

Water Resources Division Surface Water Assessment Section

# Biosurvey of the Rifle River Watershed, Michigan

July-August 2019

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### INTRODUCTION

Michigan has over 76,000 miles of rivers and streams. Understanding the quality of these waters is an important part of the Michigan Department of Environment, Great Lakes, and Energy's (EGLE) mission to protect Michigan's environment and public health by managing air, water, land, and energy resources. All of Michigan's watersheds are surveyed once every five years. As part of that effort, the Rifle River watershed (HUC8: 04080101) was sampled in 2019. This report includes the information collected during that survey.

Water quality can be measured in different ways, such as sampling macroinvertebrate and fish communities and collecting water or sediment samples. EGLE biologists sample macroinvertebrates and fish living in Michigan's rivers and streams because some are more sensitive to pollution than others. In general, macroinvertebrate and fish communities in healthy streams include those sensitive to pollution.

Looking at the quality of the physical habitat helps to understand what may be limiting the kinds of life in a stream. Habitat includes the wood, rocks, gravel, silt, and sand in the stream or river and the vegetation in the water and along the shore. Typically, a range of habitats allows for diverse types of macroinvertebrates and fish. Diverse biological communities are more resilient to change and provide greater ecological benefits. All surface waters in Michigan are protected for "designated uses" such as swimming and wading, warmwater fish communities, eating fish, aquatic life, and wildlife. All rivers, streams, lakes, ponds, drains, creeks, and the Great Lakes must be clean and meet water quality standards (WQS) to support these uses. All sites surveyed are used to assess the ability to support designated uses through the <u>Integrated Report process</u>.

# WATERSHED INFORMATION

A <u>watershed</u> is all the land that drains to a lake or stream. The Rifle River is located in the northeastern part of Michigan's Lower Peninsula. It originates in a lake-wetland complex known as the Rifle River Recreation Area located in northeastern Ogemaw County. It drains an area of approximately 385 square miles and flows 60 miles from its headwaters to Saginaw Bay in Lake Huron. The mainstem and tributaries of the Rifle upstream of the city of Omer are designated as a Michigan Natural River system by the Michigan Department of Natural Resources (MDNR, 1980; one of 16 in the state at the time of publication of this report). All state-designated Natural Rivers are required to have a Natural River Plan that maintains the water quality, ecological integrity, and recreational benefits of the river while prohibiting or severely limiting the potential for development that may damage the river's condition. Furthermore, the Rifle River and all but two of its tributaries (Table 1) are coldwater designated streams (MDNR, 1997). These areas of the Rifle River watershed are protected for coldwater fish community since many streams are indeed cold enough to support trout and salmon. These streams are also designated on the online <u>Watershed Monitoring Story Map</u>.

1001]).		
Stream	Township, Range, Section	County
Richter Creek	T19N R4E S25	Arenac

Arenac

T19N, R4E, S19

**Table 1.** Warmwater designated streams in the Rifle River watershed (adapted [MDNR, 1997]).

# LAND USE

Wells Creek

Previous reports of the Rifle River watershed used an older delineation of Michigan ecoregions (Omernik and Gallant, 1988), which has since been updated to reflect surficial geology and climate more accurately. For the purposes of scoring macroinvertebrate communities, this report retains the old classification for continuity with prior reports. However, some discussion should be put toward the updated delineation.

Beginning with the 2010 ecoregion update (Omernik and Gallant, 2010), the entirety of the Rifle River watershed is located within the Northern Lakes and Forests (Level III) ecoregion and contains a variety of landforms, soil types, soil textures, and land uses. Moreover, the

watershed of the Rifle River is split between two Level IV ecoregions (Omernik and Gallant, 2010 and United States Environmental Protection Agency [USEPA], 2020). The upper mainstem and tributaries are within the Mio Plateau. Here, steep gradients and rapid streamflow are common conditions as the rivers and streams have carved relatively pronounced valleys into the landscape. In contrast, the lower Rifle River enters the Tawas Lake Plain Level IV ecoregion. Here, below the city of Omer, streamflow becomes sluggish as the upland flattens out into a broad plain with some channelization of tributaries and draining for agriculture.

Land use in a watershed is important to water quality. Natural areas, especially wetlands, act as natural sponges, allowing rainwater to soak into the ground, reducing the amount of water that runs off the land, filtering pollutants, and recharging groundwater. These characteristics protect water quality, minimize flooding, and stabilize our shorelines and stream banks. As development of land occurs, the amount of pavement, roofing, and other hard surfaces increases, and the amount of vegetation decreases. Consequently, more water (and thus pollutants) quickly reaches our streams and lakes. Land cover in the Rifle River watershed is notably less developed than most other river systems in the Lower Peninsula. Early designation as a state-listed Natural River helped preserve natural landscape conditions. Land cover is primarily forested (deciduous, evergreen, or mixed) or wetland (woody or herbaceous), although agricultural activities are present, primarily in the lower reaches around Saginaw Bay. Land use percentages for the Rifle River are presented in Table 2. For more details on the land use in this watershed, please see the online <u>Watershed Monitoring Story Map</u>.

Land Cover	Percent of Watershed
Forest (Deciduous, Evergreen, or Mixed)	40.1
Wetlands (Woody or Herbaceous)	22.4
Cropland/ Pasture	17.4
Scrub/ Shrub or Grassland	10.1
Developed	8.7
Open Water	1.3

**Table 2.** Land use summary for the Rifle River watershed in Ogemaw and Arenac Counties,Michigan (2011 National Land Cover Database Data).

