

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
SEPTEMBER 2015

STAFF REPORT

BIOLOGICAL SURVEY OF THE RIFLE RIVER WATERSHED
ARENAC AND OGEMAW COUNTIES
AUGUST 2014

As part of the five-year watershed monitoring cycle, staff from the Michigan Department of Environmental Quality (MDEQ), Surface Water Assessment Section (SWAS), conducted biological sampling within the Rifle River watershed located in Arenac and Ogemaw Counties during August 2014. Qualitative macroinvertebrate and habitat surveys were conducted throughout the watershed (Figure 1; Table1) following the SWAS Procedure 51 (MDEQ, 1990; Creal et al., 1996), and the Biological Monitoring Status and Trend Procedure WRD-SWAS-027 (MDEQ, 2015).

OBJECTIVES

The biological surveys were conducted to:

- Support water quality-based effluent limit development for National Pollutant Discharge Elimination System (NPDES) permits.
- Identify nonpoint sources (NPS) of water quality impairment.
- Evaluate the effectiveness of specific NPS water quality improvement projects.
- Satisfy water quality monitoring requests submitted by internal and external customers.
- Support Total Maximum Daily Load development for surface waters of nonattainment and address nonattainment listings described in the 2014 Integrated Report (Goodwin et al., 2014).
- Assess the current status and condition of individual assessment units and determine whether water quality standards (WQS) are being met.
- Evaluate biological integrity temporal trends.
- Evaluate the effectiveness of specific contaminated site remediation projects.
- Support Area of Concern-related beneficial use delisting decisions.

WATERSHED DESCRIPTION

The Rifle River watershed is located in Ogemaw and Arenac counties, draining an area of approximately 385 square miles, and incorporates three ecoregions: Northern Lakes and Forests (NLF); Huron Erie Lake Plains (HELP); and the Southern Michigan Northern Indiana Till Plains (SMNITP) ecoregions (Omernik, 1987). The NLF is a region of relatively nutrient-poor glacial soils, coniferous and northern hardwood forests, undulating till plains, morainal hills, broad lacustrine basins, and extensive sandy outwash plains. Soils in this ecoregion are thicker than in those to the north and generally lack the arability of soils in adjacent ecoregions to the south. The numerous lakes that dot the landscape are clearer and less productive than those in ecoregions to the south. The HELP ecoregion is a broad, fertile, nearly flat plain punctuated by relic sand dunes, beach ridges, and end moraines. Most of the area has been cleared and artificially drained and contains highly productive farms producing corn, soybeans, livestock, and vegetables; urban and industrial areas are also extensive. Stream habitat and quality have

been degraded by channelization, ditching, and agricultural activities. Bordered by Lake Michigan on the west, this ecoregion is less agricultural than those to the south, is better drained and contains more lakes than the HELP ecoregion to the east, and its soils are not as nutrient-poor as the NLF ecoregion to the north. The region is characterized by many lakes and marshes as well as an assortment of landforms, soil types, soil textures, and land uses. Broad till plains with thick and complex deposits of drift, paleobeach ridges, relict dunes, morainal hills, kames, drumlins, meltwater channels, and kettles occur. Oak-hickory forests, northern swamp forests, and beech forests were typical. Feed grain, soybean, and livestock farming as well as woodlots, quarries, recreational development, and urban-industrial areas are common (United States Environmental Protection Agency [USEPA], 2015).

The river originates in northeastern Ogemaw County and flows for approximately 60 miles in a southeasterly direction to its confluence with Lake Huron. Historically, the source of the river was Devoe Lake but in the early 1950s a diversion was dredged around the lake. This diversion allowed the coldwater streams that once flowed into Devoe Lake to flow directly into the Rifle River, thus avoiding the warming effect of the lake (Michigan Department of Natural Resources [MDNR], 1980). The upper Rifle River, north of Selkirk, is slower moving than the portions below the village where the river is generally characterized by fast shallow riffles with deep holes (Lincoln, 1976). The entire mainstream flows through outwash plains and much of the watershed is underlain with claypan. The resulting rapid water runoff makes the Rifle River one of Lower Michigan's least stable streams (MDNR, 1980). The Rifle River has also been designated as a Natural River from its origins to just north of the village of Omer.

Land use within the watershed is dominated by forest, agriculture, and wetlands. The forested portion is dominated by aspen, jackpine, scrub oak, northern hardwoods (maple and beech), red and white pine plantations, and mixed swampland species, which covers over 45 percent of the watershed. Agriculture (pasture and crops) encompasses approximately 185,000 acres or almost 30 percent of the entire watershed. Wetlands cover approximately 23 percent including marshes, mudflats, wooded swamps, and shallow areas along rivers, streams, and lakes (Huron Pines Watershed Council, 2008).

BACKGROUND AND HISTORICAL SAMPLING EFFORTS

RIFLE RIVER

A biological survey was conducted in 1989 on the West Branch Rifle River in the vicinity of the West Branch Wastewater Treatment Plant (WWTP) to determine whether the WWTP's discharge was impacting stream quality in anticipation of the approaching renewal of their NPDES permit. Four fewer macroinvertebrate taxa were found downstream of the WWTP Outfall 001 than what was found upstream. The taxa that were missing from the downstream section were Perlodid stoneflies, Limnephilid and Leptocerid caddisflies, and Heptageniid mayflies. The absence of these taxa suggested the WWTP was impacting the river downstream of Outfall 001; however, other taxa that are indicative of good water quality were still present (Perlid and Nemourid stoneflies). Mercury was not detected in the sediments from either the upstream or downstream station (Hull, 1989).

During the summers of 1983, 1985, and 1994 biological surveys were conducted throughout the Rifle River watershed to evaluate the impact of the Rose City Wastewater Sewage Lagoon (WWSL) and West Branch WWTP on the fish and macroinvertebrate communities. The fish community survey rated good at all stations while the macroinvertebrate surveys rated good at all locations except Silver Creek, which rated fair. No biological impairment was observed in the

West Branch Rifle River due to the West Branch WWTP effluent and suggests that the macroinvertebrate community improved from the conditions found in 1989 by Hull (1989). The macroinvertebrate survey conducted on Houghton Creek suggest that the Rose City WWSL may have degraded water quality downstream of the effluent but also suggests that this degradation may have been due to a physical habitat impairment since the substrates were noticed to have been composed of mainly sand in 1985. Concentrations of nitrogen, phosphorus, and total dissolved solids were found to be elevated in Peach and Campbell Creeks. Sediments collected below the West Branch WWTP revealed detectable levels of several contaminants but more sampling was suggested to specify potential sources (Morse, 1994).

In June 1999, the biological community and habitat quality was assessed within the Rifle River watershed. The macroinvertebrate communities rated good to excellent while the habitat quality throughout the watershed rated from excellent to fair. No chemical parameters exceeded the WQS (Vidales, 2011).

A biological community and habitat quality assessment was carried out in June and July 2004 within the Rifle River watershed. Based on the targeted and probabilistic sampling, all wadeable streams met the WQS for aquatic life. The West Branch Rifle River was found to have elevated chemical concentrations when compared to the rest of the watershed and the lower Rifle River was the only known nonattainment portion due to a PCB fish consumption advisory. Two locations were identified by the NPS staff for the installation of sand traps and were constructed during the summer of 2005 (Kohlhepp, 2005).

In June and July 2009, a biological community assessment was carried out within the Rifle River. All locations rated between excellent and good meeting the WQS for aquatic life. Sand was determined to have impacted the quality of instream habitats with no evidence of an organic or conventional pollutant from the data collected during the survey. The upstream versus downstream comparisons of the sand traps constructed in 2005 at Gamble Creek were found not to be similar enough for quantitative evaluation. The quantitative evaluation on the West Branch Rifle River sand trap location was also found to be inconclusive with regard to any cause or effect related to the function of the sand trap (Cooper, 2011).

METHODS

This survey was performed according to Procedure 51 (MDEQ, 1990; Creal et al., 1996) to measure habitat and macroinvertebrate community quality in the Rifle River watershed. Fourteen status sites were selected (Figure 1; Table 1) within the Rifle River watershed using a stratified random site selection method to address statewide and watershed-specific water quality concerns and attainment status (MDEQ, 2015). Alternate sites were preselected to allow for contingencies in the field.

Two trend sites were identified to determine statewide water quality trends as well as two targeted sites. These targeted sites were selected to fulfill specific monitoring requests, assess known or potential areas of concern where more information is needed, achieve assessment coverage of the watershed, and provide information for NPDES activities. Targeted sites were identified prior to random site selection. If targeted sites were subsequently chosen in the random draw, they were considered random. Overall, 18 biological surveys were conducted within the Rifle River watershed during the 2014 field season.

Using Procedure 51, the macroinvertebrate communities were scored at all 18 locations with

metrics that rate water bodies from excellent (+5 or higher), acceptable (+4 to -4), and poor (less than -4). Negative ratings that are acceptable are indicative of water bodies that are strongly tending toward poor, while positive ratings that are acceptable indicate slight impairment (Creal et al., 1996). Stream habitat was also qualitatively evaluated at each station using a scoring system, which ranged in value from 0 (poor) to 200 (excellent).

