FOND DU LAC RESERVATION NONPOINT SOURCE MANAGEMENT PLAN

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OVERVIEW

The Fond du Lac Band of Lake Superior Chippewa is signatory to the 1854 Treaty of LaPointe with the US Government, which led to the creation of the Fond du Lac Reservation. The Fond du Lac Reservation, at the western tip of Lake Superior, is 101,000 acres and includes 23 lakes, 6 streams and the St. Louis River. Due to the rural, wetland-rich and forested nature of the area, the lakes, streams and river maintain good water quality. Fond du Lac Resource Management, Office of Water Protection (OWP) emphasizes anti-degradation to maintain the good water quality on the Reservation. Since there are no documented point sources on the Reservation, Fond du Lac OWP uses nonpoint source pollution (NPS) management to improve or maintain water quality.

On a wider scale, Fond du Lac is signatory to three treaties with the US Government: 1837, 1842 and 1854. The 1854 Ceded Territory, which includes the arrowhead region of Minnesota and encompasses the Fond du Lac Reservation, is a region where Fond du Lac Band members practice their usufructuary rights to hunt, fish and gather in perpetuity. Inherent in these rights are the expectations that the health of the land, water and air will be protected and maintained in such a way to allow for healthy and sustainable harvest of fish, wildlife and plants for food, medicine, subsistence, commercial and cultural uses.

The Fond du Lac Band was granted "treatment as a state" authority (TAS) in 1996, under the Federal Clean Water Act, enabling it to enact and enforce its federally approved water quality standards. In 2001, United States Environmental Protection Agency (EPA) Region 5 formally approved the Tribe's water quality standards. The Water Quality Monitoring Plan (WQMP) outlines in detail the strategy used to monitor and assess the water quality of the lakes and streams identified in the Water Quality Standards (WQS). A Quality Assurance Project Plan (QAPP) was developed that includes the data quality objectives and thorough documentation of field and laboratory methods to be used in the monitoring effort. The QAPP was reviewed and approved by EPA Region 5 staff, and is updated regularly. In 2004, Fond du Lac received TAS for Clean Water Act §319, Nonpoint Source Pollution. Fond du Lac's water quality standards include two cultural use designations: wild rice waters and aesthetic waters. In addition, the water quality standards surrounding fish consumption assumes a high subsistence-level fish consumption rate among Band members, so the water quality standards for bioaccumulative toxins such as mercury are more stringent in Fond du Lac's standards when compared to the state of Minnesota. These use designations maintain water quality to allow for cultural uses that include but are not limited to fishing and harvesting wild rice and plants for cultural or medicinal uses. Beyond Fond du Lac's water quality standards, the Tribal government has other ordinances and practices to protect water quality and cultural uses and values tied to the water, including a wetland use ordinance, land use ordinance, cultural protection zones, and a Conservation Committee. Fond du Lac also maintains an Integrated Resource Management Plan to outline how the various departments within Resource Management will work together to achieve their stated goals. The Reservation's lakes, streams and rivers are monitored regularly according to their designated uses, which include but are not limited to fishing, primary and secondary contact recreation and harvesting wild rice (also referred to by its Anishinaabe name, manoomin).

Not only is NPS pollution difficult to manage due to complexities in source, pollution types, and management methods, but additional problems result from the large number and variety of agencies, organizations, groups, and individuals involved in managing land and protecting resources on the Fond du Lac Reservation. The main NPS threats on the Reservation are atmospheric deposition (mainly mercury) hydromodification, roads, urban impacts (shoreline development and septic systems), invasive species, and climate change (mainly in the form of extreme large rain events). All monitored water bodies, except for Perch Lake (North Basin) are impaired for mercury in fish (human consumption) and in the water column. Second Lake is impaired for total suspended solids. Beyond these impairments, all waters on the Reservation are meeting water quality standards for their designated uses. Iron mining in the upper St. Louis River watershed impacts water quality in the St. Louis River in the form of high concentrations of inorganic salts, which leads to high levels of sulfate and high specific conductance values compared to surrounding water bodies that don't receive discharge from the mining tailings basins.

This plan serves as an update of Fond du Lac's 2004 §319 Non-Point Source Pollution (NPS) Management Plan.

Certification for Tribal Authority

Treatment as a State for Section §319 of the Clean Water Act

Certification for tribal authority can be found in Appendix H, which includes documentation of Fond du Lac's Treatment as a State authority for Section §319 of the Clean Water Act.

Water Quality Certification

Fond du Lac has Treatment as a State authority under Section §106 of the Clean Water Act to implement a tribal water quality monitoring program. The Fond du Lac Reservation Business Committee (RBC) adopted the Fond du Lac Band of Lake Superior Chippewa Water Quality Standards of the Fond du Lac Reservation (Fond du Lac Band of Lake Superior Chippewa, 2001, Appendix D). The EPA approved these Standards in 2001. Subsequently, the RBC adopted the Fond du Lac Band of Lake Superior Chippewa Water Quality Certification Ordinance (Fond du Lac Band of Lake Superior Chippewa, 2006), which outlines the procedures the FDL Office of Water Protection will use to grant, grant with conditions, or deny Clean Water Act Section 401 Water Quality Certification. By law, no permit or license can be issued by the federal government unless it has received this certification from the proper authority - in this case, any federal permit or license issued within the external boundaries of the Fond du Lac Reservation. The FDL Wetlands Protection and Management Ordinance (Fond du Lac Band of Lake Superior Chippewa, 2006a) also requires a 401 Water Quality Certification for its permits.

A Public Notice will be issued for either 30 days or 60 days to invite public comment regarding any pending 401 Water Quality Certification decisions. However, when a 401 Water Quality Certification is pending for a WPMO Wetland Activity Permit, the Public Notice for this certification will be included with the Public Notice for the actual permit (see the Wetlands page on *this website* for current WPMO Public Notices). Any current Public Notices for 401 Water Quality Certification will be posted.

The Fond du Lac OWP is slowly but systematically working towards long-term tribal goals of securing program authorization for CWA §404 (wetland fill and dredge permitting) and CWA §402 (National Pollutant Discharge Elimination System permitting), beginning with applications for TAS, as well as CWA §303(d). Our monitoring program will evolve to support these regulatory programs in the future.

INTRODUCTION

The primary objective of Fond du Lac's NPS Management Program is in keeping with the Fond du Lac Reservation Land Use and Management Plan's natural resources goal that states the following:

"An appropriately diverse landscape of viable, healthy ecosystems of sufficient extent that are naturally functioning and/or managed by humans that insure surface and ground water of the highest possible quality; insure the ongoing presence of natural resources critical to traditional Ojibwe uses; and offer, where appropriate, economic values."

The purpose of the Nonpoint Source Management Program (Management Program) is to identify Reservation-wide activities, as well as watershed-level projects, for implementing management practices

for high priority nonpoint source problems and provide a schedule for their implementation. The six types of information required for the Management Program include:

1. A description of Best Management Practices (BMPs) and measures that will be used to reduce pollutant loadings resulting from each category and subcategory on nonpoint source pollution identified in the assessment report.
2. A description of the programs that will be used to achieve implementation of the BMPs identified in #1 above.
3. A schedule containing annual milestones for the implementation of the BMPs and programs identified in #1 and #2 above.
4. A certification by an independent legal counsel that the laws of the Tribe provide adequate authority to implement such a management program, or if there is not adequate authority, a list of additional authorities that might be necessary to implement the management program. There should also be a schedule and a commitment by the Tribe to seek such additional authorities as expeditiously as practicable.
5. A list and description of any sources of Federal and other assistance/funding (other than 319(h)) that will be available for supporting the implementation of the nonpoint source pollution control measures identified in the Tribe's nonpoint source management program.
6. Identification of any Federal assistance programs and development projects to be reviewed by the Tribe for their effect on water quality or inconsistency with the Tribe's nonpoint source management program.

Goals and Objectives

Goals

Specific goals of the Management Program are as follows:

1. Prevent impacts to waters where the severity of impairment is low in the Assessment Report. This is the anti-degradation approach, and protecting good water quality will maintain sustainable ecosystems and minimize costly cleanup of tribal waters at a later time.
2. Where the severity of impairment is moderate or high in the Assessment Report, provide the most appropriate tools (e.g., education, incentives, acquisition, enforcement) to efficiently and effectively implement and maintain the BMPs necessary to insure protection and prevention of water quality impacts from nonpoint source pollution.
3. Restore waters that have been impacted and/or impaired by nonpoint source pollution.

Objectives

The objectives for the Management Program to meet the above goals include:

- Coordinate inter-governmental efforts to ensure a holistic watershed/ecosystem approach and reduce redundancy of efforts.
- Coordinate administration, policy development, and enforcement of water quality standards and Federal, state, local, and Tribal laws, codes, and regulations pertaining to land use and water quality.
- Design and install BMPs and Integrated Pesticide Management (IPM) where necessary to provide water quality protection and to restore impaired waters, using a systems approach.
- Encourage public involvement and provide education on nonpoint source pollution.

    - Continue educational collaborations as described in the Assessment Report. Highlight NPS topics at annual tribal educational events such as the Taking Care of Things Gathering and the Gichi Manidoo Giizis Pow Wow.
- Monitor water quality conditions and perform trend analysis, determine beneficial use impacts due to projects or implementation of BMPs, locate chronic and acute sources of nonpoint source pollution, and evaluate compliance with standards and criteria.
- Develop and implement a "checklist" of planning, design, and construction issues to address and incorporate during the review of new projects.
- Use the following management measures to help control nonpoint source pollution on the Reservation (links are provided in blue):
    - *National Conservation Practice Standards*, Natural Resources Conservation Service, US Department of Agriculture,
    - NRCS Field Office Technical Guide (FOTG). These technical guides are the primary scientific references for NRCS. They contain technical information about the conservation of soil, water, air, and related plant and animal resources. The FOTGs are localized so they apply specifically to the geographic area for which they are prepared.
    - *Stormwater Best Management Practices Manual*, 2000, Minnesota Pollution Control Agency
    - *Minnesota's Stormwater Manual*, 2000, Minnesota Pollution Control Agency
    - *Conservation Project Planning and Promotion*, 2014, Minnesota Board of Water and Soil Resources
    - *Urban Stormwater Management*, Minnesota Board of Water and Soil Resources,
    - Duluth/Superior Regional Stormwater Protection Team Educational Resources
    - *Field Guide for Maintaining Rural Roadside Ditches, Protecting Lakes and Streams Through Proper Ditch Management*, MN Sea Grant, 2014 Regents of the University of Minnesota
    - *Green Infrastructure*, US EPA
    - *Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers* by the Minnesota Forest Resources Council, February 1999
    - *Plants for Stormwater Design*, Shaw, Daniel and Schmidt, Rusty, 2003, Minnesota Pollution Control Agency
    - *National Management Measures to Control Nonpoint Source Pollution from Urban Areas* by the U.S. Environmental Protection Agency, July 2000
    - *Management Measure for Hydromodification* by the U.S. Environmental Protection Agency, EPA 840-B-92-002 January 1993
    - *Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates*, by Barr Engineering for the Metropolitan Council, 2003
    - *Protecting Natural Wetlands: A Guide to Stormwater Best Management Practices*, EPA-843-B-96-001, October 1996
    - *Temporary Stream, Wetland and Soft Soil Crossings*, MN Erosion Control Association, 2010
    - *Temporary Stream and Wetland Crossing Options for Forest Management*, USDA Forest Service General Technical Report NC-202, 1998
    - *Field Manual on Sediment and Erosion Control: Best Management Practices for Contractors and Inspectors*, J. Fifield, Forester Press 2002
    - *Erosion Control Handbook II*, Minnesota Department of Transportation, 2006

- *Erosion and Sediment Control Handbook*, Goldman, S.J., K. Jackson, and T.A. Bursztynsky, 1986, McGraw-Hill
- Fond du Lac Invasive Species Management Plan website
- *A Minnesota State Management Plan for Invasive Species,* MN DNR, 2009.
- *Fourth National Climate Assessment*, U.S. Global Change Research Program

The Management Program will focus on protecting existing good water quality by relying on monitoring, ordinances and other protections, and existing educational resources. In addition to education, the Management Program will emphasize technical assistance and financial incentives for Band members and other land owners to voluntarily implement BMPs to prevent or mitigate impairment. BMPs are methods, measures, procedures, or practices used to control or reduce nonpoint source pollution. BMPs can be structural controls or nonstructural controls, and/or operation or maintenance procedures applied before, during or after pollution-producing activities. The monitoring component of the program will be relied upon in order to quantify the Band's overall success in maintaining or enhancing the water resources on the Reservation.

Using a Systems Approach

NPS pollution is a complex problem with multiple solutions. Using a systems approach leads to more sustainable solutions to NPS pollution focused not only on implementing specific or innovative BMPs, but on environmental outcomes (Ghahramani and Mattox, 2000). The pollutant control achievable from any given management system is viewed as the sum of its parts, considering the range of effectiveness associated with each single practice, the costs of each practice, and the resulting overall cost and effectiveness (Shortle et al., 2019). A systems approach arises from considering all the factors that will produce a successful suite of NPS management strategies that lead to water quality protection and improvement, including multiple time scales, landscape scales and local biological and geographic features (from the site level to the watershed level) and also economic, social/cultural and policy considerations. It requires the vision to look both upstream and downstream, to consider multiple NPS pollutants and BMP types and their combined effectiveness, and to factor in community and leadership support and the cost/benefit considerations behind each decision. Equity is also a concern within a Tribal community such as Fond du Lac, so that any costs or adverse impacts associated with NPS management decisions or projects do not cause disproportionate consequences for Band members.

Within the context of Fond du Lac's NPS Management Plan, a systems approach means that the best BMP strategies will consider multiple interconnected locations within a watershed, rather than focusing on one water body or project in isolation. A systems approach may also require managing stressors that cause multiple types NPS pollution, in concert with managing the multiple sinks that ameliorate NPS, such as wetlands. In addition, Fond du Lac OWP will refer to all applicable plans and metrics when using a systems approach for BMPs, including the FDL Land Use Plan, the Environmental Benefits Index, the Wildland Fire Management Plan, the WPMO and the IRMP.

Fond du Lac's NPS Management Plan lists the main NPS categories below and states the general pollution issues for each category, followed by discussion of specific management practices, which when combined will achieve the goals and objectives both within and between NPS categories (Shortle et al., 2019). Fond du Lac OWP systems approach for NPS management and selecting BMPs includes the following steps (Ghahramani and Mattox, 2000):

- Outline the NPS pollution problem and create a needs analysis. The types of NPS pollution and their relative effects will be identified in relation to topography, economy, and possible pollutant producers. We will also refer to the Environmental Benefits Index referenced in the NPS Assessment Report The critical area must be defined since the viability of a project is defined in terms of the entire watershed and not any single source of contamination.
- Set objectives and project plans. This includes short-term and long-term environmental goals as well as social/cultural, economic, and geographic goals. Planning also involves adaptive management, so that data collection, monitoring and evaluation are built into the project.
- Secure funding and define partner roles. Partners are essential for project success, both from the local community and from governmental agencies and nongovernmental organizations (NGOs). Since Fond du Lac does not have TAS for Section §303(d) of the CWA, we rely on state and EPA partners to work within the framework of waters that are impaired due to NPS pollution. Fond du Lac OWP has a rich network of partners, collaborators and funding sources to draw from, as outlined below in the General Management Plan.
- Implement and evaluate projects. This includes ongoing assessment and improvement (where needed) for each project and how they relate together on landscape, social and economic scales to manage NPS pollution. Results will be documented and shared with the community, partners and collaborators, and other agencies.

An important consideration in the systems approach is implementing an effective monitoring design that provides enough statistical power to determine if BMPs are having the desired effect – whether that's reducing sediment or nutrient NPS pollutant loads, improving habitat for aquatic life or improving hydrologic functioning at a site with hydromodification. Such investigations should be done at the appropriate watershed scale, accounting for density of BMPs and their combined effectiveness, because geographic scale will affect the amount of variability in the water quality and hydrological data (Alexander and Allan, 2007). Even if a statistical power analysis can help determine the number of monitoring samples needed to have a reasonable level of confidence that a change in pollutant loading is due to BMP implementation rather than natural variation, funding and time constraints will limit the amount of targeted monitoring that FDL OWP staff can incorporate into their existing monitoring strategy. To reduce the monitoring workload and keep a high level of statistical confidence, it can help to reduce variability in the data by including control sites and also monitoring for a suite of covariates that could have an effect on data variability. Another solution is to incorporate a flow-corrected trend into water quality data. Because climate change has led to wide-ranging swings in both extreme drought and extreme flooding, both can significantly alter the pollutant concentration/water discharge relationship and influence the ability of a given BMP to affect pollutant loading. If a BMP is effective at reducing an NPS pollutant over time, but at the same time a given watershed is experiencing high flows due to climate change, then the overall pollutant load won't decrease over time, even with the BMP in place. The important factor is to collect the correct data to be able to qualify any observed changes in pollutant loading as having a low, medium or high likelihood of being influenced by climatic differences.

Management Program Summary

Fond du Lac has legal authority through its Treatment as an Affected State (TAS) status under Section §319 of the federal Clean Water Act (CWA), for the purposes of administering a tribal nonpoint source management program on the Reservation. The Fond du Lac Resource Management Division Houses the Environmental Program, which includes all programs covered by General Assistance Program (GAP) funding from EPA. The Office of Water Protection (OWP), within the Environmental Program, administers

the Nonpoint Source Pollution Management Program with authority from the Fond du Lac Reservation Business Committee through resolution or ordinance. The OWP consists of a Water Projects Coordinator who oversees all aspects of our work related to water quality; a Water Regulatory Specialist who administers, reviews and submits Tribal, state and federal wetland permits and water quality certifications; a Watershed Specialist who manages water quality monitoring and data analysis; a Groundwater Specialist who manages groundwater monitoring and well records; and (when Wetland Program Development Grants allow) a Wetland Specialist who manages our wetland assessment protocols and wetland restoration projects. The OWP staff report to the Environmental Program Manager and the Resource Management Director.

The OWP works closely with other Fond du Lac Resource Management Division programs – a list of these programs can be found in the Selection of BMPs section of the Assessment Report. All of Fond du Lac's Resource Management programs refer to the Integrated Resource Management Plan for recommendations on how to work with one another on cross-program projects. As part of the larger Tribal government system, Fond du Lac OWP works with the Conservation Committee, Planning, Land, Legal, and Accounting Departments to plan and administer NPS projects.

The progression of the Management Program from draft to public input to adoption follows the same format as the Assessment Report. The Fond du Lac Reservation Business Committee has the overall authority to adopt the Nonpoint Source Assessment Report and Management Program, submit funding applications, and review and approve program implementation projects. Any proposed BMP project must adhere to relevant water quality standards and ordinances before it is approved by the RBC; although Fond du Lac does not have an ordinance specific to NPS pollution, it does have a Wetland Ordinance, a Land Use Ordinance and an Invasive Species Ordinance that would likely apply to any BMP projects on the Reservation. All BMP projects would also need to adhere to the Land Use Plan and Zoning Regulations, including any relevant cultural ordinance or considerations. As part of the community, Fond du Lac OWP may consult with the Elder's Concerns Group to share proposal for ideas and to gain their input and take their concerns into account.

At the regional level, Fond du Lac OWP works within multiple governance structures, consulting with county, state and federal authorities for various BMP projects. Fond du Lac OWP works closely with Tribal governments and agencies, including the 1854 Treaty Authority, the Great Lakes Indian Fish and Wildlife Commission and the Minnesota Chippewa Tribe. A complete list of the experts we work with can be found in the Selection of BMPs section of the Assessment Report. Fond du Lac OWP staff are well-integrated within the community of water quality and wetland professionals in the area, and have access to many experts on a range of topics that we can rely on as we prioritize, plan, fund and administer BMP projects and other NPS-related work. We are well-versed in cooperative reporting; we often work together with county, state and federal agencies on wetland permits, and we also prepare joint final reports for grants that include Fond du Lac and a federal agency, such as the US Army Corps or US Geological Survey. We are also experienced in joint reporting through our research collaboration with the University of Minnesota, where we have collaborated to write multiple grant applications and educational materials. We will draw on this experience to take part in any joint reporting that may need to be completed as we administer the NPS Pollution Management Program.

It is imperative the Tribe continue to have a watershed-wide perspective of nonpoint source projects, monitoring, and assessment, because watershed indicators provide a view of the overall health of the ecosystem, not just the individual waterbodies. Although the Assessment Report listed waters by NPS Pollution Categories rather than by watersheds, Fond du Lac does all its water quality work within a

watershed-based framework. This approach is most logically and environmentally sound, as it considers upstream and downstream connections, and the relationship of the land with its receiving waters. This is especially true within the manoomin watersheds on the Reservation, where manoomin management is only successful when we respect and understand how water moves through the entire watershed and how that affects each lake's optimal water level for manoomin. When assessing BMP plans, we focus on the waterbodies that were rated as moderately or significantly impaired based on the tables in the Assessment Report for each NPS Pollution Category. From there, projects are given priority based on how they will affect water quality within the entire HUC-7 watershed (e.g., a tributary restoration project that improves water quality for the receiving water will be given priority over a project that affects only one water body or a small portion of a watershed). See the Assessment Report for a map of HUC-7 watersheds on the Reservation. Wetland function is also considered, with high priority given to projects that could improve wetland function or protect highly diverse or sensitive wetlands. Under each category, there is a list of projects followed by a table listing the project priority, agencies involved, and a potential implementation schedule.

EXISTING AUTHORITIES AND PROGRAMS

This section identifies and describes any Tribal or Federal laws or programs that address nonpoint source pollution and activities associated with each.

Federal Law

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. (the Act does not deal directly with groundwater nor with water quantity issues.) The statute employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is another hallmark of this approach.

The major CWA programs are the following: a) water quality standards, b) antidegradation policy, c) waterbody monitoring and assessment, d) reports on condition of the nation's waters, e) total maximum daily loads (TMDLs), f) NPDES permit program for point sources, g) Section §319 program for nonpoint sources, h) Section 404 program regulating filling of wetlands and other waters; i) Section 401 state water quality certification; j) state revolving loan fund (SRF).

Section §303

Section 303 of the CWA requires that EPA review and approve water quality standards (WQS) to assure the WQS are consistent with the requirements of the CWA. Water quality standards are provisions of local, state, or Federal law which consist of a designated use or uses for the waters of the United States, and water quality criteria to maintain and protect such uses. Water quality standards must protect public health or welfare, enhance the quality of water and serve the purposes of the CWA. Accordingly, WQS influence and affect all water pollution control programs. EPA reviewed and approved Fond du Lac WQS in December 2001 as being in accordance with the more protective Great Lakes Initiative criteria, an additional requirement for WQS in the Great Lakes Basin. Appendix D includes the most recent triennial review of Fond du Lac's WQS, adopted by the RBC and approved by EPA Region 5 in 2020.

It should also be noted that EPA's regulations to implement Section 303 (40 CFR Part 131) require that the Tribes adopt an antidegradation policy. Fond du Lac's WQS include a chapter describing the Band's antidegradation policy. Antidegradation policy requires that:

1. Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected;
2. Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Tribes find that after full satisfaction of the intergovernmental coordination, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the Tribes shall assure water quality adequate to protect existing uses fully. Further, the Tribes shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost effective and reasonable BMPs for nonpoint source control;
3. Where high quality waters constitute an Outstanding National Resource, such as waters of National and State parks, and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected. Fond du Lac's WQS include the special designation of "Outstanding Reservation Resource Waters" that was applied to five of the most productive wild rice lakes at the time that the ordinance was adopted by the FDLRBC. There is also a process defined for nominating other Reservation waterbodies to have this more protective designation.

Nonpoint source pollution activities are not exempt from the antidegradation policy. Tribes are required to assure that the highest statutory and regulatory requirements for all new and existing point sources and all cost effective and reasonable BMPs for nonpoint source control shall be achieved. If a particular activity will degrade water quality even after all these measures are applied, Tribes have to:

1. Identify proposed water quality degradation (where and to what degree water quality will be lowered);
2. Determine that the degradation is necessary to accommodate important social or economic development.

Section §319

The 1987 Water Quality Act passed by Congress on February 4, 1987 amended the CWA to add a new Section 319, entitled, "Management of Nonpoint Sources of Pollution". Section §319 requires each Tribe to develop a comprehensive nonpoint pollution assessment report, and to submit a management program for control of nonpoint source pollution on the reservation. The nonpoint management programs are to

include: best management practices to reduce pollutant loadings from each category and subcategory of nonpoint source pollution identified in the Tribe's Assessment report; specific management programs to achieve implementation of best management practices; a schedule for program implementation; certification of necessary legal authorities; and sources of funding to support implementation.

Section §401

Section 401 of the Federal CWA requires that any applicant must apply for a Federal license or permit for the conduct of any activity which results in a discharge into the navigable waters of the U.S. The 401-certification authority is administered on the Reservation by Fond du Lac's Office of Water Protection. Section 401 provides the EPA with authority to assure that federally permitted or licensed activities that might result in nonpoint source pollution, do not violate Tribal Water Quality Standards (water quality standards specify uses for the waters of the Reservation, and the water quality criteria necessary to protect those uses.) Section 401 provides the Tribe with a mechanism to modify potentially damaging Federally permitted or licensed projects. This authority is frequently applied toward dredge and fill permits issued by the U.S. Army Corps of Engineers and licenses issued by the Federal Energy Regulatory Commission.