## HISTORIC SAMPLING EFFORTS

Table 3 is a summary of reports available from the last two decades. For more information about older reports, or for any other questions about this watershed, please contact the watershed biologist by finding their contact information on the <u>Watershed Monitoring Story</u> <u>Map</u>.

Survey	Report Citation				
Year	Report Number	Finding/Comments			
2014	Noffke, S., 2015 #MI/DEQ/WRD-15/036	<ul> <li>Macroinvertebrate community samples collected at 18 wadeable stations with ratings of acceptable or excellent.</li> <li>Habitat ratings ranged from good to excellent.</li> </ul>			
2009	Cooper, J., 2011 #MI/DEQ/WRD-11/006	<ul> <li>Macroinvertebrate community samples collected at 30 wadeable stations with ratings of acceptable or excellent.</li> <li>Habitat ratings ranged from marginal to excellent.</li> <li>Preliminary surveys indicated that sand and siltation were the primary threats to habitat quality within the watershed.</li> </ul>			
2004	Kohlhepp, G., 2005 #MI/DEQ/WB-05/075	<ul> <li>Macroinvertebrate community samples collected at 34 stations with ratings of excellent or acceptable.</li> <li>Habitat was surveyed at 35 stations. Ratings ranged from marginal to excellent.</li> <li>Fish community data were collected at four stations. Coldwater species were recorded at all 4 locations.</li> </ul>			
1999	Vidales, N.M., 2002 #MI/DEQ/WRD-11/022	<ul> <li>Macroinvertebrate community samples collected at 13 stations with ratings of excellent or acceptable.</li> <li>Habitat was surveyed at 13 stations. Ratings ranged from fair to excellent.</li> <li>All water chemistry analysis met Michigan WQS. Mercury and silver concentrations were improved compared to surveys from the 1970s.</li> </ul>			
1983, 1985, 1994	Morse, D., 1995 #MI/DNR/SWQ-94/030	<ul> <li>Fish community rated "good" at all stations. Some anadromous brown trout were collected.</li> <li>Macroinvertebrate community sampled at 12 stations; all scoring "good" except Solver Creek, which scored "fair."</li> <li>Habitat evaluated at 14 locations with good or excellent scores, except Houghton Creek and one Rifle River site, which rated "fair" and Campbell and Silver Creeks, which rated "poor."</li> </ul>			

Survey Year	Report Citation Report Number	Finding/Comments
1999	Hull, C., 1989 #MI/DNR/SWQ-89/144	<ul> <li>Survey conducted specifically within the vicinity of the west branch Wastewater Treatment Plant (WWTP). Mercury was detected in facility effluent in 1983 but not during this survey.</li> <li>Sensitive biological taxa were less abundant downstream relative to upstream of the WWTP.</li> </ul>

### Sampling Goals:

- 1. Assess the current condition of individual rivers, streams, and lakes and determine whether Michigan WQS and designated uses are being met
- 2. Investigate water quality temporal trends
- 3. Satisfy targeted monitoring requests submitted by EGLE staff and external customers
- 4. Identify nonpoint sources of water quality pollution

### SITE-SELECTION/METHODS

In July and August 2019, 8 sites were sampled in the Rifle River watershed (1 additional targeted site, SV-1, was treated as a site-visit only and had no data collected).

Three types of site-selection methods were used in the Rifle River watershed in 2019. These include:

- (1) Status sites: Randomly selected across Michigan so statewide water quality summaries can be made. The random selection resulted in 2 sites from the Rifle River watershed to support the statewide condition portion of the Surface Water Assessment Section (SWAS) Status and Trend Program (Michigan Department of Environmental Quality [MDEQ], 2015).
- (2) Trend sites: Two sites, originally selected from a random group sampled in 2009, became trend sites that are surveyed every 5 years. These data will be used for a separate statewide trend report following analysis of wadeable river and stream sites sampled throughout Michigan from 2006 to 2020.
- (3) Targeted sites: Four targeted sites were selected because sampling was requested through our <u>targeted monitoring request process</u>. More information can be found on EGLE-Water Resources Division (WRD) <u>Biological Assessment Web page</u>.

Procedure 51: Qualitative Biological and Habitat Survey Protocols for Wadeable

<u>Streams and Rivers</u> (MDEQ, 2014; and Creal et al., 1996) was used to collect biological community and habitat information. Staff use this procedure to assess water quality conditions by evaluating the macroinvertebrate and/or fish communities within a stream. Macroinvertebrates are the primary community sampled in SWAS watershed surveys, with Procedure 51 combining all results into a one number score that ranges from +9 to -9 and categorizing conditions as Excellent, Acceptable, or Poor (Table 4). Macroinvertebrate community scores are one component used to evaluate the other indigenous aquatic life and wildlife (OIALW) designated use. Habitat is rated as Excellent, Good, Marginal, or Poor based on measures that describe the habitat in the stream and along the banks of the stream. Habitat scores are used to help better understand what might influence the fish and macroinvertebrate scores.

Macroinvertebrate	Macroinvertebrate	Fish	Fish	Habitat	Habitat
Score	Rating	Score*	Rating	Score	Rating
5 to 9	Excellent	5 to 10	Excellent	> 154	Excellent
-4 to 4	Acceptable	-4 to 4	Acceptable	105 to	Good
				154	
-5 to -9	Poor	-5 to -	Poor	56 to	Marginal
		10		104	
				<56	Poor

**Table 4.** EGLE Procedure 51 macroinvertebrate, fish and habitat scoring and rating system.

\* Fish metrics and scores apply only to warmwater streams. For designated coldwater streams, the presence of salmonids as >1 percent of the overall fish community abundance is interpreted as meeting the coldwater fishery designated use. Additionally, warmwater streams in which less than 50 fish are collected, or in which > 2 percent of fishes have anomalies, are automatically rated poor.

