FRESHWATER MUSSEL STUDY FOR THE GILE FLOWAGE STORAGE RESERVOIR

FERC No. 15055

Prepared for:

Mead & Hunt

1702 Lawrence Drive
De Pere, WI 54115

Project No.: 16081
Date: 9/16/2022

Prepared by:

EnviroScience
Excellence In Any Environment

5070 Stow Rd.
Stow, OH 44224
800-940-4025
www.EnviroScienceInc.com

Freshwater Mussel Study for the Gile Flowage Storage Reservoir

Initial Study Report

Document Date: 9/16/2022
Project No.: 16081

Prepared for: Mr. Shawn Puzen
Mead & Hunt

Authorization for Release

The analyses, opinions, and conclusions in this document are based entirely on EnviroScience's unbiased, professional judgment. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study.

To the best of their knowledge, the undersigned attest that this document and the information contained herein are accurate and conform to EnviroScience's internal Quality Assurance standards.

Emily Grossman
Senior Scientist | Field Manager

Becca Winterringer
Senior Scientist | Project Manager

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACKNOWLEDGEMENTS

Xcel Energy provided funding for the project through Mead & Hunt. Mr. Shawn Puzen was the point of contact for Mead & Hunt, and Mr. Matthew Miller was the point of contact for Xcel Energy. The project manager for EnviroScience, Inc. was Ms. Becca Winterringer. The field lead and Wisconsin permitted malacologist was Ms. Emily Grossman. Also assisting with the survey effort were Mr. Robert Williams, Mr. Ben Ebert, Mr. Paul Moreno, and Mr. Matt Gilkay. Ms. Grossman authored the report, which was reviewed by Ms. Winterringer and Ms. Melissa Vaccarino.

1.0 INTRODUCTION

Northern States Power Company, a Wisconsin corporation (NSPW or applicant), owns and operates the Gile Flowage Storage Project (Project) located on the West Fork Montreal River in the town of Gile, Wisconsin (Figure 1). NSPW is applying for an original license from the Federal Energy Regulatory Commission (FERC or Commission) to continue to operate and maintain the Project (FERC Project No. 15055). As part of the federal licensing process, NSPW is required to evaluate existing freshwater mussel resources and the potential impacts from project operations on said resources. Thus, EnviroScience, Inc. was contracted by Mead & Hunt to perform freshwater mussel studies at the Gile Flowage.

Freshwater mussels have the potential to be affected by Project operations and maintenance. More specifically, flow modification downstream of the Project may alter mussel habitat and reservoir drawdowns may result in mussel stranding. There is no existing mussel data available for the West Fork Montreal River. However, two species, Cylindrical Papershell (*Anodontoides ferussacianus*) and Eastern Elliptio (*Elliptio complanata*), have been reported in the Montreal River, which is the receiving waterbody of the West Fork (WDNR, 2022).

The Wisconsin Department of Natural Resources (WDNR) and River Alliance of Wisconsin (RAW) requested that a mussel survey be conducted as part of the FERC licensing process due to the potential effects of Project operation on mussel species. The objective of the survey was to characterize mussel habitat and determine mussel abundance and species richness in the Project vicinity. This survey provides baseline data on mussel resources and habitat conditions observed within the Project area.

2.0 METHODS

Mussel survey methods were developed following the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). The study included surveys of two riverine reaches and one within the main basin of the reservoir (Figure 1). For the riverine reaches, Reach 1 (upstream reach) began near the Sucker Hole Boat Landing and extended 1,000 meters (m) upstream, while Reach 2 (downstream reach) began at the Project tailrace and extended 1,000 m downstream.

Surveys were led by a WDNR permitted malacologist and were conducted according to the survey plan approved by WDNR (Appendix A).

2.1 RIVERINE SURVEYS

A series of transects extending bank to bank was established every 100 m, creating 10 possible transects per reach. Transects were numbered sequentially from downstream to upstream, and a random number generating function in Microsoft Excel was used to select five transects for sampling within each reach. If a randomly selected transect fell within a hazardous area (e.g., Gile Falls), the nearest accessible transect was sampled in its place.

Searches along each sampled transect were conducted in 10-m segments and extended 0.5 m on each side of the transect line. Each transect was evaluated for mussels using an adaptive sampling approach. A rapid visual search was conducted first, which entailed an initial search of 0.2 minutes per m^2 (min/m^2) along each 10-m segment to determine if mussels were present (i.e., living or shell material). If mussels were present in a segment, a semi-quantitative search was

triggered, and the search time was extended to 1 min/m^2. If no mussels or mussel evidence were observed in the rapid visual search, no additional effort was expended in that segment. During the semi-quantitative search, divers visually searched the area, probed the substrate, and turned over rocks to detect small, burrowed mussels.

General stream conditions and morphology were recorded within the study area. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.; Wentworth, 1922) were recorded for each 10-m transect segment. In addition, a general description of mussel habitat characteristics in the Project boundary was recorded.

2.2 RESERVOIR SURVEY

Reservoir sampling conducted in the Gile Flowage consisted of qualitative searches (Phase 1) and quantitative samples (Phase 2). Phase 1 included an initial reconnaissance-level habitat survey to determine if mussels were present in the reservoir. Eight sites were identified for evaluation in the mussel study plan provided by Mead & Hunt (Figure 1). A reconnaissance was conducted in the vicinity of each of the eight identified sites to detect shells or live mussels in areas of the littoral zone with the most suitable substrate. Whenever mussels were documented, a minimum of 8 person-hours (one person-hour at each of the eight sites) were spent conducting timed searches to establish a species list and inform the need for more intensive quantitative efforts under Phase 2.

Searches were divided into 15-min increments to facilitate development of a species richness curve. Half of the survey effort (four locations) was spent in littoral areas subject to winter drawdowns (between 1490.0 and 1483.0 feet [ft] NGVD) and the remaining effort (four locations) was spent in deeper areas (between 1483.0 and 1475.0 ft NGVD) (Figure 1).

Phase 2 involved quantitative sampling at those locations where mussel abundance was highest during the Phase 1 surveys. The team malacologist contacted WDNR with preliminary Phase 1 results to determine the extent to which quantitative surveys were necessary and then conducted abbreviated Phase 2 surveys as approved by WDNR. Abbreviated Phase 2 sampling was conducted at three locations where mussels were present during Phase 1. A 50-m transect was established within the Phase 1 search area and one 0.25-m^2 quantitative sample was collected in each 5-m transect segment for a total of 10 samples (2.5 m^2) per location.

2.3 DATA AND MUSSEL HANDLING

Live mussels were kept submersed in ambient river water and kept cool and moist during processing. All live mussels were identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens were scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species were recorded. Datasheets were populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of the mussel study plan provided by Mead & Hunt. Mussel taxonomy followed the names presented by Williams et al., 2017.

3.0 RESULTS AND DISCUSSION

The mussel survey was conducted June 22 – 26, 2022. The Gile Flowage reservoir elevation was 1489.46 ft NGVD throughout the survey period. There are no gauging stations present on the West Fork Montreal River, but discharge was normal to low for most other streams in the region. Maximum visibility was approximately 1 m and the surface water temperature ranged from approximately 22.2°C (72°F) to 24.4°C (76°F). Photographs of sampling sites and species encountered are provided in Appendix B.

3.1 RIVERINE SURVEYS

Habitat conditions varied among the two riverine reaches. Habitat in Reach 1 was characterized by soft, silty substrate and very slow flow, while Reach 2 consisted of coarse substrate and swift flow. Mussels were scarce in both reaches.

3.1.1 Reach 1 (Upstream)

Reach 1 was situated at the southern end of the reservoir where the West Fork Montreal River flows into the flowage. Surrounding land use was primarily forested (54%; USEPA, 2022a). Large boulders and rock outcrops were scattered throughout the area. Streamflow velocity was not measured due to unobservable flow throughout the entire reach. Transects 2, 4, 5, 8, and 9 were randomly selected for sampling in Reach 1. Transects 8 and 9 were the upstream-most transects and were located within a narrow reach where the wetted width of the channel was approximately 20 m (66 ft). Patches of emergent vegetation were present on both banks. Water depth ranged from 1.2 m (4 ft) to 1.8 m (6 ft). Substrate in Transects 8 and 9 consisted of large boulders interspersed with cobble, gravel, sand, and silt (Table 1; Figure 2).

