park Six Drive**		**Simon-ton Street**	**Well-field (Above)**	**North Main Wellfield**		**Concord H.S.**		**US 20 Bypass**		**Restoration (Below)**	
		1st Pass	**2nd Pass**			**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**	**1st Pass**	**2nd Pass**
Stonecat						X							
Stoneroller, Central								X	X	X	X	X	X
Striped Shiner				X	X	X	X	X	X	X	X	X	X
Walleye												X	
#White Sucker						X	X	X	X	X	X	X	X
#Yellow Bullhead				X	X	X	X						

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Appendix E

Summary of macroinvertebrates (insects) collected by site, 2021

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 2021.

Site Number	Stream	Location	Site Number	Stream	Location
1	St. Joseph River	Nibbyville (A)	30	Elkhart River	Oxbow (B)
2	St. Joseph River	Lexington Ave	31	Elkhart River	EEC (A)
3	St. Joseph River	McNaughton Park	32	Elkhart River	Central H.S.
6	St. Joseph River	Jefferson Blvd	35	Yellow Creek	Concord H.S.
8	St. Joseph River	LaSalle	37	Baugo Creek	Restoration (B)
9	St. Joseph River	Michigan St. (Below)	38	Bowman Creek	Chippewa Ave.
10	St. Joseph River	Keller Park	39	Bowman Creek	Green Tech Drive
11	St. Joseph River	Brick Road	43	Juday Creek	Holy Cross Parkway
13	Little Elkhart River	CR 35	45	Juday Creek	Grape Road
19	Pine Creek	SR 120	46	Juday Creek	Driftwood Drive
24	Christiana Creek	NMWF	47	Juday Creek	Myrtle Street

St. Joseph River - Nibbyville (A)

Date Collected: 08/23/21 Site #1

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	26		F
Oligochaeta	0	+	T
Gammarus sp	0	+	F
Hydrachnidia	0	+	F
Baetidae	5		
Plauditus dubius	11	+	MI
Labiobaetis dardanus	0	+	MI
Baetis intercalaris	11	+	F
Iswaeon anoka	0	+	MI
Isonychia sp	22	+	MI
Heptagenia sp	18	+	
Stenacron sp	181	+	F
Maccaffertium exiguum	32		MI
M.mediopunctatum	60		MI
Maccaffertium terminatum	22	+	MI
Teloganopsis deficiens	3		I
Tricorythodes sp	98	+	MI
Caenis sp	0	+	F
Anthopotamus sp	0	+	MI
Coenagrionidae	0	+	T
Argia sp	10		F
Pteronarcys sp	0	+	MI
Agnetina capitata complex	1		MI
Neoplea sp	0	+	F
Corydalus cornutus	1		MI
Neureclipsis sp	6		MI
Polycentropus sp	1		MI
Cheumatopsyche sp	41		F
Hydropsyche phalerata	1	+	MI
Macrostemum zebratum	5		I
Hydroptila sp	6		F
Ochrotrichia sp	1		MI
Brachycentrus numerosus	2		MI
Neophylax sp	0	+	MI
Pycnopsyche sp	1	+	MI
Helicopsyche borealis	0	+	MI
Nectopsyche exquisita	2		MI
Dineutus sp	1	+	F
Psephenus herricki	0	+	MI
Macronychus glabratus	8	+	F
Stenelmis sp	1	+	F
Simulium sp	0	+	F
Ablabesmyia rhamphe group	1	+	MT
H. senata or T. norena	1		F
Nilotanypus fimbriatus	2		F
Corynoneura sp	3		
Cricotopus (C.) bicinctus	1	+	T
Nanocladius sp	2		F
Thienemanniella xena	2	+	F
Dicrotendipes neomodestus	2	+	F
Polypedilum (flavum	15	+	F
Polypedilum (P.) fallax group	3		F
Polypedilum (P.) illinoense	4	+	T
Stenochironomus sp	1		F
Tanytarsus sp	0	+	F
Hydrobiidae	2	+	F
Elimia sp	14		MI
Physella sp	0	+	T
Ancylidae	1		F
Corbicula fluminea	0	+	F
Dreissena polymorpha	0	+	F
Elliptio dilatata	0	+	MI
Lampsilis radiata luteola		+	MI

No. of Quantitative Taxa	43
No. of Qualitative Taxa	39
Total Taxa	63
No. Organisms	631
Qualitative EPT	16
ICI	**46**

St. Joseph River - Lexington Ave

Date Collected: 08/20/21 Site #2

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	14		F	Oxyethira sp	1		F
Nemertea	1		F	Brachycentrus numerosus	0	+	MI
Oligochaeta	1	+	T	Neophylax sp	0	+	MI
Placobdella ornata	0	+	MT	Pycnopsyche sp	0	+	MI
Caecidotea sp	0	+	T	Triaenodes injustus	0	+	MI
Hyalella azteca	0	+	F	Peltodytes sp	0	+	MT
Gammarus sp	8	+	F	Macronychus glabratus	9		F
Hydrachnidia	0	+	F	Stenelmis sp	0	+	F
Acentrella turbida	31	+	I	Anopheles sp	0	+	F
Plauditus dubius	0	+	MI	Culex sp	0	+	T
Labiobaetis dardanus	0	+	MI	Simulium sp	3	+	F
Baetis intercalaris	78	+	F	Ablabesmyia mallochi	10		F
Labiobaetis propinquus	0	+	MI	Ablabesmyia rhamphe group	1		MT
Iswaeon anoka	0	+	MI	Corynoneura lobata	1		F
Isonychia sp	63		MI	Cricotopus (C.) bicinctus	10		T
Leucrocuta sp	0	+	MI	Thienemanniella xena	21		F
Stenacron sp	56	+	F	Tvetenia discoloripes group	0	+	MI
Maccaffertium exiguum	158		MI	Cryptotendipes pseudotener	0	+	F
M. mediopunctatum	79	+	MI	Dicrotendipes neomodestus	13	+	F
Maccaffertium pulchellum	17	+	MI	Polypedilum flavum	45		F
Maccaffertium terminatum	0	+	MI	Polypedilum (P.) illinoense	5		T
Teloganopsis deficiens	41		I	Rheotanytarsus sp	203		F
Tricorythodes sp	65	+	MI	Hemerodromia sp	2		F
Anthopotamus sp	0	+	MI	Elimia sp	12	+	MI
Hetaerina sp	0	+	F	Physella sp	0	+	T
Coenagrionidae	0	+	T	Planorbella trivolvis	0	+	MT
Argia sp	2	+	F	Ferrissia sp	3		F
Macromia sp	0	+	MI	Corbicula fluminea	0	+	F
Pteronarcys sp	0	+	MI	Dreissena polymorpha	0	+	F
Agnetina capitata complex	2	+	MI	Alasmidonta marginata	0	+	MI
Ranatra sp	0	+	F	Fusconaia flava	0	+	MI
Pelocoris sp	0	+	MT	Elliptio dilatata	0	+	MI
Corydalus cornutus	1	+	MI	Lampsilis radiata luteola	0	+	MI
Neureclipsis sp	2		MI				
Cheumatopsyche sp	229	+	F	No. of Quantitative Taxa	36		
Hydropsyche aerata	0	+	MI	No. of Qualitative Taxa	54		
Hydropsyche phalerata	2	+	MI	Total Taxa	73		
Hydropsyche venularis	0	+	MI	No. Organisms	1215		
Macrostemum zebratum	9	+	I	Qualitative EPT	24		
Hydroptila sp	17		F	**ICI**	**52**		

St. Joseph River - McNaughton Park

Date Collected: 08/26/21 Site #3

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	31		F
Oligochaeta	8	+	T
Caecidotea sp	0	+	T
Gammarus sp	0	+	F
Orconectes rusticus	0	+	F
Hydrachnidia	0	+	F
Plauditus dubius	0	+	MI
Labiobaetis sp	0	+	MI
Baetis intercalaris	8		F
Iswaeon anoka	0	+	MI
Isonychia sp	42		MI
Stenacron sp	96	+	F
Maccaffertium exiguum	152		MI
M. mediopunctatum	52		MI
Maccaffertium terminatum	36		MI
Teloganopsis deficiens	9		I
Tricorythodes sp	19	+	MI
Coenagrionidae	0	+	T
Argia sp	0	+	F
Neoplea sp	0	+	F
Neureclipsis sp	6		MI
Polycentropus sp	4		MI
Cheumatopsyche sp	451	+	F
Ceratopsyche morosa group	1		MI
Hydropsyche aerata	1		MI
Hydropsyche phalerata	0	+	MI
Hydropsyche phalerata	6		MI
Hydroptilidae	0	+	F
Ochrotrichia sp	1		MI
Brachycentrus numerosus	3	+	MI
Pycnopsyche sp	0	+	MI
Nectopsyche diarina	0	+	MI
Oecetis persimilis	1		MI
Dineutus sp	0	+	F
Scirtidae	0	+	F
Ancyronyx variegata	0	+	F
Macronychus glabratus	45		F
Stenelmis sp	0	+	F
Culicidae	0	+	MT
Ablabesmyia rhamphe group	6		MT
Cryptochironomus sp	0	+	F
Parachironomus frequens	5		F
P. albimanus or P. duplicatus	0	+	F
Polypedilum aviceps	18		MI
Polypedilum flavum	81	+	F
Polypedilum (P.) fallax group	3	+	F
Polypedilum (P.) illinoense	4	+	T
Rheotanytarsus pellucidus	10		MI
Rheotanytarsus sp	131		F
Tanytarsus sp	1		F
Hemerodromia sp	1		F
Elimia sp	0	+	MI
Physella sp	0	+	T
Gyraulus sp	0	+	MT
Ferrissia sp	2		F
Corbicula fluminea	0	+	F
Dreissena polymorpha	0	+	F
Actinonaias carinata	0	+	MI

No. of Quantitative Taxa	31
No. of Qualitative Taxa	35
Total Taxa	58
No. Organisms	1234
Qualitative EPT	11
ICI	**48**

St. Joseph River - Jefferson

Date Collected: 08/17/21 Site #6

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	0	+	F
Hydra sp	1		F
Turbellaria	35	+	F
Plumatella sp	1		F
Oligochaeta	94	+	T
Helobdella stagnalis	0	+	T
Caecidotea sp	0	+	T
Hyalella azteca	4	+	F
Gammarus sp	27	+	F
Baetis intercalaris	3		F
Labiobaetis propinquus	0	+	MI
Isonychia sp	1		MI
Stenacron sp	507	+	F
Maccaffertium exiguum	43		MI
Teloganopsis deficiens	2		I
Tricorythodes sp	57	+	MI
Caenis sp	0	+	F
Coenagrionidae	0	+	T
Argia sp	21		F
Corduliidae	0	+	
Ranatra sp	0	+	F
Climacia sp	0	+	F
Cyrnellus fraternus	9		F
Polycentropus sp	6		MI
Cheumatopsyche sp	247	+	F
Hydropsyche phalerata	1		MI
Macrostemum zebratum	6		I
Hydroptila sp	35		F
Oxyethira sp	4		F
Mystacides sp	0	+	MI
Oecetis sp	1	+	F
Triaenodes injustus	0	+	MI
Scirtidae	0	+	F
Macronychus glabratus	105		F
Stenelmis sp	1		F
Ablabesmyia mallochi	4		F
Ablabesmyia rhamphe group	33	+	MT
H. senata or T. norena	1		F
Helopelopia sp	1		F
Procladius (Holotanypus) sp	0	+	MT
Cricotopus (C.) bicinctus	0	+	T
C. sylvestris gp.	0	+	T
Thienemanniella lobapodema	8		F
Cryptochironomus sp	3		F
Dicrotendipes modestus	1		MT
Dicrotendipes neomodestus	4		F
Phaenopsectra obediens group	1		F
Polypedilum flavum	35	+	F
Polypedilum (P.) illinoense	2	+	T
Stenochironomus sp	61		F
Tribelos fuscicorne	0	+	F
Tribelos jucundum	0	+	MT
Rheotanytarsus sp	6		F
Campeloma sp	1	+	F
Hydrobiidae	0	+	F
Elimia sp	30		MI
Pleurocera sp	0	+	MI
Physella sp	1	+	T
Gyraulus sp	0	+	MT
Dreissena polymorpha	0	+	F

No. of Quantitative Taxa	39
No. of Qualitative Taxa	34
Total Taxa	60
No. Organisms	1403
Qualitative EPT	8
ICI	**36**

St. Joseph River - LaSalle

Date Collected: 08/09/21 Site #8

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	471	+	F
Oligochaeta	1		T
Helobdella papillata	1		MT
Placobdella ornata	0	+	MT
Caecidotea sp	0	+	T
Gammarus sp	8		F
Orconectes rusticus	0	+	F
Hydrachnidia	0	+	F
Baetis intercalaris	51	+	F
Isonychia sp	19	+	MI
Stenacron sp	6	+	F
Maccaffertium exiguum	43		MI
Maccaffertium pulchellum	37		MI
Maccaffertium terminatum	5	+	MI
Teloganopsis deficiens	37	+	I
Tricorythodes sp	154	+	MI
Hetaerina sp	0	+	F
Coenagrionidae	0	+	T
Argia sp	0	+	F
Agnetina capitata complex	1		MI
Chimarra obscura	23		MI
Polycentropus sp	0	+	MI
Cheumatopsyche sp	1303	+	F
Hydropsyche phalerata	340	+	MI
Hydropsyche venularis	1		MI
Macrostemum zebratum	47	+	I
Hydroptilidae	8		F
Brachycentrus numerosus	2		MI
Oecetis sp	26		F
Petrophila sp	1		MI
Dineutus sp	1		F
Macronychus glabratus	11	+	F
Stenelmis sp	16	+	F
Simulium sp	5	+	F
Ablabesmyia rhamphe group	1		MT
Pentaneura inconspicua	2		F
Thienemannimyia group	1		F
Orthocladiinae	1		
Cardiocladius obscurus	3		MI
Cricotopus (C.) bicinctus	2		T
N. crassicornus or N. "rectinervis"	4		F
Thienemanniella sp	2		
Thienemanniella xena	0	+	F
Tvetenia discoloripes group	52		MI
Polypedilum flavum	28		F
Polypedilum (P.) illinoense	0	+	T
Stenochironomus sp	6		F
Rheotanytarsus sp	53		F
Hemerodromia sp	2		F
Elimia sp	53	+	MI
Ferrissia sp	32	+	F
Corbicula fluminea	0	+	F

No. of Quantitative Taxa	41
No. of Qualitative Taxa	26
Total Taxa	52
No. Organisms	2860
Qualitative EPT	10
ICI	**46**

St. Joseph River - Michigan (B)

Date Collected: 08/09/21 Site #9

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	1140	+	F
Oligochaeta	0	+	T
Caecidotea sp	0	+	T
Gammarus sp	0	+	F
Orconectes rusticus	0	+	F
Plauditus dubius	16	+	MI
Labiobaetis dardanus	0	+	MI
Baetis intercalaris	794	+	F
Labiobaetis propinquus	0	+	MI
Isonychia sp	130		MI
Leucrocuta sp	0	+	MI
Stenacron sp	140	+	F
Maccaffertium exiguum	0	+	MI
M. mediopunctatum	7	+	MI
Maccaffertium pulchellum	27		MI
Maccaffertium terminatum	2	+	MI
Teloganopsis deficiens	219		I
Tricorythodes sp	92	+	MI
Argia sp	0	+	F
Chimarra obscura	35		MI
Cheumatopsyche sp	1849	+	F
Hydropsyche aerata	13		MI
Hydropsyche depravata group	0	+	F
Hydropsyche orris	2		MI
Hydropsyche phalerata	390	+	MI
Macrostemum zebratum	136	+	I
Hydroptilidae	3		F
Brachycentrus numerosus	0	+	MI
Neophylax sp	0	+	MI
Lepidostoma sp	3	+	MI
Helicopsyche borealis	0	+	MI
Mystacides sp	0	+	MI
Nectopsyche exquisita	0	+	MI
Psephenus herricki	0	+	MI
Macronychus glabratus	1	+	F
Stenelmis sp	0	+	F
Simulium sp	3	+	F
Cricotopus (C.) bicinctus	0	+	T
Cricotopus (C.) or Paratrichocladius sp	1		
N. crassicornus or N. "rectinervis"	2		F
Tvetenia discoloripes group	40		MI
Cryptochironomus sp	0	+	F
D. neomodestus	0	+	F
Polypedilum flavum	43	+	F
Polypedilum (P.) illinoense	0	+	T
Rheotanytarsus sp	1		F
Elimia sp	7	+	MI
Physella sp	0	+	T
Planorbella pilsbryi	0	+	T
Corbicula fluminea	0	+	F
Dreissena polymorpha	0	+	F
Pisidium sp	0	+	MT
Sphaerium sp	0	+	F

No. of Quantitative Taxa	26
No. of Qualitative Taxa	42
Total Taxa	53
No. Organisms	5096
Qualitative EPT	20
ICI	**46**

St. Joseph River - Keller Park

Date Collected: 8/9/2021 Site #10

Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	2		F
Turbellaria	536	+	F
Oligochaeta	9	+	T
Helobdella sp	0	+	MT
Erpobdellidae	0	+	MT
Caecidotea sp	0	+	T
Hyalella azteca	0	+	F
Gammarus fasciatus	7	+	F
Orconectes sp	1		F
Hydrachnidia	0	+	F
Plauditus dubius or P. virilis	0	+	I
Baetis flavistriga	0	+	F
Baetis intercalaris	91	+	F
Labiobaetis propinquus	0	+	MI
Iswaeon anoka	14	+	MI
Isonychia sp	81		MI
Leucrocuta sp	0	+	MI
Stenacron sp	29	+	F
Maccaffertium exiguum	86		MI
M.mediopunctatum	12		MI
M.mexicanum integrum	2		MI
Maccaffertium pulchellum	62		MI
Maccaffertium terminatum	48	+	MI
Teloganopsis deficiens	130	+	I
Tricorythodes sp	412	+	MI
Hetaerina sp	0	+	F
Coenagrionidae	0	+	T
Argia sp	0	+	F
Cheumatopsyche sp	367	+	F
Hydropsyche phalerata	36	+	MI
Macrostemum zebratum	92	+	I
Hydroptila sp	14		F
Brachycentrus numerosus	1		MI
Lepidostoma sp	5	+	MI
Helicopsyche borealis	1		MI
Nectopsyche exquisita	0	+	MI
Oecetis sp	1		F
Psephenus herricki	1		MI
Ancyronyx variegata	0	+	F
Dubiraphia quadrinotata	0	+	F
Macronychus glabratus	8	+	F
Stenelmis sp	1	+	F
Simulium sp	1	+	F
Conchapelopia sp	2		F
H.senata or T. norena	3		F
Meropelopia sp	0	+	F
Nilotanypus fimbriatus	1		F
Orthocladiinae	2		
Cricotopus (C.) sp	2		F
Cricotopus (C.) bicinctus	2		T
Cricotopus (C.) trifascia	7		F
Thienemanniella sp	0	+	
Tvetenia discoloripes group	5		MI
Cryptochironomus sp	0	+	F
D. neomodestus	1		F
Polypedilum flavum	30		F
Polypedilum (P.) illinoense	0	+	T
Stenochironomus sp	0	+	F
Elimia sp	32	+	MI
Physella sp	0	+	T
Dreissena polymorpha	1		F
Sphaerium sp	2		F

No. of Quantitative Taxa	41
No. of Qualitative Taxa	38
Total Taxa	62
No. Organisms	2140
Qualitative EPT	15
ICI	**46**

St. Joseph River - Brick Road

Date Collected: 08/19/21 Site #11

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	110		F
Oligochaeta	4	+	T
Erpobdella tetragon	0	+	
Caecidotea sp	0	+	T
Hyalella azteca	0	+	F
Gammarus sp	2	+	F
Orconectes rusticus	0	+	F
Plauditus dubius	14		MI
Baetis intercalaris	272	+	F
Iswaeon anoka	0	+	MI
Isonychia sp	43	+	MI
Stenacron sp	16	+	F
Maccaffertium exiguum	53		MI
M. mediopunctatum	2		MI
Maccaffertium pulchellum	11	+	MI
Maccaffertium terminatum	26		MI
Teloganopsis deficiens	50		I
Tricorythodes sp	144	+	MI
Calopteryx sp	0	+	F
Coenagrionidae	0	+	T
Argia sp	22	+	F
Boyeria vinosa	0	+	F
Pelocoris sp	0	+	MT
Chimarra obscura	1		MI
Neureclipsis sp	28	+	MI
Polycentropus sp	13	+	MI
Cheumatopsyche sp	312	+	F
Hydropsyche phalerata	82	+	MI
Macrostemum zebratum	105	+	
Hydroptila sp	2		F
Brachycentrus numerosus	2		MI
Pycnopsyche sp	0	+	MI
Helicopsyche borealis	0	+	MI
Mystacides sp	0	+	MI
Oecetis sp	1		F
Haliplus sp	0	+	MT
Berosus sp	0	+	MT
Psephenus herricki	0	+	MI
Ancyronyx variegata	1		F
Dubiraphia bivittata	0	+	F
Dubiraphia quadrinotata	0	+	F
Macronychus glabratus	21	+	F
Stenelmis sp	1	+	F
Anopheles sp	0	+	F
Simulium sp	9		F
Ablabesmyia rhamphe group	2		MT
H. senata or T. norena	8	+	F
Pentaneura inconspicua	6		F
Procladius (Holotanypus) sp	0	+	MT
Corynoneura sp	4		
Cricotopus (C.) bicinctus	1		T
N. crassicornus or N. "rectinervis"	4		F
Thienemanniella similis	1		MI
Tvetenia discoloripes group	14		MI
Polypedilum flavum	63		F
Polypedilum (P.) illinoense	5	+	T
Stenochironomus sp	2	+	F
Tanytarsus sp	0	+	F
Hemerodromia sp	1		F
Hydrobiidae	0	+	F
Elimia sp	98	+	MI
Planorbella pilsbryi	0	+	T
Corbicula fluminea	0	+	F
Dreissena polymorpha	4		F

No. of Quantitative Taxa	41
No. of Qualitative Taxa	42
Total Taxa	64
No. Organisms	1560
Qualitative EPT	13
ICI	**46**

Little Elkhart River - CR 35

Date Collected: 08/23/21 Site #13

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	4	+	F
Oligochaeta	3		T
Caecidotea sp	0	+	T
Gammarus sp	12	+	F
Orconectes rusticus	1	+	F
Hydrachnidia	0	+	F
Baetis flavistriga	0	+	F
Baetis intercalaris	2		F
Labiobaetis propinquus	0	+	MI
Leucrocuta sp	29	+	MI
Stenacron sp	9	+	F
Maccaffertium exiguum	51	+	MI
M. mediopunctatum	0	+	MI
Maccaffertium vicarium	51	+	MI
Calopterygidae	2		F
Calopteryx sp	0	+	F
Hetaerina sp	1	+	F
Coenagrionidae	2		T
Pteronarcys sp	0	+	MI
Paragnetina sp	1		MI
Lype diversa	0	+	MI
Cheumatopsyche sp	36	+	F
Ceratopsyche morosa gp.	4	+	MI
Hydropsyche depravata gp.	0	+	F
Pycnopsyche sp	1		MI
Nectopsyche diarina	0	+	MI
Berosus sp	1		MT
Ancyronyx variegata	0	+	F
Macronychus glabratus	22		F
Optioservus sp	0	+	MI
Stenelmis sp	0	+	F
Simulium sp	0	+	F
Conchapelopia sp	17		F
H. senata or T.norena	4		F
Pagastia orthogonia	2	+	F
Orthocladiinae	2	+	
Cricotopus (C.) bicinctus	2		T
Parakiefferiella sp	0	+	F
Parametriocnemus sp	6		F
Rheocricotopus (Psilocricotopus) robacki	2		F
Thienemanniella sp	6	+	
Thienemanniella xena	4		F
Tvetenia bavarica group	17	+	MI
P. albimanus or P. duplicatus	0	+	F
Polypedilum aviceps	4		MI
Polypedilum (P.) fallax group	4		F
Polypedilum (P.) illinoense	6	+	T
Polypedilum (P.) laetum group	4		MI
Stenochironomus sp	2		F
Rheotanytarsus pellucidus	12		MI
Rheotanytarsus sp	225		F
Empididae	0	+	F
Hydrobiidae	0	+	F
Elimia sp	0	+	MI
Physella sp	0	+	T
Ferrissia sp	1	+	F

No. of Quantitative Taxa	36
No. of Qualitative Taxa	36
Total Taxa	56
No. Organisms	552
Qualitative EPT	13
ICI	**42**

