LEECH LAKE RIVER COMPREHENSIVE WATERSHED MANAGEMENT PLAN

CLEAN WATER LAND & LEGACY AMENDMENT

PREPARED FOR

THE LANDOWNERS, CITIZENS,
AND LOCAL GOVERNMENTS OF
THE LEECH LAKE RIVER WATERSHED

FEBRUARY 2019

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CLEAN WATER, LAND & LEGACY AMENDMENT

LEECH LAKE RIVER COMPREHENSIVE WATERSHED MANAGEMENT PLAN

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Cass County Soil and Water Conservation District
Hubbard County
Hubbard County Soil and Water Conservation District

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Leech Lake Band of Ojibwe

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Minnesota Department of Agriculture
Minnesota Department of Health
Minnesota Department of Natural Resources
Minnesota Pollution Control Agency

FEDERAL AGENCIES

United States Forest Service
United States Army Corps of Engineers

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Mississippi Headwaters Board
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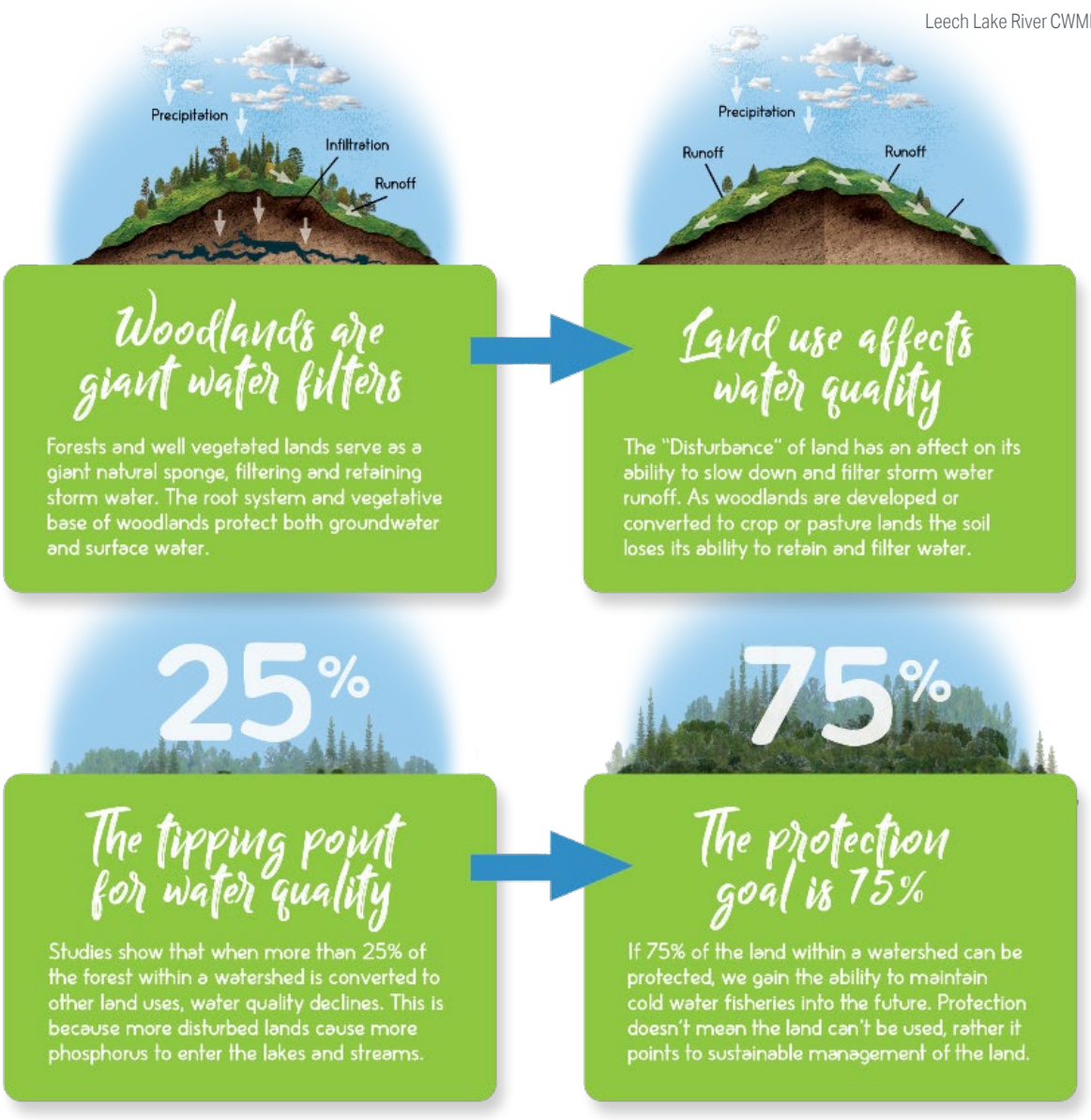
EXECUTIVE SUMMARY

The Leech Lake River (LLR) Comprehensive Watershed Management Plan (CWMP) was developed in accordance with the One Watershed, One Plan (1W1P) program implemented by the Minnesota Board of Water and Soil Resources (BWSR). The four local governments that entered into the Memorandum of Agreement (MOA) to develop the LLR CWMP were Cass County, Cass County Soil and Water Conservation District (SWCD), Hubbard County, and the Hubbard County SWCD. A representative from each MOA governmental unit was appointed to the Policy Committee, which is the decision-making authority for this planning effort. Staff from the Cass and Hubbard County SWCDs led the planning effort. Citizens and representatives from local non-profit organizations, lake associations, cities, townships, state agencies, and the Leech Lake Band of Ojibwe (LLBO) were highly involved. These partners developed and approved the following vision for this CWMP: Woods, water, wildlife, and people: a healthy watershed and a vibrant economy. This vision is the foundation from which the plan was developed and will be a cornerstone when implementing the prescriptions for protecting this pristine watershed throughout the life of this plan.

The LLR Watershed is approximately 854,659 acres and healthy forests cover approximately 60 percent of the watersheds area. These forests are critical in supporting the nearly 166,374 acres (nearly 259 square miles) of lakes and 277 miles of streams in the LLR Watershed. The pristine nature of the LLR Watershed is demonstrated by the following:

- **37 lakes in the LLR Watershed are classified as high to outstanding biological significance.**
- **12 coldwater tullibee lakes are located in the LLR Watershed.**
- **Over 50 percent of the watershed is designated as important bird areas.**
- **The LLR Watershed contains the largest number of breeding pairs of eagles in the continental United States.**
- **The LLR Watershed supports 89 species of greatest conservation need.**
- **Wild rice (*Zizania palustris)* has been found in 67 lakes and 5 streams.**



The abundance and quality of forests, lakes, and streams are critical components of the local economy, which is driven by the forestry industry and tourism. The LLR Watershed is home to the LLBO and the Leech Lake Reservation, which is the largest reservation in Minnesota. Therefore, collaborating with the LLBO, considering cultural resources, and managing natural resources in a culturally appropriate manner will be important when implementing the actions identified in the plan.

The LLR Watershed uniquely contains predominantly high-quality resources that are threatened by the potential impacts from population growth, terrestrial and aquatic invasive species, land-use conversion, and climate change. To prevent the decline of high-quality natural resources in the LLR watershed and mitigate land-use pressures, this CWMP focuses on implementing the protection measures necessary to obtain or progress toward achieving 75 percent protection of forested and undeveloped land in targeted subwatersheds. This overall goal is based on the Minnesota Department of Natural Resources (DNR) research that indicates that water quality begins to decline when watersheds have more than 25 percent disturbance.

A framework for developing the LLRCWMP was created that established four categories of values (natural world, climate and risk, leadership, and quality of life) and four levels of management goals (maintain, improve, enhance, and protect). The LLRCWMP focuses on the 12 Natural World Values that were identified because an extensive process in which stakeholders identified their priority concerns and the potential threats to the resource if these goals were not addressed. The natural world values include high quality lakes and streams, lakes and streams that are stressed or declining in water quality, wetlands, and groundwater and upland concerns (e.g., habitat, forests, working lands, and cities and townships). The other values (i.e., climate and risk, leadership, and quality of life) will be used as screening criteria to better target implementation actions.

Management goals were established for each of the 12 natural world values. In most cases, the goal is to improve the resources associated with each natural world value. Targeting implementation efforts was achieved by conducting geographic information system (GIS) data analysis with multiple criteria to determine the subwatersheds that ranked the highest in terms of threat or opportunity to achieve established management goals. To further focus implementation actions, all 33 subwatersheds were evaluated for their ability to maximize results by providing multiple benefits to the implementation activities, which resulted in selecting 11 targeted subwatersheds. The natural world value priority subwatersheds and the multiple benefit targeted subwatersheds may change throughout the 10-year plan as progress is made and new opportunities arise.

The measurable goals for the LLRCWMP include those that were established in the LLR Watershed Restoration and Protection Strategy (WRAPS) report (*https://www.pca.state.mn.us/water/watersheds/leech-lake-river*). These goals were reviewed, revised, and expanded to address all 12 natural world values and reflect the information that became available after the WRAPS report was completed.

The implementation actions identified in the plan focus on protecting forests, habitat, riparian, and shoreline areas in priority subwatersheds using conservation tools that include land acquisition, easements, near shore best management practices, and tax incentive programs. Other actions and programs include acquiring monitoring and study data; conducting an outreach and education program to targeted audiences; and implementing land use management programs that focus on protecting the forests, surface, and groundwater in the LLR Watershed.

All of the plan elements will be executed based on a joint powers agreement (JPA) that emphasizes the shared responsibility for all elements. The pace of progress when implementing plan activities depends on the availability of funds. The staff representatives from each of the JPA members will coordinate the implementation of plan activities and collaborate to obtain the grants and funding necessary to implement the plan. The JPA members will meet regularly to ensure progress is being made toward achieving the goals of the plan. An annual meeting between the Advisory Committee and members of the public will be held, so JPA members and staff can provide updates on plan progress and obtain input and recommendations regarding governance, implementation, or funding concerns.

PHOTO CREDIT: MINNESOTA POLLUTION CONTROL AGENCY

1 INTRODUCTION

1.1 LEECH LAKE RIVER COMPREHENSIVE WATERSHED MANAGEMENT PLAN PRIMER

The One Watershed, One Plan (1W1P) program is a new, evolutionary step, for the Board of Water and Soil Resources' (BWSR's) long-standing local water plan authorities. Through these authorities, BWSR oversees, sets the requirements for, and approves local water plans. The vision of the BWSR 1W1P program is to evolve from managing resources on political boundaries to focusing on the watershed as a unique resource that can be managed comprehensively. As a result, cohesive planning and implementation will provide greater assurances that water quality and natural-resource management levels will be attainable.

The Leech Lake River Comprehensive Watershed Management Plan (LLRCWMP) focuses on protecting this watershed from adverse future impacts and on actions that keep forests forested and clean waters clean. Unlike many watersheds plans that indicate specific best management practices to implement and that estimate pollution reductions from those actions, the LLRCWMP focuses on keeping this watershed intact through many tools, the least of which are best management practices.

1.2 WOODS AND WATER: HALLMARKS OF THE LEECH LAKE RIVER WATERSHED

The Leech Lake River (LLR) watershed in northcentral Minnesota (Figure1-1) sits in the heart of Minnesota's lake country and is one of the most pristine watersheds in Minnesota, and possibly the nation. Forests, which cover approximately 60 percent of the watershed (Figure 1-2), are the key to supporting the abundant clean lakes and rivers. Together, the healthy forests and clean lakes and rivers in this watershed support a diverse biological community and provide resiliency against climate change and invasive species.

The LLR Watershed is approximately 854,659 acres and includes nearly 277 miles of stream with relatively few altered drainageways and over 750 lakes covering 166,374 acres; 37 lakes are classified as having high to outstanding biological significance. Major resources in the watershed include Leech Lake, Woman Lake, Ten Mile Lake,

BENEFITS OF HEALTHY FORESTS

- Replenishes groundwater
- Reduces runoff to surface water
- Captures and stores carbon dioxide, which reduces this greenhouse gas
- Produces oxygen and reduces airborne pollution
- Improves resiliency against pests and weather changes
- Provides wildlife habitat

Bungashing Creek, and the Necktie and Kabekona Rivers. Twelve tullibee lakes, which are indicators of overall watershed health because these species require cold and clean water to thrive are located here. Extensive wetlands exist in this watershed including white cedar wetlands, which are reducing in abundance throughout northern Minnesota. The LLR Watershed provides an excellent habitat that supports a high level of biodiversity and includes more than half of the Muskie habitat in Minnesota, the largest number of breeding pairs of eagles in the lower 48 states, 89 species of greatest conservation need. Over 50 percent of the LLR Watershed is designated as important bird areas. Wild rice (*Zizania palustris)* is known to be found in 67 lakes and 5 streams; however, an inventory of wild-rice streams has not been completed. Wild rice is an important food source for waterfowl as well as humans. Wild rice stands protect shorelines from erosion and provide habitat for fish, amphibians, and birds, and wild rice provides over $2 million to the state's economy annually. The Leech Lake Band of Ojibwe (LLBO) harvests over 100,000 pounds of rice each year, which generates over $200,000 for the local economy.

Under the forest floor and throughout the watershed, sandy and coarse loamy soils are the dominant soil types (Figures 1–3). Areas with more loamy texture are at risk for erosion, especially in areas with high slopes or reduced vegetation, which makes keeping the forest intact even more important. Sandy soils can also lead to greater risk of groundwater contamination because of higher infiltration rates. Currently, one-third of all known private wells are in areas that the Minnesota Department of Health rates as highly vulnerable to contamination [Parthun, 2018]. Precautions should be taken to reduce these contamination risks.

Because of the abundance of high-quality resources, tourism is a major economic driver for local communities. In a US Army Corps of Engineers [2009] study of traveler expenditures in Minnesota from June 2005 to May 2006, Cass County was ranked 7th and Hubbard County was ranked 21st in traveler expenditures. These direct expenditures resulted in substantial total economic impact for the region.

WATERSHED

854,659 Acres

STREAMS

277 Miles

LAKES

Over 750 Covering 166,374 Acres

37 Lakes with High to Outstanding Biological Significance

HUBBARD COUNTY

- Travel Expenditures $118,101,572
- Full-Time Equivalent Jobs 2,904
- Resident Income $53,912,681
- State Revenue $14,594,482
- Local Revenue $4,829,588

CASS COUNTY

- Travel Expenditures $314,512,248
- Full-Time Equivalent Jobs 7,737
- Resident Income $143,573,014
- State Revenue $38,866,062
- Local Revenue $12,861,431

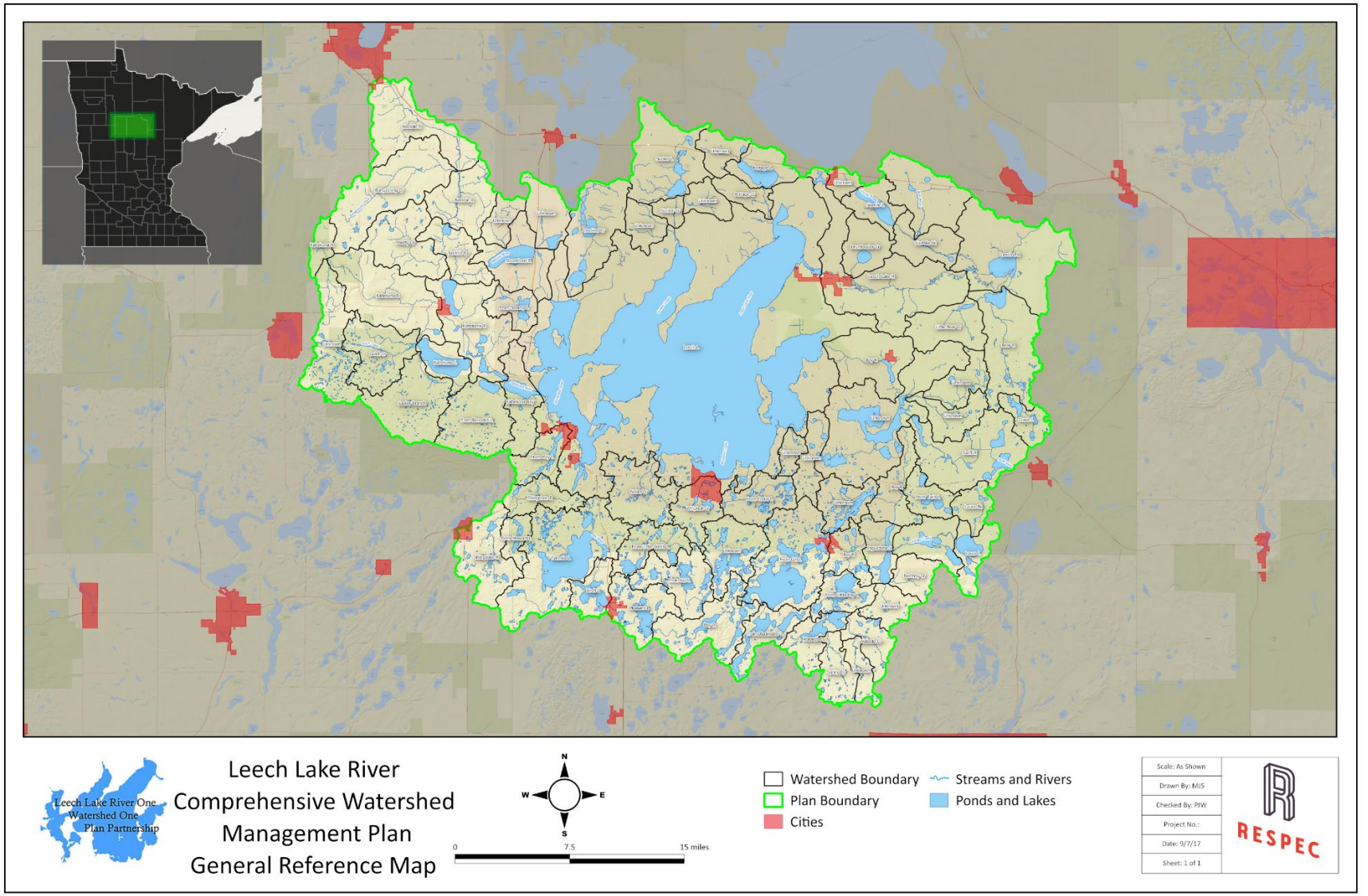


Figure 1-1. General Map of the Leech Lake River Comprehensive Watershed Management Plan Area.

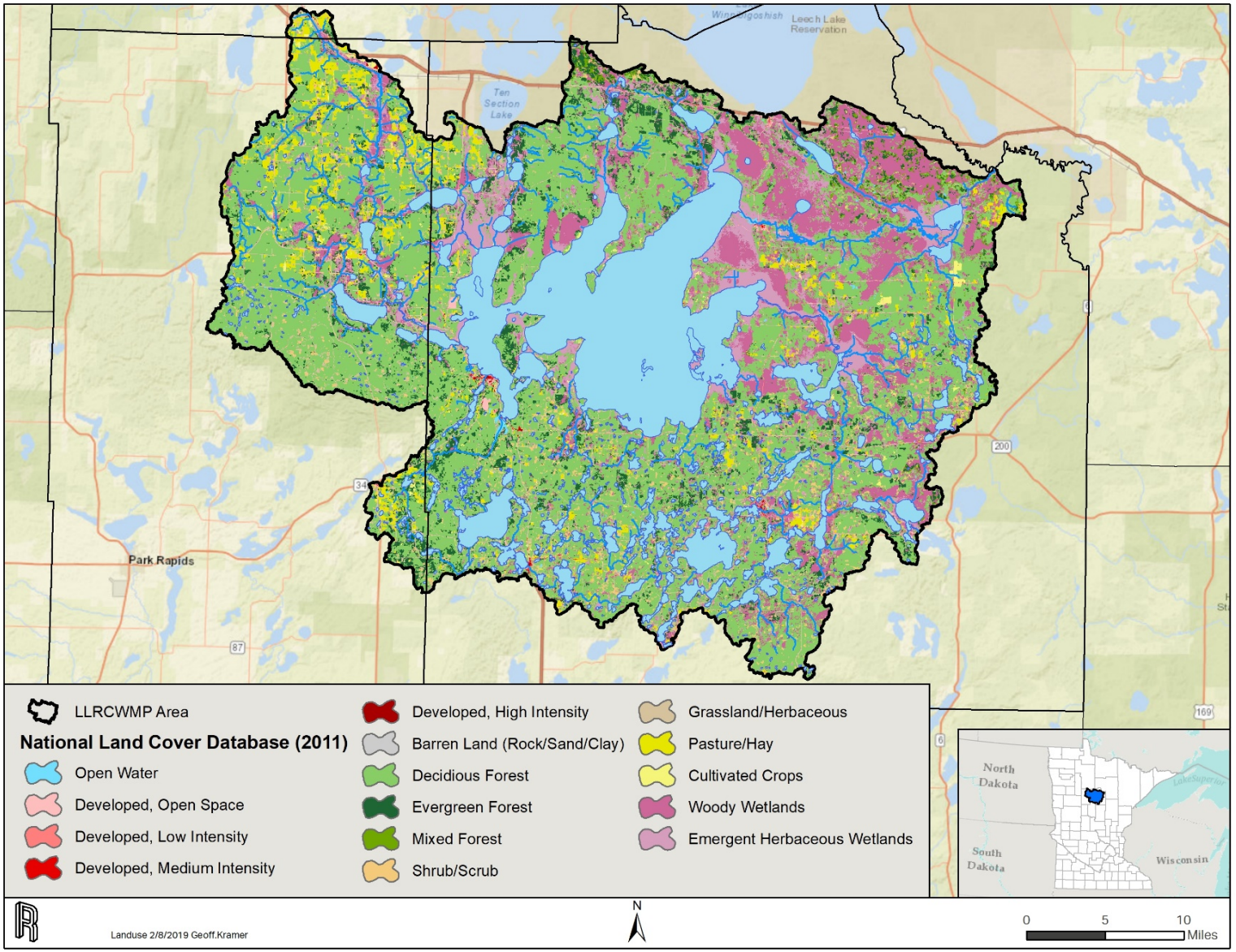


Figure 1-2. Land Cover in the Leech Lake River Comprehensive Watershed Management Plan Boundary.

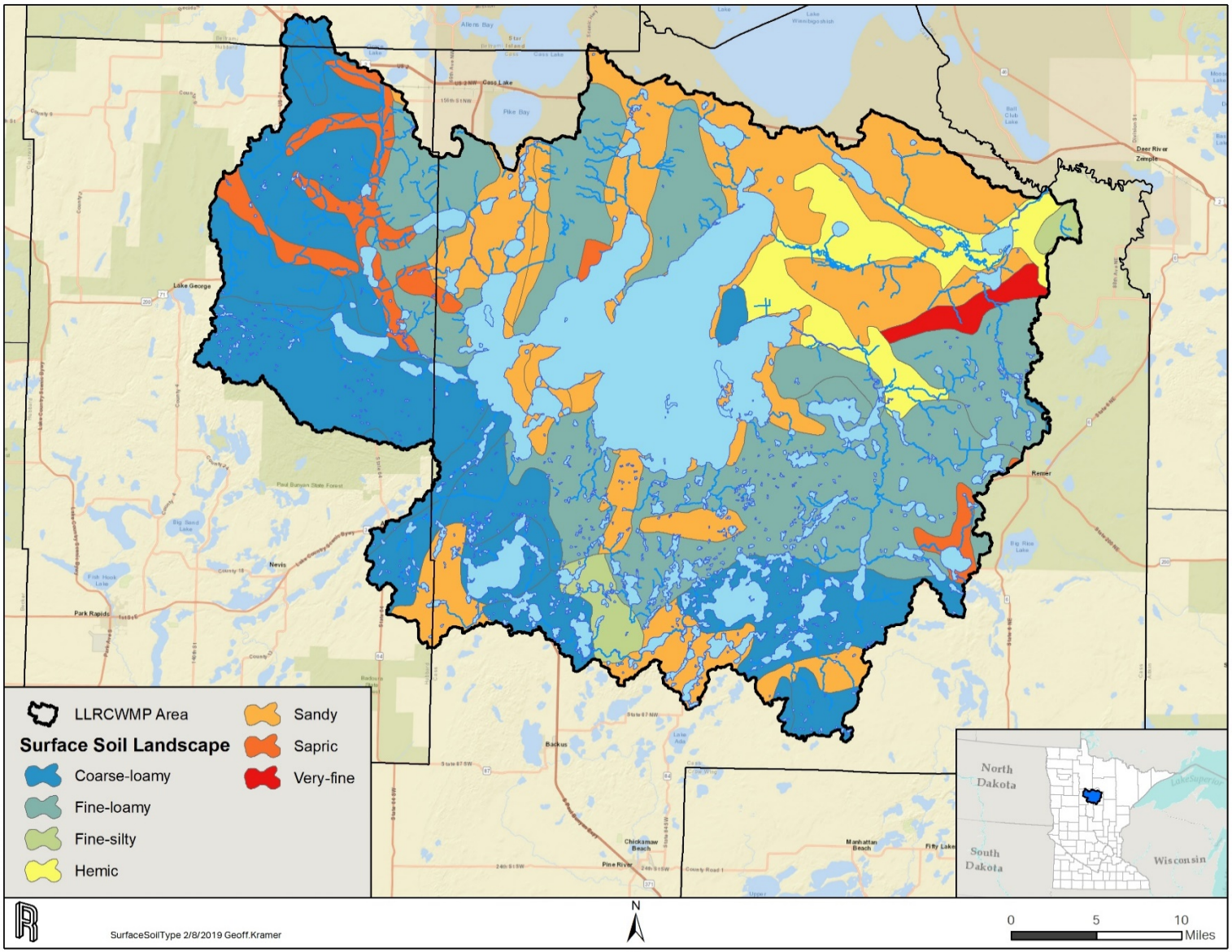


Figure 1-3. Surface Soil Texture Found Within the Leech Lake River Comprehensive Watershed Management Plan Boundary.

The abundant resources in the LLR Watershed also draw a growing population. Currently, approximately 14,500 residents live in the watershed; however, the state demographer's office projects that the area could experience as much as a 60 percent population increase by 2030 [Minnesota Pollution Control Agency (MPCA), 2016]. So far, lake and stream water quality within the watershed has been largely unimpacted by human disturbances. However, the Minnesota Department of Natural Resources (DNR) research indicates that when watersheds have more than 25 percent disturbance, water quality begins to decline. To prevent this decline and mitigate land-use pressures, planning and protection measures must be implemented.

Agriculture has historically made up a small percentage of land use and the local economy. Grazing livestock operations account for approximately 1,200 animal units with approximately 4 percent of the land area for pasture, hay, and grassland use. Although only 0.5 percent of the area is in row crops, recently an increase in crop production has occurred, particularly with irrigated potatoes in the sandy soils in the western portion of the LLR Watershed. Crop production is changing land use from what previously was mostly pine forest. Removing the forests and increasing irrigation on sandy soils increases the risk of groundwater contamination and reduces habitat and resiliency provided by forests.

The health of the LLR Watershed is important not only for the region, but for downstream purposes as well. The LLR Watershed ranked third in Minnesota in a 2009 study [Morgan, et al, 2009] of the ability of private forestlands across the Midwest and northeastern US watersheds to provide a clean water supply to downstream surface water intakes for drinking water. Keeping the LLR Watershed healthy will play a vital role in reducing downstream drinking-water treatment costs. This benefit and other ecosystem benefits (e.g. habitat and capturing and storing carbon dioxide [i.e., sequestrations]) may provide future funding opportunities as organizations seek to ensure watershed health and refuge for vulnerable species and environments that are facing increasing demands on resources.

LEECH LAKE RIVER WATERSHED
AT A GLANCE:

- Approximately 1,335 square miles
- Approximately 277 total river miles
- At least 5 streams that support trout
- Over 750 lakes with a total acreage of 166,374 acres
  - 67 wild rice lakes
  - 12 cisco/tullibee lakes
- 54 percent of the land is publicly owned or held by tribal landowners
- 60 percent of the area is forested
- 24 percent of the area is wetlands
- Only 1.8 percent of the land is developed
- State demographers project a population growth of up to 60 percent by 2030
- Walker is the largest of the eight cities in the watershed

1.3 VISION STATEMENT

The individuals who participated in the LLRCWMP planning process wanted to emphasize the uniqueness of the LLR Watershed. The participants wanted to ensure that the clear and compelling picture of what the future will be 50 years from now will occur. To manage long-term goals in a 10-year plan, the participants developed and adopted the following vision statement.

> **WOODS, WATER, WILDLIFE, AND PEOPLE:**
> A healthy watershed and a vibrant economy.

1.4 PURPOSE AND EXTENT OF THE PLAN

The LLRCWMP addresses a wide range of land and water resources with particular attention to the priority resources and subwatersheds identified through a prioritization process. This plan intends to direct the investments made into projects and programs that will protect the high-quality resources in the LLR Watershed from degradation, including the forests, wildlife, surface water and groundwater. The plan also provides information regarding potential funding opportunities to implement these goals and obtain measurable results.

Because this is a comprehensive local water plan that is governed by Minnesota Statute 103B, all statutory requirements for noticing and approval must be met. Official notification was required to adhere to the requirements for comprehensive watershed planning. Public notices were published in each local government's designated legal newspaper. The official 60-day public notice and comment period began on July 10, 2017. The comment period was extended and ended September 8, 2017. In total, eight comment letters were received and are provided in Appendix C.

In addition to the required notice and comment period, one of BWSR's 1W1P guiding principles is that the process "must involve a broad range of stakeholders to ensure an integrated approach to watershed management." [Minnesota Board of Water and Soil Resources, 2013] A public meeting to kick off the planning process was held on September 15, 2017. Approximately 70 people attended and provided feedback regarding issues, goals, and priorities; a summary of the comments received can be found in Appendix D.

1.5 PLANNING PARTNERSHIP, ROLES AND REPSONSIBILITIES

The Cass and Hubbard County partners recognized that BWSR's 1W1P program provided a unique opportunity to develop a management plan specifically to protect this pristine watershed. Several planning efforts had already been completed in the LLR Watershed, including a Watershed Restoration and Protection Strategy (WRAPS) project. Additionally, Cass and Hubbard Counties had Comprehensive Local Water Management Plans that would expire in 2027 and 2026, respectively. The soil and water conservation districts (SWCDs) within the LLR Watershed recognized the need to increase coordination, reduce potential duplication of activities, and provide greater assurances for meeting goals and measurable outcomes.

An LLRCWMP planning team was established and collaborated to develop and submit a response to a BWSR-generated Request for Interest. Upon BWSR nomination and funding approval in June 2016, the collaborative arrangement was formalized through a Memorandum of Agreement (MOA) that was executed in September 2016 (Appendix E) and subsequent bylaws that were approved in November 2016 (Appendix F). The MOA was entered into by Cass County and the Cass County SWCD and Hubbard County and the Hubbard County SWCD. These organizations are currently operating under the Cass County Local Water Management Plan [2016] and the Hubbard County Local Water Management Plan [2016].

Currently, 80 percent of the watershed area is in Cass County, 19.7 percent is in Hubbard County, and 0.3 percent of the watershed is in Beltrami County, which elected not to participate because of the small geographic area the county has in the LLRCWMP boundary. Participating in the 1W1P is not required if less than 5 percent of the jurisdictional land area of the local government is within the planning area.

Three committees were established to develop, advise, and approve the plan. The governance structure outlined in the formal agreement is provided in Figure 1–4. All committee membership is provided in Appendix G.

Policy Committee. The responsibilities of the Policy Committee included making final decisions about the content of the plan and its submittal.

Advisory Committee. The Advisory Committee made recommendations on the plan and plan implementation to the Policy Committee and identified priorities.

Planning Work Group. The Planning Work Group consisted of staff representatives of the local governments who signed the MOA, BWSR representatives, and the consultants. This work group provided logistical and day-to-day decision-making in the planning process. The Planning Work Group was responsible for overall guidance for developing the plan content, including the priorities, implementation plan, implementation programs, and funding. The Planning Work Group provided oversight to all content development and plan review.

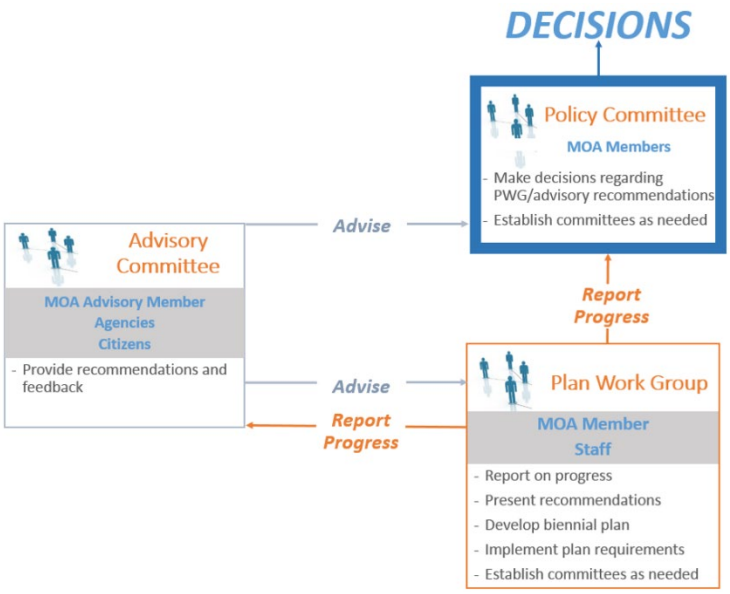


Figure 1-4. Governance Structure of the Leech Lake River Comprehensive Watershed Management Plan Memorandum of Agreement.

For further information about this project, including meeting minutes and updates, contact:

Cass County Soil and Water Conservation District
303 Minnesota Avenue
PO Box 3000
Walker, MN 56484
Telephone: 218.547.7241

1.6 PLAN APPROVAL AND ADOPTION

After the draft plan was completed, the formal review process was conducted according to Minnesota Statute 103B.315 (1990 as revised in 2003). The Policy Committee approved the draft and initiated the formal notice, comment period, and process. The draft document was submitted to the plan review authorities, who had 60 days to submit comments to the Policy Committee and the BWSR. The Policy Committee held a public hearing according to BWSR requirements after the 60-day review period ended. After the public hearing, the Policy Committee submitted the draft final plan, a summary of all comments received, the response to each comment, and additional public hearing details to the BWSR. The BWSR completed its review and approved the plan. After the BWSR approval was obtained, the plan was adopted by the local governments that signed the MOA.

2 WATERSHED PLAN VALUES AND GOALS

The LLR Watershed uniquely contains predominantly high-quality resources. Many water-planning efforts are focused on addressing known problems. Typically, the solutions are also known and, therefore, the planning effort centers on prioritizing restoration activities. Developing a watershed-based protection plan is much different. Because no problems are clearly identified and many high-value resources exist, choosing actions and where to implement them is difficult.

Because the usual process (i.e., problem-solution-result) was not appropriate for this plan, a modified version of the Envision (Institute for Sustainable Infrastructure, 2018) rating system was used to frame the planning process. Envision is a guidance and rating system for sustainable infrastructure that was developed by the Institute for Sustainable Infrastructure to establish a standardized framework for classifying sustainable practices. Although Envision was created to evaluate

decisions regarding infrastructure, this approach to categorize and evaluate sustainability performance measures provided the best known and available opportunity to tailor the planning process to this unique watershed.

The framework that was created for the LLR Comprehensive Watershed Management Plan includes establishing four categories of values and four levels of management goals. This framework is used throughout this plan and sets the context for implementation activities.

FOUR CATEGORIES OF VALUES:

NATURAL WORLD

CLIMATE AND RISK

LEADERSHIP

QUALITY OF LIFE

FOUR MANAGEMENT GOAL LEVELS:

MAINTAIN

Continues the current level of effort with some minor adjustments made to activities in some cases.

IMPROVE

Includes all the Maintain level of effort and increases implementation efforts on priority resources.

ENHANCE

Includes all the Improve level of effort and expands implementation efforts to the next level of priority resources.

PROTECT

Adequately and permanently protects resources according to the information and science available.

PLANNING FRAMEWORK AND DEFINITIONS

VALUE

What a person or local government is invested in protecting, conserving or restoring in relation to the natural world, quality of life, local leadership and climate and risk.

MANAGEMENT GOAL

The 10-Year, broad-level, plan goal that describes the management level of effort that will be directed to each natural world value.

OBJECTIVE

A general result that a person or local government aims to achieve, relative to a specific issue, within a time frame and with available resources.

STRATEGY

A chosen approach that a person or local government implements to meet the objective.

GOAL (MEASURABLE GOAL)

Either a physically-measurable metric or qualitative index established for gauging implementation success or effect.

RESOURCE GOALS

Specific goals related to an individual resource need.

2.1 PROCESS FOR DETERMINING VALUES AND MANAGEMENT GOALS

Two sources of data were used to compile a list of potential values, existing plans, and input from stakeholders. Several existing reports had been recently completed that provided valuable information and a starting point for determining values and goals. Both Cass and Hubbard County had recently updated their local water plans and MPCA's WRAPS report was completed in 2016. The WRAPS report was completed using a robust stakeholder process that provided substantial data and information regarding stakeholder values and resource-management objectives. The studies completed to develop the WRAPS report provide much of the data that this plan is based on.

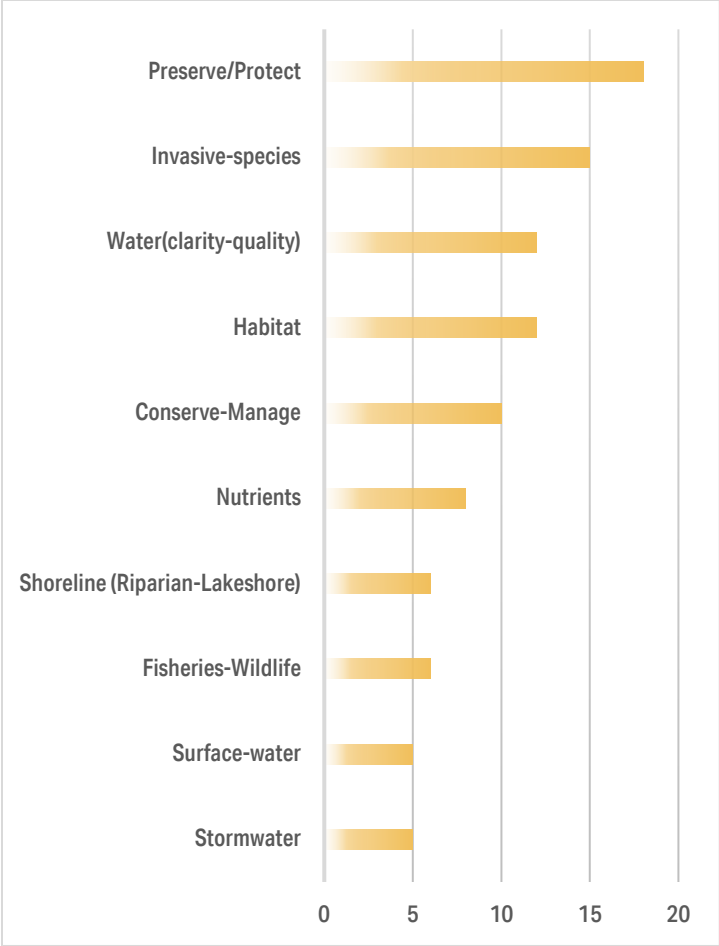


Figure 2-1. Sample of Natural Resource Key Word Frequency Analysis

Input from stakeholders included eight comment letters that were submitted during the required public noticing period, information obtained from the September 15, 2017, public meeting; and results from a survey that was administered online and in person to obtain input from the public who could not attend the meeting. The online was in the same format with the same questions as those conducted at the public meeting.

The results from the public input were recorded and grouped into resource categories (e.g., lakes, forests, and groundwater) and resource issues (e.g., climate change, land-use conversion, and invasive species) and are provided in Appendix D. After the responses were categorized, themes were determined using a process that evaluated keyword frequency. The results of the keyword frequency analysis are shown in Figure 2-1. The results were also converted to word clouds to provide an alternative way to evaluate if the priority values determined through this process fit their expectations. The word clouds are shown in Section 2.4 where each category of value is discussed.

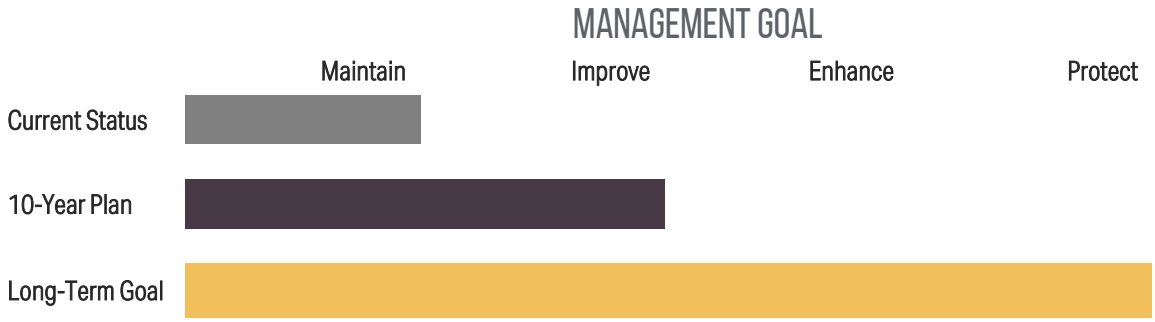
After the priority values were approved, the Advisory Committee developed the implementation criteria for each management goal level. Sample criteria for each management goal level are presented in Table2-1. Completed criteria for each management goal is provided in Appendix H. By developing and evaluating the criteria for each management goal, the Advisory Committee could evaluate the management goals that could be reasonably met within the 10-year planning period. After the criteria were developed for each natural world value, the management goals were selected.

Table 2-1. Sample Criteria That Were Developed to Define Each Management Goal

Natural World Value	Management Goal Levels and Criteria			
	Maintain	Improve	Enhance	Protect
High-Quality Lakes » High Water Quality » WRAPS Priority Lake » Sensitive Lake » Cisco/Tullibee Lakes » Wild rice » Declining/Threshold » Lakes of Biological Significance » Minnesota DNR Sensitive Shorelines	» Incorporate completed Habitat and Access Improvement work on Kabekona Creek [2017]. Ongoing habitat and access improvements on Kabekona River done in cooperation with Minnesota DNR fisheries and Trout Unlimited. » Lake associations are engaged in ensuring septic system compliance surveys and providing education on proper maintenance for riparian and non-riparian Subsurface Sewage Treatment Systems (SSTS,) provide low-interest loans and other incentive programs for noncompliant systems. » Maintain vegetated shorelines and vegetated littoral zones and establish and maintain 50-foot average and 30- foot minimum buffers on all riparian lands in compliance with State buffer law (Minnesota Statutes 103B and 103F.48, Subd. 4).	» Work with landowners on conservation pasture management. » Implementation focus on Minnesota DNR- and MPCA-identified, high-quality recreation and ecological value resources identified within the WRAPS. » Focus on trout streams and any high-value unnamed tributaries (e.g., Bungashing Creek, Kabekona River and Necktie River). » Prioritize streams whose condition is projected to adversely affect wild-rice habitat. » Acquire conservation easements along high-priority trout streams. Easements provide angler access, protect riparian areas, and allow access for fisheries management. » Develop a beaver-management plan. » Ensure proper management of gravel pit operations to avoid adversely affecting adjacent streams. » Enhance the connectivity and in-channel sediment transport (connectivity/bedload). » Modify or remove structures (e.g., culverts that inadvertently trap sediment to allow fish passage through project reach). » Remove or modify any repeatedly damaged structures in the project area to reduce the potential for flood damages.	» Expand the implementation focus to include Kawishiwash Creek, Pokety Creek, and Stall Creek.	» Expand the implementation on high-quality recreation and ecological value resources that were identified in the WRAPS and other studies to full protection levels.

The Advisory Committee developed and presented recommendations for each resource-management goal (Table 2-2) to the Policy Committee for their review and approval. The Policy Committee reviewed, refined, and approved the Advisory Committee's recommendations. Although goal statements were developed for the climate and risk, quality of life, and leadership values, measurable goals were not established for these values. The goals statements for these values will be used as a prioritization tool to direct the investment of time and resources during the plan implementation. The process for evaluating these values for program and project implementation is discussed in Chapter 6.0.

Table 2-2. Example of Recommended Management Goals That Were Identified for Each Natural World Value in the Leech Lake River Comprehensive Watershed Management Plan.



2.2 NATURAL WORLD MEASURABLE GOALS

Measurable goals, which are a critical component of the 1W1P, were established based on the results from the analysis and prioritization of values and concerns. The protection goals that have been established reflect no negative changes in a resource condition, and a risk assessment was conducted to develop the measurable goals. For the natural world values that require restoration actions, management strategies were identified. In each case, robust discussions within Advisory Committee and Policy Committee meetings led to a clearly defined and measurable plan.

Throughout the planning process and when defining measurable goals, the following questions were considered:

- Can we state the values in a way that addresses what people care about?
- What is the preferred future condition? What needs to change and how do we get there?
- How many changes can we make during the 10-year plan period? (measurable goal)
- What actions can we take that effectively work toward our goal (output), and what do we expect to accomplish (outcome)?
- Can our outcomes be measured directly? What indicator will we use?
- Who else needs to be involved? What is their role and what can we do to motivate them?
- What other assumptions are we making about the results of our work? What evidence (e.g., existing data, models, literature values, and anecdotes) leads us to believe our collective actions will lead to the preferred results? How confident are we?
- Do people care enough about the issue to make the required investments to reach the goal?

The steps to developing measurable goals that meet the 1W1P planning guidance requirements are described in greater detail in the following sections.

PROCESS FOR DEVELOPING NATURAL WORLD VALUE MEASURABLE GOALS

Measurable goals were developed for the 10-year plan's natural world values and targeted subwatersheds. Strategies identified in existing plans were adopted when possible, or otherwise, the Advisory Committee developed and presented recommendations to the Policy Committee for approval. Measurable goals were designed to be specific and clearly defined. Each measurable goal was developed to demonstrate progress during its assessment. The Advisory Committee members also contributed details regarding what should be accomplished, who will be involved, how long the process will take, and the location and purpose of any strategy. This information was used to develop the targeted implementation plan and programs. Outcomes, outputs, and indicators were developed for each measurable goal.

WATERSHED-WIDE GOALS

- Reduce phosphorus loading by 5 percent.
- Maintain an average annual discharge of 747,000 acre-feet at the USGS gage in Ball Club, MN.
- Implement stormwater management practices to reduce phosphorus loading from a 1.1-inch rain event by 60 percent .

2.3 PRIORITIZING SUBWATERSHEDS

A screening process was developed to prioritize the implementation efforts over the LLRCWMP's 10-year cycle. Hydrologic Unit Codes (HUC) are a sequence of numbers that identify a hydrologic feature or drainage area. HUC Level 12 (HUC12) drainage units (commonly known as subwatersheds), were used to identify the greatest opportunity to address multiple natural world values and resulted in a priority subwatershed ranking. The LLRCWMP expands from WRAPS-identified priority HUC12s because the LLRCWMP considers the natural world values of wetlands, groundwater, forests, and working lands. The following four steps were used to prioritize subwatersheds.

KNOW THE FACTS

- HUC Level 2 defines large drainage regions, such as the Upper Mississippi River, which is (HUC2-07.
- HUC Level 8 defines drainage units that are at the level of the familiar Minnesota DNR Major Watersheds. For example, the Leech Lake River is HUC8 07010102.
- HUC Level 12 defines the smallest federal drainage units, for example, the Woman Lake subwatershed is HUC 070101020305.
- Minnesota DNR catchments are even smaller than HUC Level 12.
- Lakesheds refer to the immediate area that drains to a lake.

1 STEP

REFINE NATURAL WORLD VALUE CATEGORIES

The original set of prioritized natural world values were reviewed and refined for more effective screening of HUC12s. Impoundments, wetlands, and upland habitat natural world values were omitted from the screening process because of

outdated or insufficient data. For example, wetlands were omitted because the National Wetland Inventory and County Geologic Atlas (Part B) are both scheduled to be completed in 2019. However, impoundments, wetlands, and upland habitats are included in watershed-wide programmatic implementation actions.

2 STEP

GATHER DATA RELATED TO EACH PRIORITY NATURAL WORLD VALUE

Information related to each natural world value was collected from various existing databases and reports and used to develop screening metrics for each natural world value. The Advisory Committee provided input that further refined the screening process metrics.

The screening metrics were used to identify subwatersheds where implementation is most needed or has the greatest opportunity. To determine these locations, opportunity and risk measures associated with each natural world value were combined and evaluated. To evaluate which recreational lake subwatersheds to focus implementation efforts on, the four metrics in Table 2-3 were evaluated.

IMPORTANT DATA SOURCES

- Leech Lake River WRAPS
- Hubbard and Cass local water management plans
- Land-use data
- State forest disturbance data
- Forests for the Future and Forest Stewardship plans
- State water quality and trend data
- State biological significance data
- State groundwater sensitivity data
- Property-value and private-public ownership data
- US Census and Enhanced 911 address data

Table 2-3. Natural World Value Screening Metrics for Recreational Lakes

Recreational Lake Metric	Function
Lake Use Classification	Screens out and prioritizes the lakes most likely to be used for recreational activities.
Lake Access	Ranks lakes by the number of established lake-access points.
Current Shoreline Development	Ranks lakes by the extent of current developmental pressure along the shoreline.
Future Shoreline Development	Estimates the potential build-out of a given lake to identify the locations where increased pressure may occur and where proactive strategies might be applied.

3 STEP

DEVELOP AND REFINE SCORING CRITERIA FOR EACH NATURAL WORLD VALUE

Scoring criteria were established for each metric to rank resources. In some cases, the existing criteria were used (e.g., Minnesota DNR general development, recreational development and natural environment lake classifications). Similarly, the MPCA lake water quality trend categories were used to rate high-value lakes. Some metrics involved developing indices using readily available GIS datasets. For example, the index value for the current shoreline development metric for recreational lakes was created using property ownership and property value data. Properties with an on-site building value greater than $10,000 were used to classify a parcel as developed. The total acreage of these parcels was divided by a lake's total acreage to generate a ratio and represent the existing developmental pressure. In all cases, each index was assigned a value between 0.01 to 1.0. Appendices I–P provide detailed information on each natural world value's metrics, why they were chosen, their data sources, and their scoring criteria.

4 STEP

ANALYZE HUC12S

The screening metrics from Step 3 were used to evaluate and rank each of the HUC12s in the watershed. Tabular and mapped results from the three analyses described in Table 2-4 were developed.

