INITIAL STUDY REPORT

for

Gile Flowage Storage Reservoir (FERC Project No. 15055)

Water Quality Monitoring

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PROJECT INFORMATION AND BACKGROUND

Northern States Power Company, a Wisconsin corporation (NSPW or Applicant), is currently seeking an original license from the Federal Energy Regulatory Commission (FERC or Commission) to continue to operate and maintain the existing Gile Flowage Storage Reservoir Project (Project). The Project is owned, operated, and maintained by NSPW. To obtain an original license, NSPW must submit a Final License Application (FLA) to FERC no later than August 18, 2023. The FLA, in part, must include an evaluation of the existing water quality associated with the Project boundary.

On January 19, 2021, FERC issued Scoping Document 1 and requested that stakeholders provide comments on the Pre-Licensing Application (PAD) and study requests within 60 days. During the 60-day comment period, NSPW received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) was the only agency which requested that NSPW complete a water quality study as part of the licensing process. The WDNR requested the study be conducted to further understand current water quality conditions and to ensure state water quality standards are being met. WDNR requested that data be collected and analyzed using the WDNR WISCALM Guidance and Surface Water Grab Sampling Protocols for 23 water quality parameters.

On behalf of NSPW, and under the direction of Mead and Hunt, Inc., Great Lakes Environmental Center, Inc. (GLEC) conducted a Water Quality Monitoring Study at the Gile Flowage (Flowage) during 2022 to determine if waters within the proposed Project boundary meet current state water quality standards. The work was completed following the Study Plan provided by Mead and Hunt.

STUDY AREA

The Gile Flowage is located within the northern highland area of northern Wisconsin which is widely known for its forests, lakes, and wetlands. The Gile Flowage is an approximately 3,200 acre reservoir formed by the impounding of the west branch of the Montreal River. The Gile Flowage and the west branch of the Montreal River are located in the vicinity of the geologic formations Gogebic and Trap Ranges. The Gogebic and Trap Ranges form two conspicuous ridges in Iron and Ashland Counties in northern Wisconsin. Both ridges are composed of rock types that are more resistant to erosion than the rock that underlies the valley separating them. A thin layer of sediment deposited during the most recent glaciation covers the valley and parts of the ridges. The Gile Flowage is situated on the southern ridge of the Gogebic Range, and contains iron-rich rock that is approximately 1.9 billion years old. Bare rock faces and boulders are common along the shoreline of the flowage. The West Branch of the Montreal River flows through the northern ridge, the Trap Range, which is distinctly different in composition from the southern ridge; it is younger volcanic rock, consisting primarily of basaltic-lava flows that are approximately 1.1 billion years old. These geologic features likely influence water quality characteristics in the Gile Flowage and West Branch Montreal River.

The study included water quality monitoring at four locations at the Project:

- downstream of the tailrace mixing zone (Gile #4),
- approximately 250 feet upstream of the Project dam (Gile #3),
- in the deep hole (at the station where citizen lake monitoring takes place) (Gile #2), and
- in a riverine area upstream of the main impoundment (Gile #1).

Figure 1 is a map of the Gile Flowage depicting the approximate sampling locations.

A permitted point-source municipal discharge, from the City of Montreal's wastewater treatment plant, is located 0.8 miles downstream of the Gile Dam. However, that discharge does not affect water quality in the Gile Flowage or the downstream sampling location.