Fish were also evaluated at the two targeted coldwater stream locations (Stations A and B) using the Procedure 51 fish metric. This metric states, "if the percentage of salmonids relative to the number of total individuals collected exceeds 1 percent, the stream will be considered to meet its coldwater designation and overall quality will be judged by the macroinvertebrate metrics" (Creal et al., 1996).

During a portion of this survey, the United States Fish and Wildlife Service scheduled Sea Lamprey Control Treatment from August 12-21, 2014, throughout the Rifle River watershed. All survey locations within the treatment area were sampled prior to the lampricide treatment to avoid catastrophic drift events and reduced macroinvertebrate populations. Survey locations outside of the lampricide treatment area were given lower priority and surveyed two weeks after the treatment.

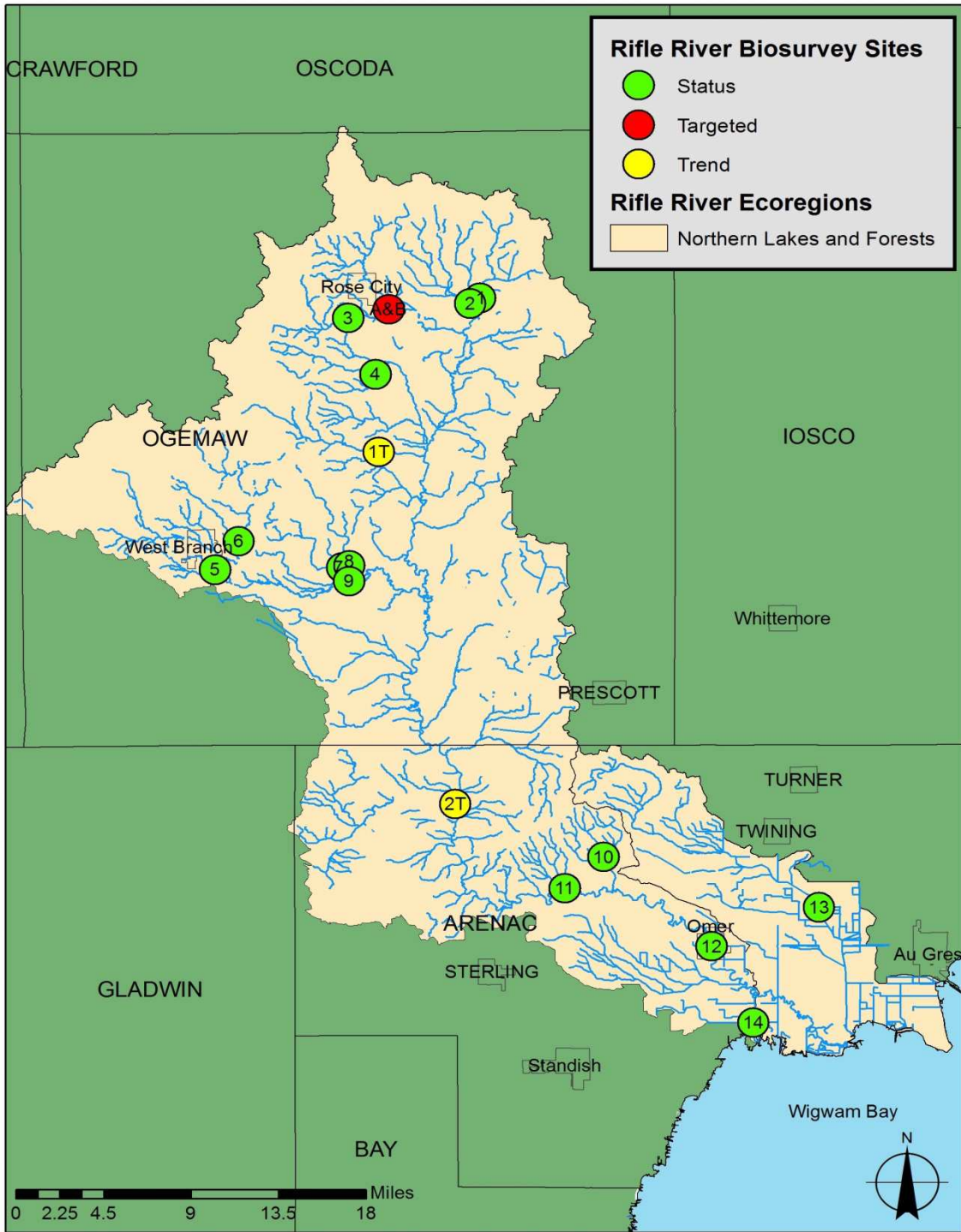


Figure 1. Locations of the targeted, trend, and status sampling locations within the Rifle River watershed for the 2014 field season.

Table 1. Status, trend, and targeted sample locations during the 2014 Rifle River biosurvey. Locations are separated into color-coded ecoregions. See key in footnote.

Site ID	Water Body Name	Location	Latitude	Longitude	AUID	Fish	Macroinvertebrates	Habitat			
Status Sites											
1	Gamble Creek	Ranch Road	44.4147	-84.0286	040801010402-01	--	--	Acceptable	2	Good	152
2	Oyster Creek	Weir Road	44.4116	-84.0355	040801010402-01	--	--	Excellent	7	Good	121
3	Wilkins Creek	Townline Road	44.4034	-84.1266	040801010401-01	--	--	Acceptable	3	Good	149
4	Bailer Creek	Morrison Road	44.3717	-84.1061	040801010403-NA	--	--	Acceptable	0	Good	131
5	C K Eddy Creek	Cook Road	44.2614	-84.2255	040801010406-01	--	--	Acceptable	-3	Good	122
6	Rifle Creek	M55	44.2773	-84.2079	040801010405-01	--	--	Acceptable	4	Excellent	168
7	Peach Lake Creek	Gallagher Road	44.2626	-84.1310	040801010406-01	--	--	Acceptable	-2	Good	144
8	Campbell Creek	M33	44.2637	-84.1257	040801010406-01	--	--	Acceptable	1	Good	149
9	West Branch Rifle River	M33	44.2547	-84.1258	040801010406-01	--	--	Acceptable	4	Excellent	159
10	Townline Creek	Knight Road	44.0984	-83.9364	040801010412-NA	--	--	Acceptable	4	Excellent	158
11	Rifle River	Bishop Road (Grove St)	44.0807	-83.9653	040801010412-02	--	--	Excellent	5	Excellent	168
12	Rifle River	US23	44.0477	-83.8561	040801010412-01	--	--	Excellent	5	Excellent	168
13	Big Creek	Jose Road	44.0699	-83.7760	040801010501-01	--	--	Acceptable	1	Marginal	62
14	Rifle River	Stover Road	44.0044	-83.8250	040801010412-03	--	--	Excellent	5	Good	117
Trend Sites											
1T	Klacking Creek	Morrison Road	44.3278	-84.1039	040801010404-NA	--	--	Excellent	5	Excellent	162
2T	Rifle River	Forest Lake Drive	44.1286	-84.0468	040801040410-03	--	--	Acceptable	1	Excellent	173
Targeted Sites											
A	Houghton Creek	u-s Flynn Road	44.4083	-84.0962	040801010401-01	*	--	Acceptable	4	Good	142
B	Houghton Creek	d-s Flynn Road	44.4083	-84.0962	010801010401-01	*	--	Acceptable	0	Excellent	164

*See Tables 4.1-4.3 for fisheries results, Houghton Creek is a coldwater stream, Procedure 51 cannot be used. >1% Trout were present meeting WQS.

Ecoregions: Blue – NLAF; Orange – SMNTP; Green - HELP

SUMMARY

Stations used for the biological and habitat evaluations are shown in Figure 1 and Table 1. The macroinvertebrate community and habitat assessments were performed at 18 locations and the results are presented in Tables 2a, 2b, and 3, respectively.

RANDOMLY SELECTED WADEABLE SITES

RIFLE RIVER WATERSHED

Gamble Creek at Ranch Road (Rifle River Recreational Area Service Road – Station 1) is located within the Rifle River State Recreational Area and is approximately 18.4-foot wide and 1.3-foot deep. The average surface velocity was found to be 1.5 feet per second (fps) corresponding to an overall flow measurement of 36.3 cubic feet per second (cfs). Substrates were found to be dominated by sand with small amounts of silt and gravel, which is disturbed frequently during high flows. Aquatic vegetation was sparse with moderate overhanging vegetation, large woody debris, and undercut banks. Rootwads throughout this section were extensive, which aided in the habitat quality, which rated good for this section of stream. The vegetative protection along the banks was excellent with almost all plants allowed to grow naturally. The macroinvertebrate communities were found to be dominated by Tricorythids and Amphipods with the Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa composing 60 percent of the total individuals identified, resulting in a final rating of acceptable. Historically, this creek has also been described by the MDNR as a good brown trout feeder tributary to the Rifle River (MDNR, 1980). The water temperature during the visit was 59°F.