Pine Creek - SR 120 Residence

Date Collected: 08/24/21 Site #19

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	2		F
Oligochaeta	176		T
Gammarus sp	32	+	F
Hydrachnidia	0	+	F
Baetis tricaudatus	7	+	MI
Baetis flavistriga	36		F
Baetis intercalaris	18	+	F
Iswaeon anoka	0	+	MI
Maccaffertium vicarium	1	+	MI
Calopteryx sp	1	+	F
Boyeria vinosa	0	+	F
Lype diversa	4		MI
Cheumatopsyche sp	73	+	F
Ceratopsyche morosa group	30		MI
Ceratopsyche sparna	19	+	F
Hydropsyche depravata group	29		F
Ptilostomis sp	0	+	F
Brachycentrus numerosus	1	+	MI
Limnephilidae	1		
Ancyronyx variegata	7		F
Macronychus glabratus	34	+	F
Optioservus sp	19	+	MI
Stenelmis sp	4	+	F
Limoniinae	4		
Tipula sp	2		F
Simulium sp	42	+	F
Conchapelopia sp	47		F
Brillia flavifrons group	7		F
Cricotopus (C.) bicinctus	33		T
Cricotopus (C.) tremulus gp.	7		MT
Cricotopus (C.) trifascia	27		F
Parametriocnemus sp	40		F
Thienemanniella xena	8		F
Tvetenia bavarica group	13		MI
Cryptochironomus sp	0	+	F
P. albimanus or P. duplicatus	0	+	F
Polypedilum aviceps	53		MI
Polypedilum flavum	306		F
Polypedilum (P.) fallax group	53		F
Polypedilum (P.) illinoense	7		T
Polypedilum scalaenum gp.	20	+	F
Micropsectra sp	13		MT
Rheotanytarsus sp	86		F
Tanytarsus glabrescens gp.	7		F
Empididae	6		F
Physella sp	2	+	T
Ancylidae	6		F
Corbicula fluminea	0	+	F

No. of Quantitative Taxa	41
No. of Qualitative Taxa	21
Total Taxa	48
No. Organisms	1283
Qualitative EPT	8
ICI	**34**

Christiana Creek - North Main Wellfield

Date Collected: 08/18/21 Site #24

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	0	+	F
Turbellaria	5	+	F
Oligochaeta	7	+	T
Helobdella stagnalis	0	+	T
E. punctata punctata	0	+	MT
Gammarus sp	23		F
Orconectes rusticus	0	+	F
Plauditus dubius	0	+	MI
Baetis flavistriga	0	+	F
Baetis intercalaris	73		F
Labiobaetis propinquus	0	+	MI
Diphetor hageni	0	+	MI
Pseudocentroptiloides sp.	0	+	MI
Stenacron sp	14	+	F
Maccaffertium exiguum	24	+	MI
M.mediopunctatum	47	+	MI
Maccaffertium pulchellum	3		MI
Teloganopsis deficiens	2		I
Tricorythodes sp	12	+	MI
Caenis sp	0	+	F
Coenagrionidae	0	+	T
Argia sp	0	+	F
Plathemis lydia	0	+	T
Corydalus cornutus	1	+	MI
Neureclipsis sp	3		MI
Cheumatopsyche sp	42		F
Hydropsyche depravata gp.	14		F
Hydropsyche frisoni	3		MI
Hydropsyche phalerata	0	+	MI
Protoptila sp	1		I
Hydroptila sp	5		F
Ithytrichia sp	1		
Brachycentrus numerosus	1	+	MI
Neophylax sp	0	+	MI
Pycnopsyche sp	0	+	MI
Ceraclea spongillovorax	0	+	MI
Nectopsyche diarina	0	+	MI
Oecetis sp	1		F
Macronychus glabratus	11	+	F
Stenelmis sp	7	+	F
Simulium sp	1	+	F
Conchapelopia sp	1		F
Corynoneura lobata	23		F
N. crassicornus or N. "rectinervis"	15		F
Nanocladius (N.) spiniplenus	5		F
Thienemanniella lobapodema	23		F
Thienemanniella xena	23		F
Cryptochironomus eminentia	1		F
Dicrotendipes neomodestus	5		F
Microtendipes "caelum"	12		MI
P. albimanus or P. duplicatus	1		F
P. obediens group	7		F
Polypedilum flavum	11		F
Polypedilum (P.) fallax group	11		F
Polypedilum (P.) illinoense	6	+	T
Polypedilum scalaenum gp.	21		F
Tribelos jucundum	2		MT
C.vanderwulpi group sp 5	5		MI
Rheotanytarsus pellucidus	9		MI
Rheotanytarsus sp	42		F
Tanytarsus sepp	5	+	F
Elimia sp	4	+	MI
Physella sp	0	+	T
Ferrissia sp	9		F
Corbicula fluminea	0	+	F
Dreissena polymorpha	0	+	F

No. of Quantitative Taxa	45
No. of Qualitative Taxa	35
Total Taxa	66
No. Organisms	542
Qualitative EPT	16
ICI	**48**

Elkhart River - Oxbow (B)

Date Collected: 08/24/21 Site #30

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	0	+	F
Turbellaria	5	+	F
Nematomorpha	0	+	F
Oligochaeta	4		T
E. punctata punctata	0	+	MT
Caecidotea sp	1	+	T
Gammarus fasciatus	3	+	F
Hydrachnidia	0	+	F
Baetis flavistriga	23	+	F
Baetis intercalaris	157	+	F
Procloeon viridoculare	0	+	MI
Leucrocuta sp	2	+	MI
Stenacron sp	2	+	F
Maccaffertium exiguum	53	+	MI
M. mediopunctatum	18	+	MI
Maccaffertium pulchellum	0	+	MI
Teloganopsis deficiens	5		I
Tricorythodes sp	6	+	MI
Calopterygidae	0	+	F
Argia sp	0	+	F
Pteronarcys sp	0	+	MI
Agnetia capitata	6	+	
Corydalus cornutus	1	+	MI
Cheumatopsyche sp	21	+	F
Ceratopsyche morosa group	53	+	MI
Ceratopsyche sparna	4		F
Hydropsyche phalerata	1		MI
Hydroptila sp	4		F
Brachycentrus numerosus	2	+	MI
Pycnopsyche sp	0	+	MI
Psephenus herricki	0	+	MI
Macronychus glabratus	40	+	F
Stenelmis sp	1	+	F
Antocha sp	1		MI
Simulium sp	0	+	F
Conchapelopia sp	6		F
Cricotopus sp	0	+	F
Rheocricotopus robacki	6		F
Tvetenia discoloripes group	6		MI
Cryptochironomus sp	0	+	F
Cryptotendipes pseudotener	0	+	F
Dicrotendipes sp	12		F
P. albimanus or P. duplicatus	0	+	F
Polypedilum flavum	199	+	F
Polypedilum (P.) fallax group	12		F
Polypedilum scalaenum group	6	+	F
Rheotanytarsus sp	317		F
Hydrobiidae	0	+	F
Elimia sp	1	+	MI
Ferrissia sp	3	+	F
Corbicula fluminea	0	+	F

No. of Quantitative Taxa	33
No. of Qualitative Taxa	39
Total Taxa	51
No. Organisms	981
Qualitative EPT	14
ICI	**46**

Elkhart River - EEC (A)

Date Collected: 08/26/21 Site #31

Taxa Name	Qualitative	Quantitative	Tolerance	Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	0	+	F	Psephenus herricki	0	+	MI
Oligochaeta	2	+	T	Ancyronyx variegata	2		F
Helobdella stagnalis	0	+	T	Macronychus glabratus	15	+	F
Helobdella papillata	0	+	MT	Optioservus sp	0	+	MI
Caecidotea sp	0	+	T	Stenelmis sp	0	+	F
Gammarus sp	3	+	F	Tipula sp	1		F
Orconectes sp	0	+	F	Simulium sp	1	+	F
Hydrachnidia	0	+	F	Conchapelopia sp	1		F
Baetis flavistriga	15	+	F	Nilotanypus fimbriatus	3		F
Baetis intercalaris	45	+	F	Brillia flavifrons group	1		F
Labiobaetis propinquus	0	+	MI	Cricotopus sylvestris grp.	0	+	T
Iswaeon anoka	5	+	MI	Rheocricotopus robacki	9		F
Isonychia sp	7		MI	Thienemanniella xena	14		F
Leucrocuta sp	25	+	MI	Cryptochironomus sp	0	+	F
Stenacron sp	4		F	D. neomodestus	0	+	F
Maccaffertium exiguum	0	+	MI	Microtendipes "caelum"	2	+	MI
M. mediopunctatum	33	+	MI	M. pedellus grp.	0	+	F
Maccaffertium terminatum	14	+	MI	Polypedilum aviceps	0	+	MI
Tricorythodes sp	0	+	MI	Polypedilum flavum	28		F
Calopteryx sp	0	+	F	Polypedilum (P.) fallax grp.	5		F
Hetaerina sp	0	+	F	Polypedilum (P.) laetum grp.	2		MI
Coenagrionidae	0	+	T	Polypedilum scalaenum grp.	3		F
Boyeria vinosa	0	+	F	R. pellucidus	8		MI
Plathemis lydia	0	+	T	Rheotanytarsus sp	36		F
Pteronarcys sp	1		MI	Tanytarsus sp	0	+	F
Acroneuria abnormis	0	+	MI	Empididae	2		F
Acroneuria internata	1		MI	Hydrobiidae	0	+	F
Acroneuria lycorias	3		I	Elimia sp	40	+	MI
Agnetina capitata complex	0	+	MI	Physella sp	0	+	T
Corixidae	0	+	F	Planorbidae	0	+	MT
Corydalus cornutus	0	+	MI	Ferrissia sp	0	+	F
Cheumatopsyche sp	22	+	F	Corbicula fluminea	0	+	F
Ceratopsyche morosa group	2	+	MI				
Ceratopsyche sparna	6	+	F	No. of Quantitative Taxa	37		
Hydropsyche depravata group	2		F	No. of Qualitative Taxa	50		
Brachycentrus numerosus	4		MI	Total Taxa	72		
Pycnopsyche sp	1		MI	No. Organisms	368		
Helicopsyche borealis	0	+	MI	Qualitative EPT	16		
Nectopsyche diarina	0	+	MI	**ICI**	**44**		
Peltodytes sp	0	+	MT				

Elkhart River - Central HS

Date Collected: 08/17/21 Site #32

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	9		F
Oligochaeta	8		T
Helobdella stagnalis	0	+	T
Caecidotea sp	0	+	T
Gammarus sp	0	+	F
Orconectes rusticus	0	+	F
Hydrachnidia	0	+	F
Baetis flavistriga	219	+	F
Baetis intercalaris	140	+	F
Iswaeon anoka	3	+	MI
Isonychia sp	29	+	MI
Leucrocuta sp	8	+	MI
Stenacron sp	2	+	F
Maccaffertium exiguum	90	+	MI
M. mediopunctatum	19	+	MI
Maccaffertium terminatum	2		MI
Teloganopsis deficiens	12	+	I
Tricorythodes sp	22	+	MI
Pteronarcys sp	0	+	MI
Paragnetina sp	1		MI
Agnetina capita	9		
Neoplea sp	0	+	F
Corydalus cornutus	1		MI
Psychomyia flavida	2		MI
Cheumatopsyche sp	175	+	F
Ceratopsyche morosa grp.	85	+	MI
Ceratopsyche sparna	124	+	F
Hydropsyche phalerata	3		MI
Hydroptila sp	26		F
Brachycentrus numerosus	14		MI
Neophylax sp	0	+	MI
Nectopsyche diarina	0	+	MI
Psephenus herricki	0	+	MI
Ancyronyx variegata	4		F
Macronychus glabratus	31		F
Stenelmis sp	8	+	F
Simulium sp	40	+	F
Ablabesmyia mallochi	0	+	F
Procladius (Holotanypus) sp	0	+	MT
Thienemannimyia group	14		F
Corynoneura sp	8		
Tvetenia discoloripes group	146		MI
Dicrotendipes neomodestus	7		F
Microtendipes pedellus grp.	0	+	F
P.albimanus or P. duplicatus	0	+	F
Polypedilum flavum	292		F
Polypedilum U. flavum	7		F
Polypedilum (P.) illinoense	0	+	T
Stenochironomus sp	7		F
Rheotanytarsus sp	111		F
Tanytarsus sepp	0	+	F
Elimia sp	15	+	MI
Planorbella pilsbryi	0	+	T
Ferrissia sp	1	+	F

No. of Quantitative Taxa	37
No. of Qualitative Taxa	34
Total Taxa	54
No. Organisms	1694
Qualitative EPT	16
ICI	**46**

Yellow Creek - Concord High School

Date Collected: 08/18/21 Site #35

Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	33		F
Turbellaria	98	+	F
Plumatella sp	1		F
Oligochaeta	404	+	T
Caecidotea sp	6	+	T
Gammarus sp	28	+	F
Orconectes sp	0	+	F
Hydrachnidia	130	+	F
Baetis tricaudatus	0	+	MI
Baetis flavistriga	555	+	F
Baetis intercalaris	50		F
Labiobaetis propinquus	41	+	MI
Stenacron sp	172	+	F
Calopteryx sp	2	+	F
Boyeria vinosa	0	+	F
Cheumatopsyche sp	399	+	F
Ceratopsyche morosa grp.	47	+	MI
Hydropsyche depravata grp.	11		F
Hydroptila sp	9		F
Peltodytes sp	0	+	MT
Ancyronyx variegata	33		F
Dubiraphia vittata group	1	+	F
Macronychus glabratus	10		F
Stenelmis sp	3	+	F
Anopheles sp	0	+	F
Simulium sp	2	+	F
Ceratopogonidae	0	+	T
Atrichopogon websteri	1		F
Conchapelopia sp	106		F
H. senata or T. norena	35		F
Nilotanypus fimbriatus	32		F
Brillia flavifrons group	35		F
Corynoneura lobata	64		F
Cricotopus (C.) sp	71		F
Cricotopus (C.) bicinctus	35	+	T
Cricotopus (C.) tremulus grp	816	+	MT
Parakiefferiella sp	35		F
Rheocricotopus robacki	35		F
Thienemanniella lobapodema	32		F
Thienemanniella xena	32		F
Tvetenia bavarica group	0	+	MI
Chironomus (C.) decorus group	0	+	T
Cryptochironomus sp	0	+	F
Dicrotendipes neomodestus	284		F
P. albimanus or P. duplicatus	0	+	F
Polypedilum aviceps	35		MI
Polypedilum flavum	1029	+	F
Polypedilum (P.) fallax group	142		F
Polypedilum (P.) illinoense	35	+	T
Polypedilum (P.) laetum group	0	+	MI
Polypedilum scalaenum group	0	+	F
Stictochironomus sp	0	+	F
Cladotanytarsus mancus group	0	+	F
Cladotanytarsus v. grp.	0	+	
Paratanytarsus sp	958	+	F
Rheotanytarsus sp	71		F
Tanytarsus sp	71		F
Tanytarsus glabrescens grp. sp 7	106		F
Hemerodromia sp	4		F
Limnophora aequifrons	0	+	F
Physella sp	3	+	T
Ferrissia sp	37		F

No. of Quantitative Taxa	46
No. of Qualitative Taxa	36
Total Taxa	62
No. Organisms	6139
Qualitative EPT	6
ICI	**38**

Baugo Creek - Restoration (B)

Date Collected: 08/16/21 Site #37

Taxa Name	Qualitative	Quantitative	Tolerance
Spongillidae	0	+	F
Turbellaria	2		F
Plumatella sp	2		F
Oligochaeta	16		T
Caecidotea sp	14		T
Gammarus sp	2	+	F
Baetis flavistriga	67	+	F
Baetis intercalaris	1	+	F
Labiobaetis propinquus	9	+	MI
Iswaeon anoka	0	+	MI
Stenacron sp	10		F
Caenis sp	0	+	F
Calopteryx sp	0	+	F
Coenagrionidae	8		T
Cheumatopsyche sp	84	+	F
Ceratopsyche morosa group	70	+	MI
Hydropsyche depravata group	11	+	F
Hydroptilidae	2		F
Ancyronyx variegata	10	+	F
Stenelmis sp	0	+	F
Simulium sp	0	+	F
Conchapelopia sp	0	+	F
H. senata or T. norena	98		F
Meropelopia sp	0	+	F
Nilotanypus fimbriatus	28		F
Corynoneura sp	8		
Cricotopus (C.) bicinctus	0	+	T
Cricotopus (C.) tremulus group	14		MT
Cricotopus (C.) trifascia	0	+	F
Parametriocnemus sp	14		F
Thienemanniella xena	24		F
Cryptochironomus sp	0	+	F
Dicrotendipes neomodestus	98		F
Endochironomus nigricans	14		MT
Polypedilum flavum	559	+	F
Polypedilum (P.) fallax group	28		F
Polypedilum (P.) illinoense	70		T
Cladotanytarsus sp	14		
Paratanytarsus sp	112		F
Rheotanytarsus sp	210		F
Tanytarsus sp	28	+	F
Tanytarsus glabrescens grp. sp 7	42		F
Hemerodromia sp	4		F

No. of Quantitative Taxa	32
No. of Qualitative Taxa	21
Total Taxa	43
No. Organisms	1673
Qualitative EPT	8
ICI	**34**

Bowman Creek - Chippewa

Date Collected: 08/09/21 Site #38

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	3	+	F
Oligochaeta	2	+	T
Gammarus sp	124	+	F
Orconectes sp	2	+	F
Hydrachnidia	0	+	F
Baetis tricaudatus	7	+	MI
Baetis flavistriga	0	+	F
Baetis intercalaris	0	+	F
Stenacron sp	3		F
Calopteryx sp	1	+	F
Coenagrionidae	0	+	T
Boyeria vinosa	0	+	F
Cheumatopsyche sp	4	+	F
Hydropsyche depravata group	0	+	F
Macronychus glabratus	26	+	F
Optioservus sp	3	+	MI
Stenelmis sp	2	+	F
Conchapelopia sp	3		F
Diamesa sp	0	+	F
Brillia parva	1		MI
Corynoneura sp	6		
Eukiefferiella sp	0	+	
Nanocladius (N.) spiniplenus	4		F
Parametriocnemus sp	1	+	F
Microtendipes pedellus group	2		F
Polypedilum (Uresipedilum) aviceps	1	+	MI
Polypedilum (P.) illinoense	1		T
Polypedilum (P.) laetum group	5		MI
Saetheria sp	0	+	F
Rheotanytarsus sp	51		F
Tanytarsus glabrescens group sp 7	1		F
Empididae	1		F
Physella sp	1	+	T
Sphaerium sp	0	+	F

No. of Quantitative Taxa	24
No. of Qualitative Taxa	23
Total Taxa	34
No. Organisms	255
Qualitative EPT	5
ICI	**32**

Bowman Creek - Green Tech

Date Collected: 08/09/21 Site #39

Taxa Name	Qualitative	Quantitative	Tolerance
Hydra sp	32		F
Turbellaria	1137	+	F
Plumatella sp	1		F
Oligochaeta	234	+	T
Helobdella stagnalis	3		T
Helobdella papillata	20		MT
Erpobdella punctata punctata	1		MT
Hyalella azteca	0	+	F
Crangonyx sp	1		MT
Hydrachnidia	0	+	F
Calopteryx sp	0	+	F
Coenagrionidae	1	+	T
Anax sp	0	+	MT
Corduliidae	1		
Erythemis simplicicollis	0	+	MT
Tramea sp	0	+	
Pelocoris sp	0	+	MT
Cheumatopsyche sp	30		F
Hydropsyche depravata group	1		F
Oecetis persimilis	1		MI
Macronychus glabratus	1		F
Stenelmis sp	17	+	F
Simulium sp	1		F
Ceratopogonidae	0	+	T
Conchapelopia sp	83		F
Helopelopia sp	416	+	F
Corynoneura sp	8		
Cryptochironomus sp	42	+	F
Dicrotendipes modestus	0	+	MT
Parachironomus sp	0	+	MT
Parachironomus frequens group	0	+	
Polypedilum (Uresipedilum) flavum	2705	+	F
Polypedilum (P.) fallax group	42		F
Polypedilum (Tripodura) halterale group	0	+	MT
Hemerodromia sp	1		F
Valvata bicarinata	42	+	
Physella sp	16		T
Helisoma anceps anceps	0	+	F
Planorbella sp	0	+	T
Corbicula fluminea	88		F
Sphaerium sp	106	+	F

No. of Quantitative Taxa	27
No. of Qualitative Taxa	23
Total Taxa	41
No. Organisms	5031
Qualitative EPT	0
ICI	**22**

Juday Creek - Holy Cross

Date Collected: 08/19/21 Site #43

Taxa Name	Qualitative	Quantitative	Tolerance
Oligochaeta	0	+	T
Gammarus sp	0	+	F
Hydrachnidia	0	+	F
Baetis tricaudatus	0	+	MI
Labiobaetis sp	0	+	MI
Baetis intercalaris	0	+	F
Stenacron sp	0	+	F
Caenis sp	0	+	F
Calopterygidae	0	+	F
Boyeria vinosa	0	+	F
Cheumatopsyche sp	0	+	F
Hydropsyche depravata group	0	+	F
Macronychus glabratus	0	+	F
Conchapelopia sp	0	+	F
Prodiamesa olivacea	0	+	MT
Orthocladiinae	0	+	
Cryptochironomus sp	0	+	F
Phaenopsectra obediens group	0	+	F
Polypedilum (P.) laetum group	0	+	MI
Polypedilum (Tripodura) scalaenum group	0	+	F
Tanytarsus sp	0	+	F
Physella sp	0	+	T
Planorbidae	0	+	MT
Corbicula fluminea	0	+	F
Sphaerium sp	0	+	F

No. of Quantitative Taxa	0
No. of Qualitative Taxa	25
Total Taxa	25
No. Organisms	0
Qualitative EPT	7
ICI	**MG - Marginally Good**

Juday Creek - Grape Road

Date Collected: 08/25/21 Site #45

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	0	+	F
Oligochaeta	8	+	T
Caecidotea sp	0	+	T
Gammarus sp	12	+	F
Orconectes sp	0	+	F
Hydrachnidia	10	+	F
Baetis tricaudatus	8	+	MI
Plauditus dubius	0	+	MI
Baetis flavistriga	0	+	F
Labiobaetis propinquus	0	+	MI
Stenacron sp	0	+	F
Calopteryx sp	8	+	F
Boyeria vinosa	0	+	F
Lype diversa	1		MI
Cheumatopsyche sp	146	+	F
Ceratopsyche morosa group	9		MI
Hydropsyche depravata group	25	+	F
Brachycentrus numerosus	1		MI
Dubiraphia sp	0	+	F
Macronychus glabratus	1	+	F
Simulium sp	0	+	F
Conchapelopia sp	70	+	F
Helopelopia sp	12		F
Meropelopia sp	12		F
Diamesa sp	117		F
Prodiamesa olivacea	0	+	MT
Corynoneura lobata	32		F
Parametriocnemus sp	82		F
Rheocricotopus robacki	328		F
Tvetenia bavarica group	105		MI
Cryptochironomus sp	0	+	F
Polypedilum aviceps	23	+	MI
Polypedilum flavum	12		F
Polypedilum (P.) fallax group	0	+	F
Stictochironomus sp	0	+	F
Micropsectra sp	23		MT
Paratanytarsus sp	12		F
Rheotanytarsus pellucidus	316		MI
Rheotanytarsus sp	117	+	F
Tanytarsus glabrescens group	12		F
Neoplasta sp	0	+	MI
Hemerodromia sp	1		F

No. of Quantitative Taxa	27
No. of Qualitative Taxa	26
Total Taxa	42
No. Organisms	1503
Qualitative EPT	7
ICI	**38**

Juday Creek - Driftwood

Date Collected: 08/25/21 Site #46

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	100	+	F
Oligochaeta	32	+	T
E. punctata punctata	0	+	MT
Gammarus sp	130	+	F
Orconectes sp	0	+	F
Hydrachnidia	0	+	F
Baetis tricaudatus	1	+	MI
Baetis flavistriga	0	+	F
Baetis intercalaris	1		F
Iswaeon anoka	0	+	MI
Stenacron sp	0	+	F
Calopterygidae	0	+	F
Cheumatopsyche sp	695	+	F
Ceratopsyche morosa group	134	+	MI
Hydropsyche depravata group	399	+	F
Nectopsyche sp	0	+	MI
Nectopsyche diarina	0	+	MI
Berosus sp	2		MT
Enochrus sp	0	+	MT
Macronychus glabratus	0	+	F
Simulium sp	0	+	F
Conchapelopia sp	439	+	F
Pentaneura inconspicua	73		F
Pagastia orthogonia	0	+	F
Cricotopus (C.) bicinctus	73	+	T
Orthocladius (O.) sp	0	+	F
Parametriocnemus sp	146		F
Rheocricotopus robacki	877		F
Cryptochironomus sp	0	+	F
Dicrotendipes modestus	0	+	MT
Dicrotendipes neomodestus	0	+	F
Microtendipes "caelum"	0	+	MI
P. albimanus or P. duplicatus	0	+	F
Phaenopsectra obediens group	0	+	F
Polypedilum flavum	366		F
Polypedilum (P.) illinoense	0	+	T
Polypedilum (P.) laetum group	136		MI
Cladotanytarsus mancus group	0	+	F
Paratanytarsus sp	73		F
Rheotanytarsus pellucidus	439		MI
Rheotanytarsus sp	3143		F
Physella sp	0	+	T
Ferrissia sp	0	+	F
Corbicula fluminea	1	+	F

