PINE RIVER WATERSHED

Harmonizing people, water, forests, and the economy in a place to renew your spirit

One watershed One plan

Cass SWCD

CASS COUNTY Minnesota Still Room to Explore

CROW WING Soil & Water CONSERVATION DISTRICT

CROW WING COUNTY MINNESOTA

BOARD OF WATER AND SOIL RESOURCES

CLEAN WATER LAND & LEGACY AMENDMENT

PINE RIVER WATERSHED

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One Watershed One Plan

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Crow Wing Soil and Water Conservation District
Cass County
Cass Soil and Water Conservation District

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State Agencies

Minnesota Board of Water and Soil Resources (BWSR)
Minnesota Department of Agriculture (MDA)
Minnesota Department of Health (MDH)
Minnesota Department of Natural Resources (DNR)
Minnesota Pollution Control Agency (MPCA)

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Section 1.

Plan Summary

PINE RIVER WATERSHED

Harmonizing people, water, forests, and the economy in a place to renew your spirit.

One Watershed One Plan

The Pine River Watershed, nestled into the heart of northern Minnesota's lakes country, is characterized by clean water, fish, wildlife, and forests. These qualities contribute to the economic significance of the area and are a magnet for tourism and development. In addition, as the "Land of 10,000 Lakes", residents often feel a deep connection to these natural resources because of the legacy of family cabins and family vacations. These assets and connection to the local area are illustrated in the watershed's vision statement, which was developed during this planning process.

White arrows on the map show the direction of water flow through the watershed.

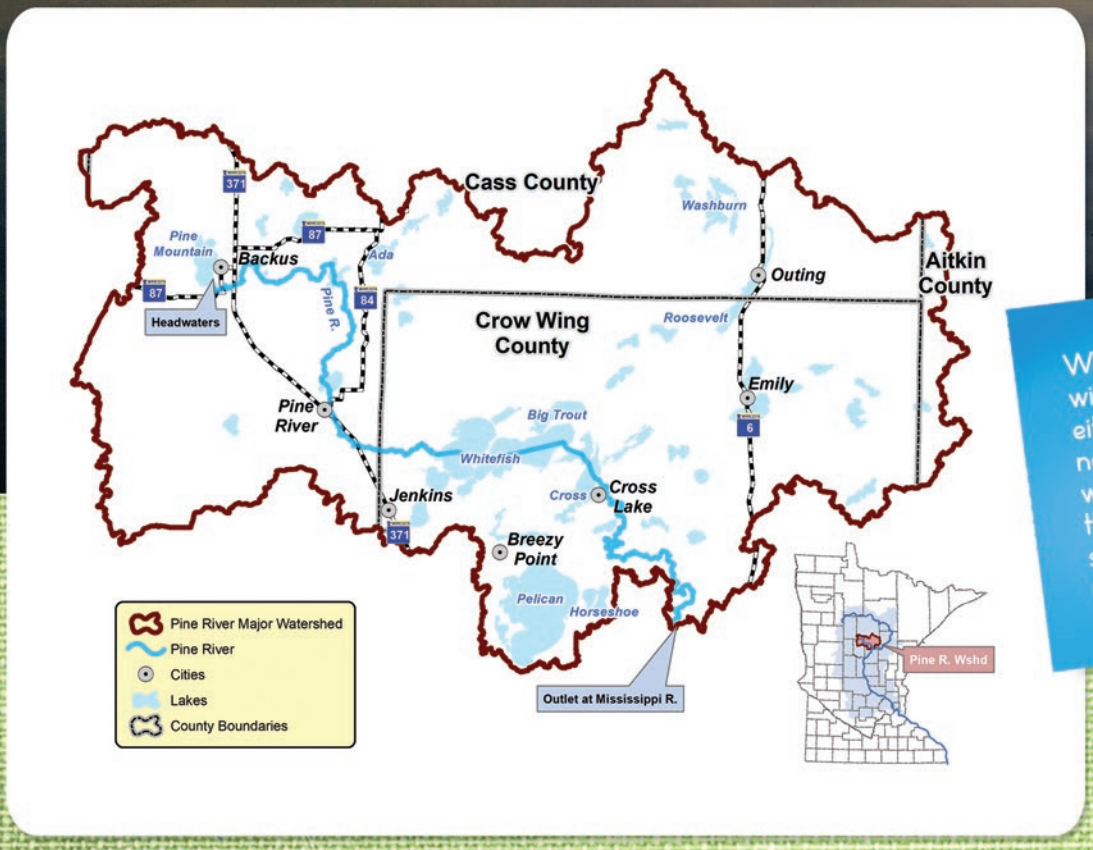
The key word to remember regarding a watershed is "Connection". Everything is connected to everything else in a watershed. For example, your property might be connected to a street which is connected to a storm sewer, which is connected to a stream which is connected to a lake, etc... The water within a watershed is always moving.

Watershed highlights:

- Contains over 500 lakes
- Lakes, rivers and wetlands cover 34% of the surface of the watershed
- Supplies 15 million people with clean drinking water from St. Cloud, MN to Cairo, Illinois.
- The watershed covers 502,400 acres *(785 square miles)*
- Is part of four counties: Aitkin, Cass, Crow Wing and slight slice of Hubbard
- Primary towns include Backus, Pine River, Breezy Point and Crosslake

What is One Watershed One Plan?

- Developed following the guidelines set by the Minnesota Board of Water and Soil Resources (BWSR)
- Aligns water planning along watershed boundaries, and enhances the existing county water plans
- Voluntary program and plan
- Uses existing authorities and funding mechanisms
- Based on current state information and data
- It is an Action Plan
- Progress is monitored and tracked for achieving measurable goals
- After adopted, BWSR implementation funding will be obtained through a non-competitive process rather than competitive process



What each of us does with our property will either have a positive or negative effect on the watershed. Thankfully, there are proven conservation methods to protect or improve water quality.

Pine River One Watershed Plan

- Formed a Memorandum of Understanding between four entities: Cass County, Cass Soil and Water Conservation District, Crow Wing County, and Crow Wing Soil and Water Conservation District.
- Resulted in a resource-based plan that recognizes the roles of watershed partners to influence future watershed conditions and identifies specific activities that achieve common goals.

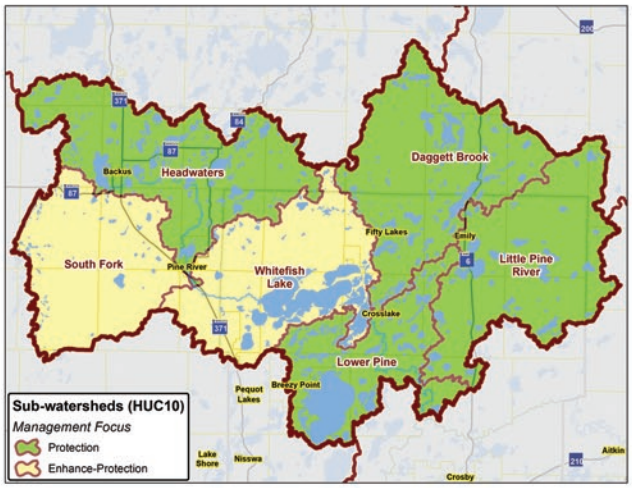
Plan Highlights

- Process had great participation from the public through the Advisory Committee, who drafted the plan content
- Under budget and on schedule *(completed draft plan one year after the public kick-off)*
- The plan targets phosphorus reduction for non-impaired lakes.This means lakes are initially protected from impairement as opposed to fixed after showing signs of impairment. *(It is less costly to protect than it is to repair!)* This analysis used data from the Watershed Restoration and Protection Strategies or "WRAPS".
- Includes a land protection goal that results in multiple benefits to lakes, streams, drinking water, habitat and forests. *(Protected land uses are defined as surface water, public land, private wetlands, conservation easements, and private forest management programs)*
- *This plan was the first to have a Landscape Stewardship Plan incorporated into it for protection planning.*

Why does it matter?

Maintaining the cleanliness of our waters is more important than most people realize. The Pine River Watershed is dependent on a strong fishing industry, a healthy deer population for hunters, and beautiful lakes to uphold tourism numbers and property values. Whitefish land value alone is worth over $2.7 billion! Our above-average water quality can, in a large part be credited to the rich forested lands within the watershed. Woodlands act as a giant sponge within the watershed, filtering and absorbing contaminants and retaining soil sediment, which in turn, keeps our water clean. Furthermore, our forested lands hold great ecological, atheistical, and monetary value! To put it simply, our Minnesota way of life is dependent on the quality of our waters.

Pine River Watershed - Plan Activities



Enhance

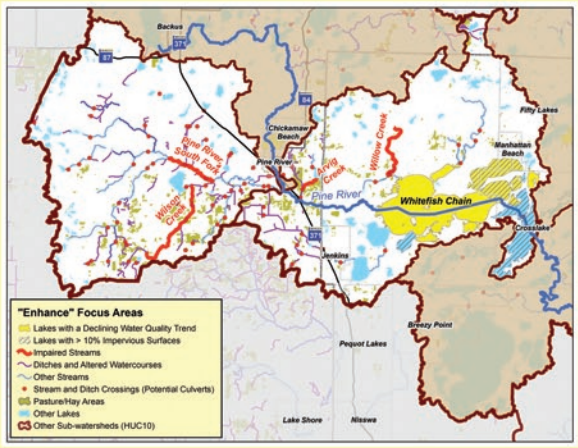
- Fix it -

What: Lakes with declining water quality trends, vulnerable groundwater, shoreland habitat, impaired streams, and problem culverts

How: (Surfacewater)

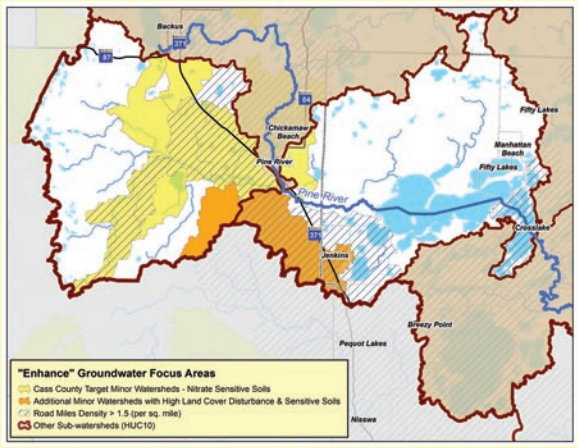
- Implement stormwater best management practices *(Shoreline Restoration, Rain Gardens, sediment treatment)*
- Pasture Management
- Culvert inventory, maintenance, & replacement

Measure: Pounds of Phosphorus Reduced
(reduce the main nutrient that feeds plants and algae in lakes)



How (Groundwater):

- Fertilizer / Chloride Management



Surface water & habitat

Ground water

Protect

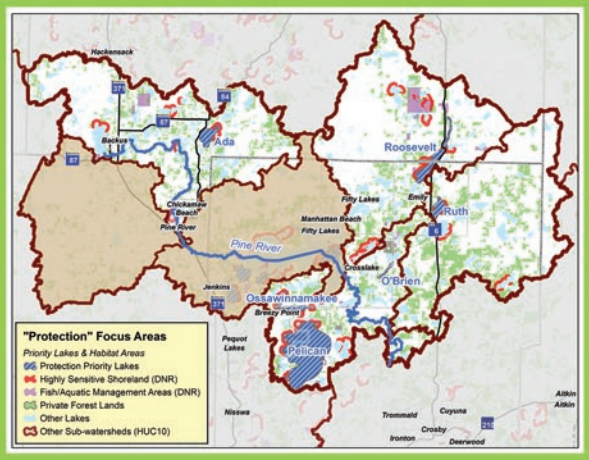
- Keep it -

What: Sensitive and Outstanding Lakes, Forests, Habitat, Groundwater, Wetlands, Source water to downstream cities & communities.

How: (Surfacewater)

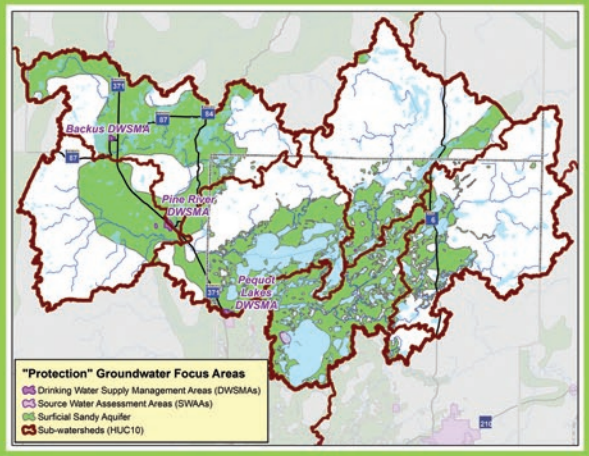
- Implement Private Forest Management to keep forested areas forested
- Protect undeveloped shore lands in sensitive habitat areas

Measure: Acres Protected
(goal is 75% of the minor watershed protected)



How: (Groundwater)

- Well sealing and Septic System Maintenance above shallow sandy aquifer



Four kinds of landowners

The goal of the Pine River 1 Watershed 1 Plan is to work with all types of landowners to protect the water and natural resources within the watershed

Woodland Land Owners | Agricultural Land Owners | Lakeshore Property Owners | Urban Land Owners

How each landowner can help

Information first

Your first step to aid in conservation is to gain the knowledge you need to be effective. There are a host of materials that provide best management practices backed by conservation success stories. Conservation professionals are ready and willing to assist you in forming a plan for your property. Ask questions, gather info, get organized, make a plan!

Managing landscapes for conservation

Managing land for conservation begins with observing ordinances, and maintaining low impact development practices. Beyond your initial efforts, and depending on the type of land you own, a forest stewardship plan, or maybe a few ag best management practices like pasture management would be helpful. Many conservation practices can be implemented in tandem with your existing plans for your working lands.

Protecting landscapes for conservation

Want to take it to the next level? Landowners can designate tracts of property under protection from development for the sake of conservation. Again... Many conservation practices and protection programs can be implemented in tandem with landowners existing plans for your working lands. Easements and Forest Management Incentive Payments can be applied to property with limited impact to the landowners working land plans. One of the major goals of conservation professionals is to keep large tracts of undeveloped lands in the hands of good land stewards.

Fixing landscapes for conservation

Some lands are beyond simple management or protection projects. Some lands will benefit from some conservation "fix it" projects. Professionally guided erosion control, shoreline stabilization, feedlot fixes, septic system upgrades, or even strategically designed rain gardens can turn the tides on declining lakes. Conservation organizations like your local SWCD are prepared to assist with technical projects that require engineering or even financial assistance.

Want to find out more?

Find out more! To dig deeper into the plan details, visit: www.crowwing.us/1476/Pine-River-1W1P

Plan Administration

This plan will be implemented through a Memorandum of Understanding between Cass County, Cass SWCD, Crow Wing County, and Crow Wing SWCD.

CASS SWCD

CASS COUNTY Minnesota Still Work to Explore

CROW WING Soil & Water CONSERVATION DISTRICT

CLEAN WATER LAND & LEGACY AMENDMENT

CROW WING COUNTY MINNESOTA

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Pine River Watershed

One Watershed One Plan

Section 2.

Land and Water Resource Narrative

2. Land and Water Resources Narrative

Imagine the ideal Northern Minnesota scene from a postcard: a large lake with lightly rippling water, a family of loons leisurely floating, a bald eagle soars by looking for fish, pine, birch and aspen trees lining the shore, kids jumping off docks and splashing in the water, and a few fishermen perched off a point. This scene perfectly describes much of the Pine River Watershed.

Nestled in the heart of north central Minnesota "Lakes Country", the Pine River Watershed contains over 500 lakes (over 10 acres) which combined with an abundance of wetlands cover 34% of the surface of the watershed. The watershed covers 502,400 acres (785 square miles), and is part of four counties: Aitkin, Cass, Crow Wing and a slight slice of Hubbard. The primary towns include Backus, Pine River, Breezy Point and Crosslake (Figure 2-1).

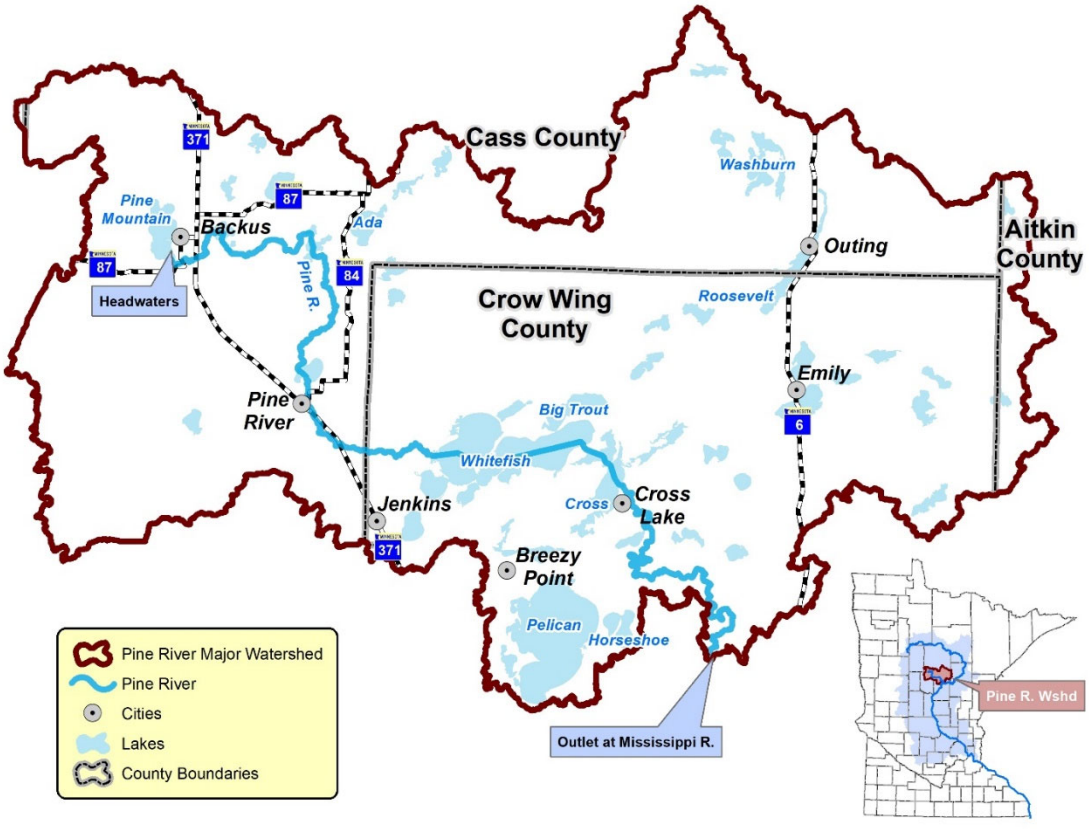


Figure 2-1. Pine River Watershed general location map.

The Pine River Watershed was formed approximately 10,000 years ago from **glaciers** moving back and forth across the landscape, carving deep holes in some areas and leaving till in others. The resulting geographic features, soils, forests and lakes bear the fingerprint of the glaciers as they slowly receded. The soils are made up of two main categories: sorted material (separated by grain size) by water (outwash) and unsorted materials with a mixture of grain sizes like gravel, sand, silt, and clay deposited directly by ice (till) (LSP 2017). Different soil types support different tree and plant species, types of lakes (deep vs shallow, oligotrophic vs eutrophic), potential for agriculture, and potential for development (lakeshore). For example, sandy areas such as moraine till and outwash support pine forests, while till plains are suitable for agriculture. Most of the lakes in the watershed are located in the outwash plain (Figure 2-2).

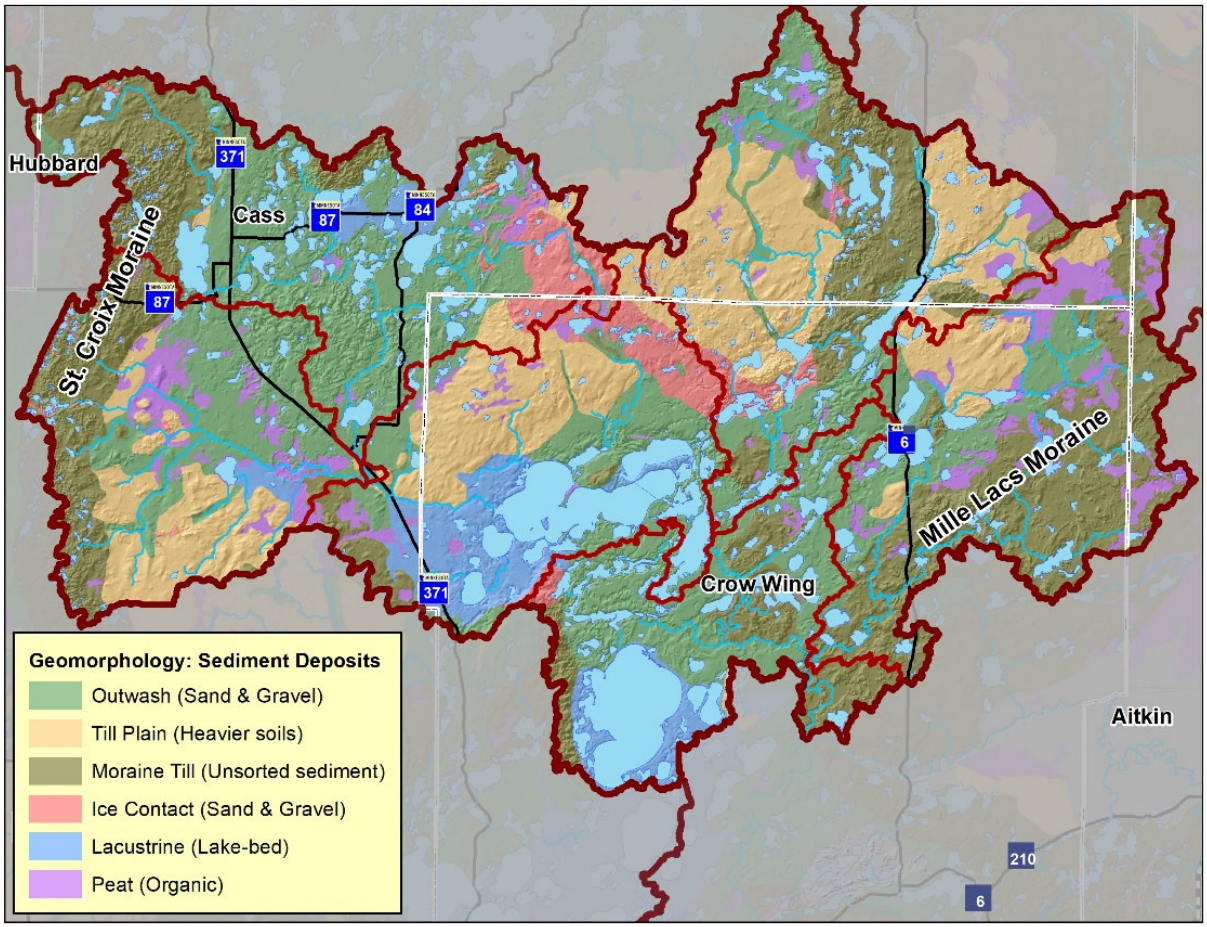


Figure 2-2. Sediment deposits from glaciation in the Pine River Watershed.

The **climate** of the Pine River Watershed has warm summers and cold winters (Figure 2-4). Because of its location on the continent, Minnesota is subject to large swings in both temperature and precipitation (Figures 2-3, 2-4). In the winter, the lakes in the watershed freeze over. The ice-on season averages 153 days, although it is highly variable from year to year. This winter freezing has a major effect on the lakes' biology.

The Crosslake area averages about 30 inches of **precipitation** annually. The majority of the precipitation occurs in the summer months (Figure 2-3). Future scenarios for climate change predict an increase of 1.4–1.7 inches of precipitation per year, along with an increase of heavy precipitation events (NCADAC 2013). The Pine River Watershed Restoration and Protection Strategy (WRAPS 2017) contains a modeling scenario for climate change-induced precipitation changes, which showed a 20 percent potential increase in watershed runoff volume and total phosphorus loads across the Pine River Watershed (WRAPS 2017).

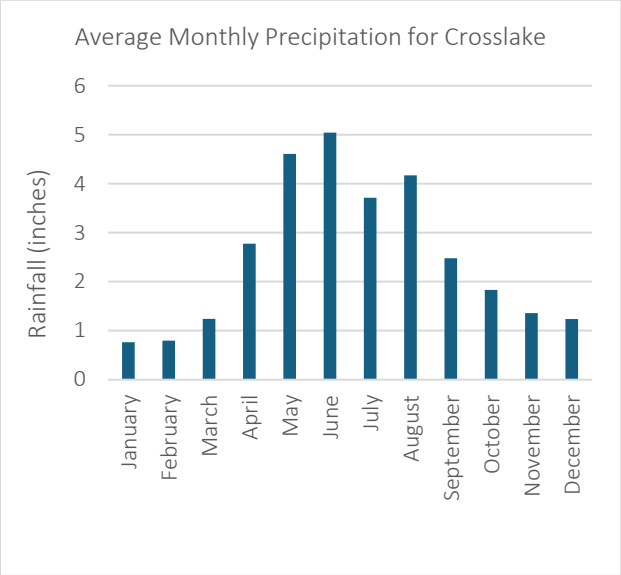


Figure 2-3. Average monthly precipitation for Crosslake, MN 2012-2017.

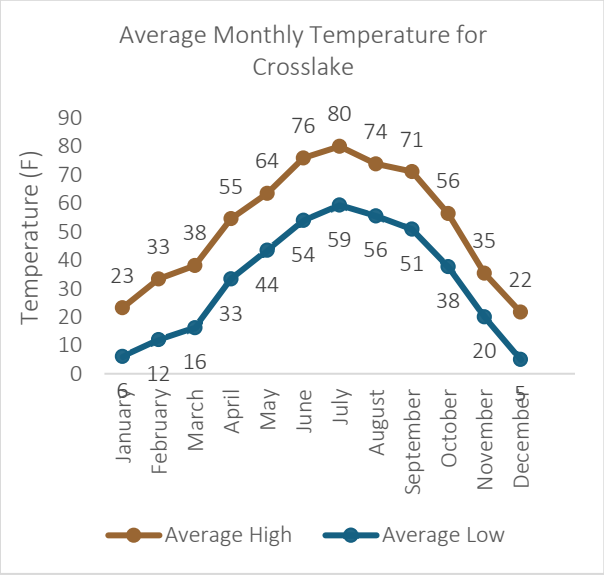


Figure 2-4. Average monthly high and low temperatures for Crosslake, MN 2017.

The **headwaters** of the Pine River Watershed originate in wetlands northwest of Backus, MN and flow into Pine Mountain Lake. The Pine River exits Pine Mountain Lake and flows through numerous smaller lakes, dropping approximately 100 feet in elevation upon reaching Whitefish Lake. The Whitefish Chain of Lakes is a reservoir made up of 14 lakes and is held back by the Cross Lake Dam, which is regulated by the Army Corps of Engineers. From the Cross Lake Dam, the elevation drops another 50 feet, flowing through Big Pine Lake before draining into the **Mississippi River** (Figure 2-5).

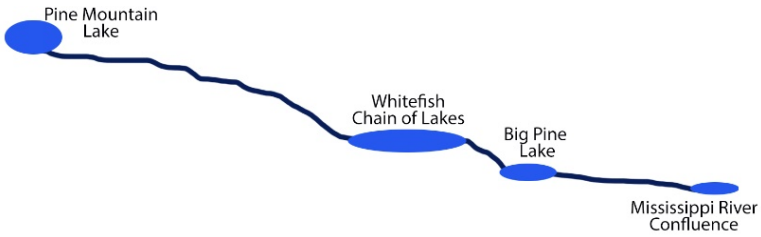


Figure 2-5. Pine River elevation profile from its headwaters to its confluence with the Mississippi River.

Major **tributaries** to the Pine River include the South Fork of the Pine River, which flows east through agricultural areas before joining the Pine River just upstream from the Whitefish Chain and Daggett Brook, which flows southwest through forested areas and numerous lakes before entering Cross Lake.

Almost half of the Pine River Watershed is forested and another third is covered by lakes and wetlands (Figure 2-6). **Forests** play a critical role in keeping water clean by absorbing and filtering water, preventing erosion through soil stabilization, and allowing for groundwater recharge (LSP 2017). The forests help to protect the outstanding surface water resources along with the shallow groundwater resources in the region. The 2017 Landscape Stewardship Plan highlighted substantial forestry opportunities. Creating Forest Stewardship Plans for private forested land and re-establishment of pine trees in the watershed were priorities in the plan.

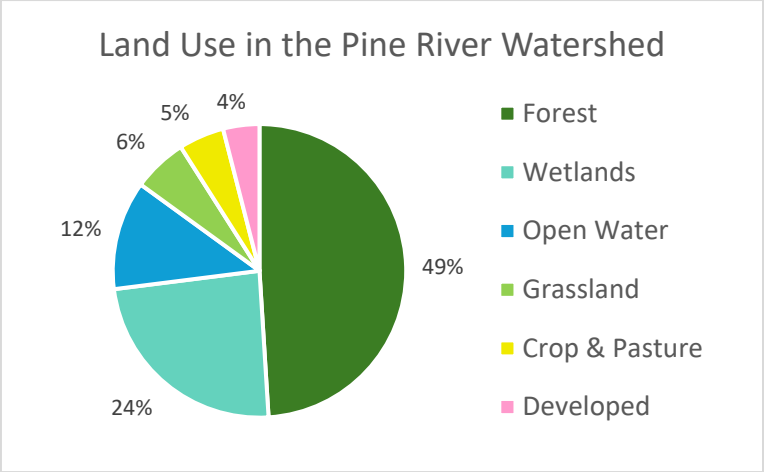


Figure 2-6. Land use in the Pine River Watershed (NLCD 2011).

Much of the agricultural land in the watershed is located in the western side (Figure 2-7). These lands contain a mixture of pasture and animal feedlots (Figure 10-5, Appendix A).

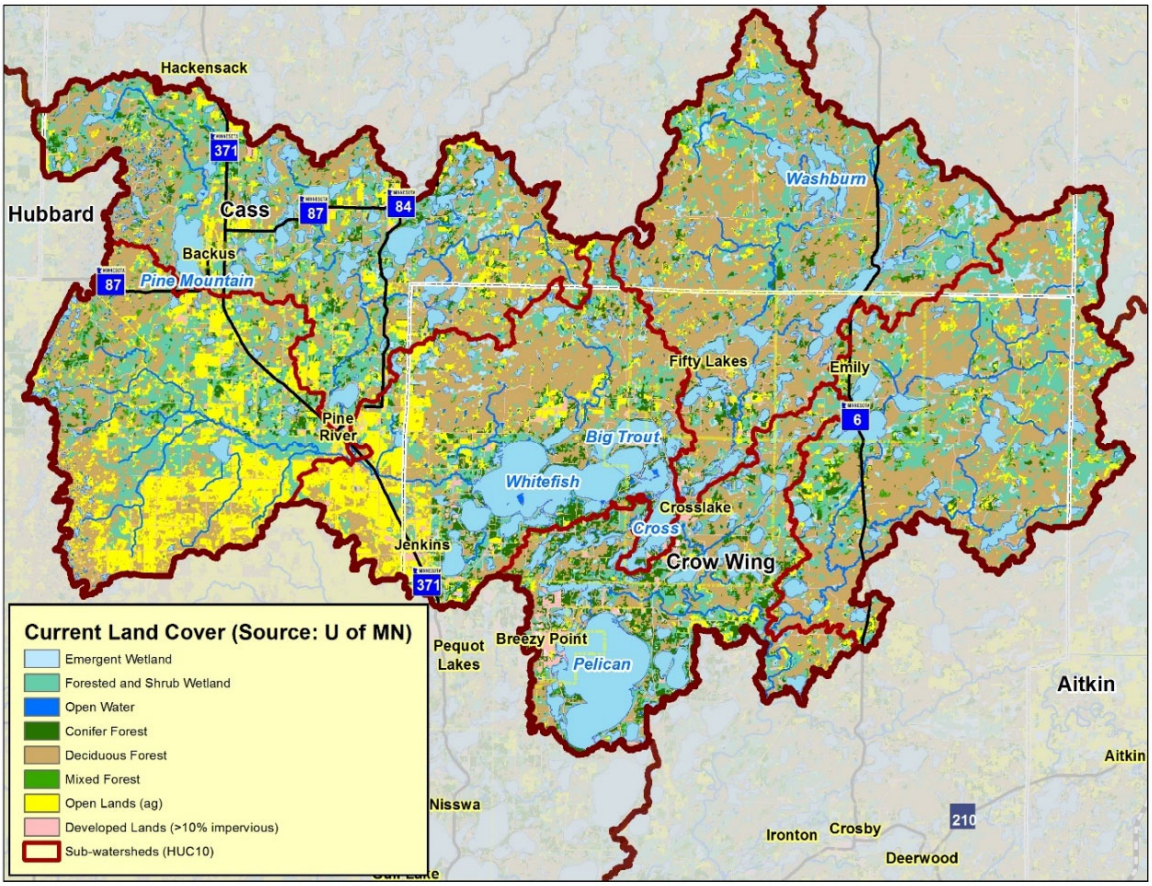


Figure 2-7. Land use in the Pine River Watershed, U of MN.

Expansion of anthropomorphic land uses such agriculture and urban expansion can cause a desire to drain water from the landscape more quickly than it would naturally. Installation of **ditches and culverts** for this purpose and historical wetland filling has changed the water drainage, storage and connections in the watershed (Figure 6.5). These alterations in hydrology can cause impacts to habitat, water levels, channel stability and increase nutrient transfer.

Pine River Watershed Outstanding Qualities:

- **Water Quality**
- **Forests/Habitat**
- **Drinking Water Source**

The **water resources** in the watershed are not only some of the **best in Minnesota**, but also some of the **best in the nation**. Lakes, streams and wetlands, home to sensitive fish species such as Ciscoes and Trout and incubators for wild rice (a major food source for waterfowl) illustrate the biological importance of this area (Figure 2-8, Table 2-1). There is one lake in the watershed with trout (Big Trout), 16 wild rice lakes, 16 cisco refuge lakes, and 25 lakes with outstanding biological significance in the watershed. Water quality is vital to this watershed as the local economy and quality of life depends on it. Pelican and Whitefish Lake, in particular, are some of the most important lakes economically in the region and in Minnesota, with high property values and excellent fisheries and recreational opportunities.

Table 2-1. Selected high quality lakes in the Pine River Watershed, sorted by size.

Lake Name	Size (acres)	Trophic State	Outstanding Qualities	Phosphorus Sensitivity	Current Water Quality Trend
Pelican	8,507	32 - Oligotrophic	Cisco	Highest	Stable
Whitefish	7,716	45 - Mesotrophic	Cisco	Highest	Declining
Pine Mountain	1,623	45 - Mesotrophic	Wild Rice, Headwaters		Stable
Washburn	1,618	43 - Mesotrophic	Cisco & Wild Rice		Improving
Roosevelt	1,520	46 - Mesotrophic	Cisco		Stable
Big Trout	1,368	40 - Mesotrophic	Cisco and Trout	Highest	Declining
Ossawinnamakee	689	40 - Mesotrophic	Cisco		Improving

Figure 2-8. Pelican Lake, in Breezy Point, MN.

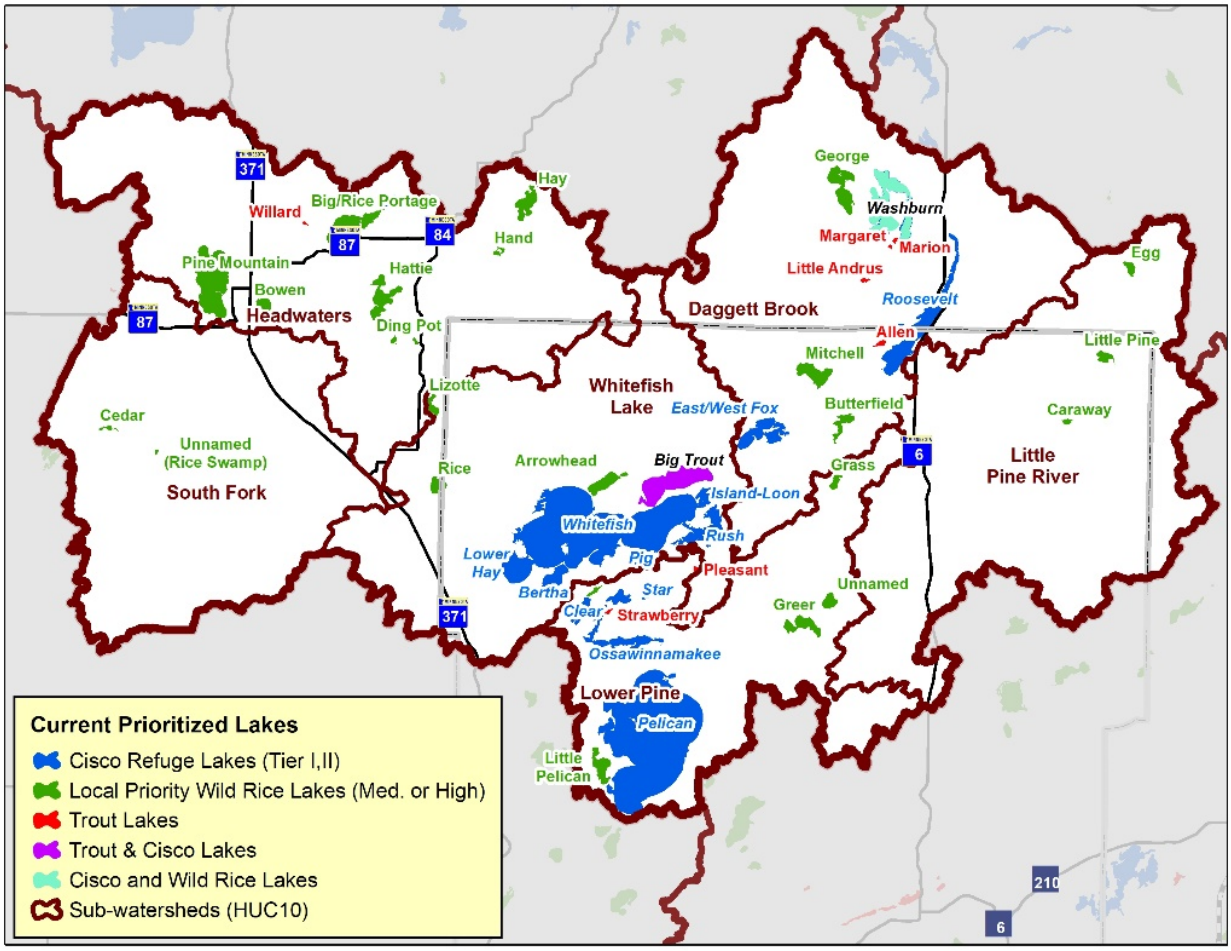


Figure 2-9. Prioritized lakes from the WRAPS with outstanding qualities highlighted.

Figure 2-10. Pine Mountain Lake, Backus, MN.

The Minnesota Pollution Control Agency (MPCA) Watershed Restoration and Protection Strategy (WRAPS), completed in 2017, resulted in very few waterbodies being listed as **impaired** (not meeting state standards), which further documents the excellent water quality of the region. Just five lakes, Kego, Mitten, Jail, Lows and Emily, and four streams are listed as impaired (non-mercury) (Figure 2-11). Of the five impaired lakes, only four are impaired due to anthropogenic (human activity) causes. Lows Lake is classified as a "natural background (4D)" impairment. Permitted phosphorus sources, such as wastewater treatment plants and feedlots can be found in Appendix A.

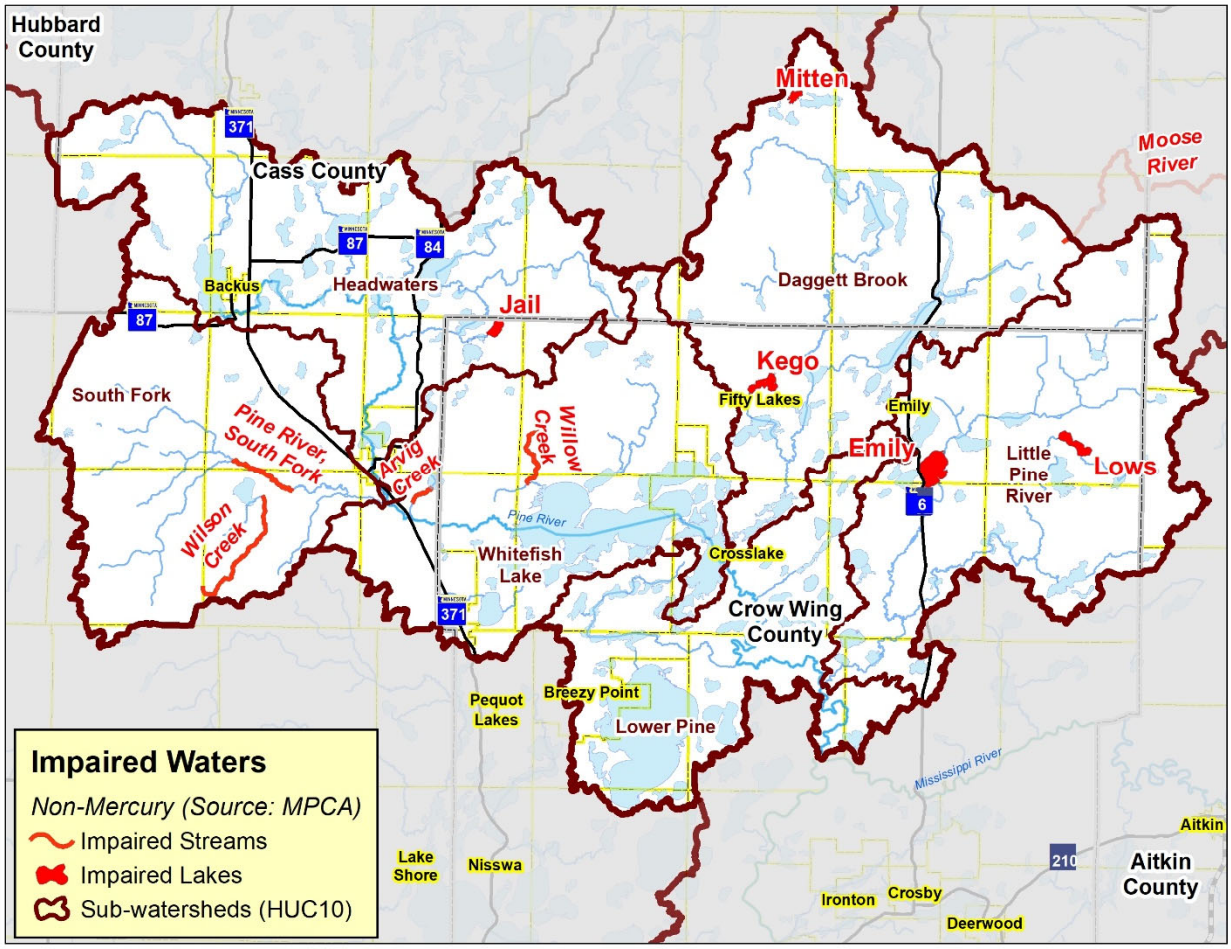


Figure 2-11. Impaired waters in the Pine River Watershed, from the Pine River WRAPS, MPCA 2017.

Because most of the lakes in the watershed are not impaired, the water quality trend of the unimpaired lakes is an important factor used to identify possible threats and assist with prioritizing (Figure 2-12). Trend analysis showed that there are some lakes that are declining in water quality, but not at the impaired waters standard yet. These lakes can be prioritized for implementation projects that can work to reverse the trend. Lakes without trends or improving trends can be prioritized for protection strategies, such as land protection and forest conservation.

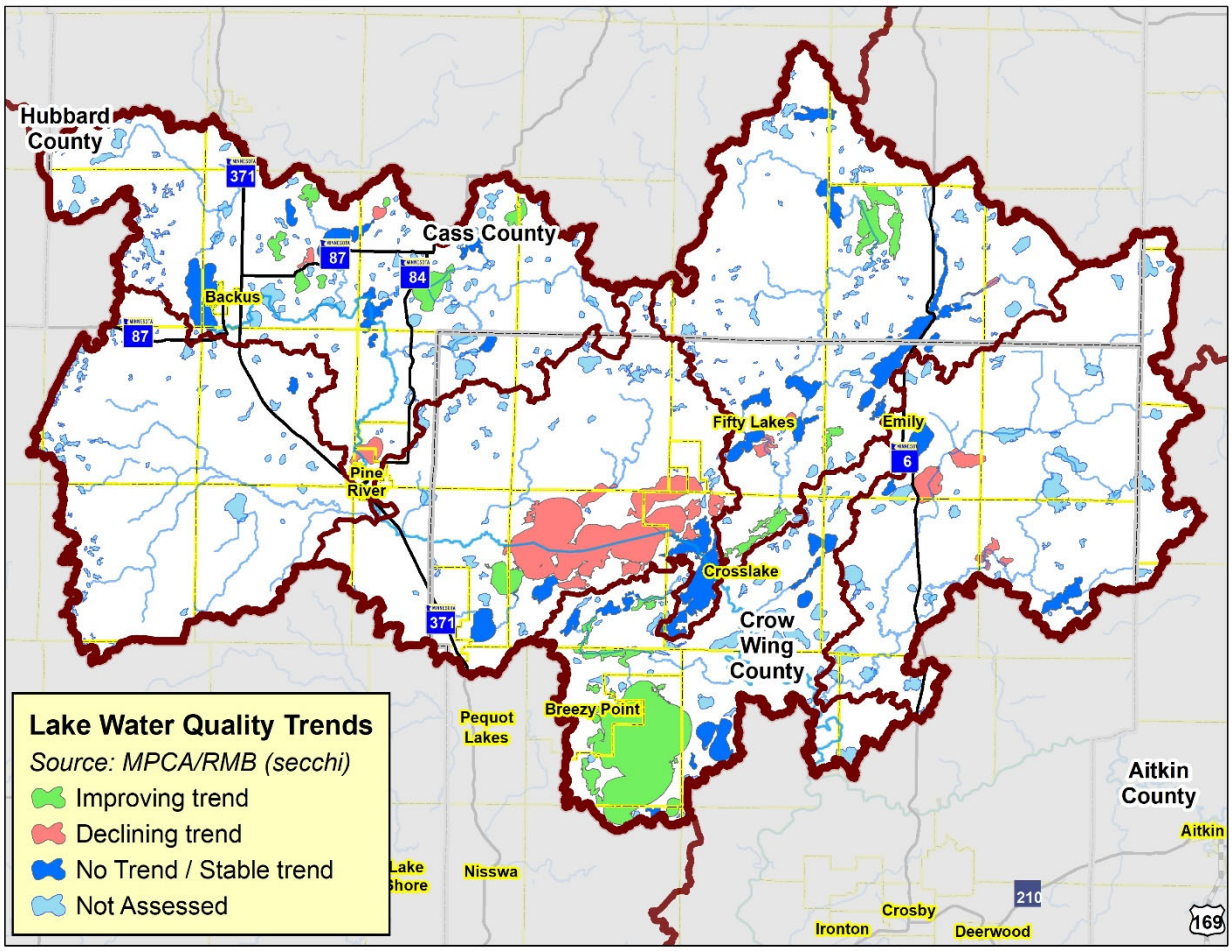


Figure 2-12. Water quality trends in the Pine River Watershed, MPCA and RMB Environmental Laboratories (2019 trends).

Groundwater in the Pine River Watershed is characterized by sand aquifers in generally thick sandy and clayey glacial drift overlaying bedrock in the Central Groundwater Province. The surficial sand aquifers are sensitive to changes in land use, since there is a close connection from the surface to the aquifer (Figure 2-13), and much of the water table in the watershed is less than 10 feet deep (Figure 10-3 in Appendix A).

These sand and gravel aquifers supply water to most of the 3,120 private wells and the 286 public water supply wells in the watershed (DNR 2016). Approximately 93% of all water appropriated in 2014 within the watershed was groundwater, 7% of appropriated water came from surface water sources (DNR Permitting and Reporting System (MPARS)). A map of Drinking Water Source

Protection areas and water appropriation permits can be found in Appendix A (Figures 10-1 and 10-2).

With this close connection between groundwater and surface water, waste treatment can be an issue. Each well has a septic system and each septic system needs maintenance, so proper septage disposal in sandy soils is important to protect both surface and groundwater. The Pine River Watershed is mostly rural, with over 3,000 subsurface waste treatment systems (county records). The total discharge from septic systems probably matches or exceeds the outputs from permitted waste water treatment plants in the watershed.