Transects 2, 4, and 5 were located in the upper portion of the reservoir and were considerably wider with transect length varying between 120 m (394 ft) and 240 m (787 ft). Emergent aquatic vegetation was present along both banks. Transect 5 was bisected by an approximately 15-m-wide (49-ft) strip of exposed lakebed and emergent vegetation (Figure 2). Water depth generally increased with distance downstream and reached a maximum of 4.6 m (15 ft) along the right descending bank at Transect 4. Substrate along Transects 4 and 5 contained some boulder and silt with submerged aquatic vegetation. Substrate along Transect 2 was exclusively deep silt and clay (Table 1; Figure 2). A visible water line was present along the right descending bank in the vicinity of Transect 4, marking previous lake levels/drawdown effects (Appendix B, Photo 3).

A single live Paper Pondshell (*Utterbackia imbecillis*) was collected along Transect 2 approximately 80 m (591 ft) from the left descending bank (Figure 3). No other evidence of mussels was observed in Reach 1. Mussel information and a summary of the survey effort are provided in Table 2.

3.1.2 Reach 2 (Downstream)

Reach 2 was located downstream of the Project tailrace. Surrounding land use was primarily forest (58%) and low intensity residential (15%; USEPA, 2022b). The reach is bisected by Gile Falls, where the stream is constricted by steep rock walls and undergoes a rapid elevation change. Transects 1, 3, 4, 8, and 9 were randomly selected for sampling. However, Transect 4 fell within Gile Falls and therefore could not be sampled safely. Transect 5 was located at the head of the falls; therefore Transect 6 was sampled in lieu of Transect 4.

Transects 8 and 9 were the upstream-most transects sampled and both featured similar habitat conditions. Substrate was primarily sand with silt and large woody debris on the surface. Depths

ranged from 0.61 m (2 ft) to 1.52 m (5 ft). Although located downstream of the Project tailrace, this portion of Reach 2 appears to be partially impounded by the constriction at Gile Falls. Current velocity was near zero along both transects. Transect 6 was located downstream of a riffle but upstream of the falls. Substrate consisted of cobble, gravel, and sand. Streamflow was categorized as swift. Transects 1 and 3 were located downstream of the falls in riffle habitat. Substrate was considerably more coarse than upstream of the falls, consisting entirely of boulder, cobble, and gravel (Figure 4). Depth along both transects was shallow, and current velocity, although not measured directly, was swift (Table 1). A summary of effort spent in Reach 2 is provided in Table 2; no mussels, living or dead, were observed.

3.2 RESERVOIR SURVEYS

Eight locations were designated for sampling in the reservoir. Reconnaissance at each location indicated that habitat was generally more suitable for mussels near the bank. Therefore, most of the sampling was conducted near the reservoir shoreline or islands, while still ensuring that a variety of water depths were included in the surveys.

Locations 1, 2, 7, and 8 were selected for sampling as they were located in an area that would be affected by winter drawdowns (Figure 1). Water depths during timed searches at these locations did not exceed 1.5 m (5 ft; Table 3). Locations 1 and 2 were located at the southeast and southwest ends of the reservoir, respectively. Substrate in both locations consisted of cobble, gravel, sand, and silt in varying proportions, with some boulders also present in Location 1. Locations 7 and 8 were in the eastern branch of the reservoir. Substrate in most searches consisted of varying proportions of boulder, cobble, gravel, sand, and silt, though silt was somewhat more abundant in Location 8 (Figure 5).

Locations 3, 4, 5, and 6 were selected for sampling as they were located in areas that are deep enough to remain inundated under drawdown conditions (Figure 1). Water depths in these locations ranged from 2.1 m (7 ft) to 3.7 m (12 ft). Although heterogeneous substrate was present along the shoreline in the shallower searches, substrate farther from the shore, at the depths required to avoid drawdown effects, was dominated by deep silt (Table 3; Figure 5). Smaller proportions of boulder, cobble, gravel, and sand were present at Locations 4 and 5. Location 3, which was the location farthest from shore, featured large deposits of woody debris (Figure 5).

Live mussels were collected at Locations 1, 2, 5, 7, and 8; however, species diversity was low (Figures 6a-6g). A total of 57 live Paper Pondshell and one live Giant Floater (*Pyganodon grandis*) were collected during timed searches from all locations combined. Fresh dead Paper Pondshell shells were also collected at Location 4. Both Paper Pondshell and Giant Floater are common, widespread species that are tolerant of impounded conditions and soft substrates such as those observed in the reservoir.

Catch per unit effort (CPUE) at the five locations ranged from 0.03 mussels per minute to 0.45 mussels per minute and averaged 0.12 per minute across all eight locations (Table 4). Despite the shallower sampling being subject to periodic drawdowns, mussel abundance was higher at these locations. Live mussels were present at all four of the shallow sampling locations but only at one of the deeper sampling locations. The heterogeneous substrate observed near the shoreline is likely more suitable for mussel colonization than the deep silt observed farther from shore.

An abbreviated Phase 2 quantitative effort was conducted at Locations 5, 7, and 8. Quantitative sampling yielded 1 live Paper Pondshell each in both Locations 5 and 7, for a density of 0.40 mussels/m^2 in each location. No live mussels were collected in quantitative samples collected at Location 8 (Table 4). The brief Phase 2 effort supports the conclusions from the Phase 1 survey that both abundance and species richness are low in the reservoir.

4.0 CONCLUSIONS

Historic information on mussel distribution for the West Fork Montreal River is lacking. The mussel and habitat information collected from this study, to be used as baseline conditions for the Gile Flowage, indicates that mussels are uncommon and that habitat is likely the limiting factor in regard to their abundance.

Mussel abundance and diversity were low in both the riverine and reservoir locations surveyed. Only one live mussel (Paper Pondshell) was collected in the upstream riverine reach, while no evidence of mussels was observed in the downstream riverine reach. Fifty-eight (58) Paper Pondshell and one Giant Floater were collected from the reservoir sample locations. Shallower areas near the reservoir shoreline provided more suitable substrate, despite potentially being affected by periodic drawdowns. Mussel abundance was higher near the shore than in the deep silt substrate observed in samples farther from shore. Truncated quantitative sampling supported the results of the Phase 1 reservoir sampling and indicated that mussel density was very low, even in those locations that had the highest abundance timed searches.

The riverine study reaches near the Gile Flowage do not appear to provide high-quality mussel habitat. The impounded conditions and loose, unstable substrate within the reservoir and above Gile Falls are also not generally considered suitable for mussels. These reaches appear to support only a few individuals of common, tolerant species. Habitat downstream of Gile Falls consisted of large, very coarse substrate and swift current, likely preventing mussels from burrowing and maintaining position in the substrate.

5.0 REFERENCES

U.S. Environmental Protection Agency (USEPA). (2022a). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?reachcode=04010302004265&measure=0.

U.S. Environmental Protection Agency (USEPA). (2022b). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?reachcode=04010302000231&measure=0.

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *Journal of Geology, 30*, 377-392.

Williams, J. D., Bogan, A. E., Butler, R. S, Cummings, K. S., Garner, J. T., Harris, J. L., Johnson, N. A., and Watters, G. T. (2017). A revised checklist of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Wisconsin Department of Natural Resources (WDNR). (2022). Wisconsin Mussel Monitoring Program. http://wiatri.net/inventory/mussels/MusselWatersState.cfm.

Table 1. Habitat characteristics observed in Gile Project riverine surveys, West Fork Montreal River, 2022.