Section §404

Section 404 of the Federal CWA establishes a permit program for the discharge of dredged or fill material into the waters of the U.S. The U.S. Army Corps of Engineers (COE), St. Paul District, administers this program on the Reservation. Discharges of dredged or fill material are frequently associated with nonpoint source pollution-causing activities occurring in or adjacent to streams and wetlands. The 404 permit program provides a mechanism to require implementation of appropriate BMPs for the control of nonpoint source pollution by stipulation of BMPs as a condition of the permit, and may also require mitigation to offset the impacts of the permitted activity. The program also allows opportunity for consultation among the COE, EPA, United States Fish and Wildlife Service, and Conservation Districts regarding appropriate BMPs. Discharges of dredged or fill material into wetlands are regulated under the 404 program. This serves as a significant means for protecting wetlands, thus preserving their important function in improving water quality through assimilation of nutrients and retention of sediments.

Tribal Authorities

The Fond du Lac Division of Resource Management will be responsible for the review of activities and programs conducted by all Federal agencies on Tribal lands to ensure compliance with the Tribal Nonpoint Source Management Program. This will be one of the duties of the Fond du Lac Environmental Program. The following is a list of Federal Agencies expected to conduct activities that would fall within the guidelines of the Management Program: USDA NRCS, Bureau of Indian Affairs, Indian Health Service, and Housing and Urban Development. The BIA has responsibilities over all properties held in trust by the U.S. Government for Indian Tribes. The BIA will provide technical assistance and resources when appropriate.

Fond du Lac Reservation Water Quality Standards and Certification Authority

The Reservation has been granted "Treatment as an Affected State" authority for administering its water quality program, and has adopted water quality standards with designated uses such as fishing, recreation, cultural and wild rice. Since 1998, we have been monitoring these waters to determine if they are meeting their uses and are able to support the types of aquatic life that we would expect to see in

lakes and streams in northern Minnesota. During the most recent triennial review, completed in 2020, we updated our water quality standards to include a numeric criterion for specific conductance in streams and river, narrative wetland quality standards, and numeric nutrient criteria for total phosphorus, total nitrogen and chlorophyll α (Appendix D, Fond du Lac Band of Lake Superior Chippewa, 2020). Fond du Lac's Water Quality Certification Standards (Ordinance #01/06) outline the procedures the FDL Office of Water Protection will use to grant, grant with conditions, or deny Clean Water Act Section 401 Water Quality Certification (Fond du Lac Band of Lake Superior Chippewa, 2020). By law, no permit or license can be issued by the federal government unless it has received this certification from the proper authority - in this case, any federal permit or license issued within the external boundaries of the Fond du Lac Reservation. The FDL Wetlands Protection and Management Ordinance (Ordinance #03/06) (WPMO) also requires a 401 Water Quality Certification for its permits (Fond du Lac Band of Lake Superior Chippewa, 2006a).

Fond du Lac Reservation Wetland Ordinance

Preserving wetlands in their natural condition is necessary to maintain the hydrologic, economic, recreational, subsistence, cultural, spiritual, and aesthetic assets for current and future residents of the Fond du Lac Reservation. The purpose of the Fond du Lac Wetlands Protection and Management Ordinance (WPMO) is to ensure maximum protection for wetlands by discouraging development activities in wetlands and those activities in adjacent upland sites that may adversely affect wetlands. The WPMO was enacted with the intent of providing a reasonable balance between the rights of individual property owners to the free use of his/her property and the rights of present and future generations.

The Office of Water Protection (OWP), operating under the Resource Management Division is responsible for the application, processing, and review of Wetland Activity Permits and Exemption Certificates under the provisions of the Fond du Lac Wetlands Protection and Management Ordinance (Fond du Lac Band of Lake Superior Chippewa, 2006a).

Emerald Ash Borer Federal Deregulation/FDL Response

In November of 2018 USDA/ APHIS announced plans to deregulate emerald ash borer (EAB) at a federal level which would result in the quarantines no longer being enforced, and efforts focusing on education and biocontrol methods. Fond du Lac submitted a response to APHIL opposing the lifting of the quarantine, and has continued work with the MDA to uphold quarantines in MN, even if it is not regulated at the federal level. Fond du Lac is currently working on an ash management plan which will help address the issues that EAB presents.

Fond du Lac Ceded Territory Conservation Code

This code, which applies to the 1854 Ceded Territory (which includes the Fond du Lac Reservation), gives a definition of infested waters. It states that no Band member shall possess, import, purchase, sell, propagate, transport, or introduce an invasive species, except under a permit issued by the Resource Management Division for the purpose of disposal, control, research, or education. The code lays out the rules for proper transport under the permit. The code prohibits Band members from transporting Eurasian water milfoil and/or purple loosestrife over a public road. The code requires Band members to remove all aquatic plants from watercraft and trailers before transport, and lays out the procedures to properly clean, drain and dry watercraft and equipment. Band members are prohibited from gathering fish and amphibians for bait from waters defined as infested under this code, unless they are used in that same infested water (Fond du Lac Band of Lake Superior Chippewa, 1992).

MANAGEMENT PROGRAM SUMMARY

The Management Plan has been divided into two parts: 1) a General Management Program and 2) a Specific Management Programs for each EPA affiliated nonpoint source pollution category. The General Management Program includes administration, assessment, monitoring, education, and other programs administered by the Reservation that apply. The Specific Management Programs for agriculture, forestry, hydromodification roads, urban, wetland management, invasive species and climate change identify BMPs, prioritize impaired waters, and propose projects to implement BMPs. Milestones have been established for the overall General Management Program. Milestones are general guidelines for project activity dates; implementation of most milestones will be dependent upon the availability of CWA §319 and other funds.

GENERAL MANAGEMENT PLAN

Administration

Administering and coordinating the Management Program includes organizing and managing inter-agency cooperation, periodic program updates (semi-annual reports, water quality assessment reports), and submitting grant applications to obtain funding for projects. The Reservation's Environmental Program personnel will be responsible for these activities.

Assessment

Knowledge of nonpoint source pollution problems on the Fond du Lac Reservation is a combination of data evaluation and best professional judgement. We compile and analyze our water quality data, and use our Assessment Methodology to determine if the designated uses in our Water Quality Standards are being met. We submit Tribal Water Quality Assessments via ATTAINS at the end of each year. Since Fond du Lac has no point source pollution, all impairments are due to NPS. The assessment will be updated every five years.

Monitoring

The Fond du Lac Reservation has a detailed description of their water quality monitoring program (physical, biological, chemical, etc.) to better characterize water quality, quantify impairments, identify trends, and propose solutions. This program (summarized in the Assessment Report) will continue. In addition, monitoring and evaluation efforts will be added to assess the success of BMP implementation projects.

Education

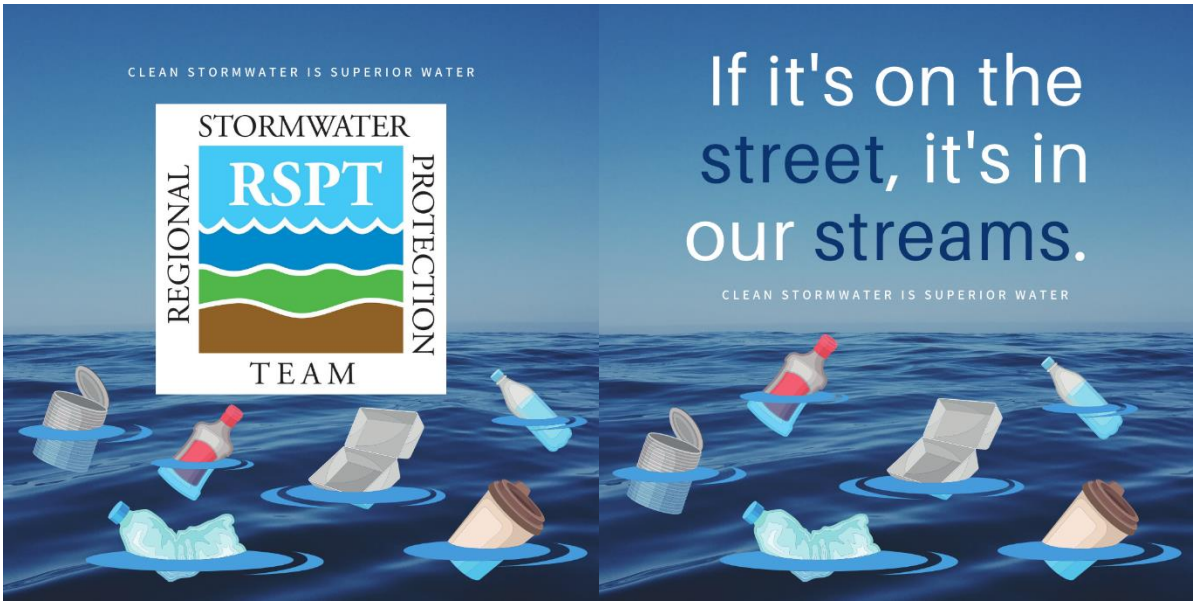
The more people who know and understand the causes, effects, and solutions to NPS pollution, the less likely they are to be part of the problem, and the more likely they are to become part of the solution. Therefore, we will continue our existing efforts to promote voluntary corrective actions by Tribal

members, other allottees and their heirs, and private landowners not associated with the Tribe. This program will help prevent or reduce future problems by increasing general public awareness.

An education program will include a variety of items targeted specifically for different age groups and sectors of the Reservation community. Existing education and outreach materials will be used for outreach with local schools, the Tribal community and specific sectors, such as the Tribal Construction Department to reinforce erosion control and stormwater management efforts. Fond du Lac has extensive ties to the Environmental Education community and their resources; examples include the Watershed Game developed by Minnesota Sea Grant and the Manoomin puppet show available through the Thirteen Moons Program. A compendium of our educational partners and events is included in the Selection of BMPs section of the Assessment Report, under the Education heading. Fond du Lac OWP will work cooperatively with other local units of government to provide a consistent framework for nonpoint source controls for private landowners on the Reservation; this will be an important component of the state of Minnesota's One Watershed One Plan for the St. Louis River basin, so this will provide a valuable opportunity for Fond du Lac to work with nearby county SWCDs to provide outreach to landowners, local governmental officials and public and private sectors that have a focus on public works.

The Regional Stormwater Protection Team (RSPT) is a workgroup for MS4s in the service area for both the Western Lake Superior Sanitary District and the City of Superior Sanitary District, to share outreach and education to reduce stormwater pollution and separate stormwater sewer overflows into Lake Superior. RSPT has a budget to create outreach materials for TV, radio and social media, and these materials are available via Google Drive for all RSPT participants (Figure 1). Fond du Lac OWP participates in the RSPT Media Outreach workgroup to devise creative outreach materials related to stormwater pollution for both urban and rural areas. Together, we create media packages for each season that include images, video, memes, infographics and content for newsletters and websites. Fond du Lac OWP will continue to collaborate with RSPT to share NPS outreach and education materials with the Fond du Lac community.

Figure 1. Examples of stormwater-related infographics produced by RSPT



Fond du Lac Resource Management Division has a Facebook page to share alerts related to nonpoint source pollution, manoomin status, invasive species, environmental education, relevant news articles and community events. In addition, the Fond du Lac Thirteen Moons have a Facebook page to share cultural events, workshops focused on hunting, fishing, gathering and traditional crafts and environmental education. In addition, Fond du Lac OWP publishes water-related articles in the Fond du Lac newspaper, Nahgahchiwanong Dibahjimowinan. Archives of past editions are posted to the Fond du Lac website. Links are listed below.

In addition, Fond du Lac has its own radio station that broadcasts mostly within the Reservation, Cloquet and Moose Lake, MN boundaries, called Dibiki Giizis (the Moon) at 89.1WGZS. The Fond du Lac website, (fdlrez.com), also has a dashboard on the front page to share the most important updates to the community, where Fond du Lac OWP shares updates such as our triennial review of water quality standards, fish consumption advisories and our Wild Rice Health Impact Assessment. Fond du Lac RM has its own program website within the fdlrez.com website, where more in-depth information on all of our resource management activities are documented. In addition to creating our own posts, content and updates, media material created by RSPT can be shared via any of the outreach platforms included above. As Fond du Lac OWP staff become well-versed in outreach products available through ArcOnline (the BIA allows Tribal governmental staff to hold ArcGIS licenses and ArcOnline accounts for free), they can use outreach platforms such as Story Maps and Tableau data dashboards to share water quality and NPS outreach with the community.

Links:
FDL Resource Management - Giiwitaa-izhikamigaawi Gikinoo'amaagewin Facebook page
13 Moons Ashiniswi giizisoog Facebook page
Nahgahchiwanong Dibahjimowinan Archives
Fond du Lac Reservation Resource Management Division website

Waste Management

Fond du Lac has a well-organized solid waste management program, including a recycling center, household hazardous waste collections, electronic waste collection, cleanup of illegal dumping, and composting. They deploy summer crews to conduct roadside cleanups and to pick up dump sites that periodically appear at lakeshores. Fond du Lac also has a Waste Management and Recycling Ordinance, (Fond du Lac Band of Lake Superior Chippewa, 1993), which outlines procedures for handling, storage, collection, transportation and disposal of solid waste. As a source of NPS, solid waste dumping increased on lakeshores in 2020, due to changes in people's daily behavior during quarantine.

General Management Plan Milestones

1. 2020-2021 – Share NPS Assessment Report and Management Program with EPA 319 Project officer, Fond du Lac Resource Management and partners for review and comment.
2. 2021 - Submit final NPS Assessment Report and Management Program as one report to EPA for final approval and adoption.
3. 2026 - Update NPS Assessment Report and Management Program
4. On-going – Submit semi-annual reports and grant close-out reports to EPA.
5. On-going – Fond du Lac OWP meets to discuss and review NPS Management Program plans, funding, and milestones.

6. As needed – Incorporate priorities into the Work Plan for the Tribe's program and submit to funding agencies (Tribes, EPA, State, USGS, BIA, NRCS, etc.).
7. On-going – Monitor the effectiveness of nonpoint source pollution BMP practices and mitigation or restoration projects.
8. Annual – Integrate the data collected in 7 above with the Reservation's overall water quality monitoring program and assessment methodology.
9. On-going – Provide educational programs listed below.
    a. Work with Fond du Lac Invasive Species Program to provide education and information on preventing the introduction of invasive species at all waters on the Reservation.
    a. Work with County SWCDs and NRCS to conduct outreach for small farm operations to reduce impacts to water quality on some water bodies (Third Lake, Annamhasung Creek).
    b. Distribute Individual Sewage Treatment System (ISTS) fact sheets for homeowners.
    c. Continue to adapt and use the Nonpoint Education for Municipal Officials (NEMO) program presentations and information. NEMO is provided by Minnesota Sea Grant and was used during the development of the Assessment Report and Management Program to provide scientifically based educational information.
    d. Continue participation and partnerships with regional stormwater education efforts, such as the Regional Stormwater Protection Team (RSPT), the Lake Superior Reserve, Thirteen Moons, and others in order to maximize stormwater education efforts.

MANAGEMENT PROGRAM DESCRIPTION

Fond du Lac's Assessment Report provides a detailed description of the steps taken to identify nonpoint source pollution problem areas and priority waterbodies. The waters given a moderate or significant impairment in the Assessment Report are addressed in the plan below. In some cases, if an NPS impact is unknown but potentially likely, proposed work to gather more information may be included.

Agriculture BMPs

Watersheds: Otter Creek, Stoney Brook

BMP Goals

Prevent NPS pollution related to agriculture practices on the Reservation. Since agriculture is not a large source of NPS pollution on the Reservation, efforts will be focused on determining if agricultural impacts are a water quality-related concern and where prevention or BMP efforts should be focused.

BMP Projects

First Lake, Second Lake and Third Lake

All three lakes have very small catchment areas relative to their size, and the land near the lakes has been impacted by past farming practices. Work in this area will likely focus on outreach to local landowners to connect them with conservation programs through NRCS and the Minnesota Department of Agriculture. Fond du Lac OWP can assist landowners with conservation plans if needed. Third Lake's agricultural impacts have already been reduced through a Competitive §319 Grant to complete an alum treatment and remove legacy manure piles from the shore of the lake. Since the completion of this work, the shoreline landowner no longer keeps horses on the property.

Annamhasung Creek

Annamhasung Creek is near the only documented feedlot on the Reservation. Fond du Lac OWP will conduct reconnaissance (walkthroughs, aerial photo surveys) to determine if we need to pursue funding to hire contractors to conduct targeted water quality monitoring.

Outcomes

Prevent NPS pollution due to agriculture in the Second Lake/Third Lake and Annamhasung watersheds by providing education and outreach to landowners and connecting them with resources available to them through state and federal agencies to prevent NPS pollution

Tracking metrics:

- Track the number of contacts made between Fond du Lac OWP and landowners in the First Lake/Second Lake/Third Lake and Annamhasung watersheds
- Track the number of educational materials disseminated, and the number of contact or resources shared with landowners and state or federal agencies to provide assistance with agricultural BMPs, if needed.

Table 1. Actions, Outcomes and Timelines for Agriculture Projects

Non-Point Source Pollution Category						
Agriculture						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
First Lake, Second Lake and Third Lake						
Conduct outreach to local landowners to connect them with conservation programs	Number of contacts, number of applications for assistance, number of agriculture conservation/BMP plans created and implemented			•	•	•
Annamhasung Creek						
Conduct reconnaissance (walkthroughs, aerial photo surveys) to determine if further action is needed	Number and type of reconnaissance methods used, number of determinations made about further actions					•

Forestry BMPs

Watersheds: all

BMP Goals

Prevent and/or manage NPS pollution from forestry-related activities, including legacy impacts from forest roads and current practices surrounding ATV use. Forest practices can expedite sedimentation rates and volumes into water bodies and increase water temperature on the Reservation. Since 1997, the Fond du Lac Band has assumed the authority to administer the Forestry Program from the Bureau of Indian Affairs (BIA). Besides the Tribe, landowners include the MDNR - Division of Forestry, St. Louis County, Carlton County, private industry, and private landowners. The long-term goal is to address nonpoint pollution by implementing better communication on forest management policies among these groups.

The Minnesota Forest Resources Council Guidebook has been developed for use by forest landowners, resource managers, loggers, contractors, and equipment operators, who share a concern for balancing forest management activities and the long-term sustainability of forest resources. Although many individuals may participate in managing a particular site, final decisions regarding guideline implementation lie with the landowner. The guidelines were designed to help landowners, resource managers and loggers determine how to protect the functions and values of forest resources during forest management activities. They do not provide advice on whether to manage or which management activities are needed. The guidelines are designed to help meet two goals: 1) Conduct forest management activities while addressing the continued long-term sustainability of diverse forest resources, and 2) Promote or enhance the functions and values of water and soil resources, riparian areas, wildlife habitat, visual quality and cultural resources.

The guidelines represent practical and sound practices based on the best available scientific information. They are particularly designed to assist with site-level forest management, not to provide broad-based landscape direction. The guidelines for water quality and wetlands provide a number of important benefits including:

- Prevention or minimization of nonpoint source pollution from forest management activities.
- Prevention or minimization of erosion and subsequent sedimentation of water bodies.
- Prevention or minimization of the movement of pesticides, fuel, lubricants and other chemicals to surface water, wetlands and ground water.
- Maintenance of water temperatures within their normal range.
- Maintenance of normal hydrologic flows in wetlands.

The Fond du Lac IRMP outlines a process (2018) for coordinating input on timber sales, to assure that all departments within the Resource Management Division have an opportunity to comment, including concerns pertinent to wetland impacts, NPS pollution prevention and erosion control.

BMP Projects

Forest Roads

The Fond du Lac Land Department keeps an accurate and updated inventory of forest roads and trails, but does not always include information on road integrity. Fond du Lac OWP will meet periodically with the Forestry and Land Departments to get updated information on forest road issues (e.g., erosion, sedimentation, road closures, drainage to nearest waterbodies). The most severely degraded roads will be addressed first, and improvement techniques may include water diversion devices, road shaping, road

rerouting, and installing new culverts. Since the 2004 NPS report, Fond du Lac has improved its capacity to manage roadways within the Reservation and also has the ability to leverage federal highway funds in a way that local governmental agencies are unable to do. Where possible, Fond du Lac OWP will assume responsibility for improving roads owned by other governmental entities or at the very least they will coordinate road improvement projects by partnering with other governmental agencies.

One goal will be to implement the Minnesota Forest Resources Council Guidebook chapter called "Forest Road Construction and Maintenance" where possible, as this chapter discusses how to protect steep slopes with erodible soils and areas where forest roads are located near water or wetlands. The goal for the Reservation is to help maintain natural flow patterns across the landscape, avoid concentration of water flows, minimize sedimentation to water bodies and wetlands, protect water resources from the toxic effects of potential spills, minimize alterations of vegetation within the riparian area in order to moderate water temperatures through shading, retain nutrients, reduce unnatural erosion and sedimentation, and provide wildlife habitat.

Priority forest roads may include:

- Burnett Road
- Marshall Road
- Hardwood Lake Road
- Arrowhead Tower Road

ATV Policy

Fond du Lac OWP and Fond du Lac Forestry will partner to develop an ATV policy for the Reservation. In addition to writing a policy that will be vetted by the public as well as the Fond du Lac Reservation Business Committee, Fond du Lac OWP will conduct outreach efforts. Outreach may include displaying a photo inventory of damaged ATV trails and wetlands (such as the trail along the shore of Sofie Lake) to show how detrimental they are to wetlands and waterways, and share tips for ATV users about less damaging ways to recreate. An ATV policy may also require enforcement by Fond du Lac or state Conservation Officers, as well as periodic monitoring of ATV trail conditions. Fond du Lac OWP may have to work with its Conservation Officers to be notified of ATV use violations that damage sensitive areas on the Reservation.

Forestry Resources Research Review

Fond du Lac OWP will work with Fond du Lac Forestry to keep current on the most up-to-date research on forestry techniques and watershed protection. Fond du Lac Forestry already implements the most updated version of the *Sustaining Minnesota Forest Resources* guidebook, and opts to use the most restrictive version of the guidelines within the ranges given. Using resources from the Forest Resource Council and the University of Minnesota Cloquet Forestry Center (who offers continuing education classes), Fond du Lac will determine if any changes in forestry practices are warranted.

Outcomes:

Work in partnership with Fond du Lac Forestry to prevent or manage NPS pollution due to erosion from forest roads and ATV trails. Complete a new ATV policy for the Band that can be used to prevent NPS pollution on ATV trails.

Tracking metrics:

- Tracking the number of forest road BMPs planned and installed
- Completion of an ATV Policy for the Band
- Number of continuing education classes or new forestry techniques that protect water quality

Table 2. Actions, Outcomes and Timelines for Forestry Projects

Non-Point Source Pollution Category						
Forestry						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Forest Roads						
Add forest road condition data to attribute tables in our shared road geodatabases	Continuously updated and shared forest road condition data	•	•	•	•	•
Prioritize forest road work by level of damage	Prioritized list of forest road issues that affect water quality		•		•	
Consult with Forestry and Land Departments on their plans to repair forest roads as needed, including during and after logging activities	Number and length of forest roads repaired during and after tribal logging activities	•	•	•	•	•
Consult with Carlton and St. Louis counties and the MN DNR on their plans to repair forest roads during and after logging activities	Number and length of forest roads repaired during and after county or state logging activities	•	•	•	•	•
Apply for additional funding if needed	Number of funding sources and amount of financial support			•	•	•

ATV Policy						
Work with Fond du lac Forestry, Land and Conservation Officers to write ATV Policy for Reservation land.	One new ATV Policy that prevents NPS pollution		•	•		
Conduct review and approval of ATV Policy with Reservation Business Committee	A new ATV Policy ordinance				•	•
Conduct outreach for ATV users on the new policy and BMPs	Number of outreach materials, number of outreach interactions with ATV users and groups				•	•
Forestry Resources Research Review						
Work with Fond du Lac Forestry to stay updated on current silvicultural practices related to water quality	Number of professional development and outreach courses on silvicultural practices that are protective of water quality	•	•	•	•	•

Hydromodification BMPs

Watersheds: Stoney Brook, Simian Creek, Otter Creek, Moosehorn

BMP Goals

Reduce the impacts of hydromodification on water flow and water quality, focusing on a watershed approach. Using information from aerial surveys, on-the-ground reconnaissance, water flow and water quality data, as well as the results of hydrologic models, create a list of impacted sites, with priority for action going to those that have the largest impact on water flow, manoomin production, wetland quality and function, and water quality. Priority will also be given to BMP projects that are cost-effective or may be completed in partnership with other entities that can assist with funding and implementation. This priority list will then be used to create BMP plans and implement them. Where feasible, implement recommendations from the EPA Management for Hydromodification Report (USEPA, 1993), focusing on the section on Instream and Riparian Habitat Restoration Management Measure.

BMP Projects

Pipeline Monitoring and Restoration

Pipeline BMPs are being addressed through the Pipeline Water Quality Monitoring Plan (PWQMP), developed by Fond du Lac OWP with assistance from IMO Consulting. The PWQMP was developed as part of negotiations between Fond du Lac and Enbridge Pipelines in response to Enbridge's Line 3 expansion project. The relevant sections of the PWQMP are excerpted here. The BMPs refer to the Enbridge and TransCanada Pipeline Corridor (Figure 2)

Through negotiations with the Reservation Business Committee, Enbridge will conduct several projects on the Reservation as follows:

1. Line 3 Replacement Project

This project consists of the complete replacement of the existing Line 3 pipeline through its entirety from Alberta, Canada to Superior, Wisconsin. The Canada, North Dakota, and Wisconsin portions of the project have already been completed. Only the Minnesota portion of the project is still awaiting permits. On the Reservation, the project will encompass the replacement of approximately 13 miles of pipeline. The 34-inch pipe will be upgraded to a 36-inch pipe, which will allow Enbridge to restore the capacity to 760,000 bpd. The Fond du Lac Office of Water Protection has already reviewed the project and granted both a Standard Wetland Activity Permit and the 401 Water Quality Certification for the project on 15 April 2019, both with conditions. The certification document contains 40% more conditions (30 in total) than any other previously issued certification to date. This pipeline will be placed on the outside of the right-of-way adjacent to Line 13/67.

2. Line 4 Relocation Project

For several years, the Fond du Lac Band had expressed concern with the safety of Enbridge's Line 4 through many parts of the Reservation. This was due to the pipeline being exposed as stated in the previous section. The safety concern is with the potential threat of third-party damage. In addition, the raised nature of the pipe does not allow vehicles or equipment to cross the right-of-way, preventing the Fond du Lac Forestry Program from conducting silvicultural practices on the opposite side of the right-of-way, as well as, Fond du Lac Band Members being unable to gain access to exercise their treaty rights. Through the negotiations, Enbridge has agreed to relocate 10 miles of Line 4 on the Reservation from

Arrowhead Forest Road on the north end to Moorhead Road on the south end. This pipeline will be relocated on the outside of the ROW adjacent to the new Line 3.

3. Line 3/Line 4 Removal

Once the new Line 3 and new Line 4 pipelines have been installed on the Reservation, Enbridge will work to remove as much of the old Line 3 and Line 4 pipes as possible. However, there are portions where removal may not be advisable, such as under paved roads and railroads. In these cases, the pipe will be cut and then filled with grout (cement).

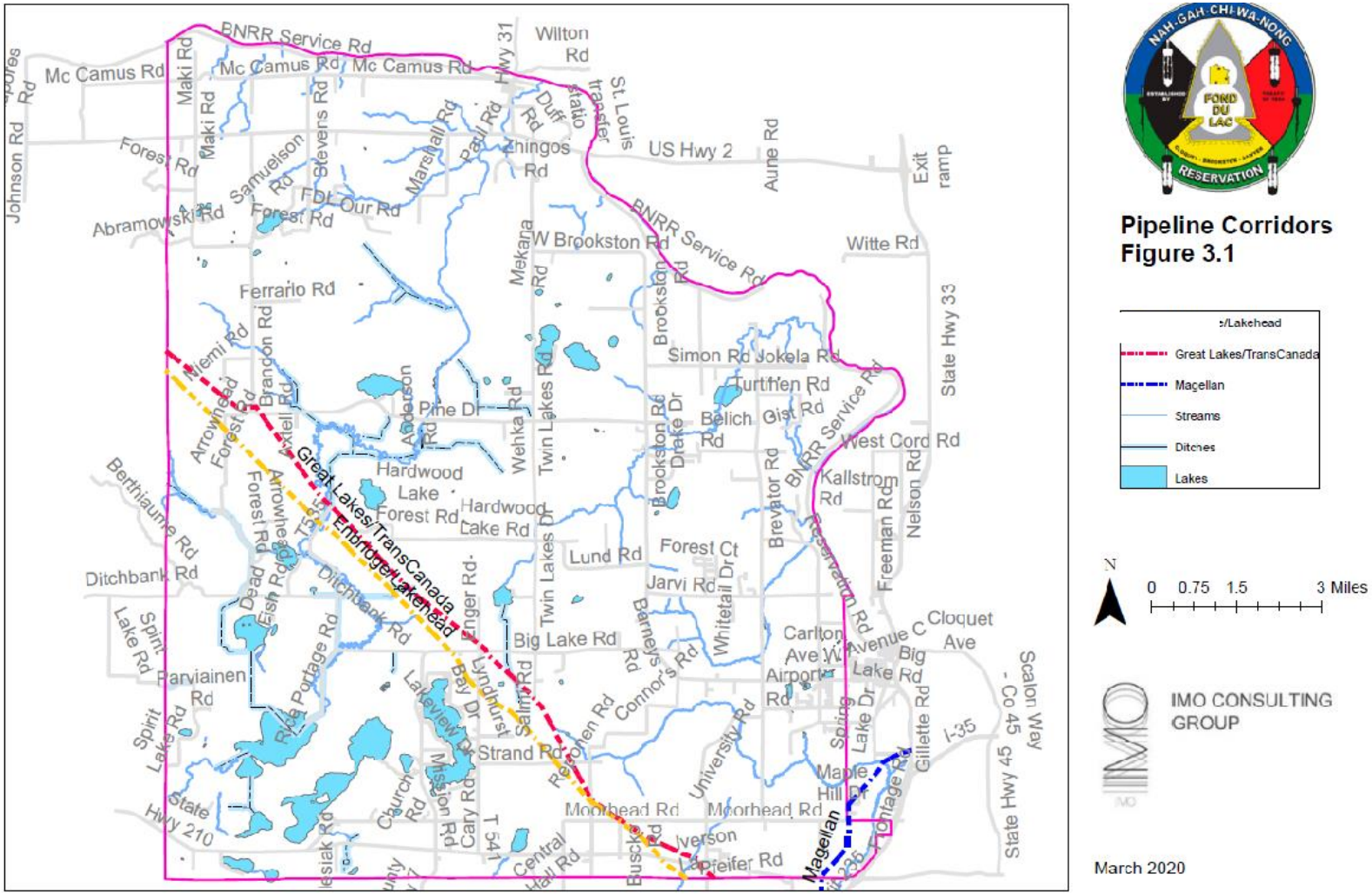
4. Line 1 Lowering

There are a few places where Line 1 is directly at the ground surface with little or no soil material on top. Enbridge proposes to lower these portions of the pipe to bury them to current depth of cover standards. Typical pipeline installation consists of surveying and staking of the new ROW and new pipe location; clearing (primarily tree cutting and grubbing) and site preparation (stripping of topsoil); pipe stringing, bending, welding, and coating; excavation of the trench; lowering-in of the pipe string; backfilling of the trench; tie-ins of pipe segments at various locations; hydrostatic testing; and clean up and restoration.

5. Post Project Conditions

In addition to the restoration of the ROW after each project completion, Enbridge will be conducting several projects on the Reservation as part of their required Compensatory Wetland Mitigation associated with their Standard Wetland Activity Permits issued for the projects. To date, Enbridge is required to mitigate 44.18 acres of wetland on the Reservation for the Line 3 Replacement Project. However, Enbridge has yet to submit any applications for the other projects listed above. Until that time, it is not known how much additional wetland impacts the projects will encompass and thus, how much additional mitigation will be required. Mitigation work cannot take place until both the new pipelines (Line 3 and 4) have been installed and the old pipelines have been removed. This is especially true in the case of the old Line 4 since it has been holding back water in many places. Once this line is gone, the return to “natural” hydrology can take place, which may take several years. To aid in this, beaver dams in some areas may need to be removed to help the flow of water away from the ROW. After the hydrology of the wetlands in and adjacent to the ROW has stabilized, then the job of reforestation can begin. In the case of the former forested wetland located between East Ditch and Ditchbank Road, an intermittent stream channel will have to be restored before the hydrology will stabilize. This stream channel can be found on older USGS topographic maps leading from the wetland to the original Stoney Brook channel. Also, as part of the mitigation, Fond du Lac is asking Enbridge to help re-establish some portions of the original stream channels of Stoney Brook. This will be accomplished by placing new culverts or improving existing culverts at key locations, such as at Ditchbank Road near First Bridge, on the road along East Ditch (Township Road 536), and on Township Road 535.

Figure 2. Map of the Enbridge and TransCanada Pipelines through the Reservation



Pipeline Corridors
Figure 3.1

:/Lakehead
Great Lakes/TransCanada
Magellan
Streams
Ditches
Lakes

N
0 0.75 1.5 3 Miles

IMO CONSULTING GROUP

March 2020

Water Monitoring to Detect Pipeline Leaks and Spills

Understanding flow direction will help predict the direction and velocity of an oil spill. Currently, Autocatchment maps from the Minnesota DNR show general flow directions (see Assessment Report); as part of Fond du Lac's pipeline monitoring and restoration work, we may have the capability to further delineate water flow direction at higher resolution using ArcHydro. The existing Simian Creek watershed model and the updated HEC-RAS watershed model for the Stoney Brook watershed (in progress) will show flow locations and velocities that can help us understand how a potential spill would impact these watersheds, and also identify places where the pipeline and access roads impact hydrology. The NWI maps that show flow direction in wetlands can be used as a proxy to predict where an oil spill will end up (see Assessment Report). Although these valves could be used to stop the flow of oil if a pipeline breach were to occur, the valves themselves increase the potential for oil releases.

Water monitoring must be a key feature of post-pipeline construction conditions. Fond du Lac, in partnership with IMO, has identified key water monitoring locations within each of the four watersheds the pipeline crosses on the Reservation (Stoney, Simian, Otter/Little Otter, and Moose). Continued monitoring is an important way for Fond du Lac to identify conditions before Line 4 restoration work and/or Line 3 expansion and to identify any contamination that may occur as a result of spill or other accidental release. Refer to the map of surface and groundwater monitoring stations (Figure 3).

Generally, the response to pipeline spills will be the same for any oil spill that flows into surface water, including both lakes and streams. The Fond du Lac Reservation will keep floating booms ready in the event of an oil spill. The booms should be of an appropriate size to be placed across a large streamcourse, such as the Stoney Brook main ditch lateral where it crosses under Pine Drive, but also small enough to catch an oil release in a smaller stream, such as Little Otter Creek.

Oil spills in lakes will be harder to manage and may require large boom structures, such as the type that are used to catch plant matter that Fond du Lac Resource Management cuts out of the manoomin lakes. In the event of an oil spill that impacts surface water, sampling efforts will follow Minnesota Pollution Control Agency and EPA protocols. An oil spill that reaches a manoomin lake would require long-term monitoring of both surface water and lake sediment, and the lake may be closed to manoomin harvest until it is deemed safe for human exposure. In addition to the general oil spill response outlined above, several specialized risk factors and needs in specific watersheds are outlined below.

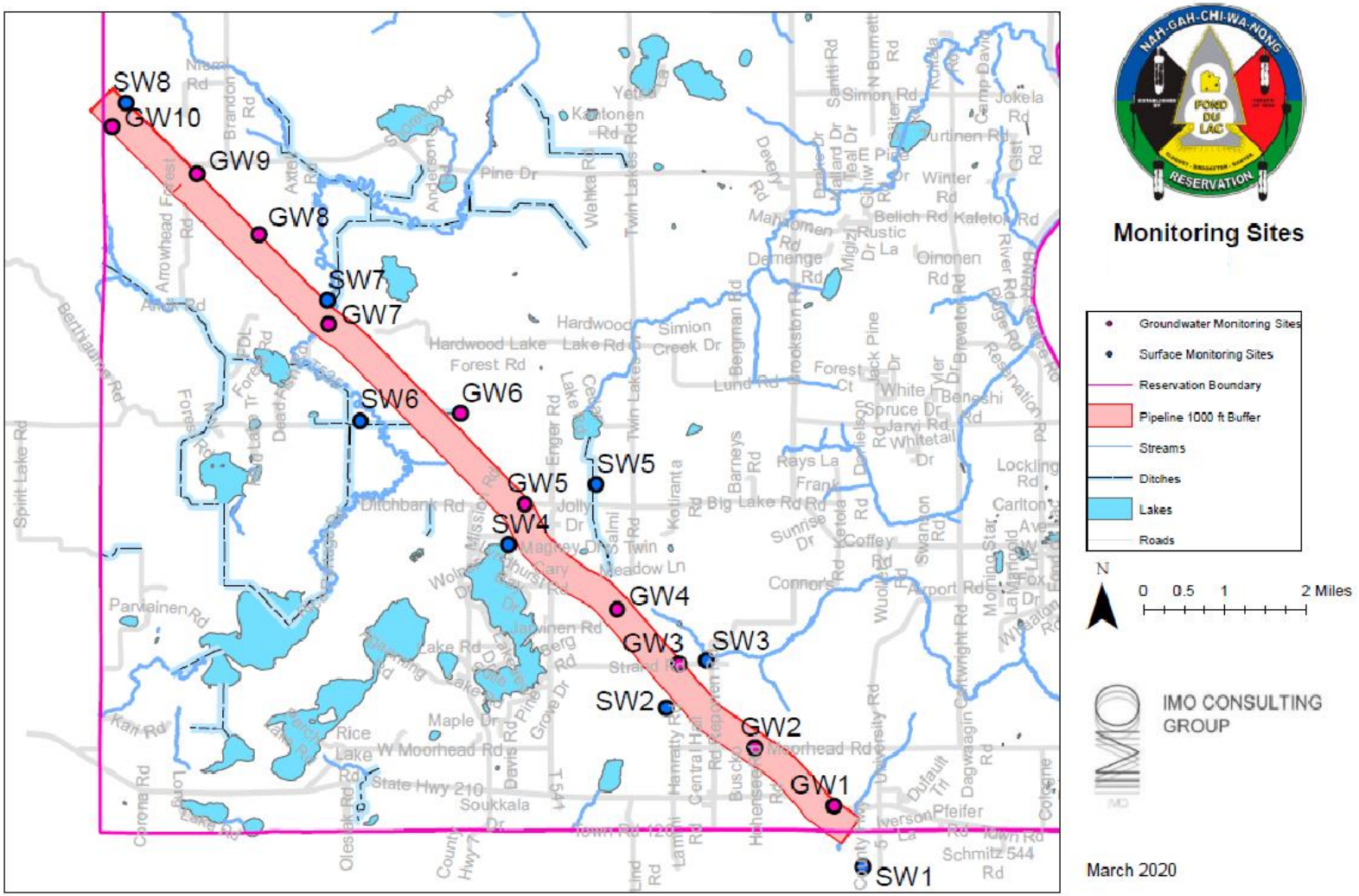
<u>Outcomes for Monitoring:</u>

Conduct the Pipeline Corridor Water Quality Monitoring Plan, such that water quality and groundwater samples are collected on a regular basis to document baseline conditions and detect any leakages or spills. Conduct monitoring at these sites during and after pipeline spills, should any occur.

<u>Tracking Metrics for Monitoring:</u>

- Number of surface water and groundwater sites installed
- Amount of data collected at surface water sites and groundwater sites; compilation of baseline information
- Number of pipeline leak/spill detections at monitoring sites.

Figure 3. Proposed groundwater and surface water monitoring sites
Part of the Pipeline Corridor Water Quality Monitoring Plan.



Stoney Brook Watershed

Since the pipeline is north of the manoomin lakes on the Reservation, and the watershed flows north, the likelihood of an oil spill reaching most of the manoomin lakes is low. However, the ditch lateral that connects the pipeline corridor to the Upper Deadfish Impoundment (Figure 4) is at the highest risk for damage that would result if the pipeline crossing this ditch caused an oil spill. An oil spill would have the potential to travel south to the Upper Deadfish Impoundment as well as into surrounding wetlands and thence to Deadfish Lake, where it could contaminate an ecologically sensitive and culturally important manoomin resource. A possible response to this scenario would be to close the dam on the Upper Deadfish Impoundment to keep the oil spill from reaching Deadfish Lake. Any post-spill monitoring that takes place should also include the original Stoney Brook stream reach remnant south of the Upper Deadfish Impoundment, as any oil that escapes into this waterway could bypass the dam and make its way to Deadfish Lake.

Figure 4. Stoney Brook stream reach remnant south of the Upper Deadfish impoundment
From 2020 Google Maps

Simian Creek/Big Lake Watersheds

Care must be taken when choosing monitoring sites for the Simian Creek watershed and for the Big Lake catchment. Because existing watershed maps do not agree on which parts of the landscape flow into Big Lake and which flow into Cedar Lake, the surface water monitoring site for Big Lake should be placed in a location where surface water is obviously flowing from the pipeline corridor and into Big Lake, since the purpose of the monitoring site is to track baseline conditions and catch any oil spills in the water flowing to Big Lake (Figure 3). Big Lake has been used for source water for hydrostatic testing in the past; any future hydrostatic testing should be conducted following permit guidelines, including preventing the transfer of aquatic invasive species.

Altered Hydrology and Protection/Restoration Potential for Streams, Ditches and Lakes

Fond du Lac, in collaboration with IMO, identified key restoration and remediation priorities and created a geodatabase of locations and needs (Table 3, Figure 5). Some of these restoration projects will take place during Line 4 reconstruction, where large sections of Line 4 will be reburied. Other projects will take place during Line 3 expansion, and will include installing or replacing culverts along access roads that lead to the pipeline corridor. Other projects may take place outside the scope of these construction projects.

Table 3 outlines the site-specific hydrologic impacts from the Enbridge/TransCanada pipeline corridor and lists proposed actions to improve water flow. Most of these proposed actions also fall under the wetland/riparian management NPS category. Fond du Lac OWP assigned a priority ranking to each impact, with priority given to projects that will restore the largest area of wetland or create better/restored flow paths for ditches or remnant stream reaches.

Stoney Brook Watershed

The Stoney Brook watershed is the most highly hydrologically modified watershed on the Reservation, due both to historic ditching and pipeline construction. For stream hydrology restoration, our ongoing work to create an updated HEC-RAS watershed model for the Stoney Brook watershed will assist in both identifying areas where we can restore the stream back to its natural channel, but also understand flow locations and velocities that can help us understand how a potential spill would impact the watershed. A number of stream restoration projects are included in this watershed, and they are outlined in Figure 5 and Table 3.

Simian Creek Watershed

The NHD Flow Types on the Simian Creek watershed headwaters shows a ditch system flowing north from the pipeline corridor and into Cedar Lake (see Assessment Report). Though this waterway is not readily visible on the ground, water likely flows along the pipeline corridor for a considerable distance before turning north to flow into Cedar Lake; this increases the risk that any pipeline spills in this area could meet up with this waterway as it flows along the corridor. The waterway should be re-routed to establish a well-defined crossing with the smallest footprint across the pipeline corridor; from there, the waterway can be re-routed to flow north into Cedar Lake. However, the first step should be to conduct on-the-ground reconnaissance of this area to confirm the flow direction and velocity of the watercourse south of Big Lake Road.

Otter Creek Watershed and Moose River Watershed

The pipeline corridor cuts through the headwaters of both the Otter Creek and the Moose River Watersheds. These adjacent watersheds are both dominated by flat, peat-rich high-quality wetlands. The pipeline causes hydrological modification by preventing lateral and vertical flow, especially in places where driveways and other roads cross the pipeline corridor see Assessment Report), so that water ponds on the pipeline corridor itself and also on the boundaries. Restoration activities should focus on restoring more natural water flow, by installing culverts or other devices to prevent water impoundment.

Outcomes for Restoration:

Following the priority database, work with Enbridge to restore hydrologically altered sites near the pipeline corridor and along access roads. Assure that correct site design is being followed. Obtain the proper permits and certifications as needed.

Tracking Metrics for Restoration:

- Number of permits and certifications

- Number of site designs
- Number of sites with restored hydrology
- Updated wetland restoration/stream restoration geodatabase.

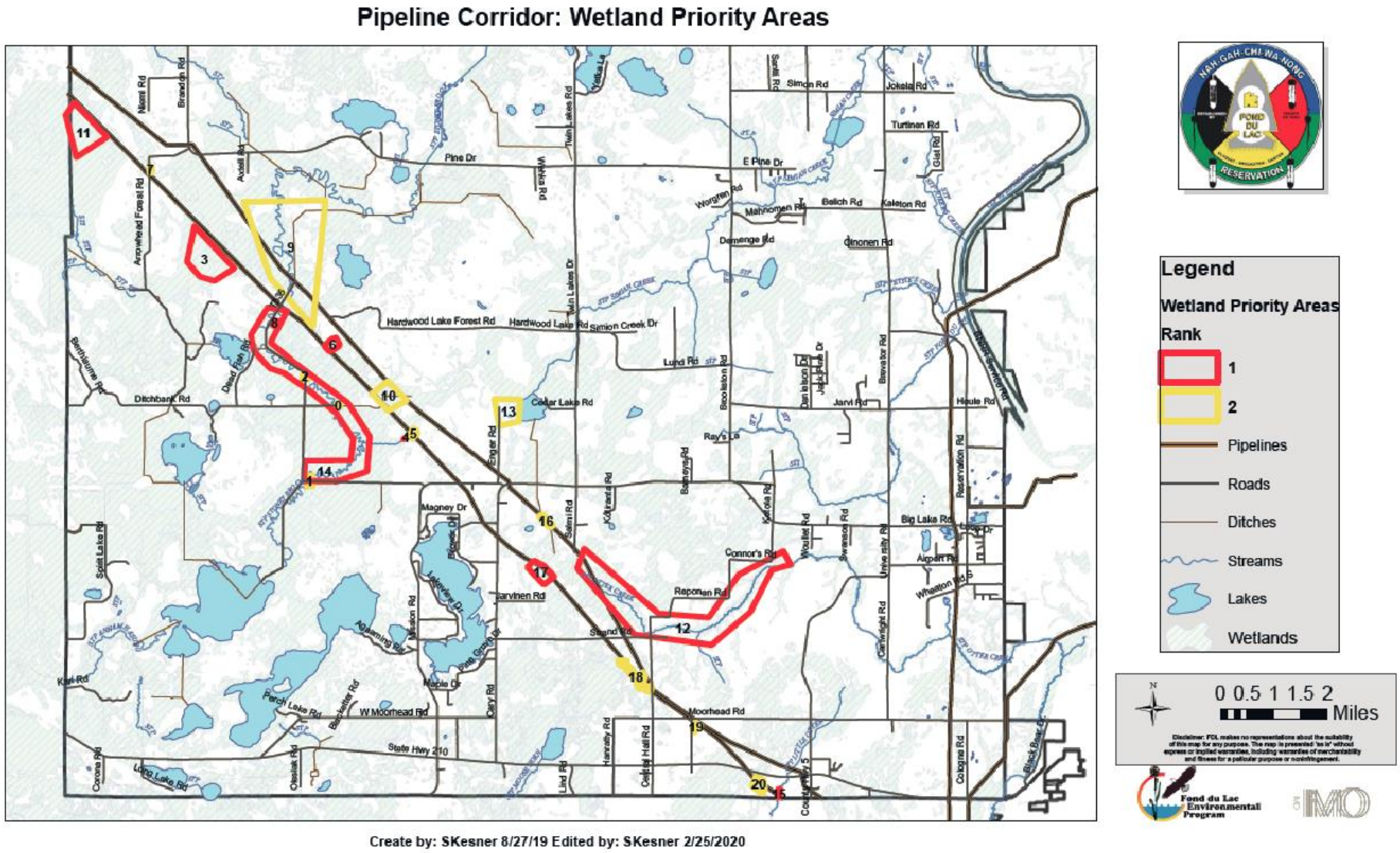
Table 3. Priority ranking for Pipeline Restoration Projects

Focus is on restoring wetlands and stream reaches impacted by the pipeline corridor. The Site IDs correspond to the locations in Figure 5.

Site ID	Priority Rank	Site Description	Proposed Actions
0	2	Existing culvert needs to be moved and resized	Will be installed during East Ditch improvement
1	2	Road damming stream; monitoring well	Culvert does not exist and needs to be installed
2	2	Culvert needs to be installed	Will be installed during road improvement
3	1	Great Dismal Swamp (GDS); pipeline blocks flow	Line 4 repair; pre and post monitoring
4	1	Pipeline blocks flow; water ponding	Requires dredging to reconnect streamcourse
5	2	Degraded cedar swamp; too much water	Restoration possible after dredging
6	1	Wetland dammed by Line 4.	Possible restoration; trees already regrowing
7	2	Access road damming wetland	Install culvert to allow drainage
8	1	Potential site for pipeline valves on new Line 3	Track effect of valves
9	2	Original Stoney Brook; blocked by beaver dams	GDS drawdown will increase flow; remove dams
10	2	Flow altered by pipeline and ditch	Potential stream restoration site
11	1	Potential site for pipeline valves on new Line 3	Above Deadfish Impoundment; track effect of valves
12	1	Otter Creek headwaters; sensitive wetlands	High priority for monitoring and protection
13	2	Groundwater flow to Cedar Lake	High quality wetlands; low priority for monitoring
14	1	SB floodplain, original channel	High priority for monitoring and protection
15	1	Trib to Little Otter Creek; moderate wetlands	Water ponds during floods; allow drainage
16	1	Headwaters to Simian Creek Watershed	Reroute crossing to reduce pipeline footprint
17	1	Two pipelines & driveway damming water	Allow water passage; install culverts
18	2	Roads damming water between them	Allow water passage; install culverts
19	2	Trib to Otter Creek; drainage blocked	Allow water passage
20	2	Trib to Little Otter Creek; beaver dam	Remove beaver dam

Figure 5. Priority Wetland Restoration Projects on the Pipeline Corridor

The numbers in the polygons below correspond to the number in Table 3. Priority 1 areas are outlined in red and priority 2 areas are outlined in yellow.



Pipeline Impacts on Groundwater

Septic system failures, agricultural and turf management, hazardous waste collection programs, illegal trash dump sites, and underground storage tanks are some just some of the threats to groundwater that have been previously described in the Band's various management documents. This document will be focusing on spills and leaks arising from the Line 3 Pipeline replacement within the Reservations pipeline corridor. This document will be using the Carlton County Geologic Atlas's "Near-Surface Pollution Sensitivity Map and the Pollution Sensitivity of Buried Aquifers Map" as guidance on how to monitor for spills and leaks from pipeline construction.

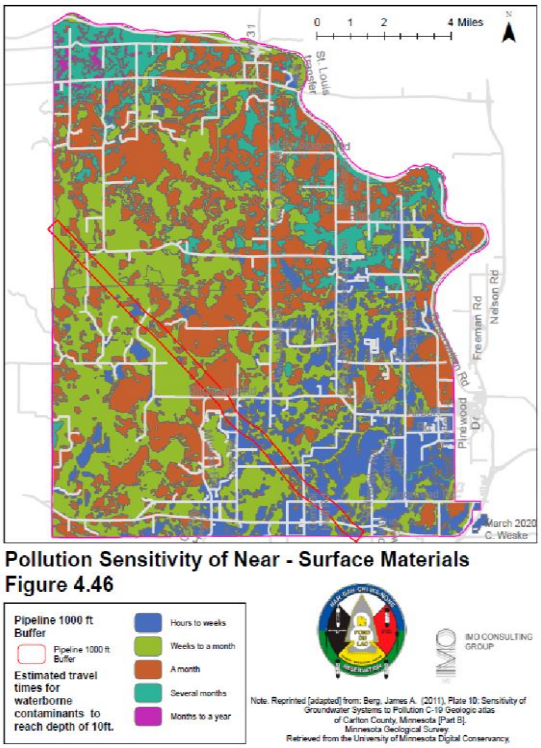
Figure 14 in the Assessment Report shows time it takes for water to infiltrate the land surface and reach the water table. Figure 6 shows the same map with the 1000-ft buffer around the pipeline corridor superimposed over it. The fastest travel times modeled within the corridor occur just north and east of Big Lake and also near Hohensee Road and Pfeifer Road. These areas of greater concern for groundwater contamination because their modeled infiltration rates that would take contamination just hours to days to reach the water table.

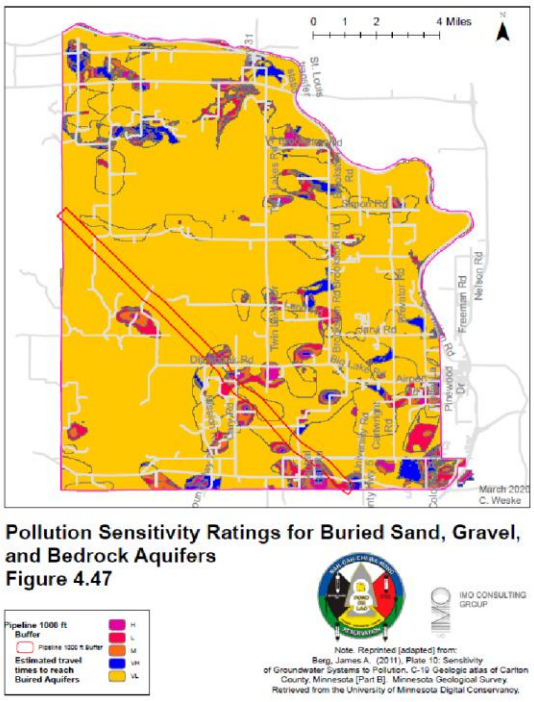
For aquifers buried farther underground and away from the surface, the MN DNR has also modeled the travel times for pollution or water infiltration to travel through the protective layers of materials around them and or the time it would take to reach them through other connected aquifers. The groundwater area of most concern is northeast of Big Lake, near the southern end of the corridor. These areas have been identified as the most susceptible to surface pollution.

Proposed Groundwater Monitoring Plan

Places that have been identified as high risk to groundwater contamination in relation to pipeline construction have been prioritized with either surface or groundwater monitoring sites. Private drinking wells that are near to the pipeline also offer prime locations to monitor groundwater. The landowners have been approached by Fond du Lac's Drinking Water and Wastewater Manager to collect well water samples pre-construction, during construction, and post construction. Figure 3 shows both the proposed surface water monitoring locations as well as the groundwater monitoring locations.

Figure 6. Map of groundwater pollution sensitivity for near-surface materials (left) and for buried aquifers (right).
From the PWQMP





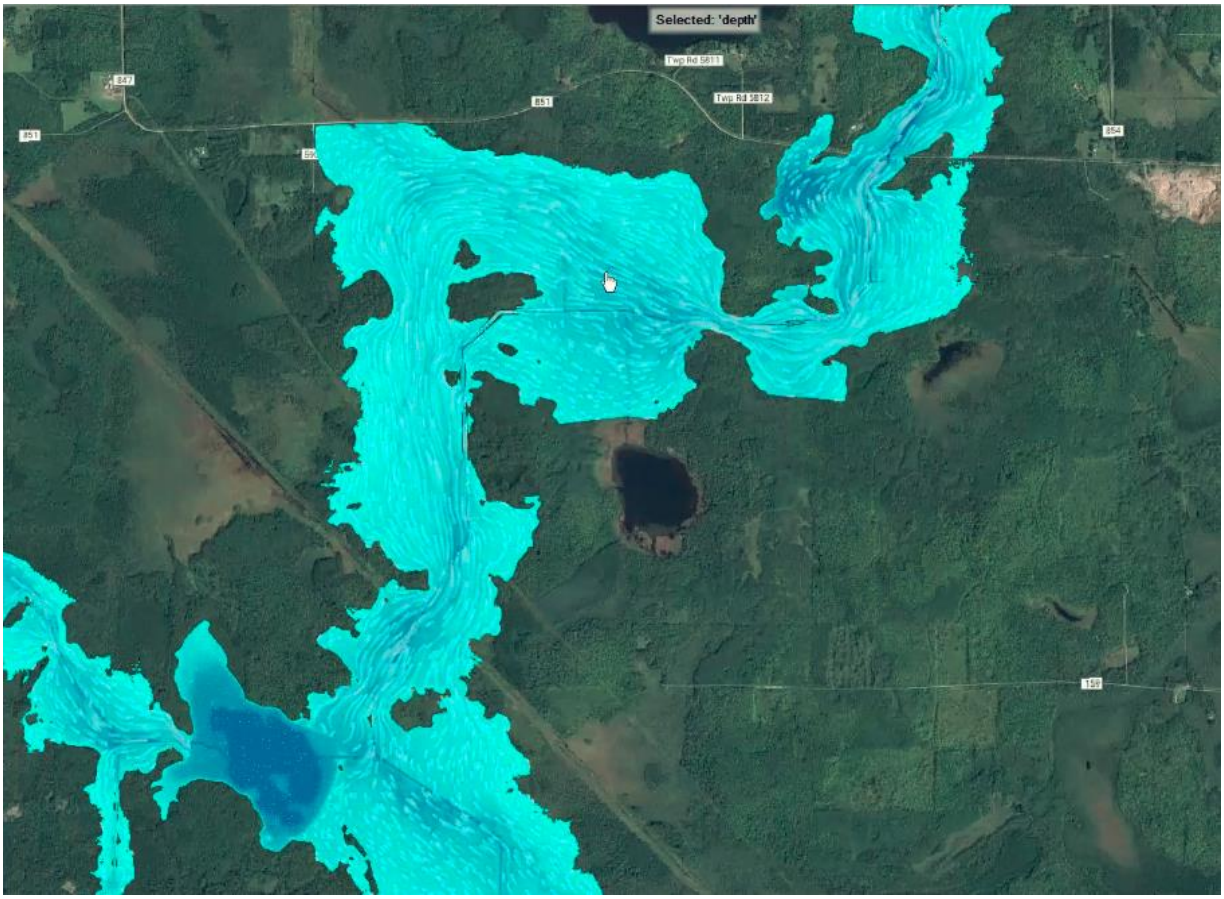
Stoney Brook Ditches

The extensive ditch network in the Stoney Brook network can never be fully restored to pre-impact conditions, but the updated Stoney Brook Watershed model and Nine-Element Watershed Plan will be completed by 2021, and the findings from this work will be used to assign restoration priorities and projects. The aim of the watershed model is to track the impacts of climate change and predict how more frequent, heavy storm events will alter water level within manoomin lakes (Figure 7). The model will help Fond du Lac Resource Management effectively operate the water control structures at the inlets and outlets of manoomin lakes, and to identify locations where water storage could be increased to prevent water level bounce during critical parts of the manoomin growing season. The model will also help identify places where the ditch walls could be breached to allow access to the historic Stoney Brook channel and floodplain, or where dredging could occur to prevent backwater effects in manoomin lakes that would benefit from drainage after a rain event. Fond du lac OWP will work in partnership with USGS (Iowa Water Resources Center) to analyze the findings of the Stoney Brook model and then use those conclusions to write the watershed plan, which will include prescribed BMPs to address hydromodification due to ditching.

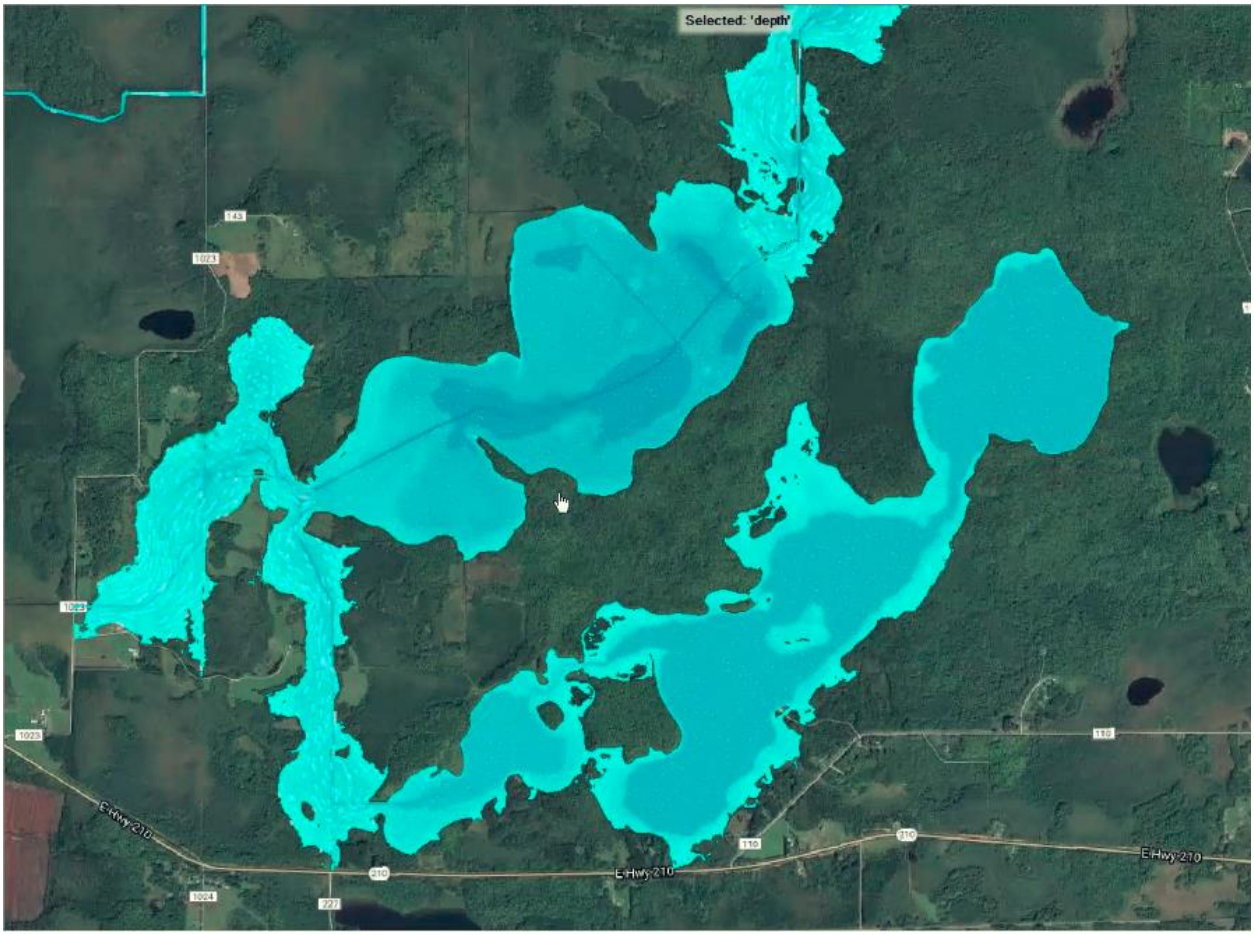
Figure 7. Updated Stoney Brook HEC-RAS Model

Preliminary outputs from the USGS Stoney Brook HEC-RAS model, used to calibrate the model to measured flood events. Map A shows the effects of flooding on Deadfish Lake, and highlights the potential for extra storage capacity near Pine Drive (upper left). Map B shows the effect of flooding on Perch Lake and Rice Portage Lake. Light blue indicates shallower water and dark blue indicates deeper water. The flow path and velocity are indicated by the white streaks.

A.



B.



Outcomes:

An updated model for the Stoney Brook watershed that will aid in managing water levels on manoomin lakes in response to flooding. A completed Watershed plan that will set the priorities and plans for reducing the hydrologic effects of ditching on the manoomin lakes and wetlands in the Stoney Brook watershed.

Tracking metrics:

- Completed model and model outputs
- Completed Stoney Brook Watershed Plan; number of recommended management actions

Wild Rice Lake

Since the MN Department of Transportation water modeling shows that the culvert under Highway 210 is not the main reason for high water levels in the lake, Fond du Lac Resource Management determined that the problem is likely backwater effects from beaver dams and aggradation downstream of the highway. It's unclear if the culvert under the railroad grade immediately downstream of Highway 210 could be causing water to back up, and more investigation is needed. The Fond du lac Reservation Business Committee has expressed strong interest in committing time and effort into management actions that will lower the water level in this lake to allow manoomin to grow and be harvested.

In conversations with Carlton County, Fond du Lac OWP learned that the County spends upwards of $40,000 a year on beaver removal when dams threaten roadway infrastructure, and they are piloting new beaver management approaches. They are using techniques taught by the Beaver Institute, which involve installing large flexible corrugated tubing through beaver dams (https://www.beaverinstitute.org/management/flow-devices/dams/). They allow flow to bypass the dams, while also tricking the beavers into thinking their dams have not been breached. The Beaver Institute focuses on living with beavers, and finding ways to adapt to having them on the landscape that don't involve costly beaver dam removal projects and trapping, which are only temporary fixes until a new beaver family moves into the area.

Proposed work is as follows:

- Conduct reconnaissance with Fond du Lac OWP and Fond du Lac Natural Resources Program staff by conducting walkthroughs of the outlet of Wild Rice Lake. Mark the locations of sedge mats, aggradation, beaver dams, and water crossing/culvert issues.
- If flow issues are identified with the railroad culvert, contact the tribal liaison with the Federal Railway Administration to discuss options.
- Work with Natural Resources staff to deploy the Marsh Master to remove beaver dams. The hummocky wetland in the area makes this site extremely difficult to access.
- If funding allows, partner with Carlton County to hire a consultant from the Beaver Institute to conduct a site visit and training on their beaver management strategies.
- Partner with Carlton County to pilot new beaver management techniques.
- If funding allows, install a water level logger and staff gauge at Wild Rice Lake, to track water levels before and after completing beaver management work.
- If water levels decline in Wild Rice Lake, partner with Natural Resources staff to conduct removal of water shield and water lily on the lake before seeding manoomin.
- If water levels decline in Wild Rice Lake, partner with Natural Resources staff to collect manoomin seed, determine seeding rate, and release seed in the fall. Track any changes in manoomin populations by taking photographs from a fixed location.
- Communicate our efforts to the Fond du Lac Reservation Business Committee, and share project updates and successes with the community through social media and news releases.

Outcomes:

- Knowledge and capability to plan for and install and effective management techniques for mitigating water level problems in manoomin lakes caused by beavers.
- Lower water levels in Wild Rice Lake, which could result in the right conditions to restore manoomin populations.
- Gathering pre- and post-beaver management monitoring data in Wild Rice, including the possibility for water level data.
- Ability to transfer new beaver management knowledge and techniques to new sites.
- Use Wild Rice Lake beaver management project as a way to showcase new techniques that others in the region can follow.

Tracking metrics:

- Observe changes in water level as beaver dam management techniques are implemented, and observe any changes in water shield and water lily due to lower water levels and/or plant management.
- Document the number of beaver dams, sedge mats and other impediments to flow that must be dealt with to lessen backwater effects in Wild Rice Lake.

- Document the number and type of beaver management techniques implemented, and track their short-term and long-term effectiveness.
- Observe changes in manoomin populations if water levels become low enough to support reseeding.

Cedar Lake

The Simian Creek model report (US ACOE, 2019) outlines two management actions to lower water level in the lake to depths that support wild rice. One action is to remove a large beaver dam complex downstream of the lake, in a remote area west of Twin Lakes Road. The other action is to conduct channel clearing and vegetation management at the lake's outlet. Figure 32 in the Assessment Report shows how these management actions, alone and together, could lower water levels and create water depths conducive to manoomin growth within the littoral zone of Cedar Lake. The second management action listed above is time-consuming and expensive, and will require multiple permits, so our first endeavor will focus on the feasibility of beaver dam removal. Fond du Lac Resource Management staff conducted reconnaissance of the largest beaver dam downstream of Cedar Lake. They determined that this beaver dam is extensive, reaching from valley wall to valley wall, and that even under frozen conditions, significant stream flow is moving through the beaver dam. The extent of the dam, and the need to cross private land with heavy equipment, make removing this dam cost-prohibitive without additional financial support. The beaver dam below Cedar Lake is a good candidate for implementing beaver management techniques following strategies and guidelines suggested by the Beaver Institute, given that removing it with equipment and dynamite will be time-consuming and expensive, and require permission from a private landowner to cross their land with heavy equipment.

To gather more information about this hard-to-reach area, Fond du Lac OWP will deploy a drone, or contract with an outside company to deploy a drone. We plan to conduct aerial reconnaissance of the channel to document the size and extent of the beaver dams in the section of stream between the outlet of the lake and Twin Lakes Road. Drone footage will help managers decide which management strategies will be the most effective. As with Wild Rice Lake, we will conduct beaver management in partnership with Carlton County, and will seek full approval for all proposed actions with private landowners. A consideration in any project budget will be the need to fix any damage to private land that might be caused by crossing with heavy equipment.

A monitoring period of one season or more is recommended after removal of the beaver dams before considering any channel improvements downstream of Cedar Lake. This period of time will allow verification of the water level response to the beaver dam removal. It will also allow additional assessment of the channel capacity downstream. An updated bathymetric survey of Cedar Lake (tied into the NAVD 88 datum) after the beaver dam is removed is also recommended. This updated bathymetry can be used to re-evaluate the optimal water level for rice production and will be useful for re-evaluating the changes that may have occurred due to any sedimentation. If channel improvements are later considered, wetland impacts should also be considered.

If beaver management (and potentially also channel improvements) proves successful, water level changes will be documented in the Cedar Lake gauge, which has been collecting continuous water level data since 2017. Along with an updated bathymetric map, these data will be used to determine if conditions are right for reseeding manoomin. Fond du Lac OWP will work with the Natural Resources Division, the Cedar Lake landowners, and tribal government to devise a vegetation management and reseeding plan, if warranted. Any changes in manoomin populations can be documented via drone footage.

Outcomes:

- Knowledge and capability to plan for and install and effective management techniques for mitigating water level problems in manoomin lakes caused by beavers.
- Lower water levels in Cedar Lake, which could result in the right conditions to restore manoomin populations.
- Gathering pre- and post-beaver management water level monitoring data in Wild Rice, including the possibility for an updated bathymetric map.
- Ability to transfer new beaver management knowledge and techniques to new sites.
- Use Cedar Lake beaver management project as a way to showcase new techniques that others in the region can follow.

Tracking metrics:

- Drone footage of lake outlet, and also of changes in manoomin populations on the lake
- Beaver management plan; number of recommendations
- Number of water level data points and trends
- Number and type of beaver management strategies implemented
- Track the progress of channel improvements, if needed, including number of permits and certifications required

Table 4. Actions, Outcomes and Timelines for Hydromodification Projects

Non-Point Source Pollution Category						
Hydromodification						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Pipelines						
Enbridge will rebury Line 4	Length of pipeline reburied, number of hydrological connections restored	•	•	•	•	•
Enbridge will lower Line 1	Length of pipeline reburied, number of hydrological connections restored	•	•	•	•	•
Enbridge will remove old sections of Lines 3 and 4	Length of pipeline removed, number of hydrological connections restored	•	•	•	•	•
Pipeline projects follow Fond du Lac 401 certifications	Number of conditions, number of inspections, number of conditions met/not met	•	•	•	•	•
Install monitoring sites under Pipeline Corridor Water Quality Monitoring Plan	Number of surface water and groundwater sites installed	•				

Conduct monitoring under Pipeline Corridor Monitoring Plan	Amount of date collected at surface water sites and groundwater sites		•	•	•	•
Restore altered hydrology on pipeline corridor and access road following priority geodatabase	Number of site designs, number of restored sites		•	•	•	•
Ditches						
Complete Stoney Brook watershed model with USGS	1 new watershed model	•				
Complete watershed plan	1 new watershed plan	•	•			
Implement recommendations from the model and the watershed plan (if funding available)	Changes in manoomin lake level, changes in manoomin population, number of projects implemented			•	•	•
Wild Rice Lake						
Reconnaissance at lake outlet	Number of flow blockages	•	•			
Beaver management strategy for lake outlet	1 plan for beaver dam management	•	•			
Beaver pilot project with Carlton County	Number of beaver management strategies deployed	•	•	•		
Water level logger (if funding available)	1 new water level logger; potential water level change documentation		•	•	•	•
Cedar Lake						
Conduct drone reconnaissance of lake outlet	Number of extent of blockages	•	•			

Plan and implement beaver management strategy for lake outlet	1 plan for beaver dam management, number of implementation strategies		•	•	•	•
Collect water data from logger and staff gauge, bathymetric map	Document potential for water level changes, 1 new bathymetric map	•	•	•	•	•
Reseed lake if water level drops	Pounds of seed disseminated; change in manoomin population					•

Roads BMPs

Watersheds: Jolicoeur Creek, Martin Branch

BMP Goals

Remove barriers caused by abandoned collapsed roadways and a sinking bridge and restore natural hydrology and stream connectivity at Jolicoeur Creek and Martin Branch (Stevens Road). More generally, conduct a culvert inventory and replace undersized, perched or misaligned culverts and continue partnerships with county and state road authorities to manage roadside vegetation.

Below is a list of general BMP goals to be addressed in all the watersheds pertaining to road and culvert maintenance:

- Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss.
- Limit land disturbance such as clearing and grading and cut fill to reduce erosion and sediment loss.
- Limit disturbance of natural drainage features and vegetation.
- Design and construct culvert and bridge structures so that sensitive and valuable aquatic ecosystems are protected.
- Prepare and implement an approved erosion control plan for all construction projects.
- Ensure proper storage and disposal of toxic materials.
- Incorporate pollution prevention into operation and maintenance procedures to reduce pollutant loadings to surface runoff.
- Develop and implement runoff pollution controls for existing and new road systems that retain the natural drainage characteristics of the landscape to reduce pollutant concentrations and volumes.
- Retain stable channel characteristics by implementing state of the art methodologies.
- Properly design and install culverts to be specific to geomorphology and floodplain issues.

BMP Projects

Jolicoeur Creek

Two unused roads, both with collapsed culverts, have created two impoundments on Jolicoeur Creek on the Fond du Lac Reservation. Fond du Lac OWP plans to remove these obstructions, follow Natural Channel Design techniques to restore the stream, and plant trees and native grasses along the repaired riparian corridor. The stream is also impounded upstream of Wheaton Road, but the culvert will likely function correctly and draw down this impoundment after the two downstream obstructions are removed. Brook trout are culturally significant to Fond du Lac Band members, and maintaining opportunities for Band members to harvest brook trout is a priority for the Band. Fond du Lac OWP conducts yearly fish population assessments in Otter Creek, and Otter Creek is currently supporting healthy populations of brook trout; however, Fond du Lac's stream habitat disturbance index lists Jolicoeur Creek as the most disturbed of any stream on the Reservation, making this site a high priority for restoration.

Google Maps photo of Jolicoeur Creek, showing the airport to the north, the gravel pit to the west, and the two impoundments south of Wheaton Road. The creek daylights between the airport and Wheaton Road, and open water is observed in this area even in winter.

Design plans were created for this stream using EQIP funds in the mid-2010s, but the project came to a stop because it needed approval from Carlton County, the City of Cloquet and the Federal Aviation Administration (FAA). Fond du Lac OWP worked to create a land use agreement with these entities, which needs to be renewed every five years. The land use agreement was created because Carlton County and the City of Cloquet own land in and near the proposed restoration area. The project also needs FAA approval because it is immediately south of the Cloquet Airport, and restoration activities (like planting trees) must not interfere with sight lines for aircraft.

Fond du Lac OWP will pursue new NRCS EQIP funds to update our existing stream restoration design plans to incorporate new climate data and Natural Channel Design Principles. We will also need to update the land use agreement as it is set to expire, which will require legal review by all parties. We will also procure any permits as necessary to conduct the work. Fond du Lac OWP will need to pursue additional funding to complete the actual restoration work. We have submitted grant proposals to the Great Lakes Basin Fish Habitat Partnership, Habitat Conservation Project several times, but have been unsuccessful in being chosen for funding for this project.

<u>Proposed work is as follows:</u>

- Remove the two collapsed culverts and unused roadways.
- Clean out the culvert under Wheaton Road, if necessary.
- Contour/grade 100 feet of restored channel to prevent head cuts, and to allow drawdown of the two impoundments on Jolicoeur Creek.
- Stabilize the riparian area by planting trees and native grasses on approximately 5 acres (Figure 8) following NRCS guidelines, which includes preventing the spread of invasive species. Plant species may include white spruce, tamarack, willow, annual rye grass, prairie cordgrass, switchgrass, western wheat and Canada wild rye.
- Conduct outreach and education with landowners and local and tribal governments about the importance of the project to maintain cold-water refugia for brook trout in the Otter Creek system.
- Partner with Fond du Lac Ojibwe School seventh-graders to collect water quality data at Jolicoeur Creek and to analyze trends before and after restoration work is completed. Ojibwe School students collected water quality data in 2019 as part of their class's participation in the Lake Superior Reserve's Rivers2Lake Program. Deploy temperature loggers as resources allow.
- Hire contractors to conduct fish population assessments before and after restoration activities.
- Engage seasonal interns in helping us to plant trees and gain an understanding of the importance of stream connectivity and healthy riparian corridors.

The expected outcomes of the project include:

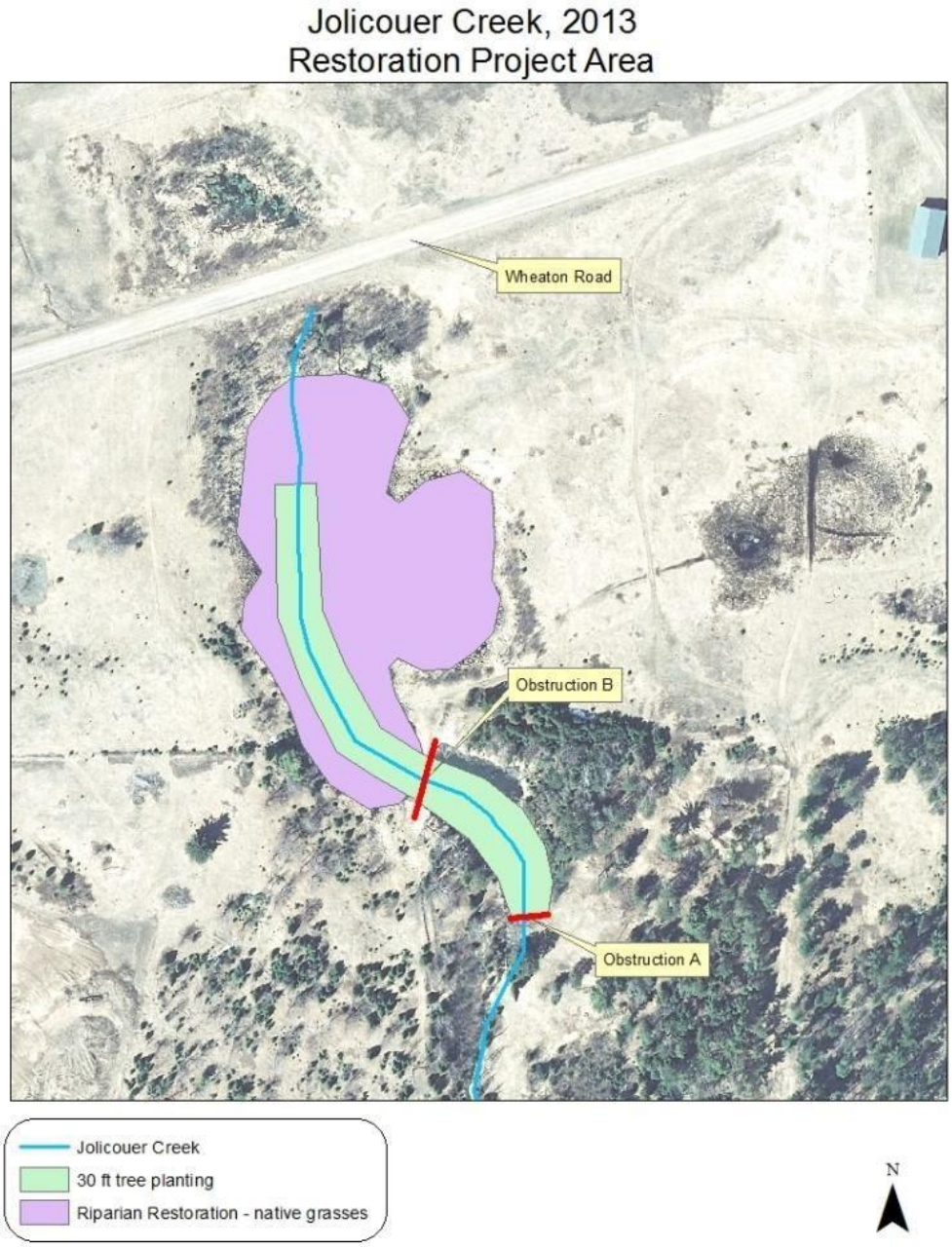
- Improving brook trout habitat and cold-water refugia within Jolicoeur Creek by eliminating the two impoundments that create warm water conditions, restoring the stream using Natural Channel Design and by using downstream portions of Jolicoeur Creek as a reference reach for restoration, and adding riparian vegetation to shade and stabilize the repaired stream course;
- Improving connectivity between Jolicoeur Creek and the Otter Creek/Little Otter Creek system;
- Gathering pre- and post-restoration monitoring data with Ojibwe School students to measure the success of the project, and to use the information to create opportunities for education and outreach with interns and Ojibwe School students.

Tracking metrics:

- Observe changes in the timing and duration of algae blooms in the impoundments and in the stream course after restoration;
- Continued sampling at our long-term monitoring site on Otter Creek (Station 1) north of Highway 210, for fish and macroinvertebrate populations (including brook trout) and water quality parameters including but not limited to nutrients, turbidity, dissolved oxygen and temperature;
- Pre- and post-restoration sampling for fish populations (if feasible) to indicate presence of brook trout and other cold-water or sensitive species, and changes in relative abundance over time;
- Calculating disturbance scores and Biological Condition Gradient scores using pre- and post-restoration fish population data and riparian habitat assessments, using metrics specifically developed for Fond du Lac waters;
- Monitoring success of post-restoration riparian plantings using timed meanders to note presence and abundance of native species during spring, summer and fall, and identifying any invasive species that require removal, and identifying any locations that need additional seeding or planting;
- Deploying continuous temperature data loggers to track changes in water temperature pre- and post-monitoring, and to detect differences above and below the impoundments;
- Monitoring basic water quality parameters (If feasible) within the restoration area, both pre- and post-restoration for parameters that include but are not limited to nutrients, turbidity, dissolved oxygen and temperature.

Figure 8. Restoration plans for Jolicoeur Creek.

Remove Obstruction A and Obstruction B. Plant trees within a 30-ft stretch of riparian area, and plant native grasses and forbs within the riparian restoration zone.



Martin Branch (Stevens Road)

The bridge at Stevens Road is sinking and degrading brook trout habitat on this reach of Martin Branch. Brook trout are culturally significant to Fond du Lac Band members, but Band members also need to use Stevens Road to access culturally significant resources and sites. Fond du Lac OWP will pursue NRCS EQIP funds to create stream restoration design plans to incorporate climate data and Natural Channel Design Principles. Project approval is contingent on agreements between the Fond du Lac Reservation Business Committee and St. Louis County on roles and responsibilities for owning and maintaining this road, and this may take time before restoration designs can begin. Fond du Lac will also need to procure any permits as necessary to conduct the work.

Once EQIP funding is secure, we will work with NRCS engineers to come up with a design plan. We will then need to pursue additional funding to begin construction work. Several Fond du Lac OWP staff visited a field site during a CWA 319/106 Tribal Water Workshop at the Nottawaseppi Huron Band of the Potawatomi where we observed a BMP called a low water crossing. A low water crossing replaces the need for a bridge or a culvert at a rural stream crossing, and instead armors a short section of stream with cobble to allow vehicles to cross a shallow stream. Once the bridge is removed, we will also implement Natural Channel Design Principles to restore hydrology upstream of the Stevens Road crossing.

Proposed work is as follows:

- Meet with the Elders Concerns Group, Fond du Lac Reservation Business Committee, and other interested community members to ascertain what kind of crossing would allow Band members to cross Stevens Road.
- Remove the sinking bridge and replace with a more sustainable crossing, such as a low water crossing.
- Contour/grade the stream channel upstream of the bridge to restore a natural channel, using an upstream reach for reference. This may involve cutting/dredging sedge mats and removing large woody debris.
- Build up the roadway both upstream and downstream of the crossing to prevent the stream from rerouting over the road.
- Discuss options for preventing the ditches on either side of the raised roadway, to become full of warm, stagnant algae-rich water or implement BMPs to allow for slow infiltration of this water into the stream.
- Continue to conduct backpack electroshocking surveys for fish populations, before and after restoration activities.
- Deploy a temperature logger at the bridge site to track changes in water temperature before and after restoration.
- If funding is available, plant Northern white cedar in restored areas, as this section of Martin Branch flows through a cedar swamp, which is a rare wetland type on the Reservation. Protect trees from lethal deer browse by bud capping and other forestry practices.
- Conduct outreach and education with landowners and local and tribal governments about the importance of the project to maintain this section of cold water for brook trout in the face of climate change.

The expected outcomes of the project include:

- Improving brook trout spawning habitat and cold-water refugia within Martin Branch (Stevens Road) by removing the sinking bridge and managing the roadway to prevent ongoing warm water conditions, restoring the stream using Natural Channel Design by using upstream portions of

Martin Branch (Stevens Road) as a reference reach for restoration, and planting Northern white cedar to shade and stabilize the repaired stream course;
- Continuing to provide a safe crossing on Stevens Road, without impairing stream hydrology
- Gathering pre- and post-restoration monitoring data by continuing fish population surveys and tracking water temperature.

Tracking metrics:
- Follow-up with community members on the accessibility of the crossing on Stevens Road;
- Pre- and post-restoration sampling for fish populations to indicate presence of brook trout and other cold-water or sensitive species, and changes in relative abundance over time;
- Calculating disturbance scores and Biological Condition Gradient scores using pre- and post-restoration fish population data and riparian habitat assessments, using metrics specifically developed for Fond du Lac waters;
- Tracking wetland functional assessment data before and after cedar swamp restoration to track improvements in wetland function and value;
- Observe changes in the timing and duration of algae blooms in the roadside ditches;
- Deploying continuous temperature data loggers to track changes in water temperature pre- and post-monitoring, and to detect differences above and below the impoundments;

Culvert Inventory

The Office of Water Protection outlined a plan to complete a culvert inventory during the previous NPS Assessment Report and Management Program. This survey was conducted, but the data was corrupted during an update to a newer version of Microsoft Access and the database became unusable. A new culvert inventory is needed in any case as many culverts have been replaced or damaged since then.
Fond du Lac OWP will begin a culvert inventory as time permits, which includes such information as GPS locations, culvert condition and size, and whether the culvert is impacting local hydrology. Where possible, we will collect data from counties and townships and ground-truth the data – for example, St. Louis County began culvert inventories on the northern portion of the reservation in 2018. This information is essential for correct hydrological modeling using ArcHydro in ArcGIS.

Proposed work is as follows:
- Share culvert inventories between counties, state and Tribe.
- Share data (such as stream flow) and design plans before and after culvert replacement projects (such as the planned culvert replacement on Highway 210 immediately upstream of our Otter Creek (Station 1) monitoring site.
- Choose subwatershed to conduct culvert inventory, based on priority needs such as hydromodification, lack of awareness, planned infrastructure problems.
- Use culvert inventory data in watershed models, outreach and education

Tracking metrics:
- Data on size, placement, and functionality of culverts, number of culverts replaced, number needing replacement;
- Tracking culvert data shared between counties, townships, state of MN, and Fond du Lac
- Number of students, landowners and governmental entities taught about benefits of proper culvert design and placement

Roadside Vegetation Management

Continue the efforts that were started as part of the MOU between Fond du Lac and MNDOT. Consider renewing and updating the 2009 MOU and consulting with Fond du Lac's new Right-of-Way Specialist. The goals and expectations, excerpted from the MOU, are included below.

Goals and Objectives:

Fond du Lac Goals

- Preserve heritage opportunities for gathering and harvesting culturally significant plants on and adjacent to MNDOT's rights of way.
- Limit the spread of invasive plants within Reservation boundaries through use of Early Detection Rapid Response.
- Monitor land within Reservation boundary for potentially invasive species.
- Protect culturally significant plants and resources.
- Limit amount of herbicide used within Reservation boundaries.
- Restrict use of soil sterilants and restricted use herbicides.
- Develop educational opportunities and public awareness for the community.

Mn/DOT Goals

- Provide a safe driving experience for all highway users by maintaining safety clear zones, sight lines and guardrails.
- Limit the spread of invasive plants on Mn/DOT roadsides through use of Early Detection Rapid Response and through the most efficient and cost-effective method.
- Control woody plants encroaching on clear zones of roads through use of the most efficient and cost-effective method.
- Effectively control weeds and woody plants around radio towers.
- Develop educational opportunities and public awareness for the community.

Understandings, Agreements, Support and Resource Needs:

Fond du Lac Agreements

- For protection purposes, share spatial information on culturally significant areas.
- Contact members with information about the location and timing of herbicide application.
- Share spatial information on wetlands and water bodies within the Reservation.
- Partner with Mn/DOT to re-evaluate the site of herbicide application after application.
- Partner with Mn/DOT to mechanically remove invasive plants in areas where the Fond du Lac does not want herbicides used.
- Notify Mn/DOT of invasive plant populations found by Fond du Lac personnel that are on Mn/DOT rights of way.

Mn/DOT Agreements

- Provide Fond du Lac Resource Management Division with list of herbicide labels and material safety data sheets commonly used.
- Provide map and coordinates of known locations of invasive plants within the Reservation to Fond du Lac Resource Management Division.
- All herbicide applications for road purposes within Reservation boundaries will be performed by a Mn/DOT employee who is a Minnesota Department of Agriculture Licensed Applicator in categories A and J.

- Apply for a Wetland Permit from Fond du Lac to comply with Fond du Lac Wetland Protection and Management Ordinance for any herbicide application that has the potential to reach a wetland or body of water within Reservation boundaries.
- Contact Fond du Lac Resource Management Division 10 working days prior to applying any herbicide within Reservation boundaries and provide herbicide name, target plant and location.
- Partner with Fond du Lac to re-evaluate the site of herbicide application after application.
- Provide Fond du Lac with copy of Pesticide Application Log after spraying.
- Partner with Fond du Lac to mechanically remove invasive plants in areas where the Fond du Lac does not want herbicides used.
- Continue to map invasive plant populations on Mn/DOT rights of way.

Table 5. Actions, Outcomes and Timelines for Roads Projects

Non-Point Source Pollution Category						
Roads						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Jolicoeur Creek						
Deploy temperature logger	5 years of water temperature data	•	•	•	•	•
Secure NRCS funds for design plans	New NRCS funding; new land agreement	•	•			
Renew land agreement		•				
Secure funds to implement stream restoration	100 feet of restored channel; number of trees and native plants added; number of fish counted; 1 culvert cleaned out		•			
Remove culverts and roads				•		
Contour 100 feet of restored channel					•	
Plant trees and native grasses on 5 acres					•	•

Fish population assessments before and after restoration		•				•
Clean out the culvert under Wheaton Road						•
Outreach and education	Number of students, interns and landowners taught about benefits of stream restoration	•	•	•	•	•
Martin Branch (Stevens Road)						
Deploy temperature logger	5 years of water temperature data	•	•	•	•	•
Community meetings on crossing	Number of community meetings	•	•			
Secure NRCS funds for design plans	New NRCS funding		•	•		
Secure funds to implement stream restoration	1 bridge removed, 1 new crossing, number of feet of improved road and ditches, number of trees planted number of fish counted, 2 wetland functional assessments			•		
Remove bridge				•		
Create new crossing				•		
Raise roadway					•	
Ditch BMPs					•	
Restore upstream channel						•
Plant Northern white cedar in restored areas						•
Fish population assessments before and after restoration		•				•

Conduct a wetland functional assessment on cedar swamp before and after restoration.		•				•
Outreach and education	Number of students, interns and landowners taught about benefits of stream restoration	•	•	•	•	•
Culvert Inventory						
Share culvert inventories	Number of culvert data items, number of culverts replaced, number needing replacement	•	•	•	•	•
Conduct culvert inventory			•	•	•	
Share data and design plans before and after culvert replacement projects	Amount of data shared, number of culverts replaced	•	•	•	•	•
Use culvert inventory data in watershed models, outreach and education	Number of students, landowners and governmental entities taught about benefits of proper culvert design and placement	•	•	•	•	•
Roadside Vegetation Management						
Follow existing MOU	Number of roadways under MOU	•	•	•	•	•
Update and expand MOU		•	•	•	•	•

Urban BMPs

Watersheds: Big Lake, Second Lake

BMP Goals

Reduce the effects of NPS pollution that arise from land use in a rural setting, including shoreland development on lakes, failing septic systems, water softeners, parking lots and gravel pits. Focus on waters that are listed as highly impacted in the NPS Assessment Report.

The long-term goals are to develop Reservation lands in a sustainable manner that will protect and preserve the water quality of all waterbodies on the Reservation. This includes limiting impervious surface coverage to ten percent or less in each watershed, maintaining up to half of the watershed in mature tree (greater than 20 years old) coverage, and preserving and providing for stormwater runoff storage to reduce peak flows and volumes, filter pollutants, and provide habitat. FDL OWP will work with the Land Department to incorporate Green Infrastructure into their revised Comprehensive Plan.

The short-term goals focus on addressing those waterbodies with significant impacts from urbanization (especially Second Lake and Big Lake) and establishing a better means of communication and cooperation among the various land use agencies on the Reservation. Improved communication and cooperation will help the Reservation meet its long-term goals.

Below is a list of general BMP goals to be addressed in all the watersheds pertaining to urbanization:

- Implement the document National Management Measures to Control Nonpoint Source Pollution from Urban Areas (USEPA 2005), a guidance and reference document for use by state, local, and Tribal managers in the implementation of nonpoint source pollution management programs. This document is an excellent source of information on the best available, economically achievable means of reducing pollution of surface and groundwater from urban areas.
- Acquire sensitive lands within and outside the Reservation to assure protection.
- Acquire lands appropriate for development to assure economic prosperity and quality living while protecting water quality.
- Where possible, create maps that show percent impervious area within each HUC-9 or HUC-7 watershed, and add in future proposed development to calculate prevent impervious surface by watershed.

BMP Projects

Big Lake

Shoreland Maps

Shoreland mapping and photography can provide baseline data that describes the health of a shoreland over time. Drawing on the experience of other shoreland outreach and education efforts (University of Wisconsin Stevens Point, Courte Oreilles Lake Association), we plan to create maps of Big Lake that classify its shorelands based on set criteria for shoreland health. These maps can pinpoint areas contributing to NPS pollution, focus on landowners that most need to receive information and assistance for restoration, and develop work plans for shoreland management. Previous work using these techniques has shown that disseminating shoreland maps that are classified by shoreland health can motivate landowners to improve shoreland management techniques, especially when making the connection between shoreland

development, water quality and land values. These maps can be disseminated in conjunction with landowner guides for proper shoreland management, such as the Minnesota Shoreland Management Resource Guide (https://shorelandmanagement.org/), and will be done in partnership with the Big Lake Improvement Association, Carlton SWCD and the Regional Stormwater Protection Team. Any outreach will also address the increasing chloride trend in Big Lake and discuss proper use of water softeners, how to salt pathways and driveways in the winter, and recommendations on stockpiling snow in upland areas away from shore.

When possible, the Fond du Lac OWP will work with landowners to gain public assistance for shoreland management through state and federal programs. The Fond du Lac OWP will also work to provide its own assistance to landowners where possible, for example by working with Master Gardeners to provide education to landowners, or by working with the Fond du Lac Ojibwe School and the Gitigaan Program to grow native plants alongside their garden. If funding and time allow, Fond du Lac OWP may also work with tribal leadership and other agencies to do a pilot project at the Fond du Lac-owned Kiwenz Beach on Big Lake, showcasing proper shoreland management.

The Fond du Lac OWP will use its training in the ArcHydro program for ArcGIS, along with new LiDAR coverage collected by the state of Minnesota, to determine the extent and flow direction of the Big Lake watershed. Drainage from the Big Lake Watershed is more than likely not tied to the Stoney Brook Watershed as the road at the southwest corner of the lake appears to block the drainage to the wetland draining to Sofie Lake, except during high water levels. The Big Lake outlet seems to generally flow to the Moosehorn River Watershed or into the Simian Creek Watershed through a low gradient ditch that crosses the intersection of Ditchbank Road and Big Lake Road during overflows. Working with ArcHydro will help us determine if our speculations about the Big Lake watershed are correct, and the locations of any impediments to water flow (such as roads or blocked culverts). The Cedar Lake feasibility study puts Big Lake in the Simian Creek watershed, and this has important implications for Fond du Lac's approach to water level management on Cedar Lake.

Septic System Outreach

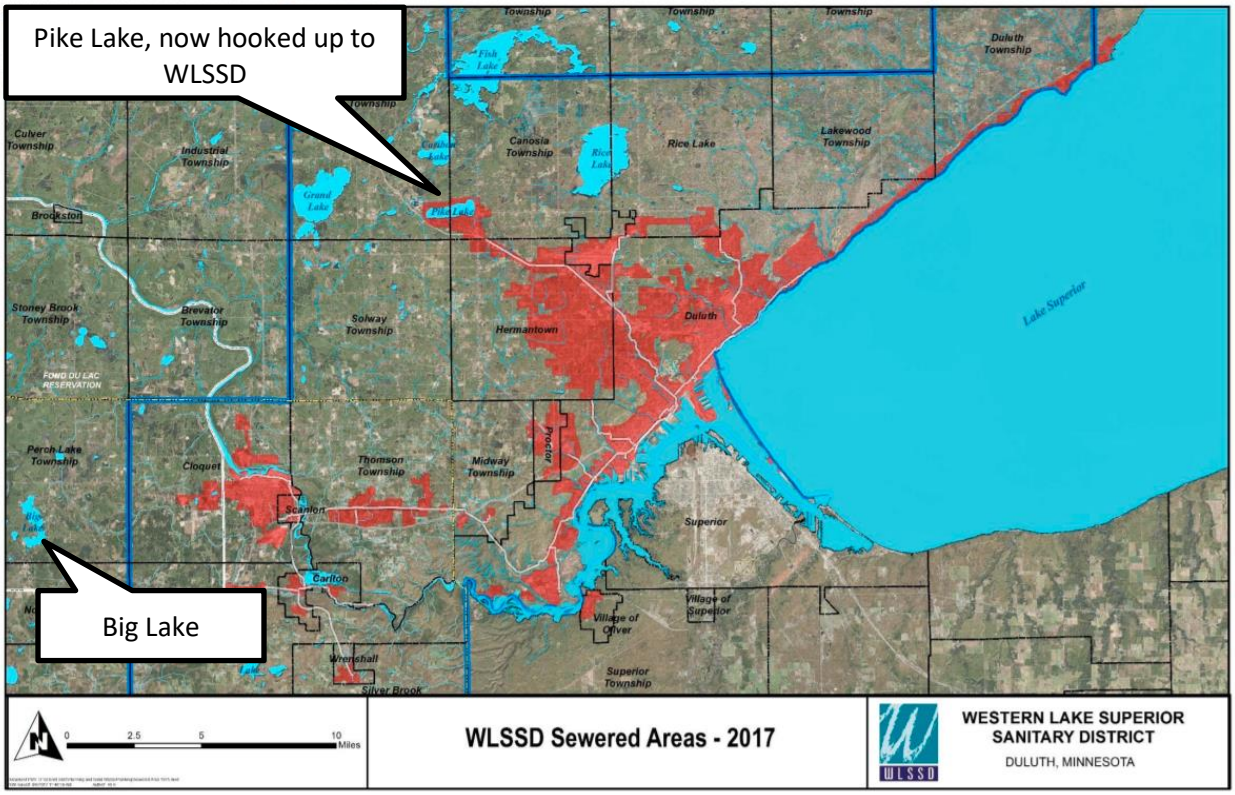
Failing septic systems are cause for concern for Big Lake's water quality. Because of dense development, there is no space to replace septic systems that are failing or have reached the end of their functional lifespan. Fond du Lac OWP has been engaged in a 15-year effort to address the issue; the first plan of action was to build a small wastewater treatment plant near the lake, but those plans fell through when a buildable site could not be found and it was not feasible to build a plant that could adhere to the strict mercury standards for effluent in the Great Lakes Basin. In addition, the plant site was also not welcome to local residents.

Ongoing efforts have focused on extending a sewer main along Big Lake Road all the way to Big Lake, connecting the area to the Western Lake Superior Sanitary District (WLSSD) collection area (Figure 9). Although this is feasible from a construction, permitting and funding standpoint (including state bonding), there is not enough support among Big Lake residents to get approval for the assessment fees that would be required of each resident to connect their homes to WLSSD. Since hooking up Big Lake homes to WLSSD may not happen in the near term, FDL OWP can use its NPS Management Program to provide outreach to Big Lake residents about failing septic systems. Although the issue of assessment fees is important, we can also highlight the imminent threat of increased risk for harmful algal blooms and the subsequent impact that can have on recreation, property values and restoration/response costs. Nearby Pike Lake can be used as an example of a community that successfully dealt with septic system overflows and *E.coli*

issues by switching from septic systems to hookups to the Western Lake Superior Sanitary District (Figure 9).

Figure 9. Western Lake Superior Sanitary District collection area

Big Lake is west of the Cloquet collection area.



Proposed work is as follows:

- Use Arc Hydro and other ArcGIS tools to determine catchment flow direction for the Big Lake subwatershed.
- Use these GIS resources to create outreach maps for Big Lake landowners, including mailers that discuss how shoreland health affects water quality, which then has impacts on land value. Include resources from the Minnesota Shoreland Management Resource Guide and from the Regional Stormwater Protection Team (RSPT)
- Conduct a social marketing campaign to share the state of shoreland health on Big Lake, in collaboration with the Big Lake Improvement Association, Carlton County and RSPT. Conduct targeted stakeholder interviews, surveys, remote meetings, and rain barrel/rain garden workshops. Send mailers. Create and share a Big Lake Story Map. Include information on how to prevent aquatic invasive species from spreading, and how to prevent water quality impacts from failing or overflowing septic systems and from water softeners.
- Help interested landowners connect with state and federal funding resources to protect shoreland health, and if needed, help them with shoreland management plans.
- Devise a shoreland management plan that includes a goal for increasing percent of shoreland that improves its health classification per year, after an initial startup period. Create Big Lake shoreland health map in ArcMap, with health scores for each parcel.

- Outreach to Big Lake residents to encourage proper septic system maintenance and pumping, and to share any concerns with Fond du Lac OWP. Link the issue of failing septic systems to water quality, recreation and property values.
- Use the most successful elements of the outreach work at Big Lake to inform outreach at other lakes such as Bang (Long) Lake

Outcomes:

- Knowledge and capability to plan for and install and effective management techniques for mitigating water level problems in manoomin lakes caused by beavers.
- Lower water levels in Cedar Lake, which could result in the right conditions to restore manoomin populations.
- Gathering pre- and post-beaver management water level monitoring data in Wild Rice, including the possibility for an updated bathymetric map.
- Ability to transfer new beaver management knowledge and techniques to new sites.
- Use Cedar Lake beaver management project as a way to showcase new techniques that others in the region can follow.

Tracking metrics:

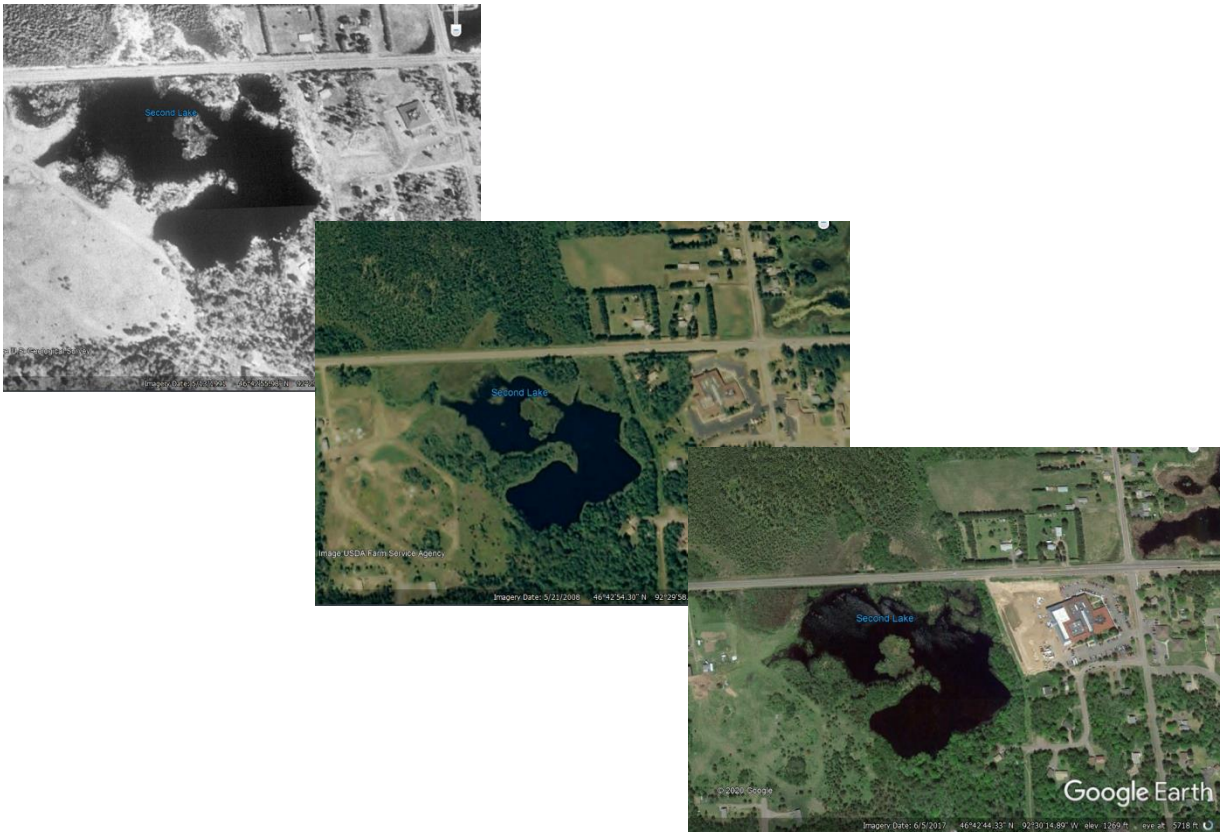
- Number and types of attribute data in a Big lake geodatabase on shoreland health, water quality and catchment flow direction/hydrology.
- Number of outreach materials, personal contacts, remote or in-person meetings, number of partners, number of outreach participants, number of surveys and number of results.
- Number of landowners who update or change shoreland practices, septic system maintenance, and/or water softener BMPs.
- Number of landowners that have shoreland management plans, and if applicable, number of landowners who receive financial assistance and amount of assistance.
- Number of shoreland health ratings that change over time due to BMP implementation.

Second Lake

In the Urban category of the Assessment Report, we highlight recent construction activities and the impact they are having on water quality in Second Lake. The Severity of Impact is listed as high due to urban NPS impacts. It is the only lake on the Reservation that has a water quality impairment in addition to mercury; it is impaired for the Aquatic Life: Warm Water Fisheries Designated Use for TSS. It also has increasing total phosphorus trends. The TSS graph in the Results section of the Assessment Report shows an increase that coincides with recent construction activities, which included an addition on the clinic and an expanded parking lot. The new parking lot includes stormwater ponds, but the ponds may have limited functionality due to the extremely high rainfall levels experienced in 2017 and 2018; in 2018, the road on the west side of the clinic was flooded for much of May and June. Data analysis on Third Lake shows a significant positive correlation between water levels and Secchi depth, so that we believe water level, in addition to NPS, plays a role in the water quality trends we see in these two lakes, where water level is primarily driven by groundwater inputs.

The photos below show both the construction activities near Second Lake, as well as the fluctuating water levels from a wet period in the 1990s, a dry period in the early 2000s, and another wet period in the late 2010s (Figure 10). TSS data for 2019 shows a decrease in TSS concentrations, so it is possible that TSS will decrease on its own now that construction has ceased. Until 2019, Second Lake was sampled once yearly under FDL OWP's monitoring plan, but starting in 2020, we plan to monitor this lake four times a year to gain more data points per season and more clearly understand its water quality trends.

Figure 10. Aerial photos of Second Lake, in 1991, 2008 and 2017
(from left to right). The photos show the water level fluctuations in this groundwater-fed lake, as well as recent construction activities at the clinic. Photo source: Google Earth



<u>The proposed work is as follows:</u>

- Increase routine monitoring frequency from once a year to match that of Primary Fisheries Lakes: May, June, August and October. Track TSS and nutrient levels and assess trends. Increased monitoring began in spring of 2020.
- Meet with clinic building managers to discuss groundskeeping practices. Encourage the following Green Infrastructure practices and use educational materials from RSPT:
    - Aerate the lawn around the clinic to encourage stormwater infiltration
    - Plant more trees
    - Investigate where gutter downspouts release water, and reposition to allow for better stormwater infiltration
    - Install rain barrels, if feasible
    - Agree on a plan for smart salting of all parking lots, access roads and walkways. Consider participating in a Smart Salting training, hosted by RSPT.
    - Agree on a plan for snow stockpiling that will allow meltwater to infiltrate into vegetated areas instead of running straight into the stormwater ponds and the lake. Conduct several rounds of parking lot sweeping in the spring to collect sand.
    - Explore possibilities for installing rain barrels, dry wells, rain gardens or bioswales
    - Many of these practices can be transferred to other parking lots that Fond du Lac manages
    - Create a stormwater management plan for the clinic and parking lot, and use this plan to apply for funding to assist with implementing NPS BMPs.

- Fond du Lac OWP will inspect the stormwater ponds and assess their functionality in containing and infiltrating stormwater. Consider planting native vegetation around the ponds, or cleaning/dredging stormwater ponds, if needed to increase functionality. Assess whether the stormwater pond with direct connection to the lake is a factor in increased TSS within the lake.
- Fond du Lac OWP will work with Carlton County to assure that the culvert under Big Lake Road is functioning properly and that plowing and/or salting of the Big Lake Trail is not contributing to NPS pollution in Second Lake.
- If these measures are not sufficient, a more complete stormwater survey of the parking lot will need to be completed. In this case, Fond du Lac will pursue grant funding to hire a contractor to design new stormwater infrastructure for the clinic.
- Where feasible, Fond du Lac may be eligible for funding Green Infrastructure through the FEMA Building Resilient Infrastructure and Communities grant program.

Outcomes:

- The facilities managers at Min No Aya Win will have a better understanding of the clinic expansion's effect on Second Lake water quality and the stormwater BMPs needed to address NPS pollution.
- Fond du Lac OWP and the facilities managers at Min No Aya Win will work together to create a stormwater management plan and implement BMPs to reduce NPS pollution.
- These approaches can be shared with other facilities on the Reservation to improve parking lot stormwater management.

Tracking metrics:

- The number of meetings between Fond du Lac OWP and the facilities managers at Min No Aya Win, and the amount of outreach materials and water quality data shared.
- A stormwater management plan for Min No Aya Win.
- Number of NPs BMPs implemented
- Changes in Second Lake water quality as a result of BMP implementation

Table 6. Actions, Outcomes and Timelines for Urban Projects

Non-Point Source Pollution Category						
Urban						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Big Lake						
Social marketing campaign to include outreach on the impact of AIS, septic systems and water softeners on Big Lake water quality. Create shoreland health map for Big Lake, including AIS issues.	Number of outreach materials, mailers and outreach interactions that arise as Fond du Lac OWP shares the Big Lake shoreland health map. Number of outreach materials, mailers and outreach interactions related to septic systems and water softeners New map that shows state of shoreland health for each parcel on Big Lake, changes in health ratings as a result of outreach and BMP implementation		•	•		
Work with landowners willing to improve shoreland health to create work plans; connect landowners with financial assistance	Number of shoreland work plans, number and amount of financial assistance grants				•	•

Second Lake						
Increase Second Lake monitoring to four times a year; include data in water quality assessments	Number of sampling visits to Second Lake; changes in water quality trends	•	•	•	•	•
Fond du Lac OWP conduct outreach on Second lake water quality and stormwater BMPs with facilities managers at Min No Aya Win	Number of meetings, number of participants, amount of information shared on Second Lake water quality and stormwater BMPs.		•	•	•	•
Create stormwater management plan for Min No Aya Win	1 new stormwater plan			•		
Apply for funding to implement stormwater BMPs	Number of applications, source and amounts of funding			•	•	•

Wetland/Riparian Management BMPs

Watersheds: all

BMP Goals

Prevent NPS effects on wetland quality and function by continuing ongoing wetland monitoring efforts, and by participating in research to determine the effect of ditching on mercury methylation.

BMP Projects

Wetland Monitoring

As long as Fond du Lac is able to secure funding through Wetland Program Development Block Grants, we will continue to conduct routine monitoring surveys for wetland quality and function. These surveys, which use a modified floristic quality assessment method, help to track wetland quality and function over time. A diversity of wetland types is monitored, with each watershed visited every five years. The monitoring data is kept in a database, which then can be used to rate wetland disturbance. Data from these surveys is also used to update the Fond du Lac Wetland Restoration Plan, and it can be used to set priorities for BMPs. Our wetland data was used to help make the wetland restoration priority table for the Pipeline Corridor Water Quality Management Plan (Table 3). This work came to a halt in 2020 because Fond du Lac OWP did not receive a Wetland Development Block grant, and because our Wetland Specialist staff person left for a new position.

Mercury Monitoring and St. Louis River Watershed Mercury Total Maximum Daily Load Development

Fond du Lac is partnering with the USGS and the MPCA to collect samples for a water quality monitoring project within the St. Louis River basin. This project aims to further understand the role that ditching plays in mercury methylation and delivery to the St. Louis River, with an eye to identifying sites that could be restored to reduce mercury bioaccumulation in this system. When possible, Fond du Lac assists with this project by collecting water quality samples from the ditch on Pine Drive that is part of the Stoney Brook system on the Reservation. We also take part in discussion with USGS and MPCA on the research goals, methods and results.

As the Minnesota Pollution Control Agency restarts a Total Maximum Daily Load (TMDL) study for the St. Louis River watershed, Fond du Lac OWP will work in at the government-to-government level with them on tasks such as:

- Choosing a watershed model, including the model assumptions, parameters, calibrations and tests of the model.
- Sharing data (including water quality and fish tissue monitoring, isotopic signatures from mercury sources, peatland monitoring and load monitoring from potential sources), conclusions from research, management approaches and enforcement/regulation.
- Track changes in mercury loads over time, with the goal of improving fish consumption guidelines for both state residents and Fond du lac Band members - keeping in mind that Fond du Lac has a more restrictive human health consumption water quality standard for mercury in in the water column compared to the state standard (since it relates to bioaccumulation in fish and assumes a higher fish consumption rate for Band members compared to other state residents).

Outcomes:

By continuing efforts to monitor wetland quality, function and value, we can track changes over time, and identify wetlands at risk for NPS impacts. We can keep our Wetland Restoration Plan updated, and use it

to set priorities to respond to any NPS issues that get identified. By participating in St. Louis River watershed-wide mercury geochemistry research, we can continue to potential management approaches that could reduce mercury methylation due to ditching, and address the most persistent and widespread water quality/NPS problem on the Reservation. By working with the state of Minnesota at the government-to-government level, we can develop a mercury TMDL for the St. Louis River watershed that will reduce mercury loading and methylation and improve fish consumption guidelines by reducing NPS and point-source mercury loading.

Tracking metrics:

- Tracking the number of EPA Wetland Program Development Block grants, or Great Lakes Restoration Initiative Grants received.
- Tracking the number of wetlands, and the number of wetland types, monitored each year.
- Tracking the number of data points entered for wetland monitoring work, the number of analyses completed on wetland function and condition, and any changes in wetland function/restoration needs over time.
- Tracking the number of sites visited for mercury geochemistry research and the number of meetings with USGS/MPCA to discuss and analyze findings.

- Tracking the number of interactions with the MPCA and other partners during the St. Louis mercury TMDL development, including amount of shared data compilation, analysis and BMP recommendations.

Table 7. Actions, Outcomes and Timelines for Wetland/Riparian Management Projects

Non-Point Source Pollution Category						
Wetland/Riparian Management						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Wetland Monitoring						
Continue Fond du Lac OWP's wetland functional surveys. Hire new Wetland Specialist, if feasible	Number of wetlands, and the number of wetland types, monitored each year, as well as their level of disturbance, and any changes over time. Number of staff involved.	•	•	•	•	•
Continue to apply for Wetland Program Development Block grants and/or Great Lakes Restoration Initiative Grants	Number of grants received, amount of funding	•	•	•	•	•
Mercury Monitoring and St. Louis River Watershed Mercury Total Maximum Daily Load Development						

Continue peatland monitoring and data analysis in partnership with USGS and MPCA	Number of sampling visits, amount of data collected, conclusions and recommendations from data analysis	•	•			
Work with MPCA on St. Louis River mercury TMDL in a government-to-to-government relationship	Number of meetings, number of participants, amount of data, analysis, conclusions and recommendations shared. Number of actions needed to reduce mercury loading; changes in mercury in water and mercury in fish data over time.	•	•	•	•	•

Invasive Species BMPs

Watersheds: all

The following information is excerpted from Fond du Lac's Invasive Species Management Plan (ISMP), except where noted in italics. Both terrestrial and aquatic invasive species are discussed because all invasive species (IS) can affect water quality. Refer to the ISMP for details on specific species of concern and the targeted methods to control them. The entire ISMP is included in Appendix I

BMP Goals

Control/eradicate existing terrestrial and aquatic invasive species infestations, prevent future introductions and establishment of new invasive species and/or infested areas by especially focusing on restoration, foster partnerships, and build outreach programs to encourage communities to proactively engage in a sustainable invasive species program.

Implement a multi-faceted invasive species management plan within the Fond du Lac Reservation boundaries as well as Spirit Island, Anderson Island and Wisconsin Point, and work with partnering organizations to manage a defined buffer area bordering the Fond du Lac Reservation, and the 1854, 1842 and 1837 Ceded Territories.

BMP Projects

All IS control activities will be carried out by Fond du Lac's Invasive Species program, which partners with Fond du Lac OWP on priority-setting, education and early detection and where control activities may impact water quality.

Prevention, Early Detection, Control and Monitoring

Prevention

Reduce or eliminate pathways for the introduction or spread of terrestrial and aquatic IS, primarily through decontamination and monitoring of equipment, and through implemented and enforced Best Management Practices (BMPs) and decontamination protocols for transported equipment and materials. Work directly with Fond du Lac conservation officers to encourage the public to follow regulations and BMPs put in place to prevent the spread of IS within the areas of concern.

a. Reduce or eliminate pathways for the introduction or spread of terrestrial and aquatic IS, primarily through decontamination and monitoring of equipment, and through implemented Best Management Practices (BMPs) for transported equipment and materials.
b. Educate staff, public, outside contractors, and others about BMPs to reduce potential of spread through human introduction pathways. In the case of outside contractors a Fond du Lac staff member with knowledge of the BMPs will make an effort to be on site for any management occurring. If staff can't be on site, contractors will be expected to follow Fond du Lac IS management BMPs.
c. All outside contractors will also be expected to follow IS permit regulations as defined by permit application and issuance, which will be a collaboration between Fond du Lac departments.

Outcomes for prevention:

Prevention is the most effective BMP to mitigate the effects that IS can have on water quality for waters and wetlands on the Reservation. By focusing on prevention BMPs, Fond du Lac IS staff will avoid the additional costs and time needed to control new IS infestations, and Reservation wetlands and waters will avoid the water quality problems that could arise from new IS infestations.

Tracking metrics for prevention:

- Recording the number of boat inspections and equipment decontaminations performed throughout the summer season.
    - Recording if any visible AIS were seen and prevented from entering and/or leaving a waterbody.
- Tracking how many wetland/contracting permits were given out to contractors on Reservation and where they were coming from, and if they were clean upon inspection entering the Fond du Lac Reservation; this will be kept track of by other departments in Fond du Lac resource management who are already procuring this information and doing this work.
- Collecting the tracking logs utilized by contractors and Fond du Lac staff to see where people were traveling to and from and when equipment was decontaminated between uses.
- Tracking how many in-the-field decontaminations occurred from staff by collecting decontamination tracking logs.

Early Detection and Surveillance

Identify current and new invasions of terrestrial and aquatic IS prioritizing high risk, high use, and culturally significant areas. Species prioritized for management will be those currently posing a threat on-Reservation and those listed under the Minnesota Department of Agriculture (MDA) "Noxious Weed List" for terrestrial invasive species (TIS) and those listed under the Minnesota Invasive Species Advisory Council (MISAC) rankings for aquatic invasive species (AIS).

a. Identify current and new invasions of terrestrial and aquatic IS prioritizing high risk, high- use, and culturally significant areas first within Reservation properties including Spirit Island, Anderson Island and Wisconsin Point, then in the area surrounding the Reservation and in the 1837, 1842 and 1854 ceded territories.
b. Create/add to geographic information system (GIS) mapping project(s) to document current and new IS invasions, intensity of infestation, and areas surveyed to enable better prioritization of control/treatment areas.
c. Enable individuals from Fond du Lac staff and members of the community to have access to the maps that show locations of current IS infestations and enable them to report new IS infestations (i.e. using EDDmapS software).
d. Implement emerging monitoring techniques (i.e. satellite imagery, drones, eDNA) and pursue grant funding for innovative techniques.

Outcomes for detection and surveillance:

Maps created from monitoring efforts will be made available to Fond du Lac staff and community members so preventative measures can be taken to avoid spreading IS from these areas. It will also enable the IS program and other staff and community members to see the scope of the problem on Reservation. These maps will also aid in planning for control methods to be implemented and also aid in creating a priority matrix of sites to be managed for IS. The priority matrix will be available to Fond du Lac staff and community members to show what areas are deemed a priority for control and can be adjusted based on feedback from Tribal elders, community members, the RBC, and Fond du Lac staff.

Tracking metrics for detection and surveillance:

- Recording the number of IS monitoring activities conducted; to aim to match or exceed 15 lakes and/ or 15 river monitoring and surveying activities being conducted each year; how many acres have been surveyed each year; and how many acres have been surveyed in culturally significant areas.

- Mapping that indicates what areas have been surveyed, what IS have been found, and where specific IS are found.
- The number of site plans created and implemented. Site plans will be made based on geographic areas and/or by individual IS. Site plans that are made will be available upon request, and will be implemented through using the priority matrix.
- Tracking the number of innovative survey techniques implemented, including utilizing eDNA and LiDAR, and creating survey techniques for AIS in river systems.

Control

Manage/eradicate new and current IS infestations using a variety of treatment methods including biological control, manual control, mechanical control, and chemical control. Restore controlled areas to culturally beneficial native landscapes, including, but not limited to pollinator, fisheries, forestry, wildlife, wetland, manoomin, and harvestable wild foods habitat. Restoration will also aid in recreational, harvestable, and potentially economic use. Restoration efforts will occur in conjunction with input from other resource management and Fond du Lac divisions and departments to ensure the efforts are of the highest benefit to the Band and support other Fond du Lac programs.

a. Manage/eradicate new and current IS infestations using a variety of treatment methods including prescribed burning, mechanical control, manual control, biological control, and chemical control, using a priority matrix to target specific species and/or locations.
    i. Seek input from various Reservation entities including, but not limited to, Resource Management staff and the Conservation Committee to ensure control methods are implemented in a culturally respectful and environmentally safe way. Large scaled management or treatment projects will be internally reviewed by RMD staff in accordance with the Integrated Resource Management Plan (IRMP)
b. Monitor success of control methods, continue to document and implement successful control/eradication techniques in infested areas.
c. Restore controlled areas to culturally significant and beneficial native landscapes including restoring habitat to support culturally significant and beneficial native species.
    i. Restoration will be a collaborative effort with other Fond du Lac programs including, but not limited to, fisheries, wildlife, wetlands, food sovereignty, forestry, water quality and others to the benefit of culturally significant species and the Fond du Lac Reservation.

<u>Outcomes:</u>

Controlling infested sites will prevent further spread of IS on the Reservation, while also giving insight into effective control measures. Restoring sites where IS have been eradicated will help maintain water quality and wetland function on the Reservation by preventing erosion and preventing trophic changes that could result from AIS in lakes and streams.

<u>Tracking metrics for control:</u>

- Recording the number of acres and locations that are treated. Control will also be counted in the number of acres treated near culturally significant resources such as manoomin lakes, fishing lakes, berry harvesting areas, and river bank areas.
- Track the number of new control techniques utilized. New control methods that potentially could be utilized can include use of goats or sheep for grazing, hand pulling and smothering, new biological controls, carbon dioxide poisoning, forestry mulching, and spot fire treatment. Success of the treatments will be measured and then can be adjusted based on the effectiveness of the treatment.

Monitoring

Monitor existing IS infestations to determine rate of spread and protect non-infested areas, prioritizing infested areas that are close to non-infested high-risk, high priority, and culturally significant areas and monitor areas that have undergone control/ treatment efforts to measure success, new species (native and invasive), and control regeneration.

a. Monitor existing IS infestations to determine rate of spread and protect non-infested areas, prioritizing infested areas that are close to non-infested high-risk, high priority, and culturally significant areas, or that have high priority IS.
b. Monitor areas that have undergone control/treatment efforts to measure success, new species (native and invasive), and control regeneration.

Outcomes:

Monitoring for IS will enable the IS program to predict a rate of spread and allow for better prioritization of sites for treatment/control. This will aid in prioritizing treatments/control, monitoring the success of treatment areas, and protecting non-infested sites.

Tracking metrics for monitoring:

- Tracking the number of acres and waterbodies that are monitored for different types of IS. This will include the number of acres monitored in culturally significant areas, lakes monitored with culturally significant resources such as manoomin and/or walleye, acres monitored nearby culturally significant resources such as maple stands or harvesting areas.
- Tracking the number of monitoring methods used. Success of monitoring will be recorded in data sheets and in GIS to show if infestations are expanding, staying the same, or declining.
- *Tracking the extent and locations that have undergone control/treatment, populations and extent of native vs. IS species present, and amount of IS regeneration.*
- Tracking the number of sites monitored (both previously treated sites and non-treated sites) and for how many consecutive years the sites had been monitored.
    - Tracking the types monitoring techniques and consistency of methods used.

Disrupting Pathways of IS Introduction and Spread

Priority pathways for introduction or spread will be primarily pathways reliant on human transport. These areas are where there is room for direct disruption to prevent any new infestation of IS. These pathways include, but are not limited to, recreational human activity pathways, constructive and destructive pathways, shipping and trade, and food distribution. To disrupt these pathways, prevention will focus and begin with education of best management practices (BMPs, outlined below) to empower individuals to follow practices that will greatly reduce the risk of spreading TIS and AIS. Education to prevent pathways of spread will also occur in placing IS trained staff and decontamination materials (outlined below) in direct areas of high- risk including placing watercraft inspectors and AIS first detector volunteers at public launches and/ or in high-risk TIS transport areas such as hiking, hunting, and harvesting areas. Preventing new IS from entering the Reservation will also occur through implementing an IS tracking and permitting system in which outside contractors will be required to provide information of where there equipment was previously located and what known IS are in that area. They will also be required to clean their equipment after leaving a known infested area AND before entering the Reservation, to ensure as little material as possible is being transported. An AIS tracking system for staff equipment will also be implemented so individuals can watch where equipment is coming from, who it was last used by, and if it has been decontaminated since leaving an infested area. Prevention will also occur by tracking movements of equipment during busy seasons such as spearing and netting, and manoomin harvesting, when equipment frequently moves from infested to non-infested areas. Decontamination protocols will

be put in place so Band members can still fully participate in all harvesting, fishing, spearing, and other cultural events with a lowered risk of spreading IS. As an IS tracking system is implemented, feedback will be asked for from Band and community members, and adjustments to procedures will be made accordingly. Prevention will also occur through posting informational signage at high risk transportation sites such as hiking trails, commercial use woodlots, boat landings, and others.

Fond du Lac currently has several partnerships contributing to the prevention of the spread of invasive species. This includes collaboration with the MN DNR and others to specify waters that are non-infested where planes may and may not take water from during fire-fighting activities. The IS program hopes to continue this and other similar partnerships aiding in preventative efforts, as well as look for opportunities for new partnerships to prevent the spread of IS both on Reservation and in the 1837,1842, and 1854 ceded territories.

Disrupting the pathways of spread will include the following BMPs:

Enforcement

The Fond du Lac Invasive Species Coordinator will work with Fond du Lac conservation officers to enforce the invasive species ordinance (Fond du Lac Band of Lake Superior Chippewa, 1992) that has been put in place to prevent the transport and introductions of aquatic invasive species. The ISC will also work with enforcement to encourage BMPs be followed for TIS and AIS for Fond du Lac staff, community members, and the general public. IS program employees will also aid in the monitoring of outside contractors to ensure they are abiding by program regulations and following permitting requirement in regards to decontaminations and the transport of IS. Permitting regulations will be determined through a collaborative effort with the IS program and other resource management departments. IS program employees will encourage Fond du Lac staff, community members, and the public to follow BMPs, but *will not* engage in any type of enforcement activity beyond contacting a conservation officer if a violation of an ordinance or law has occurred.

Decontamination

Hiring seasonal watercraft inspection and decontamination staff to protect resources such as priority fisheries lakes and manoomin lakes, as well as the St. Louis River is an integral action in controlling the pathways of introduction of spread for AIS on Fond du Lac Reservation. The Invasive Species Coordinator will coordinate with other partners such as the MN DNR and others to ensure peak user times and locations on and around the Reservation are staffed with inspectors to prevent the spread of AIS. Enforcing BMPs for boaters and recreational water users for clean equipment, bait disposal, bait usage, etc. is also critical in controlling the pathways of introduction of spread for AIS.

Field decontamination BMPs and field cleaning kits will be made available from the ISC to staff working in high risk [of transport] areas, allowing staff to follow BMPs and protocols put in place to prevent the transport and spread of IS. The ISC will also create an internal Fond du Lac staff program where reasonable IS protocols to reduce the risk of transport will be promoted, such as creating “check-in” lists for equipment so anyone using a piece of equipment can track where it has been and if it requires decontamination before moving to a new location. The ISC will also create BMPs for Fond du Lac staff to reduce the risk of spread during efforts such as firefighting and/or manoomin restoration.

Decontamination will also occur through hiring seasonal staff to act as naturalists along highly utilized terrestrial areas such as pipeline corridors. These naturalists will aid individuals in identifying different IS and providing decontamination equipment and trainings such as boot and truck brushes and a field decontamination station. Informational signage, and permanent cleaning brushes, and potentially a

cleaning station, will also be placed in busy locations around Reservation recreational entrances and exits where the risk of transporting species is significant.

All staff and items associated with decontamination will also have educational materials so community members can recognize IS, such as wild parsnip, that may be harmful to human health, and so there is an easier ability to identify, report, and learn to manage IS infestations on their personal or recreational Fond du Lac-owned property. Areas known to be highly infested or busy access sites will be prioritized for implementing prevention protocols to have the highest impact to prevent the pathways of spread for IS.

Emerald ash borer management

Although most IS can cause either a direct or indirect threat to water quality, the NPS Assessment Plan calls out the potential effect that emerald ash borer (EAB) could have on Fond du Lac's manoomin lakes by altering wetland hydrology. Therefore, BMPs related to emerald ash borer are discussed in detail. Specific BMPs for other IS can be found in the ISMP.

a. Emerald ash borer surveillance: Set out EAB traps, in partnership with the Fond du Lac IS program and Fond du Lac Forestry Program. Prioritize around sensitive areas, such as those used for timber harvesting or high risk access points.
    a. Conduct additional surveillance for EAB presence in ash stands, by looking for their tell-tale bore holes.
b. Discuss EAB prevention during outreach and education events. Focus on efforts to not move firewood and to teach the public why EAB is such a threat to our wetlands and forests in northern Minnesota.
c. Partner with state and federal agencies (MN DNR, USDA, St. Louis County, Carlton County, MN Department of Agriculture) on control efforts, when and if EAB is found on the Reservation. Provide comments on any state and federal policies related to EAB prevention and control.

<u>Outcomes:</u>

BMP activities, such as enforcing IS ordinances, equipment decontamination and EAB monitoring, will disrupt the pathways of IS spread and cause fewer IS to become established on the Reservation. This in turn will prevent water quality problems associated with IS.

<u>Tracking metrics:</u>

- Tracking the number of permits issued to Fond du Lac programs and/or outside contractors to conduct work on the Reservation.
    - Track the level of compliance of each permit issued after the project is complete.
- Tracking the number of boat landing sites staffed with IS personnel, as well as timing and duration.
    - Tracking how many times equipment is decontaminated.
    - Tracking the number of interactions with boaters.
    - Tracking behaviors such as cleaning techniques, bait disposal, bait usage, etc.
    - Tracking the number of boats and other equipment that have some type of IS present.
    - Tracking the number of educational materials disseminated.

Education and Outreach

Educate Fond du Lac staff, Fond du Lac community members, the general public, and outside contractors on how to identify, report, manage, and prevent the spread of IS, focusing especially on engaging Band member youth and working with elders to identify locations of significance. Raise awareness about IS and Fond du Lac's contribution by participating in outreach events in the Fond du Lac community and around Minnesota. Education is a key component in preventing the spread of IS around the Reservation and the

ceded territory areas. *The relationship between NPS pollution and IS will be linked at every opportunity, and especially when an NPS project such as restoration at Jolicoeur Creek, or water quality problems at Second Lake, are a topic of educational outreach.*

Other aspects of education and outreach will also include writing and enforcing best management practices (BMPs) and standard operating procedures (SOPs) for topics including, but not limited to, how to safely use and transport equipment to minimize the risk of transport of invasive species while in the field, safe management and removal of invasive species, and others. These will be written for professional and recreational use so they can be applied to Fond du Lac staff, Fond du Lac community members, and the public. Educational trainings and materials will also be specifically geared towards minimizing IS impacts during important cultural activities such as spearing and netting and manoomin harvesting. The IS program will strive towards using future funding opportunities to set up a library of nets that may only be used in infested waters, and to have permanent decontamination stations for nets and spearing equipment

Note: Until an effective vaccine has been developed and widely disseminated for Covid-19, the following education and outreach efforts will be modified to include distance-learning and outdoor events to prevent the spread of disease. Education will not take place at seasonal Pow Wows or other large-scale Fond du Lac events since they are currently canceled – but since this is a five-year plan, large-scale events may resume within that timeframe and so are discussed below. Educators will follow state of Minnesota guidelines related to educational practices and Covid-19.

School Education Programs and Events

Invasive species education will begin with the development of a wide array of programs to offer to schools, Fond du Lac community members and the general public, drawing on existing educational resources where possible. These classes will include themes of TIS and/or AIS, and issues they can cause for the environment, human health, or the economy. The IS program will continue to expand its education initiatives to include a wide variety of classroom presentations to Tribal youth about how IS disrupt ecosystems, what can be done to prevent their spread, careers in natural resources with IS, and how to aid in IS management. It will also add a hands-on approach through programs such as IS identification hikes where students will learn what IS are in their own spaces. This IS education program will also expand to include a classroom portion in the winter, paired with an in-field management activity in the spring, so students can get a first-hand experience in being an IS manager. Currently, the IS program aims to implement a minimum of five programs per year with Fond du Lac community schools and after-school programs. The programs currently available can be modified to fit any teacher requests, or new presentations pertaining to IS can be made upon request. All IS classes are available to any Fond du Lac staff or teachers if any one wishes to implement a program without any IS program staff being present.

Outreach Events

In addition to teaching classroom sessions, large scale outreach event participation has also been shown to be an effective way to target large scale audiences quickly. Participation in outreach events may happen on or off Reservation, depending on the target audience and materials hoping to be conveyed. Education in the form of outreach events can include topics such as IS identification, BMPs, management efforts, Fond du Lac's engagement in IS management, detrimental effects of IS, potentially useful aspects of some IS, and many others. Participation in large scale outreach events will mainly occur in the form of having informational booths and materials present at highly attended events such as Pow Wows, festivals, and fairs. *Partner with the Big lake Improvement Association on education events that have a double focus on NPS pollution prevent and IS prevention.*

Partnerships Involving Public Outreach
Some outreach events that occur on a large scale will be implemented with partnering organizations who are equipped with large scale materials such as MN Sea Grant and the MN DNR and others. These organizations have more access to equipment and materials that can be utilized for large scale public events. Fond du Lac will also have its own materials to hand-out at these events to engage the public in Fond du Lac's mission and also to be an IS and cultural resource. Fond du Lac will also utilize campaigns created by partnering organizations both at large and small scale events including campaigns such as "Stop aquatic hitchhikers", "Habitattitude", "PlayCleanGo", and "WorkCleanGo". These campaigns are already established and have some publicity, and Fond du Lac will partner with these organizations to also promote these ideals and practices.

Internships and Staffing Opportunities
A large part of a successful IS program will rely on introducing Tribal youth to careers in the natural resources and to gain experience in a field that may interest them for a future career. This is a way to engage the Fond du Lac community in IS management, as well as start building a sustainable IS management program. The IS program aims to provide youth and young adults full-time, seasonal, and internship employment opportunities for both AIS and TIS positions so any applicant may gain a wide array of experiences. For an IS program to be sustainable and successful it is reliant on participation from the community, and employment and internships opportunities will aid in community involvement.

Volunteer and Citizen Science Opportunities
To further engage the Fond du Lac community citizen science opportunities will be made available to any interested parties potentially including, but not limited to, "buckthorn bonfires", adopt-a-woodlot programs where adoptees will be responsible for the maintenance of a woodlot and implementing different forms of IS control including hand pulling, hand sawing, and smothering, adopt-a-lake or landing program where adoptees would be responsible for monitoring and maintenance of a boat landing or specific part of a lake, river monitoring, IS boot brush gardens where Fond du Lac staff and community members could clean the dirt off of their equipment including their boots to see what grows and what they are transporting on a daily basis, IS identification hikes, and many others. The IS program also aims to utilize Band member and community knowledge and incorporate traditional ecological knowledge throughout the entirety of the IS management program. Any member of an IS team would be trained to participate in and/ or lead any of the aforementioned programs and/ or opportunities. The IS program also aims to offer opportunities for participation in large community events including, but not limited to, the "City Nature Challenge" and the "We are Water MN" exhibits and events.

Educational signs
The Fond du Lac Invasive Species Program has installed signs at all public manoomin lakes, outlining ways to prevent the spread of AIS during harvest. Fond du Lac OWP, in partnership with the Invasive Species Program, will to apply for funds from the Minnesota DNR that are dedicated to installing AIS prevention signs at public boat landings and lake access points. We plan to gather ideas from the Fond du Lac community to design a sign that is culturally relevant (ex., focus on ricers and hunters for manoomin lakes, and on the fishing/boating community for fisheries lakes). Signs will use Ojibwe and English language.

Outcomes for education:

IS prevention and NPS pollution prevention can be tied together during efforts to educate students and the community. The public's support and knowledge about how to prevent both NPS pollution and IS spread is vital to the success of preventing both IS infestations and water quality problems caused by NPS.

Tracking metrics for education and outreach:

- Tracking the number of individuals reached (including Fond du Lac community members and the general public), the number of classroom sessions presented/ attended, the number of public outreach events attended, the number of conference presentations given, the number of Fond du Lac internal staff trainings performed, and the number of partnership events the Fond du Lac IS and OWP have participated in. IS and OWP staff can partner to spread the message about IS and NPS pollution topics.
- Tracking the number of volunteers and volunteer hours performed by FDL staff and other community members who are performing IS management.
- Measuring how many community events are put on and the number of participants, if the participants are recurring or new at each event, how much material (on both IS and NPS pollution) has been handed out at each event, and what materials were utilized at events.
- Tracking the number of Tribal youth and young adults are hired as seasonal or full time staff or are performing internships. A successful program will hire a majority of Fond du Lac Band members to fulfill the roles needed in the IS program.
- Tracking the amount of signage posted and available decontamination equipment (such as boot brushes) available. Equipment purchased to aid the IS program will also be a measure of success including documenting what has been used for citizen science initiatives, school programs, or direct IS program work.

Table 8. Actions, Outcomes and Timelines for Invasive Species Management Projects

Non-Point Source Pollution Category						
Invasive Species						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Prevention						
Fond du Lac Invasive Species (IS) staff to help Resource Management and contractors inspect and decontaminate equipment	Number and locations of equipment inspections and decontaminations. Number of IS detections	•	•	•	•	•
Outreach for public, Fond du Lac staff and contractors on BMPs, ordinances and laws related to preventing IS spread.	Number of individuals educated, number of outreach efforts, number of outreach materials shared, number of tracking logs analyzed	•	•	•	•	•
Early Detection and Surveillance						

Conduct routine IS monitoring for NEW IS infestations; include innovative monitoring techniques where feasible	Number of IS monitoring activities conducted, number and locations of NEW species detected; number and types of monitoring methods used	•	•	•	•	•
Continually update IS infestation maps	Number of maps created and updated, number of NEW species tracked and logged	•	•	•	•	•
Create site plans for infested areas	Number of plans, number of areas identified	•	•	•	•	•
Share IS infestation maps as part of outreach for public, Fond du Lac staff and contractors	Number of individuals educated, number of outreach efforts, number of outreach materials shared	•	•	•	•	•
Control						
Control and treat new/existing IS infestations; monitor success of control efforts	Number of acres and locations that are treated and are successful over time. Number of control methods used	•	•	•	•	•
Restore controlled areas to native landscapes	Number of acres and locations of restored areas, success of restoration over time	•	•	•	•	•
Monitoring						
Monitor existing IS infestations to determine rate of spread	Number of acres and locations of monitoring activities, and the number of times each site is visited. Change in number of acres infested over time, measured rate of spread. Number and type of monitoring methods used	•	•	•	•	•
Monitor areas that have undergone control/treatment efforts to measure success	Number of acres and locations that have undergone control/treatment, populations and extent of native vs. IS species present, and amount of IS regeneration	•	•	•	•	•

Disrupting Pathways of IS Introduction and Spread						
Fond du Lac IS Coordinator will work with Fond du Lac conservation officers to enforce the IS ordinance	Number of violations and enforcement actions	•	•	•	•	•
Fond du Lac Invasive Species (IS) staff posted at boat landings to decontaminate and monitor watercraft	Number and locations of equipment inspections and decontaminations. Number of IS detections				•	•
Conduct emerald ash borer surveillance in partnership with Fond du Lac Forestry	Number and locations of traps, number of detections	•	•	•	•	•
Education and Outreach						
Conduct outreach at schools and public events	Number of individuals reached, classroom sessions, public outreach events, conference presentations, internal staff trainings, outreach materials, and the number of partnership events the Fond du Lac IS and OWP have participated in	•	•	•	•	•
Educate youth/students by hiring them as interns	Number of interns hired, number of hours worked				•	•
Work with volunteers	Number of volunteers and volunteer hours spent monitoring/controlling/doing outreach related to IS					•
Post educational signs	Number of signs posted			•	•	•

Climate Change BMPs

Watersheds: all

BMP Goals

Understand the long-term effects of climate change, especially by more frequent and heavy storm events, on water quality and NPS pollution. Track the effect of climate change on Fond du Lac waters through long-term water level and water temperature monitoring, and where practicable, implement the management recommendations in the 1854 Treaty Authority's Climate Change Vulnerability Assessment and Adaptation Plan, and partner with outside organizations to further out understanding of how climate change will affect manoomin.

Fond du Lac OWP will implement hazard mitigation planning into its ongoing NPS pollution work – we are already well-versed in disaster response and Incident Command, as we mobilized staff to respond to the 2012 flood and also the 2018 coal train derailment into the St. Louis River. We plan to use FEMA BRIC funds to incorporate Green Infrastructure, (both on new infrastructure and by retrofitting old infrastructure) and using FEMA funds for any future flooding and storm damage.

BMP Projects

Many of the BMPs listed in the Management Plan have the added benefit of building climate resiliency for Fond du Lac's waters. Any BMP that prevents or ameliorates flood damage will help prevent NPS pollution from factors such as turbidity from erosion, eutrophication from nutrient runoff, or increases in water temperature that could affect sensitive organisms. Examples include restoring Jolicoeur Creek and Martin Branch (Stevens Road) to protect cold water trout habitat; monitoring for emerald ash borer to prevent flooding in manoomin lakes; using the Stoney Brook model to build flood storage and inform water level management to assist in managing Fond du Lac's manoomin lakes; and following Green Infrastructure principles at the Min No Aya Win clinic to prevent sediment from running into Second Lake during heavy rain events.

Water Level and Water Temperature Monitoring

The BMP that solely focuses on climate change is Fond du Lac's ongoing water level/water discharge monitoring at five stream sites (see monitoring map in Assessment Report). Since 2010 we have been deploying pressure transducers that take a pressure reading and a water temperature reading every 30 minutes between April and October. We pair these measurements with periodic readings of the adjacent outside staff gauges, to calibrate the water level readings and convert pressure readings to water level. We also deploy pressure transducers in air to compensate for atmospheric barometric pressure. To create rating curves, we collect stream discharge measurements and pair them to our water level measurements. Over time, we will create a detailed record of stream hydrology and water temperature at these five sites, which will track the long-term changes attributable to climate change, and give context to other changes we may see, as plant and animal communities shift around these streams.

We have partnered with the Red Lake Nation, EPA Region 5 and USGS to conduct stream gauge trainings for Tribes in Region 5, using funds and expertise from USGS. We hope to hold another training in 2021 if Covid-19 considerations allow for in-person training.

To assist in our work, we follow protocols and QA/QC measures as part of our participation in the EPA Regional Monitoring Network (RMN), which is a nationwide effort to track changes in streams and lakes due to climate change. As part of our participation in the RMN, we began deploying a phenocam at Joe

Martin Lake in 2018. The camera is deployed once in the late fall and once in the late winter, to track the exact date of ice-on and ice-off for this lake. As the climate warms, ice cover duration will likely change, and we can track these changes precisely with our phenocam data. We chose Joe Martin Lake because it is a fairly pristine, nearly oligotrophic lake with few land use impacts, so any changes due to climate change can be easily detected. This is also why Joe Martin Lake is one of the lakes chosen as a reference site for the EPA National Aquatic Resources Survey.

In 2019 we became a partner in an EPA ORD Innovation Grant, administered by EPA Regions 2 and 5. The grant, which includes state and tribal partners, uses field camera data taken from stream sites with existing gauges, to see if field camera photos of streams can be used to measure stream discharge. The partners from USGS are using their existing machine learning system to determine if this work might be possible, by comparing field camera photos to water level measurements from the nearby stream gauge. The work thus far is promising, and the hope is that in the future, field cameras could be deployed at sites without stream gauges, thereby increasing the number of streams sites that have data that could be used for watershed models, or to track climate change. We submitted our 2019 field camera photos to USGS; in 2020, when many state agencies were not able to deploy field cameras due to Covid-19 restrictions, Fond du Lac was able to deploy a field camera.

Manoomin Biophysical Research

As part of the Kawe Gidaa-Naanaagadawendaamin Manoomin workgroup partnership between the University of Minnesota and tribes in Minnesota and Wisconsin, we recently received a National Science Foundation grant to track biophysical changes in manoomin lakes due to climate change. The title of the research is, "Impacts of climate change on vegetation, ecohydrology, and management of manoomin (wild rice) watersheds." Under this grant, we will collect data to create a watershed model to understand how manoomin responds to changes in hydrology due to climate change, by collecting water quality samples and by helping to deploy data loggers, including pressure transducers and piezometers. We will work in partnership to collect data, set goals and analyze findings.

Outcomes:

Long-term water level and water temperature monitoring will help Fond du Lac OWP understand the impacts that climate change may have on hydrology, temperature, and consequently the plants and animals able to survive in potentially changing conditions. Water level and discharge data are also central to building watershed models, which can then be used to make management decisions based on future climate scenarios. Data from manoomin lakes will also help inform models that can help predict how climate change will affect manoomin lakes.

Tracking metrics:

- Track the number of sites monitored under Fond du Lac's existing water monitoring protocol, and keep a record of water level and water temperature over time, noting any changes or trends from baseline.
- Tracking the ice-on and ice-off dates on Joe Martin Lake, and noting any trends or changes from baseline.
- Tracking the number of training events and partnerships that arise out of water level monitoring efforts.
- Tracking the amount of data collected and the number of meetings and collaborations between the University of Minnesota and partner tribes.