The Pine River Watershed is also a **source water** to major downstream cities including St. Cloud, Little Falls, Minneapolis and St. Paul (serving over 1 million people). In fact, it ranked first out of 83 watersheds studied in Minnesota that are most important for providing a clean drinking water supply to the Twin Cities Metropolitan Area (USDA FS). Aquifer depletion accelerated by population growth in the Twin Cities metro area is forcing communities to increase their usage of the Mississippi River as a drinking water source.

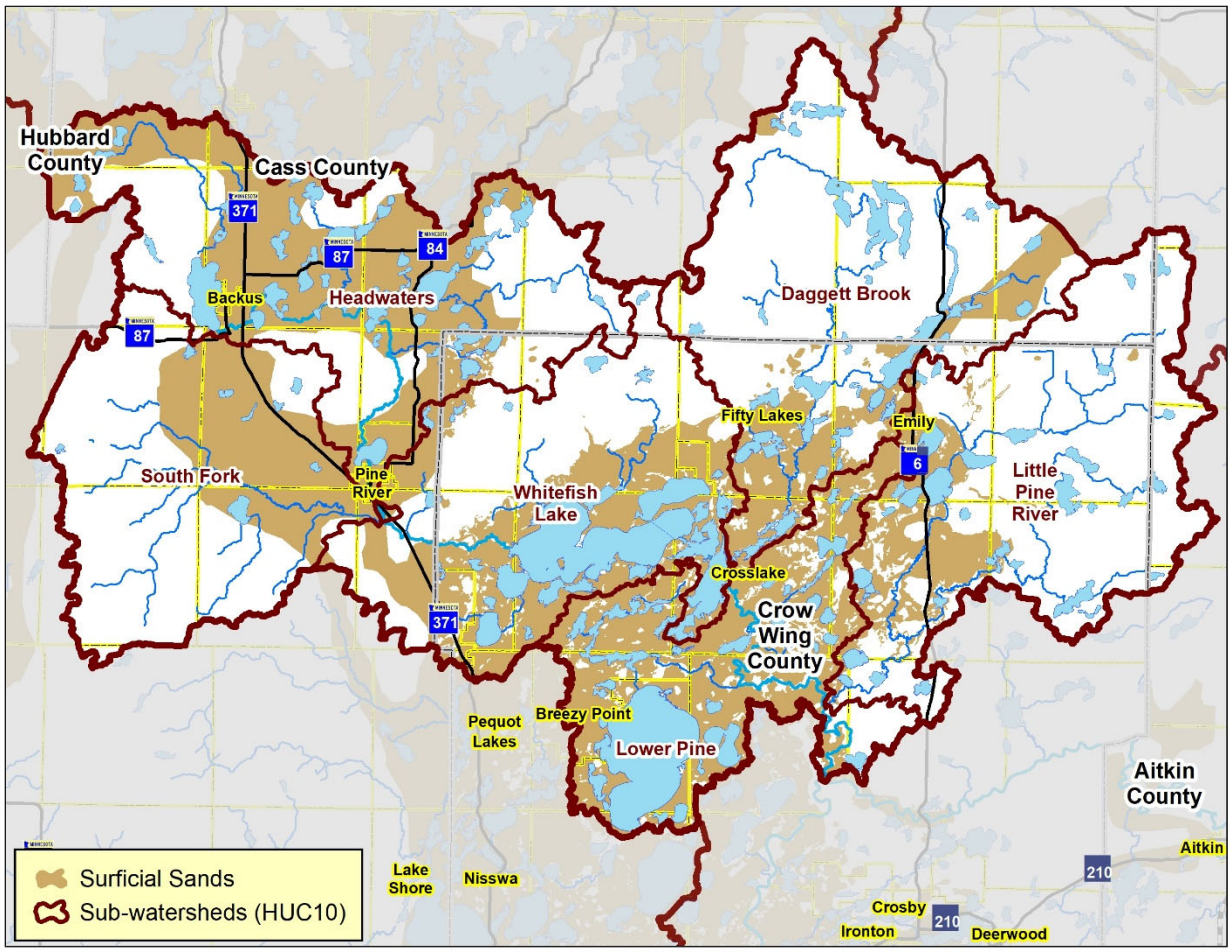


Figure 2-13. Map of surficial sand aquifers in the Pine River Watershed (MNDNR).

The Pequot Lakes, Breezy Point and Crosslake area have experienced **rapid growth** in the past twenty years (Figure 2-14). Property values in the watershed are currently in excess of $6.5 Billion (LSP 2017), with much of the value focused around the Whitefish Chain of Lakes and Pelican Lake. The population of this north central Minnesota lakes region is projected to increase 32% by 2030, with much of the increase focused around lakeshore (Gould, Walker & Frazell 2009). The MPCA WRAPS report modeling showed that in the future, if expansion occurred around lakeshores, in cities, and in local agriculture, the phosphorus loading could increase significantly (potentially up to double).

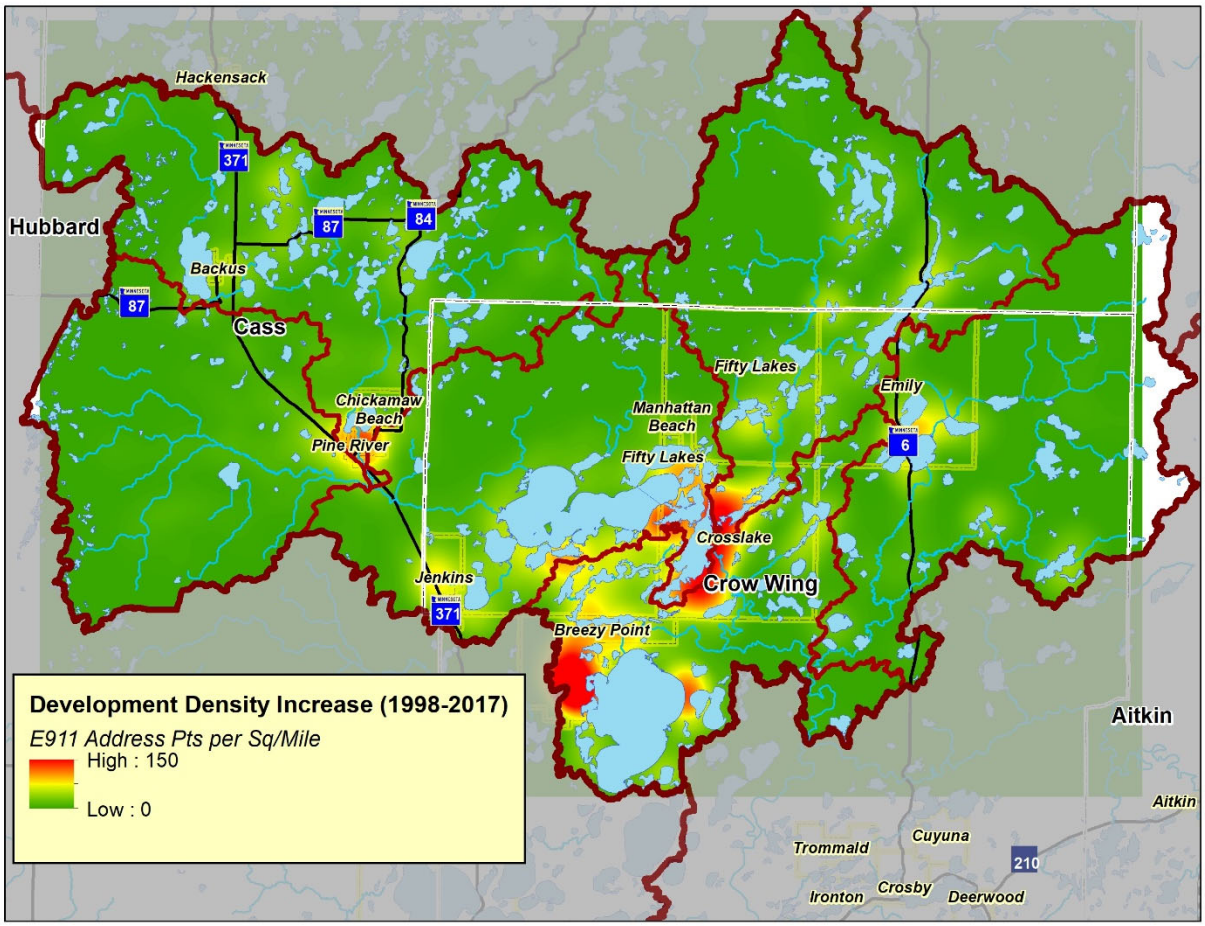


Figure 2-14. Development density increase in the Pine River Watershed between 1998-2017.

Land use changes such as agricultural practices, urban expansion, and shoreline development alter the landscape and increase impervious surface area, thereby allowing more phosphorus to enter lakes and streams than would occur naturally. Phosphorus is the main nutrient that feeds aquatic plants and algae and causes the lake's clarity to decline. These land use changes also fragment important fish and wildlife habitat such as forests, wetlands, and shoreland. For example, loons need natural emergent vegetation along the shoreline for nesting and clear water for catching their food.

These assets of **clean water, fish, wildlife** and **forests** are what draw people to this region and define its character. Along with its importance as a **drinking water source**, this character is well worth protecting. With our commitment to protecting this area, future generations will be able to enjoy it as we do today.

PINE RIVER WATERSHED

Pine River Watershed

One Watershed One Plan

Section 3.

Executive Summary

3. Executive Summary

Introduction

The Pine River Watershed, nestled into the heart of northern Minnesota's lakes country (Figure 3-1), is characterized by clean water, fish, wildlife, and forests. These qualities contribute to the economic significance of the area and are a magnet for tourism and development. In addition, as the "Land of 10,000 Lakes", residents often feel a deep connection to these natural resources because of the legacy of family cabins and family vacations. These assets and connection to the local area are illustrated in the watershed's vision statement, which was developed during this planning process.

Harmonizing people, water, forests, and the economy in a place to renew your spirit.

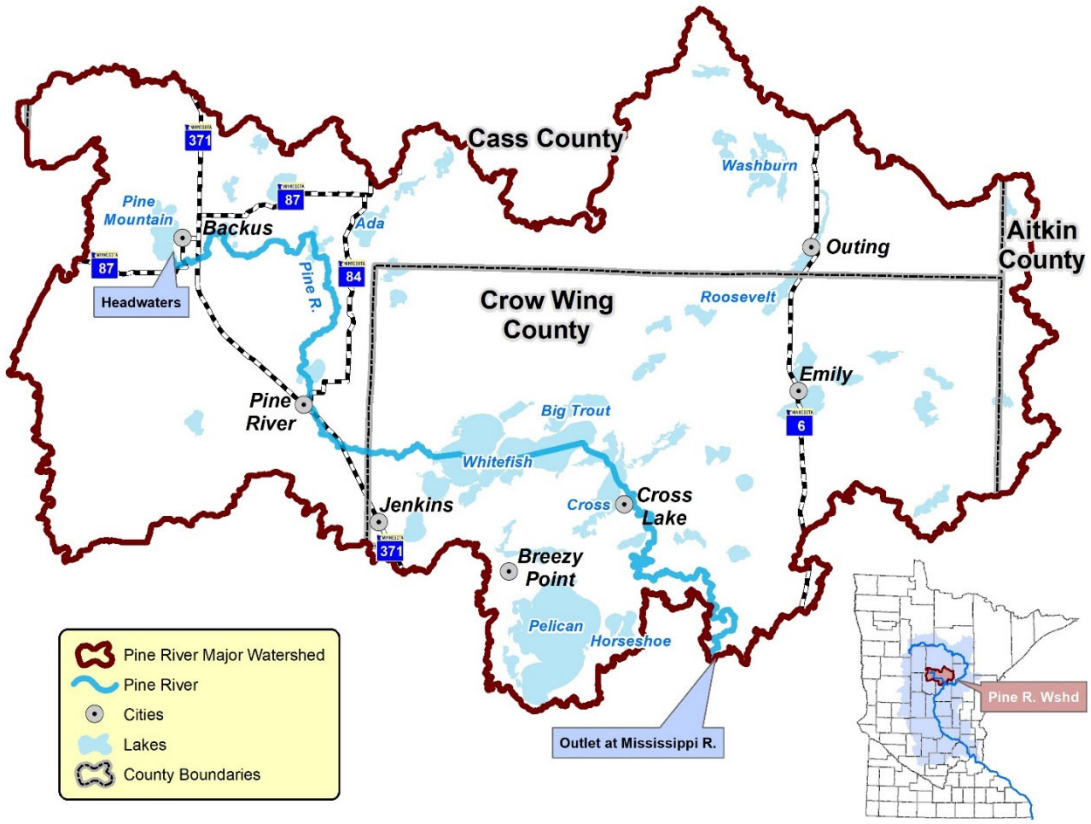


Figure 3-1. Map of the Pine River Watershed.

Purpose, Roles and Responsibilities

The Pine River Watershed One Watershed One Plan (PRW1W1P) was developed following the guidelines set by the Minnesota Board of Water and Soil Resources (BWSR). The purpose of the 1W1P process is to align local water planning along major watershed boundaries, not just local governmental jurisdictions. 1W1Ps must contain targeted, prioritized, and measurable implementation plans, with the purpose of achieving meaningful and lasting results for Minnesota's water resources.

The PRW1W1P began with a Memorandum of Agreement (MOA) between Crow Wing County Soil and Water Conservation District, Crow Wing County, Cass County Soil and Water Conservation District, and Cass County (Appendix G). Aitkin and Hubbard counties elected not to participate because they have such a small area in the watershed (Table 3-1). A representative from each MOA governmental unit was appointed to serve on the Policy Committee, which is the decision-making body for this plan. Crow Wing SWCD was the fiscal agent for this project (Figure 3-2).

Table 3-1. The percentage of the watershed in each four counties.

County	% of Watershed
Cass	50.3%
Crow Wing	47.3%
Aitkin	2.3%
Hubbard	0.1%

The writing of this plan was a collaborative effort between many committed volunteers representing lake associations, townships, cities, and local business owners involved in the public meetings and Advisory Committee, along with the Planning Work Group, comprised of local and state government officials and consultants (Figure 3-2).

The planning process began with a public kick-off meeting in May of 2018 to introduce the project and begin gathering information that would eventually form the PRW1W1P. Participants' comments were illustrated in a word map of people's feelings about the watershed (Figure 3-3). The size of the words corresponds to the frequency in which it was mentioned.

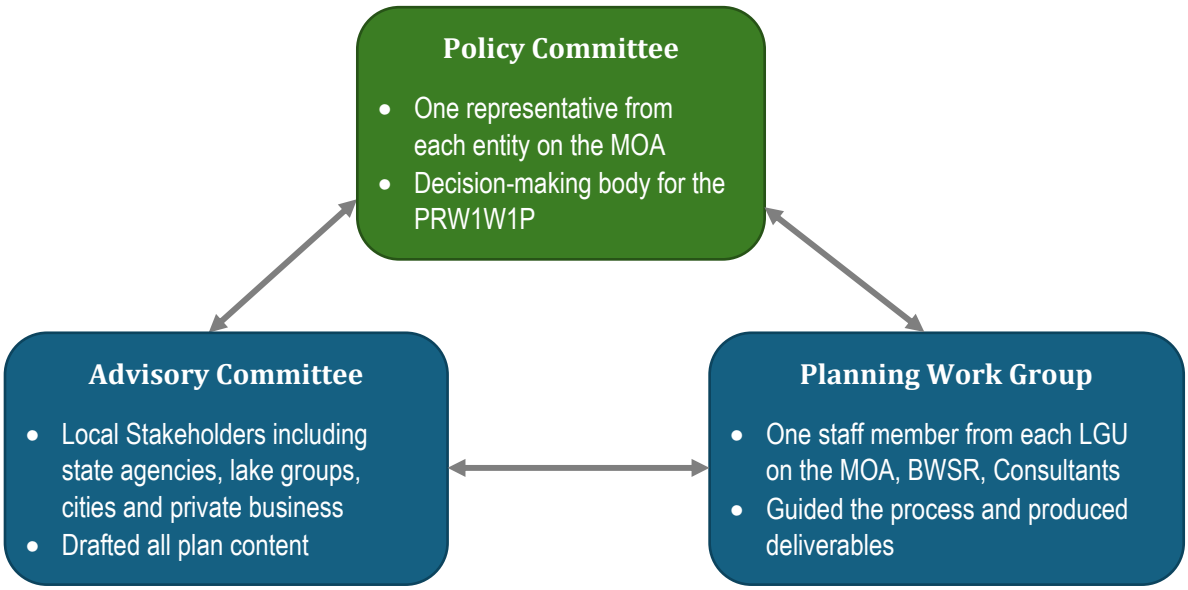


Figure 3-2. The three committees that were part of the PR1W1P process and their roles.

Figure 3-3. Word map from the Public Kick-off meeting on May 7, 2018.

The overall planning process was very inclusive with the Advisory Committee, which contained a wide range of stakeholders and citizens, drafting all the major plan content (Figure 3-4). At each milestone in the process, the output was presented to the Policy Committee for input and approval.

Prioritization and analyses were completed using the latest existing data and science including lake water quality trend data (collected by citizen volunteers), Lakes of Phosphorus Sensitivity Significance (Radomski 2018), Hydrological Simulation Program – Fortran (HSPF model, WRAPS 2017), and the Landscape Stewardship Plan (LSP 2018).

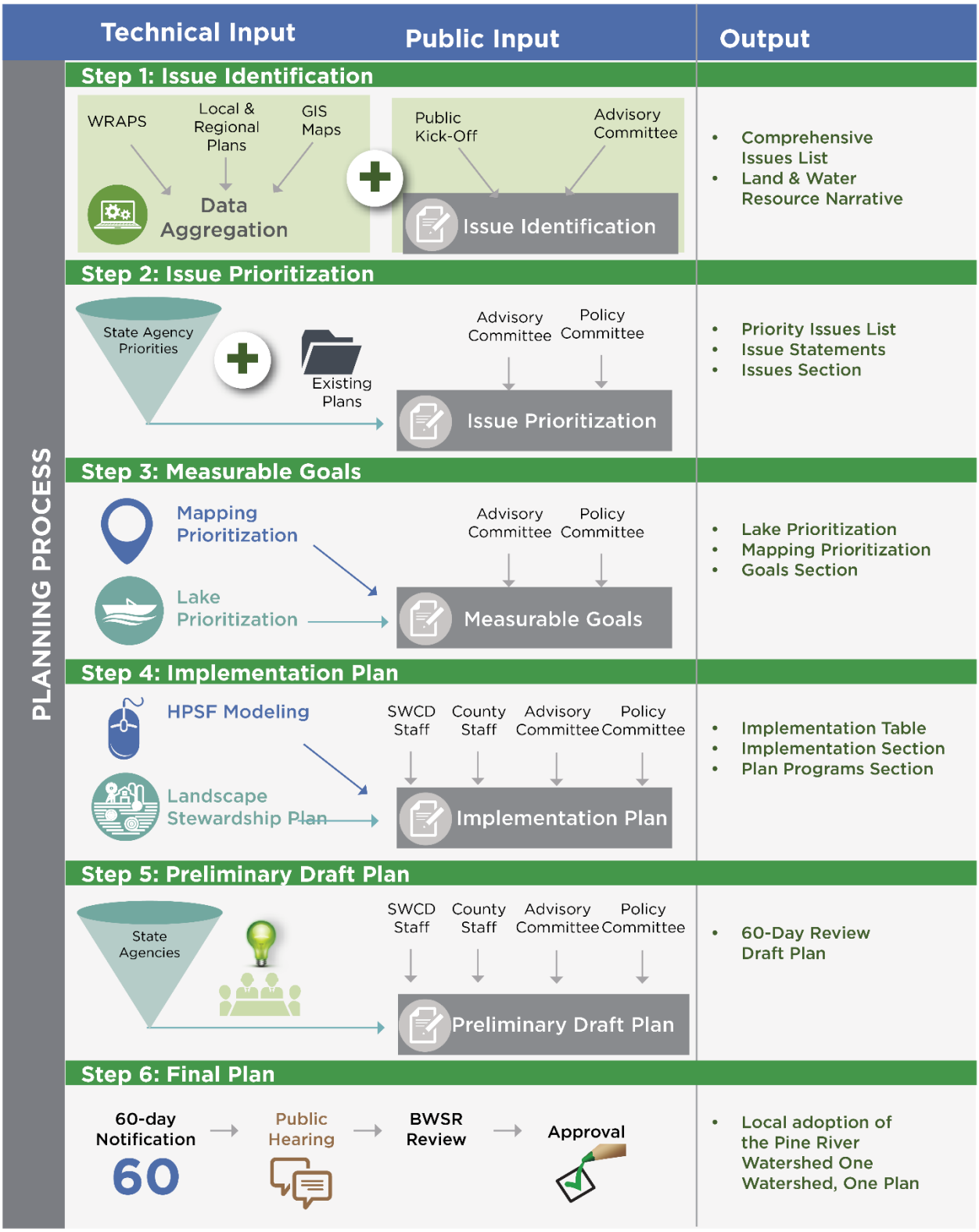


Figure 3-4. Overall plan process for the PRW1W1P.

Issue Identification

The issues were generated and prioritized with input from the Advisory Committee, existing resource plans, and state agency priorities (Appendix B, Figure 3-6, Figure 4-1). The priority issues that matched all sources emerged as issue themes. These priority issue themes were used to craft the issue statements (Figure 3-5, Section 4). Issue statements were only written for the priority issues.

The issues and resources that emerged in the planning process relate to three main resource categories: surface water, ground water, and forests & habitat. The Pine River Watershed is a protection – focused watershed, meaning that most of the water resources are currently in good condition, and this plan aims to protect that condition.

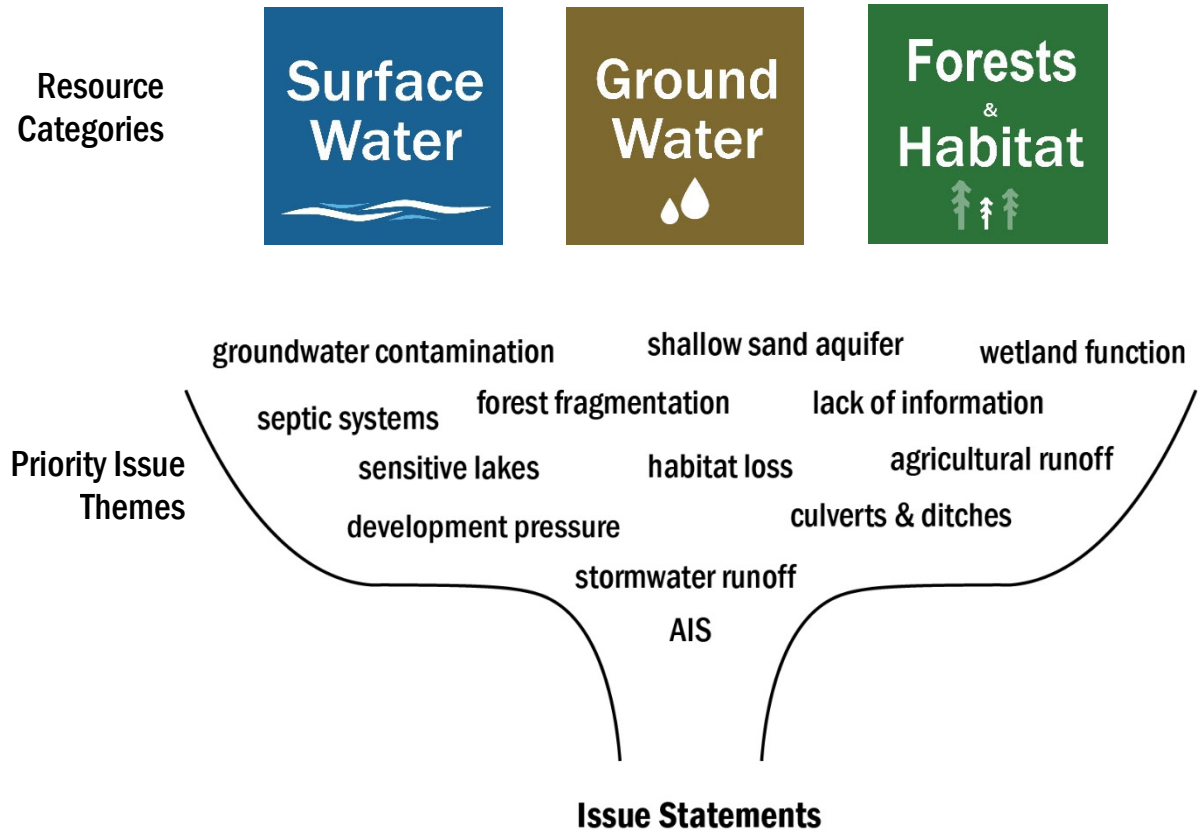


Figure 3-5. Resource categories and priority issue themes that led to issue statements.

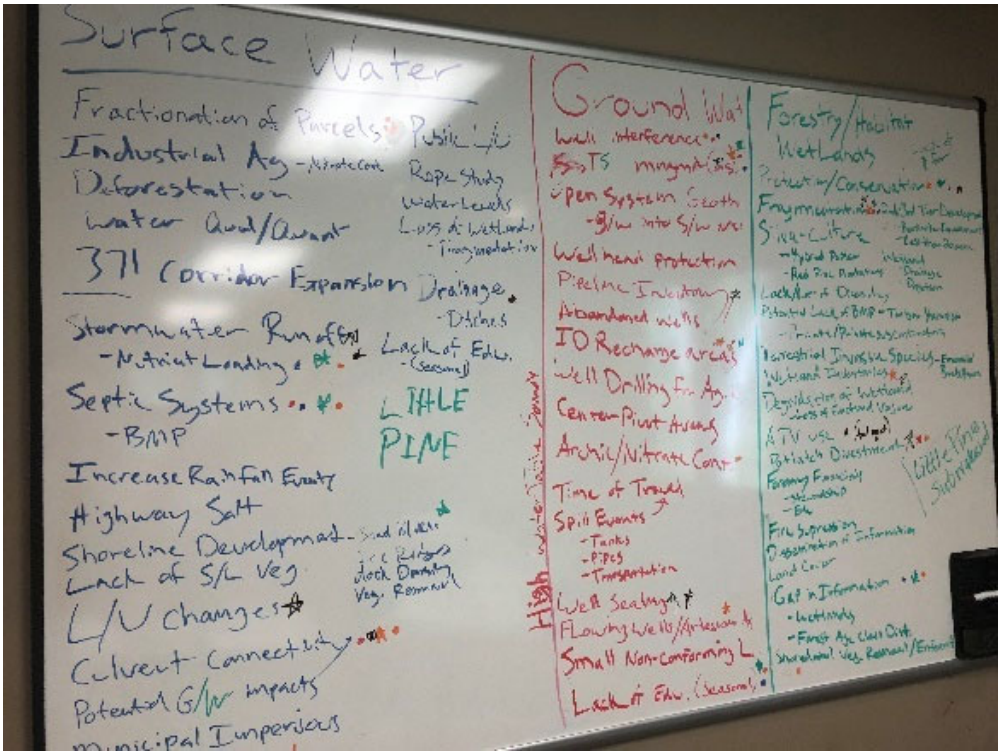


Figure 3-6. Issues generated at the Advisory Committee meeting and prioritized with dots.

Goals

The priority issue themes were then used in the development of the plan's goals. The goals guide what quantifiable changes to resource conditions this plan expects to accomplish in its ten-year lifespan. The goals for the Pine River Watershed were developed by the Advisory Committee in a three-meeting process and then revised and approved by the Policy Committee.

Due to its status as a protection-focus watershed, one protection-focused goal was written to include all three resource categories because the implementation actions for the goal would be the same. Minnesota's state agencies that manage surface water, drinking water, and habitat (DNR, MDH, MPCA, BWSR) agree that forest and vegetative cover benefits clean surface water, drinking water, and habitat. More specifically, DNR Fisheries research has shown that once a minor watershed is over 25% disturbed (urban, agriculture, mining), the water quality is negatively affected. Therefore, the measure of 75% of the minor watershed being in protected land uses is used in this combination protection goal. Protected land uses are defined as surface water, public land, private wetlands, conservation easements, and Sustainable Forest Incentive Act lands.

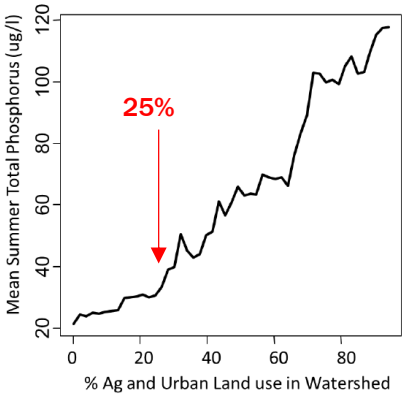


Figure 3-7. Graph showing the effect of land disturbance on water quality (DNR Fisheries).

Figure 3-8. Figure illustrating the reasoning behind 75% as a protection goal.

The surface water goals encompass a variety of issues including phosphorus loading to lakes, culvert management and wetland protection. None of the economically significant lakes in the Pine River Watershed are currently impaired, but some have declining transparency trends. It is important economically to the region to work to reverse these trends before they exceed water quality standards. Stormwater and agricultural phosphorus loading to priority declining lakes was quantified using the HSPF model developed during the Watershed Restoration and Protection Strategy (WRAPS 2017). A phosphorus reduction of 5% was determined to be achievable in a 10-year timeframe, and it was also the reduction goal used in the DNR's Phosphorus Sensitivity Analysis (Radomski 2018). Agricultural runoff and impaired streams in the South Fork Sub-watershed and Whitefish Sub-watershed can be mitigated by pasture management in the area. Specific streams and minor watersheds were identified for projects from the WRAPS.

Historical installation of ditches and culverts in the watershed has changed the water drainage, storage and connections in the watershed. In addition, when culverts are not sized correctly or installed properly, they can cause impacts to habitat, fish migration, water levels, channel stability and increase nutrient transfer. The culvert management goal addresses the issues of stream channelization, culvert installation, connectivity, channel stability, and altered hydrology as it affects nutrient transfer and habitat.

Wetlands can reduce the effects of flooding and high water, store water to allow nutrients to settle out, and are also important habitat for fish, wildlife, and birds. Although the Pine River Watershed has not lost large numbers of wetlands like western Minnesota, wetlands around lakeshore have been filled for development over time. Wetlands throughout the watershed have varying amounts of protection enforced by different government agencies, federal (Clean Water Act, ACOE), state (Wetlands Conservation Act, BWSR, MN DNR) and county (County Wetlands Ordinance). This goal aims to continue current programs and administration of ordinances.

The groundwater goals include addressing subsurface sewage treatment systems (SSTS), chlorides, nitrates, well sealing and Drinking Water Supply Management Areas (DWSMAs). The Pine River Watershed sits atop a surficial sand aquifer, making it vulnerable to surface contaminants. Chlorides, SSTS, and nitrates are all potential contaminants for drinking water. Sealing unused wells and protecting DWSMAs are ways to prevent contaminants from reaching the aquifer.

The Pine River Watershed has abundant forests and habitat, but some of these areas, especially along lakes and streams (riparian), have been lost over time as the area has developed. The forestry and habitat goals address protection of undeveloped riparian lands and corridors and enhancing and restoring riparian areas that have been disturbed.

Pine River Watershed Goals

Surface Ground Forestry

Protect and enhance forest cover, priority lakes, and surficial sand aquifers by protecting **4,396 acres*** of land.

*30% progress towards 75% protection in priority lakesheds.

Surface Ground

Reduce agricultural runoff to surface and groundwater by implementing **1,253 acres*** of agricultural best management practices.

*5% of Ag lands in the Headwaters, South Fork Pine, and Whitefish HUC10 subwatersheds.

Surface Water

Reduce phosphorus loading into declining lakes by 5 lbs each through implementing best management practices.

Maintain current coverage of wetlands as currently administrated under federal, state and local regulations.

Maintain an average discharge of 306,945 acre-feet at the pour point of the Pine River Watershed.

Ground Water

Maintain high quality drinking water in surficial sand aquifers by enforcing the SSTS ordinance, providing funding for SSTS upgrades, and conducting outreach to private landowners.

Provide resources, information, and training on chloride management to cities, public, and road authorities.

Seal **60 unused residential wells per year** to prevent groundwater contamination.

Forests & Habitat

Protect **13 miles and 5,087 acres*** of undeveloped riparian lands.

Restore **2 miles** of lakeshore or riparian vegetation.

Implementation

Implementation activities in this plan and their estimated costs are laid out in Section 7. Because one of the goals of One Watershed One Plan is to combine priorities and actions from existing local and regional plans, the implementation activities identified in this plan are labeled with their source (Section 7). Implementation activities were incorporated from the WRAPS (2017), the Cass County Water Plan (2017-2027), the Crow Wing County Water Plan (2013-2023), the Groundwater Restoration and Protection Strategy (GRAPS), the Landscape Stewardship Plan (2017), and the PRW1W1P effort.

There are already many effective conservation efforts occurring in the Pine River Watershed. To implement the full extent of this plan, additional funding and capacity over current levels will be necessary. The implementation table labels implementation actions as a level 1, 2, or 3 (Table 3-2).

Table 3-2. Levels of funding identified in the PRW1W1P.

Level 1	**This level identifies implementation activities that we plan to undertake within the 10-year time frame of the 1W1P, funded by the Natural Resources Block Grant (NRBG), Local Capacity Grant, and/or in-house contributions.**
Level 2	**This level identifies implementation activities that we hope to accomplish if additional sources of funding, staff resources, or shared service opportunities become available over the 10-year time frame of the 1W1P. Additional funding can enhance a level 1 service or project to a level 2.**
Level 3	**This level contains additional implementation activities identified during the plan development process that are the responsibility of state and/or federal agencies better suited to other entities in the watershed.**

This plan provides a framework for all the activities in the Pine River Watershed to work towards the same goals to maximize benefits. Partners that will help implement this plan include state agencies such as BWSR, MPCA, DNR, MDH and MDA, and other organizations such as the Whitefish Property Owners Association (WAPOA), the Pine River Watershed Alliance (PRWA), the Northern Waters Land Trust (NWLT), The Nature Conservancy (TNC), Minnesota Land Trust (MLT) and many more.

Administration

The PRW1W1P planning effort was conducted through a Memorandum of Agreement (MOA) between Crow Wing County and SWCD and Cass County and SWCD (Appendix G). The parties will draft an MOA for purposes of implementing this plan. The Policy Committee is advisory to the individual county and SWCD boards under the umbrella of the MOA.

Pine River Watershed

One Watershed One Plan

Section 4.

Issue Identification

4 Issue Identification

Overall Summary

The One Watershed One Plan process requires thoughtful consideration of all issues and resources in the watershed and identification of priority issues and resources that will be addressed in the plan. Issues for the Pine River Watershed were identified and prioritized using input from the general public, the Advisory Committee, State Agencies, and existing local and regional plans (Figure 4-1 and Appendix B). The common themes in the priority issues were expanded upon to craft issue statements.

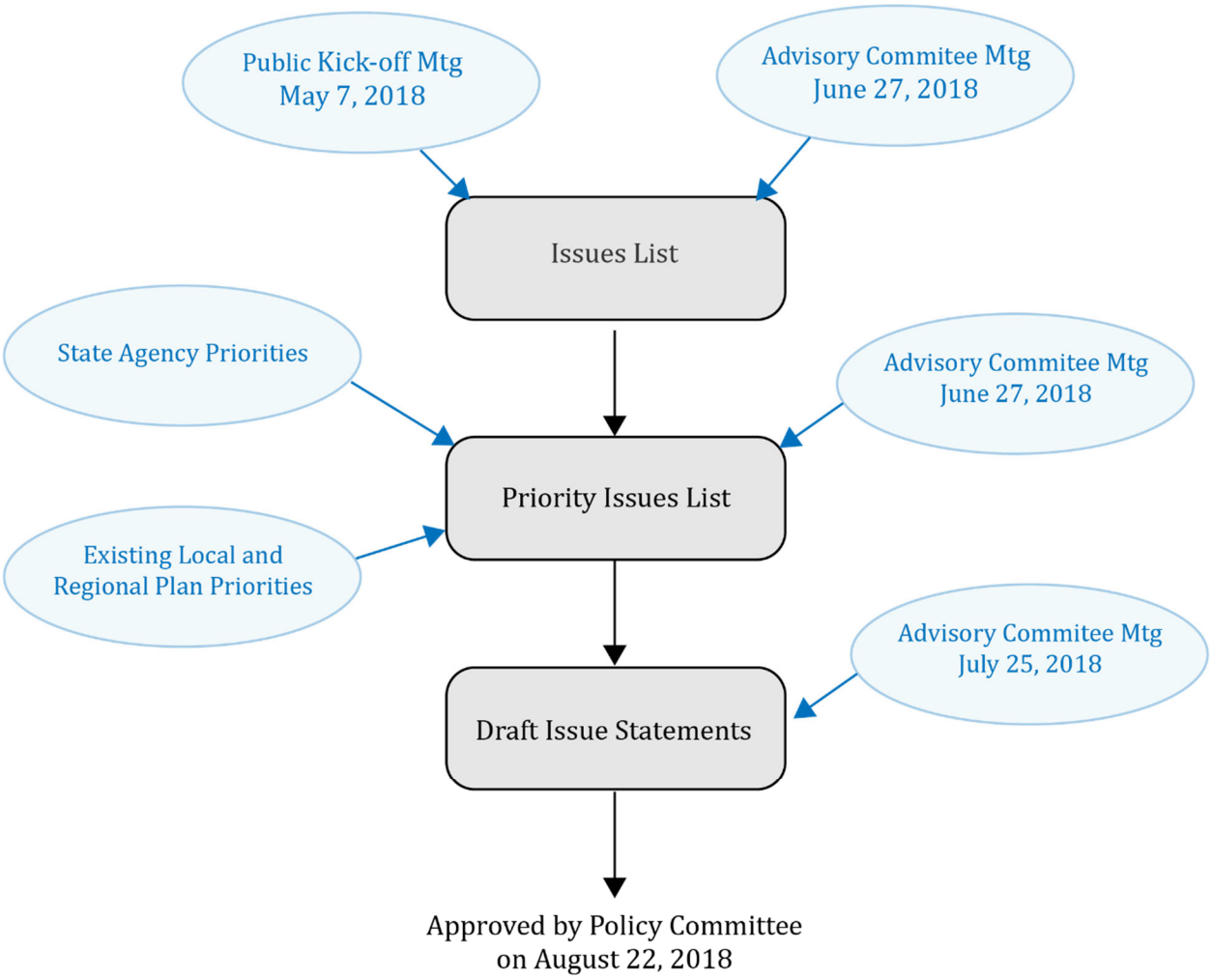


Figure 4-1. Issue identification process for the Pine River Watershed One Watershed One Plan.

Issue Statements

Issues identified from the Advisory Committee Meeting and Public Kick-off Event were compiled and compared to existing plan priorities (Crow Wing County Water Plan, Cass County Water Plan, Watershed Restoration and Protection Strategy, Landscape Stewardship Plan, Groundwater Restoration and Protection Strategy, DNR Sensitive Shoreland Report, NRCS, US Forest Service Report) and State Agency priorities (Appendix B, Figure 4-2). Common concerns across all sources resulted in priority issue themes. These priority issue themes were expanded upon to craft issue statements. Issue statements are problems, risks, or opportunities that will be addressed in this plan.

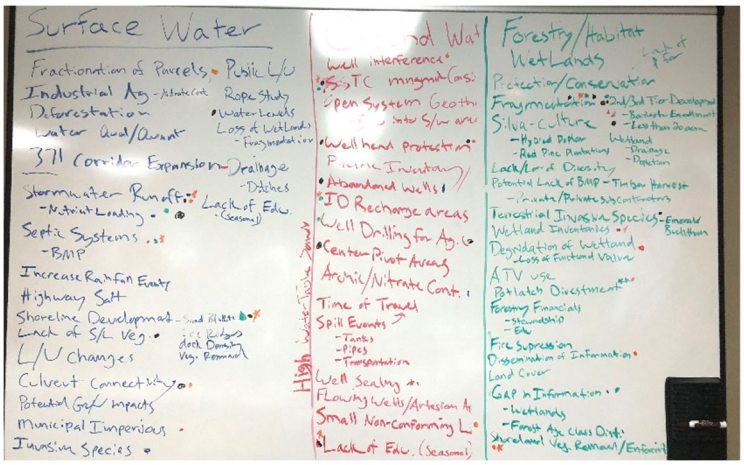


Figure 4-2. Issues list from the Advisory Committee.

Priority Issue Themes:

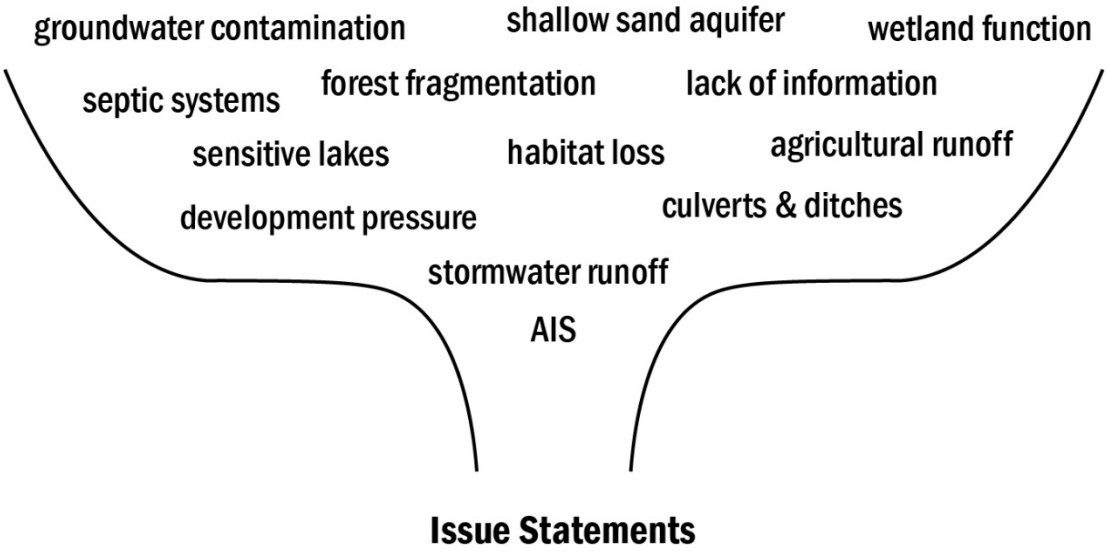


Figure 4-3. Priority issue themes developed in the PRW1W1P.

Table 4-1. Priority Issue Statements for the Pine River Watershed One Watershed One Plan. The priority issue themes are bolded.

Category	Resource	Issue Statement
Ground Water	Drinking Water	**Contamination of shallow sand aquifers**, which have a direct connection to groundwater and interact with surface water, has the potential for widespread impacts.
Surface Water	Lakes	Projected **development pressure** and conversion of seasonal properties to full-time homes has the potential to negatively affect lake water quality.
Surface Water	Lakes	Lakes with identified high phosphorus **sensitivity** and outstanding biological significance may not be sufficiently protected with standardized lake management practices.
Surface Water	Lakes & Streams	**Stormwater runoff** from urban areas, roads, and developed shoreland parcels provides nutrient loading to lakes and streams, which can cause declines in water clarity.
Surface Water	Lakes & Streams, Soil Health	**Nutrient runoff from agricultural areas** has the potential to decrease stream and lake water quality.
Surface Water	Streams, Soil Health	Road construction, stream channelization **(ditches)**, drainage activities and **culvert installation** have altered the hydrology of the watershed causing impacts to habitat, nutrient transfer, water levels and channel stability.
Surface Water	Wetlands	Existing wetlands within the watershed have a variety of protections but the **number**, **type and quantity of wetlands** have been affected by past practices with the potential to be reflected in current lake water levels, watershed precipitation storage and habitat.
Surface Water	Lakes	**Aquatic Invasive Species** are threatening the lakes' water quality and aquatic ecosystem.
Forests & Habitat	Forests	**Forests are being fragmented** by changes in land use (development, agriculture, disturbance) which can affect habitat, surface, and ground water quality.
Forests & Habitat	Habitat	Sensitive **shoreland habitat is being threatened/lost** by shoreline development and road expansion, which negatively affects fish spawning, shorebird nesting, and habitat quality for other riparian species.
Surface Ground Forestry	Public	**Lack of effective delivery of information** about land management impacts to water quality for watershed residents can impact habitat and water quality.

Issue Prioritization by Sub-watershed

For this plan, the planning regions were identified as sub-watersheds (HUC10) (Figure 4-4). The Advisory Committee prioritized the list of issues (Appendix B) by sub-watershed. There are six sub-watersheds within the Pine River Watershed. Three of these (South Fork of the Pine, Daggett Brook, and the Little Pine River) represent tributaries to the Pine River (Figure 4-4).

Each sub-watershed has a different makeup of land use, lake quality and risk and has an overall management focus assigned from this planning effort (Table 4-2).

Table 4-2. Management focus for the Pine River Watershed.

VIGILANCE	Has already achieved the 75% protection goal. Management Actions include opportunity-based projects and maintaining protected lands.
PROTECT	Natural resources are generally in good condition, risks to natural resources are low, and the management focus is to maintain and increase protection levels with strategies such as private forest stewardship and conservation easements.
ENHANCE/ PROTECT	Some lakes have declining trends and some natural resources need enhancement, and there are potential risk factors that could negatively impact the surface water and ground water systems of the watershed. Projects include enhancement such as pasture management, stormwater management, shoreline buffers and conservation easements in ecologically sensitive areas in addition to protection strategies as stated in the Protect focus above.

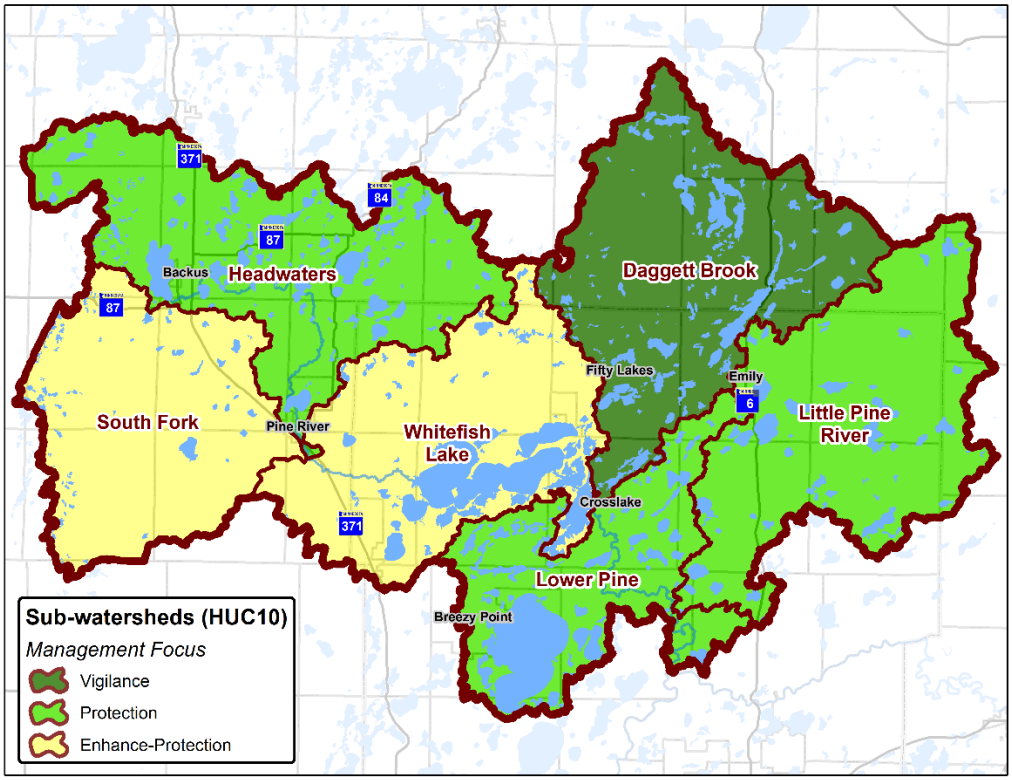
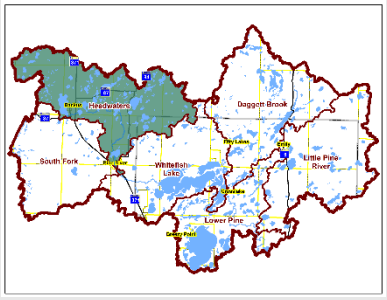


Figure 4-4. The six sub-watersheds of the Pine River Watershed color coded to management focus.