Table 2-4. Subwatershed Analysis

HUC12 Analysis	Method and/or Utility
1. Scored individual screening metrics for each natural world value	The key factors used to evaluate opportunity and risk were screened and breakpoints were established for each HUC12 (Appendices I–P).
2. Summed natural world value screening metrics for each HUC12	The individual metrics for each natural world value were summed for each HUC12 to evaluate which HUC12's offer the most opportunity or are at most risk (Appendix Q).
3. Aggregated all the natural world value scores for each HUC12	The HUC12's that received the top scores from the previous analysis were summed. The resulting aggregate value reflects the HUC12's with greatest opportunities to obtain multiple benefits. These are the targeted subwatersheds. (Appendix R).

The Policy Committee was presented with the results of the above analyses for their review, comments, and approval. The resulting priority HUC12s for each Natural World Value and targeted subwatersheds that provide the greatest opportunity to obtain multiple benefits, represent the areas of concentrated effort during the 10-year planning period. Implementation actions will occur throughout the LLR Watershed and specific actions related to programs within prioritized and targeted HUC12s will be identified. The implementation actions can occur in nonprioritized areas of the watershed if opportunities that do not diminish the focus to watershed priorities are presented. Additional results from these analyses are in Appendices I–R.

EXAMPLES OF HOW CRITERIA WERE DEVELOPED AND HOW SCORING WAS REFINED FOR EACH NATURAL WORLD VALUE

» High Value/Priority Rivers and Streams: Three metrics were used; the first two—PCA-DNR Ranking Status and Wild Rice Streams—capture high value streams by allocating a top score of 1 in both metrics for streams that have the highest PCA-DNR ranking and support known wild rice stands. The third metric (Years Since Forest Disturbance), was chosen to identify current risks to these top-ranking streams. Forest disturbance includes recently harvested stands, fires, disease, blowdowns, and more. Forest integrity affects hydrology and sediment delivery to rivers and streams. The extent of the impacts varies based on the size of the disturbance and how recently the disturbance occurred. The greater the extent and the more recent the disturbance, the greater the current effect on hydrology will be. Minnesota DNR spatial/age disturbance data were used to evaluate the potential risks to streams as determined by forest disturbance. Data were screened by years since the disturbance. The years since forest disturbance was used to generate a multiplier to prorate a given area's acres, assuming recent disturbances reflect the greatest hydrologic alteration and that full hydrologic functions would be restored at year 20. This adjusted disturbance value was multiplied by the acreage resulting in an adjusted disturbance acre (ADA). All disturbances in each HUC12 were summed resulting in an adjusted disturbance acre value (ADAV). This system scores the risk of altered hydrology and sediment transport higher in more recently disturbed areas than in reestablished areas. Summed ADAVs were assigned a decimal score according to the following scale:

> 500 acres =	**0.01**
250–500 acres =	**0.33**
100–250 acres =	**0.66**
< 100 acres =	**1.00**

For example, a 10-acre disturbance that occurred 5 years ago would result in an ADAV of 7.5 acres (5 years divided by 20 years resulted in a 2.5-acre credit assuming some vegetation reestablishment). Future risks associated with forest harvests are also important. To assess for future risks, local managers will review the Minnesota DNR Forest Disturbance data to identify locations likely to be harvested based on stand species composition and age.

» Several Natural World Value metric criteria use existing monitoring data to help screen for prioritization. For example, water quality trends in lakes derived from several years of monitoring provide insights into whether a lake is showing a declining water quality trend, is close to the threshold of impairment, is increasing its water quality trend, or has no data from which to determine its status. When a given metric lent itself to the use of this screening method, numeric values were developed for each trend category. For example, values of 1.00, 0.66, 0.33, and 0.01 were assigned to Close to Threshold, Declining Trend, No Data, and Rising Trend, respectively.

» For calculated indices (e.g., Current Shoreline Development), scoring values were assigned at breakpoints in the data. The percentage of developed land area in relation to the lake's area was designated as the following:

0–25 percent	**1.00**
25–50 percent	**0.66**
> 50 percent	**0.33**

In the case of current shoreline development, this scoring identifies minimally impacted lakes. In contrast, the future shoreline development metric is intended to identify the areas likely to see increased shoreline development in the future. This metric is the ratio of developable (i.e., undeveloped private) shoreline acres to lake acres and was assigned the following scoring indices:

> 50 percent	**1.00**
25–50 percent	**0.66**
0–25 percent	**0.33**

2.4 SUMMARY OF LLRCWMP VALUES AND GOALS

The primary focus of this plan is to protect the LLR Watershed's natural resources, which are referred to as natural world values. Quality of life, leadership, climate and risk, and cultural resources are also important values. The natural world values are the basis of the plan while the other values will become more important to consider during plan implementation. This section provides an overview of all the values.

NATURAL WORLD VALUES

The LLR Watershed has high-quality resources, and the baseline measurable goal is to maintain the current resource quality. Opportunities may arise to improve the existing resource quality and protect resources from potential impacts of increasing population growth, resource pressure, and climate change. These levels of goal attainment apply to the current 10-year planning cycle. An overview of implementation actions for each natural world value is provided in Chapter 4.0.

Figure2-2. Natural World Value Word Cloud Indicating the Keyword Frequency Use From the Input Process. The Larger the Word, the More Frequently It Was Used During the Input Process. The Colors Are to Differentiate Words.

Figure 2-3. Natural World Priority Values With Corresponding 10-Year Plan Management Goal.

QUALITY OF LIFE

The LLRCWMP stakeholders value their quality of life and want to improve the community's quality of life by implementing this plan. Their goals include stimulating sustainable growth and development, enhancing public health and safety, preserving historic and cultural resources, and maintaining views and local character.

Figure 2-4 Quality of Life Values Word Cloud Indicating the Keyword Frequency Use From the Input Process.

LEADERSHIP

The natural world value goals established in this plan will be more achievable and sustainable with strong, effective, and committed leadership. To obtain the needed level of leadership, the LLRCWMP partners will foster collaboration and teamwork and provide opportunities for authentic stakeholder involvement. The partners will work to improve the integration of infrastructure to obtain multiple benefits for capital improvement projects. Plans will be developed for the long-term monitoring and maintenance of capital improvement projects. The LLRCWMP partners will work toward consistency in the land use and regulatory environment throughout the LLR Watershed by addressing conflicting regulations and policies.

Figure 2-5. Leadership Values Word Cloud Indicating the Keyword Frequency Use From the Input Process.

CLIMATE AND RISK

Maintaining high-quality resources largely depends on reducing the risk of disruptions to the existing natural environment. The potential impacts of the threats of climate change must be assessed and considered when implementing this plan. Vulnerabilities and traps should be avoided. When implementing the plan, considerations should also be given to prepare for short-term hazards and long-term adaptability. The climate and risk issues are discussed in more detail in Chapter 3.0.

Figure 2-6. Climate and Risk Values Word Cloud Indicating the Keyword Frequency Use From the Input Process.

2.5 CULTURAL RESOURCES

In contrast to the non-tribal utilitarian view of water, the LLBO reveres water because water is life [Burnett, 2018]. Traditional practices that relate to water, such as ceremonies and procurement of resources, observe responsibilities and relationships to the natural world and the Anishanaabeg ancestors [Cozzeto et al., 2013]. Leech Lake itself has shaped the history and culture of the people of the area, as many important events have occurred in and around the lake.

The importance of ensuring access to reserved hunting, fishing, and gathering rights cannot be overstated. Procuring natural resources not only provides physical sustenance, but also enhances the tribal lifeways of the people of the LLBO. Changes to the harvest practices of natural resources (e.g., snowshoe hares, walleye, white-tailed deer and berries) have occurred with changing land-management practices and encroaching development on critical habitats. Current and predicted climate change stresses to these critical habitats have only exacerbated the concerns that LLBO members have about the sustainability of their way of life.

Wild rice is a particularly important plant to the Anishinaabeg people of northern Minnesota. As a staple food in their diets, wild rice has also provided important benefits for local economies. The value of natural wild rice to wildlife and overall ecosystem integrity has been long appreciated by the Anishinaabeg, and the Minnesota DNR (2008) has documented the importance of wild rice as food and shelter for many fish and wildlife species. An average of 1,500 licenses are sold each you to non-tribal members for wild-rice harvest.

Important threats that impact local stands of natural wild rice include changes in local hydrology because of dams and culverts, etc., water-based recreation, shoreland development, and industrial

activities. Although the impacts are to local stands, the cumulative effect of these threats can have significant implications. Current trends in population growth and development pressure within and surrounding the Leech Lake Reservation indicate that anthropogenic impacts to wild-rice habitat will only be compounded in the next several decades.

The productivity of wild-rice stands in the LLR Watershed will largely depend on its protection and management by tribal and state natural-resource agencies. The role of these agencies is complicated by the limitations of authority and challenges posed by multiple jurisdictions, as well as the annual variability of wild-rice crops caused by weather and other factors. The lack of information about the natural ecology of wild rice, historical losses, and trends in abundance and distribution, threaten its future [Minnesota DNR, 2008], and, consequently, affects the futures of the people of the LLBO.

3 CLIMATE AND RISK

Because the overarching principle of the Leech Lake Comprehensive Watershed Management Plan (LLRCWMP) is keeping the forest forested and the clean lakes clean, understanding the factors that most jeopardize the forests and lakes is important. Potential threats to the health of the watershed were identified through stakeholder input and existing reports and research. The primary threats include climate change, land-use change, irrigation, and invasive species. Lower risk threats included aging infrastructure and the increased use of chlorides for deicing purposes.

This chapter provides an overview of these threats, potential impacts if the threats were realized, and recommended actions to monitor and evaluate each threat. An adaptive management approach, which would establish benchmarks for key environmental and biological parameters that are monitored and assessed regularly, to addressing threats is encouraged. When benchmarks are triggered (e.g., exceeding a 5 percent change in forest cover), strategies for interventions can be evaluated and implemented.

3.1 CLIMATE CHANGE

To fully address future planning efforts, the impact of climate change must be considered. The consequences of the changing climate will influence many factors that directly affect water quality throughout the watershed. Changes in precipitation patterns and air temperatures will drive many of these impacts. As the climate changes, the precipitation intensity, the frequency of intense rain events, the duration of precipitation events, and the time between precipitation events will increase. These changes in precipitation trends will increase erosion and runoff, pollutant loading from landscapes (e.g., agriculture, urban areas, and forest areas) that have become fragmented, and the likelihood of consequences from droughts and flooding. In addition to increasing runoff, streams and rivers are more likely to experience stream-bank erosion as the flashiness of rain events increases the natural channel depth and width to accommodate increased flow.

Temperature changes will also influence the types of plants and animals that can thrive in the region. For example, native evergreen species are sensitive to rising temperatures and, therefore, the abundance of these species is likely to decline with increasing mean summer and annual temperatures. An extensive study on the potential impacts of climate change, including species changes and overall impacts to the ecosystem, [Cozzetto et al., 2013) evaluated the likelihood of projected changes on natural forest communities and concluded that seven of the eight forest communities have a moderate to high climate-change vulnerability rating. Forest vulnerability is a key concern because the increased risk of disease, pests, and invasive species (e.g., Emerald Ash Borer), which is likely to significantly affect northern forests.

ACTIONS TO ADDRESS CLIMATE CHANGE

ANNUALLY MONITOR AND ASSESS

- Climate trends
- Surface water flow trends
- Groundwater trends
- Forest health
- Terrestrial invasive species

IMPLEMENT

- Enact policies that reduce forest fragmentation
- Increase private forest landowner participation in Sustainable Forest Incentives Act and easement programs
- Increase forest-health management practices
- Increase the outreach efforts to private forest landowners
- Increase cooperation between tribal, federal, state, and county forest-management programs

INITIATE

- Climate change task force that uses an adaptive management approach to annually review the results of assessment information and determine intervention strategies

Climate trends in the Leech Lake River (LLR) watershed indicate that the overall precipitation has decreased and temperatures have increased over the past 30 years. These changes are more evident during the growing season from June to September. The Minnesota Department of Natural Resources (DNR) data for ice-out dates on Leech Lake also indicate that ice-out has been trending earlier into the spring over the past 30 years, which indicates warmer temperatures. The details regarding climate trends are examined in more detail in Appendix S.

3.2 LAND USE CHANGE

The land-use changes considered here are the result of intentional actions and include converting land from its original use. For instance, draining wetlands for development, converting forests to agriculture, or converting shoreland areas to residential development are land-use changes.

Approximately 46 percent of the forests are privately held. As shown in Figure 3-1, only a few areas of the LLR Watershed contain the soils and drainage characteristics that support agricultural use. Measures that mitigate or reduce the potential of land-use conversion, such as working lands easements that prioritize grazing operations, increasing enrollment in private forest management programs, and conducting suitability assessments for conditional-use permits, should be considered.

An analysis of potential future shoreline development based on percentage of private lands that are currently undeveloped (Figure 3-2) indicates the specific lakes and subwatersheds where mitigating shoreline conversion could be beneficial. Implementing policies that reduce the percentage of allowable impervious surfaces and limit shoreline alterations will help abate the impacts from future development. Education and outreach programs that target realtors, developers, and private landowners who are considering developing shoreland areas should also be implemented.

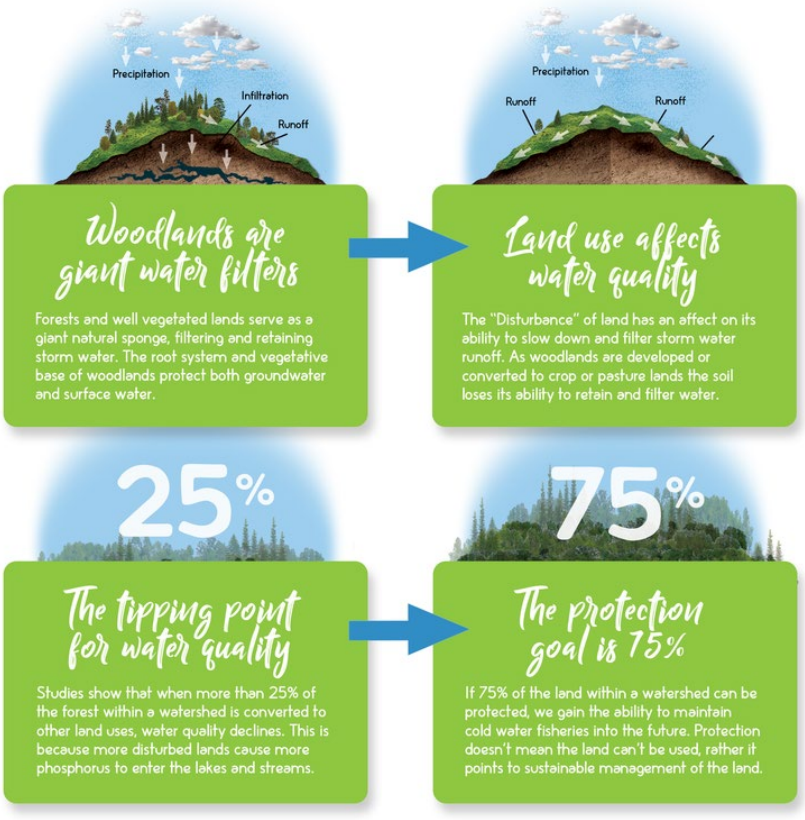
ACTIONS TO ADDRESS LAND USE CHANGE

ANNUALLY MONITOR AND ASSESS

- Lands most vulnerable to conversion, such as school trust lands, that are designated as having real estate as the highest and best use.

IMPLEMENT

- Adopt policies that reduce land conversion that may result in negative impacts
- Increase private-forest landowner participation in Sustainable Forest Incentives Act and easement programs
- Increase outreach efforts on minimal impact design and shoreland best management practices to realtors, developers, and private shoreland owners



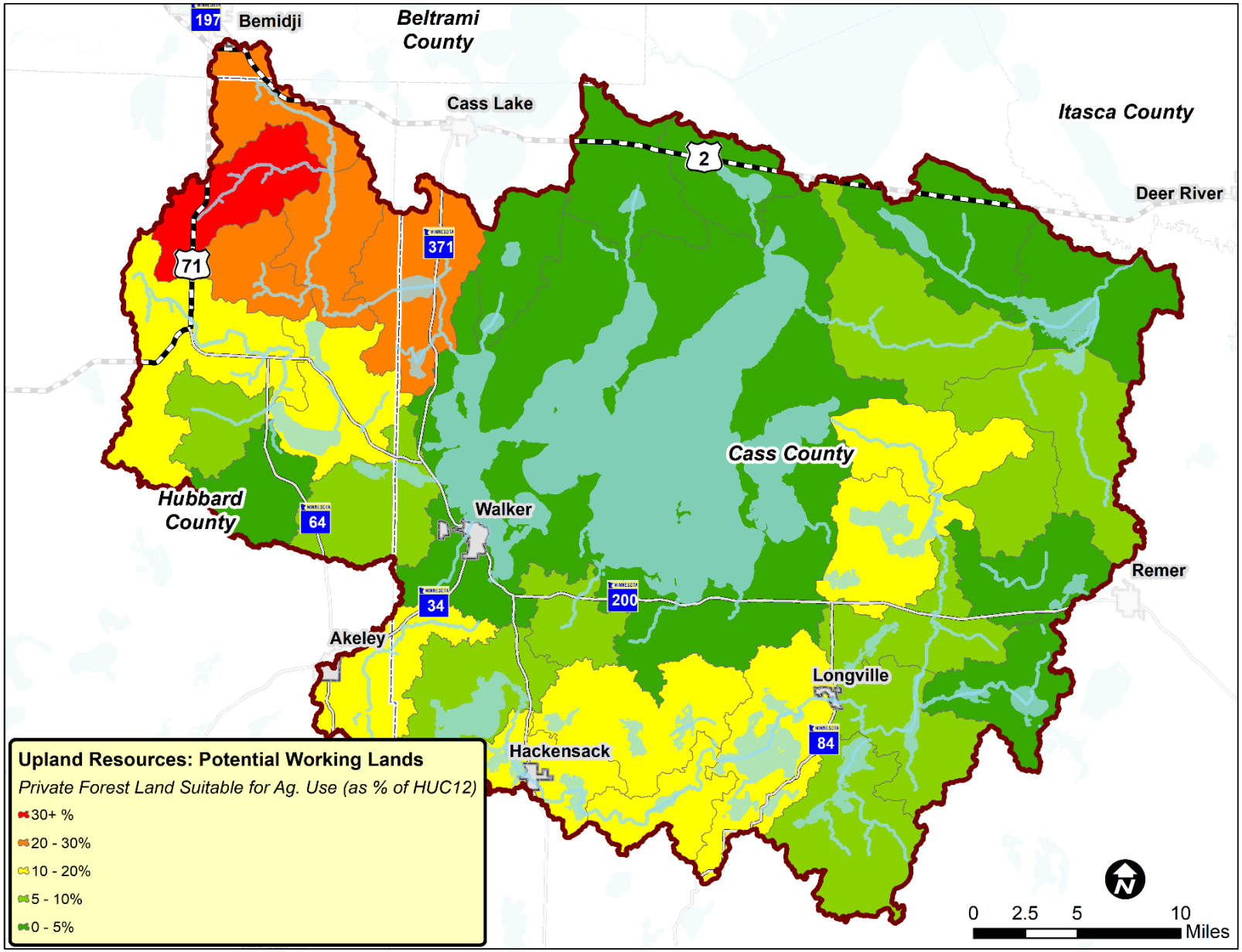


Figure 3-1. Percentage of Private Forest Lands That Are Suitable for Agricultural Use Per Subwatershed.

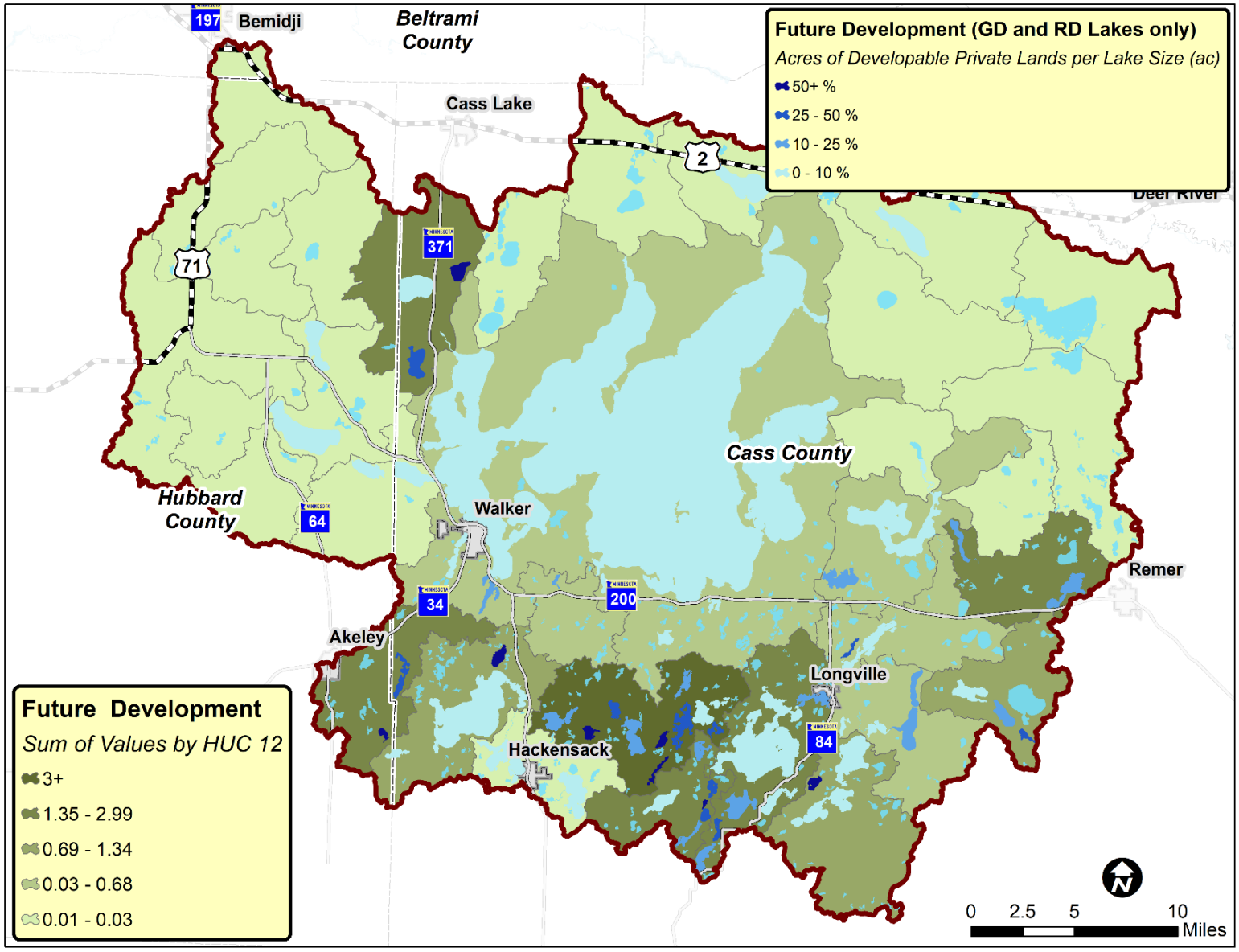


Figure 3-2. Future Potential Development on MN DNR General Use and Recreational Use Lakes by Lake and Summed by Watershed.

3.3 IRRIGATION

Most of the land within the LLR Watershed is poorly suited for agricultural uses because most of the land cover is forested areas, wetlands, and open water. According to the US Department of Agriculture's (USDA's)*Rapid Watershed Assessment* , [Natural Resources Conservation Service, 2014] "land use within the watershed is moderately agricultural, accounting for 8% of the available acres." However, the pressure for agricultural development is on the rise because available land resources are primarily being parceled out for recreation and home building. The emergence of new row crop operations farms around the watershed is of concern. Unlike the other crops grown in the area, potato acreage almost always requires irrigation to promote tuber formation and ensure successful yields.

An increase in groundwater use for irrigation purposes can lead to a reduction in stream-base flow, affect wetland hydrology, and place additional pressures on drinking-water resources within the watershed. The shallow aquifers in the region are more susceptible to high nitrate levels A number of factors can contribute to this susceptibility, including nutrient-intensive land uses and irrigation. While irrigation alone does not generate nitrate, it can accelerate infiltration locally which can have negative consequences if the infiltrating water is high in nitrate or other contaminants. One-third of the residents who rely on private wells for their drinking water are in areas with highly vulnerable aquifers. Reductions in base flow can also affect the local stream ecology. Combined with stronger and less frequent rain storms that produce additional surface runoff, the stream-flow rate and temperature can be altered and affect indigenous aquatic plants and animals.

ACTIONS TO ADDRESS IRRIGATION

ANNUALLY MONITOR AND ASSESS

- Groundwater levels
- Groundwater ambient conditions
- Short-term acute environmental conditions and long-term trends
- Results of county geologic atlas to evaluate the results and better understand risks and vulnerabilities

IMPLEMENT

- Policies that reduce groundwater risk because of increased irrigation, e.g., restrict use in highly vulnerable areas by requiring conditional use permits.
- Extend irrigation management assistance programs to the entire watershed area
- Increase irrigation outreach programs, including irrigation scheduling and uniformity testing

INTEGRATE

- Recommendations from the County Geologic Atlas into the LLR1W1P implementation plan

3.3.1 CURRENT IRRIGATION MANAGEMENT

The Minnesota DNR currently regulates irrigation and draws of more than 10,000 gallons of water per day (1 million gallons per year). These users are required to obtain a water-use appropriation permit, report their annual water use, pay fees based on their rate of use and, in some cases, monitor groundwater levels.

Within the LLR Watershed, the Cass County and Hubbard County Soil and Water Conservation Districts (SWCDs) have plans to improve their understanding of groundwater usage with the newly developed geological atlases. Hubbard County SWCD also has an irrigation-scheduler management program, so agricultural landowners are provided with guidance regarding the most appropriate time and volume to irrigate their fields. The owners report weekly rainfall and irrigation amounts, the timing of pesticide applications, and the dates of crop emergence. County representatives provide landowners with reports of soil-moisture estimates, daily evapotranspiration information, and a year-end report to create efficiencies in their usage of groundwater.

3.4 INVASIVE SPECIES

3.4.1 AQUATIC INVASIVE SPECIES

Aquatic invasive species are introduced, nonindigenous plants and animals that live in or near water. They have often adapted quickly to their new environments and reduce the overall number of native species through competition. Aquatic invasive species pose both economic and environmental threats to Minnesota waters and are managed throughout Minnesota by the Minnesota DNR, which receives support from research and academic institutions and counties. Aquatic invasive species are present in nearly all the waters of Minnesota, and public education plays a vital role in defending against their continued spread and growth.

3.4.2 CURRENT LOCAL AQUATIC INVASIVE SPECIES MANAGEMENT

The Hubbard and Cass SWCDs and Environmental Service Departments have programs for managing aquatic invasive species (AIS). Hubbard County's Comprehensive Local Water Management Plan (CLWMP) currently has an AIS plan that was developed by a Hubbard County AIS Task Force, which initiative the effort in 2012. In 2014 funding for the program was provided by the State of Minnesota. Prior to the state funding becoming available, lake associations funded AIS initiatives. The Hubbard CLWMP identifies several objectives for address AIS. This plan encompasses the following areas:

- Public Awareness and Education
- Prevention (Watercraft Inspection & Decontamination)
- Early Detection; Rapid Response and Containment
- Mitigation and Management.

This plan, which was one of the first in the state, was submitted to the Hubbard County Board, was passed, ratified, and submitted to the Minnesota DNR in December 2014. The CLWMP contains action items for the Hubbard County AIS Task Force and defines the role of its watercraft inspection and decontamination program.

Cass County initiated its AIS Task Force in 2014 to plan and implement strategies to prevent AIS from spreading to public waters. The AIS Task Force implements public education programming and watercraft/trailer inspection and decontamination and employs seasonal staff at boat launches. The Cass County SWCD website also provides the following information on AIS:

- A Cass County boat decontamination hotline
- Links to frequently asked questions about AIS including boating, fishing, bait, and laws
- A summary report from the Minnesota AIS Research Center – "Enhancing the Role of Resorts and Fishing Guides in Preventing the Introduction and Spread of Aquatic Invasive Species" [Association of Cass County Lakes, 2016]
- An informational video about AIS.

Seasonal watercraft inspectors are required to complete the Cass County Enhanced Skills Training Workshop and Minnesota DNR training. Funding for the Enhanced Skills Training Workshop is provided by a partnership grant with the Initiative Foundation and Cass County AIS Prevention funds.

3.4.3 TERRESTRIAL INVASIVE SPECIES

Terrestrial invasive species are often not a priority when considering the health of a watershed. However, the effect of these land-based, non-native plants and animals should not be underestimated. They can quickly destroy tree foliage in forests and decimate vegetative cover adjacent to waterways. These impacts can result in major short-term and long-term changes to the watershed hydrology and cause increased runoff and stream-bank erosion as well as increased risk to infrastructure such as culverts and dams that are not sized to accommodate the increased flow. Terrestrial invasive species can often be highly mobile—either by their own power or by hitching a ride—which makes controlling their spread difficult to control their spread.

3.4.4 CURRENT LOCAL TERRESTRIAL INVASIVE SPECIES MANAGEMENT

Many agencies in the LLRCWMP watershed are working to control the spread of terrestrial invasive species, including the cities, townships, Minnesota DNR, USDA, Cass and Hubbard County governments, the Leech Lake Band of Ojibwe, the US Forest Service (USFS), and local nonprofit groups. By consolidating local planning efforts and forming a joint effort built on the existing Minnesota planning frameworks, the terrestrial invasive species program implementation could be improved to match the scale of local AIS efforts.

KNOW THE FACTS

The Emerald ash borer (EAB) is an invasive forest insect that has been responsible for the death of millions of ash trees in the eastern have of the United States and southeastern Canada. EAB infests all species of ash trees, which usually die within one to three years of becoming infested. Black ash is a major species in Minnesota's northern forests, covering more than 959,000 acres (USFS, 2010). Therefore, this invasive insect poses a serious threat to the ecological health of northern forests.

Photo by: Leah Bauer, USDA Forest Service Northern Research Station, Bugwood.org.

Adult Emerald Ash Borer

3.5 AGING INFRASTRUCTURE

Stormwater sewer lines, culverts and road/all-terrain vehicle crossings can influence public safety, road infrastructure, property, water resources, and the health of the fisheries. As old pipes deteriorate, an inflow of groundwater or from water leaking from adjacent wastewater pipes occurs. Increased wet- and dry-weather flows can lead to the transmission of pathogens and nutrients. Old pipes may be undersized relative to current precipitation trends and cause localized flooding and, when structurally compromised, can lead to bursts and pothole formation that could affect the local infrastructure. Old culverts may be similarly undersized, plugged with sediment, or no longer laying in their original grade (i.e., frost-heaving or undercutting readjusts the position of culverts). Problems with old culverts can lead to road-crossing blowouts and changes to the natural levels of sediment transport in streambeds, which affects aquatic macroinvertebrate and fish habitats. Perched or plugged culverts are also barriers to fish migration. The original designs of bridges may not adequately accommodate channel flow and may infringe on its access to its floodplain. When this happens, stream flows are pinched and lead to bank and bluff erosion with similar effects to those mentioned for improperly sized or functioning culverts.

ACTIONS TO AGING INFRASTRUCTURE

MONITOR AND ASSESS

- Culverts, dams, and stormwater infrastructure

IMPLEMENT

- Culvert replacement programs
- Replace or remove earthen dams

3.5.1 CURRENT LOCAL INFRASTRUCTURE MANAGEMENT

Within the LLRCWMP watershed, counties, cities, and townships have inventories of stormwater infrastructure to varying degrees of completion. The City of Walker recently has been replacing some of its stormwater sewer infrastructure, while townships and counties have historically replaced culverts on an as-needed basis. Needs arise when culvert capacity is exceeded, which leads to erosion or transit infrastructure damage where localized flooding is caused. Efforts are being made to complete and inventory the locations and relative functional condition of stormwater infrastructure.

Photo by David R. Gonzalez of the Minnesota Department of Transportation

3.6 CHLORIDE

The results of the Minnesota Pollution Control Agency's long-term monitoring program indicate that chloride is the only pollutant in the LLR Watershed that has an increasing trend. Chloride is persistent in the environment, and once in our surface waters, chloride can only be removed by industrial processes, such as reverse osmosis. Chloride can be harmful to aquatic life and lead to impairments. An assessment of the impact of chloride in the LLR Watershed (particularly how the watershed may change with expanding transportation corridors) should be undertaken to develop appropriate management actions.

ACTIONS TO CHLORIDE USE

ANNUALLY MONITOR AND ASSESS

- Chloride levels in ecologically sensitive and high-use areas
- Application rates using township, county, and state records

IMPLEMENT

- Outreach to municipal, township, county, and state road authorities and commercial property managers on deicing BMPs

4 NATURAL WORLD VALUE PRIORITY RESOURCES

The intent of this comprehensive plan is to guide the implementation of programs and practices to protect and improve priority natural resources in targeted subwatersheds. To develop a 10-year Targeted Implementation Plan, natural resources values were determined from a combination of existing plan priorities and stakeholder input. Twelve natural world values (NWVs) were selected as the focus of the Leech Lake River Comprehensive Watershed Management Plan (LLRCWMP). An evaluation of the current level of management efforts related to these values was completed and opportunities to further develop programs and practices over the next 10 years and beyond were established. The twelve priority NWVs and associated management goals for the LLRCWMP are provided in Table 4-1. Complete descriptions of NWV management goals can be found in Appendix H.

This chapter provides an overview of the 12 priority NWVs, including:

- **SUBWATERSHED SCORING MAP** – A map of the results of the overall subwatershed evaluation (i.e., the level of opportunity and need to protect NWVs). Three NWVs (e.g., impoundments, wetlands, and habitat) were not evaluated to determine priority subwatersheds because there was insufficient data or new data is expected by 2020. Scoring of priority subwatersheds for these NWVs will be completed when better data is available.

- **NWV HIGHLIGHTS** – An overview of considerations relevant to evaluating and ranking subwatersheds, a listing of the top-scoring NWV subwatersheds, and the LLRCWMP Management Goal.
- **DRIVERS OF IMPLEMENTATION STRATEGIES** – A summary of the main risks and opportunities associated with each NWV.
- **GENERAL GUIDANCE -** A description of broad-level priority implementation considerations.
- **IMPLEMENTATION STRATEGIES** – Watershed and priority subwatershed strategies that address resource needs for each NWV. Detailed information for each implementation action is provided in Chapter 6.0.

CONSERVATION – A listing of on-the-ground implementation strategies (e.g., conservation easements and sediment and nutrient management practices).

LAND USE MANAGEMENT – A listing of policy related implementation strategies (e.g., planning and zoning strategies, state buffer program).

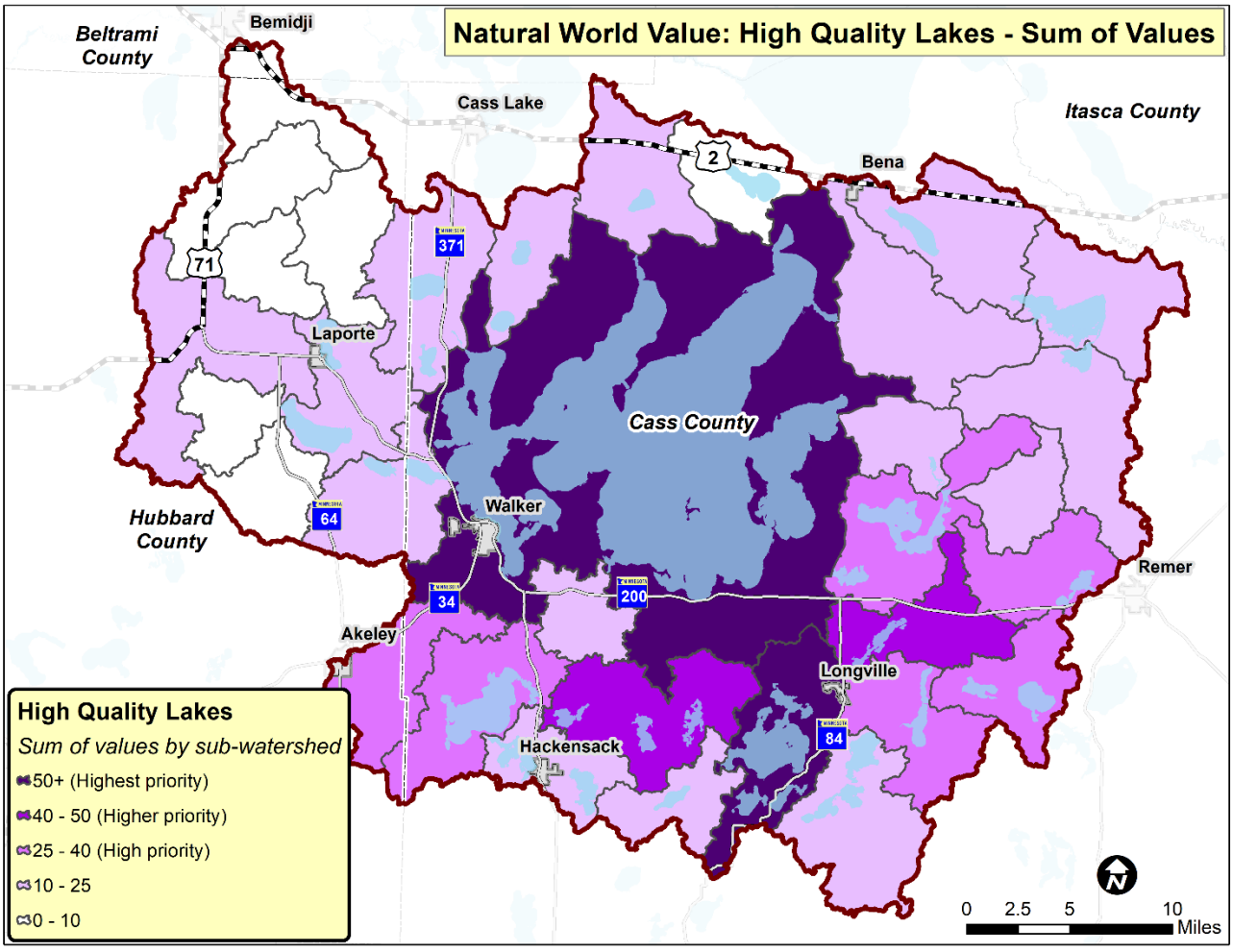
OUTREACH AND EDUCATION – A listing of public engagement implementation strategies (e.g., stakeholder roundtables, irrigation management trainings, and informational brochures on shoreland restoration to shoreland owners).

RESEARCH, DATA COLLECTION, AND MONITORING - A listing of data acquisition and decision support implementation strategies (e.g., analyze subwatersheds for targeted conservation easements based on threat, lake water quality monitoring and trend analysis for specific lakes).

Table 4-1. Natural World Values and Associated Management Goals

Priority Natural World Values	Comprehensive Watershed Management Plan Goal
High-Quality Lakes	Improve
Recreational Lakes	Improve
Impoundments	Improve
Impaired Lakes	Maintain
High-Value Rivers	Improve
Impaired and Declining Rivers	Enhance
Wetlands	Improve
Groundwater	Improve
Forests (combined with working lands)	Improve
Working Lands (combined with forests)	Improve
Habitat	Improve
Cities and Towns	Improve

4.1 HIGH-QUALITY LAKES PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

The Leech Lake River (LLR) Watershed has an abundance of high-quality lakes; however, stressors and risks exist that may reduce water quality in the future. Development pressure in this watershed is projected to increase by 60 percent by 2030 [Minnesota Pollution Control Agency (MPCA), 2016]. Converting forests from these types of activities can increase the amount of sediment and nutrients that runoff into surface waters if no preventative measures are taken. Jack pine forests are also prime lands for growing many crops, which can have similar effects if poorly managed. Disrupted hydrology also affects stream stability, which increases the bank and bed erosion that lead to additional sediment and nutrient delivery to lakes. Development in shoreland areas often impacts native plant communities, which results in shoreline erosion, more nutrients washing into lakes, and habitat loss. Urbanizing development replaces native plant communities with impervious surfaces (e.g., asphalt, concrete, and buildings) and results in more rapid and warmer runoff, which has a negative effect on local fisheries, particularly coldwater fisheries (e.g., tullibee/cisco lakes).

HIGHLIGHTS

RANKING CONSIDERATIONS

Eight criteria were evaluated to rank high-quality lakes. Each lake was scored based on lake and upland habitat abundance, water quality trends, sensitivity, and its Watershed Restoration and Protection Strategy (WRAPS) priority.

TOP TEN SUBWATERSHED RANKING RESULTS

(1) Woman Lake, (2) Leech Lake, (3) Man Lake, (4) Inguadona Lake-Boy River, (5) Long Lake-Boy River, (6) Swift Lake, (7) Boy Lake, (8) Tenmile Lake, (9) Trelipee Creek, and (10) Big Deep Lake-Boy River.

MANAGEMENT GOAL

Improve.

The identified implementation strategies build on the current level of effort to reduce future stressors and risks to high-quality lakes. These strategies are organized into four implementation programs. Specific actions, timelines, and budgets are identified in Chapter 6.0.

GENERAL GUIDANCE

The preferred strategies provide multiple benefits, instead of addressing one issue. For example, focusing on strategies that protect a lake's watershed through easements, forest-management plans, and erosion control helps ensure high-water quality within the lake, provides protection from the risk of forest conversion to development, maintains or improves forest wildlife habitat, and reduces habitat loss in streams. The LLRCWMP includes oligotrophic and sensitive lakes identified in the Leech Lake Watershed Restoration and Protection Strategy (WRAPS), combined with additional metrics, to rank subwatersheds. Specific lakes are identified in Chapter 5, by subwatershed, as well as in the Targeted Implementation Plan (Chapter 6).

PHOSPHORUS REDUCTION GOALS FOR HIGH-QUALITY LAKES WITH DECLINING WATER-QUALITY TRENDS

LAKE	TARGET MEAN LOAD (UG/L)	LOAD REDUCTION TO MEET TARGET (LBS/YR)	PERCENT LOAD REDUCTION TO MEET TARGET	TARGET LOAD (LBS/YR)	LLCWMP LOAD REDUCTION GOAL (LBS/YR)
Barnum	9.0	7	12%	55	3
Man	9.9	117	8%	1,324	72
Island	10.2	20	14%	124	7
Ponto	7.3	13	12%	94	5
Swift	17.8	202	13%	1,321	76
Leech	11.5	85,966	58%	62,680	7,432

IMPLEMENTATION SUMMARY

High-Quality Lakes Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Collaborate with neighboring counties, state agencies, and townships to identify, prioritize, and develop projects to correct problems in areas of altered hydrology. Implement road, bridge, and culvert-replacement projects that provide temporary storage to reduce downstream erosion, reduce sediment transport, and restore hydraulic balance
- Provide technical and financial assistance and on-site guidance to enable landowners to implement stormwater-management practices, natural shoreline buffers and riparian corridors, and enroll in Sustainable Forest Incentive Act (SFIA) program.

Priority Subwatersheds

- Implement permanent conservation easement and land acquisition programs identified in critical habitats, forests, shorelines, and riparian and wetland areas to advance the goal of achieving 75 percent protection within each lakeshed.
- Construct sediment and nutrient management best management practices (BMPs), such as using plants that stabilize soils and provide habitat for pollinator species for shoreline buffer and surface water runoff treatment practices in upland and shoreline areas.
- Implement urban, surface water-management projects that focus on reducing high-water temperatures adjacent to the cisco and tullibee lakes.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Develop consistent shoreland zoning across the areas of Hubbard and Cass Counties within the LLR Watershed.
- Encourage and assist zoning authorities with implementing proven methods that promote minimal impact for stormwater in land use planning and permitting processes. Methods will include using natural drainage ways and vegetated surfaces to convey, store, filter, and retain stormwater on the site using the natural hydrology.
- Continue to implement Minnesota's buffer initiative on public waters and drainage systems.
- Encourage including conservation strategies into county shoreland management ordinances and variance processes for development in the shoreland zone, especially along sensitive shorelines, wild rice lakes and rivers, exceptional waters, and the cisco and tullibee lakes.

Priority Subwatersheds

- Continue implementing spill-and-leak diversion systems, spill prevention plans, and cleanup as provided in county emergency management plans.

OUTREACH AND EDUCATION STRATEGIES

Watershed-Wide

- Update the outreach and education program and materials to reflect the LLRCWMP contents and give special attention to targeted audiences with the most potential to impact protection goals.
- Update the forest-stewardship program based on the concerns identified in the LLRCWMP and conduct private-landowner- forest-stewardship education programs.
- Develop informational and educational brochures and news articles (e.g., actions to take in case of pipeline spills and ruptures). Publicize the Cass and Hubbard County Emergency Response plans.

Priority Subwatersheds

- Prepare lake-specific, targeted, lakeshore-property owner, roundtable presentations and workshops.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Watershed

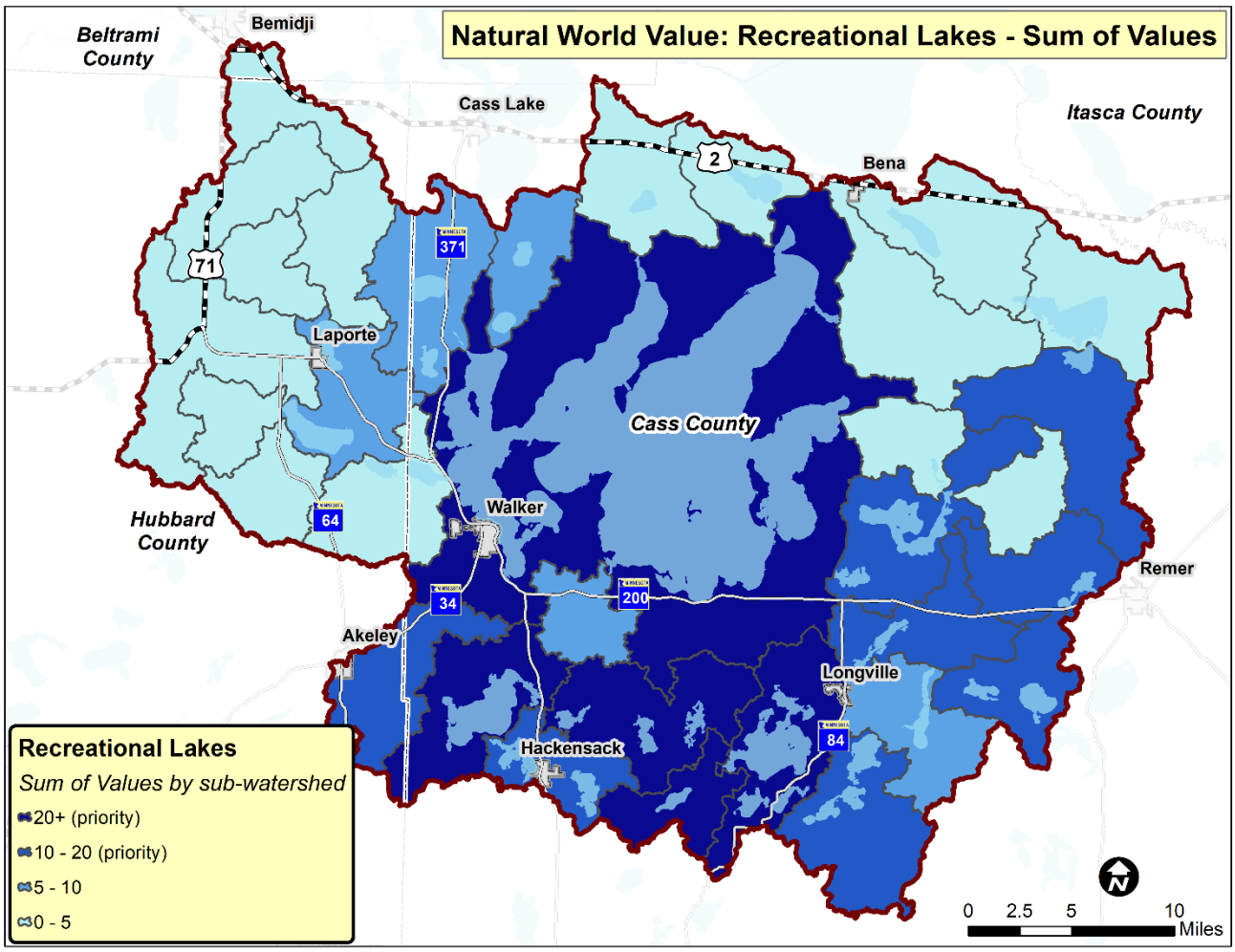
- Implement annual reviews to evaluate and undertake road, bridge, and culvert-replacement projects that provide temporary storage to reduce downstream erosion, reduce sediment transport, and restore hydraulic balance.
- Identify critical shoreland, forest, and wetland habitat areas to implement conservation projects and permanent conservation easement, land acquisition, SFIA, and private forest-management programs to advance the goal of achieving 75 percent protection within each lakeshed.
- Promote and support water quality monitoring through the Hubbard County Coalition of Lake Associations and Association of Cass County Lake Associations, local lake associations, volunteers, and school students and provide dissolved oxygen and temperature profiles services for lake associations.

- Evaluate the use and impact of chlorides in the most sensitive and vulnerable areas. Assess potential future conditions under current and potential future-use scenarios.
- Analyze lakesheds and develop lake-specific vulnerability indices that describe a lakeshed's vulnerability to climate change to better target implementation activities.
- Assess the strategies identified within this plan to estimate its potential watershed treatment using a comprehensive water quality model.
- Assess lake temperature and habitat of the priority the cisco tullibee Lakes.
- Continue annual aquatic invasive species plan implementation.

Priority Subwatersheds

- Conduct water quality monitoring at priority lakes and develop trend analyses. Focus on lakes within priority subwatersheds that have either insufficient or no data to inform management decisions.
- Assist partners in inventorying subsurface septic-treatment systems.

4.2 RECREATIONAL LAKES PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

Given the number of high-quality lakes in the LLR Watershed, these lakes are highly used by locals and visitors for recreation, including fishing, skiing, swimming, and boating. Lakes in the LLR Watershed offer tremendous fishing opportunities for warm- and coldwater species of fish and provide layover, feeding, and rearing habitat for multiple game and non-game birds. However, the quality of these recreational resources exposes the lakes to risks of aquatic ecosystem degradation because of development pressure, overuse, and invasive species. Many of the lakes in these priority subwatersheds have high percentages of developable shoreland areas (Figure 3-2). Strategies that reduce the potential for negative impacts because of shoreland development, including land use management and zoning controls, should be implemented as a preventative measure and variances should be limited to exceptional circumstances only when BMPs offset the impact of the development. Shoreland restoration opportunities should be explored using the Minnesota Department of Natural Resources' (DNR's) "Score Your Shore" program. Continued vigilance on reducing the spread of aquatic invasive species to these high recreational-use lakes is a priority.

HIGHLIGHTS

RANKING CONSIDERATIONS:

A total of four criteria were evaluated to rank high recreational. Each lake was scored based on recreational use types, amount of public access points and current and potential shoreline development.