No. of Quantitative Taxa	20
No. of Qualitative Taxa	34
Total Taxa	44
No. Organisms	7260
Qualitative EPT	9
ICI	**38**

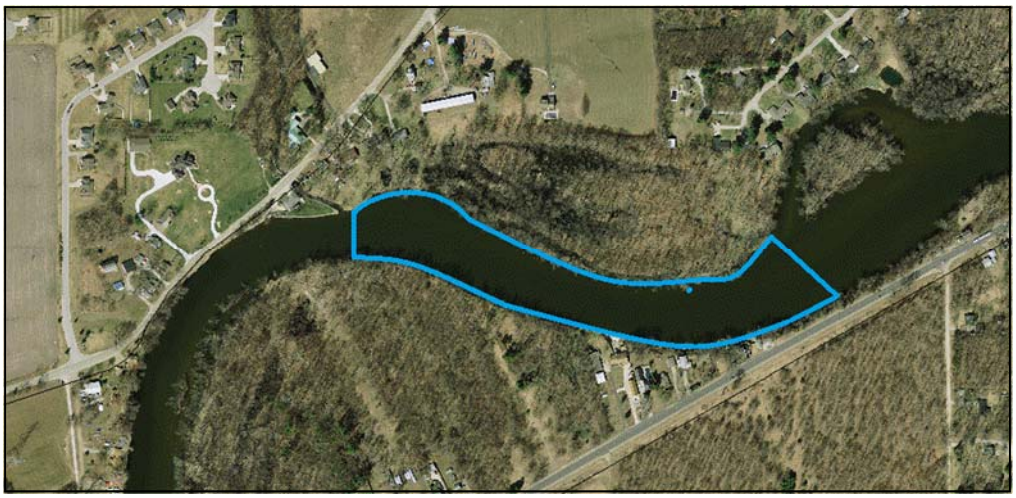
Juday Creek - Myrtle Street

Date Collected: 08/19/21 Site #47

Taxa Name	Qualitative	Quantitative	Tolerance
Turbellaria	6	+	F
Oligochaeta	47	+	T
Placobdella multilineata	1		F
Caecidotea sp	4	+	T
Gammarus sp	15	+	F
Orconectes sp	0	+	F
Hydrachnidia	0	+	F
Baetis tricaudatus	2	+	MI
Baetis flavistriga	12	+	F
Baetis intercalaris	1		F
Iswaeon anoka	0	+	MI
Stenacron sp	21	+	F
Maccaffertium exiguum	10		MI
Maccaffertium terminatum	4	+	MI
Maccaffertium vicarium	6		MI
Tricorythodes sp	1		MI
Caenis sp	3		F
Ephoron sp	3		MI
Calopteryx sp	2		F
Sialis sp	1		MT
Lype diversa	3		MI
Cheumatopsyche sp	40	+	F
Ceratopsyche morosa grp.	5	+	MI
Ceratopsyche sparna	0	+	F
Hydropsyche depravata grp.	1		F
Brachycentrus numerosus	2	+	MI
Pycnopsyche sp	0	+	MI
Leptoceridae	1		
Oecetis sp	4		F
Oecetis persimilis	0	+	MI
Ancyronyx variegata	0	+	F
Dubiraphia sp	6		F
Macronychus glabratus	26	+	F
Optioservus sp	15		MI
Stenelmis sp	195	+	F
Simulium sp	3	+	F
Conchapelopia sp	57	+	F
Pagastia sp	6		F
Prodiamesa olivacea	13		MT
Corynoneura sp	8		
Parametriocnemus sp	13		F
Rheocricotopus robacki	16		F
Thienemanniella sp	2		
Tvetenia bavarica group	16		MI
Cryptochironomus sp	3		F
Microtendipes "caelum"	9		MI
M. pedellus group	6		F
P. albimanus or P. duplicatus	9		F
Phaenopsectra obediens grp.	6		F
Polypedilum flavum	9		F
Polypedilum (P.) fallax group	41		F
Polypedilum (P.) illinoense	28	+	T
Polypedilum scalaenum grp.	9		F
Rheotanytarsus pellucidus	35		MI
Sublettea coffmani	3		MI
Tanytarsus sp	6		F
Tanytarsus glabrescens grp.	3		F
Empididae	2		F
Elimia sp	2	+	MI
Physella sp	4		T
Ancylidae	3		F
Corbicula fluminea	0	+	F
Sphaerium sp	4		F

No. of Quantitative Taxa	55
No. of Qualitative Taxa	25
Total Taxa	63
No. Organisms	753
Qualitative EPT	11
ICI	**42**

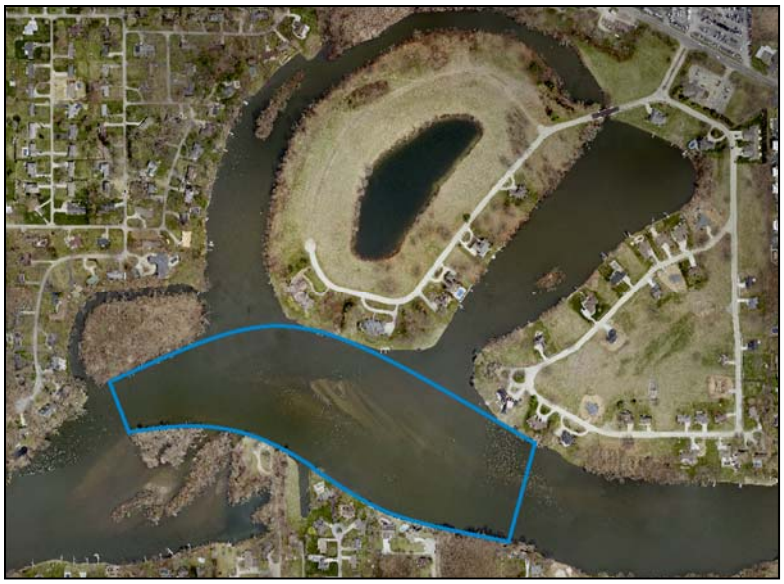
Appendix F
Aerial Site Location Maps



Site #1: St Joseph River Nibbyville (Above)

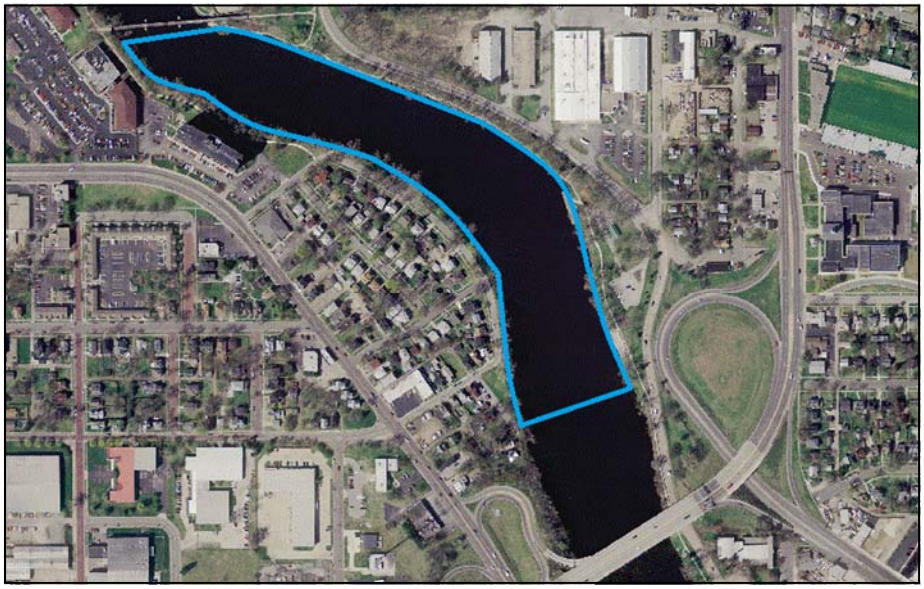
Site #2: St. Joseph River Lexington Avenue

Site #3: St. Joseph River McNaughton Park



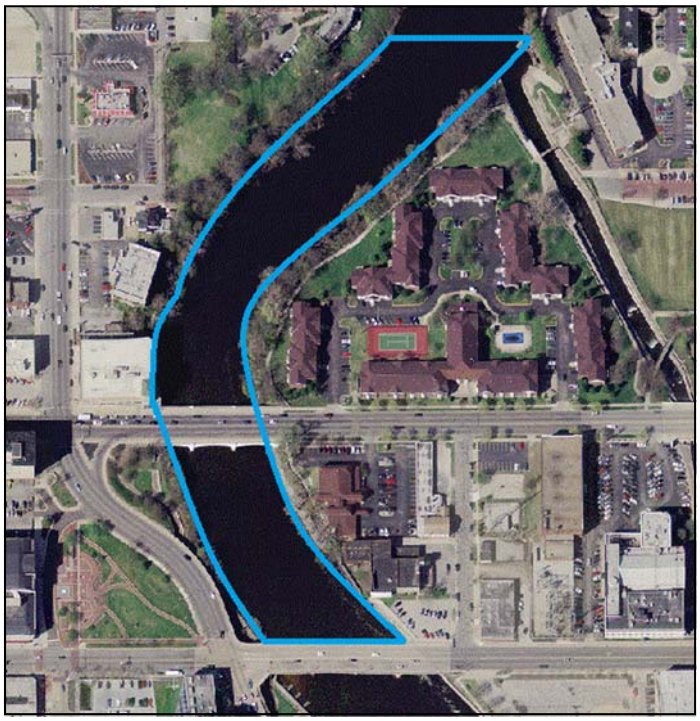
Site #4: St. Joseph River Treasure Island Park

Site #5: St. Joseph River Mouth of Cobus Creek



Site #6: St. Joseph River Jefferson Boulevard

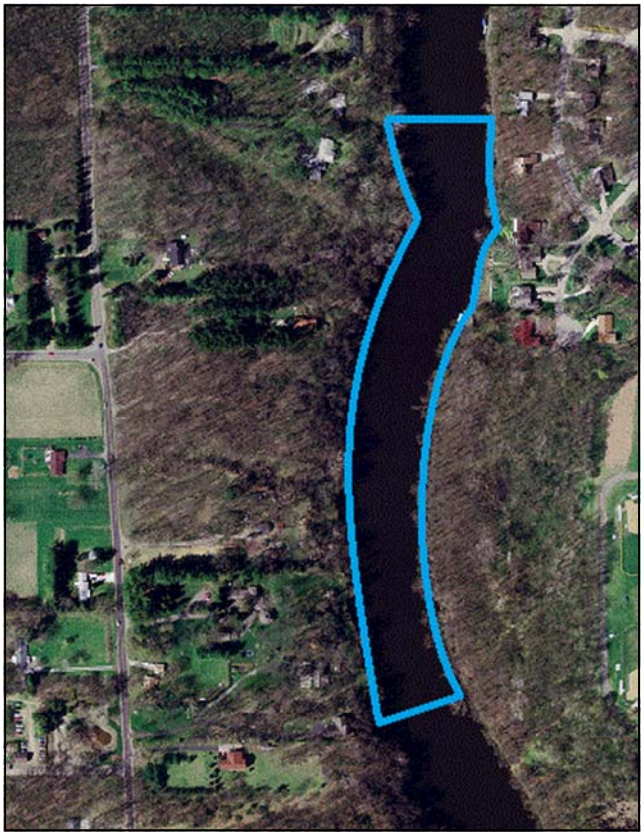
Site #7: St. Joseph River Howard Park



Site #8: St. Joseph River LaSalle Street

Site #9: St. Joseph River Michigan Street (Below)

Site #10: St. Joseph River Keller Park



Site #11: St Joseph River Brick Road

Site #12: St Joseph River Auten Road (Above)

Site #13: Little Elkhart River CR 35

Site #14: Sheep Creek Timberbrook

Site #15: Sheep Creek Timberbrook (Below)

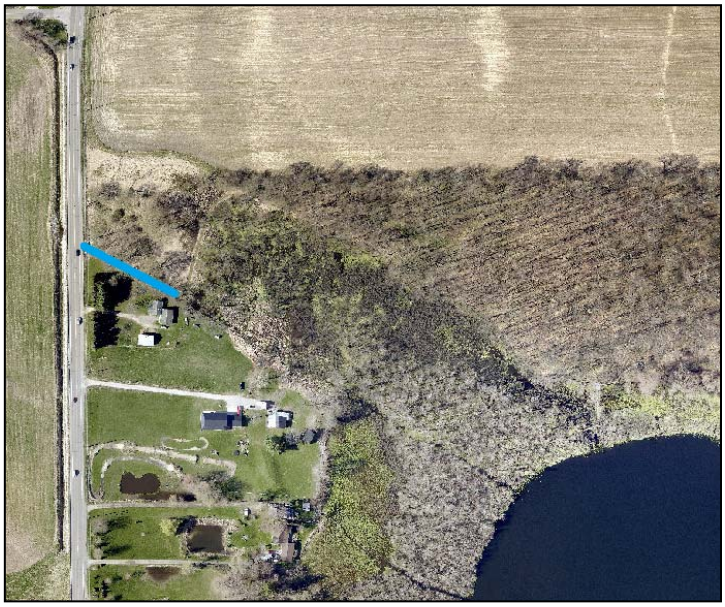
Site #16: Menges Ditch Mark Street

Site #17: Pine Creek CR 14

Site #18: Pine Creek Roske

Site #19: Pine Creek SR 120 Residence

Site #20: Wolf Lake Drain SR 15

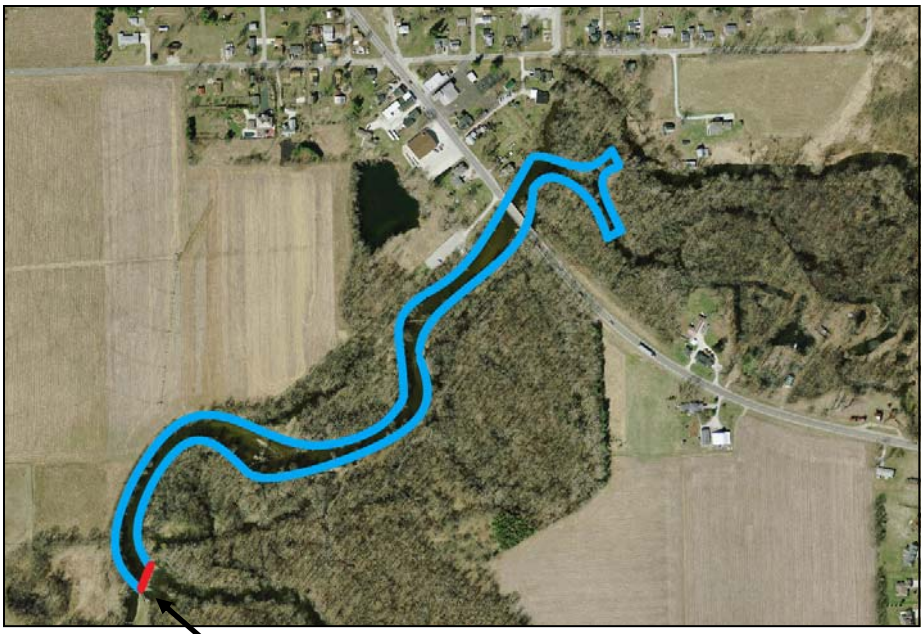


Site #21: Lily Creek Park Six Drive

Site #22: Christiana Creek Simonton Street

Site #23: Christiana Creek Wellfield (Above)

Site #24: Christiana Creek North Main Wellfield



Site #25: Elkhart River US 33 (Benton)

Benton Dam

Site #26: Elkhart River Benton Dam (Below)

Site #27: Elkhart River Defries Garden

Site #28: Elkhart River Bainertown (Below)

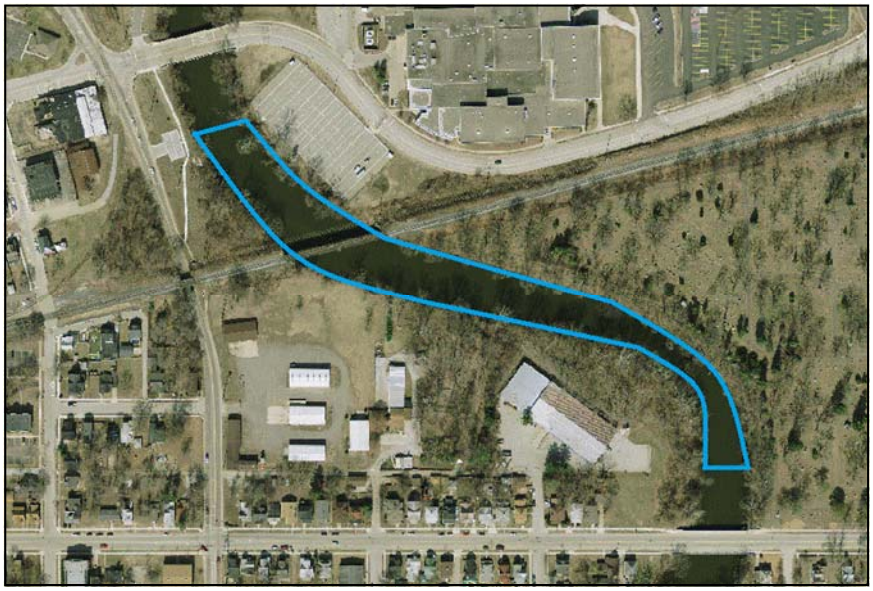
Baintertown Dam

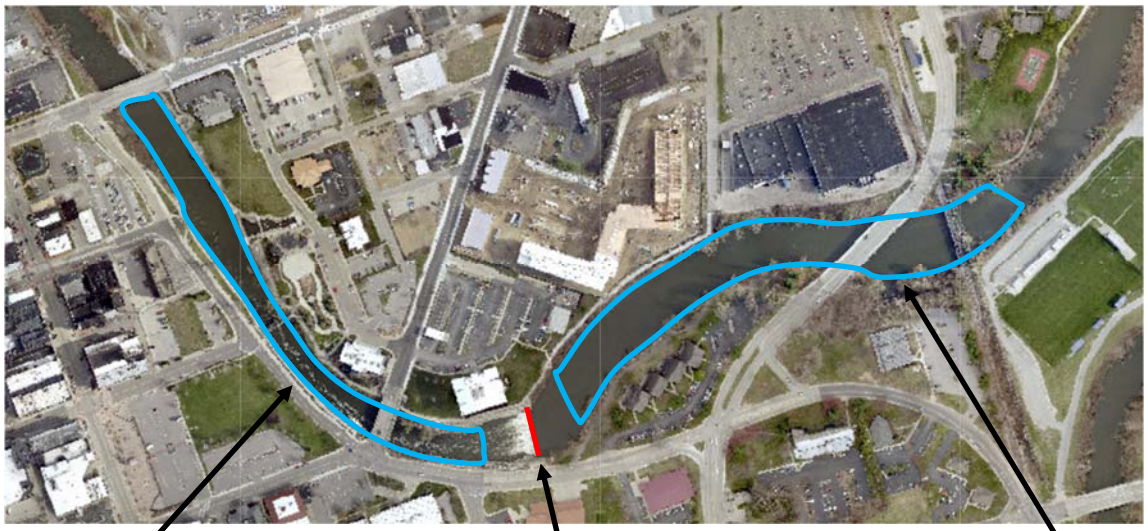
Site # 29: Elkhart River Goshen Dam (Below)

Site #30: Elkhart River Oxbow Park

Site #31: Elkhart River EEC (Above)

Site #32 Elkhart River Central H.S.



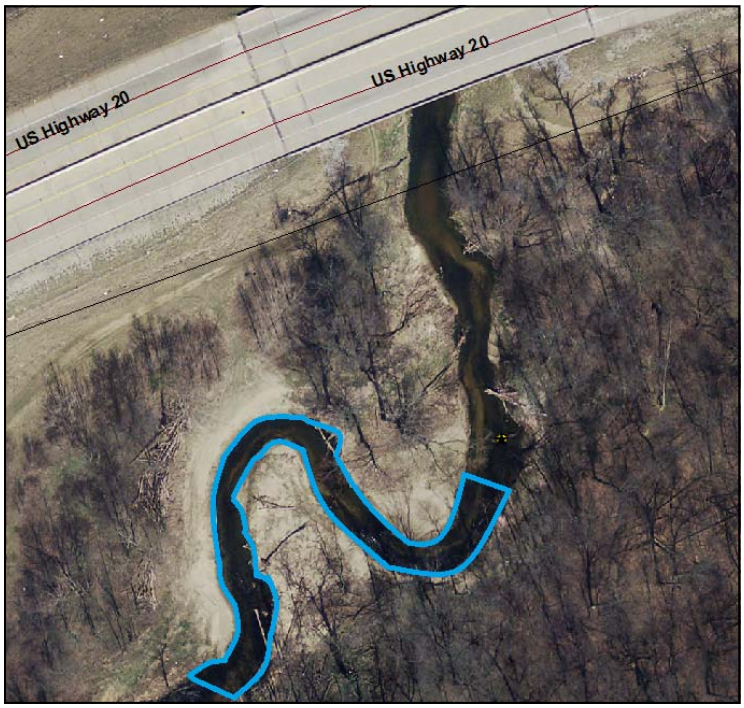


Site #33: Elkhart River Elkhart Ave.

Old Elkhart Dam

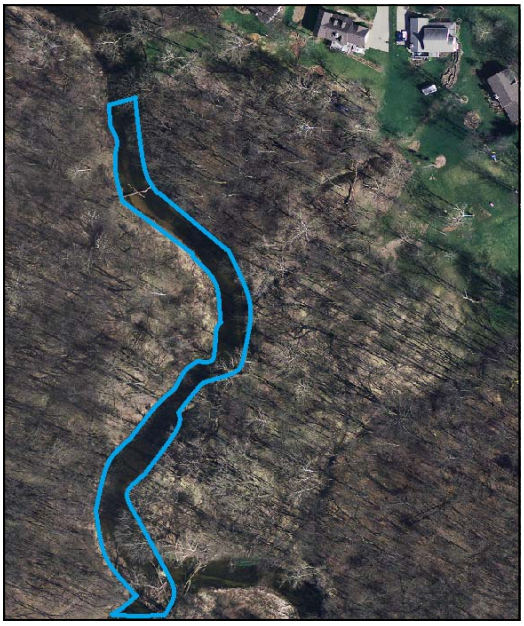
Site #34: Elkhart River Prairie St.

Site # 35: Yellow Creek Concord H.S.



Site #36: Yellow Creek US 20 Bypass

Site #37: Baugo Creek Restoration Site (Below)



Site # 38: Bowman Creek Chippewa Avenue

Site #39: Bowman Creek Green Tech Drive

Site #40: Bowman Creek Michigan Street

Site #41: Auten Ditch Jackson Road

Site #42: Eberly Ditch Locust Road

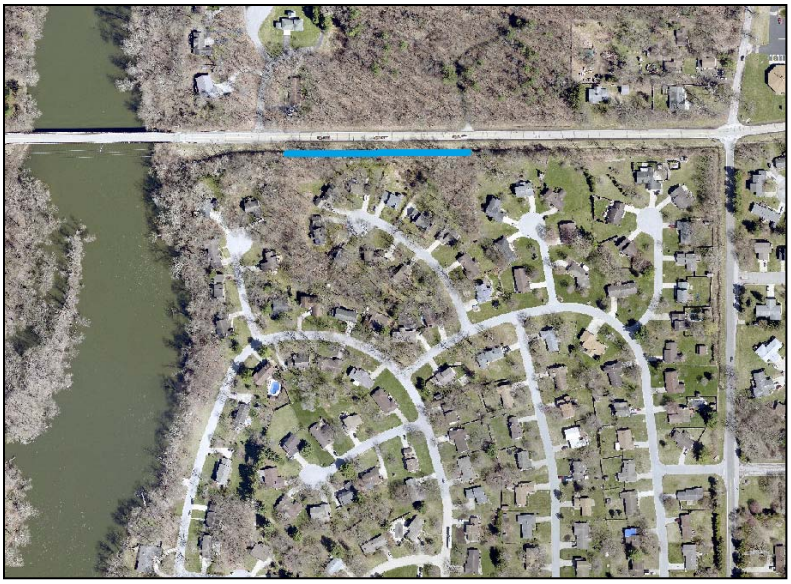
Site #43: Juday Creek Holy Cross Parkway

Site #44: Juday Creek Winding Brook Drive

Site #45: Juday Creek Grape Road

Site #46: Juday Creek Driftwood

Site #47: Juday Creek Myrtle Street



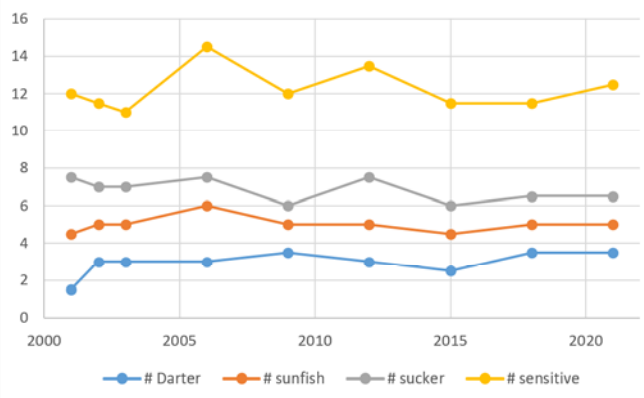
Site #48: Keifer Ditch SJR Mouth

Appendix G

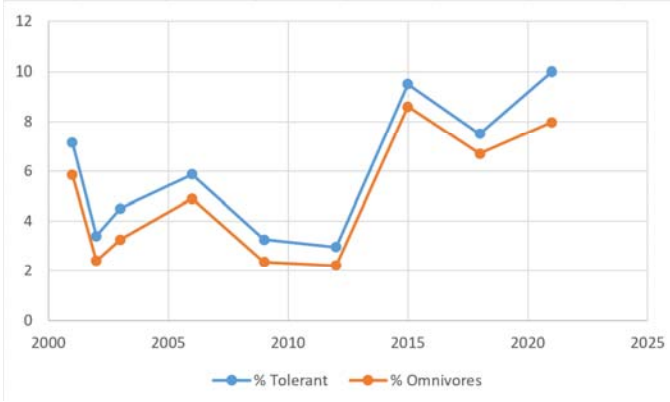
In-depth Metric Analysis

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.