Table 9. Actions, Outcomes and Timelines for Climate Change Projects

Non-Point Source Pollution Category						
Climate Change						
Action	**5-Year Measurable Outcomes**	**Timing**				
		2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Water Level and Water Temperature Monitoring						
Continue Fond du Lac OWP's collecting continuous water level and water temperature at five gauged stream sites.	Number of gauge sites, number of data points and analyses of trends. Number of years of monitoring. Number of staff involved.	•	•	•	•	•
Continue participating in the EPA RMN to track region-wide climate effects on lakes and streams.	Number of data points and analyses, number of reports submitted. Number of collaborations to develop universal QAPPs and monitoring protocols.	•	•	•	•	•
Continue tracking ice-on and ice-off dates on Joe Martin Lake	Number of data points, number of analyses of trends	•	•	•	•	•

Manoomin Biophysical Research						
Continue collaborations with University of Minnesota on manoomin research related to climate change, including ongoing biophysical research and new work on modeling the effects of climate change on manoomin lakes.	The amount of data collected and the number of meetings and collaborations between the University of Minnesota and partner tribes.	•	•	•	•	•

ACRONYM LIST

For the NPS Assessment Report and Management Plan

1W1P – One Watershed, One Plan
AIS – Aquatic invasive species
AOC – Area of Concern
APU – Asset Protection Unit
ATV – All Terrain Vehicle
AUE – Animal Unit Equivalents
AWQMS – Ambient Water Quality Monitoring System
Band – Fond du Lac Band of Lake Superior Chippewa
BCG - Biologic Condition Gradient
BIA – Bureau of Indian Affairs
BMPs – Best Management Practices
BRIC – FEMA Building Resilient Infrastructure and Communities
BOWSR – Minnesota Board of Water and Soil Resources
BUI – Beneficial Use Impairment
CWA – Clean Water Act
CWI – County Well Index
CWMP – Fond du Lac Reservation Comprehensive Wetland Management Plan
DOC – Dissolved organic carbon
DOM – Dissolved organic matter
EAB – Emerald ash borer
EDDMapS – Early Detection and Distribution Mapping System
ECS – Ecological Classification System
eDNA – Environmental Deoxyribonucleic Acid
EPA – United States Environmental Protection Agency
EQIP – Natural Resources Conservation Service Environmental Quality Incentives Program
FAA – Federal Aviation Administration
FDL – Fond du Lac
FDLTCC – Fond du Lac Tribal and Community College
FEMA – Federal Emergency Management Agency
FHA – Federal Highway Administration
FIFRA – Federal Insecticide, Fungicide, And Rodenticide Act
GIS – Geographic Information Systems
GLNPO – Great Lakes National Program Office
GLRI – Great Lakes Restoration Initiative
GPS – Global Positioning System
HGM – Hydrogeomorphic system
Hg – periodic table of the elements abbreviation for mercury
HHW – Household Hazardous Waste
HIA – Health Impact Assessment
HUC – Hydrologic Unit Code
IHS – Indian Health Service
IR – Integrated Reporting
IPM – Integrated Pesticide Management
IRMP – Integrated Resource Management Plan

IS – Invasive species
ISMP – Fond du Lac Invasive Species Management Plan
ISTS – Individual Sewage Treatment System
LiDAR – Light detection and ranging
MCL – Maximum Contaminant Level
MCT – Minnesota Chippewa Tribe
MDA – Minnesota Department of Agriculture
MECA – Minnesota Erosion Control Association
MED – Mid-Continent Ecology Division
MeHg – periodic table of the elements abbreviation for methylmercury
MGS – Minnesota Geologic Survey
MISAC – Minnesota Invasive Species Advisory Council
MN – Minnesota
MNDNR – Minnesota Department of Natural Resources
MNDOT – Minnesota Department of Transportation
MOU – Memorandum of Understanding
MPCA – Minnesota Pollution Control Agency
MS4 – Municipal Separate Storm Sewer System
NEMO – Nonpoint Source Education for Municipal Officials
NGL – Natural Gas Liquid
NGO – Nongovernmental Organization
NHD – National Hydrography Dataset
NLF – Northern Lakes and Forests ecoregion
NPS – Nonpoint Source Pollution
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
NRRI - Natural Resources Research Institute
OHV – Off Highway Vehicle
ORRW – Outstanding Reservation Resource Waters
OWP – Fond du Lac Reservation Office of Water Protection
PCB – Polychlorinated biphenyls
PFAS – Per- and polyfluoroalkyl substances
PWQMP – Fond du Lac Pipeline Water Quality Monitoring Plan
QAPP – Quality Assurance Project Plan
RBC – Fond du Lac Reservation Business Committee
Reservation – Fond du Lac Reservation
Reserve/LS NERR – Lake Superior National Estuarine Research Reserve
RMU – Resource Management Unit
REU – Research Experiences for Undergraduates
RM – Fond du Lac Resource Management Division
RMN – Regional Monitoring Network
ROW – Right-of way
RSPT – Regional Stormwater Protection Team
SDWA – Safe Drinking Water Act
SPCC – Simplified plant community classification
SOGLR – Sustain Our Great Lakes Program
SOP – Standard Operating Procedure

SQT - Sediment Quality Triad
SWCD – Soil and Water Conservation District
SRF – State Revolving Loan Fund
TAS – Treatment as a State
TESNAR – Technical training in Support of Native American Relations
TIS – Terrestrial invasive species
TLIP – Tribal Landowner Incentive Program
TMDLs – Total Maximum Daily Loads
TPP – US Army Corps Technical Project Planning
TSI – Trophic State Index
TSS – Total suspended solids
TWG – Tribal Wildlife Grants
USACOE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
U of M – University of Minnesota
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
WGZS – Fond du Lac Radio Station
WHAF – Watershed Health Assessment Framework
WLSSD – Western Lake Superior Sanitary District
WMU – Wildland Management Unit
WOTUS – Waters of the United States
WPDG – Wetlands Program Development Grants
WPMO – Fond du Lac Wetlands Protection and Management Ordinance
WQMP – Water Quality Monitoring Plan
WQS – Water Quality Standards
WQX – Water Quality eXchange

REFERENCES

For the NPS Assessment Report and Management Plan

Alexander, G.G., and Allan, J.D.. 2007. Ecological success in stream restoration: Case studies from the midwestern United States. Environ. Manage. 40: 245–255.

Boerboom, Terrence J. 2009. C-19 Geologic Atlas of Carlton County, Minnesota [Part A]. Minnesota Geological Survey, St. Paul, MN. Retrieved from the University of Minnesota Digital Conservancy, http://hdl.handle.net/11299/58760

Brady, Valerie; Dumke, Josh; Hell, Robert V. 2013. Post-flood and Post-restoration Biotic Sampling of Fond du Lac and Martin Branch Streams. University of Minnesota Duluth, Duluth, MN. Retrieved from the University of Minnesota Digital Conservancy, http://hdl.handle.net/11299/201378

Carlson, R.E. 1983. Discussion on "Using differences among Carlson's trophic state index values in regional water quality assessment," by Richard A. Osgood. Water Resources Bulletin. 19:307-309

Costa, N., 2003. Phase II Sediment Quality Assessment. GLNPO # GL-2001-047, December 2003. Environmental Protection Agency, Great Lakes National Program Office, Washington, DC

Cowardin et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service. FWS/OBS-79/31 December 1979, Reprinted 1992.

Fond du Lac Band of Lake Superior Chippewa. 1992. Fond du Lac Ceded Territory (1854) Conservation Code#01/06; adopted by Resolution #1193/12 Amending the Fond du Lac (1854) Ceded Territory Conservation Code, FDL Ordinance #02/92. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.http://www.fdlrez.com/government/ords/02-2(1854)CededTerritoryConservationCode.pdf

Fond du Lac Band of Lake Superior Chippewa. 1993. Fond du Lac Waste Management and Recycling Ordinance #06/93; adopted by Resolution #1033/06vof the Fond du Lac Reservation Business Committee on May 3 1993 and amended 2003 and 2014. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.
http://www.fdlrez.com/government/ords/06-93WasteManagementandRecycling2014.09.10.pdf

Fond du Lac Band of Lake Superior Chippewa. 2020. Fond du Lac Water Quality Certification Ordinance #01/06; adopted by Resolution #1033/06 of the Fond du Lac Reservation Business Committee on March 28, 2006. Revised in 2020. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/government/ords/01-06ord.pdf

Fond du Lac Band of Lake Superior Chippewa. 2006a. Fond du Lac Wetlands Protection and Management Ordinance. Ordinance #03/06; adopted by Resolution #1165/06 of the Fond du Lac Reservation Business Committee on June 15, 2006. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/government/ords/03-06ord.pdf

Fond du Lac Band of Lake Superior Chippewa. 2014. Biomonitoring Study - Chemical Highlights. Fond du Lac Environmental Program, Office of Water Protection, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/humanservices/biomonitoring.htm

Fond du Lac Band of Lake Superior Chippewa. 2015. Bureau of Indian Affairs and Fond du Lac Reservation MN-FDA Wildland Fire Management Plan within Midwest Region Division of Forestry and Fire Management. Fond du Lac Forestry Program, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/RM/downloads/FMPDraft_1-26-2015a.pdf

Fond du Lac Band of Lake Superior Chippewa. 2018. Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health. Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment. Fond du Lac Environmental Program, Office of Water Protection, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.

Fond du Lac Band of Lake Superior Chippewa. 2020. Fond du Lac Band of Lake Superior Chippewa Water Quality Standards of The Fond du Lac Reservation. Ordinance # 12/98, as amended, 2001 and 2020. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/RM/downloads/WQSDraftCopy.pdf

Fond du Lac Band of Lake Superior Chippewa. 2007. Land Use Ordinance. Ordinance #02/07; adopted by Resolution #1194/07 of the Fond du Lac Reservation Business Committee on May 31, 2007. Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/government/ords/02-07LandUseOrdinance2020.04.22.pdf

Fond du Lac Office of Water Protection. 2013. Fond du Lac Wetland Restoration Plan. Fond du Lac Environmental Program, Office of Water Protection, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.

Fond du Lac Reservation. 2011. Fond du Lac Reservation and Enbridge Joint Table-Top Exercise. Fond du Lac Environmental Program, Office of Water Protection, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.

Fond du Lac Resource Management Division. 2018. Integrated Resource Management Plan. Fond du Lac Resource Management Division, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN. http://www.fdlrez.com/RM/downloads/FDL_IRMP-101817.pdf

Ghahramani, B and Mattox, D. 2000. A Systems Engineering Model to Management and Abatement of Nonpoint Source Pollution. Proceedings of the Annual American Society for Engineering Education Conference.https://peer.asee.org/a-systems-engineering-model-to-management-and-abatement-of-nonpoint-source-pollution.pdf

Hansel-Welch, N. 2020. Managing Shallow Lakes in Minnesota for Wildlife and Water Quality: A 20-Year Perspective. Minnesota Department of Natural Resources, 2020 Proceedings of the North American Lake Management Society

HIA Wild Rice Steering Committee, personal communications. 2017-2019.

Howes, Thomas. 2019. Personal communication concerning Band members being able to harvest wild rice in Wild Rice Lake.

Jaakola, Carol and Ed. 2011. Personal communication about harvesting wild rice in Cedar Lake and

beaver trapping.

Jacobson Hedin, K. 2013. Final Report for Improving Water Quality in Third Lake on the Fond du Lac Reservation in Minnesota by Reducing External and Internal Nutrient Loads. Final report submitted to US EPA Region 5, NPS Pollution. Fond du Lac Environmental Program, Office of Water Protection, Fond du Lac Reservation, 1720 Big Lake Rd., Cloquet, MN.

Johnson, Nathan & Pastor, John & Swain, Edward. 2019. Cumulative Sulfate Loads Shift Porewater to Sulfidic Conditions in Freshwater Wetland Sediment. Environmental Toxicology and Chemistry. 38. 10.1002/etc.4410.

Jones, Perry M. and Tomasek, Abigail. 2013. Assessment of Groundwater Recharge, Groundwater Flow, and Evapotranspiration in the Stoney Brook Watershed, Fond du Lac Reservation, Minnesota, 2006-2009. US Geological Survey, St. Paul, MN.

Kimmerer, R. W. 2013. *Braiding Sweetgrass*. Milkweed Editions, Minneapolis, Minnesota, USA.

Kjerland, T. 2015. Wild Rice Monitoring Field Guide. The University of Minnesota Sea Grant Program Publication #SH15. ISBN 978-0-9965959-0-2.

Kloiber, Steve. 2019. National Wetland Inventory for Minnesota. Minnesota Geographic Metadata Guidelines. Minnesota Department of Natural Resources, St. Paul, MN. ftp://ftp.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_dnr/water_nat_wetlands_inv_2009_2014/metadata/metadata.html#Metadata_Reference_Information

Knight, Joe F, Rampi, Lian P and Bauer, Marvin. 2016. Minnesota Land Cover Classification and Impervious Surface Area by Landsat and Lidar: 2013 Update; Remote Sensing and Geospatial Analysis Laboratory, University of Minnesota

Kolka, R.; Mitchell, C.; Jeremiason, J.; Hines, N.; Grigal, D.; Engstrom, D.; Coleman-Wasik,; Nater, E.; Swain, E.; Monson, B.; Fleck, J.; Johnson, B.; Almendinger, J.; Branfireun, B.; Brezonik, P.; Cotner, J. 2011. Mercury cycling in peatland watersheds. Chapter 11. In: Kolka, R..; Sebestyen, S.; Verry, E.; Brooks, K., eds. *Peatland biogeochemistry and watershed hydrology at the Marcell Experimental Forest*. Boca Raton, FL: CRC Press: 349-370.

Krumwiede, B. 2019. Lake Superior Water Levels. Proceedings of the Highs and Lows: Western Lake Superior Water Levels Conference, 11 December, 2019, Duluth, Minnesota. NOAA Office of Coastal Management.

Lake Superior Streams. 2009. Electrical Conductivity (EC25) and TDS. University of Minnesota-Duluth, Duluth, MN. http://www.lakesuperiorstreams.org/understanding/param_ec.html

Lake Superior Partnership. 2015. Lake Superior Lakewide Action and Management Plan 2015-2019. Cat. No. En164-52/2016E-PDF. ISBN 978-0-660-06296-9

Legislative Coordinating Commission. 2020. Lessard-Sams Outdoor Heritage Council. https://www.lsohc.leg.mn/

Lepak, R., J. Ogorek, J. Hoffman, J. DeWild, M. Tate, AND D. Krabbenhoft. 2020. Why is Lake Superior so susceptible to methylmercury accumulation? Twin Ports Freshwater Folks Virtual Meeting, Duluth, MN, May 06, 2020. https://doi.org/10.23645/epacomptox.12407060

Minnesota Board of Water and Soil Resources. 2017. Environmental Benefits Index Top Five Percent Areas (EBI300T5). Minnesota Board of Water and Soil Resources, St. Paul, MN. ftp://ftp.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_pca/env_ebi_top_5/metadata/metadata.html

Minnesota Department of Natural Resources. 2017. Adapting to Climate Change in Minnesota. Report of the Interagency Climate Adaptation Team. Document number: p-gen4-0. Minnesota Department of Natural Resources, St. Paul, MN. https://www.leg.mn.gov/docs/2019/other/190662.pdf

Minnesota Department of Natural Resources. 2020. Climate Trends. Minnesota Department of Natural Resources, St. Paul, MN. https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html

Minnesota Department of Natural Resources, 2020. Watershed Health Assessment Framework. Minnesota Department of Natural Resources, St. Paul, MN. https://www.dnr.state.mn.us/whaf/index.html

Minnesota Department of Natural Resources. 2014. St. Louis River Estuary Wild Rice Restoration Implementation Plan. Minnesota Department of Natural Resources, Division of Ecological and Water Resources, Duluth, Minnesota

Minnesota Pollution Control Agency. 2005. Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria. Third Edition. Minnesota Pollution Control Agency, St. Paul, MN. https://www.pca.state.mn.us/sites/default/files/lwq-a-nutrientcriteria.pdf

Minnesota Pollution Control Agency. 2007. Phosphorus: Sources, Forms, Impact on Water Quality - A General Overview Water Quality MPCA News Releases, 3.12, July 2007. Minnesota Pollution Control Agency, St. Paul, MN. https://www.pca.state.mn.us/sites/default/files/wq-iw3-12.pdf

Minnesota Pollution Control Agency. 2009. Low Dissolved Oxygen in Water Causes, Impact on Aquatic Life – An Overview. Water Quality/Impaired Waters 3.24, February 2009. Minnesota Pollution Control Agency, St. Paul, MN.

Minnesota Pollution Control Agency. 2013. Nitrogen in Minnesota Surface Waters: Conditions, Trends, Sources, and Reductions. Minnesota Pollution Control Agency, St. Paul, MN. https://www.pca.state.mn.us/sites/default/files/wq-s6-26a.pdf

Minnesota Pollution Control Agency. 2014. Blue-green Algae and Harmful Algal Blooms Summertime in Minnesota: When in doubt, best keep out! MPCA News Releases, September 17, 2014. Minnesota Pollution Control Agency, St. Paul, MN. https://www.pca.state.mn.us/news/blue-green-algae-if-doubt-stay-out

Minnesota Public Radio. 2011. Water Pollution Glossary. Minnesota Public Radio, St. Paul, MN. https://www.mprnews.org/story/2011/09/12/ground-level-water-glossary

Minnesota Tribal Wild Rice Task Force. 2018. 2018 Tribal Wild Rice Task Force Report. http://mnchippewatribe.org/pdf/TWRTF.Report.2018.pdf

Moyle, J. B. 1944. Wild Rice in Minnesota. Journal of Wildlife Management 8:177–184.

Moyle, J. B. 1945. Some chemical factors influencing the distribution of aquatic plants in Minnesota. American Midland Naturalist 34:402–420.

Myrbo A. & Swain E. B. & Engstrom D. R. & Coleman Wasik & Brenner J. & Dykhuizen Shore M. & Peters E. B. & Blaha G. 2017. Sulfide Generated by Sulfate Reduction is a Primary Controller of the Occurrence of Wild Rice (*Zizania palustris*) in Shallow Aquatic Ecosystems. JGR Biogeosciences, 122(11), pp. 2736-2753.

Pastor, J, Dewey, B., Johnson, N., Swain, E., Monson, P., & Peters, E. and Myrbo, A. 2017. Effects of sulfate and sulfide on the life cycle of *Zizania palustris* in hydroponic and mesocosm experiments. Ecological Applications, 27(1), 2017, pp. 321–336.

Rader, N. 2012. Minnesota LiDAR-derived Hillshade. Minnesota Geographic Metadata Guidelines, Minnesota Geospatial Information Office. ftp://ftp.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_mngeo/elev_lidar_hillshade/metadata/metadata.html

Ramstack Hobbs, J.M. 2013. Historical water quality and ecological change in Third Lake, Fond du Lac Band of Lake Superior Chippewa Reservation. Final report submitted to Fond du Lac Resource Management. St. Croix Watershed Research Station, Science Museum of Minnesota, Marine on St. Croix, Minnesota, 55047

Risch, M.R., DeWild, J.F., Krabbenhoft, D.P., Kolka, R.K., Zhang, L. 2011. Litterfall mercury dry deposition in the eastern USA. Environmental Pollution Special Issue.

Ruhl, James F. 1988. Water Resources of the Fond du Lac Indian Reservation, East Central Minnesota. USGS Water Resources Investigations Report 88-4114.

Shortle, J. S., Mihelcic, J.R., Zhang, Q., Arabi, M. 2019. Nutrient control in water bodies: A systems approach. Journal of Environmental Quality. Volume 49, Issue3, May/June 2020. Pp. 517-533.

Soranno, P. 2011. Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Reservation Lakes

St. Amand, A. 2015. Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Fond du Lac Reservation Lakes: Analysis of the Phytoplankton Rapid Assay Results 1998-2012 compared to Southern MN lakes.

Stamp, J. and B. Jessup. 2015. Strategy for Developing Numeric Biocriteria for Wadeable Streams on Fond du Lac Reservation Lands. Prepared for Fond du Lac Band of Lake Superior Chippewa. Tetra Tech, Inc. 73 Main Street, Room 38 Montpelier, VT.

State of Minnesota. 2018. Minnesota Administrative Rules. 7050.0222 Specific Water Quality Standards for Class 2 Waters of the State; Aquatic Life and Recreation. Official Publication of the State of Minnesota, Revisor of Statutes. Published Electronically: September 10, 2018. https://www.revisor.mn.gov/rules/7050.0222/

Stults. M., Petersen, S., Bell, J., Baule, W., Nasser, E., Gibbons, E., Fougerat., M. 2016. Climate Change Vulnerability Assessment and Adaptation Plan: 1854 Ceded Territory Including the Bois Forte, Fond du Lac, and Grand Portage Reservations. Duluth, MN: 1854 Ceded Territory.

Thomas, Z. 2014. MNDNR Watershed Suite. Minnesota Department of Natural Resources, St. Paul, MN. ftp://ftp.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_dnr/geos_dnr_watersheds/metadata/metadata.html

Tiner, R. W. 2003. Correlating Enhanced National Wetlands Inventory Data with Wetland Functions for Watershed Assessments: A Rationale for Northeastern U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA

Tiner, R.W. 2014. Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors: Version 3.0. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA. 65 pp. plus Appendices

Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin. 54 p

University of Minnesota Sea Grant. 2014. Lake Superior's Natural Processes. University of Minnesota, Minnesota Sea Grant, Duluth, MN. http://www.seagrant.umn.edu/superior/processes

University of Wisconsin-Madison. 2014. Wisconsin Climate Change Vulnerability Assessment for Emergent Marsh in Wisconsin. University of Wisconsin-Madison, Madison, WI. https://www.wicci.wisc.edu/resources/Emergent_Marsh.pdf

US ACOE, 2019. Cedar Lake Wild Rice Restoration Study, Fond du Lac Band of Lake Superior Chippewa, Minnesota. Section 22, Planning Assistance to States. US Army Corps of Engineers, Detroit, MI.

US Department of Commerce, Economics and Statistics Administration, US Census Bureau. 2017. "My Tribal Area." Citing the 2013-2017 American Community Survey 5-Year Estimates. US Census Bureau, Washington DC. https://www.census.gov/tribal/?aianihh=1125

US Department of Interior. 2018. Cobell Land Buy-Back Program for Tribal Nations. US Department of Interior, Washington DC. https://www.doi.gov/buybackprogram

US National Archives. 1887. An Act to Provide for the Allotment of Lands in Severalty to Indians on the Various Reservations (General Allotment Act or Dawes Act), Statutes at Large 24, 388-91, NADP Document A1887. US National Archives, Washington DC.

USDA. 2009. Fond du Lac Water Management Project, Stoney Brook Watershed; Carlton and St. Louis Counties, Minnesota. US Department of Agriculture, Washington DC.

USDA Natural Resource Conservation Service. 2019. Web Soil Survey. US Department of Agriculture, Washington DC. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

USEPA. 1993. Management for Hydromodification, section titled Instream and Riparian Habitat Restoration Management Measure. EPA 840-B-92-002, January 1993. U.S. Environmental Protection Agency, Office of Water, Washington, DC www.epa.gov/owow/nps/MMGI/Chapter6/ch6-2b.html

USEPA. 1997. Mercury Study Report to Congress Volume V: Health Effects of Mercury and Mercury Compounds. EPA-452/R-97-007, December 1997. U.S. Environmental Protection Agency, Office of Air Quality Planning & Standards and Office of Research and Development

USEPA. 2000. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs (PDF)(232 pp, 6 MB, April 2000, EPA 822-B-00-001). U.S. Environmental Protection Agency, Office of Water, Washington, DC

USEPA. 2000a. Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria Lakes and Reservoirs in Nutrient Ecoregion VIII. b 822-B-00-010, December 2000. U.S. Environmental Protection Agency, Office of Water, Washington, DC

USEPA. 2005. National Management Measures to Control Nonpoint Source Pollution from Urban Areas. In: National Management Measures to Control Nonpoint Source Pollution from Urban Areas (November 2005, EPA-841-B-05-004). U.S. Environmental Protection Agency, Office of Water, Washington, DC

USEPA. 2012. Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion. EPA 823-R-10-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC

US EPA. 2018. EPA Integrated Reporting (IR) Categories and How ATTAINS Calculates Them. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2018-09/documents/attains_calculations_of_epa_ir_categories_2018-08-31.pdf

USFWS. 2020. NWI Program Overview. US Fish and Wildlife Service, Washington DC https://www.fws.gov/wetlands/NWI/Overview.html

Vennum, T. 1998. Wild rice and the Ojibway people. Minnesota Historical Society Press, St. Paul, Minnesota, USA.

Vogeler, Jody. 2019. Most recent fast forest disturbances in Minnesota, Version 2.0. University of Minnesota, St. Paul, MN. ftp://ftp.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_dnr/env_fast_forest_disturbances/metadata/metadata.html

Winter et al. 2018. The Social-Ecological Keystone Concept: A Quantifiable Metaphor for Understanding the Structure, Function, and Resilience of a Biocultural System. Sustainability. September 2018, 10(9):3294. DOI: 10.3390/su10093294

Wisconsin Department of Natural Resources, Division of Forestry. 2010. Wisconsin's Forestry Best Management Practices for Water Quality/Field Manual. PUB FR-093 2010. Wisconsin Department of Natural Resources, Division of Forestry, Green Bay, WI.