TOP TEN SUBWATERSHED RANKING RESULTS:

(1) Man Lake, (2) Leech Lake, (3) Tenmile Lake, (4) Woman Lake, (5) Big Deep Lake – Boy River, (6) Swift Lake, (7) Long Lake – Boy River, (8) Little Boy Lake, (9) Bear River, and (10) Boy Lake

MANAGEMENT GOAL: Improve.

The identified implementation strategies build on the current level of effort in priority subwatersheds as well as for the entire LLR Watershed. These strategies are organized into four implementation programs. Specific actions, timelines, and budgets are identified in Chapter 6.0. Additional information on aquatic invasive species management programs can be obtained from the Cass County and Hubbard County aquatic invasive species (AIS) plans.

GENERAL GUIDANCE

Lakes that experience a high degree of recreational use and have the highest percentage of shoreline available for development were prioritized because they have an increased risk of AIS infestation and conversion from native to developed shorelines. This priority also includes 10 lakes within the Minnesota DNR's Park Rapids Fisheries Management Area that have had fisheries surveys and lake management plans completed but were not identified as priority lakes in the WRAPS report.

PHOSPHORUS REDUCTION GOALS FOR RECREATIONAL LAKES WITH DECLINING WATER-QUALITY TRENDS

LAKE	TARGET MEAN LOAD (UG/L)	LOAD REDUCTION TO MEET TARGET (LBS/YR)	PERCENT LOAD REDUCTION TO MEET TARGET	TARGET LOAD (LBS/YR)	LLCWMP LOAD REDUCTION GOAL (LBS/YR)
Shingobee	17.0	231	23%	772	50
Williams	11.0	19	4%	429	22
Steamboat	18.2	276	4%	6,820	355
Big Sand	19.8	34	8%	387	21
Lower Trelipe	16.2	358	24%	1,165	76

IMPLEMENTATION SUMMARY

Recreational Lakes Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Provide technical and financial assistance and on-site guidance to enable landowners to implement shoreland and stormwater-management practices on their property.
- Enhance the current aquatic invasive species management programs by developing a coordinated, centralized program including training, staffing, and financial resources.

Priority Subwatersheds

- Prioritize AIS management efforts on lakes with greatest number of boat access points and the highest usage.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Encourage inclusion of conservation strategies into county shoreland management ordinances and variance processes for development in the shoreland zone, especially along sensitive shorelines, wild rice lakes and rivers, exceptional waters, and cisco/tullibee lakes.
- Develop consistent shoreland zoning across the areas of Hubbard and Cass Counties that are within the LLR Watershed.
- Encourage and assist zoning authorities to implement proven methods that promote minimal impact for stormwater in land use planning and permitting processes. Methods will include the use of natural drainage ways and vegetated surfaces to convey, store, filter, and retain stormwater on-site using the natural hydrology of the sites.

OUTREACH AND EDUCATION STRATEGIES

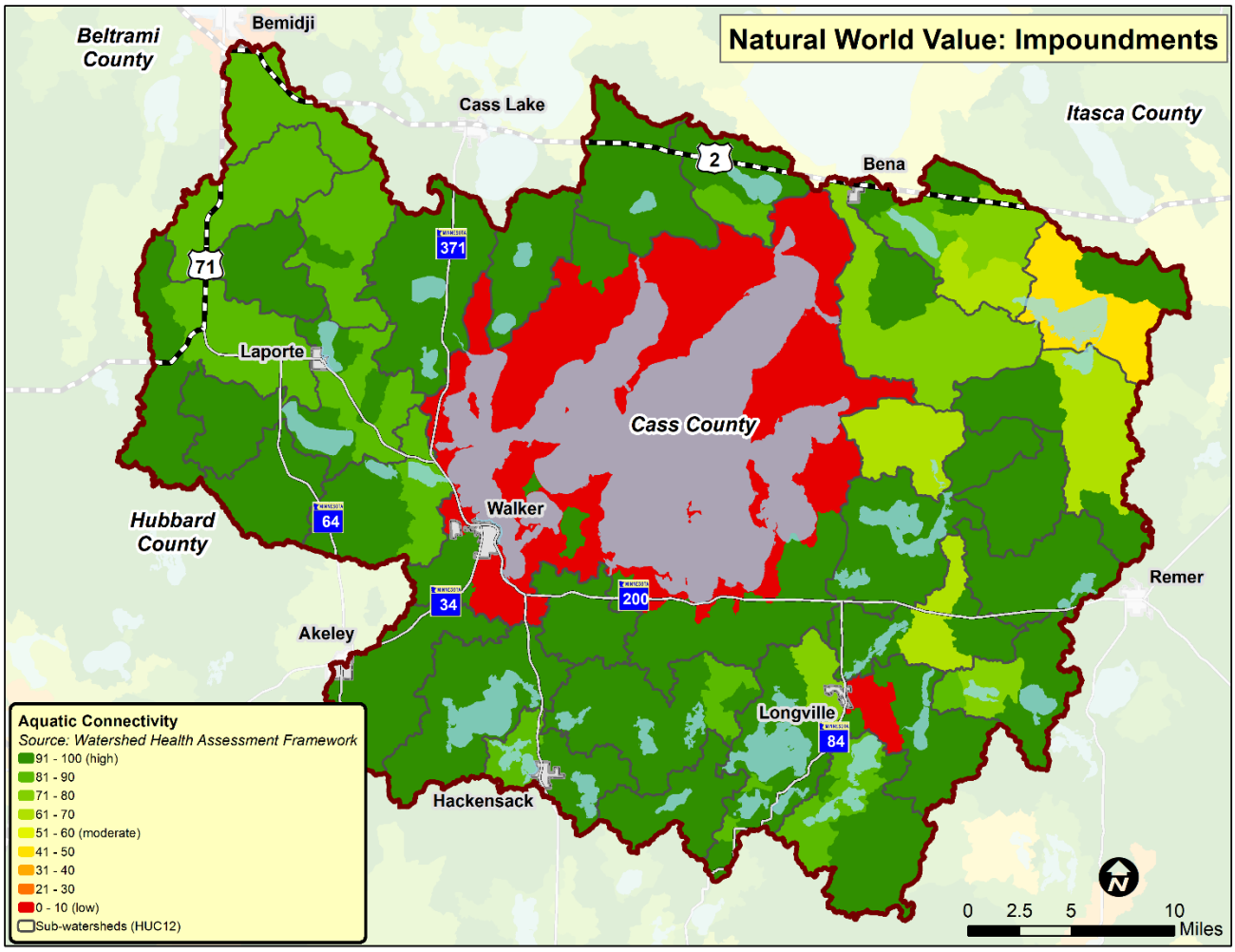
Watershed

- Keep websites, brochures, outreach and education materials regarding aquatic invasive species, distribution, control, and decontamination sites up-to-date.
- Implement professional development and educational workshops for zoning and land use management staff, decision makers, and elected officials that focus on land use management and zoning tools that mitigate potential impacts of increased land development in shoreland areas.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

- Continue to implement AIS inspection programs.
- Partner with state agencies and universities on AIS research.
- Assist partners in inventorying subsurface septic-treatment systems.

4.3 IMPOUNDMENTS



DRIVERS OF IMPLEMENTATION PRIORITIES

In this plan, an impoundment is a structure that affects the flow of water from one location to another. Major hydraulic dams, low head dams, bridge, and road crossings reduce hydrologic and habitat connectivity. Aging and potentially undersized culverts and bridges pose a structural hazard to the communities in the watershed and can adversely affect streambed and bank erosion and natural sediment transport. Excessive erosion, bed scour, and sedimentation places stress directly on the stream's health and the lakes and wetlands that the stream discharges to. Similarly, operating dams and releasing water can affect river levels that impact structures within or adjacent to floodplains and floodways as well as river health and recreation. The LLRCWMP water storage and retention goal is to maintain an average annual discharge of 747,000 acre-feet at the Federal Dam, Ball Park, MN.

The identified implementation strategies build on the current level of effort in priority subwatersheds and affect the entire LLR Watershed. These strategies are organized into three implementation programs. Specific actions, timelines, and budgets identified in Chapter 6.

IMPLEMENTATION SUMMARY

Impoundments

CONSERVATION STRATEGIES

Watershed

- Implement road, bridge, and culvert-replacement projects that provide temporary storage to reduce downstream erosion, reduce excess sediment transport, and restore hydraulic balance.
- Collaborate with neighboring townships, cities, counties, and state and federal agencies to identify, prioritize, and develop projects to correct problems in areas of altered hydrology and provide technical assistance and on-site guidance that enables landowners to implement natural shoreline buffers and restore riparian corridors.

Priority Subwatersheds

- Implement permanent conservation easement, land acquisition, SFIA, and private forest-management programs in identified critical upland, shoreline, and riparian areas to advance the goal of achieving 75 percent protection within each lakeshed.
- Construct sediment and nutrient management BMPs, such as using plants that stabilize soils and provide habitat for pollinator species for shoreline buffer and surface water runoff treatment practices in upland and shoreline areas.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Work with private entities on culvert design to effectively manage flows.
- Implement reconstruction of off-highway vehicle and all-terrain vehicle (ATV) stream crossings that imped or altered flows.

Priority Subwatersheds

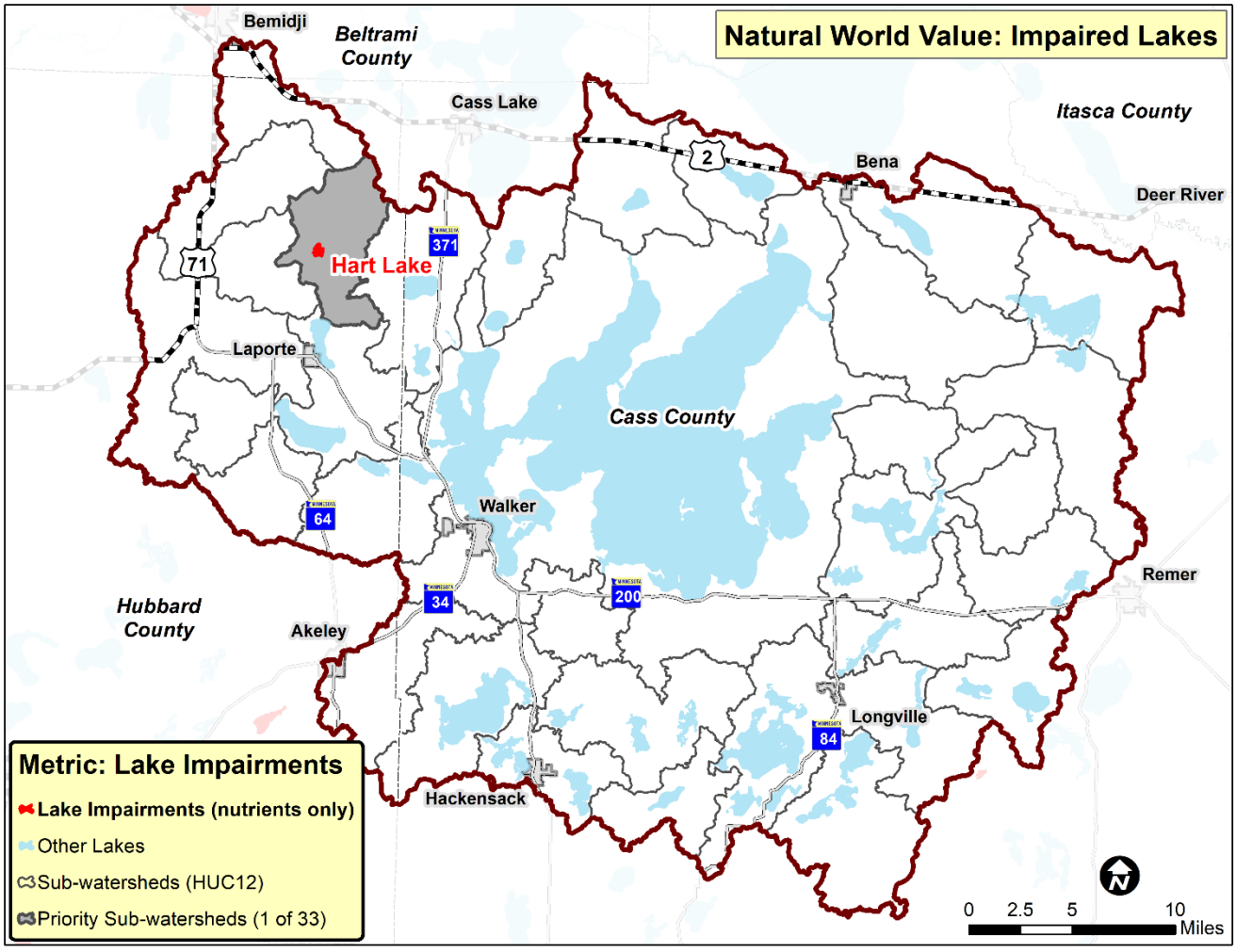
- Implement targeted culvert-replacement/modifications.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Watershed

- Collaborate with municipalities, townships and the US Army Corps of Engineers (USACE) to develop strategies to optimize management of the Federal Dam (Leech Lake Reservoir Dam) to protect aquatic habitat and recreation balanced with flood risk management.
- Implement annual reviews to evaluate and undertake road, bridge, and culvert-replacement projects that provide temporary storage to reduce downstream erosion, reduce sediment transport, and restore hydraulic balance.

4.4 IMPAIRED LAKES PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

The LLR Watershed currently has only one lake listed as impaired because of excessive nutrients[1], despite declining trends in several waterbodies. Hart Lake's impairment is likely caused by historic channelization (straightening) of the Necktie River. Limited development occurs within the lake's watershed and along its shoreline, which supports this conclusion. With river channelization comes increases in river flow and scouring action on its bed and banks. The result is an increase in sediment and nutrient conveyance to the lake. This straightening also reduces the ability of the river to assimilate nutrients before they reach Hart Lake. The Minnesota DNR is currently (as of November 2018) conducting a feasibility assessment of restoring the Necktie River to reestablish natural flows that would assist in decreasing bank erosion, sediment transport, and nutrient conveyances to Hart Lake. Hart Lake's shoreline has limited future development potential, which should prevent from future negative impacts to shoreline stability and habitat quality.

HIGHLIGHTS

RANKING CONSIDERATIONS:

One criterion was evaluated to rank nutrient impaired lakes. Lakes were scored based on MPCA designation of impairments.

RESULTS:

Necktie River (Hart Lake was the only impaired lake within this subwatershed).

MANAGEMENT GOAL:

Maintain the restorative efforts currently being implemented.

Management strategies that support the continuation of the current level of effort were identified. These strategies are organized into four implementation programs. Specific actions, timelines, and budgets are identified in Chapter 6.0.

GENERAL GUIDANCE

Though its impairment will be addressed through the Minnesota DNR's Necktie River priority habitat project after completing the feasibility study, several implementation strategies related to reducing the overall pollutant loading to the lake from the near-shore and subwatershed areas were developed.

[1] This plan only considers nutrient impairments. Many lakes are listed as impaired for mercury. Mercury impairments are managed at the state level and, therefore, not considered in this plan.

IMPLEMENTATION SUMMARY

Impaired Lakes Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Provide technical and financial assistance and on-site guidance to enable landowners to implement stormwater-management practices on their property.
- Collaborate with neighboring cities, counties, state agencies, and townships to identify, prioritize and develop projects to correct problems in areas of altered hydrology and provide technical assistance and on-site guidance to enable landowners to implement natural shoreline buffers and restore riparian corridors.
- Assist partners in inventorying subsurface septic-treatment systems.

Priority Subwatersheds

- Implement permanent conservation easement, land acquisition, and SFIA, and private forest-management programs in identified critical habitat, forest, shoreline, riparian, and wetland areas to advance the goal of achieving 75 percent protection within each lakeshed.
- Construction of sediment and nutrient management BMPs that use plants that stabilize soils and provide habitat for pollinator species in upland and shoreline areas.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Continue to evaluate potential changes to extractive use ordinances to protect against negative impacts and potentially expand Hubbard County's extractive use ordinance beyond shoreland areas.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Update the outreach and education program and materials to reflect the LLRCWMP contents, with special attention to targeted audiences with the most potential to impact restoration goals.
- Update the forest-stewardship program based on the concerns identified in the LLRCWMP and conduct private landowner- forest-stewardship education programming.

Priority Subwatersheds

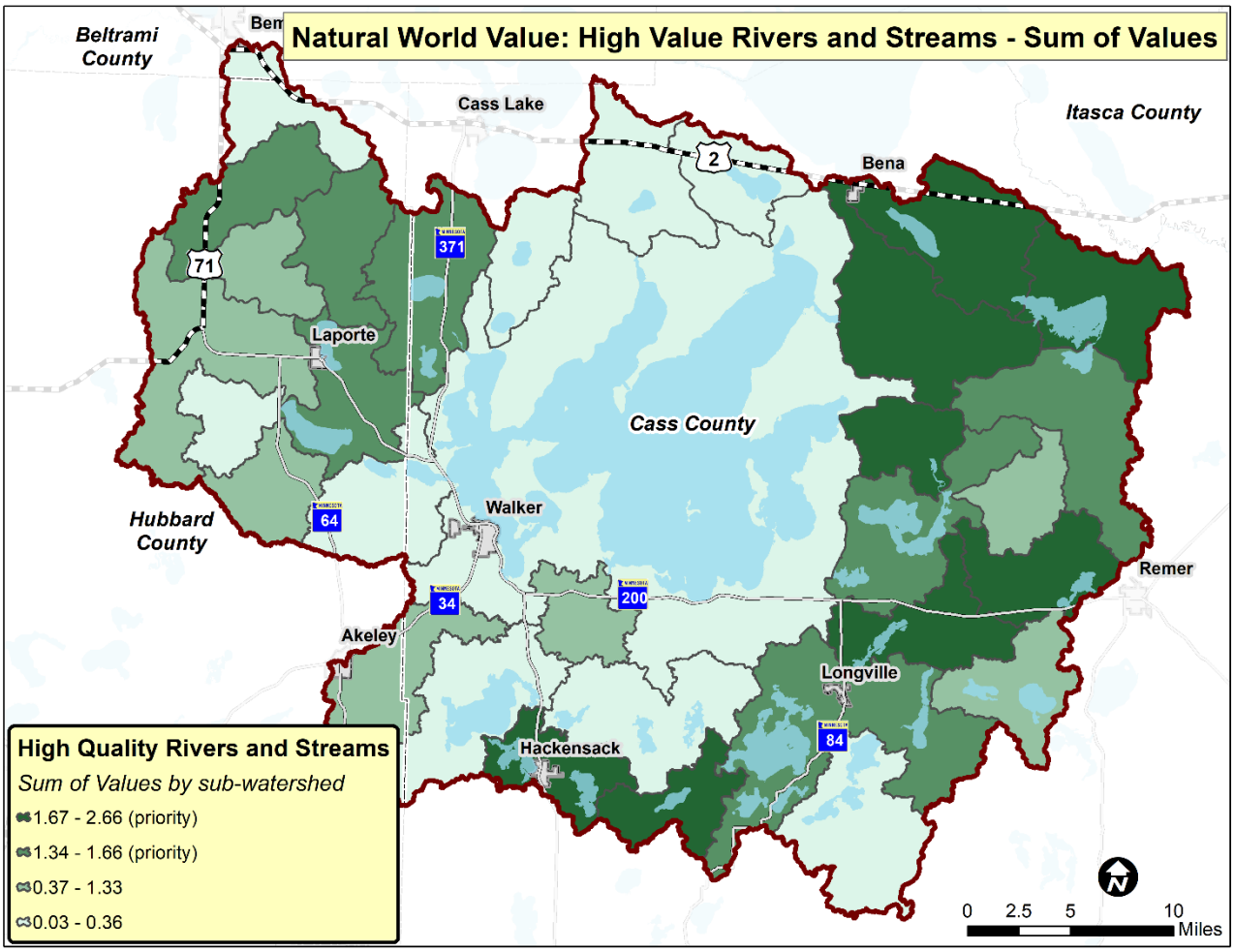
- Prepare upstream and lake-specific, targeted, riparian and lakeshore-property owner roundtable presentations/workshops.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Priority Subwatersheds

- Conduct water quality monitoring in Hart Lake and develop trend analyses.
- Identify critical shoreland, forest, and wetland habitat to implement conservation projects and permanent conservation easement, land acquisition, SFIA, and private forest-management programs to advance the goal of achieving 75 percent protection within each lakeshed.
- Conduct an annual monitoring program review and planning workshop with all stakeholders. The annual plan will fill gaps on resources, including emerging issues, to develop a prioritized list of implementation strategies.
- Promote and support water quality monitoring through Hubbard County's Coalition of Lake Associations and Association of Cass County Lake Associations, local lake associations, volunteers, and school students and provide dissolved oxygen and temperature profiles services for lake associations.
- Assess the strategies identified within this plan to estimate its potential watershed treatment using a comprehensive water quality model.
- Collaborate with other agencies and Hubbard County's Coalition of Lake Associations to analyze and identify areas of sensitive shoreline and shorelines with ecological significance.
- Continued annual aquatic invasive species plan implementation.

4.5 HIGH-VALUE RIVERS AND STREAMS PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

The LLR Watershed boasts an abundance of high-quality rivers that provide exceptional canoeing, fishing, and wildlife viewing opportunities. The watershed's river provides habitat for warm- and coldwater fisheries that support brook trout, bass, walleye, northern, and muskie. The rivers and streams also support miles of wild rice habitat. The greatest risks to these rivers and streams come from upland development encroaching into the riparian zones, altered upland hydrology that can dramatically increase flow; bank erosion; sediment and nutrient transport; flood risks to culverts, bridges, roads, and property; loss of fish habitat and continuity; and loss of wild rice habitat. The LLRCWMP water storage and retention goal is to maintain an average annual discharge of 747,000 acre-feet at the Federal Dam, Ball Park, MN. Consideration should be given to improving ecological conditions when addressing the water storage goal.

HIGHLIGHTS

RANKING CONSIDERATIONS:

Each river and stream were scored based on the results of a previous MPCA-DNR ranking system's results, the presence of wild rice habitat, and their subwatershed's scoring relative to the total acres and years since forest disturbance.

TOP TEN SUBWATERSHED RANKING RESULTS:

(1) Long Lake-By River, (2) Leech River, (3) Sixmile Brook, (4) Boy River, (5) Drumbeater Lake-Leech River, (6) Big Deep Lake-Boy River, (7) Swift Lake, (8) Pleasant Lake-Boy River, (9) Necktie River, and (10) Woman Lake.

MANAGEMENT GOAL: Improve.

The identified implementation strategies build on the current level of effort in priority subwatersheds and affect the entire LLR Watershed. These strategies are organized into four implementation programs. Specific actions, timelines, and budgets identified in Chapter 6.0.

GENERAL GUIDANCE

The implementation plan focuses on high-quality recreation and ecological value resources that were identified in the WRAPS as needing improvement. Given the relative abundance of trout streams in the watershed, the implementation plan prioritizes high-value trout streams and their tributaries. Wild rice habitat is also prioritized because it contributes greatly to cultural and ecological resources within the watershed. Emphasis was also placed on acquiring conservation easements that protect riparian areas, allow access for fisheries management, and provide angler access along high-priority streams. Lastly, working with landowners on cattle pasture and feedlot management is critical to protecting these resources from degradation.

IMPLEMENTATION SUMMARY

High-Value Rivers and Streams Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Develop a beaver management plan.
- Implement an annual review team to evaluate and implement road and culvert-replacement projects that restore connectivity, provide temporary storage that reduce downstream erosion, reduce sediment transport, and restore hydraulic balance.
- Collaborate with neighboring cities, counties, state agencies, and townships to identify, prioritize, and develop projects to correct problems in areas of altered hydrology and provide technical assistance and on-site guidance to enable landowners to restore riparian corridors.
- Conduct a culvert hydraulic, hydrologic, sediment transport and fish-barrier inventory and assessment priority.

Priority Subwatersheds

- Implement pasture and feedlot management practices by controlling livestock access to streams or separate water source, pasture and manure management, and rotational grazing and encouraging incentives for producers where possible.
- Restore riparian plant communities and reestablish stream flow access to the floodplain in areas where the streambed shows signs of degrading (e.g., cutting down).
- Sediment, nutrient, and erosion management in upstream reaches and subwatersheds.
- Riparian and wild rice easements and acquisitions (greater than 20 acres).

LAND USE MANAGEMENT STRATEGIES

Watershed

- Develop consistent shoreland zoning between the Hubbard and Cass Counties.
- Continue to implement Minnesota's buffer initiative on public waters and public drainage systems.
- Encourage including conservation-implementation strategies into county shoreland management ordinances and variance processes for development in the shoreland zone, especially along trout and wild rice streams.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Update educational and outreach programs and materials to include information on the value of high-quality rivers and streams, their stressors, future risks, and protection strategies.

Priority Subwatersheds

- Target and deliver riparian conservation and stewardship workshops at priority rivers and streams locations.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

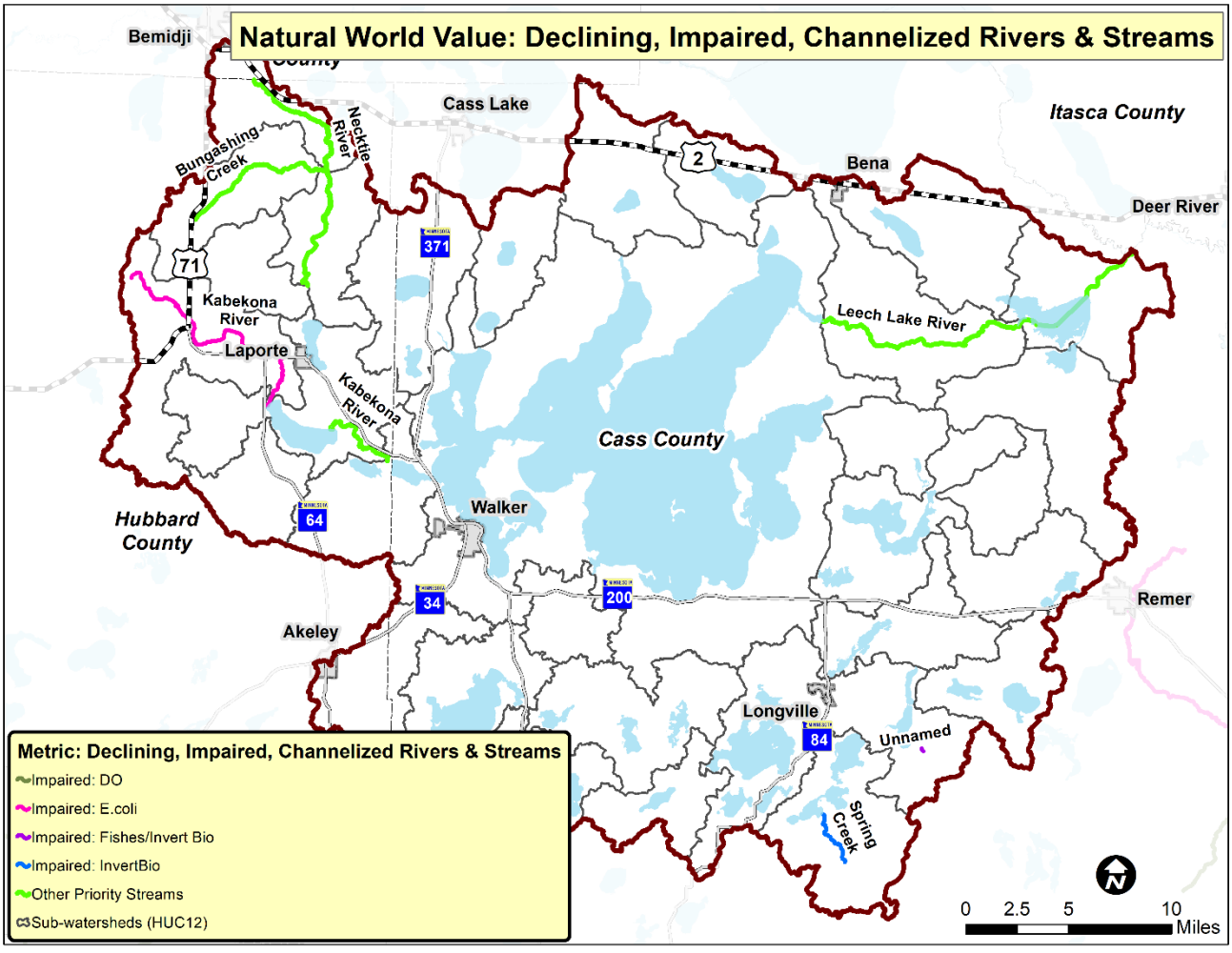
Watershed

- Monitor new plats, school trust lands, and second-tier development in riparian zones and subwatersheds and establish permanent protection.

Priority Subwatersheds

- Conduct water quality monitoring for dissolved oxygen issue.
- Secure funding and monitor Kabekona River for bacteria contamination.
- Assist partners in inventorying subsurface septic-treatment systems.

4.6 DECLINING, IMPAIRED, AND CHANNELIZED RIVERS AND STREAMS PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

While the LLR Watershed has extensive high-quality rivers and streams, a few river segments have been negatively impacted from watershed disturbances or direct impacts to the channel itself. More than 3 miles of the Necktie River was channelized in the early 1900's. This channelization negatively impacted fish and aquatic insect habitat and led to an increase in sediment and nutrients in Hart Lake, which is impaired because of excess nutrients. In a similar fashion, channelization and hydraulic alterations from normal flows imposed by a dam have altered habitat and stability along the LLR. The LLRCWMP water storage and retention goal is to maintain an average annual discharge of 747,000 acre-feet at Ball Club, MN. Consideration should be given to improving ecological conditions when addressing the water storage goal.

HIGHLIGHTS

RANKING CONSIDERATIONS:

Two criteria were evaluated. Each river/stream subwatershed was scored based on the status of their impairment or channelization and whether it was identified as a priority stream (e.g., classified as exceptional water resource or wild rice supporting stream).

TOP SEVEN SUBWATERSHED RANKING RESULTS:

(1) Leech River, (2) Bungashing Creek, (3) Necktie River, (4) Drumbeater Lake-Leech River, (5) Inguadona Lake-Boy River, (6) Headwaters Kabekona River, and (7) Little Boy Lake.

MANAGEMENT GOAL: Restore.

Bungashing is a designated trout stream and in MPCA's Monitoring and Assessment Report, it was designated as the only exceptional water in the LLR Watershed. However, it is a priority stream because existing livestock management practices in the riparian area pose a risk for maintaining its 'exceptional' status. In addition to physical alterations to rivers, converting forested lands to agriculture and livestock-grazing operations within floodplains and river channels increase sediment and nutrient supply to rivers and reduces streambank stability. The potential of increased pressure from converting forested lands to agricultural and grazing operations in the western half of the watershed pose similar risks. The projected population growth in the watershed also increases the risks of altered hydrology, sediment and nutrient transport, warming of coldwater habitats, and encroachment into the riparian corridor that all lead to further impacts to these stressed riverine systems.

The identified implementation strategies build on the current level of effort in priority subwatersheds and affect the entire LLR Watershed. These strategies are organized into four implementation programs. Specific actions, timelines, and budgets identified in Chapter 6.0.

GENERAL GUIDANCE

The preferred management approach is to focus on streams that have been channelized, are declining in water quality, or have specific issues in their watershed that could lead to their impairment. Given the presence of livestock in certain parts of the watershed, working with producers on herd management near streams and rivers is important. Actively collaborating with lake associations to bolster engagement in ensuring near-channel septic system compliance surveys and providing education on proper maintenance for riparian and non-riparian subsurface sanitary treatment systems are vital. As with high-quality streams, developing and implementing a beaver management program and an active management plan for ditches and other public drainage systems are important. Given the widespread network of ATV trails in the watershed, developing management approaches related to ATV crossings are important. Opportunities in the watershed exist to restore the channelized, unstable, and poor habitat streams and rivers that this plan addresses.

IMPLEMENTATION SUMMARY

Declining, Impaired, and Channelized Rivers and Streams Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Develop a beaver management plan.
- Implement an annual review team to evaluate and implement road and culvert-replacement projects that restore connectivity, provide temporary storage, reduce downstream erosion, reduce sediment transport, and restore hydraulic balance.
- Collaborate with neighboring cities, counties, state agencies, and townships to identify, prioritize and develop projects to correct problems in areas of altered hydrology and provide technical assistance and on-site guidance to enable landowners to restore riparian corridors.
- Conduct a culvert hydraulic, hydrologic, sediment transport and fish-barrier inventory, and assessment priority.

Priority Subwatersheds

- Implement pasture and feedlot management practices by controlling livestock access to streams or separate water source, pasture and manure management, and rotational grazing and encouraging incentives for producers as possible, particularly in the Bungashing Creek watershed.
- Restore the riparian plant community and reestablish river-flow access to the floodplain in areas where the streambed is showing signs of degrading (i.e., cutting down).
- Manage sediment, nutrient, and erosion in upstream reaches and subwatersheds.
- Manage riparian and wild rice easements and acquisitions (greater than 20 acres).
- Incorporate Minnesota DNR Necktie River evaluation and restoration feasibility results into the implementation plan.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Develop consistent shoreland zoning between the Hubbard and Cass Counties.
- Continue to implement Minnesota's buffer initiative on public waters and public drainage systems.
- Encourage including conservation-implementation strategies into county shoreland management ordinances and variance processes for development in the shoreland zone, especially along trout and wild rice streams.

Priority Subwatersheds

- Acquire conservation easements along high-priority streams.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Update educational and outreach programs and materials to include information on the value of high-quality rivers and streams, their stressors, how the watershed's streams have been impacted, future risks, and how to protect them.

Priority Subwatersheds

- Target and deliver riparian conservation and stewardship workshops at priority rivers and streams locations.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

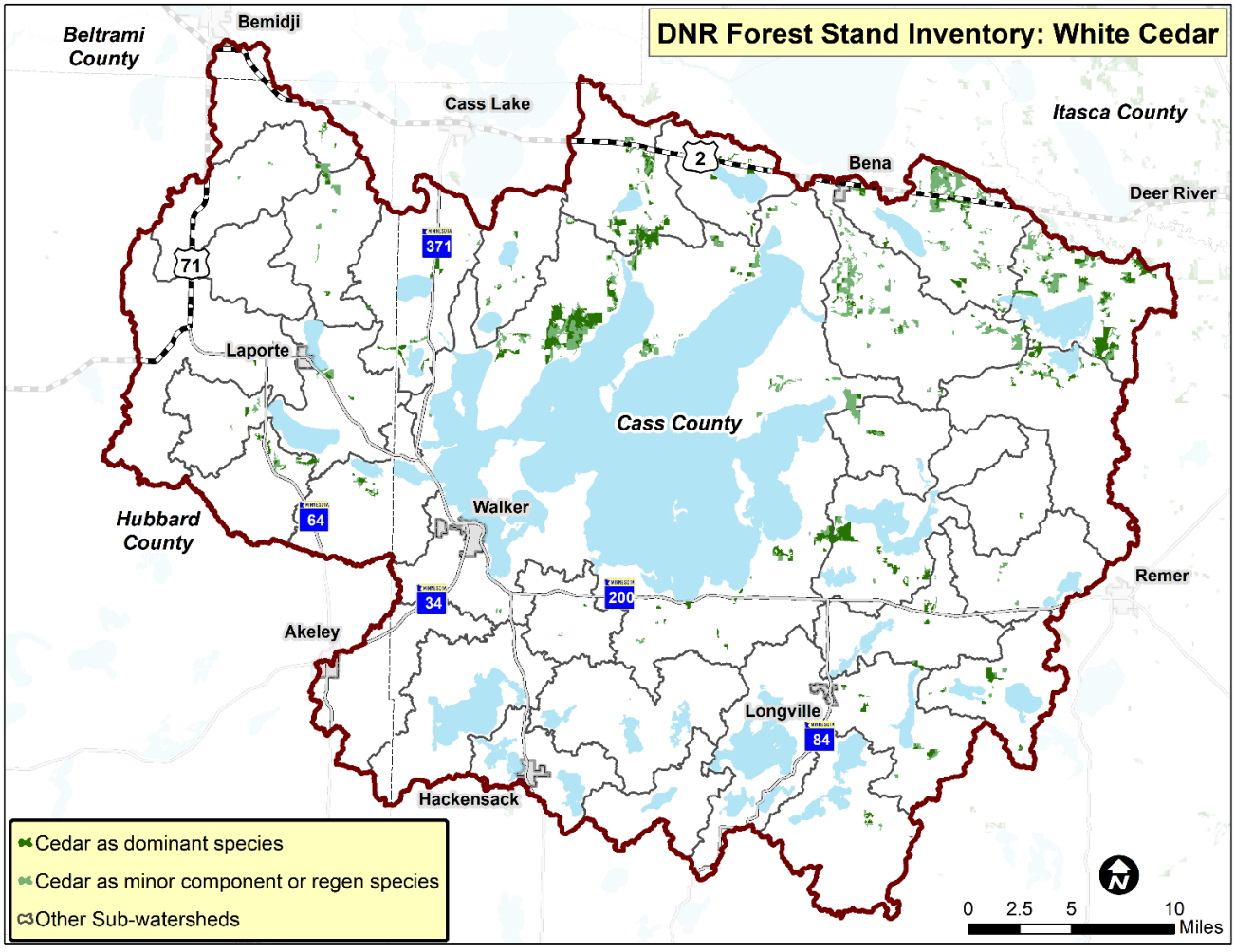
Watershed

- Monitor new plats, school trust lands, and second-tier development in riparian zones and subwatersheds and establish permanent protection where feasible.

Priority Subwatersheds

- Monitor the water quality for dissolved oxygen issue.
- Assist partners in inventorying subsurface septic-treatment systems.
- Work with the USACE and stakeholders to reevaluate the results of the Reservoir Operating Plan Evaluation (ROPE) [USACE, 2001] study to determine if alternative management scenarios that provide better outcomes for overall ecological health should be further investigated.

4.7 WETLANDS


DNR Forest Stand Inventory: White Cedar
Beltrami County
Bemidji
Cass Lake
Itasca County
Bena
Deer River
2
371
71
Laporte
Cass County
Hubbard County
64
Walker
34
200
Akeley
Remer
Longville
84
Hackensack
Cedar as dominant species
Cedar as minor component or regen species
Other Sub-watersheds
0 2.5 5 10
Miles

DRIVERS OF IMPLEMENTATION PRIORITIES

Hubbard and Cass Counties contain many wetlands that serve a myriad of functions in the LLR Watershed including attenuating rainfall runoff to buffer flood risks, enhancing water quality, providing fish-spawning habitat, offering a food source to waterfowl and wildlife, providing shelter and rearing structures, and allowing wild rice and white-cedar habitats. However, the watershed is projected to change, which places added pressure onto wetlands, including increased runoff from agricultural and developed areas, localized drawdowns on shallow waters that recharge a portion of these wetlands, climate-warming effects on habitat quality, and sedimentation and hydrologic effects on wild rice habitat.

As of November 2018, the National Wetland Inventory (NWI) was being updated with current data that will support the refinement of wetland management in the watershed. The counties and their state, federal, and tribal partners are critical to developing and implementing these actions. Hubbard and Cass Counties currently take an active role in protecting this diverse and unique natural resource, with staff who are dedicated to permitting and monitoring. The Hubbard Water Resources Advisory Committee promotes developing a Comprehensive Wetland Protection and Management Plan as part of the county's ordinances. Federal (e.g., Clean Water Act and USACE), state (e.g., Wetlands Conservation Act, Minnesota Board of Water and Soil Resources [BWSR], and Minnesota DNR) regulations and county wetlands ordinances serve to protect the watershed's valuable wetland resources. After completing the NWI, revising the county ordinances will reflect watershed priorities and strategies.

Various management strategies were identified to build on the current level of effort for wetland management in the watershed.

GENERAL GUIDANCE

The fundamental strategy for managing wetlands in the LLR Watershed is to reevaluate wetland functions and to establish a revised, watershed-wide ordinance. This strategy will entail incorporating the new NWI as well as white-cedar wetlands and an update to county forest-management plans. Coordinating the Minnesota DNR, US Forest Service (USFS), and the Leech Lake Band of Ojibwe (LLBO) will be critical in new ordinances as well as management plans.

IMPLEMENTATION SUMMARY

Wetlands

CONSERVATION STRATEGIES

Watershed

- Update the Cass County wetland ordinance to reflect the importance of wetlands outside of the shoreland zone.
- Create the Hubbard County wetland ordinance to parallel Cass County wetland ordinance.
- Update ordinances and forest-management plans to address the cedar-tree wetland needs.
- Increase accuracy of NWI mapping by incorporating existing and future wetland delineation shapefiles into county wetland geographic information system layers.

- Update the land use ordinance revision for building setbacks from wetlands.
- Investigate opportunities for the fiscal abandonment of non-maintained judicial or county drainage systems through Minnesota Statutes Chapter 103E abandonment protocol.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Update ordinance language to reflect results and protection analysis needs after the National Wetlands Inventory update is completed in 2019.
- Achieve consistency in wetland ordinances and protection strategies throughout the LLR Watershed.

OUTREACH AND EDUCATION STRATEGIES

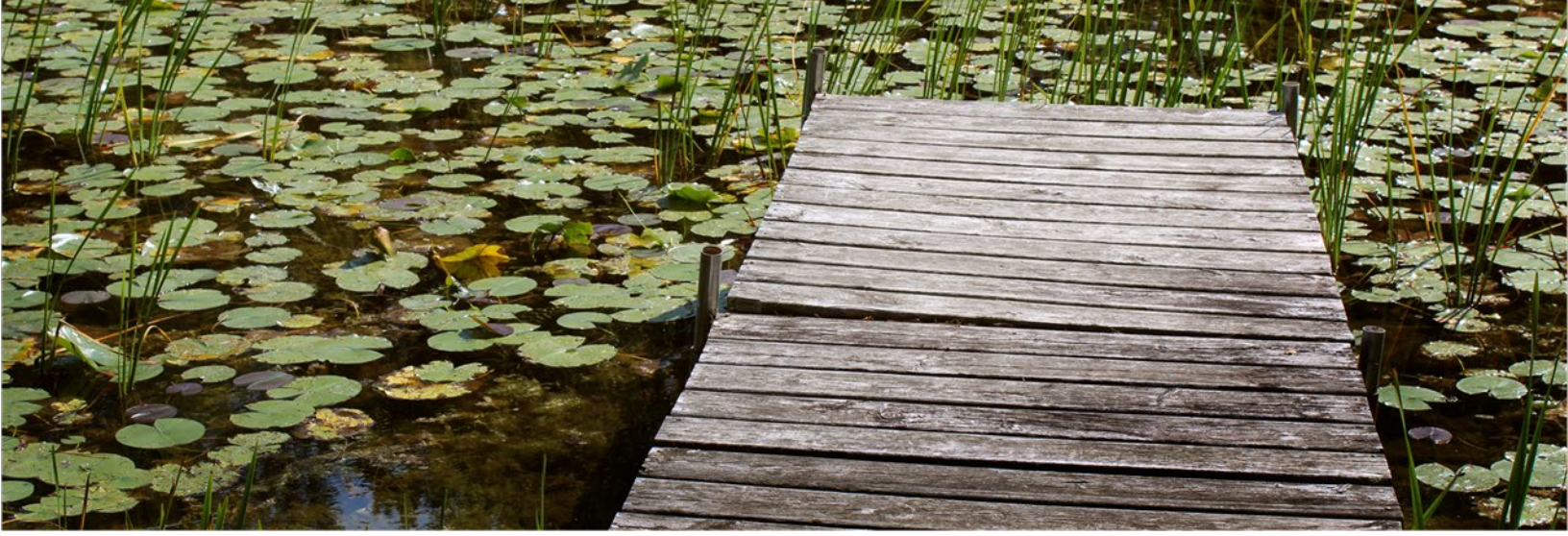
Watershed

- Update outreach and education programming to reflect the wetland functions and values and new ordinance language.

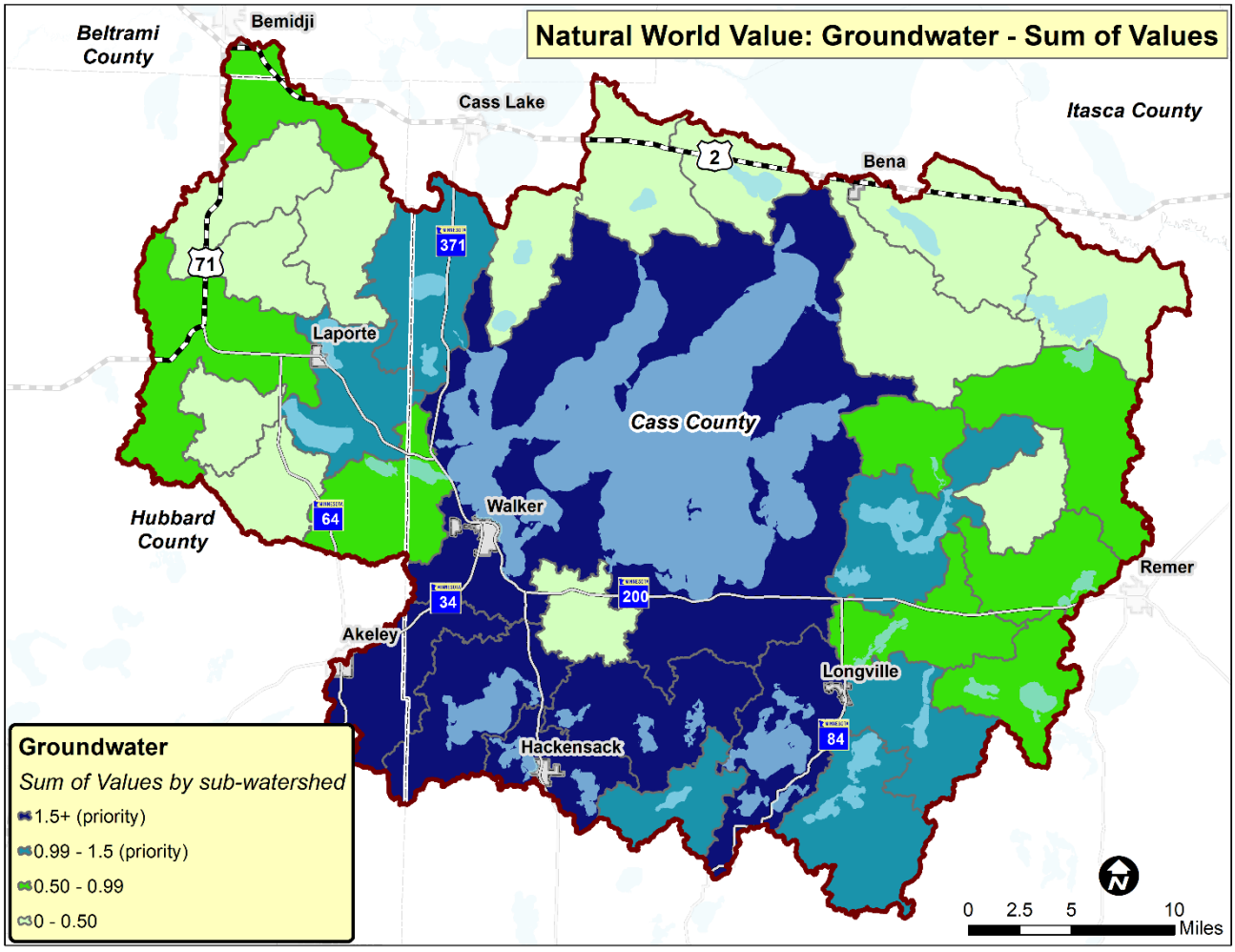
RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Watershed

- Consolidate the white-cedar wetland, wild rice wetland, and wetland habitat functional information necessary to facilitate the functions assessment and education-outreach programming.
- Continue to evaluate the effects of agricultural and development withdrawals from shallow aquifers on wetland groundwater recharge.
- Coordinate with researchers on the effects of climate change on key wetland types.



4.8 GROUNDWATER PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

Various management strategies were identified for groundwater management to build on the current level of effort in the watershed. Though, at the time of this plan's writing, completing the watershed's geologic atlas was underway and not available for guidance, several things are known regarding the current state and future risks to groundwater supply and quality. Current development in the watershed is very low, which places limited strain on the local water supply from groundwater sources. Row cropping in the watershed is limited to the western fringes and places a demand on aquifer supplies. As the watershed develops its urban and rural zones, an accompanying increase in demand from both municipal and private wells will follow. Similarly, as row crops and potato farming expand from neighboring watersheds to the south and west, a greater demand on groundwater will be most likely to occur. As groundwater demand increases, wetlands and streams may experience reduced base flow and increased water temperature, which can pose a risk to aquatic ecosystems and cause stress on fisheries. From a water quality standpoint, the watershed's groundwater supply is relatively good with only a few known arsenic or nitrate problem wells. However, sandy soils are capable of conveying contamination more readily than other soil types that are found throughout the watershed. Risks of contamination from spills, subsurface septic-treatment systems and abandoned, uncapped wells exist in a large portion of the watershed. Because private wells are only tested at the time the well is drilled, little is known about the status of water quality in wells. Shallow, sand-point wells are the most at risk for contamination. Considering these potential stressors on water supply and quality, strategies are organized into four implementation programs that inform specific actions, timelines, and budgets identified within the implementation schedule.

HIGHLIGHTS

RANKING CONSIDERATIONS:
Two criteria were evaluated to rank groundwater. Each subwatershed was scored based on their abundance of private wells within groundwater-sensitive areas and the number of known problem wells (e.g., record of nitrate and arsenic contamination).

TOP TEN SUBWATERSHED RANKING RESULTS:
(1) Woman Lake, (2) Leech Lake, (3) Pleasant Lake-Boy River, (4) Shingobee River, (5) Man Lake, (6) Tenmile Lake, (7) Inguadona Lake-By River, (8) Big Deep Lake-Boy River, (9) Steamboat River, and (10) Kabekona River.

MANAGEMENT GOAL: Improve.

GENERAL GUIDANCE

A water/groundwater supply easement program is recommended to be developed and implemented in areas that are identified as highly vulnerable to contamination. The current well-sealing program is recommended to be expanded to reduce the likelihood of directly injecting pollutants into aquifers. After completing the geologic atlas for the watershed, the LLRCWMP should be updated with a prioritized set of implementation strategies that are informed by supplemental testing for water quality and withdrawal effects, particularly in high-demand sandy soil locations. These data can inform local groundwater plans, which can develop targeted additional conservation irrigation services, including include irrigation scheduling and equipment calibration. Establishing a water quality testing database is considered very important given the sparse monitoring record. The LLRCWMP partners will support the responsible state agencies on the establishment of a groundwater quality testing database. Updated educational materials and workshops for producers who are interested in groundwater conservation and willing to volunteer with the US Department of Agriculture's (USDA's) Nitrogen Management Plan.

IMPLEMENTATION SUMMARY

Groundwater Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Continue to support implementing wellhead protection measures and monitoring municipal wellhead protection zones.
- Assist partners in inventorying subsurface septic-treatment systems.
- Enroll producers into the USDA's Nitrogen Management Plan.

Priority Subwatersheds

- Expand the well-sealing program and pay special attention to the priority resources.
- Expand the irrigation-scheduler management plan.

LAND USE MANAGEMENT STRATEGIES

Priority Subwatersheds

- After completing the geologic atlas and targeted groundwater-level monitoring data collection, procure source-water and groundwater easements in targeted locations.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Update educational materials for groundwater as new data are compiled and develop a targeted outreach program.

Priority Subwatersheds

- Conduct a workshop with stakeholders to review the results of the Cass and Hubbard Geologic Atlas, develop recommendations to address concerns, and integrate the results into program-planning efforts, and potential LLRCWMP update, based on the results.

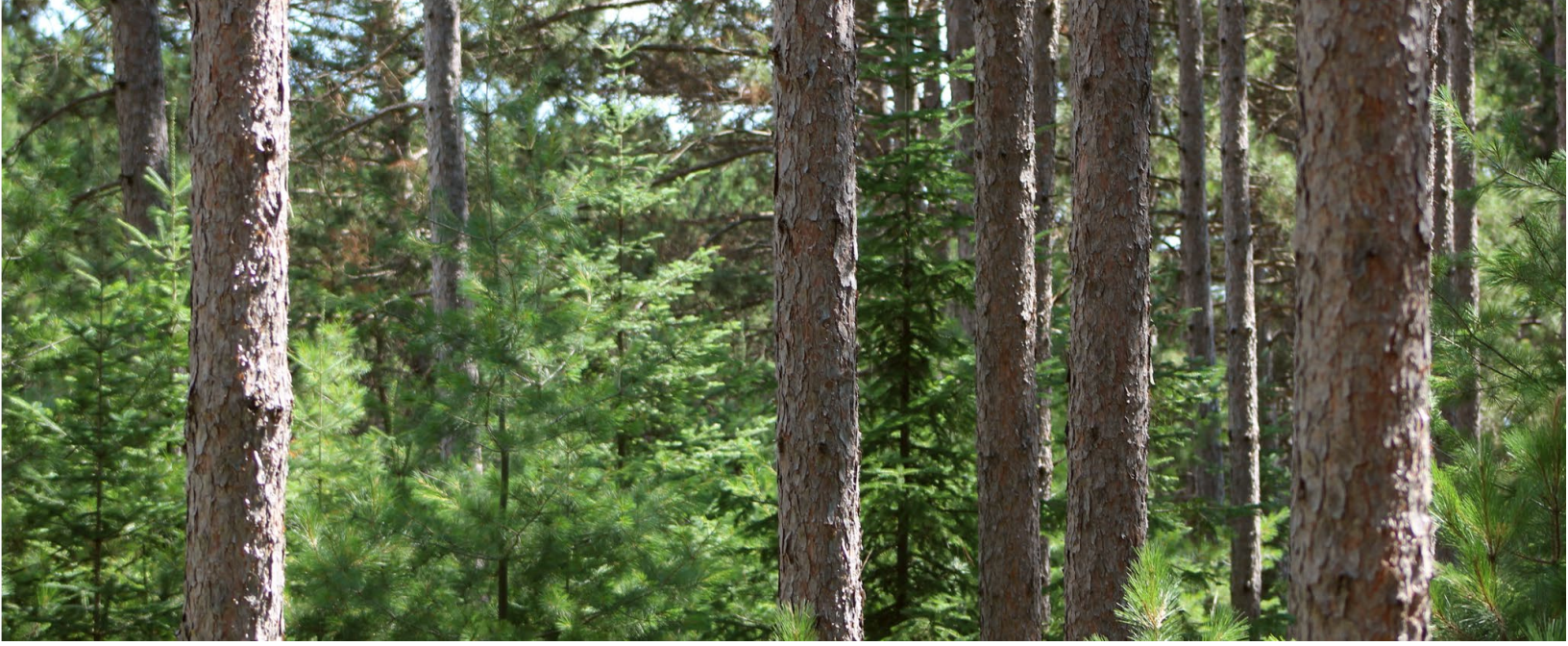
RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Watershed

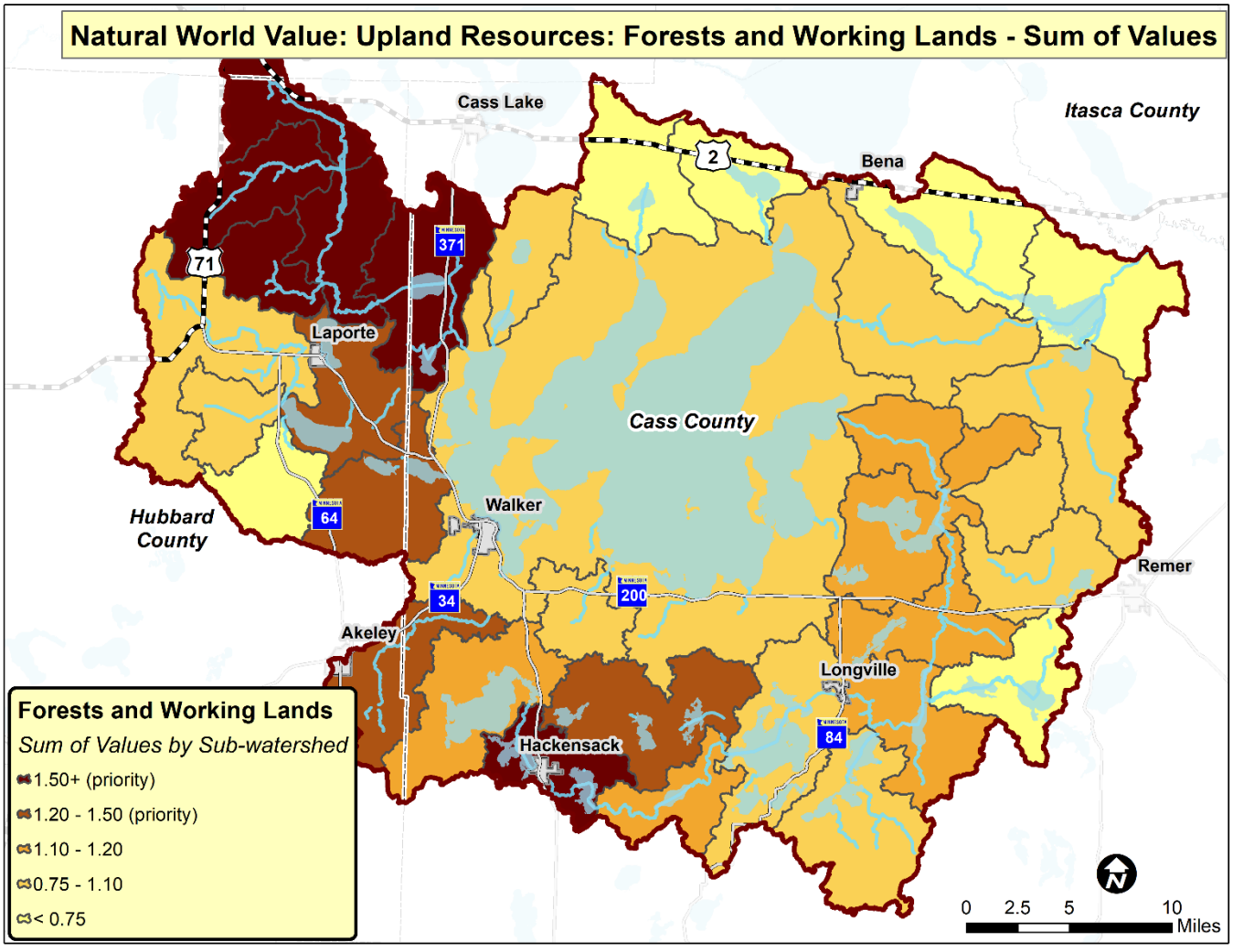
- Identify shallow wells using past 20 years of data. Integrate monitoring of pollutants of emerging concern.

Priority Subwatersheds

- Targeted water-monitoring focus for dissolved oxygen, temperature, nitrate, and water level profiles.
- Use partnerships with lake associations and volunteers; create, update, and maintain Subsurface Sewage Treatment System inventory (note that the relationship to sensitive soils and shallow wells). Use geologic atlas and well inventory information to fill in gaps in the data.



4.9 UPLAND RESOURCES: FORESTS AND WORKING LANDS PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

The greatest asset-protecting surface and groundwater quality, bank stability in streams, terrestrial and aquatic habitats, recreational opportunities, and overall economy and quality of life for the residents of the LLR Watershed is arguably its forests and (to some extent) well-managed working lands. Very few developed watersheds in the nation can boast an equivalent forest and all that it supports. The links between the healthy, widespread forests and the values the people that live here cherish are well understood. Losing and converting forests and healthy working lands to other uses are the most substantial risks to the LLR Watershed. Losing high-quality forests and working lands initiates a cascading negative impact on the watershed, including altered hydrology, increased soil loss, reduced soil health, increased sediment transport to rivers and lakes, increased flooding and streambank failure, reduced aquatic and terrestrial habitat, and reduced water quality and fisheries. Protecting the healthy and abundant forests, which are the keys to watershed health, is the single most important measure that could be taken in this watershed. Smart growth and appropriate use planning should be implemented so forests, natural hydrology, and habitat are protected. Considering these potential stressors on forests and working lands, strategies are organized into four implementation programs that inform the specific actions, timelines, and budgets identified in Chapter 6.0. The management strategies that were identified for forests and working lands build on the current level of effort in the watershed.

HIGHLIGHTS

RANKING CONSIDERATIONS:

Four criteria were evaluated to rank forests and working lands. Each lake was scored based on their opportunity to reach 75 percent protected forests, current abundance and potential of working lands, and their current risk status as determined from existing county analysis.

TOP TEN SUBWATERSHED RANKING RESULTS:

(1) Bungashing Creek, (2) Headwaters Necktie River, (3) Pokety Creek, (4) Steamboat River, (5) Pleasant Lake-Boy River, (6) Necktie River, (7) Kabekona Bay, (8) Shingobee River, (9) Man Lake, and (10) Kabekona River.

MANAGEMENT GOAL: Improve.

GENERAL GUIDANCE

The principal goal of this plan is to achieve 75 percent permanent protection for subwatersheds surrounding lakes. This goal can be achieved relatively quickly in some subwatersheds while others will take more effort and extend beyond the scope of this 10-year plan. The main strategy to achieve this goal will be through easements and fee-title acquisitions. When permanent protection is not achievable or interim measures are needed, other incentives (e.g., enrolling in SFIA programs and implementing forest-management plans) should be included. Forest-management plans will include discussing harvesting versus the effects of forest conversion, forest health, and management guidance and provide incentives to keep agricultural land in grazing and haying operations. Prioritizing where to invest in forest-management planning will occur after the Landscape Stewardship Plan is completed. This plan uses a scoring system to evaluate each minor watershed to determine the parcels best suited for land acquisition. Expanding the current tree-planting program will facilitate forest resiliency and assist in forest recovery after disturbances (e.g., fire, blowdown, and harvesting). Improving wildlife habitat and increasing forest resiliency to climate change should also be considered. For working lands (e.g., pastures and grasslands), technical and financial assistance that focus on soil health, grazing management, and habitat improvement should be provided in partnership with the Natural Resources Conservation Service and joint powers board engineer.

IMPLEMENTATION SUMMARY

Upland Resources: Forests and Working Lands Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Implement permanent conservation easement, incentives, and forest acquisition programs that focus on protecting critical forests, lakes, streams, and upland and wetland habitat.
- Increase private forest landowner enrollment in forest-management plans and incentives, such as SFIA.

Priority Subwatersheds

- Increase the adoption of rotational grazing, manure management, and agro-forestry management practices using incentives, such as Environmental Quality Incentives Program, Conservation Stewardship Program, and/or Agricultural Conservation Easement Program.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Implement a comprehensive, private forest-management program based on concerns identified in the LLRCWMP.

Priority Subwatersheds

- Update and conduct private landowner- forest-stewardship education programming with the goal of increasing participation in forest protection programs.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

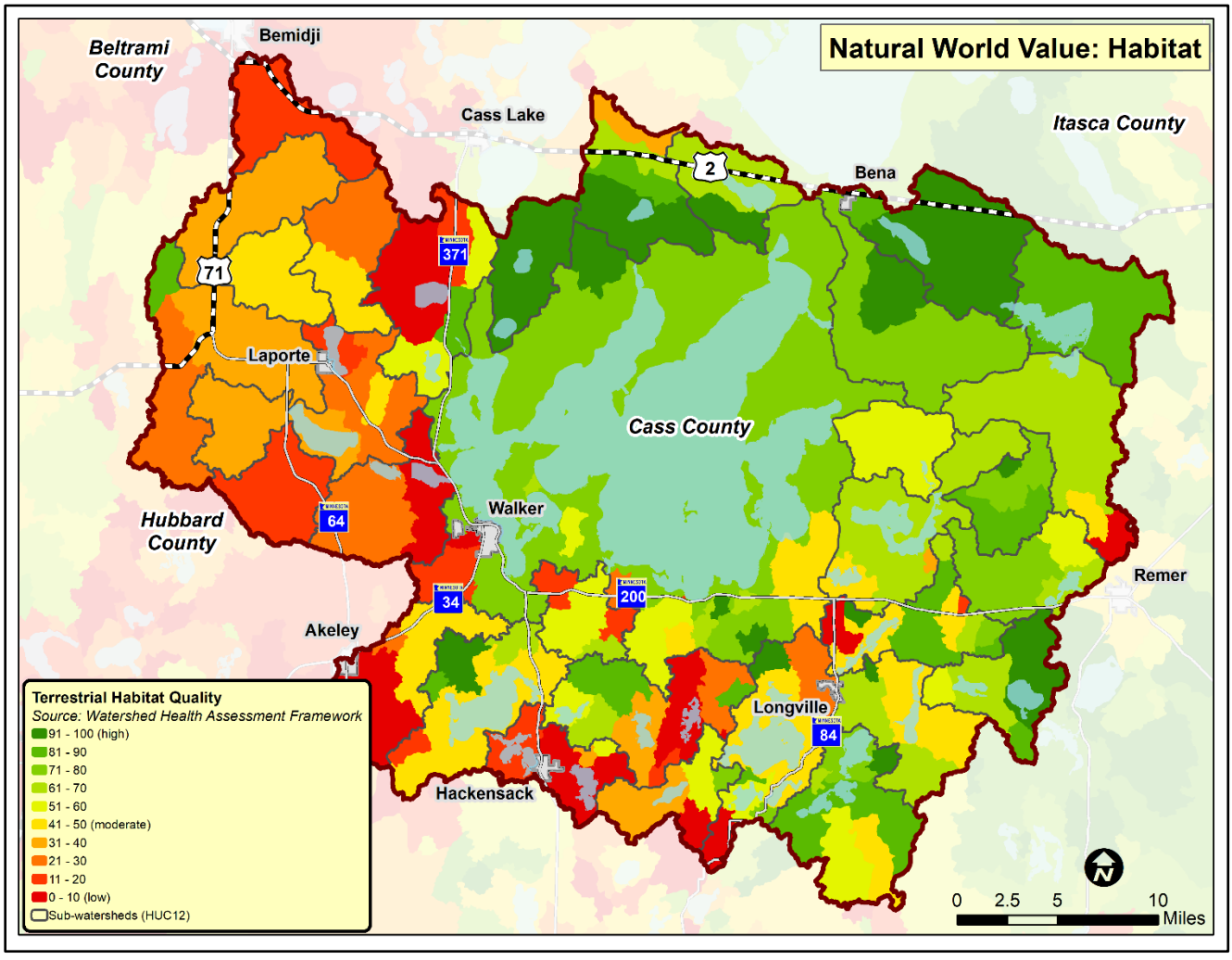
Watershed

- Conduct an analysis to identify potential forest easement and acquisition locations. Search for parcels or areas that are greater than 20 contiguous acres in size and use existing or refined scoring criteria.
- Conduct a watershed hydrology and water quality proposed treatment model to evaluate the effects of strategies identified within this plan.
- Support and cooperate with the United States Forest Service (USFS) and other stakeholders in forest-health monitoring, including changes in species diversity and abundance, extent and type of invasive species, and evaluation of frequency and extent of disasters (e.g., blowdown events and forest fires). Regularly collecting and tracking this information may indicate trends that require adaptive management strategies to ensure forest health.

Priority Subwatersheds

- Regularly evaluate the potential for school trust-fund lands classified for real estate to be divested and implement permanent protection if threatened.

4.10 HABITAT


Natural World Value: Habitat
Beltrami County
Bemidji
Cass Lake
Itasca County
Bena
2
371
71
Laporte
Cass County
Hubbard County
64
Walker
34
200
Remer
Akeley
Longville
84
Hackensack
Terrestrial Habitat Quality
Source: Watershed Health Assessment Framework
91 - 100 (high)
81 - 90
71 - 80
61 - 70
51 - 60
41 - 50 (moderate)
31 - 40
21 - 30
11 - 20
0 - 10 (low)
Sub-watersheds (HUC12)
N
0 2.5 5 10
Miles

DRIVERS OF IMPLEMENTATION PRIORITIES

A healthy watershed supports a robust landscape of habitat for aquatic, terrestrial, and avian species. The LLR Watershed provides some of the greatest intact habitat in the developed portions of the United States. A high level of biodiversity supports over half of the muskie habitat in Minnesota, the largest number of breeding pairs of eagles in the lower 48 states and 89 species of greatest conservation need. Over 50 percent of the watershed is designated as important bird areas. Wild rice (*Zizania palustris)* is found in 25 lakes and 5 streams; however, the wild rice inventory has not been completed. Wild rice is an important food source for waterfowl and humans. Wild rice stands protect shorelines from erosion and provide habitat for fish, amphibians, and birds, and wild rice provides over $2 million to the state's economy annually. The LLBO harvest over 100,000 pounds of rice each year which generates over $200,000 for the local economy. Hunting, fishing, boating, and wildlife viewing are not only ways of life for people in this watershed but also generate tremendous influx of capital from visitors each year. However, projections of future growth related to development, increases in tourism, and conversion of forests to agriculture pose direct and significant risks to the LLR Watershed's habitats. Fragmentation (e.g., loss of connectivity), increased edge effects, habitat patch size shrinkage, increasing distance between patches, stormwater and agricultural runoff, climate warming (leading to vegetative community conversion), and additional concerns conspire to place stress on habitats and the species that rely on them.

GENERAL GUIDANCE

The Landscape Stewardship Plan (LSP), which is currently in development with a targeted completion of mid-to-late 2019, will be an important tool that helps identify and guide habitat and watershed protection implementation activities. The LSP is a component of the larger Minnesota Forest Resources Council's Landscape Plans that identify collaborative forest-management projects in the broad landscape region. The LSP will focus on ways to achieve and maintain healthy water and forest resources within the LLR portion of the region as well as sustain a high level of biodiversity through land stewardship. The LSP will serve a vital role in the LLRCWMP updates. The Minnesota DNR was, at the time, working on assessing data for the watershed that can be used to supplement the general results of the Watershed Health Assessment Framework. The Minnesota DNR fisheries information related to coldwater species of interest (i.e., cisco/tullibee and trout) has been prioritized by the Policy Committee for this LLRCWMP as a metric of the overall watershed health. Muskie have been identified as an aquatic species of interest because this watershed supports such a large percentage of its habitat in Minnesota. The LLRCWMP aims to coordinate the habitat conservation efforts with nonprofit, state, and federal partners to amass as much information on habitat for multiple species of interest as is available and develop joint strategies to protect this valuable resource. The current lifespan of the first-generation LLRCWMP will also focus on protecting or enhancing known habitat resources (upland and aquatic) though land acquisition, conservation easements, erosion control, stormwater treatment, restoration of altered hydrology, and invasive species management.

IMPLEMENTATION SUMMARY

Upland Resources: Habitat Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Coordinate with the Minnesota DNR regarding coldwater fisheries and muskie water-resource projects within the waterbody as well as in its drainage area.
- Coordinate with the municipalities, counties, Minnesota DNR, USFS, and LLBO on forestry management to protect habitat continuity and diversity ahead of developing and converting to agriculture.

OUTREACH AND EDUCATION STRATEGIES

Watershed

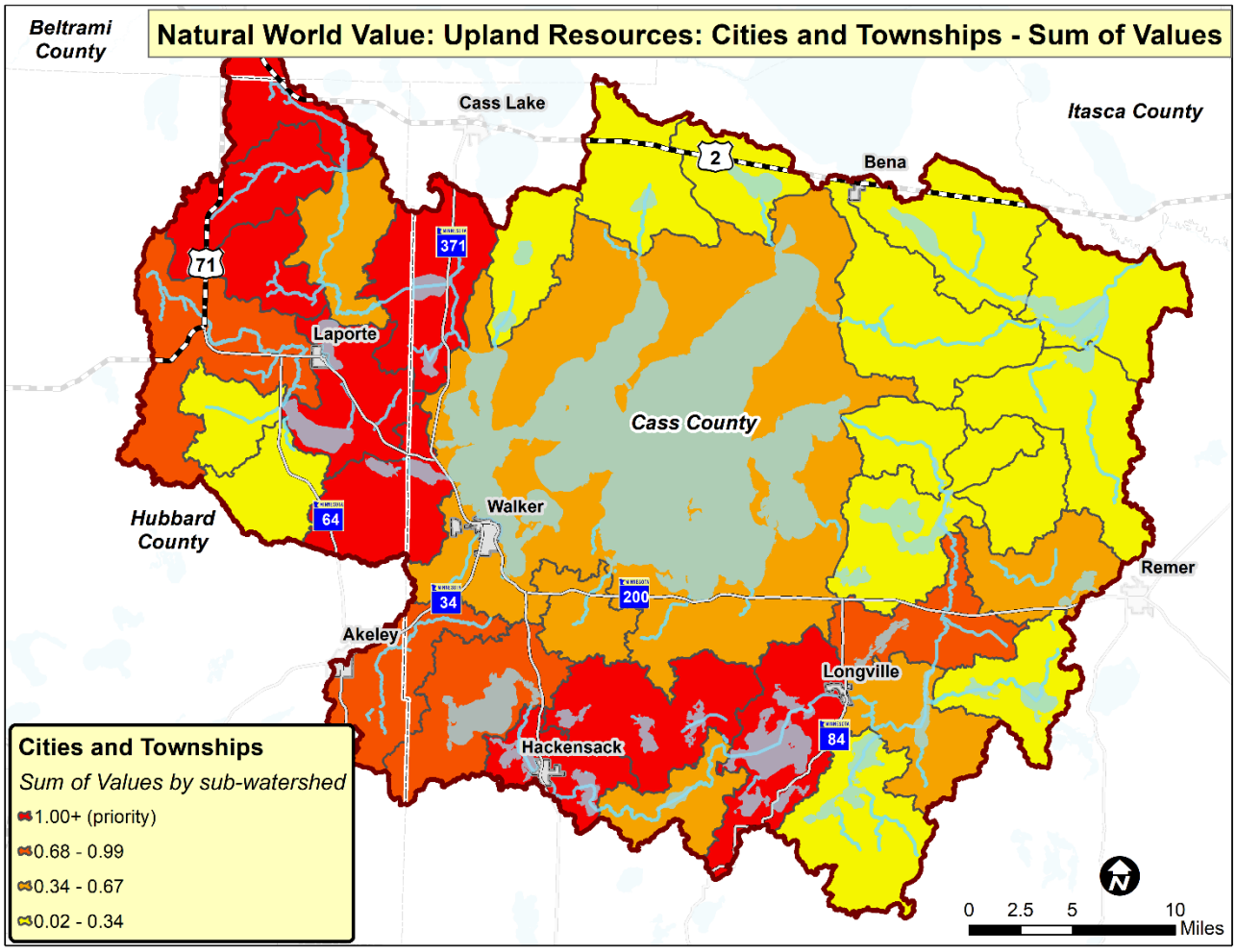
- Update the outreach and education programming to stress the importance of healthy habitats to supporting diverse fish and wildlife populations.
- Conduct outreach and education programs to targeted audiences on the importance of reducing the risk of spreading invasive terrestrial and aquatic invasive species.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

Watershed

- Coordinate with the counties, Minnesota DNR, USFS, and LLBO to assemble habitat data, identify data gaps, identify issues, prioritize objectives, target key project locations, and develop unified strategies for implementation.

4.11 UPLAND RESOURCES: CITIES AND TOWNSHIPS PRIORITIES AND PROGRAMS



DRIVERS OF IMPLEMENTATION PRIORITIES

Development pressure in the LLR Watershed is expected to increase by 60 percent within the next 12 years [MPCA, 2016]. Along with this development comes the opportunity to develop a smart growth approach that protects the values of the people living in the watershed. Many of these values came not only in the form of ecological sustainability, but also as related to the quality of life, risk management, cultural resources, and local economies that are directly affected by the quality of the watershed's natural resources. Development that protects these values and resources can be accomplished, if proactive and wise planning are implemented before development pressures occur. If properly done, the minimal investment to protect resources will be a fraction of what it would cost, down the road, to restore them. Examples of what happens when growth is not well planned with protecting the land and water in mind can be found throughout Minnesota. Understanding the potential development growth corridors to properly plan for smart growth will be important. Built landscapes produce significant sediment and pollutant loads and convert nearly all of a given rain event to runoff, instead of healthy forests that absorb runoff and keep soils in place. Developing well-crafted guidelines to minimize stormwater runoff with development designs that mimic natural hydrology as closely as possible is the first step. Construction and post-construction, stormwater-treatment guidelines will also need to be developed. Considering these potential stressors on forests and working lands, strategies are organized into four implementation programs that inform the specific actions, timelines, and budgets identified in Chapter 6.0.

HIGHLIGHTS

RANKING CONSIDERATIONS:

Two criteria were evaluated to rank cities and townships. Each subwatershed was scored based on the extent of current development as well as potential development.

TOP TEN SUBWATERSHED RANKING RESULTS:

(1) Pleasant Lake-Boy River, (2) Kabekona Bay, (3) Kabekona River, (4) Woman Lake, (5) Headwaters Necktie River, (6) Bungashing Creek, (7) Pokety River, (8) Steamboat River, (9) Man Lake, and (10) Shingobee River.

MANAGEMENT GOAL: Improve.

GENERAL GUIDANCE

Two main strategies for addressing cities and towns include (1) retrofitting existing development to treat stormwater runoff and (2) supporting townships, cities, and counties in developing progressive stormwater-management ordinances and programs. New and retrofitted stormwater practices that capture and treat the first 1.1 inches of rainfall shed from impervious surfaces that drain directly to a water resource with no current treatment should be implemented. This method level of treatment can achieve 60 percent treatment of phosphorus, which is the pollutant that causes algal blooms in lakes. This is most often achievable in residential neighborhoods or industrial parks, for instance, when an open space is available for a mid-sized practice or when a significant amount of distributed green infrastructure in employed. Green infrastructure in the road right-of-way (ROW) can also produce significant results but is recommended to have a goal of 30 percent phosphorus treatment for any given residential block or commercial district. End-of-pipe practices (which are located at storm-sewer outfalls, at larger public open spaces, or via modifications to existing ponds) are recommended to be combined with more distributed practices to achieve the 1.1 inches and 60 percent phosphorus treatment goal. BMPs, such as street sweeping/vacuuming and good housekeeping (e.g., properly storing and handling construction and road maintenance materials, including sand and deicers) will provide dust control and the initial, primary

treatment of contaminants. A set of recommended ordinances and guidelines for urban and rural communities to enhance the current county and city stormwater rules is also recommended. This set of ordinances will include construction and post-construction BMPs to meet the regulatory standards provided within the Minnesota Stormwater Manual and language from the MPCA Minimal Impact Design Standards (MIDS) – Community Design Assistance Package. This information can inform local Surface Water-Management Plans that are well suited for protecting the watershed's water resources.

IMPLEMENTATION SUMMARY

Upland Resources: Cities and Townships Priorities and Programs

CONSERVATION STRATEGIES

Watershed

- Provide technical and financial assistance and on-site guidance to enable landowners to implement stormwater-management practices.

Priority Subwatersheds

- Implement stormwater water quality and temperature BMPs to treat 1.1 inches of rain or include the channel-forming event detention when discharging to a river or stream.

LAND USE MANAGEMENT STRATEGIES

Watershed

- Encourage zoning authorities to implement proven methods that promote minimal impact for stormwater in land use planning and permitting processes. Methods should include using natural drainageways and vegetated surfaces to convey, store, filter, and retain stormwater on the site using the natural hydrology of the sites. Develop public and private drainage solutions that incorporate effective stormwater management and erosion and sediment control, and work directly with municipalities on stormwater projects.
- Encourage the development and adoption of MIDS – Community Assistance set of ordinances that are related to land development and post-construction stormwater BMPs and guidance on municipal good housekeeping.

OUTREACH AND EDUCATION STRATEGIES

Watershed

- Assist cities (Akeley, Hackensack, Longville, Federal Dam, LaPorte, and Walker), and the LLBO to create stormwater task forces for strategic planning and prioritizing projects to try and achieve zero stormwater runoff during a 1.1-inch rain event.

Priority Subwatersheds

- Update and implement urban stormwater-management education and outreach materials and programs.

RESEARCH, DATA COLLECTION, AND MONITORING STRATEGIES

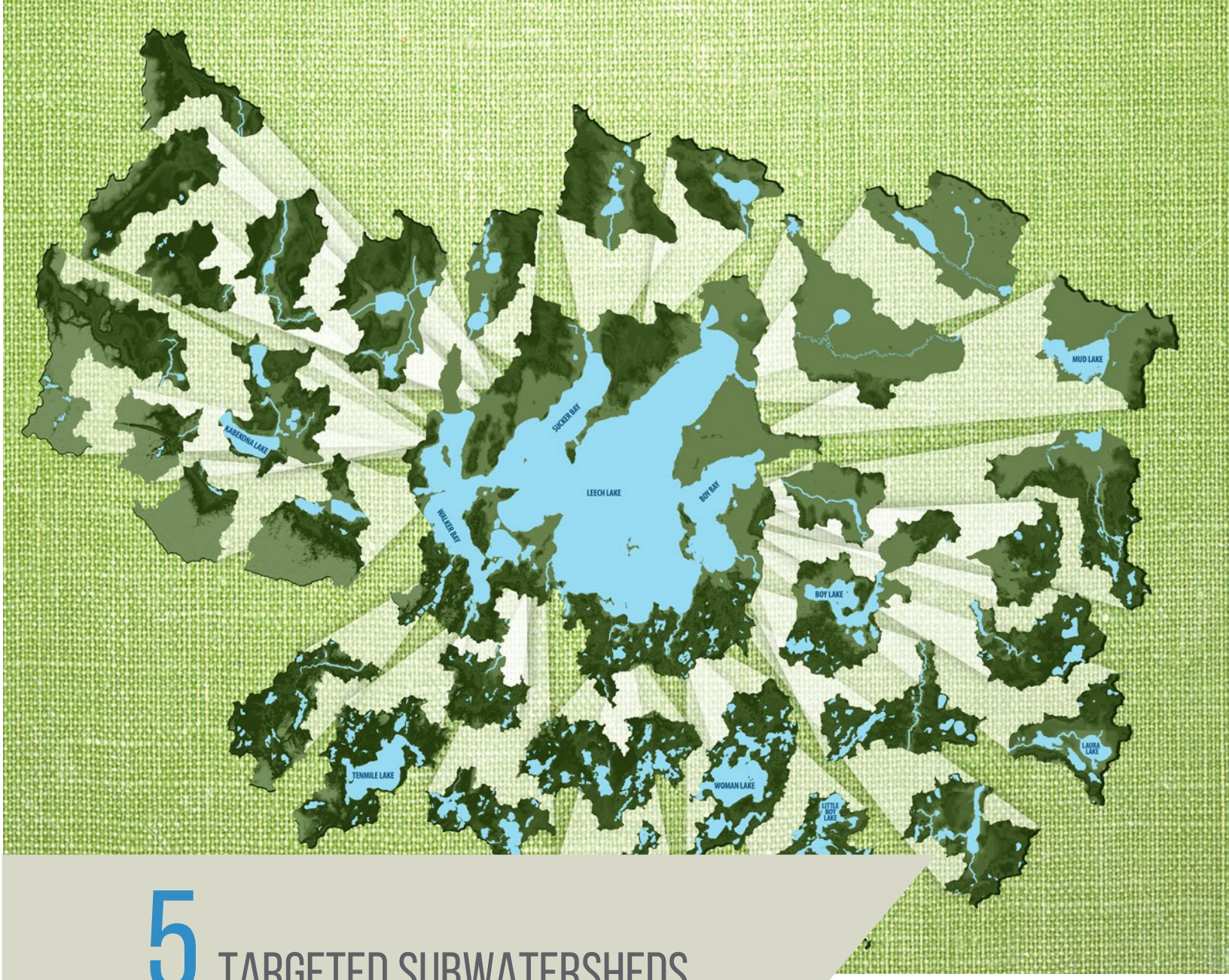
Watershed

- Work with the city stormwater task forces and acquire funding for each city to evaluate each of their stormwater systems. Evaluate the solutions to eliminate the discharge of stormwater directly into watershed lakes and rivers. A wide range of activities from rain barrels and rain gardens to large sediment basins or devices to capture debris, oils, and sediments should be considered.
- Support scientific research and methods that promote minimal impact stormwater techniques and use natural drainageways and vegetated soil surfaces to convey, store, filter, and retain stormwater on the site while mimicking the natural hydrology of a site.
- Map impervious surface coverage within 250 feet of the Ordinary High-Water Level to identify and target outreach and cost-share programs.

STORMWATER TREATMENT GOALS

SUBWATERSHED/ CITY	IMPERVIOUS AREA (ACRES)	ESTIMATED IMPERVIOUS TOTAL PHOSPHORUS LOAD (LBS/YR)	60 PERCENT TREATMENT GOAL (LBS/YR)	1.1-INCH VOLUME GOAL (AC-FT)
Pleasant Lake-Boy River	225	337	202	21
Kabekona Bay	1,075	1,613	968	99
Kabekona River	349	524	314	32
Woman Lake	112	168	101	10
Headwaters – Necktie River	1,464	2,196	1,318	135
Bungashing Creek	174	261	157	16
Pokety River	457	2,196	1,318	135
Steamboat River	257	386	232	24
Man Lake	1,193	1,790	1,074	110
Shingobee River	294	441	264	27
Necktie River	187	281	169	17
Big Deep Lake-Boy River	35	52	31	3
Woman Lake	112	168	101	10
Inguadona Lake-Boy River	98	147	88	9
City of Walker	335	503	302	31

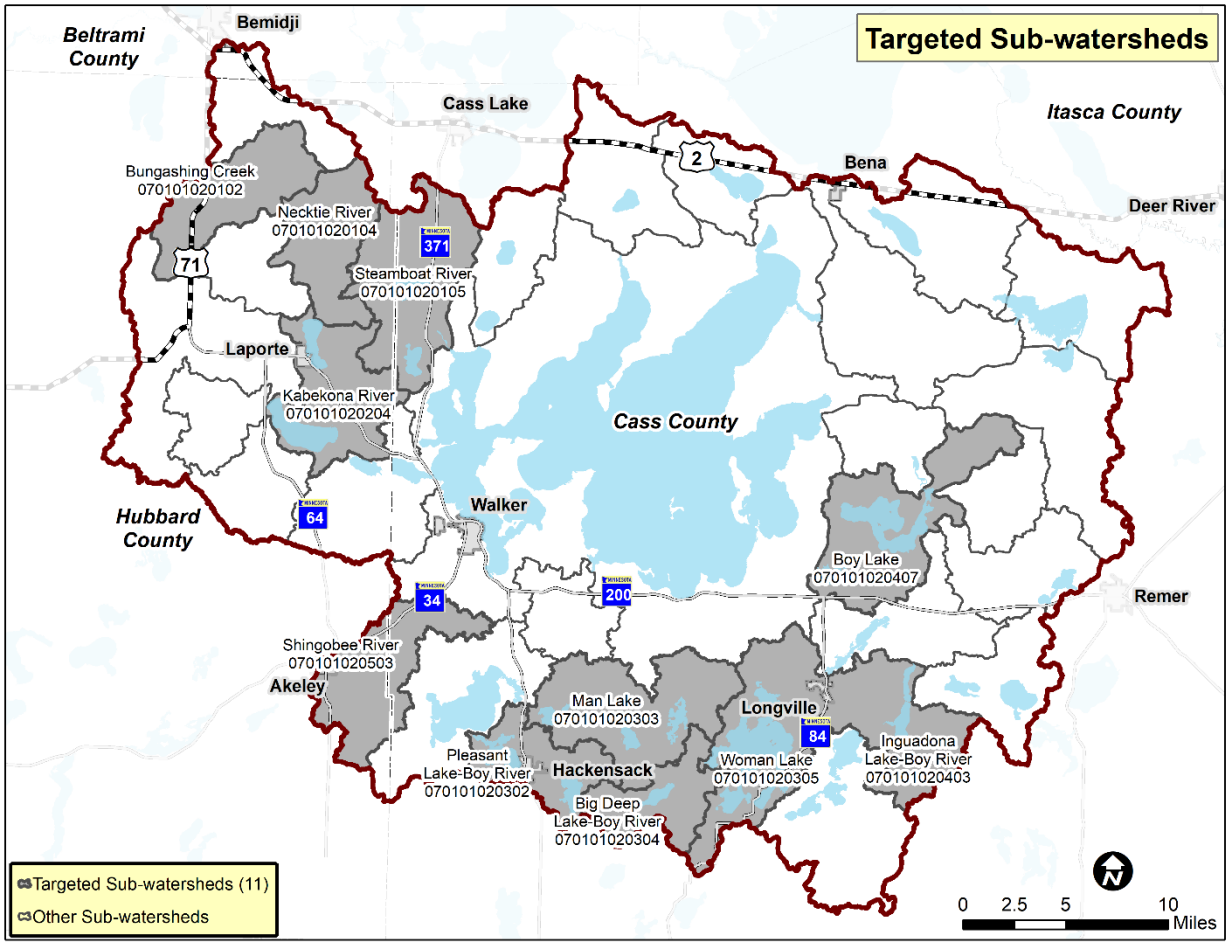
Calculated using the average annual loading (lbs/acre/year) estimate for n WINSLAMM, applied to the impervious area [University of Minnesota, 2014] for each subwatershed and impervious area within the City of Walker municipal boundary [University of Minnesota, 2013].



5 TARGETED SUBWATERSHEDS

To focus conservation efforts and produce the greatest return on investment, the 33 subwatersheds in the Leech Lake River (LLR) Watershed were evaluated to determine implementation opportunities that address multiple benefits. The top scoring subwatersheds for each Natural World Value were identified. The number of times each subwatershed received a top score for each of the natural world values was totaled. This exercise resulted in 11 targeted subwatersheds which are the focus for obtaining multiple benefits and return on investment.

This section presents a summary of each targeted subwatershed and provides an overview of its ranking among the 33 subwatersheds in the watershed, its most significant resources, and implementation strategies. The details for implementing each strategy are provided in Chapter 6.0.



BY THE NUMBERS

33

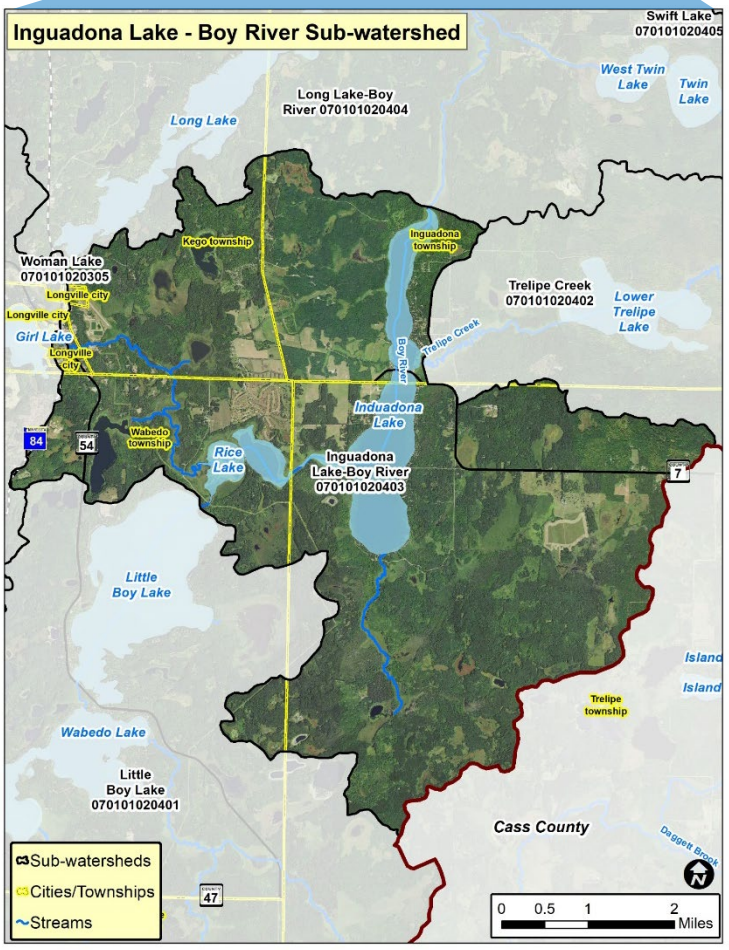
Number of subwatersheds in the Leech Lake River (LLR) Watershed that were evaluated to determine implementation opportunities that address multiple benefits.

11

Number of targeted subwatersheds which are the focus for obtaining multiple benefits and return on investment.

5.1 INGUADONA LAKE/BOY RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to wild rice streams, groundwater, high-quality lakes, and forest resources. Relatively few immediate needs for recreational lake management exist beyond aquatic invasive species management.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	4th
RECREATIONAL LAKES	10th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	Present - Unnamed stream (07010102-612)
GROUNDWATER	3rd
UPLAND RESOURCES	15th
CITIES AND TOWNSHIPS	1 of 4 tied for 5th place ranking

TOTAL ACRES: 16,547

OVERALL GOAL: 537 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGIES:

PROTECT ENHANCE

IGUADONA LAKE/BOY RIVER

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Impaired Rivers/Channels	» Riparian conservation, stewardship, easements, and acquisitions
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory, functional assessment)
Forests and Working Lands	» Easements, acquisitions, and forest-management plans » Conservation easements and forestry management incentives on private lands (riparian and non-riparian)
Cities and Townships	» New stormwater water quality and temperature stormwater BMPs in Longville » Stormwater management plan for future development, including land development and Stormwater ordinance updates
Wetlands	» Wetland functional classification and protection for the whole watershed
Inguadona Lake	» Monitoring lake water quality and inlet and outlet flow analysis; monitoring lakes upstream to assess contributions » SSTS management (inventory, functional assessment) » Shoreline inventory » Shoreline regulations » Sediment and nutrient management BMPs » Abandon Cass County Ditch 5 » City of Longville stormwater management BMPs » AIS management at public access locations (one at this lake) » Shoreline stewardship, conservation, easements, and acquisitions
Girl Lake	» Sediment and Nutrient Management (upland and shoreline BMPs, erosion BMPs) » Coldwater habitat BMPs (impervious surface thermal stormwater BMPs) » Aquatic invasive species management public access locations (1 at this lake) » Shoreline stewardship, conservation, easements, and acquisitions
Cooper Lake	» Sediment and nutrient management BMPs » Coldwater habitat BMPs » Monitoring of lake water quality for trend analyses » Shoreline stewardship, conservation, easements, and acquisitions
Rice Lake	» Sediment and nutrient management (upland and shoreline BMPs and erosion and stormwater BMPs) » Wild rice and shoreline stewardship, conservation, easements, and acquisitions
Boy River	» SSTS management (inventory, functional assessment, and regulatory) » River corridor regulation » Wild rice and riparian conservation, stewardship, easements, and acquisitions

SSTS = Subsurface Sewage Treatment System.

BMP = best management practice.

IGUADONA LAKE/BOY RIVER

PRIORITY RESOURCES

HIGH VALUE AND HIGH PRIORITY STREAMS

BOY RIVER – The Boy River is a wild rice stream that connects several lakes and subwatersheds. This river provides quality habitat in locations with calm, clear water and soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect its sustainability. The Boy River flows at the eastern edge of what Cass County has identified as an area of forest with moderately low forest disturbance. Impervious surface runoff and disturbed forest soils may contribute altered hydrology, sediment, and nutrient impacts to this river.

GROUNDWATER

More than 50 private wells are located within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. One problem well with nitrate and/or arsenic concentrations over the standard was known at the time of installation.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST (COMPARED TO WATERSHED MEAN)	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Inguadona		✓		High	Improving	Highly Developed	Moderately Low	Higher	High	Outstanding	1
Girl	✓	✓		Moderately Low	Improving			Higher	Moderate	Outstanding	1
Cooper	✓	✓		High	Improving	Highly Developed	Low	Higher	Moderate	Moderate	0
Rice		✓	✓	Moderately Low	No Trend	Highly Developed	Low	Higher	Outstanding	Outstanding	0

WRAPS = Watershed Restoration and Protection Strategy

FORESTS AND WORKING LANDS

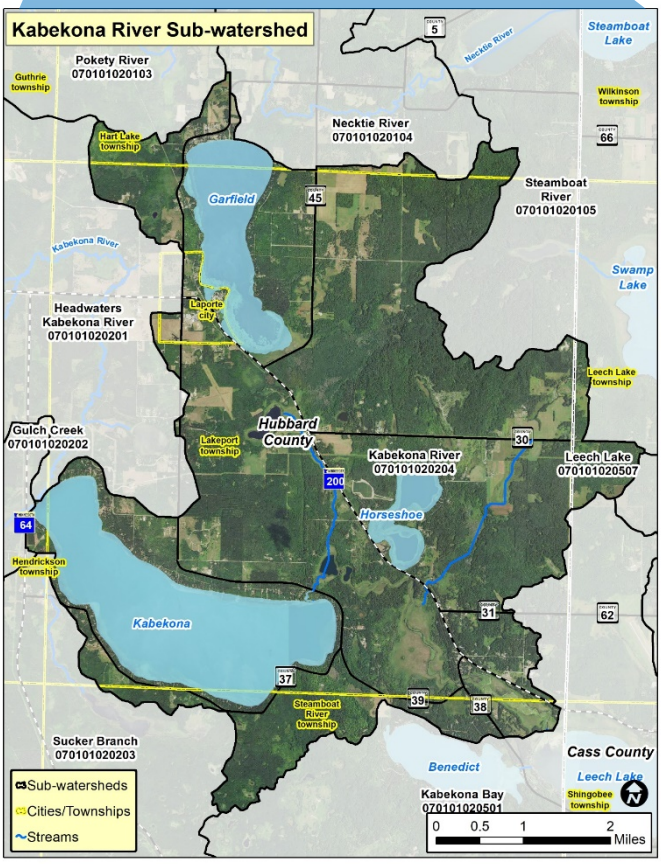
The subwatershed's forests are mostly intact and healthy; currently, a moderately low ratio of existing row crops to watershed area is estimated. Similarly, a moderately low risk of forest conversion to crops exists. In the western half of the subwatershed, there is a moderately low risk of land disturbance. The Cass and Hubbard forest evaluation suggests a moderate risk of forest conversion.

CITIES AND TOWNSHIPS

Currently, very low development density has occurred throughout this targeted subwatershed. However, the subwatershed ranks within the 50th percentile for potential future development.

5.2 KABEKONA RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to cities and townships, groundwater, forests, high value and high priority rivers and streams, and high-quality and recreational lake resources. Relatively low immediate need for recreational lake management exist beyond aquatic invasive species management



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

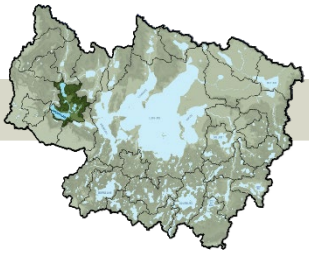
HIGH-QUALITY LAKES	20th
RECREATIONAL LAKES	18th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	Kabekona
GROUNDWATER	1 of 3 tied for 4th place ranking
UPLAND RESOURCES	10th
CITIES AND TOWNSHIPS	1st

TOTAL ACRES: 20,363

OVERALL GOAL: 4,040 acres needed to achieve 75% protected lands goal

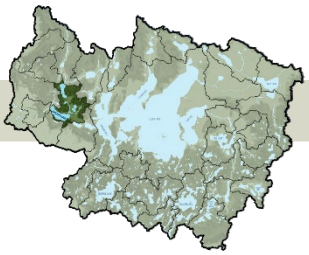
MANAGEMENT STRATEGIES:

PROTECT ENHANCE



KABEKONA RIVER

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Cities and Townships	» Urban stormwater management for the City of Laporte (particular attention to highway runoff) » Stormwater management plan for future development, including land development and stormwater ordinance updates
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory and assessment) for Garfield Lake » Groundwater and wetland management in Garfield Lake lakeshed
Forests and Working Lands	» Conservation easements and forestry management incentives on private lands in the Garfield and Kabekona lakesheds
Wetlands	» Wetland functional classification and protection for the entire watershed
Kabekona River	» SSTS management (inventory, functional assessment, regulatory) » River corridor land use management » Wild rice and riparian easements and acquisitions, conservation, and stewardship » Stormwater water quality and temperature stormwater BMPs » Culvert hydraulic, hydrologic, sediment transport, fish-barrier inventory, and priority assessment » Pasture management
Kabekona Lake	» Shoreland conservation, stewardship, easement, and acquisition » Monitor second-tier development between the Kabekona and Garfield Lakes » Aquatic invasive species management public access locations
Garfield Lake	» Shoreland conservation, stewardship, easements, and acquisitions » Water quality monitoring to determine trends » Internal load estimate needed » Education and outreach to shoreland property owners (e.g., community forum) » Monitor second-tier development between the Kabekona and Garfield Lakes » AIS management public access locations



KABEKONA RIVER

PRIORITY RESOURCES

CITIES AND TOWNSHIPS

Currently, moderately low development density exists throughout this targeted subwatershed, and the subwatershed ranks within the 75th percentile for potential future development.

GROUNDWATER

Within this targeted subwatershed, 26–50 private wells are located within moderate to high groundwater-sensitive areas. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. Two problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

FORESTS AND WORKING LANDS

The subwatershed has 24 percent coverage of private forests greater than 20 acres (the threshold in the metric screening) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area is estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately low. The Cass and Hubbard County forest evaluations suggest a moderately low risk of forest conversion.