Oyster Creek at Weir Road (Station 2) is a perennial system located six miles west of the village of Twining and is also within the Rifle River State Recreational Area. Oyster Creek was found to have an average depth of 1.2 feet and its flow was estimated at 38.3 cfs. The creek runs through a mixed forested lowland and was found to be 15-feet wide and approximately 1.2-feet deep. Vegetative protection and riparian zone width were good with 70-90 percent of the stream bank covered with trees, shrubs, and nonwoody vegetation. Sediments were dominated by heavy deposits of sand with very little silt present. Pools were absent within this stretch of river due to the substantial sediment deposition. Habitat quality rated good with extensive overhanging vegetation and undercut banks. Large woody debris was moderately present at this location but aquatic macrophytes and rootwads were found to be sparsely available for macroinvertebrate colonization. The macroinvertebrate communities rated excellent with a total of 33 different taxa identified within this reach. Forty-three percent of the total individuals identified at this location were composed of EPT taxa and dominated by Chironomids and Baetids.

Wilkins Creek at Townline Road (Station 3, Figure 2) is located approximately 1.7 miles upstream of the Klacking Creek confluence and flows through a mixed forest immediately upstream of this location. The creek was found to have an average width of 17.1 feet with an average flow of 23.4 cfs. Sediments throughout this reach were a mix of sand, silt, gravel, and cobble. The gravel and cobble present was found to be 50-75 percent embedded by fine sediments with moderate deposition within pools. Overhanging vegetation and undercut banks were extensively available with large woody debris and rootwads moderately available for macroinvertebrate colonization. Stream banks lacked mature trees and were dominated by shrubs and grasses with the riparian vegetative zone width greater than 150 feet on both banks. Overall, habitat quality rated good. Macroinvertebrate communities rated acceptable with 34 percent of the total individuals composed of EPT taxa. The dominant taxa within this reach were Chironomids and Baetids.



Figure 2. Wilkins Creek at Townline Road.

Bailer Creek was surveyed at Morrison Road (Station 4), three miles south of the village of Rose City. This creek had an average width of 4 feet with an estimated flow of less than 1 cfs. Bailer Creek is located in a heavily agricultural area of the watershed with very little riparian vegetation present on the banks upstream of this location. Habitat quality rated good with extensive availability of rootwads and large woody debris, and moderate availability of undercut banks. Overhanging vegetation and aquatic macrophytes were sparsely available throughout this section. Sediments were dominated by sand and gravel with some new increase in bar formation. The riparian vegetative zone width was found to be marginal to good with a zone width between 50 to 75 feet. The macroinvertebrate community rated acceptable with 28 taxa identified including two mayflies and four caddisfly taxa. These taxa only comprised 6 percent of the total number of individuals counted.

CK Eddy Creek at Cook Road (Station 5) is located approximately one mile southeast of the town of West Branch. The immediate watershed is dominated by a mix of agriculture, commercial, and industrial influences. CK Eddy Creek is a small creek with a width of 6.7 feet and a flow of approximately 4.2 cfs during the summer months. Sediments were dominated by clay and sand with no aquatic macrophytes present throughout the reach. Very little in-stream habitat was found within the active channel at this location with sparse undercut banks and large woody debris as well as moderate availability of rootwads. The riparian vegetative zone width was excellent on the left bank but marginal on the right bank due to the proximity of the creek to Cook Road. However, both banks were not fully vegetated and no trees were present throughout the survey area. The location was dominated by grasses and shrubs. Habitat quality rated good with the macroinvertebrate community rating acceptable, trending toward poor with a score of -3. Twenty-three total taxa were identified in which 4 percent of the individuals were from the EPT Orders. The dominant taxa at this location were comprised of Chironomids, Isopods, and Amphipods.



Figure 3. Rifle Creek at M-55.

The Rifle Creek sampling location (Station 6, Figure 3) was located below the defunct Fisk's Mill Dam and M-55, which is approximately one mile east of the town of West Branch. The sediments at this location were historically impacted with wastes from oil wells and produced sheens when disturbed. Bottom fauna was also reported as limited (Locke, 1951). During the current survey, stream width was 20.4-feet wide with an estimated flow of 37.8 cfs. Substrates were composed mainly of cobble and gravel with very little fine sediments or large woody debris present due to the high surface velocities (3.2 fps) at this location. No traces of historical oils were found during the survey.

Habitat communities rated excellent with overhanging vegetation extensively present along the bank along with moderate amounts of undercut banks and rootwads available for macroinvertebrate colonization.

Macroinvertebrate communities rated acceptable, dominated by Hydropsychids with 73 percent identified as EPT taxa.

Peach Lake Creek at Gallagher Road (Station 7, Figure 4) is located a quarter mile upstream of the convergence of Campbell Creek and Peach Lake Creek near the M-33 crossing. Peach Lake Creek was approximately nine-feet wide with flows around 4 cfs. Substrates were composed mainly of gravel and sand with very little silt present. Habitat communities rated good with overhanging vegetation extensively available throughout the site. Large woody debris was moderately available for macroinvertebrate



Figure 4. Peach Lake Creek at Gallagher Road.

colonization, all other structures were sparse. The riparian vegetative zone width was found to be marginal with a maintained yard on the right bank and agricultural fields on the left bank. Both banks were found to be moderately stable with some areas having the potential for erosion during high water events. Twenty-seven total macroinvertebrate taxa were identified in which 21 percent of the individuals were from the EPT Orders. The dominant taxa at this location were comprised of Amphipods and Hydropsychids.

Campbell Creek at M-33 (Station 8) was a quarter mile downstream of Station 7 after Peach Lake Creek and Campbell Creek converge. The survey was conducted downstream of M-33 due to accessibility issues on the upstream side of the bridge. The habitat assessment rated good with the creek flowing through predominantly agricultural and pastoral land upstream of this location. In-stream structure for macroinvertebrate colonization was found to be moderately available for all types except aquatic macrophytes, which were sparse at this location. Sediments were composed of gravel and sand throughout the creek with small amounts of fine silts and clays distributed within. Banks were found to be moderately unstable with areas of high erosion potential during high water events. Macroinvertebrate communities rated acceptable, dominated by Amphipods and Chironomids. EPT taxa made up 33 percent of the total individuals collected.

The West Branch Rifle River at M-33 (Station 9) is located five miles east of Flowage Lake, where the West Branch Rifle River originates. The river was found to be 33-feet wide with an estimated flow of 92 cfs. Sediments were dominated by gravel and sand with a layer of silt covering all habitats within the river. Habitat rated excellent with undercut banks and rootwads extensively available throughout the reach with overhanging vegetation and large woody debris moderately available. Stream bank vegetation was found to be in good condition dominated by trees and nonwoody macrophytes including Purple Loosestrife, which was sparsely abundant. The macroinvertebrate community rated acceptable with the presence of 31 total taxa, dominated by Chironomids and Elmids. The EPT Orders composed 29 percent of the total individuals identified in the sample.

Townline Creek was surveyed at Knight Road (Station 10), which is located five miles northwest of the town of Omer. Townline Creek originates about 2.5 miles upstream of the Knight Road crossing. The average width of the stream was 8.7 feet with an average flow of 4.8 cfs. Sediments were a mix of gravel, sand, silt, and clay and became extremely turbid when disturbed. Habitat quality rated excellent with moderate availability of undercut banks, large woody debris, and rootwads. Overhanging vegetation was sparse with no aquatic macrophytes present in the sample reach. Riparian vegetation was good, dominated by trees and nonwoody macrophytes but missing understory shrubs. The banks were moderately stable with only small areas of erosion. The macroinvertebrate community rated acceptable with 31 percent of the total individuals composed of the EPT taxa. The site was dominated by Hydropsychids and Athericids.



Rifle River at Bishop Road/Grove Road (Station 11, Figure 5) is located four miles northeast of the village of Sterling

Figure 5. Rifle River at Bishop Road/Grove Road.

bordering the Crystal Creek Campground. The Rifle River was found to have an average depth of 1.8 feet with a discharge of 395 cfs. The river, which is 86-feet wide, runs through a mixed forested area and was found to have surface velocities of 2.5 fps. Vegetative protection and riparian zone width were good with 70-90 percent on the left bank. On the right bank, the campground reduced the vegetative width as well as the stream bank surfaces covered by vegetation. Bare soil was common along the banks and within the campground area due to heavy human influences. Sediments were dominated by cobble and boulders. Habitat quality rated excellent even with the human influences along the stream margins. The macroinvertebrate communities rated excellent with a total of 38 different taxa identified within this reach. Fifty-seven percent of the total individuals identified at this location were composed of EPT taxa and dominated by Hydropschids and Tricorythids.