Headwaters

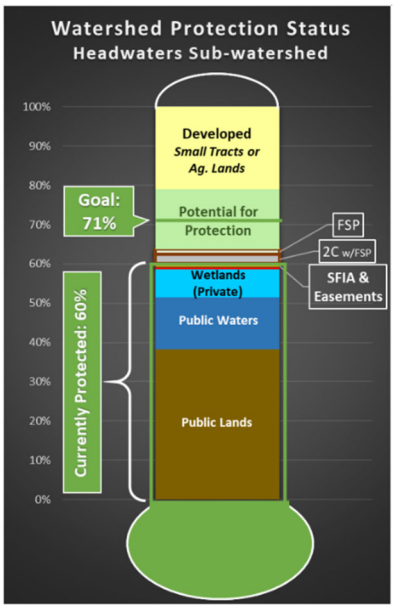
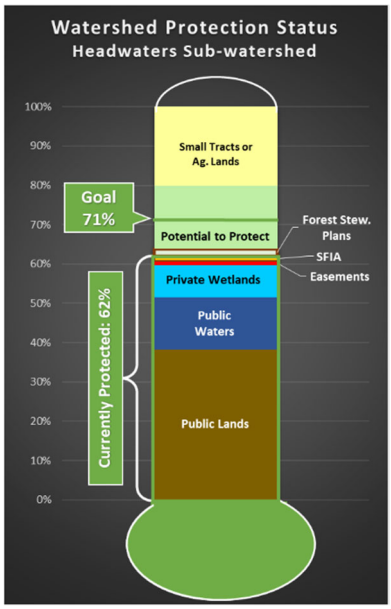
Management Focus

PROTECT



The **Headwaters** sub-watershed is a mix of forests and lakes and is mostly flat and sandy. The majority of this sub-watershed is located in Cass County and the largest town is Backus. It has the most lakes of all the sub-watersheds, and these lakes are small to medium size with high biological significance. The biological significance includes local and state priority wild rice lakes and rivers (Figure 4-6). In 2018 this sub-watershed was 60% protected with a goal of 71% protection. **As of 2024 this sub-watershed is 62% protected** (Table 4-3).

Table 4-3. Priority issues and current protection status for the Headwaters subwatershed of the Pine River Watershed.

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Lakes 2. Pine River	1. Altered drainage and culverts 2. Sensitive lakes 3. Nutrient loading		
Ground Water	1. Drinking Water 2. Shallow Sand Aquifer	1. Septic Systems 2. Wellhead protection		
Forests & Habitat	1. Forests 2. Fish and wildlife habitat	1. Fragment-ation 2. Long-term protection 3. Habitat loss		

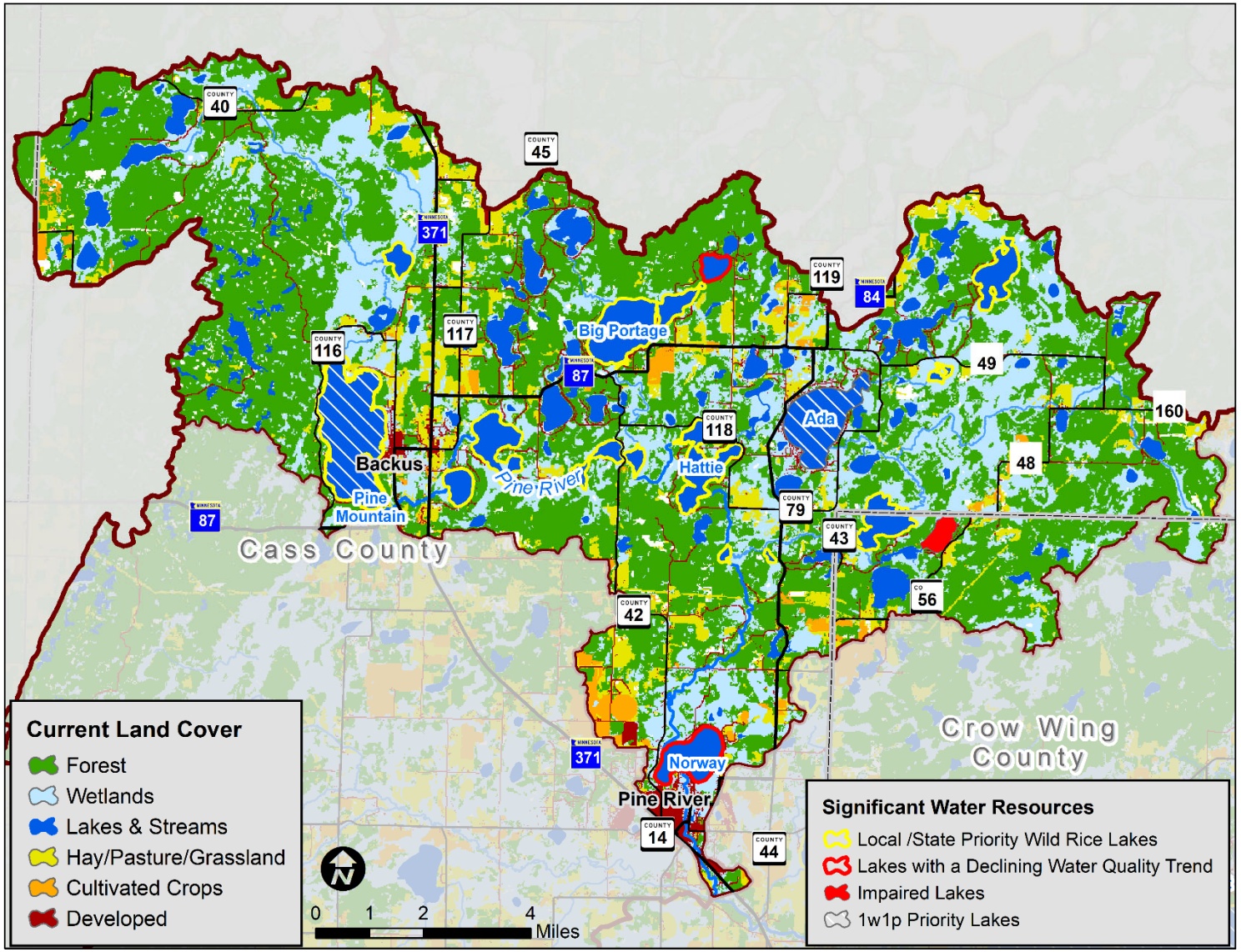
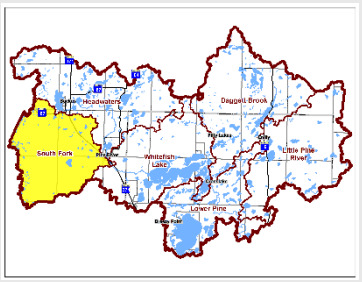


Figure 4-6. The Headwaters Sub-watershed of the Pine River Watershed, highlighting land cover and lake features.

South Fork

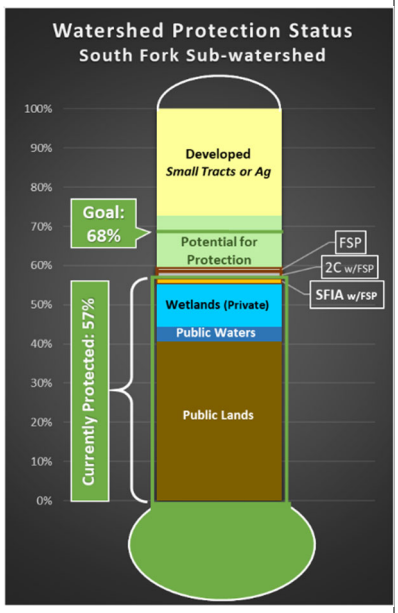
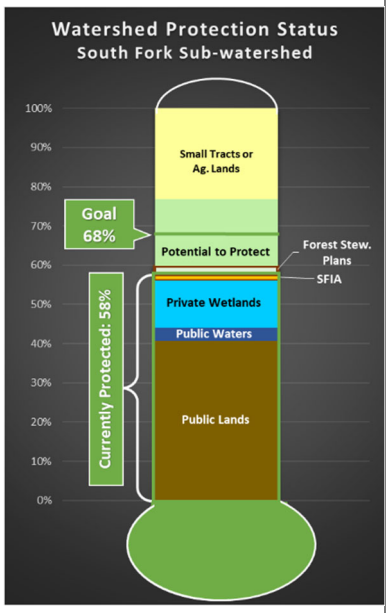
Management Focus

ENHANCE/ PROTECT



The **South Fork** sub-watershed is a mix of forests and open lands. The western edge is hilly with abundant public lands. There is high land use disturbance in this sub-watershed due to agricultural uses, mainly pastures (Figure 4-8). It is stream dominated with very few lakes but is an important tributary to the Whitefish Chain of Lakes. In 2018 this sub-watershed was 57% protected with a goal of 68% protection. **As of 2024 this sub-watershed is 58% protected** (Table 4-4).

Table 4-4. Priority issues and protection status for the South Fork subwatershed of the Pine River Watershed.

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Pine River and tributaries 2. Soil health	1. Altered drainage and culverts 2. Agricultural best management practices		
Ground Water	1. Drinking water	1. Recharge area and discharge 2. Contaminants		
Forests & Habitat	1. Forests 2. Fish and wildlife habitat	1. Lack of funding 2. Information 3. Conservation programs 4. Fragmentation		

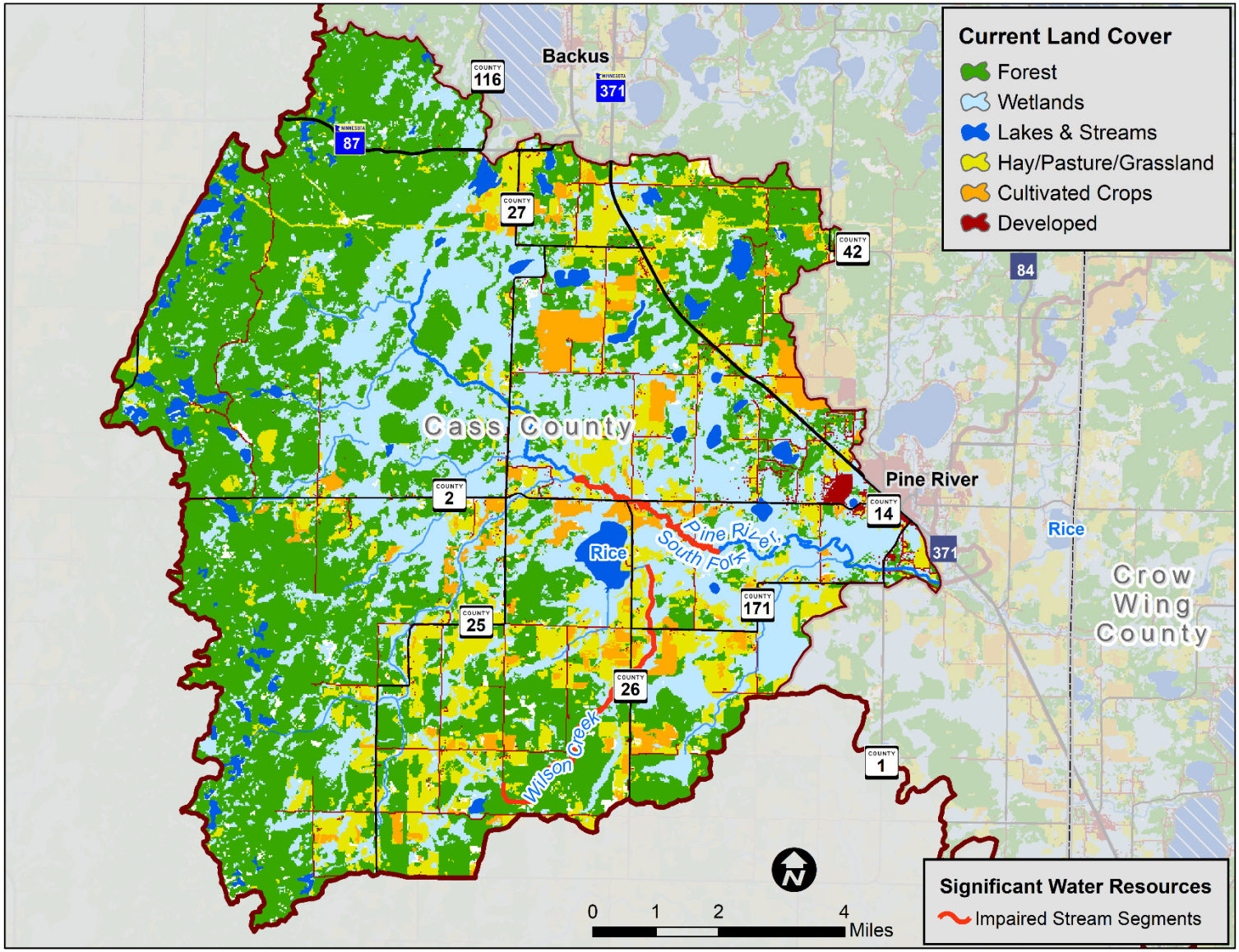
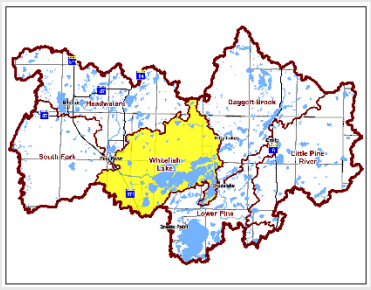


Figure 4-8. The South Fork Sub-watershed of the Pine River Watershed, highlighting land cover and surface water features.

Whitefish

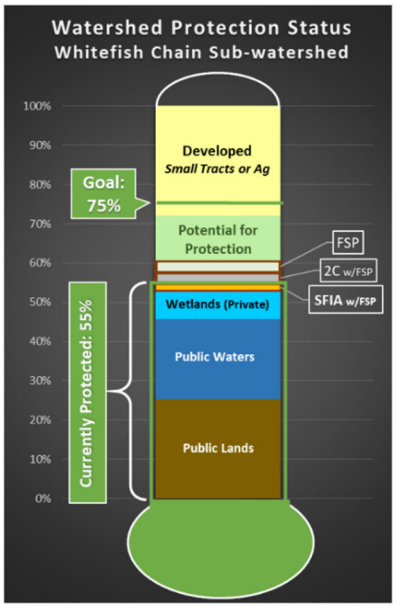
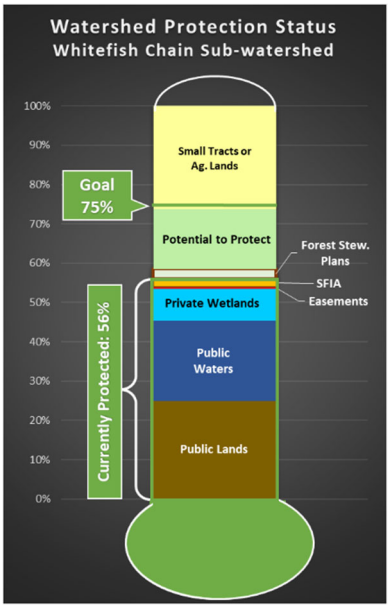
Management Focus

ENHANCE/ PROTECT



The **Whitefish** sub-watershed contains the Whitefish Chain of Lakes, which is a dominant feature in the entire Pine River Watershed and is important to the economy of the region. It contains large, deep-water lakes that hold Ciscos and many important gamefish (Figure 4-9). There are some water quality concerns with seven lakes declining in water clarity, including Whitefish Lake. The northern shore of the Whitefish Chain is a priority forest management area. Lakeshore development has very high property values, and there is increasing urban development pressure on each end of the Chain (Jenkins/Hwy 371 Corridor on the west, Crosslake on the east). In 2018 the Whitefish sub-watershed was 55% protected with a goal of 75% protection. **As of 2024 this subwatershed is 56% protected** (Table 4-5).

Table 4-5. Priority issues and protection status for the Whitefish sub-watershed of the Pine River Watershed

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Lakes 2. Pine River	1. Stormwater runoff 2. Nutrient loading 3. Shoreline development 4. Septic systems 5. Culvert connectivity		
Ground Water	1. Drinking water 2. Shallow sand aquifer	1. Septic system management 2. Well sealing 3. Wellhead protection		
Forests & Habitat	1. Forests 2. Fish and Wildlife habitat	1. Fragmentation 2. 2nd & 3rd tier development 3. Gaps in information		

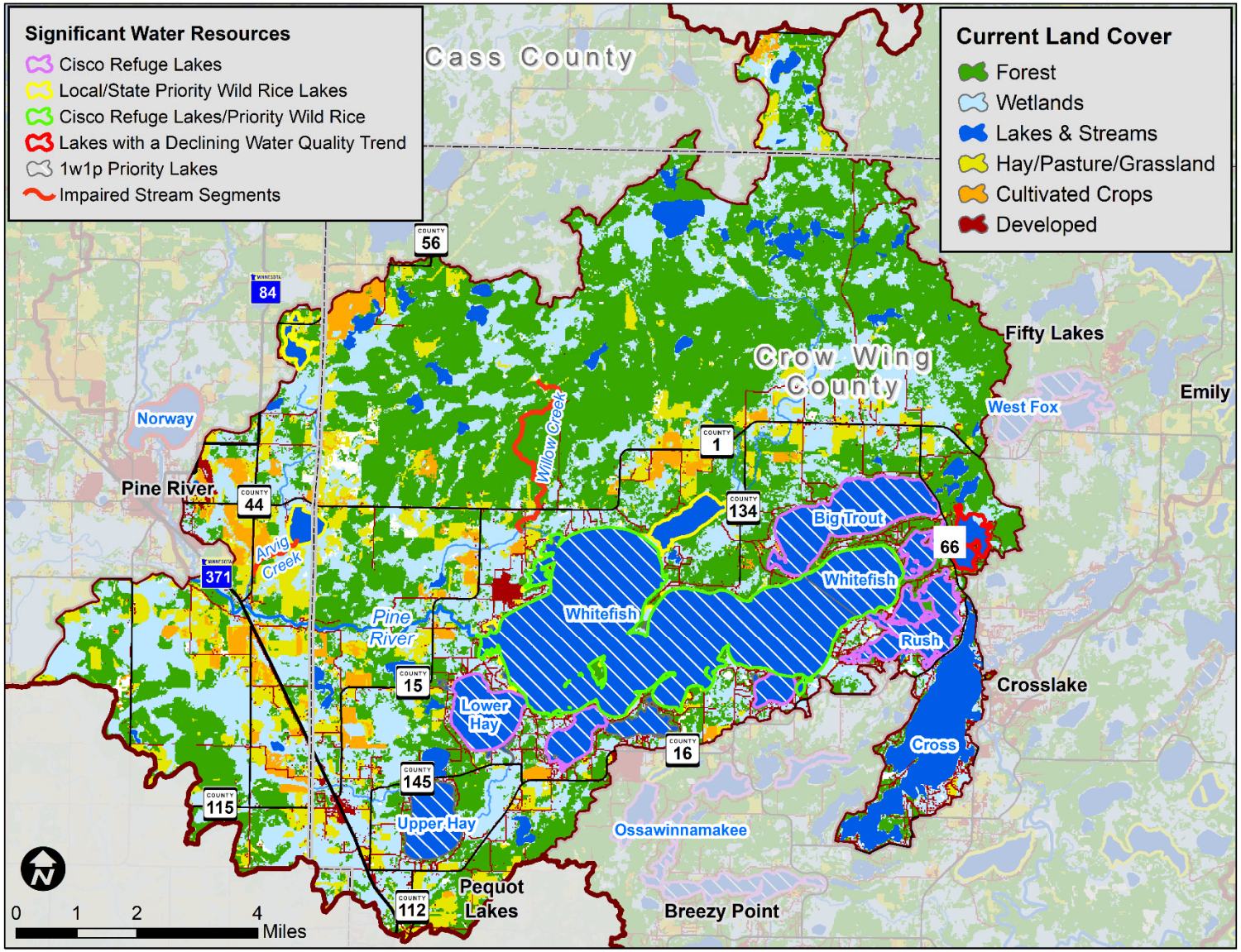
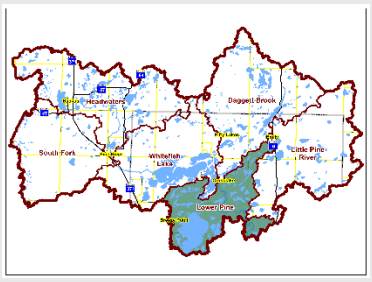


Figure 4-9. The Whitefish Sub-watershed of the Pine River Watershed, highlighting land cover and surface water features.

Lower Pine

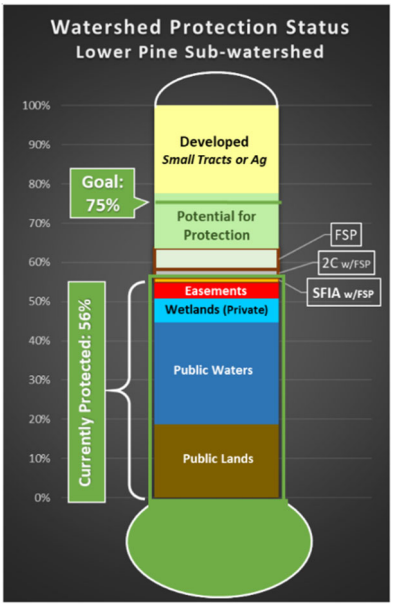
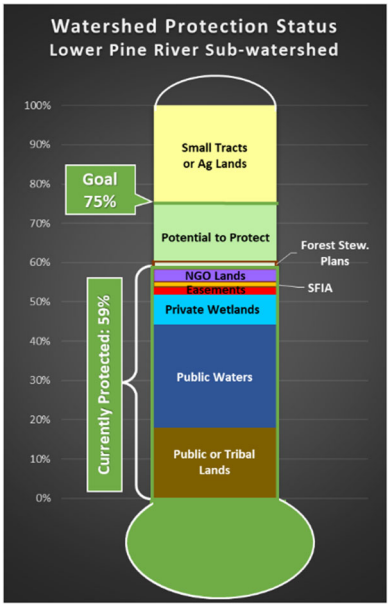
Management Focus

PROTECT



The **Lower Pine** sub-watershed is forested with low land use disturbance. There are many medium and large outstanding lakes, including Ossawinnamakee and Pelican (Figure 4-10). Water quality data show no declining trends or impairments in this sub-watershed. There are sandy soils, which have the potential to grow red and white pines. Residential development is the primary risk to forest lands and lakes. In 2018 the Lower Pine sub-watershed was 56% protected with a goal of 75% protection. **In 2024 the sub-watershed is 59% protected** (Table 4-6).

Table 4-6. Priority issues and current land protection in the Lower Pine Subwatershed of the Pine River Watershed.

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Lakes 2. Pine River	1. Stormwater runoff 2. Nutrient loading 3. Shoreline development 4. Septic systems 5. Culvert connectivity		
Ground Water	1. Drinking water 2. Shallow sand aquifer	1. Septic system management 2. Well sealing 3. Wellhead protection		
Forests & Habitat	1. Forests 2. Fish and Wildlife habitat	1. Fragmentation 2. 2nd & 3rd tier development 3. Gaps in information		

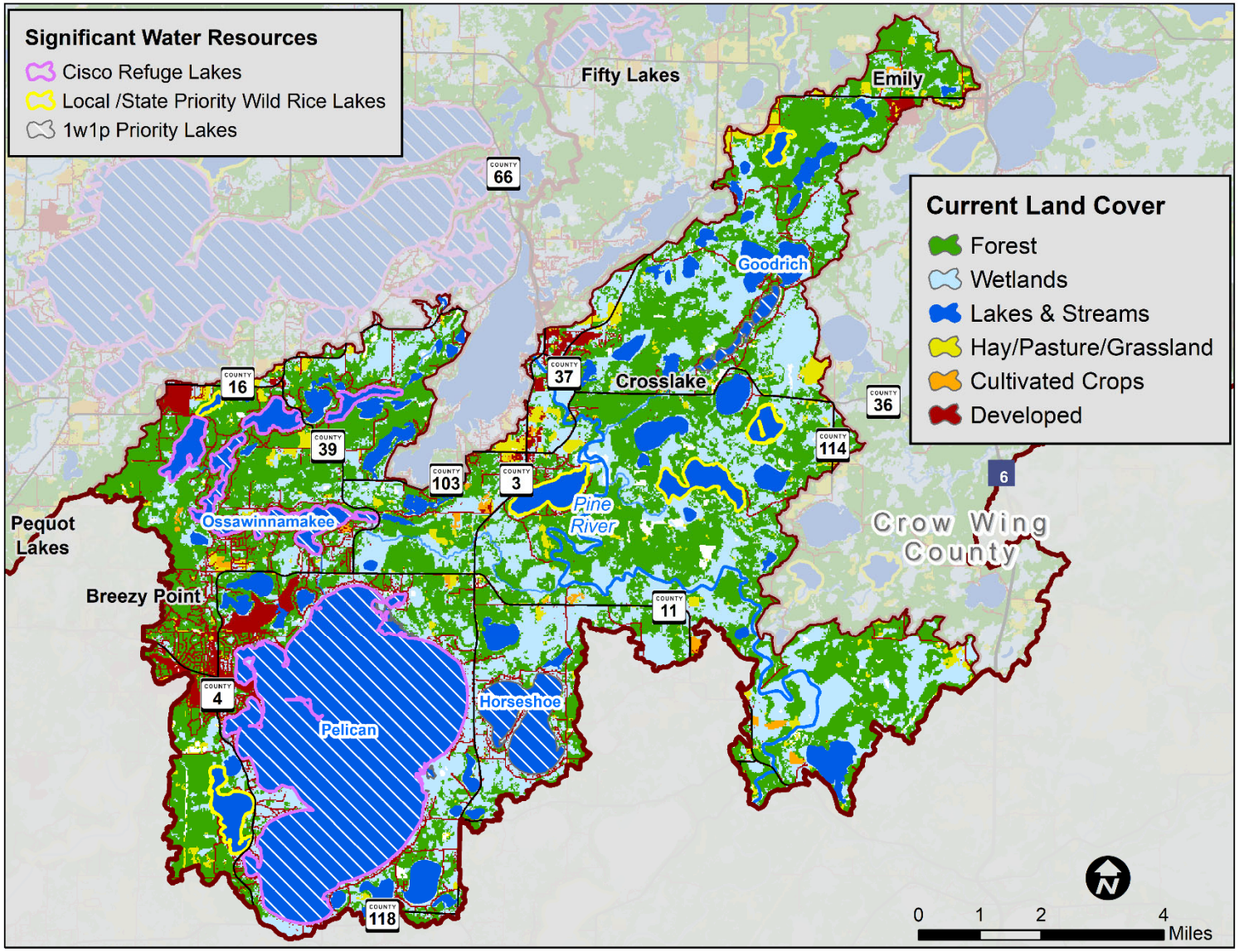
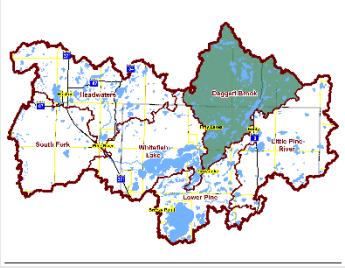


Figure 4-10. The Lower Pine Sub-watershed of the Pine River Watershed, highlighting land cover and surface water features.

Daggett Brook

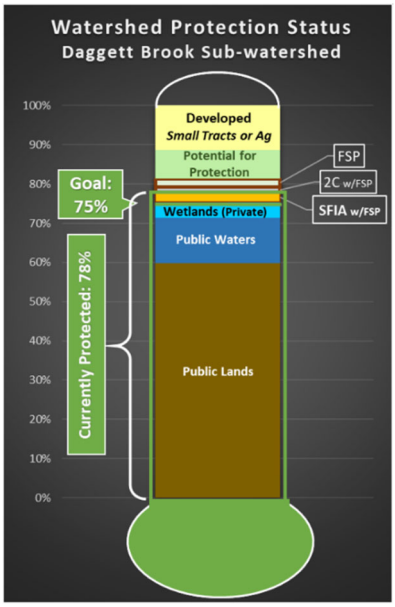
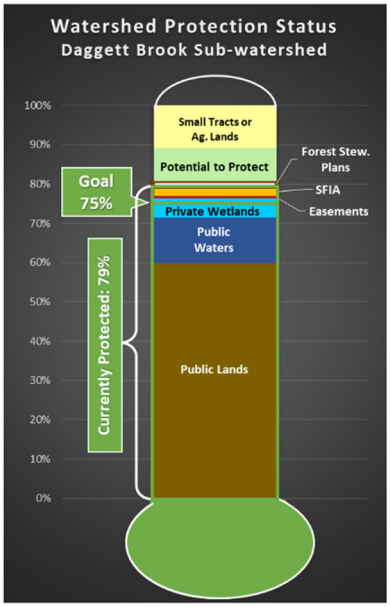
Management Focus

VIGILANCE



The **Daggett Brook** sub-watershed is a high-quality forested landscape. It has the highest amount of public/protected lands in the Pine River Watershed. It has exceeded the 75% protection goal and was 78% protected in 2018 and 79% protected in 2024 (Table 4-7). It has the second highest amount of lakes in the watershed, along with numerous wetlands and streams, and several high-quality lakes (Washburn, Roosevelt, East & West Fox) (Figure 4.11). There are some water quality concerns with eight lakes exhibiting declining trends in water clarity.

Table 4-7. Priority issues and protection status for the Daggett Brook subwatershed of the Pine River Watershed.

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Lakes 2. Daggett Brook	1. Cabin density 2. Impervious surface and stormwater runoff 3. Shoreline development		
Ground Water	1. Shallow sand aquifer 2. Drinking water	1. Protection of groundwater discharge areas 2. Septic systems 3. Well sealing		
Forests & Habitat	1. Forests 2. Fish and wildlife habitat	1. Fragmentation 2. White Cedar wetland protection 3. Education/ dissemination of information		

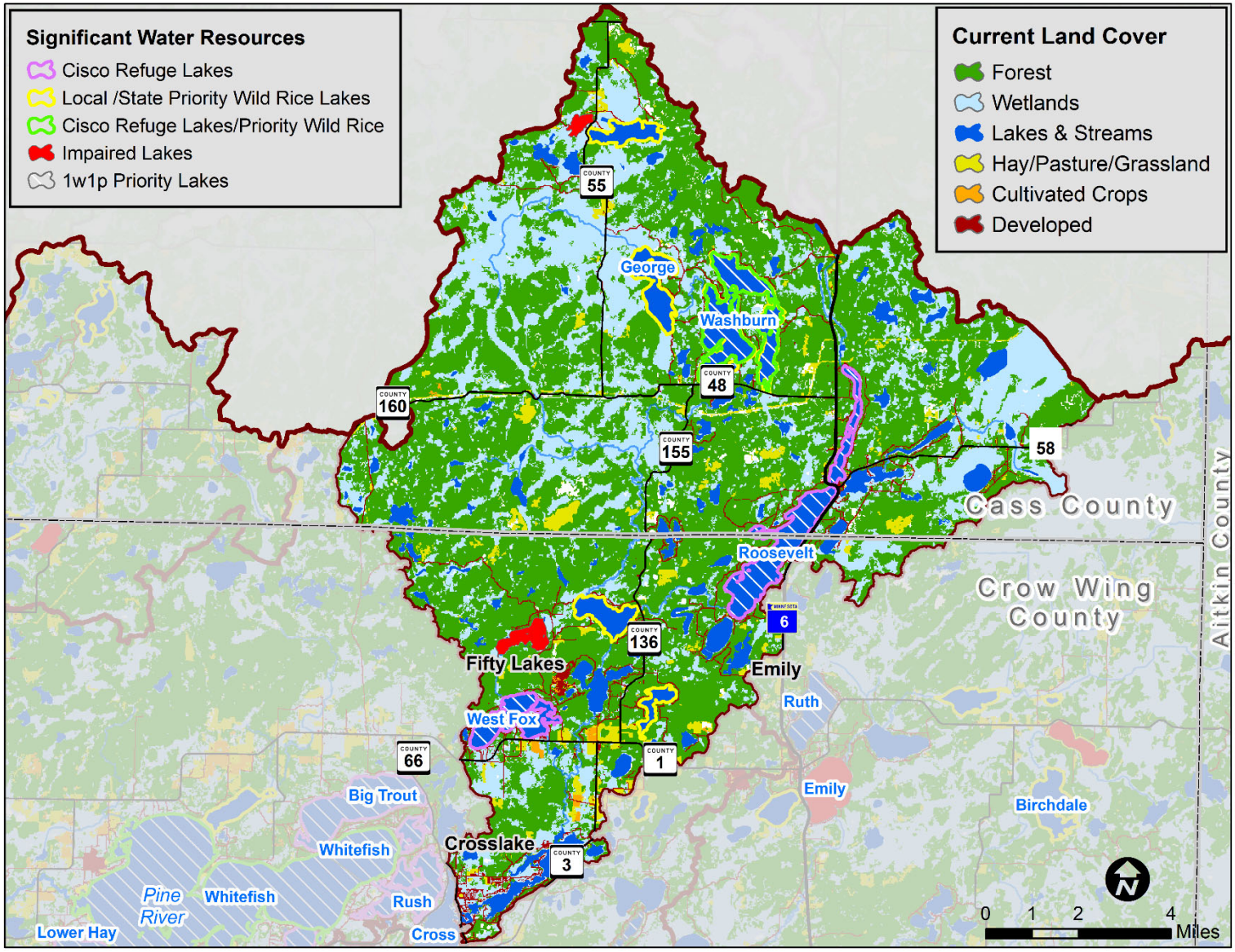
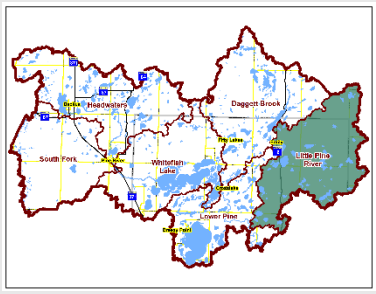


Figure 4-11. The Daggett Brook Sub-watershed of the Pine River Watershed, highlighting land cover and surface water features.

Little Pine

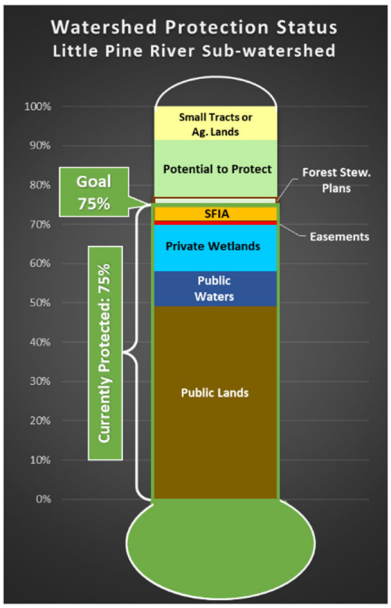
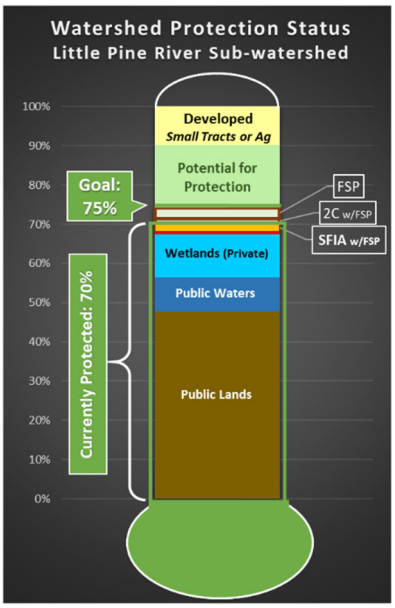
Management Focus

PROTECT



The **Little Pine River** sub-watershed is dominated by hardwood forests and many wetlands. There are public lands on the eastern edge, extending into Aitkin County. The locally important high-quality lakes are near the City of Emily, including Emily, Ruth and Mary lakes (Figure 4-12). In 2018 the Little Pine River sub-watershed was 70% protected with a goal of 75%. **As of 2024 the sub-watershed goal of 75% has been reached** (Table 4-8).

Table 4-8. Prioritized issues and protection status for the Little Pine River subwatershed in the Pine River Watershed.

Category	Resource	Issues	Protection Status in 2018	Protection Status in 2024
Surface Water	1. Lakes 2. Streams	1. Nutrient loading from stormwater runoff 2. Culvert connectivity 3. Fractionation of parcels 4. Land use changes		
Ground Water	1. Drinking water 2. Shallow sand aquifer	1. Septic system management 2. Identify recharge areas 3. Information for seasonal residents 4. Well sealing 5. Arsenic/nitrate content		
Forests & Habitat	1. Forests 2. Fish and wildlife habitat	1. Protection 2. Fragmentation 3. Potlatch divestment 4. Gap in information 5. Shore land vegetation removal/ enforcement		

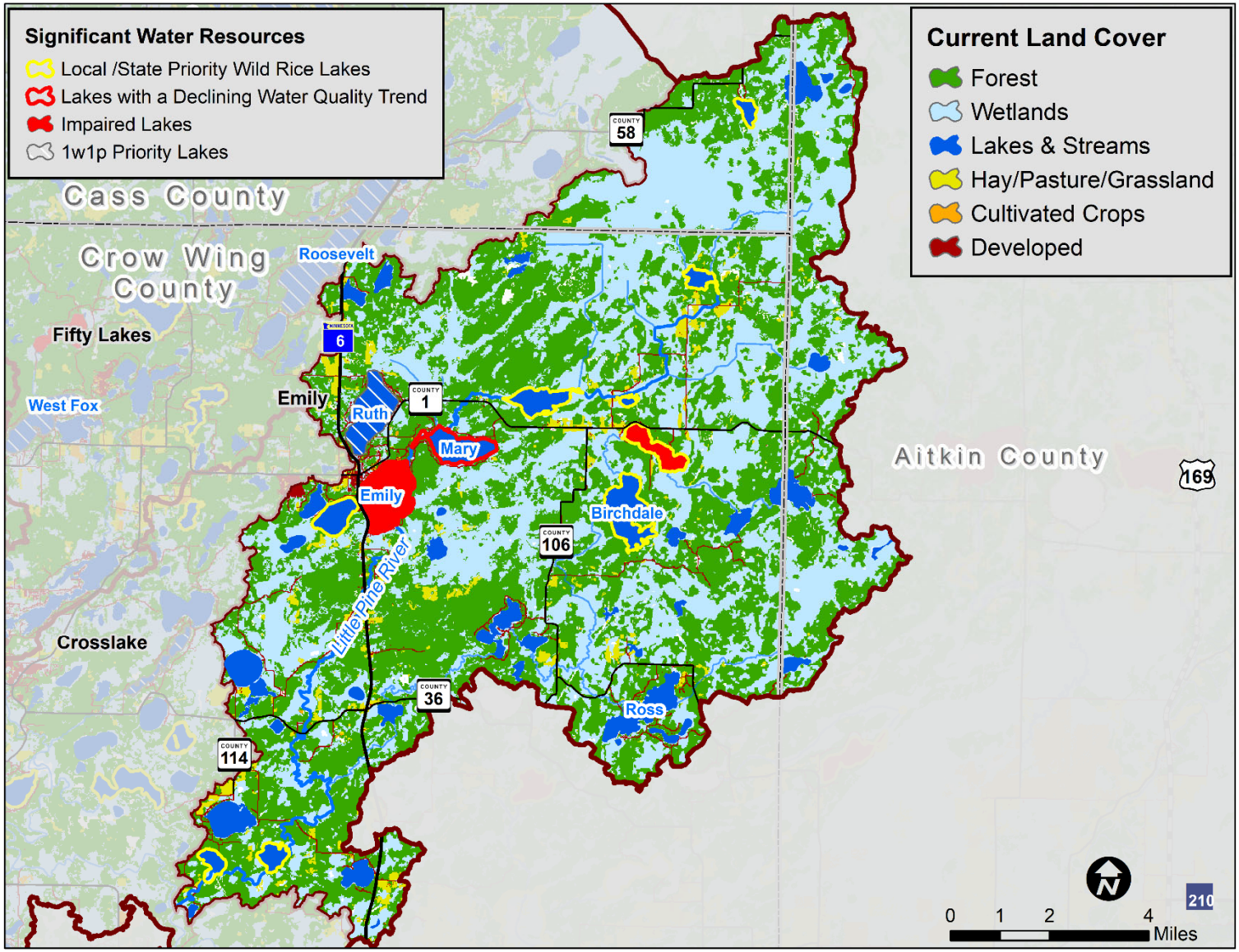


Figure 4-12. The Little Pine Sub-watershed of the Pine River Watershed, highlighting land cover and surface water features.

Emerging Issues

Aquatic Invasive Species

Aquatic Invasive Species (AIS) are species that have been introduced to Minnesota's lakes and streams that are not native to the area and that cause ecological and/or economic damage. There are some aquatic invasive species present in the Pine River Watershed including Zebra mussels, Eurasian watermilfoil and Curly-leaf pondweed. The University of Minnesota Aquatic Invasive Species Research Center is involved in many research projects state-wide to manage and fight aquatic invasive species.

Locally, both Cass County and Crow Wing County have programs and funding in place for managing aquatic invasive species; therefore, this watershed plan will not address this issue specifically in its implementation strategies.

Cass and Crow Wing County AIS Programs:

- They share an AIS boat decontamination hotline: 218-682-2225.
- They employ watercraft inspectors at public accesses.
- They have numerous fact sheets and videos available.
- Mississippi Headwaters Board AIS Awareness Campaign: www.facebook.com/MinnesotaTraditions and www.twitter.com/MNTraditions
- Cass County AIS Management Plan and helpful links: http://www.co.cass.mn.us/government/county_directory/environmental_services/aquatic_invasive_species_(ais)/helpful_ais_links/index.php
- Crow Wing County AIS Management Plan and helpful links: http://crowwing.us/1004/Aquatic-Invasive-Species-AIS
- A current map of infested waters: https://www.eddmaps.org/midwest/tools/infestedwaters.

Climate Change

Climate change has already had some effect on northern Minnesota and this trend will continue, therefore it must be considered when planning for the long-term. Climate change can change the air temperature, which affects water temperature, frequency and severity of precipitation events in addition to habitat suitability for certain temperate fish, wildlife, plant, and tree species.

There are a few species that are especially at risk from the potential impacts of climate change, including cold water fish species such as Cisco and native evergreen species such as the White pine. Forest vulnerability is a concern because a warming climate can affect the range of native species and also increase the range of invasive species such as Emerald Ash Borer and disease.

The Minnesota Pollution Control Agency's Watershed Restoration and Protection Strategy (WRAPS 2017) included modeling scenarios to predict potential changes to the Pine River Watershed (Kenner 2013a & Kenner 2013b) due to climate change. These predictions were made using the National Climate Assessment and Development Advisory Committee (NCADAC) 2013 climate report.

The changes in precipitation predicted to result from climate change resulted in a 20 percent increase in runoff volumes and phosphorus loads across the Pine River Watershed. In addition to

increased runoff, more intense precipitation events can overflow improperly sized culverts and erode stream banks as rain water makes its way downstream (WRAPS 2017).

Implementation projects in this plan take into account climate change to build more resilience into the watershed by:

- Protecting forests from fragmentation through private forest management
- Developing a collaborative approach between the state, county and townships for prioritizing and replacing improperly sized and placed culverts
- Restoring eroded stream banks in impaired streams and promoting lakeshore buffers to prevent further erosion during storm events
- Promoting integrated pasture management in the South Fork Pine River Sub-Watershed to decrease nutrient runoff

For more details see the Implementation Table, Section 7.

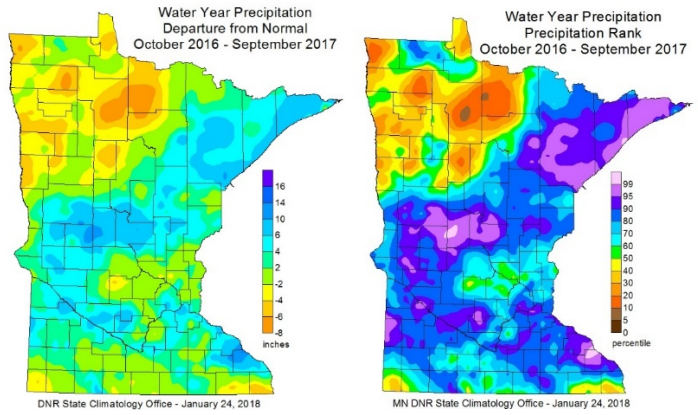


Figure 4-13. Precipitation Departure from normal and rank, October 2016 – September 2017.

Contaminants of Emerging Concern

Contaminants of emerging concern (CEC) refer to a class of thousands of compounds created by humans for pharmaceuticals, personal care products, industrial use, and more. These were produced throughout the past century without testing on the health or environmental effects of each compound. Recent concern over the fate and impacts of CEC in the environment has led to a re-examining of the extent of the problem. There is much we do not know about CEC, and current research seeks to understand the concentrations present in the environment.

CEC of special importance are endocrine disruptors, which alter normal hormone functions and have been linked to reproductive harm to organism and human health at low concentrations. BPA (an endocrine disruptor) and Per- and Polyfluoroalkyl Substances (PFAS) chemicals have grown in the public awareness.

CEC are introduced to Minnesota's surface water through wastewater treatment plant effluent (where they are not treated), stormwater runoff, and industrial discharge. A study on the presence of CEC in Minnesota lakes found antibiotics, disinfectants, antidepressants, DEET, and BPA in the water, with all lakes tested having at least one CEC (MPCA, 2021). The effect these may be having on aquatic life, or on humans, is poorly understood. Continued monitoring and research into the presence and impact of CEC will be done by MDH and MPCA.

Pine River Watershed

One Watershed One Plan

Section 5.

Lake Prioritization

5. Lake Prioritization

The Pine River Watershed is dominated by large, biologically significant lakes. Property values in the watershed are currently in excess of $10.5 billion (2024 county data), with much of the value focused around the Whitefish Chain of Lakes and Pelican Lake. In an ideal world, there is enough money and time to do all the projects we want. In the real world, time and funding limit what can be accomplished. In order to determine what projects will be done in the 10-year course of the Pine River Watershed One Watershed One Plan, prioritized areas need to be set. The flowchart below describes the process taken to prioritize lakes in the Pine River Watershed and define what types of projects would be appropriate for each lake category (Figure 5-1).

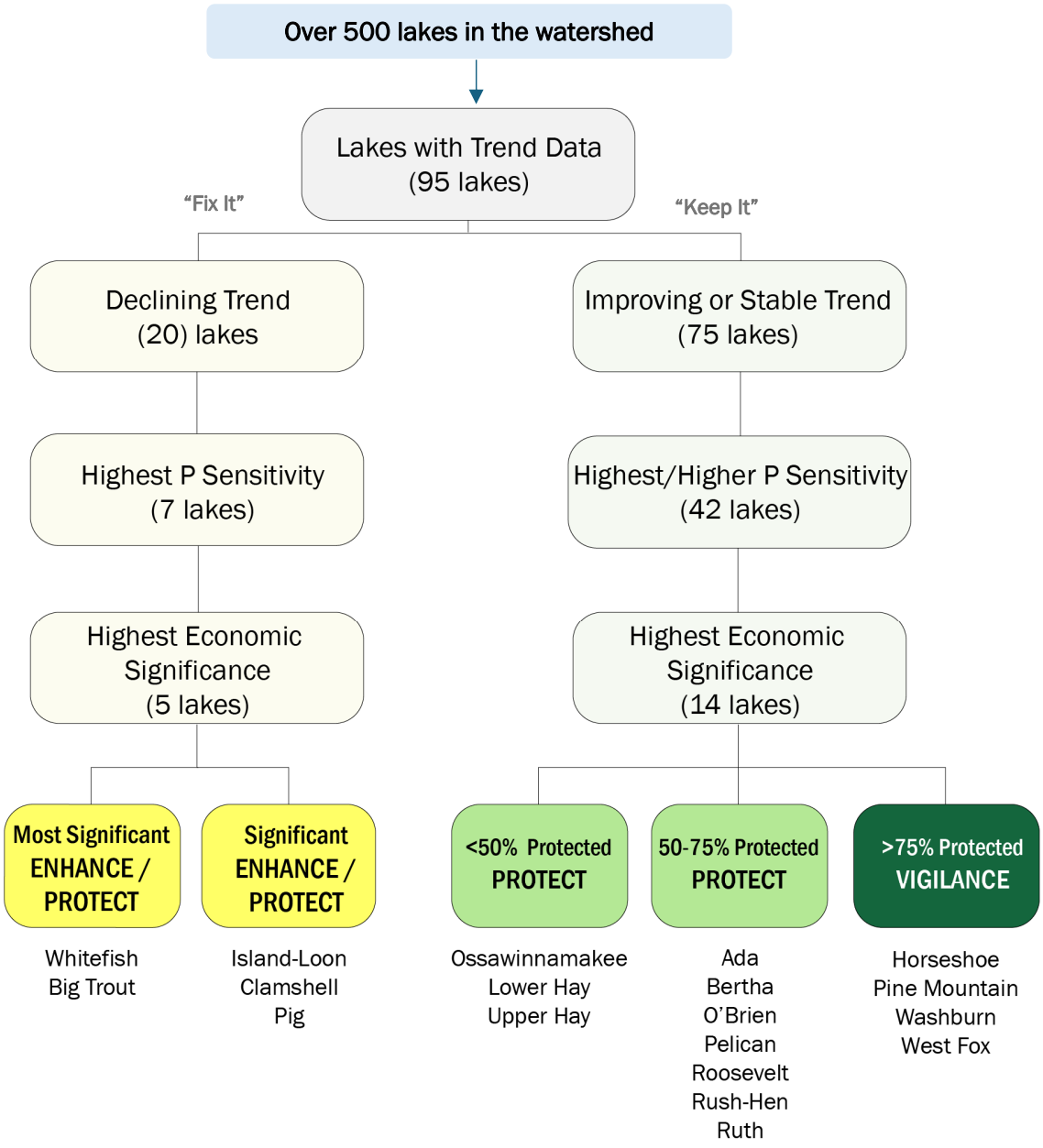


Figure 5-1. Lake prioritization process for the Pine River Watershed.