HIGH VALUE AND HIGH PRIORITY STREAMS

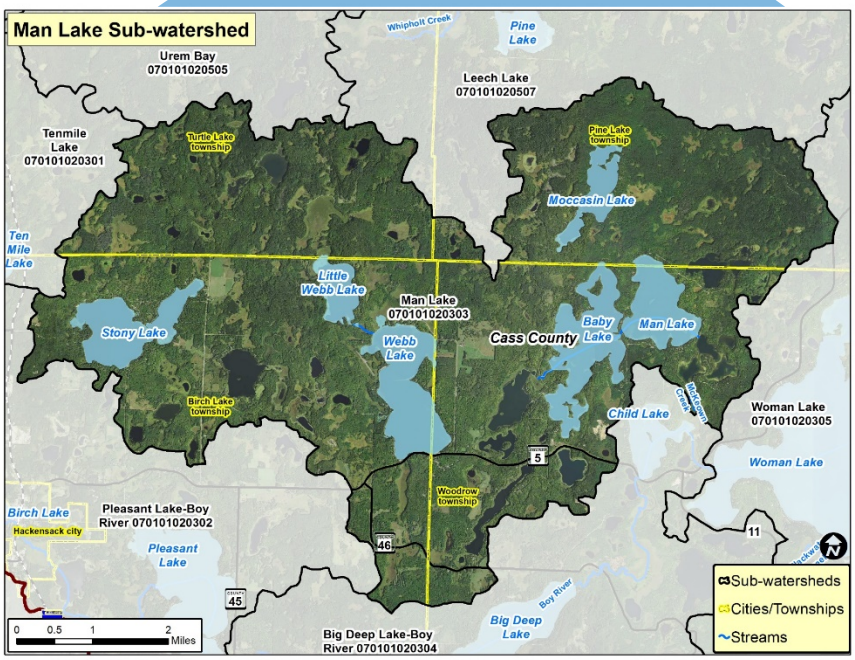
KABEKONA RIVER – the Kabekona River is a wild rice stream that provides quality habitat in locations with calm, clear water and soft, mucky stream bottom sediments. Changes in the period of high or low water from when the wild rice stands were established can adversely affect the wild rice sustainability. Similarly, excess nutrient deposition can affect crop success. Grazing operations that allow direct access to the river have caused E. coli levels to exceed water quality standards. The Kabekona River flows within an area that was identified as a forest with moderately high forest disturbance. Disturbed forest soils may contribute altered hydrology, sediment and nutrient impacts to this river.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Garfield			✓	High	No Trend	Highly Developed	Low	Higher than watershed mean	Moderate	Outstanding	1
Kabekona	✓	✓	✓	Moderate	Improving	Highly Developed	Low	Higher than watershed mean	Low	Outstanding	1

5.3 MAN LAKE SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to recreational lakes, groundwater, cities and townships, and high-quality lakes and forest resources.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	3rd
RECREATIONAL LAKES	1st
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	28th
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	1 of 4 tied for 2nd place ranking
UPLAND RESOURCES	9th
CITIES AND TOWNSHIPS	1 of 4 tied for 3rd place ranking

TOTAL ACRES: 26,597

OVERALL GOAL: 1,367 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGIES:

PROTECT ENHANCE

MAN-LAKE

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Man Lake	» Monitor new plats and second-tier development in shoreland zones » Shoreland conservation, stewardship, easements, and acquisitions » Nutrient management and sediment and erosion control BMPS » Water quality, biodiversity, and temperature BMPs
Mckeown Lake	» Prioritize the monitoring (i.e., tracking for opportunities to buy or place easements) of new plats and second-tier development in shoreland zones » Nutrient management and sediment and erosion control BMPS » Shoreland conservation, stewardship, easement, and acquisition » Water quality and biodiversity BMPs
Barnum Lake	» Monitor new plats and second-tier development in shoreland zones » Shoreland conservation, stewardship, easement, and acquisition » Water quality and biodiversity BMPs
Baby Lake	» Monitor new plats and second-tier development in shoreland zones » Sediment and nutrient management and erosion control » AIS management at public access locations (one at this lake) » Shoreland conservation, stewardship, easement, and acquisition » Water quality and biodiversity BMP
Additional Lakes	» Septic survey of properties around Stony Lake » Shoreland inventory on Stony Lake for recommended BMPs » Monitoring lake water quality and inlet and outlet flows to determine the areas contributing the greatest runoff to Stony Lake » Outreach and education for shoreline landowners along Stony Lake » Monitor groundwater vulnerability areas in Stony Lake lakeshed » Nutrient management and sediment and erosion control BMPs in the Webb, Kidd, Kerr, Lost, and Stony lakesheds
Groundwater	» Update the groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of wells sensitive to contamination risk » Well sealing » SSTS management (inventory and assessment)
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development, including land development and stormwater ordinance updates
Forests and Working Lands	» Forest management to improve the overall health within the Man, McKeown, Barnum, and Baby lakesheds » Riparian and forest easements and acquisitions » Private forest management
Wetlands	» Wetland functional classification and protection for the entire watershed

MAN-LAKE

PRIORITY RESOURCES

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Man	✓	✓		High	Declining	Highly developed	Low	Lower than watershed mean	Low	Outstanding	0
McKeown		✓		Moderately high	No trend	Highly developed	Moderate	Lower than watershed mean	Moderate	Outstanding	0
Barnum		✓		High	Declining	Highly developed	Low	Lower than watershed mean	Moderate	Low	0
Baby		✓		Moderately high	Improving	Highly developed	Moderate	Lower than watershed mean	Low	Outstanding	1

GROUNDWATER

Over 50 private wells exist within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. Two problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

CITIES AND TOWNSHIPS

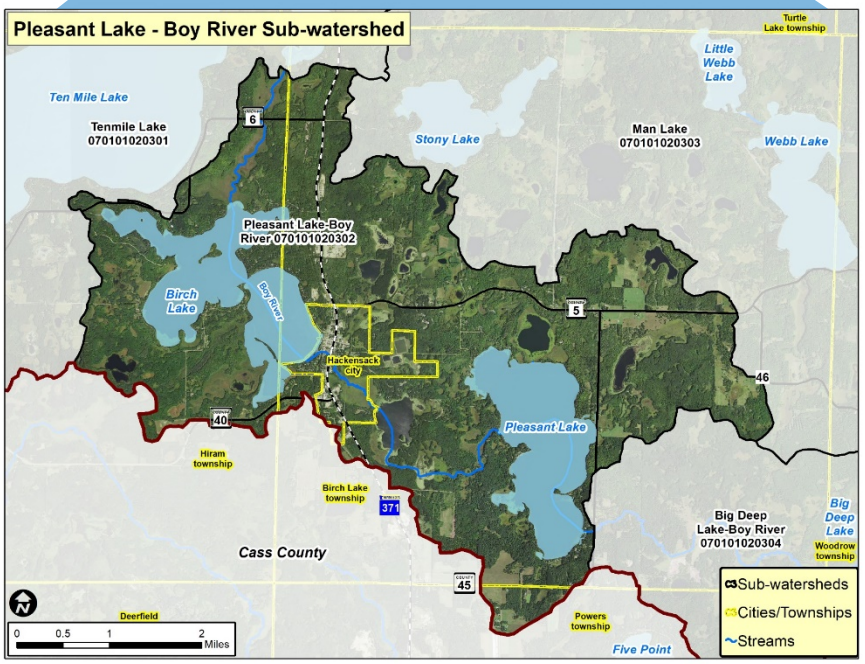
Currently, very low development density exists throughout this targeted subwatershed; however, the subwatershed ranks within the 75th percentile for potential future development.

FORESTS AND WORKING LANDS

The subwatershed has 17 percent coverage of private forests that are greater than 20 acres (the threshold in the metric scoring) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately high. The Cass and Hubbard forest evaluation suggests a moderate risk of forest conversion.

5.4 PLEASANT LAKE—BOY RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to cities and townships, groundwater, forests, high value and high priority rivers and streams, high-quality lakes, and recreational lake resources. Relatively few immediate needs exist for recreational lake management, except for aquatic invasive species management.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	17
RECREATIONAL LAKES	12
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 3 tied for 4th place ranking
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	2nd
UPLAND RESOURCES	5th
CITIES AND TOWNSHIPS	1st

TOTAL ACRES: 13,569

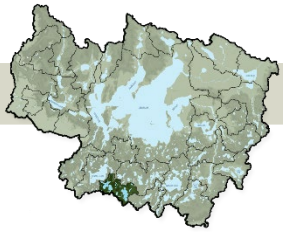
OVERALL GOAL: 3,936 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT

PLEASANT LAKE—BOY RIVER

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Cities and Townships	» Urban stormwater management for the City of Hackensack » Stormwater management plan for future development, including land development and stormwater ordinance updates
Groundwater	» Update the groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory, functional assessment) for Pleasant and Birch Lakes
Forests and Working Lands	» Monitor school trust-fund lands classified for real estate and permanently protect these lands if threatened
Wetlands	» Wetland functional classification and protection for the entire watershed
Boy River	» Establish wild rice and riparian easements along the Boy River » Riparian conservation, stewardship, easements, and acquisitions
Pleasant Lake	» Sediment and nutrient management and erosion control » Lakeshore education and outreach » Shoreline stewardship, conservation, easements, and acquisitions » AIS management at public access locations
Birch Lake	» Sediment and nutrient management and erosion control » Lakeshore education and outreach » Shoreline stewardship, conservation, easements, and acquisitions » AIS management at public access locations



PRIORITY RESOURCES

CITIES AND TOWNSHIPS

Currently, moderately low development density exists throughout this targeted subwatershed, but the subwatershed ranks within the 75th percentile for potential future development.

GROUNDWATER

Over 50 private wells are located within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest a likelihood that the wells are relatively shallow and susceptible to contamination from SSTS. Two problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

FORESTS AND WORKING LANDS

The subwatershed has 31 percent coverage of private forests that are greater than 20 acres (the threshold in the metric evaluation) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be moderately high. The Cass and Hubbard forest evaluations suggest a moderately high risk of forest conversion.

HIGH VALUE AND HIGH PRIORITY STREAMS

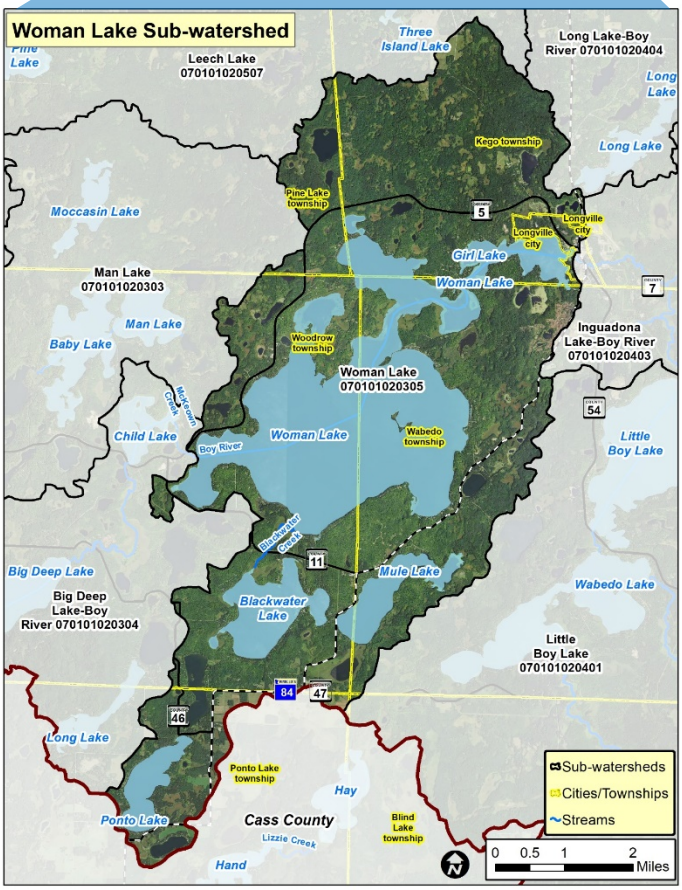
BOY RIVER – The Boy River provides quality habitat in locations with calm and clear water and soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect the Boy River's sustainability. The forest disturbance in the Boy River's lakeshed was scored moderately low.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TRENDS	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Pleasant		✓		Moderately high	No trend	Highly developed	Low	Lower than watershed mean	Low	Outstanding	1
Birch		✓		Moderately high	Increasing	Highly developed	Low	Lower than watershed mean	High	High	1

5.5 WOMAN LAKE SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to cities and townships, groundwater, high-quality lakes, recreational lakes, high value and high priority rivers and streams, and forest resources.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

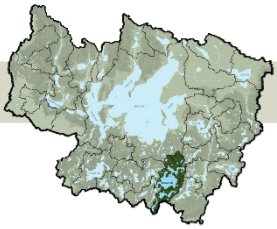
HIGH-QUALITY LAKES	1st
RECREATIONAL LAKES	4th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	1 of 2 tied for 1st place ranking
UPLAND RESOURCES	22nd
CITIES AND TOWNSHIPS	1 of 4 tied for 1st place ranking

TOTAL ACRES: 26,124

OVERALL GOAL: 1,416 acres needed to achieve 75% protected lands goal

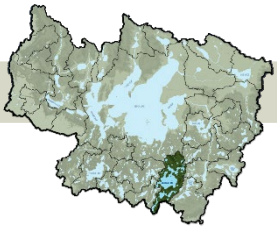
MANAGEMENT STRATEGY:

PROTECT



WOMAN LAKE

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development, including land development and stormwater ordinance updates
Groundwater	» Update the groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory, functional assessment) in all riparian areas; prioritize Ponto Lake
Woman Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Shoreline regulations » Monitor new plats and second-tier development in shoreland zones » Sediment/nutrient management and erosion control » AIS management at public access locations
Blackwater Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Shoreline regulations » Monitor new plats and second-tier development in shoreland zones » Sediment and nutrient management, erosion control » AIS management at public access locations
Island Lake	» Shoreline stewardship, conservation, easements, acquisitions, and conservation » Shoreline regulations » Monitor new plats and second-tier development in shoreland zones » Sediment/nutrient management and erosion control BMPs » Water quality monitoring to assess declining water quality » AIS management at public access locations
Ponto Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Shoreline regulations » Monitor new plats and second-tier development in shoreland zones » Sediment/nutrient management and erosion control BMPs » Landowner outreach and education » Water quality monitoring to assess declining water quality » Water flow monitoring to determine areas of heaviest runoff » AIS management at public access locations
Mule Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Ordinances to improve shoreline development practices » Monitor new plats and second-tier development in shoreland zones. » Sediment and nutrient management, erosion control » AIS management at public access locations
Hazel Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Ordinances to improve shoreline development practices » Monitor new plats and second-tier development in shoreland zones
Boy River	» Establish wild rice and riparian easements along the Boy River » Riparian conservation, conservation, easements, and acquisitions
Forests and Working Lands	» Private forest conservation, easements, and acquisition » Monitor school trust-fund lands classified for real estate and permanently protect these lands if threatened
Wetlands	» Wetland functional classification and protection for the entire watershed



WOMAN LAKE

PRIORITY RESOURCES

CITIES AND TOWNSHIPS

Currently, moderately low development density exists throughout this targeted subwatershed, but the subwatershed ranks within the 75th percentile for potential future development.

GROUNDWATER

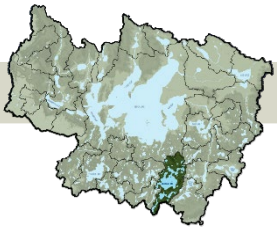
Over 50 private wells within moderate to high groundwater-sensitive areas exist within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. More than three problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

FORESTS AND WORKING LANDS

The subwatershed has 15 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with less than 50 percent of agricultural land. Currently, a low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately high. The Cass and Hubbard County forest evaluations suggest a moderate risk of forest conversion.

High-quality and Recreational Lakes

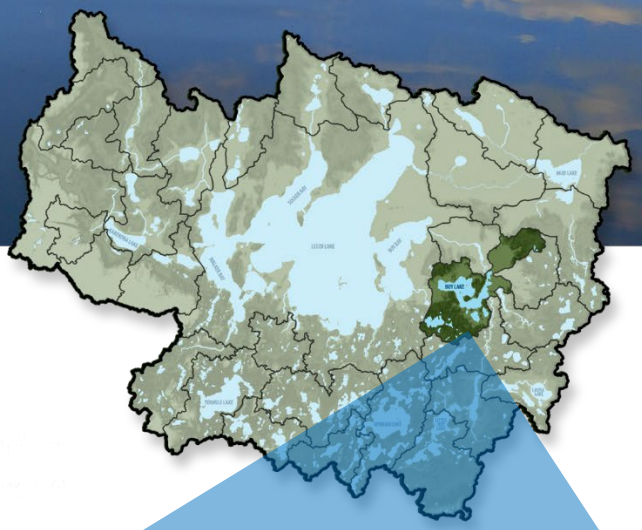
LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Woman		✓	✓	Moderately high	Improving	Highly developed	Low	Higher than watershed mean	High	Outstanding	2
Blackwater		✓		High	Improving	Highly developed	Low	Higher than watershed mean	Moderate	Outstanding	1
Island		✓	✓	High	Declining	Highly developed	Moderately High	Higher than watershed mean	Moderate	Low	1
Ponto		✓		High	Declining	Highly developed	Moderately Low	Higher than watershed mean	Low	Low	1
Mule		✓		High	Improving	Highly developed	Low	Higher than watershed mean	Moderate	Low	2
Hazel	Yes	Yes		Low	Improving	Moderately low	Low	Higher than watershed mean	Moderate	Low	0



WOMAN LAKE

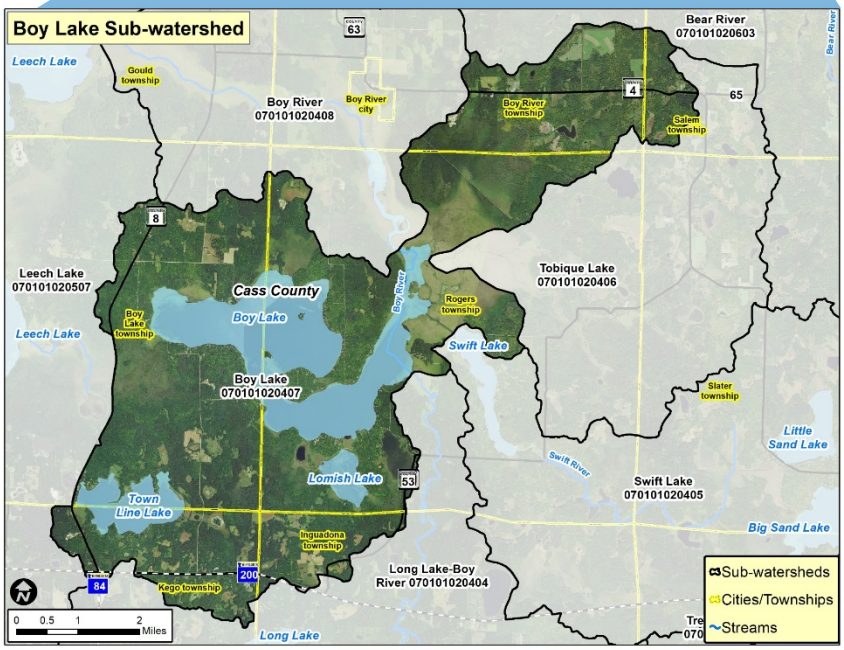
HIGH VALUE AND HIGH PRIORITY STREAMS

BOY RIVER—This river provides quality habitat in locations with calm, clear water and soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect the Boy River's sustainability. The Boy River is a priority stream of the stakeholders within the LLR Watershed. As evaluated by the Minnesota Pollution Control Agency (MPCA)-Department of Natural Resources (DNR) Stream Protection Prioritization Committee, the river's aquatic insect populations are close to impairment, there are low risks associated with riparian encroachment via land uses and/or animal husbandry, medium watershed risks, and moderately high levels of protection currently in place [MPCA and DNR Stream Priority Ranking, 2017]. There is moderately low forest disturbance in the Boy River's lakeshed.



5.6 BOY LAKE SUBWATERSHED

The greatest management needs for this watershed are enhancement and protection-focused actions related to forests, high-quality lakes, groundwater, high value and high priority rivers and streams, recreational lakes, and city and township resources



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

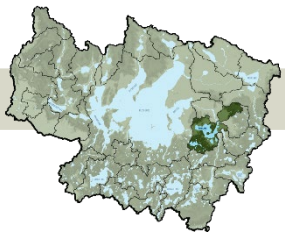
HIGH-QUALITY LAKES	7th
RECREATIONAL LAKES	11th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	16th
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	11th
UPLAND RESOURCES	15th
CITIES AND TOWNSHIPS	23rd

TOTAL ACRES: 27,008

OVERALL GOAL: 75% protection goal achieved

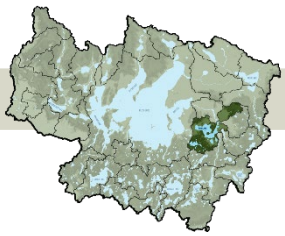
MANAGEMENT STRATEGY:

PROTECT



BOY LAKE

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Forests and Working Lands	» Monitor school trust-fund lands classified for real estate and permanently protect these lands, if threatened, especially for areas of high biodiversity adjacent to Boy Lake » Manage forests for proper health and function
Boy Lake	» Shoreline stewardship, conservation, easements, and acquisitions » Nutrient management and sediment and erosion control upstream of Boy Lake and along all-terrain vehicle trails from Boy River to Highway 200 » Monitor water quality for trend analysis » Monitor new plats and second-tier development in shoreland zones
Town Line Lake	» Monitor water quality for trend analysis » Monitor new plats and second-tier development in shoreland zones » Shoreline stewardship, conservation, easements, and acquisitions
Lomish Lake	» Monitor new plats and second-tier development in shoreland zones » Shoreline stewardship, conservation, easements, and acquisitions
Portage Lake	» Monitor new plats and second-tier development in shoreland zones » Shoreline stewardship, conservation, easements, and acquisitions
Groundwater	» Update groundwater plan in the watershed plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory, functional assessment) with focus in Boy Lake
Boy River	» Establish wild rice and riparian easements along the Boy River » Riparian conservation, conservation, easements, and acquisitions
Cities and Townships	» Urban stormwater management
Wetlands	» Wetland functional classification and protection for the entire watershed



BOY LAKE

PRIORITY RESOURCES

FORESTS AND WORKING LANDS

The subwatershed has 15 percent coverage of private forests that are greater than 20 acres (the threshold for screening metric) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be moderately low. The Cass and Hubbard County forest evaluations suggest a moderately low risk of forest conversion.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Boy		✓		Moderately low	No trend	Highly developed	Low	Higher than watershed mean	Outstanding	Outstanding	1
Townline		✓		Very high	No Trend	Highly developed	Low	Higher than watershed mean	Moderate	High	1
Lomish			✓	Low	Improving	Highly developed	Low	Higher than watershed mean	High	Outstanding	0
Portage		✓	✓	Moderately low	Improving	Highly developed	Low	Higher than watershed mean	High	High	1

GROUNDWATER

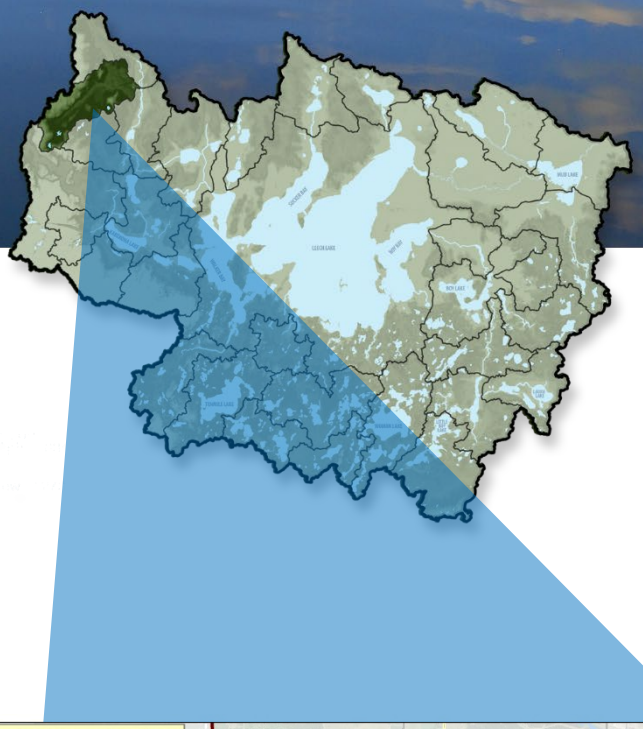
Ten or fewer private wells are located within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest a likelihood that the wells are relatively shallow and susceptible to contamination from SSTS. More than three problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

HIGH VALUE AND HIGH PRIORITY STREAMS

BOY RIVER - This river provides quality habitat in locations with calm, clear water with soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect the Boy River's sustainability. The Boy River is a priority stream of the stakeholders within the LLR Watershed. The river's aquatic insect populations are close to impairment, there are low risks are associated with riparian encroachment via land uses and/or animal husbandry, medium watershed risks, and moderately high levels of protection currently in place [MPCA and DNR, 2017]

CITIES AND TOWNSHIPS

Currently, low development density exists throughout this targeted subwatershed, and the subwatershed ranks within the 25th percentile for potential future development.



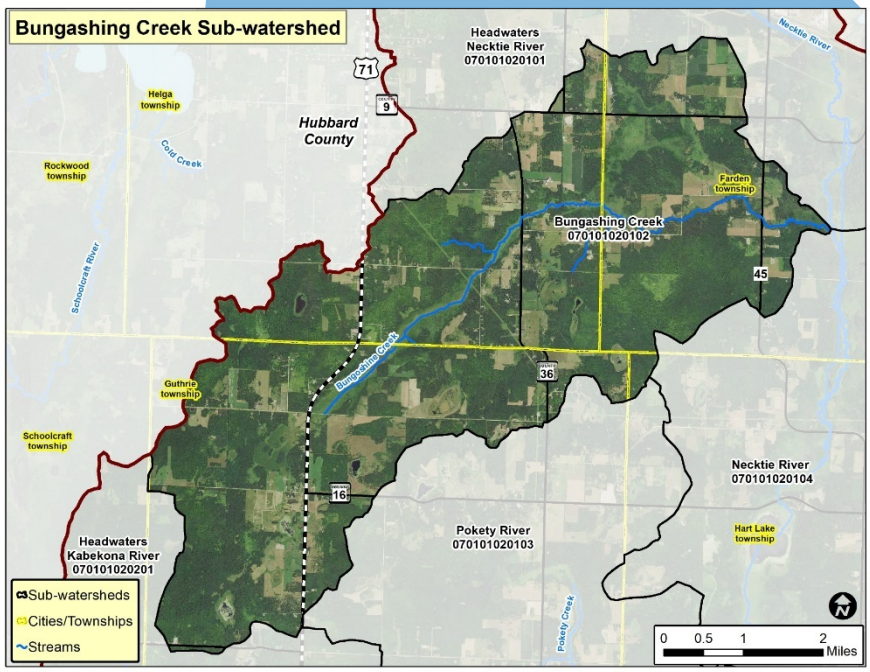
5.7 BUNGASHING CREEK SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to forests, high-quality lakes, groundwater, high value and high priority rivers and streams, recreational lakes, and city and township resources

SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	32nd
RECREATIONAL LAKES	29th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	Present
GROUNDWATER	24th
UPLAND RESOURCES	1st
CITIES AND TOWNSHIPS	1 of 4 tied for 3rd place ranking



TOTAL ACRES: 18,256

OVERALL GOAL: 7,534 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT ENHANCE

BUNGASHING CREEK

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Forests and Working Lands	» Monitor school trust-fund lands classified for real estate and permanently protect these lands if threatened, especially for areas that impact trout streams, shoreland areas and upland habitats » Private forest management
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development, including land development and stormwater ordinance updates
Bungashing Creek	» Livestock and pasture management along, specifically above the County Road 102 bridge » Monitor grazing activity » Targeted outreach and education programs for producers » Culvert redesign/maintenance for stream crossing at Township Road 45 » Sediment/nutrient and erosion management » Riparian conservation, conservation, easements, and acquisitions
Groundwater	» Update ground water plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (inventory, functional assessment)
Wetlands	» Watershed-wide wetland functional classification and protection

BUNGASHING CREEK

PRIORITY RESOURCES

FORESTS AND WORKING LANDS

The subwatershed has 44 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with have less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately high. The Cass and Hubbard County forest evaluations suggest a moderately high risk of forest conversion.

CITIES AND TOWNSHIPS

Currently, low development density exists throughout this targeted subwatershed, but the subwatershed ranks within the 75th percentile for potential future development.

HIGH VALUE AND HIGH PRIORITY STREAMS

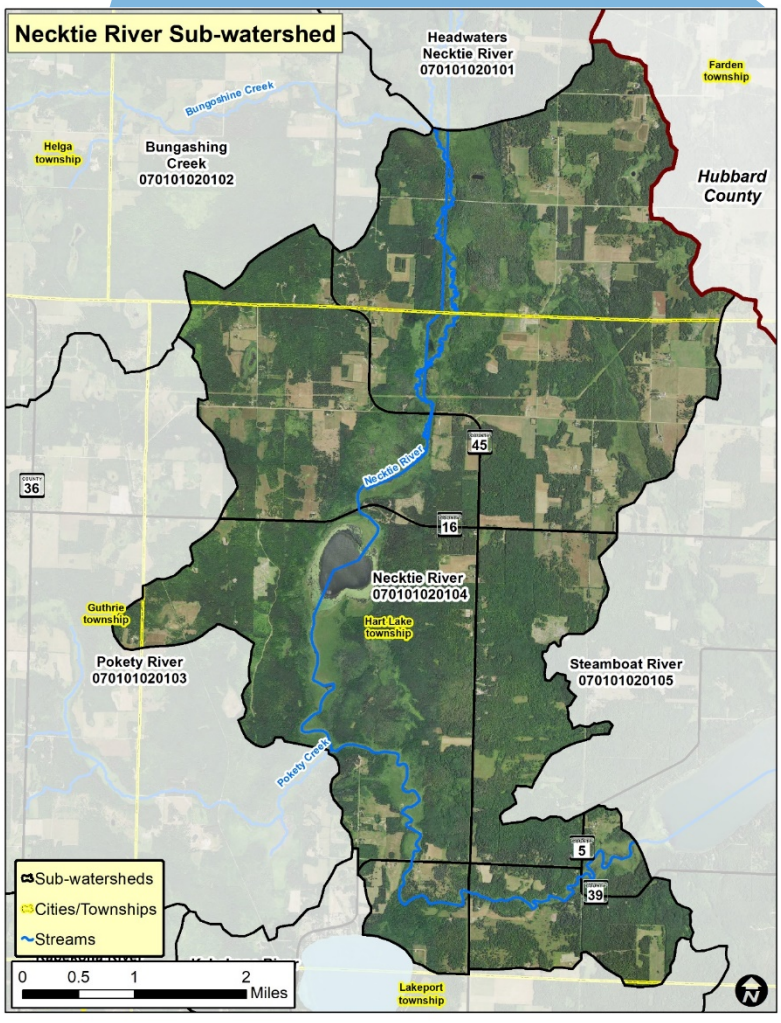
BUNGASHING CREEK – The Bungashing Creek is a priority stream for the stakeholders within the LLR Watershed. The Creek's fish and aquatic insect populations index scores were high which qualified this creek as an exceptional water. The risk of riparian encroachment via land uses and animal husbandry are medium-high and there is only a moderate level of protection currently in place [MPCA and DNR, 2017]. The Forest Disturbance in the Bungashing Creek's subwatershed scored moderately low.

GROUNDWATER

Fewer than 10 private wells occur within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. One problem well with nitrate and/or arsenic concentrations over the standard was known at the time of installation.

5.8 NECKTIE RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to impaired lakes, forests, cities and townships, high value and high priority rivers, streams, and groundwater. Relatively few immediate needs exist for recreational lake management, except for aquatic invasive species management.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	31st
RECREATIONAL LAKES	31st
IMPAIRED LAKES	Hart Lake
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	Necktie River
GROUNDWATER	21st
UPLAND RESOURCES	6th
CITIES AND TOWNSHIPS	1 of 4 tied for 5th place ranking

TOTAL ACRES: 16,342

OVERALL GOAL: 5,185 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT ENHANCE

NECKTIE RIVER

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Hart Lake	» Monitor the gravel pit and develop extraction ordinance if needed » Monitor water quality for nutrients and trend analysis » Shoreline easements, conservation, easements, and acquisitions.
Forests and Working Lands	» Monitor school trust-fund lands classified for real estate and permanently protect these lands if threatened, especially for areas around Necktie River and Hart Lake » Private forest management
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development including land development and stormwater ordinance updates
Necktie River	» Incorporate Minnesota DNR channel evaluation and restoration feasibility results into implementation plan » Feedlot management and livestock/pasture management » Targeted Outreach and Education to local producers » Riparian conservation, conservation, easements, and acquisitions
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (e.g., inventory and functional assessment)
Wetlands	» Wetland functional classification and protection for the entire watershed

PRIORITY RESOURCES

IMPAIRED LAKES:

HART LAKE – As one of the few shallow lakes in the LLR Watershed, Hart Lake was the only lake that does not support aquatic recreation use because of excess nutrients. The lake's shallow depth (10 feet) allows nutrients to be recycled from the bottom sediments during wind events, which causes internal loading. The MPCA is considering developing a shallow-lake nutrient standard that is specific to the northern lakes and forests ecoregion in Minnesota and deciding on the natural background contribution of nutrients within Hart Lake's subwatershed. The channelized portions of the upper reaches of the Necktie River, which drains to Hart Lake, could be conveying excess sediment and nutrients to the lake. At the time of this plan's writing, the Minnesota DNR was conducting a geomorphic assessment of the Necktie River that may help inform the understanding of sediment and nutrient transport to the lake from the river.

This lake, which is not a coldwater lake, is a WRAPS priority lake. The shoreline has very low development density with low potential for future development. The lake's watershed is scored lower than the overall watershed's mean forest score. The Minnesota DNR has designated the lakeshed as having high biodiversity and ranks it as a lake of outstanding biological significance. The lake is documented to have high amounts of wild rice habitat. Although technically no public access exists for the lake, a public access is located immediately nearby on the Necktie River.

FORESTS AND WORKING LANDS

The subwatershed has 39 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately low. The Cass and Hubbard County forest evaluations suggest a moderate risk of forest conversion.

CITIES AND TOWNSHIPS

Currently, low development density exists throughout this targeted subwatershed. The subwatershed ranks within the top 50th percentile for potential future development.

IMPAIRED/CHANNELIZED RIVERS AND STREAMS

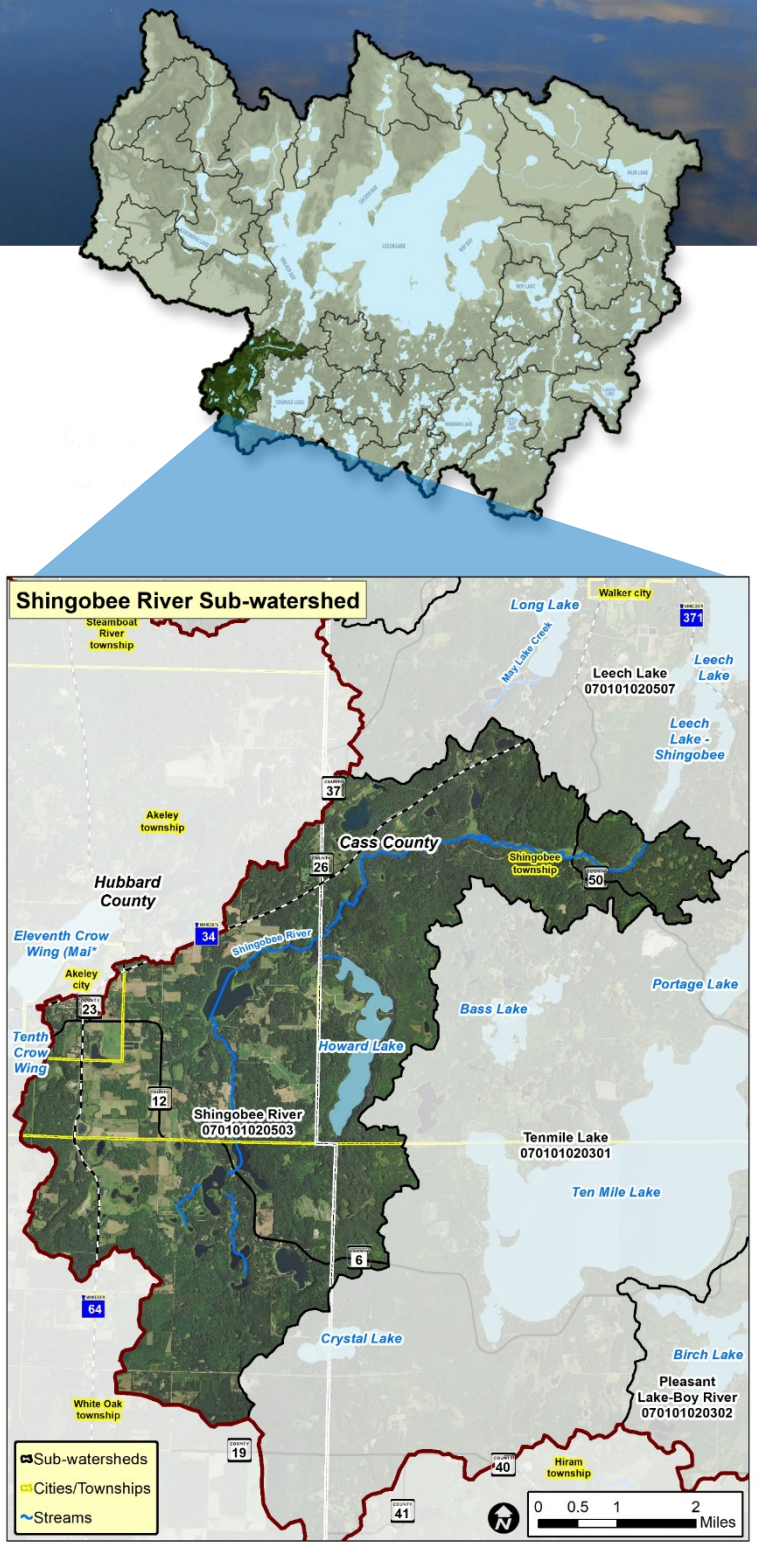
NECKTIE RIVER–The Necktie River was originally 8.5 miles long, but river channelization in the early 1900s resulted in a 5-mile straight segment with altered slope, discharge, and bank stability. Limited in-stream habitat exists for aquatic insects and fish and the river has likely contributed unnatural amounts of sediment and nutrient loading to Hart Lake.

GROUNDWATER

Fewer than 10 private wells exist within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. One problem well with nitrate and/or arsenic concentrations over the standard was known at the time of installation.

5.9 SHINGOBEE RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to forests, high-quality lakes, groundwater, high value and high priority rivers and streams, recreational lakes, and city and township resources.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	11th
RECREATIONAL LAKES	13th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	18th
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	1 of 4 tied for 2nd place ranking
UPLAND RESOURCES	8th
CITIES AND TOWNSHIPS	1 of 4 tied for 4th place ranking

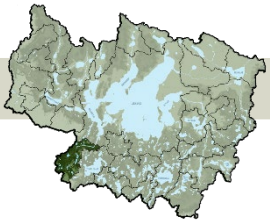
TOTAL ACRES: 20,283

OVERALL GOAL: 4,362 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT ENHANCE

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (e.g., inventory and functional assessment)
Cities and Townships	» Monitor septage disposal from Akeley Wastewater Treatment Plant near Shingobee Creek » Stormwater management plan for future development including land development and Stormwater ordinance updates » Urban stormwater BMPs
Forests and Working Lands	» Manure management during spring snow melt for two feedlots near the outlets for Steele Lake and an unnamed creek into Island Lake » Rotational grazing and agro-forestry management of pasturelands » Producer enrollment in Environmental Quality Incentives Program programs, Conservation Stewardship Program and/or Agricultural Conservation Easement Program (ACEP) » Manage forests to improve forest health in northern portions of watershed
Shingobee Creek	» Restore altered vegetation along creek at County Road 50 » Riparian conservation, conservation, easements, and acquisitions
Howard Lake	» Temperature and water quality BMPs » Monitor future parcel development » Lakeshed forest protection via private forest incentives and management plans » Shoreline stewardship, conservation, easements, and acquisitions
Shingobee Lake	» Monitor water quality for trend analysis » Lakeshed forest protection via private forest incentives and management plans » Water quality BMPs » AIS management at public access locations » Shoreline stewardship, conservation, easements, and acquisitions
Williams Lake	» Monitor future parcel development » Lakeshed forest protection via private forest incentive and management plans » Water quality BMPs » AIS management at public access locations » Shoreline stewardship, conservation, easements, and acquisitions
Anoway Lake	» Shoreline stewardship, conservation, easements, and acquisitions
Wetlands	» Wetland functional classification and protection for the entire watershed
Other	» Identify deficient culverts on stream crossings and repair as needed



PRIORITY RESOURCES

GROUNDWATER

Between 26 and 50 private wells exist within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. More than three problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

CITIES AND TOWNSHIPS

Currently, low development density exists throughout this targeted subwatershed. The subwatershed ranks within the top 50th percentile for potential future development.

FORESTS AND WORKING LANDS

The subwatershed has 33 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with less than 50 percent agriculture. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately low. The Cass and Hubbard County forest evaluations suggest a moderately low risk of forest conversion.

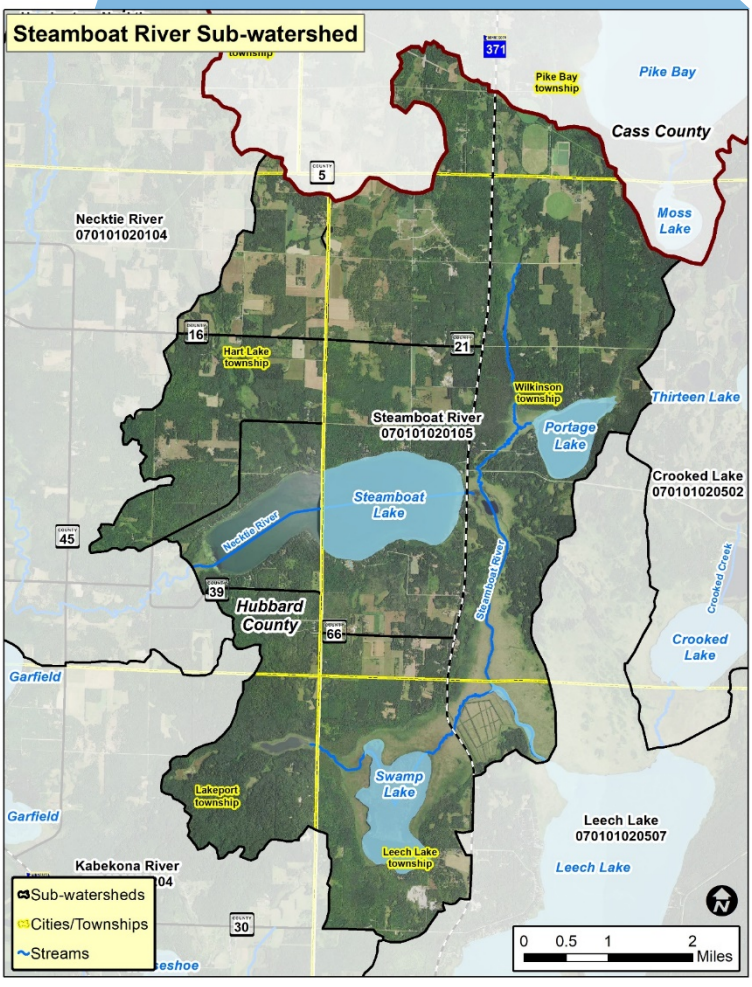
HIGH VALUE AND HIGH PRIORITY STREAMS

SHINGOBEE CREEK - The Shingobee Creek is a priority stream of the stakeholders within the LLR Watershed. The creek's aquatic insect populations are close to impairment; there are low risks are associated with riparian encroachment via land uses and/or animal husbandry; there are medium-high watershed risks and moderately high levels of protection are currently in place [MPCA and DNR, 2017]. The forest disturbance in the Shingobee Creek's lakeshed scored moderately low.

LAKE	COLDWATER LAKE	WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Howard	✓	✓		Moderately high	Improving	High	Moderately high	Higher than watershed mean	High	High	
Shingobee		✓		High	Declining	Moderately high	Low	Higher than watershed mean	Moderate	High	1
Williams				Very high	Declining	Highly developed	High	Higher than watershed mean	Low	Low	
Anoway				Low	Improving	Moderately high	Low	Higher than watershed mean	low	low	

5.10 STEAMBOAT RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to forests, cities and townships, groundwater, high value and high priority rivers and streams, and high-quality recreational lake resources.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

HIGH-QUALITY LAKES	19th
RECREATIONAL LAKES	17th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 8 tied for 5th place ranking
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	1 of 3 tied for 4th place ranking
UPLAND RESOURCES	4th
CITIES AND TOWNSHIPS	1 of 4 tied for 4th place ranking

TOTAL ACRES: 25,677

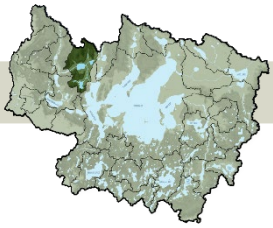
OVERALL GOAL: 8,333 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT ENHANCE

STEAMBOAT RIVER

NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Forests and Working Lands	» Inventory and protect large forested parcels in Steamboat Lake lakeshed » Private forest management
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development, including land development and stormwater ordinance updates
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (e.g., inventory and functional assessment)
Steamboat River	» Targeted Outreach and Education to riparian property owners » Culvert redesign/maintenance at Steamboat River and County State-Aid Highway 5 » Sediment, nutrient and erosion management in upstream reaches to Steamboat Lake » Riparian conservation, stewardship, easements, and acquisitions
Spring Lake	» Monitor wild rice productivity » Shoreline conservation, stewardship, easements, and acquisitions
Steamboat Lake	» Inventory and protect sensitive shorelines » Develop consistent shoreland zoning between the Cass and Hubbard Counties » Monitor future development within the lakeshed » Shoreline conservation, stewardship, easements, and acquisitions » Mass-balance analysis to determine nutrient loading
Swamp Lake	» Inventory and protect. sensitive shorelines » AIS management at public access locations » Shoreline conservation, stewardship, easements, and acquisitions » Water quality monitoring for trend analysis
Portage Lake	» Shoreline conservation, stewardship, easements, and acquisitions
Wetlands	» Wetland functional classification and protection for the entire watershed



PRIORITY RESOURCES

FORESTS AND WORKING LANDS

The subwatershed has 36 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately low. The Cass and Hubbard County forest evaluations suggest a moderately high risk of forest conversion.

CITIES AND TOWNSHIPS

Currently, low development density exists throughout this targeted subwatershed, but the subwatershed ranks within the top 75th percentile for potential future development.

GROUNDWATER

Between 26 and 50 private wells are located within moderate to high groundwater-sensitive areas in this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. Two problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

HIGH VALUE AND HIGH PRIORITY STREAMS

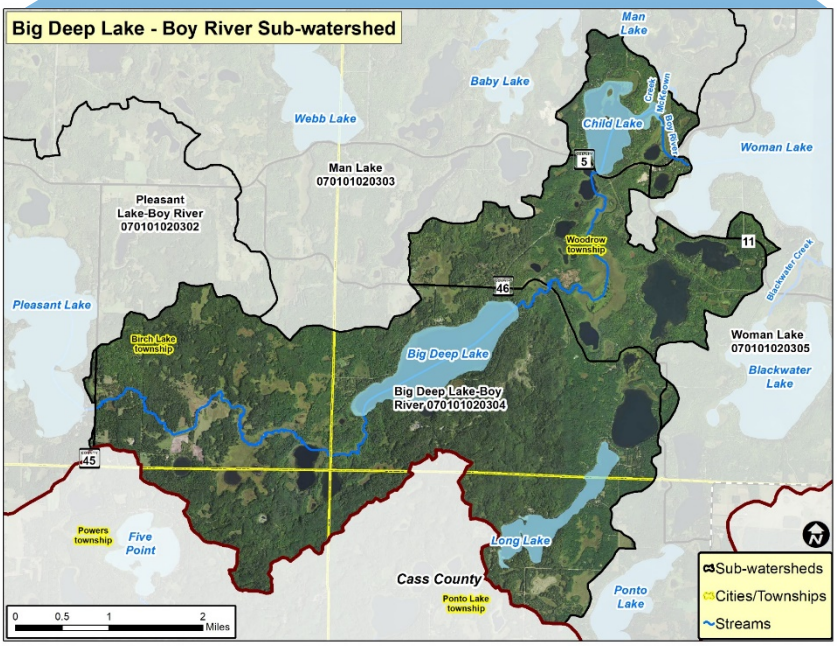
STEAMBOAT RIVER – Steamboat River is a wild rice stream that was identified as a priority stream by local stakeholders. The Steamboat River provides quality wild rice habitat in locations with calm, clear water with soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect the river's sustainability. The Steamboat River watershed is moderately to highly disturbed, which suggests a risk that is associated with the sediment and hydrologic impacts to wild rice.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLDWATER LAKE WRAPS PRIORITY	WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST (COMPARED TO WATERSHED MEAN)	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Spring		✓	Low	Increasing	Very little	Low	Lower than watershed mean	High	Outstanding	0
Steamboat	✓		High	Decreasing	Highly developed	Low	Lower than watershed mean	Low	Outstanding	1
Swamp	✓		Low	No Trend	Highly developed	High	Lower than watershed mean	High	Moderate	0
Portage	✓		High	No Trend	Highly developed	High	Lower than watershed mean	High	Low	0

5.11 BIG DEEP LAKE—BOY RIVER SUBWATERSHED

The greatest management needs for this watershed are enhancement- and protection-focused actions related to groundwater, high value and high priority rivers and streams, forests, cities and townships, and recreational and high-quality lake resources. No impaired lakes in the watershed are known.



SUBWATERSHED NATURAL WORLD VALUES

Ranking (out of 33)

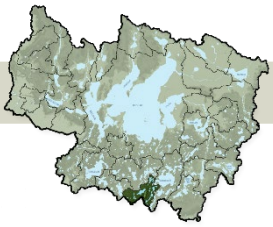
HIGH-QUALITY LAKES	10th
RECREATIONAL LAKES	5th
IMPAIRED LAKES	None known
HIGH VALUE AND HIGH PRIORITY STREAMS	1 of 3 tied for 4th place ranking
IMPAIRED/CHANNELIZED STREAMS	None known
GROUNDWATER	1 of 3 tied for 4th place ranking
UPLAND RESOURCES	12th
CITIES AND TOWNSHIPS	1 of 4 tied for 5th place ranking

TOTAL ACRES: 12,519

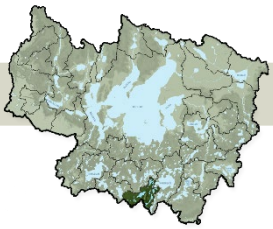
OVERALL GOAL: 977 acres needed to achieve 75% protected lands goal

MANAGEMENT STRATEGY:

PROTECT



NATURAL WORLD VALUES	MANAGEMENT STRATEGY
Groundwater	» Update groundwater plan with Geologic Atlas and shallow well data » Targeted well monitoring of sensitive wells for contamination risk » Well sealing » SSTS management (e.g., inventory and functional assessment)
High Value and High Priority Rivers	» Monitor new plats and second-tier development in shoreland zones » Riparian conservation, stewardship, easements, and acquisitions
Forests and Working Lands	» Nutrient management and sediment and erosion control BMPs upstream of Big Deep and Child Lakes » Monitor school trust-fund lands classified for real estate and permanently protect these lands if threatened, especially for areas near Big Deep Lake » Private forest management
Cities and Townships	» Urban stormwater management » Stormwater management plan for future development, including land development and stormwater ordinance updates
Big Deep Lake	» Private forest management, incentives, and management plans in the lakeshed » Monitor new plats and second-tier development in shoreland zones » Water quality monitoring for trend analysis » Shoreland conservation, stewardship, easements, and acquisitions
Child Lake	» Private forest management, incentives, and management plans in the lakeshed » Monitor new plats and second-tier development in shoreland zones » Shoreland conservation, stewardship, easements, and acquisitions
Little Woman Lake	» Shoreland conservation, stewardship, easements, and acquisitions
Widow Lake	» Private forest management, incentives, and management plans in the lakeshed » Monitor future development » AIS management at public access locations » Shoreland conservation, stewardship, easements, and acquisitions
Pick Lake	» Private forest management, incentives, and management plans in the lakeshed » Monitor wild rice productivity » Shoreland conservation, stewardship, easements, and acquisitions
Wetlands	» Wetland functional classification and protection for the entire watershed



PRIORITY RESOURCES

GROUNDWATER

Between 26 and 50 private wells are located within moderate to high groundwater-sensitive areas within this targeted subwatershed. Private wells in predominantly sandy soils suggest that the wells are relatively shallow and susceptible to contamination from SSTS. Two problem wells with nitrate and/or arsenic concentrations over the standard were known at the time of installation.

HIGH VALUE AND HIGH PRIORITY STREAMS

BOY RIVER – The Boy River provides quality habitat in locations with calm, clear water with soft, mucky sediment. Changes in the period of high or low water and excess nutrients can adversely affect the river's sustainability. The Boy River is a priority stream of the stakeholders within the LLR Watershed. The river's aquatic insect populations are close to impairment. There are low risks are associated with riparian encroachment via land uses and/or animal husbandry. There are medium watershed risks and moderately high levels of protection are currently in place [MPCA and DNR, 2017].

FORESTS AND WORKING LANDS

The subwatershed has 19 percent coverage of private forests that are greater than 20 acres (the threshold for the screening metric) and with less than 50 percent of agricultural land. Currently, a moderately low ratio of existing row crops to watershed area was estimated. The potential risk of forest conversion to agriculture within this watershed appears to be a moderately low. The Cass and Hubbard County forest evaluations suggest a moderately low risk of forest conversion.

CITIES AND TOWNSHIPS

Currently, moderately low development density exists throughout this targeted subwatershed, but the subwatershed ranks in the 75th percentile for potential future development.

HIGH-QUALITY AND RECREATIONAL LAKES

LAKE	COLD WATER LAKE	WRAPS PRIORITY WILD RICE	PHOSPHORUS SENSITIVITY	WATER QUALITY TREND	CURRENT SHORELINE DEVELOPMENT	FUTURE DEVELOPMENT POTENTIAL	FOREST	LAKESHED BIODIVERSITY	LAKE BIOLOGICAL SIGNIFICANCE	NUMBER OF PUBLIC ACCESSES
Child		✓	Moderately low	No trend	Highly developed	Low	Lower than watershed mean	Low	High	0
Big Deep		✓	Low	Increasing	Highly developed	Low	Lower than watershed mean	High	Low	0
Squaw		✓	Low	Increasing	Highly developed	Low	Lower than watershed mean	Low	High	0
Widow			High	Increasing	Highly developed	Moderately High	Lower than watershed mean	Moderate	Moderate	1
Pick		✓	low	Increasing	Highly developed	Low	lower than watershed mean	Moderate	Moderate	0

6 TARGETED IMPLEMENTATION PLAN

The Leech Lake River Comprehensive Watershed Management Plan (LLRCWMP) implementation plan contains prioritized management strategies and identifies the responsible and partnering organizations, the targeted locations for each activity, the timeline and costs to implement, and the measurable goals associated with each strategy. The implementation plan is not prescriptive to specific sites because these programs rely on voluntary landowners and partners. Whether the measurable goals are achieved depends on available funding and coordinated leadership of the plan's partners. This chapter identifies organizational responsibilities, considers other values in prioritizing implementation efforts, and provides the targeted implementation schedule for the LLRCWMP.

6.1 IMPLEMENTATION ROLES AND RESPONSIBILITIES

The LLRCWMP is owned and operated by LLRCWMP partners, Cass County and Soil and Water Conservation District (SWCD), Hubbard County and SWCD, who are responsible for implementing the programs and practices on a daily basis. The LLRCWMP partners will engage with local, state, and federal agencies; citizens; and organizations to provide additional staff resources, expand networking opportunities, enhance the engagement of the communities, and access implementation funds. These same entities will assist the LLRCWMP partners with evolving the implementation plan as new information and data becomes available throughout the 10-year plan lifecycle.

6.2 IMPLEMENTATION SCHEDULE

The following implementation schedule is provided according to the four program categories detailed in Chapters 7.0 and 8.0. The programs include the following:

IMPLEMENTATION PROGRAM CATEGORIES

CONSERVATION

TABLE 6-1

This program includes incentives and capital-improvement projects. Examples of implementation strategies include targeted lakeshore restoration, stream restoration, stormwater runoff treatment, conservation easements, and ongoing cost-share programming for private BMP implementation.

LAND USE MANAGEMENT

TABLE 6-2

This program strives to refine land-use controls for consistency; reduce duplicative or contradictory language; to promote and support smart, sustainable development and economic growth; and protect the watershed's highly valued resources. Examples of implementation include suggestions for updating land development and stormwater ordinances.

OUTREACH AND EDUCATION

TABLE 6-3

This program presents strategies that drive engagement with citizens, organizations, and governmental unites and are structured around supporting the plan's watershed goals. Examples of educational programs include developing workshops with city and township officials on smart growth, providing instructional materials on BMP for private forest landowners, and creating awareness to reduce the spread of aquatic invasive species (AIS) with lake residents and visitors.

RESEARCH, DATA COLLECTION, AND MONITORING

TABLE 6-4

This program's goal is to acquire and develop the information necessary to better target implementation activities and understand the condition of the priority natural resources in the watershed. Examples of implementation strategies include testing sensitive wells, monitoring surface waters to establish trends, and conducting GIS analysis to identify priority easement and land-acquisition opportunities.

Table 6-1. Conservation Program Schedule

CONSERVATION PROGRAMS

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Connectivity and Storage	NW 3: Impoundments NW 5: High Quality Streams NW 6:Declining Streams NW 7: Wetlands NW 10: Habitat Risk Management Quality of Life	Implement an annual review team to evaluate and implement culvert, road and bridge replacement projects that restore connectivity, provide temporary storage that reduce downstream erosion, reduce excess sediment transport, and restore hydraulic balance.	Locate, evaluate, and implement an average of five storage projects above and below culverts and within drainageways per year.			150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	1,200,000	Cass County SWCD; Hubbard County SWCD	TSA 8, Cities, Townships, Department of Natural Resources (DNR), Transportation Authorities, USFS.
Lake Shoreline and Riparian Corridor	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High-Value Streams NW 8: Wetlands Quality of Life Risk Management Leadership	Cooperatively work with neighboring counties, state agencies, and townships to identify, prioritize, and develop projects to correct problems in areas of altered hydrology and to provide technical assistance and on-site guidance to enable landowners to implement natural shoreline buffers and restore riparian corridors.	Completion of targeted land owner meetings, design, and implementation of projects on priority waterbodies identified in the NW 1 and NW 2 assessment. The targeted reduction is 1.4 lbs of phosphorus per project, per year.	10,000	10,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	620,000	Cass County SWCD; Hubbard County SWCD	Lake associations, DNR, NWLT, Townships, TSA 8
Targeted Subwatersheds	NW 1: High Quality Lakes NW 5: High-Value Streams NW 6: Declining Streams NW 7: Wetlands NW 9 and 11: Forests and Working Lands NW 10: Habitat	Implement permanent conservation and land acquisition programs that focus on protecting critical upland, forest, and wetland habitat.	Implementation of targeted easements by priority resource each year.		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	18,000,000	Cass County SWCD; Hubbard County SWCD	Lake associations, Board of Water and Soil Resources (BWSR), DNR, NWLT, MN Forest Resources Council.
Priority Lakes	NW1: High-Value Lakes NW 10: Habitat	Implement permanent conservation and land acquisition programs that focus on shoreline easements and acquisitions on priority lakes in the 11 targeted subwatersheds (Big Deep, Child, Squaw, Widow, Pick, Inguadona, Cooper, Garfield, Pleasant, Birth, Woman, Blackwater, Island, Ponto, Mule, Bungashing, Howard, Shingobee, Williams, Spring, Steamboat, Swamp, Portage).	Refer to Chapter 5 for specific conservation targets for each targeted subwatershed; specific resources will be targeted using the results of the Protection Prioritization Plan.	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	15,000,000	Cass County; Cass County SWCD; Hubbard County SWCD	Lake Associations, BWSR, DNR, NWLT.
Boy River, Rice Lake	NW1: High-Value Lakes NW 5: High-Value Streams NW 10: Habitat	Implement permanent conservation and land acquisition programs that focus on wild-rice shoreline easements and acquisitions.	Refer to Chapter 5 for specific conservation targets for each targeted subwatershed; specific resources will be targeted using the results of the Protection Prioritization Plan.	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	2,000,000	Cass County; Cass County SWCD	Lake Associations, BWSR, DNR, NWLT.

CONSERVATION PROGRAMS

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Groundwater	NW 5: High-Value Streams NW 7: Wetlands NW 8: Groundwater Wetlands Quality of Life Risk Management Leadership	Continue to support implementation of wellhead protection measures, including conservation easements, in drinking water supply management areas.	Implement measures identified in wellhead protection plans.	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	500,000	Cass County SWCD; Hubbard County SWCD	MDH, MN Rural Water Assn; municipalities.
Groundwater	NW 8: Groundwater Quality of Life Risk Management Leadership	Conduct Subsurface Sewage-Treatment System (SSTS) inventory and compliance review	Annual inspections	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County SWCD; Hubbard County SWCD	Lake Associations
Groundwater	NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Implement well sealing program with special attention to targeted resources that are identified in Chapter 5.	Annual implementation	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000	Cass County SWCD; Hubbard County SWCD	BWSR, MDH, MN Rural Water, cities, public-water suppliers.
Shingobee River	NW 8: Groundwater	Provide irrigation management planning assistance, including irrigation management assistance and uniformity testing.	2 plans and recommended BMPs adopted each year	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	40,000	Hubbard County SWCD; Cass County SWCD	MDA, University of Minnesota Extension Service, NRCS, TSA 8.
Garfield Lake, Kabekona Lake, Kabekona River, Man Lake, Bungashing River, Necktie River	NW 9 and 11: Forests and Working Lands	Increase adoption of forestry management programs and practices on private lands.	Refer to Chapter 5 for specific conservation targets for each targeted subwatershed; specific resources will be targeted using the results of the Protection Prioritization Plan. The targeted reduction is 1.4 lbs of phosphorus per project, per year.	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	4,000,000	Hubbard County; Hubbard County SWCD	DNR, NWLT, Lake Associations, MN Forest Resources Council, TSA 8
Shingobee Lake, Howard Lake, Long Lake, Lake May	NW 9 and 11: Forests and Working Lands	Encourage livestock producers to participate in Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program, and Agricultural Conservation Easement Program (ACEP)	Enroll two participants per year (practices to be determined)	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	80,000	Hubbard County SWCD; Cass County SWCD	NRCS
Bungashing Creek Lakeshed	NW 9 and 11: Forests and Working Lands	Implement livestock and pasture management (specifically above County Road 102 bridge).	Completion of pasture management strategies	7,500	7,500									15,000	Hubbard County; Hubbard County SWCD	NRCS
Steel Lake, Island Lake	NW 9 and 11: Forests and Working Lands	Implement manure management projects and practices to reduce spring runoff from two feedlots near outlet for Steel Lake and creek into Island Lake	2 nutrient management plans	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	40,000	Hubbard County SWCD; Cass County SWCD	MDA, NRCS
Shingobee Lake, Howard Lake, Long Lake, Lake May	NW 9 and 11: Forests and Working Lands	Implement rotational grazing and agro-forestry management of pasture lands	2 plans per year	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	40,000	Hubbard County SWCD; Cass County SWCD	NRCS

CONSERVATION PROGRAMS

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Necktie River	NW 5: High-Value Streams	Implement feedlot management and livestock/pasture management	Completion of feedlot and pasture management project	15,000										15,000	Hubbard County; Hubbard County SWCD	MDA, NRCS
Inguadona Lake	NW 1: High-Value Lakes	Abandon Cass County Ditch 5	Completion of abandonment				2,000							2,000	Cass County; Cass County SWCD	DNR
Necktie River	NW 6: Declining Streams	Incorporate MNDNR channel evaluation and restoration feasibility results into implementation plan	Update plan with recommended strategies	5,000										5,000	Hubbard County; Hubbard County SWCD	DNR
Kabekona River	NW 5: High-Value Streams NW 6:Declining Streams	Implement pasture management practices such as controlled livestock access to stream or separate water source, pasture and manure management, and rotational grazing; where possible.	Targeted implementation at known problem site	15,000	15,000									30,000	Hubbard County; Hubbard County SWCD	NRCS
Cooper Lake, Howard Lake	NW1: High-Value Lakes NW 10: Habitat	Implement nutrient, erosion, and sediment control and temperature BMPs with a focus on maintaining cold-water fisheries.	Two projects per lake, per year. The targeted reduction is 1.4 lbs of phosphorus per project, per year.	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	300,000	Cass County; Cass County SWCD	Lake Association, MDA, NRCS
Priority Lakes	NW1: High-Value Lakes NW 10: Habitat	Implement erosion and sediment-control projects (Three Island, May and Long, Inguadona, Rice, Garfield, Kabekona, Man, McKeown, Barnum, Baby, Stony, Pleasant, Birch, Woman, Blackwater, Island, Girl, Ponto, Mule, Hazel, Boy, Town Line, Lomish, Portage, Shingobee, Williams, Anoway, Spring, Steamboat, Swamp, Big Deep, Child, Squaw, Widow, Pick, Long, Swift Lakes).	An average of 2,000 ln ft of shoreline buffer/stabilization per year. The targeted reduction is 1.4 lbs of phosphorus per project, per year.	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	1,500,000	Cass County; Cass County SWCD	DNR
Priority Lakes	NW1: High-Value Lakes	Implement sediment and nutrient management projects (Three Island, May and Long, Inguadona, Rice, Garfield, Kabekona, Man, McKeown, Barnum, Baby, Stony, Pleasant, Birch, Woman, Blackwater, Island, Girl, Ponto, Mule, Hazel, Boy, Town Line, Lomish, Portage, Shingobee, Williams, Anoway, Spring, Steamboat, Swamp, Big Deep, Child, Squaw, Widow, Pick, Long, Swift Lakes).	An average of 25 surface water treatment projects per year. The targeted reduction is 1.4 lbs of phosphorus per project, per year.	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	1,250,000	Cass County; Cass County SWCD	DNR, MDA, NRCS, Townships

CONSERVATION PROGRAMS

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Boy Lake	NW1: High-Value Lakes	Implement sediment, erosion, and nutrient management projects upstream of Boy Lake and along ATV trails from Boy River to Highway 200.	Two projects. The targeted reduction is 1.4 lbs of phosphorus per project, per year.							7,500		7,500		15,000	Cass County; Cass County SWCD	Lake Association
Shingobee Creek	NW 5: High-Value Streams	Restore degraded and altered vegetation along creek at County Road 50.	Completion of project	20,000										20,000	Hubbard County SWCD; Cass County SWCD	DNR
Urban Stormwater	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Provide technical and financial assistance and on-site guidance to enable landowners to implement stormwater management practices.	Coordinate with LGUs and TS8 to implement on targeted watersheds and urban areas identified in the urban stormwater analysis				50,000	50,000	50,000	50,000	50,000	50,000	50,000	350,000	Cass County SWCD; Hubbard County SWCD	TSA 8
Priority Resources	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater NW 12: Cities and Townships	Implement stormwater BMPs in the 11 targeted subwatersheds, City of Hackensack, and in the Kabekona Headwaters; implement temperature control BMPs in the Inguadona Lake-Boy River Subwatershed.	Locations and projects to be determined after the completion of the stormwater water quality BMP study and then updated biannually; Retention and treatment of 1.1-inch rain event from all impervious surfaces	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000	Hubbard County; Hubbard County SWCD	Cities and Municipalities
Program Total				**2,832,500**	**4,772,500**	**4,965,000**	**5,017,000**	**5,015,000**	**5,015,000**	**5,022,500**	**5,015,000**	**5,022,500**	**5,015,000**	**47,672,000**		

Table 6-2. Land-Use Management Program Schedule

LAND-USE MANAGEMENT

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Urban Stormwater	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Encourage zoning authorities to implement proven methods that promote minimal impact for stormwater in land-use planning and permitting processes. Methods should include the use of natural drainage ways and vegetated surfaces to convey, store, filter and retain stormwater on site using the natural hydrology of the sites. (1) Develop public and private drainage solutions that incorporate effective stormwater management and erosion and sediment control, (2) Work directly with municipalities on storm water projects.	Number of entities that have adopted zoning ordinances that include the top performing BMPs identified in the Urban Stormwater Study.			5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	40,000	Cass County SWCD; Hubbard County SWCD	TSA 8, Townships, Cities listed and Leech Lake Band of Ojibwe (LLBO), Transportation authorities, USFS, DNR
Steamboat Lake	NW1: High-Value Lakes	Develop consistent shoreland zoning between Hubbard and Cass Counties.	Completion of coordinated ordinance language revision.					5,000	5,000					10,000	Cass County; Hubbard County; Hubbard SWCD	Cass County, Lake Association
Cities and Townships	NW 12: Cities and Townships	Work with counties and cities for adoption of stormwater management plan for future development including land development and stormwater ordinance updates in 11 targeted subwatersheds.	Local adoption of Minimal Impact Design Standards (MIDS) community design assistance and land development and stormwater ordinances.							11,000	11,000	11,000		33,000	Cass County, Cass County SWCD; Hubbard County, Hubbard County SWCD	Cities
Wetland management as restoration	NW 7: Wetlands Quality of Life	Upon completion of the 2018 NWI, evaluate the need to develop wetland management plans for white cedar, black ash and tamarack wetlands. Incorporate the NWI results into the county wetland ordinance and county forest stewardship plans. Update the county wetland ordinances to reflect importance of wetlands outside of the shoreland zone.	Update county ordinance and county forest stewardship plans.	7,500	7,500									15,000	Cass County; Hubbard County	DNR, USFS, Minnesota Pollution Control Agency (MPCA)
Groundwater	NW 5: High-Value Steams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Conduct a workshop with stakeholders to review the results of the Cass and Hubbard Geologic Atlas, develop recommendations to address concerns, and integrate results into program planning efforts and potential Comprehensive Water Management Plan (CWMP) update, based on results.	Stakeholder workshop; strategies developed; and plans created and adopted.		10,000									10,000	Cass County SWCD; Hubbard County SWCD	MDH, MDA, MPCA, DNR, MN Rural Water Assn.
Water Resource contamination	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Continue to support pipeline, rail, and roads spill action protocols and programs.	Annual input on updates to plan.	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000	Cass County Hubbard County	Cass County Emergency Services; Hubbard County Emergency Services; LLBO
Lake Shoreline and Riparian Corridor	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 3: Impoundments NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands Quality of Life Leadership	Continue to implement Minnesota's Buffer Initiative on public waters and public drainage systems.	Annual buffer program implementation.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County SWCD; Hubbard County SWCD	DNR, BWSR
Program Total				**13,500**	**23,500**	**11,000**	**11,000**	**16,000**	**16,000**	**22,000**	**22,000**	**22,000**	**11,000**	**168,000**		

Table 6-3. Outreach and Education Program Schedule

OUTREACH AND EDUCATION

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Leadership	All NW Values Leadership Risk Management Quality of Life	Develop an outreach and education plan, program and materials to reflect the plan contents, with special attention to engaging targeted audiences that can implement protection measures such as private landowners, planning and zoning authorities, and working lands owners and managers.	Outreach and education plan and program developed and implemented.	25,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	115,000	Cass County SWCD; Hubbard County SWCD	MPCA, DNR, MDH, MDA, LLBO, TSA 8, Lake Associations, NWLT
Land-Use Management as protection	All NW Values Leadership Risk Management	Research alternatives for inclusion of implementation strategies into county shoreland management ordinances and variance processes for development in the shoreland zone, especially along trout streams, sensitive shorelines, wild-rice lakes, exceptional waters, and identified Tullibee lakes	Sample language to counties including specific resources of concern.					10,000						10,000	Cass County SWCD; Hubbard County SWCD	MPCA, DNR, MDH, MDA
Land-Use Management as protection	All NW Values Leadership Risk Management	Conduct workshops and seminars, such as Non-Point Education for Municipal Officials (NEMO) and provide on-going informational materials to land-use decision-making authorities and staff regarding smart growth and land-use management best practices, such as MIDS.	Annual land-use decision-makers workshop; regular informational materials provided.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County SWCD; Hubbard County SWCD	MPCA, DNR
Water Quality Monitoring	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands Quality of Life Leadership	Update minor watershed maps including the "Protection Prioritization Plan" and implementation toolbox for all minor watersheds to visually represent that watershed's vulnerability index; provide maps and information to targeted audiences using digital and traditional formats.	"Protection Prioritization Plan" completed and provided via website and paper format to targeted audiences.	20,000	2,500	2,500	2,500	2,500	2,500	20,000	2,500	2,500	2,500	60,000	Cass County SWCD; Hubbard County SWCD	TSA 8
Forest stewardship as protection	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 9: Forests Quality of Life	Update materials and implement the outreach and training actions that will result in increased participation in the forest stewardship program and adoption of forest management plans.	Cass and Hubbard County forest stewardship plans updated; Forested land area covered by a forest management plan increased; five targeted outreach activities each year.	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000	Cass County SWCD; Hubbard County SWCD	DNR, USFS, MN Forest Resources Council
Lakes, Streams, and Wetlands	NW1: High Value Lakes NW3: Impaired Lakes NW 5: High Value Streams NW 6: Declining streams	Conduct workshops with businesses, road authorities, and municipal officials to decrease chloride application and impelement appropriate applicatin timine practices.	One workshop per year.	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	Cass County SWCD; Hubbard County SWCD	MPCA, Road Authorities.
Risk, Climate Change	NW 9: Forests NW 10: Habitat	Support and cooperate with USFS and other stakeholders in forest health monitoring by providing private forest landowners with critical information on forest health initiatives that they can participate in.	Annual support to partner agencies and organizations.	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	Cass County, Hubbard County	USFS, Chippewa National Forest, Forest Resources Council

OUTREACH AND EDUCATION

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Urban Stormwater	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Assist the cities of Akeley, Hackensack, Longville, Federal Dam, Laporte, Walker, and the LLBO in creating stormwater task forces to do strategic planning and prioritization of projects to try and achieve zero stormwater runoff during a 1" rain event by 2030	Annual roundtable discussions to develop a prioritized list of implementation activities and programs; follow-up with local government units as necessary for continuity of effort.			5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	40,000	Cass County SWCD; Hubbard County SWCD	Cities and LLBO listed; Transportation authorities; DNR, MPCA
Wetland management as restoration	NW 8: Wetlands Quality of Life	Provide education and outreach throughout the county with presentations, news articles, newsletters, and brochures on wetlands and wetland regulation	Annual wetland workshops, website updates, press releases.	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	25,000	Cass County SWCD; Hubbard County SWCD	DNR, MPCA
Necktie River	NW 5: High-Value Streams	Targeted education and outreach to local producers.	Roundtable presentation and workshop and targeted mailings annually.	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	Hubbard County Hubbard County SWCD	US Army Corps of Engineers (USACE), DNR, NWLT
Lakes, Streams, and Wetlands	NW1: High-Value Lakes NW3: Impaired Lakes NW 5: High-Value Streams NW 6: Declining streams	Conduct workshops with riparian and shoreline land owners to increase stewardship and conservation.	Three riparian and shoreline owner workshops per year.	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	150,000	Cass County SWCD; Hubbard County SWCD	DNR, NWLT
Water Resource Contamination	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 3: Impoundments NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership Risk Management	Develop informational and educational brochures and news articles on "What to do in case of pipeline spills and ruptures". Publicize the Cass and Hubbard County Emergency Response plans.	Provide program recommendations to counties and cities. Identify need for on-line Emergency Response Management Tool.			15,000								15,000	Cass County SWCD; Hubbard County SWCD	Cass County Emergency Services; Hubbard County Emergency Services
Aquatic Invasive Species Management	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands Quality of Life Risk Management	Implement the county aquatic invasive species (AIS) plans.	Annual implementation of AIS plan.	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	3,500,000	Cass County SWCD; Hubbard County	DNR, Conservation Officers, Sheriff's Department, Volunteers, Lake Associations
Internal Capacity Building	Leadership	Build internal capacity through the acquisition of skills and knowledge by providing opportunities for staff and partners to attend trainings and participate in educational programs.	Annual training.	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	25,000	Cass County SWCD; Hubbard County SWCD	BWSR, MPCA, DNR, MDA, MDH,
Program Total				**386,000**	**386,000**	**406,000**	**391,000**	**391,000**	**391,000**	**391,000**	**391,000**	**391,000**	**391,000**	**3,915,000**		

Table 6-4. Research, Data Collection, and Monitoring

RESEARCH, DATA COLLECTION, AND MONITORING

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Connectivity and Storage	NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 10: Habitat Quality of Life Risk Management Leadership Quality of Life	Culvert and Bridge Crossing Inventory and Assessment: (1) Inventory all existing county, township, and private culverts and bridges crossings to determine functionality of culverts. Assess drainage function, infrastructure risk, fish passage, sediment transport, and hydraulic function related to channel stability and flooding. (2) Assess hydraulic capacity in relation to Atlas 14. (3) Data to be used when addressing connectivity issues identified in WRAPS documents as well as in urban stormwater feasibility study. Steamboat and Bungashing River have specific needs identified in the targeted subwatersheds implementation table.	Culvert and crossing inventory, assessment, and prioritization.	10,000	10,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	36,000	Cass County, Hubbard County; Hubbard County SWCD	Townships, DNR, Transportation authorities, USFS.
Urban Stormwater	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Work with the city stormwater task forces and acquire funding for each city to evaluate each of their stormwater systems. Evaluate solutions to eliminate direct discharge of stormwater directly into watershed lakes and rivers. A wide range of activities from rain barrels and rain gardens to large sediment basins or devices to capture debris, oils and sediments should be considered.	Urban Stormwater Water Quality BMP Feasibility Study (Years 1 and 2; update funding options and public outreach thereafter).			37,500	37,500							75,000	Cass County SWCD; Hubbard County SWCD	Cities and LLBO, transportation authorities, USFS, DNR, MPCA
Urban Stormwater	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Map impervious surface coverage within 250 feet of the Ordinary High-Water Level (OHWL) to identify and target outreach and cost-share programs.	Maps identifying priority areas for targeting implementation projects and programs.	1,000										1,000	Cass County SWCD; Hubbard County SWCD	

RESEARCH, DATA COLLECTION, AND MONITORING

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Habitat, groundwater, wetland, and shoreline protection	All NW Values Quality of Life Risk Management Leadership	Develop a "Protection Prioritization Plan" by conducting an analysis to identify potential easement and acquisition locations. Analyze and identify prime forests, habitat, sensitive shorelines, riparian areas, wetlands, shorelines with ecological significance, and of large undeveloped tracts of shoreline. Create a prioritized list of parcels to focus future projects, programs, easements or fee title acquisitions on. Use existing tools to evaluate existing vegetation, slope, runoff potential, soil type, and contiguous linear distance of protection into account. This is to be done on a minor watershed basis. An example of a program is the modified DNR fisheries program "Score the Shore" that lake associations can conduct on the lakes they represent. Search for parcels or contiguous areas greater than 20 contiguous acres in size and use existing or refined scoring criteria. The analysis should: (1) Identify preferred corridor locations to mitigate effects of habitat fragmentation and water quality concerns due to the potential impacts of increased land development pressure. (2) Identify locations to mitigate effects of potential conversion of land to agricultural land-use on water and habitat resources concerns. (3) Identify locations to prevent degradation to groundwater.	Completion of initial "Protection Prioritization Plan" and biennial updates.	15,000		2,500		2,500		2,500		2,500		25,000	Cass County SWCD; Hubbard County SWCD	TSA 8
Habitat, groundwater, wetland, and shoreline protection	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Evaluate school trust fund lands classified for real estate and other high-risk land conversion areas for opportunities to implement land conservation and protection activities.	Annual evaluation.	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	25,000	Cass County, Cass County SWCD; Hubbard SWCD	DNR
Habitat, groundwater, wetland, and shoreline protection	Risk Management	Monitor easements and acquisitions to insure program compliance.	Annual monitoring.	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	310,000	Cass County, Cass County SWCD; Hubbard SWCD	
Wetland management as restoration	NW 7: Wetlands Quality of Life	Watershed-wide wetland functional categorization. Update Cass categorization with new NWI and possibly revise wetland replacement ratios to accommodate wetlands needing functional lift. Include known White Cedar, Tamarac and Black Ash wetlands locations and include ownership (public versus private).	Wetland functional classification update.	27,500	27,500									55,000	Cass County SWCD; Hubbard County SWCD	DNR, TSA 8
Wetland management as restoration	NW 7: Wetlands Quality of Life	Increased accuracy of NWI mapping by incorporating existing and future wetland delineation shapefiles into county wetland GIS layers.	Annually use existing and future wetland delineation reports to adjust appropriate protection levels throughout county.	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000	Cass County SWCD; Hubbard County SWCD	DNR, TSA 8

RESEARCH, DATA COLLECTION, AND MONITORING

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Wetland management as restoration	NW 1: High Quality Lakes NW 4: Impaired Lakes NW 5: High Quality Rivers NW 6: Declining Rivers NW 7: Wetlands Quality of Life	Analyze wetland nutrient and sediment functions in terms of source versus sink in wetlands draining to priority resources. Coordination with water quality monitoring program. (Use Bungo Creek, in Pine River, as reference). Develop recommendations regarding water management level or other implementation practices to reduce phosphorus loading.	Completion of the wetland source-sink study.							75,000	75,000			150,000	Cass County SWCD; Hubbard County SWCD	MPCA, DNR, U of M researchers.
Wetland management as restoration	NW1: Declining Rivers NW 7: Wetlands Quality of Life	Investigate opportunities, potentially on the Necktie River, to abandon of non-maintained County Drainage systems following the provisions of 103E protocol.	Identification of public drainage ditch systems that no longer are maintained and abandonment is allowable.						2,500	2,500				5,000	Cass County, Hubbard County; Hubbard County SWCD	Drainage Authorities
Groundwater	NW 5 High-Value Streams NW 8: Groundwater Quality of Life Risk Management Leadership	Identify shallow wells using past 20-years of data. Integrate monitoring of pollutants of emerging concern.	Establishment of a database and update to management plans.			10,000	10,000	12,500	12,500					45,000	Cass County SWCD; Hubbard County SWCD	MDH, MDA, MPCA, DNR,
Groundwater	NW 5 High-Value Streams NW 8: Groundwater Quality of Life Risk Management Leadership	Conduct nitrate testing for private well owners.	Ad hoc.	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	120,000	Cass County SWCD; Hubbard County SWCD	MDH
Groundwater	NW 8: Groundwater	Sensitive well monitoring.	Evaluation of all 415 wells in metric map.	51,000	27,000	43,000	65,000	62,000	0	71,000	3,000	93,000	0	415,000	Cass County, Cass County SWCD; Hubbard County SWCD	MDH
Groundwater	NW 8: Groundwater	Monitor vulnerable groundwater areas in the Man Lake lakeshed.	Annual monitoring.	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	10,000	Cass County, Cass County SWCD	MPCA, MDH, DNR
Subsurface Septic Treatment Systems	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 3: Impoundments NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands NW 8: Groundwater Quality of Life Risk Management Leadership	Using partnerships with lake associations and volunteers, create, update, and maintain SSTS inventory noting relationship to sensitive soils and shallow wells. Use geologic atlas and well inventory information to fill in the gaps.	Updated CLWMPs.			10,000	10,000							20,000	Cass County SWCD; Hubbard County SWCD	Lake associations, MPCA, MDH; Hubbard County Coalition of Lake Associations, Cass County Association of Lakes

RESEARCH, DATA COLLECTION, AND MONITORING

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Water Quality Monitoring	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 8: Groundwater Quality of Life Leadership	Conduct an annual monitoring program review and planning workshop with all stakeholders and develop an annual plan to fill information gaps. Plan will promote and support surface and groundwater water quality monitoring through Hubbard COLA and Association of Cass Lakes, lake associations, volunteers, schools, students, and others. The County LWMP's will continue to support COLA's water quality monitoring program by providing financial assistance to lake associations that are unable to pay lab costs. SWCD's will provide the service for lake associations to collect dissolved oxygen and temperature profiles on their lakes.	Annual monitoring plan; annual allocation of funding for surface and ground water monitoring activities; technical support. This data will then be submitted to appropriate sources following stated protocols and will be incorporated into the LLRCWMP as it becomes available.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County SWCD; Hubbard County SWCD	MPCA, DNR, Volunteers, Lake Associations, LLBO
High Quality Lakes Impaired Lakes High Quality Rivers Declining Rivers	NW1: High-Value Lakes	Conduct monitoring and analysis on priority resources as necessary to develop an understanding of the resource that will facilitate more informed resource management decisions and actions. These activities may include: - inlet and outlet flows, nutrients, and dissolved oxygen - monitor lakes upstream to assess contributions - determine areas of heaviest runoff (Woman Lake, Inguadona Lake, Stony Lake) - internal load estimate needed (Garfield Lake) - mass balance analysis to determine nutrient loading (Steamboat Lake) - trend analysis (Hart, Boy, Town Line, Shingobee, Swift, Big Sand, May and Long, Cooper, Swamp, Big Deep, Island, Ponto, Garfield) - water temperature (annual) and habitat assessment (5-7 years) of the priority tullibee/Cisco lakes (Benedict, Cooper, Girl, Howard, Kabekona, Long, Man, May, Portage, Ten Mile).	Water quality sampling data for two growing seasons then analysis and report.	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	400,000	Cass County, Cass County SWCD, Hubbard County, Hubbard County SWCD	Lake associations, MPCA, DNR, LLBO
Kabekona River	NW 5: High-Value Streams NW 6: Declining Streams	Monitor Kabekona River for bacteria contamination at impairment site (Kabekona River) and upstream (Kabenona River Headwaters).	Water quality sampling data for two growing seasons then analysis and report; Annual monitoring at impairment site.	15,500	15,500	15,500	2,000	2,000						50,500	Hubbard County SWCD	MPCA
Leech Lake	NW 2: Recreational Lakes	Support the DNR in the Leech Lake Fisheries Management plan including monitoring levels of chemicals used for treatment of aquatic invasive plants and animals; revising lake management plan as needed, conducting aquatic vegetation and fish surveys; implementing strategies to reduce invasive species threat.	Annual collaboration with and support of the DNR monitoring and implementation of Leech Lake Fisheries Management Plan.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County, Cass County SWCD	DNR, Cass County, Leech Lake Lake Association, LLBO

RESEARCH, DATA COLLECTION, AND MONITORING

Natural Resource Value Affected	Priority Issue/ Value	Implementation Action	Measurable Output	Annual Implementation ($)										10-Year Estimated Cost	Lead LGU	Supporting Entities
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Water Quality Monitoring	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 3: Impoundments NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands Quality of Life Leadership	Evaluate use and impact of chlorides in the most sensitive and vulnerable areas. Assess potential future conditions under current and potential future use scenarios.	Report of assessment with recommendations.					60,000						60,000	Cass County SWCD; Hubbard County SWCD	Road authorities, MPCA, DNR
Loading from watershed	NW 1: High Quality Lakes NW 2: Recreational Lakes NW 3: Impoundments NW 4: Impaired Lakes NW 5: High Quality Streams NW 6: Declining Streams NW 7: Wetlands Quality of Life	Conduct an analysis to evaluate estimated pollutant loading, particularly to sensitive resources, based on plan implementation progress.	5-year, 10 year, or as needed plan updates.					30,000						30,000	Cass County SWCD; Hubbard County SWCD	MPCA
Aquatic ecosystem health	Priority lakes, streams, habitat,	Work with the USACE and stakeholders to reevaluate the results of the 2001 ROPE study to determine if alternative management scenarios that provide better outcomes for overall ecological health should be investigated further.	Completion of evaluation.								10,000	10,000		20,000	Cass County, Hubbard County	USACE
	N/A	Complete annual reporting requirements.	Completion of data and report submissions to each agency.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	50,000	Cass County, Cass County SWCD, Hubbard County, Hubbard County SWCD	
Program Total				**217,500**	**177,500**	**218,000**	**224,000**	**268,500**	**114,500**	**250,500**	**187,500**	**205,000**	**99,500**	**1,962,500**		

6.3 ADDITIONAL VALUE SCREENING

While the LLRCWMP focuses on natural world values, the values of leadership, climate and risk, and quality of life, provide additional screening criteria that can be used to identify site-specific implementation actions, particularly when resources are scarce. The screening criteria for these values, which is provided in Appendix T, can be used to refine the selection of projects through a qualitative assessment that will result in the greatest return on investment for long-term sustainability.

QUALITY OF LIFE

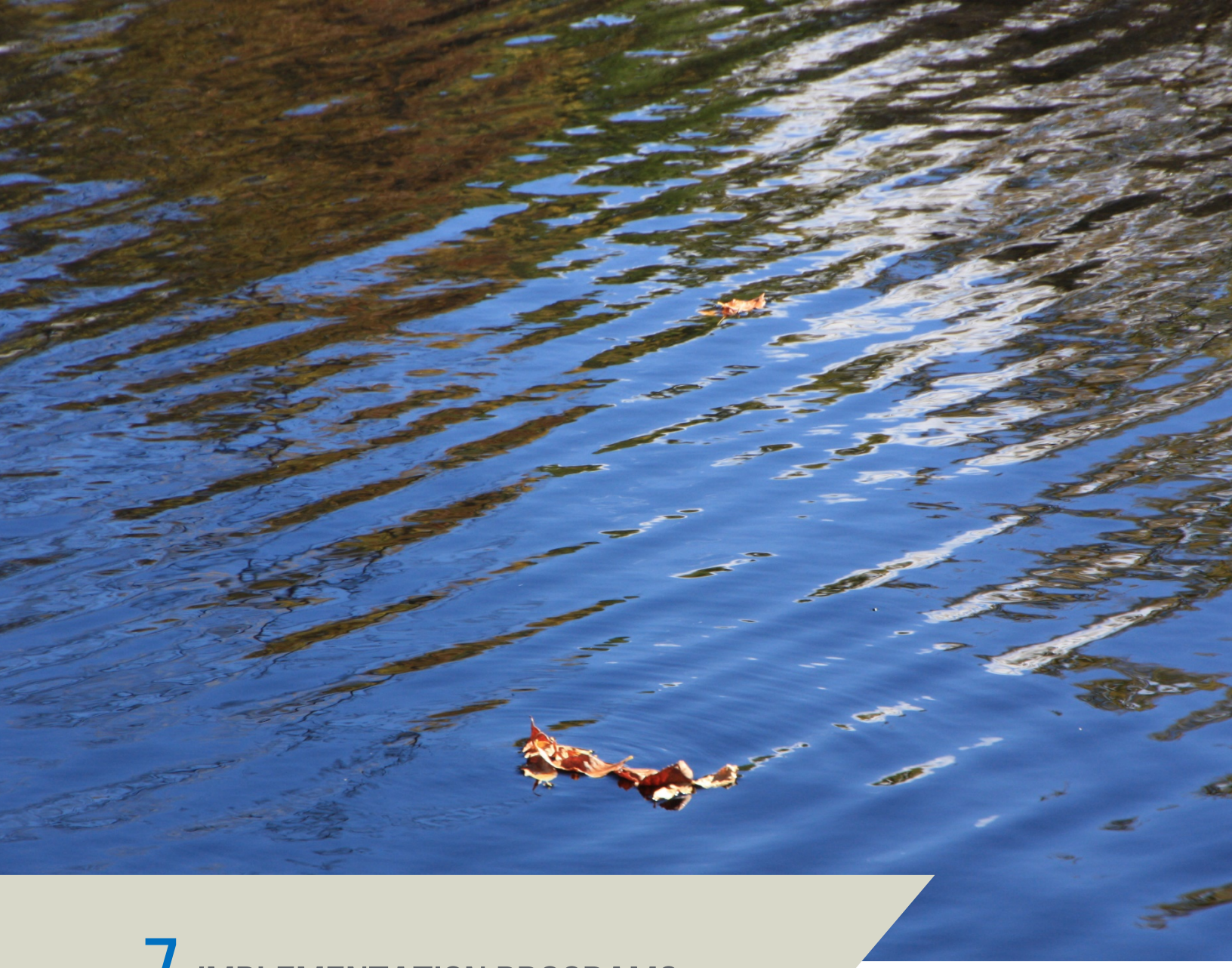
- Improve community quality of life
- Stimulate sustainable growth and development
- Enhance public health and safety
- Preserve historic and cultural resources
- Preserve views and local character

LEADERSHIP

- Provide effective leadership and commitment
- Foster collaboration and teamwork
- Obtain stakeholder involvement
- Improve infrastructure integration
- Plan for long-term monitoring and maintenance
- Address conflicting regulations and policies

CLIMATE AND RISK

- Assess climate threat
- Avoid traps and vulnerabilities
- Prepare for short-term hazards
- Prepare for long-term adaptability



7 IMPLEMENTATION PROGRAMS

This portion of the plan outlines the key components to support and implement the targeted implementation schedule. These components include incentive programs, cost-share programs, capital-improvement projects, regulatory and enforcement programs, and outreach and engagement programs.

7.1 CONSERVATION PROGRAMS

Incentive programs are formal programs used to promote specific actions or behaviors. Various mechanisms can be used to conduct incentive programs, including financial assistance or providing benefits for enrolling in programs.

7.1.1 COST-SHARE PROGRAMS

A cost-share program is where the costs of systems or practices for water quality improvements that are designed to protect and improve habitat, forest health, and soil and water resources are shared with landowners. Landowners seeking cost-share assistance should contact the Cass or Hubbard County SWCD offices to obtain information on available programs. Structural practices that may be eligible for cost-share programs include sediment-control structures or streambank-stabilization projects. Nonstructural practices that may be eligible include forest management planning services.

Financial incentives may be used to encourage landowners to install or adopt land-management practices that improve or protect water quality. Incentive payments and enhanced protection measures should be reasonable and justifiable, supported by grant recipient policy, and consistent with prevailing local conditions; they must be accomplished using established standards.

To ensure that goals are met given limited funding sources, a ranking process is used to evaluate potential projects. The highest scoring projects will be funded first. The ranking criteria will be unique for each priority concern and program area and will be evaluated and updated on a regular basis (at least once every biennial planning cycle).

7.1.2 LOW-INTEREST LOANS

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

7.1.3 CONSERVATION EASEMENTS

The LLRCWMP partners seek to maintain a healthy, economically sustainable mix of public and private land ownership within the watershed. Conservation easements are a critical land protection tool for the Leech Lake River (LLR) Watershed. Conservation easements are voluntary legal agreements that are made by a landowner and a qualified agency or non-profit organization. These easements permanently conserve targeted resources to prevent land uses that are incompatible with the long-term health of the watershed while keeping the land in private ownership. Several conservation easement programs target priority resources such as tullibee/cisco lakes, wild-rice lakes and rivers, high-value forests and habitat, and sensitive shorelines. Conservation easements are available through state and local government agencies as well as several non-profit organizations such as the Northern Waters Land Trust, The Nature Conservancy, and the Minnesota Land Trust. Conservation easements are recorded on property deeds and inspected regularly to ensure that the provisions of the easement agreement are maintained.

7.1.4 LAND ACQUISITION

The LLRCWMP partners seek to maintain a healthy, economically sustainable mix of public and private land ownership within the watershed. In cases when a unique and significant resource meets state goals (i.e., prime spawning habitat for walleye or trout) the Minnesota DNR may purchase and manage the land as a state-owned resource. Conservation organizations may also acquire land to meet their organization's goals and may purchase sensitive lands that are available.

Several examples of incentive programs and the types of projects that may be available in the LLR Watershed include forests, lakes and rivers, crops and grazing, cities and towns, and homes and businesses, which are highlighted in the following listings.

FORESTS

- **Sustainable Forest Incentives Act (SFIA):** This program provides financial incentives to private landowners to keep forested land undeveloped. Private land owners apply for the program through the Department of Revenue while the Minnesota DNR manages the forest-management aspect. Once enrolled, landowners receive payment for each acre of qualifying forest land, agree not to develop enrolled land, and follow a forest-management plan for a set time period of 8, 20, or 50 years. Information on this program is available online (*https://www.dnr.state.mn.us/foreststewardship/sfia/land-eligibility.html*).
- **Forest-Management Plans:** Forest-management plans (FMPs)help private landowners better understand and improve their forested land and provide the opportunity to receive technical and financial assistance from federal and state agencies. This plan is prepared by a Minnesota DNR-approved writer and is required to be eligible for SFIA. Cass and Hubbard County SWCD have approved FMP writers that assist. Approved private foresters may also be able to assist. After scheduling a forest-management plan, a Minnesota DNR-approved writer visits the landowner to inspect their wooded land; map the plants, trees, and soils; and prepare a forest-management plan that is tailored to the specific conditions observed. More information (including how to register a forest-management plan with the Minnesota DNR) is available online (*https://www.dnr.state.mn.us/foreststewardship/sfia/registration.html*).
- **Conservation Easements:** Forested areas in high-priority subwatersheds help protect water quality. Keeping forested land forested is a key goal in the LLR watershed. Contact the Cass or Hubbard County SWCD office to inquire about current conservation easement programs and eligibility.

LAKES AND RIVERS

- **Shoreland Restoration:** Maintaining a healthy, natural shoreline with an abundance of diverse plants is one of the most important ways shoreland owners can protect and improve water quality. Technical and financial assistance may be available to landowners who want to restore the shore.
- **Conservation Easements:** Forested areas in high-priority subwatersheds help protect water quality. Keeping forested land forested is a key goal in the LLR watershed. Contact the Cass or Hubbard County SWCD office to inquire about current conservation easement programs and eligibility.

CROPS AND GRAZING

- **Irrigation Scheduling and Uniformity Testing:** The Hubbard County SWCD offers several technical and financial assistance programs (e.g., irrigation scheduling, uniformity testing on irrigation equipment, and conservation planning) to irrigators.
- **Ag-Waste Management:** Technical and financial assistance, including low-interest loans and grants, are available for livestock operations in Hubbard County.
- **Agricultural Water Quality Certification Program:** Producers who are certified for this program are provided regulatory certainty for up to 10 years and receive priority financial and technical assistance. Certified producers can also use their certified status to promote the business as valuing water quality.

CITIES AND TOWNS

- **Stormwater Treatment:** Technical and financial assistance is available to treat and reduce the impact of stormwater runoff into lakes, streams, and wetlands.
- **Erosion Control:** Financial and technical assistance may address erosion issues that result in sediment runoff into nearby surface waters.
- **Wellhead Protection:** Funding may be available to acquire conservation easements in vulnerable wellhead areas to permanently protect wellhead areas from potentially harmful land management practices.

HOMES AND BUSINESSES

- **Nitrate Testing:** Hubbard County SWCD offers free nitrate testing to residents every month.
- **Septic Systems Replacement:** Low-interest loans for septic system replacement may be available for qualified, low-income homeowners.
- **Pollinator Habitat:** Technical and financial assistance may be available to property owners to restore native vegetation and increase habitat for pollinators.
- **Rain Barrels:** Rain barrels that capture rainwater can reduce runoff and benefit lawns and gardens.

7.1.5 AQUATIC INVASIVE SPECIES

The Cass and Hubbard SWCDs and Environmental Services Departments have established programs to manage AIS. Cass County initiated the Cass County AIS Task Force in 2014 to plan and implement strategies to prevent aquatic invasive species from spreading to public waters. The AIS Task Force implements public education programming and watercraft/trailer inspection and decontamination and employs seasonal staff at boat launches.

The Hubbard County AIS Task Force wrote a plan encompassing the areas of public awareness and education; prevention (watercraft inspection and decontamination); early detection; rapid response and containment; mitigation and management; and administration. The Hubbard County AIS Task Force's plan contains action items and defines the role of its watercraft inspection and decontamination program.

The Minnesota Department of Natural Resources Has Identified Leech Lake As Infested With Eurasian Watermilfoil, An Aquatic Invasive Species.

7.1.6 CAPITAL IMPROVEMENTS

Capital-improvement projects are projects that are large-scale and more expensive with a longer effective life than projects that are typically funded through agricultural incentive and cost-share programs. A capital project exceeds $50,000 in cost and has an expected life greater than 10 years. Some capital projects may be slightly under the $50,000 cost threshold but may meet the other requirements; these projects require operation and maintenance (O&M) plans for the life of the project, including inspection plans to ensure the project's effectiveness. These projects are often completed along with multiple entities and are good candidates for state or federal grant funding. Early coordination with permitting agencies is encouraged. The types of projects identified in this section are intended to provide significant benefits (often on a regional scale) and require feasibility studies before design and construction.

7.2 LAND-USE MANAGEMENT

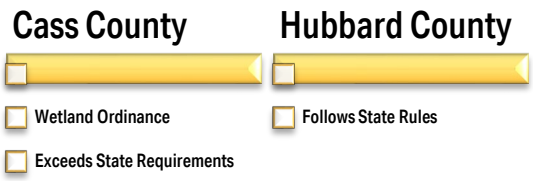
Implementing the restoration and protection practices and projects outlined in the Targeted Implementation Plan in Chapter 6.0 will achieve the goals of the plan if no additional, future impacts occurred in the watershed. Therefore, mitigating these impacts is critical to reduce the risk to watershed health. The effects that climate factors, water availability, and economics will have on LLR Watershed natural resources remains uncertain. Because of these factors, land-use controls are an important tool for protecting against the decline in the quality of the LLR Watershed resources. This plan recommends increasing local land-use controls to reduce impacts from shoreland development, increased groundwater demands, and harmful land-management practices.

Opportunities exist for land-use authorities to manage and plan for the long-term protection of LLR Watershed resources and balance economic growth with ecological and environmental concerns. A key aspect of a successful land-use program is obtaining consistent requirements and enforcement of land-use management controls across the watershed. A summary of existing state and local land-use controls and ordinances is provided in Appendix U.

7.2.1 EXISTING LAND-USE MANAGEMENT PROGRAMS

Local units of government (including counties, cities, and townships) are responsible for regulating land-use controls and implementing various state programs, such as the shoreland program. Federal and state laws, regulations, and rules that relate to watershed and natural-resource management have been established. A summary of the land-use controls that are most related to watershed management is included in the following sections.

7.2.1.1 WETLAND MANAGEMENT

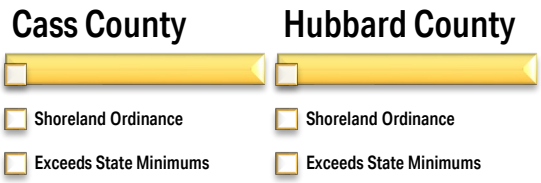


Wetlands have regulatory controls regarding the discharge of dredged or fill materials into waters of the United States including wetlands. The USACE and the US Environmental Protection Agency (EPA) share responsibilities for implementing Section 404 of the Clean Water Act, which governs these discharges. Section 401 of the Clean Water Act requires certification of water quality compliance measures. This certification is a requirement of various federal permit programs and is implemented at the state level by the MPCA. The US Department of Agriculture (USDA) implements the Federal Farm Bill policies regarding draining or filling wetlands for farm program participation. Minnesota also has the Wetland Conservation Act that intends to result in "no-net loss" of wetlands through various mitigation, replacement, and permitting activities. The Minnesota BWSR administers the program however, the program is implemented on a local level by local governments.

Regulations: Minnesota Statute portions of 103B and 103G; Minnesota State Rule Chapter 8420.

7.2.1.2 SHORELAND MANAGEMENT

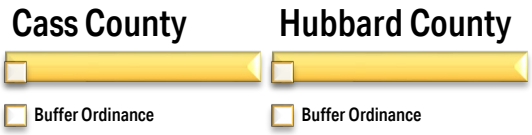
Minnesota has standards that are identified in rules and are overseen by the Minnesota DNR. Local governments are required to adopt land-use controls that protect shorelands along rivers and lakes. Ordinances may be more restrictive depending on the local government units. Cass and Hubbard Counties have shoreland ordinances that are more restrictive than the state minimum; however, the requirements of their ordinances are not consistent.



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

7.2.1.3 BUFFER MANAGEMENT

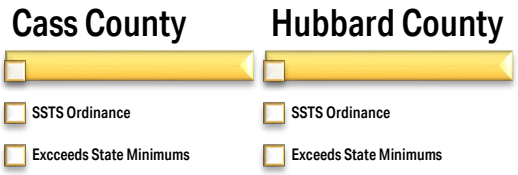
Buffers are required on public waters and drainage systems. According to legislation enacted in 2015, buffers of perennial vegetation are required to an average of 50 feet with a minimum of 30 feet on public waters and 16.5 feet for public drainage systems. Flexibility is provided if other practices provide the same water quality benefit as a buffer. Exceptions are allowed for areas that are covered by roads, buildings, or other structures; areas that are enrolled in the EQIP; public-water accesses; and municipalities that follow federal and state stormwater requirements. BWSR is the regulatory authority of this program, which is operated at the county level. Both Cass and Hubbard Counties have approved buffer ordinances.



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

7.2.1.4 SUBSURFACE SEWAGE-TREATMENT SYSTEMS

The goal of the SSTS program is to protect the public health and the environment by adequately dispersing and treating domestic sewage from dwellings or other establishments that generate volumes less than 10,000 gallons per day. SSTS requirements are adopted and enforced locally. Requests for assistance or complaints should first be directed to the local unit of government (e.g., county, city, and township). Counties in the LLRCWMP planning area may have grants available for SSTS upgrades for individuals that meet limited income qualifications.



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

7.2.1.5 GROUNDWATER/SURFACE WATER USE

A water-use (appropriation) permit from the Minnesota DNR Division of Ecological Water Resources is required for all users who withdraw more than 10,000 gallons of water per day or 1 million gallons per year. The Minnesota DNR is required to manage water resources to ensure that an adequate supply is available to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality-control purposes. SWCDs and Planning and Zoning Offices are offered the opportunity to comment on these permit applications.

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

7.2.1.6 INVASIVE SPECIES

Invasive species pose a serious threat to aquatic and terrestrial habitats in the LLR Watershed. The Minnesota DNR has regulatory authority over aquatic plants and animals and terrestrial animals. The Minnesota Department of Agriculture has regulatory authority over terrestrial plants (noxious weeds) and plant pests. Each county has an agriculture inspector whose responsibility is to ensure that all laws and rules related to noxious weeds are enforced. A counterpart law does not exist for aquatic plants and animals or terrestrial vertebrates.

Common buckthorn is a terrestrial invasive plant that outcompetes native plants causing habitat to degrade. It is also a host to other pests, increasing risk to northern Minnesota ecological resources.

7.2.1.7 WASTE MANAGEMENT

Waste-management permitting and regulatory programs (including hazardous waste, storage tanks, and solid waste) are implemented by the MPCA. Local land-use and zoning controls may regulate whether the waste storage and handling facilities are compatible. Household hazardous-waste facilities for each county are located as follows: Cass County, Cass County Solid Waste Transfer Station in Backus; Hubbard County, Household Hazardous-Waste Disposal in Park Rapids.

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

7.2.1.8 FEEDLOTS

The MPCA administers the feedlot regulations in Minnesota. Counties can be delegated by the MPCA to administer the program for feedlots that are not required to have a state or federal permit. Because few registered feedlots in the LLRCWMP area exist, neither county has become delegated to administer state feedlot programs.

Regulations: Minnesota Rules Chapter 7020.

7.2.1.9 PUBLIC WATERS

The Minnesota DNR administers the Public Waters Work Permit program, which regulates activities below the OHWL in public waters and wetlands. Many activities are required to be permitted before work commences. These activities may include excavating, dredging, filling, installing structures, and implementing shore protection measures.

Regulations: Minnesota Statute 103G.245.

7.2.1.10 POINT-SOURCE POLLUTION REGULATIONS

Mandates regulating the point sources of pollution were a major component of the Clean Water Act, which was passed in 1972. The EPA is responsible for regulating point sources through the National Pollutant Discharge Elimination System. The MPCA implements this program, which includes municipal sewage-treatment plants, industrial discharges, concentrated animal feeding operations, and stormwater at the state level. Minnesota has general permits that govern activities (e.g., confined animal feedlots), and the standards are outlined in state rule.

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

7.2.1.11 FORESTS

The Chippewa National Forest covers a large portion of the LLR Watershed. The Chippewa National Forest Land Management Plan [USDA Forest Service, 2004] guides the natural-resource management activities for the Chippewa National Forest and describes desired resource conditions, resource management practices, levels of resource production and management, and availability of suitable land for resource management.

7.2.2 LAND-USE MANAGEMENT RECOMMENDATIONS

Detailed recommendations to improve resource protection with land-use controls are provided in Chapter 6.0. The recommendations include reviewing the results of the County Geologic Atlas, which is scheduled to be completed in 2019. Groundwater is a highly sensitive resource because if contaminated, the impact is likely permanent. Groundwater availability depends on aquifer levels and has a limited recharge capacity. Land-use control measures that seek to reduce pollution potential and withdrawals are the best protection against these threats.

7.3 OPERATION AND MAINTENANCE

After the construction has been completed, regular inspections and maintenance are important to keep the project functioning at its design capacity and life expectancy. O&M plans must be prepared before construction. The plan should include the expected activities, timing of activities, and inspection schedule. Information should also be developed on the procedure if the inspection determines that maintenance is required or if required maintenance has not been performed, including potential penalties or enforcement actions. Minnesota State Rules Chapters 8400.1700 and 8400.1750 outline the program requirements for the projects funded through state cost-share programs.

Inspections should be conducted on a regular basis and after significant weather events throughout the life of the practice to confirm that the O&M plan is being followed and that the practice is still performing as designed. Site inspections should include written records, photographs, and a report regarding the status of the practice that outlines the required repairs or maintenance. Inspection records should be kept throughout the life of the practice to verify maintenance activities. 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.

7.4 OUTREACH AND EDUCATION PROGRAM

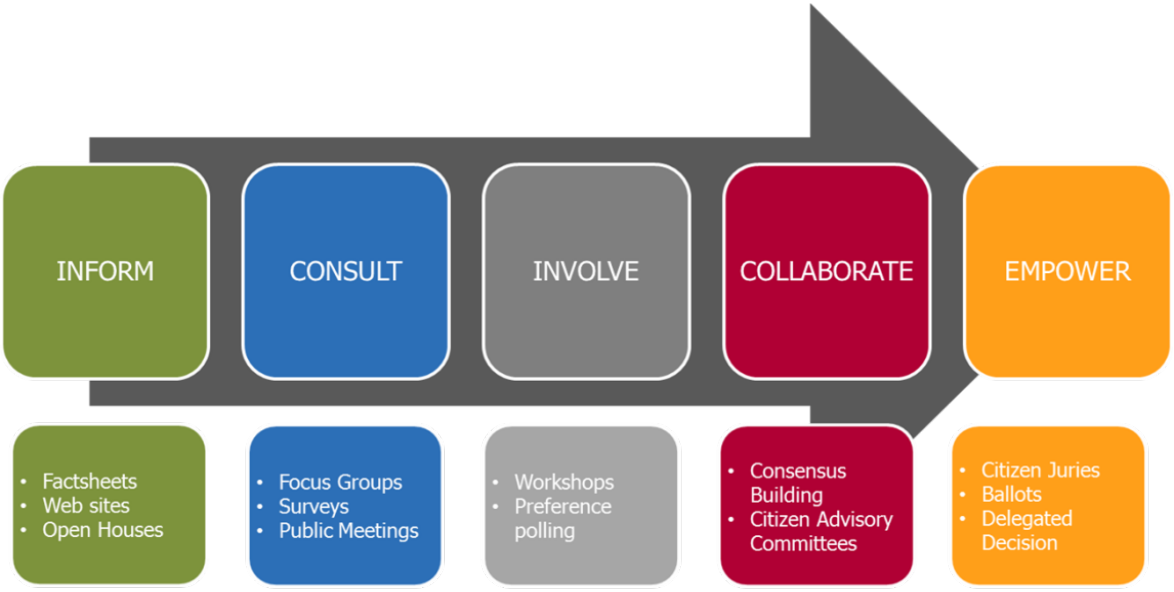
Because the LLRCWMP is a protection plan, an effective public outreach program that motivates voluntary participation is crucial to achieving watershed goals. The LLRCWMP partners understand that they must coordinate outreach campaigns and activities to create awareness about the importance of keeping the watershed healthy and inspire landowners, organizations, and visitors to take actions to prevent the degradation of resources.

To realize this protection goal, an effective outreach and engagement program will be developed. The LLRCWMP will employ a wide range of outreach and engagement activities structured around the priority resources and implementation activities in the plan. The outreach and engagement will also consist of deliberate, planned activities that contain cohesive messages supporting watershed goals and using the activities described throughout this section.

7.4.1 PUBLIC ENGAGEMENT

The goal of the outreach and education project is to encourage the public into taking actions that are necessary to protect the LLR Watershed from degrading. The LLRCWMP partners acknowledge the importance of engaging citizens and will implement activities across a broad spectrum of public participation opportunities. The LLRCWMP partners will develop a comprehensive outreach and education plan that contains elements across the entire spectrum of engagement (depicted in Figure 7-1) from simple updates on a website to more complex resource management forums.

Opportunities to increase public participation in resource management (e.g., open houses and consensus building) will be explored through the life of the plan.



Adapted from IAP2, International Association for Public Participation

Figure 7-1. Increasing Levels of Public Engagement.

7.4.2 COMMUNICATIONS PLAN

The core of the outreach and education program is a well-developed, comprehensive communications plan that prescribes custom messages to targeted audiences. Audience- and message-appropriate tactics (e.g., social media, broadcast media, face-to-face engagement, or marketing media such as billboards and direct mailing) will be identified. The LLRRCWMP outreach activities will focus on creating a broad awareness of the watershed's pristine resource to instill a conservation ethics and compel individuals to take action to protect the resources. Examples of targeted messaging to specific audiences are provided in Table 7-1. The communications plan will be reviewed biannually to evaluate program success and adapt the messaging and methods to address changing program priorities.

Table 7-1. Communications Plan

Target Audience	Goal	Message	Tactic
Shoreland Owners	Improve shoreline health	Grow, don't mow; natural shorelines keep nature in place	Articles in lake association newsletter
	Reduce threats from septic systems	Protect your investment: ensure that your septic system will continue to function using the tips in the owner's guide	Informational brochures provided at time of purchase for new shoreland property owners
	Increase the number of Secchi disk-monitoring volunteers	You can help collect valuable data to guide your lake management	Existing volunteer ambassadors speak at lake association meetings
Private Forest Owners	Increase acreage covered by a forest stewardship plan	Improve your bottom line and the health of your forest	Workshops with private forest landowners
	Increase number of conservation easements	Leave a legacy. Protect your forest for future generations today	Custom mailings to property owners in areas identified as the most at-risk of conversion
Visitors	Reduce the spread of aquatic and terrestrial invasive species	Help keep the lakes and forests you came to see intact	"Stop hitchhikers" billboards and signs at boat ramps and trailheads
Township, City, County Officials	Improve aquatic connectivity	Replace deficient culverts and improve fish habitat	Presentations at annual townships meetings
	Reduce risk from development	Increase the tax base without harming the natural-resource base	Workshops with elected and appointed land-use decision makers
	Increase protection for sensitive wetlands	Protect the wetlands that are impossible to replace	Presentations of task force developed draft ordinance to boards and councils

7.4.3 FORMAL EDUCATION PROGRAMS

Formal training and education programs will be implemented as appropriate to ensure that implementation goals are achieved. The purposes of these training programs will be for participants to obtain the skills necessary to manage their resources more effectively, improve program results, and/or make better decisions. Examples of these programs include enhanced skills training for watercraft inspectors, forest management guideline training for forestry professionals, conservation irrigation training for agricultural producers, and NEMO training for land-use decision makers. The LLRCWMP partners will seek opportunities to partner with entities with established curriculum and certification or continuing education programs to conduct these trainings.

7.4.4 CAPACITY BUILDING

The skills and knowledge necessary to implement the LLRCWMP programs and address emerging concerns and technologies require that staff and elected officials continually increase their knowledge and expand their skillsets to align with the newest science, technology, research, and management strategies. The LLRCWMP partners will pursue opportunities that increase their ability to successfully implement the programs identified in the plan. Finally, the partnership will establish internship programs that bring additional capacity to the watershed, while increasing the skills and on-the-ground training for soon-to-be or recent college and technical school graduates.

8 MONITORING OUR WATERSHED RESOURCES

An important component of watershed management is understanding watershed conditions and trends. Gaining knowledge about our lesser understood resources is also important. Data obtained through research and monitoring programs provide the information that allows implementation actions to be adapted and tailored to meet changing conditions. This section of the plan presents information about current monitoring and data-gathering efforts, identifies potential future data-gathering and research efforts, and provides information about the organizations and programs involved in the monitoring and research activities.

8.1 LAKES

WATER QUALITY

The Minnesota Pollution Control Agency (MPCA) conducts intensive monitoring of each of the state's 80 major watersheds (8-digit hydrologic unit code [HUC]) on a rotating 10-year cycle. This program was originally designed for stream monitoring, but as of 2009, the MPCA incorporated lakes into the watershed monitoring program and has located water-chemistry monitoring sites on lakes in each watershed. The first intensive watershed monitoring program to take place in the Leech Lake River (LLR) Watershed was in 2012 with a follow-up program that filled gaps and further assessed resources in 2013. The next intensive monitoring study of this watershed will be in 2022.

In addition to the intensive watershed monitoring, the MPCA uses a citizen-monitoring program for lake-clarity measurements across the state. Citizen volunteers are used to take Secchi measurements, which provides water-clarity data for the lake. Water clarity is an important indicator of water quality and is used with water-chemistry measurements to determine the lake water quality. With a continuous record of water-clarity measurements from the citizens-monitoring program, lake-clarity trends are developed to monitor long-term changes.

BIOLOGICAL COMMUNITY

The Minnesota Department of Natural Resources (DNR) conducts fish sampling on lakes across the state as a part of their program to develop lake index of biological integrity (IBI) scores. Lake IBI scores are used to categorize a lake based on the health of the local fish community. Based on the species sampled in a lake and the physical characteristics of the lake (e.g., shoreline, depth, and vegetation), a lake is listed as exceptional, full-supporting, vulnerable, not supporting, and insufficient information. Lakes that are sampled by the Minnesota DNR are reported to the MPCA, local governments and conservation groups, and lake associations to guide future planning efforts. Vulnerable lakes are prime candidates for protection and restoration efforts, and not supporting lakes are listed as impaired and require restoration efforts.

ADDITIONAL RESOURCES

Summary information and several in-depth reports can be found on the MPCA website:

(*https://www.pca.state.mn.us/water/watersheds/leech-lake-river*).

The information on the website includes the following:

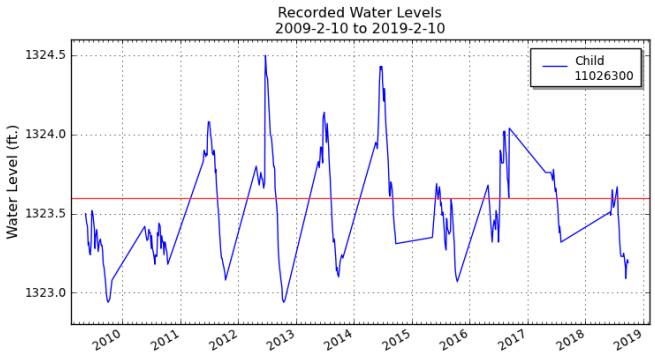
- The Leech Lake River Watershed Monitoring and Assessment report
- The Leech Lake River Watershed Stressor Identification report
- Leech Lake River watershed WRAPS (watershed restoration and protection strategies) report.

WHAT IS AN INDEX OF BIOLOGICAL INTEGRITY (IBI)?

Biological integrity is the ability of a stream, lake, or wetland to support a healthy and diverse population of organisms. An IBI uses biological data and indicators to create an overall assessment of biological conditions. Because an index is a cumulative assessment, IBIs are used to rate and compare resources.

LAKE LEVELS

Fluctuating lake levels can adversely affect shorelines and can cause access and flooding issues. Documenting lake water levels is an important tool for understanding and addressing fluctuating water levels. If a lake is selected to be in the lake level monitoring program, the DNR installs a gage and provides training and materials to the volunteers. Volunteers record lake levels once per week and after significant rainfall and submit the information to the DNR regularly.



Water Levels on Child Lake Have Been Monitored Since 1957. Ten Years of Lake Level Readings Are Graphed (Blue Line) Compared to the Established Ordinary High-Water Mark (Red Line).

8.2 STREAMS

WATER QUALITY AND QUANTITY

Streams are monitored as a part of the MPCA's intensive watershed monitoring program. In this approach, outlets to intermediate (approximately 12-digit HUC) and minor (14-digit HUC) watersheds are sampled, along with the major (8-digit HUC) watershed outlet to provide a complete water quality assessment. This approach provides a comprehensive assessment of rivers and streams without needing to monitor every stream segment. A watershed approach is employed to guide the MPCA's monitoring efforts; aggregate monitoring information from local, state, and federal agencies; and integrate small- and large-scale watershed information. The US Army Corps of Engineers (USACE) records daily pool and tail water levels and calculates flow at the Leech Lake Dam.

BIOLOGICAL COMMUITY

As a part of the intensive monitoring program, the MPCA establishes biological monitoring stations throughout the watershed to sample the local fish and macroinvertebrate communities. The local biota community structure and water-chemistry data are used to determine which stream segments do not meet water quality standards. If a stream segment does not meet water quality standards, the stream segment is considered impaired. Once designated as impaired, the MPCA conducts an assessment to determine the existing conditions that stress the biological community. This assessment is called the 'stressor identification process'. Stressor identification includes a rigorous assessment to identify what is causing harm to fish and other river life. Stressors include low dissolved oxygen, high sediment, lack of habitat, low flows, and lack of stream connectivity. The MPCA's LLR Watershed Biotic Stressor Identification report was completed in 2016.

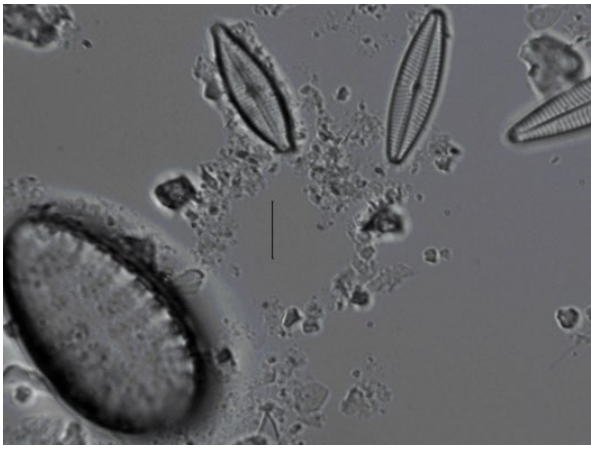
ADDITIONAL RESOURCES

Information on more than 4,500 lakes and rivers can be found on the DNR LakeFinder website:

(*https://www.dnr.state.mn.us/lakefind/index.html*).

The information available on the website includes the following:

- Lake surveys
- Lake depth maps
- Lake water clarity information
- Lake levels
- Fish consumption advice



8.3 GROUNDWATER

Multiple organizations are involved in monitoring quality and quantity. Figure 8-1 provides a graphical overview of the state agencies involved in monitoring groundwater. Additional monitoring is provided at the local level by soil and water conservation districts (SWCDs).

QUALITY

The MPCA monitors water quality conditions at four wells in the LLR Watershed. The Minnesota Department of Health (MDH) requires arsenic tests on every new well installed. The Minnesota Department of Agriculture (MDA) is responsible for monitoring for pesticides in the agricultural areas of the state, which includes the central sands geographic area in the most western areas of the LLR Watershed. The Hubbard County SWCD test nitrates in well water for residents. This service is free and available to residents and property owners once every month.

QUANTITY

The Hubbard County SWCD works with the Minnesota DNR to monitor groundwater quantity through the Minnesota DNR's Cooperative Groundwater Monitoring Program. As a part of this program, the Minnesota DNR measures the static water levels at established observation wells over time. These data are used to monitor aquifer levels, recharge groundwater, interpret impacts of pumping and climate, plan for water conservation, and evaluate water conflicts. The Minnesota DNR is monitoring landscape and groundwater activities west of Ten Mile Lake because this area is on the edge of the forested area that has recently had agricultural conversion.

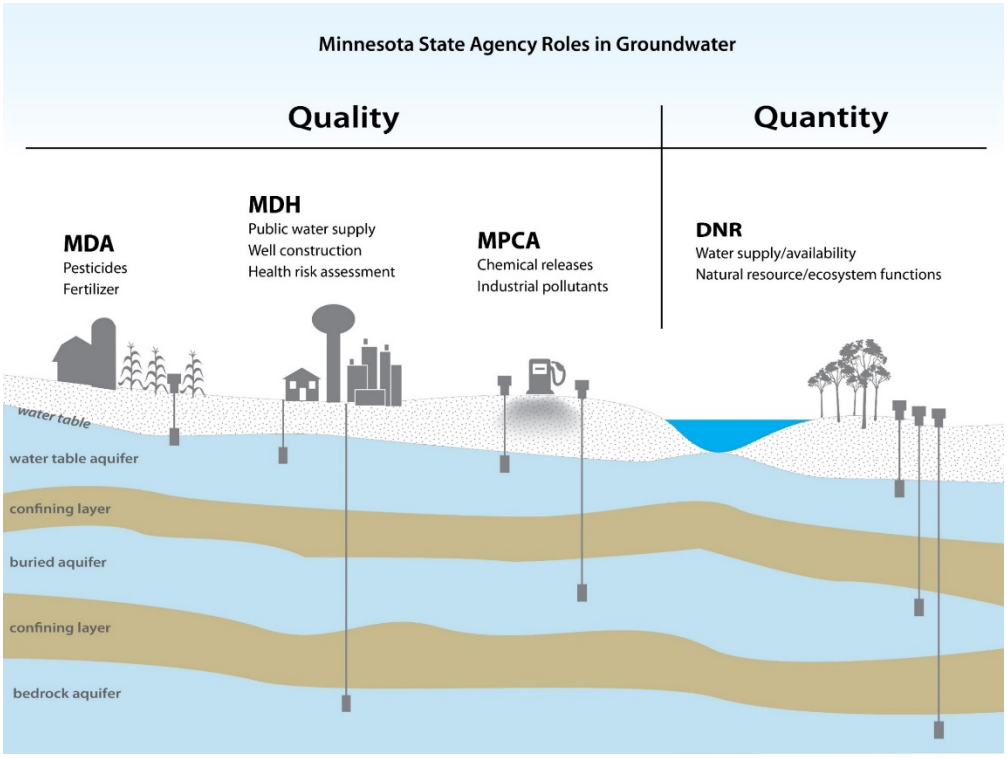


Figure 8-1. Schematic of Agencies Involved in Groundwater Monitoring (Minnesota Board of Water and Soil Resources, [2018]).

8.4 WETLANDS

The MPCA conducted an IBI assessment for seven depressional wetlands in the LLR Watershed as part of their intensive watershed monitoring program. The IBI evaluated the health of plants and invertebrates, and the Minnesota DNR monitors wild-rice wetlands. The US Forest Service (USFS) has an inventory of vernal pools located in the LLR Watershed.

8.5 UPLAND

The only upland category that has been monitored is habitat. The county biological survey and important bird area inventories and species-specific inventories exist. However, no summary assessment is available.

8.6 FUTURE MONITORING CONSIDERATIONS, RESOURCES, AND GOALS

To better assess watershed conditions, detect trends, and close data gaps, additional data, information, and studies will need to be conducted. These efforts, which are aimed at better quantified watershed conditions, will provide the information needed for future restoration and protection efforts. The detailed monitoring, data acquisition, and studies implementation schedule are included in Chapter 6.0.

STREAM FLOWS

Water-level gages are installed at three locations on the LLR. Currently, the Minnesota DNR converts the water-level elevations to flows to determine continuous flows. Implementing continuous flow-monitoring gages at these sites would improve the accuracy and timeliness of reporting.

ASSESSING CONNECTIVTY AND SURFACE-WATER STORAGE

Performing Light Detection and Ranging (LiDAR) and hydro-conditioning of digital elevation models are already underway for the watershed. These data, hydrologic and water quality models, and a complete culvert inventory can be used in planning. Culvert inventories for Cass County and Hubbard County have been completed and townships make annual culvert inspections. The data should be evaluated in a comprehensive manner to more effectively target, plan, and design transportation, fish passage, and water quality projects.

As opportunities arise, LLRCWMP partners should identify locations where culverts/crossings are failing and putting infrastructure at risk, currently impact stream stability, sediment transport, fish passage and flood frequency and duration. The River Ecology Unit of the Minnesota DNR offers

ADDITIONAL RESOURCES

The Minnesota DNR Watershed Health Assessment Framework (WHAF) assesses watershed biology, connectivity, geomorphology, hydrology, and water quality. An interactive map is available online to view watershed health scores for these criteria.

(https://www.dnr.state.mn.us/whaf/index.html).

training and quality control services to facilitate application of their culvert assessment program. The estimated costs for performing the assessment are based on the results from the Root River and Pomme de Terre Minnesota DNR evaluations. The Minnesota DNR has mapped 150 culverts in the LLR, although some US Forest Service (USFS) culverts may have been missed. Four weeks of data collection performed by a two-person intern team is estimated to be sufficient for this watershed.

STREAM CLASSIFICATION AND STABILITY STUDIES

A greater understanding of the stream characteristics, mechanisms, and stability of the streams in the LLR Watershed is important. Comprehensive stream classification using Rosgen Stream Classification, or an equivalent methodology, will provide a thorough, detailed description of the stream channel, bed material, sinuosity, and other characteristics. The data collected through this study will be used to predict stream-channel stability, erosion risk, sediment-transport capacity, and other elements that will be critical for planning watershed projects involving stream restoration. The Necktie River above Hart Lake is being evaluated for stream geomorphology to determine feasible alternatives to realign this stream to provide for stability, improved habitat, and clean water.

WILD-RICE STREAMS

No inventory of or location map for wild-rice streams is available. A low-cost method of obtaining locations could include using crowd-sourcing applications to identify locations. This information could be used to plan a formal inventory and assessment.

WETLANDS

Wetlands are an important resource in the LLR Watershed. Additional data are needed to develop implementation programs that preserve and protect these wetlands. Identifying wetlands that are connected to groundwater is needed, so that actions to protect groundwater from potential contamination can be implemented. Many lakes have areas that are either wetlands or features that are similar to wetlands. These areas indicate sensitive shorelines that are subject to erosion and a loss of habitat if disturbed. While most wetlands help to improve water quality by filtering runoff, some wetlands may contribute to downstream pollution by releasing nutrients and sediment.

White cedar wetlands are highly valued resources because they are unique, rare, and difficult to establish. Therefore, white cedar wetlands may require additional implementation efforts, such as outreach to private landowners with white cedar wetlands. The locations of these wetlands have been mapped, but an assessment of their ecological health has not been conducted.

The National Wetlands Inventory for this watershed will be updated in 2019. The information from this update and the information and analysis contained in Part B of the Geologic Atlas (which is scheduled for completion in 2019) will be an important source when addressing the studies and assessments needed to protect wetlands in the LLR Watershed.

GROUNDWATER

The Geologic Atlas studies provide essential information for managing and protecting groundwater resources. The study contains two parts: Part A provides geology information with mapping completed by the Minnesota Geological Survey and Part B provides the hydrogeology that is completed by the

Minnesota DNR. Part A has been completed for both counties, but Part B will not be completed by the Minnesota DNR until 2019. The data and information obtained through these studies should be examined to develop recommendations that inform land-use decisions and prioritize monitoring, permitting, easement locations, well sealing, and well-construction activities. For example, understanding groundwater recharge rates can be useful when assessing the potential impacts of irrigation and population increases to groundwater availability.

TRANSPORTATION AND CHLORIDE USE

Chloride is persistent in the environment, which means that once it is in our surface waters, chloride can only be removed by industrial processes, such as reverse osmosis. Chloride can be harmful to aquatic life and lead to impairments. An assessment of the impact of chloride in the LLR Watershed, particularly as it may change with expanding transportation corridors, should be undertaken to develop the appropriate management actions.

SEPTIC SYSTEM COMPLIANCE SURVEYS AND INSPECTIONS

Subsurface sewage treatment systems (SSTS), otherwise known as septic systems, can pose a threat to surface water and groundwater. To determine compliance and the potential risk of septic systems, lake associations and other entities may seek funding to undergo SSTS compliance surveys and inspections. GIS mapping or other data sources could be used to determine the most vulnerable groundwater and surface-water resources. These areas should be the priorities for inspections. By completing these activities, implementation funding can be prioritized to the systems that pose the biggest threats.

UPLAND – FORESTS

Evaluating the impacts of climate change on the forest of the region will be critical to maintaining the long-term health of the watershed. Monitoring should evaluate the overall forest health, changes in species diversity and abundance, extent and type of invasive species, and frequency and extent of disasters (such as blow-down events and forest fires). Regular collection and tracking of this information may indicate trends that require adaptive management strategies to ensure forest health.

COMPREHENSIVE DAM MANAGEMENT

In 1998, the Mississippi Headwaters Board requested that the USACE conduct a review of the operating plans for the Mississippi Headwaters reservoirs to "evaluate the effects of the reservoir operations to people and nature" (USACE, 2009). This resulted in a reconnaissance study that was completed in 2001, which resulted in the Reservoir Operating Plan Evaluation and Environmental Impact Statement that were completed in 2009 for approximately $4.5 million dollars. The purpose of this study was to evaluate the alternative management of the Headwaters reservoirs to achieve a balance of benefits for multiple purposes, including tribal trust, flood control, water quality, recreation, navigation, and environmental concerns, including habitat, fisheries, and wild-rice management. The outcome of this study was the implementation of operating rules that largely mimicked the existing operating rules. The most environmentally preferred plans were not selected because of public opposition and lack of support for the environmental benefits and a more natural hydrologic regime.

8.7 ORGANIZATIONS AND PROGRAMS

Many agencies, organizations, and individuals are involved in monitoring resources within the watershed. A summary of primary monitoring activities is provided in this section but is not inclusive of all monitoring activities.

MINNESOTA POLLUTION CONTROL AGENCY

To characterize Minnesota's water quality, the MPCA collects data and uses the data collected by state, local, and federal agencies, and citizens to conduct a rigorous assessment. One of the MPCA's recent advances is developing the intensive watershed monitoring approach for providing monitoring resources (local and agency) and standard assessment methods throughout Minnesota. A potential result of this effort is identifying waterbodies that do not meet the intended beneficial uses, which are listed as impaired waters. The MPCA submits a list of these waterbodies to the US Environmental Protection Agency as 303(d) listed waters.

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

The Minnesota DNR is responsible for overseeing surface and groundwater levels, flow, and availability as well as conducting fisheries and aquatic plant monitoring and surveys. The Minnesota DNR is also responsible for monitoring and evaluating forest health, including forest pests and disease.

MINNESOTA DEPARTMENT OF AGRICULTURE

The MDA monitors nitrates and pesticides in Minnesota surface and groundwater resources. Through this program, the MDA identifies surface-water pesticides of concern, determines pesticide and nitrate trends, provides information on the effectiveness of nitrate and pesticide management plans and best management practice, and provides data needed by the MPCA to assess water quality.

MINNESOTA DEPARTMENT OF HEALTH

The MDH is responsible for the human health aspects of surface and groundwater and therefore, monitors the pollutants that are known to affect human health, such as arsenic and nitrates. The MDH also sets the standards and issues guidance regarding pollution contamination levels in fish.

US GEOLOGICAL SURVEY

The US Geological Survey (USGS) maintains a long-term surface-water gage at the Federal Dam on Leech Lake and at Willow Point on the Mississippi River, just downstream from the outlet of the LLR.

US FOREST SERVICE

The Chippewa National Forest (CNF) is responsible for managing all vegetation resources on USFS lands. The CNF implements the 2004 CNF Land Management plan that guides all the resource management activities and provides management direction to ensure that ecosystems can provide a sustainable flow of beneficial goods and services to the public.

US ARMY CORPS OF ENGINEERS

The USACE records daily precipitation and minimum and maximum temperatures at the Leech Lake Dam and transmits the information to the National Weather Service. The USACE also monitors daily pool and tail water levels and calculates river outflows at Leech Lake Dam, which is located on the LLR and is adjacent to the Federal Dam. The official lake gage for monitoring the level of Leech Lake is located near the Minnesota DNR public access in Boy Bay near Battle Point.

CITIZEN MONITORING

The MPCA coordinates two volunteer-monitoring programs—Citizens Stream Monitoring Program and Citizens Lake Monitoring Program—that are available at no cost to participants. Citizens are responsible for monitoring a specific stream with transparency tubes or lake with Secchi disks once each month. The goal is to maintain the same monitoring locations for many years so that trends can be established. Interested parties are encouraged to contact the MPCA Brainerd Regional Office to obtain information on monitoring protocols and a list of certified laboratories.

LAKE ASSOCIATIONS AND COALITIONS

Lakeshore property owners are oftentimes the most active and energetic group of individuals that are working to protect and improve lake water quality. Many lake associations sponsor monitoring programs that expand beyond transparency to include water quality monitoring with a field-and-laboratory service provider. Lake associations in the LLR Watershed have played an important role in Aquatic Invasive Species prevention, detection, and identification programs throughout the watershed. Lake associations coordinate education and outreach programs and oftentimes provide important information to their members through newsletters, websites, or social media platforms such as Facebook. Both Cass and Hubbard county also have coalitions of lake associations. These coalitions actively facilitate cooperation among member lake associations and support and encourage the formation of individual lake associations.

ADDITIONAL RESOURCES

Cass and Hubbard County lake coalitions can provide helpful information and resources to lake residents. Individuals who are interested in learning more about LLR watershed resources or which to become more active in managing local lake resources are encouraged to contact their county lake coalition.

- Association of Cass County Lakes (ACCL): *www.acclakes.org*
- Hubbard County Coalition of Lake Associations (COLA): *hubbardcolamn.org*

WATERSHED POLLUTANT LOAD MONITORING NETWORK

The MPCA's Watershed Pollutant Load Monitoring Network (WPLMN) collects much of the long-term data that are used to assess the large-scale watershed conditions. Monitoring data collected at WPLMN sites in the LLR are typically combined with flows from the Minnesota DNR's and the MPCA's Cooperative Stream Gaging (CSG) program flows to define mass balances and loads. The CSG is a joint effort between the Minnesota DNR and MPCA and was designed to ensure that either USGS or Minnesota DNR flow-gaging stations were established and maintained at WPLMN locations through 2034. Depending on the

classification of the site, 25–35 nutrient and sediment samples are collected at these sites annually or seasonally.

WEATHER CONDITIONS

Periodic summaries of recent and long-term weather-reporting station data may be helpful when modifying monitoring activities and interpreting data to reflect weather variability. Several free weather-reporting services are available to better define patterns. Data summaries are available from the Minnesota Climatology Office (http://climate.umn.edu/) and the Midwestern Regional Climate Center (*http://mrcc.isws.illinois.edu/CLIMATE/*) with local reporting stations at Walker and Federal Dam. Notable data include characterizing wet-period cumulative precipitation from back-to-back storms, dry-period durations and intensities (e.g., the number of consecutive days with a cumulative total of less than 0.1 inch of precipitation), and the number of winter-thaw periods (defined for this purpose as 2 or more days with peak temperatures above 32 degrees Fahrenheit).

LEECH LAKE BAND OF OJIBWE SURFACE WATER QUALITY MONITORING PROGRAM

Protecting water is critical to the traditions and culture of the Leech Lake Band of Ojibwe (LLBO). High-quality water in lakes, rivers, and streams and groundwater is vital to the LLBO's tribal life in terms of wild-rice growth and harvest, ceremonial activities, subsistence fisheries, and recreation. Anthropogenic impacts (e.g., channelization, damming, land-use changes, and industrial pollution) can decrease water quality and cause harmful effects to aquatic ecosystems. As a result, the LLBO Water Resources Program has instituted a water quality monitoring plan to ascertain the scale and locations of anthropogenic effects on water resources within the boundaries of the Leech Lake Reservation.

Surface water quality monitoring is an important tool for gauging human-induced impacts on water resources. Surface water monitoring can identify impaired conditions in lakes, rivers, and streams, and inform management decisions when developing watershed protection plans. Surface water monitoring of lakes, rivers, and streams can characterize the current conditions for future comparisons and obtain data for trend analyses.

In general, waters of the Leech Lake Reservation are in very good to pristine condition, although each water body is impacted to some extent by mercury, lakeshore development, forestry practices, climate change, polluted runoff, septic leakage, and atmospheric deposition, as well as many other anthropogenic and natural causes. As of 1997, baseline data were only available for certain designated lakes, rivers, and streams that were monitored by other government agencies and some lake associations. Many of the remaining waterbodies within the Leech Lake Reservation have little or no data for baseline comparisons.

Baseline data collection is vital to examine trends in water quality over time and evaluate potential sources of impairments. Collecting water quality conditions on the LLBO's designated-use lakes for wild rice and fisheries is important to ensure that these waterbodies are protected if any impairment should arise. Monitoring baseline water quality and biological conditions is also vital on various lakes, rivers, and streams with a significant amount of land available for development, because these waterbodies may be threatened in the near future.

The LLBO Water Resources Program's main goals include the following:

- Collect water quality monitoring data (i.e., physical, chemical, and biological parameters) to track changes in water quality trends
- Assess water quality standards (e.g., aquatic life use support, aquatic consumption use and aquatic recreational use) within the Leech Lake Reservation
- Maintain and protect water quality for subsistence and cultural and spiritual benefits for LLBO members
- Assess nonpoint-source pollution (note that the data generated will be used to evaluate the quality of the waterbodies with ecoregion standards)
- Track quality and quantity trends, identify impacted waters, and measure the success or failure of water-management programs and plans and/or land-use alterations through surface water monitoring
- Assess trophic state indices and eutrophication (e.g., phosphorus, chlorophyll-*a* and Secchi transparency) on LLBO lakes
- Identify environmental status by examining data to determine condition of individual waterbodies in terms of their ability to meet established standards and criteria
- Develop an aquatic plant inventory on selected lakes.

Table 8-1. Summary of the Types of Resource Monitoring in the Leech Lake River Watershed and Responsible Organizations.

Resource		Responsible Organizations							
		MPCA	DNR	MDA	MDH	Cass County	Hubbard County	USFS	USGS
Streams	Quality	X					X		
	Biology	X	Trout Streams						
	Quantity	X	X						X
Lakes	Quality	X							
	Biology		X						
	Quantity		X						
Groundwater	Quantity		X				X		
	Drinking Water Quality	X			X		X		
	Pesticides			X					
Wetlands		X	X						
Upland - Forests			X			X	X	X	

9 FUNDING

The following sections discuss, current local funding, funding needs, and potential funding sources. The extent to which the Leech Lake River Comprehensive Watershed Management Plan (LLRCWMP) implementation plan and goals can be accomplished depends on the level of funding that is available. The variance between the current and needed revenue is expected to be filled primarily with funds from the Clean Water, Land, and Legacy Amendment.

9.1 CURRENT LOCAL FUNDING, ANNUAL LEECH LAKE RIVER ONE WATERSHED, ONE PLAN COST AND TOTAL PLAN COST

The current local funding, the estimated annual cost to implement the LLRCWMP, and estimated total plan cost are outlined in Table 9-1. The current funding level is based on the annual revenue and expenditures for the Cass County Environmental Services and SWCD and the Hubbard County Environmental Services and Soil and Water Conservation District (SWCD) combined and allocated to the

Leech Lake River (LLR) Watershed based on the percentage of county land area in the LLR Watershed. The current level of investment by each local government unit is expected to remain the same during the LLRCWMP time period. The current expenditure includes all the state program and conservation delivery grants, including the Natural Resources Block Grant and SWCD Local Capacity Building Grants.

The estimated annual cost to implement the LLRCWMP is an average of all 10 years of the plan implementation. However, the actual amount needed to implement the plan will vary annually. All the figures are rounded to simplify funding estimates. The details on program activities, timelines, and outcomes are provided in the Targeted Implementation Plan (Chapter 6.0).

Table 9-1. Summary of Current Local Funding, Estimated Annual Cost, and Total Cost to Fund the LLRCWMP

Program	Average Current Expenditure (Base Funding Level)	Estimated Annual Cost	Estimated Total Plan Cost (10 Years)
IMPLEMENTATION	$305,000	$4,769,200	$47,692,000
LAND-USE MANAGEMENT	$200,000	$16,800	$168,000
OUTREACH AND EDUCATION	$350,000	$389,500	$3,895,000
RESEARCH, DATA COLLECTION, AND MONITORING	$130,000	$196,250	$1,962,000
TOTALS	$985,000	$5,371,750	$53,717,500

9.2 POTENTIAL LOCAL FUNDING

The current local funding levels provided Table 9-1 will not be adequate to implement the plan. Therefore, additional local money will be needed for successful plan implementation. Various state laws with provisions for counties to generate additional currently revenue exist under the provisions of Minnesota Statutes 103B. These opportunities will be explored as appropriate, but a very limited tax base exists within the watershed and, therefore, generating a large amount of local revenue is not possible.

COUNTY

Water Planning Authority for Special Projects (Minnesota Statute 103B.355): Counties have the authority to levy funds for priority projects and assist Soil and Water Conservation Districts (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 AUTHORITIES

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.

CITIES

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.

9.3 STATE FUNDING

Minnesota has the responsibility to fund watershed management programs through various capacities, programs, and agencies. The 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.

Funding for capital improvement projects may be obtained through legislative appropriations directly or through state agency programs that have bond funds available, such as Reinvest In Minnesota (RIM). Grants are also available from the Minnesota Board of Water and Soil Resources (BWSR), Minnesota Pollution Control Agency (MPCA), Minnesota Department of Natural Resources (DNR), Minnesota Department of Health (MDH), and the Minnesota Department of Agriculture (MDA) to fund programs, practices, and projects or through legislative commissions, such as the Lessard-Sams Outdoor Heritage Council (which funds habitat projects) and the Legislative and Citizens Commission on Minnesota Resources Environmental Trust Fund (which funds research and innovation funds). State-revolving fund loans can be obtained from the MPCA and MDA. Potential funding sources for the LLRCWMP goals program are outlined in Table 9-2.

Table 9-2. Potential Funding Sources for the LLRCWMP Activities (Page 1 of 2)

Source	Organization	Program/ Fund Name	Type of Assistance	Form of Assistance	Conservation	Land-Use Management	Monitoring, Data Acquisition, Studies	Education and Outreach
STATE FUNDING	BWSR	Clean Water Fund	Financial	Grant	X			
	BWSR	RIM	Financial	Easement	X			
	BWSR	Natural Resource Block Grant	Financial	Grant		X	X	X
	BWSR	SWCD Local Capacity Service Grants	Financial	Grant	X	X	X	X
	BWSR	Erosion Control and Management Program	Financial	Grant	X			
	DNR	Conservation Partners Legacy	Financial	Grant	X			
	DNR	Aquatic Invasive Species Control	Financial/ Technical	Grant				
	DNR	Forest Stewardship Program	Technical	Cost Share	X			
	DNR	Aquatic Management Area, Wildlife Management Area, Scientific and Natural Area	Financial	Fee Title Acquisition	X			
	DNR/Revenue	Sustainable Forest Incentive Act	Financial	Tax Incentive	X			
	MPCA	Clean Water Partnership	Financial	Grant	X			
	MPCA	State-Revolving Fund	Financial	Loan	X			
	MPCA	Surface Water Assessment Grant	Financial	Grant			X	
	MDH	Source Water Protection Grant	Financial	Grant	X			
	MDH	Nitrate Testing	Technical	Monitoring			X	
	MDA	Agricultural BMP Loan Program	Financial	Loan	X			
	LSOHC	Outdoor Heritage Funds	Financial	Grant	X			
	LCCMR	Environmental Trust Fund	Financial	Grant	X		X	X
	Legislature	Bonding	Financial	Bond	X			

Table 9-3. Potential Funding Sources for the LLRCWMP Activities (Page 1 of 2)

Source	Organization	Program/ Fund Name	Type of Assistance	Form of Assistance	Conservation	Land-Use Management	Monitoring, Data Acquisition, Studies	Education and Outreach
FEDERAL FUNDING		Conservation Reserve Program	Financial	Cost Share	X			
	FSA	Grassland Reserve Program	Financial	Cost Share	X			
	NRCS	Conservation Innovation Grant	Financial	Grant	X		X	X
	NRCS	EQIP	Financial	Cost Share	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			
	Trout Unlimited		Financial/ Technical	Easement/ Cost Share	X			
	Muskies, Inc.		Financial/ Technical	Easement/ Cost Share	X			
	Leech Lake Area Watershed Foundation		Financial	Easement	X			
	The Nature Conservancy		Financial	Easement	X			
	Minnesota Land Trust		Financial	Easement	X			

9.4 FEDERAL FUNDING

Federal agencies expected to partner with the LLRCWMP entities and from which funds will be sought include US Forest Service (USFS), US Fish and Wildlife Service (USFWS), US Army Corps of Engineers (USACE), US Geological Survey (USGS), Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), and the US Environmental Protection Agency (EPA). Dam improvement programs that address habitat and connectivity concerns may involve partnering with the USACE. The USGS will likely provide support for data acquisition and monitoring programs, while the USFWS may provide land-retirement program funds.

9.5 NONREGULATORY ECOSYSTEM SERVICE PROGRAMS

Most ecosystem service trading programs are currently facilitated through regulatory permits and programs, such as wetland banking. However, demand is increasing to provide ecosystem service grants that are not regulatory in scope. Funding initiatives that may be available might focus on increasing or protecting habitat for particular species (e.g., endangered or threatened species) or for increasing or protecting habitat for a particular ecosystem (e.g., increasing habitat for pollinators). Funds for programs could come from federal, state, nonprofits, or foundation organizations.

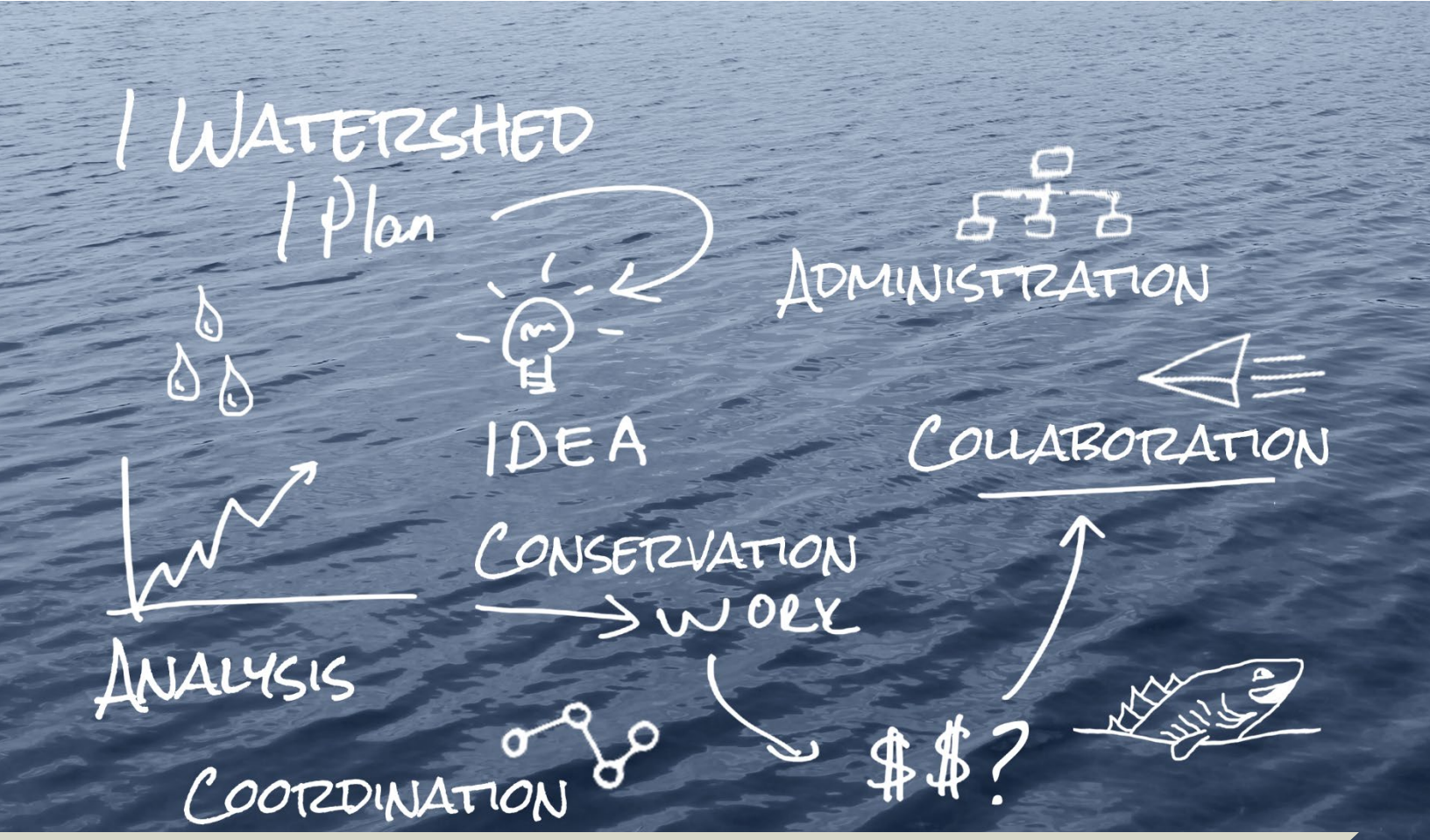
9.6 OTHER FUNDING SOURCES

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 Minnesota, such as The Nature Conservancy, the Audubon Society, the Leech Lake Area Watershed

Foundation, and Minnesota Deer Hunters Association. 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.