				Substrate Composition (%)										
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
Reach 1 (US)	T2	0-10	1.22	0	0	0	0	0	100	0	0	0	0	0
	T2	10-20	1.52	0	0	0	0	0	100	0	0	0	0	0
	T2	20-30	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	30-40	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	40-50	2.13	0	0	0	0	0	100	0	0	0	0	0
	T2	50-60	2.44	0	0	0	0	0	100	0	0	0	0	0
	T2	60-70	2.13	0	0	0	0	0	100	0	0	0	0	0
	T2	70-80	2.13	0	0	0	0	0	100	0	0	0	0	0
	T2	80-90	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	90-100	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	100-110	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	110-120	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	120-130	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	130-140	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	140-150	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	150-160	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	160-170	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	170-180	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	180-190	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	190-200	1.83	0	0	0	0	0	100	0	0	0	0	0
	T2	200-210	2.13	0	0	0	0	0	100	0	0	0	0	0
	T2	210-220	2.74	0	0	0	0	0	100	0	0	0	0	0
	T2	220-230	3.35	0	0	0	0	0	100	0	0	0	0	0
	T2	230-240	1.52	0	0	0	0	0	100	0	0	0	0	0
Reach 1 (US)	T4	0-10	0.61	0	10	0	0	0	80	0	0	10	0	0
	T4	10-20	1.22	0	10	0	0	0	80	0	0	10	0	0
	T4	20-30	2.13	0	10	0	0	0	80	0	0	10	0	0
	T4	30-40	2.13	0	10	0	0	0	80	0	0	10	0	0
	T4	40-50	1.83	0	10	0	0	0	60	0	0	30	0	0
	T4	50-60	1.22	0	10	0	0	0	60	0	0	30	0	0
	T4	60-70	1.52	0	10	0	0	0	80	0	0	10	0	0
	T4	70-80	1.52	0	10	0	0	0	80	0	0	10	0	0

Table 1. Habitat characteristics observed in Gile Project riverine surveys, West Fork Montreal River, 2022.

				Substrate Composition (%)										
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
	T4	80-90	1.52	0	10	0	0	0	80	0	0	10	0	0
Reach 1	T4	90-100	2.74	0	10	0	0	0	80	0	0	10	0	0
(US)	T4	100-110	3.35	0	30	0	0	0	60	0	0	10	0	0
	T4	110-120	4.57	0	50	0	0	0	40	0	0	10	0	0
	T5a	0-10	0.91	0	0	0	0	0	60	30	0	10	0	0
	T5a	10-20	0.91	0	0	0	0	0	60	30	0	10	0	0
	T5a	20-30	1.52	0	0	0	0	0	60	30	0	10	0	0
	T5a	30-40	2.13	0	0	0	40	0	60	0	0	0	0	0
	T5a	40-50	0.91	0	0	0	0	0	60	30	0	10	0	0
	T5b	0-10	1.22	0	20	0	0	0	40	0	0	40	0	0
Reach 1	T5b	10-20	0.91	0	20	0	0	0	40	0	0	40	0	0
(US)	T5b	20-30	1.22	0	20	0	0	0	40	0	0	40	0	0
	T5b	30-40	1.22	0	20	0	0	0	40	0	0	40	0	0
	T5b	40-50	1.22	0	20	0	0	0	40	0	0	40	0	0
	T5b	50-60	1.22	0	20	0	0	0	40	0	0	40	0	0
	T5b	60-70	0.91	0	20	0	0	0	40	0	0	40	0	0
	T5b	70-80	0.91	0	20	0	0	0	40	0	0	40	0	0
	T5b	80-85	0.61	0	20	0	0	0	40	0	0	40	0	0
Reach 1	T8	0-10	1.22	0	30	10	10	40	0	0	10	0	0	0
(US)	T8	10-20	1.22	0	30	20	20	10	20	0	0	0	0	0
Reach 1	T9	0-10	1.83	0	40	10	20	10	0	0	20	0	0	0
(US)	T9	10-20	1.52	0	30	10	30	10	20	0	0	0	0	0
Reach 2 (DS)	T1	0-10	0.30	0	50	40	10	0	0	0	0	0	0	0
Reach 2	T3	0-10	0.30	0	50	40	10	0	0	0	0	0	0	0
(DS)	T3	10-15	0.30	0	20	80	0	0	0	0	0	0	0	0

Table 1. Habitat characteristics observed in Gile Project riverine surveys, West Fork Montreal River, 2022.

				Substrate Composition (%)										
Reach	Transect/Segment		Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
Reach 2 (DS)	T6	0-10	0.61	0	0	30	30	40	0	0	0	0	0	0
	T6	10-15	0.61	0	0	40	30	20	10	0	0	0	0	0
Reach 2 (DS)	T8	0-10	1.52	0	0	20	10	30	10	0	30	0	0	0
	T8	10-20	1.07	0	0	0	20	50	0	0	30	0	0	0
	T8	20-25	0.61	0	0	0	0	50	30	0	0	20	0	0
Reach 2 (DS)	T9	0-10	0.76	0	0	0	10	70	10	0	10	0	0	0
	T9	10-20	0.61	0	0	0	0	70	10	0	20	0	0	0
	T9	20-30	0.76	0	0	0	0	60	10	0	0	30	0	0

LWD = large woody debris

Table 2. Summary of effort and mussels collected in Gile Project riverine surveys, West Fork Montreal River, 2022.

		Reach 1 (Upstream)							Reach 2 (Downstream)							Total	
Species	Common Name	T2	T4	T5	T8	T9	Total	%	T1	T3	T6	T8	T9	Total	%	Total	%
Anodontini																	
Utterbackia imbecillis	Paper Pondshell	1	-	-	-	-	1	100.0	-	-	-	-	-	-	-	1	100.0
Total Abundance		1	0	0	0	0	1	100.0	0	0	0	0	0	0	-	1	100.0
Live Species		1	0	0	0	0	1		0	0	0	0	0	0			
Effort (m^2)		240	120	135	20	20	535		10	15	15	25	30	95		630	
Surface Density (no./m^2)		0.004	0.000	0.000	0.000	0.000	0.002		0.000	0.000	0.000	0.000	0.000	0.000		0.002	

Table 3. Habitat characteristics observed in Gile Project reservoir surveys, West Fork Montreal River, 2022.

				Substrate Composition (%)										
Location	Method	Replicate	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
1	Qual.	1	1.22	0	20	0	20	30	20	0	10	0	0	0
	Qual.	2	1.22	0	10	20	20	30	20	0	0	0	0	0
	Qual.	3	1.22	0	20	10	20	20	20	0	10	0	0	0
	Qual.	4	1.22	0	10	20	30	10	30	0	0	0	0	0
2	Qual.	1	1.52	0	0	10	20	40	20	0	10	0	0	0
	Qual.	2	1.52	0	0	10	30	30	20	0	0	10	0	0
	Qual.	3	1.52	0	0	20	20	20	30	0	0	10	0	0
	Qual.	4	1.52	0	0	20	20	20	30	0	0	10	0	0
3	Qual.	1	3.66	0	0	0	0	0	20	0	60	0	0	20
	Qual.	2	3.35	0	0	0	0	0	20	0	60	0	0	20
	Qual.	3	3.35	0	0	0	0	0	20	0	60	0	0	20
	Qual.	4	3.05	0	0	0	0	0	50	0	50	0	0	0
4	Qual.	1	2.44	0	0	20	10	0	50	0	20	0	0	0
	Qual.	2	2.74	0	0	0	10	10	50	0	30	0	0	0
	Qual.	3	2.13	0	10	20	10	0	60	0	0	0	0	0
	Qual.	4	2.13	0	20	10	20	10	40	0	0	0	0	0
5	Qual.	1	2.44	0	0	0	0	0	80	20	0	0	0	0
	Qual.	2	2.44	0	0	0	0	0	95	0	5	0	0	0
	Qual.	3	2.44	0	0	30	20	20	30	0	0	0	0	0
	Qual.	4	2.44	0	0	0	0	30	30	0	20	0	0	20
	Quant.	1	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	2	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	3	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	4	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	5	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	6	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	7	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	8	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	9	2.13	0	0	0	10	0	80	0	0	10	0	0
	Quant.	10	2.13	0	0	0	10	0	80	0	0	10	0	0

Table 3. Habitat characteristics observed in Gile Project reservoir surveys, West Fork Montreal River, 2022.