Rifle River at US-23 (Station 12) is located in the town of Omer approximately 4.5 miles upstream from the mouth. The survey was carried out downstream of the US-23 bridge at the public canoe access site. The survey location was within the downstream limit and moved due to construction on the bridge. The river at this location was found to be 94-feet wide, with a depth less than one foot. Surface water velocities were found to be 2.8 fps with a total discharge estimated at 248 cfs. Habitat quality rated excellent with moderate overhanging vegetation, large woody debris, and rootwads with sparse undercut banks and aquatic macrophytes. Substrates were dominated by bedrock with the remaining substrates an even mix of cobble, gravel, sand, and silt. The riparian zone was impacted by human activities on both sides; vegetation on the left bank consisted of a manicured lawn close to the river. However, on the right bank, bank vegetation and the riparian zone were slightly better with a 70-foot buffer between the river and the maintained residential lawns. Macroinvertebrate communities rated excellent with 31 percent of the identified organisms as part of the EPT orders. This site was dominated by Chironomids, Baetids, and Amphipods.

Big Creek at Jose Road (Station 13, Figure 6) is located in the Big Creek watershed, four miles east of the Rifle River at Omer. Big Creek is an extremely flashy system and is channelized for 4.5 miles upstream of this location and 6 miles downstream to the mouth of the river. Habitat rated marginal at this location due to the complete absence of any in-stream vegetation. Habitat along the banks was also sparse with a small amount of overhanging vegetation, rootwads, and undercut banks. Almost all the wood has been removed from this portion of the creek.



Figure 6. Big Creek at Jose Road.

The sediments were composed of sand, which is frequently disturbed during high water events and was approximately 2.5-foot deep when measured with the handle of a dip net. Water depth was 5 inches with flows estimated at 8.6 cfs. Steep banks were also present along the entire reach and propose a high erosion potential during high water events. The riparian vegetative zone width was found to be marginal on the right bank with approximately 10 feet or less of vegetation present. The left riparian zone width was excellent with a distance greater than 150 feet. However, the vegetation present on the bank was still marginal with patches of bare soil or closely cropped vegetation. Invasive species present at this location consisted of Purple Loosestrife and Rusty Crayfish, which were

both sparsely abundant. Macroinvertebrate communities rated acceptable with a total of 36 taxa, dominated by Chironomids and Isopods. Twenty-three percent of the total individuals identified were composed of the EPT taxa.

Rifle River at Stover Road (Station 14) is located approximately 1.5 miles upstream of the mouth of the Rifle River where it empties into Saginaw Bay. The river at this location was 120-feet wide with an average depth of 1.7 feet. Estimated flows were found to be around 259 cfs. Habitat quality rated good with moderate overhanging vegetation with all other macroinvertebrate structures sparsely available for colonization. The left bank was marginally vegetated with patches of bare soil and closely cropped vegetation. The right bank had excellent vegetative bank protection and zone width with sparse pockets of Purple Loosestrife. Both banks were found to be moderately stable with only small areas of potential erosion. Sediments were composed of sand and silt with no variability in the channel depth. Macroinvertebrate communities rated excellent with 35 total taxa identified, dominated by Chironomids and Baetids. EPT taxa made up 38 percent of the total individuals collected.

TREND SITES

RIFLE RIVER WATERSHED

Klacking Creek is located six miles south of the village of Rose City. The survey was conducted at the Morrison Road (Station 1T, Figure 7) crossing. The creek measured 14.7-feet wide and had an estimated flow of 18.9 cfs. Habitat quality rated excellent with substrates dominated by cobble with equal parts of gravel and sand. All habitat parameters rated excellent to good with only the left riparian vegetation zone width rating marginal. This rating was due to a residential lawn that was being maintained to the edge of the creek. Overhanging vegetation along the banks was found to be extensive throughout the study reach with undercut banks and rootwads moderately available. Large woody debris and aquatic macrophytes were sparse. Macroinvertebrate communities were dominated by Chironomids and Hydropsychids and rated excellent. Thirty-six percent of the individuals collected in the sample were composed of the EPT taxa

The Rifle River at the Forest Lake Drive (Station 2T) location runs through a predominately forested portion of the watershed. It is located approximately four miles east of the village of Alger and one mile upstream of the Forest Lake spillway confluence. The stream was 99-feet wide and 1.5-feet deep with surface velocities of 2.1 fps. Substrates were composed of mainly cobble and gravel with small amounts of boulder and sand. In-stream habitat was moderate to sparse with an overall habitat rating of excellent. Vegetation on the right bank was marginal, missing shrubs and nonwoody macrophytes along the majority of the bank. The lack of bank vegetation was due to the recreational pull-off adjacent to the stream. The remainder of the riparian zone was fully vegetated with excellent zone widths. Macroinvertebrate communities



Figure 7. Klacking Creek at Morrison Road.

rated acceptable with 32 total taxa identified, dominated by Amphipods and Physid snails with EPT taxa representing 17 percent of the total individuals collected.

TARGETED MONITORING SUMMARY

RIFLE RIVER WATERSHED

The targeted monitoring of Houghton Creek above (Station A) and below (Station B) Flynn Road was a public request to collect preconstruction data for the replacement of the road crossing. The road/stream crossing is one mile southwest of the village of Rose City and has been identified as a source of unnecessary sediment input and a barrier to fish passage. Historically, Houghton Creek was described by the MDNR as an excellent brown trout feeder stream to the Rifle River and is large enough to support fly-fishing after the confluence with Wilkens Creek (MDNR, 1980).

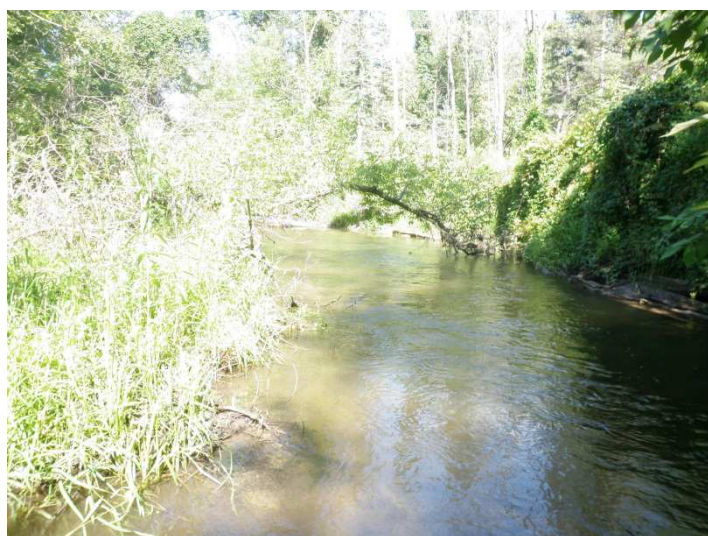


Figure 8. Houghton Creek upstream of the Flynn Road Crossing.

Above Flynn Road, the stream measured 24-feet wide with an estimated discharge of 61 cfs and surface velocity of 2.5 fps (Station A, Figure 8). Habitat rated good at this location consisting of moderate to extensive availability of rootwads, large woody debris, overhanging vegetation, and aquatic macrophytes. The substrates were composed of frequently disturbed sand and silt with a few small spots of exposed gravel. Sediment deposition was found mainly at obstructions with moderate deposition in pools. Vegetative protection on the banks was good, but disruption of the bank was evident; however, not affecting most of the plant growth. Several dead trees were observed at

this location reducing the canopy cover to the stream. The macroinvertebrate community rated acceptable with 30 taxa identified during this survey. This site was dominated by Chironomids with 21 percent of the sample composed of EPT taxa. Forty-nine fish were collected during the backpack electrofishing survey consisting of brown trout and mottled sculpin. Brown trout ranged from 2 to 9 inches (5.5 to 22.9 cm) in length. The MDNR also electrofished this portion of stream earlier in the summer as part of their three-year Status and Trends sampling protocol. Year one of the three-year survey is strictly a trout survey. Their survey resulted in the collection of brown trout ranging from 2 to 25 inches (5.5 to 63.5 cm) and rainbow trout ranging from 1 to 8 inches (2.5 to 20 cm) (K. Schrouder, personal communication). Results from the current electrofishing survey can be found in Tables 4.1 and 4.2.

Stream width below Flynn Road was 26 feet with a surface velocity of 1.8 fps and discharge of 46 cfs. Habitat below Houghton Creek (Station B, Figure 9) rated excellent with all habitat structures moderately available except for undercut banks, which were sparse at this location. Substrates were composed of gravel, cobble, and sand with a small layer of silt covering all available structure. The riparian vegetative zone width and vegetative protection was excellent for most of the reach except for the private property on the right bank that had a maintained

lawn down to the edge of the river. The macroinvertebrate community rated acceptable with a total of 24 taxa identified. The community was dominated by Chironomids and Oligochaetes with EPT taxa representing 21 percent of the total individuals collected. The lower portion of the road crossing was also electrofished resulting in 82 fish collected. Game fish collected included: brown trout, rainbow trout, and brook trout. Lengths ranged from 1 to 13 inches (2.5 to 33 cm) and can be found in Tables 4.1 and 4.3 along with the remainder of the fish collected during this survey.



Figure 9. Houghton Creek downstream of the Flynn Road Crossing.

Table 4.1. Electrofishing results for Houghton Creek at Flynn Road.

