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Red Lake River (Thief River Falls-Crookston) and Black River EPA Nine Element Plan

Federal Clean Water Act Section 319 Small Watersheds Focus Grant Workplan

MINNESOTA POLLUTION CONTROL AGENCY

CLEAN WATER LAND & LEGACY AMENDMENT

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Executive summary

This plan was developed to fulfill the requirements set forth by the U.S. Environmental Protection Agency (EPA) for recipients of grants appropriated by Congress under Section 319 of the Clean Water Act (EPA 2013). The requirements emphasize the use of watershed-based plans that contain the nine minimum elements documented in the guidelines and EPA's *Handbook for Developing Watershed Plans to Restore and Protect our Waters* (EPA 2008).

This plan builds on the foundation of many levels of planning efforts, water quality conditions, implementation goals and activities and an evaluation approach for the watershed. With the EPA approval of the plan, the plan will set the stage to further the previous and current restoration activities and continue efforts on to achieve the water quality goals in the watershed.

Through the efforts of the One Watershed One Plan (1W1P), the Red Lake River partners developed a plan for the Red Lake River Watershed. The partners prioritized areas during that process and continued a strong working relationship. The Black River, County Ditch (CD) 96, and the mainstem of the Red Lake River between Thief River Falls and Crookston, Minnesota, was selected to be the priority are to write and implement a nine-element watershed based plan.

The preliminary work, completed during the 1W1P process, identified plans and projects for approximately 10% of TSS reductions. For the purposes of this plan, the partners focused on the smaller watersheds to develop a detailed plan to achieve all the needed estimated reductions to achieve water quality standards in all three areas. If fully implemented as plan, all three watershed will have enough reductions to meet water quality standards in 10 years.

1. Introduction

The Red Lake River (Thief River Falls to Crookston, Minnesota) and Black River Watersheds (Planning Area) includes three waterbodies with eight assessed stream reaches and 16 impairments. Five of these impairments are for mercury, which fall outside the usual NPS BMPs. Those impairments are addressed via the Implementation Plan for Minnesota's Statewide Mercury total maxium daily load (TMDL). The remaining 11 impairments will be addressed through this plan. The watershed includes four waterbodies that are assigned to 9 reaches that have not been formally assessed.

The goal for this Planning Area is to meet water quality standards for each watershed. The Red Lake River Management Team chose the Planning Area for the Section 319 Small Watersheds Focus Program because the contributing streams are considered "nearly/barely." Streams that are impaired are barely impaired, or impaired but close to meeting the water quality standard, which increases the likelihood of successful restoration. Other streams are not considered impaired, but may be bracketed by impaired reaches or analysis shows a trend toward failing to meet water quality standards.

1.1 Document overview

The intent of the Red Lake River (Thief River Falls-Crookston) and Black River EPA Nine Element Plan (NKE Plan) is to concisely address the nine elements identified in EPA's Handbook for Developing Watershed Plans to Restore and Protect our Waters (EPA 2008 are critical to preparing effective watershed plans to address nonpoint source pollution. The EPA emphasizes the use of watershed-based plans containing the nine elements in Section 319 watershed projects in its guidelines for the Clean Water Act Section 319 program and grants (EPA 2013). The plans for implementation will achieve the reductions needed for the identified waterbodies to meet water quality standards in 10 years.

This plan's foundation is the data collection, analysis, and development of plans from multiple sources and scales. Most of the monitoring and planning efforts sponsored by the state (IWM, impairment assessments, TMDLs, WRAPS, 1W1P, etc.) are conducted and reported on a HUC 8 level. These foundational efforts provide the support and understanding to develop the very targeted and detailed Focus Grant Workplans for small watersheds. Instead of overall strategies, this Focus Grant Workplan will delve into specific and targeted actions to achieve water quality goals in the Planning Area. This NKE Plan will also discuss further monitoring (Section 6) to evaluate the performance of the BMPs and to help guide the future of the plan.

This Grant Workplan is intended to be a living document. Through the initial development, first steps of implementation, and the final data collection, this road map is intended to change, react, and correct the course of watershed implementation in the watershed. This is only the first step along the path to water quality goals in the Planning Area.

The intent of the nine elements and the EPA watershed planning guidelines is to provide direction in developing a sufficiently detailed plan at an appropriate scale so that problems and solutions are targeted effectively to increase the likelihood of making a measurable change in water quality. The nine elements are listed in Table 1 along with the section of this report in which each nine element can be found.

Table 1. Nine elements and applicable report section

Section 319 Nine Element	Applicable Report Section
a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan.	Section 4.4: Stressor identification Section 4.5: Pollutant source assessments Section 4.6 TMDLs
b. An estimate of the load reductions expected from management measures.	Section 5: Management strategies and activities
c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in element b, and a description of the critical areas in which those measures will be needed to implement this plan.	Section 2: Planning areas Section 5: Management strategies and activities
d. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.	Section 5: Management strategies and activities (Tables in each subwatershed) Section 5.4 Potential funding sources
e. An information and education component used to enhance public understanding of the project and encourage the public's early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.	Section 5.5: Information/Education Activities Milestones included in specific strategies tables in each subwatershed
f. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.	Section 5: Management strategies and activities
g. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.	Section 5: Management strategies and activities (subwatershed goals, milestones tables)
h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.	Section 5: Management strategies and activities (subwatershed goals, milestones tables) Section 7: Monitoring
i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item h immediately above.	Section 7: Monitoring

1.2 Planning purpose and process

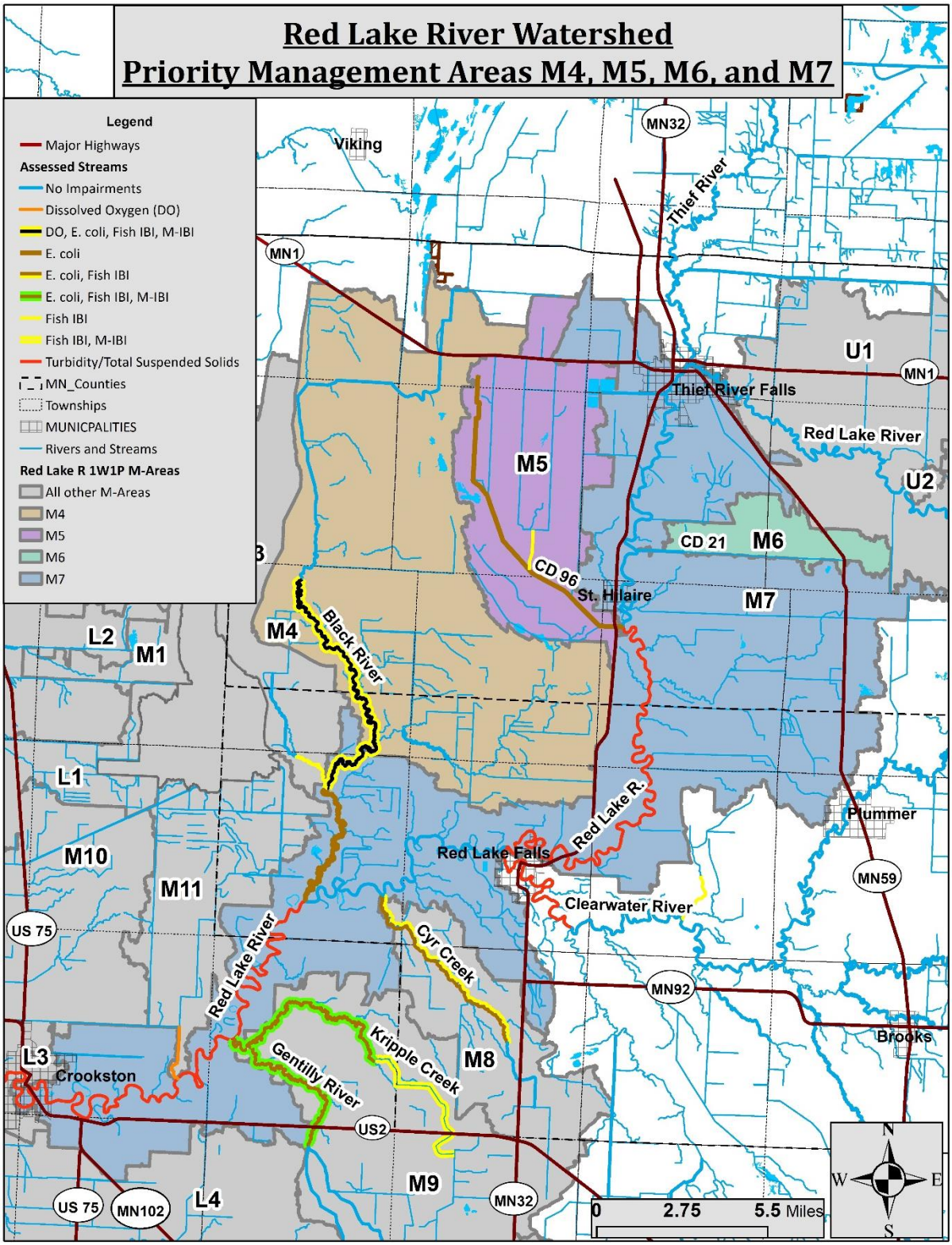
Water planning in Minnesota occurs at several levels and through various programs. The large size of the Red Lake River drainage area with the inclusion of three HUC8 watersheds results in a complex planning structure. The Red Lake Watershed District (RLWD) includes the entire drainage basin of the Red Lake River and its tributaries, including Clearwater River and Thief River. The counties included in this area are Red Lake County and parts of the following counties: Beltrami, Clearwater, Itasca, Koochiching, Mahnomen, Marshall, Pennington, Polk and Roseau. In addition, the RLWD geographically encompasses a major portion of the Red Lake Reservation. The Red Lake Nation is a sovereign nation of the Red Lake Band of Chippewa Indians, wherein neither the RLWD nor the State of Minnesota has jurisdiction. The RLWD overall plan, county water plans, and the Red Lake River 1W1P address water quantity and other issues in addition to water quality.

The purpose and approach of the Section 319 Small Watersheds Focus Grant Workplan is to synthesize the available information and incorporate the detailed information needed to establish a NKE plan to achieve the water quality goals for a specific portion of the whole Red Lake River Watershed. The portion of the whole watershed addressed in this document includes the Black River HUC10 Watershed, City of St. Hilaire – Red Lake River HUC10 Watershed, and City of Crookston – Red Lake River HUC10 Watershed upstream of the USGS gage at Crookston.

2. Planning areas

This NKE Plan incorporates part of the planning zone and management area geographic divisions used in the Red Lake River 1W1P. The watersheds of this detailed plan are located in the Planning Area and include the Black River, CD 96, and the portion of the Red Lake River mainstem, between Thief River Falls and Crookston, Minnesota (Figure 1). The planning area watersheds were selected because of their barely impaired status, with strong likelihood of being fully restorable. The water quality impairments addressed in the planning area watersheds are described in Section 4.2. The impairments are also shown in the figure below.

Figure 1. Red Lake River TRF to Crookston, Minnesota, Black River, and CD 96 Watersheds and stream impairments



The management areas largely encompass stream or ditch drainage boundaries or portions of the drainage area.

The Red Lake River Watershed partners went through a prioritization process during the development of the 1W1P. Through the public participation process and the development of the plan, the group prioritized these waterbodies described in this NKE Plan. The Minnesota Pollution Control Agency (MPCA) completed assessments, listed impaired waterbodies, and collaborated with the local partners in developing the TMDLs and WRAPS reports for the area. Partners developed a resource management classification to rank and plan their work. The classifications scheme is based on the condition of the resource and was used to assign various management levels. The following are the resource management classification used:

1. High Quality - Un-impaired stream segments furthest from the impairment listing standard for any given parameter
2. Needs Protection - Un-impaired stream segments closest to the impairment listing standard for any given parameter
3. Impaired stream segments closest to the impairment listing standard for any given parameter
4. Impaired stream segments furthest from the impairment listing standard for any given parameter
5. No monitoring data available at the time of plan writing

Partners worked with stakeholders to generate priorities needing protection, impaired but restorable (close to WQS), and significantly impaired (other).

3. Watershed description

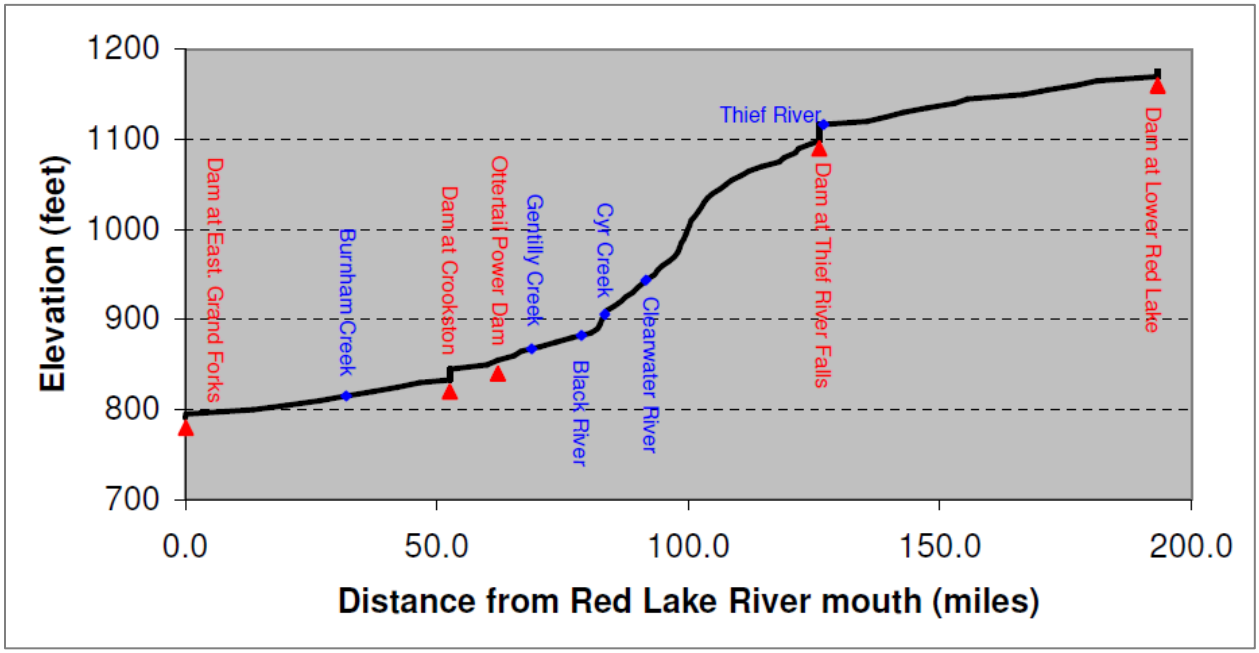
The Planning Area is located in the Red Lake River Watershed, which is part of the Red River Basin of northwest Minnesota. The planning area drains approximately 304 square miles of land in Pennington and Red Lake Counties, with a small portion in Polk County.

Row crop agriculture is prevalent throughout the planning area. Decades of work to clear and drain the wetlands and prairies of the region have resulted in one of the richest agricultural regions in the country. However, conversion to agriculture has come at a considerable cost to the rivers and streams of the region. The Red Lake River is not only a major contributor of water but is also considered to be a major contributor of pollutants to the Red River (NRCS 2008). Today, over 60% of streams in the planning area have been altered to improve drainage. Sediment loading caused by erosion of both stream banks and runoff from surrounding land is a major problem. Although much of the erosion of stream banks occurs primarily during high flows, it is not limited to these times as wind is also a significant mechanism of soil loss, especially given the relatively wide-open nature of this watershed. Although erosion of stream banks is a natural process that takes place under normal conditions in streams, cultural activities that affect the amplitude of discharge fluctuations can exacerbate erosion of stream banks (Waters, 1995). For the Red Lake River Watershed, the combination of minimized riparian zones and hydrological alteration (channelization and tiling) are among the most prevalent of these activities.

3.1 Topography and drainage

The Red Lake River drops approximately 385 feet over its length from Lower Red Lake to its confluence with the Red River (Figure 2), for an average of approximately 2 feet per mile. Overall, the elevation drop of the Red Lake River in the planning area is steeper than the other portions of the river, with an average of approximately 5 feet per mile. The downstream portion of the Red River in the planning area is a higher gradient segment that flows across a series of glacial beach ridges, and riffles and pools are common (Groshens 2005). The upstream portion is relatively lower gradient and parallels the beach ridge.

Figure 2. Red Lake River gradient plot (from Groshens 2005)



3.2 Soils

Soils in the planning area are primarily loam and fine sandy loam, with areas of clay in the Black River Watershed (SSURGO Soils Surface Texture).

3.3 Streams

The major river within the planning area, the Red Lake River, originates from Lower Red Lake in Beltrami County approximately 67 river miles upstream of the planning area. The river flows for approximately 35 miles within the planning area. The Thief River discharges into Red Lake River at the most upstream part of the planning area at the City of Thief River Falls, and the Clearwater River enters Red Lake River at the most downstream part of the planning area at the City of Red Lake Falls. The Red Lake River reaches its confluence with the Red River in East Grand Forks, approximately 92 miles downstream of the planning area. Eventually this water is carried into Lake Winnipeg in Canada through the Red River. The Boundary Waters Treaty of 1909 guides watershed management between Canada and the United States. The text can be found in Appendix A.

Pennington County Ditch 96 flows into the Red Lake River downstream of Saint Hilaire, and the Black River flows into the Red Lake River approximately 13 river miles downstream of Red Lake Falls. The Shirrick Dam was constructed on the Black River in 1984 in Section 35 of Wylie Township in Red Lake County, approximately six miles northwest of Red Lake Falls. The primary purpose of the impoundment is to provide flood relief on the Red Lake River and the Red River of the North by controlling the flow contribution from the Black River. The reservoir has the capacity to detain up to 4,800 acre-feet of water. The Shirrick Dam is an on-channel impoundment. The outlet structure is a barrier to fish passage and negatively affects upstream fish communities.

Groshens (2005) evaluated stream morphology and stability in the Red Lake River Watershed. Although the study did not have monitoring sites in the planning area, some general conclusions can be drawn. Many of the sites are sensitive to changes in hydrology and sediment supply and have high erosion potential. In the less entrenched streams with wider floodplains, vegetation controls stream width-to-depth ration stability. On the more unstable, channelized stream segments, other factors such as altered stream flows have a greater effect on the channel than riparian vegetation.

3.4 Lakes

There are a limited number of lakes and corresponding monitoring data in the planning area. Lakes were not assessed in the Red Lake River Watershed Monitoring and Assessment Report (MPCA 2016) due to insufficient information.

3.5 Wetlands

There are approximately 10,775 acres of wetland in the planning area, or approximately 6% of the planning area. The predominant wetland types are wet meadow (37%), shallow marsh (19%), and shrub swamp (19%). (Data source: NWI Circular 39 Classification)

Prior to settlement, wetlands were much more prevalent and evenly distributed throughout the Red Lake River Watershed. As wetland soil features persist after artificial drainage, soil survey data can be used to estimate historical wetland extent. Poorly and very poorly drained soil drainage classes (which would typically support wetlands) equal 127,816 acres in the watershed—or approximately 66%. Comparing that total to the current NWI estimate reveals that approximately 92% of the historical wetland extent has been lost.

3.6 Groundwater

The planning area is located in the Red River of the North Basin in the Northwest Hydrogeologic Region of Minnesota (Region 3). This basin is composed of thick lacustrine sediments, averaging 150 to 300 feet deep, with up to 95 feet of silt and clay lacustrine deposits underneath left behind by Glacial Lake Agassiz. The lake was formed in the Hudson Bay drainage during the last de-glaciation, leaving behind two distinct hydrogeological features—beach ridges and the lake plain. The beach ridges are remnants of the shorelines of Glacial Lake Agassiz and are characterized by sandy, coarse-textured deposits and disjoined aquifers. In these disconnected aquifers, water collects and moves horizontally through the ridge and forms wetlands and springs at the base. The plain, known as the Lake Agassiz Plain, is composed of glacial till overlying thick lacustrine sediments and is more specifically characterized by glacially-deposited, clay-rich sediments, poorly drained organic soils, peat, and open and wooded wetlands (Lorenz & Stoner 1996). The plain is extremely flat with few lakes, making it highly prone to flooding.

The planning area is located in the groundwater province known as the Western Province. This province is characterized by clayey glacial drift overlying Cretaceous and Precambrian bedrock, which contain a limited extent of sand and sandstone aquifers, respectively (MDNR 2001).

The lake plain aquifers are covered with thick lake deposits that are recharged primarily from an area of stagnation moraines to the east of the Red Lake River Watershed. These areas are where glaciers "stagnated," deposited coarse-grained material, and left behind rough topography. Stagnation moraines are important for regional groundwater recharge in the entire northwestern portion of the state; they average five inches of recharge per year, but can account for up to 10 inches (MPCA 2016).

Groundwater is available primarily through surficial sand and gravel aquifers, buried sand and gravel aquifers, and deeper cretaceous aquifers. Recharge of these aquifers is limited to areas located at topographic highs, areas with surficial sand and gravel deposits, and those along the bedrock/surficial deposit interface. Typically, recharge rates in unconfined aquifers are estimated at 20 to 25 percent of precipitation received, but can be less than 10 percent of precipitation where glacial clays or till are present (USGS 2007). The average annual recharge rate to surficial materials in the planning area is zero to four inches per year.

Surface water withdrawals in this regions are primarily for irrigation and municipal use. The drinking water supply management area (DWSMA) for the city of St. Hilaire is classified as very low vulnerability and covers 210 acres.

3.7 Land cover

Prior to European settlement, the region was primarily prairie grassland. The rivers and streams are mostly low gradient with poorly defined floodplains and drainage areas. Consequently, the watershed was prone to annual flooding. The flooding brought in nutrient rich soil, making the area attractive for agricultural use. Upon settlement, the land quickly gave way to the plow resulting in the conversion from prairie to farmland throughout the watershed. This widespread conversion from prairie to farmland and some urban development leaves the area subject to even more severe and frequent flooding. Today, a majority of the land in the planning area is being used for agricultural production—approximately 76% with about 69% of this being used for cultivated crops (Table 2). The change in land use has resulted in even more severe and frequent flooding.

Table 2. Land cover summary of planning area

Land Cover	Area (%)
Agriculture	75%
Developed	7%
Natural (forest, shrub, grassland)	6%
Open water and wetlands	12%

3.8 Climate and precipitation

The region has a continental climate, marked by warm summers and cold winters. The mean annual temperature for Minnesota is 4.5˚C; the mean summer temperature for the Red Lake River Watershed is 18.3˚C; and the mean winter temperature is -12.8˚ C (MPCA 2016).

The Red Lake River Watershed is located in the northwest precipitation region. Figure 3 and Figure 4 display the areal average precipitation in northwest Minnesota for 20 and 100 years, respectively. An areal average is a spatial average of all the precipitation data collected within a certain area presented

as a single dataset. This data is taken from the Western Regional Climate Center, available on the University of Minnesota Climate website. Although rainfall can vary in intensity and time of year, rainfall totals in the northwest region display no significant trend over the last 20 years. However, precipitation in northwest Minnesota exhibits a statistically significant rising trend over the past 100 years (p=0.001). This is a strong trend and matches similar trends throughout Minnesota.

Figure 3. Precipitation trends in Northwest Minnesota (1992-2012) with five-year running average

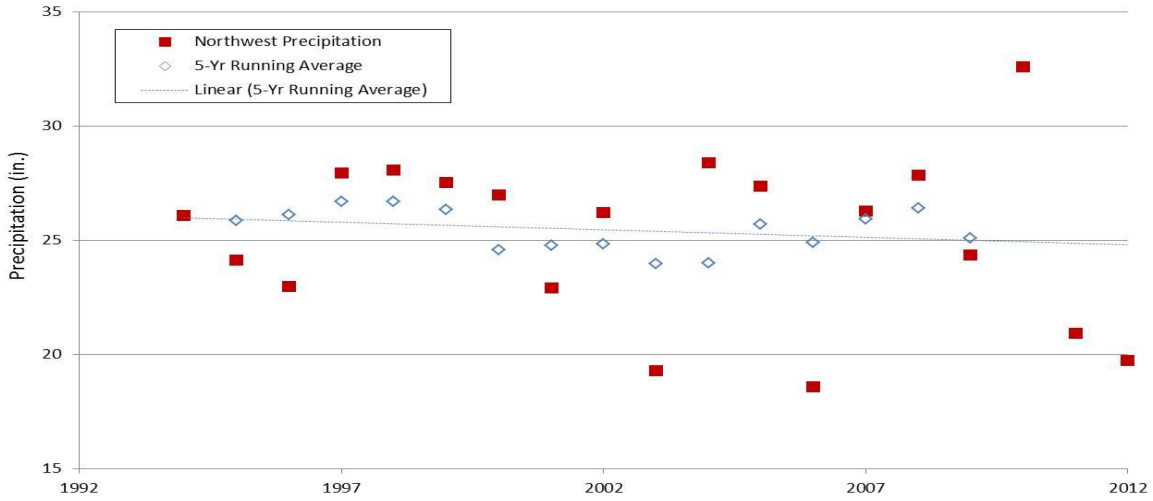
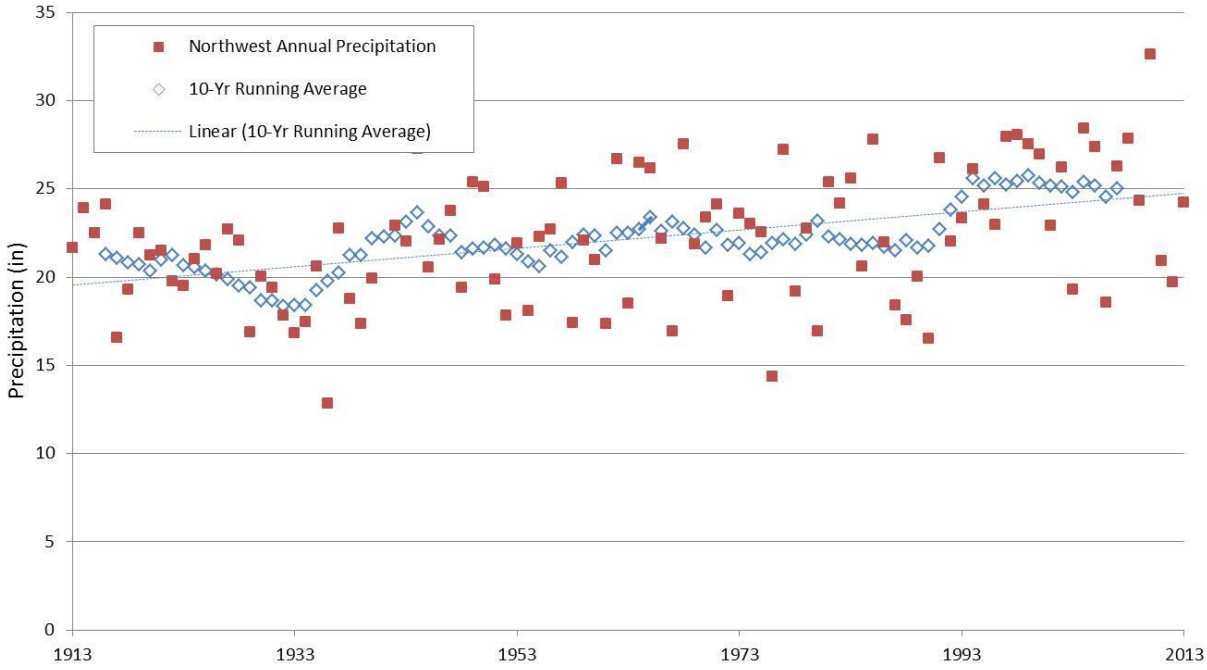


Figure 4. Precipitation trends in Northwest Minnesota (1913-2013) with ten-year running average



4. Water quality and quantity

4.1 Water quality standards

The federal Clean Water Act requires states to designate beneficial uses for all waters and develop water quality standards to protect each use. Water quality standards consist of several parts:

- Beneficial uses — Identify how people, aquatic communities, and wildlife use our waters
- Numeric criteria — Amounts of specific pollutants allowed in a body of water and still protects it for the beneficial uses
- Narrative criteria — Statements of unacceptable conditions in and on the water
- Antidegradation protections — Extra protection for high-quality or unique waters and existing uses

Together, the beneficial uses, numeric and narrative criteria, and antidegradation protections provide the framework for achieving Clean Water Act goals.

Minnesota's water quality standards are provided in Minnesota Rules chapters 7050. All current state water rules administered by the MPCA are available on the Minnesota water rules page (https://www.pca.state.mn.us/water/water-quality-rules).

4.1.1 Beneficial uses

The beneficial uses for public waters in Minnesota are grouped into one or more classes as defined in Minnesota Rule (Minn. R.) ch. 7050.0140. The classes and beneficial uses are:

- Class 1 – domestic consumption
- Class 2 – aquatic life and recreation
- Class 3 – industrial consumption
- Class 4 – agriculture and wildlife
- Class 5 – aesthetic enjoyment and navigation
- Class 6 – other uses and protection of border waters
- Class 7 – limited resource value waters

The aquatic life use class now includes a tiered aquatic life uses (TALU) framework for rivers and streams. The framework contains three tiers—exceptional, general, and modified uses.

All surface waters are protected for multiple beneficial uses.

4.1.2 Numeric criteria and state standards

Narrative and numeric water quality criteria for all uses are listed for four common categories of surface waters in Minn. R. ch. 7050.0220. The four categories are:

- cold water aquatic life and habitat, also protected for drinking water: classes 1B; 2A, 2Ae, or 2Ag; 3A or 3B; 4A and 4B; and 5;
- cool and warm water aquatic life and habitat, also protected for drinking water: classes 1B or 1C; 2Bd, 2Bde, 2Bdg, or 2Bdm; 3A or 3B; 4A and 4B; and 5;

- cool and warm water aquatic life and habitat and wetlands: classes 2B, 2Be, 2Bg, 2Bm, or 2D; 3A, 3B, 3C, or 3D; 4A and 4B or 4C; and 5; and
- limited resource value waters: classes 3C; 4A and 4B; 5; and 7.

The narrative and numeric water quality criteria for the individual use classes are listed in Minn. R. ch. 7050.0221 through 7050.0227. The procedures for evaluating the narrative criteria are presented in Minn. R. ch. 7050.0150.

The MPCA assesses individual water bodies for impairment for class 2 uses—aquatic life and recreation. Class 2A waters are protected for the propagation and maintenance of a healthy community of cold water sport or commercial fish and associated aquatic life and their habitats. Class 2B waters are protected for the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish, and associated aquatic life and their habitats. Both class 2A and 2B waters are also protected for aquatic recreation activities including bathing and swimming.

Protection for aquatic recreation entails the maintenance of conditions safe and suitable for swimming and other forms of water recreation. In streams, aquatic recreation is assessed by measuring the concentration of *Escherichia coli* (*E. coli*) in the water, which is used as an indicator species of potential waterborne pathogens. To determine if a lake supports aquatic recreational activities, its trophic status is evaluated using total phosphorus, Secchi depth, and chlorophyll-*a* as indicators. Lakes that are enriched with nutrients and have abundant algal growth are eutrophic and do not support aquatic recreation.

Protection of aquatic life entails the maintenance of a healthy aquatic community as measured by fish and macroinvertebrate IBIs. Fish and invertebrate IBI scores are evaluated against criteria established for individual monitoring sites by water body type and use subclass (exceptional, general, and modified).

General use waters harbor “good” assemblages of fish and macroinvertebrates that can be characterized as having an overall balanced distribution of the assemblages and with the ecosystem functions largely maintained through redundant attributes. Modified use waters have been extensively altered through legacy physical modifications, which limit the ability of the biological communities to attain the general use. Currently the modified use is only applied to streams with channels that have been directly altered by humans (e.g., maintained for drainage, riprapped).

The ecoregion standard for aquatic recreation protects lake users from nuisance algal bloom conditions fueled by elevated phosphorus concentrations that degrade recreational use potential.

4.1.3 Antidegradation policies and procedures

The purpose of the antidegradation provisions in Minn. R. ch. 7050.0250 through 7050.0335 is to achieve and maintain the highest possible quality in surface waters of the state. To accomplish this purpose:

A. Existing uses and the level of water quality necessary to protect existing uses shall be maintained and protected.
B. Degradation of high water quality shall be minimized and allowed only to the extent necessary to accommodate important economic or social development.
C. Water quality necessary to preserve the exceptional characteristics of outstanding resource value waters shall be maintained and protected.

D. Proposed activities with the potential for water quality impairments associated with thermal discharges shall be consistent with section 316 of the Clean Water Act, United States Code, title 33, section 1326.