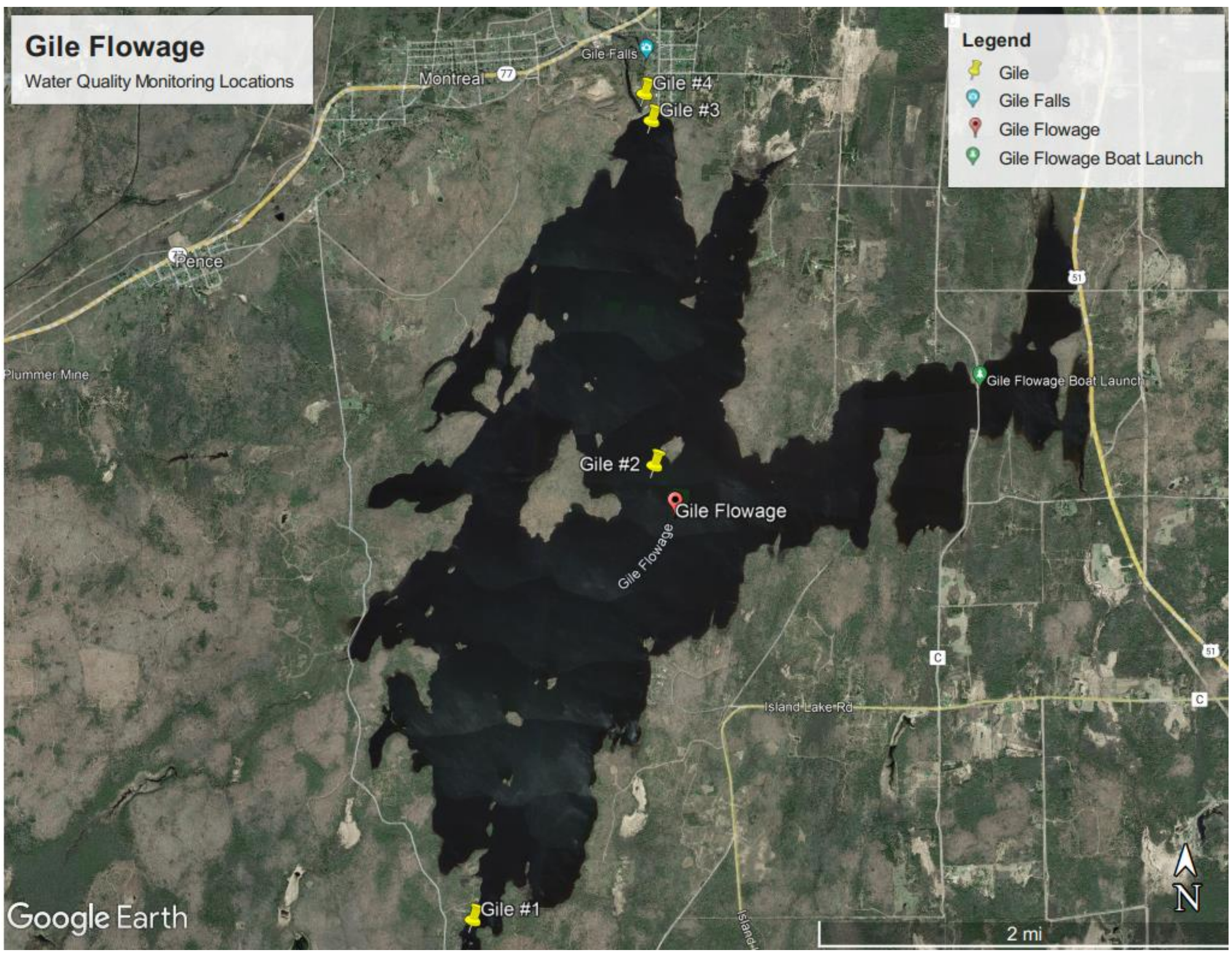


FIGURE 1. GILE FLOWAGE SAMPLING LOCATIONS FOR THE 2022 WATER QUALITY ASSESSMENT

METHODOLOGY

The objective of the water quality monitoring study was to determine if the Project meets current state water quality standards. WDNR indicated that the data should be collected and/or analyzed using river monitoring protocols., Those protocols were implemented at four locations within the Project area:

- Gile #1 – far upper reaches of the impoundment,
- Gile #2 – within the deep hole in the impoundment,
- Gile #3 – deep area of the impoundment, typically near the dam,
- Gile #4 – downstream of the dam.

NSPW developed the study plan to include monitoring for all parameters requested by WDNR with the exception of sediment accumulation. A summary of the Gile Flowage water quality assessment plan is shown in Figure 2. At each location, the following was collected and/or recorded at the frequency outlined in Figure 2:

- Ammonia
- Bacteria (*Escherichia coli* (*E. coli*))
- Chloride
- Chlorophyll *a*
- Color
- Conductivity
- Dissolved Oxygen (DO)
- Dissolved Phosphorus
- Sulfide Nitrate (plus Nitrite)
- pH
- Secchi Depth
- Sulfate
- Iron
- Manganese
- Total Mercury
- Temperature
- Total Nitrogen
- Total Phosphorus

The analysis of the above parameters was completed following written Standard Operating Procedures (SOPs) which are based upon USEPA analytical methods and WDNR Nutrient Grab Sample Protocols located online at https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=114118765. GLEC staff and the GLEC Nutrient Chemistry laboratory (Traverse City, MI) completed the analysis for:

- Ammonia
- Bacteria (*E. coli*)
- Chlorophyll *a*
- Conductivity
- Dissolved Oxygen
- Dissolved Phosphorus
- Nitrate (plus Nitrite)
- pH
- Secchi Depth
- Temperature
- Total Nitrogen
- Total Phosphorus
- Color

The analysis for the remaining parameters, listed below, was completed by Pace and ALS Laboratories (Green Bay, WI and Holland ,MI, respectively).

- Chloride
- Iron
- Sulfate
- Total Mercury
- Sulfide
- Manganese

A hydrographic profile for the following parameters was conducted in the deepest part of the reservoir (Gile #2) and immediately upstream of the dam (Gile #3) beginning at the water surface and continuing at 1-meter intervals until the reservoir bed was reached:

- Conductivity
- Dissolved oxygen
- pH
- Temperature

A hydrographic profile at the furthest upstream sampling location (Gile #1) was not possible due to insufficient depth. However, near surface water measurements were collected.

Data was collected and analyzed using the WDNR Wisconsin Consolidated Assessment and Listing Methodology (WisCALM Guidance) located online at the following web address: https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html. The analysis for bacteria (*E. coli*) was completed using the IDEXX Colilert methodology (IDEXX Colilert 2022). All field collection and subsequent analysis were conducted by individuals with prior water quality monitoring training and experience.

Parameter	Samples	Type of Sampling	Sampling Frequency			
			May	July	Aug.	Sept.
Ammonia	1 total	Lab		x		
Bacteria	3 total	Lab		x	x	x
Chloride	1 total	Lab	x			
Chlorophyll *a*	3 total	Lab		x	x	x
Conductivity	4 total	Field Profile	x	x	x	x
Color	1 total	Lab		x		
DO	4 total	Field Profile	x	x	x	x
Dissolved Phosphorus	3 total	Lab		x	x	x
Iron	3 total	Lab		x	x	x
Manganese	3 total	Lab		x	x	x
Sulfide	3 total	Lab		x	x	x
Nitrate (plus nitrite)	1 total	Lab		x		
pH	4 total	Field Profile	x	x	x	x
Secchi depth	4 total	Field	x	x	x	x
Sulfate	1 total	Lab	x			
Total Mercury	1 total	Lab	x			
Temperature	4 total	Field Profile	x	x	x	x
Total Nitrogen	1 total	Field Fixed		x		
Total Phosphorus	4 total	Field Fixed	x	x	x	x
Total Suspended Solids	4 total	Lab	x	x	x	x

