



Framework for a Domestic Phosphorus Management Plan

For the Rainy River and Lake of the Woods

(Discussion draft- June 30, 2022)

Revision history:

-
-

This project was undertaken with the
financial support of:

Ce projet a été réalisé avec l'appui
financier de:



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Contents

Executive Summary.....	1
Introduction	2
A framework for a PMP.....	2
Prerequisites to a PMP.....	3
Minnesota goals.....	3
Canada goals	3
Understanding the watershed	3
Key Considerations.....	4
Community Engagement	4
Indigenous Engagement and Consultation.....	5
The PMP Road Map	6
Geographic Scope	8
Management Zone Designations	8
Establishing Boundary Conditions	10
Jurisdictions and Areas of Authority.....	11
Domestic Canadian	11
Federal	11
Manitoba.....	11
Ontario	12
Indigenous Nations	14
Anishinaabe Nation in Treaty #3.....	14
Northwestern Ontario Métis Community— MNO.....	17
Phosphorus Sources.....	19
Point Sources	21
Non-Point Sources	23
Management Plan Team.....	28
Potential Partners and Roles in Plan Development.....	32
Remedial Plan Development and Implementation.....	36
Core Monitoring.....	37
Reporting and Accountability	39
Appendix A —Phosphorus Conditions in Lake of the Woods and Rainy River	40

Executive Summary

Persistent algal blooms in Lake of the Woods (LoW) and elsewhere in its watershed underscore the importance of developing a Phosphorus Management Plan (PMP) for the Rainy-Lake of the Woods basin. Phosphorus (P) is the nutrient that controls the growth of algae in lakes within the basin.

This framework outlines the process that is required to develop a domestic PMP for the Canadian portion of the Rainy-LoW basin. Detailed PMPs such as Minnesota's TMDL study have been developed for areas of the basin outside of Canada and these have included loads from outside the US. Although a domestic PMP will address Canadian sources of P within the basin the overall objective is to consider and combine binational P reduction strategies to achieve desired nutrient reduction goals for waters within the basin which are a shared resource. The framework provides details with respect to all jurisdictions and areas of authority (including Indigenous Nations) that would be required to provide input to the plan.

Before a PMP can be developed there are prerequisites that need to be established. Foremost among these is the establishment of desired in-lake phosphorus concentrations for different areas of the watershed that will allow the achievement of water quality goals within the lake. These concentration goals must be evaluated between the various jurisdictions and areas of authority that play a role as outlined above. General guidance is provided with respect to the different areas of the watershed that are distinctly different with respect to their geographic characteristics and resulting phosphorus concentrations. Observing these boundary conditions will help to assess the extent to which phosphorus management will be practical for the different areas of the watershed. This framework outlines in detail the key considerations that must be used to achieve these goals including a step-by-step roadmap that will ensure the successful development of a PMP including aspects of adaptive management. This framework also cautions that the efficacy of a completed PMP must be tested in the future by a robust core monitoring program. To be effective, establishment of a core monitoring program must begin early in the process even though its utility is illustrated later the adaptive management aspects of the plan roadmap. Much work has already been completed towards this goal. The importance of public accountability and reportability is stressed.

Although it will be the responsibility of those partners who will develop a PMP to identify P sources and the potential for reduction of those sources to meet in-lake goals, this framework provides a considerable inventory and assessment of point and non-point sources of phosphorus within the Canadian portion of the watershed. This should provide a baseline for rapid plan development.

The final chapters of this framework include guidance for the development of a management plan team including committee structures including roles and expected outcomes from working groups. Included is a list of potential partners to help with the plan development including their roles.

Introduction

Lake of the Woods (LoW) is a massive lake spanning the borders of Ontario, Manitoba and Minnesota. With a surface area of over 3,846 km² it is the fifth largest lake shared between Canada and the U.S. The Canadian portion of the lake and watershed is part of Anishinaabe Nation in Treaty 3 territory and also includes homelands of the Northwestern Ontario Métis Community – Métis Nation of Ontario. The lake has significant values culturally and economically to both countries and to the Indigenous Nations in the region.

These values are impaired by severe cyanobacterial blooms that develop seasonally and become widespread across much of LoW and in other areas to a lesser extent through the summer and into the fall. These blooms are fed by the nutrient phosphorus and likely exacerbated by climate change in recent decades (Figure 1). Excess phosphorus loadings to the lake, resulting in these harmful algal blooms, has been a significant public concern in recent decades both in Canada and the United States.

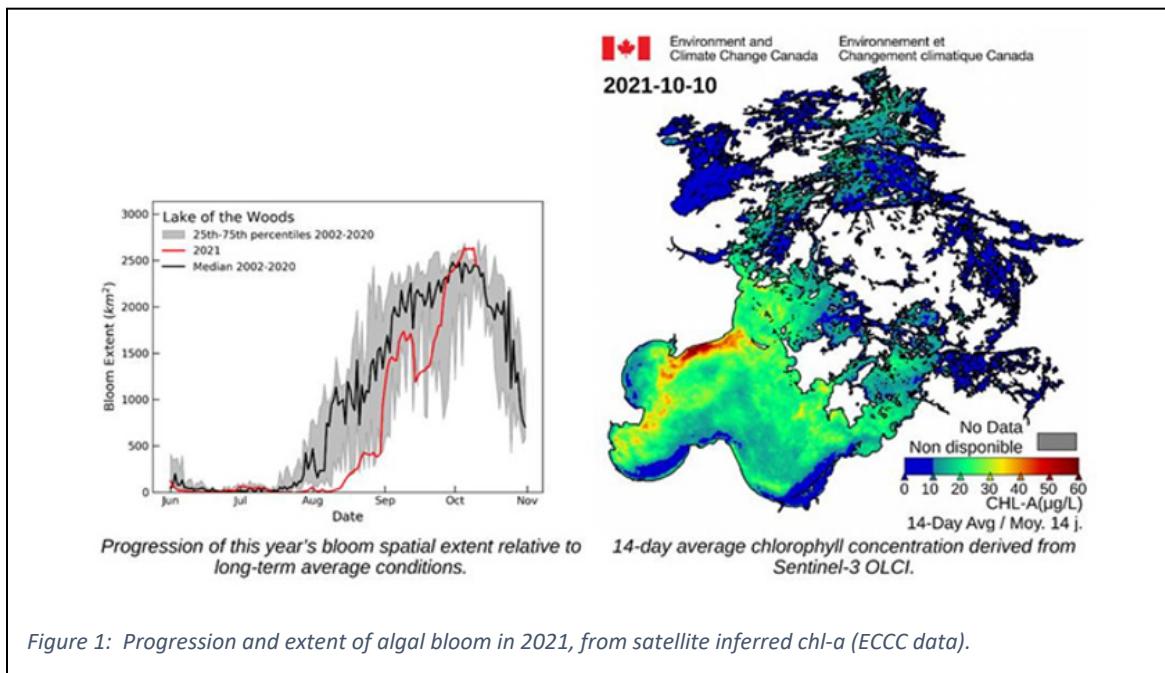


Figure 1: Progression and extent of algal bloom in 2021, from satellite inferred chl-a (ECCC data).

Addressing these concerns will require the identification of in-lake concentrations of phosphorus that will result in desirable ecological or water quality outcomes (goals) and the subsequent development of a phosphorus management plan (PMP) to identify load reductions that are required to meet those goals.

A framework for a PMP

The purpose of this framework is to provide guidance for the development of a domestic PMP for the Canadian portion of LoW and the Rainy River. A PMP is needed to identify the means to reduce excessive phosphorus concentrations in receiving water that will allow desired water quality outcomes (goals) to be met. This framework document is, therefore, not an exercise to derive specific eutrophication water quality targets. Rather the PMP is a tool designed to meet predetermined goals through identification of reductions in phosphorus loads to the system.

Prerequisites to a PMP

A first step prior to developing a PMP will be to identify phosphorus reduction goals through the clear identification of the desired outcomes that the plan is to achieve. This prerequisite means establishing a shared understanding between the multiple jurisdictions (Federal, Provincial, Indigenous) and stakeholders on desired ecosystem outcomes, substance objectives and overall load reduction required to achieve this in the receiving waters of concern in the southern and northern basins of LoW. There has been substantial progress towards establishing these prerequisites in recent years, and this can form the basis for developing a shared vision that is to be accomplished through the PMP.

Minnesota goals

In 2008, Minnesota declared the US waters of LoW to be impaired due to exceedances of the State's eutrophication standards, initiating a study and development of a phosphorus management plan for the US portion of the watershed. The Minnesota plan, *Final Lake of the Woods Excess Nutrients Total Maximum Daily Load*, sets allocations (targets) for each phosphorus source in Minnesota, articulates an implementation strategy, and outlines monitoring that would be required to assess progress.

Canada goals

Environment and Climate Change Canada (ECCC) has completed a four-year science program (2016-2020) and development of phosphorus reduction scenario modeling to evaluate levels of phosphorus reductions that would be required to meet certain ecosystem objectives. This should allow Canada to proceed with developing desired phosphorus load reductions for the Canadian portion of LoW and the Rainy River. Some aspects of Canadian allocations (target) with respect to specific load reductions require further development.

With these science initiatives completed, the next step is to develop a domestic phosphorus management plan for LoW and its primary tributary, the Rainy River. This will be an essential and integral element of an international effort to manage the cumulative phosphorus loads to binational LoW from its binational watershed.

Understanding the watershed

It is important to understand the phosphorus dynamics of the watershed to set goals that are tied to concentrations and loads because these goals necessarily vary for different areas of the watershed. This is due to the significant spatial variation in phosphorus concentrations within the basin together with seasonal variations observed in any given location. This is discussed further in Appendix A.

Phosphorus dynamics are described in detail in the State of the Basin Report series (Editions 1 through 3) and are examined in the Minnesota TMDL report. There are several information sheets regarding the ECCC outcomes but no detailed technical or data reports are available at this time. Some details of the ECCC science and modeling work are expected to be published in 2022 in an upcoming special issue of the Journal of Great Lakes Research.

Harmonization of binational phosphorus load reduction details is required as a first step for the development of a PMP.

It is important to realize that objectives, targets and source allocations, must be realistic, attainable, and easily measured and reported on.

A long-term view is essential for developing targets and measuring success.

Key Considerations

Some key considerations to the development of a PMP are:

- Outcome goals are required as a perquisite to developing a plan, including substance objective(s) for receiving water sectors of concern and an overall reduction target required to achieve the objectives.
- A common set of facts is needed upon which to base planning decisions. The major phosphorus studies (i.e., by ECCC and the MPCA) for these shared waters were conducted separately, with differing methods, scope, and time-periods. Comparison of the detailed information on loads, methods, and assumptions in the MN TMDL, with analogous information in the Canadian studies, is needed to develop a consensus understanding of areas of agreement, differences, and harmonized understanding, to form a solid foundation for planning.
- A domestic plan is an integral element of an international effort to manage the cumulative phosphorus loads to binational LoW from its binational watershed. Net effects must be examined and considered in the overall context of phosphorus sources and management / remedial plans in the US portion of the watershed.
- A PMP is not an effort to change local governance. It should foster collaboration between upstream and downstream neighbors to work where it's most important in the watershed, not limited to local, municipal, or other jurisdictional boundaries. It should support local partnerships to develop prioritized, targeted, and measurable implementation plans at appropriate watershed/sub-watershed levels, aligned with domestic goals and strategies.
- Managing phosphorus is a shared responsibility —all levels of government (including Indigenous), industry, non-governmental organizations, and individuals have roles in plan development and implementation.
- Every kilogram of phosphorus is important.
- In a PMP, not all loads can or will be reduced. Specific source-allocation target options can include: reduce, status quo, increase (e.g., allowance for development, population growth etc.) The cumulative, net load to the receiving water is the “bottom-line” in a plan.
- Adaptive management approach is fundamental to managing uncertainty. Management plan decisions should be made based on best available knowledge. Information gaps, or uncertainty should not be an excuse for inaction.
- A systematic and sustained binational monitoring program is essential to support effectiveness assessment, managing uncertainty, and adaptive management.

Effects of external drivers such as climate change on the relationship between phosphorus concentrations and in-lake processes should be considered.

Community Engagement

This framework outlines a process for plan development that is inclusive and that engages all relevant interests collaboratively to set the stage for successful implementation.

The plan framework recognizes that a variety of interests, rights and perspectives exist among the nations, provinces, municipalities, and stakeholders within the watershed. The plan should focus on topics and actions that are rooted in science and Indigenous knowledge systems. It should provide benefit to all and represent mutual interest and agreement throughout all jurisdictions.

The vision is for a domestic plan that provides guidance to local water planning within major Rainy River-LoW subwatershed boundaries, toward prioritized, targeted implementation plans, with measurable outcomes for substance (phosphorus indicators) and ecological objectives (algae indicators).

Changes will not happen overnight. Long-term, collective actions and commitment of many individuals, organizations and sectors will be necessary to reduce phosphorus loads to restore the health of the LoW basin. This will reflect the success of the PMP, given the challenges that exist due to diffuse, landscape sources of phosphorus that are widespread across the basin. Community, rightsholder, and stakeholder representation and input should be explicitly incorporated throughout the project by the team steering the development of the plan and in the nutrient working groups designed to define feasible and desirable actions.

Indigenous Engagement and Consultation

Lake of the Woods and its watershed exists within a complex, multi-national governance environment, with Canada, the United States and Indigenous Nations having jurisdiction both in Canada and the United States. Additionally, the multi-jurisdictional nature of the basin is more complex, with sub-national jurisdictions (e.g., provincial and state) that also have roles and responsibility in these respects.

Within the Canadian portion of the watershed, the Anishinaabe Nation in Treaty #3 and the Northwestern Ontario Métis Community – MNO have rights, laws, protocols and significant interests and roles in protecting the lands and waters.

A key principle for all phases of plan development and implementation is to ensure opportunities and equitable space and respect of Indigenous knowledge systems, cultural protocols and processes, and governance to develop respectful and meaningful joint decision-making and governance.