Definitions (Figure 5.1)

Trends: These lakes have over 10 years of consistent water clarity data for determining a statistical trend. Results of the trend analysis show if the lake is improving, declining, or stable.

P Sensitivity: The lake's sensitivity to phosphorus as determined by the DNR. Sensitivity means that added phosphorus would affect the clarity in these lakes the most (Radomski 2018).

Economic Significance: These lakes have the highest economic value to the region.

% Protected: This percentage describes the amount of land in the lake's subwatershed that is protected. Protected land uses include public lands, public waters, wetlands on private lands, easements, other conservation lands, Sustainable Forest Incentive Act (SFIA).

Management Focus:

ENHANCE/ PROTECT

Tier 1
Whitefish
Big Trout

Tier 2
Island-Loon
Clamshell
Pig

Definition: Reduce phosphorus loading through stormwater and agricultural best management practices.

Management Actions: Short-term phosphorus reduction, long-term protection

Funding Source: Clean Water Fund

Examples:
- Stormwater retention
- Stormwater treatment

Management Focus:

PROTECT

Tier 1 (<50% protected)
Ossawinnamakee
Lower Hay
Upper Hay

Tier 2 (50-75% protected)
Ada
Roosevelt
Bertha
Rush-Hen
Pelican
Ruth
O'Brien

Definition: Protect current water quality by protecting the surrounding land.

Management Actions: Need proactive protection of land in the subwatershed.

Funding Source: Outdoor Heritage Fund, Sustainable Forest Incentive Act (SFIA), Lessard Sams Outdoor Heritage Council, Minnesota Land Trust, Northern Waters Land Trust

Examples:
- Private forest management
- Conservation easements
- Maintain native vegetation

Management Focus:

VIGILANCE

(>75% protected)
West Fox
Washburn
Horseshoe (CW)
Pine Mountain

Definition: High quality lakes with over 75% of the subwatershed protected, no imminent water quality threats.

Management Actions: Opportunity-based projects, maintain protected lands.

Phosphorus Loading

Many of the lakes in the Pine River Watershed, especially the Whitefish Chain, have abundant water quality data due to citizen monitoring programs. These data were used for trend analysis and determining lake trophic state. The Hydrological Simulation Program FORTRAN (HSPF) model output from the WRAPS was used to quantify the phosphorus loading to priority lakes for setting phosphorus reduction goals and determine what types of projects to implement and where.

The nearshore phosphorus load was separated from the tributary load because different projects can be implemented based on the loading focus for the lake. For example, if the majority of the phosphorus load is coming from nearshore sources, stormwater retention and treatment is most effective. If the majority of the phosphorus load is coming from the watershed, a combination of projects can be used such as pasture management, stream restoration, soil health, and stormwater management.

The Enhance-Protection and Protection Lakes will be the focus of phosphorus reduction projects for this plan, and a 5 pound/year reduction goal was agreed upon as achievable in 10 years (Table 5-1). The desired future condition is a 5% reduction goal identified in the Lakes of Phosphorus Sensitivity Significance analysis (Radomski 2018).

Table 5-1. Phosphorus loading estimates for priority lakes.

DOW	Lake	County	Management Focus	Loading Focus	Nearshore P Load (lbs/year)	Tributary P Load (lbs/year)	Total P Load (lbs/year)	10-Year Goal (lbs/year)
18031500	Big Trout	Crow Wing	Enhance-Protection	Nearshore	892	0	**892**	5
18031000	Whitefish	Crow Wing	Enhance-Protection	Watershed	2,275	13,574	**15,849**	5
18035600	Clamshell	Crow Wing	Enhance-Protection	Nearshore	166	0	**166**	5
18026900	Island-Loon	Crow Wing	Enhance-Protection	Nearshore	85	0	**85**	5
18035400	Pig	Crow Wing	Enhance-Protection	Nearshore	80	0	**80**	5
11025000	Ada	Cass	Protection	Mix	40	673	**713**	5
11004300	Roosevelt	Cass	Protection	Mix	1,243	1,447	**2,690**	5
18035500	Bertha	Crow Wing	Protection	Mix			**237**	5
18031100	Rush-Hen	Crow Wing	Protection	Watershed			**183**	5
18030800	Pelican	Crow Wing	Protection	Nearshore	1,234	0	**1,234**	5
18021200	Ruth	Crow Wing	Protection	Nearshore	357	0	**357**	5
18022700	O'Brien	Crow Wing	Protection	Mix	91	456	**547**	5
18035200	Ossie	Crow Wing	Protection	Mix	123	369	**492**	5
18037800	Lower Hay	Crow Wing	Protection	Mix	372	540	**912**	5
18044400	Upper Hay	Crow Wing	Protection	Mix	334	1,423	**1,757**	5
18029700	West Fox	Crow Wing	Vigilance	Mix	128	137	**265**	5
11005900	Washburn	Cass	Vigilance	Mix	939	840	**1,779**	5
18025100	Horseshoe	Crow Wing	Vigilance	Nearshore	334	0	**334**	5
11041100	Pine Mountain	Cass	Vigilance	Mix	630	1,522	**2,152**	5

Protection

The Pine River Watershed has some of the best water quality not only in Minnesota, but in the nation. It is also a drinking water source for downstream metropolitan areas (Little Falls, St. Cloud, Minneapolis and St. Paul). This asset must be protected and that is a major focus of this plan. The desired future condition for protection is 75% of the minor watershed where possible (Figure 5-3). Some lakes have a smaller long-term goal based on the potential available acres to protect (Table 5-2). The priority lakes in the Vigilance category already have reached the 75% goal. In 10 years, the Steering Committee thought they could make 30% progress towards the long-term goal. Some progress was already made from 2020-2024, so the remaining progress needed for the next five years is shown in Table 5-2.

Protected acres include public waters, wetlands, public land, conservation easements and private forest management achieved via SFIA covenants or other longer-term agreements. Increasing protected lands within a minor watershed can come from a variety of options including those spelled out in the Private Forest Landowner Implementation Toolbox (Figure 5-2). With these options, the landowner gets to choose what works best for them, and the Plan It, Improve It, Manage It options are already paid for through the state general fund.

Table 5-2. Current protection levels and acres needed to reach the 10-year goal and the long-term goal for priority lakes in the Pine River Watershed.

DOW	Lake	County	Management Focus	% minor wshd protected (including SFIA)	Long-term Goal in acres (% goal)	10 Year Goal (acres)	Remaining 5 Year Goal (acres)
18031500	Big Trout	Crow Wing	Enhance-Protect	59%	1,351 (75%)	405	365
18031000	Whitefish	Crow Wing	Enhance-Protect	66%	1,498 (75%)	450	371
18035600	Clamshell	Crow Wing	Enhance-Protect	x	Combined with Whitefish		
18026900	Island-Loon	Crow Wing	Enhance-Protect	x	Combined with Whitefish		
18035400	Pig	Crow Wing	Enhance-Protect	x	Combined with Whitefish		
11025000	Ada	Cass	Protect	63%	585 (75%)	176	0
11004300	Roosevelt	Cass	Protect	66%	1,187 (75%)	356	59
18035500	Bertha	Crow Wing	Protect	x	Combined with Whitefish		
18031100	Rush-Hen	Crow Wing	Protect	x	Combined with Whitefish		
18030800	Pelican	Crow Wing	Protect	64%	2,040 (75%)	612	479
18021200	Ruth	Crow Wing	Protect	62%	985 (75%)	296	19
18022700	O'Brien	Crow Wing	Protect	50%	1,756 (75%)	527	197
18035200	Ossie	Crow Wing	Protect	36%	2,156 (55%)	1,043	480
18037800	Lower Hay	Crow Wing	Protect	34%	1,383 (50%)	415	349
18044400	Upper Hay	Crow Wing	Protect				
18029700	West Fox	Crow Wing	Vigilance	85%	0	0	
11005900	Washburn	Cass	Vigilance	80%	0	0	
18025100	Horseshoe	Crow Wing	Vigilance	78%	0	0	
11041100	Pine Mountain	Cass	Vigilance	75%	0		

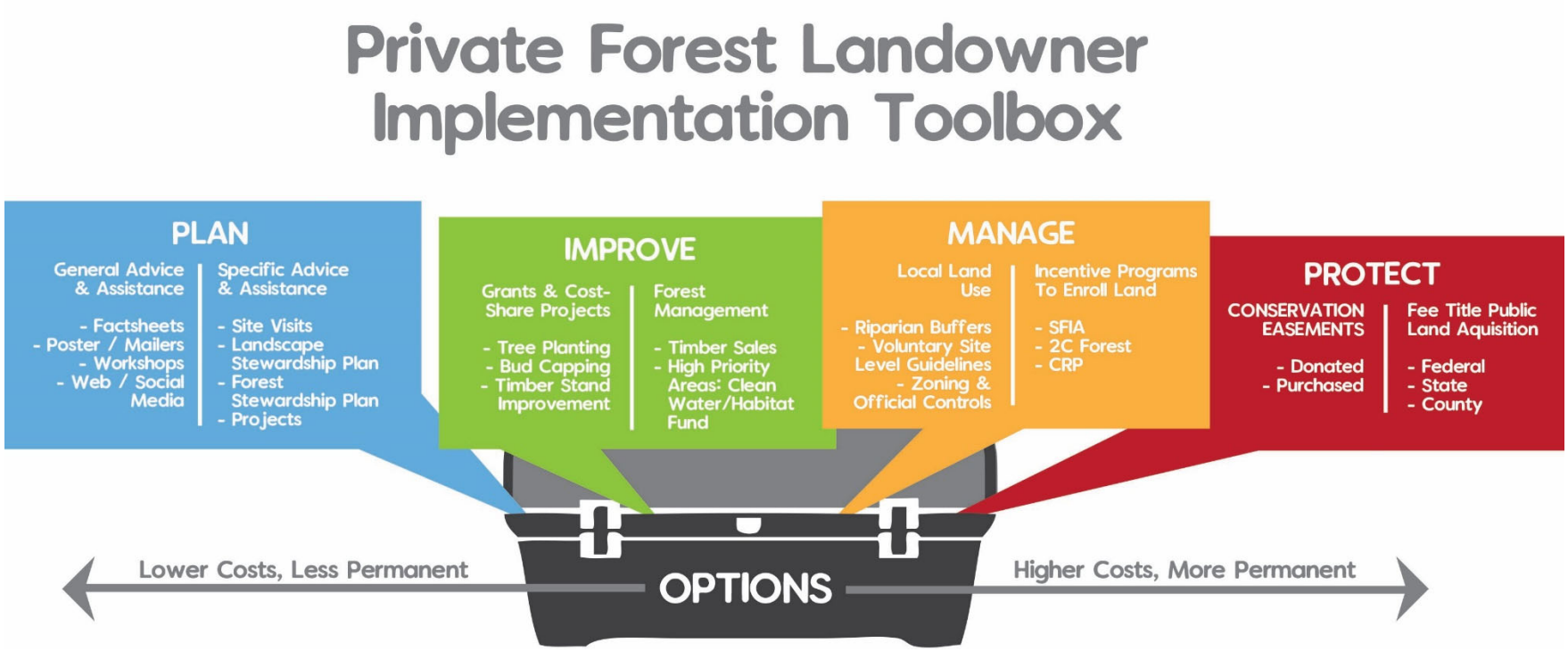


Figure 5-2. The implementation toolbox for private forest management (Landscape Stewardship Plan).

Figure 5-3. Explanation of the 75% land protection goal.

Pine River Watershed

One Watershed One Plan

Section 6.

Measurable Goals

6. Measurable Goals

The goal development phase of the planning process is where the plan starts to take shape as to what will be done and what measurable change is desired in the priority resources. In this section, the goals are laid out with the following descriptions:

1. **Description**: Background and justification for the goal.
2. **Issues Addressed**: Which priority issue themes the goal addresses (Figure 4.3).
3. **Prioritization**: How the targeted area for this goal was developed.
4. **Implementation**: How progress towards achieving the goal will be measured.

The goals for this plan were originally drafted during two Advisory Committee meetings and then reviewed and revised at a third meeting. At the midpoint update of the plan in 2024-2025, the goals were revised. They cover the three main resource categories of the watershed: surface water, ground water, and habitat/ forests, and incorporate all the priority issue themes developed during the planning process.

The priority areas for implementation of each goal were determined using results from lake prioritization (Figure 5-1), the WRAPS, and mapping analysis and are shown in the explanation of each goal on the following pages.

The way each goal will be measured over the course of the plan is also outlined in general in this section and then in more detail in the Implementation Table, Section 7.

Figure 6-1. The Advisory Committee drafting goals in 2018.

Goal 1. Lake Protection

Surface
Ground
Forestry

GOAL: Protect and enhance forest cover, priority lakes, and surficial sand aquifers by protecting 4,396 acres* of land.

*30% progress towards 75% protection in priority lakesheds.

Description

The Pine River Watershed is a protection-focused watershed because there are very few nutrient impairments, no turbidity impairments, a high number of outstanding water resources, and vast forests. It is also a drinking water source for downstream metro areas including Little Falls, St. Cloud, and the Twin Cities Metro Area.

Due to its status as a protection-focus watershed, a goal was written to include all three resource categories (Surface water, Ground water, and Forests & Habitat) because the implementation actions for the goal would be the same. Minnesota's state agencies that manage surface water, drinking water, and habitat (DNR, MDH, MPCA, BWSR) agree that forest and vegetative cover benefits clean surface water, drinking water, and habitat. More specifically, DNR Fisheries research has shown that once a minor watershed is over 25% disturbed (urban, agriculture, mining), the water quality is negatively affected. Therefore, the measure of 75% of the minor watershed being in protected land uses is used in this goal (Figure 5-3). Protected land uses are defined as surface water, public land, private wetlands, conservation easements, and Sustainable Forest Incentive Act lands.

Issues Addressed

This goal addresses the issue themes of protecting sensitive lakes, forest fragmentation, and the shallow sand aquifer within the watershed.

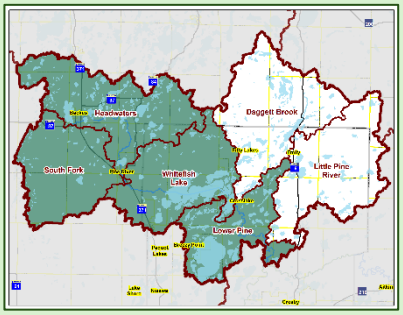
Prioritization

The lake prioritization process identified priority lakes for protection opportunities (Figure 5-1 and Figure 6-2). RAQ (Riparian + Adjacency + Quality = Priority) maps from the Landscape Stewardship Plan can be used to target individual parcels and DWSMAs for protection (LSP 2017).

Prioritization

PRIORITY SUBWATERSHEDS

	Priority
Headwaters	x
South Fork	
Whitefish	x
Lower Pine	x
Little Pine	
Daggett Br.	x



PRIORITY RESOURCES

Ada Lake
Bertha Lake
Big Trout Lake
Clamshell Lake
Island-Loon Lake
Lower Hay Lake
O'Brien Lake
Ossawinnamakee Lake
Pelican Lake
Pig Lake
Roosevelt Lake
Rush-Hen Lake
Ruth Lake
Upper Hay Lake

Implementation

Implementation actions for this goal include protecting additional land through the Sustainable Forest Incentive Act (SFIA), conservation easements, and acquisitions (Figure 5-2).

Measurability

This goal will be measured by the number of acres protected.

Midpoint Update

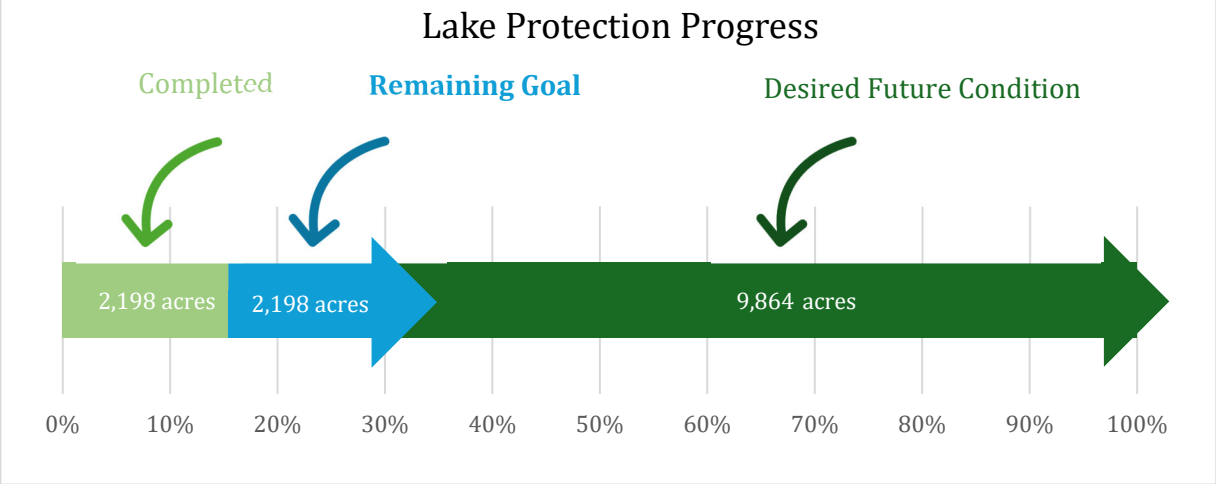
A midpoint plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

From 2020-2024, the planning partners made 15% progress towards the long-term goal (75% protection) in priority lakesheds (2,198 acres). In the next five years, the planning partners estimate they can make another 15% progress (2,198 acres).

Adjusted 10-year goal: 30% progress towards the long-term goal in priority lakesheds (Table 5-2, 4,396 acres).

Desired Future Condition: to reach the long-term goal in priority lakesheds (Table 5-2, 9,864 acres).

Priority Minor Watersheds: Figure 6-2.



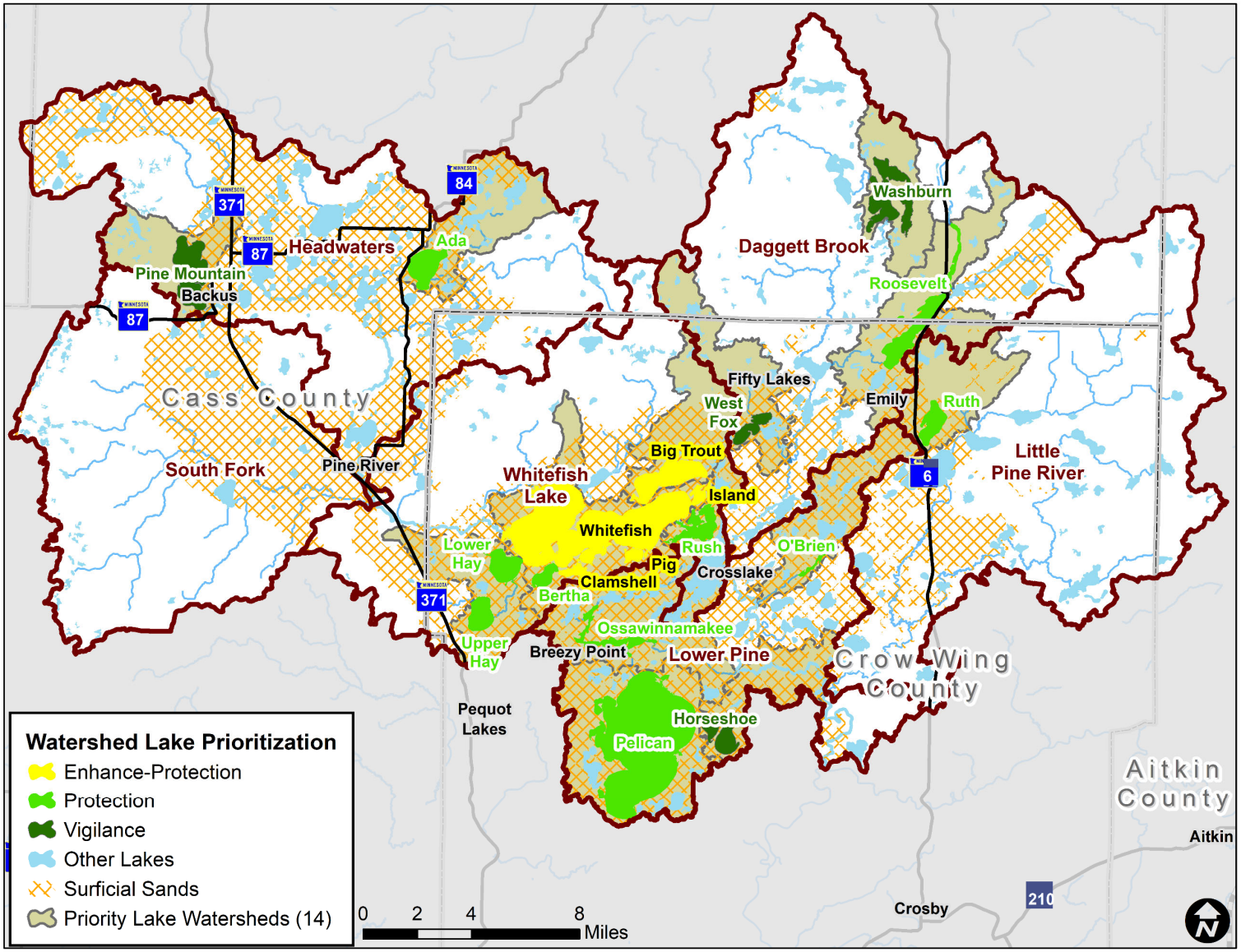


Figure 6-2. Prioritized lakes with management focus.

Goal 2. Phosphorus Reduction

Surface Water

GOAL: Reduce phosphorus loading in priority lakes by 5 lbs each through implementing best management practices.

Description
None of the economically significant lakes in the Pine River Watershed are currently impaired, but some have declining transparency trends. It is important economically to the region to work to reverse these trends before they exceed water quality standards. For lakes in the Northern Lakes and Forest Ecoregion the standard is 30 ug/L total phosphorus.

Issues Addressed
This goal addresses the issues of development pressure and nutrient runoff from residential areas and roads, mainly from stormwater. Address point density data shows that development pressure has been increasing since the COVID19 pandemic. Northern Minnesota now has better internet access and people are choosing to work from their lake homes. From 2019-2024, 1,249 addresses have been added to the E911 address list (Figure 6-3). The increases are focused mostly around the cities of Breezy Point and Crosslake. These numbers don't capture cabins being upgraded to large homes.

Prioritization
The lake prioritization process is outlined in Section 5 of this plan (Figure 5-1).

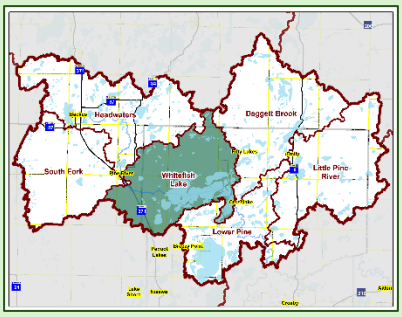
Implementation
The implementation actions for this goal include implementing stormwater best management practices in developed areas to reduce phosphorus loading to the declining lakes.

Measurability
This goal will be measured in pounds of phosphorus reduced through Pollution Reduction Calculators.

Prioritization

PRIORITY SUBWATERSHEDS

	Residents	Roads
Headwaters		
South Fork		
Whitefish	x	x
Lower Pine		
Little Pine		
Daggett Br.		



PRIORITY RESOURCES

Ada Lake
Bertha Lake
Big Trout Lake
Clamshell Lake
Horseshoe
Island-Loon Lake
Lower Hay Lake
O'Brien Lake
Ossawinnamakee Lake
Pelican Lake
Pig Lake
Pine Mountain
Roosevelt Lake
Rush-Hen Lake
Ruth Lake
Upper Hay Lake
Washburn
West Fox
Whitefish Lake

Midpoint Update

A mid-point plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

The original lake goals from 2019 were a 5% reduction in phosphorus loading. Through plan implementation, planning partners learned that for lakes with large watersheds, a 5% goal was too high to be achievable in 10 years. Therefore, during the midpoint update process, they changed all the 10-year goals to 5 lbs reduction over 10 years. Big Trout and Island-Loon reached their 5% reduction goal in 2024, however, planning partners will continue to work on them because they have some of the highest property values and development pressure in the watershed (Figure 6-3). The planning partners decided to re-set their goals to 5 additional lbs reduction in the next five years.

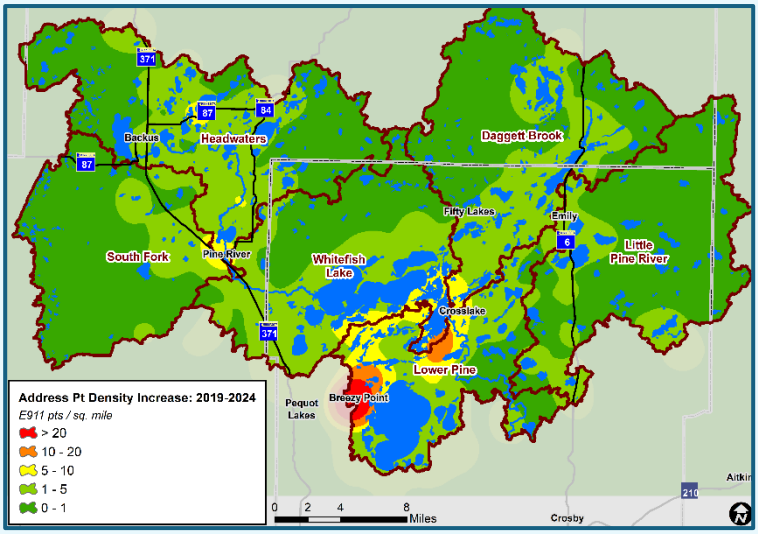


Figure 6-3. Address point density increase from 2019-2024.

Lake	County	Management Focus	ORIGINAL 10 YEAR GOAL (lbs P)	NEW 10 YEAR GOAL (lbs P)	PROGRESS from 2020-2024	NEW REMAINING 5 YR GOAL (lbs P)
Big Trout	Crow Wing	Enhance-Protection	45	5	100%	5 (additional)
Whitefish	Crow Wing	Enhance-Protection	792	5	52%	2.4
Clamshell	Crow Wing	Enhance-Protection	8	5	2%	4.9
Island-Loon	Crow Wing	Enhance-Protection	4	5	100%	5 (addtional)
Pig	Crow Wing	Enhance-Protection	4	5	14%	4.3
Ada	Cass	Protection	36	5	38%	3.1
Roosevelt	Cass	Protection	135	5	76%	1.2
Bertha	Crow Wing	Protection	12	5	60%	2
Rush-Hen	Crow Wing	Protection	9	5	50%	2.5
Pelican	Crow Wing	Protection	62	5	10%	4.5
Ruth	Crow Wing	Protection	18	5	40%	3
O'Brien	Crow Wing	Protection	27	5	0%	5
Ossawinnamakee	Crow Wing	Protection	25	5	78%	1.1
Lower Hay	Crow Wing	Protection	46	5	12%	4.4
Upper Hay	Crow Wing	Protection	88	5	84%	0.8

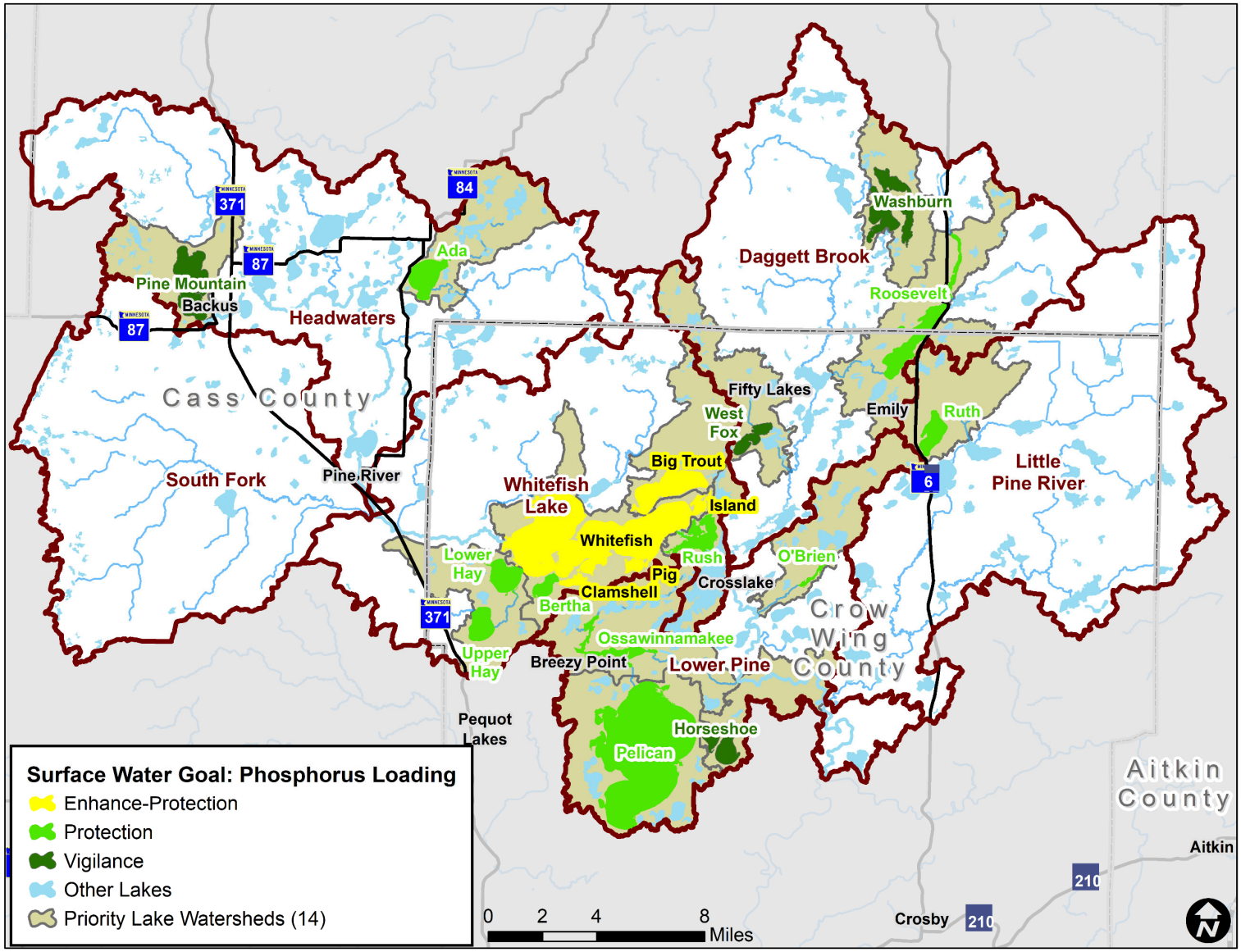


Figure 6-4. Prioritized lakes with management focus.

Goal 3. Agricultural Land Management

Surface Ground

GOAL: Reduce agricultural runoff to surface and groundwater by implementing 1,253 acres* of agricultural best management practices.

*5% of Ag lands in the Headwaters, South Fork Pine, and Whitefish HUC10 subwatersheds.

Description

The WRAPS identified four streams in the Pine River Watershed that were impaired for fish and macroinvertebrate life (biological impairments) (Figure 6-5). These impairments can be caused by poor water quality, excess sediment, and lack of in-stream habitat structure such as woody debris, boulders, rapids, and aquatic and riparian vegetation. Cattle standing, walking, and defecating in the stream can also affect in-stream habitat.

Intensive grazing practices can compact the soil, decrease vegetative cover, and enable erosion into streams during storm events. Converting practices from intensive grazing to rotational grazing can reduce this nutrient loading and improve downstream lake water quality.

Nitrates are an issue in groundwater because they can cause blue baby syndrome, which affects the blood's ability to carry oxygen, and can be fatal for infants. Nitrate fertilizer application paired with the sandy soils and shallow aquifer in the Pine River Watershed has the potential to cause elevated nitrate concentrations in well water.

Issues Addressed

The issues addressed by this goal include nutrient loading from agricultural runoff, groundwater contamination, and habitat loss.

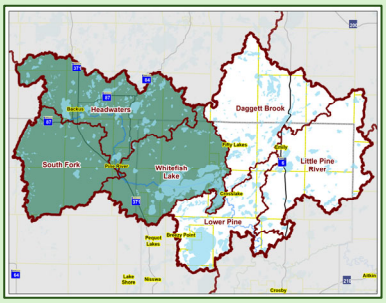
Prioritization

The Headwaters, South Fork, and Whitefish sub-watersheds are where the stream impairments and most of the agricultural practices are in the Pine River Watershed.

Prioritization

PRIORITY SUBWATERSHEDS

	Ag Lands	Impaired
Headwaters	x	
South Fork	x	x
Whitefish	x	x
Lower Pine		
Little Pine		
Daggett Br.		



PRIORITY RESOURCES

Pine River
South Fork Pine River
Priority Lakes
Impaired Streams
- Arvig Creek
- Willow Creek
- Wilson Creek
- South Fork Pine River

Implementation

Implementing agricultural best management practices such as cover crops, no till, and pasture management, will reduce nutrient runoff to surface waters and groundwater. Rental equipment will also be available for implementation of best management practices (i.e. no till drills).

Measurability

This goal will be measured in acres of practices implemented.

Midpoint Update

A mid-point plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

This goal was originally named "Pasture Management", but during the midpoint update process, planning partners decided to widen it to all agricultural best management practices. They also decided to incorporate the 'nitrogen reduction to groundwater goal' into this goal, since the best way to reduce nitrogen leaching into the groundwater is agricultural best management practices.

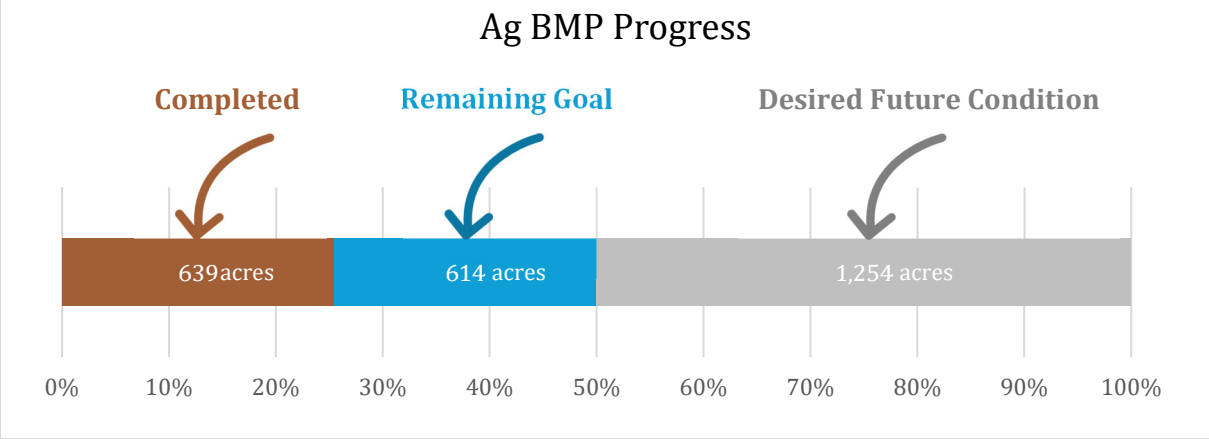
From 2020-2024, the planning partners added 639 acres of agricultural best management practices to the landscape. In the next five years, the planning partners figure they can make another 614 acres of progress to get to 1,252 acres of Ag BMPs.

Adjusted 10-year goal: Reach 5% coverage of Ag BMPs in priority HUC10s (1,253 acres).

Desired Future Condition: Reach 10% coverage of Ag BMPs in priority HUC10s (2,507 acres).

Priority HUC10 Subwatersheds: Headwaters, South Fork Pine, Whitefish, Figure 6-5.

Subwatershed (HUC10)	Hay/pasture	cultivated	Total Ag Lands	5% of Ag acres	10% of Ag acres
Headwaters Pine River	4,811	1,420	6,231	312	623
South Fork Pine River	7,990	2,880	10,871	544	1087
Daggett Brook	953	144	1,097		
Whitefish Lake	5,662	2,303	7,965	398	796
Little Pine River	1,633	10	1,643		
Lower Pine River	1,399	240	1,639		
	22,448	**6,997**	**29,446**	**1,253**	**2,507**



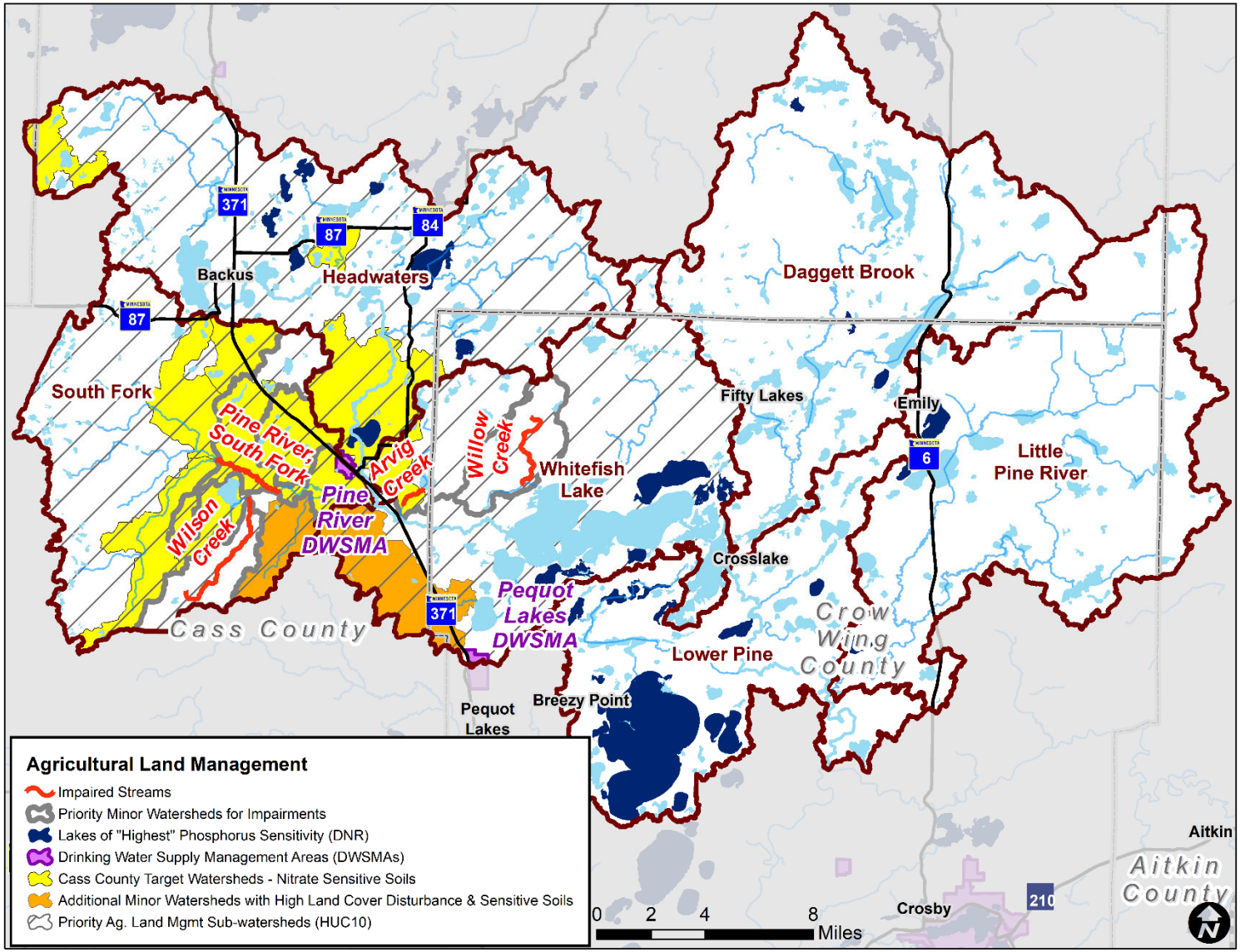


Figure 6-5. Priority areas for Agricultural Land Management in the Pine River Watershed.

Goal 4. Wetland Management

Surface Water

GOAL: Maintain current coverage of wetlands as currently administrated under federal, state and local regulations.

Description
Wetlands are natural sponges where water is stored on the landscape. They can reduce the effects of flooding and high water, store water to allow nutrients to settle out, and are also important habitat for fish, wildlife, and birds. Although the Pine River Watershed has not lost large numbers of wetlands like western Minnesota, wetlands around lakeshore have been filled for development over time. Wetlands throughout the watershed have varying amounts of protection enforced by different government agencies, federal (Clean Water Act, ACOE), state (Wetlands Conservation Act, BWSR, MN DNR) and county (County Wetlands Ordinance).

Issues Addressed
This goal addresses issues of wetland function and number of wetlands in the watershed.

Prioritization
Priority areas include minor watersheds that have the most drained wetlands (NWI 2018, Figure 6-6), especially the South Fork, Little Pine and Whitefish sub-watersheds.

Implementation
This plan will continue to implement federal, state and local ordinances and protection as is currently administered.

Measurability
This goal will be measured by adherence to the Minnesota Rule 8420 requirement over the ten-year plan period.

Midpoint Update

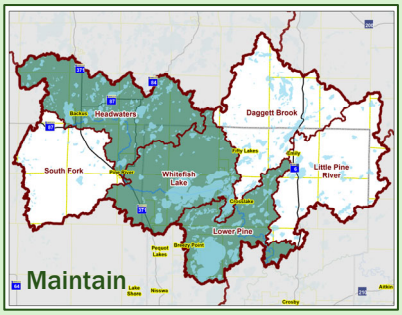
A mid-point plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

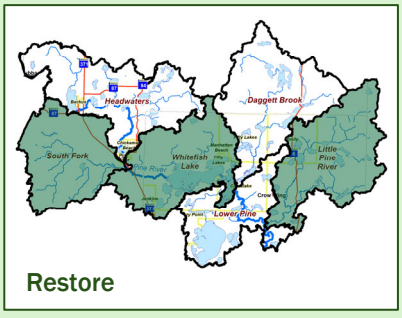
From 2020-2024, planning partners implemented WCA and worked with five landowners on restoration plans. They did not make any changes to this goal during the update.

Prioritization

PRIORITY SUBWATERSHEDS

	Priority Maintain	Priority Restore
Headwaters	x	
South Fork		x
Whitefish	x	x
Lower Pine	x	
Little Pine		x
Daggett Br.		





PRIORITY RESOURCES

Minor Watersheds
Little Pine River, Behler Creek, Starry Lake, Wilson Creek, South Fork Pine River, Arvig Creek, Hay Creek, Hoblin Creek, Bungo Creek, Island/Mitten Lakes, Mud/Goose Lakes

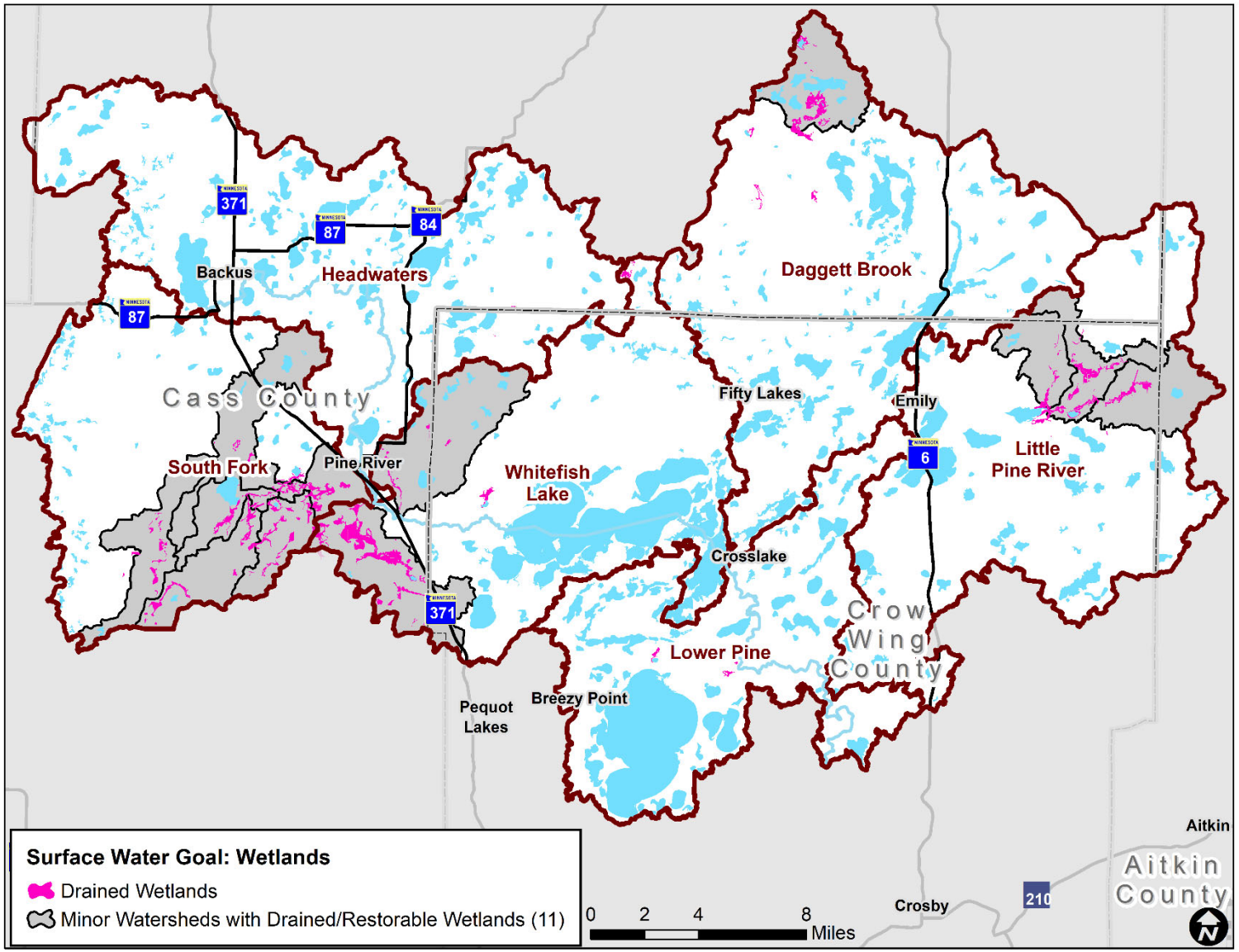


Figure 6-6. Wetlands in the Pine River Watershed with drained wetlands highlighted.

Goal 5. Subsurface Sewage Treatment Systems (SSTS)

Ground Water

GOAL: Maintain high quality drinking water in surficial sand aquifers by enforcing the SSTS ordinance, providing funding for SSTS upgrades, and conducting outreach to private landowners.

Description

In much of the Pine River Watershed the water table is less than 10 feet deep (Figure 10.3, Appendix A). Shallow aquifers paired with sandy soil means that the groundwater is vulnerable to contaminants. When not properly maintained, SSTS can leach nutrients and bacteria into the aquifers and lakes. Proper maintenance includes pumping septic systems at a minimum of every three years. Cass and Crow Wing Counties require inspections with property ownership changes or building permits to increase square footage of known habitable buildings. Crow Wing County also requires an inspection with shoreline alteration. Inspections are paid for by the property owner and must be completed by a certified inspector.

Issues Addressed

This goal addresses the issues of groundwater contamination of shallow sand aquifers from septic systems.

Prioritization

Priority areas include minor watersheds that are located on the surficial sands aquifer, have the most septic systems, and are on economically significant lakes (Figure 6-7).

Implementation

Implementation actions include cost sharing replacements for failing septic systems, enforcing the SSTS ordinance, and providing information to residents and installers about proper maintenance.