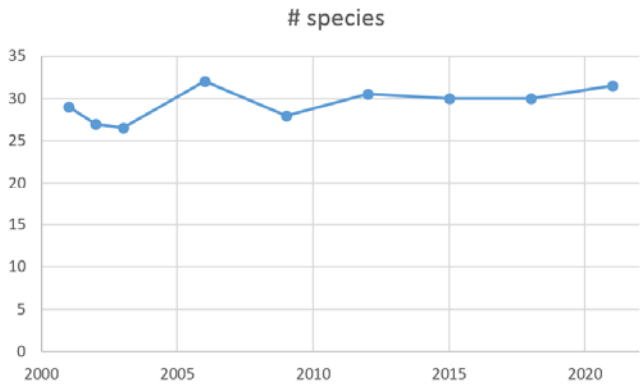
Site 1: St. Joseph River—Nibbyville (A)



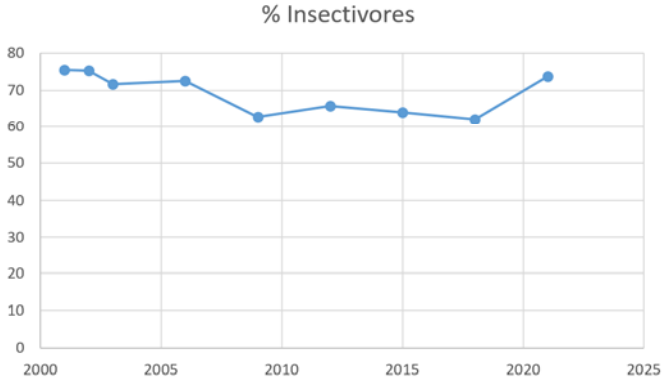
Since the inception of monitoring at this site, the number of sensitive species has stayed relatively similar. The number of sucker species as decreased slightly, the number of darters has increased slightly and the number of sunfish has stayed relatively similar.



Since the inception of monitoring, the percent of tolerant individuals and omnivores have fluctuated. However, the percent of both metrics has remained very low over time.

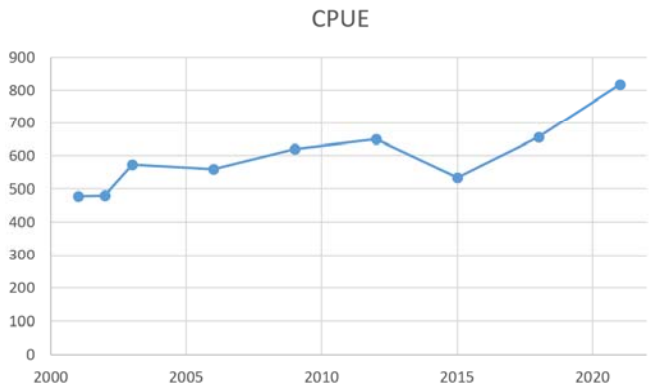


Since the inception of monitoring, the number of species has varied slightly and has not increased or decreased over time.



The percent of insectivores fish has decreased from approximately 75% to just over 60% between 2001 and 2018, but increased back over 70% in 2021.

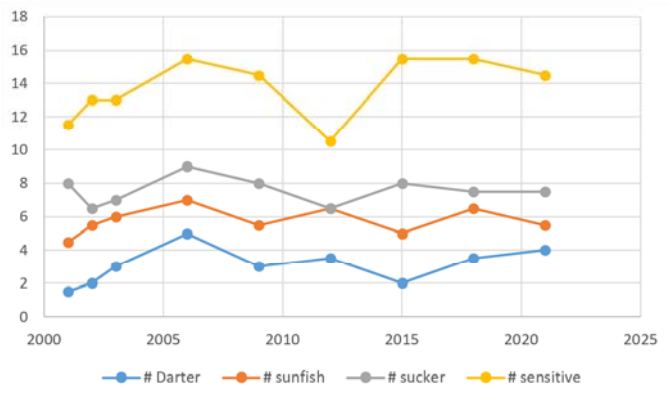
The % of simple lithophils appeared to be trending slightly upward over the years, but it dropped significantly in 2021.



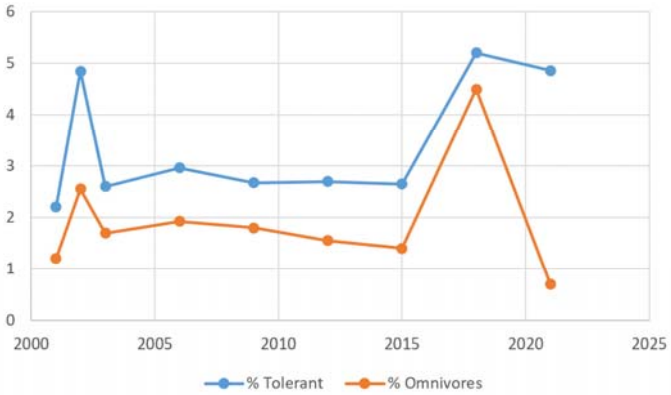
The total number of fish collected (CPUE) was relatively similar over time, but increased substantially in 2021.

**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.*

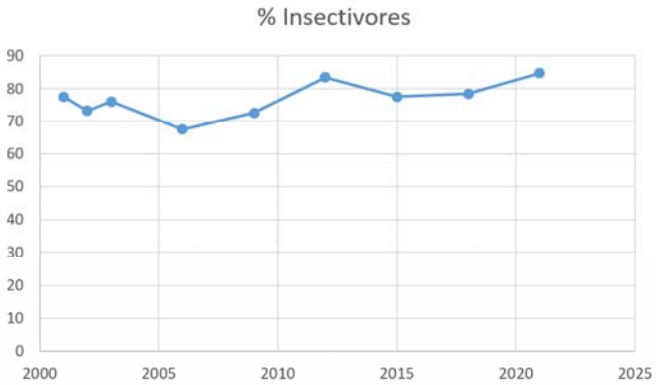
Site 2: St. Joseph River—Lexington Ave



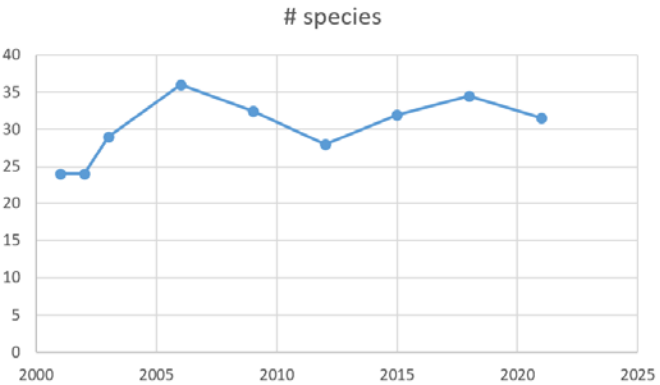
Since the inception of monitoring, the number of darters, sunfish, and suckers have remained relatively similar. The number of sensitive species has fluctuated considerably but has remained high (15 species) from 2015 to 2021.



The % of tolerant individuals and omnivores has always been extremely low at this site (5% or less).

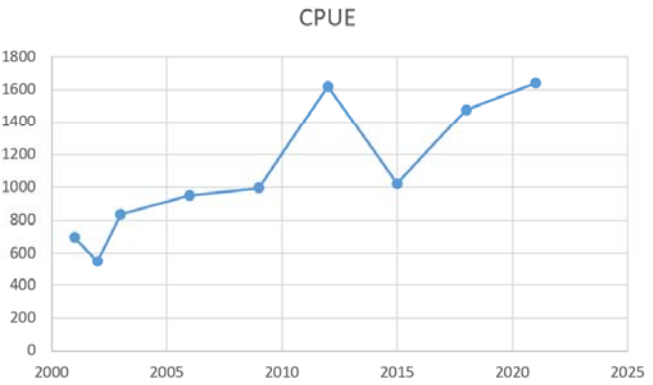


The % of insectivores has remained relatively similar at this site over time and has always been very high.



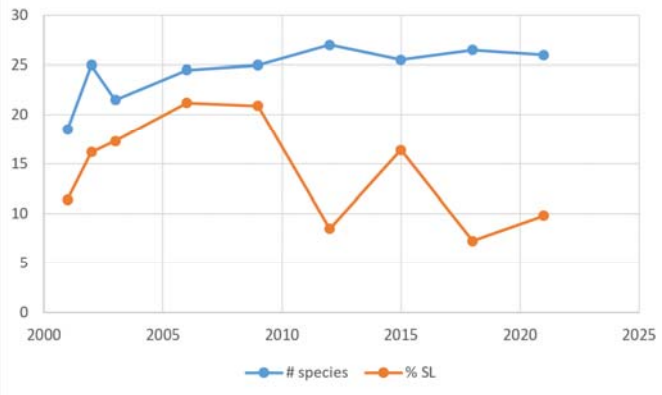
Since the inception of monitoring, the number of species has fluctuated but there has been a general increase by about 5 to 10 species.

The percent of simple lithophilic spawners has fluctuated over time, but hit its lowest level (and was below 10% for the first time) in 2021.

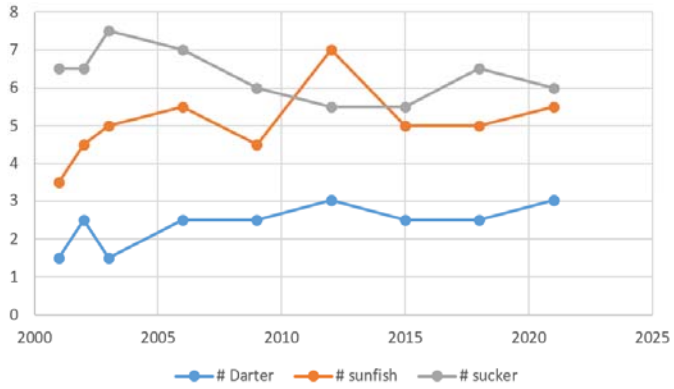


The total number of fish collected (CPUE) has increased substantially since the inception of monitoring.

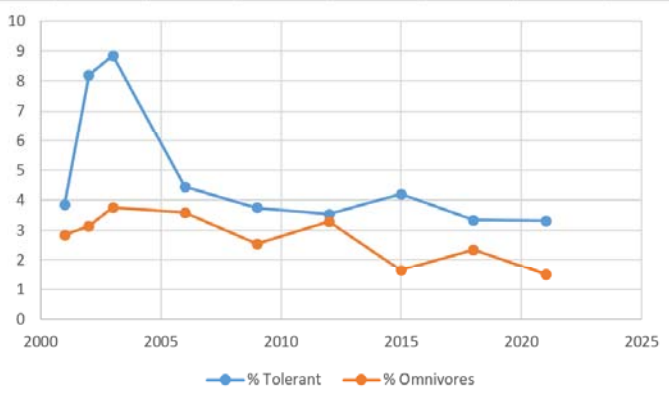
Site 3: St. Joseph River—McNaughton Park



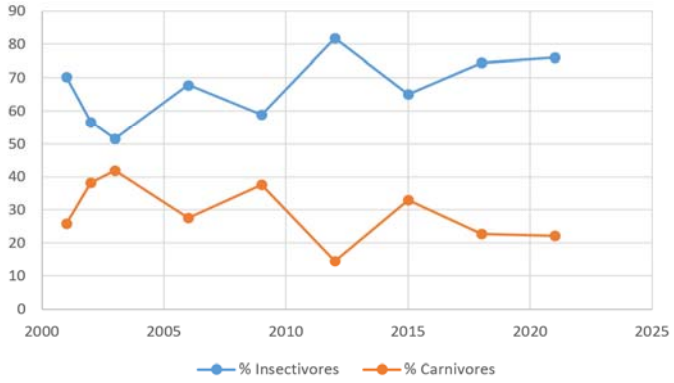
The number of species has increased gradually since the inception of monitoring and has been consistently over 25 in the past several years. The percent of simple lithophilic spawners initially increased but this metric hit its lowest point in 2018 and remained low in 2021.



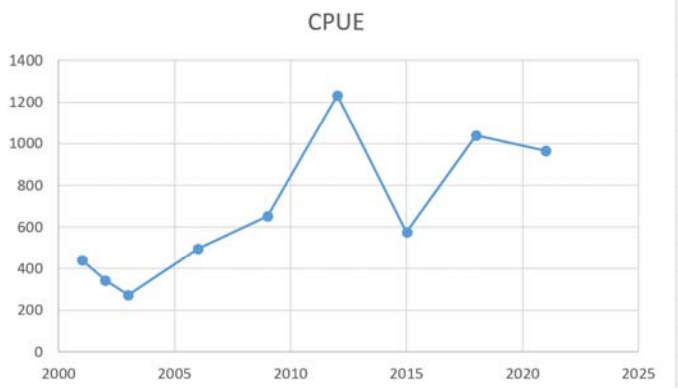
The number of darter and sunfish species have increased since the inception of monitoring, while the number of sucker species appears to have gradually declined with a slight rebound in 2018.



Despite an early spike in the percentage of tolerant individuals, this metric along with the percent of omnivores has remained very low since the inception of monitoring.

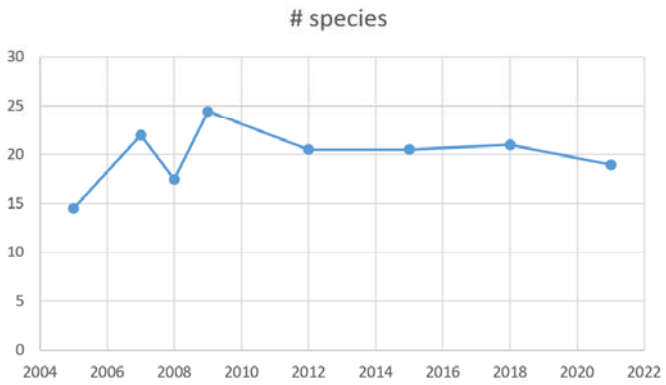


The percentage of carnivores and insectivores have fluctuated over the years, although carnivores appear to be slightly trending down while insectivores appear to be slightly trending up. It is pretty evident based on this graph that these two metrics have a strong negative relationship. This means as one increases the other decreases.

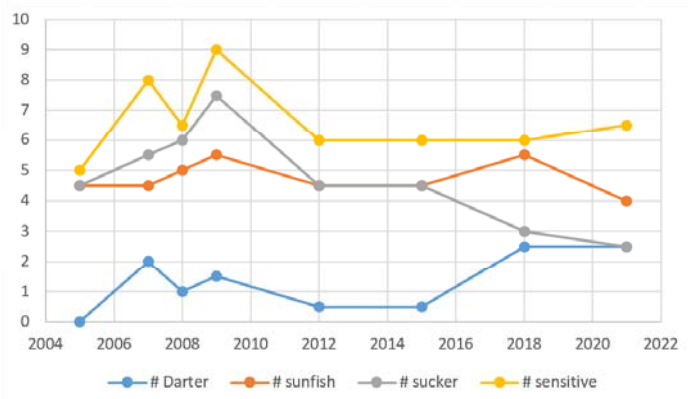


The total number of fish collected (CPUE) has increased significantly since the inception of monitoring.

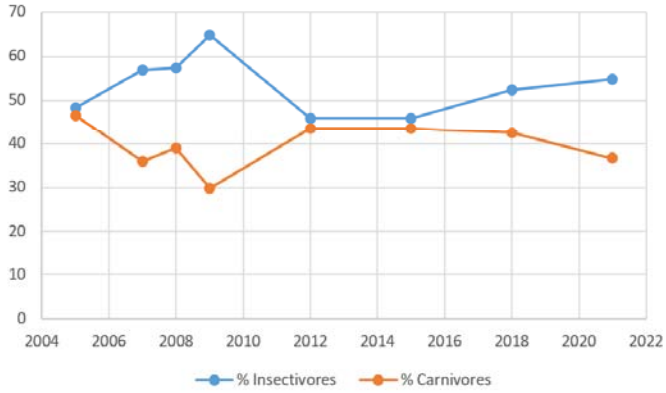
Site 6: St. Joseph River—Jefferson



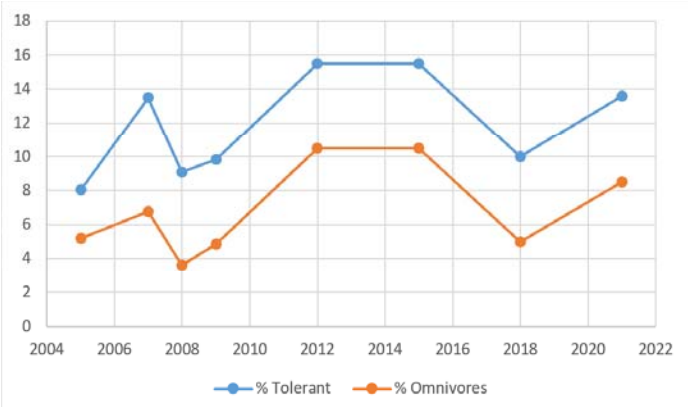
Since the inception of monitoring, the number of species has increased slightly, although the number at this site has remained relatively low compared to most other sites on the St. Joseph River.



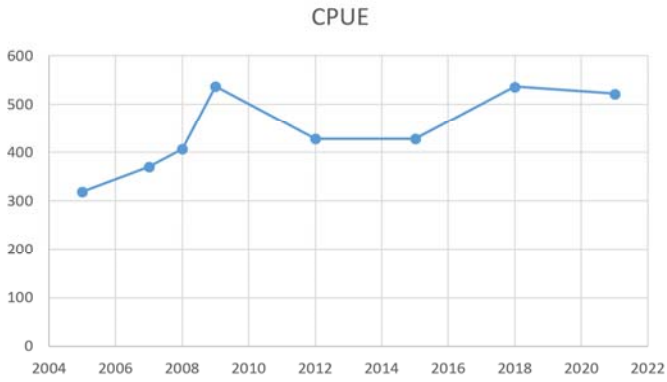
Since the inception of monitoring, the number of darters has increased slightly, while the number of suckers has decreased. In the late 2000s, the number of sensitive species increased considerably, however, that metric has since lowered closer to original numbers. The number of sunfish has decreased slightly.



The percent of carnivores and insectivores has been relatively similar over the years. Both metrics appear to occupy close to 50 percent of the population. Note the strong negative relationship between both metrics.

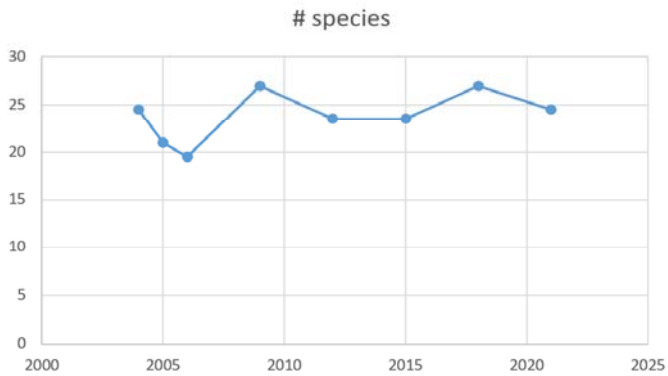


Since the inception of monitoring, the percent of tolerant individuals and omnivores has fluctuated. Both metrics have been very low (15% or less) over the years.

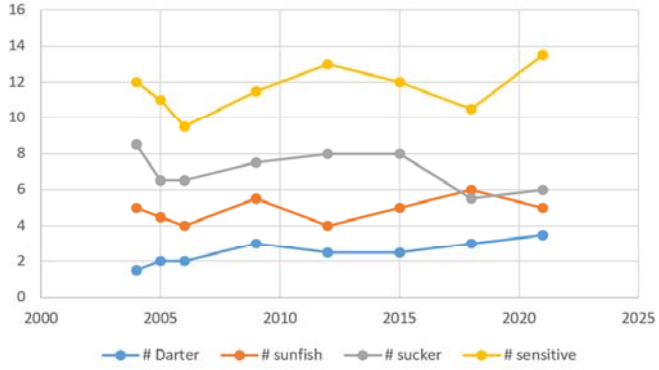


The total number of fish collected (CPUE) has increased significantly since the inception of monitoring.

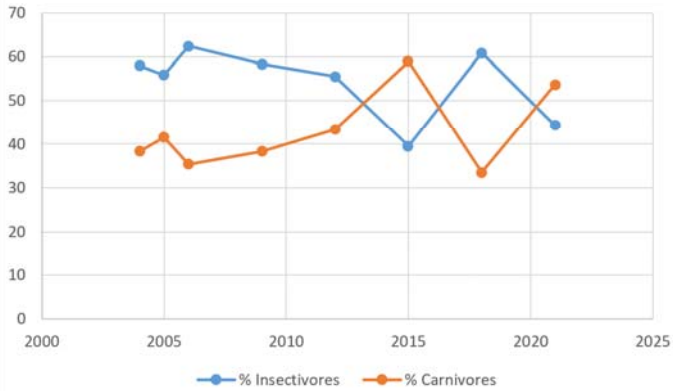
Site 8: St. Joseph River—LaSalle Ave.



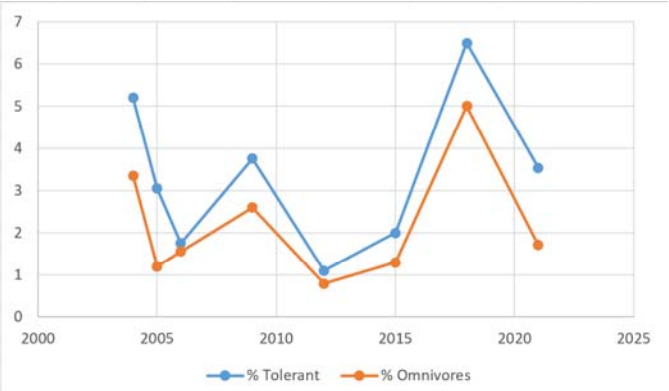
The number of species dropped in the first few years of monitoring to 20 species, but has rebounded and been consistently close to 25 in the past several years of monitoring.



The number of darters and sunfish species have increased slightly since the inception of monitoring. The number of sucker species has declined slightly, and the number of sensitive species has fluctuated slightly with a modest increase in 2021.

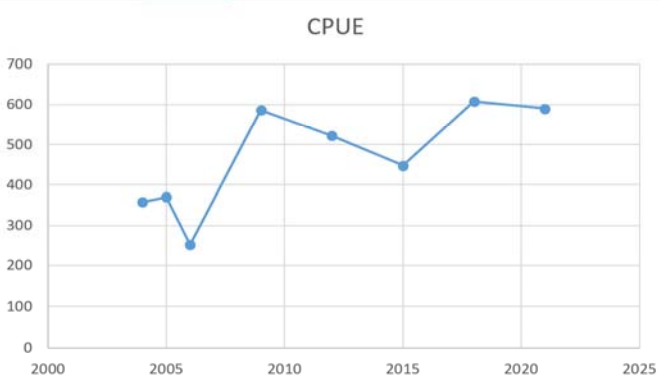


The percent of carnivores and insectivores has been relatively similar over the years. Both metrics appear to occupy close to 50 percent of the population. Note the strong negative relationship between both metrics.