4.1.4 Standards and criteria

The stream and lake in the watershed are designated as class 2B waters. The water quality standards and criteria used in assessing the streams and lakes in the planning area include the following parameters:

- *E. coli* – not to exceed 126 organisms per 100 milliliters (org/100 mL) as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies between April 1 and October 31.
- Dissolved oxygen – daily minimum of 5 milligrams per liter (mg/L).
- pH – to be between 6.5 and 9.0 pH units.
- Total suspended solids (TSS) – 65 mg/L not to be exceeded more than 10% of the time between April 1 and October 31.
- Chloride
  - Chronic: 230 mg/L
  - Maximum standard: 860 mg/L
  - Final acute value: 1,720 mg/L
- Stream eutrophication – based on summer average concentrations for the South River Nutrient Region
  - Total phosphorus (TP) concentration less than or equal to 150 micrograms per liter (µg/L) and
  - Chlorophyll-*a* (seston) concentration less than or equal to 35 µg/L or
  - Diel dissolved oxygen (DO) flux less than or equal to 4.5 mg/L or
  - Five-day biochemical oxygen demand (BOD) concentration less than or equal to 3.0 mg/L.
  - If the TP criterion is exceeded and no other variable is exceeded, the eutrophication standard is met.
- Lake eutrophication – based on summer average values for shallow lakes in the western corn belt plains ecoregion
  - Total phosphorus concentration less than or equal to 90 µg/L and
  - Chlorophyll-*a* concentration less than or equal to 30 µg/L or
  - Secchi disk transparency not less than 0.7 meter.
- Biological indicators – The basis for assessing the biological community are the narrative water quality standards and assessment factors in Minn. R. 7050.0150. Attainment of these standards is measured through sampling of the aquatic biota and is based on impairment thresholds for indices of biological integrity (IBI) that vary by use class. Appendix 4.1 in the Cedar River Watershed Monitoring and Assessment Report (MPCA 2012) provides the IBI numeric thresholds.

4.2 Impairments

The Clean Water Act, Section 303(d) requires total maximum daily loads (TMDLs) to be developed for surface waters that do not meet applicable water quality standards necessary to support their designated uses. A TMDL determines the maximum amount of a pollutant a receiving waterbody can assimilate while still achieving water quality standards and allocates allowable pollutant loads to various sources needed to meet water quality standards. Several reaches are listed as impaired for turbidity and fecal coliform bacteria; however, these impairments are now measured by total suspended solids (TSS) and *Escherichia coli* (*E. coli*). This plan will address these impairments through the use of the current TSS and *E. coli* standards.

There are 12 impairments along eight reaches in the planning area (Table 3). The impairments affect aquatic consumption, aquatic life, and aquatic recreation uses based on mercury in fish tissue, dissolved oxygen (DO), turbidity, fish and macroinvertebrate bioassessments, and *E. coli* concentrations. Causes of the fish and macroinvertebrate impairments were investigated in the *Red Lake River Watershed Stressor Identification Report* (MPCA 2015) and are summarized in Section 4.3.3. If the identified stressor(s) is a pollutant (e.g., TSS), and if there is a state water quality standard for that pollutant, a TMDL can be developed. Non-pollutant stressors (e.g., lack of base flow) are not subject to load quantification and therefore do not require TMDLs. All aquatic life use impairments—not just those with associated TMDLs—are addressed in the watershed restoration and protection strategies (WRAPS) report and the 1W1P.

Table 3. Impairments in the planning area from the 2018 303(d) list of impairments

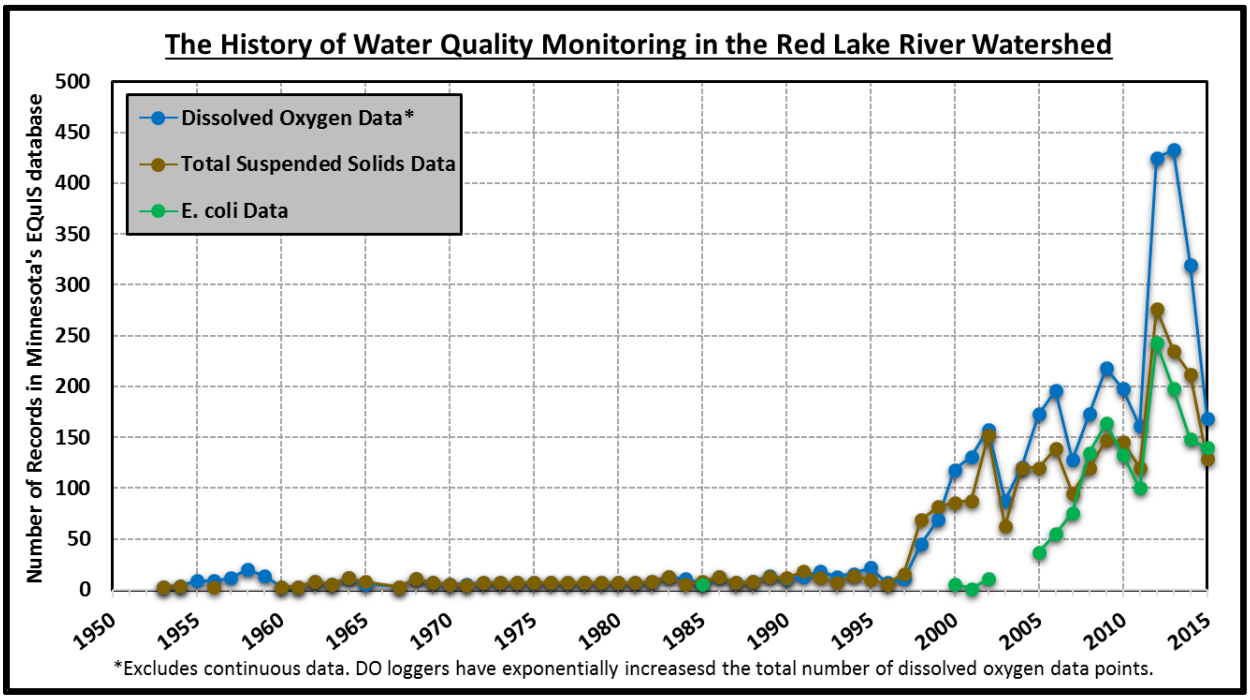
Water body name	Water body description	AUID	Affected designated use	Pollutant or stressor	TMDL
Black River	-96.4328 48.0146 to Little Black R	09020303-558	Aquatic Life Aquatic Recreation	Aquatic macroinvertebrate bioassessments Dissolved Oxygen Fishes bioassessments *E. coli*	No No No Draft 2019
Black River	Little Black R to Red Lake R	09020303-529	Aquatic Recreation	*E. coli*	Draft 2019
Branch 5 of Pennington County Ditch 96	BR 2 CD 96 to CD 96 main stem	09020303-545	Aquatic Life	Fishes bioassessments	No
Pennington County Ditch 96 (76)	Headwaters to Red Lake R	09020303-505	Aquatic Recreation	*E. coli*	Draft 2019
Red Lake River	Black R to Gentilly R	09020303-502	Aquatic Life	Turbidity Mercury	Draft 2019 2007

Water body name	Water body description	AUID	Affected designated use	Pollutant or stressor	TMDL
Red Lake River	County Ditch 96 to Clearwater R	09020303-504	Aquatic Life	Turbidity Mercury	Draft 2019 2007
Red Lake River	County Ditch 99 to Burnham Cr	09020303-506	Aquatic Life	Turbidity Mercury	Draft 2019 2007
Red Lake River	Thief River to Thief River Falls Dam	09020303-509	Aquatic Consumption	Mercury	2007
Red Lake River	Gentilly R to County Ditch 99	09020303-512	Aquatic Life	Turbidity Mercury	Draft 2019 2007

4.3 Water quality summary

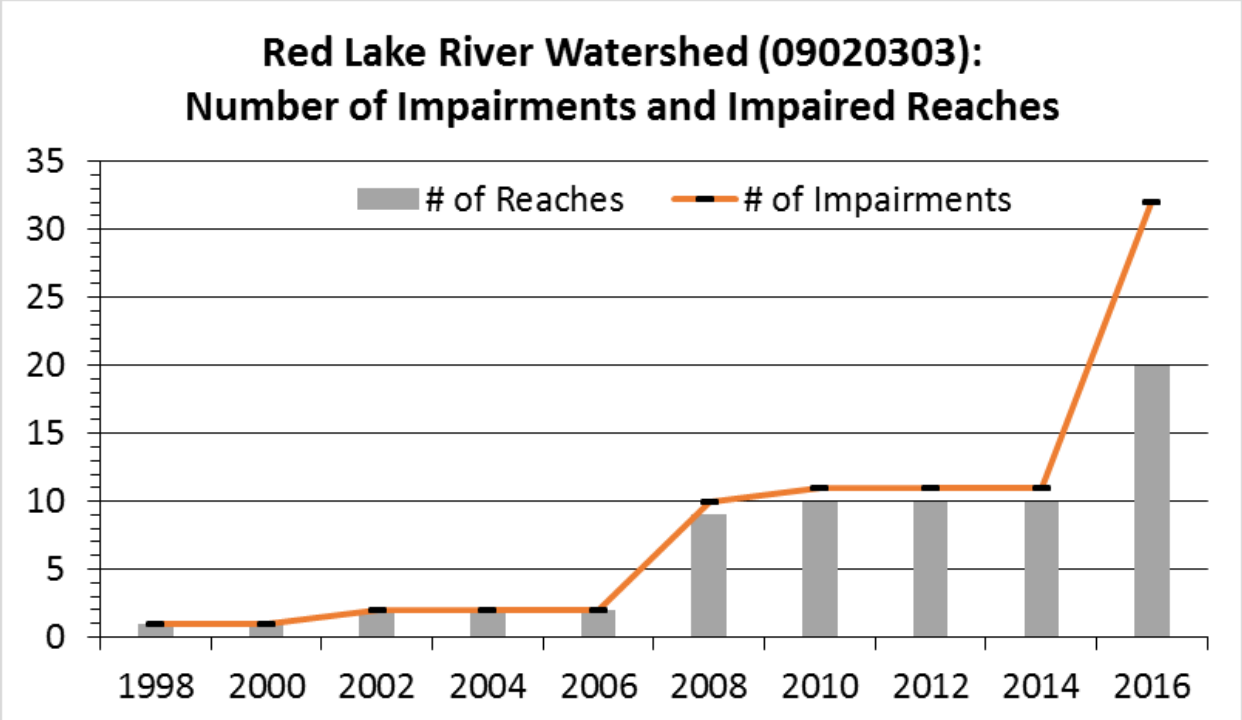
The intensity of monitoring efforts has increased in the last two decades (Figure 5). Increased awareness of the importance of monitoring data collection, monitoring methods, water quality standards, and assessment results have motivated multiple, productive, local monitoring programs (LGUs and volunteers). In the last two decades, through the collaborations of local and state agencies, have collected a cornucopia of data at identified key locations within the prioritized areas of the Middle Red Lake River Watershed. The RLWD collects samples semi-monthly from key sites. The soil water and conservation districts (SWCDs) collect monthly samples from several areas during ice-out. Volunteer monitoring by River Watch programs at schools generates a significant amount of water quality data. State agencies have allocated funding for intensive studies, load monitoring, and supplemental condition monitoring. The scope of monitoring efforts has expanded to include continuous water quality monitoring with deployed loggers, increased local stage/flow monitoring, and MPCA biological monitoring. All data collected by the local and agencies is uploaded to the Minnesota's EQuIS systems.

Figure 5. Historical quantification of WQ monitoring data collection



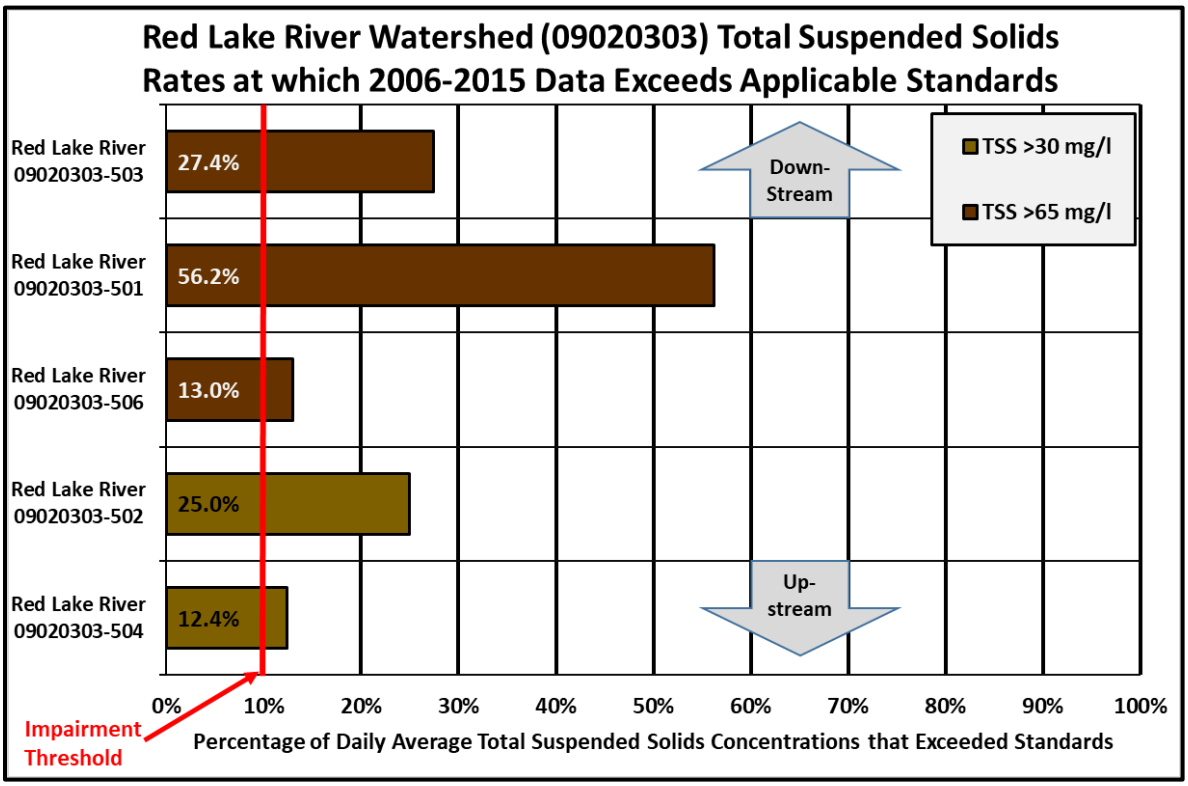
Five reaches were split during the 2014 assessment so that TALU standards could be applied properly. In most cases, a channelized portion of the reach was separated from a natural-channel portion. Local monitoring efforts have expanded in order to attain sufficient data from as many of those new assessment units as possible (draft TMDL, 2019).

Figure 6. Number of impairments and impaired reaches in the RLRW



The TSS through the whole of the Red Lake River generally increases from low to high along the entire river. The TSS impairments are less severe in upstream reaches (Figure 7). The Red Lake River -504 is the reach addressed in this plan.

Figure 7. Rates at which the TSS standard is exceeded in impaired reaches of the Red Lake River (draft TMDL, 2019)

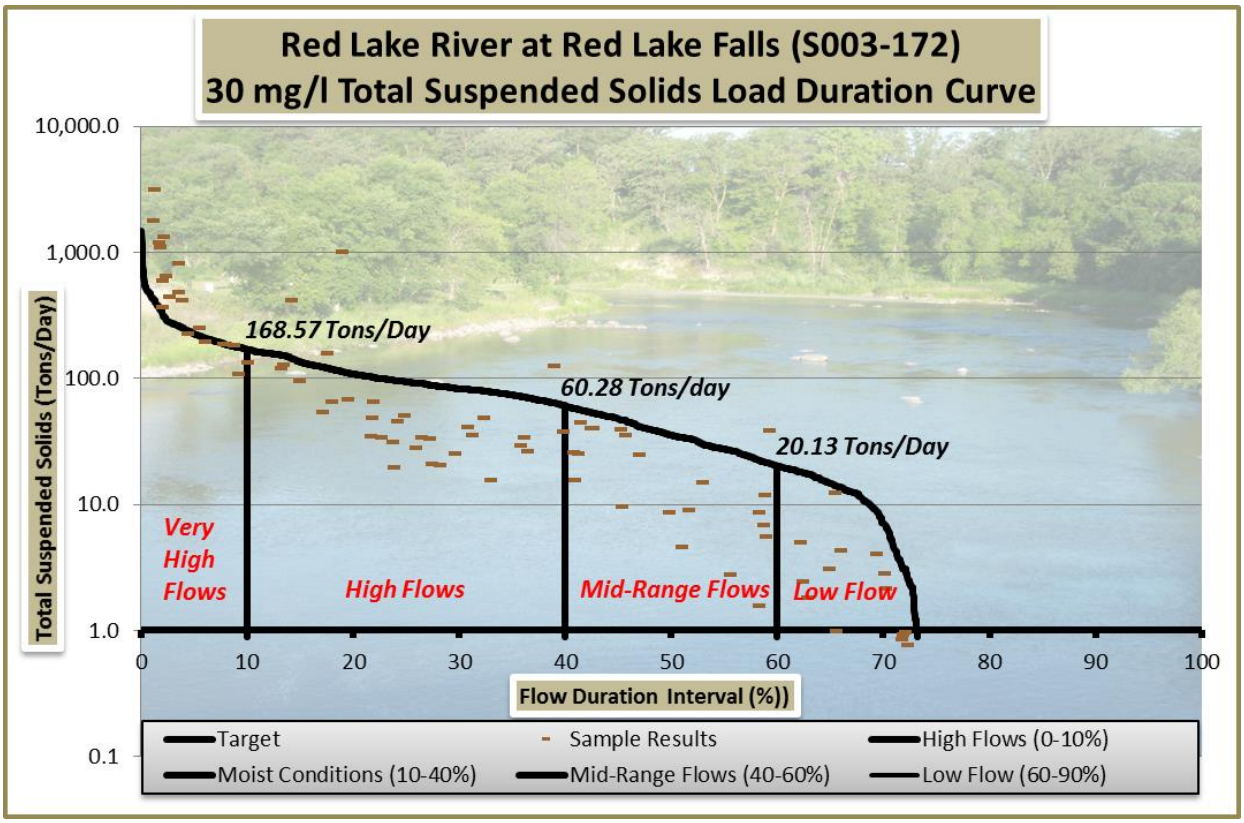


The Red Lake Watershed District (RLWD), MPCA, and project partners collected a large amount of data and other information about the extent of water quality problems, sources of pollutants, and stressors of aquatic life during the Red Lake River WRAPS project. Intensive sampling, longitudinal sampling, deployment of DO loggers, windshield surveys, geomorphic assessment, stressor identification, water quality models, and stakeholder input have all contributed to the current knowledge of stressors and pollutant sources in the watershed.

4.3.1 TSS

One stream reach in the planning area, the Red Lake River from Pennington CD 96 to Clearwater River, has an aquatic life impairment due to high turbidity and TSS. TSS concentrations exceed the 30 mg/L standard primarily under very high and high flows, with only one exceedance under mid-range or lower flows (Figure 8). Biological monitoring indicates that the fish and macroinvertebrate assemblages meet the biological indicators for aquatic life.

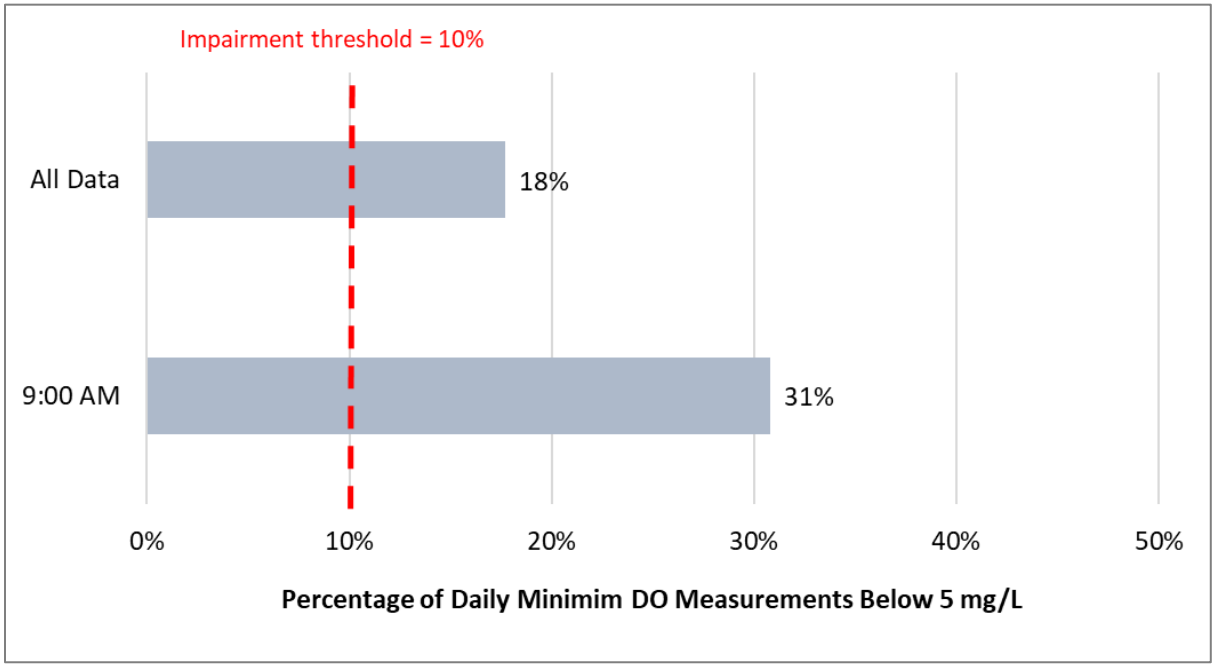
Figure 8. Load duration curve for TSS for the Red Lake River at Red Lake Falls (WID -504; figure from MPCA and RLWD 2019)



4.3.2 Dissolved oxygen

The Black River (WID -558) has an aquatic life impairment due to low levels of dissolved oxygen. 18% of all DO daily minimums were below the 5 mg/L standard, and over 30% of all data taken at 9:00 AM were below 5 mg/L (Figure 9).

Figure 9. Severity of dissolved oxygen impairment on Black River (WID -558; data from MPCA and RLWD 2019)
Data from 2006–2015.



4.3.3 *E. coli*

Concentrations of *E. coli* in surface waters were evaluated against the water quality standard as part of the MPCA's watershed assessment in 2014. Three reaches in the planning area were identified as having aquatic recreation impairments due to high levels of *E. coli*. The monthly geometric mean was exceeded once in Pennington CD96, once in the upstream Black River reach, and during three months in the lower Black River reach (Table 4). The standard was exceeded most frequently in July.

Insufficient data were available to assess the Little Black River (unnamed ditch to Black River, WID -528). However, *E. coli* concentrations were high in the summer of 2015, and the reach might be listed as impaired when additional data are collected (MPCA 2019).

In the three impaired reaches, higher *E. coli* concentrations were observed across all flow regimes that were sampled (Figure 10 through Figure 12).

Table 4. *E. coli* monthly geometric mean concentrations on impaired reaches (data from MPCA and RLWD 2019)
Values in red indicate geometric means that exceed the 126 org/100 mL *E. coli* standard.

Stream Name	WID	*E. Coli* Monthly Geometric Mean Concentration (org/100 mL)				
		May	Jun	Jul	Aug	Sep
Pennington CD96	-505	47	111	264	61	100
Black River, end of channelized reach to Little Black River	-558	11	90	142	111	25
Black River, Little Black River to Red Lake River	-529	67	247	150	42	137

Figure 10. *E. coli* load duration curve for Pennington County Ditch 96 at Highway 32, representing AUID 09020303-505 (from MPCA and RLWD 2019)

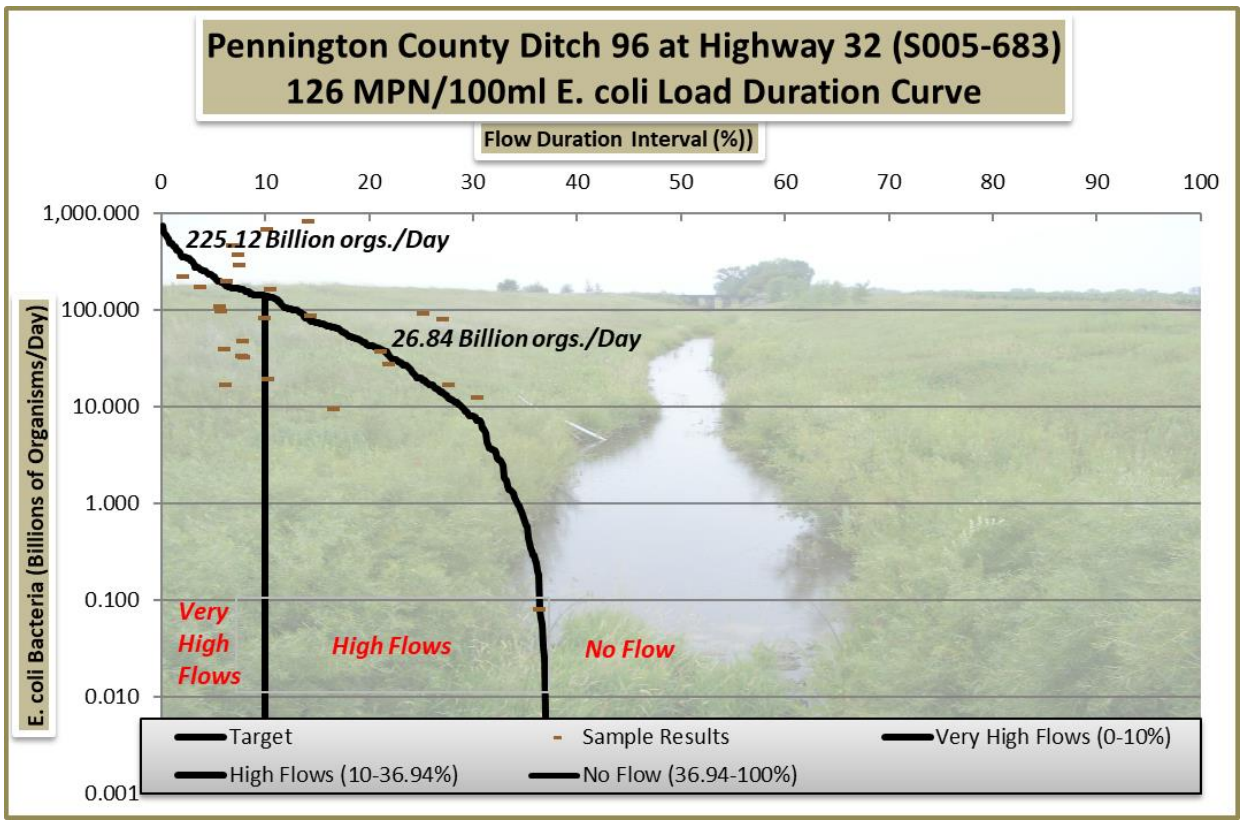


Figure 11. *E. coli* load duration curve for the Black River at CSAH 18, representing AUID 09020303-529 (from MPCA and RLWD 2019)

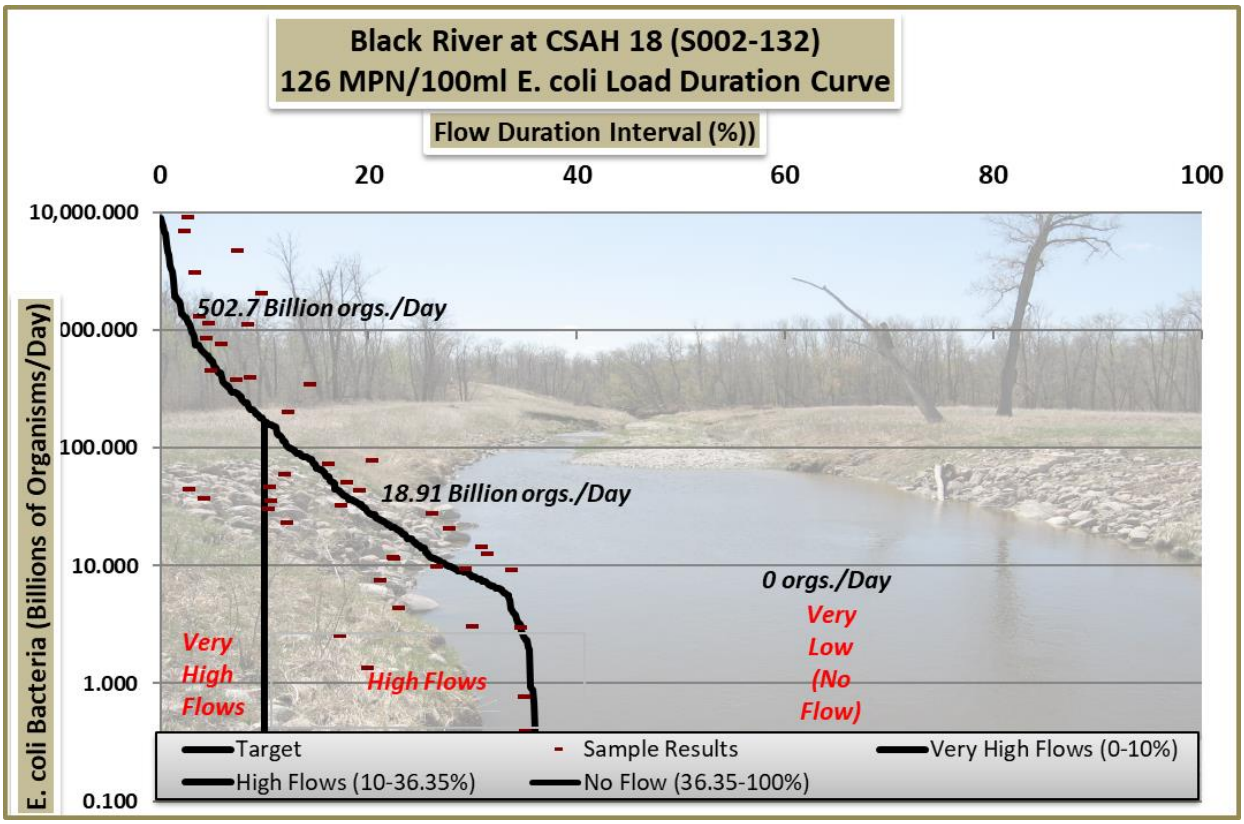
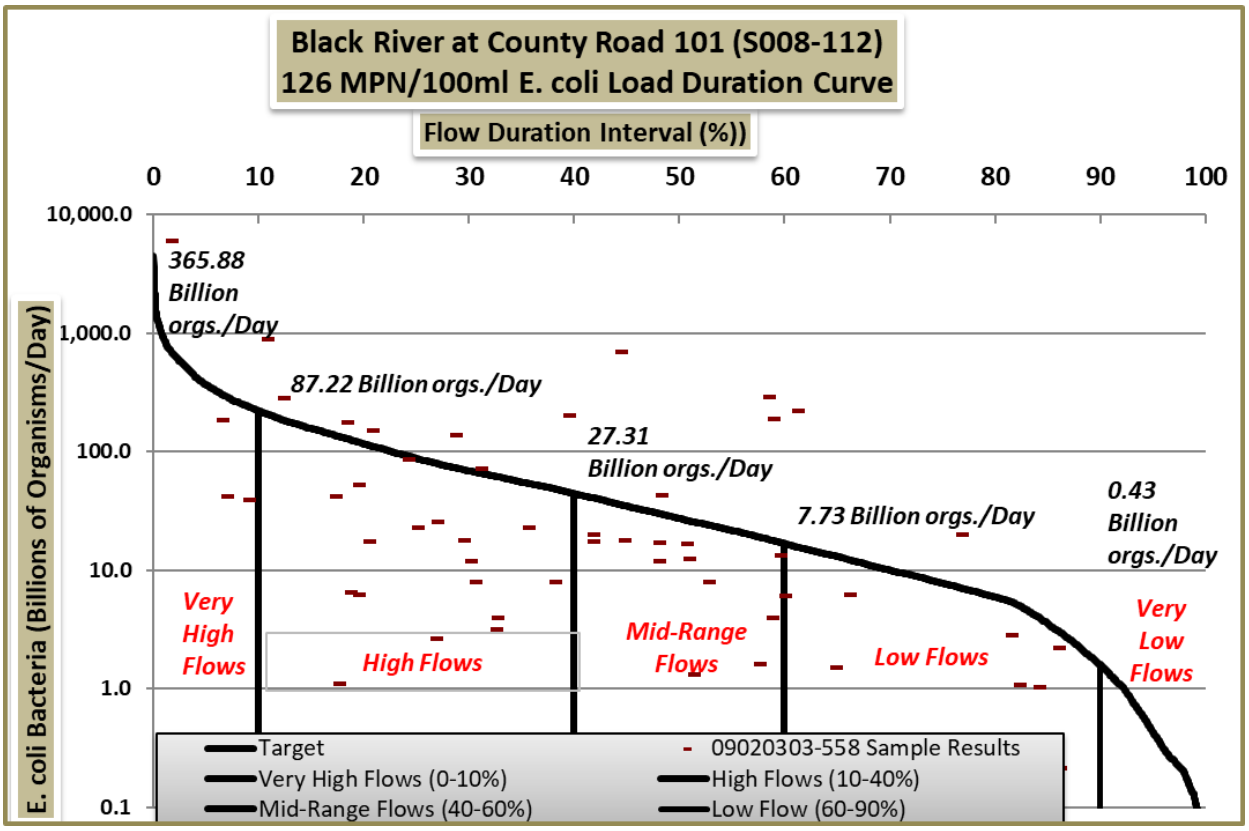


Figure 12. *E. coli* load duration curve for the Black River at Red Lake County Road 101, representing AUID 09020303-558 (from MPCA and RLWD 2019)



4.4 Stressor identification for biological impairments

In order to develop appropriate strategies for restoring and protecting waterbodies, the stressors and/or sources impacting or threatening the waterbodies must be identified and evaluated. Stressors to waterbodies with either fish or macroinvertebrate impairments are determined through a biological stressor identification (SID) process. SIDs evaluate both pollutant and non-pollutant-related (e.g., altered hydrology, fish passage, habitat) factors as potential stressors. If a non-pollutant stressor is linked to a pollutant (e.g., habitat issues driven by total suspended solids (TSS) or low dissolved oxygen (DO) caused by excess phosphorus), a TMDL is required. Non-pollutant stressors are not subject to load quantification and therefore do not require TMDLs. Streams determined to be stressed by degraded habitat and other non-pollutant stressors are not addressed by TMDLs but are still priorities for restoration efforts.