Procedure 51 can be used to rate the fish community in a similar way. In warmwater streams, fish community scores are used to evaluate the warmwater fishery designated use. Fish community metrics are combined into a one number score that ranges from +10 to -10 and categorizing conditions as Excellent, Acceptable, or Poor (with some exceptions, see Table 4 footnote). For designated coldwater streams, those fish community metrics do not apply. Instead, to determine if the coldwater designated use is being met, the presence of salmonids at  $\geq$  1 percent in the fish community is interpreted as meeting the coldwater designated use. More information on the metrics and scoring can be found in the <u>Procedure-51 Scoring</u> <u>Document</u>.

# MONITORING FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS Goal 1: Determine the condition of individual waters of the state and if Michigan WQS are being met.

All sampled stations had macroinvertebrate community ratings that were acceptable or excellent (Table 5, Figures 1 and 2). Therefore, the other OIALW designated use was being met at all stations. The coldwater fish community was sampled in Houghton Creek upstream and downstream of Flynn Road and was found to be supporting the coldwater fishery designated use. Detailed results for targeted monitoring sites will be discussed under Goal 3. Habitat evaluations can be found in Table 7; macroinvertebrate evaluations can be found in Tables 8a and 8b; fish community evaluations can be found in Table 9. No water chemistry samples were collected as part of this watershed survey.

Station	Stream	Road Crossing	STORET	Latitude	Longitude	Date	Habitat	Habitat	Bug Rating	Bug	Station
	Name					2019	Rating	Score <sup>1</sup>		Score <sup>2</sup>	Type <sup>3</sup>
1	Houghton	Rose City Rd. (E Main St)	650078	44.42188	84.10907	7/31	Excellent	169	Acceptable	3	Т
	Creek										
2	Houghton	Upstream Flynn Road	650134	44.40850	84.09670	7/31	Excellent	164	Acceptable	0	Т
	Creek										
3	Houghton	Downstream Flynn Road	650135	44.40800	84.09560	7/30	Good	142	Acceptable	2	Т
	Creek										
4	Klacking	Morrison Road	650070	44.32780	84.10389	7/31	Excellent	172	Excellent	6	Tr
	Creek										
5	Campbell	M33	650075	44.26370	84.12564	8/19	Good	143	Acceptable	1	S
	Creek										
6	Rifle River	N Forest Lake Drive	060148	44.12859	84.04681	7/31	Excellent	168	Excellent	5	Tr
7	Rifle River	Bishon Road (Grove Road)	060076	44 08065	83 96523	8/19	Good	145	Excellent	6	S
8	W Branch	Simmons Boad	650085	1/1 25/190	8/ 19818	8/7	Excellent	175		4	т
			000000		04.10010		LYCENELL	1,2	Acceptable		
0)/4.4		Lass Deed	000150	44.0000	00 77000	0/1	NIAE	NIA	NIA.	NIA	Ŧ
SV4-1	Big Creek	Jose Road	060159	44.06998	83.77609	8/1	INA <sup>5</sup>	NA	NA	NA	

**Table 5.** Procedure 51 sampling results for stations sampled in the Rifle River watershed, 2019. Unless otherwise noted, stations are sampled upstream of road crossings.

<sup>1</sup> Habitat Scoring: Poor < 56, Marginal 56-104, Good 105-154, Excellent >154

<sup>2</sup> Macroinvertebrate Scoring: Poor -9 to -5, Acceptable -4 to 4, Excellent 5-9

<sup>3</sup> Tr = Trend, T = Targeted, S = Status

<sup>4</sup> SV = Site visit only

<sup>5</sup>NA = Not Applicable



**Figure 1.** Macroinvertebrate ratings for stations sampled in the Rifle River watershed, July-August 2019.



Figure 2. Habitat ratings for stations sampled in the Rifle River watershed, July-August 2019.

### **Klacking Creek**

The trend site for Klacking Creek at Morrison Road (Station 4) was sampled as part of this biosurvey. Extensive forests within the riparian corridor supported the habitat quality of the stream. All habitat metrics rated good or excellent, except for the riparian vegetative zone on the left bank, since a small lawn was maintained up to the streambank within the sample reach (Figure 3). Substrate (e.g., gravel, cobble) was not heavily impacted by sediment deposition. Habitat conditions were favorable to sensitive aquatic life, and this site scored the second highest for habitat metrics among all sites in the survey. Unsurprisingly, macroinvertebrate metrics also rated excellent with a score of 6. Twenty-eight aquatic macroinvertebrate taxa were sampled at this location, with over 45 percent of this representation coming from taxa sensitive to pollution. Three families of stoneflies, insects often seen as indicators of high-quality coldwater streams, were sampled at this location.



Figure 3. Klacking Creek looking upstream into the sample reach, photo taken July 31, 2019.

### Campbell Creek

Most of Campbell Creek is protected by a forested riparian corridor, but the area within this status site along the M33 highway (Station 5) was more open with less canopy cover (Figure 4). Perhaps due to the increased availability of sunlight, extensive macrophyte and algal growth were present on the substrate within the sample reach. Substrate availability and embeddedness were negatively impacted by this expression of nutrients. Despite these undesirable habitat characteristics, the other aspects of habitat quality were sufficient to allow this site an overall "good" habitat rating. The macroinvertebrate community also rated within the "acceptable" range with a score of 1. The abundance of Amphipods collected within the

sample reach may indicate degraded water quality conditions. Amphipods in general are tolerant of many forms of water quality impairment and Procedure 51 scoring metrics are negatively impacted when they are the dominant taxa. However, five families of caddisflies (normally indicators of good water quality) were also sampled at this location. It is likely that historical canopy removal activities are affecting conditions at this site.