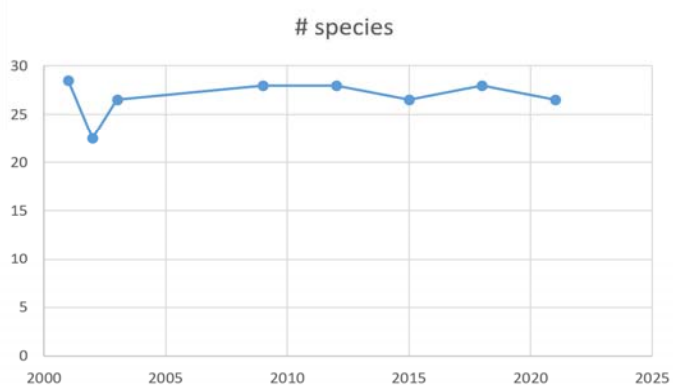
The percent of tolerant individuals and omnivores has fluctuated at this site, but these metrics have always been very low (less than 10%)

The percent of simiple lithophilic spawners has decreased substantially at this site since the inception of monitoring

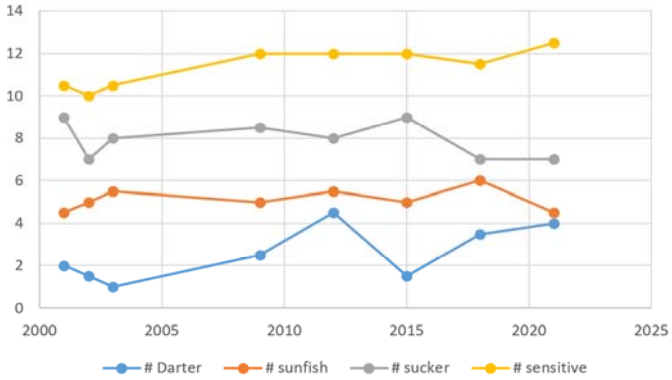


The total number of fish collected (CPUE) has increased significantly since the inception of monitoring.

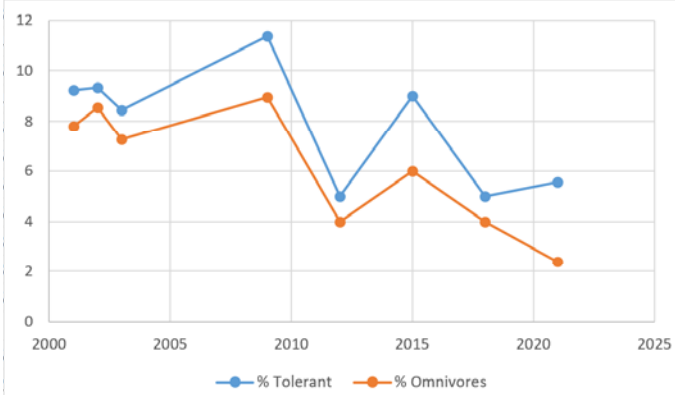
Site 10: St. Joseph River—Keller Park



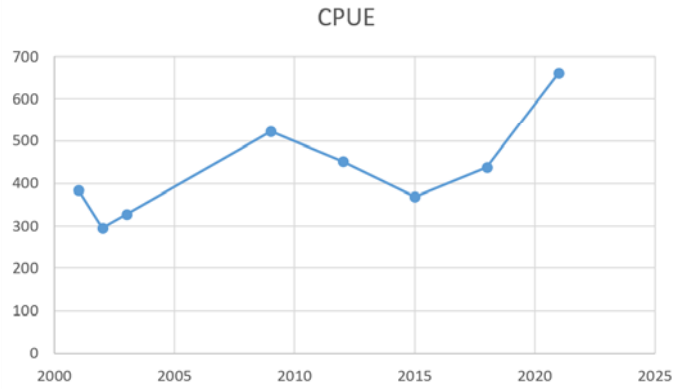
The number of species at this site has been very consistent with one minor deviation in the early 2000s.



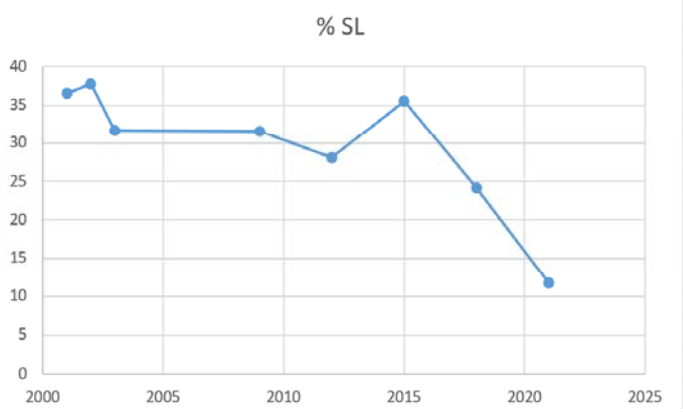
The number of sensitive species and sunfish has increased slightly since the inception of monitoring, while the number of darters, suckers, and sunfish have fluctuated.



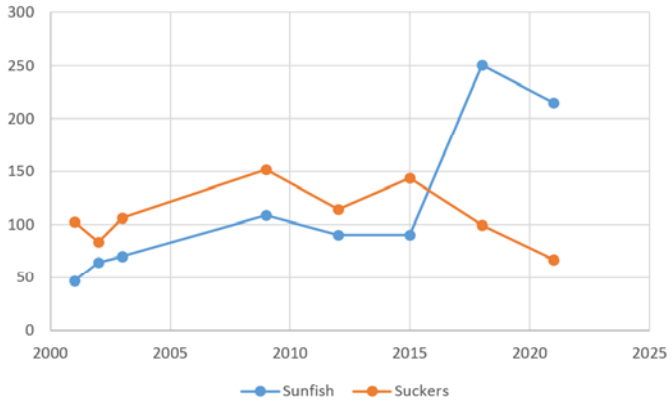
The % of tolerant individuals and omnivores have dropped since the inception of monitoring, although these metrics have always been very low (less than 15%)



The total number of fish collected (CPUE) increased substantially in 2021

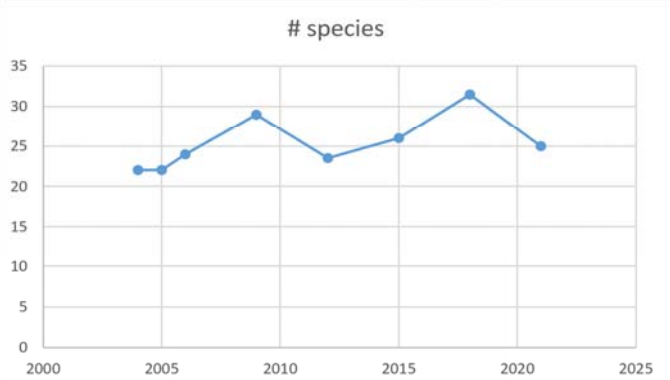


The % of simple lithophils plummeted in 2021. In 2018, this metric was already dropping.

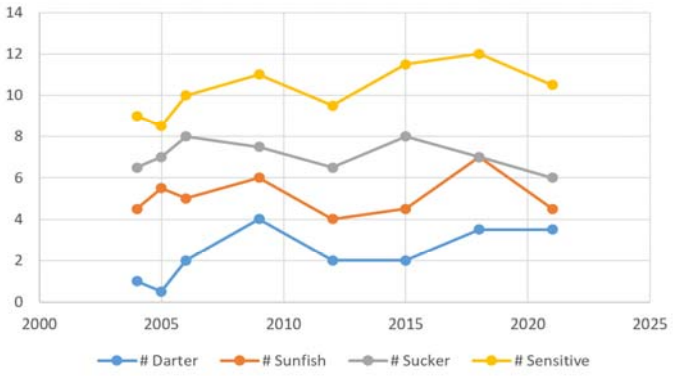


The change in the % of simple lithophils has happened for a couple of reasons: 1) the number of suckers have dropped 2) the number of sunfish skyrocketed in 2018 and 2020.

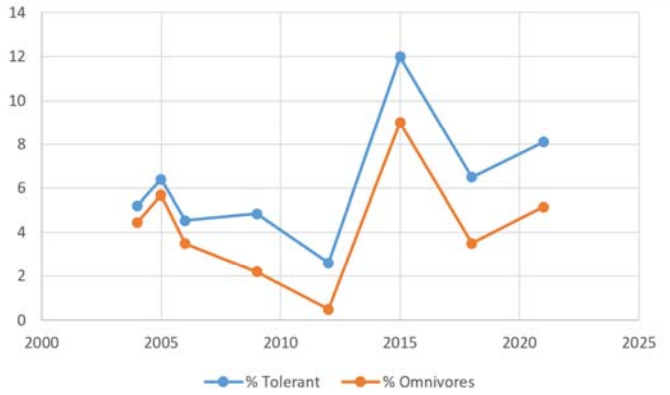
Site 11: St. Joseph River—Brick Road



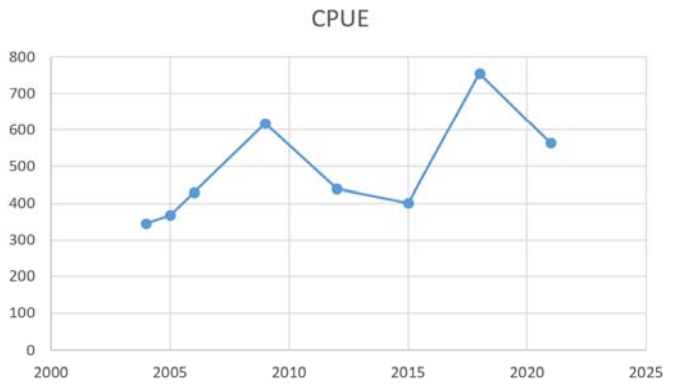
Since the inception of monitoring, the # of species has increased with a slight check downwards in 2021.



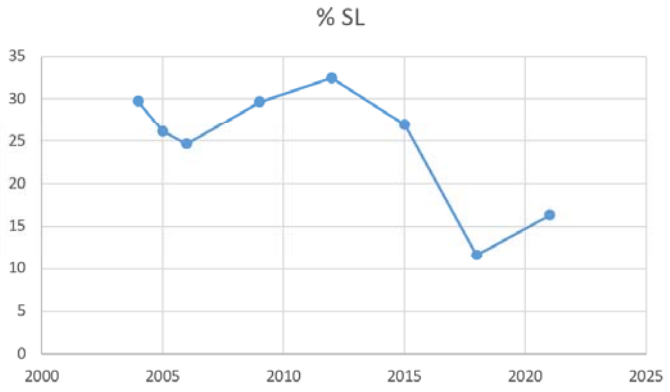
Since the inception of monitoring, the number of sensitive species and darters have increased. The number of sunfish species increased slightly in 2018 but dropped again in 2021. The number of sucker species has been relatively consistent over time.



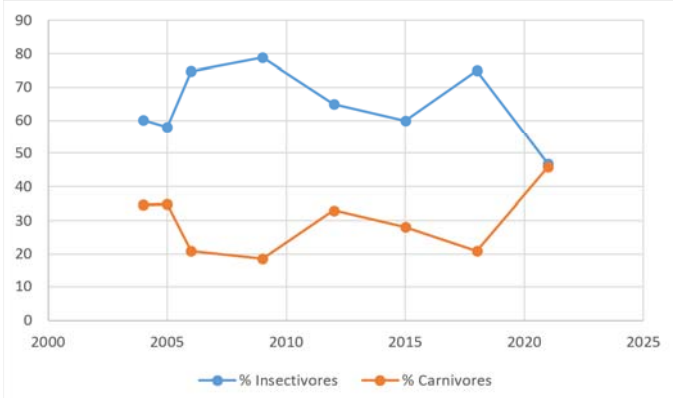
The percent of tolerant individuals and omnivores has fluctuated, but has always been very low (less than 15%).



The total number of fish collected (CPUE) increased significantly since the inception of monitoring. It increased substantially in 2018, but dropped slightly again in 2021.

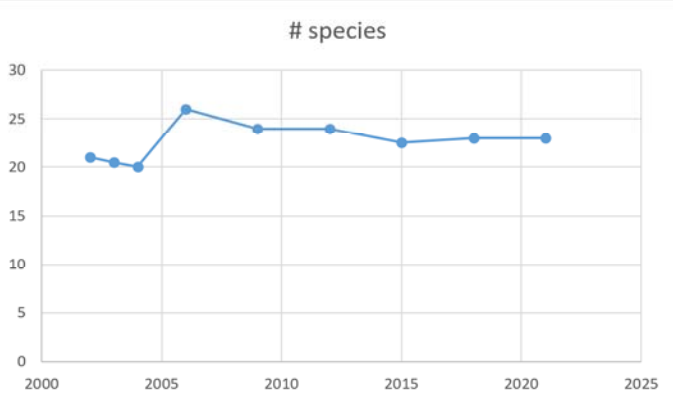


The percent of simple lithophilic spawning fish has decreased substantially since the inception of monitoring. A huge decrease occurred in 2018 relative to previous years with a slight check in 2021. Similar to Keller Park, the % simple lithophil metric at this site is related to changes in sunfish abundance.

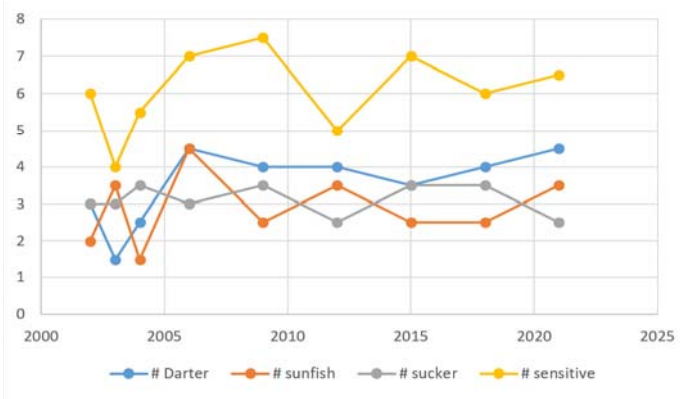


The percent of insectivores and carnivores have remained relatively similar over time, although insectivores dropped significantly in 2021 and carnivores increased significantly.

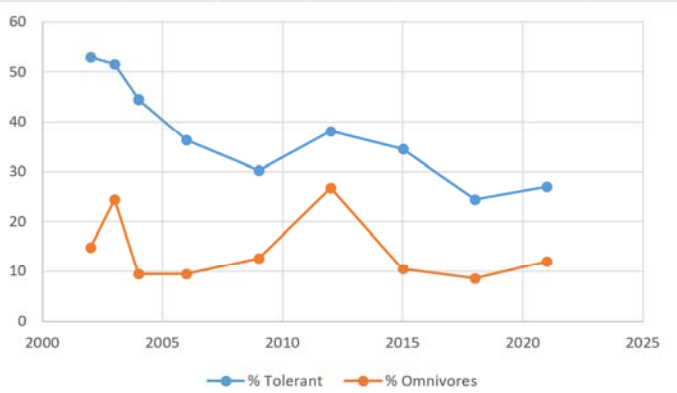
Site 13: Little Elkhart River—CR 35



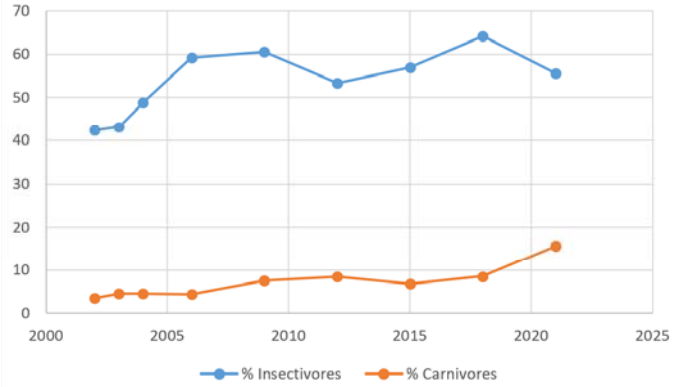
The number of species at this site increased substantially in 2006 (from approximately 21 species to approximately 25) and has remained close to 25 species since that time.



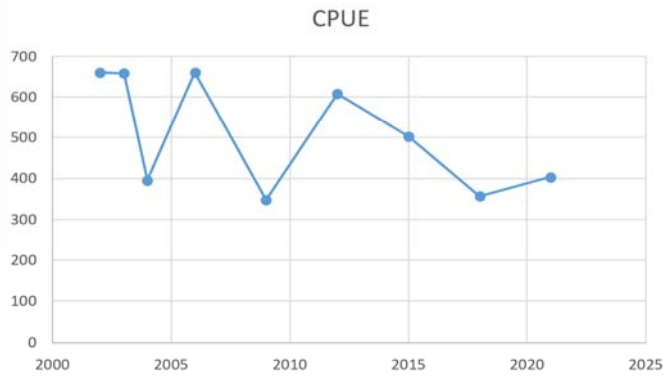
The number of sensitive species, sunfish, and suckers have fluctuated to a certain extent since the inception of monitoring. The number of darters, however, increased to approximately 4 species in 2006 and has remained similar to that number since.



The percent of tolerant individuals has decreased substantially since the inception of monitoring, while the percent of omnivores has remained relatively similar over time.

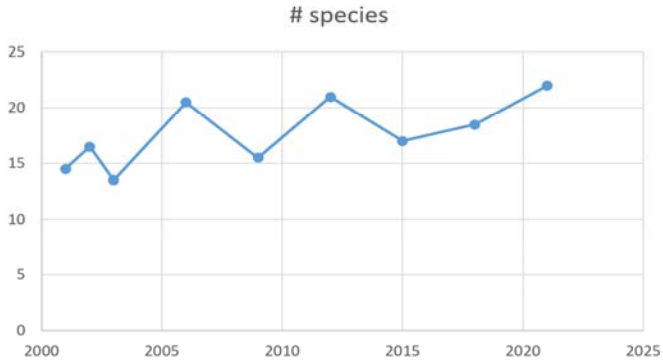


The percent of insectivores has increased substantially since the inception of monitoring, while the percent of carnivores has also increased gradually with an all-time high in 2021.

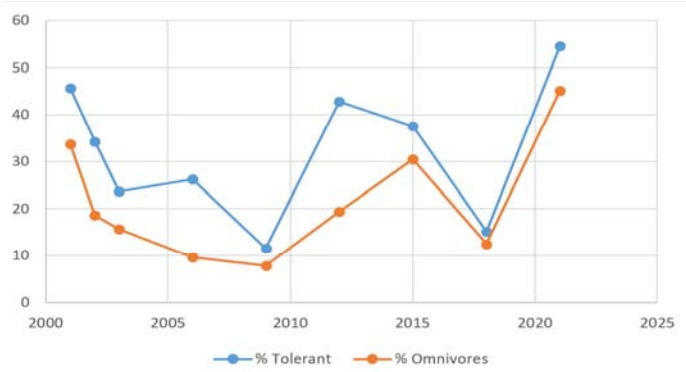


The total number of fish collected (CPUE) has fluctuated significantly since the inception of monitoring. It has remained relatively low from 2018 to 2021.

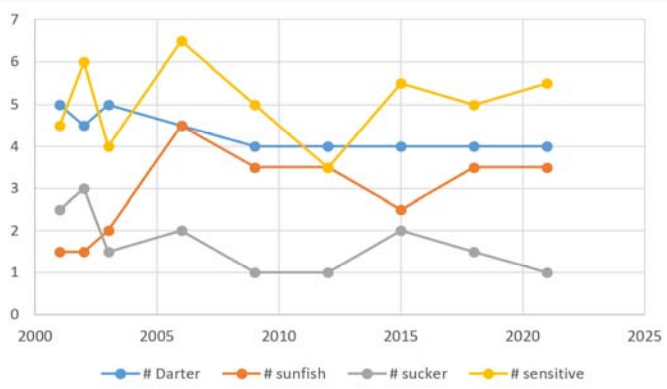
Site 19: Pine Creek—SR 120 Residence



The number of species has fluctuated at this site, but the general trend has been upwards since the inception of monitoring. Species richness was at its highest level in 2021.

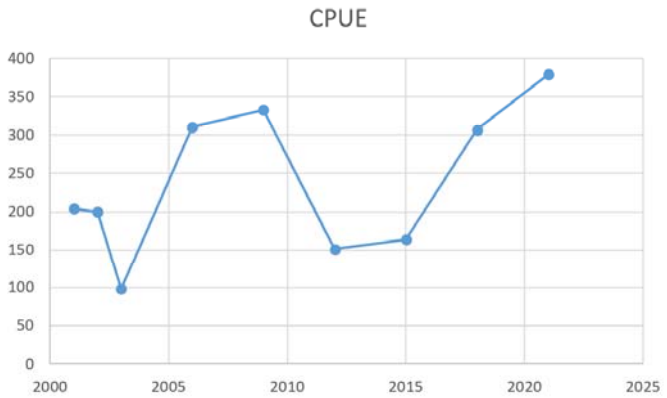


The % of tolerant species and omnivores have fluctuated greatly since the inception of monitoring with 2018 being a positive year (low % for both metrics), but 2021 being a negative year as both metrics hit their highest level. A high percentage of Bluntnose Minnows (a tolerant omnivore) accounted for the increase in 2021.

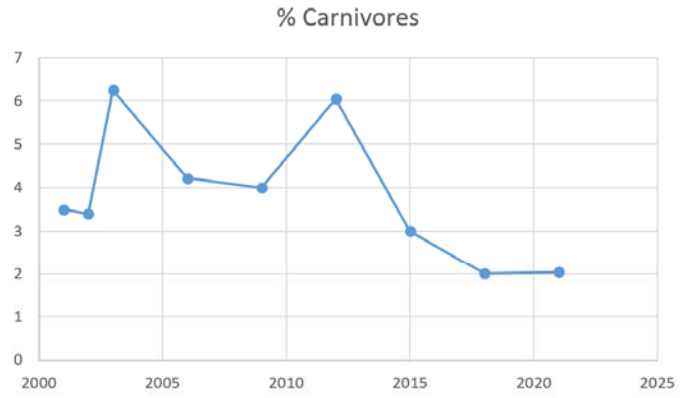


The number of sunfish species has increased since the inception of monitoring at this site, while the number of darters and suckers has decreased slightly. The number of sensitive species has fluctuated slightly but has generally stayed the same over time.

The percent of simple lithophilic fish and insectivores decreased significantly in 2021. A higher proportion of other species like Bluntnose Minnow negatively influenced some of these important metrics.

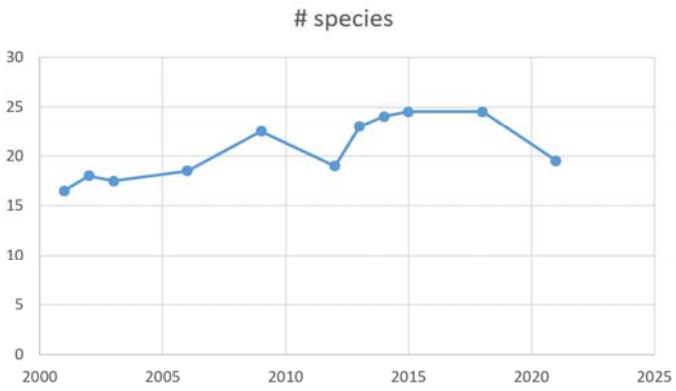


The total number of fish collected (CPUE) has fluctuated significantly over the years but hit its highest level in 2021.

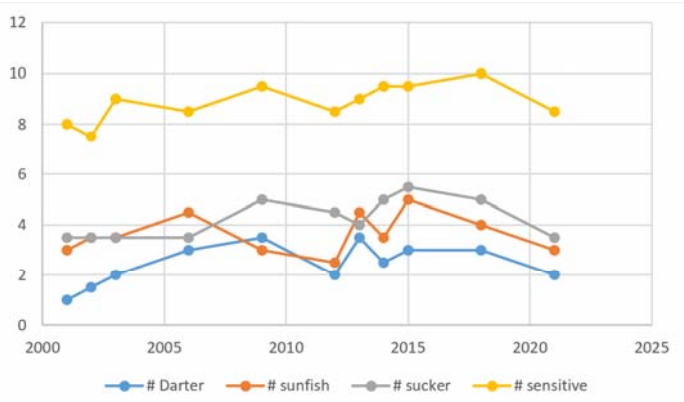


The percent of carnivores has always been very low at this site and hit its lowest point in 2018 and 2021.

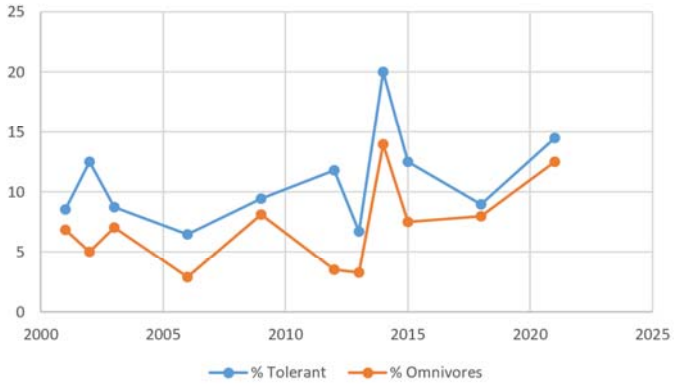
Site 24: Christiana Creek—NMWF



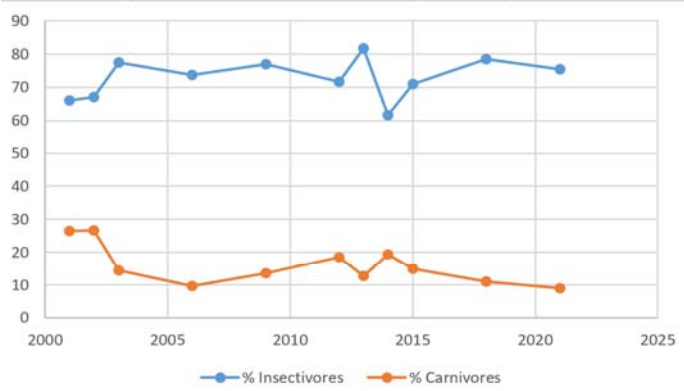
The number of fish collected at this site has increased in a gradual fashion since the inception of monitoring, with a check on the increase occurring in 2021.



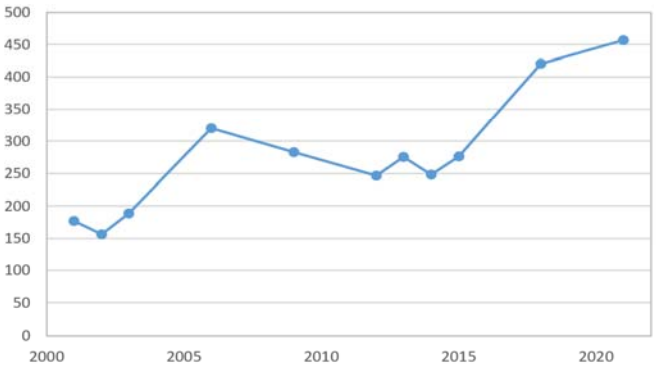
The number of sensitive species, darters, and suckers increased gradually from 2001 to 2018, although all three metrics decreased in 2021 (note how the # of sensitive species corresponds with the number of species in the graph to the left). The number of sunfish species has remained relatively similar over time.



The percent of tolerant individuals and omnivores has fluctuated slightly over the years, but both metrics have always been very low for this site.

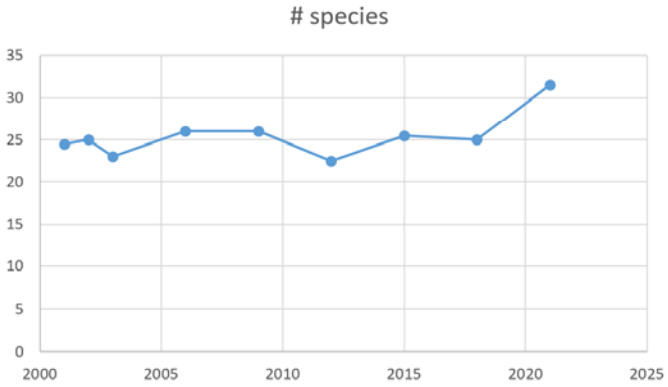


The percent of carnivores has decreased significantly since the inception of monitoring while the percent of insectivores has fluctuated slightly but remained relatively similar.

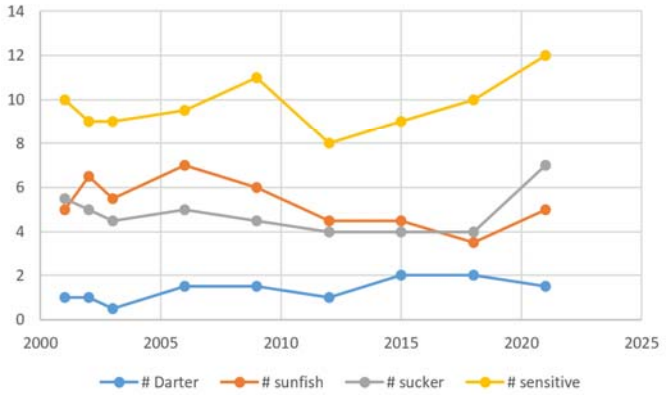


The total number of fish collected (CPUE) has increased significantly since the inception of monitoring.

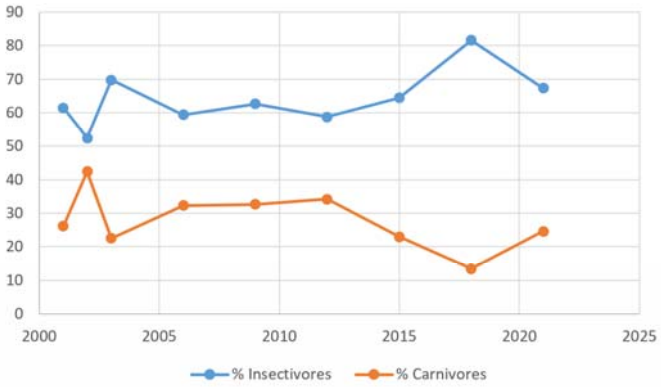
Site 30: Elkhart River—Oxbow Park (B)



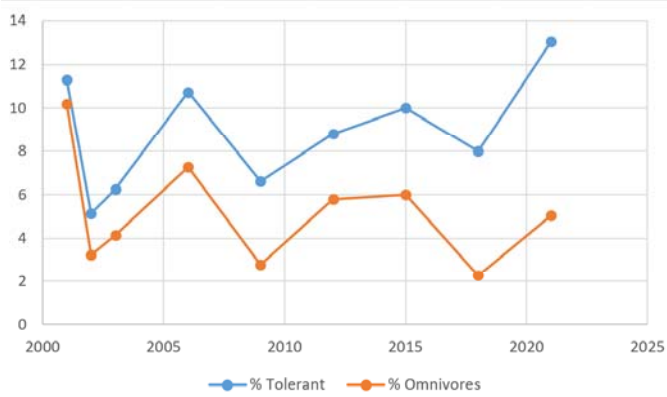
The number of species collected from 2001 to 2018 was 25 but increased to over 30 in 2021. This jump in 2021 has been observed at all Elkhart River sites, a likely result of the Elkhart River Dam removal in downtown Elkhart.



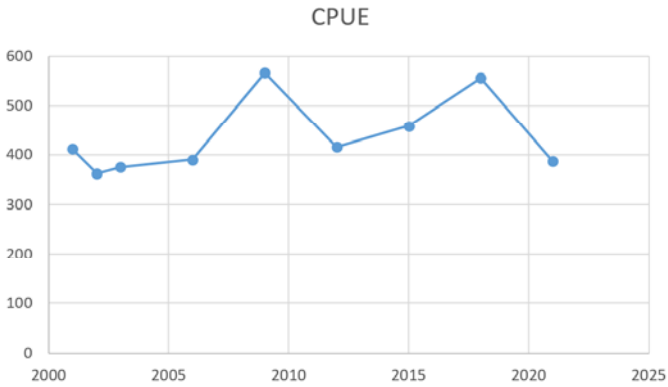
The number of darters has increased slightly at this site. The numbers of suckers and sunfish were decreasing slightly over time, but increased significantly in 2021. The number of sensitive species has remained the same with minor fluctuations over time.



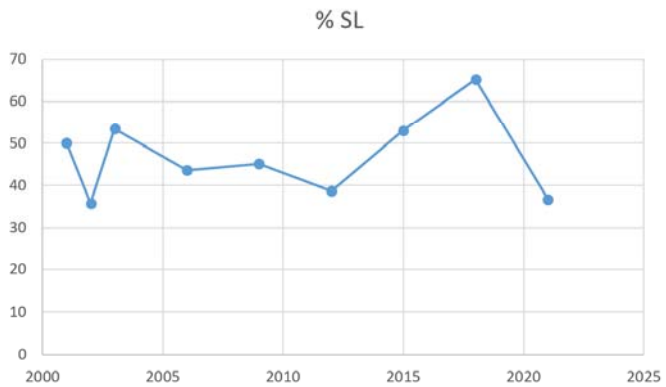
The percent of carnivores and insectivores has fluctuated since the inception of monitoring. Both metrics were stable between 2006 and 2012, but started fluctuating in 2015.



The percent of tolerant individuals and omnivores has fluctuated since the inception of monitoring but both metrics have always been low (less than 15%).

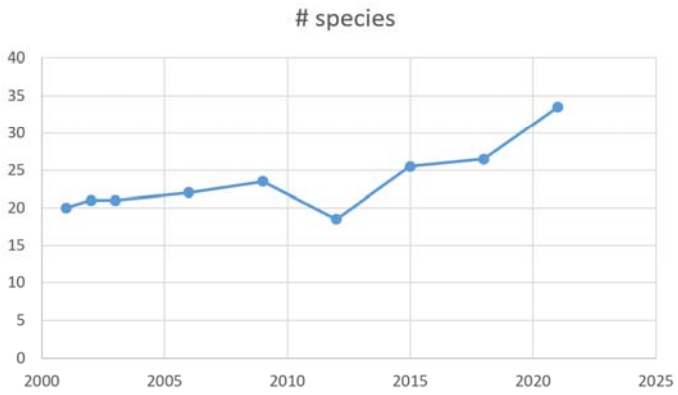


The total number of fish collected (CPUE) appeared to be generally increasing over time, but dropped significantly in 2021.

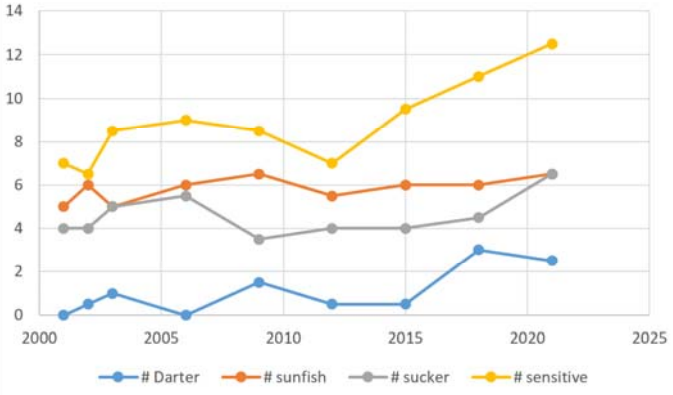


The percent of simple lithophils remained close to 45 for the first 10 years of monitoring but started fluctuating in 2015. Note the similarities between this metric and the percent of insectivores. (most insectivorous sucker species are simple lithophils).

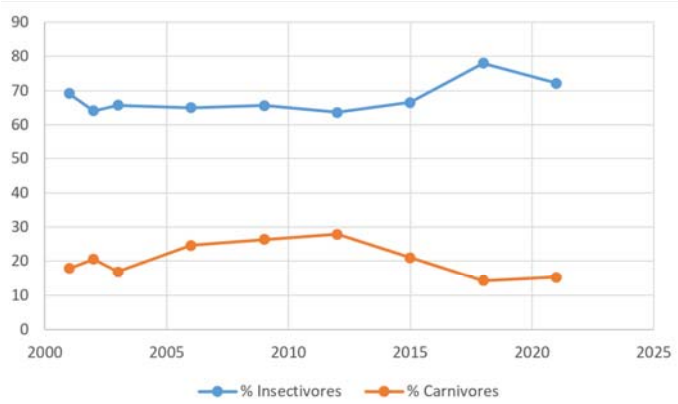
Site 31: Elkhart River—Elkhart Environmental Center (EEC) (A)



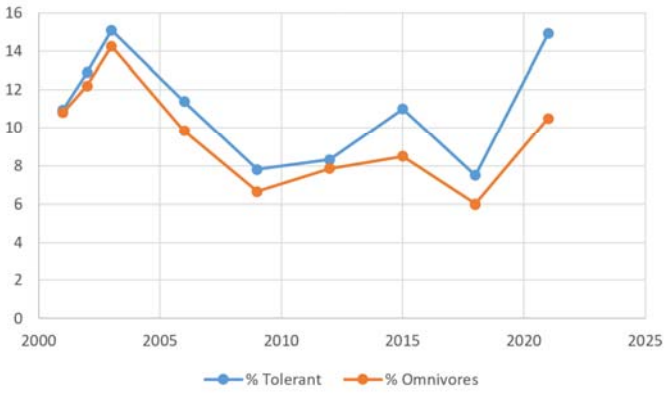
The number of species was gradually increasing at this site, but this metric jumped significantly in 2021. This jump in 2021 has been observed at all Elkhart River sites, a likely result of the Elkhart River Dam removal n downtown Elkhart.



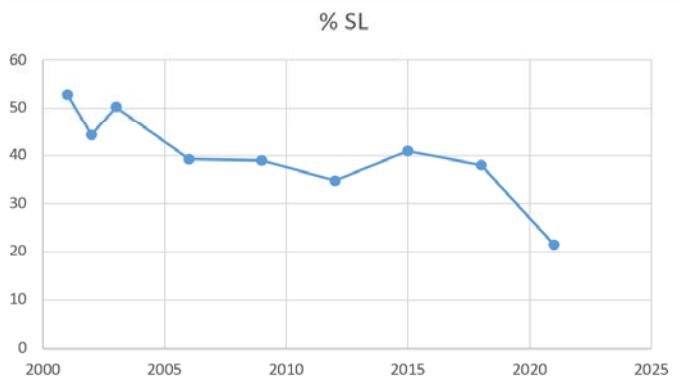
The number of darter species has increased at this site over time, while the number of sensitive species has increased significantly, starting in 2015. The number of sunfish and sucker species have been relatively consistent over time with a slight increase in 2021.



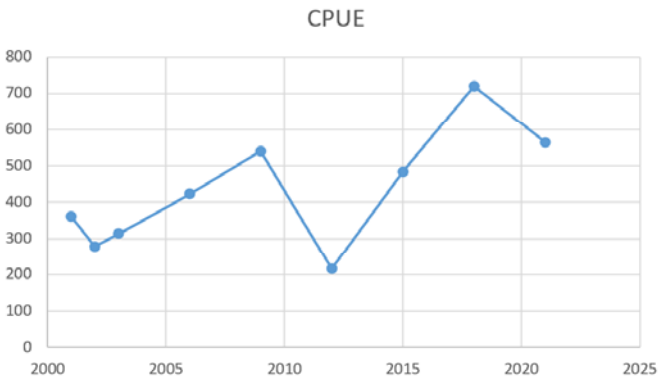
The numbers of carnivores and insectivores have remained relatively similar over time with carnivores slightly decreasing in 2018 and insectivores slightly increasing.



The percent of tolerant individuals and omnivores have fluctuated over time, however, these metrics have always been low (less than 16%) at this site.

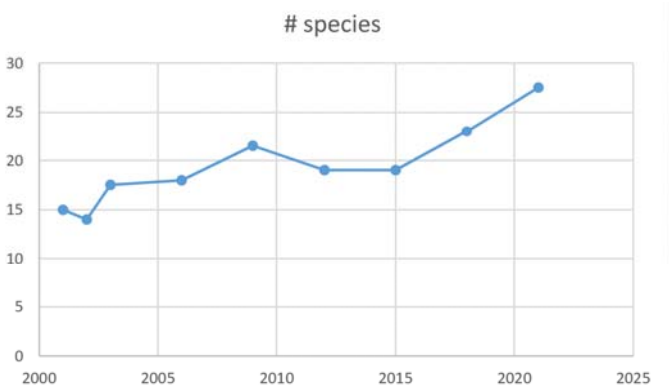


The percent of simple lithophilic spawning fish were steadily decreasing over time at this site, but this metric really plummeted in 2021.

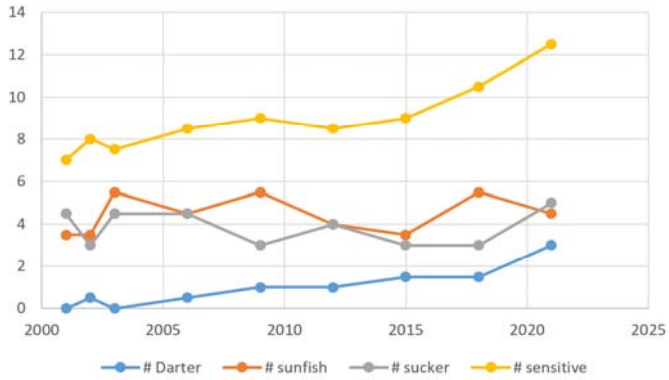


The total number of fish collected (CPUE) has increased over time with a major increase occurring in 2018 and a slight check in 2021.

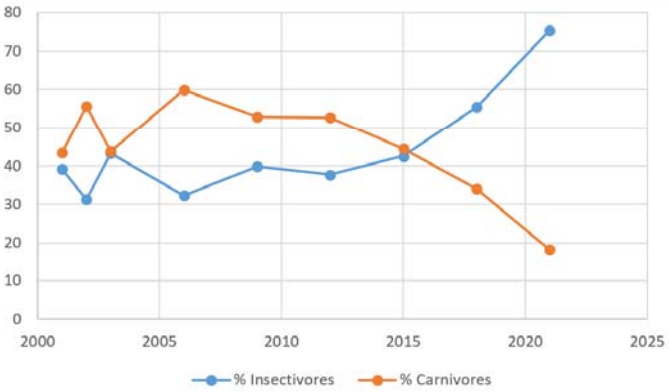
Site 32: Elkhart River—Central High School



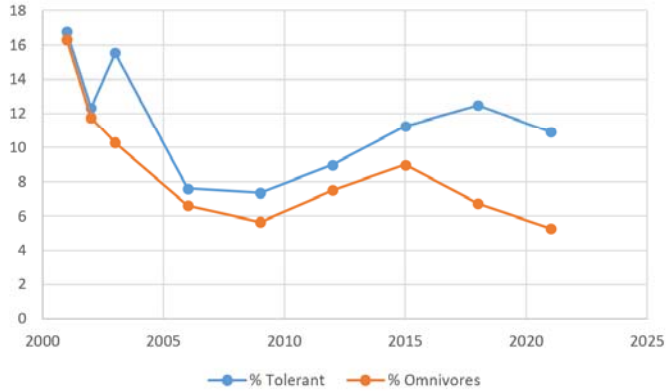
The number of species has increased at this site with a significant increase in 2018 and another in 2021. This jump in 2021 has been observed at all Elkhart River sites, a likely result of the Elkhart River Dam removal in downtown Elkhart.



The number of darters and sensitive species have increased at this site, while the number of suckers and sunfish have remained relatively similar.

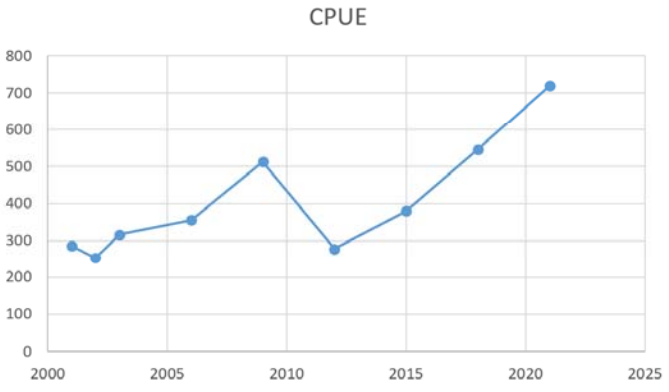


The % of insectivores skyrocketed in 2021 while the % of carnivores plummeted. These metrics have a very strong negative relationship at this site (as one increases, the other decreases).



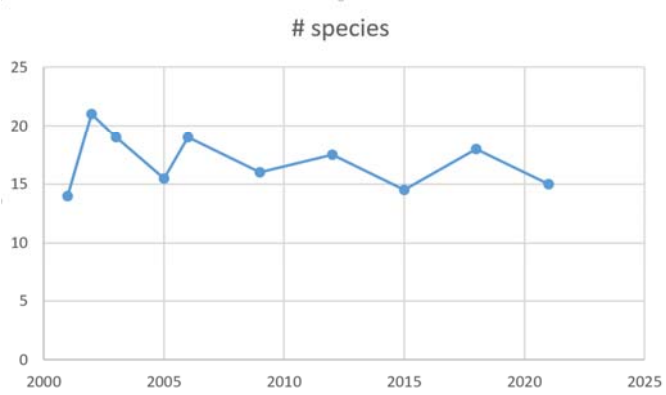
The percent of tolerant individuals and omnivores have generally decreased since the inception of monitoring.

The percent of simple lithophilic spawners has decreased significantly since the inception of monitoring.

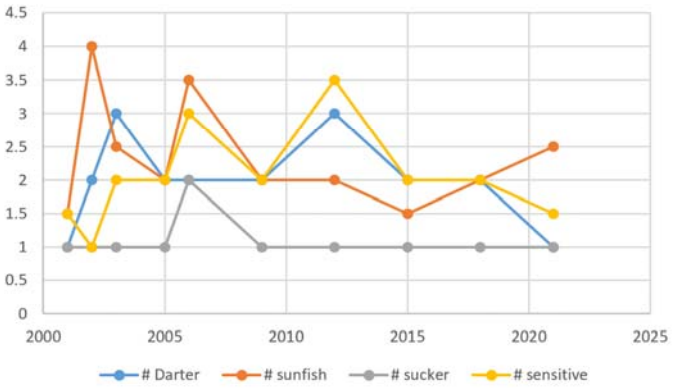


The total number of fish collected was trending upwards in recent years, but skyrocketed in 2021.

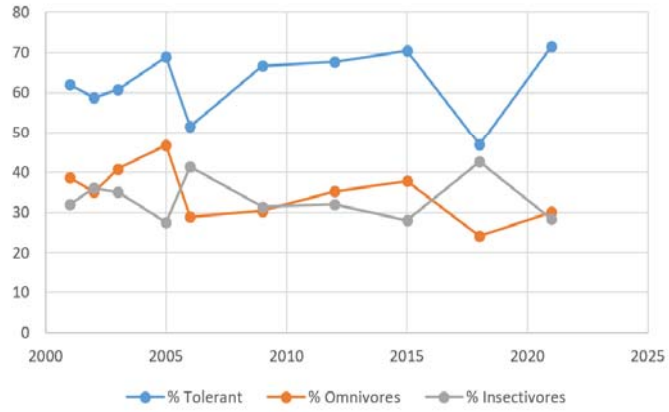
Site 35: Yellow Creek—Concord High



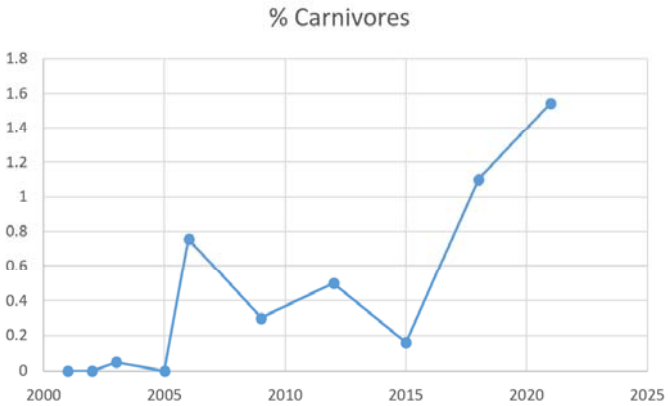
The total number of species has fluctuated over the years but is relatively similar to what it was when monitoring was initiated at this site.



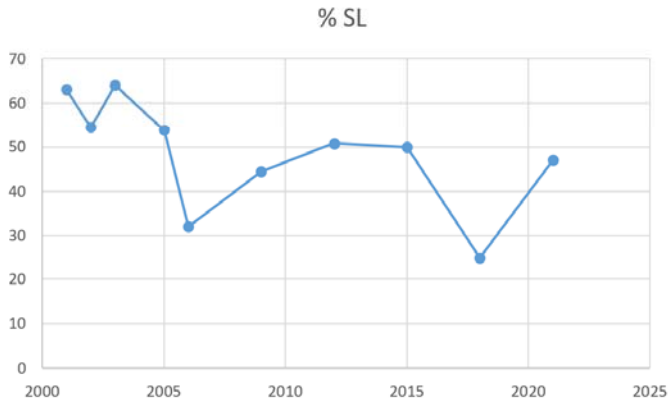
The number of sucker, sunfish, and darter species have remained similar since the inception of monitoring, while the number of sensitive species has increased slightly.



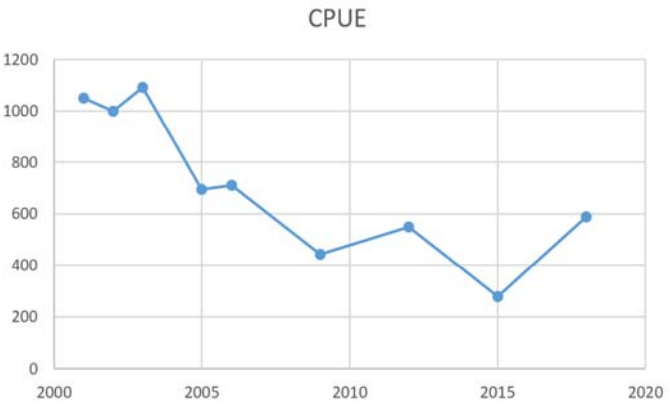
The percent of insectivores, tolerant individuals, and carnivores has fluctuated over the years. Note that tolerant individuals comprise a significant proportion of the fish community at this site.



The percent of carnivores has always been extremely low at this site.

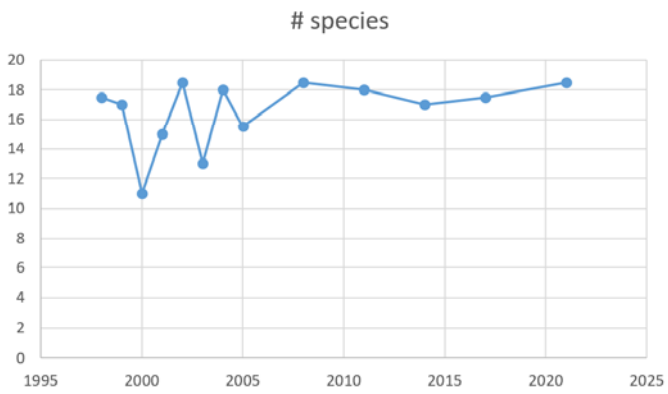


The percent of simple lithophils has fluctuated at this site over the years, but has generally decreased over time.

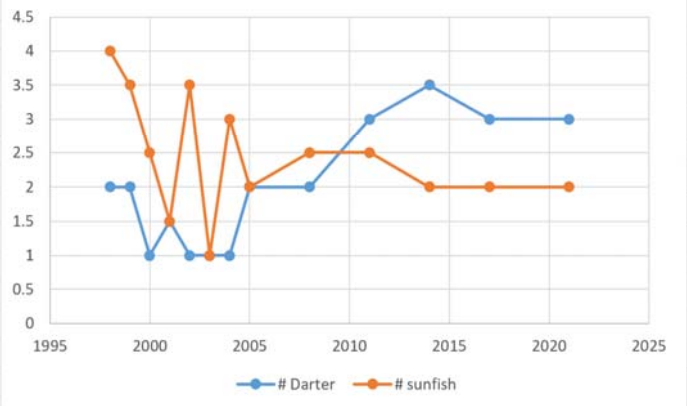


The total number of fish collected (CPUE) has decreased significantly at this site since the inception of monitoring. This is an interesting trend as most other sites are experiencing an increase in CPUE.

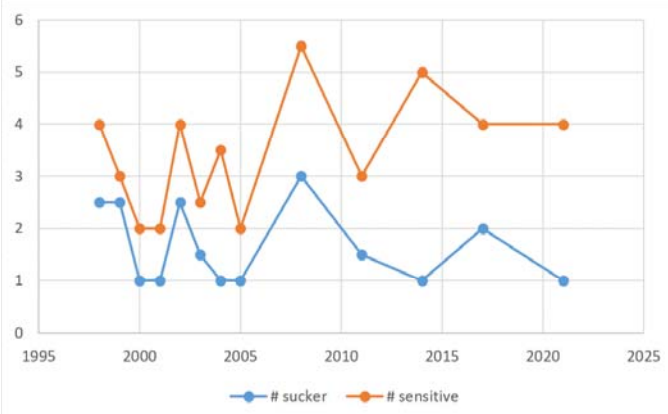
Site 36: Yellow Creek—US 20 Bypass



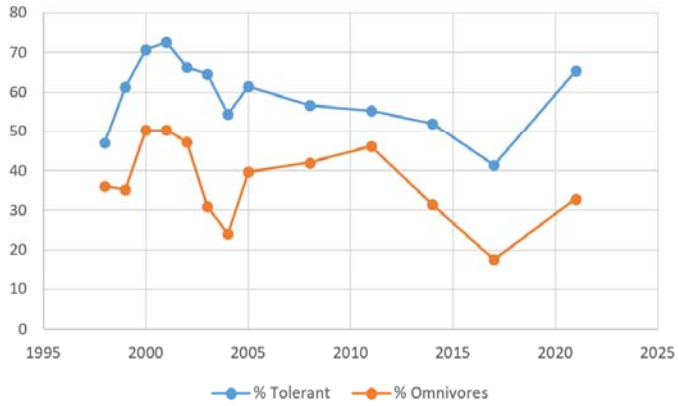
The number of species fluctuated at this site in the early 2000s but became more stable starting in 2008 and has remained close to 18.



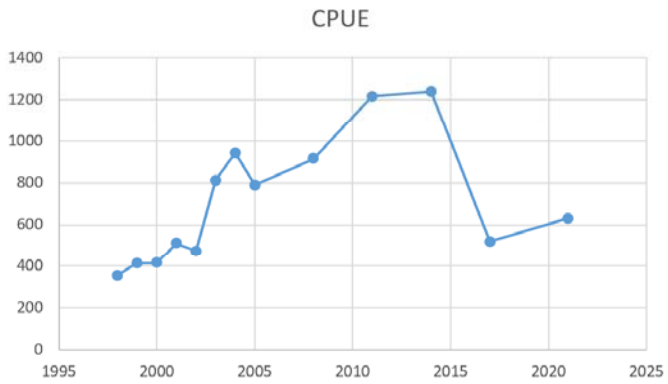
The number of darters has increased since the inception of monitoring, while the number of sunfish appears to have declined.



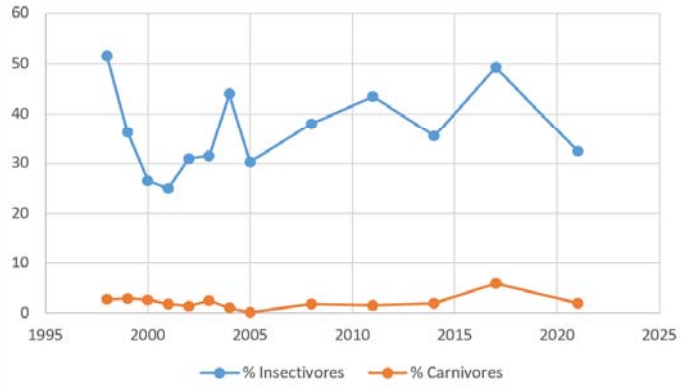
The number of suckers and sensitive species have fluctuated over time, but in general both metrics have stayed similar over time.



The % of tolerant individuals and omnivores have been trending in a downward direction since the inception of monitoring but both metrics increased in 2021.

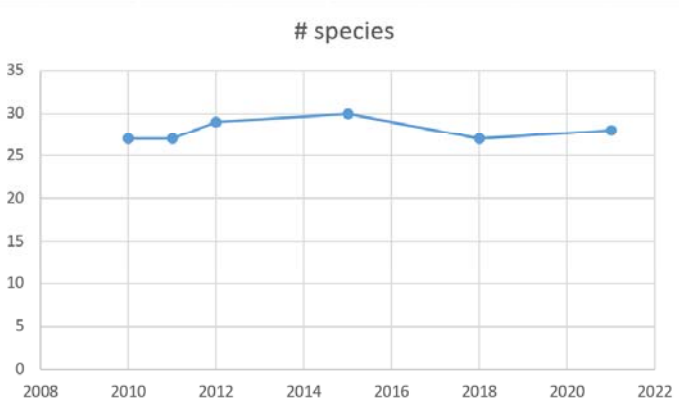


The number of fish collected (CPUE) at this site increased significantly between 1998 and 2014, but dropped significantly in 2017 and 2021.

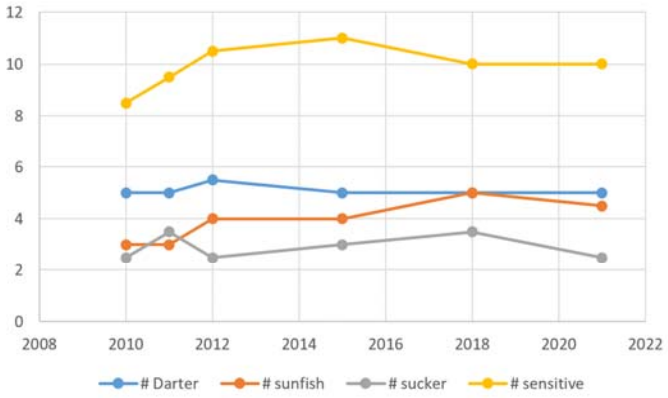


The % of insectivores has fluctuated considerably (between 25 and 55%) since the inception of monitoring, while the % of carnivores has always been very low (less than 10%).

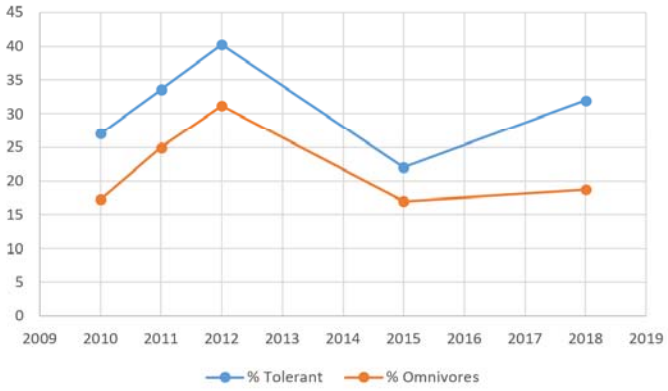
Site 37: Baugo Creek—Restoration (B)



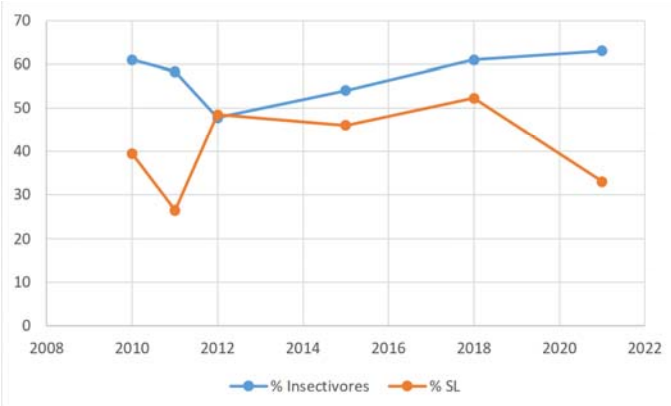
The number of species has consistently been between 25 and 30 since the inception of monitoring.



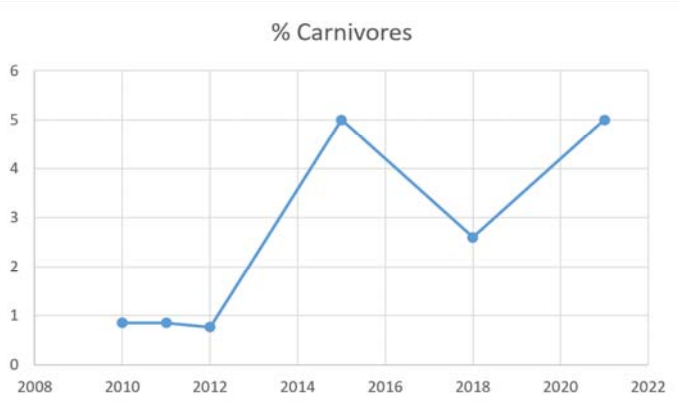
There has been a slight increase in the number of sensitive species and sunfish, while the number of darters and suckers has remained relatively similar over time.



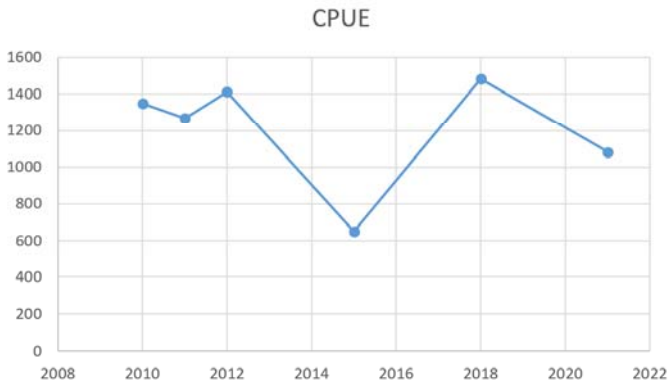
The percent of tolerant individuals and omnivores have fluctuated since the inception of monitoring.



The percent of insectivores has remained relatively consistent since the inception of monitoring (between 50-60%). The percent of simple lithophils increased close to 50% following the baseline period but dropped close to 30% in 2021.

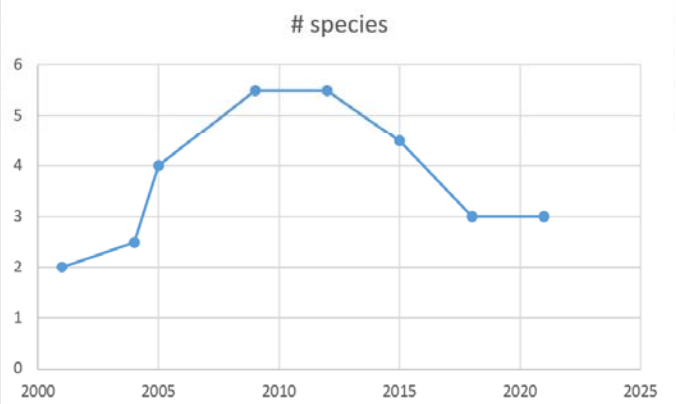


There was a slight rise in the percent of carnivores at this site, but this metric has always been very low (less than 5%).

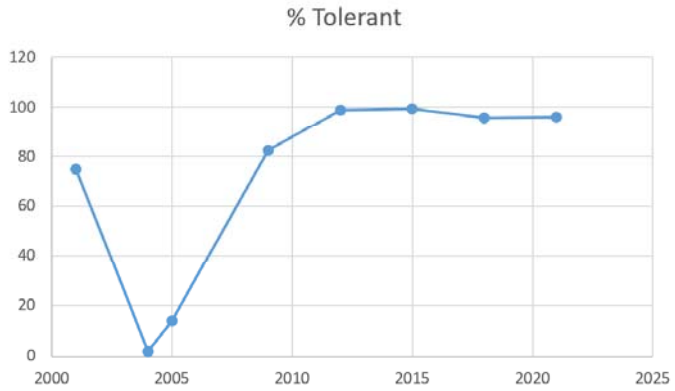


The number of fish collected (CPUE) has fluctuated over the years.

Site 38: Bowman Creek—Chippewa Ave

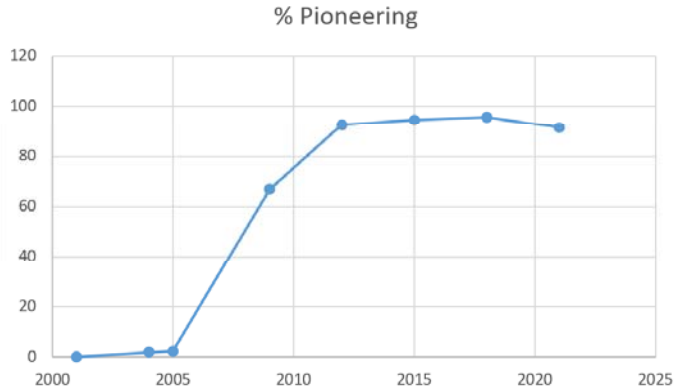


The total number of species rose at this site in the mid-2000s but this metric appears to be trending back towards the level seen during the first few years of sampling.

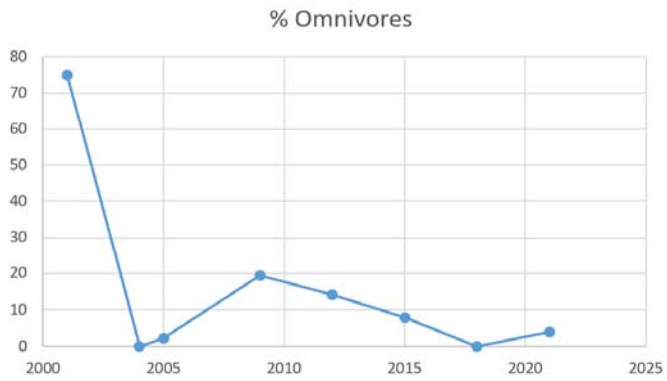


The percent of tolerant individuals has increased in recent years and has been close to 100% since 2007.

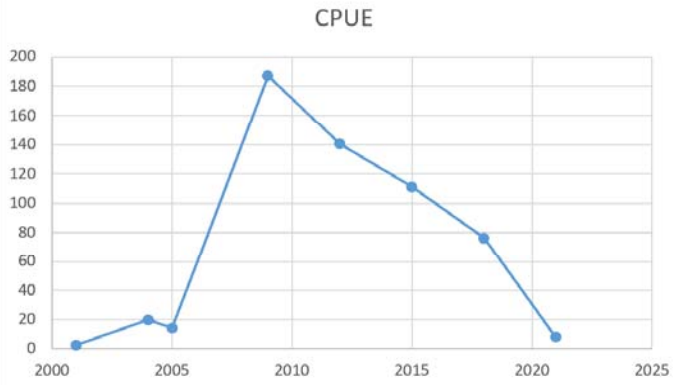
The percent of insectivores rose significantly in the first few years of sampling, but it has since plummeted.



The percent of pioneering species has risen significantly in recent years.

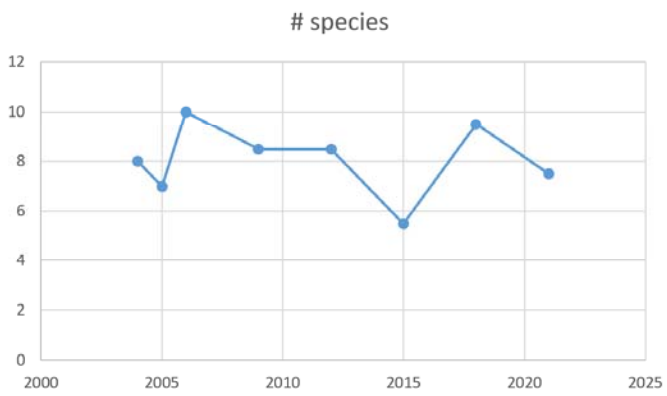


The percent of omnivores was very high in the first sampling season, but it has dropped and stayed very low since.

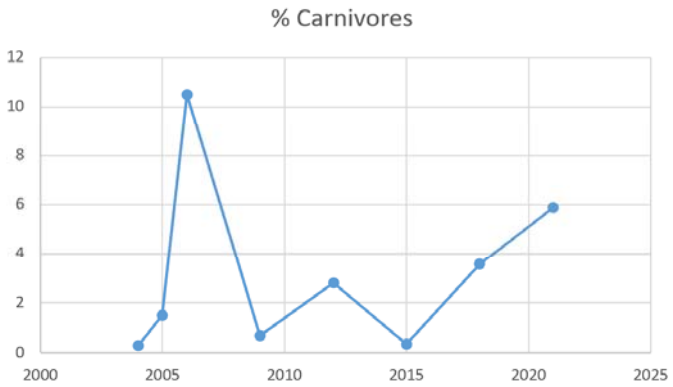


The total number of fish collected (CPUE) was very low in the first few years of sampling and increased significantly between 2009 and 2018, but plummeted to baseline levels in 2021.

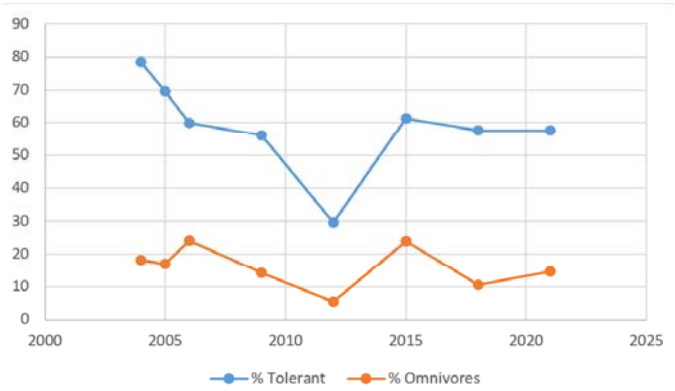
Site 45: Juday Creek—Grape Road



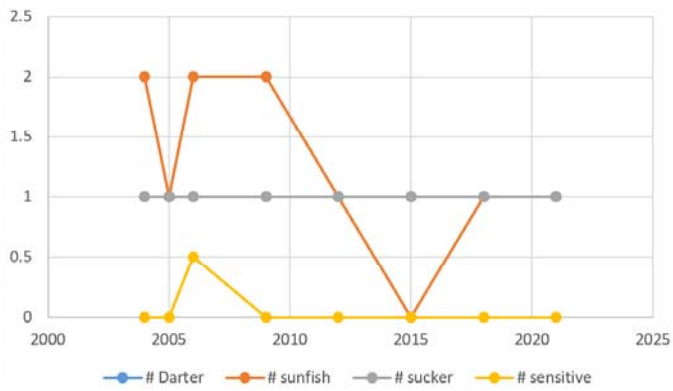
The number of species at this site has fluctuated since the inception of monitoring.



The percent of carnivores at this site has always been very low, with the exception of a minor spike above 10% in 2006.

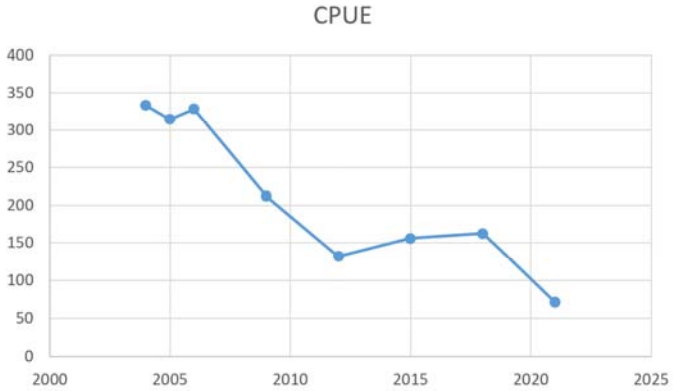


The % of tolerant individuals and omnivores have fluctuated since the inception of monitoring, although the % of tolerant individuals has been consistent at 60% since 2015. The percent of omnivores has always been low (less than 30%).



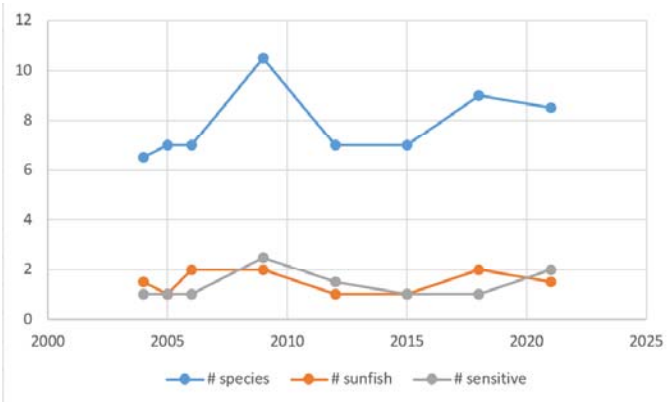
The number of darters, suckers and sensitive species have remained consistent at this site, while the number of sunfish species has fluctuated. Darter data are covered up by sucker data and have always been 1.

The percent of insectivores has increased at this site, while the percent of simple lithophilic spawning fish has remained relatively similar.

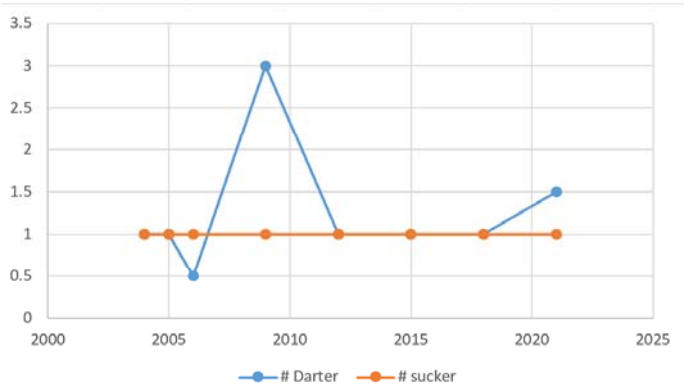


The total number of fish collected (CPUE) has dropped significantly since the inception of monitoring.

Site 47: Juday Creek—Myrtle Street

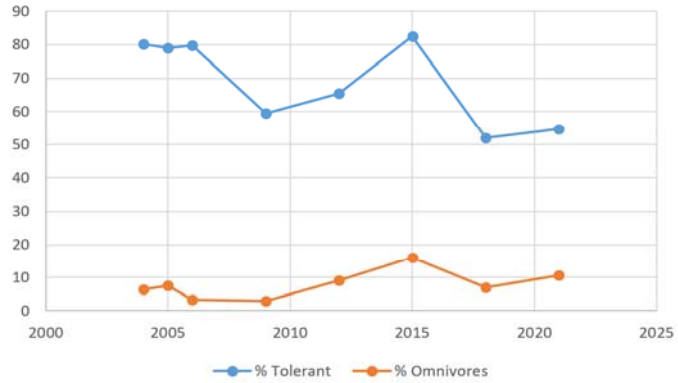


The number of species at this site has fluctuated but has increased slightly since the inception of monitoring. The number of sensitive species and sunfish have always been very low at this site.

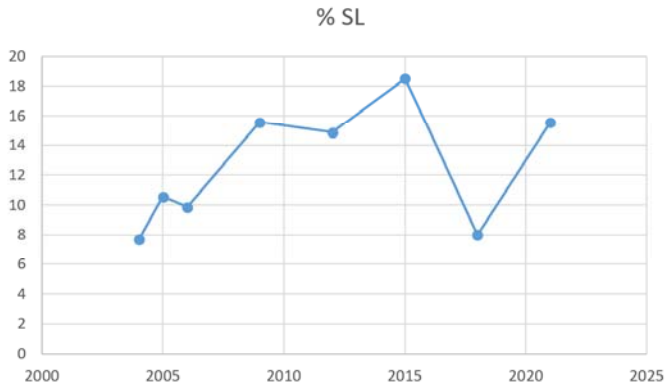


The number of darters at this site increased in the late 2000s, but since that time their numbers have been very low. Only one sucker species (white sucker) has been found at this site since the inception of monitoring.

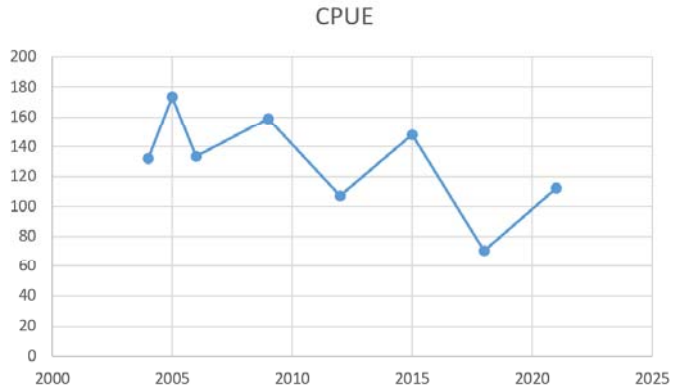
The percent of insectivores has fluctuated over the years of monitoring at this site, while the percent of carnivores has always been low, but increased significantly in 2018.



The percent of tolerant species has fluctuated at this site over the years, but did drop significantly in 2018. The percent of omnivores has had some minor fluctuations over the years, but has always been low.



The percent of simple lithophils has fluctuated over the years but has always been low at this site.



The total number of fish collected (CPUE) has fluctuated over the years, but has generally trended downwards over time.

Appendix H
IBI Calculations

Site #1
St. Joseph River Nibbyville (A)
Drainage Area: 2446
Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	27	5		Total # of Species	36	5
# of Darters	3	5		# of Darters	4	5
# of Sunfish	4	3		# of Sunfish	6	5
# of Suckers	6	5		# of Suckers	7	5
# of Sensitive	12	5		# of Sensitive	13	5
% Tolerant	7.78	5		% Tolerant	12.22	5
% Omnivores	5.41	5		% Omnivores	10.53	5
% Insectivores	79.68	5		% Insectivores	67.84	5
% Carnivores	14.7	3		% Carnivores	20.93	5
CPUE	925	3		CPUE	712	3
% Simple Lithophil	12	1		% Simple Lithophil	16.85	3
% DELT anomalies	0	5		% DELT anomalies	1.26	3
Total		50		**Total**		54

Average	52

Site #2
St. Joseph River Lexington Avenue
Drainage Area: 3372
Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	29	5		Total # of Species	34	5
# of Darters	3	5		# of Darters	5	5
# of Sunfish	5	3		# of Sunfish	6	5
# of Suckers	8	5		# of Suckers	7	5
# of Sensitive	13	5		# of Sensitive	16	5
% Tolerant	3.17	5		% Tolerant	6.55	5
% Omnivores	0.53	5		% Omnivores	0.87	5
% Insectivores	82.72	5		% Insectivores	86.85	5
% Carnivores	16.53	5		% Carnivores	12.18	3
CPUE	1325	1		CPUE	1954	1
% Simple Lithophil	8.38	1		% Simple Lithophil	6.86	1
% DELT anomalies	0.53	3		% DELT anomalies	0.2	3
Total		48		**Total**		48

Average	48

Site #3

St. Joseph River McNaughton Park

Drainage Area: 3374

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	27	5		Total # of Species	25	5
# of Darters	3	5		# of Darters	3	5
# of Sunfish	6	5		# of Sunfish	5	3
# of Suckers	7	5		# of Suckers	5	3
# of Sensitive	14	5		# of Sensitive	12	5
% Tolerant	4.06	5		% Tolerant	2.56	5
% Omnivores	2.13	5		% Omnivores	0.89	5
% Insectivores	72.92	5		% Insectivores	79.29	5
% Carnivores	24.47	5		% Carnivores	19.82	5
CPUE	1034	1		CPUE	898	3
% Simple Lithophil	7.06	1		% Simple Lithophil	12.58	1
% DELT anomalies	0.58	3		% DELT anomalies	0.22	3
Total		50		**Total**		48

Average	49

Site #6

St. Joseph River Jefferson Boulevard

Drainage Area: 3580

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	13	3		Total # of Species	25	5
# of Darters	1	1		# of Darters	4	5
# of Sunfish	4	3		# of Sunfish	4	3
# of Suckers	2	1		# of Suckers	3	3
# of Sensitive	5	3		# of Sensitive	8	3
% Tolerant	6.9	5		% Tolerant	20.32	5
% Omnivores	3.77	5		% Omnivores	13.25	5
% Insectivores	57.53	3		% Insectivores	52.12	3
% Carnivores	38.7	5		% Carnivores	34.63	5
CPUE	478	3		CPUE	566	5
% Simple Lithophil	0.84	1		% Simple Lithophil	7.77	1
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		38		**Total**		48

Average	43

Site #8
St. Joseph River LaSalle Street
Drainage Area: 3583
Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	23	3		Total # of Species	26	5
# of Darters	2	3		# of Darters	5	5
# of Sunfish	5	3		# of Sunfish	5	3
# of Suckers	6	5		# of Suckers	6	5
# of Sensitive	13	5		# of Sensitive	14	5
% Tolerant	2.51	5		% Tolerant	4.56	5
% Omnivores	0.42	5		% Omnivores	3	5
% Insectivores	44.68	3		% Insectivores	44.08	3
% Carnivores	54.49	5		% Carnivores	52.92	5
CPUE	479	3		CPUE	701	5
% Simple Lithophil	16.08	3		% Simple Lithophil	7.99	1
% DELT anomalies	1.04	3		% DELT anomalies	0.71	3
Total		46		**Total**		50

Average	48

Site #9
St. Joseph River Michigan Street (Below)
Drainage Area: 3583
Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	23	3		Total # of Species	24	5
# of Darters	2	3		# of Darters	5	5
# of Sunfish	3	3		# of Sunfish	4	3
# of Suckers	8	5		# of Suckers	5	3
# of Sensitive	13	5		# of Sensitive	12	5
% Tolerant	3.34	5		% Tolerant	3.77	5
% Omnivores	2.92	5		% Omnivores	1.64	5
% Insectivores	59.29	3		% Insectivores	52.45	3
% Carnivores	37.58	5		% Carnivores	45.91	5
CPUE	479	3		CPUE	795	3
% Simple Lithophil	12.11	1		% Simple Lithophil	7.04	1
% DELT anomalies	1.46	1		% DELT anomalies	0.38	3
Total		42		**Total**		46

Average	44

Site #10

St. Joseph River Keller Park

Drainage Area: 3595

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	24	5		Total # of Species	29	5
# of Darters	3	5		# of Darters	5	5
# of Sunfish	4	3		# of Sunfish	5	3
# of Suckers	7	5		# of Suckers	7	5
# of Sensitive	10	5		# of Sensitive	15	5
% Tolerant	7.65	5		% Tolerant	3.49	5
% Omnivores	2.72	5		% Omnivores	2.07	5
% Insectivores	70.62	5		% Insectivores	73.53	5
% Carnivores	26.17	5		% Carnivores	23.09	5
CPUE	405	3		CPUE	918	3
% Simple Lithophil	15.06	3		% Simple Lithophil	8.39	1
% DELT anomalies	0.25	3		% DELT anomalies	0.22	3
Total		52		**Total**		50

Average	51

Site #11

St. Joseph River Brick Road

Drainage Area: 3652

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	21	3		Total # of Species	29	5
# of Darters	2	3		# of Darters	5	5
# of Sunfish	3	3		# of Sunfish	6	5
# of Suckers	6	5		# of Suckers	6	5
# of Sensitive	10	5		# of Sensitive	11	5
% Tolerant	2.52	5		% Tolerant	13.69	5
% Omnivores	0.95	5		% Omnivores	9.37	5
% Insectivores	42.9	3		% Insectivores	50.92	3
% Carnivores	56.15	5		% Carnivores	35.64	5
CPUE	317	3		CPUE	811	3
% Simple Lithophil	17.03	3		% Simple Lithophil	15.66	3
% DELT anomalies	2.52	1		% DELT anomalies	0.25	3
Total		44		**Total**		52

Average	48

Site #13

Little Elkhart River CR 35

Drainage Area: 35

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	23	5		Total # of Species	23	5
# of Darters	4	5		# of Darters	5	5
# of Sunfish	3	3		# of Sunfish	4	5
# of Suckers	2	3		# of Suckers	3	3
# of Sensitive	5	3		# of Sensitive	8	5
% Tolerant	19.7	5		% Tolerant	34.17	3
% Omnivores	8.18	5		% Omnivores	15.93	5
% Insectivores	55.76	3		% Insectivores	55.35	3
% Carnivores	22.42	5		% Carnivores	8.81	3
CPUE	330	5		CPUE	477	3
% Simple Lithophil	28.79	3		% Simple Lithophil	42.35	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		50		**Total**		48

Average	49

Site #19

Pine Creek SR 120 Residence

Drainage Area: 32.2

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	21	5		Total # of Species	23	5
# of Darters	4	5		# of Darters	4	5
# of Sunfish	3	5		# of Sunfish	4	5
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	4	3		# of Sensitive	7	5
% Tolerant	66.6	1		% Tolerant	42.36	3
% Omnivores	55.47	3		% Omnivores	34.93	3
% Insectivores	20.94	1		% Insectivores	38.86	3
% Carnivores	0.57	1		% Carnivores	3.49	1
CPUE	530	1		CPUE	229	3
% Simple Lithophil	36.98	3		% Simple Lithophil	26.2	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		34		**Total**		42

Average	38

Site #21
Lily Creek - Park 6 Drive
Drainage Area: 7
Year 2021

Metric	calc	score		Metric	calc	score	Scoring Mod
Total # of Species	N	5		Total # of Species	1	1	1
# Darter/Madtom/Sculpins	O	5		# Darter/Madtom/Sculpins	0	1	1
% Headwater		1		% Headwater	0	1	1
# of Minnows	F	5		# of Minnows	0	1	1
# of Sensitive	I	5		# of Sensitive	0	1	1
% Tolerant	S	1		% Tolerant	0	5	5
% Omnivores	H	1		% Omnivores	0	5	1[1]
% Insectivores		1		% Insectivores	100	5	1[1]
% Pioneering		5		% Pioneering	0	5	1[1]
CPUE		1		CPUE	1	1	1
% Simple Lithophil		1		% Simple Lithophil	0	1	1
% DELT anomalies		5		% DELT anomalies	0	5	1[2]
Total		36		**Total**		32	
SCORING MOD TOTAL		0		SCORING MOD TOTAL			16
				Average	34		
				SCORING MOD AVG			8

*NO FISH gets a "0" score

1[1]scoring mod based on <50 individuals in sample

1[2]scoring mod based on <25 individuals in sample

Site #24
Christiana NMWF
Drainage Area: 127
Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	21	5		Total # of Species	18	5
# of Darters	2	3		# of Darters	2	3
# of Sunfish	4	5		# of Sunfish	2	3
# of Suckers	4	5		# of Suckers	3	3
# of Sensitive	10	5		# of Sensitive	7	5
% Tolerant	6	5		% Tolerant	23	5
% Omnivores	5	5		% Omnivores	20	5
% Insectivores	82	5		% Insectivores	69	5
% Carnivores	10	3		% Carnivores	8	3
CPUE	517	3		CPUE	396	5
% Simple Lithophil	64	5		% Simple Lithophil	44	3
% DELT anomalies	0.19	3		% DELT anomalies	0	5
Total		52		**Total**		50

Average	51

Site #25

Elkhart River US 33 (Benton)

Drainage Area: 335

Year 2021

Metric	calc	score
Total # of Species	23	5
# of Darters	3	5
# of Sunfish	3	3
# of Suckers	4	3
# of Sensitive	8	5
% Tolerant	16.77	5
% Omnivores	14.24	5
% Insectivores	68.35	5
% Carnivores	17.41	5
CPUE	316	3
% Simple Lithophil	37.66	3
% DELT anomalies	0	5
Total		52

Site #26

Elkhart River Benton Dam (Below)

Drainage Area: 340

Year 2021

Metric	calc	score
Total # of Species	32	5
# of Darters	3	5
# of Sunfish	5	5
# of Suckers	4	3
# of Sensitive	11	5
% Tolerant	7.45	5
% Omnivores	6.24	5
% Insectivores	72.44	5
% Carnivores	12.65	3
CPUE	577	3
% Simple Lithophil	39.86	3
% DELT anomalies	0	5
Total		52

Site #27

Elkhart River Defries Gardens

Drainage Area: 390

Year 2021

Metric	calc	score
Total # of Species	23	5
# of Darters	2	3
# of Sunfish	2	3
# of Suckers	4	3
# of Sensitive	8	5
% Tolerant	6.57	5
% Omnivores	5.84	5
% Insectivores	79.2	5
% Carnivores	13.5	3
CPUE	274	3
% Simple Lithophil	67.52	5
% DELT anomalies	0	5
Total		50

Site #28

Elkhart River Bainertown (B)

Drainage Area: 400

Year 2021

Metric	calc	score
Total # of Species	29	5
# of Darters	3	5
# of Sunfish	5	5
# of Suckers	3	3
# of Sensitive	10	5
% Tolerant	24.75	5
% Omnivores	24.25	5
% Insectivores	60.2	5
% Carnivores	14.05	3
CPUE	598	3
% Simple Lithophil	29.26	3
% DELT anomalies	0	5
Total		52

Site #30

Elkhart River Oxbow Park (B)

Drainage Area: 652

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	30	5		Total # of Species	33	5
# of Darters	2	3		# of Darters	1	1
# of Sunfish	5	5		# of Sunfish	5	5
# of Suckers	6	5		# of Suckers	8	5
# of Sensitive	11	5		# of Sensitive	13	5
% Tolerant	17.53	5		% Tolerant	8.58	5
% Omnivores	5.21	5		% Omnivores	4.9	5
% Insectivores	59.45	3		% Insectivores	75.25	5
% Carnivores	29.59	5		% Carnivores	19.61	5
CPUE	365	3		CPUE	408	5
% Simple Lithophil	30.41	3		% Simple Lithophil	43.14	3
% DELT anomalies	1.37	1		% DELT anomalies	2.94	1
Total		48		**Total**		50

Average	49

Site #31

Elkhart River EEC (A)

Drainage Area: 694

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	35	5		Total # of Species	32	5
# of Darters	2	3		# of Darters	3	5
# of Sunfish	6	5		# of Sunfish	7	5
# of Suckers	7	5		# of Suckers	6	5
# of Sensitive	13	5		# of Sensitive	12	5
% Tolerant	16.02	5		% Tolerant	13.81	5
% Omnivores	9.53	5		% Omnivores	11.46	5
% Insectivores	65.52	5		% Insectivores	78.81	5
% Carnivores	21.5	5		% Carnivores	8.95	3
CPUE	493	5		CPUE	637	3
% Simple Lithophil	20.08	3		% Simple Lithophil	22.92	3
% DELT anomalies	0.81	3		% DELT anomalies	0.47	3
Total		54		**Total**		52

Average	53

Site #32

Elkhart River Central H.S.

Drainage Area: 697

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	30	5		Total # of Species	25	5
# of Darters	4	5		# of Darters	2	3
# of Sunfish	5	5		# of Sunfish	4	3
# of Suckers	5	5		# of Suckers	5	5
# of Sensitive	14	5		# of Sensitive	11	5
% Tolerant	12.1	5		% Tolerant	9.74	5
% Omnivores	5.81	5		% Omnivores	4.75	5
% Insectivores	67.9	5		% Insectivores	82.7	5
% Carnivores	24.35	5		% Carnivores	12.18	3
CPUE	620	3		CPUE	821	1
% Simple Lithophil	23.87	3		% Simple Lithophil	13.64	1
% DELT anomalies	3.06	1		% DELT anomalies	0.85	3
Total		52		**Total**		44

Average	48

Site #33

Elkhart River Elkhart Avenue

Drainage Area: 700

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	34	5		Total # of Species	32	5
# of Darters	5	5		# of Darters	4	5
# of Sunfish	8	5		# of Sunfish	6	5
# of Suckers	5	5		# of Suckers	5	5
# of Sensitive	16	5		# of Sensitive	15	5
% Tolerant	9.65	5		% Tolerant	6.74	5
% Omnivores	0.96	5		% Omnivores	3.37	5
% Insectivores	84.32	5		% Insectivores	84.67	5
% Carnivores	14.47	3		% Carnivores	11.83	3
CPUE	1244	1		CPUE	1513	1
% Simple Lithophil	6.99	1		% Simple Lithophil	6.81	1
% DELT anomalies	0.08	5		% DELT anomalies	0.33	3
Total		50		**Total**		48

Average	49

Site #34

Elkhart River Prairie Street

Drainage Area: 699

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	28	5		Total # of Species	31	5
# of Darters	4	5		# of Darters	4	5
# of Sunfish	4	3		# of Sunfish	5	5
# of Suckers	7	5		# of Suckers	4	3
# of Sensitive	14	5		# of Sensitive	13	5
% Tolerant	11.39	5		% Tolerant	9.78	5
% Omnivores	6.88	5		% Omnivores	7.46	5
% Insectivores	67.98	5		% Insectivores	80.18	5
% Carnivores	23.97	5		% Carnivores	11.07	3
CPUE	509	5		CPUE	777	3
% Simple Lithophil	31.63	3		% Simple Lithophil	16.86	3
% DELT anomalies	0.98	3		% DELT anomalies	0.77	3
Total		54		**Total**		50

Average	52

Site #35

Yellow Creek Concord High School

Drainage Area: 30

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	15	5		Total # of Species	15	5
# of Darters	1	1		# of Darters	1	1
# of Sunfish	2	3		# of Sunfish	3	5
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	1	1		# of Sensitive	2	1
% Tolerant	69.21	1		% Tolerant	73.85	1
% Omnivores	29.63	5		% Omnivores	30.54	5
% Insectivores	33.1	3		% Insectivores	23.75	1
% Carnivores	0.69	1		% Carnivores	2.4	1
CPUE	432	3		CPUE	501	1
% Simple Lithophil	56.02	5		% Simple Lithophil	38.12	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		34		**Total**		30

Average	32

Site #36

Yellow Creek US 20 Bypass

Drainage Area: 32

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	16	5		Total # of Species	21	5
# of Darters	3	5		# of Darters	3	5
# of Sunfish	2	3		# of Sunfish	2	3
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	3	3		# of Sensitive	5	5
% Tolerant	72.1	1		% Tolerant	58.84	3
% Omnivores	27.44	5		% Omnivores	38.35	3
% Insectivores	27.13	1		% Insectivores	37.85	3
% Carnivores	0.15	1		% Carnivores	3.64	1
CPUE	656	1		CPUE	605	1
% Simple Lithophil	42.53	3		% Simple Lithophil	37.36	3
% DELT anomalies	0	5		% DELT anomalies	0.17	3
Total		34		**Total**		36

Average	35

Site #37

Baugo Restoration Site (B)

Drainage Area: 78

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	29	5		Total # of Species	27	5
# of Darters	5	5		# of Darters	5	5
# of Sunfish	5	5		# of Sunfish	4	5
# of Suckers	2	3		# of Suckers	3	3
# of Sensitive	9	5		# of Sensitive	11	5
% Tolerant	27	5		% Tolerant	26	5
% Omnivores	14	5		% Omnivores	12	5
% Insectivores	63	5		% Insectivores	63	5
% Carnivores	6	1		% Carnivores	4	1
CPUE	950	1		CPUE	1213	1
% Simple Lithophil	31	3		% Simple Lithophil	35	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		48		**Total**		48

Average	48

Site #38
Bowman Creek - Chippewa
Drainage Area: 8
Year 2021

Metric	calc	score	Scoring mod	Metric	calc	score	Scoring mod
Total # of Species	2	1	1	Total # of Species	4	1	1
# Darter/Madtom/Sculpins	0	1	1	# Darter/Madtom/Sculpins	0	1	1
% Headwater	0	1	1	% Headwater	0	1	1
# of Minnows	1	1	1	# of Minnows	1	1	1
# of Sensitive	0	1	1	# of Sensitive	0	1	1
% Tolerant	100	1	1	% Tolerant	92	1	1
% Omnivores	0	5	1[1]	% Omnivores	8	5	1[1]
% Insectivores	25	1	1	% Insectivores	17	1	1
% Pioneering	100	1	1	% Pioneering	83	1	1
CPUE	4	1	1	CPUE	12	1	1
% Simple Lithophil	0	1	1	% Simple Lithophil	0	1	1
% DELT anomalies	0	5	1[1]	% DELT anomalies	0	5	1[1]
Total		20		**Total**		20	
SCORING MOD TOTAL			12	SCORING MOD TOTAL			12
				Average	20		
1[1]scoring mod based on <50 individuals in sample				SCORING MOD AVG	12		

Site #39
Bowman Creek - Green Tech Drive
Drainage Area: 12
Year 2021

Metric	calc	score	Scoring mod	Metric	calc	score	Scoring mod
Total # of Species	3	1	1	Total # of Species	5	1	1
# Darter/Madtom/Sculpins	0	1	1	# Darter/Madtom/Sculpins	0	1	1
% Headwater	0	1	1	% Headwater	0	1	1
# of Minnows	1	1	1	# of Minnows	1	1	1
# of Sensitive	0	1	1	# of Sensitive	0	1	1
% Tolerant	83	1	1	% Tolerant	86	1	1
% Omnivores	0	5	1[1]	% Omnivores	0	5	1[1]
% Insectivores	61	5	1[2]	% Insectivores	39	3	3
% Pioneering	83	1	1	% Pioneering	86	1	1
CPUE	23	1	1	CPUE	44	1	1
% Simple Lithophil	0	1	1	% Simple Lithophil	0	1	1
% DELT anomalies	0	5	1[1]	% DELT anomalies	0	5	1[1]
Total		24		**Total**		22	
SCORING MOD TOTAL			12	SCORING MOD TOTAL			14
				Average	23		
1[1]scoring mod based on <50 individuals in sample				SCORING MOD AVG	13		

1[2]scoring mod based on <50 individuals in sample with a high proporation of sample being insectivores

Site #43

Juday Creek Holy Cross Parkway

Drainage Area: 22

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	7	3		Total # of Species	7	3
# of Darters	1	1		# of Darters	1	1
# of Sunfish	1	1		# of Sunfish	1	1
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	0	1		# of Sensitive	0	1
% Tolerant	77.45	1		% Tolerant	64.41	3
% Omnivores	31.37	5		% Omnivores	20.34	5
% Insectivores	27.45	1		% Insectivores	38.98	3
% Carnivores	0	1		% Carnivores	0	1
CPUE	102	1		CPUE	118	3
% Simple Lithophil	52.94	5		% Simple Lithophil	44.07	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		26		**Total**		30

Average	28

Site #44

Juday Creek Grape Road

Drainage Area: 26

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	8	3		Total # of Species	7	3
# of Darters	1	1		# of Darters	1	1
# of Sunfish	1	1		# of Sunfish	1	1
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	0	1		# of Sensitive	0	1
% Tolerant	53.23	3		% Tolerant	61.73	3
% Omnivores	19.35	5		% Omnivores	9.88	5
% Insectivores	40.32	3		% Insectivores	38.27	3
% Carnivores	8.06	3		% Carnivores	3.7	1
CPUE	62	1		CPUE	81	1
% Simple Lithophil	35.48	3		% Simple Lithophil	25.93	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		30		**Total**		28

Average	29

Site #46

Juday Creek Myrtle Street

Drainage Area: 35

Year 2021

Metric	calc	score		Metric	calc	score
Total # of Species	8	3		Total # of Species	9	3
# of Darters	1	1		# of Darters	2	3
# of Sunfish	2	3		# of Sunfish	1	1
# of Suckers	1	1		# of Suckers	1	1
# of Sensitive	1	1		# of Sensitive	3	3
% Tolerant	54.55	3		% Tolerant	54.78	3
% Omnivores	10	5		% Omnivores	11.3	5
% Insectivores	44.55	3		% Insectivores	40.87	3
% Carnivores	0.91	1		% Carnivores	4.35	1
CPUE	110	1		CPUE	115	3
% Simple Lithophil	13.64	1		% Simple Lithophil	17.39	3
% DELT anomalies	0	5		% DELT anomalies	0	5
Total		28		**Total**		34

Average	31