A range of stressors is associated with the biologically impaired reaches in the planning area (Table 5). These stressors are described in more detail in the subsections that follow.

Table 5. Summary of the stressors associated with the biologically impaired reaches in the planning area (MPCA 2015)

	Consistency of Evidence [a]				
Reach Name (WID)	**Loss of Physical Connectivity**	**Lack of Base Flow**	**Lack of Instream Habitat**	**High Suspended Sediment**	**Low Dissolved Oxygen**
Branch 5 of Pennington County Ditch 96 (-545)		+++			+++
Black River (-558)	+++	++	++	+	++

a. +++ Convincingly supports; ++ Strongly supports; + Somewhat supports

4.4.1 Branch 5 of Pennington County Ditch 96 (-545)

The subwatershed of this reach contains three miles of intermittent stream and 27 miles of intermittent drainage ditch (MPCA 2015). 95% of the watercourses in the subwatershed have been hydrologically altered, including the entire stream reach of this one-mile long WID. Cultivated crops are the predominant land cover (68%) in the watershed.

The primary stressors leading to an impaired fish assemblage are lack of base flow and low dissolved oxygen (MPCA 2015). The main channel of CD96 is in need of a grade stabilization project that alleviates the problem of the perched culvert at the Highway 32 crossing. Continuous data collected on County Ditch 96 downstream of Branch 5, field observations, and watershed modeling suggest that the reach is prone to frequent periods of minimal to no flow. Continuous DO sampling during a two-week period in the summer of 2014 showed violations of the DO standard 89% of the time. Fish sampling indicates low DO.

4.4.2 Black River (-558)

The subwatershed of this 14-mile reach is in the beach ridges region. Whereas the reach itself has not been hydrologically altered, 60% of the watercourses in the subwatershed have been either channelized, ditched, or impounded. Cultivated crops are the predominant land cover (78%) in the watershed.

Several factors are stressing the biological assemblages in this reach of the Black River (Table 6). A loss of physical connectivity is the stressor with the highest consistency of evidence. The Schirrick Dam and the associated impoundment is a barrier to connectivity. A private watercourse crossing (e.g., “Texas” crossing) along the reach downstream of this impaired reach also may be a barrier to connectivity. Other stressors include a lack of base flow, low dissolved oxygen, and lack of in-stream habitat. The evidence only somewhat supports high TSS as a stressor to the biota—there are occasional periods of high TSS that could be leading to embeddedness of coarse substrate. A turbidity impairment on a former assessment unit (-530) of the Black River, which included WID -558, was removed in 2016 for this portion of the Black River because the reach meets the TSS standard.

Table 6. Stressors to biota in the Black River, -558 (MPCA 2015, MPCA 2019, HDR 2017)

Stressor	Fish/ Invertebrates	Source/cause	Consistency of Evidence [a]
Loss of physical connectivity	F	Schirrick Dam, "Texas" crossing on lower part of reach	+++
Lack of base flow	F, I	Channel modification of upstream reach (-557)	++
Lack of in-stream habitat	F, I	Areas with poor substrate, channel morphology, land use, and riparian characteristics.	++
High suspended sediment	F, I	Upland erosion; inadequate riparian buffers; streambank erosion	+
Low dissolved oxygen	F, I	Lack of base flow, upstream channelization (-557)	++

b. +++ Convincingly supports; ++ Strongly supports; + Somewhat supports

4.5 Pollutant source assessments

Different from stressors, sources of pollutants are determined through a pollutant source assessment. A pollutant source assessment for pollutant related impairments is provided in the draft TMDL report (MPCA and RLWD 2019), and a pollutant source assessment for TSS and *E. coli* was completed for the entire planning area as part of the WRAPS development (MPCA 2019). Information from both of these efforts is included below, in addition to watershed model outputs.

4.5.1 TSS

4.5.1.1 Point sources

Several point sources contribute sediment to surface waters in the planning area, although the sources are minor and likely do not contribute to sediment impairment. It is assumed pollutant loads from permitted point sources meet the waste load allocations for the entities and no further reductions are required.

Permitted stormwater

Construction stormwater is regulated through an NPDES permit. The annual percentage of land area that is regulated through the construction stormwater permit is less than 0.04% of the planning area. Pollutant loading from construction stormwater is not considered a significant source.

Industrial stormwater is also regulated through an NPDES permit when stormwater discharges have the potential to come into contact with materials and activities associated with the industrial activity. It is estimated that a small percent of the planning area is permitted through the industrial stormwater permit, and industrial stormwater is not considered a significant source

There are no permitted municipal separate storm sewer systems (MS4s) in the planning area.

It is assumed pollutant loads from permitted point sources meet the waste load allocations for the entities and no further reductions are required.

Permitted wastewater

Three permitted wastewater treatment plants (WWTPs) are located in the planning area and discharge to Red Lake River:

- Thief River Falls WWTP (MN0021431)
- Saint Hilaire WWTP (MN0024741)
- 7-Clans Casino WWTP (MN0063452)

It is assumed pollutant loads from permitted point sources meet the waste load allocations for the entities and no further reductions are required. During the development of the TMDL, it was ensured that the permit limits were correctly assigned to meet water quality standards.

4.5.1.2 Stream and ditch bank erosion

Eroding banks along the Red River of the North are sources of sediment to the river. Removal of deep-rooted and woody vegetation can lead to sloughing and mass wasting of stream banks. Additionally, increased drainage of agricultural land in the Red River Valley and record precipitation have led to frequent and significant flooding, which have caused river channels to down cut and widen. This has led to an increase in the number of slope failures across the Red River Valley (Rush et al. n.d.).

The following reaches in the planning area have eroding river and stream banks (MPCA 2019):

- The Red Lake River between Hwy 32 and Old Crossing Treaty Park (starts at the downstream end of -504 and extends downstream of the planning area)
- 6.3 miles of the Red Lake River downstream of the southern edge of Thief River Falls (48.092769/-96.186071 to 48.040046/-96.210036)
- Black River, downstream of CSAH 18

Erosion rates were measured along some of these reaches; erosion rates were highest along the TSS-impaired reach (Table 7). Stream and ditch bank erosion is often an increased problem in channels that are unstable. Channel incision is often associated with the unstable state. High flows, especially flood flows, are then confined within the incised channel and do not extend into flood plain areas, dissipating the energy. The areas of greatest risk are identified in the bulleted list above. Table 7 provides estimated erosion rates using the BANCS model for the three critical sites.

Table 7. 2012 erosion estimates using BANCS model (MPCA 2019)

River	Reconnaissance Reach	WID	TSS Impairment	Length (mi.)	Erosion Volume (yd^3/yr)	Erosion Mass (ton/yr)	Erosion Rate (ton/mi-yr)	Pfankuch Stability Rating
Red Lake River	Mark Blvd to Hwy 32/CR7	-513	No	3.8	1,545	2,009	529	Stable
Red Lake River	Hwy 32 to Sportsman's Park near Red Lake Falls	-504	Yes	4.9	6,144	7,988	1,630	Stable
Black River	CSAH 18 to Red Lake River	-529	No	0.95	238	310	326	Unstable

Outlets of public drainage systems can also be a TSS source. Headcutting, gully formation, instability, and mass wasting occur along some outlets of drainage systems that discharge to streams. Pennington County and Red Lake County are in the process of conducting ditch inventories. Ditches will be prioritized for BMP implementation based on the magnitude of need for side water inlets and buffers.

Sediment yields from bed and bank erosion were estimated with the Hydrological Simulation Program–FORTRAN (HSPF) watershed model (RESPEC 2014). Bed and bank erosion represents approximately 44% of the sediment load in the planning area. A watershed model developed with the Soil and Water Assessment Tool (SWAT) also found that instream erosion contributes significantly to sediment loading in the Red Lake River Watershed (Glazewski and Kurz 2011).

4.5.1.3 Overland erosion

Overland erosion can be a sediment source primarily due to gully erosion from cultivated fields and unstable and eroding ditch outlets. The HSPF watershed model indicates that overland erosion represents approximately 56% of the sediment load in the planning area.

4.5.1.4 Wind erosion

Wind erosion can be a source of sediment in the planning area, particularly in the spring and early summer. The Red River Valley in general is susceptible to wind erosion due to its flat topography, tillage depth and intensity, residue and vegetative cover, crop selection, and natural carbonates at the surface. In the planning area, wind erodibility on average is highest in the Pennington CD96 watershed and portions of the Black River watershed. A study of six field ditches in western Minnesota found on average 9.1 tons of soil accumulated per acre of road ditch (DeJong-Hughes et al. 2011).

4.5.1.5 Stormwater runoff

Stormwater runoff from the City of Thief River Falls can transport sediment to surface water. The City of Saint Hilaire and part of the City of Red Lake Falls are also in the planning area, but to a lesser extent. Stormwater runoff from these cities is considered nonpoint because the stormwater is not regulated through the MS4 permit. The HSPF watershed model indicates that stormwater runoff represents approximately 3% of the sediment load in the planning area. Although overall the contribution from stormwater runoff is low, it could be having localized effects on surface water quality.

A Stormwater study for the city of Thief River Falls was completed and Stormwater BMPs were identified in the *Thief River Falls Water Quality Study* in 2017 even though they are not designated as a MS4. Stormwater in Thief River Falls will be addressed through continued monitoring and voluntary practices.

4.5.1.6 Drainage

Sediment loading from subsurface tile drainage systems in fields is not a significant source of TSS given that surface inlets are rarely used in the watershed. Erosion at tile outlets into streams and ditches is a potential source if the outlet erosion is not controlled.

4.5.1.7 TSS source summary

Most of the exceedances of the TSS water quality standards coincide with high and very high flows. This, along with the HSPF modeling results, indicates that nonpoint sources of sediment are the primary source of excess sediment. Nonpoint sediment sources include streambank erosion, overland erosion (primarily from cropland), wind erosion, and stormwater runoff. HSPF modeling estimated that instream and cropland erosion contribute 44% and 53%, respectively, of the TSS loading in the planning area (Table 8). Figure 13, Figure 14, and Figure 15 illustrate the sources of sediment by land use for each watershed as estimated by STEPL.

Table 8. TSS loads by source in the planning area (2000–2016 average)

TSS Source	Percent TSS Load
Bed and bank	44%
Cropland	53%
Pasture	<1%
Developed	3%
Natural	<1%
Point sources	<1%

Figure 13. Sources of sediment by land use in the Red Lake River Mainstem Watershed

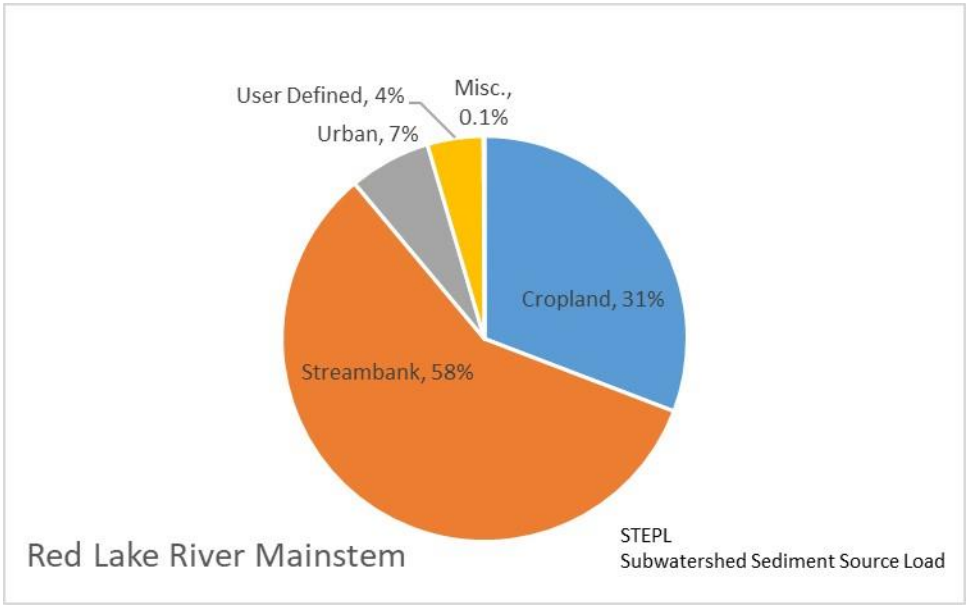


Figure 14. Sources of sediment by land use in the Black River Watershed

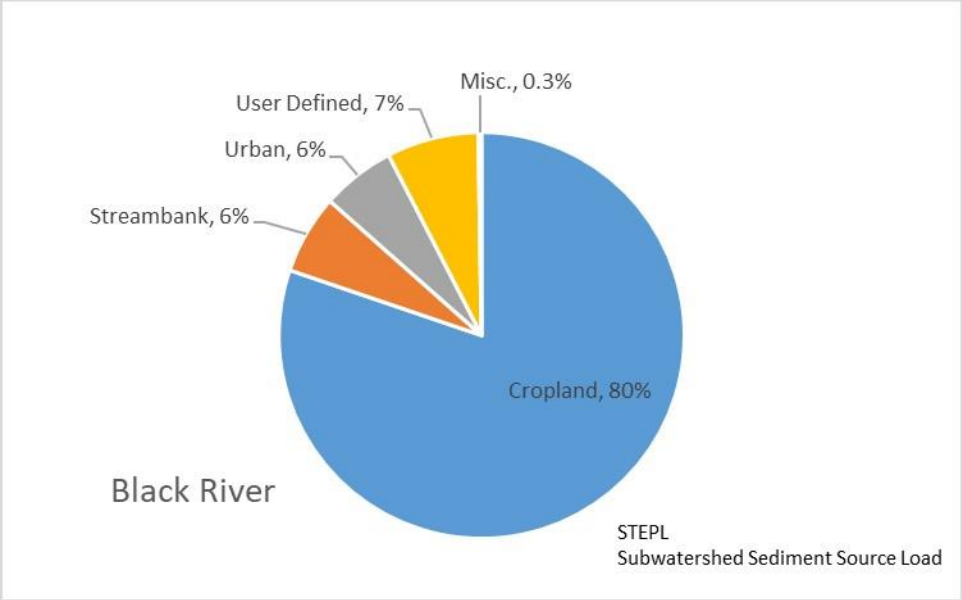
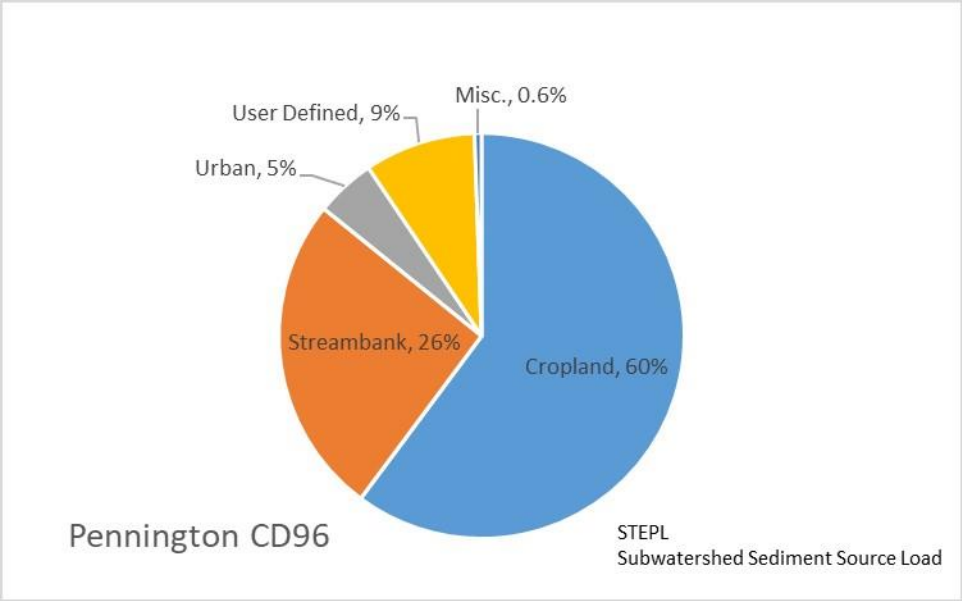


Figure 15. Sources of sediment by land use in the Pennington CD96 Watershed



4.5.2 E. coli

4.5.2.1 Point sources

Permitted wastewater

It is assumed pollutant loads from permitted point sources meet the waste load allocations for the entities and no further reductions are required.

Permitted feedlots

One NPDES permitted feedlot is located in the Black River watershed. There are no NPDES feedlots in the rest of the planning area. NPDES-permitted feedlots are designed to contain all manure from the

facility with the exception of manure storage basin overflows due to extreme climatic events. Manure application to cropland is to be managed by a manure management plan, but is not directly regulated. Manure release from a basin or runoff from cropland can be a source of *E. coli*.

It is assumed pollutant loads from permitted point sources meet the waste load allocations for the entities and no further reductions are required.

4.5.2.2 Feedlots

Runoff from non-permitted animal feeding operations (AFOs) can be a source of *E. coli* to surface waters. Longitudinal sampling at several locations in the Red Lake River watershed indicates that livestock operations can increase *E. coli* concentrations in small rivers (MPCA 2019).

AFOs are areas where animals are raised in confined areas. AFOs under 1,000 animal units and those that are not federally defined as concentrated animal feeding operations (CAFOs) are not required to have NPDES permits; however, the requirements of Minn. R. chs. 7020, 7050 and 7060 still apply. Feedlots with greater than 50 animal units, or greater than 10 animal units in shoreland areas, are required to register with the state as defined in Minn. Rules. Facilities with fewer animal units are not required to register with the state. AFOs are generally areas where manure may accumulate and vegetative cover is not maintained due to the density of animals. Animal number and types are listed in Table 9.

Table 9. Animals in Black River, CD96, and Red Lake River Mainstem Watersheds

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse
Black River	873	121	735	105	17
CD 96	285	0	0	0	0
Red Lake River Mainstem	2064	896	0	20	20

The planning area includes 37 active, registered feedlots. One NPDES permitted operation and 10 registered feedlots are located in shoreland areas. The feedlots are registered for up to about 4,000 animal units with most being beef cow/calf operations (MPCA statewide feedlots database). Livestock access to surface waters and poorly managed pastures near streams have been identified as likely sources of *E. coli* to the streams. Feedlot locations are shown in Figure 16, Figure 17, Figure 18, and Figure 19.

Figure 16. Black River watershed E. coli impairment and feedlot locations

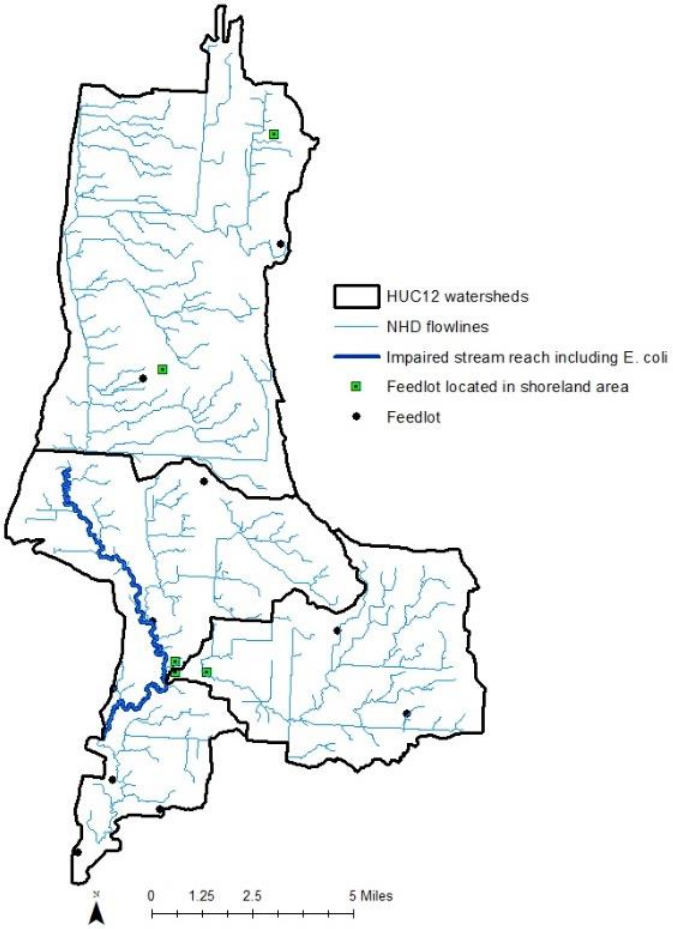


Figure 17. CD 96 watershed E. coli impairment and feedlot locations

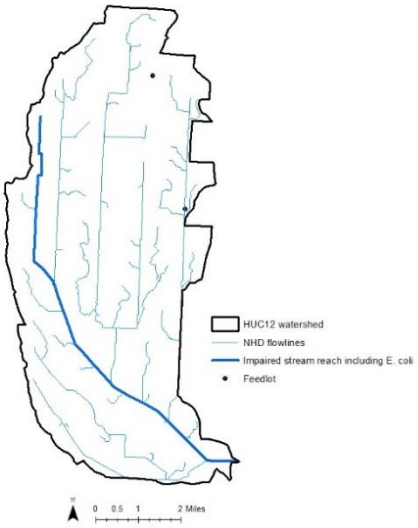


Figure 18. Red Lake River – Thief River Falls to Red Lake Falls watershed feedlot locations

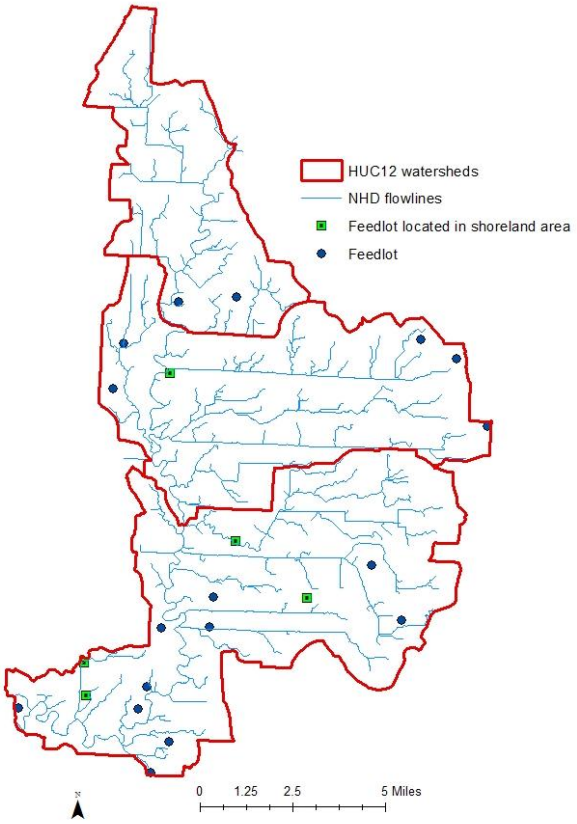
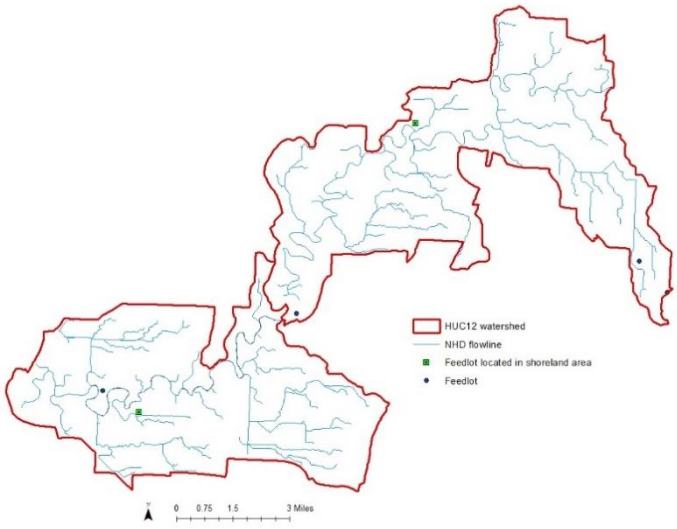


Figure 19. Red Lake River – Red Lake Falls to Crookston watershed feedlot locations



4.5.2.3 Wildlife

Waste from mammals and birds are natural background sources of *E. coli* that minimally contribute to *E. coli* concentrations in surface waters. In natural settings, wildlife is scattered, and such a small fraction of wild animal waste is deposited in waterways that natural background sources are not enough to cause an impairment. In certain locations, wildlife concentrates near a waterway and can be a more substantial *E. coli* source. Birds and waterfowl congregate at locations that provide favorable habitat and food. There are no areas of congregated wildlife in the planning area that have been documented as contributing to the *E. coli* impairments. Microbial source tracking on the Red Lake River at Sportsman's Bridge (CSAH 13) on WID -504 showed trace amounts of bird markers, suggesting that wildlife are a potential *E. coli* source. This reach of the Red Lake River, however, does not have an *E. coli* impairment.

4.5.2.4 Septic systems

Septic systems that discharge untreated sewage to the land surface or directly to streams are considered imminent threats to public health and safety (ITPHS) and can contribute *E. coli* to surface waters. Only one to two percent of septic systems in the planning area are considered to be an ITPHS. However, about 20% of the SSTS will require some type of replacement/upgrade as described in Table 10. These failing SSTS are determined by the county annual reports to the MPCA (Pennington, Polk, and Red Lake Counties).

Table 10. SSTS and estimated failure rates in Black River, CD96, and Red Lake River Mainstem Watersheds

Watershed	# of SSTS	% of failing SSTS	# Failing SSTS
Black River	100	20	20
CD 96	66	20	13
Red Lake River Mainstem	217	20	43

Microbial source tracking conducted on the Black River (monitoring site Black River at CSAH 18) showed trace amounts of human markers, suggesting that septic systems could potentially be contributing to fecal contamination (MPCA 2019). The *E. coli* data from this site show high concentrations across all flow zones that were sampled (Figure 11), also indicating that septic systems could be a potential source of *E. coli*.

4.5.2.5 *E. coli* source summary

Higher *E. coli* concentrations were observed across all flow regimes that were sampled (Figure 10 through Figure 12), suggesting that a variety of sources contribute to *E. coli* impairment. Permitted wastewater and permitted feedlots exist in the planning area; however, they are not likely to be sources. Nonpoint *E. coli* sources include runoff from feedlots, pastured livestock, wildlife, and ITPHS septic systems. Figure 20, Figure 21, and Figure 22 illustrate the sources of sediment by land use for each watershed as estimated by STEPL.

Figure 20. *E. coli* loading by land use for the Red Lake River Mainstem Watershed

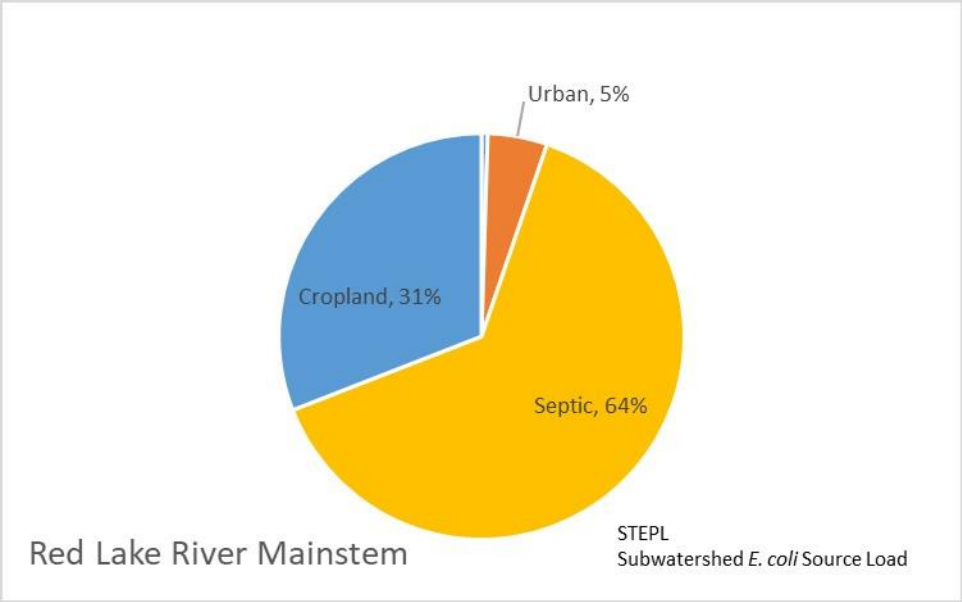


Figure 21. *E. coli* loading by land use for the Black River Watershed

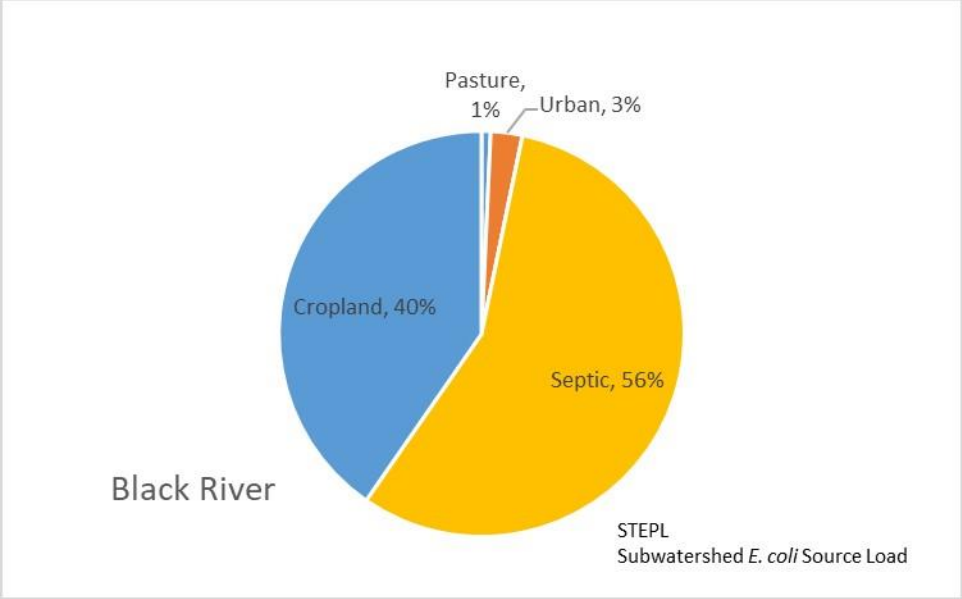
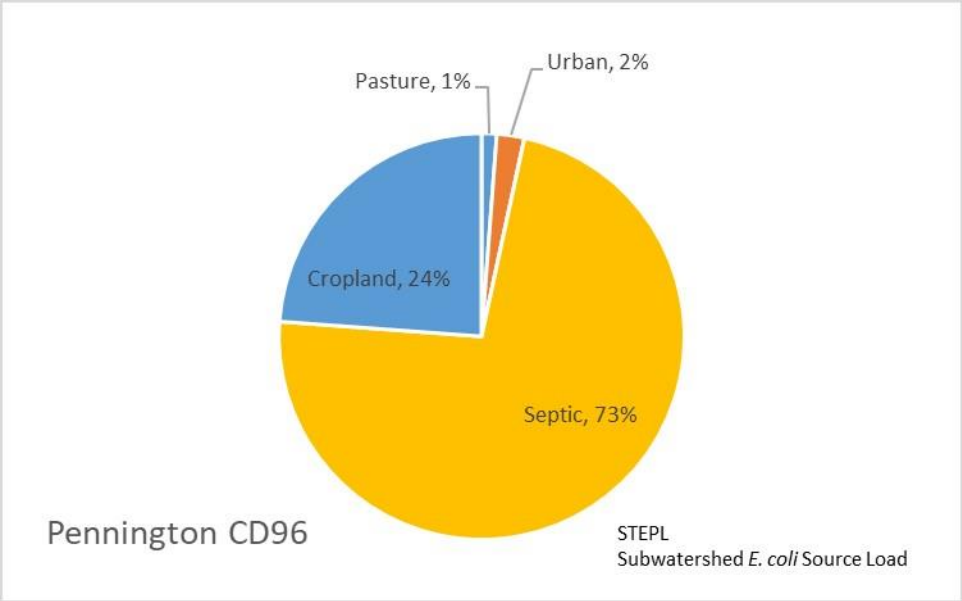


Figure 22. *E. coli* loading by land use for the Pennignton CD96 Watershed



4.6 TMDLs

TMDLs were developed in the *Draft Red Lake River Watershed Total Maximum Daily Load* Report (MPCA and RLWD 2019) and the *Minnesota Statewide Mercury TMDL* (MPCA 2007) for the load-based impairments in the planning area. Table 11 lists the impairments for which TMDLs were developed and, where applicable, the percent load reductions needed to achieve the TMDL.