FIGURE 2. GILE FLOWAGE WATER QUALITY ASSESSMENT PLAN (2022)

STUDY RESULTS

Field measurements and water samples collected for analysis were completed as outlined in the Study Plan and followed written Standard Operating Procedures. Monitoring was conducted on May 18, July 13-14, August 17-18, and September 6, 2022. A summary of the laboratory analysis of the water samples is provided in Table 1. Depth profiles for temperature, pH, dissolved oxygen and specific conductance were completed at three (Gile #1: upstream, Gile #4: tailrace and Gile #2: reservoir) of the four locations per the study plan. At Gile #1 (upstream location), the depth was too shallow to develop a profile. For the May sampling, poor weather prohibited the profiling at Gile #3. Figures 3, 4, 5, and 6 show the depth profile for temperature, dissolved oxygen and pH at Gile #2 and Gile #3. Specific conductance was not plotted and varied little from surface to bottom, ranging between 35.5 and 36.9 µmhos/cm in May, 42.0 and 44.7 µmhos/cm in July, 46.1 and 50.2 µmhos/cm in August, and 47.6 and 51.5 µmhos/cm in September. A summary of the field collected data is also provided in Table 2. Raw field data including field notes and depth profile data are provided in Appendix A. Analytical data including laboratory analysis results are provided in Appendix B.

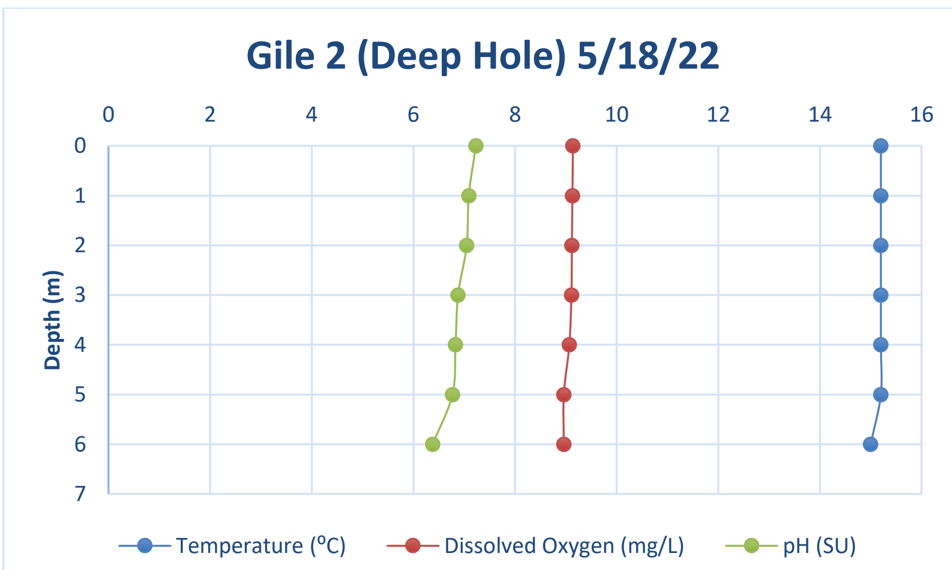
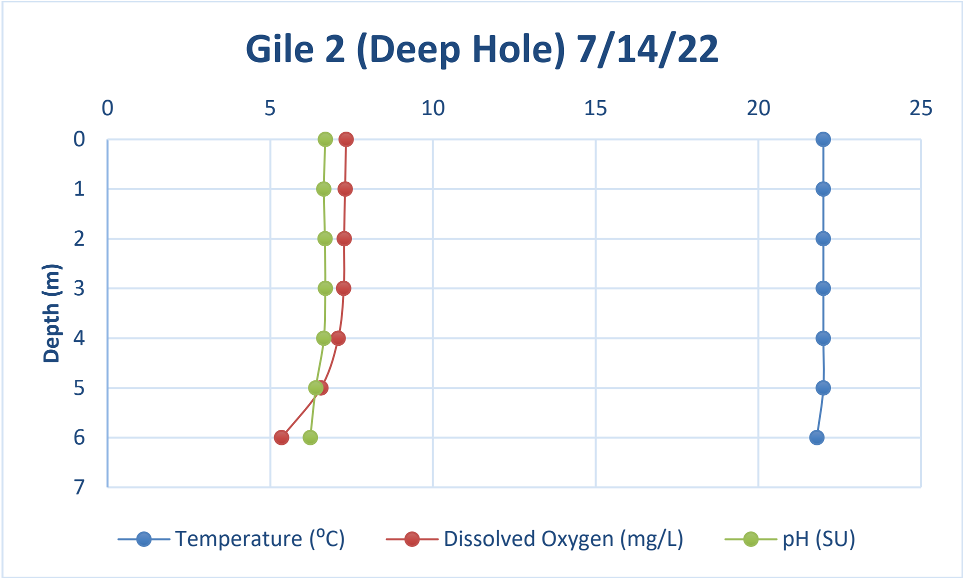


FIGURE 3. DEPTH PROFILE OF TEMPERATURE, DISSOLVED OXYGEN AND PH AT GILE LOCATION #2 (MAY 18, 2022)