Fish Species	Houghton Creek u-s Flynn Road	Houghton Creek d-s Flynn Road
Brown Trout	21	33
Rainbow Trout	--	5
Brook Trout	--	1
Grass Pickerel	--	1
White Sucker	--	2
Mottled Sculpin	28	37
Blackside Darter	--	1
Bluntnose Minnow	--	1
Logperch	--	1

Table 4.2. Fish measurements collected from the electrofishing survey conducted *upstream* of Flynn Road, Ogemaw County, August 2014.

Inch Group	Brown Trout	Rainbow Trout	Brook Trout	Mottled Sculpin	White Sucker	Grass Pickerel	Blackside Darter	Bluntnose Minnow	Logperch
0		--	--	2	--	--	--	--	--
1	2	--	--	6	--	--	--	--	--
2	9	--	--	10	--	--	--	--	--
3	1	--	--	10	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--
5	2	--	--	--	--	--	--	--	--
6	4	--	--	--	--	--	--	--	--
7	2	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--	--
9	1	--	--	--	--	--	--	--	--

Table 4.3. Fish measurements collected from the electrofishing survey conducted *downstream* of Flynn Road, Ogemaw County, August 2014.

Inch Group	Brown Trout	Rainbow Trout	Brook Trout	Mottled Sculpin	White Sucker	Grass Pickerel	Blackside Darter	Bluntnose Minnow	Logperch
0	--	--	--	3	--	--	--	--	--
1	3	--	--	12	--	--	--	--	--
2	16	--	--	14	--	--	--	1	--
3	4	--	--	8	--	--	1	--	1
4	1	1	--	--	1	--	--	--	--
5	1	3	--	--	--	1	--	--	--
6	3	1	--	--	--	--	--	--	--
7	2	--	--	--	--	--	--	--	--
8	1	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--
10	--	--	--	--	1	--	--	--	--
11	--	--	--	--	--	--	--	--	--
12	--	--	1	--	--	--	--	--	--
13	2	--	--	--	--	--	--	--	--

WATER CHEMISTRY

No water chemistries were collected throughout this survey.

POTENTIAL AREAS OF FURTHER INVESTIGATION

Houghton Creek at Flynn Road (Stations A and B)

- Future biological surveys should be conducted to monitor the effect the construction of the new road crossing will have on the local macroinvertebrate and fisheries communities.

Big Creek at Jose Road

- Big Creek is a channelized system and has been surveyed continuously over several cycles. Lehman Road to Manor Road has been described as having marginal habitat due to poor channel substrate, channel gradient, and channel form (Kohlhepp, 2005 and Cooper, 2011). Land cover maps (Huron Pines Watershed Council, 2008) show the Big Creek watershed impacted heavily by row crop agriculture, which may be influencing the heavy sediment loads observed in the river (2.5-foot deep at Jose Road).
- Implementation of agricultural Best Management Practices as well as the installation of sand traps may benefit the system.
- If NPS controls could be put into place, further monitoring would be recommended during the next watershed survey to determine if biological and/or habitat improvements have occurred.

WATERSHED ATTAINMENT

Based on the probabilistic monitoring aspect of this watershed survey, 100 percent of the randomly selected sites supported the other indigenous aquatic life and wildlife designated use component of R 323.1100(1)(e) of the Michigan WQS using Procedure 51. Percent attainment was calculated by dividing the number of random sites that met WQS by the total number of random locations (14 / 14 = 1.00).

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Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, NLA Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

TAXA	Gamble Creek Ranch Rd 8/12/2014 STATION 1	Oyster Creek Weir Road 8/12/2014 STATION 2
ANNELIDA (segmented worms)		
Hirudinea (leeches)		1
Oligochaeta (worms)	14	25
ARTHROPODA		
Crustacea		
Amphipoda (scuds)	39	15
Decapoda (crayfish)	1	3
Isopoda (sowbugs)		1
Arachnoidea		
Hydracarina	1	
Insecta		
Ephemeroptera (mayflies)		
Baetiscidae		5
Baetidae	14	30
Heptageniidae	6	16
Isonychiidae		21
Tricorythidae	111	22
Odonata		
Anisoptera (dragonflies)		
Aeshnidae	5	4
Gomphidae	1	1
Zygoptera (damselflies)		
Calopterygidae	1	17
Plecoptera (stoneflies)		
Leuctridae	2	
Perlidae		4
Hemiptera (true bugs)		
Corixidae	1	
Gerridae	1	
Veliidae	2	8
Megaloptera		
Corydalidae (dobson flies)	4	2
Sialidae (alder flies)	1	
Trichoptera (caddisflies)		
Brachycentridae		7
Hydropsychidae	8	16
Hydroptilidae		1
Lepidostomatidae	2	
Leptoceridae		1
Limnephilidae		4
Philopotamidae		1
Polycentropodidae	1	
Coleoptera (beetles)		
Gyrinidae (adults)	1	2
Elmidae	1	13
Diptera (flies)		
Chironomidae	14	47
Culicidae		1
Dixidae		2
Simuliidae	7	12
Tabanidae		1
Tipulidae		4
MOLLUSCA		
Gastropoda (snails)		
Ancylidae (limpets)		4
Physidae		5
Pelecypoda (bivalves)		
Sphaeriidae (clams)	3	4
TOTAL INDIVIDUALS	241	300

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, NLAf Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

METRIC	Gamble Creek		Oyster Creek	
	Ranch Rd		Weir Road	
	8/12/2014		8/12/2014	
	STATION 1		STATION 2	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	24	0	33	1
NUMBER OF MAYFLY TAXA	3	0	5	1
NUMBER OF CADDISFLY TAXA	3	0	6	1
NUMBER OF STONEFLY TAXA	1	0	1	0
PERCENT MAYFLY COMP.	54.36	1	31.33	1
PERCENT CADDISFLY COMP.	4.56	0	10.00	0
PERCENT DOMINANT TAXON	46.06	-1	15.67	1
PERCENT ISOPOD, SNAIL, LEECH	0.00	1	3.67	1
PERCENT SURF. AIR BREATHERS	2.07	1	3.67	1
TOTAL SCORE		2		7
MACROINV. COMMUNITY RATING		ACCEPT.		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

TAXA	Wilkins Creek Townline Road 8/12/2014 STATION 3	Bailer Creek Morrison Road 8/26/2014 STATION 4	CK Eddy Creek Cook Road 11/14/2014 STATION 5	Rifle Creek M55 8/25/2014 STATION 6
PLATYHELMINTHES (flatworms)				
Turbellaria				1
ANNELIDA (segmented worms)				
Oligochaeta (worms)	17	2	9	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	17	117	45	10
Decapoda (crayfish)		1	1	1
Isopoda (sowbugs)	11	13	55	11
Arachnoidea				
Hydracarina	9			
Insecta				
Ephemeroptera (mayflies)				
Baetidae	63	2	5	2
Caenidae	11			
Heptageniidae		1	1	9
Isonychiidae				1
Tricorythidae	1			
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		6		1
Zygoptera (damselflies)				
Calopterygidae		1		1
Plecoptera (stoneflies)				
Nemouridae	11			
Perlidae	3			15
Hemiptera (true bugs)				
Corixidae			7	
Gerridae	2	5		1
Mesoveliidae			2	
Notonectidae			2	
Veliidae		5	1	
Megaloptera				
Corydalidae (dobson flies)		3		1
Sialidae (alder flies)		1	3	
Trichoptera (caddisflies)				
Brachycentridae				1
Glossomatidae			1	
Helicopsychidae				2
Hydropsychidae	5	3		131
Hydroptilidae		1		
Lepidostomatidae	2			
Leptoceridae				1
Limnephilidae	9	6	1	
Molannidae	2			
Philopotamidae				11
Phryganeidae		1	3	
Polycentropodidae				1
Coleoptera (beetles)				
Dytiscidae (total)	1		1	
Hydrophilidae (total)		1	3	1
Psephenidae (adults)				1
Dryopidae		4		
Elmidae	6	14	11	11
Psephenidae (larvae)			1	3
Diptera (flies)				
Athericidae		2	3	1
Ceratopogonidae	3			
Chironomidae	133	18	95	15
Dixidae		2		
Simuliidae	7	3		1
Tabanidae		3		1
Tipulidae	4	2		
MOLLUSCA				

Gastropoda (snails)				
Ancylidae (limpets)		3		
Physidae		17	30	1
Planorbidae		1	3	
Pelecypoda (bivalves)				
Sphaeriidae (clams)	2		1	
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TOTAL INDIVIDUALS	319	238	284	237

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

METRIC	Wilkins Creek		Bailer Creek		CK Eddy Creek		Rifle Creek	
	Townline Road		Morrison Road		Cook Road		M55	
	8/12/2014		8/26/2014		11/14/2014		8/25/2014	
	STATION 3		STATION 4		STATION 5		STATION 6	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	21	0	28	1	23	0	27	1
NUMBER OF MAYFLY TAXA	3	0	2	1	2	0	3	0
NUMBER OF CADDISFLY TAXA	4	0	4	1	3	0	6	1
NUMBER OF STONEFLY TAXA	2	1	0	-1	0	-1	1	1
PERCENT MAYFLY COMP.	23.51	1	1.26	-1	2.11	-1	5.06	0
PERCENT CADDISFLY COMP.	5.64	0	4.62	0	1.76	-1	62.03	1
PERCENT DOMINANT TAXON	41.69	-1	49.16	-1	33.45	0	55.27	-1
PERCENT ISOPOD, SNAIL, LEECH	3.45	1	14.29	-1	30.99	-1	5.06	0
PERCENT SURF. AIR BREATHERS	0.94	1	4.62	1	5.63	1	1.27	1
TOTAL SCORE		3		0		-3		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