**Figure 4.** Campbell Creek looking into the sample reach, photo taken August 19, 2019. The M33 highway runs parallel to the stream in the upper right corner of the image.

### **Rifle River**

Two sites on the Rifle River were sampled as part of this watershed survey. One status site and one trend site. The status site (at the Grove Road crossing; Station 7) is located about 4 miles upstream from the city of Omer. Here, the river is wide and relatively low gradient, with no obvious modifications to the stream channel or riverbanks (Figure 5). Macroinvertebrates at this site scored "Excellent" and tied for the highest overall score with Klacking Creek at a score of 6. The macroinvertebrate community was robust, both in overall abundance and in diversity of sensitive taxa. Habitat quality scored "Good"; the in-stream habitat and surrounding riparian corridor were reflective of natural conditions. Some erosion issues along the right bank precluded an excellent habitat score.

The trend site (at N Forest Lake Drive; Station 6) also scored well in both the habitat and macroinvertebrate metrics. Results were comparable to prior surveys from 2009 and 2014 in both overall metric ratings (excellent or acceptable) and macroinvertebrate species diversity,

resulting in a macroinvertebrate metric score of 5. As was the case with most of the upper Rifle River, the riparian buffer zone was dominated by natural vegetation and forests or wetlands (Figure 6). Substrate was primarily cobble or gravel; stream morphology consisted of long runs interspersed with cobble and boulder riffles. Some bank erosion was visible toward the downstream section of the sample reach, where a small park interrupts the otherwise continuous riparian forest corridor. Minor nutrient expression was evident as macrophyte growth amongst the cobbles.



Figure 5. The Rifle River at Grove Road, photo taken August 19, 2019.



Figure 6. The Rifle River at N Forest Lake Drive, photo taken July 31, 2019.

### Goal 2: Evaluate biological integrity temporal trends.

Two sites within the Rifle River watershed were part of the statewide trend analysis. Details of these sites are explained above in Goal 1 to describe overall conditions and WQS attainment throughout the watershed. Statewide trend information will be summarized in a statewide report that describes conditions in Michigan from 2006-2020.

## Goal 3: Satisfy monitoring requests submitted by EGLE staff and external customers.

### **Big Creek**

The previous watershed report (Noffke, 2015) indicated that Big Creek along Jose Road was heavily impacted by row crop agriculture and sand deposition, though macroinvertebrate biosurvey results at and upstream of Jose Road, collected between 2004 and 2014, ranged between +1 (acceptable; at Jose Road in 2014) and 0 (acceptable; ~ 3 miles upstream at Lehman Road in 2004) to +5 (excellent; at the most upstream sampled location, Maple Ridge Road in 2009) (Kohlhepp, 2005; Cooper, 2011; and Noffke, 2015). A site a few miles downstream of Jose Road (i.e., Big Creek Drain at the corner of Big Ck Rd and Manor Road) scored lower acceptable (i.e., -2) in 2009. EGLE received a request to conduct a site visit to this stream during the 2019 biosurvey field season to determine whether conditions had improved. Five locations were given quick site visits: Jose Road, S Crawford Road, N Hale Road, N Walker Rd, and Maple Ridge Road. Big Creek is a channelized system with poor to marginal habitat quality when surveyed in prior reports. Unfortunately, these conditions have not improved since the last cycle. The dominant substrate throughout the entire stretch was

sand, which completely overlies the native substrate in many areas, though at some locations (e.g., N Walker Road) there were gravel and cobble moderately abundant. Furthermore, large depositional sand banks were present along the inside bends of the stream (Figure 7, near Jose Road). The sedimentation was up to 3 feet thick in some locations (especially near Jose Road). The stream traveled along an agricultural field, where it was artificially channelized with little to no canopy cover (Figure 8, near N Hale Road). Most of the stream/drain from S Crawford Road, down through Jose Road, and then downstream until Lake Huron, cuts through existing or former wetlands. The combination of local geology being a flat clay and sand lake plain (from historically larger Great Lakes; Albert, 1995) with channel dredging, over-widening, and low gradient may all be contributing to the abundance of loose sediments in the channel near Jose Road. Site visits at upstream road locations revealed that loose sand deposits became less thick, and that gravel and cobble were occasionally present. Some algal growth was observed at N Hale Road. The road crossing culvert has degraded over time and drops off slightly into the downstream segment; it may be a hindrance to fish passage (Figure 9, N Hale Road). Overall, little to no improvement has been made to habitat quality within and around Big Creek.



**Figure 7.** Big Creek upstream of the Jose Road crossing, photo taken August 1, 2019. Note sand deposition on the inside bank.



Figure 8. Big Creek downstream of N Hale Road, photo taken August 1, 2019.



Figure 9. The Big Creek culvert at N Hale Road, photo taken August 1, 2019.