Table 11. TMDL reports addressing planning area impairments and recommended reductions

TSS and *E. coli* reductions are from the Draft Red Lake River Watershed TMDL (MPCA and RLWD 2019) and the mercury impairments are in the Minnesota Statewide Mercury TMDL (MPCA 2007)

Water body name and description	WID	% TSS reduction	% *E. coli* reduction	Mercury
Red Lake River (Thief River to Thief River Falls Dam)	509			Statewide reductions [a]
Red Lake River (Thief River Falls Dam to Pennington County Ditch 96)	513			Statewide reductions [a]
Red Lake River (Pennington CD 96 to Clearwater River)	504	58%		Statewide reductions [a]
Red Lake River (Black R to Gentilly R)	502	59%		Statewide reductions [a]
Red Lake River (Gentilly R to CD99)	512	--[b]		
Red Lake River (CD 99 to Burnham Cr)	506	40%		
Pennington CD 96 (Headwaters to Red Lake River)	505		3%	
Black River (end of channelized reach to Little Black River)	558		2%	
Black River (Little Black River to Red Lake River)	529		98%	

[a] The Statewide Mercury TMDL (MPCA 2007) and Implementation Plan (MPCA 2009) present statewide mercury load reduction goals that are not specific to individual water bodies.

[b] There was too little TSS data available to reliably calculate current loads or prescribe load reductions.

5. Management strategies and activities

The management strategies are described as a targeted group of activities to reach a shorter, ten-year goal reduction. There are also general suites of BMPs for each watershed that will be implemented with prioritization to critical areas that will enable the watersheds to reach water quality standards over the long term.

5.1 Implementation Strategies applicable to all subwatersheds

5.1.1 Suite of BMPs and the issues they address

Table 12 provides a list of the BMPs that have been identified as suitable for implementation in the watersheds. The table describes which issue they address.

Table 12. BMP alignment with Issues of Concern (1W1P, 2017)

BMPs	Issues of Concern								
	Surface Water Quality	Soil Erosion and Sedimentation	Altered Hydrology	Drainage Systems Management	Flood Damage Reduction	Habitat	Shoreland and Riparian Management	Groundwater Protection	Source Water Protection
Alternative Tile Intakes	x	x		x					
CSP Precision Agriculture Practices	x							x	x
Channel Bed and Stream Channel Stabilization	x	x				x	x	x	x
Conservation Crop Rotation	x	x							
Conservation Cover	x	x						x	x
Conservation Tillage	x	x							
Cover Crop	x	x				x		x	x
Critical Area Planting	x	x		x		x	x	x	x
Diversions	x		x	x	x				
Drainage Water Management	x	x	x	x	x				x
Field Borders	x	x				x			
Filter Strips	x	x				x		x	x
Grade Stabilization Structures	x	x		x					x
Grassed Waterways	x	x							x

BMPs	Issues of Concern								
	Surface Water Quality	Soil Erosion and Sedimentation	Altered Hydrology	Drainage Systems Management	Flood Damage Reduction	Habitat	Shoreland and Riparian Management	Groundwater Protection	Source Water Protection
Milk House Waste Treatment	x							x	x
Multi-stage ditch	x	x		x					
Noxious Weed Management						x			
Nutrient Management	x							x	x
Pest Control						x			
Prescribed Burning						x			
Raingardens	x	x						x	x
Restoration and Management of rare or declining habitat						x			
Riparian Buffers	x	x				x	x	x	x
Rotational and Prescribed Grazing	x	x							
Septic System Upgrades	x							x	x
Stormwater Management BMPs	x	x			x			x	x
Stormwater Retention Basins	x	x	x	x	x			x	x
Streambank, Shoreland, and Roadside Protection	x	x					x	x	x
Tree and Shrub Establishment		x				x			
Upland Wildlife Habitat Management						x			
Waste Storage Facility	x							x	x
Wastewater and Feedlot Runoff Control	x	x						x	x
Water Control Structures	x	x	x	x	x				
Water and Sediment Control Basins	x	x	x	x	x			x	x
Wetland Restorations	x	x	x	x	x	x		x	x
Well Sealing	x							x	x

5.1.2 Mercury management

Atmospheric deposition of mercury is uniform across the state and supplies more than 99.5% of the mercury getting into fish. Agency research has demonstrated that 70% of current mercury deposition in Minnesota comes from human sources and 30% from natural sources, such as volcanoes. There are no known natural sources in the state that emit mercury directly to the atmosphere.

The long-term goal of the mercury TMDL is for the fish to meet water quality standards; the approach for Minnesota's share is mass reductions from state mercury sources. This mercury TMDL establishes that there needs to be a 93% reduction in state emissions from 1990 for the state to meet its share. Water point sources will be required to stay below 1 percent of the total load to the state and all but the smallest dischargers will be required to develop mercury minimization plans. Air sources of mercury will have a 93% emission reduction goal.

Almost all the mercury in Minnesota's lakes and rivers is delivered by the atmosphere. Mercury can be carried great distances on wind currents before it is brought down to earth in rain and snow. About 90% of the mercury deposited on Minnesota comes from other states and countries. Similarly, the vast majority of Minnesota's mercury emissions are carried by wind to other states and countries. It is impossible for Minnesota to solve this problem alone; the United States and other countries must greatly reduce mercury releases from all sources.

Because mercury in runoff is derived from atmospheric deposition, mercury in stormwater is accounted for in the calculation of the atmospheric load. Separate strategies for reducing nonpoint sources are not included in this plan because implementation of the strategies in section 4 to reduce air deposition will ultimately reduce stormwater loading.

Any efforts to reduce soil erosion will tend to reduce mercury entering a lake or river from nonpoint water sources. Many of these practices are already employed for control of sediment and nutrient loading and will result in reducing mercury loading to surface waters.

5.2 Watershed specific strategies and goals

The 1W1P started the process of identifying goals, priority areas, and management practices to address water quality problems in each management area. This plan will focus on three waterbodies the Black River, Pennington CD 96, and the mainstem of the Red Lake River between Thief River Falls and Crookston. The focus of this effort will be on the tributaries to the mainstem; however, it is expected that those practices will also impact the water quality of the mainstem Red Lake River. This section was selected due to the likelihood of success of restoration—most of the waterbodies are considered barely impaired.

For the purposes of this NKE Plan, all of the BMPs needed to meet or exceed the reductions goals will be described in Section 5.

A 'Tailored Targeted Implementation Plan with Measurable Water Quality Outcomes' was completed to provide planning region implementation profiles that summarize current resource conditions and present information about the potential number, location, and types of management practices and structural BMPs for implementation. The implementation profile also presents information about the relationship between the fiscal investment to implement structural BMPs relative to the estimated cost-

share available for implementation and stated surface water quality load reduction goals. The implementation profile for each management area targets the implementation of management practices and structural BMPs. Each implementation profile summarizes the following:

- Measurable goal for the management area
- The approach used for targeting practices
- Cost-effectiveness of conservation efforts within the management area (i.e., a conservation investment guide)
- Summary of targeted practices and their anticipated measurable water quality benefits
- A map of the management area and targeted practices
- A description of how the targeted implementation profile can be tailored for on-the-ground implementation

5.2.1 Red Lake River from Thief River Falls to Crookston

The Red Lake River between CD 96 and Red Lake Falls, Minnesota, is impaired for TSS and the TMDL calls for a 58% load reduction. PTMApp estimates that approximately 25% of the land area in this subwatershed contains a critical area for sediment loss and delivery as illustrated in Figure 23, Figure 24, and Figure 25**.** Critical loading areas will be prioritized for implementation and practices. To further narrow the critical loading areas, the watershed partners have and continue to conduct farm visits and field inventories to identify the highest erodibility and sediment loss areas. With field observations and refinements to PTMApp, the watershed partners are confident that the critical loading areas will be identified and addressed. These areas are targeted by the outreach staff to get BMPs implemented in these areas.

The Red Lake River from Thief River Falls to Crookston, Minnesota, is comprised of a total of 123,388 acres. It is broken down to 8,410 acres urban, 93,845 acres cropland, 1,138 acres pastureland, 2,543 forest, and 60 acres of feedlots. The remaining 17,392 are a combination of open water (3,797 acres), wetlands (13,442 acres), barren (22 acres), and shrub/herbaceous land (135 acres).

The TMDL calls for a total TSS reduction of 31,000 t/yr at Crookston, which includes the all tributaries. The reduction of 3,900 t/yr identified by the PTMApp model as part of the 1W1P development process will achieve an 8% reduction in upland loading in the next ten years at a cost of approximately $873,652. For the purposes of this plan, the existing RLR Mainstem loading, along with the two tributaries included in this plan (Black River and CD96), is estimated by the EPA's Spreadsheet Tool for Estimating Pollution Loading (STEPL) to be 12,094 t/yr.

Assuming that the current load is half upland watershed loading and half channel erosion, the reduction goal for upland runoff is 6,047 t/yr. To meet the necessary elements of an NKE plan, the watershed partners have gone beyond the PTMApp suggestions to implement BMPs estimated to reach a 3,719 t/yr reduction in TSS. These BMPs, goals, milestones and assessment criteria are described in Table 13 and Table 14. Planned work for the CD 96 and Black River Watersheds will yield (described fully in Sections 5.2.2 and 5.2.3) an estimated reduction in TSS of 1,568 t/yr. Previous work completed in all three watersheds yielded an estimated 1,062 t/yr TSS reductions. The grand total for all work is a reduction of 71% TSS loading or 8,471 t/yr TSS. If implemented fully, this plan will meet the reductions required to meet TSS water quality standards in this watershed. It is also the intention of the Red Lake

River partners to continue development of NKE(s) for the tributaries to the Red Lake River as work is completed in the Black River and CD96 Watersheds.

There is no *E. coli* reduction needed for the Red Lake River Mainstem; however, it should be noted that the practices planned to be implemented and past completed work in the Red Lake River Mainstem, CD 96, and Black River Watersheds will yield an estimated 343,709.6 Billion MPN/yr *E. coli*. This estimate is a 127% reduction for the area. This is based on efficiencies and the best available information; however, the partners expect that the practices outlined are beneficial to the watershed and will improve the water to continue to meet *E. coli* water quality standards in the Red Lake River Mainstem.

Pennington County Ditch 21 is tributary to the Red Lake River and is a source of concern for sediment loading (Figure 25). This ditch is not listed as impaired and has not been assessed by the MPCA. The PTMApp model has targeted a 10% reduction of TSS (104 t/yr) at a cost of $336,690. For the purposes of this plan, the Red Lake River Watershed partners have increased the activities and management practices that exceed the 10%. The PTMApp estimates that approximately 17% of the land area contains a critical area for sediment loss and delivery. Critical loading areas will be prioritized for implementation and practices. The estimated reductions for this plan are discussed in the preceding paragraphs.

Figure 23. Critical areas in the Red Lake River from Thief River Falls to Red Lake Falls, Minnesota and CD 96 (PTMApp)

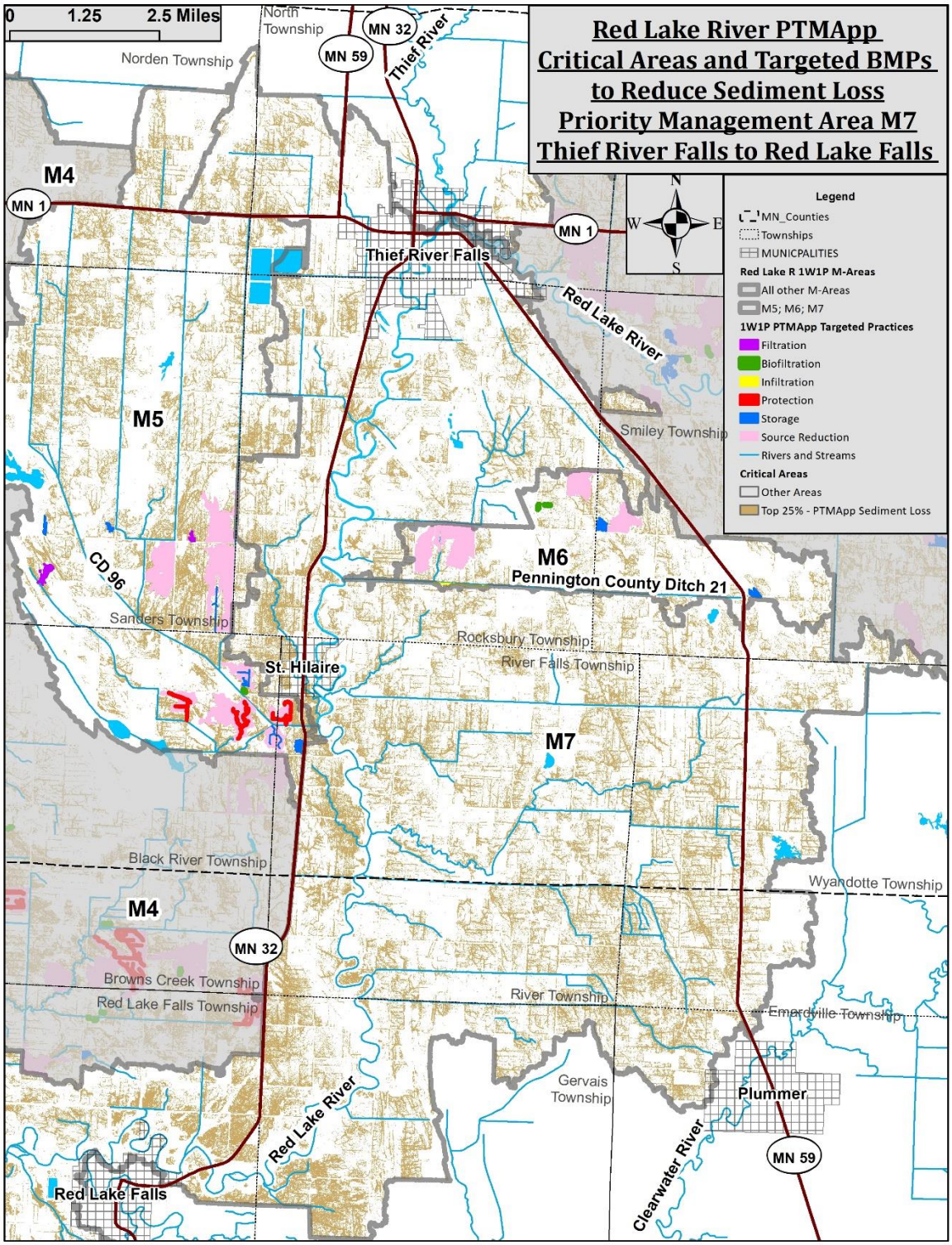


Figure 24. Critical areas in the Red Lake River from Red Lake Falls to Crookston, Minnesota (PTMApp)

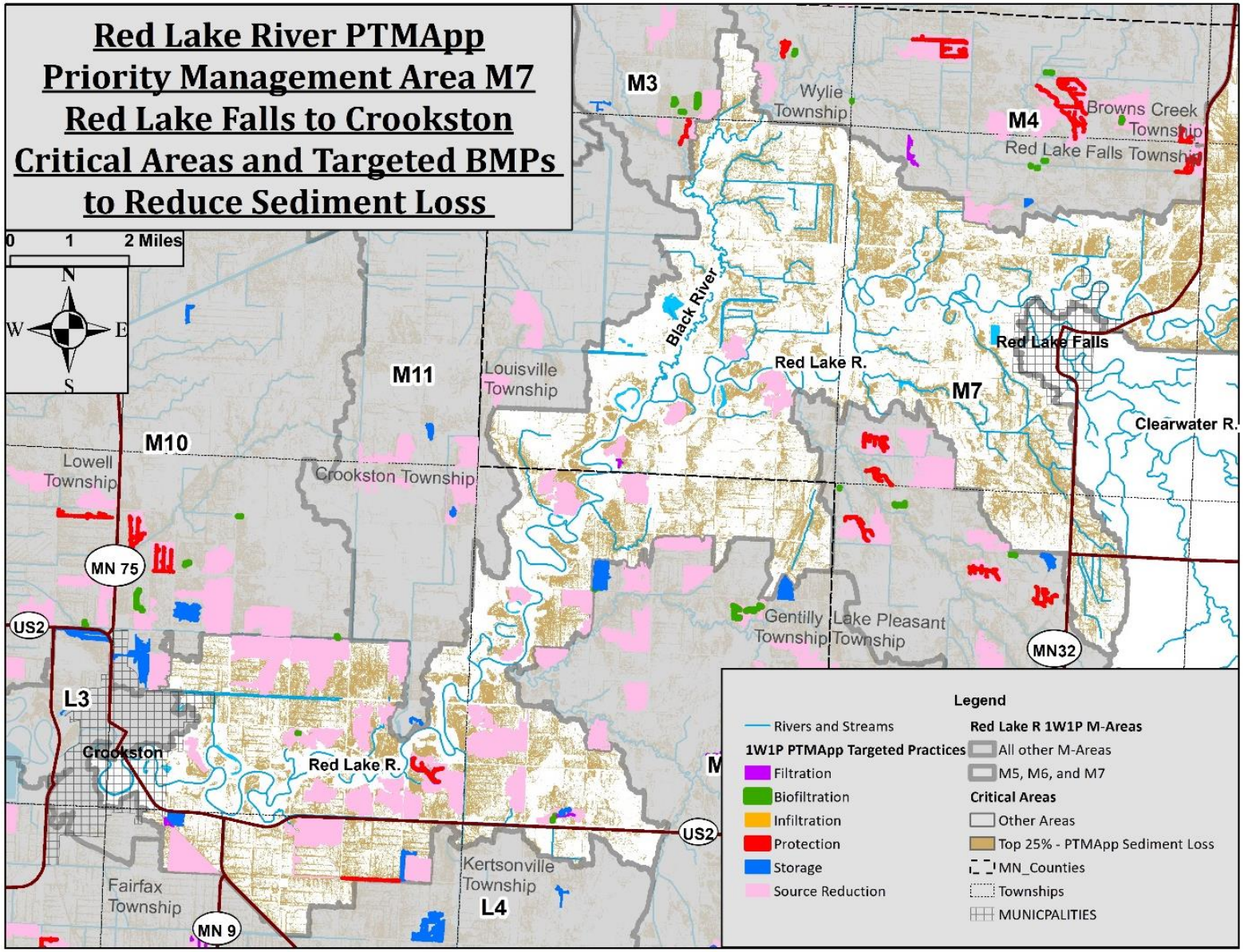
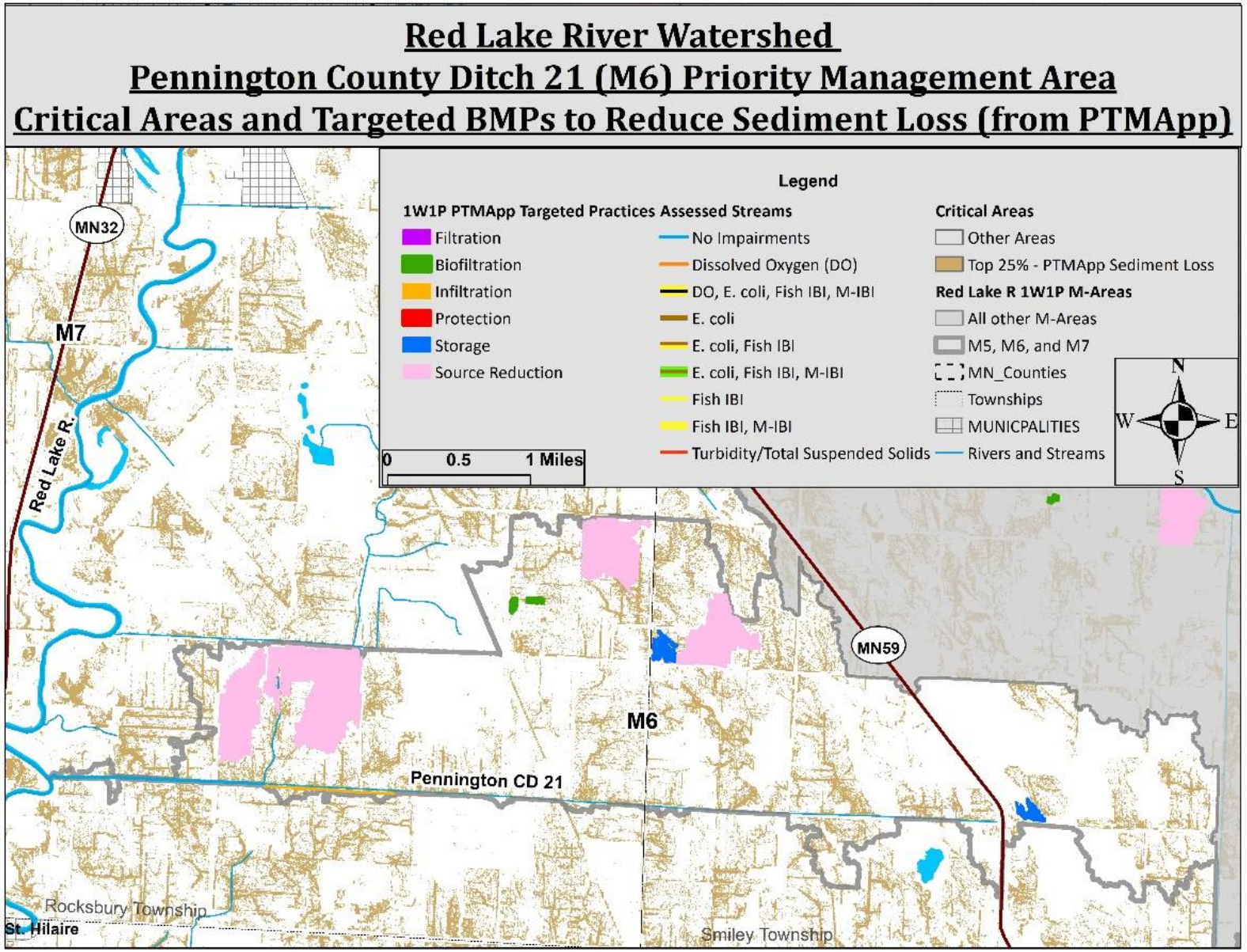


Figure 25. Pennington CD 21 Critical areas and targeted BMPs to reduce TSS (PTMApp)



The 10-year implementation targets developed through the 1W1P and subsequent PTMApp analyses are shown in Table 13 for the Red Lake River Watershed between Thief River Falls and Crookston, Minnesota. Table 14 includes the ten-year implementation targets for the County Ditch 21 Watershed that is tributary to the Red Lake River in this area. The prioritization of these projects is based upon critical loading areas and greatest impact on water quality. These practices target the prioritized impairment for TSS on the waterbody and will meet or exceed the needed estimated reductions to meet water quality standards.

Table 13. Goals, milestones, and assessments of PTMApp targeted implementation in critical areas in the Red Lake River Watershed between Thief River Falls and Crookston, Minnesota

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Drainage Water Management		Analyze permitted tile lines to find opportunities to utilize drainage water management practices	Determine the best course of action and start outreach, then implementation – target 25% implantation	Continue implementation and outreach – target 25% implementation from new plan	Continue implementation and outreach – target 50% implementation from new plan	Create plan and implement to improve drainage management plans on tile lines	Analysis complete Plan complete # of landowners contacted % of plan implemented
		RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database		Database maintained
		Implement practices to achieve a minimum 10% of needed reductions targeting both watershed/upland and near channel sources	Implement practices to achieve a minimum 10% of needed reductions targeting both watershed/upland and near channel sources	Implement practices to achieve a minimum 10% of needed reductions targeting both watershed/upland and near channel sources	Implement practices to achieve a minimum 10% of needed reductions targeting both watershed/upland and near channel sources	Implement practices to achieve a minimum 10% of needed reductions targeting both watershed/upland and near channel sources	Reductions should target 50% watershed/upland; 50% near-channel	% of upland/near-channel targets
Storage	Wetland Restoration	Identifying landowners and conducting outreach	Design and implement 80 acres of wetland restoration	Design and implement 80 acres of wetland restoration	Design and implement 80 acres of wetland restoration	Design and implement 80 acres of wetland restoration	Total of 320 acres of wetland restoration	# of acres of wetlands restored

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Water Control Structures	Inventory degraded water control structures	Outlet to the RLR restored Replace 13 water control structures	Replace 12 water control structures	Replace 13 water control structures	Replace 12 water control structures	Replace 50 water control estimated # to be refined after inventory	# of water control structures replaced
	Water and Sediment Control Basins	Install 6 WASCOBs	Install 6 WASCOBs	Install 6 WASCOBs	Install 6 WASCOBs	Install 6 WASCOBs	Install minimum of 30 WASCOBs	# of WASCOBs installed
		Outreach and identifying landowners, min. 2 landowners	Outreach continues with a minimum of 4 additional landowners	Outreach continues with a minimum of 4additional landowners	Outreach continues with a minimum of 4 additional landowners	Outreach continues with a minimum of 4 additional landowners	Interact with a minimum of 18 unique landowners	# of landowners
	Stormwater	Pennington SWCD stormwater assessment with Thief River Falls (15 projects identified)	Implement 3 BMPs identified in the Thief River Falls water quality study	Implement 1 more BMP from TRF WQ study	Implement 1 more BMP from TRF WQ study	Implement 1 more BMP from TRF WQ study	Implement minimum of 6 stormwater BMPs in TRF	# of stormwater BMPs implemented
		Identify stormwater priority projects in Red Lake Falls	Identify stormwater priority projects in Red Lake Falls	Implement 1 stormwater BMP in Red Lake Falls	Implement 1 stormwater BMP in Red Lake Falls	Implement 1 stormwater BMP in Red Lake Falls	Implement a minimum of 3 stormwater BMPS in Red Lake Falls Adjust based on identification process	Inventory/priority projects identified # of projects implemented
		Identify stormwater	Identify stormwater priority	Implement 1 stormwater	Implement 1 stormwater	Implement 1 stormwater	Implement a minimum of 3 stormwater	Inventory/priority projects identified

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	**4-year (2025)**	**6-year (2027)**	**8-year (2029)**	**10-year (2031)**		
		priority projects in Crookston	projects in Crookston	BMP in Crookston	BMP in Crookston	BMP in Crookston	BMPS in Crookston Adjust based on identification process	
	Chief Coulee	Continue surface water sampling and tracking source of contaminants	Continue surface water sampling and tracking source of contaminants	Continue surface water sampling and tracking source of contaminants	Continue surface water sampling and tracking source of contaminants	Continue surface water sampling and tracking source of contaminants	To understand and implement practices to mitigate potential problems at Chief Coulee.	# of sampling events # of identified contaminants
						4 filtration implementation practices	Four filtration implementation practices installed	# of filtration implementation practices
Filtration	Cover Crop	20% (18,769 acres) of cover crops	20% (18,769 acres) of cover crops	20% (18,769 acres) of cover crops	20% (18,769 acres) of cover crops	Total of 100% (93,845 acres) of cover crops planted annually		# of acres of cover crops % of cropland cover crops
		Education and outreach to landowners	Education and outreach to landowners	Education and outreach to landowners	Education and outreach to landowners			Program continues
		Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	To encourage 100% of producers to use cover crops on a continual basis	Program continues

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Filter Strips	Identifying landowners and conducting outreach – min 3 landowners Install 1 filter strip	Identifying landowners and conducting outreach – min 3 landowners Install 1 filter strip	Identifying landowners and conducting outreach – min 3 landowners Install 1 filter strip	Identifying landowners and conducting outreach – min 3 landowners Install 1 filter strip	Identifying landowners and conducting outreach – min 3 landowners Install 1 filter strip	Landowners awareness raised, at least 5 filter strips installed	# Landowners identified # of filter strips
	Grassed Waterway			Implement 1 grassed waterway		Total of 1 grassed waterway		# of grassed waterways completed
	Riparian Buffers	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Continue working with landowners and observing the continued compliance	Buffer Law compliance
						1 biofiltration implementation practices, reducing sediment by 439 t/yr		# of biofiltration practices complete
Biofiltration	Saturated buffer	Identifying landowners and conducting outreach		1 saturated buffer installed				# of saturated buffers
	Residue and Tillage Management	20% (18,769 acres) residue and tillage management	20% (18,769 acres) residue and tillage management	20% (18,769 acres) residue and tillage management	20% (18,769 acres) residue and tillage management	20% (18,769 acres) residue and tillage management	Total of 100% (93,845 acres) in	# of acres of residue and tillage management

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
							residue/tillage mgmt	
Source Reduction	Nutrient Management/Manure management plan	Outreach to smaller livestock operations to encourage a manure management plan, minimum 2 producers	Outreach to smaller livestock operations to encourage a manure management plan, minimum 2 producers	Outreach to smaller livestock operations to encourage a manure management plan, minimum 2 producers	Outreach to smaller livestock operations to encourage a manure management plan, minimum 2 producers	Outreach to smaller livestock operations to encourage a manure management plan, minimum 2 producers	100% of livestock operations implementing a nutrient management/ manure management plan	# of producers contacted
	Cattle exclusion	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	To continually educate and encourage producers to employ cattle exclusion practices	# of cattle exclusions
		EQIP cattle exclusions – min 2 pasture	EQIP cattle exclusions – min 2 pasture	EQIP cattle exclusions – min 2 pasture	EQIP cattle exclusions – min 2 pasture	EQIP cattle exclusions – min 2 pasture	100% of pastures using cattle exclusions	# of cattle exclusions funded by EQIP
		Outreach to smaller livestock operations to encourage a manure management plan –min 2 producers	Outreach to smaller livestock operations to encourage a manure management plan –min 2 producers	Outreach to smaller livestock operations to encourage a manure management plan –min 2 producers	Outreach to smaller livestock operations to encourage a manure management plan –min 2 producers	Outreach to smaller livestock operations to encourage a manure management plan –min 2 producers	All cropland appropriately applying manure	# of landowner outreached 100% of acreage implementing a manure management plan

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
		Implement 20% total acreage of manure management plans	Implement 20% total acreage of manure management plans	Implement 20% total acreage of manure management plans	Implement 20% total acreage of manure management plans	Implement 20% total acreage of manure management plans		
	Rotational grazing	EQIP rotational grazing-20% of pasture land in rotational grazing	EQIP rotational grazing-20% of pasture land in rotational grazing	EQIP rotational grazing-20% of pasture land in rotational grazing	EQIP rotational grazing-20% of pasture land in rotational grazing	EQIP rotational grazing-20% of pasture land in rotational grazing	100% of pastures implementing rotational grazing	% of pasture land implementing rotational grazing funded by EQIP
	Streambank and shoreline protection	Red Lake County ditch outlet assessments	Polk County ditch outlet assessments	Implement estimated 2 ditch outlet based on the assessments	Implement estimated 2 ditch outlet based on the assessments	Implement estimated 2 ditch outlet based on the assessments	Plan in place to target degraded ditch outlets in Red Lake and Polk Counties Minimum 6 outlets repaired	# Ditch assessment completed # of feet of ditch stabilization
		Restore 1100 feet of RLR outlet	Maintain inventory of highest erosion outlets				List of critical area erosion outlets to be targeted	Inventory maintained # feet of outlet restored
In channel practices source reduction		Geomorphology study and evaluate the change of the area assessed from first assessment	Prioritize areas to implement projects to stabilize banks					Study conducted

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	**4-year (2025)**	**6-year (2027)**	**8-year (2029)**	**10-year (2031)**		
		Red Lake SWCD Erosion site inventory to identify emerging erosion problems/outreach benefits annually	Identify erosion sites and seek funding (e.g., CWFs)	Red Lake SWCD Erosion site inventory to identify emerging erosion problems/outreach benefits annually	Identify erosion sites and seek funding (e.g., CWFs)	Red Lake SWCD Erosion site inventory to identify emerging erosion problems/outreach benefits annually		Inventory completed/maintained/ outreach continues
		Pennington County SWCD Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)			Sites identified/$ sought
	Grade stabilizations	Grade stabilizations/side inlets structures 10 installed per year	Grade stabilizations/side inlets structures 10 installed per year	Grade stabilizations/side inlets structures 10 installed per year	Grade stabilizations/side inlets structures 10 installed per year	Grade stabs/side inlets structures 10 installed per year	100 Grade stabilizations installed	# of grade stabilizations completed
Protection	SSTS upgrades	County funding to upgrade failing SSTS with cost share assistance-promotional mailing 1/yr	County funding to upgrade failing SSTS with cost share assistance-promotional mailing 1/yr	County funding to upgrade failing SSTS with cost share assistance-promotional mailing 1/yr	County funding to upgrade failing SSTS with cost share assistance-promotional mailing 1/yr	County funding to upgrade failing SSTS with cost share assistance-promotional mailing 1/yr	County provides funding options for SSTS upgrade/replacements and promotes by mailing	# of SSTS funded # of mailings

Treatment group	Practices Recommended (by treatment group)	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
		Replace/upgrade 9 failing/nonconforming SSTS	Replace/upgrade 9 failing/nonconforming SSTS	Replace/upgrade 9 failing/nonconforming SSTS	Replace/upgrade 8 failing/nonconforming SSTS	Replace/upgrade 8 failing/nonconforming SSTS	Upgrade and replace all known failing/nonconforming SSTS (43)	# of SSTS replaced/upgraded
		MTS assessment completed	Create plan to act on the MTS assessment	Implement MTS actions				Study conducted

Table 14. Goals, milestones, and assessments of PTMApp targeted implementation in critical areas in the CD 21 Watershed

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
Storage						2 storage practices with 33 t/yr reduction		# of storage practices
	Drainage Water Management		Analyze permitted tile lines to find opportunities to utilize drainage water management practices	Identify and implement estimated minimum 2 drainage management practices	Implement estimated minimum 2 drainage management practices	Implement estimated minimum 2 drainage management practices	Complete inventory of opportunities and tweak implementation goals Implement at least 6 drainage management practices	Analysis completed # of drainage management practices implemented
		RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database		Database maintained

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Wetland Restoration	Identifying landowners and conducting outreach		2 wetland restorations		3 wetland restorations	Restore 25 acres of wetlands	# acres wetland restored
		Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act		Program continues
Infiltration						1 infiltration, 8 t/yr reduction		# of infiltration practices
	Grade stabilization	Pennington County completed ditch outlet assessment	Implement ditch stabilization in CD 21 (1,100 ft)	Monitor effectiveness of stabilization	Assess success of restoration		Stabilize 1,100 ft of CD 21	# feet ditch stabilized
Filtration						2 filtration practices, reducing by 34 t/yr		# of filtration practices
	Cover Crop			Education and outreach to landowners	40 acres with cover crops			# of acres of cover crops
	Filter Strips	Identifying landowners and conducting outreach	Implementing 10 acres filter strips					# of acres of filter strips
	Riparian Buffers	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer		Buffer Law compliance

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
Biofiltration						1 biofiltration, reducing by 20 t/yr		# of biofiltration completed
	Saturated buffer	Identifying landowners and conducting outreach			1 saturated buffer installed			# of saturated buffers installed

The suite of implementation practices and long-term implementation goals for the management area are shown in Table 15. Implementation of the practices will be done over many years and are expected to protect or restore water quality to water quality standards. Prioritization for these practices will include the critical areas, funding availability, and landowner interest.