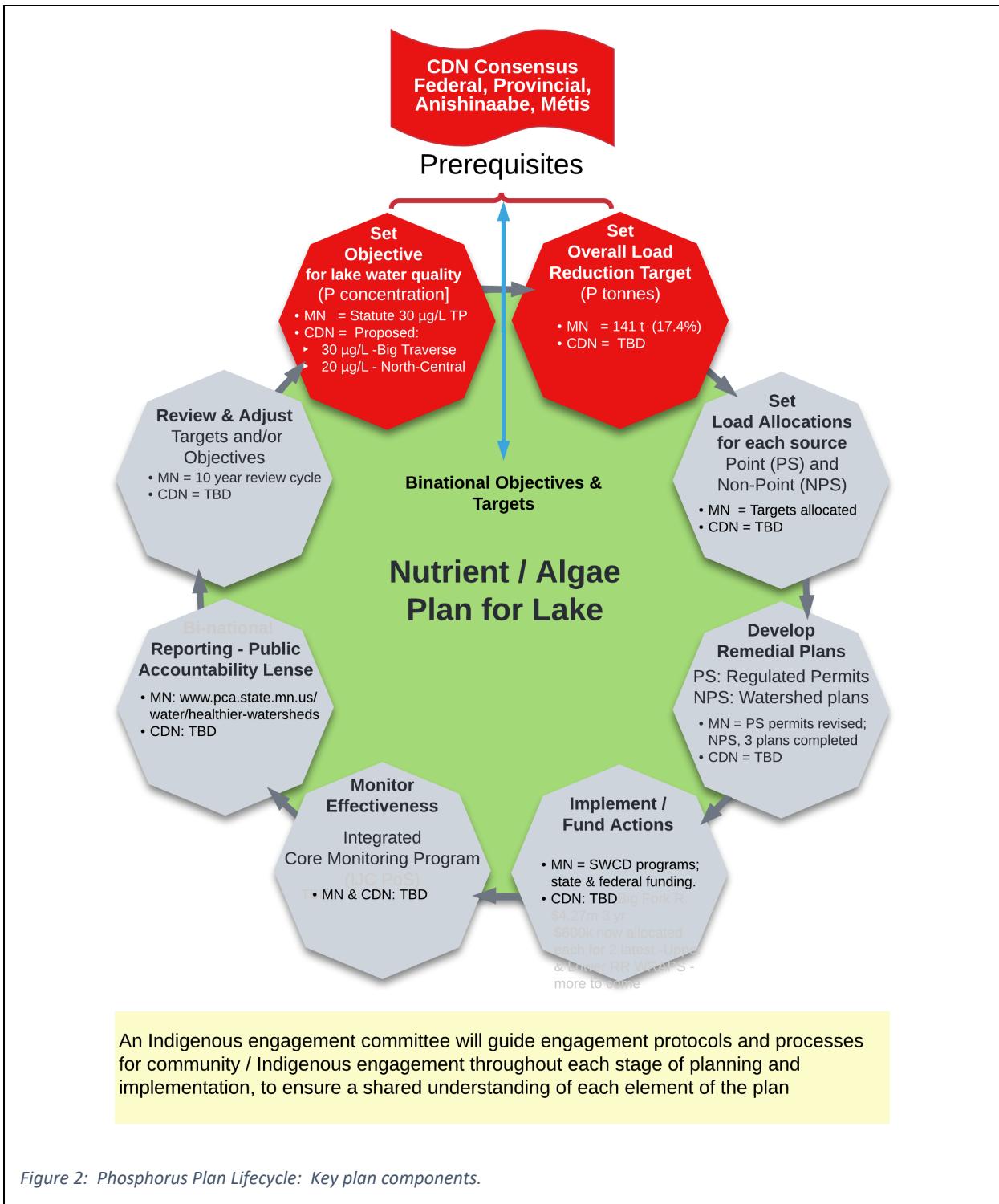
Under this lens, the PMP must be developed through partnership. Engagement, as directed by each of the jurisdictions, must occur at each stage of the plan and its development. By doing so, the PMP and vision for a PMP will encompass a shared understanding for the protection of the water.

The PMP Road Map

The lifecycle for the phosphorus management plan (PMP) with the key component steps are shown graphically in Figure 2. Included for reference in Figure 2, is information summarizing the status of analogous initiatives in Minnesota at each step in the lifecycle of the PMP. This information is important context to assessment and decision making for development of Canadian domestic plan elements.

Key elements of the PMP adaptive management lifecycle (Figure 2) are:

1. Establish Planning Team, including:
 - a. Steering Committee, to oversee plan development representing responsible jurisdictions and rightsholders (Canada, Ontario, Manitoba, Grand Council Treaty 3, Métis), and additional experts as required).
 - b. Indigenous Engagement Committee – to provide guidance to the planning team, on engagement processes and protocols, at all stages of the PMP lifecycle.
 - c. Working groups for non-point and point sources of phosphorus.
2. Set Objectives for plan (ecological outcomes, substance objectives) and overall load target as consensus minimally of domestic jurisdictions, and preferably as shared binational metrics.
3. Establish source load allocations, through advice of non-point and point source work groups.
4. Develop remedial strategies and plans
5. Implement and fund actions
6. Monitor effectiveness, through development and implementation of a core monitoring program
7. Assess and report effectiveness publicly, with regular reporting cycle
8. Review and adjust in an adaptive management approach.



Geographic Scope

Management Zone Designations

The binational Rainy-Lake of the Woods Basin covers approximately 70,000 km² and comprises portions of Ontario, Manitoba, and Minnesota; approximately 60% lies within Canada. The scope of a domestic Phosphorus Management Plan (PMP) will include the Canadian portion of the basin. There are four areas or zones that can be considered with respect to the PMP. These are largely defined by what we currently know about nutrient sources and pathways in the basin. They are briefly outlined as follows (Figure 3):

- Area 1:** The Rainy Lake subbasin (RL-SB) — the upstream headwaters to Rainy River (minimum potential for phosphorus management).
- Area 2:** The Lower Rainy River subbasin (LRR-SB) — the primary area to develop and apply a PMP.
- Area 3:** The south basin of LoW (LoW-S) — the primary area to assess management outcomes, and secondary area to consider to develop and apply a PMP.
- Area 4:** The north basin of LoW (LoW-N) — a secondary management outcome area, and secondary area to consider to develop and apply a PMP.

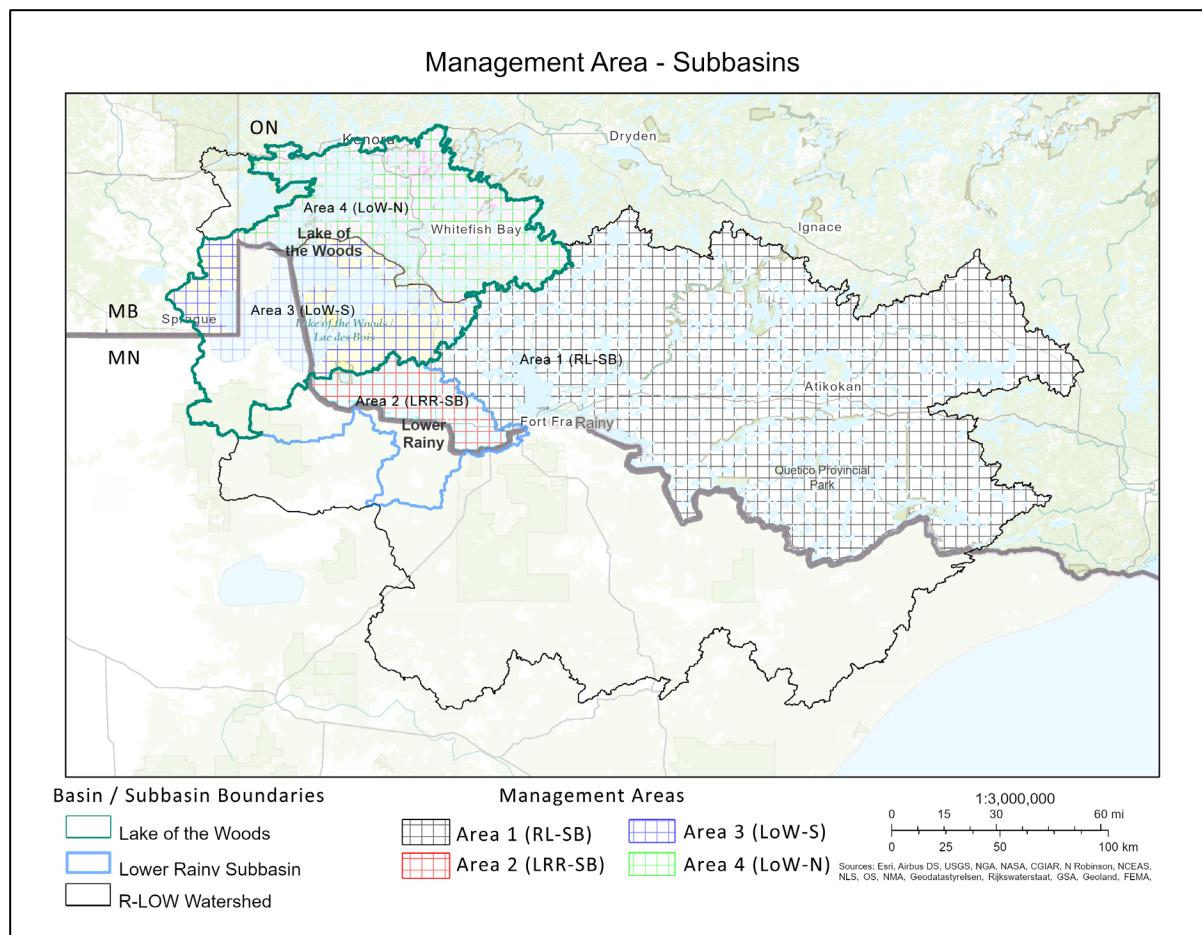


Figure 3: Proposed Management Areas, including planning and outcome focus areas.

Area 1. The upstream extent of the Rainy Lake subbasin (RL-SB) is relatively undeveloped and Rainy Lake TP concentrations together with its outflow to the Rainy River are consistently below the Ontario provincial water quality objectives for lakes (20 µ/L) and for rivers (30 µ/L); outflow flow-weighted mean concentration is 16 µg/L. Although the RL-SB contributes phosphorus to the Rainy River (estimated at 148 t, of which about 70% originates in Canada), aerial export loading is very small and these loads are largely natural. Although included in the plan as part of the watershed and the headwaters source load to the Rainy River, Area 1 should be considered as having minimum potential for phosphorus management and low priority for management recommendations, currently. Should conditions change in the future, this could be reassessed as part of the long-term plan review cycle.

Area 2. The TP load to the Rainy River increases by an estimated 62% along the length of the Rainy River to Lake of the Woods suggesting that the Lower Rainy River subbasin (LRR-SB) should be a focus for management plan investigation. The LRR-SB load constitutes about 27% of the total whole-lake TP budget and about 52% of the south basin TP budget from sources that could be considered for domestic management (i.e., excluding atmospheric deposition, internal loading, direct lakeshed loads, and shoreline erosion on the US south shore).

Area 3. The southern basin of Lake of the Woods (LoW-S) may not present substantial loads that could be easily managed in a domestic PMP because it is sparsely populated and relatively undeveloped overall. However, this area receives phosphorus loads within Minnesota's jurisdiction that are to be managed to load reduction allocation targets established by the Minnesota TMDL. This is also the portion of the watershed where improvements to water quality can be expected as a result of phosphorus management (by both countries) that focus on the Rainy River. In this way, it is a significant area in the PMP and will be important and the primary area to monitor to assess the cumulative outcomes of a domestic PMP and Minnesota's TMDL process. The LoW-S is largely undeveloped and populated by many Treaty #3 communities in the Canadian portion, as well as some cottage and tourism development clustered in the Morson and Sabaskong Bay areas. Other developments consist of some forestry operations and some pastureland. Tributary TP loads are a small percent of the total load (~3.4%) and septic loads are a very small percent (<0.1%) of the total loading to the LoW-S. Although anthropogenic loads in the Canadian portion are small, this does not mean that prudent PMP considerations are not necessary and there may be some incremental gains that should be assessed.

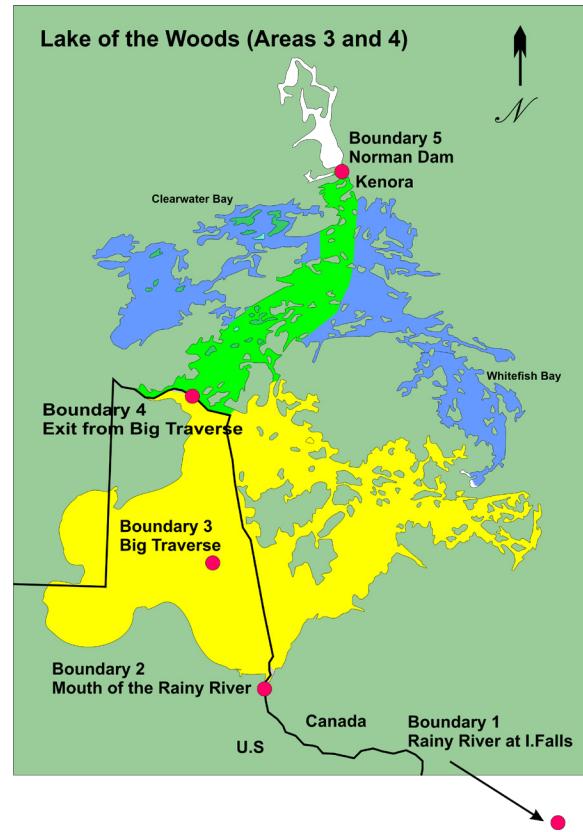


Figure 4: Lake of the Woods Showing south portion (yellow) and north end of LoW with central nutrient-rich flow from south (green), and proposed boundary condition locations (red dots).

Area 4. The north end of LoW (LoW-N) could be considered as a secondary outcome area because it is expected that improvements in water quality in the south portion of LoW should have positive outcomes in the north. This is because central areas of the lake channel water from the south to the north (green area, Figure 4). With the exceptions of Kenora, Sioux Narrows-Nestor Falls, and the northern part of the Lake of the Woods Township, the region is unincorporated. There are, however, several reasons to suggest the potential need for a PMP. These include:

- The presence of urban areas
- High shoreline development density in several enclosed bays
- Forestry and mining (proposed) activities
- Spatial variability in lake trophic status including areas in isolated bays that have substantially lower TP concentrations, i.e., the Ptarmigan-Clearwater Bay area and the Whitefish Bay area.

Population is focused toward the northern end of the lake, with the City of Kenora, multiple Treaty #3 communities, and many seasonal residences near Kenora. Other developments consist of tourism lodges, and forestry operations widespread in the region under the Kenora Forest plan and the Whiskey Jack Forest plan. These areas may benefit from a PMP.

The consideration of PMPs within the four areas should consider aspects of both risk assessment and feasibility studies.

Establishing Boundary Conditions

Boundary conditions are necessary for assessment of progress against goal metrics, numeric or otherwise. Segmentation of the selected Management Plan Area is necessary because the ecological conditions and provincial water quality objectives differ between river and lake environments. In addition, within Lake of the Woods, conditions differ substantially between south and north basins and there will be different desired outcome goals and metrics. For these reasons, the plan should establish several boundary conditions, for example:

- (1) at the outlet of Rainy Lake to the Rainy River, at Fort Frances, ON / International Falls, MN.
- (2) near the outlet of the Rainy River to the southern basin of Lake of the Woods, perhaps at the new location of the international gauging station known as the Wheelers Point gauge (USGS 05137500).
- (3) a site (or amalgam of sites) representing conditions in the southern basin / Big Traverse Bay of Lake of the Woods.
- (4) the outflow from Lake of the Woods to the Winnipeg River, at Kenora.

Observing boundary conditions, especially through long term monitoring, is necessary for plan effectiveness and progress assessment. This will involve establishment of a long-term, core monitoring program that includes these boundary condition. This is discussed further, under Core Monitoring, later in this plan framework.

Jurisdictions and Areas of Authority

It is important to identify potential partners and engage them early and collaboratively in the development of the phosphorus management plan (PMP). Sources of phosphorus to Lake of the Woods (LoW) comes from many sources, some more easily identified point sources, and many diffuse landscape sources. There will be challenges to reduce loads, given the major categories in the lake's phosphorus budget, and every kilogram of phosphorus will be important. Reducing phosphorus is a shared responsibility —all levels of government, industry, non-governmental organizations, and individuals should have roles in plan development and implementation. A long-term view, and commitment of governments along with partners with local vesting and understanding of the jurisdictional challenges and opportunities will be essential to success.

Domestic Canadian

Federal

Environment and Climate Change Canada (ECCC) — Lake of the Woods waters, and its watershed, are both inter-jurisdictional and international. As such, ECCC has statutory authorities for research, monitoring, establishment of federal-provincial agreements and programs for water quality management, including designating water quality management areas and providing for water quality management programs for these waters. Although ECCC also has authority to prescribe water quality standards, in practice such metrics exist as guidelines of the Canadian Council of Ministers of Environment, or as negotiated treaty substance objectives, such as in the Great Lakes Water Quality Agreement. The government of Canada has also committed to create a new Canada Water Agency, which may have authorities and roles with respect to water quality restoration on LoW. However, the structure of the Canada Water Agency, its mission, and the operationalization of its objectives have yet to be defined.