### **Houghton Creek**

A follow-up survey was conducted upstream and downstream of the Flynn Road crossing to evaluate stream conditions after the replacement of an undersized culvert that took place after the 2014 cycle (Targeted Monitoring Request [TMR] Request #2019217). The old culvert and earthworks support structure (Figures 10 and 11) were completely removed and replaced with a wooden bridge (Figure 12). Fish, macroinvertebrates, and habitat characteristics were surveyed and compared to 2014 values. Habitat quality was generally similar; however, unlike 2014, habitat metrics rated better in the upstream sample reach when compared to downstream (Table 6). Embeddedness scored lower in the downstream segment, which may be a legacy effect of disturbance and construction activity during culvert replacement. Canopy cover and bank stability were good or excellent. Macroinvertebrate community scores were also similar to 2014, both rating acceptable. The number of sensitive taxa found upstream of the road crossing decreased from 11 to 6, while the number of sensitive taxa downstream of the road crossing remained the same at 8. As in 2014, the fish community was sampled above (Figure 13) and below (Figure 14) the Flynn Road crossing during this survey. Both locations again met coldwater fishery standards due to the abundant presence of Rainbow and Brown Trout. In 2014, one Brook Trout was sampled in the downstream segment. In 2019, no Brook Trout were sampled at this location. Comparison of the fish and macroinvertebrate communities in the upstream and downstream segments, respectively, indicate that the culvert replacement did not substantially improve biological indices in the area immediately surrounding the road crossing. However, in 2014, only two fish species (brown trout and mottled sculpin) were observed upstream of the road. In 2019, a third species (banded killifish) was observed upstream of the road and in abundance (163 individuals). So, it is possible that banded killifish benefitted from the culvert replacement – perhaps due to more natural channel dimensions or improved flow conditions. It is important to note that these near-culvert biological surveys were not intended to be a thorough examination of possible improvements to watershed scale biological community conditions that may be affected by improved stream continuity at this single location. Moreover, fish that benefitted from the culvert replacement may have moved to locations other than near Flynn Road.



**Figure 10.** Houghton Creek upstream of Flynn Road in 2014, before the culvert replacement. Note partial impoundment of water and undersized culvert impeding flow.



Figure 11. Houghton Creek downstream of Flynn Road in 2014, prior to culvert replacement.



**Figure 12.** A new bridge built over Houghton Creek at Flynn Road, photo taken July 30, 2019.



Figure 13. Houghton Creek at Flynn Road (facing upstream), photo taken July 30, 2019.



Figure 14. Houghton Creek at Flynn Road (facing downstream), photo taken July 30, 2019.

**Table 6:** Habitat and macroinvertebrate metrics on Houghton Creek before (2014) and after (2019) the culvert replacement at Flynn Road. US = upstream; DS = downstream.

	Habitat Score	Habitat Rating	Bug Score	Bug Rating
US Flynn Road,		J		
2014	142	Good	4	Acceptable
US Flynn Road,				
2019	164	Excellent	0	Acceptable
DS Flynn Road,				
2014	164	Excellent	0	Acceptable
DS Flynn Road,				
2019	142	Good	2	Acceptable

A request was also submitted to sample macroinvertebrates and examine substrate in Houghton Creek at Rose City Road (TMR Request #2019218). An old, deteriorated dam upstream of this site is being considered for removal. The dam has occasionally discharged sediment from the upstream impoundment into Houghton Creek due to failing infrastructure. Dam removal may result in a pulse of considerable sedimentation into the stream; a follow-up survey may be warranted in the event of dam removal. Habitat here was excellent (receiving the highest score for habitat metrics among all sites) with very little embeddedness and lots of available substrate for aquatic fauna. This location was surrounded by mixed forest with superb canopy cover and variable riffle-pool habitats (Figure 15). Flow was stable with little evidence of flashiness. Macroinvertebrates scored "acceptable" with a score of 3 and an abundance of caddisfly and true fly taxa. Other sensitive taxa (mayflies, stoneflies) were also present.



Figure 15. Houghton Creek at Rose City Road, photo taken July 31, 2019.

### West Branch Rifle River

EGLE Permits Section staff conducted a targeted biosurvey (TMR Request #2019234) within the Rifle River watershed during the 2019 field season on the West Branch Rifle River at Simmons Road. The goal of this survey was to examine stream conditions immediately downstream of a WWTP outfall. Macroinvertebrate diversity rated acceptable with a score of 4. Sensitive taxa comprised 33 percent of all individuals sampled. An abundance of Physid snails were also recorded at this site. Habitat scored excellent according to the 'glide/pool' scoring criteria. Most other streams within the survey fell into the 'riffle/run' criteria given the steep gradients and cobbly substrates common throughout the Rifle River watershed. Nonetheless, some issues with turbidity were noted. Woody debris was a common habitat feature throughout the sample reach (Figure 16). WWTP effluent appeared to have negligible impact on stream conditions at this location.



Figure 16. The West Branch Rifle River at Simmons Road, photo taken August 7, 2019.

### Goal 4: Identify potential nonpoint and other sources of water quality impairment.

The installation of sand traps and nonpoint source controls like the implementation of agricultural best management practices have been suggested in prior reports. Despite this, sedimentation continues to be an important issue in the Rifle River and Big Creek watersheds. Elevated sedimentation is known to inhibit the spawning activity of important coldwater fish species and reduce habitat availability for benthic macroinvertebrates. However, the Rifle River watershed currently provides excellent trout fishing opportunities for recreational anglers. Sedimentation issues should be addressed to maintain this resource in perpetuity. Moreover, nutrient expression issues were found within the Rifle River watershed where the natural canopy cover or riparian buffer were removed. Nonpoint source issues from row crop agriculture in the lower watershed, and canopy clearing for powerline right-of-way may be contributing to algal and macrophyte growth.

#### RECOMMENDATIONS

- Rivers and streams within the Rifle River watershed generally have habitat conditions that score good to excellent using Procedure 51, largely due to the Natural River designation that provides additional protections from development. All sampled sites met WQS and supported the designated uses of coldwater/warmwater fisheries and OIALW where sampled. Efforts should be made to protect the Natural River designation of the watershed.
- 2. Minor stream bank erosion is present in the Rifle River and several tributaries where the riparian vegetative barrier is interrupted. Efforts to minimize disruption of forest cover along the streambanks would likely reduce sediment getting into the stream.
- 3. The extent of nutrient expression found at Campbell Creek along the M33 highway may exceed WQS. Future monitoring should include a nuisance condition assessment to assess this site.
- 4. Algae and macrophytes were noted in some areas of canopy removal (e.g., Big Creek at N Hale Road and Campbell Creek), consider evaluating several areas in the watershed for nuisance conditions when nutrient guidance is complete.
- 5. Extensive sand deposition and turbidity were visible on Big Creek at Jose Road where the site visit occurred. Nutrient expression and a degraded culvert that may be a hindrance to fish passage were observed at Big Creek at N Hale Road. Nonpoint source staff should further investigate stream impacts and make efforts to inform nearby landowners of agricultural best management practices. A targeted survey should be conducted in the future to determine whether this site is meeting WQS, preferably with the assistance of a geologist or river restoration specialist to assess the sedimentation issues.

### CREDITS

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# **BIOSURVEY TABLES**

**Table 7.** Habitat evaluation for selected stations in the Rifle River watershed, Michigan, July-August 2019. \*Applies only to Riffle/Run stream surveys. \*\*Applies only to Glide/Pool stream surveys.

	Station 1	Station 2	Station 3	Station 4
	Houghton Creek	Houghton Creek	Houghton Creek	Klacking Creek
	Rose City Road	upstream Flynn	downstream	Morrison Poad
		Road	Flynn Road	WOITISOIT ROad
Date	7/31/2019	7/30/2019	7/30/2019	7/31/2019
HABITAT METRICS	RIFFLE/RUN	RIFFLE/RUN	RIFFLE/RUN	RIFFLE/RUN
Substrate and Instream Cover				
Epifaunal Substrate/ Available Cover (20)	18	17	15	18
Embeddedness (20)*	16	15	8	18
Velocity/Depth Regime (20)*	15	19	12	19
Pool Substrate Characterization (20)**				
Pool Variability (20)**				
Channel Morphology				
Sediment Deposition (20)	19	16	14	17
Flow Status -Maintained Flow Volume (10)	9	10	10	9
Flow Status -Flashiness (10)	8	9	8	8
Channel Alteration (20)	18	15	16	18
Frequency of Riffles/Bends (20)*	15	13	17	18
Channel Sinuosity (20)**				
Riparian and Bank Structure				
Bank Stability (L) (10)	8	7	8	9
Bank Stability (R) (10)	9	8	10	8
Vegetative Protection (L) (10)	9	8	6	8
Vegetative Protection (R) (10)	9	9	6	9
Riparian Vegetative Zone Width (L) (10)	9	9	7	4
Riparian Vegetative Zone Width (R) (10)	7	9	5	9
TOTAL SCORE (200):	169	164	142	172
HABITAT RATING:	EXCELLENT	EXCELLENT	GOOD	EXCELLENT
Weather:	sunny	sunny	sunny	sunny
Air Temperature: °F	70	63	80	75
Water Temperature: °F	58	58	67	62
Average Stream Width: Feet	21	22.66666667	19.33333333	14.66666667
Average Stream Depth: Feet				
Surface Velocity: Feet/Second	2.044684706	1.693249727	2.27490434	3.98918828
Estimated Flow: Cubic Feet/Second	50.81041494	77.27239199	44.73978535	44.57696281
Stream Modifications:	bankstabilization		bankstabilization	canopyremoval
Nuisance Plants (Yes/No):	N	Ν	Ν	Ν
STORET Number:	650078	650134	650135	650070
County Code:	65	65	65	65
Town Range Section:	24N03E31	23N03E5	23N03E05	22N03E06
Latitude (dd):	44.42188	44.40826	44.40826	44.32798
Longitude (dd):	-84.10907	-84.09619	-84.09619	-84.10402
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP
Stream type:	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4080101	4080101	4080101	4080101

**Table 7.** Habitat evaluation for selected stations in the Rifle River watershed, Michigan, July-August2019. \*Applies only to Riffle/Run stream surveys. \*\*Applies only to Glide/Pool stream surveys.