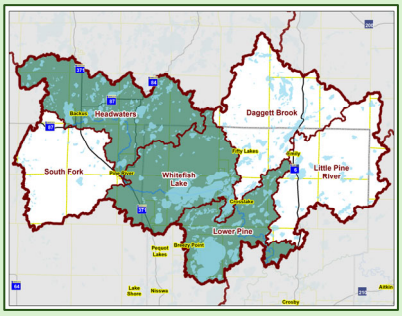
Measurability

This goal will be measured by the educational outreach can be accomplished by mailers, informational sheets included in tax statement mailings, and workshops.

Prioritization

PRIORITY SUBWATERSHEDS

	% wells in surficial sand aquifer	Priority
Headwaters	17.1%	x
South Fork	4.5%	
Whitefish	20.5%	x
Lower Pine	17.1%	x
Little Pine	6.4%	
Daggett Br.	10.6%	



PRIORITY RESOURCES

Surficial sands aquifer

Midpoint Update

A mid-point plan update was completed in 2025. The evaluation determined the goal as originally written was not measurable. Planning partners determined that measuring outreach efforts and county data on upgrades would be most useful moving forward.

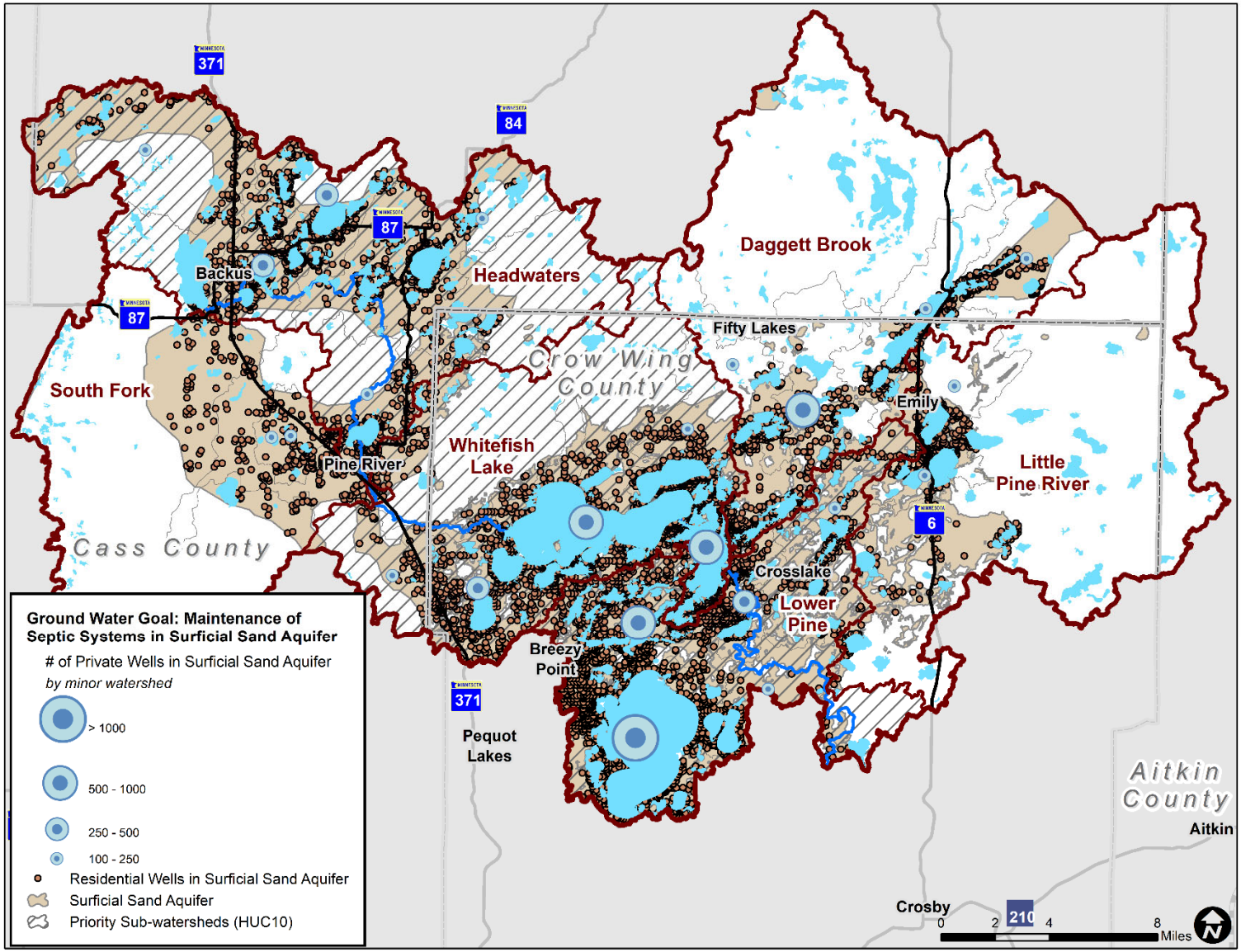


Figure 6-7. Private residential wells and surficial sand aquifer. All properties with wells should also have a septic system, so wells are being used as a proxy for septic system locations.

Goal 6. Chloride Management

Ground Water

GOAL: Provide resources, information, and training on chloride management to cities, public, and road authorities.

Description
Chlorides can enter waterbodies from two main sources: road salts and water softener salts. Chlorides can affect the biology and habitat of the lake including plant and fish life. The State of Minnesota has best management practices guidelines for cities and homeowners to use when applying road salt in winter (https://www.pca.state.mn.us/water/salt-and-water-quality).

An emerging issue is the overuse of water softener salts in homes. This issue applies to both rural residents using septic systems and those on city wastewater treatment. Too much salt in a septic system can affect its biological function in the treatment of the waste. Salt in city wastewater is not treated, therefore is discharged into the environment after leaving the facility.

Issues Addressed
This goal includes the issues of groundwater contamination and surface water quality in sensitive lakes.

Prioritization
Priority areas for road salts include minor watersheds with concentrated road development, especially the Highway 371 and Highway 66 corridors (Figure 6-8).

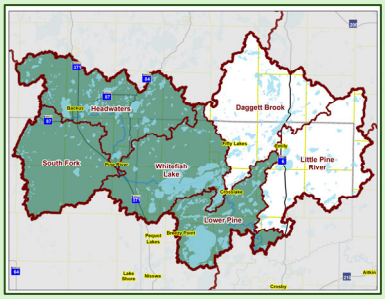
Implementation
Actions include obtaining funding to assist cities in upgrading their road salting equipment, providing information for private snow removal companies on chloride best management practices, hosting workshops, and providing information to the public on water softener salts and how much to use.

Measurability
This goal will be measured by the number of workshops held.

Prioritization

PRIORITY SUBWATERSHEDS

	Priority
Headwaters	x
South Fork	x
Whitefish	x
Lower Pine	x
Little Pine	
Daggett Br.	



PRIORITY RESOURCES

Minor Watersheds
Pine River/Lindsey Lake
Lizzie Lake
South Fork Pine River
Tamarack/Clam Lakes
Pine River/Norway Lake
Hay Creek
Sylvan/Smiley Lakes
Daggett/Little Pine Lakes
Upper/Lower Hay Lakes
Pine River/Big Pine Lake
Cross Lake
Ossie/Pelican Brook
Pelican Lake

Midpoint Update

A mid-point plan update was completed in 2025. From 2020-2024 planning partners have conducted annual workshops, updated chloride policies, implemented brining in Cass County, and upgraded equipment to include more automation. There were no changes made to this goal during the update.

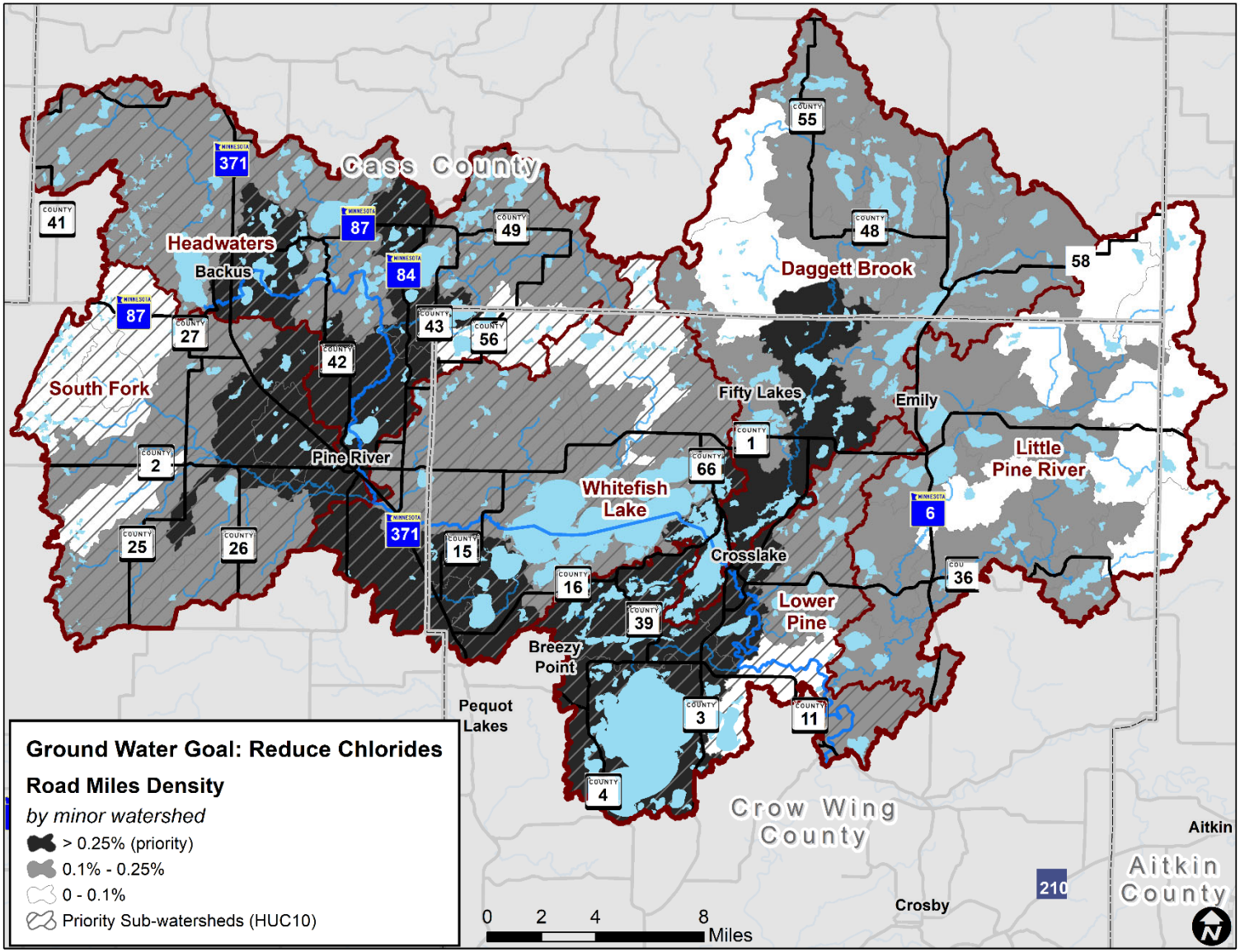


Figure 6-8. Road density by minor watershed.

Goal 7. Well sealing

Ground Water

GOAL: Seal 60 unused residential wells to prevent groundwater contamination.

Description

Over time, development has occurred in the watershed and there is not always a record of every well that was installed historically. Unused wells that are not properly sealed can pose a safety, health, and environmental threat to the community as well as a potential legal risk to the landowner. If a landowner has a well that is not in use and does not have a Water Well Maintenance Permit, or the well poses a threat to health or safety, Minnesota law requires that the well must be sealed. Once fully sealed, the contractor is required to submit a Well and Boring Sealing Record to MDH and landowner. Cass SWCD and Crow Wing County have a cost-share program available throughout the county to help landowners with well sealing. Records show that 103 wells were sealed in the Pine River Watershed between 2012-2020. Of the wells sealed, 90% of them were in the surficial sand aquifer and 80% were within 500 feet of lakes.

Issues Addressed

This goal addresses the issue of groundwater contamination.

Prioritization

Priority areas are where there are numerous wells in the shallow sand aquifer (Figure 6-9).

Implementation

Implementation actions include cost share to seal unused wells.

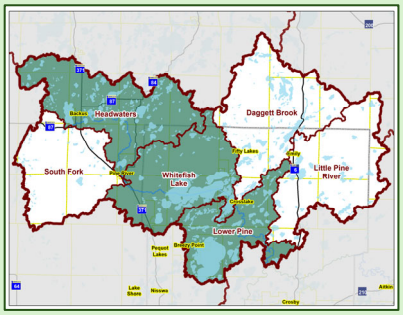
Measurability

This goal will be measured by the number of wells sealed in the ten-year plan timeframe.

Prioritization

PRIORITY SUBWATERSHEDS

	% wells in surficial sand aquifer	Priority
Headwaters	17.1%	x
South Fork	4.5%	
Whitefish	20.5%	x
Lower Pine	17.1%	x
Little Pine	6.4%	
Daggett Br.	10.6%	



PRIORITY RESOURCES

1) Surficial sand aquifer
2) Watershed wide

Midpoint Update

A mid-point plan update was completed in 2025. The original goal was to seal 30 wells per year (300 in 10 years). From 2020-2024 planning partners cost-shared the sealing of 32 unused wells. Because it is unknown how many unsealed wells exist, the planning partners decided to revise this goal to sealing 60 wells in 10 years. Therefore from 2020-2024 they made 50% progress towards the revised goal.

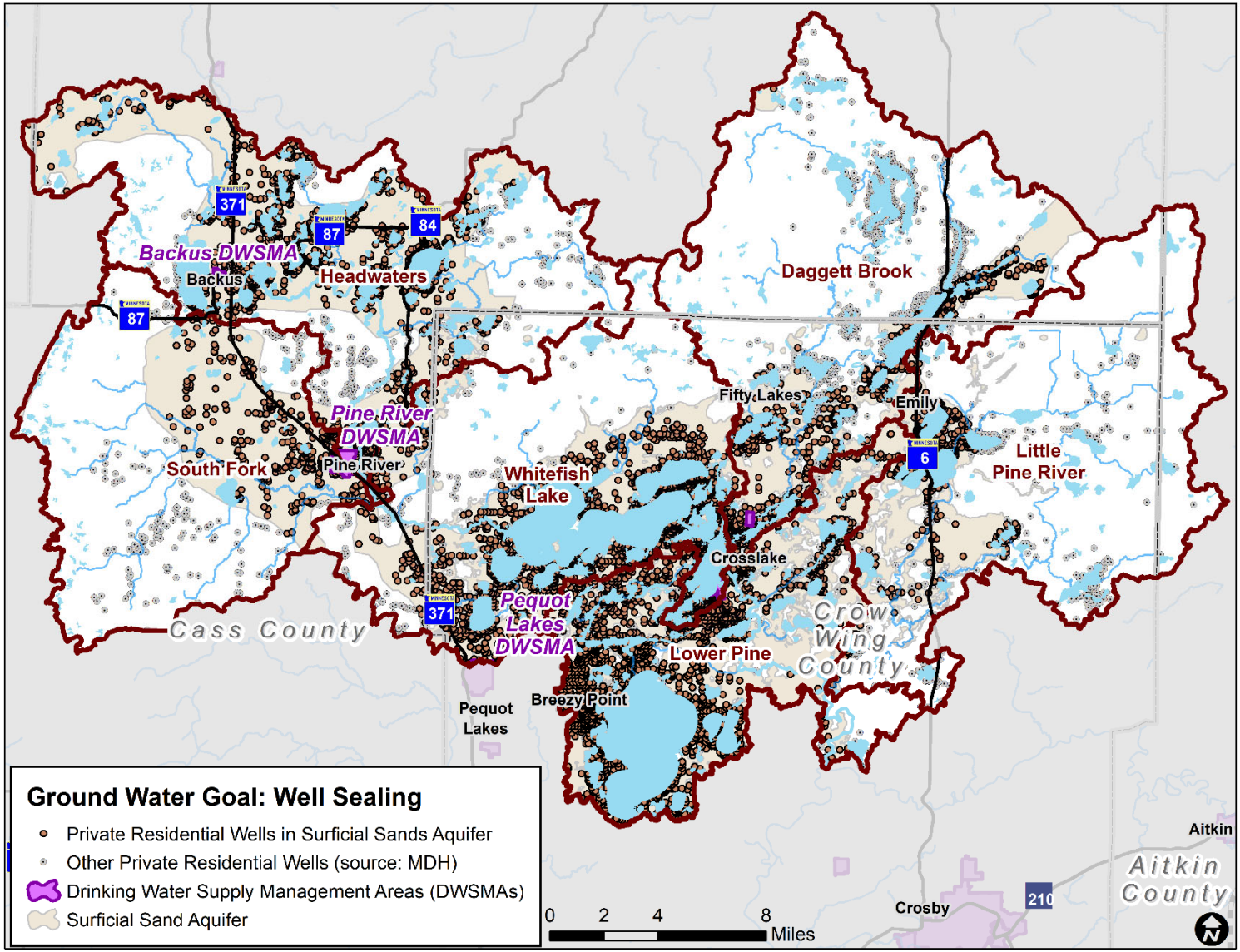


Figure 6-9. Drinking Water Supply Management Areas and private wells in the Pine River Watershed.

Goal 8. Habitat Protection

Forestry & Habitat

GOAL: Protect 13 miles and 5,087 acres* of undeveloped riparian lands through outreach to private residents.

*35% progress towards 75% protection in priority habitat minor watersheds.

Description
Undeveloped riparian corridors, lakeshore, and forests are essential to protecting surface water quality, ground water quality, and fish and wildlife habitat. These areas are especially important for wild rice, waterfowl production, loon nesting, and fish spawning. The Pine River Watershed has numerous biologically significant lakes, wetlands and stream corridors that are a priority for protection (Figure 6-10).

DNR research shows that Minnesota has currently lost 40 to 50% of its natural lakeshore, and they are being degraded at a rate of 1-2% more each decade. At this rate, a majority of Minnesota lakeshore will soon be unable to protect water quality and provide fish and wildlife habitat (Radomski 2006).

In the Pine River Watershed, 55% of the lakeshore is privately owned and at risk for losing their buffers. In the next decade, 5-11 miles of privately owned lakeshore could be degraded. This goal aims to permanently protect lakeshore and river riparian corridors to prevent future degradation.

Issues
This goal addresses the issues of forest fragmentation, habitat loss and sensitive lakes.

Prioritization
The DNR's Sensitive Shoreland study was used to prioritize areas for protection (Figure 6-10).

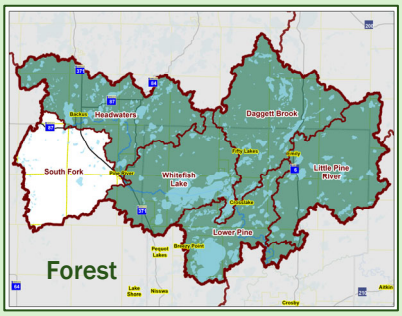
Implementation
Lakeshore and riparian corridors can be permanently protected by SFIA, conservation easements administered by numerous organizations, or acquisitions such as Aquatic Management Areas administered by the DNR.

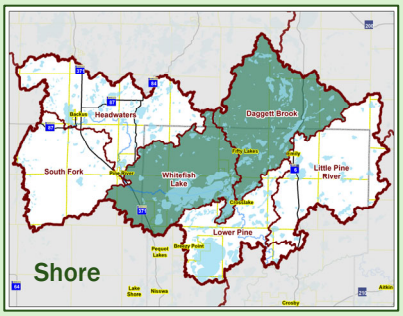
Measurability
Progress will be measured by the miles of lakeshore and riparian corridors and acres protected.

Prioritization

PRIORITY SUBWATERSHEDS

	Forest Priority	Shore Priority
Headwaters	x	
South Fork		
Whitefish	x	x
Lower Pine	x	
Little Pine	x	
Daggett Br.	x	x





PRIORITY RESOURCES

Lake focus: See Lake Protection goal and Figure 6-10.

Habitat focus: Figure 6-10.

Midpoint Update

A mid-point plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

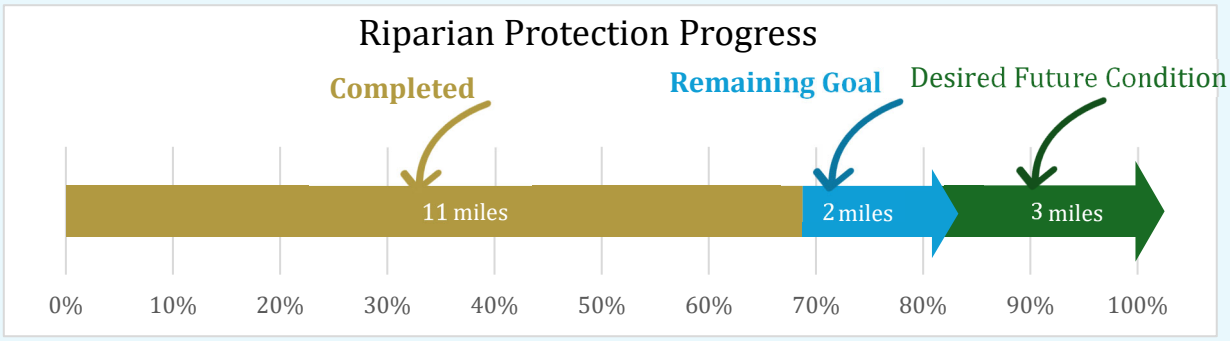
The original goal was to protect two miles of riparian land, but from 2020-2024, planning partners protected 11 miles of lakeshore and riparian corridors. Therefore, they adjusted their long-term goal to 13 miles of lakeshore and riparian land protected. This leaves the remaining goal as two more miles to protect in the next five years.

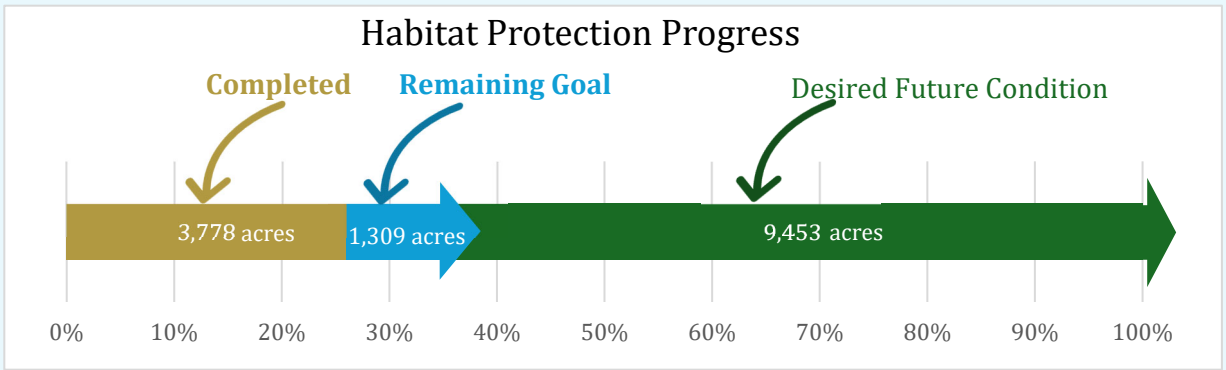
Planning partners also protected numerous acres of habitat from 2020-2024 and have made 28% progress towards the long-term acre protection goal for the priority habitat minor watersheds (3,778 acres). Therefore, they decided to include an acre goal in the plan update as well. In the next five years, the planning partners figure they can make another 9% progress (1,309 acres).

Adjusted 10-year goal: 13 miles of riparian/lakeshore protection and 35% progress towards the long-term acre protection goal in priority habitat minor watersheds (5,087 acres).

Desired Future Condition: To protect 3% of privately owned riparian/lakeshore (16 miles) to stay in front of the 1-2% predicted shoreline loss each decade, and to reach the long-term protection goal (75%) in priority habitat minor watersheds (14,540 acres).

Priority Minor Watersheds: Figure 6-10.





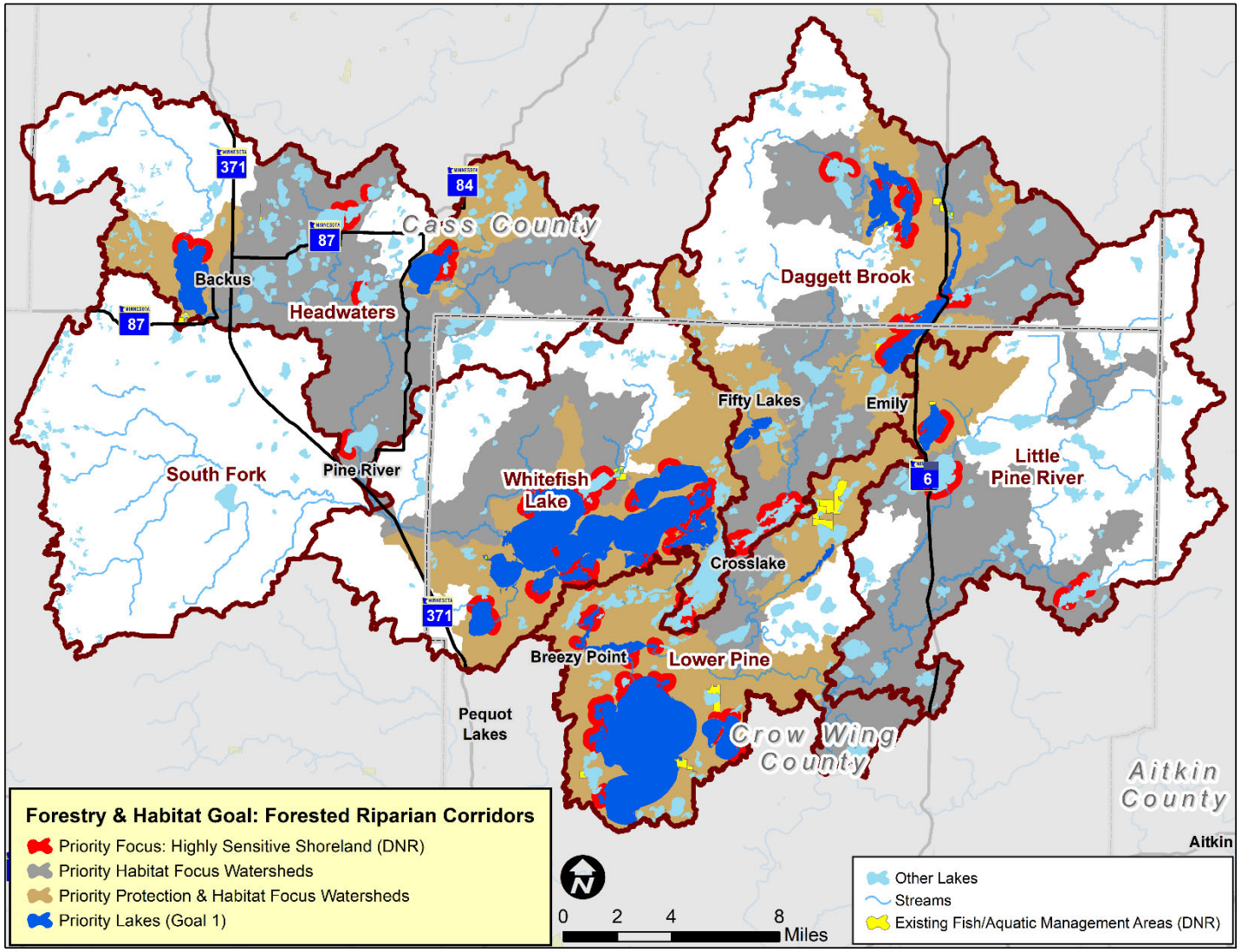


Figure 6-10. Minor watersheds prioritized for lake and habitat protection.

Goal 9. Habitat Restoration

Forestry & Habitat

GOAL: Restore 2 miles of lakeshore or riparian vegetation.

Description

Over time, development in the watershed and especially in riparian areas has affected fish and wildlife habitat through removal of shoreline vegetation, ice ridges, and trees. For fish and wildlife to continue to thrive, riparian vegetation must be preserved, enhanced, and restored. Both the Cass and Crow Wing have these projects as priorities in their county water plans and currently offer help to residents for these projects.

As stated in the previous goal, DNR research has shown that lakeshore buffers are being lost at a rate of 1-2% per decade. As shown in the table below, this is a significant amount of lakeshore in the Pine River Watershed.

This goal aims to reverse the loss by restoring two miles of shoreline (1%) on priority lakes. The desired future condition is to restore five miles (3%) on priority lakes.

Pine Watershed Lakeshore	Total Miles	1%	2%	3%
All lakeshore	959	10	19	29
Privately owned lakeshore	532	5	11	16
Priority lake privately owned lakeshore	163	2	3	5

Issues Addressed

This goal addresses the issues of development pressure, habitat loss and sensitive lakes.

Prioritization

Priority lakes were determined in Section 5 of this plan and are shown in Figure 6-11.

Implementation

This goal will be implemented by completing shoreline restoration projects on private properties.

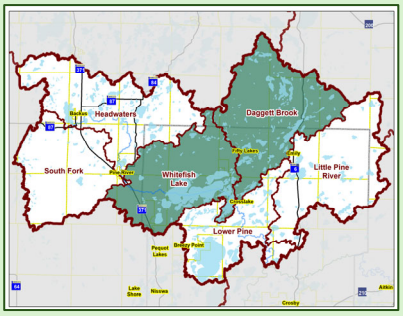
Measurability

This goal will be measured by the number of workshops held, projects implemented, and feet of riparian/lakeshore restored to reach the two-mile goal.

Prioritization

PRIORITY SUBWATERSHEDS

	Priority
Headwaters	
South Fork	
Whitefish	x
Lower Pine	
Little Pine	
Daggett Br.	x



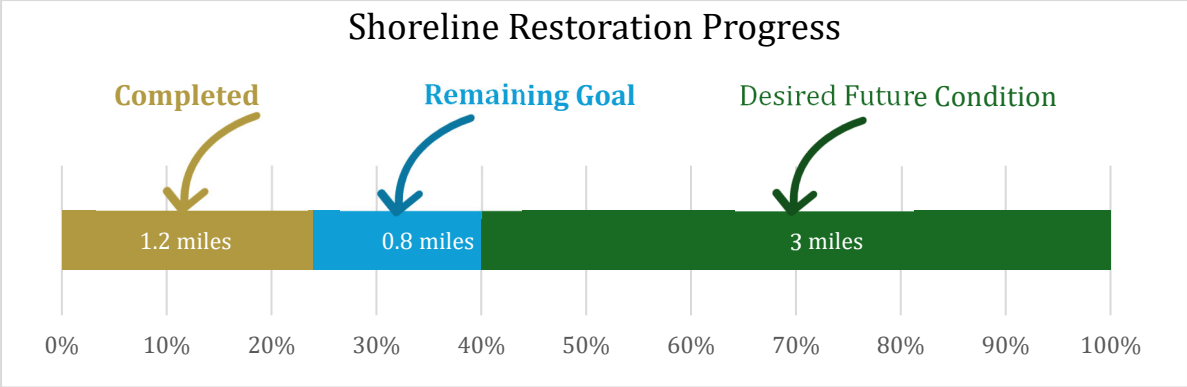
PRIORITY RESOURCES

Ada Lake
Bertha Lake
Big Trout Lake
Clamshell Lake
Horseshoe
Island-Loon Lake
Lower Hay Lake
O'Brien Lake
Ossawinnamakee Lake
Pelican Lake
Pig Lake
Pine Mountain
Roosevelt Lake
Rush-Hen Lake
Ruth Lake
Upper Hay Lake
Washburn
West Fox
Whitefish Lake

Midpoint Update

A mid-point plan update was completed in 2025. During this update, planning partners summarized the progress they have made towards the goals in the first five years of implementing the plan and made adjustments based on their implementation experience.

The original goal was to restore two miles of lakeshore. From 2020-2024, planning partners restored 1.2 miles of lakeshore on priority lakes. Therefore, they felt they were making good progress and did not make any adjustments to this goal. This leaves the remaining goal as 0.8 more miles to restore in the next five years. There are 163 miles of privately owned lakeshore along the priority lakes. A 3% loss per decade is five miles, therefore that is the desired future condition to reach.



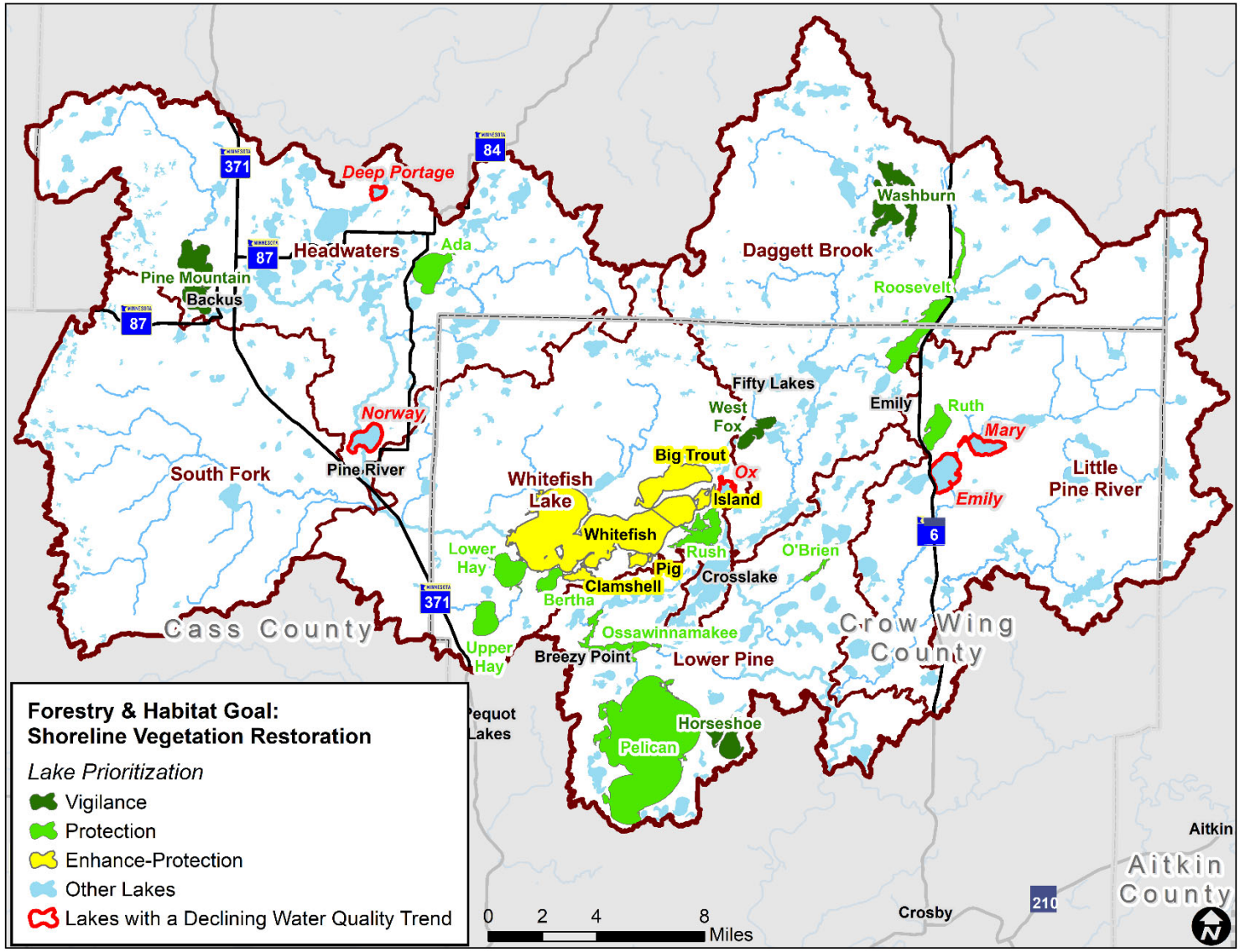


Figure 6-11. Priority lakes for shoreline restoration.

Goal 10. Water Retention

Surface Ground

GOAL: Maintain an average discharge of ~307,000 acre-feet at the pour point of the Pine River Watershed allowing for annual variations in rainfall and runoff.

Description

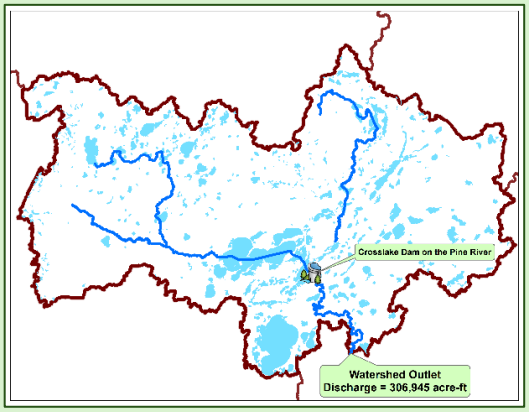
Alterations to the landscape to increase and control water flow (impoundments) can also cause adverse effects to water quality. Improperly sized and placed culverts, ditches, draining of wetlands, dams, and bridges can enable water to flow more quickly off the landscape and increase the erosion of sediments and nutrients into streams and lakes.

The Whitefish Chain of Lakes is a reservoir made up of 14 lakes and is held back by the Crosslake Dam, which is regulated by the Army Corps of Engineers (USACE). Water level management is guided by an operational plan designed to keep the channels navigable for boaters, to assure the lakes have enough storage space for snow melt and to keep the river flowing consistently.

The HSPF model shows an average discharge of ~307,000 acre-feet at the pour point of the watershed. The PRW1W1P water storage and retention goal is to maintain this average discharge over the life of the plan.

SUBWATERSHED DISCHARGE

Location	Acre-feet discharge
Watershed pour point	~307,000



Implementation

Implementation projects in this plan take into account protecting and maintaining current water storage across the landscape, and build resilience into the watershed by:

- Protecting forests from fragmentation through private forest management [Goals 1 and 8].
- Promoting agricultural best management practices to decrease nutrient runoff [Goal 3].
- Maintaining current wetland coverage and implementing WCA [Goal 4].
- Completing stormwater management projects [Goal 2].
- Restoring eroded stream banks in impaired streams and promoting lakeshore buffers to prevent further erosion during storm events [Goals 3, 8 and 9].

Pine River Watershed

One Watershed One Plan

Section 7.

Targeted Implementation Schedule

7 Targeted Implementation Schedule

The main goal of this plan is to guide projects in the watershed for the next ten years in a way to affect positive and meaningful change in water resource conditions. The implementation table spells out the what, who, when and where of these projects. Implementation will be carried out to the extent that funding is available.

These actions were reviewed in 2024 during the midpoint update. Some actions were moved to different goals based on goal revisions in the previous section. Changes are listed below.

- The actions under the original Nitrate Management goal were moved under the new Agricultural Land Management goal since those goals were merged.
- The actions for the original Culvert Management goal were moved under the Water Retention Goal.
- Actions that were completed in 2019-2024 were moved to a table at the end of the section on page 101.

There are currently many effective programs being implemented in the Pine River Watershed by numerous agencies and organizations through other planning efforts including the Cass County Water Plan, Crow Wing County Water Plan, Landscape Stewardship Plan, and Watershed Restoration and Protection Strategy. In order to distinguish between current projects and future proposed projects, a level system was used in the implementation table (Table 7-1).

Table 7-1. Level system used to identify current and future actions in the implementation table.

Level 1	**This level identifies implementation activities that we plan to undertake within the 10-year time frame of the 1W1P, funded by the Natural Resources Block Grant (NRBG), Local Capacity Grant, and/or in-house contributions.**
Level 2	**This level identifies implementation activities that we hope to accomplish if additional sources of funding, staff resources, or shared service opportunities become available over the 10-year time frame of the 1W1P. Additional funding can enhance a level 1 service or project to a level 2.**
Level 3	**This level contains additional implementation activities identified during the plan development process that are the responsibility of state and/or federal agencies better suited in the watershed.**

The One Watershed One Plan is designed to encompass and draw from existing plans. Sources for plan actions are shown in Table 7-2.

Table 7-2. Plans that were used to draw implementation actions for the PRW1W1P.

Plan Acronym	Plan
WRAPS	MPCA Watershed Restoration and Protection Strategy
GRAPS	MDH Groundwater Restoration and Protection Strategy
LSP	Landscape Stewardship Plan
Water Plans	The existing Cass and Crow Wing County Water Plans
1W1P	This current One Watershed One Plan effort

When determining what type of project to implement, there are four main implementation programs to consider: Planned Landscape Management (Manage It), Protected Lands Maintenance (Keep It), Constructed Environmental Enhancements (Fix It), and Analysis and Information. These four categories encompass different types of projects and funding sources (Figure 7-1). For more detail on these programs see the Plan Implementation Programs Section of this plan. Consideration and compilation of numerous different types of projects to achieve similar goals enables the local agencies, organizations, and landowners to have flexibility in choosing what type of project will work best for them.

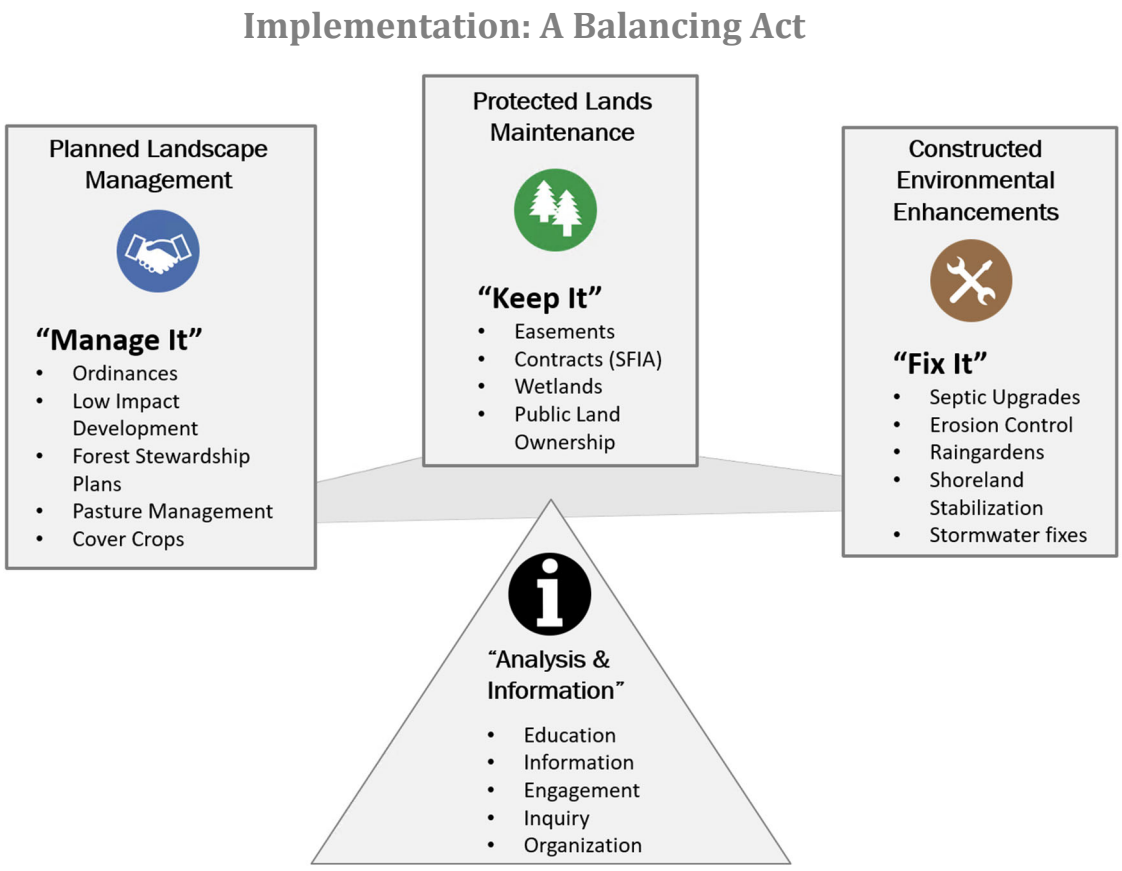


Figure 7-1. Implementation programs for achieving the plan's goals.

Table 7-3. Acronyms and explanation of organizations and funding sources listed in the PRW1W1P implementation table.

Acronym	Organization or Funding Source
ACOE	Army Corps of Engineers
BMP	Best Management Practice
BWSR	Board of Soil and Water Resources
CRP	Conservation Reserve Program
CCo	Cass County Environmental Services
CSWCD	Cass Soil and Water Conservation District
CWCo	Crow Wing County
CWSWCD	Crow Wing Soil and Water Conservation District
CWF	Clean Water Fund
DNR	Department of Natural Resources
DWSMA	Drinking Water Supply Management Areas
LAs	Lake Associations
LCCMR	Legislative Citizen Commission for Minnesota Resources
LSOHC	Lessard Sams Outdoor Heritage Council
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MHB	Mississippi Headwaters Board
MLT	Minnesota Land Trust
MPCA	Minnesota Pollution Control Agency
NWLT	Northern Waters Land Trust (*formerly Leech Lake Area Watershed Foundation*)
RIM	Reinvest in Minnesota
SFIA	Sustainable Forest Initiative Act
SSTS	Subsurface Sewage Treatment System (septic systems)
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USDA	US Department of Agriculture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey

Goal 1. Lake Protection

Surface
Ground
Forestry

GOAL: Protect and enhance forest cover, priority lakes, and surficial sand aquifers by protecting 4,396 acres*.

*30% progress towards the long-term goal in priority lakesheds.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead & Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Promote private forestry stewardship planning using the Private Forest Landowner Implementation Toolbox (Figure 5-2).		2	Whitefish, Lower Pine, Headwaters	Priority Lakes (Table 5-2) DWSMAs (Figure 6-9)	10 plans per year	**CWSWCD, CSWCD, DNR**	CSWCD, CWSWCD, DNR	2020-2030 $20,000/yr	$200,000
Promote forest management on private lands.		2	Same as above	Same as above	10 acres	**CWSWCD, CSWCD, Counties, DNR, NRCS**	CSWCD, CWSWCD, DNR, NRCS	2020-2030 $500/yr	$5,000
Promote the Sustainable Forest Initiative Act (SFIA)* to provide annual incentive payments to encourage private landowners to keep their wooded areas undeveloped.		2	Same as above	Same as above	4,396 acres	**CWSWCD, CSWCD, DNR**	SFIA	2020-2030 $92,312.70/yr*	$923,127* *Not included in total below because it is already allocated from the general fund.
Permanently protect undeveloped land with conservation easements.		1,2	Same as above	Same as above	Same as above	**CWSWCD, CSWCD,** DNR, MLT, NWLT, MHB	NWLT, TNC, MLT, LCCMR, CWF, LSOHCC, DNR	2020-2030 $670,104/yr	$6,701,042
Permanently protect undeveloped land with acquisitions.		3	Same as above	Same as above	Same as above	**DNR**, Trust for public lands	DNR, LCCMR, LSOHCC	2020-2030	Combined with easements above
							Goal Total	**$690,604/yr**	**$6,906,042**

*SFIA: if the funding and program is available.