Particularly relevant to the development of a PMP, ECCC has completed a four-year science program (2016-2020) and phosphorus reduction scenario modeling effort to evaluate levels of phosphorus reductions that would be required to meet certain ecosystem objectives. This research focused on four themes including: enhanced monitoring of LoW, Rainy River and select tributaries in Canada; nutrient and algae research; development of tools to identify and monitor algae blooms using remote sensing; and development of integrated watershed and lake-based models to assess potential lake and ecological responses to nutrient reductions.

Indigenous Services Canada (ISC) — ISC has responsibilities to First Nations including in the areas of environment and natural resources and community infrastructure through the First Nations Land Management Act. ISC is also responsible for processes around Treaty Land Entitlement and additions to reserve. Funding and capacity can also be accessed through ISC for work around water quality by Indigenous Nations. ISC may not be directly relevant to the development of a PMP but could be a resource for implementation measures.

Manitoba

A small fraction of the Area 3 (LoW-S) is in Manitoba, largely comprised of undeveloped forest and wetland areas, draining to LoW via the Reed River. This area consists of provincial unincorporated lands, a small portion of the rural municipality of Piney, and territories of Buffalo Point First Nation. Buffalo

Point First Nation operates a leased cottage site, a marina, golf course, convention centre, and campground.

The Province of Manitoba has multiple interest in water quality on LoW, including protecting the drinking water of the City of Winnipeg (drawn from Shoal Lake), importance of the lake to many Manitobans who have seasonal properties on the lake, and as part of a watershed-approach to reducing nutrient loading to Lake Winnipeg. With respect to this latter point, Manitoba has communicated its support of setting nutrient objectives and targets for LoW. In 2021, Manitoba entered public consultations on proposed nutrient targets for Lake Winnipeg and watershed tributaries, including the Winnipeg River, acknowledging that most of the TP load to the Winnipeg River was from upstream jurisdictions. Although not finalized yet, achievement of the Winnipeg River loading targets is likely predicated on reduction in outflow load from LoW.

Ontario

In this far-west region of Northwestern Ontario, the jurisdictional environment is very different from regions in southern Ontario. The entire region is encompassed within the Anishinaabe Nation in Treaty #3 territory and includes homelands of the Northwestern Ontario Métis Community – Métis Nation of Ontario (see Indigenous Nations below). There are few urban municipalities, with Kenora being the largest, situated at the outlet of LoW and Fort Frances at the outlet of Rainy Lake. There is also some rural municipal organization primarily in the LRR-SB as well as on the east side of LoW.

Much of the region is unincorporated territory comprised of provincial Crown land and Federal Crown/Treaty Land and some private patented lands, the latter being concentrated in Area 4 (LoW-N). There are no Conservation Authorities, nor other watershed-based planning bodies, nor provincial Area Planning Boards for the areas outside of municipal organization. Key relevant provincial legislation, including the Planning Act, the Building Code Act, and the Nutrient Management Act are normally delivered by municipalities or Conservation Authorities. The lack of local or regional planning authorities or implementation instruments is a challenge.

For the vast tracts of provincial Crown Land, land use and development planning (e.g., forestry, mining planning, etc.) is managed by the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) in accordance with the Public Lands Act of Ontario.

For private (patented) lands in the unincorporated, there is no land use planning or development controls other than review and approvals by the Ministry of Municipal Affairs and Housing (MMAH) for applications requiring consent (e.g., land severances, subdivisions etc.). MMAH review is guided by the Provincial Policy Statement, which sets out general provincial objectives about managing growth, using and managing natural resources, protecting the environment, and public health and safety. Although MMAH has authority to establish Area Planning Boards, there are no such boards in the region. In the absence of a municipality to issue permits under the Building Code Act, building permits are not required and wastewater permitting is delegated to the Northwestern Health Unit (NWHU) for small scale systems or to the Ministry of Environment, Conservation and Parks (MOECP) for systems greater than 10,000 litres per day. Even within the rural municipalities (see below), wastewater permitting is delegated to the NWHU, except the few small areas served by centralized wastewater lagoon systems (i.e., Town of Rainy River, Emo, and Barwick – MOECP jurisdiction) and Rainy River First Nations' system, which is under federal jurisdiction.

The Minister of MMAH may also enact quasi-zoning orders controlling building in areas without municipal organization, where it is deemed that special circumstances exist requiring protection of a provincial interests. In the Rainy-LoW basin, the Clearwater Bay Restricted Area Order is one such instrument, enacted in 1990 to limit lakeshore development and associated phosphorus loads to maintain the quality of habitat for lake trout.

Within the proposed primary Management Area of the Ontario portion of the LRR-SB (Area 2), and primary outcome / secondary management area (Area 3) much of the region is incorporated as single-tier municipalities (Figure 5). With exception of the Town of Fort Frances, these municipalities are predominantly rural, sparsely populated, provide limited municipal services, and have small tax bases and limited staff and planning resources.

In LoW-N (Area 4), the only major population centre is the City of Kenora. In the unincorporated lake area outside the municipal boundaries of Kenora, there is a substantial population both seasonal and permanent. The population in the area in and around the City of Kenora is thought to approximately double in the summer months.

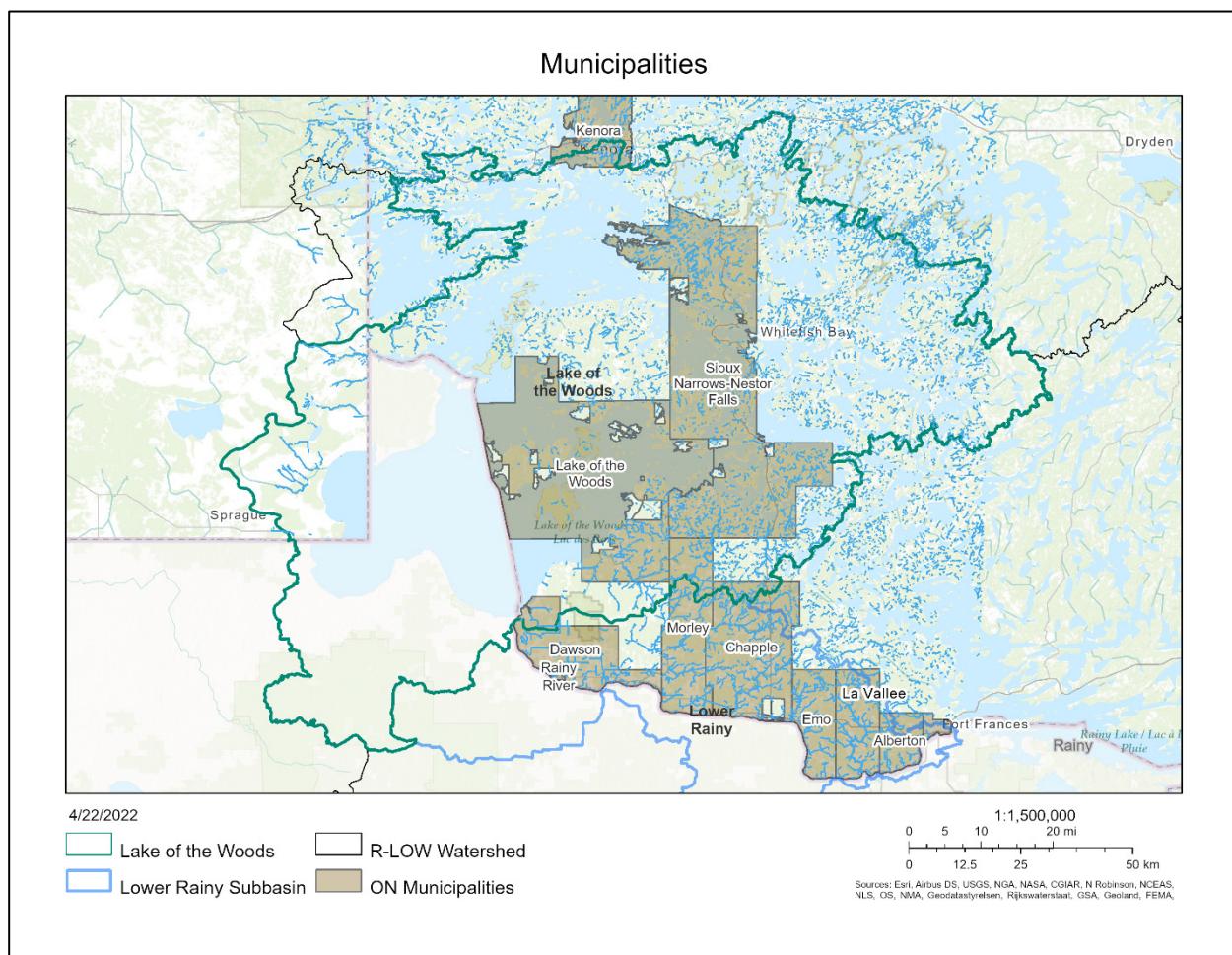


Figure 5: Location of municipal organization in the proposed study zones

Table 1: Municipalities in the Lower Rainy and Lake of the Woods subbasins

Lower Rainy Subbasin	Municipalities within LRR-SB and LoW-SB	Area (km²)	Population (Δ % vs 2016)	Population Centre
Lower Rainy Subbasin	Dawson	343.4	399 (-14.7%)	(see Rainy R.)
	Rainy River (Town)	3.12	752 (-6.8%)	(Rainy River)
	Morley (Township)	388.4	493 (+2.5%)	Stratton
	Chappel (Township)	558.2	763 (+19.7%)	Barwick
	Emo (Township)	202.3	1204 (-9.7%)	Emo
	La Vallee (Township)	237.1	788 (-16.0%)	Devlin
	Alberton (Township)	116.6	954 (-1.5%)	
	Fort Frances (Town)	25.6	7466 (-3.5%)	Fort Frances
Low S-B	Kenora (City)	21.7	14,967 (-0.9%)	Kenora
	Sioux Narrows – Nestor Falls (Township)	1215.8	727 (28.2)	Sioux Narrows
	Lake of the Woods (Township)	746.2	308 (+33.9)	Morson

Indigenous Nations

Anishinaabe Nation in Treaty #3

The Canadian portion of the R-LoW basin is entirely encompassed within the territory of the Anishinaabe Nation of Treaty #3, which spans over 142,450 km², from west of Thunder Bay to north of Sioux Lookout, along the international border and into Manitoba. Treaty 3 is comprised of 28 First Nations (Figure 6), with an estimated population of 25,000.

Within the areas proposed for primary consideration in development of a PMP (Area 2 LRR-SB, Area 3 LoW-S, and Area 4 LoW-N) there 12 Treaty #3 Communities, some of which have multiple reserve lands and land bases across the Lake of the Woods – Rainy River region (Figure 7). All of these communities have traditional territories shared among the 28 communities of Treaty #3.

Grand Council Treaty #3 (GCT3) provides territory-wide governance, alongside of individual First Nations' governments. GCT3 has a Territorial Plan Unit (TPU) that has relevant, robust planning capacity, and has been undertaking relevant water and natural resource policy and law initiatives and watershed management planning that must be respected in the development of a domestic PMP.

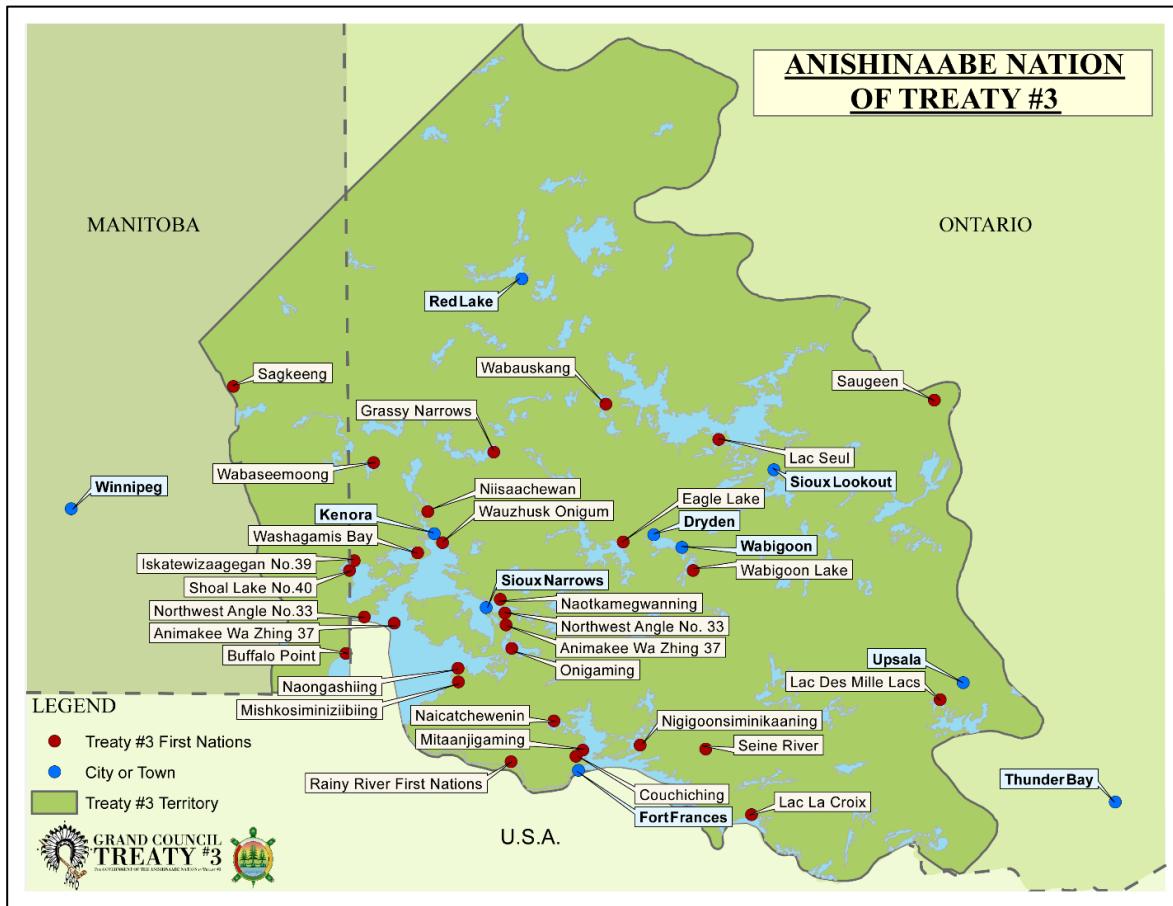


Figure 6: Treaty 3 territory and First Nations in northwestern Ontario

First Nation Communities

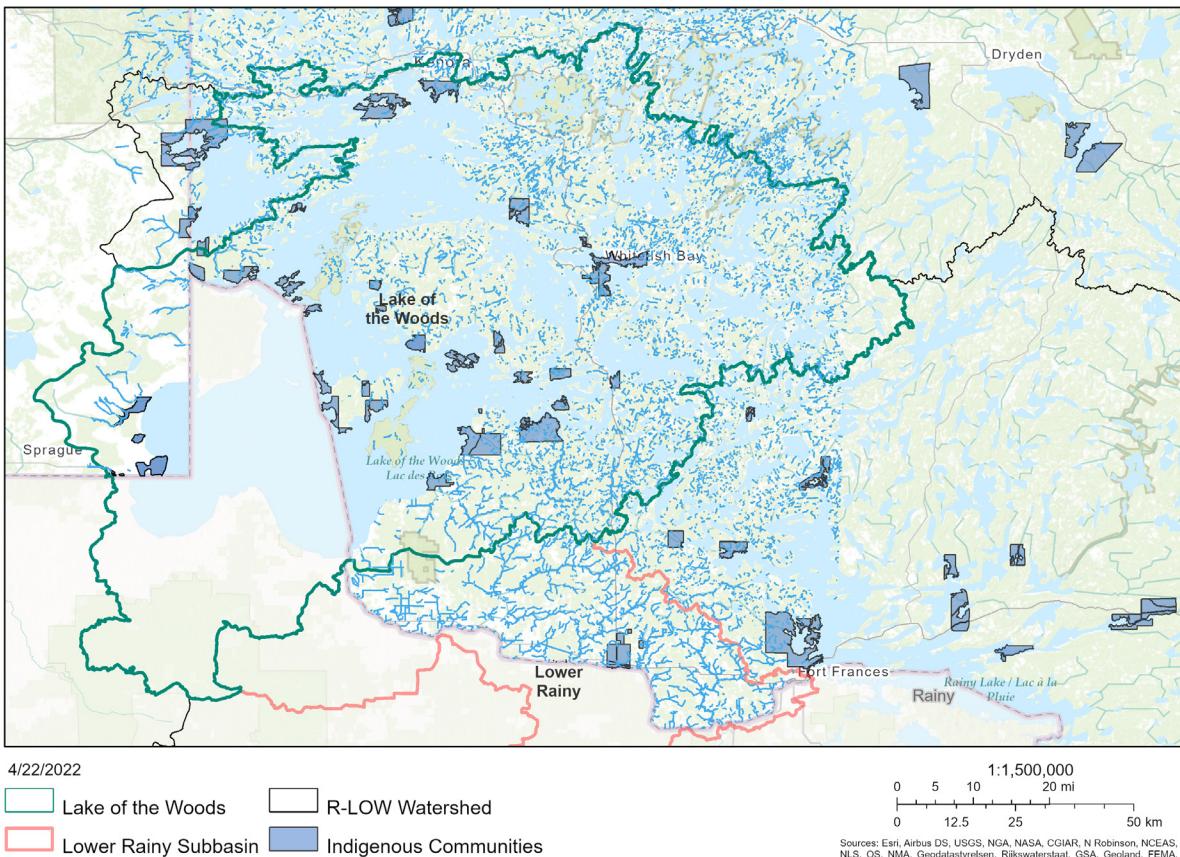


Figure 7: Location of First Nation communities

Manito Aki Inaakonigaawin – Anishinaabe Law

Territorial Planning is guided by Manito Aki Inaakonigaawin, inherent Anishinaabe Law, that is based on the duty and responsibility of the Anishinaabe and all others to ensure that the land, the people, and the future is protected, and that decision-making throughout Treaty #3 respects the jurisdiction of the Nation, in relation to the lands and water. These principles of Anishinaabe Law underpin GCT3 efforts for joint decision-making as treaty partners between the Crown and Anishinaabe in matters of resource protection and development.