	Station 5	Station 6	Station 7	Station 8
	Campbell Creek	Rifle River	Rifle River	West Branch Rifle River
	M-33 S of M-55	Forest Lake Drive	Bishop Road (Grove Street)	Simmons Road
Date	8/19/2019	7/31/2019	8/19/2019	8/7/2019
HABITAT METRICS	<b>RIFFLE/RUN</b>	<b>RIFFLE/RUN</b>	<b>RIFFLE/RUN</b>	GLIDE/POOL
Substrate and Instream Cover				
Epifaunal Substrate/ Available Cover (20)	13	17	14	18
Embeddedness (20)*	13	19	10	
Velocity/Depth Regime (20)*	14	15	14	
Pool Substrate Characterization (20)**				18
Pool Variability (20)**				18
Channel Morphology				
Sediment Deposition (20)	17	17	15	15
Flow Status -Maintained Flow Volume (10)	9	9	9	10
Flow Status -Flashiness (10)	8	8	9	9
Channel Alteration (20)	19	19	18	20
Frequency of Riffles/Bends (20)*	8	17	15	
Channel Sinuosity (20)**				15
Riparian and Bank Structure				
Bank Stability (L) (10)	7	9	8	8
Bank Stability (R) (10)	8	7	6	8
Vegetative Protection (L) (10)	6	9	8	8
Vegetative Protection (R) (10)	8	9	7	8
Riparian Vegetative Zone Width (L) (10)	5	9	8	10
Riparian Vegetative Zone Width (R) (10)	8	4	4	10
TOTAL SCORE (200):	143	168	145	175
HABITAT RATING:	GOOD	EXCELLENT	GOOD	EXCELLENT
Weather:	sunny	sunny	sunny	sunny
Air Temperature: °F	73	78	82	85
Water Temperature: °F		60	74	71
Average Stream Width: Feet	14.33333333	97	74.33333333	1.35
Average Stream Depth: Feet				
Surface Velocity: Feet/Second	1.411212077	1.934911602	0	1.467477786
Estimated Flow: Cubic Feet/Second	8.60839367	330.3281087	0	62.28993174
Stream Modifications:	canopyremoval	none	none	none
Nuisance Plants (Yes/No):	Ν	Ν	Ν	Ν
STORET Number:	650075	060148	060076	650085
County Code:	65	06	06	65
Town Range Section:	22N03E30	20N04E18	19N04E03	22N02E34
Latitude (dd):	44.263611	44.12859	44.08152	44.25458
Longitude (dd):	-84.125555	-84.04681	-83.9672	-84.18492
Ecoregion:	SMNITP	HELP	HELP	SMNITP
Stream type:	Coldwater	Coldwater	Warmwater	Coldwater
USGS Basin Code:	4080101	4080101	4080101	4080101

Table 8a. Qualitative macroinvertebrate sampling results for the Rifle River watershed, 2019.				
	Houghton Creek	Houghton Creek	Houghton Creek	Klacking Creek
	Rose City Road	upstream Flynn Road	downstream Flynn Road	Morrison Road
	7/31/2019	7/30/2019	7/30/2019	7/31/2019
Таха	STATION 1	STATION 2	STATION 3	STATION 4
PLATYHELMINTHES (flatworms)				
Turbellaria		1		
ANNELIDA (segmented worms)				
Oligochaeta (worms)	15	16	12	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	23	25	13	73
Isopoda (sowbugs)	2	1	3	
Arachnoidea				
Hydracarina	47	32	102	8
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae		1		
Baetidae	5			13
Caenidae		2		
Ephemerellidae	1		4	4
Heptageniidae	1			3
Tricorythidae (Leptohyphidae)		7	7	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		1		1
Plecoptera (stoneflies)				
Nemouridae	1			1
Perlidae				3
Perlodidae			1	
Pteronarcyidae				1
Hemiptera (true bugs)				
Corixidae			1	
Gerridae	1		1	
Megaloptera				
Corydalidae (dobson flies)	1			2
Sialidae (alder flies)		1	1	
Trichoptera (caddisflies)				
Brachycentridae	1	7	6	11
Goeridae	2			8
Hydropsychidae	20	46	25	57
Hydroptilidae		8	3	
Lepidostomatidae	1			17
Leptoceridae			1	

### Biosurvey of the Rifle River Watershed, Michigan July-August 2019

	Houghton Creek	Houghton Creek	Houghton Creek	Klacking Creek
	Rose City Road	upstream Flynn Road	downstream Flynn Road	Morrison Road
	7/31/2019	7/30/2019	7/30/2019	7/31/2019
Таха	STATION 1	STATION 2	STATION 3	STATION 4
Limnephilidae	3		2	1
Philopotamidae				11
Lepidoptera (moths)				1
Pyralidae				1
Coleoptera (beetles)				
Hydrophilidae (total)	2		1	1
Dryopidae	1	1		
Elmidae	16	2	4	2
Diptera (flies)				
Athericidae	3	1	1	3
Ceratopogonidae	1			1
Chironomidae	47	115	197	61
Simuliidae	58	2	9	19
Tabanidae	3		1	1
Tipulidae	5	1		1
MOLLUSCA				
Gastropoda (snails)				
Physidae		4	5	1
Pelecypoda (bivalves)				
Pisidiidae		6	2	2
Total Individuals	260	280	402	308

Table 8b. Macroinvertebrate metric evaluation of the Rifle River watershed, 2019.

	Houghton Creek		Houghto	on Creek	Houghton Creek		Klacking Creek		
	Rose City Road		upstream Flynn Road		downstream Flynn Road		Morrison Road		
	7/31/2019		7/30/	7/30/2019		7/30/2019		7/31/2019	
	STAT	ION 1	STATION 2		STATION 3		STATION 4		
METRIC	Value	Score	Value	Score	Value	Score	Value	Score	
Total Number of Taxa	24	0	21	0	23	0	28	1	
Number of Mayfly Taxa	3	0	3	0	2	0	3	0	
Number of Caddisfly Taxa	5	1	3	0	5	1	6	1	
Number of Stonefly Taxa	1	1 1		-1	1	1	3	1	
Percent Mayfly Composition	2.69	-1	3.57	0	2.74	-1	6.49	0	
Percent Caddisfly Composition	10.38	0	21.79	0	9.20	0	34.09	1	
Percent Dominant Taxon	22.31	0	41.07	-1	49.00	-1	23.70	0	
Percent Isopod, Snail, Leech	0.77	0.77 1		1	1.99	1	0.32	1	
Percent Surface Air Breathers	1.15 1		0.00	1	0.75	1	0.32	1	
TOTAL SCORE	3			0		2		6	
Macroinvertebrate Community Rating	Acceptable		Acce	Acceptable Acceptable			Excellent		

	Campbell Creek	Rifle River	Rifle River	West Branch Rifle River
	M-33 S of M-55	Forest Lake Drive	Bishop Road (Grove Street)	Simmons Road
	8/19/2019	7/31/2019	8/19/2019	8/7/2019
Таха	STATION 5	STATION 6	STATION 7	STATION 8
PLATYHELMINTHES (flatworms)				
Turbellaria	1			3
ANNELIDA (segmented worms)				
Oligochaeta (worms)	2	12	1	3
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	355	49	16	17
Decapoda (crayfish)	1	2	3	1
Isopoda (sowbugs)	9	1		14
Arachnoidea				
Hydracarina	7	16		4
Insecta				
Ephemeroptera (mayflies)				
Baetidae	49	26	33	18
Ephemerellidae			1	
Heptageniidae	5	9	10	5
Isonychiidae			7	1
Polymitarcyidae		4	1	
Tricorythidae (Leptohyphidae)		16	140	3
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	1	1	5
Gomphidae			1	
Zygoptera (damselflies)				
Calopterygidae	2	2	10	1
Plecoptera (stoneflies)				
Perlidae		2	1	3
Pteronarcyidae			1	
Hemiptera (true bugs)				
Belostomatidae			1	
Corixidae	1	31	1	
Gerridae	1		2	
Pleidae	1	3		
Veliidae		1	16	
Megaloptera				
Corydalidae (dobson flies)	3	1	1	
Trichoptera (caddisflies)				
Brachycentridae	5	1		6
Helicopsychidae		2	1	2

 Table 8a.
 Qualitative macroinvertebrate sampling results for the Rifle River watershed, 2019.

## Biosurvey of the Rifle River Watershed, Michigan July-August 2019

	Campbell Creek	Rifle River	Rifle River	West Branch Rifle River
	M-33 S of M-55	Forest Lake Drive	Bishop Road (Grove Street)	Simmons Road
	8/19/2019	7/31/2019	8/19/2019	8/7/2019
Таха	STATION 5	STATION 6	STATION 7	STATION 8
Hydropsychidae	89	48	31	57
Hydroptilidae	2			
Leptoceridae	1	10	3	15
Limnephilidae		1	1	
Molannidae				1
Phryganeidae	1			
Polycentropodidae		1		
Coleoptera (beetles)				
Dytiscidae (total)				1
Gyrinidae (adults)		3	1	
Haliplidae (adults)		1		
Hydrophilidae (total)		1	2	2
Dryopidae	1			
Elmidae	60	8	55	15
Gyrinidae (larvae)			3	
Psephenidae (larvae)	1			
Scirtidae (larvae)		1		
Diptera (flies)				
Athericidae		17		2
Chironomidae	156	22	11	13
Dixidae	1			
Simuliidae	8	6	7	88
Tabanidae			1	1
Tipulidae	4			1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	1	1	2	
Physidae	30	22	11	20
Pelecypoda (bivalves)				
Pisidiidae		6	2	1
Total Individuals	798	327	378	303

	Campbell Creek		Rifle	River	Rifle	River	West Branch Rifle River		
	M-33	S of	Fores	Forest Lake		Bishop Road		Simmons	
	M-55		Drive		(Grove Street)		Road		
	8/19/	2019	7/31/2019		8/19/2019		8/7/2019		
	STAT	ION 5	STAT	STATION 6		STATION 7		STATION 8	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score	
Total Number of Taxa	28	1	33	1	32	1	28	1	
Number of Mayfly Taxa	2 0		4	1	6	1	4	1	
Number of Caddisfly Taxa	5 1		6	1	4	1	5	1	
Number of Stonefly Taxa	0 -1		1	1	2	1	1	1	
Percent Mayfly Composition	6.77 0		16.82	0	50.79	1	8.91	0	
Percent Caddisfly Composition	12.28	0	19.27	0	9.52	0	26.73	0	
Percent Dominant Taxon	44.49	-1	14.98	1	37.04	-1	29.04	0	
Percent Isopod, Snail, Leech	5.01	0	7.34	0	3.44	1	11.22	-1	
Percent Surface Air Breathers	0.38 1		12.23	0	6.08	1	0.99	1	
TOTAL SCORE	1			5		6		4	
Macroinvertebrate Community Rating	Acceptable		Excellent		Excellent		Acceptable		

 Table 8b.
 Macroinvertebrate metric evaluation of the Rifle River watershed, 2019.

	Houghton Creek	Houghton Creek	
	upstream Flynn Road	downstream Flynn Road	 
	7/30/2019	7/30/2019	
Таха	<b>STATION 2</b>	<b>STATION 3</b>	
Salmonidae (trouts)			
Oncorhynchus mykiss (Rainbow trout)		4	
Salmo trutta (Brown trout)	30	34	
Cyprinidae (minnows and carps)			
Semotilus atromaculatus (Creek chub)		1	
Notropis heterolepis (Blacknose shiner)		1	
Cottidae (sculpins)			
Cottus bairdii (Mottled sculpin)	19	50	
Catostomidae (suckers)		_	
Catostomus commersoni (White sucker)		1	
Labidesthes sicculus (Brook silverside)			
Fundulus diaphanus (Banded killifish)	163		 
Total Individuals	212	91	
Percent salmonids	14	42	
Reach sampled (ft)	300	250	
Gear	bps	bps	

Table 9.	Qualitative	fish sam	pling resu	ults* for th	ne Rifle I	River wate	ershed,	2019

\*Note: Houghton Creek is a coldwater stream, so standard Procedure 51 scoring cannot be used. >1 percent salmonids were present, indicating attainment of the coldwater fishery designated use.

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