Goal 2. Phosphorus Reduction

Surface Water

GOAL: **Reduce phosphorus loading** in priority lakes by 5 lbs through implementing best management practices.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Implement near-shore stormwater infiltration BMPs on developed lots.		2	Headwaters, Whitefish, Little Pine, Daggett Br.	Priority Lakes (Table 5-1)	Individual Lake Goals (Table 5-1)	**CSWCD**, **CWSWCD**, CWCo, CCo	CWF	2020-2030 $315,420/yr	$3,154,200
Continue to monitor Secchi depth annually on major lakes to track trends.		3	All	Lakes: 95 lakes (Appendix 4)	Continued trend analysis	**LAs, ACCL, WAPOA, PRWA, LARA**, MPCA	None needed	2020-2030	$0
Expand the availability of information and network of resources for promoting stormwater management to lake residents.		2	Whitefish, Little Pine	Priority Lakes (Table 5-1)	One workshop per year	**CSWCD, CWSWCD**, ACCL, WAPOA, LAs, contractors, Freshwater	BWSR	2020-2030 $1,000/yr	$10,000
Work with MNDOT to ensure proper stormwater treatment for new road improvements.		1	Whitefish, Lower Pine	Hwy 371 corridor	Proper stormwater treatment on all new projects	MNDOT, SWCDs	Current funding	2020-2030 Staff time	$10,000
Work with townships to ensure proper stormwater treatment.		1	Whitefish, Lower Pine	NA	Proper stormwater treatment	Townships, SWCDs	Current funding	2020-2030 Staff time	$10,000
Complete a TMDL study on Lake Emily to determine phosphorus reduction options.		3	Little Pine River	Lake Emily	TMDL Report (phosphorus load allocation and reduction options)	**MPCA**, CWSWCD, City of Emily	MPCA	2025-2026	$10,000
							Goal Total	**$319,420/yr**	**$3,194,200**

Goal 3. Agricultural Land Management

Surface Water

GOAL: Reduce agricultural runoff to surface and groundwater by implementing 1,253 acres of agricultural best management practices.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Possible Funding Sources	Timeframe	Total 10-year Cost
Implement agricultural best management practices (i.e. cover crops, no till, pasture management).		2	Headwaters, South Fork, Whitefish	Pine River and tributaries	1,253 acres	**CSWCD**, **CWSWCD**, NRCS, PRWA, private landowners	NRCS, CWF, AgBMP program	2022-2030 $25,410/yr	$203,280
Prevent feedlot runoff using manure storage, water diversions, reduced lot sizes, and vegetative filter strips to reduce open lot phosphorus losses.		3	Headwaters, South Fork, Whitefish	Pine River and tributaries	2 nutrient management plans	**MPCA Feedlot Officer**, NRCS	MPCA	2020-2030 $4,000/yr	$40,000
Work with livestock owners to exclude cattle from stream riparian corridor with fencing.		2	South Fork, Whitefish	Wetlands, South Fork & Whitefish HUC10 Streams, Impaired Streams: Arvig Creek, Willow Ck, Wilson Ck, S. Fork Pine River	2 projects	**NRCS**, CWSWCD, CSWCD, landowners, PRWA	NRCS, CWF	2022-2030 $10,125/yr	$81,000
Restore in-stream habitat in impaired streams to improve biological health.		3	South Fork, Whitefish	Impaired Streams: Arvig Creek, Willow Ck, Wilson Ck, S. Fork Pine River	Meet or exceed Macroinvertebrate IBI	**DNR**, PRWA	LSHO, CPL, DNR	2026-2030 $100,000/yr	$400,000
Install EQIP general water quality practices and CSP water quality enhancements on agricultural lands.		3	Headwaters, South Fork, Whitefish	South Fork Pine River and tributaries	Enroll 2 participants per year	**NRCS**	USDA - NRCS Farm Bill	2020-2030 $8,000/yr	$80,000
Implement the Minnesota Agricultural Water Quality Certification Program and Nutrient Management Initiative.		3	Headwaters, South Fork, Whitefish	Watershed-wide	Enroll 1 participant per year	**MDA**, CSWCD, CWSWCD	MDA, AgBMP program	2020-2030 $1,000/yr	$10,000

Goal 3. Agricultural Land Management continued…

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Possible Funding Sources	Timeframe	Total 10-year Cost
Provide free nitrate testing or screening to residents with private wells.		1	Headwaters, South Fork, Whitefish	minor watersheds with center pivot agriculture	Twice a year	**CWCo**	CWCo	2020-2030 $200/yr	$2,000
Conduct a nitrate clinic for landowners with private wells to educate them about fertilizer application on lawns and the vulnerability of shallow groundwater.		2, 3	Headwaters, South Fork, Whitefish	NA	One clinic per year. Could be at county fair.	**CSWCD, CWSWCD**	SWCD	2020-2030 $1,000/yr	$10,000
Inventory land at potential risk for conversion to agricultural, subdivision, or development.		1	Headwaters, South Fork, Whitefish	NA	Map of areas most at risk of conversion.	**CCo, CWCo,** TSA8	SWCD	2021 $1,000/yr	$1,000
Increase access to equipment for soil health BMP implementation (example: no till drill).		2	Headwaters, South Fork, Whitefish	NA	No till drill	**CSWCD, CWSWCD, MDA**	Ag BMP Loans, SWCD Rental Equipment	2020-2030	$20,000
Soil health outreach and education (soil tests, workshops, demonstration plots, landowner site visits, etc)		3	Headwaters, South Fork, Whitefish	NA	soil tests for 5 different landowners	**CSWCD, CWSWCD, MDA**	SWCD, MDA	$1,000	$1,000
							Goal Total	**$84,828**	**$848,280**

Goal 4. Wetlands

Surface Water

GOAL: Maintain current coverage of wetlands as currently administrated under federal, state and local regulations.

Implementation Action:	Program	Levels	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Assist landowners with wetland restoration in areas of filled wetlands		1	South Fork, Whitefish, Little Pine	Little Pine River, Starry Lake, South Fork Pine River, Arvig Creek, Hay Creek, Behler Creek, Wilson Creek, Hoblin Creek, Bungo Creek, Island/Mitten Lakes, Mud/Goose Lakes	Work with 10 landowners in priority areas	**CSWCD, CWSWCD**	SWCD	2020-2030 $5,000/yr	$50,000
Provide technical and administrative assistance through site visits, project reviews, permit applications, and agency coordination.		1	All	Watershed-wide	Counties and SWCDs fulfill the Minnesota Rule 8420 requirement	**CSWCD, CWSWCD**, ACOE, BWSR	SWCD	2020-2030 $5,000/yr	$50,000
Follow and implement the wetland conservation act and the county wetland ordinances.		1	All	Watershed-wide	Counties and SWCDs fulfill the Minnesota Rule 8420 requirement	**CSWCD, CWSWCD**	SWCD	2020-2030 $25,000/yr	$250,000
Restore wetlands and soils that are producing high phosphorus concentrations.		2, 3	South Fork	Bungo Creek	Restore 2 areas	**CSWCD, CWSWCD,** Consultant	SWCD	2028-2030 $10,000/yr	$20,000
Use the new NWI to prioritize wetlands for protection (using Cass County model).		2	All	NA	Priority list	**CWSWCD, CSWCD**, CCo, CWCo, BWSR, DNR, ACOE	SWCD	2021-2022 $5,000/yr	$10,000
							Goal Total	**$38,000/yr**	**$380,000**

Goal 5. Septic Systems

Ground Water

GOAL: Maintain high quality drinking water in surficial sand aquifers by enforcing the SSTS ordinance, providing funding for SSTS upgrades, and conducting outreach to private landowners.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Offer assistance for non-compliant systems for residents through low interest loans.		2, 3	Headwaters, Whitefish, Lower Pine	Priority lakes, surficial sands	10/year	**CSWCD, CWSWCD**, Ag BMP Loan, Region 5, MPCA	MPCA, MDA	2020-2030 $20,000/yr	$200,000
Implement an educational program to increase knowledge of SSTS maintenance.		1	Same as above	Same as above	One workshop per year for professionals and homeowners	**SWCDs**, MPCA, local installers and inspectors	SWCD	2020-2030 $200/year	$2,000
Implement voluntary lake sweeps for SSTS inspections.		2	Same as above	Same as above	90% compliance	**CWCo, CCo**	BWSR	2023-2024 $1,000/yr	$10,000
Provide outreach for people to maintain their septic systems and get them pumped every three years.		2	Same as above	Same as above	90% compliance	**CSWCD, CWSWCD**	SWCD	2020-2030 $1,000/yr	$10,000
Conduct a records check to find developed lots that haven't had a recent inspection. Target those properties for incentives and assistance.		2	All	Target developed properties that haven't had maintenance	Completed records check with priority list.	**CWCo, CCo**	SourceWell, CWF, MN Green Corps, UMN Extension	2021-2022 $1,000/yr	$2,000
Ensure land application sites for septage are in compliance (nutrients, bacteria, PFAS).		3	All	Surficial sand aquifer	100% compliance	**MPCA**	MPCA	$0	$0
Continue to enforce SSTS ordinances and update as needed.		1	All	NA	Effective ordinances	**CWCo, CCo**	NA	$1,000	$10,000
							Goal Total	**$23,400/yr**	**$234,000**

Goal 6. Chloride Management

Ground Water

GOAL: **Provide resources, information, and training** on chloride management to cities, public, and road authorities.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Work with cities to ensure they are applying chlorides to roads following best management practices. See Winter Maintenance Assessment Tool (WMAt) at https://www.pca.state.mn.us/water/salt-and-water-quality		3	Headwaters, South Fork, Whitefish, Lower Pine	See Figure 6-8 (Goals Section)	All cities comply with BMPs	**CSWCD, CWSWCD**, Backus, Pine River, Breezy Point, Crosslake, county highway departments	MPCA	2020-2030 $1,000/yr	$10,000
Educate property owners and plumbers about the proper use of softener salt so as to not impact septic system or city water treatment.		2	All	NA	One workshop per year	**CSWCD, CWSWCD**	more capacity	2020-2030 $1,000/year	$10,000
Cost share regional upgrades to road salting equipment.		2, 3	Headwaters, Whitefish, Lower Pine	Towns: Backus, Pine River, Breezy Point, Crosslake	New equipment for each town.	Townships, Backus, Pine River, Breezy Point, Crosslake, county highway departments	funding for upgrading equipment	2026-2029 $25,000/yr	$100,000
Provide training to road authorities, private snow removal contractors, and dust control on chloride BMPs.		2	Headwaters, Whitefish, Lower Pine	Towns: Backus, Pine River, Breezy Point, Crosslake, Gravel Pits	Three workshops per year	**CSWCD, CWSWCD**	more capacity	2020-2030 $1,000/year	$10,000
							Goal Total	**$13,000/yr**	**$130,000**

Goal 7. Well Sealing

Ground Water

GOAL: Seal 60 unused residential wells to prevent groundwater contamination.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Seal 60 unused wells.		1	Headwaters, Whitefish, Lower Pine	Surficial sand aquifer areas (Figure 6-9)	6 wells/year	**CWCo, CCo**	CWF	2020-2030 $6,000/year	$60,000
Conduct a well inventory to produce a map of all wells in the watershed. Combine data from geologic atlas.		1	All	NA	Map and database. Know how many wells and septic systems are in the watershed.	MDH, Geologic Atlas, TSA8	CWF	2027-2028 $2,500/yr	$5,000
Develop a program for individual wellhead protection, distribute educational information. Combine with septic system education.		2	All	Rural landowners	Develop a program	Public	1W1P, MDH	2023-2024 $2,500/yr	$5,000
							Goal Total	**$7,000/yr**	**$70,000**

Goal 8. Habitat Protection

Forestry & Habitat

GOAL: Protect 13 miles and 4,718 acres of undeveloped riparian lands through outreach to private residents.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Implement conservation easements in areas with identified sensitive shoreline.		3	Headwaters, Whitefish, Daggett Brook, Little Pine, Lower Pine	Priority Lakes, Figure 6-10.	4,718 acres protected, 13 miles of shoreline protected	**CWSWCD, CSWCD**, NWLT, Miss Headwaters, DNR	LCCMR, LSOHC, USFWS, TNC	2020-2030 $50,000/yr	$500,000
Manage conservation easements to ensure compliance.		1,2	All	NA	100% compliance	**CWSWCD, CSWCD**, TNC, MLT, NWLT, DNR	CWF, LSOHC, LCCMR, BWSR RIM	2020-2030 $2,000	$20,000
Promote acquisitions (AMAs, WMAs) in areas identified with sensitive shoreline		3	Headwaters, Whitefish, Daggett Brook, Little Pine, Lower Pine	Priority Lakes, Figure 6-10.	4,718 acres protected, 13 miles of shoreline protected (outcome numbers are combined with conservation easements, not additive)	**DNR, CWCo, CCo**	DNR, MLT, CWCo, CCo	2020-2030 $50,000/yr	$500,000
							Goal Total	**$102,000/yr**	**$1,020,000**

Goal 9. Habitat Restoration

Forestry & Habitat

GOAL: Restore 2 miles of lakeshore or riparian vegetation.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Work with private landowners to install buffers along riparian lands.		1, 2	Whitefish, Daggett Brook	Priority Lakes, Figure 6-11	2 miles of shoreline restored	**CWSWCD, CSWCD**, WAPOA, ACCL	CWF	2020-2030 $132,000/yr	$1,320,000
Continue to administer Shoreland Management Ordinances. Coordinate land use ordinances in the watershed where possible.		1, 2	All	NA	Meet once a year and agree to notify the other entity of ordinance changes.	**CWCo, CCo**, cities, townships, DNR	CCo, CWCo	2020-2021 $5,000/yr Staff time	$50,000
Provide education and/or conduct workshops on shoreland BMPs and restoration options including the need for proper permits/project reviews within shoreland areas.		1	Whitefish	Priority Lakes, Figure 6-11	1 workshop each year	**CWSWCD, CSWCD**, WAPOA, ACCL, LARA	CWF	2020-2030 $1,000/yr	$10,000
Complete a LiDAR/remote sensing study to understand trends in shoreland change.		2	Whitefish, Daggett Brook	Priority Lakes, Figure 6-11	Inventory report and maps	**CSWCD**, CWCo, TSA8	SWCD, Source Well	2025-2026 $10,000/yr	$20,000
Native tree sale conducted each spring for landowners.		1	All	NA	Sell 30,000 trees each year.	**CWSWCD**	SWCD - current funding	2020-2030 $15,000/yr	$150,000
							Goal Total	**$155,000/yr**	**$1,550,000**

Goal 10. Water Retention

Surface Ground

GOAL: Maintain an average discharge of 306,945 acre-feet at the pour point of the Pine River Watershed.

Implementation Action:	Program	Level	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Lead/Supporting Entities:	Funding Source	Timeframe	Total 10-year Cost
Replace improperly installed culverts at 36th Ave.		2	South Fork	South Fork Pine River	Meet or exceed Fish IBI	**CSWCD**, CCo, Townships, DNR	SWCD, CWF, LCCMR	2024-2025 $1,500/yr	$3,000
Replace culverts along Long Farm Road to improve connectivity.		2	Whitefish	Willow Creek	Meet or exceed Macroinvertebrate IBI	**CWSWCD**, CWCo, Ideal Township, DNR	SWCD, CWF, LCCMR	2024-2025 $1,500/yr	$3,000
Provide engineering and design support for culvert replacements.		2	South Fork, Whitefish	Arvig Creek, Behler Creek, Bungo Creek, Hay Creek, Pine River South Fork/Ditch #4	Support 3 culvert replacements in highest priority areas (Figure 6-5)	County Hwy Depts, Townships	SWCD, CWF, LCCMR	2026-2029 $3,300/ culvert	$10,000
Outreach to road authorities for support in maintaining culvert information.		2	All	Watershed-wide	One meeting/year	SWCD, Road authorities	Road authorities	2020-2030 $1,000/yr	$10,000
Implement and monitor Minnesota Buffer and Soil Loss Law through monitoring, education, and buffer installation assistance to attain County water quality buffer compliance.		1	South Fork, Whitefish	Ditch map	Maintain 100% compliance over 10 years	SWCDs, BWSR, counites	BWSR	2020-2030 $10,000/yr	$100,000
							Goal Total	**$12,600/yr**	**$126,000**

Actions that were 100% completed in 2019-2024

Original Goal	Implementation Action:	Program	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Description of Work Completed in 2019-2024
Culvert Mgmt	Complete watershed-wide culvert inventory and identify incorrectly sized culverts causing water quality issues. Training on the Collector App.		South Fork, Whitefish	Whitefish Chain	Mapped inventory of culverts. ☑	Cass County staff completed a culvert inventory according to the MN DNR requirements and worked with counties to gather data.
Wetlands	Identify wetlands and soils that are producing high phosphorus for potential sites for wetland restoration.		South Fork	Bungo Creek	Identify 2 problem areas ☑	Crow Wing SWCD worked with EOR to sample stormwater at Wilson and Arvig Creeks and identified locations for potential BMPs.
Nitrates	Coordinate with the DNR on well installation in the watershed and future monitoring including one or more wells in Cass County on public land.		All	NA	At least one monitoring well in the watershed ☑	The MN DNR installed a new observation well at Pine River Township. Cass SWCD has a contract to monitor the well.
Pasture Mgmt	Inventory of pastureland in the South Fork sub-watershed and determination of whether it is intensive or rotational grazing. Identify high phosphorus areas and how to manage them.		South Fork	Whitefish Lake, Impaired Streams	GIS database and map of pastureland. ☑	Crow Wing SWCD contracted with HEI to develop PTMApp for the Southfork Pine River subwatershed. This identified potential future projects.
Phosphorus Reduction	Alum treatment on Arrowhead Lake to reduce phosphorus loading to Upper Whitefish Lake.		Whitefish	Arrowhead Lake	Complete feasibility study. ☑	HEI completed a BATHTUB model and determined that Alum treatment in Arrowhead Lake would not be successful in reducing Upper Whitefish phosphorus.
	Inventory stormwater inputs draining into the Whitefish Chain.		Whitefish	Lakes: Whitefish Chain	Map, # of catchments ☑	In the summer of 2020, Crow Wing SWCD contracted with HR Green to inventory stormwater inputs. Minimal feasible projects were found.
	Conduct a phosphorus sediment study of Upper Whitefish Lake for options on how to reduce in-lake loads.		Whitefish	Upper Whitefish Lake	pre-settlement phosphorus concentration vs present day. ☑	Crow Wing SWCD worked with EOR to complete sediment core samples of Upper Whitefish. They determined that Alum would be too expensive and insufficient to improve the lake.

Orig-inal Goal	Implementation Action:	Program	Targeted sub-watersheds (HUC10):	Prioritized Resources (lakes or watersheds):	10 year Measurable Outcome:	Description of Work Completed in 2019-2024
Chloride Mgmt	Implement brining in Cass County. Crow Wing County already uses brining.		All	N/A	Brining used in both counties ☑	Cass County has adopted an MPCA innovative salting training program and techniques. Brining is now used in both Cass and Crow Wing Counties. Cass County sells brine to other municipalities and counties now as well.
Habitat Restoration	Complete an impervious surface inventory for Cass County and update Crow Wing County inventory. Use for ranking projects.		Headwaters, Daggett Brook	Cass County Large Lakes	Inventory report and maps ☑	An impervious study and maps were completed for Cass County in 2020.

Pine River Watershed

One Watershed One Plan

Photo credit: Mitch Brinks

Section 8.

Plan Implementation Programs

8. Plan Implementation Programs

This section of the plan describes key programs that can be used to implement the PRW1W1P. These programs are organized into four categories: Planned Landscape Management (Manage It), Protected Lands Maintenance (Keep It), Constructed Environmental Enhancements (Fix It), and Analysis and Information (Figure 8-1).

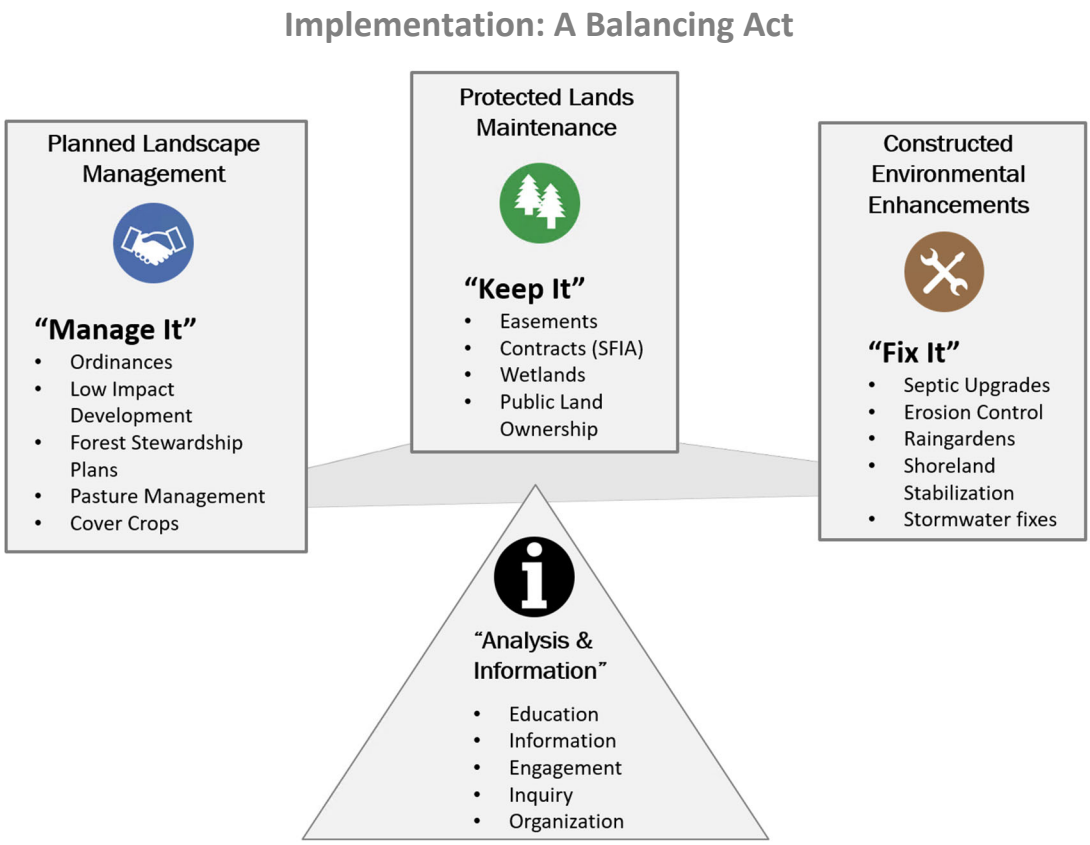


Figure 8-1. Plan Implementation Programs for the PRW1W1P.

"Fix It"

Constructed Environmental Enhancements

"Fix it" programs involve installation of on-the-ground, usually permanent or long-term constructed enhancements including septic system upgrades, erosion control, rain gardens, cattle fencing, and well sealing.

Project Spotlight:

There are some very successful "Fix It" projects that have already been implemented in the Pine River Watershed. Crow Wing County has leveraged two Clean Water Fund grants from BWSR totaling $52,000 to seal 186 unused and abandoned wells since 2012. The grants cover 50% of well sealing costs and the landowner is responsible for the remaining balance. The well-sealing initiative far exceeded a 2013 local water plan goal of sealing 20 wells in 10 years. In 2019, the county received a $31,000 Clean Water Fund grant from the Minnesota Department of Health to continue their efforts to seal abandoned wells.

Cost-Share Programs

Cost-share programs are where the costs to install a project or adopt land practices (for example habitat improvement, forest health, or stormwater retention) are shared with the landowner. There are many cost-share programs available through the Cass and Crow Wing County Soil and Water Conservation Districts. These programs will be continued with the hope of increased watershed-based funding for plan activities.

Through the implementation of this plan, cost-share programs will be actively targeted to the prioritized areas for enhancement and protection (Tables 5-1 & 5-2). Projects in non-priority areas will be considered on an opportunity basis.

Low-Interest Loans

Low-interest loans may be made available for septic system replacement, small community wastewater-treatment systems, agricultural best management practices, or other projects that meet the eligibility criteria.

Capital Improvements

Capital improvement projects are larger in scale, more expensive, and a longer lifespan than cost-share programs. They often require feasibility studies before design and construction. These projects are often done in collaboration with multiple entities and are good candidates for state or federal grant funding. Example projects that could be considered are stormwater improvements in the city of Crosslake and a new sewer line in Moonlight Bay.

Figure 8-2. Rain garden installation.

"Manage It"

Planned Landscape Management

"Manage It" programs involve managing the landscape with programs such as ordinances, regulations, private forest management plans, and pasture management.

Regulation and Enforcement

Counties and cities will meet once a year to discuss ordinances and counties will notify each other of any proposed ordinance amendments. A full comparison of Cass and Crow Wing County Ordinances can be found in Appendix F.

Shoreland Management

Minnesota has shoreland management rules that are administered by the DNR. Local governmental units are required to have land-use controls that protect shorelands along lakes and rivers, and they can adopt more strict ordinances than the state's if desired. Crow Wing and Cass Counties both have DNR Approved Ordinances that are more restrictive than the DNR, but they are slightly different. The DNR published an Innovative Shoreland Standards Showcase website that may be helpful to local governments as they implement this plan: https://www.dnr.state.mn.us/waters/watermgmt_section/shoreland/innovative-standards.html

Crow Wing County	☑ DNR Approved Ordinance	1,000 ft. for lakes, 300 ft. for streams/rivers, & 500 ft. for the Miss. R.
Cass County	☑ DNR Approved Ordinance	1,320 feet to all Public Waters

Regulations: Minnesota Statute 103F and Minnesota Rules 6120.2500–3900

Buffer Management

In 2015, Minnesota enacted legislation requiring buffers of perennial vegetation of an average of 50 feet with a minimum of 30 feet on public waters and 16.5 feet for public drainage systems. This program is regulated by BWSR and implemented at the county level.

Crow Wing County	No Ordinance
Cass County	☑ Approved Ordinance and 100% compliant in 2019

Regulations: Minnesota Statutes 103B and 103F.48, Subd. 4

Septic System Ordinance

The Subsurface Sewage Treatment System (SSTS) Program is administered by the MPCA in order to protect the public health and environment. SSTS Ordinances are adopted and enforced at the county level, and exceed state requirements. Low interest loans and low income grants are available through the Region 5 Development Commission to replace noncompliant septic systems.

Crow Wing County	☑ Alternative Local Standards for less than 2,500 GPD for Types 1-3, MN Rules for everything else
Cass County	☑ Alternative Local Standards for less than 2,500 GPD for Types 1-3, MN Rules for everything else

Regulations: Minnesota Statutes 115.55 and 115.56, Minnesota Rules Chapters 7080, 7081, 7082, 7083.

Groundwater use

The Minnesota DNR administers groundwater appropriation permits for all users who withdraw more than 10,000 gallons of water per day or 1 million gallons per year. SWCD and County Planning and Zoning Offices are offered the opportunity to comment on these permit applications.

Regulations: Minnesota Statute 103G for appropriation; 103H, 1989 Groundwater Act

Aquatic Invasive Species

Invasive species, both aquatic and terrestrial can cause ecological and economic damage to water resources and forests. The DNR has regulatory authority over aquatic plants and animals and terrestrial animals. The MDA has regulatory authority over terrestrial plants (noxious weeds) and plant pests. The counties have inspectors who have enforcement over noxious weeds. For aquatic species, permits are required by the general public for transporting lake water, invasive species, and for treating invasive plants.

Regulations: Minnesota Statute 84D

Waste Management

Waste-management permitting and regulatory programs (including hazardous waste, storage tanks, and solid waste) are implemented by the MPCA. The counties each have a hazardous-waste facility available at no charge to county residents.

Crow Wing County	☑ Crow Wing County Solid Waste Disposal Site, 15728 State Highway 210, Brainerd
Cass County	☑ Cass County Solid Waste Transfer Station, 1705 St Hwy 371, Backus, MN

Regulations: Minnesota Statutes 115.55, Minnesota Rules Chapters 7001, 7035, 7045, 7150, 7151,9215, 9220.

Feedlots

Feedlots are administered by the MPCA and county land use ordinances. Cass and Crow Wing are not delegated counties and as such the MPCA is the chief regulatory agent for feedlots in both counties, the land use ordinance is secondary (Figure 9-5).

Regulations: Minnesota Rules Chapter 7020

Public Waters

The Minnesota DNR administers the Public Waters Work Permit Program, which regulates activities below the Ordinary High-Water Level (OHWL) in public waters and wetlands. Many activities along the shoreline, including excavating, filling, and building are required to be permitted.

Regulations: Minnesota Statute 103G.245

Point-Source Pollution
Point sources, such as municipal waste water treatment plants, industrial discharges, and stormwater, are regulated by the EPA's National Pollutant Discharge Elimination System (NPDES). In Minnesota these regulations are implemented by the MPCA.

Regulations: Minnesota Statutes 115 and 116, as amended, and MN Rules Chapters 7001, 7050, 7060 and 7090; Minnesota Rules Chapters 7050 and 7052

Private Forest Management

There are many different options for managing forests on privately-owned lands. These can range from permanent protection (page 92) to management plans described in this section. For a full list of options, see the Private Forest Landowner Implementation Toolbox, Figure 4-2.

Forest Stewardship Plans
A *Woodland Stewardship Plan* is a way for private landowners to manage forests on their own lands. It can include protection and forest harvest activities and qualifies the landowner to apply for local or state tax-relief or incentive programs. Plans must be prepared by a DNR-approved plan writer, which may include SWCD staff and private foresters. For more information contact the SWCD or see https://www.dnr.state.mn.us/foreststewardship/sfia/registration.html

Forest 2C Designation
Landowners that have a registered *Woodland Stewardship Plan* with the DNR are eligible for 2C Classification, which is a state program that provides a reduced tax rate to forested property of 20 acres or more.

Operations and Maintenance

After projects are installed, regular inspections and maintenance are required to ensure the project's continued function and success. These details, along with records including notes and photos should be included in the O&M Plan. Minnesota State Rules Chapters 8400.1700 and 8400.1750 outline the program requirements for the projects funded through state cost-share programs.

BWSR's recommended inspection plans include the following:

Conservation practice with a minimum effective life of 10 years:
- the ends of Years 1, 3, and 9 after the certified completion are recommended.

Capital-improvement projects with a minimum effective life of 25 years:
- The ends of Years 1, 8, 17, and 24 after certified completion is a recommended minimum.

If easement encroachments or maintenance requirements are not corrected within the designated time frame, the authorities vested in local government units and state and funding agencies will be used to compel compliance.

"Keep It"
Protected Lands Maintenance

"Keep It" programs involve permanent landscape protection including conservation easements, Aquatic Management Areas, public land ownership and Sustainable Forest Initiative Act contract lands.

Project Spotlight:

There are some very successful "Keep It" projects that have already been implemented in the Pine River Watershed. The Pine River Healthy Water Protection (HWP) was the first BWSR approved Clean Water Funded protection program and was the crucible of invention for Clean Water Fund Reinvest in Minnesota (RIM). In this project, Crow Wing SWCD partnered with The Nature Conservancy and BWSR to receive $2 million from Clean Water Fund matched by The Nature Conservancy by $250,000. To Date, 5 easements for 174 acres and 1 mile of shoreline have been protected. There are 4 more easements in the process for 392.9 acres and 3 miles of shoreline protected (March 2019).

Conservation Easements

Conservation Easements are individually tailored agreements through which landowners voluntarily limit the use and development of their property to permanently preserve its natural and/or scenic features. These features could include wildlife and vegetation habitat, lake or river shoreline, wetlands, or important scenic lands that benefit the public. Many organizations provide help with conservation easements including the Northern Waters Land Trust, Minnesota Land Trust, and The Nature Conservancy. The local SWCD can help direct landowners to what will work for them.

Land Acquisition

When there is a unique and important resource that meets state goals the DNR may purchase and manage the land as a state-owned resource. A couple examples include an Aquatic Management Area for fish spawning habitat or a Wildlife Management Area for small game hunting and waterfowl migration.

Sustainable Forest Incentive Act

The Sustainable Forest Incentive Act (SFIA) provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped. Private landowners can receive a payment for each acre of qualifying forest land they enroll in SFIA. In return, they agree not to develop the land and to follow a forest management plan for a set period of time: either 8, 20, or 50 years. For more information, visit:
https://www.dnr.state.mn.us/foreststewardship/sfia/index.html

Wetlands

Activities in a wetland are regulated by the Minnesota Wetland Conservation Act (WCA), which intends to result in "no net loss" of wetlands through various mitigation, replacement and permitting activities. WCA is administered locally by Crow Wing County Land Services and Cass County Environmental Services.

"Analysis and Information"

Outreach, Inventories, and Monitoring

Analysis and information programs include inventories, monitoring, and public outreach efforts. These efforts are integral to achieving the plan's goals.

Public Participation and Engagement

Public participation and engagement are crucial to this plan's success. Because this is a protection watershed, much of the activities are voluntary rather than regulated. Luckily, there are many established organizations in the watershed to partner with in implementing this plan including the Pine River Watershed Alliance (PRWA), the Whitefish Area Property Owners Association (WAPOA), the Association of Cass County Lakes (ACCL), Lakes and Rivers Alliance (LARA), Lake Associations, and others.

This plan will continue the Advisory Committee, which is made up of local stakeholders in the watershed. The Advisory Committee will meet twice a year to track progress of the plan implementation. Advisory Committee members are also advocates of this plan, and will help promote it to their respective community groups and others.

Outreach activities named in this plan include:

- Promote private forestry stewardship planning [Goal 1].
- Expand the availability of educational materials, workshops, and network of resources for promoting stormwater management to lake residents [Goal 2].
- Implement an educational program to increase knowledge of septic system maintenance, individual wellhead protection, water softener and road salt use [Goals 6, 7, 9].
- Provide training to road authorities, private snow removal contractors, and dust control on chloride best management practices [Goal 7].
- Provide education and/or conduct workshops on shoreland best management practices and restoration options including the need for proper permits/project reviews within shoreland areas [Goal 11].
- A total of $257,000 (average $25,700/year) is proposed for implementing outreach in this plan.

Information on better land management choices to citizens

Most of the actions listed above are related to providing information on better land management choices to citizens. Throughout this planning process, the Advisory Committee discussed and encouraged these activities. These activities ranged from groundwater to surface water to forests. A summary of the subjects and ways to reach citizens is presented in Table 8-1.

Table 8-1. Ways to reach citizens about better land management choices.

Subject	Workshops	Lake Association meetings	Mailers	Educational articles	Presentations
Septic System Maintenance		x	x	x	x
Wellhead protection		x	x	x	x
Shoreland habitat protection		x	x	x	x
Water softener salt use		x	x	x	x
Private Forest Management	x	x	x	x	x

Capacity Building

It is important to continually engage the Policy Committee and other government officials in this plan and increase their understanding of plan programs. Updates to these groups will be done on an annual basis, as well as increased communication between the Cass and Crow Wing County Boards.

This plan also will likely need additional staff to implement plan programs, which will build capacity at each of the PRW1W1P entities.

Data Collection and Monitoring

Data collection and monitoring are crucial in watershed management. These activities inform watershed managers of current conditions and track project progress toward meeting the watershed plan's goals. Sometimes additional data is needed to implement plan projects, so filling data gaps is another activity in this plan.

Monitoring is already occurring on many levels with many organizations (Table 8-2). These programs are ongoing and provide valuable information for this plan. Because these are already established projects, they don't cost any additional funds for this plan.

Figure 8-3. Monitoring a lake with a Secchi disk and a 2-meter integrated sampler.

Table 8-2. Summary of ongoing water quality & quantity monitoring programs. RS = rivers & streams, L = lakes, W = wetlands, and GW = groundwater.

Parameters	MPCA	MN DNR	MDH	MDA	County	Lake Associations
Nutrients	RS, L, W	RS, L		RS, GW	GW	RS, L
Suspended Solids	RS, L, W	RS		RS		
Productivity	RS, L	RS		RS		RS, L
Pesticides				RS, L, W, GW		
Bacteria	RS, L		GW			
Biology	RS, L, W	RS, L				
Water level/Flow	RS, L	RS, L				
Algal Toxins	L					
Invasive Species		RS, L			L	RS, L
Fish Contaminants	RS	L				
Chlorides	RS, L, W	RS	RS, L, GW	RS		
Sulfates	RS, L, W	RS, L	RS, L, GW			

Current Monitoring and Data Collection

- Every 10 years, the MPCA conducts intensive monitoring of each of the state's 80 major watersheds (HUC8). This monitoring resulted in the Watershed Restoration and Protection Strategy (WRAPS) for the Pine River Watershed in 2017. This intensive monitoring is expected to occur again in the Pine River Watershed in 2022.
- The organizations in the Pine River Watershed have a strong history of water quality monitoring, with over 95 of the lakes in the watershed having 10-year transparency trend data (Appendix C). This plan intends to continue to encourage local lake association volunteers to collect this data so that future trends may be tracked throughout the plan's 10-year lifespan.
- There are many stream sites being monitored by volunteers through the MPCA's Citizen Stream Monitoring Program and through local laboratories. Stream testing for transparency and phosphorus tracks the loading going into lakes and throughout the watershed.
- The biological community is tracked in lakes by the DNR (fish communities) and in streams by the MPCA (macroinvertebrate and fish communities). The biological communities better illustrate the full picture of water quality and habitat quality than just water samples, because the data show what animals can live in the water body year-to-year. The WRAPS conducted in 2017 resulted in some biological impairments, meaning that there were less macroinvertebrates present than expected (Figure 5.4). After restoration activities are implemented from this planning effort, these streams can be re-tested to see if the biological communities have recovered.

- Surface water quantity is monitored as part of the MPCA's intensive watershed monitoring program. Through this program stream loads at specific watershed pour points can be tracked for changes. The US Army Corps of Engineers monitors daily water levels and flow at the Cross Lake Dam, which controls the water levels in the Whitefish Chain of Lakes.

Ground Water

- Crow Wing County offers nitrate testing for watershed residents.
- The Minnesota Department of Health requires arsenic, nitrate, and bacteria tests on every new well installed.
- The Minnesota DNR monitors groundwater quantity through the Cooperative Groundwater Monitoring System.

Forests & Habitat

- The Pine River Watershed Landscape Stewardship Plan (LSP 2017) was instrumental in providing the numbers for assessing current land protection levels. The LSP provided numbers on a minor watershed scale including:
  - Acres currently protected (public land, easements, SFIA, wetlands, public waters)
  - Acres that have the potential for protection
  - A percent protected goal for each minor watershed
  - The cost for protection in each minor watershed to the goal (50% easements at 60% of the current land value and 50% SFIA)
- In 2012-2014 Crow Wing County completed an inventory of shoreland impervious surface area around large priority lakes. This study was used to identify areas for shoreline habitat restoration.
- The DNR completed a Sensitive Shoreline Assessment of large priority lakes in the watershed. These areas are mapped (Figure 6-11), and are targeted for habitat protection.

Figure 8-4. White pines.

Filling Data Gaps

This implementation plan contains some data gathering and inventory actions. The Planning Work Group would like to complete these items over the life of the 10-year PRW1W1P and the results from these inventories will inform plan projects. Project partners and additional capacity will likely be necessary to complete these actions. Specific costs for each of the actions can be found in the Implementation Table in Section 6.

- Continue citizen Secchi depth monitoring program to maintain trend data on 95 lakes in the watershed [Goal 2].
- Inventory of stormwater inputs draining into Whitefish Lake [Goal 2].
- Conduct a phosphorus sediment study of Upper Whitefish Lake and incorporate results into a report with options on how to reduce in-lake loads [Goal 2].
- Complete a TMDL study on Lake Emily [Goal 2].
- Inventory of pasture land in the South Fork sub-watershed and determination of whether it is intensive or rotational grazing [Goal 3].
- Complete a watershed-wide culvert inventory and identify incorrectly sized culverts causing water quality issues. Gain training on the collector app [Goal 4].
- Use the new National Wetlands Inventory (NWI) to prioritize wetlands for protection [Goal 5].

Ground Water

- Conduct a records check to find developed lots that haven't had a recent septic system inspection. Target those properties for incentives and assistance [Goal 6].
- Implement voluntary lake sweeps for septic system inspections [Goal 6].
- Provide free nitrate testing to residents with private wells [Goal 8].
- Inventory potential industrial forest holdings for future agricultural development and subdivision [Goal 8].
- Conduct a well inventory to produce a map of all wells in the watershed. Combine data from geologic atlas [Goal 9].

Forests & Habitat

- Monitor conservation easements to ensure compliance [Goal 10].
- Complete a shoreland impervious surface inventory for Cass County and update the Crow Wing County inventory [Goal 11].

Achieving Plan Goals

Overall plan monitoring and progress will be tracked by Crow Wing County. Projects completed as a part of this plan will be compiled on a map on an annual basis and displayed on the project website: https://www.crowwing.us/1476/Pine-River-1W1P.

The PRW1W1P's major focus for surface water is protection of stable and improving lakes, and enhancement of declining lakes (Figure 3-2). Continuation of the volunteer lake monitoring program will enable future tracking of lake water quality trends to see if plan goals are achieved. For Whitefish Lake, specifically, additional monitoring will be needed to track water quality improvements from projects such as alum treatment in Arrowhead Lake, pasture management in the South Fork subwatershed, and restoration of impaired streams. This will be done by monitoring transparency and phosphorus concentrations in Arrowhead Lake, monitoring the Pine River inlet to Upper Whitefish Lake for phosphorus concentration, and re-assessing the biological communities of the impaired streams in the next MPCA intensive watershed round.

The PRW1W1P's major focus for groundwater is protecting the shallow sand aquifer and preventing contamination. Protection will be measured by the 75% of the minor watershed metric, which is the same as used in the Forestry and Habitat section. Contaminants will be monitored through continued well testing and keeping records of septic system compliance, maintenance, and improvements.

The PRW1W1P's major focus for forests and habitat is protecting undeveloped sensitive shorelands and uplands and restoring habitat in developed riparian areas. Protection will be measured by the 75% of the minor watershed metric. Records will be kept at the county of the number of acres in each watershed that are protected including updating any new easements, SFIA contracts, and acquisitions. Habitat restoration will be tracked by the amount of feet and miles restored in shoreland areas of lakes with over 10% shoreland impervious surface and/or a declining water quality trend over the 10-year timeframe of this plan.

Pine River Watershed

One Watershed One Plan

Section 9.

Plan Administration and Coordination

9. Plan Administration and Coordination

The Pine River Watershed One Watershed One Plan (PRW1W1P) will be administered through a Memorandum of Understanding (MOA). The MOA largely contains the same provisions that were included in the memorandum of understanding that was executed to develop the plan. Refinements to the MOA focus on clarifying voting procedures and fiscal agent responsibilities.

Decision-making and Staffing

It is understood that the implementation of the PRW1W1P will require additional capacity including staffing, funding and coordination, than current levels. Successful implementation of this plan will rely on generating active interest and partnerships in the watershed. The PRW1W1P entities also plan to continue sharing technical services with Area 8 Joint Powers Board.

The PRW1W1P will be implemented similarly to this planning effort and current shared services between the entities. Presented below are the probable roles and functions related to plan implementation (Table 9-1). Expectations are that the roles of each committee will shift and change focus during implementation. The PRW1W1P fiscal and administrative duties will be assigned to an LGU through a Policy Committee decision as outlined in the formal agreement. Responsibilities for work planning and serving as the central fiscal agent will be revisited by the Planning Work Group on an annual basis.

Figure 9-1. The PRW1W1P Advisory Committee drafting Issues during the planning process.

Table 9-1. Roles for different groups in the implementation of the PRW1W1P.

Committee Name	Description	Primary Implementation Role/Functions
Policy Committee	One representative from each MOA entity	○ Meet quarterly or as needed ○ Review the implementation funds from plan participants ○ Approve the annual work plan ○ Annual review and confirmation of Planning Work Group priority issue recommendations ○ Direction to Planning Work Group on addressing emerging issues ○ Approve plan amendments
Advisory Committee	A committee of local stakeholders appointed by Policy Committee	○ Meet twice a year ○ Review and provide input for the annual work plan ○ Review and identify collaborative funding opportunities ○ Recommendations to Planning Work Group on program adjustments ○ Assist with execution of the targeted implementation schedule
Planning Work Group	A representative from the staff of each MOA entity and local BWSR Board Conservationist.	○ Review the status of available implementation funds from plan participants ○ Review opportunities for collaborative grants ○ Review annual fiscal reports ○ Review annual reports submitted to BWSR ○ Biennial review and confirmation of priority issues ○ Evaluate and recommend response to emerging issues ○ Prepare plan amendments ○ Implement the targeted implementation schedule
Local Fiscal & Administrative Agent	Crow Wing SWCD	○ Convene committee meetings ○ Prepare the annual work plan ○ Prepare and submit grant applications/funding requests ○ Research opportunities for collaborative grants ○ Compile annual results for annual assessment

Collaboration

Collaboration between PRW1W1P Planning Partners

The PRW1W1P Planning Work Group and Policy Committee recognize the value in collaboration between planning partners in order to successfully implement this plan. The benefits of successful collaboration between planning partners include consistent implementation of actions watershed-wide, increased likelihood of funding, and resource efficiencies gained. Where possible and feasible, the PRW1W1P Planning Work Group will pursue opportunities for collaboration with fellow planning partners to gain administrative and program efficiencies, pursue collaborative grants, and provide technical assistance. The PRW1W1P Planning Work Group will also review similarities and differences in local regulatory administration to identify local successes and identify changes needed in the future to make progress towards goals outlined in this plan.

Collaboration with Other Units of Government

The PRW1W1P Planning Work Group will continue coordination and cooperation with other governmental units at all levels. Coordination with agencies such as BWSR, MNDNR, and the MPCA are mandated through legislative and permit requirements. Cooperation with units of government such as municipalities, city councils, township boards, county boards, joint powers boards, and other water management authorities are a practical necessity to facilitate watershed wide activities.

The implementation actions and goals were predominantly defined through a collaborative effort. However, some agency goals, objectives, directions, and strategies for resource management within the plan area have not been selected as priority issues. The responsibility for achieving the goals associated with lower priority tier issues remains with the respective agency or organization.

The PRW1W1P Planning Work Group, with input from the Advisory Committee, will act as the lead for the implementation of this plan's goals. Due to local funding, technological, and other capacities, the lower ranked issues that were not prioritized are encouraged to be implemented with agency-led efforts, including but not limited to funding.

Collaboration with Others

The success of the PRW1W1P relies on the local support and partnerships that will drive its implementation. Many of these existing collaborations have been involved in the development of this plan and are committed to protecting and enhancing the Pine River Watersheds resources. Partners for these collaborations include, but are not limited to, lake associations, the Association of Cass County Lakes, the Whitefish Area Property Owners Association, Pine River Watershed Alliance, Lakes and Rivers Alliance, civic groups, private businesses, individuals, and foundations. Planning partners collaborate frequently with these groups for education, outreach, and project implementation.

Funding

This section describes how the plan will be funded**.** Plan participants expect to pursue grant opportunities collaboratively to fund implementation of the targeted implementation schedule (Section 7). Within the targeted implementation schedule, actions are assigned implementation programs. Table 9-5 shows the most commonly used programs and grants for executing the implementation programs described by this plan and used within the targeted implementation schedule. These funding grants and programs are cross-referenced to plan implementation programs, thereby showing potential sources of revenue for implementation. Programs will be coordinated uniformly throughout the watershed where possible.

Current programs and funding (Level 1) will not be sufficient to meet the full targeted implementation schedule. As such, the success of implementing the plan will depend on collaboratively sought competitive state, federal, and private grant dollars and increased capacity. As an alternative to reliance on competitive grants, this plan envisions successful legislation to allow for reliable non-competitive grant dollars for plan implementation.

The current funding level (Level 1) is based on the annual revenue and expenditures for the Crow Wing County Soil and Water Conservation District, Crow Wing County Land Services, Cass County Soil and Water Conservation District and Cass County Environmental Services combined and allocated to the Pine River Watershed based on the percentage of each county's land area in the

Pine River Watershed. The current level of investment by each local government unit is expected to remain the same during the PRW1W1P ten-year time period. The current expenditure includes all of the state program and conservation delivery grants, including the Natural Resources Block Grant and SWCD Local Capacity Building Grants. Level 2 and 3 funding describe additional funding that could be obtained to implement the plan (Table 9-2). The total funding can also be broken out by management focus (Table 9-4). Because this is a protection watershed, 59% of the total funding is being spent on protection activities.

Table 9-2. Estimated implementation funding for the PRW1W1P broken out by level.

Level	Description	Estimated Plan Total (10 years)	Estimated Annual Average
Level 1	Continue Current Programs	$2,063,156	$206,316
Level 2	Obtain additional grant and capacity funding	$10,753,566	$1,075,357
Level 3	Partner funding	$1,915,800	$191,580
	Total	**$14,732,522**	**$1,473,252**

Table 9-3. Estimated implementation funding for the PRW1W1P broken out by program.

Implementation Program	Estimated Plan Total (10 years)	Estimated Annual Average
Fix It	$5,949,480	$594,948
Manage It	$431,000	$43,100
Keep It	$8,001,042	$800,104
Inventory & Outreach	$351,000	$35,100
	$14,732,522	**$1,473,252**

Table 9-4. Estimated implementation funding for the PRW1W1P broken out by management focus.

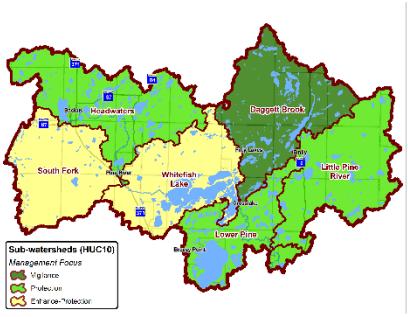
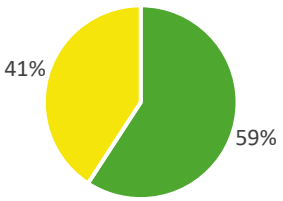
Map of Management Focus Areas	Management Focus	Total Funding	Percentage of total funding
	PROTECT	$8,743,042	
	ENHANCE/ PROTECT	$5,989,480	

Table 9-5. Available funding sources for implementation of the PRW1W1P.