				Substrate Composition (%)										
Location	Method	Replicate	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
6	Qual.	1	3.05	0	0	0	0	0	90	0	10	0	0	0
	Qual.	2	3.05	0	0	0	0	0	80	0	20	0	0	0
	Qual.	3	2.74	0	0	0	0	0	80	0	20	0	0	0
	Qual.	4	2.74	40	0	0	0	40	20	0	0	0	0	0
7	Qual.	1	1.52	0	50	30	20	0	0	0	0	0	0	0
	Qual.	2	1.52	0	30	30	30	10	0	0	0	0	0	0
	Qual.	3	1.52	0	0	0	0	10	30	0	0	60	0	0
	Qual.	4	1.52	0	10	20	20	10	30	0	10	0	0	0
	Quant.	1	1.83	0	30	20	0	0	50	0	0	0	0	0
	Quant.	2	1.83	0	30	10	0	0	60	0	0	0	0	0
	Quant.	3	1.83	0	50	10	0	0	40	0	0	0	0	0
	Quant.	4	1.83	0	20	10	0	0	70	0	0	0	0	0
	Quant.	5	1.83	0	20	10	0	0	60	0	10	0	0	0
	Quant.	6	1.83	0	70	0	0	0	30	0	0	0	0	0
	Quant.	7	1.52	0	30	30	0	0	40	0	0	0	0	0
	Quant.	8	1.52	0	10	30	0	0	60	0	0	0	0	0
	Quant.	9	1.52	0	50	10	0	0	40	0	0	0	0	0
	Quant.	10	1.52	0	50	10	0	0	40	0	0	0	0	0
8	Qual.	1	1.52	0	0	0	40	40	0	0	20	0	0	0
	Qual.	2	1.52	0	5	5	10	20	60	0	0	0	0	0
	Qual.	3	1.52	0	20	0	0	0	40	0	40	0	0	0
	Qual.	4	1.52	40	0	0	0	0	20	0	40	0	0	0
	Quant.	1	1.52	0	10	0	0	10	60	0	20	0	0	0
	Quant.	2	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	3	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	4	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	5	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	6	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	7	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	8	1.52	0	0	0	0	10	60	0	30	0	0	0
	Quant.	9	1.52	0	20	0	0	0	50	0	20	10	0	0
	Quant.	10	1.52	0	20	0	0	0	70	0	0	10	0	0

Qual. = qualitative samples, Quant. = quantitative samples, LWD = large woody debris

Table 4. Mussels collected in Gile Flowage reservoir surveys, West Fork Montreal River, 2022.

		Location											Total	
		1	2	3	4	5		6	7		8			
Species	Common Name	Qual.	Qual.	Qual.	Qual.	Qual.	Quant.	Qual.	Qual.	Quant.	Qual.	Quant.	Total	%
Anodontini														
Pyganodon grandis	Giant Floater	-	-	-	-	-	-	-	-	-	1	-	1	1.7
Utterbackia imbecillis	Paper Pondshell	2	9	-	FD	12	1	-	27	1	5	-	57	98.3
Total Abundance		2	9	0	0	12	1	0	27	1	6	0	58	100.0
Live Species		1	1	0	0	0	1	0	1	1	2	0		
Effort (min)		60	60	60	60	60	-	60	60	-	60	-	480	
CPUE (no./min)		0.03	0.15	0.00	0.00	0.20	-	0.00	0.45	-	0.10	-	0.12	
Effort (m^2)		-	-	-	-	-	2.5	-	-	2.5	-	2.5	7.5	
Density (no./m^2)		-	-	-	-	-	0.40	-	-	0.40	-	0.00	0.27	

Qual. = qualitative samples, quant. = quantitative samples, FD = fresh dead shell

Reach 2
46.428876, -90.227982

Reach 1
46.368319, -90.243399

1
2
3
4
5
6
7
8

Figure 1. Gile Project Location on USGS 7.5-minute Topographic Map of Ironwood and Pine Lake Quadrangles. Iron County, Wisconsin.

Reservoir Sampling Locations

Riverine Reach Study Area

0 2,500 5,000 10,000 Feet

0 750 1,500 3,000 Meters

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map1_Location_Gile.mxd

Basemap courtesy of National Geographic Society (2013).

Figure 2. Substrate and Depth for the Gile Project Reach One on the West Fork Montreal River. Iron County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map2_Substrate_R1_Gile.mxd

Basemap courtesy of Esri.

Figure 3. Mussel Abundance for the
Gile Project Reach One
on the West Fork Montreal River.
Iron County, Wisconsin.

Survey Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map5_Mussels_R1_Gile.mxd

Figure 4. Substrate and Depth for the Gile Project Reach Two on the West Fork Montreal River. Iron County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Basemap courtesy of Esri.

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map3_Substrate_R2_Gile.mxd

Location 5

5

Observed Substrate (%)

- Bedrock
- Boulder
- Clay
- Cobble
- Detritus
- Gravel
- Sand
- Silt
- Vegetation
- Wood

Depth (m)

- 0.30 - 0.61
- 0.62 - 1.07
- 1.08 - 1.52
- 1.53 - 2.74
- 2.75 - 4.57

Figure 5a. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Date: 8/18/2022

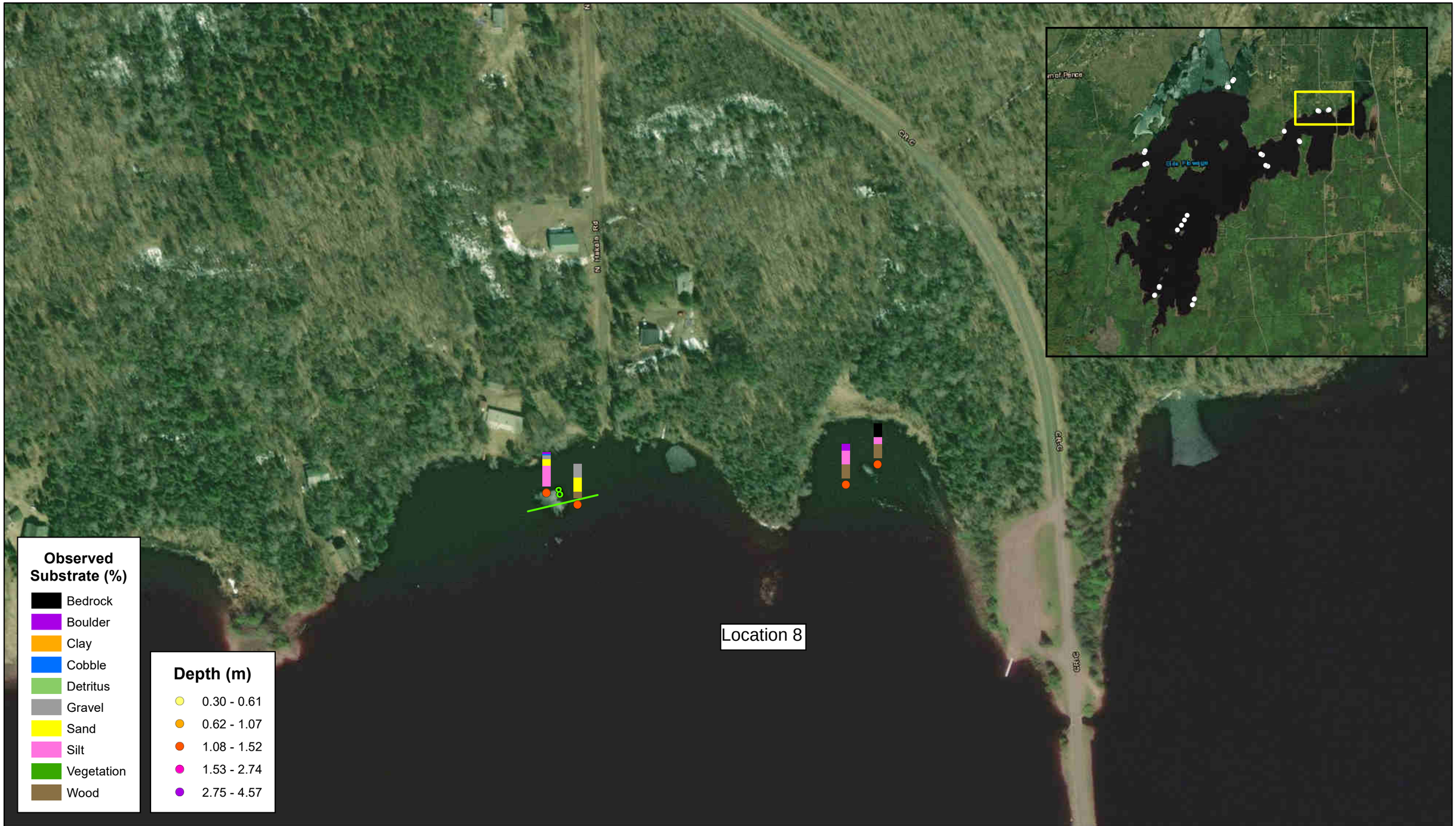


Figure 5b. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Basemap courtesy of Esri.

Figure 5c. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Basemap courtesy of Esri.

Figure 5d. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

EnviroScience Excellence In Any Environment

Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Date: 8/18/2022

Basemap courtesy of Esri.

Figure 5e. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

EnviroScience
Excellence In Any Environment

Basemap courtesy of Esri.

Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd
Date: 8/18/2022

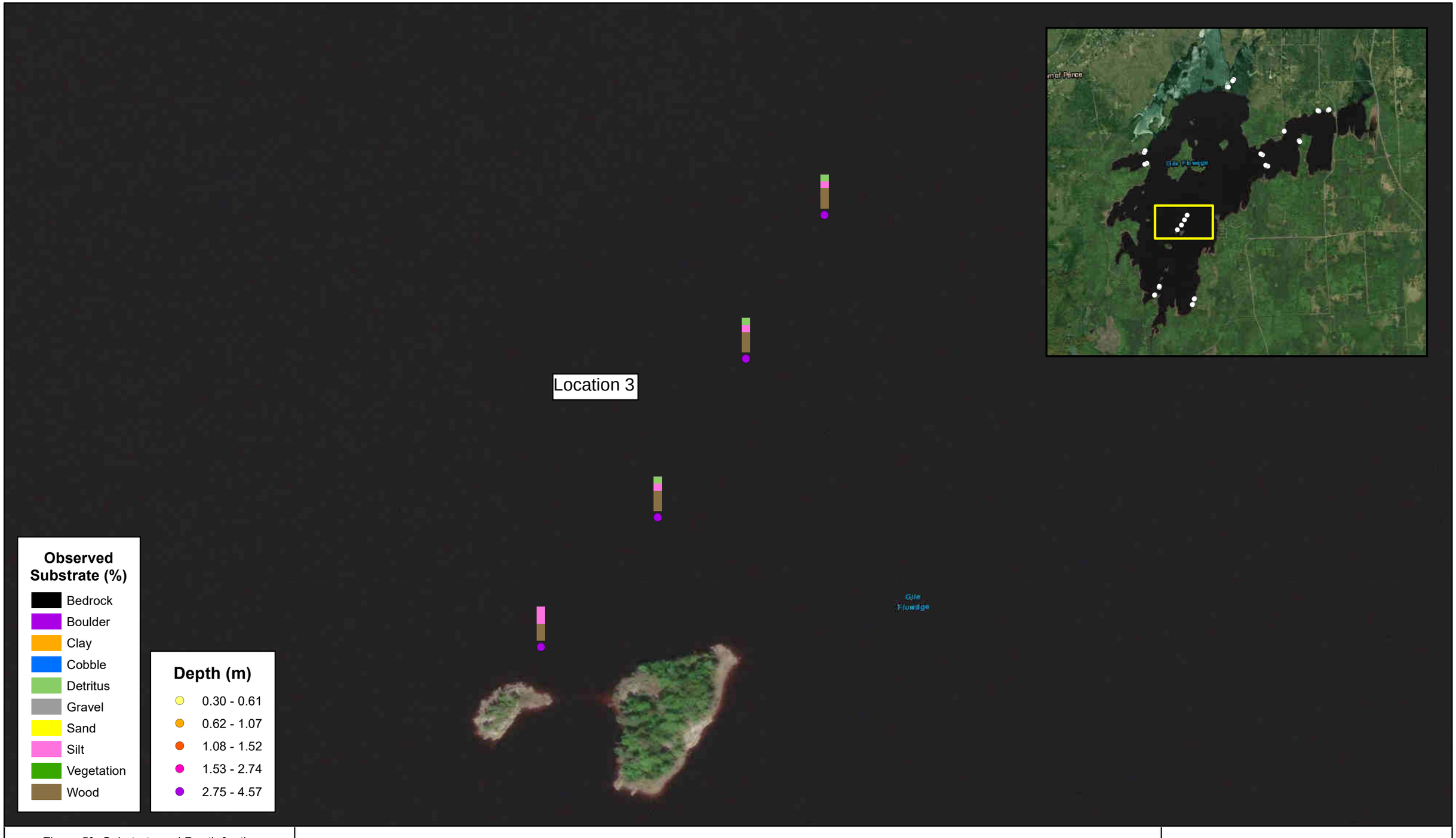


Figure 5f. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\116082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Location 2

Location 1

Gile Flowage

Gile Flowage

Gile Flowage

Observed Substrate (%)

- Bedrock
- Boulder
- Clay
- Cobble
- Detritus
- Gravel
- Sand
- Silt
- Vegetation
- Wood

Depth (m)

- 0.30 - 0.61
- 0.62 - 1.07
- 1.08 - 1.52
- 1.53 - 2.74
- 2.75 - 4.57

Figure 5g. Substrate and Depth for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Substrate_Quan_Gile.mxd

Basemap courtesy of Esri.

Mussel Abundance (No. Live)

- 0
- 1 - 3
- 4 - 5
- 6 - 7
- 8 - 20

Location 5

Figure 6a. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Basemap courtesy of Esri.

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Mussel Abundance (No. Live)

- 0
- 1 - 3
- 4 - 5
- 6 - 7
- 8 - 20

N Hazel Rd

CR C

CR C

CR C

Location 8

Figure 6b. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Basemap courtesy of Esri.

Figure 6c. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

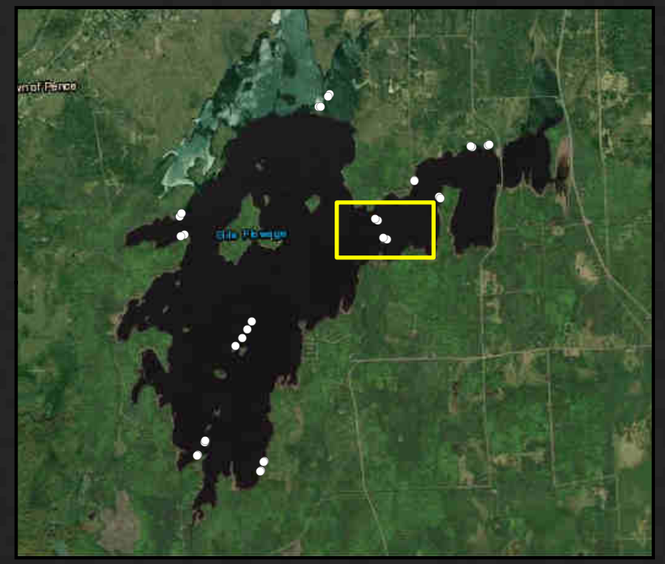
EnviroScience
Excellence In Any Environment

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Basemap courtesy of Esri.

Mussel Abundance (No. Live)

- 0
- 1 - 3
- 4 - 5
- 6 - 7
- 8 - 20



Location 6

Gile Flowage

Figure 6d. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Date: 8/7/2022

Mussel Abundance (No. Live)

- 0
- 1 - 3
- 4 - 5
- 6 - 7
- 8 - 20

Location 4

Gile Flowage

Figure 6e. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

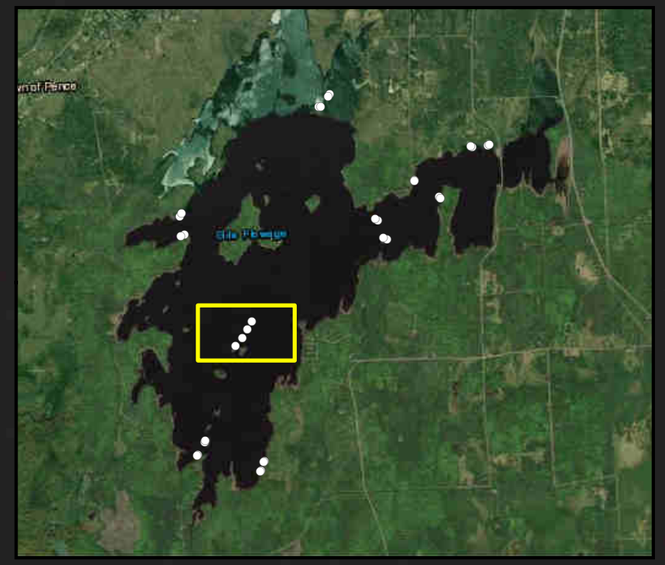
0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Mussel Abundance (No. Live)

- 0
- 1 - 3
- 4 - 5
- 6 - 7
- 8 - 20



Location 3

Gile Flowage

Figure 6f. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Basemap courtesy of Esri.

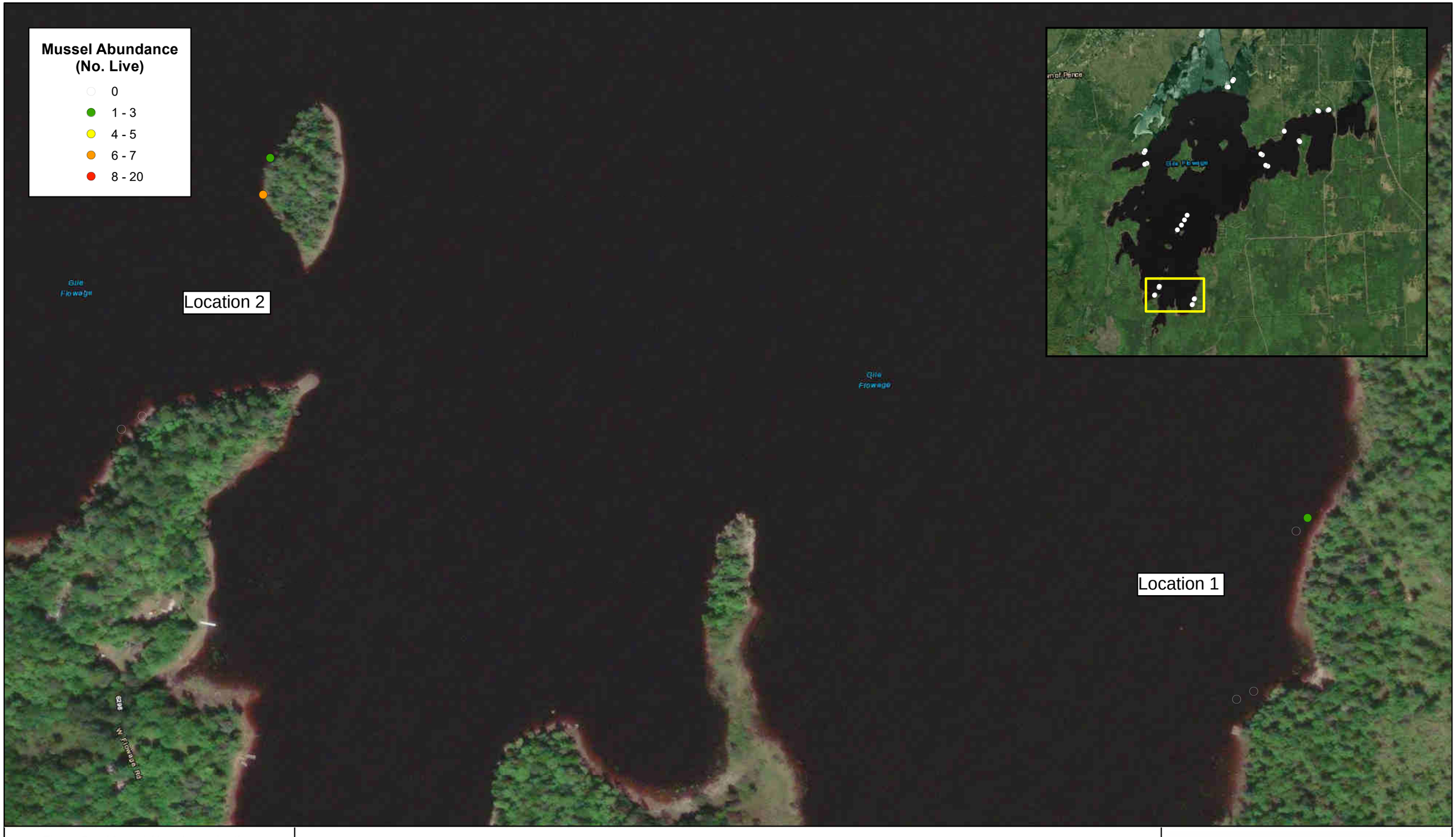


Figure 6g. Mussel Abundance for the Gile Project Reservoir Search Areas on the West Fork Montreal River. Iron County, Wisconsin.

Quantitative Transect

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\Map6_Mussels_Quan_Gile.mxd

Date: 8/7/2022

Basemap courtesy of Esri.

Appendix A

Scientific Collecting Permit and Survey Plan

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463

July 30, 2021

Emily Grossman
EnviroScience, Inc
2977 Hwy K #226
O'Fallon, MO 63368

Subject: WI E/T Permit Enclosed

Dear Emily:

With this letter we are updating your **ET Species Permit #1130**, per your request, as follows:

Species added to permit for removal and relocation to nearest suitable habitat outside impacted area:

- All Wisconsin threatened/endangered mussel species, collected as encountered on projects. Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.

These updates are now part of your WI E/T Permit and will expire along with your original permit. Updated conditions are attached to this letter.

Please keep this letter and your E/T permit with you when conducting activities involving species listed on your permit.

Thank you for your efforts on behalf of Wisconsin's endangered and threatened resources.

Sincerely,

Drew Feldkirchner
Bureau Director

Wisconsin Endangered and Threatened Species Permit Conditions

The following conditions apply to Wisconsin E/T Species Permit **#1130** issued to **Emily Grossman**:

1. Bureau of Natural Heritage Conservation Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
2. Permit holder must follow equipment disinfection protocols at outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
3. Permit holder agrees to follow Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling unless approved by the DNR species expert.
4. If you anticipate encountering a federally listed mussel species while conducting mussel surveys, a federal permit may also be required. For further information, contact U.S. Fish and Wildlife Service, Twin Cities Field Office at (952) 252-0092.
5. If a federally listed species is not anticipated, but is encountered during a survey or relocation, the surveyor must contact the U.S. Fish and Wildlife Service's Twin Cities Field Office (612) 725-3548 ext. 2206) within 24 hours of the encounter, unless the surveyor is already authorized to handle the species under a federal permit.
6. Permit holder must contact Lisie Kitchel (608) 266-5248) prior to conducting field work for each new project.

USACE GUIDELINES

1. Target and non-target species should be returned to point of capture, unless the project involves relocation. If the project involves relocation, please contact Lisie Kitchel (608) 266-5248).
2. Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
3. It is recommended to follow the equipment disinfection protocols for aquatic invasives as outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
4. It is recommended to follow the Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling.

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921

Endangered and Threatened Species Permit

Form 1700-002 (R 3/06)

The below named person is authorized by the Wisconsin Department of Natural Resources, pursuant to section 29.604, Wis. Stats., and Chapter NR 27, Wis. Adm. Code, to conduct the described activities for scientific or educational purposes.

DNR Permit Number	DNR Metal Tag Number
1130	
Date DNR Permit Issued	**Date DNR Permit Expires**
07/24/2018	01/31/2024
Federal Permit Number	**Date Federal Permit Expires**

Permittee Information

Last Name	First
Grossman	Emily

Street or Route	City	State	ZIP Code
21 Fort Zumwalt Dr	O'Fallon	MO	63366

Phone Number	Email Address	Date of Birth	Eye Color	Hair Color	Weight	Height
(847) 269-4159	egrossman@enviroscienceinc.com	3/19/1987	Blue	Brown	150	5'6"

Species or Study Information

County(ies) of Activity

Statewide

Name and Number of Specimens or Description of Study

All Wisconsin threatened/endangered mussel species
Mussels will be collected as encountered on projects; specific numbers of each species are not known at this time

Source of Species or Area of Study	Where Species or Item Will Be Kept
Aquatic systems (rivers/streams/lakes) throughout Wisconsin	Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.
Method of Taking and/or Transporting	**During the Following Period of Time**
Mussels will be collected by hand via wading/ snorkeling/diving.	Duration of permit validity.

Purpose for Obtaining or Collection

Mussel surveys and possible translocation for construction and/or ecological monitoring projects

Final Disposition of Specimens

Live mussels will be returned to the wild. Dead shells may be retained as vouchers, if permitted.

Scientific Qualification of Permittee

See permit file.

Additional Conditions of This Permit

See attached letter with conditions.

Permittee Certification

I hereby certify that I have read, am familiar, and agree to comply with the regulations described herein. This permit is not transferable and must be exhibited to any authorized agent of the Department of Natural Resources on demand.

Permittee Signature	Date Signed
DocuSigned by: Emily Grossman BCABDB7B5AC8410...	8/3/2021 | 12:23 PM CDT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
For the Secretary

By: DocuSigned by: Drew Feldkirchner F8586A547FC44E3... Date: 7/30/2021 | 12:00 PM C

Address updated on 1/14/2022 by NRR.

Becca Winterringer

From: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>
Sent: Monday, June 6, 2022 4:00 PM
To: Emily Grossman; Weinzinger, Jesse J - DNR
Cc: Becca Winterringer
Subject: RE: Mussel survey plans

Emily – all three look good, the only thing I would add would be to please note if there is an obvious 'drawdown zone' in any of the river reaches as a result of either consistent drawdownd or seasonal drawdownd where no mussels are present due to being dewatered, the classic 'bathtub ring', to document habitat that is impacted by operation or seasonal maintenance. This is especially important for the Gile Flowage which has a significant drawdown.
By document I mean not just if its present but the extent to which it occurs, 1 foot, 2 feet, 1 meter, etc. in width, or however best to describe it, not if it is not present.
Hope that is clear, give me a call if you want to discuss.

Have fun in northern Wisconsin!!

Lisie Kitchel
Conservation Biologist
Bureau of Natural Heritage Conservation
Wisconsin Department of Natural Resources
101 S. Webster St.
Madison, WI 53707
Cell Phone: (608-220-5180

dnr.wi.gov

From: Emily Grossman <egrossman@enviroscienceinc.com>
Sent: Monday, June 6, 2022 11:26 AM
To: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Cc: Becca Winterringer <bwinterringer@enviroscienceinc.com>
Subject: Mussel survey plans

Lisie and Jesse,

EnviroScience was recently contracted by Mead and Hunt to conduct mussel surveys for four hydropower licensing/relicensing projects in northern Wisconsin. The locations and survey plans include:

- Hayward Lake and Trego Lake, Namekagon River near Hayward & Trego
- White River Flowage, White River near Ashland
- Gile Flowage, W. Fork Montreal River near Gile

Fieldwork will be led by either me (WI E/T permit #1130) or Becca Winterringer (WI E/T permit #1164). Per our permits, we wanted to notify you that we'll be conducting the surveys and request your review of the survey plans to ensure they're adequate. Based on the RFP we received, it looks like Mead and Hunt may have already discussed the survey methods with WIDNR, but please take a look at the attached plans and let me know if you have any comments or questions. We are hoping to start fieldwork in the next couple weeks, if possible, in order to complete the White River site before a planned drawdown of this reservoir in early July.

Again, please let me know if you have any questions/comments or need any additional info.

Thank you!

Emily Grossman
Senior Scientist/Project Manager

EnviroScience™
Excellence In Any Environment

5070 Stow Road, Stow, OH 44224 | EnviroScienceInc.com
O. 800.940.4025 | C. 847.269.4159 | 24-HR 888.866.8540
OH | TN | VA | WV | NC
Meet our new team in North Carolina!

SURVEY PLAN:

FRESHWATER MUSSEL STUDY FOR THE GILE FLOWAGE STORAGE RESERVOIR

(FERC No. 15055)

Prepared for:

WISCONSIN DEPT. OF NATURAL RESOURCES

On Behalf of :

Mead & Hunt

Prepared by:

EnviroScience
Excellence In Any Environment
5070 Stow Rd.
Stow, OH 44224
800-940-4025
www.EnviroScienceInc.com

ES Project No. 16082

Date: June 6, 2022

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

EnviroScience, Inc. is pleased to submit this survey plan to the Wisconsin Department of Natural Resources (WDNR) on behalf of Mead & Hunt to perform freshwater mussel studies associated with the Federal Energy Regulatory Commission (FERC) licensing process for the Gile Flowage Storage Reservoir (FERC Project No. 15055). Northern States Power Company – Wisconsin, d/b/a Xcel Energy (Licensee/Applicant), is required to evaluate existing freshwater mussel resources and potential impacts to freshwater mussel resources associated with proposed project operations. The Gile Flowage Storage Reservoir project is located on the West Fork Montreal River near Gile, Iron County, Wisconsin.

2.0 MUSSEL SURVEY SCOPE OF WORK

TASK ONE: MUSSEL STUDIES

Mussel survey methods were developed following the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). Mussel studies will include field surveys of two riverine reaches at the project location. In addition, a phased survey will be conducted within the Gile Flowage Storage Reservoir.

Riverine Surveys

Mussel studies within riverine habitat will be conducted at the project location. The upstream reach will begin near the Sucker Hole Boat Landing and extend 1,000 m upstream. The downstream reach will begin at the project tailrace and will extend 1,000 m downstream.

Within each reach, a series of transects extending bank to bank will be established every 100 m, creating a series of 10 possible transects per reach. Transects will be numbered sequentially from downstream to upstream, and a random number selector will be used to select five transects for the survey within each reach.

Searches along each transect will be conducted in 10-m segments and will extend 0.5 m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search will entail an initial search of 0.2 minutes per m^2 (min/m^2) along each 10-m segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 min/m^2. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.

EnviroScience will record general stream conditions and morphology within the study area. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only when visibility at depth is at least 20 inches. In addition, a general description of mussel habitat in the project boundary will be provided.

Reservoir Survey

WDNR will be contacted before commencement of field work. Reservoir sampling will be conducted in the Gile Flowage Storage Reservoir using a phased approach consisting of qualitative searches and quantitative samples. Phase 1 will include an initial reconnaissance-level

habitat survey to determine if mussels are present in the reservoir. Reconnaissance searches will be conducted in the littoral zone at locations with suitable substrate to detect shells or live mussels. If mussels are documented, a minimum of 8 person-hours of search time will be spent conducting timed searches to establish a species list and inform the need for more intensive quantitative efforts under Phase 2. Eight general locations have been identified in the mussel study plan for evaluation. Half of the survey effort (four locations) will be spent in littoral areas subject to winter drawdowns (between 1490.0 and 1483.0 feet NGVD) and the remaining effort (four locations) will be spent in deeper areas (between 1483.0 and 1475.0 feet NGVD). One of the eight sites will be located along the old river channel if adequate depths are observed. At least 1 person-hour of search time will be spent at each of the eight sites. Searches will be divided into 15-min increments to facilitate development of a species richness curve.

Phase 2 will involve quantitative sampling at locations where mussel abundance was highest in Phase 1 surveys. Prior to initiating the Phase 2 survey, the team malacologist will contact WDNR to determine the extent to which quantitative surveys are necessary and the most efficient method for collecting the samples. If WDNR cannot be reached, the team malacologist will proceed using his or her professional judgement.

Phase 2 sampling will be conducted at the five Phase 1 locations with the highest mussel abundance. If mussels were not present in at least five stations during Phase 1, Phase 2 sampling will only be conducted at locations where mussels were present. Quantitative samples will be collected in grids or along transects, as determined in consultation with WDNR, at each Phase 2 location. If grids are used, a 5-m by 5-m grid will be established at each location and one 0.25-m^2 quantitative sample will be collected at 25 randomly selected points within the grid. If transects are used, a transect(s) will be established at each location and 0.25-m^2 quadrats will be sampled at random 1-m intervals along the transect. Regardless of sample design (grid or transects), 25 quantitative samples (totaling 6.25 m^2) will be collected at each Phase 2 location.[1]

Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. Datasheets will be populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of the mussel study plan provided by Mead & Hunt. Mussel taxonomy will

[1] We understood Section 2.7.1, Phase 2 Reservoir Sampling, in the RFP to mean there will be twenty-five 0.25-m^2 quadrats in each grid (25 quadrats x 0.25 m^2 = 6.25 m^2 total sample area in each grid). If all five grids were to be sampled (5 grids x 6.25 m^2 sample area), this would yield a total sample area of 31.25 m^2 for the reservoir. The RFP reports a calculated "total quantitative sample area of 125 square meters for the reservoir". If the project intent is quantitatively sample a maximum area of 125 m^2, 500 quadrats maximum would need to be sampled (125 m^2 ÷ 0.25-m^2 quadrats = 500).

follow the names presented by Williams et al., 2017.

If any living or dead federal or state-listed species are encountered, EnviroScience will notify Mead & Hunt immediately; per surveyor collection permits, WDNR and the U.S. Fish & Wildlife Service (USFWS) will be notified within 24 hours. No live mussels will be harmed or taken during this project. Any specimens of federally listed species that are encountered will be individually hand placed in their original locations.

TASK TWO: REPORTING

EnviroScience will provide Mead & Hunt with a draft report for the Gile project by September 1, 2022, if fieldwork can be completed in time to meet this deadline. If fieldwork is not complete in time, a preliminary draft report will be provided by August 15, 2022, and will include all data collected for the project to date. The second draft will be provided by October 31, 2022. A final draft report for distribution to the licensing participants will be completed within seven days after receiving Mead & Hunt's comments. EnviroScience will review and address participant comments and provide a final study report within 30 days of receiving participant comments from Mead & Hunt.

The report will include a description of mussel survey activities and the prescribed Mussel Survey Summary Tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. GIS-based mapping will provide further visual presentations of the findings of the survey. Geo-referenced photos and GIS shapefiles will be provided electronically to Mead & Hunt.

MUSSEL SURVEY SCHEDULE

Field work will be initiated following coordination with WDNR, receipt of permits, and when suitable weather and river conditions allow. Normal to low water conditions and good visibility must occur to conduct field work; project activities will be planned accordingly. Fieldwork is tentatively planned for mid-June 2022.

3.0 LITERATURE CITED

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

Williams, J. D., Bogan, A. E., Butler, R. S., Cummings, K. S., Garner, J. T., Harris, J. L., ... & Watters, G. T. (2017). A revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Appendix B

Photographic Record

Appendix B. Index of photo locations, Gile Flowage Storage Reservoir Mussel Survey, June 2022.

	Coordinates				
	UTM Zone 15N		NAD 1983		
Photo No.	Northing	Easting	Latitude	Longitude	View direction
Photo 1	5138797	712182	46.36900	-90.24131	Southeast
Photo 2	5138653	711987	46.36800	-90.24390	South
Photo 3	5138649	712007	46.36800	-90.24365	Southeast
Photo 4	5138553	711919	46.36700	-90.24483	Northeast
Photo 5	5138282	711898	46.36500	-90.24523	South
Photo 6	5145686	712990	46.43100	-90.22768	West
Photo 7	5145599	713054	46.43000	-90.22688	Southwest
Photo 8	5145412	712955	46.42900	-90.22826	North
Photo 9	5145282	712978	46.42800	-90.22802	South
Photo 10	5139110	712768	46.37200	-90.23355	Northeast
Photo 11	5139307	711973	46.37400	-90.24379	South
Photo 12	5140993	712648	46.38900	-90.23426	South
Photo 13	5142063	711755	46.39900	-90.24537	Northeast
Photo 14	5143851	713630	46.41400	-90.22020	South
Photo 15	5142261	714237	46.40000	-90.21303	West
Photo 16	5142531	714704	46.40200	-90.20684	North
Photo 17	5143188	715425	46.40800	-90.19717	East
Photo 18	5138821	712064	46.37000	-90.24283	N/A
Photo 19	5143683	713493	46.41300	-90.22205	N/A
Photo 20	5143188	715425	46.40800	-90.19717	N/A

Photo 1. Riverine Reach 1, view looking southeast toward right descending bank at Transect 2.

Photo 2. Riverine Reach 1, view looking upstream from Transect 4.

Photo 3. Riverine Reach 1, view of visible waterline on right descending bank at Transect 4.

Photo 4. Riverine Reach 1, view looking northeast toward mid-channel vegetation patch and island from Transect 5.

Photo 5. Riverine Reach 1, view looking upstream from Transect 8.

Photo 6. Riverine Reach 2, view looking downstream from Transect 3.

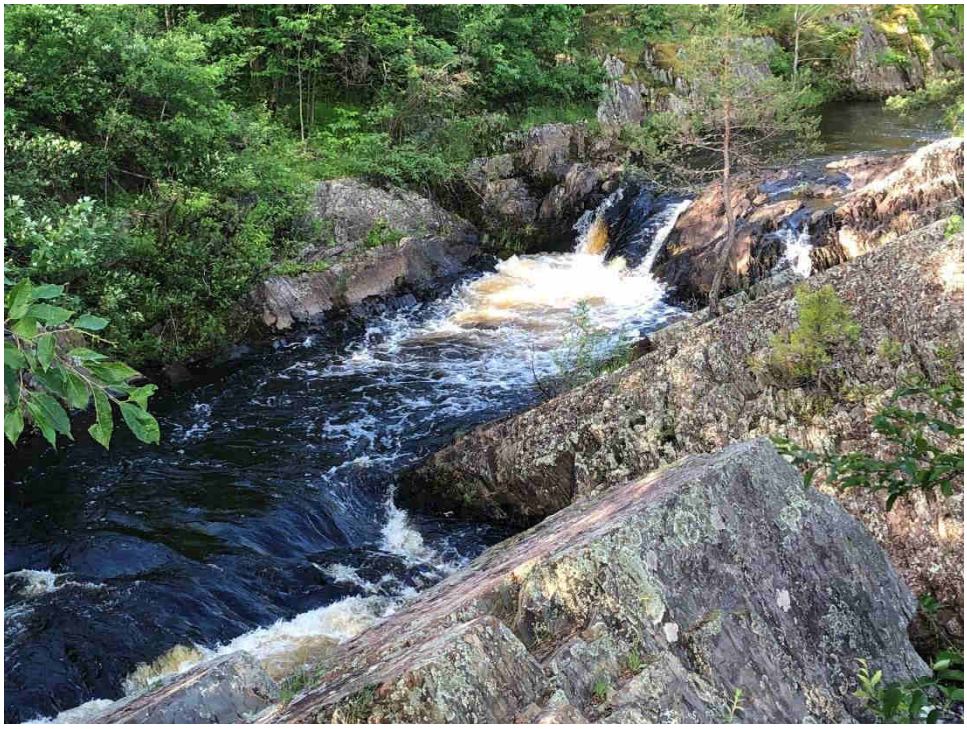


Photo 7. Riverine Reach 2, view of Gile Falls from the right descending bank.

Photo 8. Riverine Reach 2, view looking downstream toward Transect 6.

Photo 9. Riverine Reach 2, view looking upstream from Transect 8.

Photo 10. Reservoir Location 1, view looking northeast along the bank.

Photo 11. Reservoir Location 2, view looking south along the bank.

Photo 12. Reservoir Location 3, view looking south toward islands.

Photo 13. Reservoir Location 4, view looking northeast along bank.

Photo 14. Reservoir Location 5, view looking south toward islands.

Photo 15. Reservoir Location 6, view looking west toward northern island.

Photo 16. Reservoir Location 7, view looking north toward sampling locations.

Photo 17. Reservoir Location 8, view looking east toward bank.

Photo 18. Photo of Paper Pondshell (*Utterbackia imbecillis*) collected from Transect 2, Riverine Reach 1.

Photo 19. Representative photo of Paper Pondshell (*Utterbackia imbecillis*) collected in reservoir surveys.

Photo 20. Photo of Giant Floater (*Pyganodon grandis*) collected from Reservoir Location 8.