TAXA	Peach Lake Creek Gallagher Road 8/27/2014 STATION 7	Campbell Creek M-33 S of M-55 8/26/2014 STATION 8	W.B. Rifle River M-33 8/12/2014 STATION 9	Townline Creek Knight Road 8/26/2014 STATION 10
PLATYHELMINTHES (flatworms)				
Turbellaria	2	1		
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1			
Oligochaeta (worms)		1	17	2
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	133	127	9	70
Decapoda (crayfish)	1	1	3	1
Isopoda (sowbugs)	24	18	2	2
Arachnoidea				
Hydracarina			1	1
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae			1	
Baetidae	8	46	30	11
Ephemerellidae		1		
Ephemeridae				1
Heptageniidae	2	4	6	1
Isonychiidae			4	
Tricorythidae			2	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	2	2	1	4
Gomphidae			4	
Zygoptera (damselflies)				
Calopterygidae	7	7	8	4
Plecoptera (stoneflies)				
Perlidae			3	
Hemiptera (true bugs)				
Corixidae			8	
Gerridae	1	1		
Veliidae		3	2	1
Megaloptera				
Corydalidae (dobson flies)				6
Sialidae (alder flies)		1		1
Trichoptera (caddisflies)				
Brachycentridae	1	2	13	
Hydropsychidae	61	55	18	41
Hydroptilidae				18
Leptoceridae			9	3
Limnephilidae		1		1
Molannidae				2
Phryganeidae		1		
Polycentropodidae			5	
Coleoptera (beetles)				
Dytiscidae (total)		1		
Gyrinidae (adults)	1	1		1
Hydrophilidae (total)	1	1	1	
Dryopidae	5	1		1
Elmidae	14	18	41	13
Psephenidae (larvae)	2			
Diptera (flies)				
Athericidae	7	2	2	37
Ceratopogonidae		1		
Chironomidae	33	68	94	12
Dixidae	2	1		
Simuliidae	6	24	8	6
Stratiomyidae		1		1
Syrphidae	1	1		

Tabanidae		2	3	
Tipulidae	1	3	1	2
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	6		2	
Bithyniidae			1	
Hydrobiidae	1			
Physidae	11	1	10	4
Planorbidae		1		
Pelecypoda (bivalves)				
Sphaeriidae (clams)	4		7	6
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TOTAL INDIVIDUALS	338	399	316	253

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

METRIC	Peach Lake Creek		Campbell Creek		W.B.Rifle River		Townline Creek	
	Gallagher Road		M-33 S of M-55		M-33		Knight Road	
	8/27/2014		8/26/2014		8/12/2014		8/26/2014	
	STATION 7		STATION 8		STATION 9		STATION 10	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	27	1	33	1	31	1	28	1
NUMBER OF MAYFLY TAXA	2	0	3	0	5	1	3	1
NUMBER OF CADDISFLY TAXA	2	0	4	0	4	0	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	0	-1
PERCENT MAYFLY COMP.	2.96	-1	12.78	0	13.61	0	5.14	0
PERCENT CADDISFLY COMP.	18.34	0	14.79	0	14.24	0	25.69	0
PERCENT DOMINANT TAXON	39.35	-1	31.83	0	29.75	0	27.67	0
PERCENT ISOPOD, SNAIL, LEECH	12.72	-1	5.01	0	4.75	0	2.37	1
PERCENT SURF. AIR BREATHERS	1.18	1	2.26	1	3.48	1	1.19	1
TOTAL SCORE		-2		1		4		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, HELP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

TAXA	Rifle River Bishop Road (Grove Street) 8/11/2014 STATION 11	Rifle River US23 8/11/2014 STATION 12	Big Creek Jose Road 8/27/2014 STATION 13	Rifle River Stover Road 8/11/2014 STATION 14
ANNELIDA (segmented worms)				
Oligochaeta (worms)	3	26	3	4
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	47	35	16	4
Decapoda (crayfish)	4	2	1	1
Isopoda (sowbugs)			22	
Arachnoidea				
Hydracarina	1	5	2	1
Insecta				
Ephemeroptera (mayflies)				
Baetidae	11	35	17	29
Caenidae	1	2		3
Ephemeridae	2	2		10
Heptageniidae	8	9	17	6
Isonychiidae	6	1		
Tricorythidae	52	20		24
Odonata				
Anisoptera (dragonflies)				
Aeshnidae			8	1
Gomphidae	1	5	1	12
Zygoptera (damselflies)				
Calopterygidae	6	3	12	1
Plecoptera (stoneflies)				
Perlidae	1	5		2
Pteronarcyidae	3	1		
Hemiptera (true bugs)				
Corixidae	1	6	1	2
Gerridae	4	1	3	5
Nepidae		1		
Pleidae	2			1
Veliidae	1	1	3	6
Megaloptera				
Corydalidae (dobson flies)	1		1	
Sialidae (alder flies)	1		1	1
Trichoptera (caddisflies)				
Brachycentridae	2		14	2
Helicopsychidae	1	1		
Hydropsychidae	109	14	17	4
Hydroptilidae	1		1	3
Lepidostomatidae	1			
Leptoceridae	5	19	1	26
Limnephilidae			1	2
Philopotamidae		2		
Phryganeidae			1	
Polycentropodidae	2	5		16
Coleoptera (beetles)				
Dytiscidae (total)	1		1	
Gyrinidae (adults)		2	1	
Haliplidae (adults)				1
Hydrophilidae (total)			1	2
Psephenidae (adults)		1		
Dryopidae			4	
Elmidae	18	9	11	10
Gyrinidae (larvae)	1	1		4
Diptera (flies)				
Athericidae	4		15	
Ceratopogonidae			3	
Chironomidae	19	135	45	64
Culicidae			3	1
Simuliidae	2	12	13	1

Stratiomyidae			1	
Tabanidae	4	1	2	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	1	2		1
Bithyniidae			32	
Lymnaeidae	2			1
Physidae	20	6	18	19
Planorbidae				1
Pelecypoda (bivalves)				
Sphaeriidae (clams)	10	5	2	
TOTAL INDIVIDUALS	359	375	295	271

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, HELP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

METRIC	Rifle River Bishop Road 8/11/2014		Rifle River US23 8/11/2014		Big Creek Jose Road 8/27/2014		Rifle River Stover Road 8/11/2014	
	STATION 11		STATION 12		STATION 13		STATION 14	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	38	1	32	1	36	1	35	1
NUMBER OF MAYFLY TAXA	6	1	6	1	2	0	5	1
NUMBER OF CADDISFLY TAXA	7	1	5	1	6	1	6	1
NUMBER OF STONEFLY TAXA	2	1	2	1	0	-1	1	1
PERCENT MAYFLY COMP.	22.28	0	18.40	0	11.53	-1	26.57	1
PERCENT CADDISFLY COMP.	33.70	1	10.93	0	11.86	0	19.56	0
PERCENT DOMINANT TAXON	30.36	-1	36.00	-1	15.25	1	23.62	-1
PERCENT ISOPOD, SNAIL, LEECH	6.41	0	2.13	1	24.41	-1	8.12	0
PERCENT SURF. AIR BREATHERS	2.51	1	3.20	1	4.75	1	6.64	1
TOTAL SCORE		5		5		1		5
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		ACCEPT.		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

TAXA	Klacking Creek Morrison Road 8/26/2014 STATION 1T	Houghton Creek upstream Flynn Road 11/14/2014 STATION A	Houghton Creek downstream Flynn Road 8/13/2014 STATION B
ANNELIDA (segmented worms)			
Oligochaeta (worms)	2	7	36
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	83	9	12
Decapoda (crayfish)			1
Isopoda (sowbugs)		3	5
Arachnoidea			
Hydracarina		11	15
Insecta			
Ephemeroptera (mayflies)			
Baetidae	31	45	20
Caenidae	7		
EphemereIIDae	1	1	1
Heptageniidae	4	3	1
Tricorythidae		19	25
Odonata			
Anisoptera (dragonflies)			
Aeshnidae		1	
Zygoptera (damselflies)			
Calopterygidae		1	
Plecoptera (stoneflies)			
Nemouridae	1		
Perlidae	1		
Pteronarcyidae		1	
Hemiptera (true bugs)			
Gerridae	1		
Veliidae			1
Megaloptera			
Corydalidae (dobson flies)	1	1	
Trichoptera (caddisflies)			
Brachycentridae	1	1	
Glossosomatidae	2		
Hydropsychidae	56	7	27
Hydroptilidae		1	2
Lepidostomatidae		1	
Leptoceridae			1
Limnephilidae	1	1	
Molannidae		1	
Phryganeidae			1
Polycentropodidae	15		
Uenoidae	1		
Coleoptera (beetles)			
Gyrinidae (adults)	1		
Hydrophilidae (total)		3	1
Dryopidae	1	1	
Elmidae	13	5	4
Diptera (flies)			
Athericidae	2	2	1
Ceratopogonidae	2	1	
Chironomidae	60	227	171
Simuliidae	49	9	11
Tabanidae		1	
Tipulidae		4	8
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)			3
Lymnaeidae			1
Physidae	3	6	11
Planorbidae		1	
Pelecypoda (bivalves)			
Sphaeriidae (clams)		4	12