Source	Organization	Program/Fund Name	Type of Assistance	Form of Assistance				
STATE FUNDING	BWSR	Clean Water Fund	Financial	Grant	x			
	BWSR	Reinvest in Minnesota (RIM)	Financial	Easement			x	
	BWSR	Natural Resources Block Grant	Financial	Grant	x			
	BWSR	SWCD Local Capacity Service Grants	Financial	Grant	x	x	x	x
	BWSR	Erosion Control & Management Program	Financial	Grant	x			
	DNR	Conservation Partners Legacy	Financial	Grant	x		x	
	DNR	Aquatic Invasive Species Control	Financial/Technical	Grant		x		
	DNR	Forest Stewardship Program	Technical	Cost Share			x	
	DNR	Aquatic Management Area, Wildlife Management Area	Financial	Fee Title Acquisition			x	
	DNR/Revenue	Sustainable Forest Incentive Act	Financial	Incentive payment			x	
	MPCA	Clean Water Partnership	Financial	Grant	x			
	MPCA	State-Revolving Fund	Financial	Grant	x			
	MPCA	Surface Water Assessment Grant	Financial	Grant				x
	MDH	Source Water Protection Grant	Financial	Grant			x	
	MDH	Nitrate Testing	Technical	Monitoring				x
	MDH	Agricultural BMP Loan Program	Financial	Loan	x			
	LSOHC	Outdoor Heritage Funds	Financial	Grant			x	
	LCCMR	Environmental Trust Fund	Financial	Grant	x		x	
	Legislature	Bonding	Financial	Bond	x			
FEDERAL FUNDING	USDA	Conservation Reserve Program	Financial	Cost Share		x	x	
	FSA	Grassland Reserve Program	Financial	Cost Share		x	x	
	NRCS	Conservation Innovation Grant	Financial	Grant	x			
	NRCS	EQIP	Financial	Cost Share	x	x		
	USGS	Stream Gaging Network	Technical	Monitoring				x
	USACE	Planning Assistance	Technical	Planning		x		
	EPA	State Revolving Fund	Financial	Loan	x			
OTHER FUNDING	Ducks Unlimited		Financial/Technical	Easement/Cost Share	x		x	
	Trout Unlimited		Financial/Technical	Easement/Cost Share	x		x	
	Muskies, Inc		Financial/Technical	Easement/Cost Share	x		x	
	Northern Waters Land Trust*		Financial	Easement			x	
	The Nature Conservancy		Financial	Easement			x	
	Minnesota Land Trust		Financial	Easement			x	

*Formerly Leech Lake Area Watershed Foundation

Local Funding

Local revenue is defined as money derived from either the local property tax base or in-kind services of any personnel funded from the local tax base. Local funding excludes general operating funds obtained from BWSR, fees for service and grants, or partnership agreements with the federal government or other conservation organizations.

These funds will be used for locally focused programs where opportunities for state and federal funding are lacking because of misalignment of a program's purpose with state or federal objectives. These funds will also be used for matching grants where statutory authority already exists. Some examples include:

- Water Planning Authority for Special Projects (Minnesota Statute 103B.355): Counties have the authority to levy funds for priority projects and assist SWCDS with program implementation.
- Road Authorities: Counties can provide limited local funding to assist with the local share of road retention and other floodwater-retention projects.
- Drainage System Costs (Minnesota Statute 103E.601): The funding of all costs related to construction, maintenance, and improvement of drainage systems is apportioned to property owners within the drainage system based on the benefits received from the improved drainage.
- External Sources of Funding (Minnesota Statute 103E.011, Subd. 5): A drainage authority can accept and use funds from sources other than assessments from benefitted landowners for the purposes of flood control, wetland restoration, or water quality improvements., Minnesota Statutes Chapter 103E, section 15, subdivision. 1a requires drainage authorities to investigate the potential use of external funding for the purposes identified in Minnesota Statutes Chapter 103E, section 11, subdivision 5.
- Stormwater Utility Fee (Minnesota Statute 444.075): Municipalities (home rule charter or statutory city that is not in an orderly annexation process) are authorized to collect stormwater utility fees to build, repair, operate, and maintain stormwater-management systems. Stormwater utility fees must be set using reasonable calculations based on runoff volume or pollution quantities, property classification, or an equitable basis.

State Funding

Leadership from the state agencies that are tasked with protection and restoration of Minnesota's water resources came together and agreed on a set of high-level state priorities that align their programs and activities working to reduce nonpoint source pollution. The resulting Nonpoint Priority Funding Plan outlines a criteria-based process to prioritize Clean Water Fund investments. These high-level state priority criteria include:

1. Restoring those waters that are closest to meeting state water quality standards
2. Protecting those high-quality unimpaired waters at the greatest risk of becoming impaired
3. Restoring and protecting water resources for public use and public health, including drinking water

State funding includes all funds derived from the State tax base for state cost-share and regulatory purposes. State funding excludes general operating funds obtained from BWSR, counties, fees for service and grants, or partnership agreements with the federal government or other conservation organizations.

Collaborative Grants

The PRW1W1P fiscal agent, Crow Wing SWCD, will apply as an entity for collaborative grants, which may be competitive or non-competitive. The assumption is that future base support for implementation will be provided to the PRW1W1P as one or more non-competetive implementation watershed-based funding. Where the purpose of an intitiative aligns with the objectives of various state, local, non-profit, or private programs, these dollars will be used to help fund the implementation programs described by this plan. Potential funding sources for the PRW1W1P are outlined in Table 9-5.

Federal Funding

Federal funding includes all funds derived from the Federal tax base. For example, this includes programs such as the Environmental Quality Incentives Program (EQIP) administered by the Natural Resources Conservation Service (NRCS). Federal funding excludes general operating funds obtained from BWSR, counties, fees for service and grants or partnership agreements with state government or other conservation organizations.

Federal agencies need to be effectively engaged following the approval of this plan and prior to implementation, to create an avenue to access federal resources for implementation. An opportunity may exist to leverage state dollars through some form of federal cost-share program. Where the purpose of an implementation program aligns with the objectives of various federal agencies, federal dollars will be used to help fund the implementation programs described by this plan. For example, the USGS will likely provide support for data acquisition and monitoring programs, while the USFWS may provide land-retirement program funds (Table 9-5).

Other Funding Sources

Foundations, nonprofit organizations, and private contributions (including landowners and corporate entities) will be sought for plan implementation activities. Local foundations may fund education, civic engagement, and other local priority efforts. Several conservation organizations are very active in the watershed, such as The Nature Conservancy, the Northern Waters Land Trust, and the Pine River Watershed Alliance. These organizations acquire funding of their own and may have project dollars and technical assistance that can be leveraged. Major cooperators and funding sources are private landowners who typically contribute 25 percent of project costs and may donate land, services, or equipment for projects or programs.

Work Planning

This plan envisions collaborative implementation. Therefore, biennial work planning is envisioned to align the priority issues addressed, the availability of funds, and the roles and responsibilities for implementation.

Local Work Plan

A biennial work plan will be developed by the Planning Work Group based on the targeted implementation schedule and any adjustments made through self-assessments. The biennial work plan will then be presented to the Policy Committee, who will ultimately be responsible for approval. The intent of these biennial work plans will be to maintain collaborative progress toward completing the targeted implementation schedule.

Funding Request

The Planning Work Group will collaboratively develop, review, and submit a watershed-based funding request from this plan. This request will be submitted to and ultimately approved by the Policy Committee, prior to submittal to BWSR. The watershed-based funding request will be developed based on the 2020-2021 priority projects outlined in the targeted implementation schedule and any adjustments made through self-assessments.

Assessment, Evaluation, and Reporting

Accomplishment Assessment

Each year the Planning Work Group will provide the Policy Committee with an annual update on the progress of the plan's implementation. Plan progress towards goals will be tracked in spreadsheets and GIS by the metrics described in the Goals and Implementation sections. For example, any additional acres of protection will be tracked so that each year the Planning Work Group can report on how many additional acres were protected in the watershed. These areas can also be added to a map in GIS, highlighting each year's acres in a different color and posted on the plan's web page. Tracking these metrics will also make them available for supporting future work plan development, progress evaluation and reporting.

Partnership Assessment

Every two years, the Planning Work Group will review the PRW1W1P goals and progress towards implementation, including fulfillment of committee purposes and roles, efficiencies in service delivery, collaboration with other units of government, and success in securing funding. During this review process, feedback will be solicited from the boards, Policy Committee, Advisory Committee, and partners such as state agencies and non-governmental organizations (NGOs). This feedback will be presented to the Policy Committee to set the coming biennium's priorities for achieving the plan's goals and to decide on the direction for grant submittals. In addition, this feedback will be documented and incorporated into the five-year evaluation. The PRW1W1P Planning Group intends to pursue watershed-based funding to meet goals and plan implementation schedules.

Five-Year Evaluation

This plan has a ten-year life cycle beginning in 2020. Over the course of the plan life cycle, progress towards reaching goals and completing the implementation schedule may vary. In addition, new issues may emerge and/or new monitoring data, models, or research may become available. As such, in 2025-2026 a five-year evaluation will be undertaken to determine if the current course of actions is sufficient to reach the goals of the plan, or if a change in the course of actions is necessary. At the 10-year mark, and every five years after, the plan will be fully re-evaluated.

Reporting

LGUs have several annual reporting requirements. A number of these reporting requirements will remain a responsibility of the LGUs. However, reporting related to grants and programs developed collaboratively and administered under this plan will be reported by the Fiscal Agent. In addition to annual reports, the Planning Working Group will also develop a biennial State of the Watershed Report. This report will document progress toward reaching goals and completing the targeted implementation schedule and will describe any new emerging issues or priorities. The information needed to biennially update the State of the Watershed Report will be developed through the annual evaluation process.

The Crow Wing County SWCD is the fiscal agent and responsible for submitting all required reports and completing annual reporting requirements for PRW1W1P as required by state law and policy. The MOA organizations will assist in developing the required reports.

Amendments

This plan is in effect through 2030. The activities described in this plan are not prescriptive and are meant to allow flexibility in implementation. Therefore, an amendment will not be required for addition, substitution, or deletion of any of the actions, initiatives, and projects if those changes will still produce outcomes that are consistent with achieving the plan goals. This provision for flexibility includes changes to the activities except for those of capital improvement projects.

During the time that this plan is in effect, new data that provide a better understanding of watershed issues and solutions will be generated. Administrative authorities, state policies, and resource concerns may also change. New information, significant changes to the projects, programs or funding in the plan, or the potential impact of emerging concerns and issues may require revising and updating the plan if major policies or a significant shift in the focus of implementation activities are planned. If revisions are required or requested, the PRW1W1P Policy Committee members will initiate a plan amendment process.

Formal Agreements

The PRW1W1P Policy Committee is a coalition of Crow Wing County and SWCD and Cass County and SWCD. The PRW1W1P Policy Committee previously entered into a formal agreement through a Memorandum of Agreement (MOA) for planning the 1W1P for the Pine River Watershed (Appendix G). The parties will draft a MOA for purposes of implementing this plan. The Policy Committee is advisory to the individual county and SWCD boards under the umbrella of the MOA.

Pine River Watershed

One Watershed One Plan

Section 10.

Appendices

10. Appendices

Appendix A. Additional maps supporting the Land and Water Resource Inventory

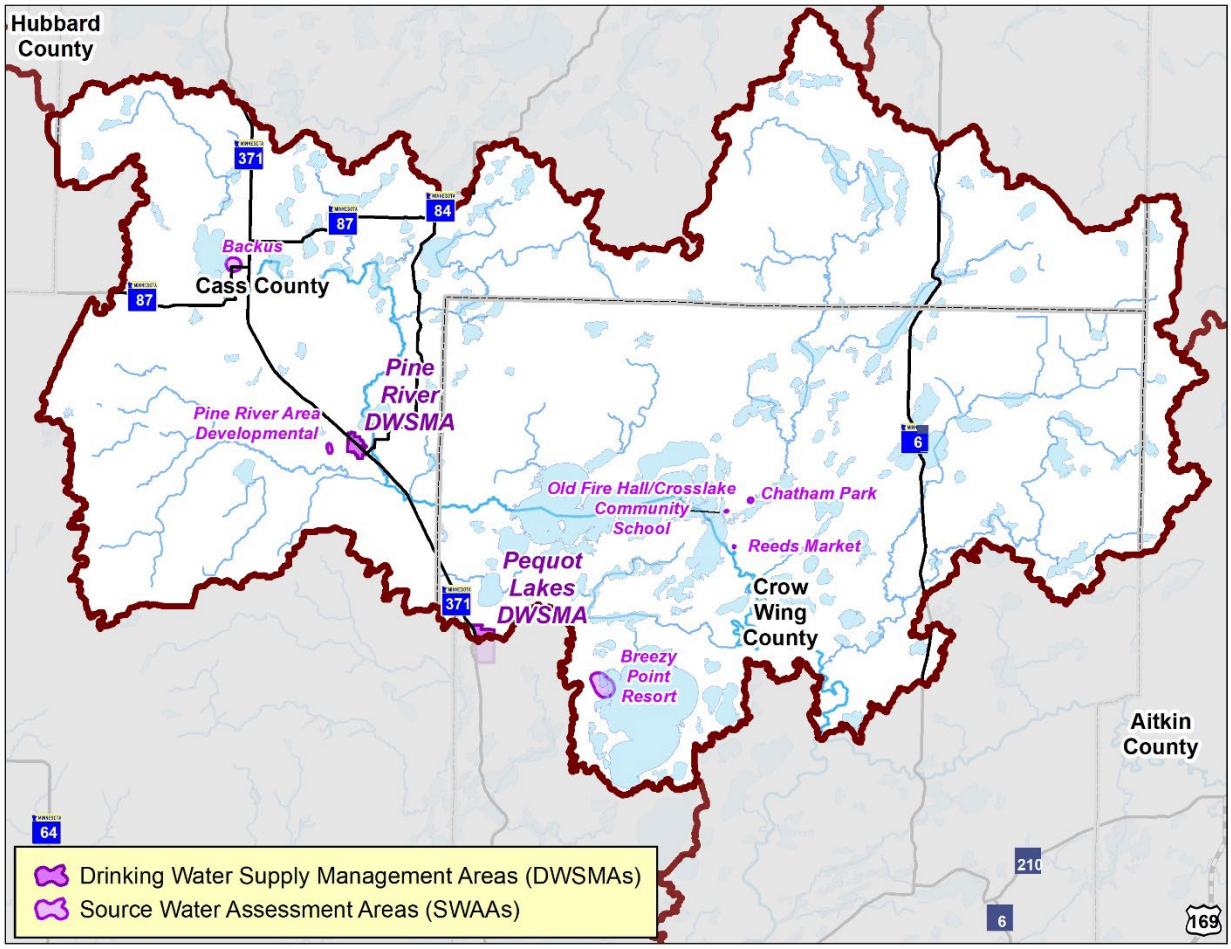


Figure 10-1. Drinking Water Supply Management Areas and Source Water Assessment Areas in the Pine River Watershed.

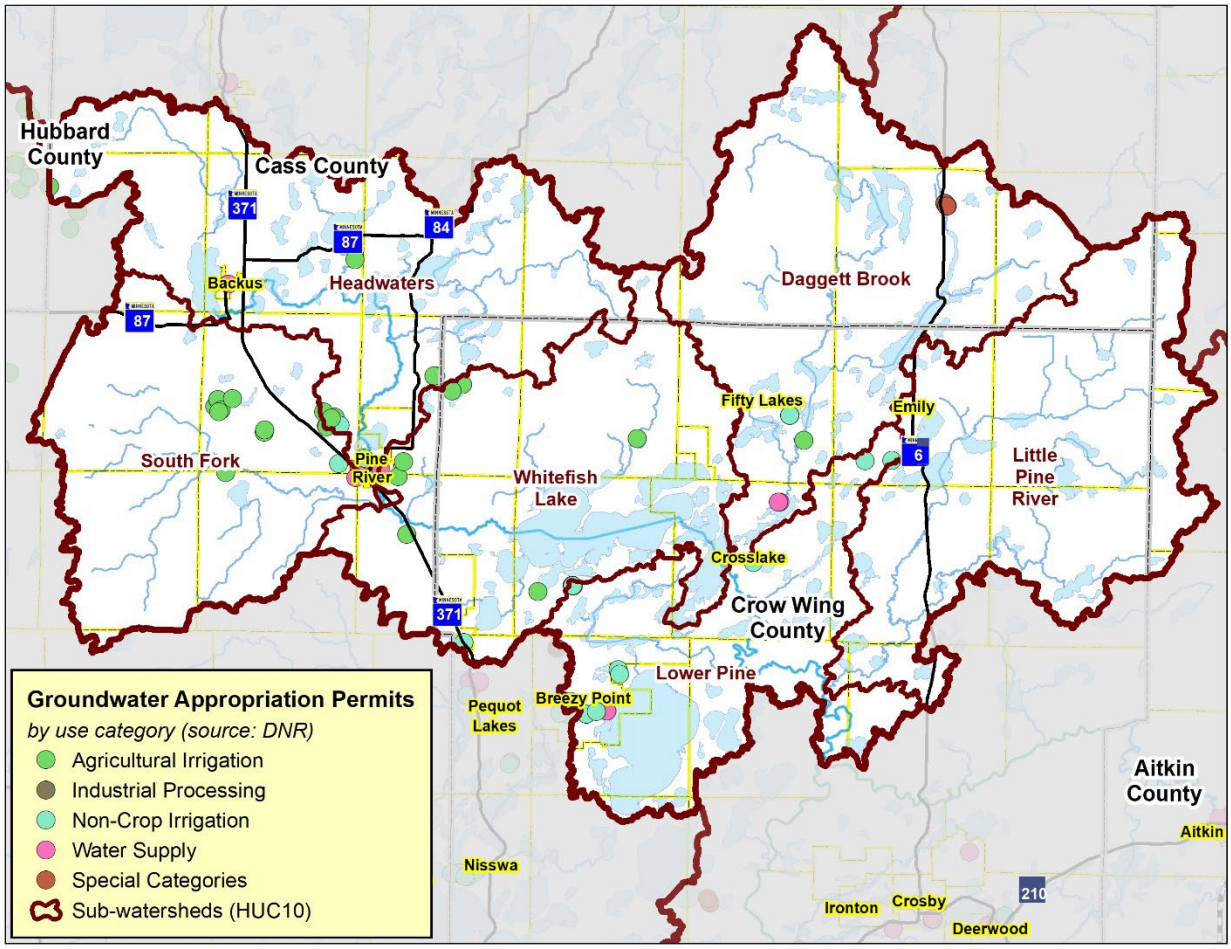


Figure 10-2. Groundwater appropriation permits in the Pine River Watershed.

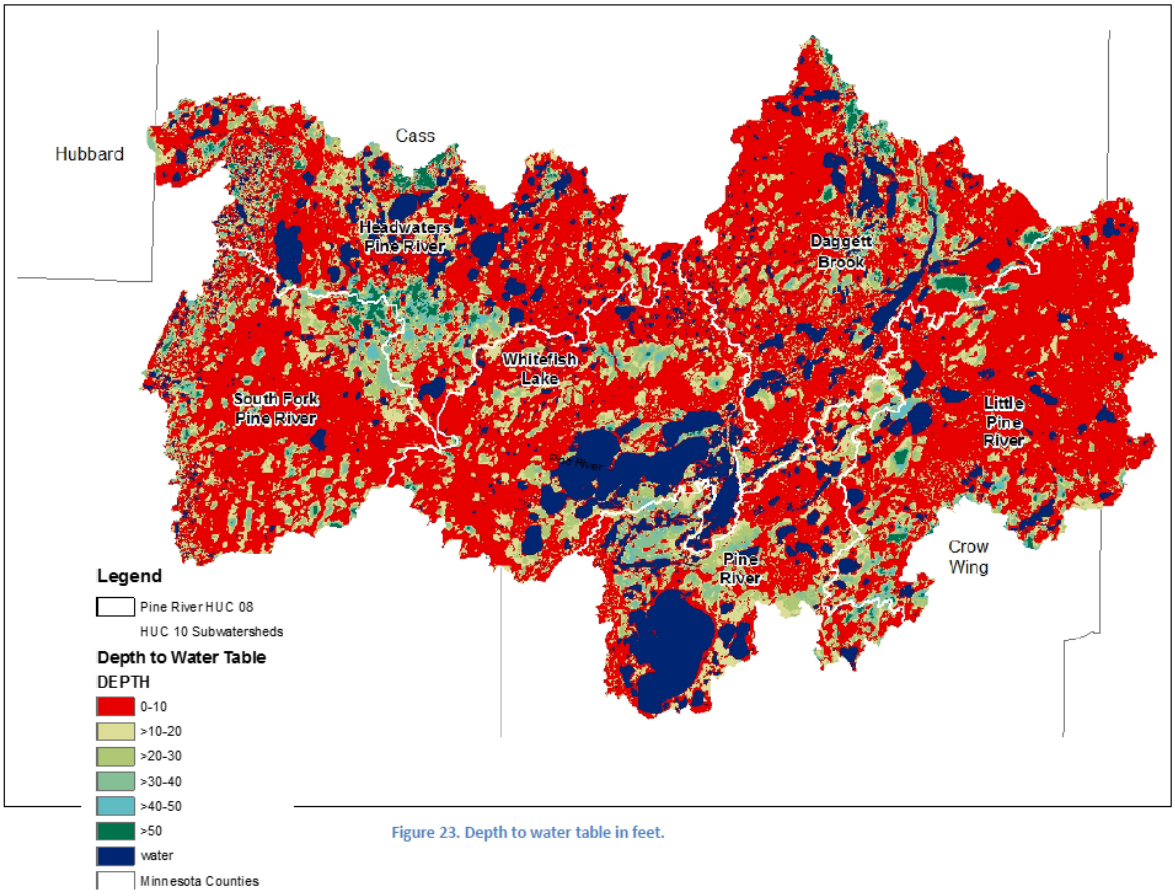


Figure 23. Depth to water table in feet.

Figure 10-3. Depth to water table from the Pine River WRAPS report.

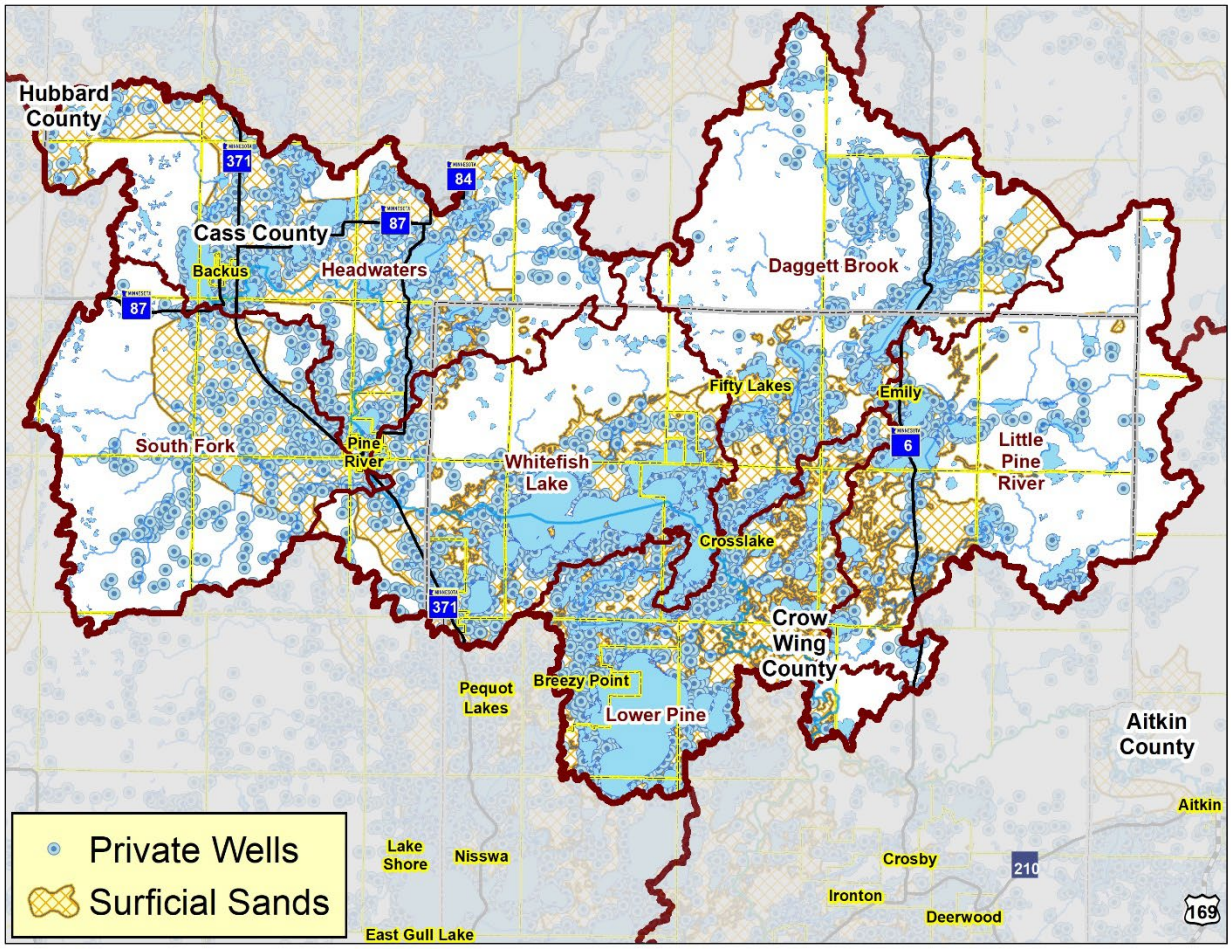


Figure 10-4. Private wells and the surficial sand aquifer in the Pine River Watershed.

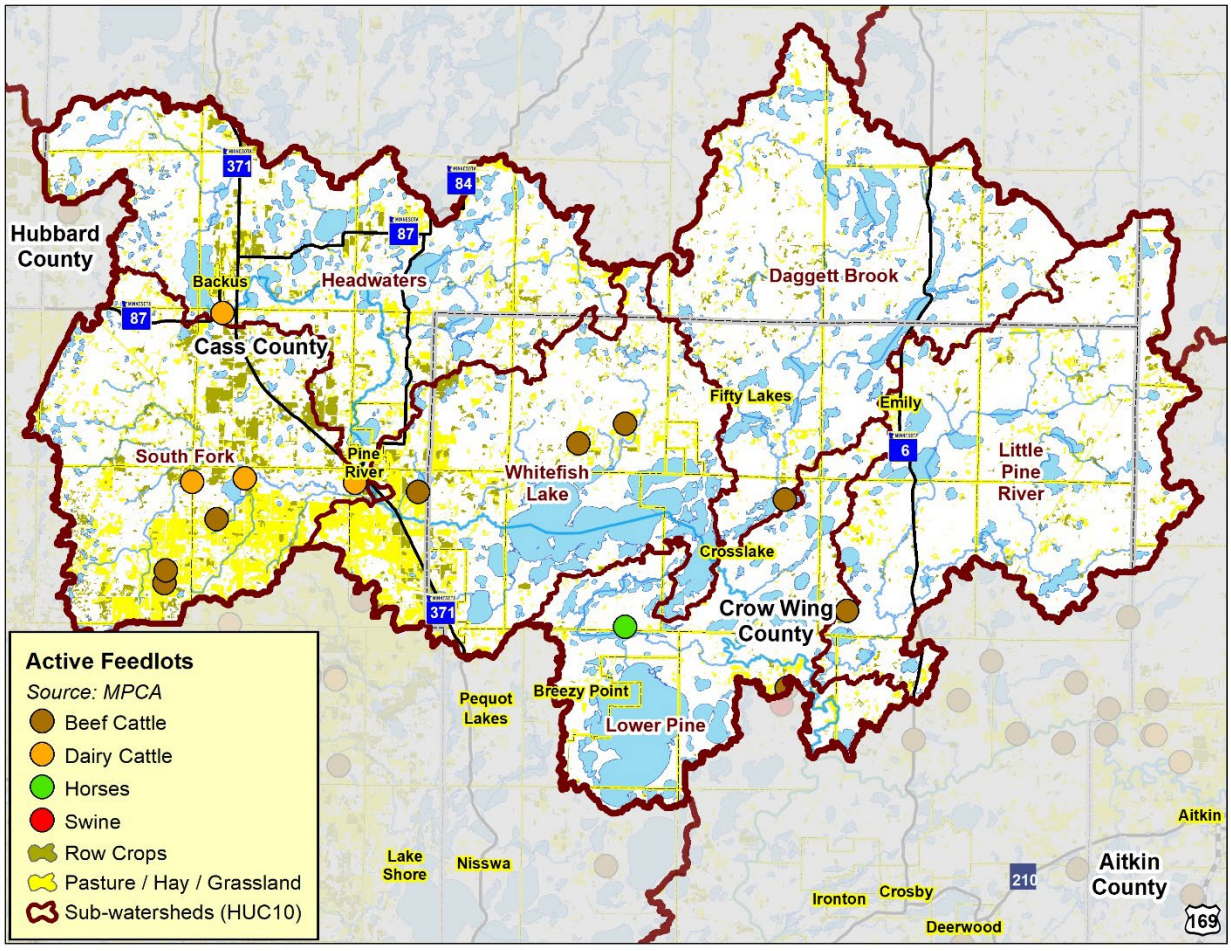
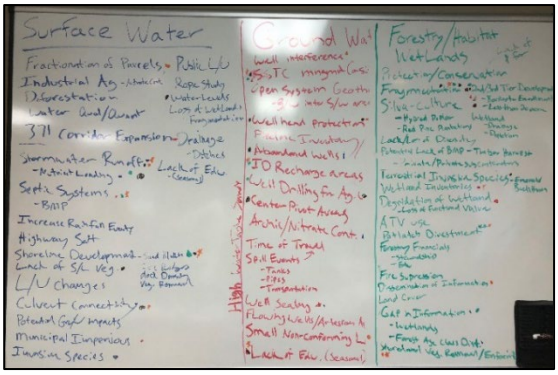


Figure 10-5. Active feedlots, row crops and pasture lands in the Pine River Watershed.

Appendix B. Issues List and Prioritization

The Pine River Watershed Advisory Committee met on June 27, 2018 to generate issues for the Pine River Watershed and then prioritize them. To brainstorm issues, the room divided into two groups and generated their own lists. Then the full group reconvened to share issues and record them all on the marker board.



Surface Water Issues (lakes & streams)

- Fractionation of parcels for residential development
- Commercial row crop agriculture
- Intensive animal use/pasture management BMPs
- Deforestation
- Water quality
- Water quantity
- 371 corridor expansion – increase transportation efficiency
- Storm water runoff/Impervious surface
- Increased high rain events – increased runoff/erosion
- Nutrient loading
- Septic system maintenance
- Erosion
- Road salt from highways
- Shoreline development
    - Dock density
    - Sand blankets
    - Ice ridge removal
- Land use change
- Loss of shoreline vegetation
- Blocking connectivity, culverts, roads
- Outstanding lakes
- Municipal Impervious surface
- Invasive species
- Shallow groundwater impacts
- Public land use – logging, etc
- ROPE study – ACOE, how to use the reservoir vs how to set water levels
    - Reservoir Operation Procedure Evaluation
- Loss and fragmentation of wetlands
- Drainage – increased ditch use for increased precip for ditches that aren't currently maintained
- Source water for St. Cloud, Twin Cities metro area, Sauk Rapids, Little Falls

Groundwater Issues

- Well interference/too many wells in the area for that resource
- Unused wells that aren't capped/ managed
- Well drilling for agricultural use
- Number of private wells/concentration (3,500?)
- SSTS management onsite near wells
- Open loop geothermal systems, unidentified
    - Quantity of putting groundwater into surface areas
- Encourage cities to have drinking water supply management areas, wellhead protection area, land use
- Oil spills and leaks along transportation corridors – identify locations of pipelines
- Need to identify recharge areas
- Arsenic/nitrate contamination
- Time of travel – how quickly water moves through the ground
- Flowing wells
- Small non-conforming lake lots
- Land owner education on wellhead protection
- Seasonal living and not knowing how to manage SSTS and wells
- SSTS sweeps for townships, cities, lakes
- Rapid connection between surface and groundwater here – interface, interconnectivity

Habitat/Forests/Wetlands Issues

- Fragmentation of forests and habitats
- Private forest management
- Divestiture of industrialized forest land, potlach
- Subdivision of 2nd and 3rd tier parcels
- Wetland loss on a local level – is it a problem? Data gap? Wetland inventory
- Degradation of wetlands and reduced function, loss of functional value
- Old growth forests for habitat
- Vegetation removal opens spaces for terrestrial invasive species, buckthorn
- Tree and vegetation species with climate change
- Sensitive areas along shorelines for habitat
- Property value vs ecological value
- Funding for Protection/Conservation – long-term protection, SFIA, Easements
- Silviculture – monocultures, hybrid poplars, row planting, habitat diversity
- Loss of diversity
- Proper best management practices on private lands – wetlands and timber harvest (BMPs not required on private lands
- ATV use near wetlands
- Forestry financials – education to private landowners on how to manage private woodlands
- Too much fire suppression
- Dissemination of information
- Land cover
- Loss of pollinators

Issue Comparison and Prioritization

The table below was created to see where issues and priorities cross and agree between different sources. The State Agency and Existing Plans columns aren't necessarily worded as issues, but they match up with the priority issues generated at the Advisory Committee Meeting on June 27, 2018. Where issues match up between two or three columns they are highlighted in blue. The issues were also put in the same order under each column for comparison. Sources for State Agency Priorities and Existing Plan Priorities are noted in parentheses.

Category	Advisory Committee & Public Issues	State Agency Priorities	Existing Plans Priorities
Ground Water	1. **Sealing of unused wells** 2. **Insufficient well head protection and identification of these areas** 3. **Contaminants entering the groundwater** 4. Insufficient protection (*mapping?*) of groundwater recharge/discharge areas 5. Lack of education of seasonal residents as to how to maintain wells and septic systems. 6. Industrial agriculture 7. Well drilling for agricultural use 8. Pipeline Inventory (*oil?*)	1. **Sealing abandoned wells** (MDH, BWSR) 2. **Wellhead and source protection:** Protecting Water Supply Management Areas in the Pine River Watershed, protection of private wells. Protecting Noncommunity Public Water Supplies (MDH, BWSR) 3. Protection activities in highly vulnerable Drinking Water Supply Management Areas where there are not currently water quality impacts to drinking water aquifers (MPCA, MDH, BWSR).	1. **Well sealing** (CC Water Plan, CWC Water Plan) 2. **Wellhead and source protection** (CWC Water Plan, CC Water Plan, WRAPS-City of Pine River) 3. **Contaminants** (CC Water Plan, CWC Water Plan) 4. Hazardous waste disposal (*could be combined with contaminants*?) (CC Water Plan, CWC Water Plan) 5. Well testing (CC Water Plan, CWC Water Plan)
Ground water / surface water interface	1. **Leakage from improperly maintained subsurface sewage treatment systems** 2. **Insufficient identification, education and protection of shallow vulnerable sands aquifer**	1. **Proper maintenance of septic systems, especially in sensitive areas** (MDH, BWSR) 2. **Shallow groundwater/surface water interface in Pine River Watershed** (MDH, BWSR).	1. **Septic system maintenance** (CC Water Plan, CWC Water Plan) 2. **Shallow groundwater vulnerability** (WRAPS, GRAPS)

Category	Advisory Committee & Public Issues	State Agency Priorities	Existing Plans Priorities
Surface Water	1. **Fractionation of parcels along lakes, shoreline development, high cabin density** 2. **Impervious surface & stormwater runoff (nutrient loading)** 3. **Insufficient agricultural BMPs (nutrient loading)** 4. **Aquatic Invasive Species** 5. Culvert connectivity 6. Lack of education 7. Land Use changes	1. **Development pressure**: planned growth strategies that protect water quality (MPCA, DNR, BWSR) 2. **Stormwater and runoff:** maintain vegetative cover, reduce runoff, and increase water infiltration (MPCA, DNR, BWSR). 3. **High-quality unimpaired waters, unique water resources including lakes that are highly sensitive to phosphorus**, shallow lakes, wild rice lakes, and designated trout streams (MPCA, DNR, BWSR). 4. Prioritize Impairments: 5 lakes and 4 stream reaches (MPCA). 5. Continue Monitoring of lakes and streams to build on the results of the WRAPs (MPCA).	1. **Development pressure** (LSP, CWC Water Plan, WRAPS, NRCS). 2. **Stormwater management and Runoff, vegetative buffers** (CC Water Plan, CWC Water Plan, WRAPS, NRCS) 3. **Agricultural BMPs** (CWC Water Plan, WRAPS, NRCS) 4. **Sensitive, vulnerable biologically significant lakes**: wild rice, cisco, trout (LSP, WRAPS). 5. **Aquatic Invasive Species** (CC Water Plan, CWC Water Plan, MHB Annual Plan) 6. Drinking water source to downstream metropolitan areas (LSP, USDAFS, WRAPS). 7. Lakes with declining trends (LSP, WRAPS, CWC Water Plan, CC Water Plan).
Forests, Habitat, Wetlands	1. **Fragmentation of forests and habitat** 2. **Insufficient Long-term protection** 3. **Enforcement of shoreland vegetation removal** 4. **Historic loss of wetlands** 5. **Lack of current wetland inventories & mapping** 6. **Potlatch divestments (fragmentation)** 7. **Highway 371 Corridor expansion** 8. **Need updated wetland inventory** (*happening statewide as part of LIDAR*) 9. Lack of education & dissemination of information 10. White cedar wetland protection 11. 2nd & 3rd Tier development 12. Gaps in information 13. Lack of funding for protection/conservation programs (i.e. PFM, SFIA).	1. **Manage, maintain, and enhance forest cover** (MPCA, DNR, MDH, BWSR) **with a 75% protection goal** (MDH, BWSR). 2. **Protect and restore upland vegetation next to wetlands, streams, and lakes to benefit wildlife, fisheries, and water quality** (DNR, BWSR). 3. **Maintain, restore, and enhance critical habitats to improve water quality, increase infiltration, maintain biodiversity, and support wildlife (DNR, BWSR).**	1. **Forest conversion to developed or agricultural use & disturbance** (LSP, CC Water Plan, WRAPS, NRCS). **75% protection goal** (LSP, CWC Water Plan, CC Water Plan, WRAPS). 2. **Protect sensitive shoreland habitat to benefit fish and wildlife** (DNR Sensitive Shoreland Report) 3. **Wetland loss & protection** (WRAPS, NRCS, CC Water Plan, CWC Water Plan) 4. **Wetland mapping** (CC Water Plan, CWC Water Plan) (*happening statewide as part of LIDAR*) 5. **Potlatch divestments** (WRAPS) 6. **Highway 371 corridor expansion** (WRAPS)

Category	Advisory Committee & Public Issues	State Agency Priorities	Existing Plans Priorities
Other Items		1. Plan for land use changes in the watershed. Awareness of and planning for changes potentially threaten the health of the watershed, including invasive species, development, and changing climate, should lead to a more resilient watershed capable of adapting to these changes. Use future scenarios from HSPF Modeling in WRAPS (MPCA, DNR). 2. A review of buffer law should be discussed as Cass County has chosen to implement the buffer law while Crow Wing County has not (BWSR). 3. Review of local ordinances and regulations across the watershed should be considered with the purpose of identifying commonalities and significant differences and opportunities for coordination of lakes that are split by political boundaries (BWSR).	

Appendix C. Lake Transparency Trends

Source

The majority of these data were collected by volunteers. The data was compiled from the Minnesota Pollution Control Agency and RMB Environmental Laboratories, Inc

Analysis

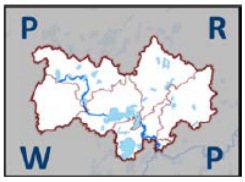
Trend analysis through 2019 was completed with Mann Kendall trend statistic. Eight or more years of data was required to run the trend, and a 90% probability was required for a true trend. "No trend/stable" indicates that there was no statistical trend above 90% in the data.

DNR_DOW	LAKE_NAME	FINAL TREND
11025000	Ada	Improving
18022500	Adney	No trend/stable
18021300	Anna	Decreasing-weak
18036600	Arrowhead	Declining
18035800	Bass	No trend/stable
18035500	Bertha	No trend/stable
11030800	Big Portage	No trend/stable
18031500	Big Trout	Declining
18021100	Blue	No trend/stable
18023100	Butterfield	Improving
18035600	Clamshell	Decreasing
18036400	Clear	No trend/stable
18031200	Cross	No trend/stable
18027100	Daggett	Improving
11023700	Deep Portage	Decreasing
11005900	Donut	Increasing
18035000	Douglas L	Increasing-weak
18029601	Eagle	No trend/stable
11034200	Eagle	No trend/stable
18029603	Eagle - East Basin	No trend/stable
18029602	Eagle - West Basin	Declining
18029800	East Fox	Declining
18025700	East Twin	No trend/stable
18020300	Emily	Declining
11035100	Five Point	Increasing
18022400	Fool	Increasing
11010100	George	No trend/stable
18022600	Goodrich	No trend/stable
11024200	Hand	No trend/stable
11025500	Harriet	Increasing-weak

DNR_DOW	LAKE_NAME	FINAL TREND
11023200	Hattie	No trend/stable
11019900	Hay	Increasing
18027000	Hen	Decreasing
11035800	Horseshoe	Increasing
18025100	Horseshoe	No trend/stable
18018300	Island	Declining
18026900	Island	Decreasing
11010200	Island	No trend/stable
18041500	Jail	No trend/stable
11036300	Johnson	Increasing-weak
18029300	Kego	No trend/stable
18036100	Kimball	No trend/stable
11005300	Lawrence	No trend/stable
11003700	Leavitt	Declining
18020700	Little Emily	No trend/stable
18035100	Little Pelican	Increasing
18026600	Little Pine	Improving
11023600	Little Portage	Increasing-weak
18035700	Little Round	No trend/stable
11023000	Little Sand	No trend/stable
18036000	Little Star	Increasing
18032400	Littler Markee	No trend/stable
18034200	Lougee	Improving
18037800	Lower Hay	Improving
18034700	Lynch	Increasing
18034300	Markee	Increasing
18018500	Mary	Declining
18029400	Mitchell	No trend/stable
18016600	Mud	Decreasing
18041100	Nelson	Increasing-weak
11030700	Norway	Declining
18022700	O'Brien	No trend/stable
18035200	Ossawinnamakee	Improving
18028800	Ox	Declining (95%)
11035500	Oxyoke	No trend/stable
18020600	Papoose	No trend/stable
11005500	Pavelgrit	No trend/stable
18030800	Pelican	Improving
18035400	Pig	Declining
18026100	Pine	No trend/stable
11041100	Pine Mountain	No trend/stable

DNR_DOW	LAKE_NAME	FINAL TREND
11035600	Rainy	Decreasing
11004301	Roosevelt Lake - North	No trend/stable
11004302	Roosevelt Lake - South	No trend/stable
18016500	Ross	No trend/stable
18031100	Rush	No trend/stable
18021200	Ruth	No trend/stable
11036100	Sanborn	Increasing
18034800	Shaffer	No trend/stable
18022000	Smokey Hollow	No trend/stable
18035900	Star	Increasing
11011600	Stevens	No trend/stable
11024600	Sylvan	No trend/stable
18021800	Trout	No trend/stable
18041300	Unnamed	No trend/stable
18041200	Upper Hay	No trend/stable
11046300	Variety	No trend/stable
18028400	Velvet	No trend/stable
11005900	Washburn	Improving
18029700	West Fox	No trend/stable
18025800	West Twin	No trend/stable
18031000	Whitefish	Declining
18031000	Whitefish	Declining
18022200	Wood	No trend/stable
18025200	Young	Possible Increasing

Appendix D. Landscape Stewardship Plan Summary



Pine River Watershed Landscape Stewardship Plan

Key Concepts:

- Keep Forested Lands Forested
- Keep Forested Lands Working (management is encouraged)
- Follow the Risk (to private lands)
- Priority is at the intersection of Quality & Risk
- Stack Public Benefits to Maximize Taxpayer Investment $$
- Build in Resilience to Existing Public Forest Lands
- Major in the Minors using Improved Methodology (incl. RAQ Scoring)

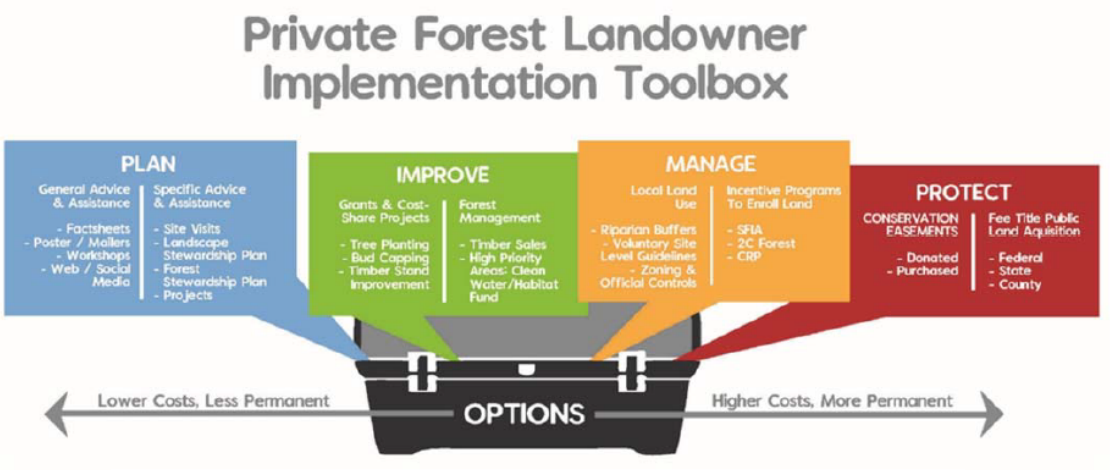
Protected Lands in the Pine River Watershed					
Public Lands	Public Waters	Wetlands (Private)	Easements (no wtl)	SFIA (no wtl)	Total
40%	13%	8%	1%	2%	64%

Additional Lands (not considered "protected"):
Managed Forest 2C Lands (upland only) = 2%
Forest Stewardship Plans (on file with DNR) = 5%

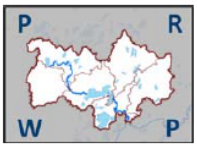
What's in the Plan?

- Part 1: Where have we been and where are we at today?
  - Forest / Watershed Protection
  - Sub-watershed & Minor Watershed Framework
- Part 2: Where do we want to go?
  - To the landowners (we don't plan to plan, we plan to implement!) using the Implementation Toolbox
  - Target using RAQ Scoring (R=Riparian, A=Adjacency to Public Lands, Q=Quality)
- Part 3: How will we get there?
  - Need strong PFM program/leadership
  - Need strong tools w/funding (Implementation Toolbox)
  - Need strong teamwork (Local Tech. Team) working collaboratively with other efforts, such as 1w1p

The Plan Includes 69 Minor Watershed Protection & RAQ Scoring Maps



Foundational Concept: Landowner's Choose



Pine River Landscape Stewardship Plan:
Where do we want to work?

Cluster A: Whitefish Lake North Shore

- The WFC, when paired with the adjacent Ossawinnamakee and Pelican lakes, is one of the largest concentrations of high quality surface water in Minnesota. This area makes up a significant portion of the county's tax base.
- The Whitefish Chain (WFC) has a very large watershed as it receives flow from both the Headwaters and South Fork sub-watersheds.
- The WFC is downstream from two large public forestland complexes; the Stewart Lake till plain to the north, and the St. Croix moraine to the west. These two public forest areas ease runoff off the higher elevations down into the outwash plain and into the lakes. They are the foundation around which further forest protection can be built.

Cluster B: Pine River Headwaters

- The Headwaters sub-watershed is a forested watershed with a "protection" status of about 60% There are numerous high quality small to medium sized lakes in this sub-watershed, including Sanborn and Oxyoke, which are very highly sensitive to increased phosphorus. Thick with wild rice, the Pine River flows through many of these smaller lakes.
- This cluster focuses on private forested land between the two large blocks of public land located on the St. Croix moraine to the west and the Stewart Lake till plain to the east. This interface between public and private lands is an important place to target PFM.