Table 15. BMPs identified for the Red Lake River Watershed, between Thief River Falls and Crookston, Minnesota to reach water quality standards and provide protection

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
Protection	Channel Bed and Stream Channel Stabilization	2	Miles	$252,600	SWCDs	2017-2026
	Critical Area Planting	45	Acres	$39,056	SWCDs	2017-2026
	Grade Stabilization Structure	100	Each	$856,600	SWCDs/NRCS	2017-2026
	Streambank, Shoreland, and Roadside protection	4	Miles	$1,719,748	SWCDs	2017-2026
	Tree/Shrub Establishment	15	Acres	$6,790	SWCDs	2017-2026
	Well Sealing	35	Each	$17,500	SWCDs	2017-2026
	Alternative Tile Intakes	1	Each	$500	NRCS	2020-2026
	Septic System Upgrades	25	Each	$200,000	SWCDs/Environmental Services	2017-2026
	Upland Wildlife Habitat Management	3,000	Acres	$60,000	SWCDs/ Pheasants Forever/RLWD	2020-2026
	Restoration & Management of Rare/Declining Habitat	80	Acres	$69,440	SWCDs/ Pheasants Forever/ RLWD	2020-2026

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
	Prescribed Burning	250	Acres	$25,000	SWCDs/ Pheasants Forever/ RLWD	2020-2026
Source Reduction	Residue and Tillage Management	3,040	Acres	$51,680	NRCS	2017-2026
	Nutrient Management	2,240	Acres	$2,240	NRCS	2017-2026
	Rotational and Prescribed Grazing	1,760	Acres	$857,153	NRCS	2017-2026
	Precision Ag Practices	40	Acres	$800	NRCS	2017-2026
Storage	Drainage Water Management (Tile)	320	Acres	$126,720	NRCS/RLWD	2020-2026
	Stormwater Detention Basins	10	Each	$750,000	SWCDs/RLWD	2020-2026
	Raingardens	10	Each	$50,000	SWCDs/RLWD	2020-2026
	Water and Sediment Control Basins	30	Each	$307,500	SWCDs/NRCS/RLWD	2020-2026
	Wetland Restoration	320	Acres	$2,155,200	SWCDs/RLWD	2020-2026
	Water Control Structures	50	Each	$50,000	NRCS/RLWD	2020-2026
	Diversion	20	Each	$38,000	SWCDs/RLWD	2020-2026
	Milkhouse Waste Storage Treatment	1	Each	$1,000	SWCDs/NRCS	2020-2026
Filtration	Conservation Cover	2,560	Acres	$1,638,688	NRCS	2017-2026
	Cover Crop	960	Acres	$102,846	NRCS	2017-2026

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
	Filter Strips	30	Miles	$81,480	NRCS/RLWD	2017-2020
	Grass Waterways	3.5	Miles	$98,266	SWCDs/NRCS/RLWD	2017-2020
	Riparian Buffers	10	Miles	$27,160	SWCDs/NRCS/RLWD	2017-2020
	Field Borders	25	Miles	$16,750	NRCS	2017-2026
Infiltration	Multi-Stage Ditch	1	Miles	$311,520	Counties/RLWD	2017-2026

Table 16. BMPs identified for the CD21 Watershed to reach water quality standards and provide protection

Treatment group	Treatment type	Number	Unit	Estimated cost	Lead entity	Schedule
Protection	Channel Stabilization	1	Miles	$126,300	SWCDs	2017-2026
	Critical Area Planting	40	Acres	$34,716	SWCDs/NRCS	2017-2026
	Grade Stabilization Structure	30	Each	$256,980	SWCDs/NRCS	2017-2026
	Streambank, Shoreland, and Roadside protection	1	Miles	$429,937	SWCDs/NRCS	2017-2026
	Tree/Shrub Establishment	3	Acres	$1,358	SWCDs	2017-2026
	Well Sealing	3	Each	$1,500	SWCDs	2017-2026
Protection	Septic System Upgrades	3	Each	$24,000	SWCDs	2017-2026

	Upland Wildlife Habitat Management	200	Acres	$4,000	SWCDs/Pheasants Forever/RLWD	2017-2026
	Restoration and Management of Rare and Declining Habitat	20	Acres	$17,360	SWCDs/Pheasants Forever/RLWD	2017-2026
	Prescribed Burning	10	Acres	$1,000	SWCDs/Pheasants Forever/RLWD	2017-2026
	Residue and Tillage Management	160	Acres	$2,720	NRCS	2017-2026
Source Reduction	Nutrient Management	160	Acres	$160	NRCS	2017-2026
	Rotational and Prescribed Grazing	80	Acres	$38,962	NRCS	2017-2026
	Precision Ag Practices	80	Acres	$1,600	NRCS	2017-2026
	Drainage Water Management (Tile)	160	Acres	$63,360	NRCS/RLWD	2017-2026
Storage	Water and Sediment Control Basins	1	Each	$10,250	SWCDs/NRCS/RLWD	2017-2026
	Wetland Restoration	10	Acres	$67,350	SWCDs/NRCS/RLWD	2017-2026

5.2.1.1 Reduction estimates

Based on STEPL, the reduction estimates are described in Table 17. This table includes past work, currently underway work, and work planned in this NKE for all three watersheds. Because Pennington County Ditch 96 and Black River are tributaries to the mainstem Red Lake River, reductions from these watershed will contribute to the reductions in this watershed. The estimated reductions for this watershed for work in this plan and already completed exceed the reductions required by the TMDL for this reach. It is expected that if this plan is implemented as planned, this watershed will meet water quality standards.

Table 17. STEPL estimated loads and reductions for the Red Lake River and CD21

Watershed	TSS load (no BMP) t/yr	*E. coli* load (no BMP) billion MPN/yr	TSS reduction t/yr	*E. coli* reduction billion MPN/yr	TSS load (with BMP) t/yr	*E. coli* load (with BMP) billion MPN/yr	TSS reduction %	*E. coli* reduction %
Black River	2495.7	7.9E+04	1458.6	2.5E+04	1037.1	5.4E+04	58.4	31.5
Pennington CD96	1373.9	4.0E+04	742.1	8.3E+03	631.9	3.2E+04	54.0	20.5
RLR Mainstem	8132.9	1.5E+05	2469.0	3.6E+04	5663.9	1.2E+05	30.4	23.9
Total	12002.6	2.7E+05	4669.7	6.9E+04	7332.9	2.0E+05	38.9	25.6
SSTS reductions by watershed								
Black River				4.5E+04			56.4	
Pennington CD96				2.9E+04			72.8	
RLR Mainstem				9.7E+04			63.8	
Total SSTS reductions				1.7E+05			63.0	
Total reductions (SSTS and other BMPs) by watershed								
Black River				6.9E+04			87.9	
Pennington CD96				3.8E+04			93.3	
RLR Mainstem				1.3E+05			87.8	
Total all watershed and all *E. coli* reductions				2.4E+05			88.6	
Completed work and planned work in tributaries (Black River and CD96)								
Completed work in the RLR Mainstem Watershed			28.3	2.9E+01				
NKE planned work for CD96 Watershed			742.1	3.8E+04				
Completed work for CD96 Watershed			363.2	9.7E+01				
NKE planned work for Black River Watershed			1535.2	1.8E+05				
Completed work for Black River Watershed			0.5	6.5E+00				
Total tributary planned and completed work			2592.7	3.9E+04				
Total load reductions to the Red Lake River Mainstem			**7262.4**	**2.8E+05**			**60.5**	**98.1**

5.2.2 Black River

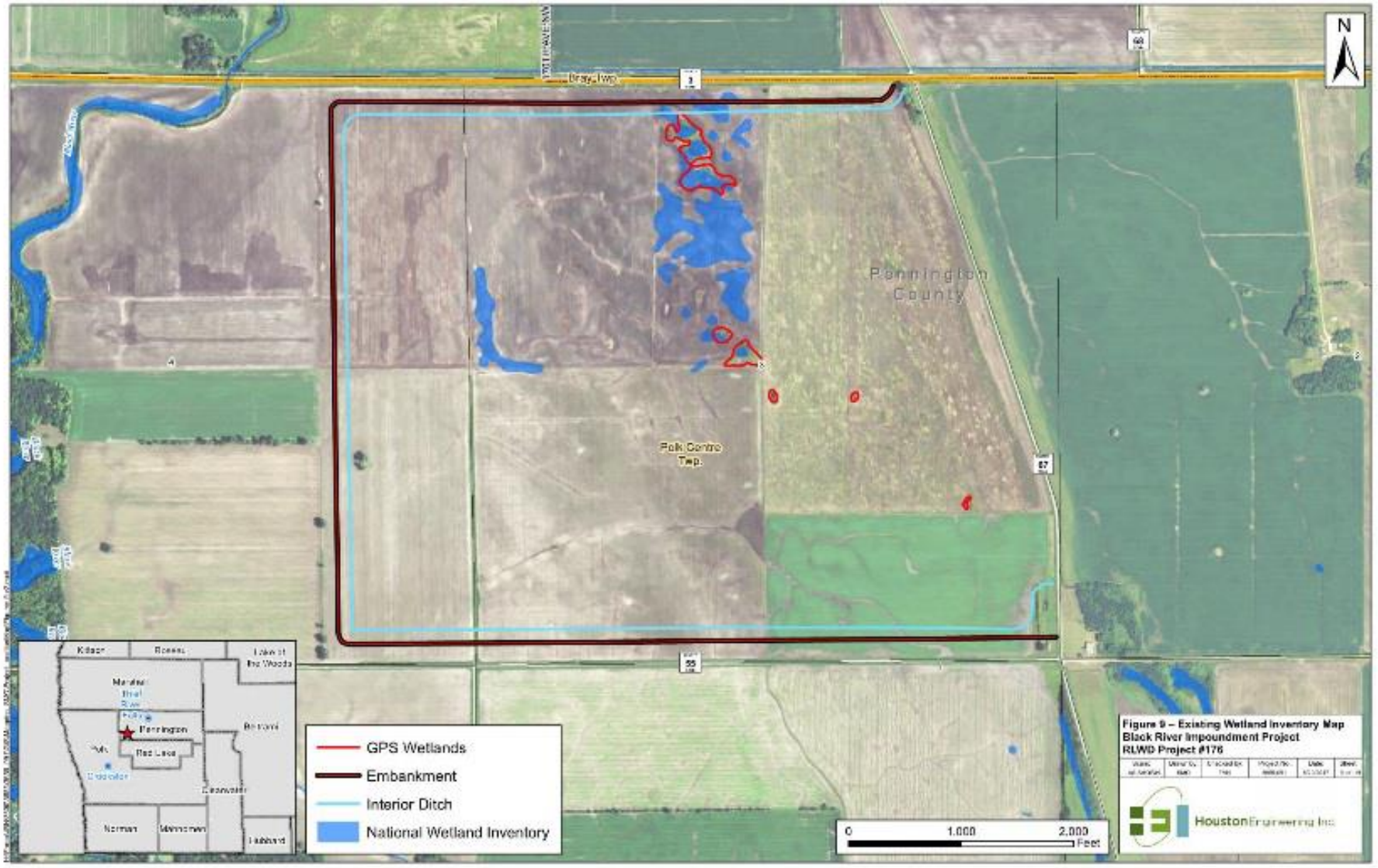
The Black River is impaired for fish and macroinvertebrates, dissolved oxygen, and *E. coli*. Sediment is used as a surrogate in implementation planning through the 1W1P given that it is a primary stressor for the fish and macroinvertebrate communities. The 1W1P does not address the *E. coli* impairment. The

Black River Watershed is also a concern for sediment loading to the mainstem of the Red Lake River. The low dissolved oxygen impairment is primarily associated with low stream flow conditions and are addressed through implementation practices that may contribute to increased base flows in the stream. It is assumed that connections between sediment, nutrients, and low dissolved oxygen provide for the use of sediment as a surrogate in implementation planning for the low dissolved oxygen impairment. *E. coli* sources include livestock in pasture along streams, failing septic systems, and natural background.

This planning area covers 76,929 acres and it is broken into urban (2,325 acres), cropland (63,902 acres), pastureland (875 acres), forest (2,269 acres), and feedlots (4 acres). The remaining 7,463 acres are broken into open water (84 acres), wetlands (7,439 acers), barren (35 acres), and shrub/herbaceous (69 acres) lands. The critical areas for the loading was identified using PTMApp and it is illustrated in Figure 27.

A significant effort to increase water storage and reducing peak flows is beginning with the development of an off-channel impoundment in the Black River Watershed (Figure 26). Implementation of the impoundment will include the implementation of several other BMPs in the drainage area of the eventual impoundment. It is believed that the increased storage will increase the base flows in the stream. The private watercourse crossing (e.g., “Texas” crossing) in this watershed will be addressed. The watershed district and SWCD staff will work with the landowner to identify a stream crossing solution that would not act as a fish barrier.

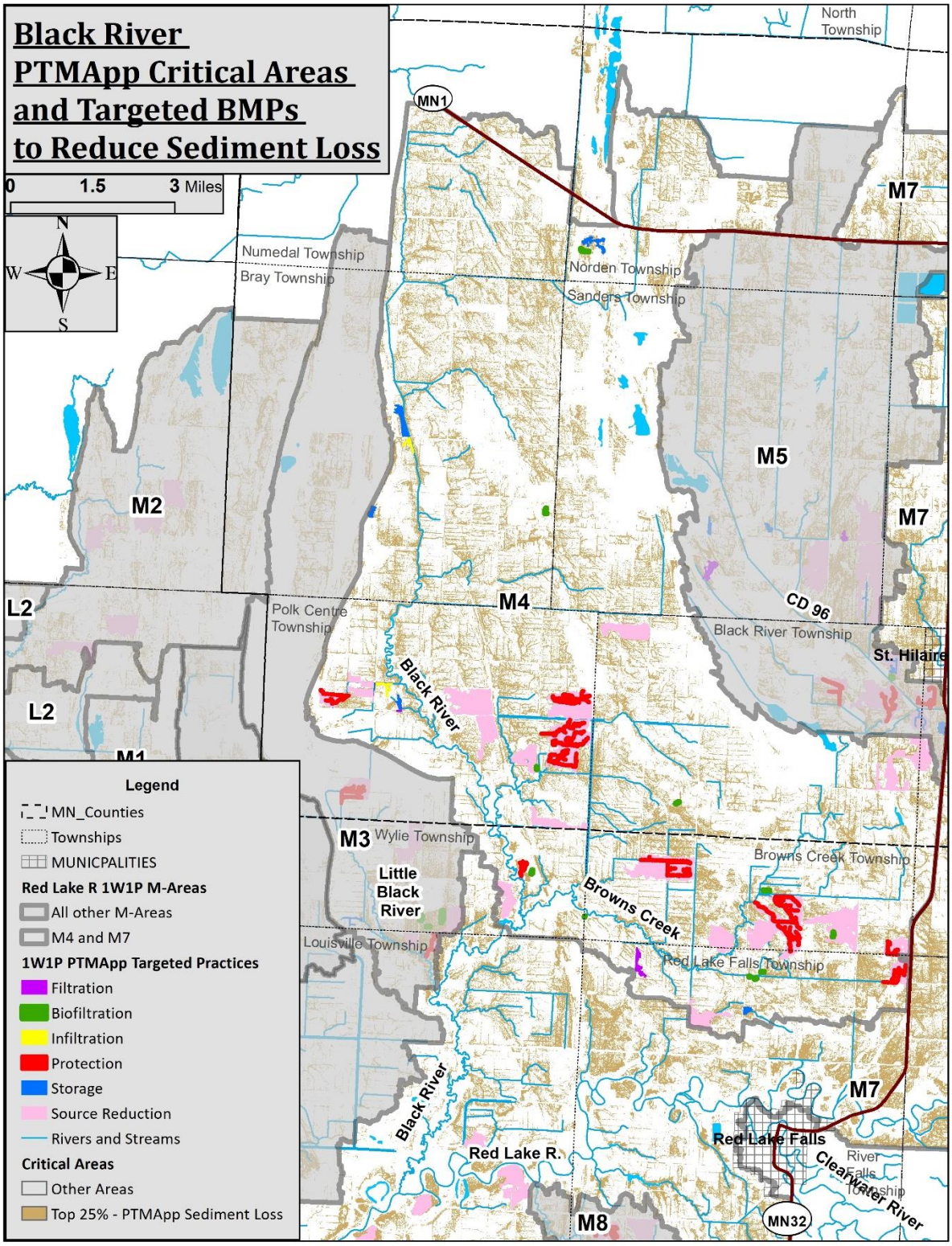
Figure 26. Black River off-channel impoundment project



The PTMApp model for the 1W1P Appendix, assuming their set of practices for TSS reductions, will achieve a 7% targeted reduction of upland loading in the next ten years at a cost of approximately $1,170,249. For the purposes of the NKE, the Red Lake Watershed partners have created an aggressive plan to meet the reductions required meet the TSS and *E. coli* reductions to achieve water quality standards in 10 years. Table 18 includes the planned implementation activities, milestones, goals, and assessment criteria for these practices.

PTMApp estimates that roughly 22% of land area in the Black River Watershed may contain a critical area for sediment loss and delivery to a concentrated flow path. These critical areas are in almost every parcel of the area. This indicates that most of the watershed has opportunities to treat areas that could have critical sediment loss. Critical loading areas and implementation practices will be prioritized for implementation and practices (Figure 27). To further narrow the critical loading areas, the watershed partners have and continue to conduct farm visits and field inventories to identify the highest erodibility and sediment loss areas. With field observations and refinements to PTMApp, the watershed partners are confident that the critical loading areas will be identified and addressed. These areas are targeted by the outreach staff to get BMPs implemented in these areas.

Figure 27. Critical areas and targeted practices in the Black River Watershed (PTMApp)



The draft TMDL calls for a 98% reduction in *E. coli* at very high flow conditions in the load duration curve. SSTS inspections will be made and noncompliant systems will be upgraded over the course of ten years. Inadequate septic systems are identified as a moderate potential contributor. BMPs for livestock management will focus on stream exclusions and grazing practices to address the high potential *E. coli*

contribution from livestock predominantly along the stream reaches. This reduction will be met by the implementation of the practices and activities in this plan as described.

The ten-year implementation are shown in Table 18 for the Black River Watershed. The prioritization of these projects is based upon critical loading areas and greatest impact on water quality. These practices target the prioritized impairment for *E. coli to* the waterbody. Additionally, the practices will represent a significant TSS reduction intended to address the downstream TSS load to the Red Lake River Mainstem.

Table 18. Goals, milestones, and assessments of PTMApp targeted implementation in critical areas in the Black River Watershed

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
						6 Storage practices, reducing 79 t/yr	Increase Fish IBI to above 47	FIBI Score
	Drainage Water Management						Increase Macroinvertebrate IBI to above 41	MIBI Score
	Wetland Restoration	Restore wetlands as part of the Black River Impoundment						Impoundment wetlands completed
	Water Control Structures	Black River Impoundment will be constructed using state flood hazard mitigation funding as a cost share.						Impoundment built
	Water and Sediment Control Basins	Install 2 WASCOBs	Install 2 WASCOBs	Install 2 WASCOBs	Install 2 WASCOBs	Install 2 WASCOBs	Install 10 WASCOBs	# of WASCOBs installed
	Diversion	Diversion flood waters directly outletting into the Black River will be addressed with a 15 square mile drainage area	Monitor performance of diversion and other implementations					# of sq miles of drainage area diversion
Storage	Grade Stabilization Structure	50 side inlet controls as part of the impoundment	10 per year of side inlets	10 per year of side inlets	10 per year of side inlets	10 per year of side inlets	Install total of 80 grade stabilizations	# of side inlets

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
							Exceed 5.0 mg/L DO as a daily minimum in > 90% of measurements	Continuous DO data
						4 filtration practices, reducing by 54 t/yr		# of practices
	Cover Crop	20% (12,780 acres) of cover crops	20% (12,780 acres) of cover crops	20% (12,780 acres) of cover crops	20% (12,780 acres) of cover crops	20% (12,780 acres) of cover crops	100% of producers using cover crops continuously (63,902 acres)	# of acres of cover crops
		Education and outreach to landowners, min 5 landowners/yr	Education and outreach to landowners, min 5 landowners/ yr	Education and outreach to landowners, min 5 landowners/yr	Education and outreach to landowners, min 5 landowners/y r	Education and outreach to landowners, min 5 landowners/yr	Education and outreach to landowners about cover crops, residue/tillage , and nutrient management	# Events completed # of landowners contacted
		Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Red Lake County SWCD Cover Crop Incentive program	Provide producers with cover crop incentives	# of landowners enrolled in incentive programs
Filtration	Buffer Strips	Buffer strip on diversion strips 15 miles (Black River Impoundment)						# feet buffer strips

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Grassed Waterway		Implement 1 grassed waterway				Total of 1 grassed waterway	# of grassed waterways
	Riparian buffers	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law	Maintain 100% compliance with Minnesota Buffer Law		Buffer law compliance
	Saturated buffer	Identifying landowners and conducting outreach		1 saturated buffer installed				# of saturated buffers installed
Infiltration						1 infiltration practice, reducing by 10 t/yr		# of infiltration practices
	Multi-stage Ditch	Identify one project area		1 mile of multi-stage ditch implemented				# of miles multi-stage ditches
	Infiltration Trench or small basin	Identify project area	Implement basin				Implement one filtration basin	# of infiltration basins
Protection						10 protection practices		# of protection practices

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
	Critical Area Planting	Implement planting with appropriate associated practices	Use PTMApp analyses for identifying critical planting areas for multiple benefits			45 acres in critical planting		# of acres in critical planting
	Grade Stabilization Structure	Red Lake SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Red Lake SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Red Lake SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Red Lake SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Identify erosion sites and seek funding (e.g., CWFs)	Reduce total sediment export as modeled at management area pour point in PTMApp by 10% to assure that no more than 10% of TSS samples exceed 65 mg/l in future assessments	Tasks completed
Protection		Pennington SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Pennington SWCD Erosion site inventory to identify basic erosion problems/outreach	Pennington SWCD Erosion site inventory to identify basic erosion problems/outreach benefits annually	Pennington SWCD Erosion site inventory to identify basic erosion problems/outreach	Identify erosion sites and seek funding (e.g., CWFs)		# of erosion sites/$ of funding

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
			benefits annually		benefits annually			
Protection		Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)	Identify erosion sites and seek funding (e.g., CWFs)		# of stabes/side inlets structures 10 installed per year
	Tree/Shrub Establishment	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program		# of Pennington SWCD tree planting program
	Well Sealing					Seal a total of 15 wells		# of wells sealed
	Septic System Upgrades	County funding to upgrade failing SSTS with cost share assistance	County funding to upgrade failing SSTS with cost share assistance	County funding to upgrade failing SSTS with cost share assistance	County funding to upgrade failing SSTS with cost share assistance	Replace/upgrade 20 SSTS	Replace/upgrade all failing SSTS	# of SSTS
		MTS assessment completed						

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
						24 source reduction practices, reducing by 379 t/yr		# of source reduction practices
	Residue and Tillage Management	12,780 acres of residue and tillage management	12,780 acres of residue and tillage managemen t	12,780 acres of residue and tillage management	12,780 acres of residue and tillage management	12,780 acres of residue and tillage management	100% of producers implementing residue and tillage management	# of residue and tillage management
Source reduction	Nutrient Management/Manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure managemen t plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	640 acres under nutrient/manu re management	All producers using manure mgmt plans	# of acres under nutrient/manu re management
	Cattle exclusion	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemente d	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	Red Lake SWCD cattle exclusion incentive program implemented	All cattle excluded from streams	# of Lake SWCD cattle exclusion incentive program implemented
		EQIP cattle exclusions (fencing and alternative water sources)	EQIP cattle exclusions (fencing and alternative water sources)	EQIP cattle exclusions (fencing and alternative water sources)	EQIP cattle exclusions (fencing and alternative water sources)		Funding for implementatio n of cattle exclusions	# of cattle exclusions funded

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
		Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	100% of producers using manure management plan	# of producers using manure mgmt. plans
	Rotational grazing	EQIP rotational grazing	EQIP rotational grazing	EQIP rotational grazing	EQIP rotational grazing	875 acres of rotational grazing	All producers using rotation grazing	# of acres of rotational
	Wastewater and Feedlot Runoff Control				Identify any potential project sites	Implement 1 each wastewater and feedlot runoff control practice		# of 1 each wastewater and feedlot runoff control practice
	Ag Waste Storage				Identify any potential project sites	Implement 1 ag waste storage practice		# of 1 ag waste storage practice
	Streambank and shoreline protection	Red Lake County ditch outlet assessments	Polk County ditch outlet assessments					
			Maintain inventory of highest erosion outlets					
In channel prac		Geomorphology study and evaluate	Prioritize areas to					

Treatment Group	Treatment type	Milestones					Long-Term Goals	Assessment
		2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10-year (2031)		
		the change of the area assessed from first assessment	implement projects to stabilize banks					
		Additional surveys conducted in the Black River	Develop method for prioritizing the projects/identifying critical areas	Site critical project areas/begin constructing in critical areas				
		Implement critical area erosion control project 1 each	Implement critical area erosion control project 1 each	Implement critical area erosion control project 1 each	Implement critical area erosion control project 1 each	Total of 5 critical erosion projects completed		# of 5 critical erosion projects completed

The suite of implementation practices and long-term implementation goals for the management area are shown in Table 19. Implementation of the practices will be done over many years and are expected to protect or restore water quality to water quality standards. Prioritization for these practices will include the critical areas, funding availability, and landowner interest.

Table 19. BMPs identified in the Black River Watershed to reach water quality standards and provide protection

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
Protection	Channel Bed and Stream Channel Stabilization	1	Miles	$126,300	SWCDs	2026-2056
	Critical Area Planting	45	Acres	$39,056	SWCDs	2017-2026
	Grade Stabilization Structure	80	Each	$685,280	SWCDs	2017-2026
	Streambank, Shoreland, and Roadside protection	2	Miles	$859,874	SWCDs	2017-2026
	Tree/Shrub Establishment	10	Acres	$4,526	SWCDs	2017-2026
	Well Sealing	15	Each	$7,500	SWCDs	2017-2026
	Septic System Upgrades	10	Each	$80,000	SWCDs/Environmental Services	2017-2026
	Upland Wildlife Habitat Management	6,000	Acres	$120,000	SWCDs/Pheasants Forever/RLWD	2020-2026
	Restoration & Management of Rare/Declining Habitat	45	Acres	$39,060	SWCDs/Pheasants Forever/RLWD	2020-2026
	Prescribed Burning	300	Acres	$30,000	Pheasants Forever/RLWD	2020-2026
	Gravel Pit Reclamation	2	Acres	$1,736	Counties	2020-2026
	Residue and Tillage Management	960	Acres	$16,320	NRCS	2017-2026
Source Reduction	Nutrient Management	640	Acres	$640	NRCS	2017-2026
	Rotational and Prescribed Grazing	1,760	Acres	$857,153	NRCS	2017-2026
	Precision Ag Practices	40	Acres	$800	NRCS	2017-2026
	Drainage Water	320	Acres	$126,270	NRCS/RLWD	2020-2026

	Management (Tile)					
Storage	Water and Sediment Control Basins	10	Each	$102,500	SWCDs/RLWD	2020-2026
	Wetland Restoration	160	Acres	$1,077,600	SWCDs/NRCS/RLWD	2020-2026
	Wastewater and Feedlot Runoff Control	1	Each	$1,000	SWCDs/NRCS/RLWD	2020-2026
	Water Control Structures	2	Each	$2,000	NRCS/RLWD	2020-2026
	Ag Waste Storage	1	Each	$1,000	SWCDs/NRCS/RLWD	2020-2026
	Diversion	5	each	$9,500	SWCDs/RLWD	2020-2026
	Conservation Cover	800	Acres	$512,090	NRCS	2017-2026
Filtration	Cover Crop	320	Acres	$34,282	NRCS	2017-2026
	Filter Strips	15	Miles	$40,740	SWCDs/NRCS	2017-2020
	Grass Waterways	2.5	Miles	$70,190	SWCDs/NRCS/RLWD	2017-2020
	Riparian Buffers	25	Miles	$67,900	SWCDs/RLWD	2017-2020
	Field Borders	10	Miles	$6,700	NRCS/RLWD	2017-2020
Infiltration	Multi-Stage Ditch	1	Miles	$311,520	Counties/RLWD	2017-2026
FDR	Impoundment	5000	ac-ft	$5,000,000	RLWD	2017-2026
				$10,231,537.00		

5.2.2.1 Black River reductions

Reductions for the practices described in Table 18 are described in Table 20. The reductions were calculated using the STEPL spreadsheet. The table include estimated reductions for work being planned in this NKE and work that is either completed or currently underway. This plan will reduce TSS loading to the RLR Mainstem by 1,536 t/yr (61.5%) and *E. coli* loading by 1.2E+03 billion MPN/yr (99.4%).

Table 20. STEPL reductions for the planned work in the Black River Watershed

Watershed	TSS load (no BMP) t/yr	*E. coli* load (no BMP) billion MPN/yr	TSS reduction t/yr	*E. coli* reduction billion MPN/yr	TSS load (with BMP) t/yr	*E. coli* load (with BMP) billion MPN/yr	TSS reduction %	*E. coli* reduction %
Black River	2495.7	1.8E+05	1535.2	2.6E+04	1037.1	3.1E+04	58.4	31.5

Watershed	TSS load (no BMP) t/yr	*E. coli* load (no BMP) billion MPN/yr	TSS reduction t/yr	*E. coli* reduction billion MPN/yr	TSS load (with BMP) t/yr	*E. coli* load (with BMP) billion MPN/yr	TSS reduction %	*E. coli* reduction %
Black River SSTS reductions				1.6E+05				
Totals Black River	2495.7	1.8E+05	1535.2	1.8E+05	1037.1	3.1E+04	58.4	99.3
Black River completed/ underway			0.5	6.50E+00				
Total planned/ completed reductions			1535.7	1.8E+05	1037.1	1.2E+03	61.5	99.4

5.2.3 Pennington County Ditch 96

Pennington County Ditch 96 is impaired for *E. coli*. Branch 5 of CD 96 is impaired for fish IBI. Sediment is used as a surrogate in implementation planning through the 1W1P given that it is a primary stressor for the fish and macroinvertebrate communities. The CD 96 Watershed is also a concern for sediment loading to the mainstem of the Red Lake River. There is no TSS reduction required by a TMDL for CD 96. The CD 96 is a contributor of TSS to the Red Lake River Mainstem. TSS reductions in this tributary will reduce TSS loads in the Red Lake River.

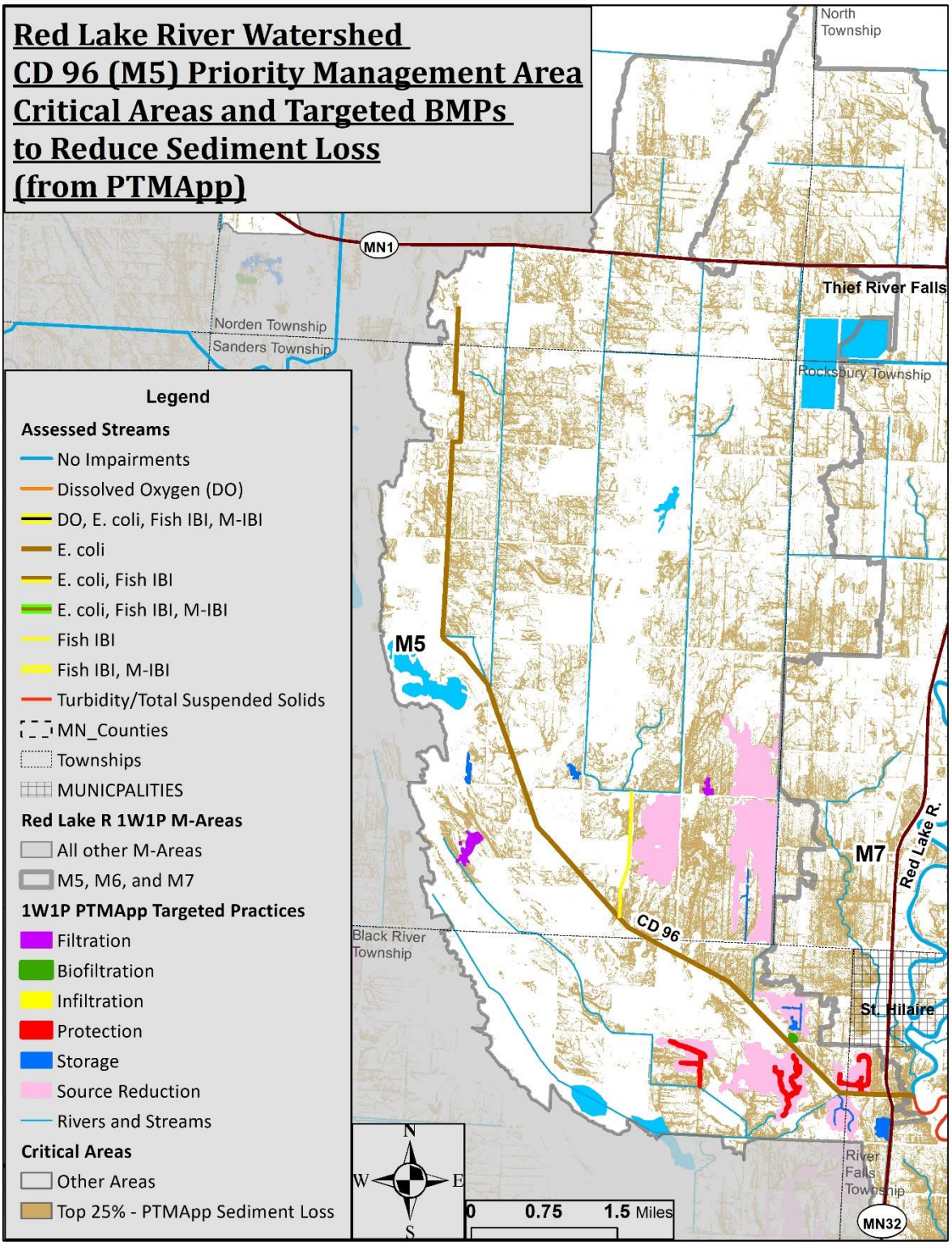
The Pennington CD 96 Watershed is 26,617 acres. The land use is broken down by 1,037 developed acres, 19,304 acres of cropland, 745 acres pastureland, 1,888 acres forest, and 4 acres of feedlots. The remaining 3,639 acres are 27 acres of shrub/herbaceous, 3,613 wetlands.

The PTMApp model for the 1W1P Appendix, assuming their set of practices for TSS reductions, will achieve a 9% targeted reduction of upland loading in the next ten years at a cost of approximately $391,951. In addition to practices recommended by the PTMApp 1W1P, the watershed partners have expanded the number and types of practices, described in Table 21 and Table 22. It is estimated that those practices, and work currently underway, will reduce TSS by 665 tons/yr into the Red Lake River (Table 23). The practices will also reduce *E. coli* loading by 28%, far exceeding the 3% reduction required by the TMDL. It is expected that the work described in Table 21 and Table 22 will achieve the reductions needed to meet *E. coli* water quality standards. Current work includes the installation of 50 side inlets and 1,100 feet of ditch stabilization at the outlet of CD 96.

PTMApp estimates that roughly 23% of land area in the Pennington County Ditch 96 Watershed may contain a critical area for sediment loss and delivery to a concentrated flow path. These critical areas are in almost every parcel of the area. Critical areas are illustrated in Figure 28. This indicates that most of the watershed has opportunities to treat areas for sediment loss. To further narrow the critical loading areas, the watershed partners have and continue to conduct farm visits and field inventories to identify the highest erodibility and sediment loss areas. With field observations and refinements to PTMApp, the

watershed partners are confident that the critical loading areas will be identified and addressed. These areas are targeted by the outreach staff to get BMPs implemented in these areas.

Figure 28. Critical areas and targeted practices in CD 96 Watershed



The draft TMDL calls for a 10% reduction in E. coli at high flow conditions in the load duration curve. SSTS inspections will be made and noncompliant systems will be upgraded over the course of ten years. Inadequate septic systems are identified as a low potential contributor. BMPs for livestock management will focus on stream exclusions and grazing practices to address the low potential E. coli contribution from livestock predominantly along the stream reaches. Birds e.g. cliff swallows were identified as a high potential *E. coli* contributors. Waterfowl and SSTS are also identified as low potential contributors.

The ten-year implementation targets developed through the 1W1P and subsequent PTMApp analyses are shown in Table 21 for the Pennington County Ditch 96 Watershed. The prioritization of these projects is based upon critical loading areas and greatest impact on water quality. These practices target the prioritized impairment for TSS on the waterbody.

Table 21. Goals, milestones, and assessments of PTMApp targeted implementation in critical areas in the Pennington County Ditch 96

Treatment type	Milestones					Long-Term Goals	Assessment
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10 year (2031)		
Drainage Water Management		Analyze permitted tile lines to find opportunities to utilize drainage water management practices					
	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database	RLWD maintain tile permit database		
Wetland Restoration	Identifying landowners and conducting outreach		2 wetland restorations	3 wetland restorations	3 wetland restorations	Restore 8 (80 acres) wetlands	# of wetlands restored
	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act	Pennington County administration of the Wetland Conservation Act		
Filter Strips	Identifying landowners and conducting outreach	Implementing 10 acres filter strips				10 acres of filter strips implemented	# of acres filter strips
Riparian Buffers	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Maintaining 100% compliance with Minnesota Buffer	Continue working with landowners and observing the continued compliance	Buffer Law compliance

Treatment type	Milestones					Long-Term Goals	Assessment
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10 year (2031)		
Biofiltration practice				Outreach to landowner for implementation	1 biofiltration practice	One biofiltration practice implemented	# of biofiltration practices
Saturated Buffer	Identifying landowners and conducting outreach		1 saturated buffer implemented			1 Saturated buffer implemented	# of saturated buffers
Filtration practices		Implement 1 filtration practice		Implement filtration practice		Implement 2 filtration practices	# of filtration practices
Critical Area Planting	Implement planting with appropriate associated practices	Use PTMApp analyses for identifying critical planting areas for multiple benefits	Implement 20 acres critical area planting	Implement 25 acres critical area planting		Implement 45 acres critical area planting	# of acres critical area planting
Grade Stabilization Structure	Grade stabilization to alleviate perched culvert at Hwy 32	Assess area to see if there are grade stabilization opportunities or two stage ditch		Identify grade stabilization needs upstream of Hwy 32		To know the needs for further grade stabilizations	
	Grade stabes/side inlets structures 10 installed per year	Grade stabes/side inlets structures 10 installed per year	Grade stabes/side inlets structures 10 installed per year	Grade stabes/side inlets structures 10 installed per year	Grade stabes/side inlets structures 10 installed per year	50 Grade stabilization implemented	# of grade stabilizations implemented
	Pennington County completes ditch outlet assessment	Target ditch projects/conduct outreach, min 5 landowners	Implement one outlet restoration			Implement one outlet restoration	# of outlets restored

Treatment type	Milestones					Long-Term Goals	Assessment
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10 year (2031)		
Ditch bank stabilization	Stabilize outlet of CD 96 1100 feet of stabilization ditchbank	Evaluate performance of stabilization				Outlet ditchbank stabilized	# of feet stabilized
Tree/Shrub Establishment	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program	Continue Pennington SWCD tree planting program		
Well Sealing						Seal a total of 10 wells	# of wells sealed
Septic System Upgrades	Conduct microbial source tracking assessment in CD 96	Analyze data from microbial source tracking	Plan further implementations based on source tracing			Conduct and analyze bacterial sources and plan implementation	# of plans
	Replace/upgrade 6 SSTS	Replace/upgrade 5 SSTS	Replace/upgrade 5 SSTS	Replace/upgrade 5 SSTS	Replace/upgrade 6 SSTS	Replace or upgrade 32 SSTS	# SSTS
Gravel Pit Reclamation			Develop a potential gravel pit reclamation guidance document				
Cover Crop	20% of producers in continual cover crops (3,860 acres)	20% of producers in continual cover crops (3,860 acres)	20% of producers in continual cover crops (3,860 acres)	20% of producers in continual cover crops (3,860 acres)	20% of producers in continual cover crops (3,860 acres)	100% of producers using cover crops (19,304 acres)	# of acres cover crops
Residue and Tillage Management	20% (3,860 acres) of cropland in residue and tillage management	20% (3,860 acres) of cropland in residue and tillage management	20% (3,860 acres) of cropland in residue and tillage management	20% (3,860 acres) of cropland in residue and tillage management	20% (3,860 acres) of cropland in residue and tillage management	100% (19,304 acres) using residue/tillage management techniques	# of acres

Treatment type	Milestones					Long-Term Goals	Assessment
	2-year (2023)	4-year (2025)	6-year (2027)	8-year (2029)	10 year (2031)		
Nutrient Management/Manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	Outreach to smaller livestock operations to encourage a manure management plan	100% (19,304 acres) implementing manure management	# of acres
Cattle Exclusion	MST conducted for CD 96	Outreach and identify willing landowners	Outreach and identify willing landowners		No cattle access w/in 50 ft buffer along ditch	100% of producers excluding cattle from streams (745 acres)	# of exclusions
Rotational Grazing	20% of producers implementing rotational grazing	20% of producers implementing rotational grazing	20% of producers implementing rotational grazing	20% of producers implementing rotational grazing	20% of producers implementing rotational grazing	100% of producers implementing rotational grazing (745 acres)	# of acres % of producers
Two-stage ditch	Assess area to see if there are grade stabilization opportunities or two stage ditch		Assess feasibility of stream restoration or 2-stage ditch projects	Improving stream habitat	1 mile of two-stage ditch	One 1-mile two-stage ditches	# of two-stage ditches

The suite of implementation practices and long-term implementation goals for the management area are shown in Table 22. Implementation of the practices will be done over many years and are expected to protect or restore water quality to water quality standards. Prioritization for these practices will include the critical areas, funding availability, and landowner interest.

Table 22. BMPs identified in the Pennington County Ditch 96 Watershed to reach water quality standards and provide protection

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
Protection	Channel Bed and Stream Channel Stabilization	1	Miles	$126,300	SWCDs	2017-2026
	Critical Area Planting	40	Acres	$34,716	SWCDs	2017-2026
	Grade Stabilization Structure	50	Each	$428,300	SWCDs/NRCS	2017-2026
	Streambank, Shoreland, and Roadside protection	1	Miles	$429,937	SWCDs	2017-2026
	Tree/Shrub Establishment	10	Acres	$4,526	SWCDs/NRCS	2017-2026
	Well Sealing	10	Each	$5,000	SWCDs	2017-2026
	Septic System Upgrades	5	Each	$40,000	SWCDs	2017-2026
	Upland Wildlife Habitat Management	1,500	Acres	$30,000	SWCDs/Pheasants Forever/RLWD	2017-2026
	Restoration & Management of Rare/Declining Habitat	20	Acres	$17,360	SWCDs/Pheasants Forever/RLWD	2017-2026
	Prescribed Burning	50	Acres	$5,000	SWCDs/Pheasants Forever/RLWD	2017-2026
	Gravel Pit Reclamation	2	Acres	$1,736	Counties	2017-2026
Source Reduction	Residue and Tillage Management	320	Acres	$5,440	NRCS	2017-2026
	Nutrient Management	320	Acres	$320	NRCS	2017-2026
	Rotational and Prescribed Grazing	160	Acres	$77,923	NRCS	2017-2026
	Precision Ag Practices	40	Acres	$800	NRCS	2017-2026

Strategy	BMP	Total	Unit	Cost	Lead entity	Schedule
	Drainage Water Management (Tile)	160	Acres	$63,360	NRCS/RLWD	2017-2026
Storage	Water and Sediment Control Basins	10	Each	$102,500	SWCDs/NRCS/RLWD	2017-2026
	Wetland Restoration	80	Acres	$538,800	SWCDs/NRCS/RLWD	2017-2026
	Wastewater and Feedlot Runoff Control	1	Each	$1,000	SWCDs/NRCS/RLWD	2017-2026
	Water Control Structures	2	Each	$2,000	NRCS/RLWD	2017-2026
	Ag Waste Storage	1	Each	$1,000	SWCDs/NRCS/RLWD	2017-2026
Filtration	Conservation Cover	640	Acres	$409,672	NRCS	2017-2026
	Cover Crop	160	Acres	$17,141	NRCS	2017-2026
	Filter Strips	10	Miles	$27,160	SWCDs/NRCS/RLWD	2017-2020
	Grass Waterways	0.5	Miles	$14,038	SWCDs/NRCS/RLWD	2017-2020
	Field Borders	10	Miles	$6,700	NRCS	2017-2020
Infiltration	Multi-Stage Ditch	1	Miles	$311,520	Counties/RLWD	2017-2026

5.2.3.1 Load reduction estimates for Pennington CD 96

Reductions for the practices described in Table 21 are described in Table 23. The reductions were calculated using the STEPL spreadsheet. Reductions for the practices described in Table 20 are described in Table 22. The reductions were calculated using the STEPL spreadsheet. The table include estimated reductions for work being planned in this NKE and work that is either completed or currently underway.

Table 23. Estimated reductions for TSS and *E. coli* for CD 96

Watershed	TSS load (no BMP) t/yr	*E. coli* load (no BMP) billion MPN/yr	TSS reduction t/yr	*E. coli* reduction billion MPN/yr	TSS load (with BMP) t/yr	*E. coli* load (with BMP) billion MPN/yr	TSS reduction %	*E. coli* reduction %
Pennington CD96	1373.9	4.0E+04	742.1	8.3E+03	631.9	3.2E+04	54.0	20.5
Pennington CD96 SSTS				2.9E+04				
Total NKE plan for CD96	1373.9	4.0E+04	742.1	3.8E+04	631.9	2.7E+03	54.0	93.3
Underway/completed work for CD96 Watershed			363.2	9.7E+01				
Total reductions for CD96			1105.3	3.8E+04	268.7	2.6E+03	80.4	93.5

5.3 Planning Area watershed NPS management activities

Several NPS management activities were identified for the Planning Area watershed as a whole (Table 24). The activities are a combination of general concepts, additional specific topic planning, special studies, data collection, and integrating various existing programs. The activities were targeted by year or range of years, but many require a source of funding before being completed. The potential cost of all of the activities combined would range between $3,750,000 and $3,860,000.

Table 24. Non-structural Implementation Plan for the Planning Area (1W1P, p. 6-25)

Action	Cost	Lead Entity	Year(s)
Wind Erosion Prediction System (WEPS) Plan	$30,000 - $60,000 for 1W1P Watershed	RLWD	2017
Protect unprotected highly wind-erodible soils	TBD	SWCDs	2017-2026
Conserve protected highly wind-erodible soils	TBD	SWCDs	2017-2026
Reach Assessment Classification, Prioritization and Implementation Plan	$30,000 - $60,000 for 1W1P Watershed	DNR, RLWD	2017
Protect stable, at-risk reaches	TBD	DNR, SWCDs	2017-2026
Restore unstable, at-risk reaches	TBD	DNR, SWCDs	2017-2026
Delineate 10-yr non-contributing areas and develop policy and practices to detain runoff	$10,000 - $20,000 for 1W1P Watershed	RLWD	2017
Map of suitable potential flood control projects	$5,000 - $10,000for 1W1P Watershed	RLWD	2017
Urban BMP retrofit assessment and implementation plan	$10,000 - $15,000 for one City	SWCDs	2017-2020
Conduct Stormwater Assessment	TBD	SWCDs	2020-2026
Buffer and side water inlet prioritization and implementation plan	$10,000 for Planning Zone	SWCDs	2017-2020
Drainage System Management incentive (grant) program development and implementation	$200,000	RLWD	2017-2026

Action	Cost	Lead Entity	Year(s)
Habitat Evaluation Procedures Analysis and Hydrogeomorphic Analysis	$50,000 - $100,000 for 1W1P Watershed	DNR, RLWD	2020-2021
Protect high value habitats	TBD	DNR, SWCDs	2020-2026
Restore at risk or moderately degraded habitats	TBD	DNR, SWCDs	2020-2026
Revised AIS and Terrestrial Non-Native/invasive Plan	$10,000 - $20,000	SWCDs/RLWD	2017-2026
Fish passage field assessment and implementation	$30,000 - $60,000	DNR/SWCDs/ RLWD	2017-2026
Update Education and Outreach Program to include MN Buffer Initiative details, DNR and Department of Health Plan information related to source water, AIS and SSTS	$5,000 - $10,000	SWCDs	2017-2026
Participate in wellhead protection and plan development. Develop a geologic county atlas. Inventory unused, unsealed wells Seal known unused wells Distribute education/outreach materials of proper well management and well sealing Implement a cost share program to financially assist property owners in sealing unused, unsealed wells on their property, including the public water suppliers in the watershed	$100,000	MDH/RLWD/ SWCDs	2017-2026
Ground water conservation feasibility study	$100,000	Env Services/ SWCDs	2017-2022
Conduct a regional hydrogeological assessment of groundwater resources; map areas of groundwater contamination	$10,000	DNR, SWCD's	2017-2026
SSTS • Inventory SSTS • Develop and implement a SSTS tracking system	$25,000-$35,000	Env Services /SWCDs	2017-2020
Public Waters buffers under MN Buffer Initiative	$100,000	SWCDs	2017-2020
Public Drainage Ditch buffers under MN Buffer Initiative	State Allocation	SWCDs	2017-2020
RLWD Long-Term Water Quality Monitoring Program	$215,000	RLWD	2017-2026
RLWD Support of the River Watch Program	$460,000 for the entire RLWD	RLWD	2017-2026
Stage and flow monitoring	$63,000	USGS, MPCA, RLWD	2017-2026
Red Lake County Water Quality Monitoring	$30,000	Red Lake SWCD	2017-2026
Pennington County Water Quality Monitoring	$60,000	Penn SWCD	2017-2026
Continuous dissolved oxygen monitoring	$102,000	RLWD	2017-2026
Erosion site inventories, updates, and sharing of information	$48,000 (RLWD) + $48,000 (SWCDs)	SWCDs, RLWD	2017-2026
Assist the DNR with geomorphological assessments	$19,000 for the entire RLR watershed	RLWD	2022

Action	Cost	Lead Entity	Year(s)
Aerial data collection (drone technology) to measure channel stability and erosion rates along river channels	$500,000	RLWD, SWCDs	2017-2026
Surface Water Assessment Grant Sampling (SWCDs)	$97,500 for entire watershed	RLWD	2022
Pursue aerial data collection (drone technology) to inspect ditch systems and/or ID BMP opportunities	$500,000	RLWD, SWCDs	2017-2026
Conduct a culvert inventory that includes location, sizing, and fish passage. Plan for systematic replacement of culverts based upon inventory results.	$180,000	SWCDs, RLWD	2017-2020
Inventory of legal ditch outlets and natural waterway outlets for grade stabilization structures	$150,000	SWCDs	2020-2026
Identify new and/or closed registered feedlots or ag waste systems	$10,000	SWCDs	2023-2026
Update existing inventories with the new information as needed	$30,000	LGU	2017-2026
Observation well monitoring	$50,000	DNR, SWCDs	2017-2026
Update or develop new County Ordinances	$50,000	LGU	2017-2026
Update Education and Outreach Programs	$500,000	LGU	2017-2026

5.4 Potential funding sources

Section 8 of the 1W1P (2017) describes various funding sources to be used to fund implementation of the plans. For the Focus Workplan, Section 319 grant money will be a centerpiece; however, it is critical to the success of the watershed to leverage many different sources of funding and various programs. In addition to funding, the multiple programs and organizations involved will contribute technical assistance.

The implementation costs for the management strategies reflect EQIP payment rates. Actual costs for the BMPs are estimated by the Red Lake Partners to be double, when taking into account area contractor rates, land cost, technical and engineer assistance, project development, and administrative costs.

Other funding sources include state Clean Water Funds and federal EQIP funds. Red Lake River Watershed is included in a current RCCP program for targeted EQIP funds.

RCCP

The Red Lake River Watershed is eligible for federal funding through the Regional Conservation Partnership Program (RCPP). The BWSR and MN Association of Soil and Water Conservation Districts (MASWCD) submitted an application to NRCS to leverage Clean Water Fund dollars. Priority management areas were identified by the Red Lake River Planning Workgroup and include; CD96, the Black River, Burnham Creek, and the Red Lake River between Thief River and Crookston. Resource Concerns and Land Uses were also identified through the RCPP that align with the Red Lake River 1W1P. $428,000 is available for fiscal years 2019-2021 to implement practices in the Red Lake River watershed through the RCPP.

5.5 Cost of implementation

Costs for the implementation of the practices are included. PTMApp was used to estimate the cost of implementing BMPs. The model uses EQIP estimates to calculate costs. The watershed partners believe these costs to be too low for their area based on their experience, the price and the availability of contractors, and the uniqueness of the Red Lake River area. The PTMApp cost is listed, with the caveat that the total cost would be doubled to cover the increased costs, the technical assistance, project design, and administration.

With complete consideration of the costs, the cost of BMP implementation, technical, and administrative costs to achieve the necessary reductions in the next 10 years is estimated to be $28,000,000.

The costs described are estimates and will vary with time, inflation, market concerns, and overall time and economic change. No future costs of money have been calculated, nor do these costs represent a contractual obligation.

5.6 Information and education

The resources of concern for the 1W1P effort were determined by working with many stakeholders. The LGUs in the Red Lake River Watershed will continue ongoing education and outreach programs and activities. Information, outreach, and education is provided to the general public, stakeholders, and K-12th grade students, etc. Table 25 lists current educational events and programs along with the responsible LGUs. LGUs will provide information, outreach, and educational material for any new programs that arise throughout the Red Lake River Watershed.

Table 25. Summary of Education and Outreach Programs (1W1P, 2017)

Event/Program	LGUs/Notes
K-12th Grade – Annual events	
NW MN Water Festival	Pennington SWCD, Red Lake County SWCD, West Polk SWCD, RLWD, Local, State and Federal Agencies and other LGU's
Outdoor Education Day	Pennington SWCD, Red Lake County SWCD, West Polk SWCD, RLWD
Envirothon	Pennington SWCD, Red Lake County SWCD, West Polk SWCD
Poster Contest	Pennington SWCD
Arbor Day	Pennington SWCD, W. Polk SWCD
Long Lake Conservation Camp	Pennington SWCD, Red Lake County SWCD, West Polk SWCD
Science Fair	SWCD, NRCS, and RLWD staff participate in judging and awarding projects related to soil/water conservation
Science Museum	Sponsor Bemidji Science museum presentation for local elementary students
New Opportunities	All LGUs
General Public – Annual	

Event/Program	LGUs/Notes
Banquet	Pennington SWCD
Presentations	W. Polk SWCD (UMC, Townships, DNR Firearm Safety Course)
Climatology Program	Pennington SWCD, Red Lake County SWCD, West Polk SWCD
Well Water Testing Clinic	Pennington SWCD
Well Testing Kits	Provide for private landowners to test well water year round
Nitrate Testing Clinic	Red Lake County SWCD
Aquatic Invasive Species Program (AIS)	Pennington SWCD, Red Lake County SWCD, Polk County
MAWQCP	Pennington SWCD, Red Lake County SWCD, West Polk SWCD
WRAPS	Civic Engagement-Red Lake Watershed District
Newsletters, Reports, and Websites	RLWD – www.redlakewatershed.org www.rlwdwatersheds.org www.facebook.com/Red-Lake-Watershed-District-26652173412008 https://redlakeriver.wordpress.com Pennington SWCD – www.penningtonswcd.org Red Lake SWCD – www.reedlakecountyswcd.org West Polk SWCD – www.westpolkswcd.com 1W1P – http://westpolkswcd.com/1w1p/html
Social media	All LGUs
Tile Drainage	Red Lake Watershed District
News Releases/Publications	All LGU's
Field Days / Tours / Demonstration Workshops	All LGUs
River Watch	The RLWD provides technical and financial support River Watch programs within the District
Open House Events	The RLWD, and possibly other LGU's may hold open-house events to promote attitudes toward the river.
County Fair Booths	All LGU's
Thief River Falls Community Expo	Pennington SWCD, RLWD
Red Lake River Corridor Enhancement Project	The RLWD is a member of the RLRCE Joint Powers Board and supports the work of the group, improving connections with rivers will help improve attitudes towards the river.
Water Resource Advisory Committee	The Pennington County SWCD organizes the meetings and the RLWD is represented among the regular attendees.

6. Monitoring

Water quality in the Red Lake River between Thief River Falls and Crookston is being monitored at nearly all available road crossings. Sample analysis conducted by local organizations generally includes total suspended solids, total phosphorus, orthophosphorus, total Kjeldahl nitrogen, ammonia nitrogen, nitrates & nitrites, and *E. coli*. Direct measurements of dissolved oxygen, temperature, specific conductivity, and pH are conducted with multiparameter Sondes. Turbidity has been measured with HACH 2100P and 2100Q portable turbidimeters. Stage and observations of river conditions are also recorded during site visits.

The MPCA's Watershed Pollutant Load Monitoring Network (WPLMN) includes three sites near the Planning Area. The WPLMN samples more intensively for total suspended solids, total phosphorus, nitrate plus nitrite, total Kjeldahl nitrogen, and dissolved orthophosphate and targets higher flows when pollutant levels are likely elevated.

River Watch volunteers monitor water quality on a semi-monthly schedule. Extra, short-term monitoring will be conducted as determined necessary and funds are available. River Watch is a citizen monitoring program providing hands on, real world science opportunities for students, teachers, and citizens in the Red River of the North Basin. The program incorporates monitoring of baseline water quality data in area streams with public outreach and leadership experiences. The program is part of the International Water Institute and the Red River Basin Decision Information Network.

The MPCA IWM and stressor identification monitoring will be developed with the watershed partners when it begins. Dissolved oxygen logger deployments have been conducted in most of the tributaries and will be repeated prior to the MPCA 2024 waterbody assessment. The MPCA conducts biology and chemistry monitoring on a ten-year cycle across the state at the HUC-8 watershed scale. Water bodies in the planning area were sampled as part of the Red Lake River HUC-8 watershed in 2014–2015 and will be sampled again in 2024–2025. MPCA monitoring consists of fish and macroinvertebrate sampling at several stream sites in each watershed. Water chemistry sampling is conducted at a subset of the biological monitoring sites.

The Red Lake and Pennington SWCDs sample monthly during the open water season. The Red Lake WD samples sites for its long-term monitoring program at least four times each year in order to obtain the minimum number of samples needed for assessments and trend analysis.

1. The Red Lake River crossing at Greenwood Street in Thief River Falls (S006-225) is a location where the Red Lake WD collects samples to characterize water quality in the river where it begins to flow south of the city.
2. The next crossing of the Red Lake River, at CSAH 3 near St. Hilaire (S003-942) is sampled monthly by the Pennington SWCD. Stations S006-225 and S003-942 bookend an unimpaired reach of the Red Lake River (AUID 09020303-513).
3. Volunteer monitoring of Red Lake River is conducted by the Red Lake Fall High School River Watch team at an old railroad bridge crossing that is now used as a bike/pedestrian crossing in Red Lake Falls (S002-975). The river is not regularly monitored at the Highway 32 Bridge, upstream of Red Lake Falls (S008-097), due to traffic-related safety concerns.

4. The Sportsman's Bridge (CSAH 13) crossing of the Red Lake River (S003-172) is the last road crossing upstream of the river's confluence with the Clearwater River. It is sampled intensively by the MPCA's WPLMN. It has also been sampled regularly by the Red Lake WD and the Red Lake SWCD. Flow at this location is monitored by an MPCA/DNR Cooperative Stream Gauging station. Stations S002-975 and S003-172 represent water quality along the furthest upstream reach of the Red Lake River (AUID 09020303-504) that is impaired by total suspended solids.
5. The Huot Bridge (S002-976 at CSAH 3) is the only road crossing on the impaired AUID 09020303-502 and has been sampled by the Red Lake County SWCD and the Red Lake Falls High School River Watch team. The two assessment units between the Clearwater River confluence and the Black River confluence (09020303-510 and 09020303-511) have not been sampled because there are no road crossings or other public access points along those reaches.
6. The CSAH 11 crossing of the Red Lake River (S000-042) along the impaired AUID 09020303-512 has been monitored by the Crookston High School River Watch team and has recently been added to the Red Lake WD long-term monitoring program.
7. In Crookston, the Red Lake River is monitored intensively by multiple programs (WPLMN, Red Lake WD, and Crookston River Watch) at the Woodland Avenue crossing (S002-080). Flow is recorded by a USGS gage (05079000).

Conditions in the upstream reaches of the river are also being monitored at several crossing by local organizations: Smiley Bridge (S007-063), Kratka Bridge (S003-947), and Highlanding Bridge (S002-077). The Highlanding Bridge is also intensively sampled by the WPLMN because it is also the location of a USGS gage station (05075000). The pour points of significant tributaries that flow into the M7 management area portion of the Red Lake River between Thief River Falls and Crookston are also regularly sampled by the Red Lake WD and SWCD. Those tributaries include

1. Pennington County Ditch 21 (AUID 09020303-541 at S008-889)
2. Pennington County Ditch 96 (AUID 09020303-505 at S005-683)
3. Black River (AUID 09020303-529 at S002-132)

The water quality monitoring goals and measures of success are summarized in Table 26.The DNR-MPCA Stream Monitoring (WPLMN) Sites, MPCA biological monitoring sites, and water quality monitoring sites with data in the EQuIS database are shown in Figure 29, Figure 30, Figure 31, and Figure 32. Monitoring for this NKE plan will include four stream flow and water quality monitoring sites, six water quality monitoring sites, and ten biological monitoring sites. There will also habitat and stream geomorphology assessments completed twice over the ten-years of this plan. Volunteer monitoring through the River Watch Program. Sites will be selected from the existing monitoring sites displayed in the following figures. Estimated monitoring and costs are summarized in

Table 27.

Table 26. Water quality monitoring goals to continue long-term monitoring efforts at key locations to provide sufficient data for water quality, hydrologic, hydraulic, and biotic analysis.

Goal	Measures of Success
Strategically conduct long-term monitoring efforts to maximize the extent to which future water quality assessments are complete, representative, and comprehensive.	Maintain or increase the number of reaches that are assessed in the 2024 assessment compared to the 2015 assessment.
	LGUs remain equipped with properly functioning multi-parameter sondes and sampling equipment
	LGUs participate in annual training sessions.
	LGUs collaborate on monitoring efforts that are of mutual interest.
	>5 E. coli samples are collected for each site during each calendar month within a 10-year period.
	>20 days with dissolved oxygen measurements from each AUID
	>20 days with pre-9am dissolved oxygen measurements from each AUID
	>20 days of unbiased TSS samples from each AUID
	LGU water quality data is submitted to the MPCA for entry into the EQuIS database prior to each annual deadline.
Conduct intensive monitoring efforts to answer specific questions about water quality issues.	Data provides sufficient proof to guide actions that minimize the influence of specific pollutant sources.
	Document and share information about the locations of pollutant sources
Monitor the effectiveness of significant projects.	Sufficient pre-project data is collected to characterize water quality conditions prior to the project.
	Regular sampling continues after the completion of the project.
	Data is analyzed to determine pre/post-project changes in water quality
Support and Expand River Watch Monitoring Programs	Existing River Watch programs continue to regularly collect water quality data.
	Local River Watch programs participate in the River Watch forum and win awards.

Goal	Measures of Success
	Water quality data from River Watch schools is submitted annually to the MPCA for the EQuIS database prior to the data submission deadline.
Collect stage and flow data for four sites	>10 years of stage and flow data from each site.
	Robust flow rating curves are developed through regular flow measurements.

Figure 29. Monitoring sites in the Black River Watershed

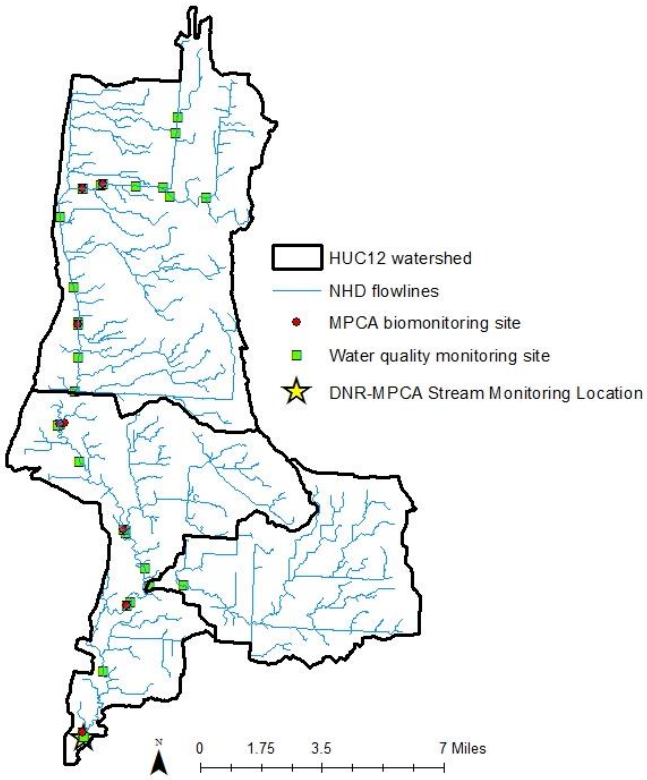


Figure 30. Monitoring sites in the CD 96 Watershed

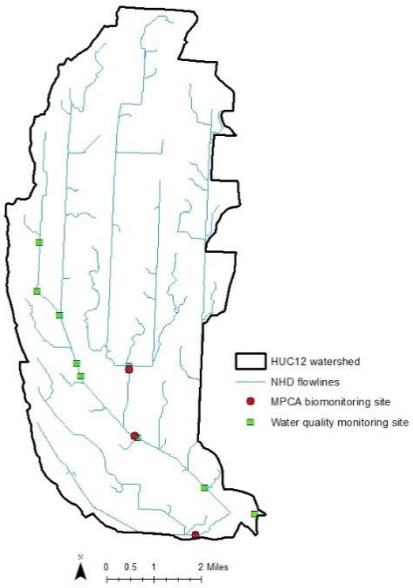


Figure 31. Monitoring sites in the Red Lake River – Thief River Falls to Red Lake Falls Watershed

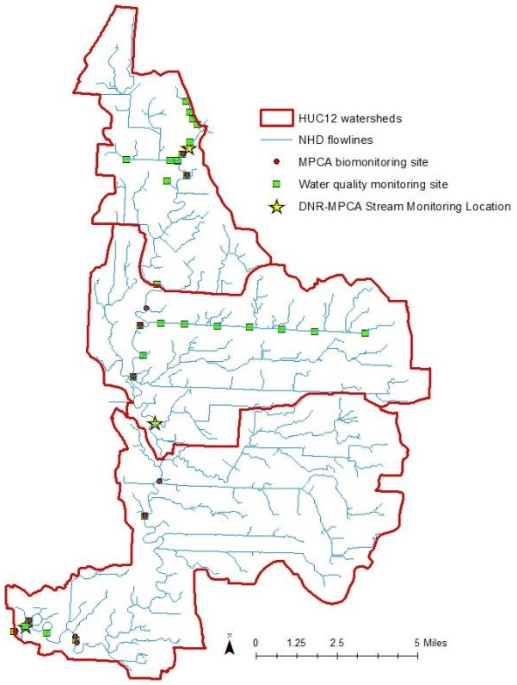


Figure 32. Monitoring sites in the Red Lake River – Red Lake Falls to Crookston Watershed

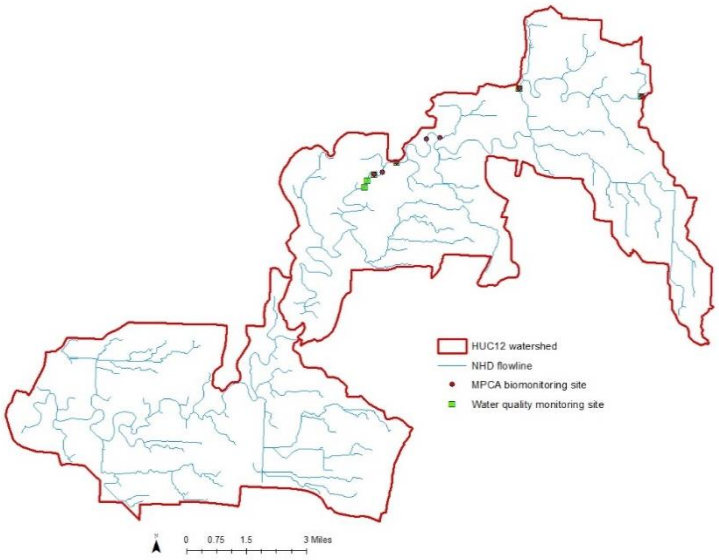


Table 27. Estimated monitoring and costs in the Red Lake River (Thief River Falls-Crookston) and Black River Watersheds

Monitoring type	Description	Unit cost (annual)	Total (10-years)
Streamflow and water quality sampling and analysis	0.2 FTE for 4 sites 0.1 FTE for data analysis Lab costs/site Equipment/4 sites	$20,000 $10,000 $2,000/site $5,000/site	$340,000
Water quality monitoring	0.1 FTE for 6 sites Lab costs/site	$10,000 $1,000/site	$100,000 $60,000
Biological monitoring	0.1 FTE for 10 sites 2-4 person crew and data analysis	$10,000	$100,000
Habitat and stream geomorphology	0.2 FTE (2 times per 10-year period)	$20,000	$40,000
Total			**$640,000**

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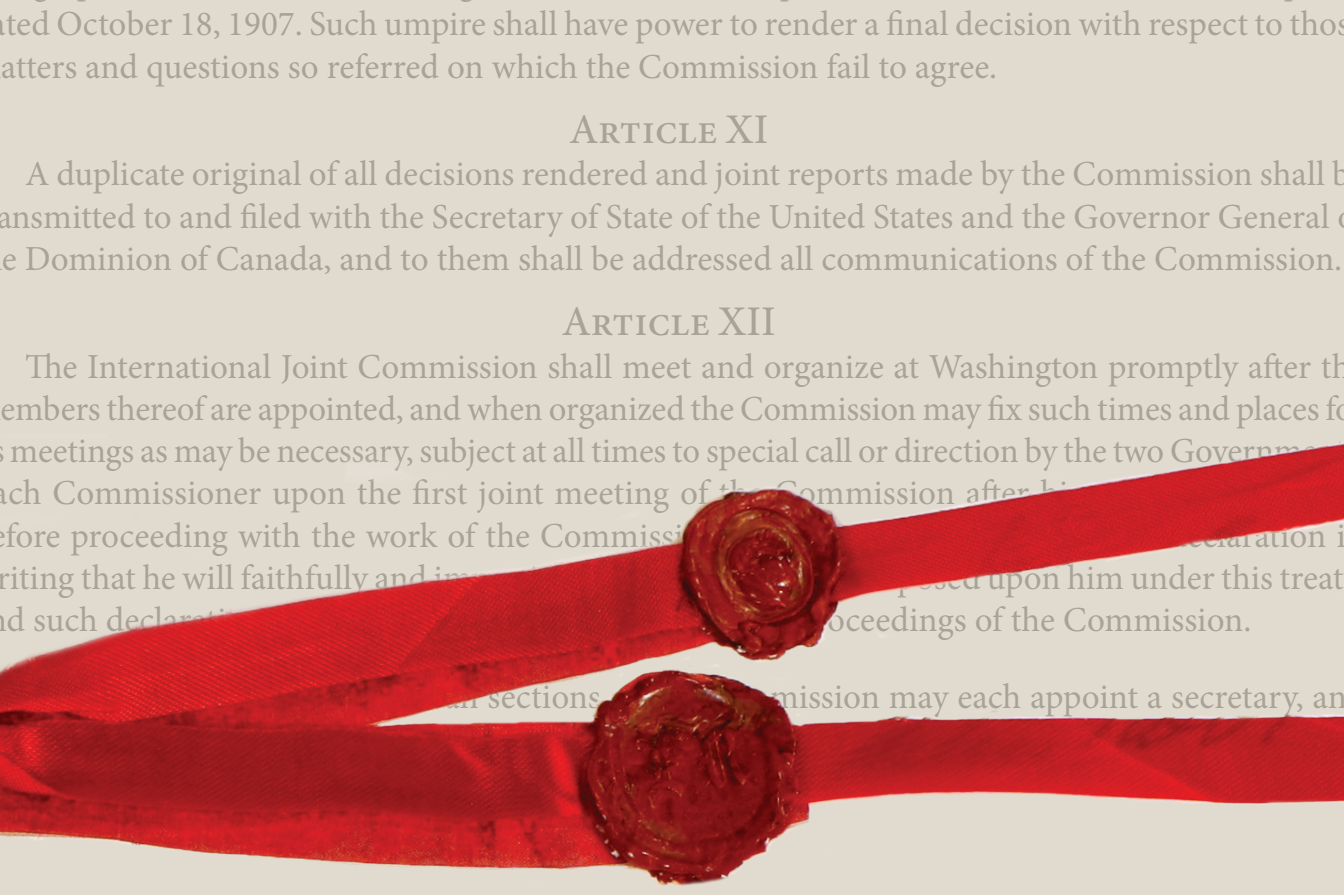
Appendix A
The Boundary Waters Treaty of 1909



THE BOUNDARY WATERS TREATY OF 1909

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TREATY
of January 11, 1909
between the United States and Great Britain

RATIFICATION, PROCLAMATION, MEETING AND ADOPTION AND PUBLICATION OF RULES OF PROCEDURE

Signed at Washington	January 11, 1909
Ratification advised by the Senate	March 3, 1909
Ratified by Great Britain	March 31, 1910
Ratified by the President	April 1, 1910
Ratifications exchanged at Washington	May 5, 1910
Proclaimed	May 13, 1910

INTERNATIONAL JOINT COMMISSION

Meeting of Commission for organization under Article XII of the treaty at Washington	January 10, 1912
Adoption and publication of rules of procedure in accordance with Article XII	February 2, 1912
Major revision of the rules of procedure	December 2, 1964

TREATY BETWEEN THE UNITED STATES AND GREAT BRITAIN RELATING TO BOUNDARY WATERS AND QUESTIONS ARISING BETWEEN THE UNITED STATES AND CANADA

The United States of America and His Majesty the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, being equally desirous to prevent disputes regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise, have resolved to conclude a treaty in furtherance of these ends, and for that purpose have appointed as their respective Plenipotentiaries:

The President of the United States of America, Elihu Root, Secretary of State of the United States; and His Britannic Majesty, the Right Honourable James Bryce, O.M., his Ambassador Extraordinary and Plenipotentiary at Washington;

Who, after having communicated to one another their full powers, found in good and due form, have agreed upon the following articles:

PRELIMINARY ARTICLE

For the purpose of this treaty, boundary waters are defined as the waters from main shore to main shore of the lakes and rivers and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters which in their natural channels would flow into such lakes, rivers, and waterways, or waters flowing from such lakes, rivers, and waterways, or the waters of rivers flowing across the boundary.

ARTICLE I

The High Contracting Parties agree that the navigation of all navigable boundary waters shall forever continue free and open for the purposes of commerce to the inhabitants and to the ships, vessels, and boats of both countries equally, subject, however, to any laws and regulations of either country, within its own territory, not inconsistent with such privilege of free navigation and applying equally and without discrimination to the inhabitants, ships, vessels, and boats of both countries.

It is further agreed that so long as this treaty shall remain in force, this same right of navigation shall extend to the waters of Lake Michigan and to all canals connecting boundary waters, and now existing

or which may hereafter be constructed on either side of the line. Either of the High Contracting Parties may adopt rules and regulations governing the use of such canals within its own territory and may charge tolls for the use thereof, but all such rules and regulations and all tolls charged shall apply alike to the subjects or citizens of the High Contracting Parties and the ships, vessels, and boats of both of the High Contracting Parties, and they shall be placed on terms of equality in the use thereof.

ARTICLE II

Each of the High Contracting Parties reserves to itself or to the several State Governments on the one side and the Dominion or Provincial Governments on the other as the case may be, subject to any treaty provisions now existing with respect thereto, the exclusive jurisdiction and control over the use and diversion, whether temporary or permanent, of all waters on its own side of the line which in their natural channels would flow across the boundary or into boundary waters; but it is agreed that any interference with or diversion from their natural channel of such waters on either side of the boundary, resulting in any injury on the other side of the boundary, shall give rise to the same rights and entitle the injured parties to the same legal remedies as if such injury took place in the country where such diversion or interference occurs; but this provision shall not apply to cases already existing or to cases expressly covered by special agreement between the parties hereto.

It is understood, however, that neither of the High Contracting Parties intends by the foregoing provision to surrender any right, which it may have, to object to any interference with or diversions of waters on the other side of the boundary the effect of which would be productive of material injury to the navigation interests on its own side of the boundary.

ARTICLE III

It is agreed that, in addition to the uses, obstructions, and diversions heretofore permitted or hereafter provided for by special agreement between the Parties hereto, no further or other uses or obstructions or diversions, whether temporary or permanent, of boundary waters on either side of the line, affecting the natural level or flow of boundary waters on the other side of the line shall be made except by authority of the United States or the Dominion of Canada within their respective jurisdictions and with the approval, as hereinafter provided, of a joint commission, to be known as the International Joint Commission.

The foregoing provisions are not intended to limit or interfere with the existing rights of the Government of the United States on the one side and the Government of the Dominion of Canada on the other, to undertake and carry on governmental works in boundary waters for the deepening of channels, the construction of breakwaters, the improvement of harbours, and other governmental works for the benefit of commerce and navigation, provided that such works are wholly on its own side of the line and do not materially affect the level or flow of the boundary waters on the other, nor are such provisions intended to interfere with the ordinary use of such waters for domestic and sanitary purposes.

ARTICLE IV

The High Contracting Parties agree that, except in cases provided for by special agreement between them, they will not permit the construction or maintenance on their respective sides of the boundary of any remedial or protective works or any dams or other obstructions in waters flowing from boundary waters or in waters at a lower level than the boundary in rivers flowing across the boundary, the effect of which is to raise the natural level of waters on the other side of the boundary unless the construction or maintenance thereof is approved by the aforesaid International Joint Commission.

It is further agreed that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.

ARTICLE V

The High Contracting Parties agree that it is expedient to limit the diversion of waters from the Niagara River so that the level of Lake Erie and the flow of the stream shall not be appreciably affected. It is the desire of both Parties to accomplish this object with the least possible injury to investments which have already been made in the construction of power plants on the United States side of the river under grants of authority from the State of New York, and on the Canadian side of the river under licences authorized by the Dominion of Canada and the Province of Ontario.

So long as this treaty shall remain in force, no diversion of the waters of the Niagara River above the Falls from the natural course and stream thereof shall be permitted except for the purposes and to the extent hereinafter provided.

- The United States may authorize and permit the diversion within the State of New York of the waters of said river above the Falls of Niagara, for power purposes, not exceeding in the aggregate a daily diversion at the rate of twenty thousand cubic feet of water per second.

- The United Kingdom, by the Dominion of Canada, or the Province of Ontario, may authorize and permit the diversion within the Province of Ontario of the waters of said river above the Falls of Niagara, for the power purposes, not exceeding in the aggregate a daily diversion at the rate of thirty-six thousand cubic feet of water per second.

- The prohibitions of this article shall not apply to the diversion of water for sanitary or domestic purposes, or for the service of canals for the purposes of navigation.

Note: The third, fourth and fifth paragraphs of Article V were terminated by the Canada-United States Treaty of February 27, 1950 concerning the diversion of the Niagara River.

ARTICLE VI

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.

ARTICLE VII

The High Contracting Parties agree to establish and maintain an International Joint Commission of the United States and Canada composed of six commissioners, three on the part of the United States appointed by the President thereof, and three on the part of the United Kingdom appointed by His Majesty on the recommendation of the Governor in Council of the Dominion of Canada.

ARTICLE VIII

This International Joint Commission shall have jurisdiction over and shall pass upon all cases involving the use or obstruction or diversion of the waters with respect to which under Article III or IV of this treaty the approval of this Commission is required, and in passing on such cases the Commission shall be governed by the following rules or principles which are adopted by the High Contracting Parties for this purpose:

The High Contracting Parties shall have, each on its own side of the boundary, equal and similar rights in the use of the waters hereinbefore defined as boundary waters.

The following order of precedence shall be observed among the various uses enumerated hereinafter for these waters, and no use shall be permitted which tends materially to conflict with or restrain any other use which is given preference over it in this order of precedence:

(1.) Uses for domestic and sanitary purposes;

(2.) Uses for navigation, including the service of canals for the purposes of navigation;

(3.) Uses for power and for irrigation purposes.

The foregoing provisions shall not apply to or disturb any existing uses of boundary waters on either side of the boundary.

The requirements for an equal division may in the discretion of the Commission be suspended in cases of temporary diversions along boundary waters at points where such equal division cannot be made advantageously on account of local conditions, and where such diversion does not diminish elsewhere the amount available for use on the other side.

The Commission in its discretion may make its approval in any case conditional upon the construction of remedial or protective works to compensate so far as possible for the particular use or diversion proposed, and in such cases may require that suitable and adequate provision, approved by the Commission, be made for the protection and indemnity against injury of all interests on either side of the boundary.

In cases involving the elevation of the natural level of waters on either side of the line as a result of the construction or maintenance on the other side of remedial or protective works or dams or other obstructions in boundary waters or in waters flowing therefrom or in waters below the boundary in rivers flowing across the boundary, the Commission shall require, as a condition of its approval thereof, that suitable and adequate provision, approved by it, be made for the protection and indemnity of all interests on the other side of the line which may be injured thereby.

The majority of the Commissioners shall have power to render a decision. In case the Commission is evenly divided upon any question or matter presented to it for decision, separate reports shall be made by the Commissioners on each side to their own Government. The High Contracting Parties shall thereupon endeavour to agree upon an adjustment of the question or matter of difference, and if an agreement is reached between them, it shall be reduced to writing in the form of a protocol, and shall be communicated to the Commissioners, who shall take such further proceedings as may be necessary to carry out such agreement.

ARTICLE IX

The High Contracting Parties further agree that any other questions or matters of difference arising between them involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along the common frontier between the United States and the Dominion of Canada, shall be referred from time to time to the International Joint Commission for examination and report, whenever either the Government of the United States or the Government of the Dominion of Canada shall request that such questions or matters of difference be so referred.

The International Joint Commission is authorized in each case so referred to examine into and report upon the facts and circumstances of the particular questions and matters referred, together with such conclusions and recommendations as may be appropriate, subject, however, to any restrictions or exceptions which may be imposed with respect thereto by the terms of the reference.

Such reports of the Commission shall not be regarded as decisions of the questions or matters so submitted either on the facts or the law, and shall in no way have the character of an arbitral award.

The Commission shall make a joint report to both Governments in all cases in which all or a majority of the Commissioners agree, and in case of disagreement the minority may make a joint report to both Governments, or separate reports to their respective Governments.

In case the Commission is evenly divided upon any question or matter referred to it for report, separate reports shall be made by the Commissioners on each side to their own Government.

ARTICLE X

Any questions or matters of difference arising between the High Contracting Parties involving the rights, obligations, or interests of the United States or of the Dominion of Canada either in relation to each other or to their respective inhabitants, may be referred for decision to the International Joint Commission by the consent of the two Parties, it being understood that on the part of the United States any such action will be by and with the advice and consent of the Senate, and on the part of His Majesty's Government with the consent of the Governor General in Council. In each case so referred, the said Commission is authorized to examine into and report upon the facts and circumstances of the particular questions and matters referred, together with such conclusions and recommendations as may be appropriate, subject, however, to any restrictions or exceptions which may be imposed with respect thereto by the terms of the reference.

A majority of the said Commission shall have power to render a decision or finding upon any of the questions or matters so referred. If the said Commission is equally divided or otherwise unable to render a decision or finding as to any questions or matters so referred, it shall be the duty of the Commissioners to make a joint report to both Governments, or separate reports to their respective Governments, showing the different conclusions arrived at with regard to the matters or questions referred, which questions or matters shall thereupon be referred for decision by the High Contracting Parties to an umpire chosen in accordance with the procedure prescribed in the fourth, fifth and sixth paragraphs of Article XLV of the Hague Convention for the pacific settlement of international disputes, dated October 18, 1907. Such umpire shall have power to render a final decision with respect to those matters and questions so referred on which the Commission fails to agree.

ARTICLE XI

A duplicate original of all decisions rendered and joint reports made by the Commission shall be transmitted to and filed with the Secretary of State of the United States and the Governor General of the Dominion of Canada, and to them shall be addressed all communications of the Commission.

ARTICLE XII

The International Joint Commission shall meet and organize at Washington promptly after the members thereof are appointed, and when organized the Commission may fix such times and places for its meetings as may be necessary, subject at all times to special call or direction by the two Governments. Each Commissioner, upon the first joint meeting of the Commission after his appointment, shall, before proceeding with the work of the Commission, make and subscribe a solemn declaration in writing that he will faithfully and impartially perform the duties imposed upon him under this treaty, and such declaration shall be entered on the records of the proceedings of the Commission.

The United States and Canadian sections of the Commission may each appoint a secretary, and these shall act as joint secretaries of the Commission at its joint sessions, and the Commission may employ engineers and clerical assistants from time to time as it may deem advisable. The salaries and personal expenses of the Commission and of the secretaries shall be paid by their respective Governments, and all reasonable and necessary joint expenses of the Commission, incurred by it, shall be paid in equal moieties by the High Contracting Parties.

The Commission shall have power to administer oaths to witnesses, and to take evidence on oath whenever deemed necessary in any proceeding, or inquiry, or matter within its jurisdiction under this treaty, and all parties interested therein shall be given convenient opportunity to be heard, and the High Contracting Parties agree to adopt such legislation as may be appropriate and necessary to give the Commission the powers above mentioned on each side of the boundary, and to provide for the issue of subpoenas and for compelling the attendance of witnesses in proceedings before the Commission. The Commission may adopt such rules of procedure as shall be in accordance with justice and equity, and may make such examination in person and through agents or employees as may be deemed advisable.

ARTICLE XIII

In all cases where special agreements between the High Contracting Parties hereto are referred to in the foregoing articles, such agreements are understood and intended to include not only direct agreements between the High Contracting Parties, but also any mutual arrangement between the United States and the Dominion of Canada expressed by concurrent or reciprocal legislation on the part of Congress and the Parliament of the Dominion.

ARTICLE XIV

The present treaty shall be ratified by the President of the United States of America, by and with the advice and consent of the Senate thereof, and by His Britannic Majesty. The ratifications shall be exchanged at Washington as soon as possible and the treaty shall take effect on the date of the exchange of its ratifications. It shall remain in force for five years, dating from the day of exchange of ratifications, and thereafter until terminated by twelve months' written notice given by either High Contracting Party to the other.

In faith whereof the respective Plenipotentiaries have signed this treaty in duplicate and have hereunto affixed their seals.

Done at Washington the 11th day of January, in the year of our Lord one thousand nine hundred and nine.

(Signed) ELIHU ROOT [SEAL]

(Signed) JAMES BRYCE [SEAL]

AND WHEREAS the Senate of the United States by their resolution of March 3, 1909, (two-thirds of the Senators present concurring therein) did advise and consent to the ratification of the said treaty with the following understanding to wit:

"Resolved further, as a part of this ratification, That the United States approves this treaty with the understanding that nothing in this treaty shall be construed as affecting, or changing, any existing territorial or riparian rights in the water, or rights of the owners of lands under, on either side of the international boundary at the rapids of the St. Mary's River at Sault Ste. Marie, in the use of water flowing over such lands, subject to the requirements of navigation in boundary waters and of navigation canals, and without prejudice to the existing right of the United States and Canada, each to use the waters of the St. Mary's River, within its own territory, and further, that nothing in the treaty shall be construed to interfere with the drainage of wet swamp and overflowed lands into streams flowing into boundary waters, and that this interpretation will be mentioned in the ratification of this treaty as conveying the true meaning of the treaty, and will, in effect, form part of the treaty;"

AND WHEREAS the said understanding has been accepted by the Government of Great Britain, and the ratifications of the two Governments of the said treaty were exchanged in the City of Washington, on the 5th day of May, one thousand nine hundred and ten;

NOW, THEREFORE, be it known that I, WILLIAM HOWARD TAFT, President of the United States of America, have caused the said treaty and the said understanding, as forming a part thereof, to be made public, to the end that the same and every article and clause thereof may be observed and fulfilled with good faith by the United States and the citizens thereof.

In testimony whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the City of Washington this thirteenth day of May in the year of our Lord one thousand nine hundred and ten, and of the Independence of the United States of America the one hundred and thirty- fourth.

Wm. H Taft [SEAL]

By the President:
P C KNOX
Secretary of State

PROTOCOL OF EXCHANGE

On proceeding to the exchange of the ratifications of the treaty signed at Washington on January 11, 1909, between the United States and Great Britain, relating to boundary waters and questions arising along the boundary between the United States and the Dominion of Canada, the undersigned Plenipotentiaries, duly authorized thereto by their respective Governments, hereby declare that nothing in this treaty shall be construed as affecting, or changing, any existing territorial, or riparian rights in the water, or rights of the owners of lands under water, on either side of the international boundary at the rapids of St. Mary's River at Sault Ste. Marie, in the use of the waters flowing over such lands, subject to the requirements of navigation in boundary waters and of navigation canals, and without prejudice to the existing right of the United States and Canada, each to use the waters of the St. Mary's River, within its own territory; and further, that nothing in this treaty shall be construed to interfere with the drainage of wet, swamp, and overflowed lands into streams flowing into boundary waters, and also that this declaration shall be deemed to have equal force and effect as the treaty itself and to form an integral part thereto.

The exchange of ratifications then took place in the usual form.

In WITNESS WHEREOF, they have signed the present Protocol of Exchange and have affixed their seals thereto.

DONE at Washington this 5th day of May, one thousand nine hundred and ten.

PHILANDER C KNOX [SEAL]

JAMES BRYCE [SEAL]

ATTENDU que ladite réserve a été acceptée par le Gouvernement de la Grande-Bretagne, et que les instruments de ratification des deux Gouvernements parties audit Traité ont été échangés dans la ville de Washington le 5e jour de mai mil neuf cent dix;

POUR CES MOTIFS, moi, William Howard Taft, Président des États-Unis d'Amérique, ai ordonné que ledit Traité et ladite réserve, qui en fait partie, soient rendus publics, afin que chacune de leurs dispositions soit observée de bonne foi par les États-Unis et leurs citoyens.

En foi de quoi, j'ai signé le présent document et ordonné que le sceau des États-Unis y soit apposé.

Fait à Washington ce 13e jour de mai mil neuf cent dix, en l'année du cent trente quatrième anniversaire, de l'indépendance des États-Unis d'Amérique.

(Signé) WM. H. TAFT [SCEAU]
Par le Président

P C Knox
Secrétaire d'État

Protocole d'échange des ratifications

En procédant à l'échange des ratifications du traité signé à Washington le 11 janvier 1909, entre la Grande-Bretagne et les États-Unis, relativement aux eaux limitrophes et aux questions qui surgissent le long de la frontière entre les États-Unis et le Dominion du Canada, les plénipotentiaires soussignés régulièrement autorisés à cet effet par leurs gouvernements respectifs, déclarent par les présentes que rien dans ce traité ne doit être interprété comme devant affecter ou changer aucun des droits territoriaux ou riverains existants sur les eaux, ni les droits des propriétaires de terres sous l'eau, d'un côté ou d'un autre de la frontière internationale, aux rapides de la rivière de Sainte-Marie à Sault-Sainte-Marie, dans l'usage qui sera fait des eaux coulant sur lesdites terres subordonnément aux exigences de la navigation dans les eaux limitrophes et dans les canaux et sans préjudice des droits actuels des États-Unis et du Canada, chacun des deux pays devant faire usage des eaux de la rivière Sainte-Marie qui sont situées dans son propre territoire; en outre que rien dans le présent traité ne doit être considéré comme devant gêner l'égouttement des terrains humides, des marécages, ou des terres inondées, par les ruisseaux qui se jettent dans les eaux limitrophes, et aussi que la présente déclaration sera considérée comme ayant la même valeur et le même effet que le traité lui-même, et comme en formant une partie intégrale.

L'échange des ratifications a donc été fait dans les formes ordinaires.

EN FOI DE QUOI les plénipotentiaires ont signé le présent Protocole d'échange et y ont apposé leurs sceaux.

FAIT à Washington le 5e jour de mai mil neuf cent dix.

PHILANDER C. KNOX [SCEAU]

JAMES BRYCE [SCEAU]

ARTICLE XIII

Dans tous les cas où il est question dans les articles précédents des conventions spéciales entre les Hautes parties contractantes, il est entendu que ces dites conventions comprennent non seulement les conventions directes entre les Hautes parties contractantes, mais encore toute entente mutuelle entre les États-Unis et le Dominion du Canada, exprimée par des mesures législatives concurrentes ou réciproques de la part du Congrès et du Parlement du Dominion.

ARTICLE XIV

Le présent traité est ratifié par Sa Majesté britannique et par le président des États-Unis d'Amérique, de l'avis et du consentement du Sénat de ces deux pays. Les ratifications seront échangées à Washington dans le plus bref délai possible, et le traité entrera en vigueur à partir de la date de l'échange des ratifications. Il est valable pour cinq ans à compter de la date de l'échange des ratifications, et jusqu'à la terminaison de sa durée qui devra être signifiée par un avis écrit émanant de l'une ou l'autre des Hautes parties contractantes.

En foi de quoi les plénipotentiaires respectifs ont signé le présent traité en duplicata et y ont apposé leurs sceaux.

Fait à Washington le 11e jour de janvier en l'année de notre Seigneur mil neuf cent neuf.

(Signé) ELIHU ROOT [SCEAU]

(Signé) JAMES BRYCE [SCEAU]

Le traité ci-dessus a été approuvé par le Sénat des États-Unis le 3 mars 1909, avec les résolutions suivantes :

RÉSOLU : - Que le Sénat conseille et consent à la ratification du traité conclu entre les États-Unis et la Grande-Bretagne, pourvoyant au règlement des différends internationaux entre les États-Unis et le Canada, et signé le 11e jour de janvier 1909.

RÉSOLU de plus (comme formant partie de cette ratification) : - Que les États-Unis approuvent le présent traité en convenant que rien dans ledit traité ne peut être interprété comme devant affecter, ou modifier, ni d'un côté ni de l'autre de la frontière internationale aux rapides de la rivière Sainte-Marie à Sault-Sainte-Marie, aucun des droits territoriaux ou riverains existant actuellement sur les eaux, ni aucun des droits des propriétaires de terrains sous l'eau, dans l'usage qui sera fait des eaux coulant sur lesdits terrains subordonnément aux exigences de la navigation dans les eaux limitrophes et dans les canaux, et sans préjudice des droits actuels des États-Unis et du Canada. Chacun des deux pays devant faire usage des eaux de la rivière Sainte-Marie, qui sont situées dans les limites de son territoire : en outre, que rien dans ce traité ne peut être invoqué comme devant gêner l'égouttement des terrains humides, des marécages ou des terres inondées, par les ruisseaux qui se jettent dans les eaux limitrophes, et que la présente interprétation sera mentionnée dans la ratification du présent traité comme exprimant le sens véritable du traité et qu'elle fera effectivement partie du traité.

les conclusions différentes auxquelles elle est arrivée concernant la question ou l'affaire en litige, et les Hautes parties contractantes feront en conséquence décider la question ou l'affaire par un arbitre choisi conformément à la procédure indiquée dans les paragraphes quatre, cinq et six de l'article XLV de la convention de La Haye pour le règlement pacifique des différends internationaux en date du 18 octobre 1907. Cet arbitre sera autorisé à rendre une décision finale sur les questions ou affaires en litige au sujet desquelles la Commission n'aura pu s'entendre.

ARTICLE XI

Un original en duplicata de toutes les décisions et des rapports conjoints de la Commission doit être transmis et conservé chez le Secrétaire d'État des États-Unis, et chez le Gouverneur général du Canada. Et à eux doivent être adressées toutes les communications de la Commission.

ARTICLE XII

La Commission mixte internationale doit se réunir et s'organiser à Washington, promptement après la nomination de ses membres, et une fois organisée, elle peut fixer les époques et les lieux auxquels, suivant les besoins, elle tiendra ses assemblées qui toutes sont subordonnées à une convocation ou à des instructions spéciales de la part des deux gouvernements. Chacun des commissaires doit, à la première réunion conjointe de la Commission qui suit sa nomination, et avant de se livrer aux travaux de la Commission, faire et souscrire une déclaration solennelle par écrit par laquelle il s'engage à remplir fidèlement et impartialement les devoirs qui lui sont imposés par le présent traité et ladite déclaration sera inscrite dans les procès-verbaux des séances de la Commission.