Nibi Declaration

The Nibi Declaration voices the sacred relationship with water (nibi) and the gift of life it brings, and the responsibility that Anishinaabe have, and others living within the territory should have, with the water. The intent is to ensure that the spirit of Nibi is central to decision-making and water governance. Key pillars of the Nibi Declaration are respecting the life and spirit of nibi through asserting responsibilities and ceremony. The Nibi declaration guides the GCT3 in developing policy and decision making processes that relate to water.

Watershed Management Planning & Community Based Monitoring

The TPU has begun a watershed management planning process for the Treaty 3 territory. Its planning framework is based on four interrelated pillars: governance, ceremony, community-based monitoring,

and outreach / education. This established framework provides substantial opportunities for engagement in/with GCT3 communities in the development and collaborative implementation of a PMP. It is worth noting that substantial capacity building is underway in community training and engagement in direct environmental monitoring and in data governance, with the development of the Treaty 3 geospatial database and data portal, intended for internal Treaty 3 community uses and public-facing uses.

Related Treaty #3 Lands and Resources Organizations

Miitigoog Forest Management Company, operating as Miisun Integrated Resource Management Company, is a 100% First Nations owned resource management company formed in 2010 and based in Kenora. Miisun manages both the Kenora Forest and the Whiskey Jack Forests, that surround LoW, in a partnership with Miitigoog, a closely related First Nation–Industry limited partnership that holds the sustainable forest licence for the Kenora Forest and the forest resource license for the Whiskey Jack Forest. The Misum – Mittigoog partnership provides forest management planning, road construction, environmental compliance monitoring and data services. Miisun is the lead for development of forestry management plans in the LoW-SB, working with NDMNRF and the Kenora Local Citizens Committee (a citizen advisory group). The Miisun – Mittigoog partnership is comprised of:

- Niisaachewan Anishinaabe Nation (formerly the Dalles)
- Naotkamegwanning First Nation (Whitefish Bay)
- Wabaseemoong First Nations (Whitedog First Nation)
- Ojibways of Onigaming First Nation
- Anishinaabeg of Naongashiing (Big Island First Nation)
- Shoal Lake 40 First Nation
- Northwest Angle #33 First Nation
- Wabauskang First Nation

The Niiwin Wendaanimok (Four Winds) Partnership is an Indigenous-owned and operated corporation formed in 2018 representing four Nations, Wauzhusk Onigum Nation, Washagamis Bay First Nation, Shoal Lake 40 First Nation and Niisaachewan Anishinaabe Nation. The Niiwin Wendaanimok Partnership mandate is on securing the partners' territorial interests in economic development and respect for Anishnaabe laws and voices and environmental protection in development projects. Its primary focus has been on the project to twin Highway 17 from the Manitoba border to Kenora.

Northwestern Ontario Métis Community— MNO

The Rainy-LoW watershed is located in the traditional territory of Region 1 of the Métis Nation of Ontario including Lake of the Woods/Lac Seul and Rainy Lake/Rainy River (Figure 8). In the R-LoW region, the Northwestern Ontario Métis Community (NWOMC) has a unique history and has credibly asserted and established claims to Métis and treaty rights throughout its traditional homelands. The Northwestern Ontario Métis Community is represented within the Region 1 territory of the Métis Nation of Ontario by the Regional Councillor and more locally in the proposed PMP areas in the LRR-SB and the LoW-SB, by community councils – Kenora Métis Council and Sunset Country Métis Council. The local community councils work collaboratively to represent the distinct interests, rights, and claims of the NWOMC within the Métis Nation of Ontario's overall governance structure. The Kenora Métis Council and its Senator have been actively engaged in basin water issues, including at the binational level. The

Métis Nation of Ontario has developed a Crown protocol for community awareness and consultation protocol concerning the Northwestern Ontario Métis Community.

In Region One, the local/regional protocols for communication are through the Regional Councillor who works with the elected community council leadership and Métis citizens to advocate and negotiate on behalf of the NWOMC. Although the MNO provides some support for consultations, unlike funded First Nations, the Métis lack adequate funding or capacity to fully be engaged or involved.

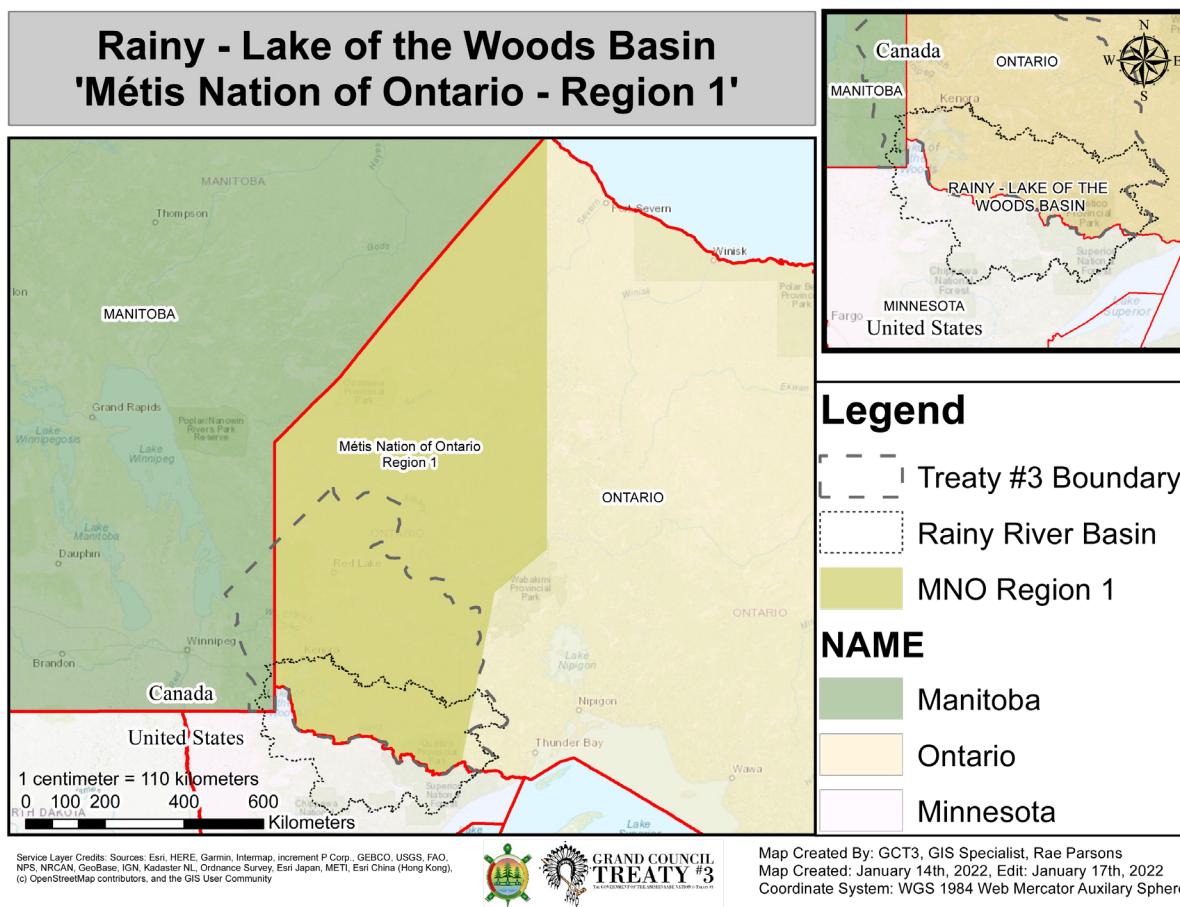


Figure 8: Métis Nation of Ontario - Region 1, including homeland of the Northwestern Ontario Métis Community

Phosphorus Sources

A thorough understanding of the sources and loads of phosphorus is foundational to phosphorus management planning. This is the basis for evaluating source-risks, opportunities and challenges for management, and feasibility of management. The management plan must start by identifying what can and cannot be managed effectively, assess relevance to outcomes, and prioritize key sources to focus on.

The sources of phosphorus to the Rainy River and Lake of the Woods have been comprehensively inventoried and either measured or modelled as part of the intensive studies of the Minnesota Pollution Control Agency (i.e., the Minnesota Lake of the Woods TMDL) and ECCC's Lake of the Woods Science Program and Ecosystem Objectives and Phosphorus Reduction Scenario development. Additional work is being completed by researchers at Trent University, to better understand phosphorus loading dynamics to the Rainy River from Canadian tributaries, including identification of "hot spots" and "hot moments" driving landscape and land-use based loading in the LRR-SB. This information should become available sometime later in 2022 and should be reviewed for guidance in developing plan elements, recommendations, and actions pertinent to land use, development, and drainage planning.

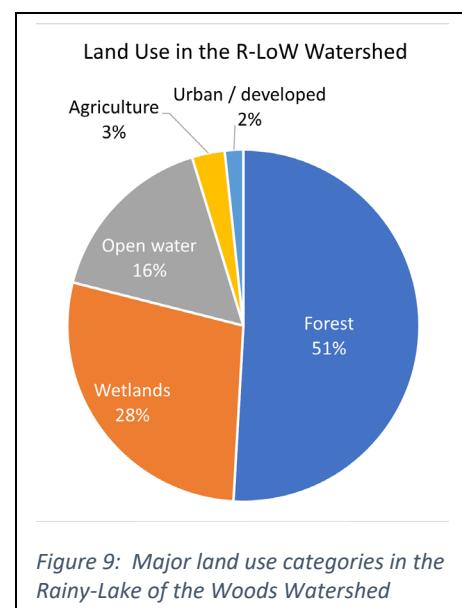
Phosphorus budgets constructed by the MPCA and ECCC studies show general agreement with respect to the sources and magnitude of phosphorus loads, even though some components are not directly comparable due to differences in categorization of sources, time-period of study, and methodology. Nevertheless, the understanding of TP loads, and the overall scale of required reductions has converged.

Some gaps and uncertainties remain. However, enough is known to proceed with developing a domestic plan to assess the relative importance of phosphorus sources, identify source allocation targets required to meet lake objectives, opportunities for management, and actions required. The basis for this assessment **must consider the cumulative binational context of all loads**, rather than assessing Canadian sources in isolation.

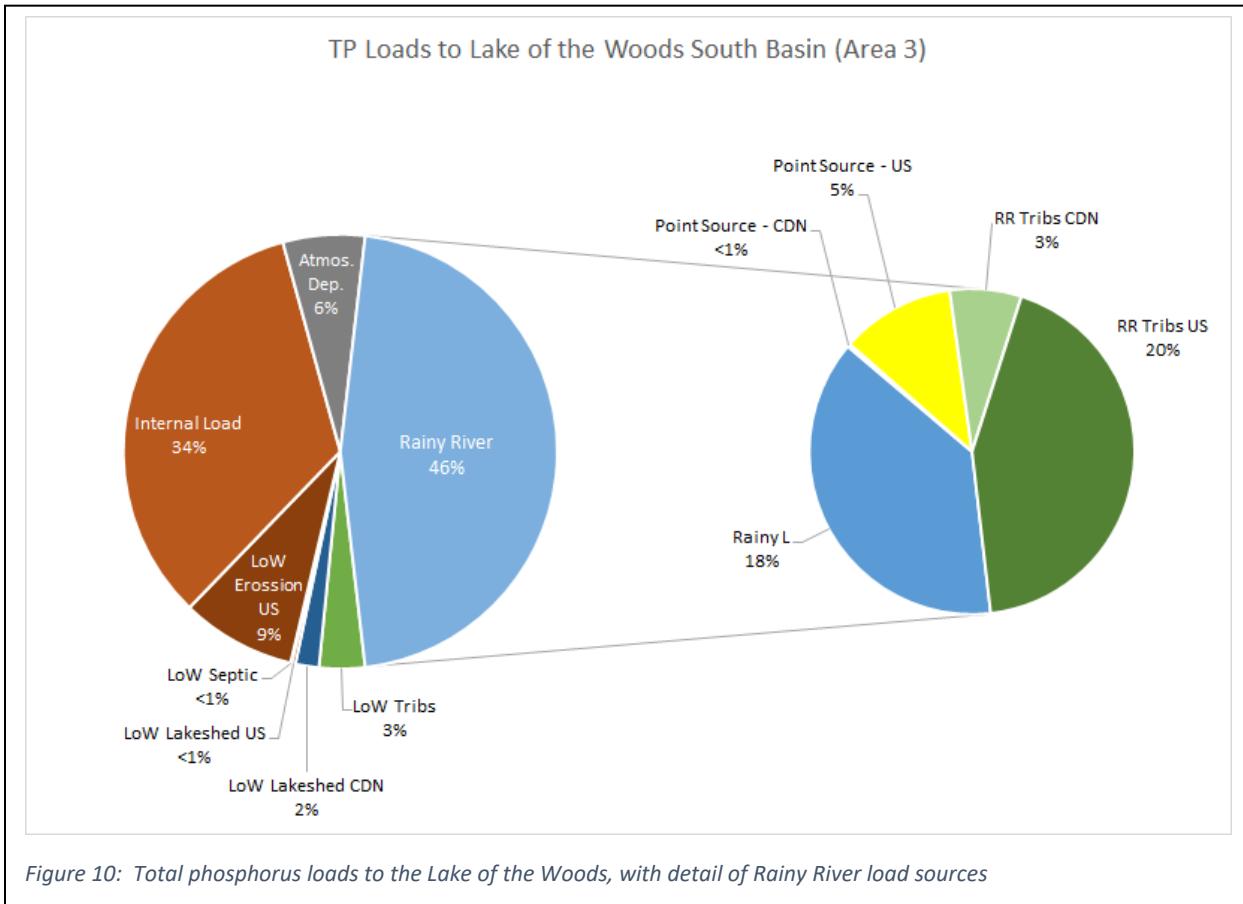
Phosphorus supporting algae blooms on Lake of the Woods comes from both external and internal sources. External sources include natural sources from the vast areas of undeveloped landscape, human land-use / development sources (e.g., agriculture, urban), and some point sources including domestic and industrial wastewater. Internal loading from phosphorus in the lake sediments is a substantial component of nutrient supply feeding summer algae blooms as well.