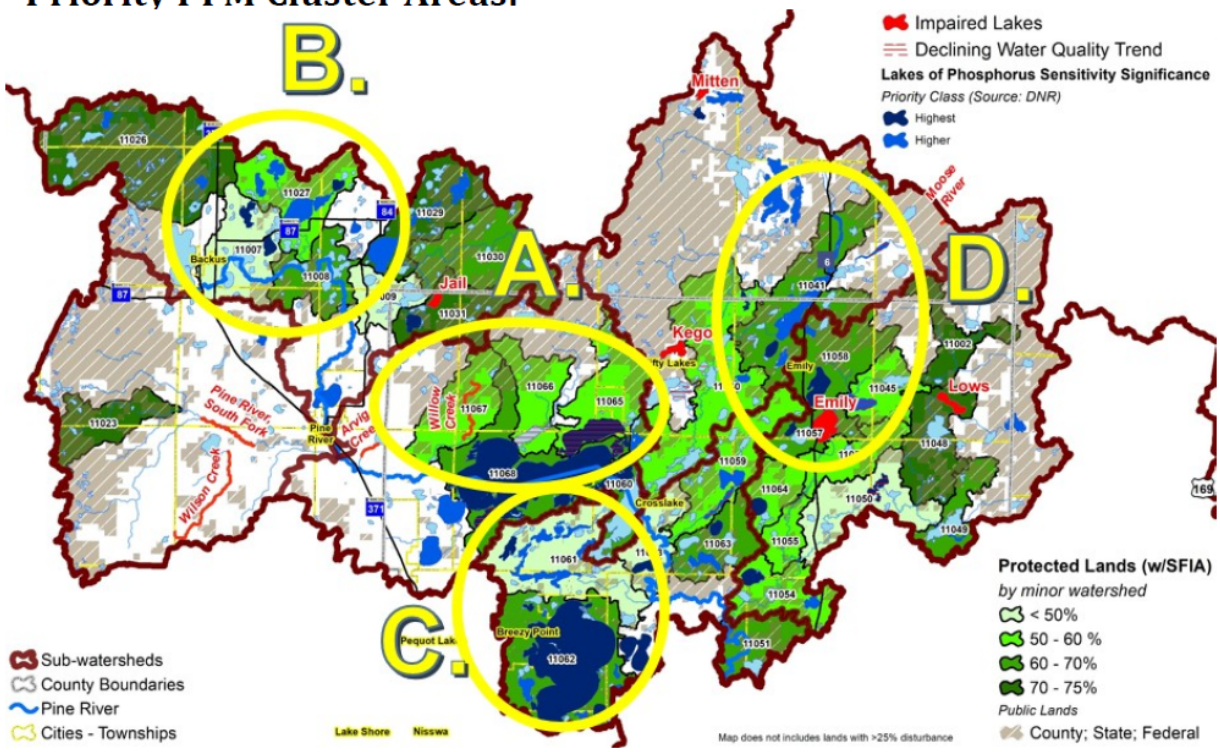
Cluster C: Pelican/Ossawinnamakee Lakes

- Pelican Lake is a large high quality recreational lake that is also very highly sensitive to phosphorus loading.
- Lake Ossawinnamakee is between Pelican and the WFC and is also an important high quality lake in its own right. In addition, its minor watershed contains numerous high quality lakes, many of which contain tullibee/cisco, a cold-water forage fish.
- This cluster has abundant private forest land, but is at risk for development given it's proximity to Highway 371.

Cluster D: Outing/Emily Area

- This cluster is part of the Daggett Brook sub-watershed (78% "protection" status) and the Little Pine sub-watershed (71% "Protection"). It contains Roosevelt Lake, which is one of the six largest lakes in the Pine River watershed, but is below 75% protection. Both Roosevelt and its neighbor, Ruth Lake, are highly sensitive to phosphorus loading. This area has abundant private forest land remaining.

Priority PFM Cluster Areas:



The full Landscape Stewardship Plan can be found online: https://www.crowwing.us/1476/Pine-River-1W1P

Appendix E. Potential Protection Acreage for all Minor Watersheds

Some minor watersheds have a protection goal of less than 75% due to the potential of acres that were available for protection. The protection goal for each minor watershed was determined during the Landscape Stewardship Planning process (LSP 2017).

Table 10-1. Potential protection acreage and cost for all minor watersheds.

Minor wshd #	Lake	Acres of Minor wshd	Current % Protection	Current Acres Protected	Protection Goal (%)	Protection Goal (ac)	Acres Needed for Goal	Land Value (>20 acre tracts)	Total Cost to Achieve Protection Goal (incl SFIA for 100 years)	Cost for Easements only	SFIA for only 10 years
11024		3,145	99.7%	3,136	75%	2,359	0	$0	Goal Met	$0	$0
11034		9,317	99.6%	9,278	75%	6,988	0	$25	Goal Met	$0	$0
11035		5,923	99.5%	5,892	75%	4,442	0	$72	Goal Met	$0	$0
11001		7,063	95.4%	6,739	75%	5,297	0	$236	Goal Met	$0	$0
11003		6,089	91.6%	5,578	75%	4,567	0	$527	Goal Met	$0	$0
11046		5,312	91.1%	4,839	75%	3,984	0	$401	Goal Met	$0	$0
11037	George	7,481	90.9%	6,798	75%	5,611	0	$567	Goal Met	$0	$0
11039		5,370	90.2%	4,841	75%	4,027	0	$557	Goal Met	$0	$0
11044		3,938	88.3%	3,476	75%	2,953	0	$267	Goal Met	$0	$0
11070		5,902	88.0%	5,192	75%	4,426	0	$354	Goal Met	$0	$0
11005		5,433	87.5%	4,754	75%	4,075	0	$519	Goal Met	$0	$0
11025		7,034	86.4%	6,078	75%	5,276	0	$903	Goal Met	$0	$0
11004		5,259	85.5%	4,499	75%	3,945	0	$592	Goal Met	$0	$0
11022		4,648	85.3%	3,964	75%	3,486	0	$436	Goal Met	$0	$0
11033	East Fox, West Fox, Kego	8,592	84.9%	7,294	75%	6,444	0	$522	Goal Met	$0	$0
11036	Island (Cass Co)	6,736	84.2%	5,673	75%	5,052	0	$755	Goal Met	$0	$0
11032		9,971	83.4%	8,316	75%	7,479	0	$668	Goal Met	$0	$0
11048	Lows	7,307	81.9%	5,982	75%	5,480	0	$554	Goal Met	$0	$0
11038	Washburn	7,405	81.7%	6,047	75%	5,554	0	$1,061	Goal Met	$0	$0
11043		9,850	81.6%	8,038	75%	7,387	0	$330	Goal Met	$0	$0
11052	Horseshoe	6,562	78.0%	5,116	75%	4,921	0	$1,323	Goal Met	$0	$0
11002		4,673	75.8%	3,545	75%	3,505	0	$577	Goal Met	$0	$0
11031	Clough	6,151	75.5%	4,646	75%	4,613	0	$570	Goal Met	$0	$0
11042		4,264	75.5%	3,218	75%	3,198	0	$478	Goal Met	$0	$0

table continued on the next page...

Table 10-1 continued. Potential protection acreage and cost for all minor watersheds

Minor wshd #	Lake	Acres of Minor wshd	Current % Protection	Current Acres Protected	Protection Goal (%)	Protection Goal (ac)	Acres Needed for Goal	Land Value (>20 acre tracts)	Total Cost to Achieve Protection Goal (incl SFIA for 100 years)	Cost for Easements only	SFIA for only 10 years
11006	Pine Mtn	7,696	74.5%	5,737	75%	5,772	35	$941	$31,788	$9,813	$2,198
11023		5,589	74.2%	4,146	75%	4,192	46	$598	$37,131	$8,215	$2,892
11026		20,541	73.0%	14,993	75%	15,406	412	$771	$355,914	$95,400	$26,051
11021		4,778	72.2%	3,449	75%	3,584	135	$665	$111,926	$26,846	$8,508
11030		10,745	70.3%	7,551	75%	8,059	507	$885	$455,378	$134,754	$32,062
11029	Ada	8,771	68.3%	5,994	75%	6,578	585	$1,191	$578,262	$208,837	$36,943
11051	Fool	4,919	67.9%	3,338	75%	3,689	351	$1,302	$358,802	$137,063	$22,174
11008	Hattie	5,895	67.7%	3,990	75%	4,421	432	$1,572	$476,207	$203,473	$27,273
11041	Roosevelt	13,588	66.3%	9,004	75%	10,191	1,187	$802	$1,035,347	$285,369	$74,998
11068	Whitefish Chain	15,733	65.5%	10,302	75%	11,800	1,498	$1,072	$1,428,883	$481,858	$94,703
11060	Rush, Cross	5,274	63.7%	3,362	75%	3,955	594	$294	$427,529	$52,311	$37,522
11062	Pelican	17,816	63.5%	11,322	75%	13,362	2,040	$1,138	$1,986,194	$696,815	$128,938
11063	Velvet	5,518	63.3%	3,495	75%	4,138	643	$1,226	$643,195	$236,586	$40,661
11049	Ross	4,043	62.8%	2,538	75%	3,032	495	$1,384	$518,051	$205,390	$31,266
11058	Ruth	7,697	62.2%	4,788	75%	5,773	985	$664	$819,098	$196,314	$62,278
11057	Emily, Dahler	4,033	62.2%	2,507	75%	3,025	518	$769	$446,926	$119,508	$32,742
11045	Mary	4,658	61.8%	2,879	75%	3,494	614	$829	$540,943	$152,793	$38,815
11027	Deep Portage, Big Portage	8,642	59.9%	5,178	75%	6,482	1,303	$1,230	$1,304,506	$480,764	$82,374
11067		6,916	59.3%	4,102	75%	5,187	1,085	$1,047	$1,026,659	$340,804	$68,585
11065	Big Trout	8,263	58.6%	4,846	75%	6,197	1,351	$3,635	$2,327,832	$1,473,731	$85,410
11054	Adney	6,224	58.4%	3,632	75%	4,668	1,036	$1,237	$1,039,232	$384,394	$65,484
11056		4,725	57.9%	2,737	75%	3,544	806	$1,166	$791,625	$281,981	$50,964
11055		2,593	54.8%	1,421	75%	1,944	524	$1,195	$518,685	$187,722	$33,096
11064		3,577	53.6%	1,917	75%	2,683	766	$1,245	$770,285	$286,136	$48,415
11066	Arrowhead	5,698	53.1%	3,028	75%	4,274	1,245	$1,156	$1,218,881	$431,915	$78,697
11040	Eagle, Mitchell, Daggett, Little Pine	16,968	52.0%	8,831	75%	12,726	3,895	$1,237	$3,907,728	$1,445,900	$246,183
11059	Goodrich, O'Brien	8,354	49.8%	4,164	75%	6,266	2,102	$1,470	$2,256,099	$927,428	$132,867

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Table 10-1 continued. Potential protection acreage and cost for all minor watersheds

Minor wshd #	Lake	Acres of Minor wshd	Current % Protection	Current Acres Protected	Protection Goal (%)	Protection Goal (ac)	Acres Needed for Goal	Land Value (>20 acre tracts)	Total Cost to Achieve Protection Goal (incl SFIA for 100 years)	Cost for Easements only	SFIA for only 10 years
11053		5,025	48.9%	2,457	75%	3,769	1,311	$991	$1,218,763	$389,957	$82,881
11017		3,783	47.7%	1,806	60%	2,270	464	$2,148	$591,739	$298,774	$29,297
11019		3,206	47.5%	1,521	60%	1,923	402	$1,403	$423,474	$169,273	$25,420
11014		11,103	46.4%	5,157	75%	8,327	3,170	$1,303	$3,243,355	$1,239,730	$200,362
11009	Lizzie	4,087	46.4%	1,898	70%	2,861	963	$1,770	$1,120,009	$511,401	$60,861
11050		8,118	45.9%	3,729	75%	6,089	2,360	$1,550	$2,588,553	$1,097,241	$149,131
11010		8,988	43.9%	3,950	60%	5,393	1,443	$1,120	$1,396,606	$484,741	$91,186
11007	Horseshoe, Lind	8,457	42.0%	3,549	60%	5,074	1,525	$1,246	$1,533,612	$569,910	$96,370
11016		9,492	41.0%	3,888	75%	7,119	3,231	$1,822	$3,807,831	$1,765,727	$204,210
11061	Ossie, Kimball	12,893	36.0%	4,647	63%	8,122	3,475	$1,556	$3,818,465	$1,622,374	$219,609
11011		11,191	35.7%	3,993	60%	6,715	2,721	$1,510	$2,952,475	$1,232,704	$171,977
11020		6,001	33.8%	2,031	50%	3,001	970	$1,984	$1,190,098	$577,209	$61,289
11047	Upper/Lower Hay	8,542	33.8%	2,888	50%	4,271	1,383	$1,949	$1,682,142	$808,316	$87,383
11018		5,422	33.8%	1,832	50%	2,711	879	$1,849	$1,042,965	$487,488	$55,548
11013	Norway	10,617	31.2%	3,309	60%	6,370	3,062	$1,392	$3,213,145	$1,278,224	$193,492
11012		4,386	30.6%	1,343	60%	2,632	1,289	$1,139	$1,255,287	$440,630	$81,466
11028	Tamarac	3,909	29.6%	1,158	60%	2,345	1,187	$1,757	$1,375,610	$625,566	$75,004
11015		2,988	20.6%	615	75%	2,241	1,626	$2,579	$2,285,421	$1,257,838	$102,758
Total Protection Costs for the Pine River Watershed									**$60,152,657**	**$24,349,220**	**$3,580,344**

Appendix F. Phosphorus Load Estimates

The HSPF output from the 2017 WRAPS report was used to calculate the phosphorus loading for each of the major lakes in the watershed, each of the sub-watersheds, and the watershed as a whole (Tables 10-2, 10-3).

Table 10-2. Phosphorus loading for each of the major lakes in the Pine River Watershed, P = Total Phosphorus (WRAPS 2017).

DOW	Lake	County	Management Focus	Loading Focus	HSPF Reach #	Nearshore P Load (lbs/year)	Tributary P Load (lbs/year)	Total P Load (lbs/year)	5% Reduction Goal
18-0378-00	Ada	Cass	Protection	Mix	92	40	673	713	36
18-0366-00	Arrowhead	Crow Wing	Enhance-Protection	Mix	221	376	928	1304	65
18-0355-00	Bertha	Crow Wing	Protection	Mix	280			237	12
11-0308-00	Big Portage	Cass	Protection	Nearshore	52	877	0	877	44
18-0315-00	Big Trout	Crow Wing	Enhance-Protection	Nearshore	224	892	0	892	45
18-0356-00	Clamshell	Crow Wing	Enhance-Protection	Nearshore	280	166	0	166	8
18-0312-00	Cross	Crow Wing	Protection	Watershed	280	321	Whitefish + 3,619	NA	0
11-0237-00	Deep Portage	Cass	Enhance-Protection	Mix	52	97.5	97.5	195	10
18-0203-00	Emily	Crow Wing	Enhance-Protection	Mix	306	519	3101	3620	181
11-0101-00	George	Cass	Vigilance	Mix	246	895	1092	1987	99
11-0232-00	Hattie	Cass	Protection	Watershed	80	279	2857	3136	157
11-0059-00	Horseshoe (CW)	Crow Wing	Vigilance	Nearshore	308	334	0	334	17
18-0183-00	Island	Crow Wing	Enhance-Protection	Watershed	315	44.65	1146.4	1191	60
18-0269-00	Island-Loon	Crow Wing	Enhance-Protection	Nearshore	280	85	0	85	4
11-0037-00	Leavitt	Cass	Enhance-Protection	Mix	253	235	589	824	41
18-0412-00	Lower Hay	Crow Wing	Protection	Mix	214	372	540	912	46
18-0185-00	Mary	Crow Wing	Enhance-Protection	Mix	305	382	3109	3491	175

Table continued on next page...

Table 10-2 continued. Phosphorus loading for each of the major lakes in the Pine River Watershed, P=Total Phosphorus (WRAPS 2017).

DOW	Lake	County	Management Focus	Loading Focus	HSPF Reach #	Nearshore P Load (lbs/year)	Tributary P Load (lbs/year)	Total P Load (lbs/year)	5% Reduction Goal
11-0307-00	Norway	Cass	Enhance-Protection	Mix	120	1630	3313	4943	247
18-0227-00	O'Brien	Crow Wing	Protection	Mix	267	91	456	547	27
11-0411-00	Ossawinnamakee	Crow Wing	Protection	Mix	284	123	369	492	25
18-0311-00	Pelican	Crow Wing	Protection	Nearshore	282	1,234	0	1,234	62
18-0354-00	Pig	Crow Wing	Enhance-Protection	Nearshore	280	80	0	80	4
18-0261-00	Pine	Crow Wing	Protection	Watershed	290	288	13555	13843	692
18-0352-00	Pine Mountain	Cass	Vigilance	Mix	20	630	1,522	2,152	108
11-0250-00	Roosevelt	Cass	Protection	Mix	254	1,243	1,447	2,690	135
18-0165-00	Ross	Crow Wing	Protection	Mix	314	460	601	1061	53
18-0251-00	Rush-Hen	Crow Wing	Protection	Watershed	280	183	Whitefish	NA	9
18-0212-00	Ruth	Crow Wing	Protection	Nearshore	302	357	0	357	18
18-0297-00	Upper Hay	Crow Wing	Protection	Mix	212	334	1,423	1,757	88
11-0043-00	Washburn	Cass	Vigilance	Mix	248	939	840	1,779	89
18-0308-00	West Fox	Crow Wing	Vigilance	Mix	263	128	137	265	13
18-0310-00	Whitefish	Crow Wing	Enhance-Protection	Watershed	280	2,275	13,574	15,849	792

Table 10-3. Phosphorus loading from each of the sub-watersheds and the Pine River Major Watershed (WRAPS 2017).

Watershed	HUC Level	HSPF Reach	Total Phosphorus Loading out at pour point (lbs/year)
Headwaters Sub-watershed	HUC10	130	3,714
South Fork Pine River Sub-watershed	HUC10	230	6,592
Whitefish Sub-watershed	HUC10	280	12,161
Daggett Brook Sub-watershed	HUC10	266	3,619
Little Pine Sub-watershed	HUC10	319	4,051
Pine River Major Watershed	HUC8	330	18,481

Appendix G. Local Ordinances and Standards

Table 10-4. Land use authority and regulatory control.

General Ordinance Standards	Cass County	Crow Wing	Comments
County Wide Zoning Ordinance	YES	YES	CW = Comprehensive "overhaul" in 2011; Annually updated each year; Cass = 1,320 feet to all PW
DNR Approved Shoreland Ordinance	YES	YES	CW = 1,000 ft. for lakes, 300 ft. for streams/rivers, & 500 ft. for the Mississippi River; Cass = 1,320 feet to all Public Waters
SSTS ordinance	YES - Exceeds	YES	CW = Alternative Local Standards for less than 2,500 GPD for Types 1-3, 7080-7083 for everything else; Cass exceeds minimums in MN Rules 7080
Subdivision Ordinance	YES	YES	CW = Rolled into the County's Land Use Ordinance. In shoreland: Admin. subdivision if creating no more than 5 parcels, each less than 10 acres; Outside shoreland district: Admin. subdivision if creating no more than 6 parcels, each less than 10 ac. More intensive divisions w/in 3 years requires plat process; Cass = up to nine lots meeting zoning district is minor subdivision
WCA Ordinance	YES - Exceeds	YES	CW = Follows MN Rules 8420; Cass = Local Ordinance that exceeds MN Rules 8420
Shoreland Standards			
Allowable # mooring spaces	NO	YES	CW = 1 "mooring space" for each site within the first tier for conservation designs; Cass = Based upon need for resorts & commercial PUD
Boardwalks	YES	N/A - not in MN 6120	CW = Up to 8 ft. with a permit. Permit only required in shoreland district; Cass = 6 feet Wide and needs permit to cross riparian wetlands
Controlled Access Lots	YES	YES	Neither allow Controlled Acess Lots anymore
Dirt Moving - CUP - (Non-Shoreland)	YES - Exceeds	YES - Exceeds	CW = No permit if non-wetland; Cass = >1,000 ydds needs a CUP
Dirt Moving - CUP/Var (Shoreland)(Beyond Building Setback)	YES - Exceeds	YES - Exceeds	CW = Over 100 cubic yards RLZ; Cass >200 yds needs CUP
Dirt Moving - CUP/Var (Shoreland)(Shore Impact)	YES - Exceeds	YES - Exceeds	CW = Over 30 cubic yards SIZ 1, over 50 cubic yards SIZ 2, over 100 cubic yards RLZ; Cass = >50 yds needs a permit
Dirt Moving - no permit (Shoreland)	NO	NO	CW = 0-10 cubic yards SIZ 2, 0-10 cubic yards RLZ; Cass = Any needs a permit
Dirt Moving - no permit (Shoreland) SIZ 2	NA	NA	CW = 0-10 cubic yards SIZ 2
Dirt Moving - Permit - (Non-Shoreland)	YES - Exceeds	YES - Exceeds	CW = No permit if non-wetland; Cass = >200 ydds needs a permit
Dirt Moving - Permit (Shoreland)(Beyond Building setback)	YES - Exceeds	YES - Exceeds	CW = 10-100 cubic yards; Cass = 0-200 yds needs a permit
Dirt Moving - Permit (Shoreland)(Shore Impact)	YES - Exceeds	YES - Exceeds	CW = 0-30 cubic yards SIZ 1, 10-50 cubic yards SIZ 2, 10-100 cubic yards RLZ; Cass = 0-50 yds needs a permit
Dirt Moving -no permit (Shoreland) (Building Setback)	NO	NO	CW = 0-10 cubic yards RLZ, Cass = any needs a permit
Dock (Setbacks Only)	YES	NO	CW = No regulation; Cass = 10 foot side yard setback

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Table 9-2 continued. Land use authority and regulatory control.

Shoreland Standards	Cass County	Crow Wing	Comments
Fences	YES	YES	CW = No permit for fences. Cannot exceed 4.5 ft. in SIZ 1 and SIZ 2; Cass = 8 feet tall
Ice Ridge -Historic	YES	YES	CW = Permit for up to 15 ft. cut if no access through the ridge already exists on the property; Cass = Ice ridge modification 20 feet wide
Ice Ridge -Seasonal	YES	YES	CW = No permit for Annual Ice Ridge Repair, must be done that year; Cass = need permit to restore
Meets Minimum Lot Size Requirements	YES - Exceeds	YES - Exceeds	CW = GD riparian lots: 30k total lot size, 100' min. width, 12k buildable lot size; See Article 11, Table 11.1 for requirements of lot size within the shoreland district; Cass = GD Lakes 30,000 Square feet
Meets Minimum OHW Setbacks	YES	YES	Minimum Standards in MN Rules 6120 are followed
Meets Minimum SSTS OHW Setbacks	YES	YES	CW = Lakes: NE-150 ft., RD-100 ft., GD-75 ft.; Rivers: Mississippi-125 ft., Cold Water-150 ft., Natural Enviroment-150 ft., General Development-100 ft.; Cass = 150 foot setback on all lakes and rivers
Patios in Setback Area	YES	YES	CW = SIZ 1 can follow the water oriented accessory structure rule. SIZ 2 requires a permit, up to 250 sq. ft., and up to 400 sq. ft. with a stormwater plan; Cass = Allows 400 square foot patio - 15% of exisiting building setback - closest is 40 feet
Retaining Walls	YES	YES	CW = Permits required in SIZ 1 and SIZ 2 - 4 ft. height limit without engineer. Prohibited in BIZ. No permit in RLZ.; Cass = Cass - 4 foot height limit without engineered plan
Riprap	YES	YES	CW = No permit required from the county, ordinance indicates that landowner must follow DNR standards; Cass = requires permit and 10 foot buffer
Sand Blankets	YES	YES	CW = Permit for 25 ft. deep x 30% of lot width, 200 ft. max length. Not in a wetland. Annual maintenance is allowed; Cass = 20 feet wide - 50 yards with permit
Shoreline Recreation Area	YES	YES	CW = 25 ft. deep x 30% of lot width, 200 ft. max length; Cass = 20 ft wide
Stairway Lifts Landings	YES	YES	Both = Permits required for stairways/lifts/landings to access the lake/river and in BIZ. 4 ft. wide and 32 sq. ft.
Stormwater / Buffers	YES-Exceeds	YES-Exceeds	CW = Stormwater permits are required for all permits over 15% impervious. The BOA may require one as a condition even if below 15%. Buffers are required based on shoreline rapid assessment model (SRAM) score. A SRAM is done if over 20% or if adding a guest cottage. The BOA may require a buffer as a condition even if below 20%. Cass = at discretion of PC/BOA and ESD using the Shoreline Rapid Assessment Model for permits, CUP variance Plats
Vegetation Removal - Bluff/Steep Slopes	YES - Exceeds	YES - Exceeds	CW = Permit for an 8 ft. clearing in a bluff to accommodate the 4 ft. stairway; Cass = no vegetation removal allowed except for walkway/stairway lifts landings with permit
Vegetation Removal - SIZ 1	YES - Exceeds	YES - Exceeds	CW = Recreational Use area permit for 30% of lot width up to 200 ft. max. 25 ft. deep. Permit to access the Recreational Use area up to 15 ft. wide. Both items are for up to 100% clearing within the described widths/lengths; Cass = 20 foot wide path only with permit
Vegetation Removal - SIZ 2	YES - Exceeds	YES - Exceeds	CW = If not a bluff, no permit/restrictions; Cass = 25% tree removal and 30% shrubs with permit
Walkway/Access Path	YES	YES	CW = Permit for up to 8 ft. wide in SIZ 1, SIZ 2, and BIZ; Cass = 4 foot wide
Water Oriented Structures	YES	YES	CW = 20 ft. OHW setback. Residential 120 sq. ft., Commercial 250 sq. ft.; Cass = 150 Square foot Platform 10 foot setback (Res) and 250 square foot shed 20 foot setback (Com)
Watercraft Access Ramps	YES	YES	Both = Permit if the lake has no public access

Table continued on the next page...

Table 9-2 continued. Land use authority and regulatory control.

Non-Shoreland Standards	Cass County	Crow Wing	Comments
Accessory Structure Requirements	YES - Exceeds	YES - Exceeds	CW = No specific size limit, dictated by impervious; Cass = size limited to lot size
Buildable/Suitable Area Standards	YES - Exceeds	YES - Exceeds	Both CW and Cass require new lots to have minimum buildable/suitable area
Building Height	YES	YES	CW =35 ft. (permission to exceed State height); Cass = 30 feet; State Standard = 25 feet
Conservation Design Standards	YES	YES	CW = Yes, addressed under Article 33 - Residential development standards (see speficially Article 33.8); Cass = Conservation Design Bonus Density
Geothermal	NO	N/A - not in MN 6120	CW = County regulates solar collectors and wind collectors, and other residential energy conversation systsms
Guest Cottage/Guest Quarters	NO	NO	CW = Allowed on any lot size per conditions of ordinance; Cass = allowed on any lot size
Meets Minimum Land Uses Requirements	YES	YES	Permitted vs allowable vs conditional uses
PUD's	NO	YES - Exceeds	CW = See Conservation Design standards (below); Cass = no provision
Decision Making Authority			
Planning Commission Roles	YES	YES	CW = PC/BOA are the same appointed people. PC recommends Plats and Land Use Map Amedment project to the County Board; BOA determines variance and conditional use permits; Cass = PC Final Decision on CUP, Plats, Eaw, EIS

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Appendix H. Memorandum of Agreement

MEMORANDUM OF AGREEMENT

This AGREEMENT is made and entered into by and between the following PARTIES:

The Minnesota Counties of Cass and Crow Wing, by and through their respective County Board of Commissioners, and the Cass and Crow Wing Soil and Water Conservation Districts, by and through their respective Soil and Water Conservation District Board of Supervisors, collectively referred to as the "Parties";

WHEREAS, the Counties of this Agreement are political subdivisions of the State of Minnesota, with authority to carry out environmental programs and land use controls, pursuant to Minnesota Statutes Chapter 375 and as otherwise provided by law; and

WHEREAS, the Soil and Water Conservations Districts (SWCDs) of this Agreement are political subdivisions of the State of Minnesota, with statutory authority to carry out erosion control and other soil and water conservation programs, pursuant to Minnesota Statutes Chapter 103C and as otherwise provided by law; and

WHEREAS, the parties to this Agreement have a common interest and statutory authority to prepare, adopt, and assure implementation of a comprehensive watershed management plan in the Pine River Watershed (Attachment A- map) to conserve soil and water resources through the implementation of practices, programs, and regulatory controls that effectively control or prevent erosion, sedimentation, siltation and related pollution in order to preserve natural resources, ensure continued soil productivity, protect water quality, reduce damages caused by floods, preserve wildlife habitat, protect the tax base, and protect public lands and waters; and

WHEREAS, with matters that relate to coordination of water management authorities pursuant to Minnesota Statutes Chapters 103B, 103C, and 103D with public drainage systems pursuant to Minnesota Chapters 103E, this Agreement does not change the rights or obligations of the public drainage system authorities.

WHEREAS, the Parties have formed this Agreement for the specific goal of developing a plan pursuant to Minnesota Statutes§ 103B.801, Comprehensive Watershed Management Planning, also known as *One Watershed, One Plan.*

NOW, THEREFORE, the parties hereto agree as follows:

1. **Purpose:** The parties to this Agreement recognize the importance of partnerships to plan and implement protection and restoration efforts for the Pine River Watershed (see Attachment A- map). The purpose of this Agreement is to collectively develop and adopt, as local government units, a coordinated watershed management plan for implementation per the provisions of the Plan. Parties signing this agreement will be collectively referred to as the Pine River Watershed One Watershed One Plan Policy Committee.
2. **Term:** This Agreement is effective upon signature of the Parties in consideration of the Board of Water and Soil Resources (BWSR) Operating Procedures for One Watershed, One Plan; and will remain in effect until adoption of the Plan by all parties OR, the end

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date of the Board of Water and Soil Resources Grant Agreement, unless cancelled according to the provisions of this Agreement or earlier terminated by law.

3. **Adding Additional Parties:** A qualifying party desiring to become a member of this Agreement shall indicate its intent by adoption of a board resolution prior to June 30, 2018. The party agrees to abide by the terms and conditions of the Agreement, including but not limited to the bylaws, policies, and procedures adopted by the Policy Committee.
4. **Withdrawal of Parties:** A party desiring to leave the membership of this Agreement shall indicate its intent in writing to the Policy Committee in the form of an official resolution by that party. Notice must be made at least 30 days in advance of leaving the Agreement.
5. **General Provisions:**
    a. **Compliance with Law/Standards:** The Parties agree to abide by all federal, state, and local laws: statutes, ordinances, rules and regulations now in effect or hereafter adopted pertaining to this Agreement or to the facilities, programs, and staff for which the Agreement is responsible.
    b. **Indemnification:** Each party to this Agreement shall be liable for the acts of its officers, employees or agents and the results thereof to the extent authorized or limited by law and shall not be responsible for the acts of any other party, its officers, employees, or agents. The provisions of the Municipal Tort Clam Act, Minnesota Statute Chapter 466 and other applicable laws govern liability of the Parties. To the full extent permitted by law, actions by the Parties, their respective officers, employees, and agents pursuant to this Agreement are intended to be and shall be construed as a "cooperative activity." For the purposes of liability, as set forth in Minnesota Statutes § 471.59, subd. La, it is the intent of the Parties that they be considered a "single governmental unit;" that the total liability for the participating governmental units and the joint board, if established, shall not exceed the limits on governmental liability for a "single governmental unit;" and that this Agreement does not create any liability or exposure of one party for the acts or omissions of any other party.
    c. **Record and Retention and Data Practices:** The Parties agree that records created pursuant to the terms of this Agreement will be retained in a manner that meets their respective entity's records retention schedules that have been reviewed and approved by the State in accordance with Minnesota Statutes § 138.17. The Parties further agree that records prepared or maintained in furtherance of the Agreement shall be subject to the Minnesota Government Data Practices Act. At the time this Agreement expires, all records will be turned over to the County of Crow Wing or its Soil and Water Conservation District for continued retention.
    d. **Timeliness:** The Parties agree to perform obligations under this Agreement in a timely manner and keep each other informed about any delays that may occur.
    e. **Extension:** The Parties may extend the termination date of this Agreement upon agreement by all Parties.
    f. **Amendment of Memorandum of Agreement:** This MOA may be amended by recommendation of the Advisory Committee and approval of the amendment(s)

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by the Policy Committee with final approval by the Crow Wing County and Cass County Boards of Commissioners.

6. **Administration:**
   a. **Establishment of Committee for Development of the Plan:** The Parties agree to designate one representative and one or more alternate(s), who must be an elected or appointed member of the governing board, to a Policy Committee for the development of the watershed-based plan. Parties also may appoint one or more technical representative(s) to an Advisory Committee for development of the Plan in consideration of the Board of Water and Soil Resources Operating procedures for the *One Watershed, One Plan.*
      i. The Policy Committee will meet as needed to decide on the content of the plan, serve as a liaison to their respective boards, and act on behalf of their Board. Each representative shall have one (1) vote.
      ii. Each governing board may choose one or more alternate(s) to serve on the Policy Committee as needed in the absence of the designated member.
      iii. The Policy Committee will establish bylaws by June 30, 2018 to describe the functions and operations of the committee(s).
      iv. The appointed technical representatives of the Advisory Committee shall recommend stakeholders to serve on the Advisory Committee to be approved by the Policy Committee. The Advisory Committee will meet monthly or as needed to assist and provide technical support and make recommendations to the Policy Committee on the development and content of the Plan. Members of the Advisory Committee may not be a current board member of any of the Parties.
   b. **Submittal of the Plan:** The Policy Committee will recommend the plan to the Parties of this Agreement. The Policy Committee will be responsible for initiating a formal review process for the watershed-based plan conforming to Minnesota Statutes Chapters 103B and 103D, including public hearings. Upon completion of local review and comment, and approval of the plan for submittal by each party, the Policy Committee will submit the watershed-based plan jointly to the Board of Water and Soil Resources for review and approval.
   c. **Adoption of the Plan:** The Parties agree to adopt the plan within 120 days of receiving notice of state approval, and provide notice of plan adoption pursuant to Minnesota Statues Chapters 103B and 103D.
7. **Fiscal Agent:** Crow Wing Soil and Water Conservation District will act as the fiscal agent for the purposes of this Agreement and agrees to:
   a. Accept all responsibilities associated with the implementation of the Board of Water and Soil Resources grant agreement for developing a watershed-based plan.
   b. Perform financial transactions as part of the grant agreement and contract implementation.

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c. Annually provide a full and complete audit report.
d. Provide the Policy Committee with the records necessary to describe the financial condition of the Board of Water and Soil Resources grant agreement.
e. Retain fiscal records consistent with the agent's records retention schedule until termination of the Agreement (at that time, records will be turned over to the Board of Water and Soil Resources).

8. **Grant Administration:** Crow Wing County will act as the grant administrator for the purposes of this Agreement and agrees to provide the following services:
   a. Accept all day-to-day responsibilities associated with the implementation of the Board of Water and Soil Resources grant agreement for developing a watershed-based plan, including being the primary Board of Water and Soil Resources contact for the *One Watershed, One Plan* Grant Agreement and being responsible for Board of Water and Soil Resources reporting requirements associated with the grant agreement.
   b. Provide the Policy Committee with the records necessary to describe the planning conditions of the Board of Water and Soil Resources grant agreement.
9. **Secretary:** Crow Wing County Soil and Water Conservation District will act as the secretary for the purposes of this Agreement and agrees to provide the following services to the Parties:
   a. Assist with data compilation, meeting facilitations, and plan writing.
   b. Coordination and facilitation of Policy Committee meetings, including establishing date, location, time, and any necessary accommodations such as refreshments.
   c. Coordination and facilitation of Advisory Committee meetings including establishing date, location, time, space, technology needs, and any necessary accommodations such as refreshments.
10. **Multiple Counterparts:** The Parties may sign multiple counterparts of this Agreement. Each signed counterpart shall be deemed an original, but all of them together represent the same Agreement.
11. **Authorized Representatives:** The following persons will be the primary contacts for all matters concerning this Agreement:

Cass County

County Commissioner
Cass County Courthouse
P.O. Box 3000, Walker MN 56468
(218)547-7204

Cass SWCD - District Manager
John P. Ringle
Cass County Courthouse
P.O. Box 3000, Walker MN 56468
(218)547-7256

Cass SWCD Supervisor

SWCD Supervisor
Cass County Courthouse
P.O. Box 3000, Walker, MN 56484
218-547-7256

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Crow Wing County
Paul Thiede
Crow Wing County
Courthouse
326 Laurel St. Suite 13
Brainerd, MN 56401

Crow Wing SWCD Supervisor
JoAnn Weaver
322 Laurel St. Suite 22
Brainerd, MN 56401

Crow Wing County
Jacob Frie
Natural Resource Manager
Land Service Department
322 Laurel St. Suite 15
Brainerd, MN 56401

Crow Wing SWCD
Melissa Barrick
District Manager, Crow SWCD
322 Laurel St. Suite 22
Brainerd, MN 5640

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IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

BY: Diane F Jacobson 12-20-17

Crow Wing SWCD Board Chair Date

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IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

BY: DocuSigned by: _____

Crow Wing County Chair Date

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IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

APPROVED AS TO FORM

BY: DocuSigned by: _____

Crow Wing County Attorney Date

IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

BY: Tom Kuschel 11/3/17

Cass SWCD Board Chair Date

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IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

BY: Richard Dornham 12/1/17
Cass County Chair Date

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IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers.

APPROVED:

APPROVED AS TO FORM

BY: _____

Cass County Attorney Date

DocuSign SECURED

Certificate Of Completion

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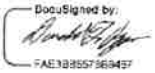
Donald F. Ryan Don.Ryan@crowwing.us CWC Attorney Accela, Inc. Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	DocuSigned by:  Using IP Address: 156.98.157.211	Sent: 11/28/2017 2:14:50 PM Viewed: 11/29/2017 3:11:53 PM Signed: 11/29/2017 3:14:07 PM Freeform Signing
In Person Signer Events	**Signature**	**Timestamp**
Editor Delivery Events	**Status**	**Timestamp**
Agent Delivery Events	**Status**	**Timestamp**
Intermediary Delivery Events	**Status**	**Timestamp**
Certified Delivery Events	**Status**	**Timestamp**
Carbon Copy Events	**Status**	**Timestamp**
Notary Events	**Signature**	**Timestamp**
Envelope Summary Events	**Status**	**Timestamps**
Envelope Sent	Hashed/Encrypted	11/28/2017 2:14:50 PM
Certified Delivered	Security Checked	11/29/2017 3:11:53 PM
Signing Complete	Security Checked	11/29/2017 3:14:07 PM
Completed	Security Checked	11/29/2017 3:14:07 PM
Payment Events	**Status**	**Timestamps**

Appendix I. Glossary of Terms

Enhance/Protect (management focus): A minor or subwatershed where some lakes have declining trends and some natural resources need enhancement, and there are potential risk factors that could negatively impact the surface water and ground water systems of the watershed. Projects include enhancement such as pasture management, stormwater management, shoreline buffers and conservation easements in ecologically sensitive areas in addition to protection strategies as stated in the Protect focus.

HSPF (Hydrological Simulation Program – FORTRAN): A model for simulation of watershed hydrology and water quality for pollutants. This model was run for the Pine River Watershed during the 2017 Watershed Restoration and Protection Strategy (WRAPS).

Impairment: Waterbodies are listed as impaired if they do not meet the state water quality standard for designated uses including aquatic life, aquatic recreation, and aquatic consumption.

Index of Biological Integrity (IBI): A way of measuring the biological community (fish and aquatic macroinvertebrates) in the water body. The index is a scale of 0 to 100 with 0 being the lowest quality and 100 being the highest quality.

Phosphorus Sensitivity: The lake's sensitivity to phosphorus as determined by the DNR. Sensitivity means that added phosphorus would affect the clarity in these lakes the most (Radomski 2018).

Protect (management focus): A minor or subwatershed where the natural resources are generally in good condition, risks to natural resources are low, and the management focus is to maintain and increase protection levels with strategies such as private forest stewardship and conservation easements.

Protected: Protected land uses include public lands, public waters, wetlands on private lands, easements, other conservation lands, Sustainable Forest Incentive Act (SFIA).

Secchi Depth: a measure of water clarity that can indicate the overall health of a lake. A black and white metal disc is lowered into the water on a rope until it can't be seen anymore and raised to the point it can be seen. The depth of the disk to the surface of the water is the Secchi Depth.

Trend Analysis (Mann Kendall statistic): a way to test the probability of a trend in data being real versus just happening by chance.

TMDL (Total Maximum Daily Load): the amount of a particular pollutant that a body of water can handle without violating state water quality standards.

TSI: Trophic State Index is a measurement of overall lake productivity (nutrient enrichment). It is a scale from 0 to 100 with 0 being the lowest productivity and 100 being the highest productivity.

Watershed: A land area that channels rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean.

WRAPS (Watershed Restoration and Protection Strategy): A watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands implemented by the Minnesota Pollution Control Agency on a 10-year cycle. https://www.pca.state.mn.us/water/watershed-approach-restoring-and-protecting-water-quality

Vigilance (management focus): A minor or subwatershed that has already achieved the 75% protection goal. Management Actions include opportunity-based projects and maintaining protected lands.

Appendix J. References

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Crow Wing County Water Plan, 2013-2023. Crow Wing County Land Services, Brainerd, MN.

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LSP 2017: *Landscape Stewardship Plan*, US Forest Service, Minnesota Department of Natural Resources, MN.

NCADAC 2013: *National Climate Assessment***.** National Climate Assessment Development Advisory Committee, National Oceanic and Atmospheric Association (NOAA).

NRCS *Rapid Watershed Assessment: Pine River HUC 010105*. United States Department of Agriculture Natural Resources Conservation Service.

Radomski, P. 2018. *Phosphorus Sensitivity Study*, Minnesota Department of Natural Resources, Brainerd, MN.

Whitefish Chain Sensitive Shoreline Report, 2012, Minnesota Department of Natural Resources, Brainerd, MN.

TMDL 2017: *Pine River Total Maximum Daily Load Report*, Minnesota Pollution Control Agency, Brainerd, MN

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WRAPS 2017: *Pine River Watershed Restoration and Protection Strategy*, Minnesota Pollution Control Agency, St. Paul, MN.

Appendix K. Midpoint Update Goal Revisions Table

Resource Category	Original Goal in 2019	Revised Goal in 2024
Surface Ground Forestry	Protect and enhance forest cover, outstanding lake water quality, habitat, surficial sand aquifers, and downstream drinking water by promoting **75% land protection** in targeted minor watersheds.	Protect and enhance forest cover, priority lakes, and surficial sand aquifers by protecting **4,396 acres*** of land. *30% progress towards 75% protection in priority lakesheds.
Surface Water	Reduce phosphorus loading into declining lakes by **5%** by implementing best management practices in residential and road areas.	Reduce phosphorus loading in priority lakes by **5 lbs** each through implementing best management practices.
Surface Ground	Reduce agricultural runoff to downstream lakes by **5%** and improve stream habitat in impaired streams to meet the IBI standard in the South Fork and Whitefish Subwatersheds by promoting pasture management.	Reduce agricultural runoff to surface and groundwater by implementing **1,253 acres*** of agricultural best management practices. *5% of Ag lands in the Headwaters, South Fork Pine, and Whitefish HUC10 subwatersheds.
Surface Water	Implement an integrated approach to **culvert management** that includes inventories and cooperation between local units of government to understand drainage and restore proper function with future culvert replacements.	*Not really a measurable goal. Changed this to be an action under the storage goal. Include ditch issues actions under the storage goal too.*
Surface Water	**Maintain** current coverage of wetlands as currently administrated under federal, state and local regulations and identify potential restoration areas where past disturbance occurred.	**Maintain** current coverage of wetlands as currently administrated under federal, state and local regulations.
Ground Water	Maintain high quality drinking water in surficial sand aquifer areas by encouraging landowners to have their subsurface sewage treatment systems maintained every three years to achieve a **90% maintenance rate** for the watershed.	**Maintain** high quality drinking water in surficial sand aquifers by enforcing the SSTS ordinance, providing funding for SSTS upgrades, and conducting outreach to private landowners.
Ground Water	**Manage chlorides** reaching surface and groundwater from road salts and water softener salts going into sewage treatment systems.	**Provide** resources, information, and training on chloride management to cities, public, and road authorities.
Ground Water	Manage fertilizer application to keep **nitrates** in drinking water below the state standard of 10 mg/L.	*Not really a measurable goal. We rolled it into the Ag BMP acre goal above targeted to groundwater/nitrate protection practices.*
Ground Water	**Protect Drinking Water Supply Management Areas (DWSMAs)** and locate and **seal 30 unused residential wells per year** to prevent groundwater contamination.	Seal **60 unused residential wells** to prevent groundwater contamination. *DWSMA protection language moved to Goal 1.*
Forests & Habitat	**Protect two miles of undeveloped riparian lands**, ice ridges and forested riparian corridors through outreach to private residents.	Protect **13 miles and 5,087 acres*** of undeveloped riparian lands through outreach to private residents. *35% progress towards 75% protection in priority habitat minor watersheds.
Forests & Habitat	**Maintain and enhance/restore two miles of riparian vegetation** near streams and lakes with over 10% shoreland impervious surface/disturbed area and/or a declining water quality trend through outreach to private residents.	Restore **2 miles** of lakeshore or riparian vegetation.
Surface Ground	**Maintain** an average discharge of 306,945 acre-feet at the pour point of the Pine River Watershed.	**Maintain** an average discharge of ~307,000 acre-feet at the pour point of the Pine River Watershed allowing for annual variations in rainfall and runoff.

Appendix L. Midpoint Partner Goal Progress

Other partners in the Pine River Watershed cost-shared projects and practices on privately owned land that make progress towards this plan's goals and actions. These accomplishments are summarized in this Appendix.

PLAN GOAL: Reduce agricultural runoff to surface and groundwater by implementing 1,253 acres of agricultural best management practices.

Practices cost-shared by the Minnesota Department of Agriculture between 2020-2024

Three producers have been certified through the Minnesota Agricultural Water Quality Certification Program. These certifications cover 980 acres including the adoption of the following newly adopted practices.

- 117 acres cover crops
- 0.5 acres critical area planting
- 1 acre access control
- 204 acres irrigation water management
- 100 acres of N and P rate reductions

Practices cost-shared by Natural Resources Conservation Service (NRCS) from 2020-2024.

Practice Description	acres	count	feet	square feet	Practice Type
Comprehensive Nutrient Management Plan - Written		1			Buffers
Riparian Herbaceous Cover	6				Buffers
Forest Stand Improvement	29				Forest Management
Tree/Shrub Establishment	1				Forest Management
Early Successional Habitat Development/Management	61				Habitat
Herbaceous Weed Control	45				Other
High Tunnel System				2,161	Other
Fence			5,360		Pasture Management
Forage and Biomass Planting	130				Pasture Management
Forage Harvest Management	12				Pasture Management
Heavy Use Area Protection				400	Pasture Management
Livestock Pipeline			275		Pasture Management
Prescribed Grazing	239				Pasture Management
Pumping Plant		1			Pasture Management
Watering Facility		1			Pasture Management
Conservation Cover	1				Soil Health
Cover Crop	110				Soil Health
Residue and Tillage Management, No-Till	200				Soil Health
Grand Total	**834**	**3**	**5,635**	**2,561**	

PLAN ACTION: Promote forest management on private lands (10 acres).

Practices cost-shared by the Minnesota Department of Natural Resources Division of Forestry Incentives Program between 2020-2024

(Eligibility: Must be a non-industrial, private landowner, including School Forests, educational institutions, and non-profit organizations)

Practice Description	Acres	Count
FOR-1 Reforestation and Afforestation *Establish a stand of forest trees for conservation and timber production, maintain newly established trees.*	**226**	**3,923**
Competition Control – rolled mats, branded mulch, tree mats, applied mulch	1	500
Planting – hardwoods, softwoods, shrubs	220	3,420
Site Prep – herbicide use, timer removal	5	3
FOR-2 Forest Improvement *Increase tree growth and stand vigor, improve forest health and timber quality.*	**3**	**1**
Release – removal of competing vegetation by chemical, mechanical or prescribed burns	3	1
FOR-3 Forest Health and Protection *Protect, improve, restore forest health, provide control or preventative measures for insects, disease, invasive species, animal browsing, grazing.*	**26**	**271**
Protection – pruning, tree tubes, fencing	26	271
FOR-4 Wildlife Habitat Enhancement *Restore, improve, or establish permanent habitat for native, non-game, threatened, or endangered flora or fauna.*	**2**	**40**
Planting – seeding native grasses and forbs	2	40
FOR-8 Forest Recreation Enhancement *Establish and enhance forest recreation.*	**0**	**2,400**
Trails – construction, maintenance, pruning, fencing	0	2,400
FOR-10 Timber Harvest Enhancement Promote and encourage active forest management.	**23**	**5,300**
Forest Roads – construct or improve roads used for timber sale access	2	4,800
Planting – hardwoods, softwoods, shrubs	21	500
FOR-11 Drought-Killed Seedling Replacement *Replace seedlings killed by drought.*	**79**	**101**
Planting – hardwoods, softwoods, shrubs	39	100
Release – removal of competing vegetation by chemical, mechanical or prescribed burns	39	1
Totals	**359**	**12,035**