Les sections américaine et canadienne de la Commission peuvent chacune désigner un secrétaire et ceux-ci agissent en qualité de secrétaires conjoints de la Commission, pendant ses séances communes; la Commission peut en tout temps, lorsqu'elle le juge à propos, prendre à son service des ingénieurs et des aides aux écritures. Les traitements et les dépenses personnelles de la Commission et des secrétaires sont payés par leur gouvernement respectif, et tous les frais raisonnables et nécessaires faits conjointement par la Commission sont acquittés par moitiés égales par les Hautes parties contractantes.

La Commission a le pouvoir de faire prêter serment aux témoins, et de recevoir quand elle le juge nécessaire des dépositions sous serment dans toute procédure ou toute enquête ou toute affaire qui, en vertu du présent traité, sont placées sous sa juridiction. Il est donné à toutes les parties qui y sont intéressées, la faculté de se faire entendre, et les Hautes parties contractantes conviennent d'adopter telles mesures législatives qui peuvent être à propos ou nécessaires soit pour conférer à la Commission de chaque côté de la frontière les pouvoirs ci-dessus énumérés, soit pour assurer le lancement des assignations, et forcer les témoins à comparaître devant la Commission. La Commission peut adopter telles règles de procédure qui sont justes et équitables, elle peut personnellement ou par l'intermédiaire d'agents ou d'employés faire subir les interrogatoires qu'elle peut juger à propos.

ARTICLE IX

Les Hautes parties contractantes conviennent de plus que toutes les autres questions ou différends qui pourront s'élever entre elles et impliquant des droits, obligations ou intérêts de l'une relativement à l'autre ou aux habitants de l'autre, le long de la frontière commune aux États-Unis et au Canada, seront soumis de temps à autre à la Commission mixte internationale pour faire l'objet d'un examen et d'un rapport, chaque fois que le gouvernement des États-Unis ou celui du Canada exigera que ces questions ou différends lui soient ainsi référés.

La Commission mixte internationale est autorisée dans chaque cas qui lui est ainsi soumis d'examiner les faits et les circonstances des questions ou des différends particuliers à elle soumis et d'en dresser rapport, avec les conclusions et les recommandations qui peuvent être appropriées, subordonnément, toutefois, aux restrictions ou aux exceptions qui peuvent être imposées à cet égard par les termes du référé.

Ces rapports de la Commission ne seront pas considérés comme des décisions des questions ou des différends soumis, soit en fait soit en droit, et ne seront en aucune manière de la nature d'une sentence arbitrale.

La Commission devra faire un rapport conjoint aux deux gouvernements dans tous les cas où tous les commissaires ou une majorité d'eux s'entendent, et en cas de désaccord la minorité peut faire un rapport conjoint aux deux gouvernements, ou des rapports séparés à leurs gouvernements respectifs. Dans le cas où la Commission serait également partagée sur quelque question ou différend qui lui est soumis pour en dresser un rapport, des rapports séparés devront être faits par les commissaires de chaque côté à leur propre gouvernement.

ARTICLE X

Toute question ou sujet de différend s'élevant entre les Hautes parties contractantes comportant les droits, obligations ou intérêts des États-Unis ou du Canada, soit dans leurs relations envers l'un et l'autre ou envers leurs habitants respectifs, peut être soumis à la décision de la Commission mixte internationale du consentement des deux parties avec l'entente que de la part des États-Unis toute telle action aura lieu de l'avis et du consentement du Sénat et de la part du gouvernement de Sa Majesté avec le consentement du Gouverneur général en conseil. Pour tout cas ainsi soumis, la Commission est autorisée à faire l'examen et un rapport des faits et circonstances des questions spéciales et des sujets soumis, avec les conclusions et les recommandations qui peuvent être convenables, subordonnément toutefois à toutes les restrictions ou exceptions qui peuvent être imposées par les termes du référé.

La majorité de la Commission pourra entendre et juger toutes les questions ou les cas qui lui seront soumis.

Si la Commission est également partagée ou autrement empêchée de prononcer un jugement sur une question ou une affaire qui lui aura été soumise, il sera du devoir des commissaires de faire un rapport conjoint aux deux gouvernements, ou un rapport séparé à leur gouvernement respectif, indiquant

ARTICLE VIII

La Commission mixte internationale devra entendre et juger tous les cas comportant l'usage ou l'obstruction ou le détournement des eaux à l'égard desquelles l'approbation de cette Commission est nécessaire aux termes des articles III et IV de ce traité et sera régie par les règles ou principes qui suivent et qui sont adoptés par les Hautes parties contractantes pour cette fin :

Les Hautes parties contractantes auront, chacune de son côté de la frontière, des droits égaux et similaires pour l'usage des eaux ci-dessus définies comme eaux limitrophes. L'ordre de préséance suivant devra être observé parmi les divers usages des eaux ci-après énumérés, et il ne sera permis aucun usage qui tend substantiellement à entraver ou restreindre tout autre usage auquel il est donné une préférence dans cet ordre de préséance :

(1.) Usages pour des fins domestiques et hygiéniques ;

(2.) Usages pour la navigation, y compris le service des canaux pour les besoins de la navigation ;

(3.) Usages pour des fins de force motrice et d'irrigation.

Les dispositions ci-dessus ne s'appliquent pas ni ne portent atteinte à aucun des usages existants d'eaux limitrophes de l'un et l'autre côté de la frontière.

L'exigence d'un partage égal peut, à la discrétion de la Commission, être suspendu dans les cas de détournements temporaires le long des eaux limitrophes aux endroits où ce partage égal ne peut être fait d'une manière avantageuse à cause des conditions locales, et où ce détournement ne diminue pas ailleurs la quantité disponible pour l'usage de l'autre côté.

La Commission à sa discrétion peut mettre comme condition de son approbation la construction d'ouvrages de secours et de protection pour compenser autant que possible l'usage ou le détournement particulièrement proposé et dans ces cas elle peut exiger que des dispositions convenables et suffisantes, approuvées par la Commission soient prises pour protéger contre tous dommages les intérêts de l'autre côté de la frontière et pour payer une indemnité à cet égard.

Dans les cas entraînant l'élévation du niveau naturel des eaux de l'un ou l'autre côté de la ligne par suite de la construction ou de l'entretien de l'autre côté d'ouvrages de secours ou de protection ou de barrages ou autres obstacles dans les eaux limitrophes ou dans les eaux qui en proviennent ou dans les eaux en aval de la frontière dans des rivières qui coupent la frontière, la Commission doit exiger, comme condition de son approbation, que des dispositions convenables et suffisantes, approuvées par la Commission, soient prises pour protéger contre tous dommages tous les intérêts de l'autre côté de la frontière qui pourraient être par là atteints, et payer une indemnité à cet égard.

La majorité de la Commission aura le pouvoir de rendre une décision. Dans le cas où la Commission serait également partagée sur quelque question ou chose soumise à sa décision, les commissaires de chaque côté devront faire des rapports séparés qui seront présentés à leur propre Gouvernement. Les Hautes parties contractantes devront en conséquence s'efforcer de s'entendre sur le règlement de la question ou de l'affaire qui fait le sujet du différend, et s'il intervient un arrangement entre elles, cet arrangement sera couché par écrit sous la forme d'un protocole et sera communiqué aux commissaires, qui devront prendre les mesures ultérieures qui pourront être nécessaires pour mettre à exécution cet arrangement.

- Les prohibitions énoncées au présent article ne s'appliquent pas au détournement de l'eau pour des fins hygiéniques ou domestiques, non plus que pour le service des canaux pour la navigation. Remarque: Le Traité canado-américain du 27 février 1950, portant sur la dérivation de la rivière Niagara, a mis fin aux troisième, quatrième et cinquième paragraphes de l'article V.

Remarque : Le Traité canado-américain du 27 février 1950, portant sur la dérivation de la rivière Niagara, a mis fin aux troisième, quatrième et cinquième paragraphes de l'article V.

ARTICLE VI

Les Hautes parties contractantes conviennent que les rivières Milk et Sainte-Marie soient, avec leurs affluents (dans l'État du Montana et dans les provinces d'Alberta et de la Saskatchewan), traités comme un seul et même cours d'eau pour les fins d'irrigation et de force hydraulique, et que leurs eaux soient attribuées par parts égales entre les deux pays, mais en faisant cette attribution par parts égales plus de la moitié des eaux d'une rivière et moins de la moitié de celles de l'autre puissent être prises de manière que chaque pays puisse tirer de ces eaux le plus grand avantage possible. Il est de plus convenu que, dans le partage de ces eaux pendant la saison d'irrigation, savoir du 1 er avril au 31 octobre inclusivement, chaque année, les États-Unis ont droit les premiers à une prise de 500 pieds cubes par seconde dans les eaux de la rivière Milk, ou autant de cette quantité qu'il en faut pour constituer les trois quarts de leur écoulement naturel, de même que le Canada a droit le premier à une prise de 500 pieds cubes par seconde dans les eaux de la rivière Sainte-Marie, ou autant de cette quantité qu'il en faut pour constituer les trois quarts de leur écoulement naturel.

Le chenal de la rivière Milk au Canada peut être utilisé, à la convenance des États-Unis, pour l'apport, à travers le territoire canadien, des eaux détournées de la rivière Sainte-Marie. Les dispositions de l'article 11 de ce traité s'appliqueront à tout préjudice causé à des biens situés au Canada par l'apport de ces eaux s'écoulant par la rivière Milk.

Le jaugeage et l'attribution des eaux à être employées par chaque pays seront de tout temps effectués conjointement du côté des États-Unis, par les fonctionnaires du Reclamation Office régulièrement constitués, et, du côté canadien, par les fonctionnaires du service de l'irrigation aussi régulièrement constitués, sous la direction de la Commission mixte internationale.

ARTICLE VII

Les Hautes parties contractantes conviennent de créer et maintenir une Commission mixte internationale des États-Unis et du Canada, composée de six commissaires dont trois pour les États- Unis, et nommés par le Président, et trois pour le Royaume-Uni et nommés par Sa Majesté, sur la recommandation du Gouverneur en conseil du Dominion du Canada.

chenaux, la construction de brise-lames, l'amélioration des ports, et autres entreprises du gouvernement dans l'intérêt du commerce ou de la navigation, pourvu que ces travaux soient situés entièrement sur son côté de la frontière et ne modifient pas sensiblement le niveau ou le débit des eaux limitrophes de l'autre, et ne sont pas destinées non plus à gêner l'usage ordinaire de ces eaux pour des fins domestiques ou hygiéniques.

ARTICLE IV

Les Hautes parties contractantes conviennent, sauf pour les cas spécialement prévus par un accord entre elles, de ne permettre, chacun de son côté, dans les eaux qui sortent des eaux limitrophes, non plus que dans les eaux inférieures des rivières qui coupent la frontière, l'établissement ou le maintien d'aucun ouvrage de protection ou de réfection, d'aucun barrage ou autre obstacle dont l'effet serait d'exhausser le niveau naturel des eaux de l'autre côté de la frontière, à moins que l'établissement ou le maintien de ces ouvrages n'ait été approuvé par la Commission mixte internationale.

Il est de plus convenu que les eaux définies au présent traité comme eaux limitrophes non plus que celles qui coupent la frontière ne seront d'aucun côté contaminées au préjudice des biens ou de la santé de l'autre côté.

ARTICLE V

Les Hautes parties contractantes conviennent qu'il est à propos de restreindre le détournement des eaux de la rivière Niagara de manière que le niveau du lac Érié et le débit de l'eau ne soient pas sensiblement diminués. Les deux parties désirent atteindre cet objet en causant le moins de préjudice possible aux placements de fonds qui ont déjà été faits pour la construction d'usines de force motrice sur le côté américain de la rivière sous l'empire de concessions de privilèges de la part de l'État de New-York, et sur le côté canadien sous l'empire de permis accordés par le Dominion du Canada et la province de l'Ontario.

Tant que ce traité restera en vigueur, nul détournement des eaux de la rivière Niagara, en amont des chutes, de leur lit et de leur cours naturels, ne sera permis excepté pour les objets et dans la mesure ci-après prévus.

- Les États-Unis peuvent autoriser et permettre, dans les limites de l'État de New-York, le détournement des eaux de ladite rivière en amont des chutes, pour des fins de force motrice, jusqu'à concurrence d'un détournement moyen et quotidien d'au plus vingt mille pieds cubes d'eau par seconde.

- Le Royaume-Uni, par le Dominion du Canada ou par la province de l'Ontario, peut autoriser et permettre, dans les limites de la province de l'Ontario, le détournement des eaux de ladite rivière en amont des chutes pour des fins de force motrice, jusqu'à concurrence d'un détournement moyen et quotidien de trente-six mille pieds cubes d'eau par seconde.

Il est convenu en outre qu'aussi longtemps que ce traité restera en vigueur, ce même droit de navigation, s'étendra aux eaux du lac Michigan et à tous les canaux reliant les eaux limitrophes qui existent maintenant ou qui pourront être construits à l'avenir sur l'un ou l'autre côté de la ligne. L'une ou l'autre des Hautes parties contractantes peut adopter des règles et règlements déterminant l'usage de ces canaux dans les limites de son propre territoire, et peut imposer des péages pour l'usage de ces canaux, mais toutes ces règles et ces règlements et péages s'appliqueront également à tous les sujets ou citoyens des Hautes parties contractantes et à tous navires, bateaux et vaisseaux des deux Hautes parties contractantes qui seront sur un pied d'égalité quant à l'usage de ces canaux.

ARTICLE II

Chacune des Hautes parties contractantes se réserve à elle-même ou réserve au Gouvernement des différents États, d'un côté, et au Dominion ou aux gouvernements provinciaux, de l'autre, selon le cas, subordonnément aux articles de tout traité existant à cet égard, la juridiction et l'autorité exclusive quant à l'usage et au détournement, temporaires ou permanents, de toutes les eaux situées de leur propre côté de la frontière et qui, en suivant leur cours naturel, couleraient au-delà de la frontière ou se déverseraient dans des cours d'eaux limitrophes, mais il est convenu que toute ingérence dans ces cours d'eau ou tout détournement de leur cours naturel de telles eaux sur l'un ou l'autre côté de la frontière, résultant en un préjudice pour les habitants de l'autre côté de cette dernière, donnera lieu aux mêmes droits et permettra aux parties lésées de se servir des moyens que la loi met à leur disposition tout autant que si telle injustice se produisait dans le pays où s'opère cette ingérence ou ce détournement; mais cette disposition ne s'applique pas au cas déjà existant non plus qu'à ceux qui ont déjà fait expressément l'objet de conventions spéciales entre les deux parties concernées.

Il est entendu cependant, que ni l'une ni l'autre des Hautes parties contractantes n'a l'intention d'abandonner par la disposition ci-dessus aucun droit qu'elle peut avoir à s'opposer à toute ingérence ou tout détournement d'eau sur l'autre côté de la frontière dont l'effet serait de produire un tort matériel aux intérêts de la navigation sur son propre côté de la frontière.

ARTICLE III

Il est convenu que, outre les usages, obstructions et détournements permis jusqu'ici ou autorisés ci-après, par convention spéciale entre les parties, aucun usage ou obstruction ou détournement nouveaux ou autres, soit temporaires ou permanents des eaux limitrophes, d'un côté ou de l'autre de la frontière, influençant le débit ou le niveau naturels des eaux limitrophes de l'autre côté de la frontière, ne pourront être effectués si ce n'est par l'autorité des États-Unis ou du Dominion canadien dans les limites de leurs territoires respectifs et avec l'approbation, comme il est prescrit ci-après, d'une commission mixte qui sera désignée sous le nom de Commission mixte internationale.

Les stipulations ci-dessus ne sont pas destinées à restreindre ou à gêner l'exercice des droits existants dont le gouvernement des États-Unis, d'une part, et le gouvernement du Dominion, de l'autre, sont investis en vue de l'exécution de travaux publics dans les eaux limitrophes, pour l'approfondissement des

TRAITÉ RELATIF AUX EAUX LIMITROPHES ET AUX QUESTIONS ORIGINANT LE LONG DE LA FRONTIÈRE ENTRE LE CANADA ET LES ÉTATS-UNIS

Sa Majesté le roi du Royaume-Uni de la Grande-Bretagne et d'Irlande et des possessions britanniques au-delà des mers, empereur de l'Inde, et les États-Unis d'Amérique, désirant également prévenir tous différends relativement à l'usage des eaux limitrophes et pour régler toutes les questions qui sont actuellement pendantes entre les États-Unis et le Dominion du Canada impliquant les droits, obligations ou intérêts de l'un et l'autre pays relativement à son voisin et à ceux des habitants des deux pays le long de leur frontière commune, et dans le but de pourvoir à l'ajustement et au règlement de toutes questions qui pourraient surgir dans l'avenir, ont résolu de conclure un traité pour atteindre ces fins, et pour cet objet ils ont nommé comme leurs ministres plénipotentiaires:

Le Président des États-Unis d'Amérique, Elihu Root, Secrétaire d'État des États-Unis;

Sa Majesté britannique, le très honorable James Bryce, O.M., son ambassadeur extraordinaire et ministre plénipotentiaire à Washington; et

Lesquels, après s'être mutuellement communiqué leurs pleins pouvoirs respectifs, et les avoir trouvés en bonne et due forme, ont arrêté les articles suivants :

ARTICLE PRÉLIMINAIRE

Pour les fins de ce traité, les eaux limitrophes sont définies comme les eaux de terre ferme à terre ferme des lacs, fleuves et rivières et des voies d'eau qui les relient - ou les parties de ces eaux - que longe la frontière internationale entre les États-Unis et le Dominion du Canada, y compris les baies, les bras et les anses qu'elles forment. Sont toutefois exclues de la présente définition les eaux des affluents qui, dans leur cours naturel, se verseraient dans ces lacs, fleuves, rivières et voies d'eau, les eaux coulant de ces lacs, fleuves, rivières et voies d'eau, ainsi que les eaux des fleuves et rivières traversant la frontière.

ARTICLE I

Les Hautes parties contractantes conviennent que la navigation de toutes les eaux limitrophes navigables se continue pour toujours, libre et ouverte dans un but de commerce pour les habitants et pour les navires, vaisseaux et bateaux des deux pays également, subordonnément, toutefois, à toutes les lois et à tous les règlements de l'un ou l'autre pays dans les limites de son propre territoire, ne venant pas en contradiction avec tel privilège de navigation libre et s'appliquant également et sans distinction aucune entre les habitants, les navires, les vaisseaux et les bateaux des deux pays.

TRAITÉ

du 11 janvier 1909

conclu entre les États-Unis et la Grande-Bretagne

RATIFICATION, PROCLAMATION, RÉUNION ET ADOPTION ET PUBLICATION DES RÈGLES DE PROCÉDURE

Signé à Washington	11 janvier 1909
Ratification conseillée par le Sénat	3 mas 1909
Ratifié par la Grande-Bretagne	31 mars 1910
Ratifié par le Président	1 avril 1910
Ratifications échangées à Washington	5 mai 1910
Proclamation	13 mai 1910

COMMISSION MIXTE INTERNATIONALE

Réunion d'organisation de la Commission aux termes de l'article XII du Traité, à Washington	10 janvier 1912
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TRAITÉ RELATIF AUX EAUX LIMITROPHES

Appendix B
STEPL practices and efficiencies

The STEPL was used to estimate TSS and *E. coli* loads and reductions for the watershed. The BMPs identified in the ten-year milestone table were summed and entered as individual practices in STEPL. Reduction efficiencies for E. coli were assumed from MPCA (2011) and Wright Water Engineers, Inc. (2010) and added to the 'BMPList' worksheet in STEPL. The practices and assumed reduction efficiencies are shown in Table 28.

Table 28. Land use BMPs, efficiencies, and assumptions for STEPL

Landuse	BMP & Efficiency	TSS	*E. coli*	Assumptions
Cropland				
Cropland	Buffer - Grass (35ft wide)	0.533	0.65	
Cropland	Conservation Cover	0.2	0.5	Added Conservation Cover, assuming same efficiencies as STEPL practice Cover Crop 3
Cropland	Conservation Tillage 1 (30-59% Residue)	0.403	0.3	
Cropland	Cover Crop 3 (Group A Traditional Early Planting Time) (High Till only for TP and Sediment)	0.2	0.5	
Cropland	Critical Area Planting	0.95	0.9	Added cropland Critical Area Planting, assuming same efficiencies as STEPL practice land Retirement
Cropland	Diversions	0.95	0.9	Added Diversions, assuming same efficiencies as STEPL practice Land Retirement
Cropland	Drainage Water Management	0.4	0.3	Added Drainage Water Management, assuming same efficiencies as STEPL Practice Terrace, assume 50 acres treated per practice
Cropland	Field Borders	0.4	0.3	Added Field Borders, assuming same efficiencies as STEPL practice Filter Strips (Terrace)
Cropland	Filter Strips	0.4	0.3	Added Filter Strip, assuming same efficiencies as STEPL practice Terrace, assume 10 acres treatment per acre of filter strip
Cropland	Filtration Practices	0.4	0.3	Added Filtration Practices, assuming same efficiencies as STEPL practice Terrace, assuming 40 acres treated per practice
Cropland	Grade Stabilization Structures	0.4	0.3	Added Grade Stabilization Structures, assuming same efficiencies as STEPL practice Terrace, assume 40 acres treated per practice.
Cropland	Grassed Waterways	0.4	0.3	Added Grassed Waterways, assume 1,000 ft of grassed waterways treats 50 acres, assume same efficiencies as STEPL practice Terrace
Cropland	Impoundment	0.95	0.9	Added Impoundment, assume same efficiencies as STEPL practice Land Retirement
Cropland	Land Retirement	0.95	0.9	

Landuse	BMP & Efficiency	TSS	*E. coli*	Assumptions
Cropland	Manure/Nutrient Management	ND	0.9	Added Nutrient/Manure Management, Assuming same efficiencies as STEPL practice Nutrient Management 1, increased *E. coli* efficiencies to .9
Cropland	Nutrient Management 1 (Determined Rate)	ND	0.5	
Cropland	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	ND	0.9	
Cropland	Residue/Tillage Management	0.403	0.3	Added Residue/Tillage Management, assuming same efficiencies as STEPL practice Conservation Tillage 1
Cropland	Saturated Buffer	0.533	0.65	Added Saturated Buffer, assuming same efficiencies as STEPL practice Buffer-Grass
Cropland	Side water inlets	0.4	0.3	Added Side Water inlets, assumed same efficiencies as Terrace
Cropland	Streambank Erosion Practices	0.4	0.3	
Cropland	Streambank Stabilization and Fencing	0.75	0.3	Added Streambank Erosion Practices, assuming same efficiencies as STEPL practice Terrace, assuming 5 practices treat 100 acres
Cropland	Terrace	0.4	0.3	
Cropland	Two-Stage Ditch	ND	0.3	Assume 2 miles with treatment as 80 ac/mil (1/8 mile width) as Two-Stage Ditch
Cropland	WASCOB (Water and Sediment Control Basin	0.4	0.3	Added WASCOB, assuming the same efficiencies as Terrace, assuming 40 acres treated per WASCOB
Cropland	Water Control Structures	0.4	0.3	Added cropland Water Control Structures, assuming same efficiencies as STEPL practice Terrace, assume 40 acres treated per practice installed
Cropland	Wetland Restoration	0.95	0.9	Added Wetlands, assuming same efficiencies as STEPL practice Land retirement assuming 40 acres treated per acre of wetland
Pastureland				
Pastureland	30m Buffer with Optimal Grazing	ND	0.65	
Pastureland	Alternative Water Supply	0.187	0.65	
Pastureland	Cattle Exclusions	0.62	0.65	Added pastureland Cattle Exclusions, assuming same efficiencies as STEPL practice Livestock exclusion fencing
Pastureland	Combined BMPs-Calculated	0	0	
Pastureland	Critical Area Planting	0.42	.9	
Pastureland	Fencing and Watering Projects	0.62	0.65	Added pastureland Fencing and watering projects, assuming same efficiencies as STEPL practice Livestock Exclusion Fencing

Landuse	BMP & Efficiency	TSS	*E. coli*	Assumptions
Pastureland	Forest Buffer (minimum 35 feet wide)	0.533	ND	
Pastureland	Grass Buffer (minimum 35 feet wide)	0.648	ND	
Pastureland	Grazing Land Management (rotational grazing with fenced areas)	ND	0.65	
Pastureland	Livestock Exclusion Fencing	0.62	0.65	
Pastureland	Multiple Practices	0.221	ND	
Pastureland	Pasture and Hayland Planting (also called Forage Planting)	ND	ND	
Pastureland	Prescribed Grazing	0.333	ND	
Pastureland	Rotational Grazing	0.333	0.65	Added pastureland Rotational Grazing, assuming same efficiencies as STEPL practice Grazing Land Management, and TSS reduction from Prescribed Grazing
Feedlots				
Feedlots	Runoff Mgmt System	ND	0.5	
Feedlots	Waste Storage Facility	ND	0.9	
Urban				
Urban	Bioretention facility	ND	0.9	Added Urban STEPL Bioretention practice, efficiencies for TSS and E. coli based on MN Stormwater manual (https://stormwater.pca.state.mn.us/index.php/Calculating_credits_for_bioretention)
Urban	Biotretntion practices	0.85	0.95	
Urban	Infiltration Basin	0.75	0.9	
Urban	Infiltration Devices	0.94	ND	
Urban	Raingardens	0.75	0.9	Added Urban STEPL raingardens, assuming same efficiencies as STEPL practice Infiltration basin (urban)

E. coli loads and subsequent reductions with replacement estimated in STEPL by assuming the average concentration (MPN/mL) of *E. coli* effluent reaching a stream from septic overcharge is 948,000 as equivalent to the BWSR SSTSS Tool assumption. STEPL SSTS worksheet assumptions are described in Table 29.

Table 29. SSTS STEPL worksheet and assumptions

Nutrient load from septic systems

Watershed	No. of SSTS	Pop per SSTS	SSTS Failure Rate %	Failing SSTS	Pop on Failing SSTS	Failing SSTS Flow gal/day	Failing SSTS Flow l/hr	N Load lb/hr	P Load lb/hr	BODlb/ hr	*E. coli*, MPN/hr
Black River	100	2.43	20	20	49	3402	537	0.071	0.028	0.290	5.09E+09
CD 96	66	2.43	20	13	32	2245	354	0.047	0.018	0.191	3.36E+09
RLR Mainstem	217	2.43	20	43	105	7382	1164	0.154	0.060	0.629	1.10E+10

Septic nutrient load					**Load after reduction**				
Watershed	**N Load lb/yr**	**P Load lb/yr**	**BOD lb/yr**	***E. coli* MPN/ yr**	**N Load lb/yr**	**P Load lb/yr**	**BOD lb/yr**	***E. coli* MPN/yr**	***E. coli* Billion MPN/yr**
Black River	622	244	2539	4.46E+13	622	244	2539	4.46E+13	4.46E+04
CD 96	410	161	1676	2.94E+13	410	161	1676	2.94E+13	2.94E+04
RLR Mainstem	1349	528	5509	9.67E+13	1349	528	5509	9.67E+13	9.67E+04

Assumptions made for SSTS

The direct contribution of nutrients to a stream is mainly from failing septic systems.

Required input for calculating septic nutrient load are number of systems, failure rate, loading rate (lb/hr) and flow (cfs).

Assume the average concentrations reaching the stream (from septic overcharge) are:

Total Nitrogen:	60	mg/L (range of 20 to 100)
Total Phosphorus:	23.5	mg/L (range of 18 to 29)
Organics (BOD):	245	mg/L (range of 200 to 290)
E. coli	9.48E+05	MPN/100ml

Typical septic overcharge flow rate of: 70 gal/day/person(range of 45 to 100)

***E. coli* effluent # assumed to be 948,000 as equivalent from BWSR SSTSS Tool assumption**

Individual BMP estimated reductions for each watershed are summarized in Table 30, Table 31, and Table 32.

Table 30. Individual BMP estimated reductions in the Red Lake River Mainstem Watershed

BMP	Acres treated	% of land treated	TSS reduction t/yr	*E. coli* reduction Billion MPN/yr	TSS reduction %	*E. coli* reduction %
Diversion	9,600	4.9%	116.7	2,064.2	1.4	1.4
WASCOBs	1,200	1.3%	13.0	182.5	0.2	0.1
Wetlands	13,800	11.2%	266.7	4,718.1	3.2	3.1
Cover crops	93,845	0.2%	501.3	23,403.3	6.2	15.5
Grassed waterway	50	0.04%	0.4	5.6	0.0	0.0
Buffer law compliance	123,400	100.0%	1,336.0	30,424.3	16.1	20.2
Saturated buffer	200	0.2%	0.3	6.1	0.0	0.0

BMP	Acres treated	% of land treated	TSS reduction t/yr	*E. coli* reduction Billion MPN/yr	TSS reduction %	*E. coli* reduction %
Tillage mgmt	93,845	2.5%	1,010.1	14,042.0	12.4	9.3
Cattle exclusions	1,138	100.0%	3.8	480.8	0.0	0.3
Rotational grazing	1,138	100.0%	2.0	480.8	0.0	0.3
Outlet to the RLR restored	--	--	50.9	0.0	0.6	0.0
Replace estimated 50 water control structures TRF	2,000	2.1%	21.1	294.9	0.3	0.2
Implement 6 stormwater BMPS in TRF	120	--	3.5	94.2	0.0	0.1
Implement 3 stormwater BMPS in RLF	60	--	2.3	54.3	0.0	0.1
Implement 3 stormwater BMPS in Crookston	60	--	2.3	54.3	0.0	0.1
Install 5 filter strips	280	0.3%	3.0	42.1	0.0	0.0
Manure/nutrient management	93,845	100%	0.0	42,125.9	0.0	27.8
Ditch outlets stabilized and repaired	--	--	277.9	0.0	3.4	0.0
Grade stabilization	5,000	5.3%	53.1	744.2	0.6	0.5
Drainage management practices	320	0.3%	3.0	42.1	0.0	0.0
Pennington CD 21 outlet stabilization	--	--	50.9	0.0	0.6	0.0
Biofiltration practice	20	--	1.1	14.5	0.0	0.0

Table 31. Individual BMP reduction estimates for the Black River Watershed

BMP	Acres treated	% of land treated	TSS reduction t/yr	*E. coli* reduction Billion MPN/yr	TSS reduction %	*E. coli* reduction %
5000 ac-ft of impoundment	5000	7.8%	148.3	2237.4	5.9	2.8
Restore wetlands as part of the Black River Impoundment	375	0.6%	11.4	172.1	0.5	0.2
Diversion of 15 sq miles	9600	15.0%	285.2	4302.7	11.4	5.4
10 WASCOBs	400	0.6%	4.8	57.4	0.2	0.1
Cover crops	63902	100.0%	400.3	15936.0	16.0	20.2
Buffer strips on diversion project 79,200 ft	63	0.1%	1.1	20.7	0.0	0.0
1 Grassed waterway 1,000	50	0.1%	0.8	9.6	0.0	0.0
100% compliance with MN Buffer Law	63902	100.0%	1066.9	20716.8	42.7	26.2
1 Saturated buffer	100	0.2%	2.1	41.4	0.1	0.1
1 multistage ditch 1 mile	40	0.1%	0.0	9.6	0.0	0.0
1 Infiltration basin (urban)			0.4	13.3	0.0	0.0
Critical area planting 45 acres	45	0.1%	1.9	28.7	0.1	0.0
Grade stabilizations 80	3200	5.0%	40.0	478.1	1.6	0.6
Residue management	63902	100.0%	806.7	9561.6	32.3	12.1
Manure management	63902	100.0%	0.0	28684.9	0.0	36.3
Cattle exclusion	875	100.0%	3.4	369.7	0.1	0.5

BMP	Acres treated	% of land treated	TSS reduction t/yr	*E. coli* reduction Billion MPN/yr	TSS reduction %	*E. coli* reduction %
Rotational grazing	875	100.0%	1.8	369.7	0.1	0.5
Feedlot runoff control 1	2	2.1%	0.0	0.0028	0.0	0.0
Ag waste Storage 1	2	2.1%	0.0	0.0031	0.0	0.0
Stream erosion projects 5	500	0.8%	6.4	76.5	0.3	0.1

Table 32. Individual BMP reduction estimates for CD96 Watershed

BMP	Acres treated	% of land treated	TSS reduction t/yr	*E. coli* reduction Billion MPN/yr	TSS reduction %	*E. coli* reduction %
Wetlands	3200	17	133.5	1473.1	10.3	3.6
Filter strips	100	1	3.3	28.9	0.3	0.1
Cover crops	19304	100	165.4	4814.1	12.7	11.9
Buffer law compliance	19304	100	440.7	6258.3	33.9	15.5
Saturated buffer	100	1	4.4	62.6	0.3	0.2
Two-stage ditch	80	0.4	0.0	11.6	0.0	0.0
Grade stabilizations/Side inlets	2500	13	43.0	375.5	3.3	0.9
Tillage mgmt	1600	8	26.7	231.1	2.0	0.6
Cattle exclusions	745	100	4.0	314.8	0.3	0.8
Filtration Practices	80	0.4	1.3	11.6	0.1	0.0
Biofiltration	20	0.1	69.5	14.5	5.1	0.0
Stabilize outlet of CD 96 1100 ditchbank			15.3	0.0	1.1	0.0
Nutrient/ manure application	19304	100	0.0	8665.3	0	21.4