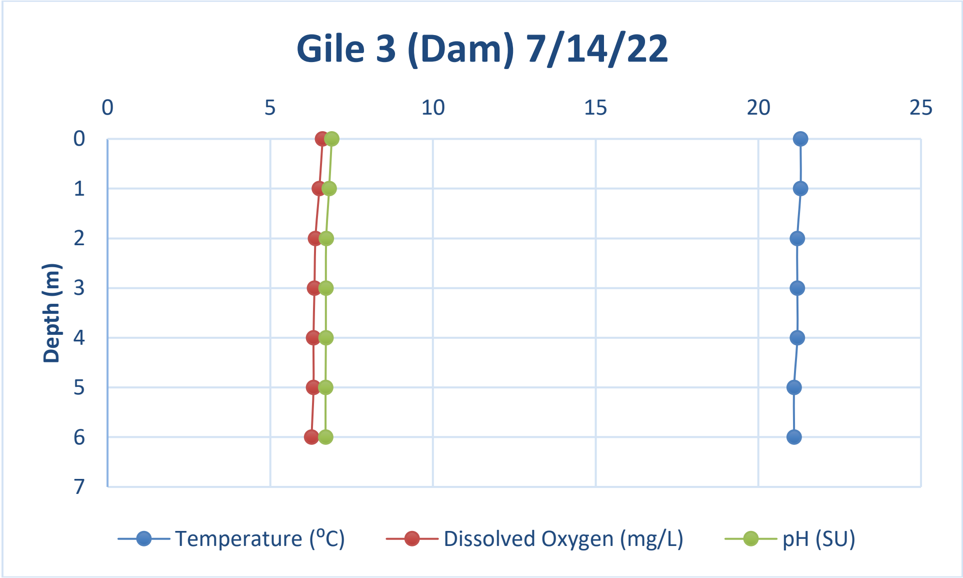
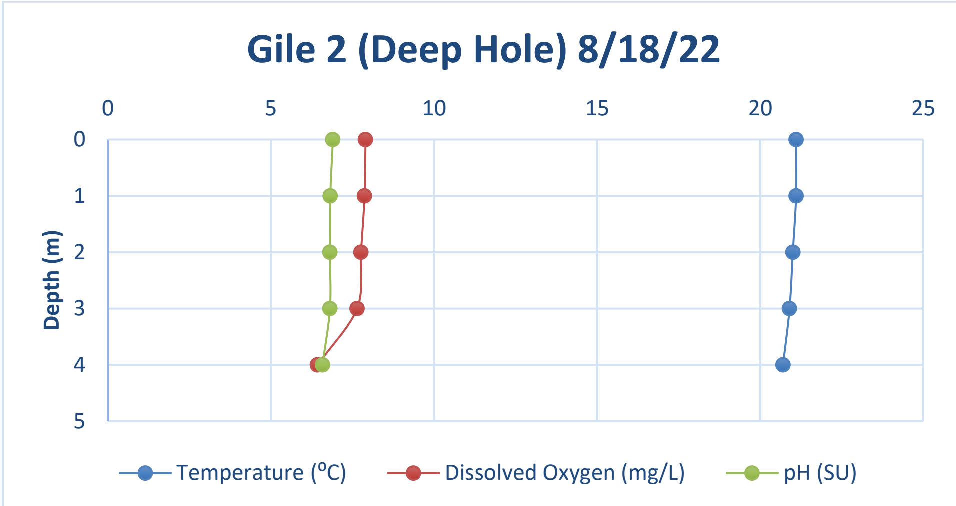


FIGURE 4. DEPTH PROFILE OF TEMPERATURE, DISSOLVED OXYGEN AND PH AT GILE LOCATIONS #2 AND #3 (JULY 14, 2022)



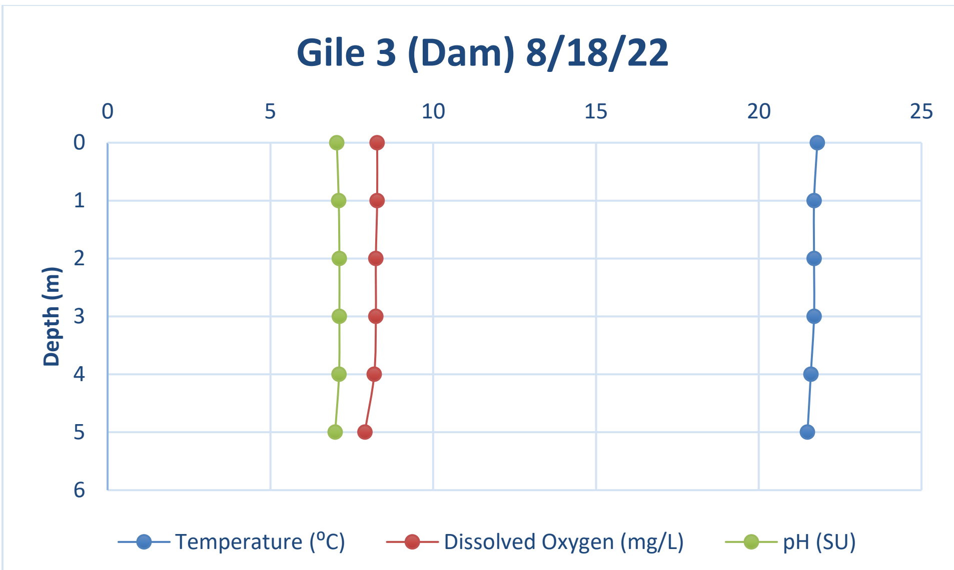
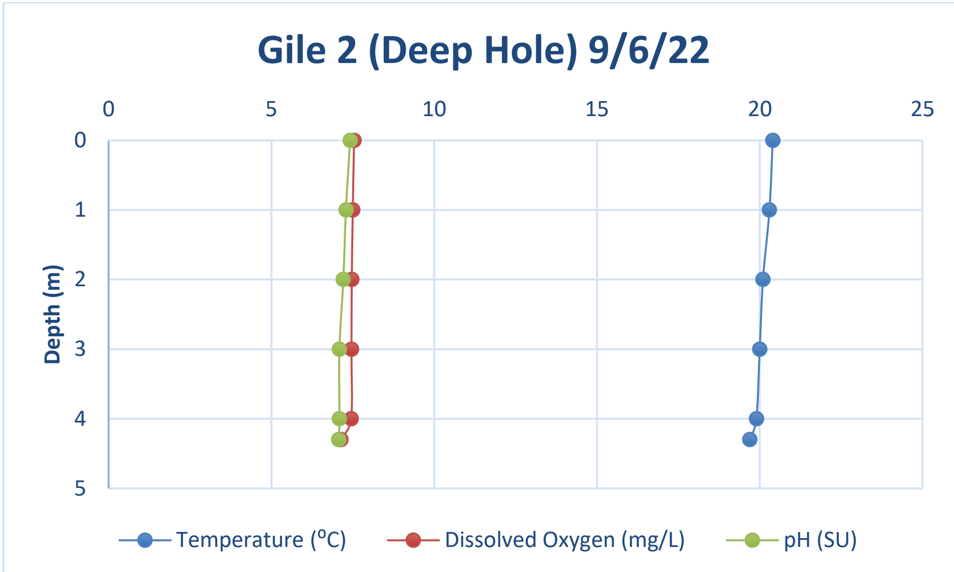


FIGURE 5. DEPTH PROFILE OF TEMPERATURE, DISSOLVED OXYGEN AND PH AT GILE LOCATIONS #2 AND #3 (AUGUST 18, 2022)



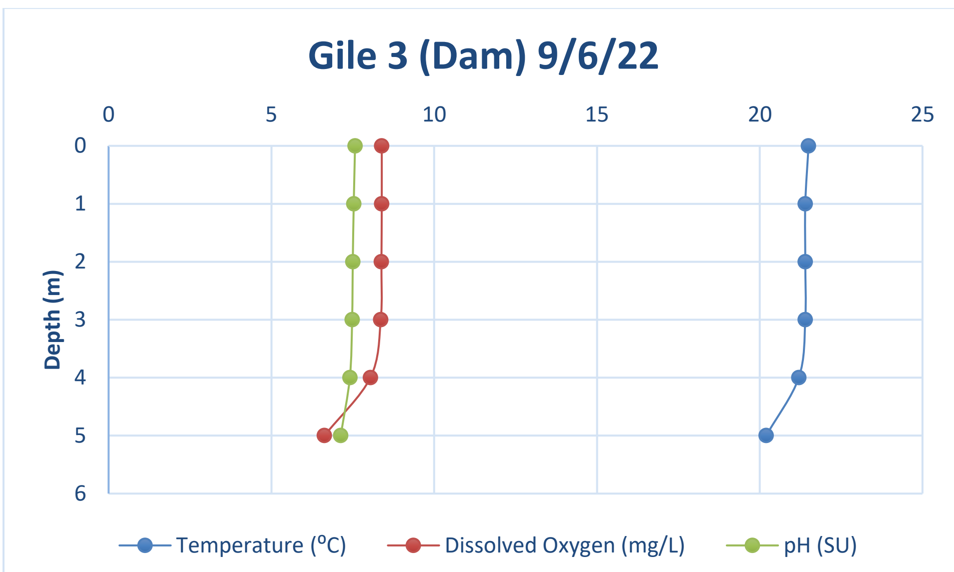


FIGURE 6. DEPTH PROFILE OF TEMPERATURE, DISSOLVED OXYGEN AND PH AT GILE LOCATIONS #2 AND #3 (SEPTEMBER 6, 2022)

TABLE 1. SUMMARY OF WATER QUALITY PARAMETER SAMPLE ANALYSIS FOR THE GILE FLOWAGE (2022)

	Gile Location #1				Gile Location #2				Gile Location #3				Gile Location #4			
Parameter	**May**	**July**	**Aug.**	**Sept.**	**May**	**July**	**Aug.**	**Sept.**	**May**	**July**	**Aug.**	**Sept.**	**May**	**July**	**Aug.**	**Sept.**
Ammonia (µg/L)		33.6				31.7				42.9				41.9		
E. coli (MPN)		5.2	6.3	2.0		1.0	3.1	<1		1.0	1.0	<1		1.0	16.1	1.0
Chloride (mg/L)	2.0				1.9				1.9				1.9			
Chlorophyll-*a* (µg/L)		5.42	4.84	3.30		6.70	4.41	3.80		3.93	2.55	3.70		2.88	5.11	3.26
Color (PCU)[1]		126				100				104				115		
Dissolved Phosphorus (µg/L)		3.4	6.0	<1.5		3.3	5.4	1.7		5.5	4.9	1.8		6.8	2.7	2.9
Iron (µg/L)		544	614	610		415	454	458		440	412	442		463	427	435
Manganese (µg/L)		46.4	51.4	54.2		21.9	20.2	23.5		24.3	14.6	17.9		28.0	16.3	19.5
Nitrate (plus nitrite) (µg/L)		<3.4				3.4				12.0				10.2		
Sulfide (mg/L)		<1.2	<1.2	<1.2		<1.2	<1.2	<1.2		<1.2	<1.2	<1.2		<1.2	<1.2	<1.2
Sulfate (mg/L)	<7.1				<0.71				<1.4				<0.71			
Total Mercury (µg/L)	<0.16				<0.16				<0.16				<0.16			
Total Nitrogen (mg/L)		0.67				0.62				0.60				0.58		
Total Phosphorus (µg/L)	5.2	10.1	14.1	15.1	3.5	12.1	7.7	12.7	3.7	10.9	10.2	12.3	4.7	11.7	9.6	15.8
Total Suspended Solids (mg/L)	2.6	8.6	4.1	4.8	4.6	7.3	6.0	3.1	3.4	4.1	4.2	3.9	3.3	8.4	4.3	3.4

[1] PCU = Platinum Cobalt Units

TABLE 2. SUMMARY OF WATER QUALITY FIELD PARAMETER RESULTS FOR THE GILE FLOWAGE (2022)

Field Measurements[1]	Gile Location #1				Gile Location #2				Gile Location #3			
	May	July	Aug.	Sept.	May	July	Aug.	Sept.	May	July	Aug.	Sept.
Sp. Conductance (µmhos/cm)	36.2	44.7	50.2	51.5	35.5	42.0	46.5	47.7	36.3	42.0	46.1	47.7
DO (mg/L)	9.35	8.41	7.71	7.26	9.14	7.33	7.90	7.54	9.26	6.61	8.28	8.39
pH (s.u.)	7.22	7.28	7.13	7.21	7.23	6.69	6.90	7.42	7.29	6.89	7.04	7.57
Secchi depth (inches)	VOB[2]	33	44	40	50	46	55	59	NC[3]	50	65	67
Temperature (°C)	15.4	24.5	21.2	19.5	15.2	22.0	21.1	20.4	15.0	21.3	21.8	21.5

[1] Near Surface Measurements Only

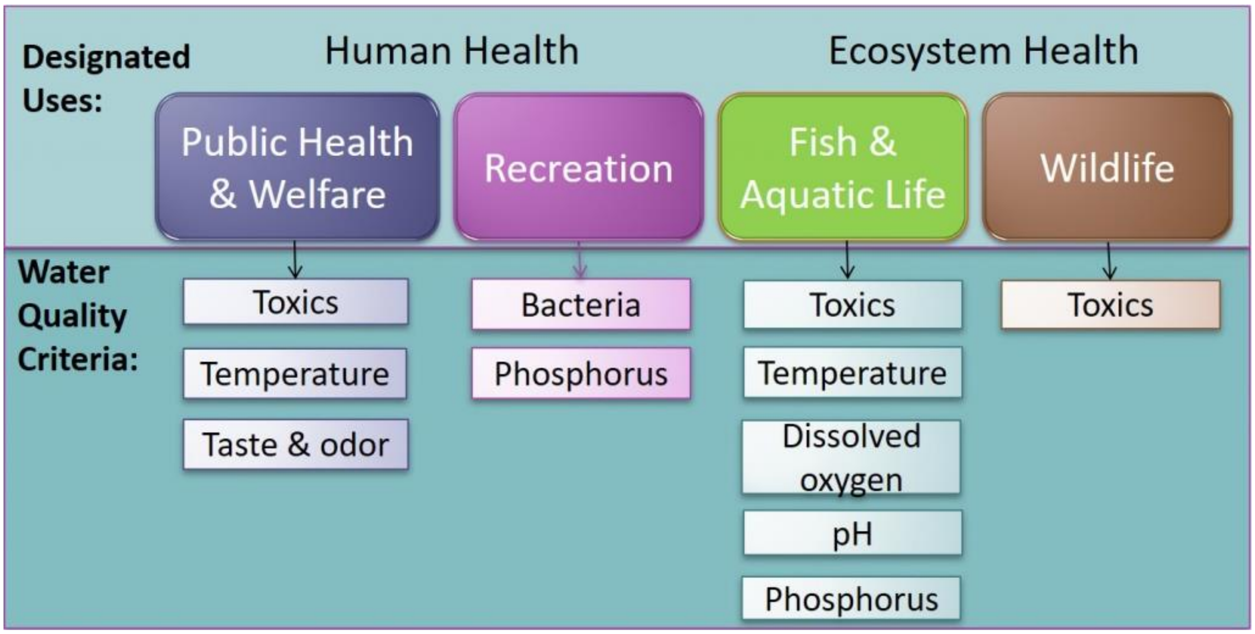
[2] VOB = Visible On Bottom

[3] NC = Not Collected

Analysis and Discussion

Analysis of the hydrographic data indicate that the Gile Flowage was not stratified in terms of temperature or dissolved oxygen at any location throughout the study.

Chapter NR 102 of the Water Quality Standards for Wisconsin Surface Waters describes water quality standards and criteria for the protection of waterbody designated uses that are intended to protect human and ecosystem health (Figure 7). In regard to the Gile Flowage, satellite water clarity was measured annually from 2010 through 2017; metals were measured in 2010, and water quality parameters were collected in 2012 and 2017-2019. Fish contaminant monitoring was conducted in 2013 (WDNR, 2021). These results are reported elsewhere and are also included within the PAD. Consequently, those analyses were excluded from this study which focused on recreation, fish and aquatic life and water quality criteria.



Source: https://dnr.wisconsin.gov/topic/SurfaceWater/Standards.html

FIGURE 7. WISCONSIN GRAPHIC OF SURFACE WATER STANDARDS AND CRITERIA

The Gile Flowage is listed by the Wisconsin DNR as a "Healthy Waterbody" (https://dnr.wisconsin.gov/topic/SurfaceWater/ConditionLists.html: Appendix E). None of the analyzed parameters or collected samples used in laboratory analysis exceeded Wisconsin water quality criteria or standards. A narrative for each measured parameter is provided in the following paragraphs.

Temperature

Wisconsin Administrative Code NR 102.24 and 102.29 states that temperature of a water of the state or a discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state. The temperature measurements collected from the Gile Flowage did not exceed this standard.

pH

The purpose of a pH standard is to protect aquatic organisms from changes in pH that would affect their health and reproduction. Wisconsin Administrative Code NR 102.04 (c) states that the pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum. The pH measurements collected from the Gile Flowage did not exceed this standard.

Dissolved Oxygen

NR 104.02 (3), states that the dissolved oxygen content in surface waters may not be lowered to less than 5 mg/L at any time. None of the dissolved oxygen measurements taken in the Gile Flowage were lower than 5 mg/L.

Iron

Iron (Fe) is a trace element required by both plants and animals. It is a vital part of the oxygen transport mechanism in the blood (hemoglobin) of all vertebrates and some invertebrate animals. Ferrous (Fe++) and ferric (Fe+++) ions are the primary ions of concern in the aquatic environment. The ferrous ion (Fe++) can persist in water devoid of dissolved oxygen and usually originates from groundwater or mines that are pumped or drained. Black or brown swamp waters may contain iron concentrations of several mg/L in the presence (ferric iron) or absence (ferrous iron) of dissolved oxygen, but these iron ions have little effect on aquatic life. The concentration of total Iron during the study ranged between 412 and 614 µg/L which is typical of waterbodies in this area of Wisconsin.

Manganese

Manganese is primarily regulated as a secondary drinking water standard because it can create aesthetic problems with the use of the water. These problems include the presence of black particles (MnO_2), black coatings and films on porcelain, a bitter/ metallic taste to the water, stains on laundry, and black films on automatic dishwashers and on dishes.

Manganese and iron together may affect the role of reduction and oxidation (redox) processes in lake and reservoir sediments in the vicinity of a redox boundary such as at the sediment water interface at the bottom of the reservoir. Mechanisms of redox include the role of micro-organisms, however, they appear to play a smaller role in the transport of trace metals and phosphorus than what was once believed. Various lacustrine environments, sediments, the sediment-water interface and anoxic and oxygenated waters, are considered within a unifying context of the processes occurring at a redox boundary. The concentration of total Manganese in this study ranged between 14.6 and 54.2 µg/L which is typical of waterbodies in this area of Wisconsin.

Chloride

Chloride is present in rainwater, streams, groundwater, seawater, wastewater, urban runoff, humans, geologic formations, and animal waste streams. Chloride is commonly associated with other ions, such as sodium, potassium, carbonates, and sulfate. Elevated chloride levels can be associated with oil/natural gas drilling, saltwater intrusion, landfill leachate, fertilizers, septic system effluent, road salt storage, salt mining, deicing agents, and saline/brine water deposits. The concentration of total Chloride in this study ranged between 1.9 and 2.0 mg/L which is typical of waterbodies in this area of Wisconsin. At these concentrations, there is no evidence of anthropogenic input.

Chlorophyll *a*

Chlorophyll *a* is tested in lakes to determine how much algae is in the lake. Algae is an important factor in the health of lakes because it adds oxygen to the water as a by-product of photosynthesis. However, if there is too much algae in a lake it can produce a foul odor and be unpleasant for swimming. The concentration of Chlorophyll *a* in this study ranged between 2.55 and 6.70 µg/L which is a very low concentration and typical of waterbodies in this area of Wisconsin.

Sulfide and Sulfate

Sulfides are stable in low oxygen environments whereas sulfates are stable in high oxygen environments. When sulfides are exposed to a high oxygen environment, or when sulfates move into a low oxygen environment, the ions can end up in water as they change to a more stable form in the new environment.

Certain bacteria can take advantage of the oxidation or reduction of sulfur because such chemical changes are a source of energy. Sulfur-reducing bacteria thrive when sulfate-rich water moves into a low oxygen environment. Such bacteria mediate the transformation of sulfate into hydrogen sulfide which, being a gas, can dissolve into water; this is the important exception to sulfides being very insoluble in water. Sulfur-oxidizing bacteria do the opposite, deriving energy by mediating the oxidation of sulfides into sulfates in oxygen-rich environments. The concentration of sulfide and sulfate in this study were below detection.

Bacteria (*E. coli*)

E. coli is part of the total coliform group of bacteria which is a gram-negative, rod-shaped facultative anaerobic coliform bacteria. This bacteria tends to inhabit the gastrointestinal system of warm-blooded animals in a symbiotic relationship where the bacteria aid in making available vitamin K to the host organism. There are a number of subspecies of *E. coli*, but only a few are pathogenic or disease causing.

Humans can be exposed to *E. coli* bacteria through a number of routes including foodborne or waterborne vectors. The Wisconsin recreational standard for *E. coli* is under the WDNR's beach advisory program. A beach advisory is issued when a beach reaches the "Beach Action Value" of 235 counts per 100 mL and a beach closure is issued at 1000 counts per 100 mL, unless site-specific conditions indicate use of an alternate metric. Using the IDEXX methodology, *E. coli* concentration is given as a "Most Probable Number" or MPN that is equivalent to colony counts per 100 mL. *E. coli* colony counts in the Gile Flowage ranged between <1 and 16.1. Consequently, the Wisconsin standard for *E. coli* was not exceeded in the Gile Flowage.