TOTAL INDIVIDUALS

339

378

371

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

METRIC	Klacking Creek		Houghton Creek		Houghton Creek	
	Morrison Road		u-s Flynn Road		d-s Flynn Road	
	8/26/2014		11/14/2014		8/13/2014	
	STATION 1T		STATION A		STATION B	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	24	0	30	1	24	0
NUMBER OF MAYFLY TAXA	4	1	4	1	4	1
NUMBER OF CADDISFLY TAXA	6	1	6	1	4	0
NUMBER OF STONEFLY TAXA	2	1	1	1	0	-1
PERCENT MAYFLY COMP.	12.68	0	17.99	0	12.67	0
PERCENT CADDISFLY COMP.	22.42	0	3.17	-1	8.36	0
PERCENT DOMINANT TAXON	24.48	0	60.05	-1	46.09	-1
PERCENT ISOPOD, SNAIL, LEECH	0.88	1	2.65	1	5.39	0
PERCENT SURF. AIR BREATHERS	0.59	1	0.79	1	0.54	1
TOTAL SCORE		5		4		0
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, HELP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

Rifle River	
Forest Lake Drive	
8/11/2014	
TAXA	STATION 2T
<hr/> <hr/>	
ANNELIDA (segmented worms)	
Oligochaeta (worms)	2
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	119
Decapoda (crayfish)	11
Arachnoidea	
Hydracarina	1
Insecta	
Ephemeroptera (mayflies)	
Caenidae	1
Ephemeridae	4
Heptageniidae	3
Isonychiidae	3
Tricorythidae	12
Odonata	
Anisoptera (dragonflies)	
Aeshnidae	1
Gomphidae	1
Zygoptera (damselflies)	
Calopterygidae	9
Plecoptera (stoneflies)	
Perlidae	1
Hemiptera (true bugs)	
Corixidae	45
Veliidae	2
Megaloptera	
Corydalidae (dobson flies)	1
Sialidae (alder flies)	1
Trichoptera (caddisflies)	
Brachycentridae	2
Helicopsychidae	7
Hydropsychidae	27
Polycentropodidae	1
Coleoptera (beetles)	
Dytiscidae (total)	1
Hydrophilidae (total)	1
Elmidae	10
Gyrinidae (larvae)	1
Psephenidae (larvae)	2
Diptera (flies)	
Athericidae	1
Chironomidae	13
Tabanidae	2
MOLLUSCA	
Gastropoda (snails)	
Ancylidae (limpets)	4
Physidae	69
Pelecypoda (bivalves)	
Sphaeriidae (clams)	1
<hr/> <hr/>	
TOTAL INDIVIDUALS	359

Table 2B. Qualitative macroinvertebrate sampling results for the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

Rifle River		
Forest Lake Drive		
8/11/2014		
STATION 2T		
METRIC	Value	Score
TOTAL NUMBER OF TAXA	32	1
NUMBER OF MAYFLY TAXA	5	1
NUMBER OF CADDISFLY TAXA	4	1
NUMBER OF STONEFLY TAXA	1	1
PERCENT MAYFLY COMP.	6.41	-1
PERCENT CADDISFLY COMP.	10.31	0
PERCENT DOMINANT TAXON	33.15	-1
PERCENT ISOPOD, SNAIL, LEECH	20.33	-1
PERCENT SURF. AIR BREATHERS	13.65	0
 TOTAL SCORE		 1
MACROINV. COMMUNITY RATING		ACCEPT.

Table 3. Habitat evaluation for selected streams within the Rifle River Watershed, NLAf Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

	Gamble Creek Ranch Road GLIDE/POOL STATION 1	Oyster Creek Weir Road GLIDE/POOL STATION 2
HABITAT METRIC		
Substrate and Instream Cover		
Epifaunal Substrate/ Avail Cover (20)	10	12
Embeddedness (20)*		
Velocity/Depth Regime (20)*		
Pool Substrate Characterization (20)**	16	13
Pool Variability (20)**	11	3
Channel Morphology		
Sediment Deposition (20)	10	5
Flow Status - Maint. Flow Volume (10)	10	10
Flow Status - Flashiness (10)	6	6
Channel Alteration (20)	18	16
Frequency of Riffles/Bends (20)*		
Channel Sinuosity (20)**	13	8
Riparian and Bank Structure		
Bank Stability (L) (10)	10	10
Bank Stability (R) (10)	10	10
Vegetative Protection (L) (10)	9	7
Vegetative Protection (R) (10)	9	7
Riparian Veg. Zone Width (L) (10)	10	4
Riparian Veg. Zone Width (R) (10)	10	10
TOTAL SCORE (200):	152	121

HABITAT RATING:

GOOD
(SLIGHTLY
IMPAIRED)

GOOD
(SLIGHTLY
IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/12/2014	8/12/2014
Weather:	Cloudy	Cloudy
Air Temperature:	65 Deg. F.	65 Deg. F.
Water Temperature:	59 Deg. F.	61 Deg. F.
Ave. Stream Width:	18.4 Feet	15.5 Feet
Ave. Stream Depth:	1.3 Feet	1.2 Feet
Surface Velocity:	1.5 Ft./Sec.	2.1 Ft./Sec.
Estimated Flow:	35.88 CFS	39.06 CFS
Stream Modifications:	None	None
Nuisance Plants (Y/N):	N	N
Report Number:		
STORET No.:	650137	650118
Stream Name:	Gamble Creek	Oyster Creek
Road Crossing/Location:	Ranch Rd	Weir Road
County Code:	65	65
TRS:	23N03E2	23N03E02
Latitude (dd):	44.41474	44.41159
Longitude (dd):	-84.02864	-84.03547
Ecoregion:	NLAF	NLAF
Stream Type:	Coldwater	Coldwater
USGS Basin Code:	4080101	4080101

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for selected streams in the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

	Wilkins Creek Townline Road RIFFLE/RUN STATION 3	Bailer Creek Morrison Road GLIDE/POOL STATION 4	CK Eddy Creek Cook Road GLIDE/POOL STATION 5	Rifle Creek M55 RIFFLE/RUN STATION 6	Peach Lake Creek Gallagher Road RIFFLE/RUN STATION 7
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	7	16	11	19	16
Embeddedness (20)*	8			15	13
Velocity/Depth Regime (20)*	20			13	13
Pool Substrate Characterization (20)**		13	8		
Pool Variability (20)**		5	3		
Channel Morphology					
Sediment Deposition (20)	8	13	16	15	13
Flow Status - Maint. Flow Volume (10)	10	7	10	10	8
Flow Status - Flashiness (10)	4	6	9	7	8
Channel Alteration (20)	20	18	13	18	18
Frequency of Riffles/Bends (20)*	18			18	15
Channel Sinuosity (20)**		8	6		
Riparian and Bank Structure					
Bank Stability (L) (10)	10	7	9	9	6
Bank Stability (R) (10)	10	8	9	9	6
Vegetative Protection (L) (10)	7	10	7	9	9
Vegetative Protection (R) (10)	7	10	7	9	9
Riparian Veg. Zone Width (L) (10)	10	6	10	7	5
Riparian Veg. Zone Width (R) (10)	10	4	4	10	5
TOTAL SCORE (200):	149	131	122	168	144
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).					
Date:	8/12/2014	8/26/2014	8/26/2014	8/25/2014	8/27/2014
Weather:	Cloudy	Partly Cloudy	Cloudy	Cloudy	Sunny
Air Temperature:	65 Deg. F.	74 Deg. F.	80 Deg. F.	80 Deg. F.	80 Deg. F.
Water Temperature:	52 Deg. F.	61 Deg. F.	67 Deg. F.	68 Deg. F.	64 Deg. F.
Ave. Stream Width:	17.1 Feet	4.2 Feet	6.7 Feet	20.4 Feet	8.9 Feet
Ave. Stream Depth:	1.6 Feet	0.19 Feet	0.96 Feet	0.6 Feet	0.32 Feet
Surface Velocity:	0.9 Ft./Sec.	1.2 Ft./Sec.	0.7 Ft./Sec.	3.2 Ft./Sec.	1.4 Ft./Sec.
Estimated Flow:	24.624 CFS	0.9576 CFS	4.5024 CFS	39.168 CFS	3.9872 CFS
Stream Modifications:	None	None	Dredged	Impounded	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	650108	650079	650136	650138	650080
Stream Name:	Wilkins Creek	Bailer Creek	CK Eddy Creek	Rifle Creek	Peach Lake Creek
Road Crossing/Location:	Townline Road	Morrison Road	Cook Road	M55	Gallagher Road
County Code:	65	65	65	65	65
TRS:	23N02E12	23N03E19	22N02E31	22N02E20	22N02E36
Latitude (dd):	44.40348	44.37159	44.26136	44.27733	44.26259
Longitude (dd):	-84.12646	-84.10617	-84.22551	-84.20787	-84.13091
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater		Coldwater	Coldwater	Coldwater
USGS Basin Code:	4080101	4080101	4080101	4080101	4080101