The R-LoW watershed overall is largely natural in terms of land use, with about half comprised by forests, along with substantial areas of wetlands and open water, and relatively small areas of agricultural and urban development (Figure 9), mostly focused in the LRR-SB.

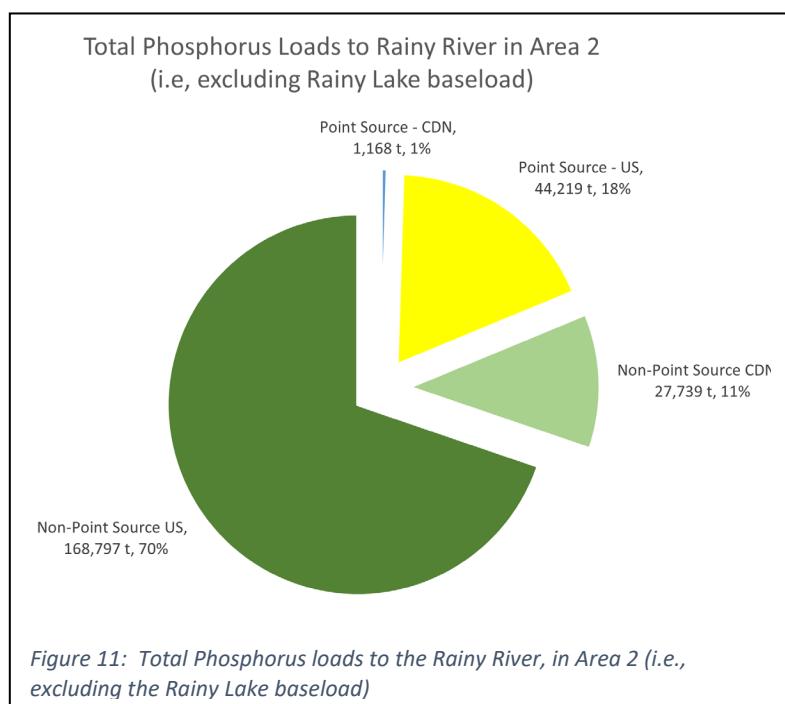
Just under half of the annual external phosphorus load to LoW comes from the Rainy River, consisting of a baseload from upstream Rainy Lake, and point source and tributary loads



downstream along the length of the Rainy River (Figure 10), which result in a doubling of flow-weighted mean annual concentration and a 62% increase in load along the 140 km length of the river.



Loadings along the Rainy River are dominated by non-point sources with US sources accounting for 70% and Canadian sources 11% of the incremental load to the river over its baseload from Rainy L. Point sources add about 18%, with the majority being US sources, since the closure of the Resolute Fort Frances, ON mill in 2014.



Point Sources

A total of 19 point sources discharge to the Rainy River, from US and Canadian domestic and industrial wastewater facilities, either directly or via tributaries to the river. US phosphorus point sources are addressed under the MN TMDL plan, through revised permits for domestic wastewater, and industrial wastewater (including new addition of P load criteria to the Boise White LLP mill in International Falls). US sources must be considered in the overall binational source-risk and feasibility-benefit assessment of Canadian point source planning.

Historically, the Resolute Fort Frances mill was a significant Canadian source of phosphorus. The permit-effluent limit of the mill when operating in the 2000s was approximately 71.5 t/year but effluent loads were closer to 43.5 t/y in the years leading up to its closure, due to partial mill idling. The closure of the Resolute Fort Frances mill in 2014 removed about 43.5 tones in annual point source loads. This equates to a nearly 50% reduction in point source loads binationally and about 97% in the Canadian portion. This Canadian point source reduction is accounted for already in the MN TMDL plan. Nevertheless, this defunct load should still be a primary consideration in development of a domestic plan because any significant return of this load, from as yet unknown alternative re-development, will likely negate any incremental gains possible from other point and non-point sources, both in Canada and the US.

Point sources remaining in Canada in Area 2 (LRR-SB) consist of 5 domestic wastewater treatment facilities, of which four are regulated by Ontario and one is under federal jurisdiction (Table 2). The Fort Frances wastewater treatment plan accounts for about two thirds of the Ontario point source load. Ontario facilities operate under MOECP Certificates of Approval with effluent discharge criteria of 1.0 mg/L. Maximum discharge loads are not regulated but can be imputed from effluent criteria and maximum design flow capacity.

Table 2: Estimated total phosphorus loads (data: Ontario acknowledge loads, MN TMDL; MOECP data)

WWTP	Estimated Loads (kg/yr)	Notes
Fort Frances	779.6	<ul style="list-style-type: none">Class 3, secondary treatment, with P removal and UV disinfection.
Emo	353.9	<ul style="list-style-type: none">Lagoon with multiple batch discharges per year to Everett Creek.
Barwick	6.0 ¹ ¹ TMDL estimate; see notes as is possibly in error	<ul style="list-style-type: none">Lagoon with one batch discharge / y to Rainy R.P sampling not required prior to 2017.Effluent concentration now estimated at 3.5 mg/L for extrapolated load of 62–75 kg/y.
Town of Rainy River	28	<ul style="list-style-type: none">Lagoon with batch discharges to Rainy River.
Rainy River First Nations	Not identified	<ul style="list-style-type: none">Federally regulated. Data not readily available.Lagoon drained once per year to Rainy River.RRFN 2018 plan reports lagoon nearing capacity and expansion / upgrade required to meet future needs.
New Gold Mine	Not Readily available	<ul style="list-style-type: none">Has Industrial and Domestic sewage provision on its Environmental Compliance Approval re: discharge to the Pinewood river.On-site domestic sewage reportedly being trucked to Fort Frances WWTP.

Resolute Mill (closed)	118	<ul style="list-style-type: none"> • Residual load from accumulated surface water and landfill leachate. • Continuation of the residual load is not certain, given the dismantling of the mill (winter 2021) and a recent (March 2022) proposal for rezoning and conversion/cleanup of the lagoon property for use as an industrial scale computing and a solar farm.
------------------------	-----	---

In Area 3 (LoW-S), there are three US point sources (one industrial and two municipal wastewater systems), that combined contribute a minor TP load to the lake estimated at 62 kg/yr. The City of Warroad, located on the south-west shore of LoW, operates a wastewater treatment plant that discharges to the Red River basin. There are likely few substantial point sources in the Canadian portion of Area 3. However, there is insufficient information and potential sources under provincial and federal jurisdictions should be inventoried and considered as part of source-risk and feasibility assessments in plan development.

In Area 4 (LoW-N) there are likely few substantial point sources. The City of Kenora wastewater treatment system discharges to the Winnipeg River downstream of Area 4. Wauzhusk Onigum Nation, which formerly operated a lagoon system discharging to LoW, was interconnected to the Kenora wastewater treatment system in 2020. However, there is insufficient information about other potential sources under provincial and federal jurisdictions should be inventoried and considered as part of a source-risk and feasibility assessments in plan development.

Non-Point Sources

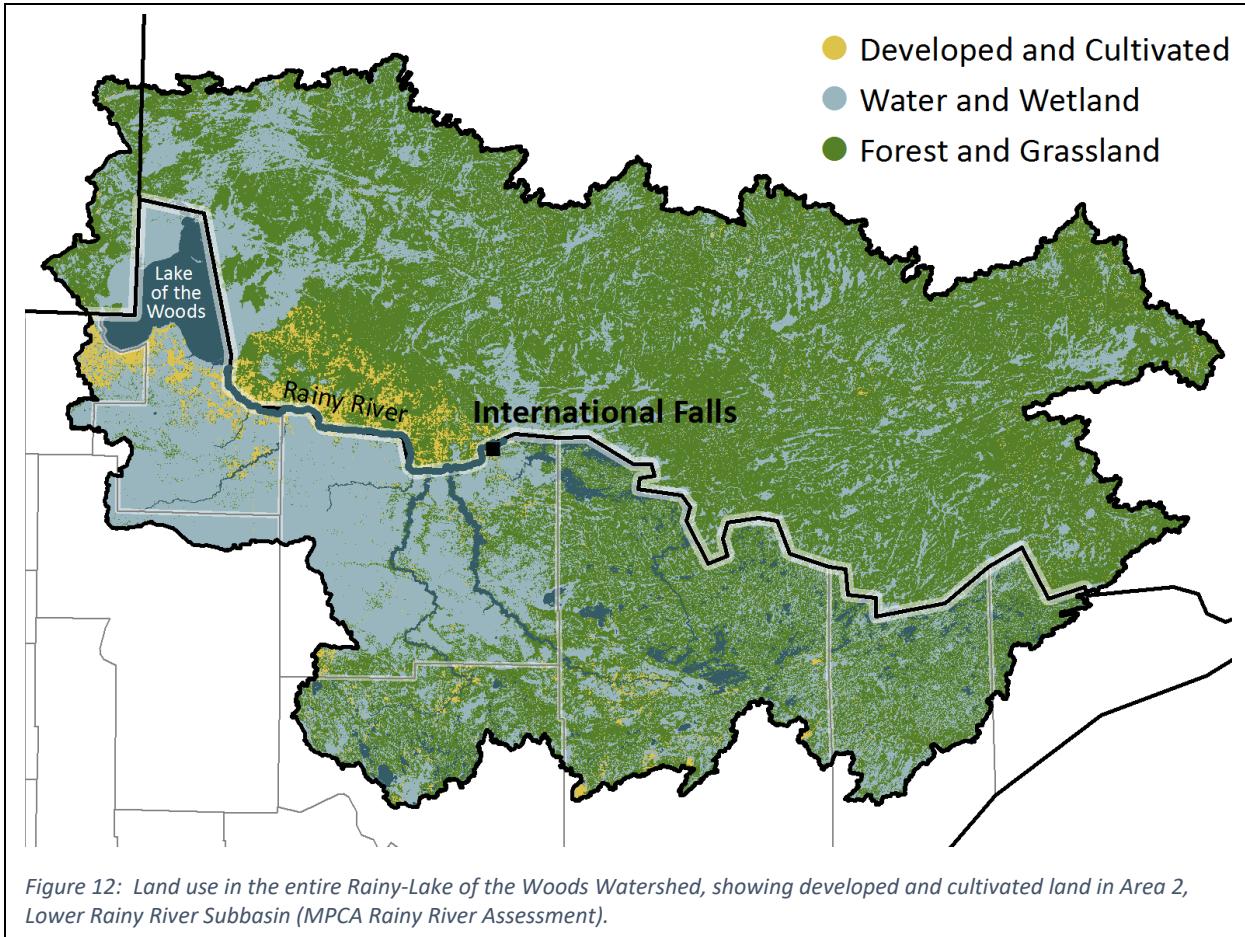
The R-LoW watershed overall is largely natural in terms of land use, with about half comprised by forests, along with substantial areas of wetlands and open water, and relatively small areas of agricultural and urban development (Figure 12). Canadian non-point sources to the Rainy River are poorly characterized, lacking long-term tributary monitoring. Additional data may be available later in 2022 with completion and publication of studies of tributaries to the Rainy River, by researchers at Trent University. Loads for Canadian tributaries estimated by the Minnesota TMDL study are a reasonable approximation (C. Eimers, Trent U., pers. comm), estimated to contribute approximately 28 tonnes of phosphorus to the Rainy River annually, which equates to approximately 11% of the total (Canada and USA) load and 96% of the load to the Rainy River in Area 2 from Canadian sources.

Forestry operations are a major land use throughout the entire R-LoW basin and agricultural development is mostly focused in the Lower Rainy River Subbasin (Area 2, LRR-SB). Non-point source phosphorus contributions, specific to these activities, is not quantified but are considerations for the development of the PMP. These activities and considerations are further discussed below.

Agriculture

Agriculture comprises about 20 percent of domestic land use in the LRR-SB (Area 2), concentrated in the southern portion near the Rainy River. Considerations for planning include current trends towards expansion of the agriculture sector, conversion from shrub and pastureland to higher-value, more intensive row crop cultivation, including soya beans, and canola, winter wheat, and corn, combined with expansion of tile drainage in the area.

Additionally, although much of this area is under municipal organization, the reality in the northwest region is vastly different from southern Ontario. These are small, sparsely populated municipalities with limited resources and capacity for planning or implementing comprehensive drainage or nutrient management programs. Additional support from higher governments would be required.



Soils are characterized as fine textured with higher potential for erosion due to anthropogenic disturbance. Soils are naturally rich in phosphorus and more productive for agriculture than the majority of the domestic portion of the R-LoW basin. As such, most of the crop and pastureland in the entire R-LoW basin is located in the LRR-SB.

There are four main tributaries draining Area 2 to the Rainy River, as well as ditching and direct landscape drainage. Phosphorus loads of the main Canadian tributaries as well as direct drainage were estimated by the MN TMDL study (Table 3). Canadian monitoring and research began in 2018 by researchers at Trent University to better understand phosphorus loading from the Canadian tributaries, including identification of “hot spots” and “hot moments” driving landscape and land-use based loading in the LR-SB. This information should become available in detail sometime later in 2022 and should be reviewed for guidance in developing plan elements, recommendations, and actions pertinent to land use, development, and drainage planning. This work is expected to identify “hot spots” and “hot moments” for phosphorus loading that may provide guidance to development of recommendation for policies or programs (e.g., BMPs) to reduce erosion and runoff export to the Rainy River.

Table 3: Estimates of TP loads to Rainy River from Canadian tributaries and landscape (MN TMDL)

Canadian Tributary	Estimated TP Load Kg/yr (MN TMDL)
La Vallee River	3,634
Everett Creek	(not estimated, may be included in direct drainage);
Sturgeon River	3,156
Pinewood River	5,696
Direct Drainage	15,254
TOTAL	27,739

Preliminary results of the Trent University studies of tributaries in the agricultural areas of the LRR-SB suggest an association between erosion and tributary phosphorus delivery to the Rainy River and Lake of the Woods, with areal loading nearly double in agricultural developed areas. Further, TP tributary concentrations exceed provincial water quality objectives throughout the water season and very high concentrations are observed related to spring melt and storm events. This suggests there may be some potential for reducing erosional and runoff losses of P through agricultural best management practices, and also the importance of enhanced monitoring in this region. These factors should be considerations in drainage and agricultural planning as part of a subbasin approach to a phosphorus management plan.

Tile Drainage

As noted above, in recent years, there has been a trend towards increased agricultural development including row crop expansion, particularly soybeans, corn, and canola, and tile drainage installation. This is aided by provincial programs promoting agricultural expansion in northern Ontario, subsidy programs for land clearing and tile drainage. In addition to the long-standing provincial program of 10-year loans, the province is now actively promoting tile drainage in northern Ontario, through a subsidy program, “Invest North – Regional Tile Drainage”. In 2021, this program, delivered through the Northern Ontario Heritage Fund awarded \$1.3 million to support tile draining projects in the LRR-SB, consisting of \$1 million for the project, administered by the Rainy River Futures Corporation, to install tile draining 1,900 acres in the district plus \$364,833 to a contractor from southern Ontario to set up an office in Rainy River and purchase equipment to expand its installation business into the region. These projects are subject to the normal review by OMAFRA for permitting.

Some tile drainage has been installed since the early 2000s, however most installations have been in the past few years. Publicly available data (Ontario Geo-portal) on the extent and location of recent tile drainage installations are shown in Figure 13. However, it is not certain whether these data are complete and up to date, lacking details in some cases (e.g., acres tiled data missing for many entries) and few record entries from the past several years. Reportedly, there may have been delays in populating the database due to staffing resources and impacts of COVID-19 over the past few years. These data should be interpreted with caution and updated / validated by the Non-Point Source Work Group as part of the source-risk assessment in plan development. Anecdotal reports suggest that about 10,000 acres is under tile drainage in Area 2, however this should be confirmed or validated by authoritative sources by the Non-Point Source Working Group.

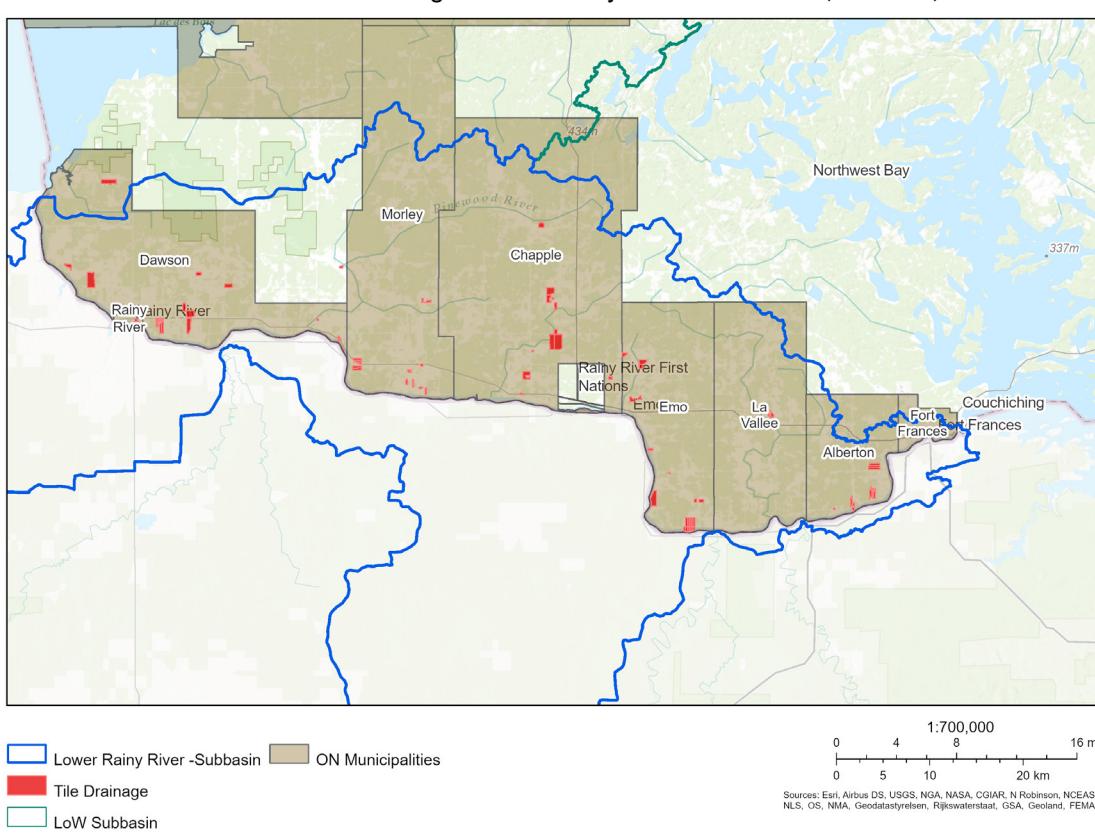


Figure 13: Tile drainage location, Lower Rainy River Subbasin -- Note: data may not be complete nor up to date

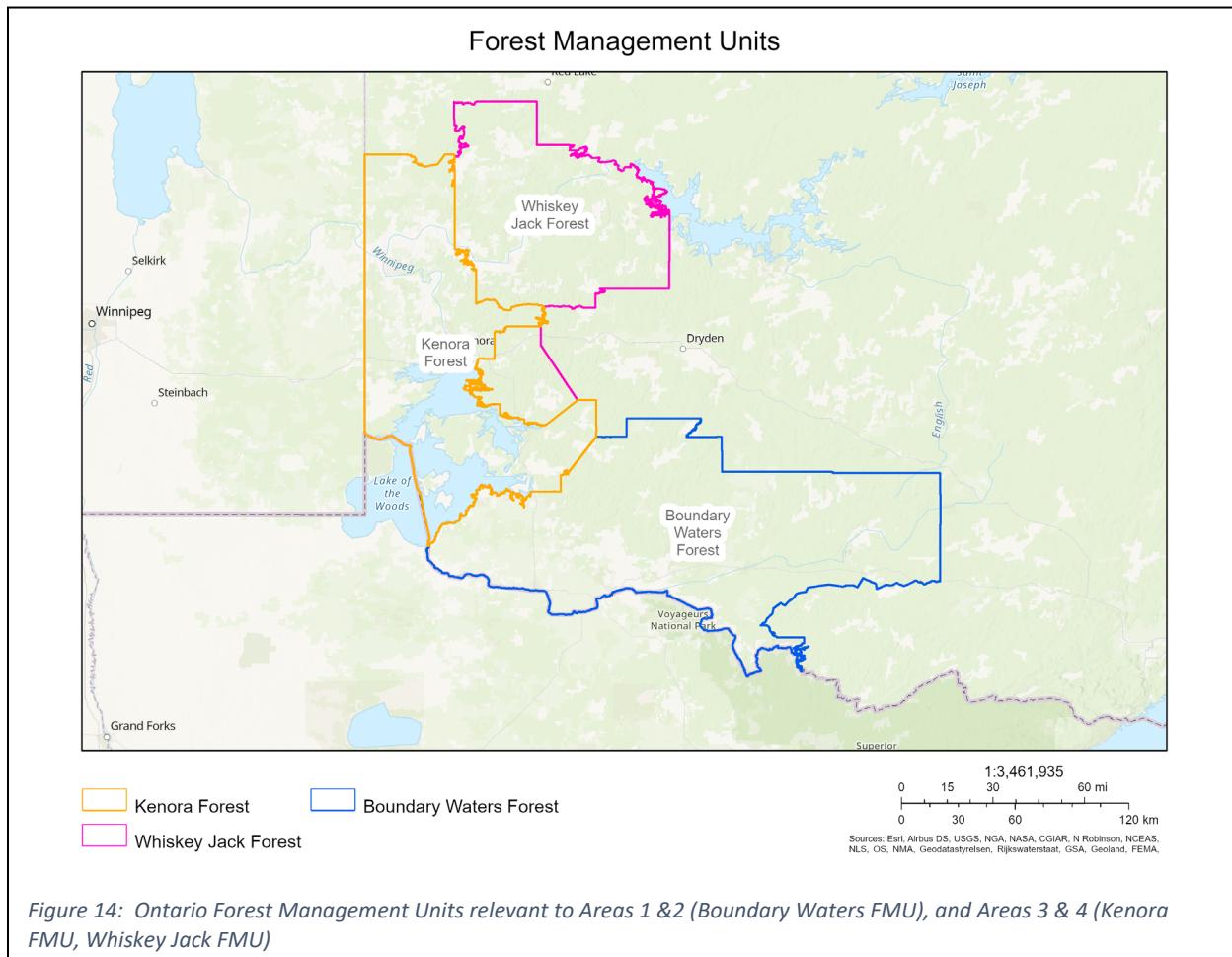
In Area 1 (Rainy Lake Subbasin) the primary phosphorus sources are natural landscape based, with possible influences by forestry activities and some seasonal cottage development. In this framework Area 1 is not identified as a priority candidate for phosphorus management actions so is not elaborated further. In the Lake of the Woods Subbasin, Area 3 (LoW-S) and Area 4 (LoW-N), non-point sources include natural landscape export, and possibly anthropogenic sources that could be considered for management including forestry operations and septic. These sources are estimated to be relatively small compared to the predominant load delivery from the Rainy River. As such, priority focus should be given to Area 2 (LRR-SB).

Forestry

Forestry is a major land use activity throughout the entire Rainy-Lake of the Wood Basin. Forestry operations have potential to affect nutrient export from the landscape, through removal of forest cover and increased erosion from land disturbance, road building etc. Potential impacts on nutrient loading could be small incremental effects summing across broadly distributed areas, or local impacts, in isolated embayment areas of the lake.

Ontario's Crown Forest is divided into geographic planning areas known as forest management units (FMU). Forest management plans are prepared for each FMU and are periodically renewed based on the

forest management planning cycle. Planning is lead by industry in partnership with NDMNRF and a “local citizens committee” of stakeholders. Crown forests are managed by industry under license from the province. Figure 14 shows the location of FMU relevant to the PMP. They are the Kenora and Whiskey Jack FMUs in management plan Areas 3 and 4 (managed by Miisun Integrated Resource Management Co; licenses effective 2012-2022), and the Boundary Waters FMU in management plan Areas 1 and 2 (managed by Boundary Waters Forest Management Corp.; license effective 2020-2030). Opportunities for integrating enhanced P management consideration could be explored as part of the planning cycles.



Management Plan Team

The management plan will be developed with a broad range of government, rightsholder, stakeholder, and community input. The Management Plan Team (Figure 15), will consist of a steering committee, Indigenous engagement committee, and working groups for non-point and point sources of phosphorus. Project team committees and working groups will include representation from governments, Indigenous Nations, and industrial sectors (wastewater, agriculture, forestry, tourism) and community stakeholders as appropriate. Details of these committee and working group structures are provided in the sections that follow.

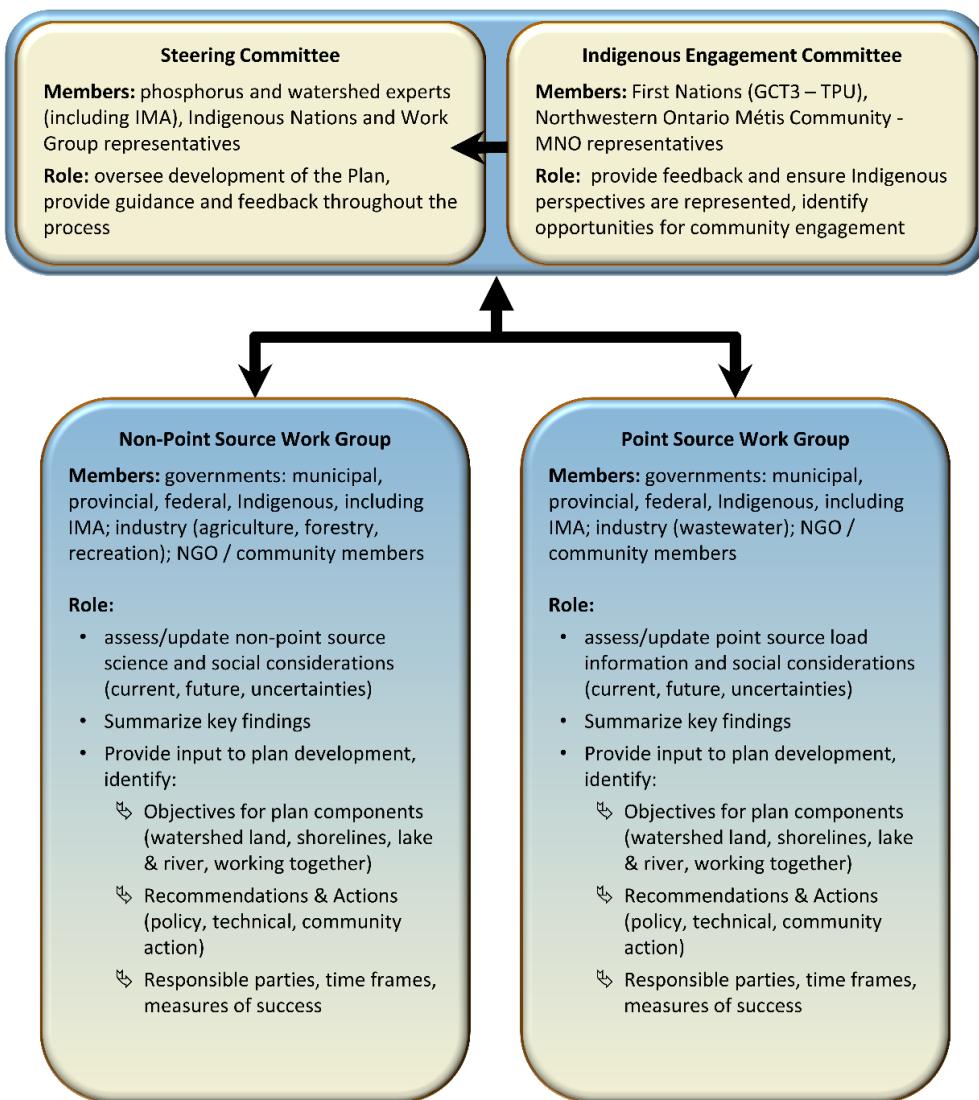


Figure 15: Management Plan Team Structure

The **Steering Committee** complement should include representatives from responsible jurisdictions and rightsholders (federal, provincial, indigenous) as well as representation from relevant organizations responsible for water quality monitoring and protection in the basin, including representation from Indigenous Nations and other watershed management experts (including from the International Multi-Agency Arrangement [IMA]) and representation from the non-point and point source work groups. Steering committee membership should represent decision-making authority, positioned to endorse a plan, or ensure its endorsement by their respective organizations.

The primary role of the steering committee is to oversee the development of the PMP, including providing direction and feedback to the non-point and point source work groups, ensuring opportunities for engagement of Indigenous Nations in the process, and providing collective endorsement of the plan developed.

The **Indigenous engagement committee** will be a subcommittee to the steering committee. Although the steering committee will have membership representing indigenous jurisdictions in the basin for decision-making processes, the indigenous engagement committee will be comprised of leadership, knowledge keepers and community members that will guide the steering committee in engagement and ceremonial protocols necessary throughout the planning and implementation processes. This committee will provide expertise in ensuring equitable space is dedicated for both western and indigenous knowledge systems and provide guidance on the assertion of ceremonial responsibilities. This committee can also guide engagement protocols and processes throughout each stage of the planning and implementation process.

Existing collaborative organizations in the watershed should be leveraged to participate as members of the plan development team – both on the steering committee and point and non-point source work groups. The International Multi-Agency Arrangement (IMA) collaboration of agencies has been working on nutrient issues in the basin since 2008. The IMA has an existing steering committee of signatory representatives and relevant subordinate technical advisory committees, including a nutrient management committee and a core monitoring committee. Additional membership from non-IMA agencies would likely be identified for participation both on the steering committee and work groups for point and non-point sources. One such example would likely be Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), which is currently not a member of the IMA collaborative.

Work Groups (non-point and point sources) primary roles are to:

- (1) Review available science and social considerations.
- (2) Summarize key findings and knowledge gaps (current, future considerations and uncertainties such as climate, demographic change etc.).
- (3) Provide detailed input to plan development, including assessment of phosphorus risks and feasibility / benefits of management, and identify and prioritize:
 - Goals for each main plan component (perhaps considering plan components for Watershed lands; Shorelines, Working Together)
 - Recommendations, and feasible and desirable actions, that will be supported over the long haul. Due consideration should be given to recommendations and actions in areas of Policy

(jurisdictional plans, bylaws, other instruments), Technical needs and actions (science and monitoring), and Community Action (advocacy, education, voluntary action, stewardship etc.)

- Responsible parties (lead, supporting), time frames, and success measures.

Table 4 is provided as an example framework for the roles and expected outputs from the working groups. Detailed terms of reference, complements and work plans for the steering committee and nutrient work groups will be developed by the team as first steps in plan development.

Table 4: Example output framework from working groups, illustrating roles and expected results

Key Findings: (Example: Tributary P-Loads in LRR-SB account for 11% of total load in Area 2; tied to runoff events and land use)

Objectives: (Examples)

1. Improve phosphorus management for all land uses to achieve a net reduction in nutrient runoff
2. Protect groundwater that feeds to the Rainy River or Lake of the Woods
3. Promote clean runoff practices to reduce the transport of nutrients to the Rainy River and Lake of the Woods.

(EXAMPLE) Land Use and Phosphorus Management				
Objective 1: (Example) Improve phosphorus management for all land uses to achieve a net reduction in nutrient runoff				
Recommendations	Type	Roles	Time Frame	Success Measure
1a Land use plans, bylaws, other instruments: Statement of recommendation; provisions include: <ul style="list-style-type: none"> • Action 1 • Action 2 • Action 3 	Policy	Lead: Support:		
1b Agricultural operations: Statement of recommendation; provisions include: <ul style="list-style-type: none"> • Action 1 • Action 2 • Action 3 	Policy Community action	Lead: Support:		
1c Recreational operations: Statement of recommendation; provisions include: <ul style="list-style-type: none"> • Action 1 • Action 2 • Action 3 		Lead: Support:		
1d Industrial operations: Statement of recommendation; provisions include: <ul style="list-style-type: none"> • Action 1 • Action 2 • Action 3 		Lead: Support:		
1e Watershed Stewardship Advocacy & Education: Statement of recommendation; provisions include: <ul style="list-style-type: none"> • Action 1 • Action 2 • Action 3 	Community action			

Potential Partners and Roles in Plan Development

Collaborative actions and commitment of many individuals, organizations and sectors will be necessary to successfully develop and implement the PMP. This will be a long-term effort and it is important that all are vested in the process. Governments, rightsholder, communities, sectors and stakeholder representation and input should be engaged early and throughout the process. “Ownership” of the plan by all will be critical to its success. Potential partners and their possible roles are outlined in Table 5.

In addition to these domestic potential partners, there are binational organizations and resources relevant to a comprehensive, watershed-based approach to nutrient management. Although this document focuses on a framework for a domestic phosphorus plan, sources of phosphorus loads, and solutions are binational. For many years, government agency and other experts have been working together binationally, in existing collaborative structures to assess and work toward solutions for the nutrient and algae problem on Lake of the Woods.

The IMA provides a venue for data sharing and inter-agency and international collaboration on research and management activities in the basin. The IMA has been working for many years on nutrients and core monitoring needs and has played a key role in cross border collaboration, data sharing, and the development of both major nutrient studies in the basin conducted by Minnesota and Canada. The International Joint Commission’s International Rainy-Lake of the Woods Watershed Board, and its Aquatic Ecosystem Health Committee, have been involved in assessing nutrient objective needs and is working with the IMA on the scoping of a core monitoring program for the basin. These structures and expert resources should be engaged and leverage in the development of a domestic phosphorus management plan.

Table 5: Potential partner-mapping in phosphorus management plan

Potential Partner	Relevance to PMP	Relevant Legislation / charter	Potential Role
Environment and Climate Change Canada	Federal lead on phosphorus science program and ecosystem response modelling; responsible for research and monitoring in inter-jurisdictional and transboundary watersheds	Canadian Environmental Protection Act Canada Water Act	Steering Committee Point Source Committee Non-point Source Committee
Ontario Ministry of Environment, Conservation and Parks	Provincial ministry responsible for wastewater permitting, regulations and monitoring	Environmental Protection Act Nutrient Management Act Water Resources Act (storm sewers)	Steering Committee Point Source Committee
Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry	Provincial ministry responsible for managing development on Crown land and forest management partnerships	Public Lands Act Crown Forest Sustainability Act	Non-point Source Committee
Ontario Ministry of Agriculture, Food and Rural Affairs	Provincial ministry responsible for agriculture and nutrient management planning and approvals	Nutrient Management Act Agricultural Tile Drainage Installation Act	Steering Committee Non-point Source Committee
Ontario Ministry of Municipal Affairs and Housing	Provincial ministry responsible for: <ul style="list-style-type: none"> • municipal affairs, including the co-ordination of programs of financial assistance to municipalities • land use planning / controls and Area Planning Boards in areas with no municipal organization 	Ministry of Municipal Affairs and Housing Act Provincial Policy Statement	Non-point source committee
Grand Council Treaty #3 – Territorial Planning Unit	Inherent indigenous, territorial and treaty rights; responsible for implementing community-based water monitoring, Nibi declaration and watershed planning	Manito Aki Inakonigaawin Treaty #3 Nihi Declaration	Steering Committee Point Source Committee Non-point Source Committee Indigenous Engagement Committee
Treaty #3 Communities	Inherent indigenous, territorial and treaty rights	Manito Aki Inakonigaawin Treaty #3	Steering Committee Point Source Committee

Potential Partner	Relevance to PMP	Relevant Legislation / charter	Potential Role
		Nibi Declaration	Non-point Source Committee Indigenous Engagement Committee
NWO Métis Community - Métis Nation of Ontario	Inherent indigenous, territorial and treaty rights; Community-based water monitoring		Steering Committee Point Source Committee Non-point Source Committee Indigenous Engagement Committee
Municipalities: LRR-SB (Dawson, Rainy River, Morley, Chapple, Emo, LaVallee, Alberton, Fort Frances)	<p>Land use planning within municipality; zoning and by-laws related to environment, waste management, public utilities, drainage and overland flood control (not storm sewers)</p> <p>To manage erosion, municipalities must have policies in their land use planning documents that direct land development away from hazardous areas</p>	<p>Provincial Policy Statement</p> <p>Municipal Act</p> <ul style="list-style-type: none"> • Implementation aspects of Planning Act, Nutrient Management Act, Building Code Act 	<p>Non-point Source Committee (all)</p> <p>Point Source Committee (Fort Frances, Emo, Rainy River)</p>
Municipalities: LOW-SB (Lake of the Woods, Sioux Narrows-Nestor Falls, Kenora)	<p>Land use planning within municipality; zoning and by-laws related to environment, waste management, public utilities, drainage and overland flood control (not storm sewers)</p> <p>To manage erosion, municipalities must have policies in their land use planning documents that direct land development away from hazardous areas</p>	<p>Provincial Policy Statement</p> <p>Municipal Act</p> <ul style="list-style-type: none"> • Implementation aspects of Planning Act, Nutrient Management Act, Building Code Act 	Non-point Source Committee
Lake of the Woods Water Sustainability Foundation	Binational organization working to put a plan in place for Lake of the Woods, ensure enough science and management focus and coordinate actions binationally.		Steering Committee
Lake of the Woods District Stewardship	NGO that provides education on water quality stewardship to its members, environmentally		Non-point Source Committee

Potential Partner	Relevance to PMP	Relevant Legislation / charter	Potential Role
Association	sustainable property management (natural shorelines, reducing runoff)		
Ontario Federation of Agriculture	Advocacy group for sustainable farming and food sector; can provide advice regarding wetland conservation, source water protection, farming BMPs	Nutrient Management Act Agricultural Tile Drainage Installation Act	Non-point Source Committee
Northwestern Soil and Crop Improvement Association	NGO that delivers educational workshops and incentive programs to the Ontario farm community re optimal farm production and stewardship (no local representation)	Canada-Ontario Environmental Farm Plan	Non-point Source Committee
Ontario Cattlemen's Association	Provides leadership to cattlemen regarding farm mentoring, business planning, farm stewardship		Non-point Source Committee
Rainy River District Stewardship Association	Actively engaged in facilitating, developing, supporting, and administering local stewardship activities (e.g. tree planting, role of the farmer in environmental wellness)		Non-point Source Committee
Northern Ontario Farm Innovation Alliance	Non-profit industry organization: hub for information and partnerships for research, innovation, commercialization of agriculture in northern Ontario		Possible resource to non-point source committee
Miisin Integrated Resource Management Co.	Lead partner in forestry management planning for Kenora Forest and Whiskey Jack Forest	Kenora Forest Sustainable Forest License No. 550400 Whiskey Jack Resource Forest Resource License	Non-point Source Committee
Boundary Waters Forest Management Corp.	Lead partner in forestry management planning for Boundary Waters Forest	Forestry License No. 542245	Non-point Source Committee
New Gold-Rainy River Mine	Effluent treated in a tailings management area, water management pond and engineered wetland prior to discharge to the Pinewood River (Township of Dawson and/or Morley)	Environmental Protection Act Water Resources Act Mining Act	Point Source Committee

Remedial Plan Development and Implementation

The development of remedial plans and implementation strategies are essential elements of the PMP lifecycle, although the detailed processes and steps needed to develop and implement specific remedial plans are outside the scope of this PMP framework outline. Remedial plan development will entail a dedicated series of processes, specific to reach the particular goals, objectives, and source allocations set forth in the PMP process, and specific to the nature of source-actions needed.

Much work will be necessary to set the stage and parameters for remedial plans and actions and to develop strategies to support implementation over the long-haul. The requirement, as a key plan element, for follow through with commitment of all parties to develop and implement remedial actions, is foundational to the process. Additionally, the PMP should make recommendations that identify remedial plan needs and potential mechanisms for funding and implementation.

There are significant challenges that will have to be addressed and this will require federal and provincial leadership and engagement. Federal and provincial cooperation is needed to address the lack of local or regional planning authorities and implementation structures (with funding), and the lack of a federal—provincial agreement respecting Lake of the Woods water quality, such as the Canada-Ontario Great Lakes Agreement, that outlines how the governments will cooperate and coordinated efforts to restore and protect the multinational waters of Lake of the Woods.

In addition, there is no “low hanging fruit” where large reductions in phosphorus loads could be achieved through point source regulation. Long-term infrastructure planning and improvements in domestic wastewater systems may provide some benefits, but the incremental reductions will be small. Non-point loads are primarily landscape based, broadly distributed across a vast region and management of these will require engagement of provincial policy and programs. Provincial leadership, and federal support will be required.

In the US portion of the basin, development of remedial plans is well underway. Consideration of the approach in Minnesota is instructive in that it not only provides an example, but also exposes the gaps and challenges to taking analogous action in the Canadian portion of the basin. US federal legislation and state statutes require that plans be developed and implemented to restore Lake of the Woods to water quality standards. All point source allocations in the Minnesota TMDL have already been addressed through revised permits. Non-point source remedial plan development is proceeding on a sub-watershed basis, as part of the State’s One Watershed One Plan program (1W1P), with three plans completed or nearing completion. The 1W1P program supports partnerships of local governments in developing prioritized, targeted, and measurable implementation plans, with planning at the major watershed scale and alignment of local plans with state strategies. Planning is typically led by Soil and Water Conservation Districts, which are political subdivisions of the State, that deliver planning and programs in partnership with landowners, with program funding from the Minnesota Bureau of Water and Soil Resources (BWSR).

Core Monitoring

Long-term monitoring is the keystone of the adaptive management approach in the PMP lifecycle. Detailed specification of a core monitoring program is beyond the scope of this framework document but is included as an integral requirement of the PMP development. The lack of a core monitoring program is a primary challenge to both domestic and multi-national watershed management in the Rainy-Lake of the Woods Basin. A substantial impediment to effectiveness monitoring and adaptive management is the limited availability of long-term, strategically-located, binational balanced, consistent data with harmonized protocols. To be effective, establishment of a core monitoring program must begin early in the process even though its utility is illustrated later the adaptive management aspects of the plan lifecycle roadmap. This is particularly relevant in the case of the Rainy-Lake of the Woods, given that Minnesota has established a PMP for its portion of the basin and begun remedial actions.

A key consideration, that needs to be addressed by all agencies, is seasonal timing of the metric used for assessment (e.g., substance objectives and/or ecological outcomes). The seasonal averages for total phosphorus, used by both Canadian and US agencies, likely does not represent well the conditions when excessive bloom formation occurs— and that phosphorus management is intended to address. Total phosphorus rises substantially in late summer through fall in both southern and north-central basins of Lake of the Woods, coinciding with metrics of peak blooms (i.e., satellite-derived indices of extent, intensity, severity). Consensus on a baseline-time for progress assessment should be an important consideration in core monitoring to support progress assessment and adaptive management.

To date, monitoring has proceeded on a jurisdiction-specific and in many cases, project-specific purpose, without a binational lens on design, nor for the purposes of continuing long-term assessment, management effectiveness monitoring, and adaptive management. As a result, there is a plethora of monitoring sites in some areas of the basin that are monitored inconsistently (both within and between each country) or discontinuous, or without validation to current and future needs. A key tenant of the domestic PMP must be collaboration with US state and federal jurisdictions on the development of a binationally integrated monitoring network with harmonized protocols and that is sustainable for the long-haul.

Proposed segmentation of the Management Plan area is discussed earlier in the framework because the ecological conditions and provincial water quality objectives differ between river and lake environments and there will be different desired outcome goals and metrics for the north and south basins of Lake of the Woods. As such, for long-term assessment of progress, a minimum of four boundary conditions is recommended (see Establishing Boundary Conditions):

- (1) at the outlet of Rainy Lake to the Rainy River, at Fort Frances, ON / International Falls, MN.
- (2) near the outlet of the Rainy River to the southern basin of Lake of the Woods, perhaps at the new location of the international gauging station known as the Wheelers Point gauge (USGS 05137500) or alternatively, upstream at Manitou Rapids where there is an existing long term pollution load monitoring site (MPCA S006-897) as well as a closely located ECCC monitoring station.

(3) a site (or amalgam of sites) representing conditions in the southern basin / Big Traverse Bay of Lake of the Woods.

(4) the outflow from Lake of the Woods to the Winnipeg River, at Kenora.

However, core monitoring needs are likely more than just the boundary conditions articulated above, and should be considered as only the bare minimum required for effectiveness monitoring, particularly given the substantial seasonal and spatial variability in phosphorus in Lake of the Woods, and in particular the Big Traverse (see Appendix A —Phosphorus Conditions in Lake of the Woods and Rainy River). As well, consideration should be given to also include key tributary monitoring, particularly given the potential role of land use and BMP actions to reduce erosion and runoff loads from land use.

We are not starting with a blank sheet of paper in the basin. A binationally-balanced core monitoring program has been previously recommended, and much background work has been done already to outline elements of a core monitoring framework and gaps to be filled (e.g., IJC PoS 2015, SOBR 2009 & 2014; Baratono & Story MPCA unpubl. 2013, IMA 2019). The goal is to establish consensus among relevant agencies on performance indicators and a sustainable core monitoring program of strategically located, representative stream and lake sites that are sampled in a consistent and systematic manner, with harmonized protocols, over the long term, to support effectiveness monitoring and future adaptive management. This work needs to be completed. We recommend as part of a domestic PMP that Canadian jurisdictions collaborate through the IMA and IJC watershed board to review and rationalize the inventory of monitoring locations, identify gaps and needs, costing, and reach consensus on harmonization of protocols.

Government agencies have finite capacities and with agency budgets continuing under strain, integration of community-based monitoring into design of a network may be a valuable consideration. Key resources and capacity to engage include the Grand Council Treaty #3 Community Based Monitoring Program and developing Guardians program, which could provide monitoring resources, capacity, and collaborative data governance through a geospatial portal that it is developing. For many years, the Ontario Lake Partner Program and the Minnesota Citizen Lake and Stream Monitoring program have supplemented agency data and should be considered as well.

Reporting and Accountability

Restoring and protecting the water quality of Lake of the Woods will require long-term commitments and investments from governments, rightsholders, individuals and organizations. Progress will not happen overnight, and reporting is a cornerstone of maintaining engagement of all parties and support for actions. Transparency is a central tenant of the trust that all must have in the long term benefits of actions, even when immediate benefits are not apparent at shorter time scales. A regular review cycle with reporting and engagement with the public and Indigenous Nations must be an essential part of the PMP and provide information for adaptive management decisions in the future.

Reporting at multiple time scales is recommended. A mixture of ongoing reporting (e.g., satellite tools) and periodic progress assessments and public reporting against boundary conditions should be developed, based on development of the core monitoring program.

Satellite tools developed by ECCC hold much promise and can provide near real-time tracking of algae blooms and derived indices of extent, intensity and severity. These data are reported on a daily basis which provides engaging snapshots of conditions but may be more useful compiled both as growing season average and maximum indices. These seasonal indices may prove useful over longer timescales (i.e., decadal or longer) in progress assessment, given the substantial variability within shorter time periods, with climatic and wind influence on surface bloom formation.

Domestic reporting should be integrated with the other jurisdictions to provide a comprehensive view of progress towards boundary conditions and ecological objectives. Consideration should be given to harmonizing reporting with Minnesota, which has a 10-year major assessment and adaptive management cycle, combined with annual public accountability reporting of previous year results, actions and investments. Minnesota's first Lake of the Woods major assessment is scheduled to start in 2023 and in 2028 for the Lower Rainy River subbasin.

In developing a harmonized reporting program, consideration should be given to approaches in other jurisdictions, including possible roles for the IJC Rainy-Lake of the Woods Watershed Board in providing binational progress reporting, as it does on the Great Lakes, and the Blue Accounting portal approach managed by the Great Lakes Commission for the Great Lakes.

Appendix A — Phosphorus Conditions in Lake of the Woods and Rainy River

Lake of the Woods — It is difficult to describe average conditions with respect to TP in LoW because there is both seasonal and between-year variations in TP concentrations coupled with extreme observed spatial variation. However, understanding this variation across the lake is important to planning decisions about setting water quality objectives, loading targets, and decisions around management approaches to individual subbasins.

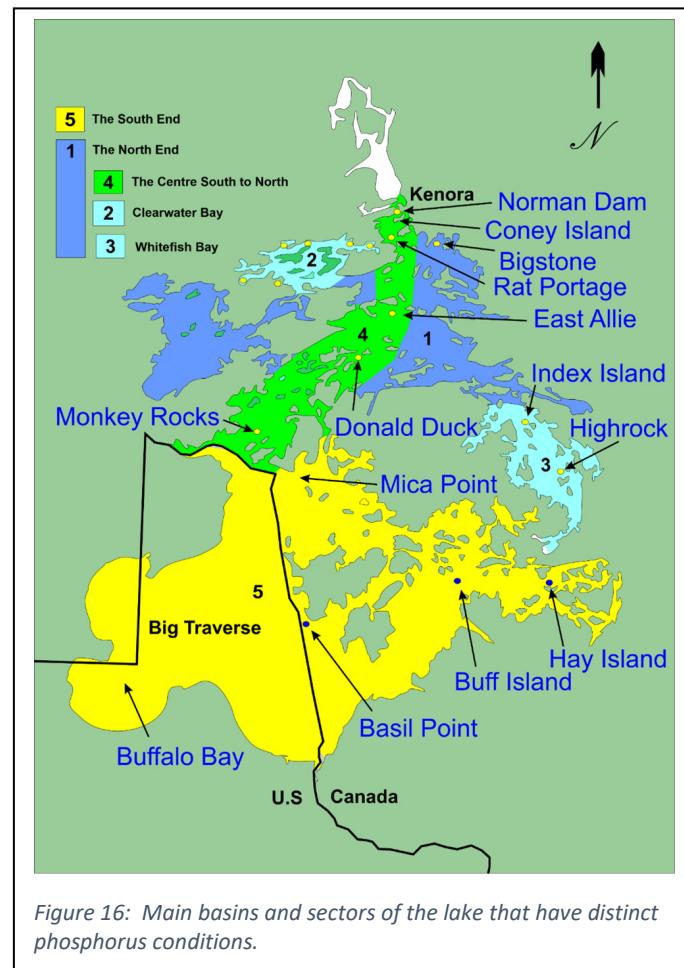
The lake can be generally divided into two main basins – one is fairly homogeneous (south), the other is fairly convoluted (north) with multiple sub-basin sectors with differing TP.

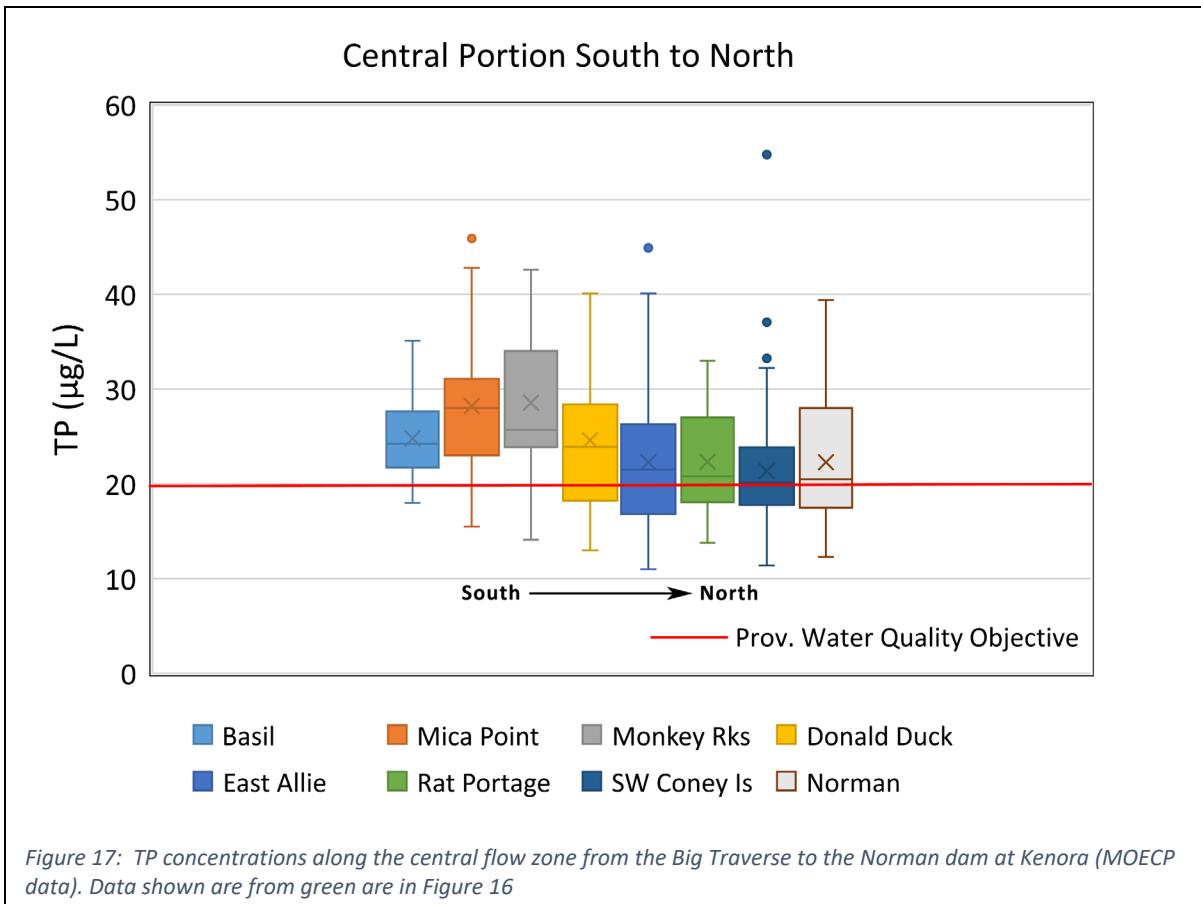
The south basin, shown as the yellow area (5) in Figure 1, receives water from the Rainy River, the local sub-watershed and other sources including internal loading and shoreline erosion. This water is nutrient-rich, and the south end of the lake reflects this high concentration of TP with its high productivity and elevated tendency to support algal blooms.

In the south basin, phosphorus concentrations are lower in the spring and increase throughout the summer and into the late fall. Data from the MN TMDL study show concentrations in the south basin exceeding the State criteria of 30 µg/L by mid-summer and continuing to rise, reaching much higher levels by late fall.

In the northern portion of the lake, the nutrient-rich water from the south flows like a river to the outflow at the Norman Dam in Kenora – this is shown as the green area (4) in Figure 1. This area through the central portion of the lake has a range in TP concentrations from higher in the south to lower at the north.

Averages and ranges in TP for eight sample locations along this central south–north flow zone are summarized by boxplots in Figure 17. Most of the concentrations are above 20 µg/L but they are generally closer to 30 µg/L in the south and closer to 20 µg/L in the north, exiting the outflow to the Winnipeg River at Kenora at a open-water season average TP of 23 µg/L.





These averages in the central-north zone are driven by a distinct seasonal pattern (Figure 3) of high TP in the spring, decline through summer followed by progressive increases to higher values again in the fall (there are no winter data, but fall peak is presumed to connect with the spring). With concentrations above 20 $\mu\text{g}/\text{L}$, this zone is at elevated risk for harmful algal blooms, particularly in the late summer through late fall.

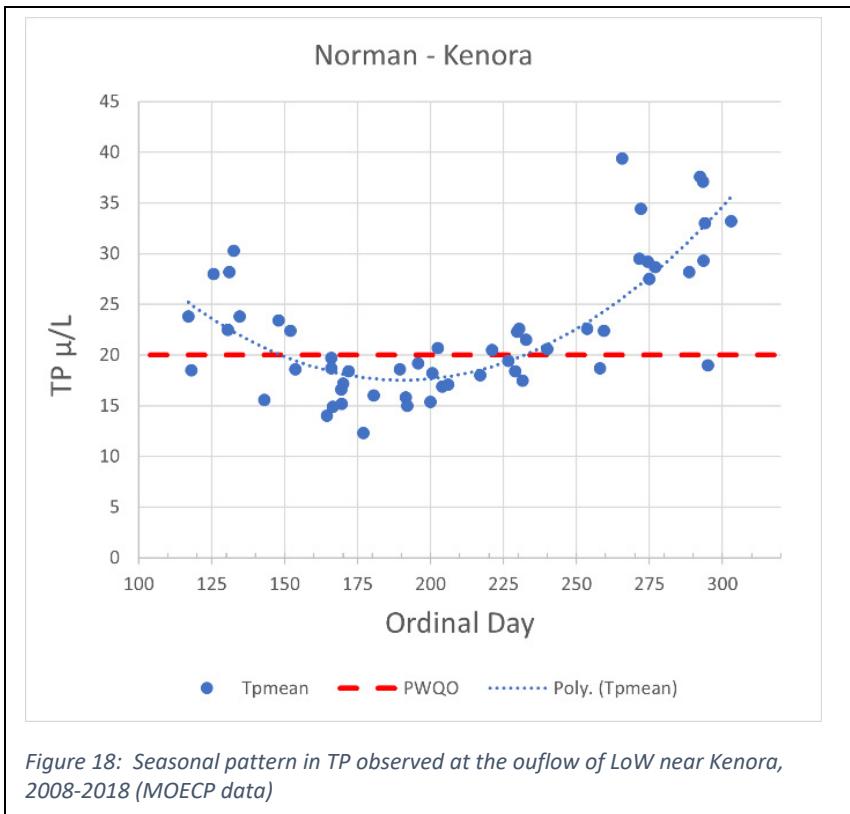


Figure 18: Seasonal pattern in TP observed at the ouflow of LoW near Kenora, 2008-2018 (MOECP data)

These datasets highlight the importance of including seasonal ranges in any discussions around average conditions. These data also stress the importance of examining the TP concentrations in the lake at those times when algal blooms are most likely to occur. These will be important considerations in establishing objectives metrics, and sampling protocols for assessing effectiveness of remedial actions.

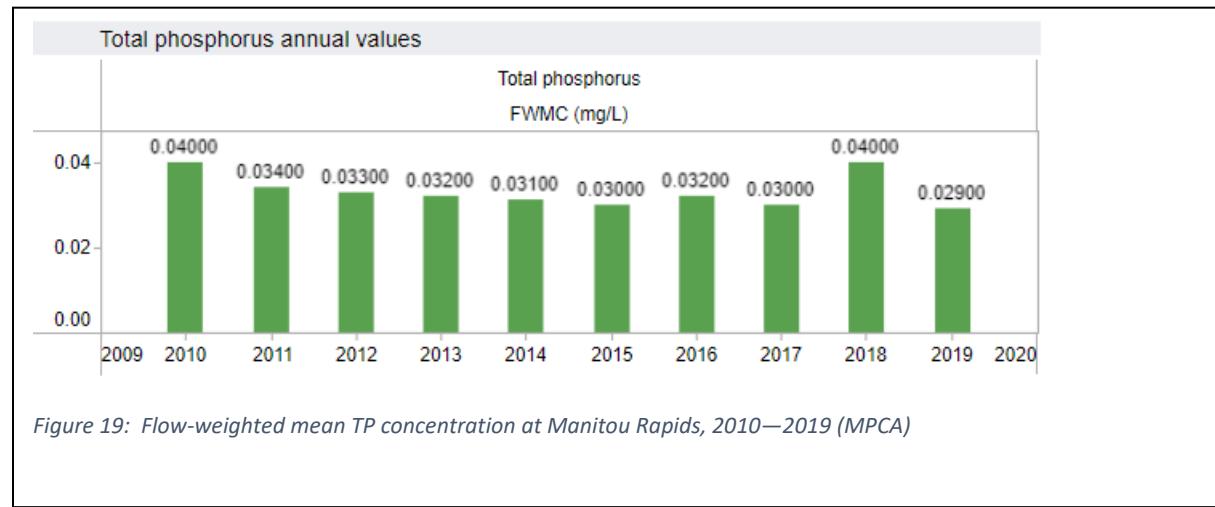
The rest of the northern main portion (Figure 1, dark blue) has phosphorus concentrations generally around 20 $\mu\text{g}/\text{L}$ or slightly higher and this is mesotrophic water which may or may not support nuisance algal blooms.

At the northwest and northeast of the main northern based, there are two isolated bays (light blue in Figure 1), the Ptarmigan-Clearwater Bay area (2) and Whitefish Bay (3) respectively, that both have very low TP concentrations in the 10-13 $\mu\text{g}/\text{L}$ range. These areas are influenced by local watershed sources rather than the nutrient rich flow from the Rainy River and south basin of the lake.

Rainy River — It is difficult to describe mean concentrations of any parameter in the river environment due to daily and seasonal variations in runoff and river flow, which are not captured in monitoring programs with calendar-based sample intervals, especially if sample intervals miss the high flow and high TP concentration events of the spring freshet or instantaneous peak flows caused by storms. On the Rainy River, TP daily concentrations have been recorded over 200 $\mu\text{g}/\text{L}$ in the March-April freshet period. Flow-weighted means likely provide the best estimate of ambient concentration over time, aggregating the impact of variations in both concentration and hydrologic flow.

The MPCA maintains a long-term monitoring program at Manitou Rapid with near daily sampling. At this site, flow weighted mean TP has remained remarkably consistent over the past decade, with an

average of 33 µg/L, which meets Minnesota's river objective and slightly exceeds the Ontario objective for rivers (30 µg/L) and Minnesota's receiving water objective (30 µg/L) for Lake of the Woods.



The Manitou Rapids site is located about 60 km downstream of Fort Frances / International Falls and thus, does not capture the additional loads from both Countries to the Rainy River from the further 74 km of river downstream to Lake of the Woods. However, it captures the major point sources and the largest tributary load (the Little Fork R.) and is likely the best currently available estimate of TP in the Rainy River. A better pollutant load monitoring station location downstream, closer to the river's outlet to Lake of the Woods, might be considered as part of an integrated core monitoring program (see Core Monitoring).

Rainy River Headwaters — The Rainy River headwaters are largely undeveloped and show generally dilute water with TP concentrations below 20 µg/L. This area does not have, nor does it need, areas that should be considered for TP load reductions. More information about TP concentrations in the headwaters of the Rainy River are available in the State of the Basin Report series (Editions 1 through 3) and are examined in the Minnesota TMDL report (reference).