Total and Dissolved Phosphorus

Phosphorus is usually measured in two ways in lakes; ortho-phosphate (soluble reactive phosphorus or dissolved phosphorus) and total phosphorus. Ortho-phosphate is the chemically active dissolved form of phosphorus that is taken up directly by plants. Ortho-phosphate levels fluctuate daily and are typically low in lakes because it is incorporated into plants quickly. Total phosphorus (TP) is a better way to measure phosphorus in lakes because it includes both ortho-phosphate and the phosphorus in plant and animal fragments suspended in lake water. TP levels are more stable, and an annual mean can be a good indicator of the lake's water quality and trophic state.

Another means by which phosphorus can enter a lake is from the sediment on the lakebed. When the bottom of a lake is anoxic (usually in late summer and late winter), chemical processes at the sediment/water interface cause phosphorus to be released from the sediments. This phenomenon is called internal loading because the phosphorus is coming from within the lake (from the sediment). When the lake mixes again, this increased phosphorus fuels algae growth.

For stratified reservoirs, total phosphorus criterion is 30 µg/L. For reservoirs that are not stratified, total phosphorus criterion is 40 µg/L (Wisc. Adm Code 102.04(5)). Phosphorus is a nutrient important for plant growth. In most lakes, phosphorus is the limiting nutrient, which means that everything that plants and algae need to grow is available in excess (sunlight, warmth, water, nitrogen, etc.) except phosphorus. This means that phosphorus has a direct effect on plant and algal growth in lakes – the more phosphorus that is available, the more plants and algae there are in the lake. Phosphorus originates from a variety of sources, many of which are related to human activities. Major sources include human and animal wastes, soil erosion, detergents, septic systems and runoff from farmland or fertilized lawns. The concentration of total phosphorus and dissolved phosphorus in Gile Flowage is far less than the concentration that would support unwanted plant growth. In this study, total phosphorus ranged from 3.5 to 15.8 µg/L and dissolved phosphorus ranged from <1.5 to 6.8 µg/L in the Gile Flowage.

Color

Lakes exist in many sizes and shapes, but often the most obvious characteristic of a lake is its color. The differences in color or transparency between lakes can be rather striking due to geology, surrounding wetlands and suspended solids. Lake color can tell you many things about the waterbody including nutrient load, algal growth, water quality and the surrounding landscape. There are three main categories of lake color: blue water lakes, green water lakes and brown water lakes. The Gile Flowage would be considered a brown water lake due to the input of tannins from adjacent wetlands and the surrounding geologic characteristics of the watershed. Color measurements in the Gile flowage varied between 100 and 126 PCU with the highest concentration measured in the most upstream sampling location. Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state (Wisconsin Administrative code: NR 102.04). Color in Gile Flowage is typical of lakes in this region.

Nitrate/Nitrite

Nitrates are a form of nitrogen, which is found in several different forms in terrestrial and aquatic ecosystems. These forms of nitrogen include ammonia (NH_3), nitrates (NO_3), and nitrites (NO_2). Nitrates are essential plant nutrients, but in excess amounts they can cause significant water quality problems. Together with phosphorus, nitrates in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in the stream. This, in turn, affects dissolved oxygen, temperature, and other environmental indicators. Excess nitrates can also cause hypoxia (low levels of dissolved oxygen) and can become toxic to warm-blooded animals at high concentrations (10 mg/L or higher) under certain conditions. The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L Nitrate/Nitrite). Nitrogen in Gile Flowage ranged between less than 0.0034 and 0.012 mg/L. Consequently, nitrate/nitrite concentrations in the Gile Flowage are not a concern.

Ammonia

Ammonia is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a waterbody at elevated concentrations and indirect effects on aquatic life, ammonia may cause direct toxic effects on aquatic life. Ammonia is produced for commercial fertilizers and other industrial applications. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes.

Ammonia can enter the aquatic environment via direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as nitrogen fixation, air deposition, and runoff from agricultural lands. When ammonia is present in water at high levels, it is difficult for aquatic organisms to sufficiently excrete the toxicant, leading to toxic buildup in internal tissues and blood, and potentially death. Environmental factors, such as pH and temperature, can affect ammonia toxicity to aquatic animals. Ammonia concentrations in the Gile Flowage ranged between 31.7 and 42.9 µg/L (0.0317 and 0.0429 mg/L, respectively). These concentrations are far below the toxicity threshold of freshwater aquatic organisms. For example, the 2013 EPA Final Acute Value (weighted average acute toxicity) for freshwater organisms is 33.52 mg/L (USEPA 2013).

Total Suspended Solids (TSS)

TSS are waterborne particles that exceed 2 microns (µm) in size. Any particle that is smaller than 2 microns is considered a total dissolved solid (TDS). The majority of total suspended solids are comprised of inorganic materials; however, algae and bacteria may also be considered TSS.

TSS could be anything that floats or "suspends" in water, including sand, sediment, and plankton. When certain water sources are contaminated with decaying plants or animals, the organic particles released into the water are usually suspended solids. While some sediment will settle at the bottom of a waterbody, other TSS will float on the water's surface or remain suspended somewhere in between. TSS affects water clarity; the higher a water source's TSS content, the less clear it will be. TSS in the Gile Flowage ranged between 2.6 and 8.6 mg/L, with the greatest concentration at Gile #1 or the inlet to the Gile Flowage. TSS concentrations in this range are considered very low.

Agency Correspondence and Consultation

There was no correspondence with any agency during the study.

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APPENDIX A

Raw Field Data Including Field Notes and Depth Profile Data
(sent as a separate Excel file)

APPENDIX B

Analytical Data Including Laboratory Analysis Results
(sent as a separate Excel file)