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for selected streams in the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

	Campbell Creek M-33 S of M-55 RIFFLE/RUN STATION 8	W.B. Rifle River M-33 GLIDE/POOL STATION 9	Townline Creek Knight Road RIFFLE/RUN STATION 10	Klacking Creek Morrison Road RIFFLE/RUN STATION 11
HABITAT METRIC				
Substrate and Instream Cover				
Epifaunal Substrate/ Avail Cover (20)	17	16	15	19
Embeddedness (20)*	13		18	15
Velocity/Depth Regime (20)*	13		13	13
Pool Substrate Characterization (20)**		14		
Pool Variability (20)**		13		
Channel Morphology				
Sediment Deposition (20)	15	15	11	15
Flow Status - Maint. Flow Volume (10)	8	10	8	10
Flow Status - Flashiness (10)	4	5	7	7
Channel Alteration (20)	19	20	20	16
Frequency of Riffles/Bends (20)*	13		16	18
Channel Sinuosity (20)**		13		
Riparian and Bank Structure				
Bank Stability (L) (10)	6	10	7	9
Bank Stability (R) (10)	5	10	7	9
Vegetative Protection (L) (10)	9	8	8	9
Vegetative Protection (R) (10)	9	8	8	9
Riparian Veg. Zone Width (L) (10)	9	8	10	3
Riparian Veg. Zone Width (R) (10)	9	9	10	10
TOTAL SCORE (200):	149	159	158	162
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	8/26/2014	8/12/2014	8/26/2014	8/26/2014
Date:	8/26/2014	8/12/2014	8/26/2014	8/26/2014
Weather:	Cloudy	Rainy	Partly Cloudy	Cloudy
Air Temperature:	75 Deg. F.	65 Deg. F.	84 Deg. F.	75 Deg. F.
Water Temperature:	62 Deg. F.	65 Deg. F.	65 Deg. F.	55 Deg. F.
Ave. Stream Width:	17.4 Feet	33.1 Feet	8.7 Feet	14.7 Feet
Ave. Stream Depth:	0.9 Feet	1.6 Feet	0.7 Feet	0.9 Feet
Surface Velocity:	0.5 Ft./Sec.	1.8 Ft./Sec.	0.8 Ft./Sec.	1.4 Ft./Sec.
Estimated Flow:	7.83 CFS	95.328 CFS	4.872 CFS	18.522 CFS
Stream Modifications:	None	None	None	Bank Stabilization
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	650075	650125	60103	650070
Stream Name:	Campbell Creek	West Branch Rifle River	Townline Creek	Klacking Creek
Road Crossing/Location:	M-33 S of M-55	M-33	Knight Road	Morrison Road
County Code:	65	65	06	65
TRS:	22N03E30	22N02E36	20N04E25	22N03E06
Latitude (dd):	44.263611	44.25536	44.09844	44.32798
Longitude (dd):	-84.125555	-84.1255	-83.93644	-84.10402
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Warmwater	Coldwater	Coldwater
USGS Basin Code:	4080101	4080101	4080101	4080101

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for selected streams in the Rifle River Watershed, HELP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

	Rifle River Bishop Road RIFLE/RUN STATION 11	Rifle River US23 RIFLE/RUN STATION 12	Big Creek Jose Road GLIDE/POOL STATION 13	Rifle River Stover Road GLIDE/POOL STATION 14	Rifle River Forest Lake Drive RIFLE/RUN STATION 2T
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	16	15	3	6	18
Embeddedness (20)*	20	19			20
Velocity/Depth Regime (20)*	20	20			15
Pool Substrate Characterization (20)**			7	10	
Pool Variability (20)**			3	3	
Channel Morphology					
Sediment Deposition (20)	18	20	3	15	18
Flow Status - Maint. Flow Volume (10)	10	9	7	10	10
Flow Status - Flashiness (10)	5	8	1	4	6
Channel Alteration (20)	20	20	13	18	20
Frequency of Riffles/Bends (20)*	18	17			18
Channel Sinuosity (20)**			1	8	
Riparian and Bank Structure					
Bank Stability (L) (10)	9	9	3	8	9
Bank Stability (R) (10)	5	9	3	9	9
Vegetative Protection (L) (10)	8	7	4	4	9
Vegetative Protection (R) (10)	5	7	3	9	8
Riparian Veg. Zone Width (L) (10)	10	4	10	3	10
Riparian Veg. Zone Width (R) (10)	4	4	1	10	3
TOTAL SCORE (200):	168	168	62	117	173
HABITAT RATING:	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/11/2014	8/11/2014	8/27/2014	8/11/2014	8/11/2014
Weather:	Cloudy	Cloudy	Cloudy	Partly Cloudy	Rainy
Air Temperature:	70 Deg. F.	69 Deg. F.	60 Deg. F.	75 Deg. F.	70 Deg. F.
Water Temperature:	68 Deg. F.	Deg. F.	63 Deg. F.	Deg. F.	67 Deg. F.
Ave. Stream Width:	86 Feet	93.9 Feet	18 Feet	120.3 Feet	99.5 Feet
Ave. Stream Depth:	1.8 Feet	0.94 Feet	0.42 Feet	1.7 Feet	1.5 Feet
Surface Velocity:	2.5 Ft./Sec.	2.8 Ft./Sec.	1.1 Ft./Sec.	1.3 Ft./Sec.	2.1 Ft./Sec.
Estimated Flow:	387 CFS	247.1448 CFS	8.316 CFS	265.863 CFS	313.425 CFS
Stream Modifications:	None	None	Dredged	Bank Stabilization	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	60076	60158	60159	60081	60148
Stream Name:	Rifle River	Rifle River	Big Creek	Rifle River	Rifle River
Road Crossing/Location:	Bishop Road (Grove Street	US23	Jose Road	Stover Road	Forest Lake Drive
County Code:	06	06	06	06	06
TRS:	19N04E03	19N05E15	19N06E5	19N05E36	20N04E18
Latitude (dd):	44.08152	44.04774	44.06993	44.00436	44.12859
Longitude (dd):	-83.9672	-83.85607	-83.77604	-83.82497	-84.04681
Ecoregion:	HELP	HELP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater		Warmwater	Coldwater
USGS Basin Code:	4080101	4080101	4080101	4080101	4080101

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for selected streams in the Rifle River Watershed, SMNITP Ecoregion, located in Arenac and Ogemaw Counties, August 2014.

	Houghton Creek upstream Flynn Road GLIDE/POOL STATION A	Houghton Creek downstream Flynn Road RIFFLE/RUN STATION B
HABITAT METRIC		
Substrate and Instream Cover		
Epifaunal Substrate/ Avail Cover (20)	10	17
Embeddedness (20)*		16
Velocity/Depth Regime (20)*		18
Pool Substrate Characterization (20)**	18	
Pool Variability (20)**	13	
Channel Morphology		
Sediment Deposition (20)	8	16
Flow Status - Maint. Flow Volume (10)	10	10
Flow Status - Flashiness (10)	7	9
Channel Alteration (20)	18	18
Frequency of Riffles/Bends (20)*		18
Channel Sinuosity (20)**	8	
Riparian and Bank Structure		
Bank Stability (L) (10)	7	7
Bank Stability (R) (10)	7	9
Vegetative Protection (L) (10)	8	7
Vegetative Protection (R) (10)	8	7
Riparian Veg. Zone Width (L) (10)	10	9
Riparian Veg. Zone Width (R) (10)	10	3
TOTAL SCORE (200):	142	164

HABITAT RATING: **GOOD** **EXCELLENT**
 (SLIGHTLY (NON-
 IMPAIRED) IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/13/2014	8/13/2014
Weather:	Sunny	Sunny
Air Temperature:	75 Deg. F.	65 Deg. F.
Water Temperature:	54 Deg. F.	54 Deg. F.
Ave. Stream Width:	23.5 Feet	26.2 Feet
Ave. Stream Depth:	1.1 Feet	1 Feet
Surface Velocity:	2.46 Ft./Sec.	1.8 Ft./Sec.
Estimated Flow:	63.591 CFS	47.16 CFS
Stream Modifications:	Bank Stabilization	None
Nuisance Plants (Y/N):	N	N
Report Number:		
STORET No.:	650134	650135
Stream Name:	Houghton Creek	Houghton Creek
Road Crossing/Location:	upstream Flynn Road	downstream Flynn Road
County Code:	65	65
TRS:	23N03E5	23N03E05
Latitude (dd):	44.40826	44.40826
Longitude (dd):	-84.09619	-84.09619
Ecoregion:	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater
USGS Basin Code:	4080101	4080101

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys