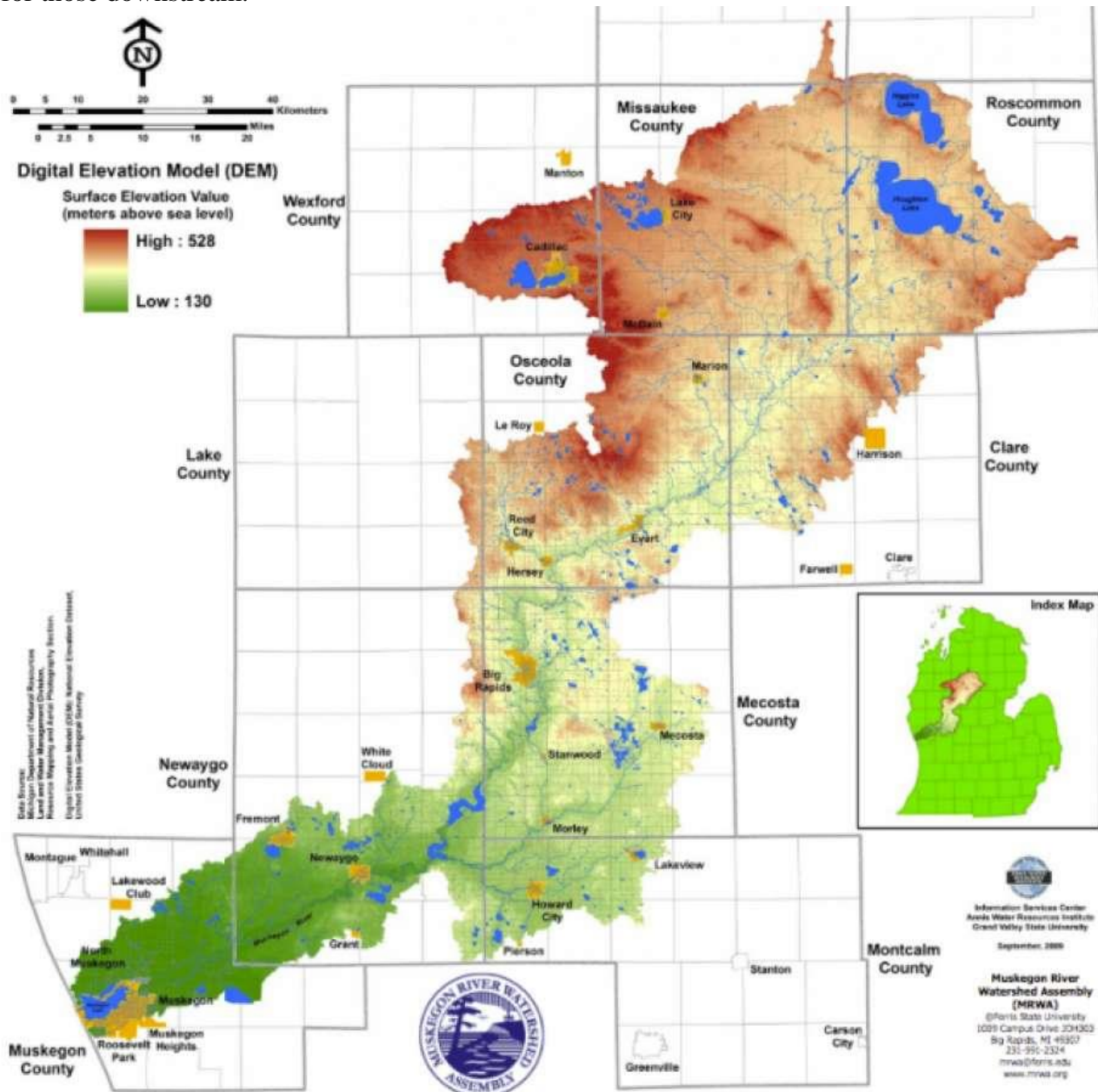


## Big Creek and Cut River Invertebrate Sampling

Melanie Brown, Environmental Committee Member

This is the second year of our water quality monitoring program for our main surface water inlet and outlet to Higgins Lake. On the north end of the lake, our largest inflow of surface water into the Higgins Lake is from Big Creek. On the southeast corner of the lake, the Cut River discharges water from Higgins Lake into Marl Lake and beyond. Higgins Lake is the headwaters of the Muskegon River watershed so our water eventually flows into Lake Michigan. What we do in Higgins Lake can have an effect on water bodies downstream that are within the Muskegon River watershed so maintaining good water quality is important not only for Higgins Lake users but also for those downstream.



Being part of HLPOA provides the opportunity to also connect with others in the State that have our mutual concern for water quality and good data. For the second year, we are working with the Muskegon River Watershed Assembly (MRWA) (<https://mrwa.org/mrwa-home/>) to gather information on invertebrates in Big Creek and the Cut River. Invertebrates are animals without backbones, like insects and snails. The numbers and types of invertebrates in a stream provides information on the water quality as some invertebrates cannot tolerate pollution as well as others.

The MRWA is collecting invertebrate data throughout the watershed and are happy to have Higgins Lake added to the effort as it is located at the top of the watershed. The MRWA monitors results and reports the results and conditions for the sections studied to local communities and takes action where possible to improve any diminished sites found. MRWA will present results after three years of invertebrate data collection, along with a habitat assessment and one season of temperature measurements. If extreme changes in invertebrates are observed, MRWA will contact appropriate authorities regarding these unverified results and will remain in contact as needed during a further investigation. The goal is to determine problem areas where best management practices can be used.

Following the methods developed by the Michigan Clean Water Corps (MiCorps) <https://micorps.net/>, an experienced crew of bug collectors and sorters sampled for stream invertebrates in Big Creek and the Cut River in September 2022. Using the same 300 feet sections as last year, we sampled for invertebrates at the Dewey Road culvert in Big Creek and in a section of the Cut River between the dam and the County Road 100 culverts.



Melanie Brown and Rick Larobardiere sampling for invertebrates upstream of the Dewey Ave. Culvert, Big Creek, August 2022. Photo by Wayne Brooks

We used a net to sweep the water and sediment and hand-picked logs, and leaf litter looking for invertebrates. Volunteers sorted the samples and counted each species. Invertebrate species found were preserved in alcohol for later species identification and to maintain a historical record of our sampling.



Working in the rain, sorting samples and counting invertebrates from the Cut River. Left to Right clockwise: Melanie Brown, Leah Higgins, Rick and Carol Larobardiere, Wayne and Susan Brooks. August 2022, Photo by Jamie Brown

We ranked each species by its tolerance to pollution and counted the number of each species to provide an overall water quality rating. A stream with good quality will have a wide variety of species and a large number of the pollution intolerant species. The table below shows the tolerance to pollution of invertebrate species likely to be found in Big Creek and the Cut River. Listing is by least tolerant to most tolerant with dobson fly being the least tolerant and leaches being the most tolerant to pollution.

<b>Invertebrates Less Pollution Tolerant</b>	<b>Invertebrates More Pollution Tolerant</b>
Dobson Fly	Damsel fly
Clubtailed Dragonfly	True bug
Mayfly	Sowbug
Stonefly	True flies
Caddisfly*	Crayfish
Midges	Snails
Alderfly	Clams
Scud	Aquatic worms
	Leaches

\*except net-spinning caddisfly which is more tolerant

### **Invertebrates Sampled in 2021 and 2022**

Here is what we found in the Big Creek and Cut River invertebrate sampling for last year and this year. The species in the table are listed from less tolerant to pollution to more tolerant of pollution.

Species	Big Creek 2021	Big Creek 2022	Cut River 2021	Cut River 2022
Dobson Fly	1		1	
Clubtail Dragonfly			1	7
Stonefly		7		6
Caddisfly	2		37	
Mayfly	11	7	16	1
Alderfly				8
Scud	100+	304	1	104
Dragonfly	1	2	6	8
Beetle		5	1	
True Fly (crane-fly)		9		
Crayfish		1	3	15
Damselfly			2	2
Sowbug		1		9
Leaches				1
Aquatic worms	30	145	1	6
<b>Water quality rating</b>	Good	Fair	Very Good	Good

The water quality rating is based on the number and species of invertebrates collected at that time. We need one more year of sampling before we can determine any potential trends in water quality.

There may be a number of factors that could have affected the ratings for each stream between 2021 and 2022. Some factors that may affect the water quality ratings include:

**Annual Variation:** Long-term monitoring is important because of annual differences that occur invertebrate populations. River habitat and invertebrate populations are influenced by temperature, nutrients, rainfall and discharge, and a number of other environmental factors. It will be important to understand if trends are found based on multiple years of data.

**Timing:** Sampling in 2021 was in late September while sampling in 2022 was in late August. There may be a change in invertebrate populations as the weather cools.

**Methods:** Our sampling crew was new in 2021 and got overwhelmed with the number of scuds to count from Big Creek. Scud counting in 2022 was a more complete count from the samples, which may show a higher number even though the abundance between years was not likely as great a difference.

**Habitat Changes:** Weather dependent changes in temperature and rainfall could potentially affect pulses of nutrients that may drive plant growth that could change the habitat. The Dewey Avenue culvert replacement in 2021 may have led to short-term changes in habitat, and the invertebrate community may have been influenced. The replaced culvert will allow for a more natural stream function where the local habitat changes over time as the stream finds its new channel shape and habitat. We also noticed a significant increase in algae matted to the bottom of the stream in the Cut River, which may change habitat for the better or worse for some invertebrates and predators.



New Algal Matting in Cut River in sampling area below Dam. Rick Larobardiere and Melanie Brown, August 2022. Photo by Wayne Brooks

**Water Quality Changes:** We will need one more year of invertebrate sampling before we can have enough data from this study to provide some confidence on whether our water quality is changing for the Cut River and Big Creek. Visually, with the extra algal growth in the Cut River in combination with the reduced rating for water quality based on invertebrate sampling, there appears to be a change in the stream habitat from 2021 to 2022. We will continue to monitor the Big Creek and the Cut River and compare results from previous years to determine if there is a trend in water quality change.

Thanks to all of our volunteers for this effort: Wayne and Susan Brooks, Dan Schaeffer, Candy Hendrickson, Rick and Carol Larobardiere, Jamie Brown, and Leah Higgins, intern with the Michigan DNR. Dr. Marty Holtgren provided a rapid review of the draft article and very helpful suggestions. Thanks also to the Townsend and Schmidt families for allowing use of their properties to access the streams and process samples. Stay tuned for next year's sampling efforts. Hopefully, our invertebrate sampling work will provide a better understanding of the potential water quality trend of the surface water inlet and outlet to Higgins Lake.