9.7 COLLABORATIVE GRANTS

The SWCD staff will develop grant applications and seek funding from various governmental and nongovernmental agencies based on the biennial plan. Individual entities will continue to submit grant applications for their existing programs and activities. However, grants that focus exclusively on implementing the activities of this plan will be developed and submitted by the SWCD staff.



10 PLAN ADMINISTRATION AND COORDINATION

An important component of the Minnesota BWSR One Watershed, One Plan (1W1P) program is that Comprehensive Watershed Management Plans provide a clear understanding of how the plan will be administered, including the plan roles and timeline and under what provisions and authorities work will be conducted. Accomplishments also need to be reported to ensure that accountability is maintained with stakeholders and approval authorities. A process that allows for an adaptive management approach must be implemented to ensure that strategies can be adjusted to accommodate changing conditions, including staffing and funding levels as well as emerging issues.

10.1 PLAN ADMINISTRATION AND COORDINATION

The LLRCWMP will be administered through a joint partnership agreement (JPA). The JPA largely contains the same provisions that were included in the memorandum of understanding that was executed to develop the plan. Refinements to the JPA focus on clarifying voting procedures and fiscal agent responsibilities.

DECISION MAKING AND STAFFING

The Policy Committee, with representatives from each JPA entity, will meet at least four times a year. The Cass and Hubbard Counties and SWCD staff will continue to work in their existing capacities to conduct the LLRCWMP implementation actions and programs. They will meet regularly to review their progress, identify program funding needs, develop the biennial budget request, and modify this plan as needed. An Advisory Committee meeting will be held with the Policy Committee once per year. Membership to the Advisory Committee will not be formalized through an appointment or approval process and the Advisory Committee can organize and interact with the Policy Committee on an as-needed basis.

Figure 10-1. Governance Framework for Administering the Leech Lake River Comprehensive Watershed Management Plan

The LLRCWMP goals require a new, coordinated approach to implementing and achieving the goals of the plan. The Policy Committee recognizes that the current staffing levels and former approach that relied on individuals seeking assistance for site-specific issues will not result in the LLRCWMP goals being accomplished. The successful implementation of this plan will rely on generating active interest in protecting the LLR Watershed resources. Therefore, the Policy Committee will establish a coordinator role. This role may be provided through hiring staff or contracting for services. The role will entail the intentional and active engagement of individuals, civic organizations, nonprofit organizations, and businesses by aligning interests with implementation strategies and goals. In addition to establishing a coordinator role, the LLRCWMP entities plan to continue sharing technical services with Area 8 Joint Powers Board (JPB).

The partners recognize the benefit of obtaining efficiencies through shared service delivery. Throughout the plan's implementation and particularly at the biennial planning and 5-year evaluation benchmarks, the Policy Committee will assess appropriate use of shared services to ensure that goals are achieved.

LLRCWMP POTENTIAL PARTNERS

- Leech Lake Area Watershed Foundation
- Lake and Coalition of Lake Associations
- The Nature Conservancy
- Muskie, Inc.
- Trout Unlimited
- Chamber of Commerce
- Minnesota Land Trust
- Forest Resources Council

COLLABORATION WITH OTHER UNITS OF GOVERNMENT AND TRIBAL ENTITIES

The LLRCWMP Policy Committee and staff will actively seek opportunities for early coordination and collaboration with other units of government, including cities, townships, federal agencies, and special purpose JPBs such as the Mississippi Headwaters Board. The LLRCWMP Policy Committee and staff will continue to coordinate joint program, policy, and implementation efforts with the Leech Lake Band of Ojibwe. Governmental units that are not part of the formal JPA will be invited to participate in implementation activities where those activities are relevant to their own goals or implementation measures. Collaboration with state agencies (e.g., the Minnesota BWSR, MPCA, and the Minnesota DNR) are critical for executing the programs and goals of the plan. Federal government partners (including the US Forest Service [USFS], US Fish and Wildlife Service [USFWS], USACE, US Geologic Survey [USGS], NRCS, and FSA) are not required participants, but their programs and staff expertise are necessary components to fulfilling plan goals.

COLLABORATION WITH NONGOVERNMENTAL PARTERS

The success in obtaining the LLRCWMP goals will depend on the local support that drives its implementation. The LLRCWMP partners are committed to working with nongovernmental entities (including individual and coalitions of lake associations, civic groups, nonprofit entities, private businesses, volunteers, individuals, and foundations), many of which are already involved in protecting and improving LLR Watershed's resources. To leverage the opportunities these nongovernmental entities can offer, the LLRCWMP calls for committing the resources necessary to establish a LLRCWMP coordinator role. By establishing this role, a concerted effort will be made to engage with these entities on all activities related to the goals and programs in this plan. Potential partners will be invited to the annual Advisory Committee meeting with the Policy Committee and will be sought out to build relationships, programs, and projects that support the plan initiatives.

WORK PLANNING

Work planning will be completed by each SWCD on a biennial basis with annual adjustments made as needed to accommodate unforeseen or opportunistic situations. The work plan will be approved by the Policy Committee before the plan implementation. The biennial work plan will be based on progress made toward goals and may include new initiatives aimed at either maintaining or accelerating progress in targeted watersheds. Staff and financial resource availability will be considered. The work plan will be adopted and implemented separately by each local government.

The biennial work plan will be used to develop the BWSR's Biennial Budget Request (BBR). The biennial work plan will be developed based on the targeted implementation schedule and other initiatives and programs that support efforts to achieve plan goals. The BBR will be submitted by the Cass County SWCD as a fiscal agent.

REPORTING AND EVALUATION

REPORTING AND ASSESSMENT

The BBR will serve as the foundation for all reporting directly related to implementing the plan. eLINK will be used to gather information on annual accomplishments. This information will be supplemented by program accomplishments that were not contained in the BBR but that address the LLRCWMP measurable outcomes. This may include activities from collaborators or initiatives undertaken by the JPA entities but are next explicitly identified in the BBR. A state of the watershed or similar report will be created for each biennial budget cycle and updated each year of the biennial budget cycle. The purpose of this report is to provide transparent accountability and demonstrate outcomes. In addition to the natural resource goals, the LLRCWMP includes risk, leadership, and quality of life goals. The annual report will include commentary regarding collective efforts regarding these goals. The Policy Committee will approve all the reports before to submitting, publishing, or distributing.

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

FIVE YEAR EVALUATION

Every 5 years, the JPA entities will evaluate the overall progress toward the 10-year and long-term goals. The evaluation will begin with an assessment of new data, information, and trends that may require a shift in the focus of implementation efforts. An assessment will be made regarding the 10-year goals will be met with the current pace of progress, if additional resources are needed, or if the delivery of services should be adjusted to strengthen implementation efforts. If these changes are deemed necessary, the Policy Committee will initiate a plan amendment process.

AMENDMENTS

This plan is in effect through 2029. 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 LLRCWMP Policy Committee members will initiate a plan amendment process consistent with Minnesota Statute Chapter 103B, section 314, subdivision 6 and Minnesota Rules Part 8410.0140 (as revised).

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APPENDIX A

ACRONYMS

APPENDIX A: ACRONYMS

BBR	Biennial Budget Request
BMP	Best Management Practice
BWSR	Board of Waters and Soil Resources
CLWMP	Comprehensive Local Water Management Plans
CRP	Conservation Reserve Program
DEM	Digital elevation maps
DNR	Department of Natural Resources
DWSMA	Drinking Water Supply Management Areas
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Programs
FSA	Farm Service Agency
HUC	Hydrologic Unit Code
IBI	Index of biological integrity
JPA	Joint Powers Agreement
LGU	Local Government Unit
LiDAR	Light Detection and Ranging
LLBO	Leech Lake Band of Ojibwe
LSOHC	Lessard Sams Outdoor Heritage Council
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MGS	Minnesota Geological Survey
MOA	Memorandum of Agreement
MPCA	Minnesota Pollution Control Agency
NPDES	National Pollutant Discharge Elimination System
NRBG	Natural Resources Block Grant
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
O&M	Operation and maintenance
OHWL	Ordinary High-Water Level
PWG	Plan Work Group
RIM	Reinvest in Minnesota
SPI	Stream power index
SSTS	Subsurface Sewage Treatment System
SWCD	Soil and water conservation districts
TMDL	Total Maximum Daily Load
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USFS	US Forest Service
USGS	US Geological Survey
WRAPS	Watershed Restoration and Protection Strategy

APPENDIX B

GLOSSARY OF TERMS

APPENDIX B: GLOSSARY OF TERMS

Hydrologic Unit Code (HUC): A Hydrologic Unit Code (HUC) is assigned by the USGS for each watershed. HUCs are organized in a nested hierarchy by size. For example, the Upper Mississippi River Basin is assigned a HUC-4 of 0701 and the LLR Watershed is assigned a HUC-8 of 07010102.

Impairment: Waterbodies are listed as impaired if water quality standards are not met for designated uses including aquatic life, aquatic recreation, and aquatic consumption.

Index of Biotic integrity (IBI): A method for describing water quality using characteristics of aquatic communities, such as the types of fish and invertebrates found in the waterbody. It is expressed as a numerical value between 0 (lowest quality) to 100 (highest quality).

Management Goal Value: What a person or local government is invested in protecting, conserving or restoring in relation to the natural world, quality of life, local leadership and climate and risk.

Objective: A general result that a person or local government aims to achieve, relative to a specific issue, within a time frame and with available resources.

Protection: This term is used to characterize actions taken in watersheds of waters not known to be impaired to maintain or improve conditions and beneficial uses of the waterbodies. Restoration: This term is used to characterize actions taken in watersheds to improve conditions, and in impaired watersheds to eventually meet water quality standards and achieve beneficial uses of the waterbodies.

Resource Goals: Specific goals related to an individual resource need.

Source (or Pollutant Source): This term is distinguished from 'stressor' to mean only those actions, places or entities that deliver/discharge pollutants (e.g., sediment, phosphorus, nitrogen, pathogens).

Strategy: a chosen approach that a person or local government implements to meet the objective.

Stressor (or Biological Stressor): This is a broad term that includes both pollutant sources and nonpollutant sources or factors (e.g., altered hydrology, dams preventing fish passage) that adversely impact aquatic life. SWCD: Soil and Water Conservation District.

Total Maximum Daily Load (TMDL): A calculation of the maximum amount of a pollutant that may be introduced into a surface water and still ensure that applicable water quality standards for that water are met. A TMDL is the sum of the wasteload allocation for point sources, a load allocation for nonpoint sources and natural background, an allocation for future growth (i.e., reserve capacity), and a margin of safety as defined in the Code of Federal Regulations.

Value: What a person or local government is invested in protecting, conserving or restoring in relation to the natural world, quality of life, local leadership and climate and risk.

APPENDIX C

COMMENT LETTERS

BOARD OF WATER AND SOIL RESOURCES

August 29, 2017

Leech Lake One Watershed One Plan Planning Work Group / Leech Lake River Watershed
C/O John Ringle, Cass Soil and Water Conservation District
300 Minnesota Ave W
Walker, MN, 56484

RE: Response to request for priority issues and plan expectations (One Watershed, One Plan).

Dear John,

Thank you for providing the opportunity to provide priority issues and plan expectations for the development of the Leech Lake River Comprehensive Watershed Management Plan under Minnesota Statutes section 103B.101, Subd. 14. We appreciate the partner's willingness to participate in development of a watershed-based plan.

The Board of Water and Soil Resources (BWSR) has the following overarching expectations for the plan:

Process

- The planning process must follow the requirements outlined in the One Watershed, One Plan (1W1P) – Operating Procedures document, adopted by the BWSR Board on March 23, 2016 and available on the BWSR website: www.bwsr.state.mn.us/planning/1W1P/index.html. More specifically, the planning process must:
    - Involve a broad range of stakeholders to ensure an integrated approach to watershed management.
    - Reassess the agreement established for planning purposes when finalizing the implementation schedule and programs in the plan, in consultation with the Minnesota Counties Intergovernmental Trust and/or legal counsel of the participating organizations, to ensure implementation can occur efficiently and with minimized risk. This step is critical if the plan proposes to share services and/or submit joint grant applications.

Plan Content

- The plan must meet the requirements outlined in the 1W1P – Plan Content Requirements document, adopted by the BWSR Board on March 23, 2016 and available on the BWSR website: www.bwsr.state.mn.us/planning/1W1P/index.html. Specifically, the plan must have:
    - A thorough analysis of issues, using available science and data, in the selection of priority resource concerns.
    - Sufficient measurable goals to indicate an intended pace of progress for addressing the priority issues.
    - A targeted and comprehensive implementation schedule, sufficient for meeting the identified goals.

- A thorough description of the programs and activities required to administer, coordinate, and implement the actions in the schedule; including work planning (i.e. shared services, collaborative grant-making, decision making as a watershed group and not separate entities) and evaluation.

BWSR has the following specific priority issues:

- **Unique Aquatic Resources:** Protection of the abundance of unique aquatic resources in the Leech Lake River watershed such as wild rice, cisco, and Muskie lakes and trout streams.
- **Stormwater Management:** Mitigation of impacts to surface and groundwater of current and future development, transportation corridor expansion, and urbanization of shorelines and community expansion.
- **Forestland Management:** Coordination of public land management between federal, state and local authorities. Working with private forestland owners to minimize habitat fragmentation and forest land conversion with the goal of obtaining 75% protection.
- **Surface Water Quality:** Utilization of the DNR Phosphorous sensitivity analysis and/or other tools to quantify management objectives for long term water quality sustainability.
- **Wastewater Management:** Protection of vulnerable surface and groundwater resources from effects of wastewater treatment and disposal in highly permeable soils.
- **Ordinance Review:** A 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.

General Watershed Considerations:

Vegetation Management

- **Natural Habitat Protection/Restoration**: Protecting and restoring diverse forests and other habitats has multiple benefits including water quality protection for groundwater and surface water, stable plant composition to resist invasive species, protecting pollinator populations, wild rice beds, and wildlife habitat and increasing resiliency to weather extremes. The plan should identify high priority natural habitats including wildlife and water quality complexes and corridors, and promote a combination of forest stewardship, conservation plantings, wetland projects and riparian activities that will protect, restore and link water quality and habitat corridors. Minnesota's Wildlife Action Plan is a resource that can be used.
- **Protecting Pollinator Populations**: Projects should identify opportunities to benefit pollinator populations through creating areas of refuge and providing floral resources that can benefit a wide range of pollinators. BWSR's Pollinator Toolbox provides guidance for projects and a Minnesota State Agency Pollinator Report is focused on meeting pollinator goals identified in Governor Dayton's Executive Order "Directing Steps to Reverse Pollinator Decline and Restore Pollinator Health in Minnesota".

- **Invasive Species and Landscape Management**: A cooperative approach across the watershed is recommended for invasive species management to address invasive species and noxious weeds or specially regulated plants across the watershed. Invasive species should be prioritized based on their risk to ecosystems, agriculture, recreation, and human health, as well as focusing on emerging weed threats. Adaptive management strategies should be used to address invasive species and maintain ecological functions and services within landscapes.
- **Soil Health:** The use of cover crops and perennial vegetation is recommended to promote good soil structure, organic content and microorganism populations that promote soil health and sustain productive ecological and agricultural landscapes. More vegetation more of the time increases evapotranspiration during the spring and fall seasons, reduces runoff and erosion and helps recycle nutrients. More roots more of the time increases organic matter in the soil profile, which increases infiltration and water holding capacity for plant available water, and also reduces runoff, erosion and nutrient transport.
- **Riparian Management:** Protecting and restoring riparian areas, including adjacent floodplains, have multiple benefits by reducing soil erosion, stream channel instability, phosphorus and nitrogen loading, and restoring flood attenuation, wildlife habitat and wetland functions. The Plan should identify high priority areas for riparian buffer easements, riparian erosion and sediment reduction, wetland restoration and other water storage and nutrient treatment opportunities, and target implementation efforts to those areas.

Groundwater

- **Groundwater Coordination and Prioritization:** Work with BWSR staff and agency partners (MDH, DNR, MDA, and MPCA) to outline any groundwater – related priority issues for this planning area. Take into account any Groundwater Management Areas, areas of groundwater concern, wellhead protection areas, and Drinking Water Supply Management Areas that have been identified. Address specific concerns about groundwater contamination and overuse that have been identified. Be sure to make use of existing groundwater data and publications. These include maps, data layers, and publications available from the Minnesota Geological Survey (MGS), DNR, US Geological Survey (USGS), and other sources.

Wetlands

- **Wetland Management:** Protection and restoration of wetlands provides benefits for water quality, peak flow reduction, habitat and wildlife. The plan should support the continued implementation of the Wetland Conservation Act and look for opportunities to improve coordination across jurisdictional boundaries. The plan should also identify high priority areas for wetland restoration and strategically target restoration projects to those areas. The Restorable Wetland Prioritization Tool is one resource that can be used to help identify areas for wetland restoration.
- **Wetland Prioritization:** The state is embarking on a wetland prioritization plan that will guide wetland mitigation in the future. Wetland restoration and preservation priorities you identify in your plan may be eligible for inclusion in this statewide plan in the future.

Easements

- Re-Invest in Minnesota (RIM): The State's Re-Invest in Minnesota (RIM) Reserve easement program considers several site specific and landscape scale factors when funding applications. Though it is dependent on specific program terms, the State does consider local prioritization of areas for easement enrollment.

Drainage Management (103E):

- Drainage authorities consider the permissive authority to incrementally implement permanent buffer strips of perennial vegetation or side inlet controls to control erosion and sedimentation, improve water quality, or maintain efficiency of the drainage system allowed in 103E.201 subd. 6. In addition a drainage authority shall order a 16-1/2 feet strip of **perennial vegetation** for any proceeding to establish, construct, improve or do any work affecting a public drainage system under any law that appoints viewers to assess benefits and damages pursuit to 103E.021 subd. 1. Chapter 103E drainage authorities be fully engaged from the early stages of the planning process. Use Section 103E.015 *CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE* and other provisions of drainage law identified below to capture both the extent and the limitations of drainage authority responsibility and authority for participating in the planning and implementation of conservation practices involving public drainage systems and their associated drainage areas.
- Prioritization of the watershed include landscapes and identification of Chapter 103E drainage systems and their drainage areas.
- Multipurpose drainage management be included in the approach for targeting best management practices (BMPs) within the drainage area of Chapter 103E drainage systems.
- Measurable outcomes for erosion and sediment reduction, nutrient reduction, improved instream biology, and detention storage to assist those outcomes, should include correlation to Chapter 103E drainage systems.
- Lay out a coordinated approach for how implementation of multipurpose drainage management practices identified in the plan can be coordinated with, and/or integrated early into 103E processes and proceedings. When projecting funding needs for BMP implementation on, or within the drainage area of, public drainage systems, incorporate use of Sections 103.011, Subdivision 5. *Use of external sources of funding*, 103E.015, Subdivision 1a. *Investigating potential use of external sources of funding and technical assistance, 103E.227 Impounding, Rerouting and diverting drainage system waters, and 103E.701, subdivision 6. Wetland Restoration and replacement; water quality protection and improvement. These enable public-private funding partnerships involving 103E drainage systems.*
- Drainage authorities consider the permissive authority in 103E.021 subd. 6 to incrementally implement permanent buffer strips of perennial vegetation and/or side inlet controls, where necessary to control erosion and sedimentation, improve water quality, or maintain the efficiency of the drainage system. Note that a drainage authority shall order minimum 16-1/2 ft. wide strip(s) of **perennial vegetation approved by drainage authority** for any proceeding to establish, construct, improve or do any work affecting a public drainage system under any law that appoints viewers to assess benefits and damages pursuant to 103E.021 Subd. 1.

Additional Considerations

- **Review of the Nonpoint Priority Funding Plan:** The state's Nonpoint Priority Funding Plan (NPFP) outlines a criteria-based process to prioritize Clean Water Fund investments—if planning partners are intending to pursue Clean Water Fund as a future source of funding, partners are strongly encouraged to consider the high-level state priorities, keys to implementation, and criteria for evaluating proposed activities in the NPFP.
- **Climate Change Review:** Please review the 'Climate Change Trends and Action Report-Updated December 13, 2016' and incorporate climate change information within your planning effort. This document includes information related to mitigation and adaptation.
- http://www.bwsr.state.mn.us/native_vegetation/BWSR_Climate_Change.pdf
- **Leech Lake River WRAPS:** The Leech Lake River Watershed Restoration and Protection Strategies approved in June of 2017 contains information related to existing watershed conditions, pollutant sources and TMDL information, and management strategies pertaining to restoration and protection.

We commend the partners for their participation in the planning effort. We look forward to working with you through the rest of the plan development process. If you have any questions, please feel free to contact either Maggie Leach at 218-203-4477 or Jeff Hrubes at 218-203-4478.

Sincerely,

Maggie Leach
BWSR Board Conservationist
1601 Minnesota Drive
Brainerd, MN 56401
Phone: 218-203-4477
Email: maggie.leach@state.mn.us

Jeff Hrubes
Clean Water Specialist
1601 Minnesota Drive
Brainerd, MN 56401
Phone: 218-203-4478
Email: jeff.hrubes@state.mn.us

cc: Leech Lake River Watershed- Planning Work Group
Ryan Hughes, Board of Water and Soil Resources (via email) ryan.hughes@state.mn.us
Annette Drewes, MDNR (via email) Annette.drewes@state.mn.us
Barbara Weisman, MDNR (via email) barbara.weisman@state.mn.us
Darrin Hoverson, MDNR (via email) darrin.hoverson@state.mn.us
Luke Stuewe, MDA (via email) luke.stuewe@state.mn.us
Chris Parthun, MDH (via email) chris.parthun@state.mn.us
Phil Votruba, MPCA (via email) phil.votruba@state.mn.us
Juline Holleran, MPCA (via email) juline.holleran@state.mn.us

MINNESOTA POLLUTION CONTROL AGENCY

Brainerd Office | 7678 College Road | Suite 105 | Baxter, MN 56425 | 218-828-2492

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

August 8, 2017

John Ringle
Director, Cass County Environmental Services Department
Cass County Courthouse
PO Box 3000
Walker, MN 56484

Dear Mr. Ringle:

Thank you for the opportunity to submit priority issues and plan expectations for the Leech Lake River (LLR) Watershed One Watershed One Plan project. The MPCA is committed in supporting this effort and providing assistance as needed throughout the process.

The Watershed Restoration and Protection Strategy (WRAPS) was recently completed (June 2017) for the LLR watershed and is available on the MPCA's LLR Watershed webpage at the following location https://www.pca.state.mn.us/water/watersheds/leech-lake-river . The WRAPS and supporting reports were developed through a very successful collaborative effort which included partners throughout the watershed. The MPCA would recommend the utilization of this document and supporting LLR watershed reports (e.g. Monitoring and Assessment, Stressor ID) where applicable during this important planning process. This includes Table 14 in the WRAPS "Strategies and actions proposed for the Leech Lake River Watershed" where specific strategies are described for future implementation considerations for water quality protection. Specific considerations within the WRAPS that the MPCA would like to highlight as priority issues and expectations include the following:

- Kabekona River – bacteria impairment. Continue to monitor this stream and work to resolve the ongoing bacteria issue through cooperative efforts with existing landowners and watershed partners.
- Work to maintain healthy forestlands. "Keeping Forests Forested" was one of the primary strategies proposed through this WRAPS process. To date the forestlands have done an excellent job protecting the quality of the existing surface and ground water resources within this watershed. If we continue to effectively manage and protect the forest component of this watershed it will go a long way in ensuring healthy water supplies into the future, in addition to providing important habitat for numerous flora and fauna species.
- School Trust Fund Lands - Monitor ownership and acquire and permanently protect, if threatened, critical school trust fund lands classified for real estate.
- Necktie River subwatershed – continue to explore options in the effort to restore and protect the resources within this high conservation potential area (as shown in the Zonation Model) and described in Table 14.
- Continue to pursue the implementation of protection strategies within the subwatersheds identified as high priority subwatersheds (Figure 24 - Priority HUC 12 Watersheds for Lake Protection in the Leech Lake River Watershed) in the LLR WRAPS.

- Consider climate variability in the overall planning process and the potential impacts to the natural resources within the watershed. This would include potential changes to the forest community (e.g. species composition, damage and subsequent management considerations from major wind storm events, invasive species (e.g. Emerald Ash Borer) management etc.
- Development and other considerations. State demographers project a population growth of up to 60% by 2030. Stormwater runoff from development, roads, and other nonpoint sources threaten water quality. Invasive species threaten biodiversity and healthy ecosystems. Working towards the overall protection of the water resources is critical for sustaining the local economy and natural heritage and character of this unique and beautiful watershed.

The MPCA looks forward to its continued water quality partnership with the watershed partners within the LLR watershed. Please feel free to contact me throughout the process if you need any assistance from the MPCA.

Sincerely,

Phil Votruba
State program Administrator Principal
MPCA Watershed Division

Minnesota Department of Natural Resources
Regional Operations
2115 Birchmont Beach Road NE
Bemidji, MN 56601

August 24, 2017

John Ringle, Director
Cass County Environmental Services Department
Cass County Courthouse
PO Box 3000
Walker, MN 56484
john.ringle@co.cass.mn.us

Dear Mr. Ringle:

Thank you for inviting the Minnesota Department of Natural Resources (DNR) to provide input on resource priorities for the Leech Lake River Watershed as you and your partners begin developing a Comprehensive Watershed Management Plan. I am writing on behalf of DNR Commissioner Tom Landwehr to share our resource priorities and express our support of this effort, which will help sustain and improve healthy water resources for the future.

Attached are priorities we encourage you to address in your plan – keys to protecting and improving the health of the watershed. Along with these priorities the DNR can assist with scientific data and information as needed. We look forward to participating and providing assistance to help ensure success of the One Watershed One Plan (1W1P) process.

Our lead staff person for this 1W1P project is Annette Drewes, Clean Water Legacy Specialist, 218-308-2468, Annette.drewes@state.mn.us, based at the Ecological and Water Resources co-located DNR office in Bemidji. Please contact Annette if you have questions or would like more information about the attached priorities or the types of technical support we can provide.

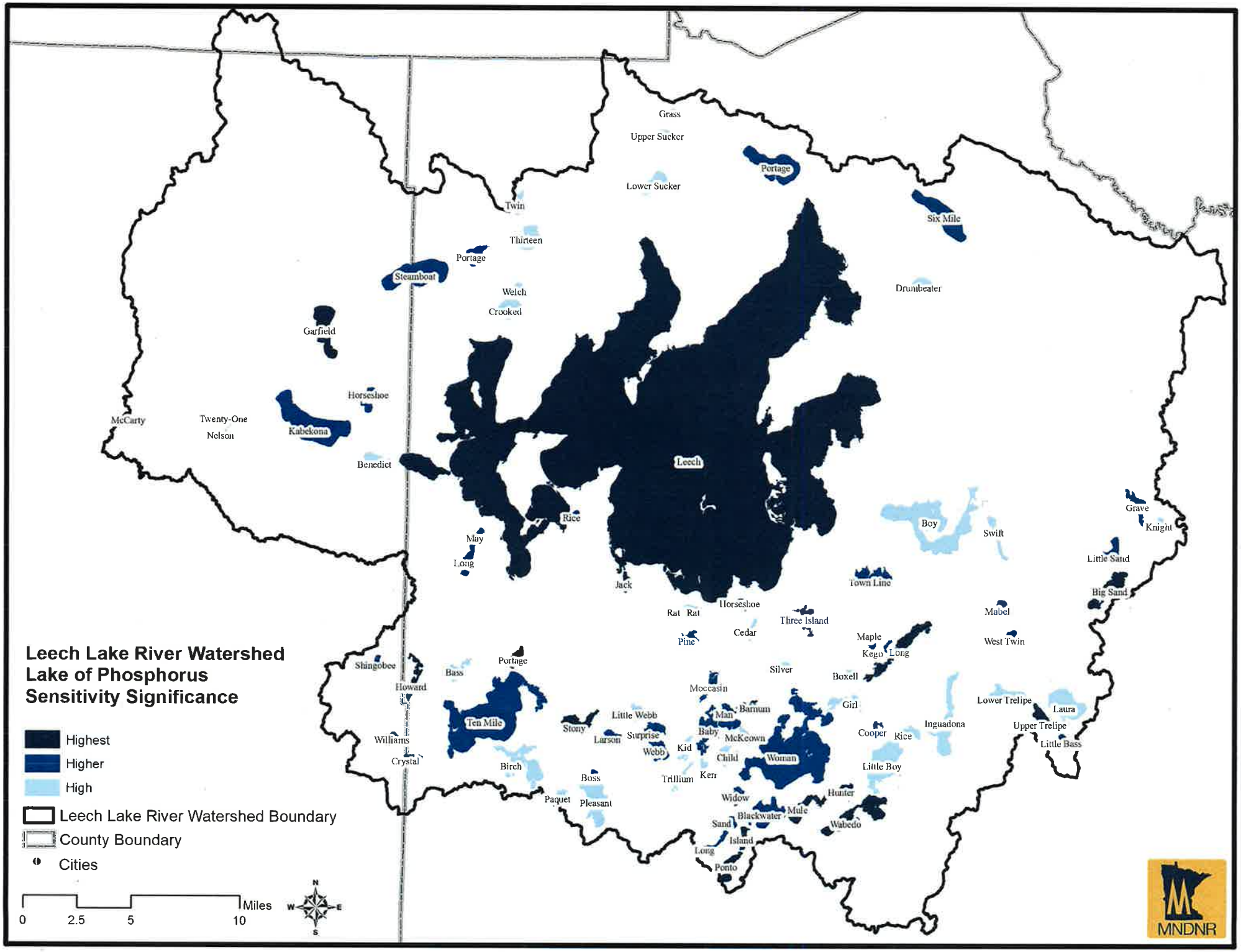
Also feel free to contact me directly if needed. As the DNR's Regional Director, I am committed to ensuring that DNR staff in the region are organized to support 1W1P planning efforts and implementation of future projects identified through the plan. We greatly value the opportunity to contribute to the process and hope the information we provide is helpful.Sincerely,

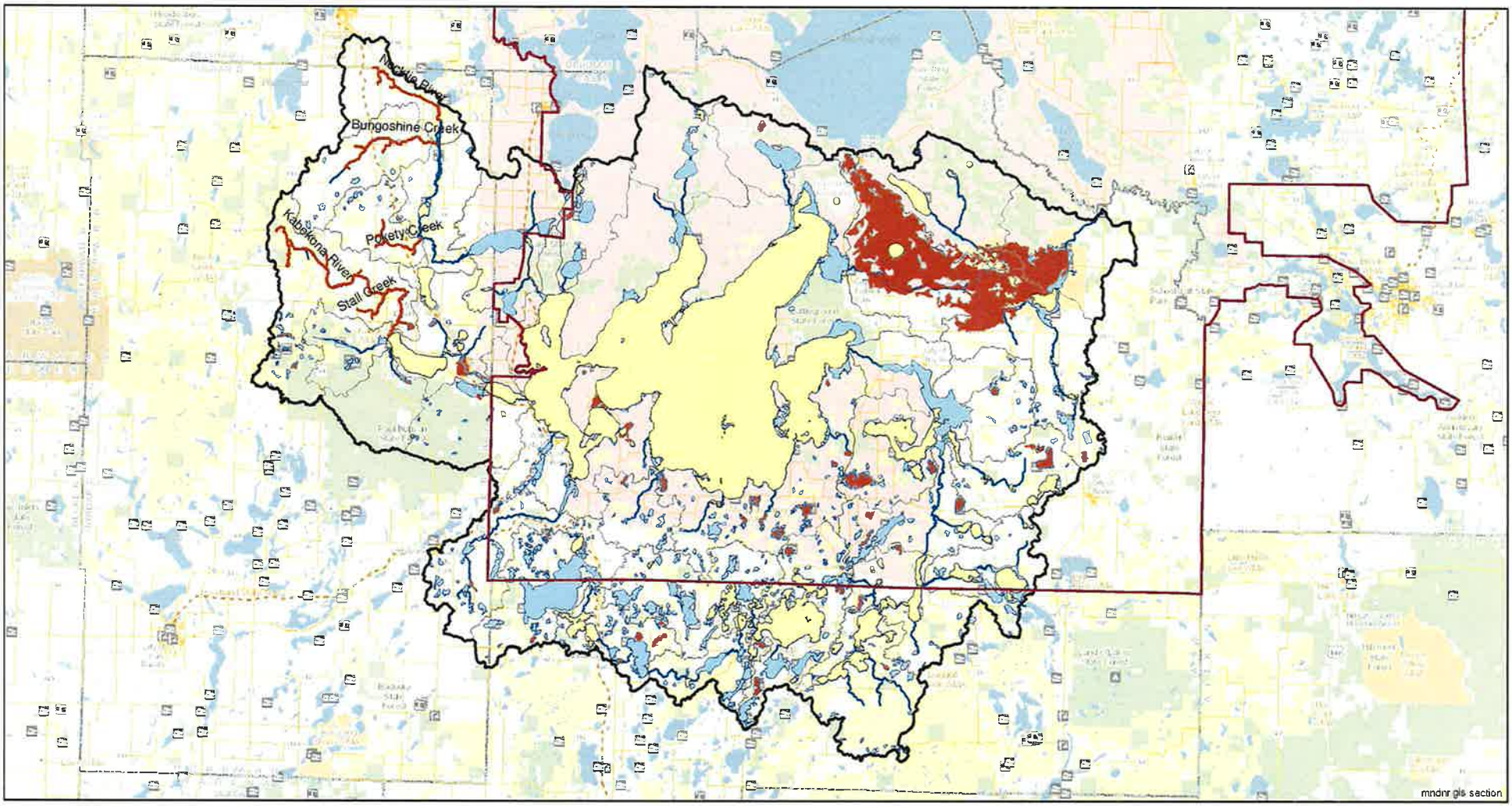
Sincerely,

Rita C. Albrecht
Northwest Regional Director

ec: Annette Drewes (DNR), Nathan Kestner (DNR), Barbara Weisman (DNR), Maggie Leach (BWSR), Phil Votruba (MPCA), Chris Parthun (MDH), Luke Stuewe (MDA)

Attachments: LLRW HVorSensRes, LLRW lakebiosig2, LLRW lakePsensig


Leech Lake River Watershed
Lake of Phosphorus
Sensitivity Significance
Highest
Higher
High
Leech Lake River Watershed Boundary
County Boundary
Cities
0
2.5
5
10
Miles
N
W
E
S
MNDNR
Grass
Upper Sucker
Lower Sucker
Twin
Thirteen
Portage
Steamboat
Welch
Crooked
Garfield
Horseshoe
McCarty
Twenty-One
Nelson
Kabekona
Benedict
Leech
Rice
May
Long
Jack
Portage
Six Mile
Drumbeater
Grave
Knight
Boy
Swift
Little Sand
Big Sand
Town Line
Mabel
West Twin
Rat
Rat
Horseshoe
Three Island
Pine
Cedar
Maple
Kego
Long
Silver
Boxell
Moccasin
Girl
Lower Trelipe
Laura
Upper Trelipe
Little Bass
Inguadona
Cooper
Rice
Little Boy
Shingobee
Howard
Bass
Portage
Ten Mile
Williams
Crystal
Birch
Stony
Little Webb
Larson
Surprise
Webb
Kid
Man
Barnum
Baby
McKeown
Child
Woman
Kerr
Trillium
Boss
Paquet
Pleasant
Widow
Blackwater
Mule
Hunter
Wabedo
Sand
Island
Long
Ponto



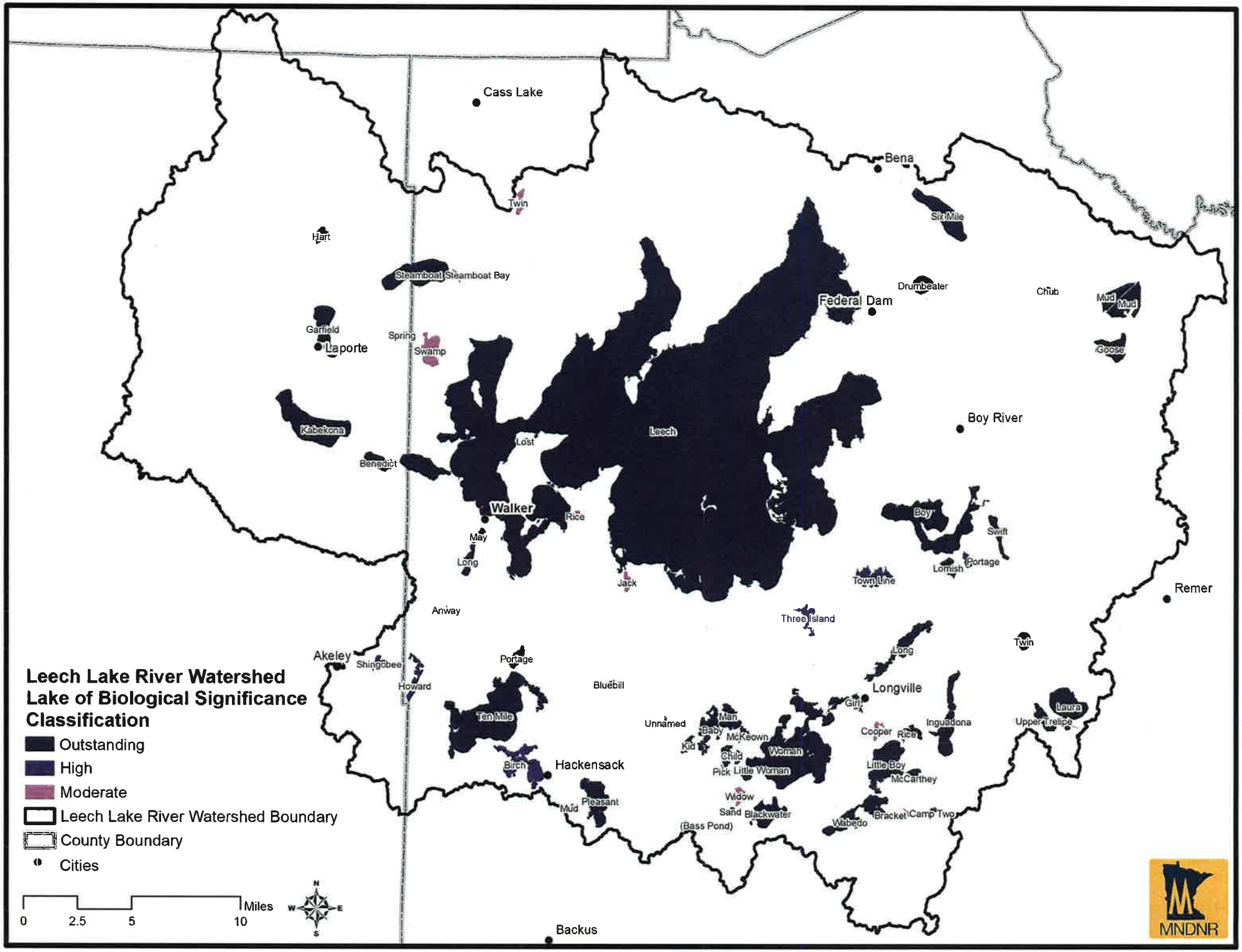
Leech Lake River Watershed - High Value or Sensitive Resources

Legend

- Public Waters Basins
- Public Watercourses
- HUC 12 Catchment subwatershed
- Shallow Lakes
- Trout Stream Designation
- Wild Rice Lakes Identified by DNR Wildlife
- Minnesota Important Bird Areas By Audubon MN

0 2.5 5 10 15 Miles

N


Cass Lake
Bena
Twin
Six Mile
Hart
Steamboat
Steamboat Bay
Drumbeater
Chub
Federal Dam
Mud
Mud
Garfield
Laporte
Spring
Swamp
Goose
Kabekona
Leech
Boy River
Lost
Benedict
Walker
Rice
Boy
Swift
May
Long
Lomish
Portage
Town Line
Jack
Remer
Three Island
Anway
Akeley
Shingobee
Howard
Portage
Bluebill
Long
Longville
Twin
Girl
Ten Mile
Unnamed
Man
Baby
McKeown
Kid
Child
Pick
Little Woman
Woman
Cooper
Rice
Inguadona
Laura
Upper Turtle
Little Boy
McCarthey
Birch
Hackensack
Widow
Sand
Blackwater
(Bass Pond)
Mud
Pleasant
Wabedo
Bracket
Camp Two
Backus
Leech Lake River Watershed
Lake of Biological Significance
Classification
Outstanding
High
Moderate
Leech Lake River Watershed Boundary
County Boundary
Cities
Miles
0
2.5
5
10
N
W
E
S
MNDNR

DNR Priorities for *Leech Lake River Watershed (LLRW)*

Protecting the very good water quality in the LLRW is a priority for the DNR. Much of this water quality is due to forested land cover across more than 50% of the watershed. Because of this focus on protection, our high level priority issues include Water Quality and Land Cover, Habitat and Outdoor Recreation and Emerging Issues.

Priority Resource Concerns & Opportunities	High-level priority issue
• **Leech Lake Watershed has very good water quality overall.** Protecting water quality up front, through a combination of local controls and ordinances, by maintaining existing undeveloped public lands and private lands in a conservation status and other measures available to local government, is much more cost effective than trying to fix impaired waters. o **Protect those high-quality unimpaired waters at greatest risk of becoming impaired, including designated trout streams, shallow lakes, wild rice lakes and lakes that are highly sensitive to phosphorus**. These have been identified in the WRAPS process, and DNR staff can assist with protection strategies. Cold water streams that support trout include the headwaters of the Necktie, Kabekona and Bungashing (all in NW corner of watershed). Leech Lake, Kabekona, Steamboat, Woman and Ten Mile are just a few of the lakes with higher or highest sensitivity to phosphorous (see attached maps *Lakes of Phosphorous Sensitivity Significance* and *High Value or Sensitive Resources*). o **Consider planned growth strategies that protect environmental infrastructure and promote the value of conservation lands as it relates to water quality.** Public lands (undeveloped) and private lands in a conservation status protect water quality by maintaining cover, reducing runoff and infiltrating water. The DNR has private lands and wildlife habitat specialists, technical resources, and recommendations on funding sources. o **Consider strengthening local controls that protect water quality**, such as shoreland, wetland ordinances, stormwater infrastructure, livestock and manure management. Keeping water quality protection in mind when planning expansion of new recreation opportunities (e.g., public water accesses) and development can prevent expensive fixes to water quality in the future. • **Manage, maintain and enhance forest cover** within the watershed. A well-managed forest is the best land use we have in Minnesota to protect water quality. Keeping forest lands forested, implementing water quality best management practices (BMPs) and site-level forest management guidelines are important to maintaining water quality. o **Private forest lands are vulnerable to conversion to non-forest land uses.** The DNR can help identify tracts of privately owned forestland at risk of development and help promote sustainable timber harvest management to protect high-priority fisheries. The DNR has a Private Forest Management Program and staff who can provide technical guidance and information on resources for landowners.	**Water Quality and Land Cover**

o **Research shows that water quality BMPs are effective when implemented on forested watersheds.** Promoting BMPs and providing guidance on implementation are strategies that can protect water quality in a forested landscape. The Minneosta Forest Resource Council has guidelines related to riparian area management, wildlife habitat, and soil productivity.	
• **Habitat corridors, natural shorelines and large, intact tracts of forestland** are important for sustaining the healthy fish and wildlife communities that support public recreation opportunities. More than 50% of the watershed is designated an Important Bird Area, as identified by Audubon Minnesota and DNR – areas that provide critical habitat for migrating and resident birds (see attached map *High Value or Sensitive Resources).* o **Lands in Hubbard County and along the Boy River corridor** are most at risk. o **Reduce landscape fragmentation and protect natural shorelines.** The DNR can provide technical assistance and identify those lakes and habitats with high biodiversity and significant natural features, important for maintaining healthy watersheds The larger lakes with outstanding biological significance include Leech, Steamboat, Kabekona, Ten Mile, Woman and Boy, as well as more than a dozen smaller lakes. (see attached map *Lakes of Biological Significance*). o **Where appropriate, restore aquatic connectivity to improve fish passage and water quality**. High water levels, dams and culverts can impact habitat for fish and birds, increase erosion and restrict movement of species. DNR hydrologists and stream specialists can help identify issues and look for solutions.	**Habitat & Outdoor Recreation**
• **Plan for changes in the watershed.** Awareness of and planning for changes potentially threatening the watershed, including invasive species and a changing climate, should lead to a more resilient watershed capable of adapting to these changes. o **Enhance the ability of the land to withstand changes in precipitation patterns, adapt to increasing temperatures, and recover from severe weather events.** o **Address terrestrial and aquatic invasive species**. The DNR has data and resources that can help identify strategies, programs or funding.	**Emerging Issues**

MDH
Minnesota
Department
of Health

PROTECTING, MAINTAINING & IMPROVING THE HEALTH OF ALL MINNESOTANS

August 21, 2017

Mr. John Ringle
Director, Cass County Environmental Services Department
Cass County Courthouse
PO Box 3000
Walker, MN 56484

Re: Initial Comment Letter – *Leech Lake River Watershed One Watershed, One Plan*

Dear Mr. Ringle:
Thank you for the opportunity to submit comments regarding water management issues for consideration in the 1W1P planning process for the Leech Lake River Watershed. Our agency looks forward to working closely with the local government units, stakeholders, and other agency partners on this initiative.

The Minnesota Department of Health's (MDH) mission is to protect, maintain, and improve the health of all Minnesotans. An important aspect to protecting citizens' health is the protection of drinking water sources. MDH is the state agency responsible for implementing programs under the federal Safe Drinking Water Act.

Source Water Protection (SWP) is the framework MDH uses to protect drinking water sources. The broad goal of SWP in Minnesota is to protect and prevent contamination of public and private sources of drinking water, groundwater and surface water, using best management practices and local planning. Core MDH programs relevant to watershed planning are the State Well Code (MR 4725), Wellhead Protection Program (MR 4720) and surface water intake protection planning. These programs result in a strong focus on groundwater management to protect drinking water sources.

One of the three high level state priorities in Minnesota's Nonpoint Priority Funding Plan, "Restore and protect water resources for public use and public health, including drinking water", aligns with our agency's mission and informs our recommendations to your planning process.

MDH Priority Concerns:

Protection of public water supply drinking water sources. Wellhead protection planning involves the delineation of Drinking Water Supply Management Areas (DWSMAs). The DWSMA boundary establishes a protection area through an extensive, science-based evaluation that determines the contribution area within a source aquifer to a public water supply well. In the wellhead protection planning process, the vulnerability of the source aquifer to contamination from the land surface is also assessed.

- Consider DWSMAs as priority areas within the watershed. The vulnerability of a DWSMA determines the level of risk posed by various land uses and potential sources of contamination. The land management needed, and the implementation practices utilized to protect drinking water in a DWSMA, can be targeted and tailored based on the vulnerability.

Protection of drinking water sources for private wells. Many residents in the Leech Lake River watershed rely on private wells for the water they drink. There are 6,866 private wells with known locations in the watershed; of these, 2,239 are located in a highly vulnerable setting. No public entity, however, is responsible for water quality testing or management of a private well after construction is completed.

- Local governments are best equipped to assist private well owners in maintaining the water quality of their wells. Land use management and ordinance development can have significant impact on protecting private wells. Other suggested activities to protect private wells include: hosting well testing or screening clinics, providing water testing kits, working with landowners to better manage nutrient loss, promoting household hazardous waste collection, managing stormwater runoff, managing septic systems, and providing best practices information to private well owners.

- Prioritize the protection of private wells. Utilize information regarding pollution sensitivity of the upper-most aquifers and wells, and nitrate and arsenic results from well testing, to target areas within the watershed for implementation activities.

Unused 'abandoned' wells. Unused, unsealed wells can provide a conduit for contaminants from the land surface to the sources of drinking water. Sealing unused wells can be particularly important when they penetrate a confining layer above a drinking water source aquifer.

- Prioritize sealing unused wells. This is a central practice in protecting groundwater quality. However, when resource dollars are limited, it is important to further evaluate an unsealed well by examining the risk the unused well poses to active public water supply wells or to an aquifer used by many private wells (private well density).

Data and information provided by or available from MDH:

Public Drinking Water Information – Where do people get their drinking water from in the Leech Lake River Watershed? It can be assumed that all residents obtain their drinking water from groundwater sources.

There are eleven community public water supply systems that are located in the watershed, with the following municipalities actively engaged in wellhead protection planning – Akeley, Hackensack, Laporte, and Walker.

In addition to the community public water suppliers, there are also noncommunity public water suppliers. These public water suppliers provide drinking water to people at their places of work or play (schools, offices, campgrounds, etc.). There are three nontransient and 261 transient noncommunity public water supply wells in the watershed.

For additional information regarding the drinking water sources for both community and noncommunity public water suppliers, review the Source Water Assessments located at http://www.health.state.mn.us/divs/eh/water/swp/swa/index.html. MDH developed these assessments using existing data such as water sampling results, water system surveys, and well records.

ESRI ArcGIS Shapefiles of the Drinking Water Supply Management Areas (DWSMA) in the watershed and other helpful downloadable geospatial data sets are located at http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm.

Enclosed are four figures that will be helpful:

- A figure titled "Leech Lake River Watershed - Pollution Sensitivity of the Uppermost Aquifers". This map is the same as the DNR's "Pollution Sensitivity of Near-surface Materials dataset, and shows the ease with which recharge and contaminants from the land surface may be transmitted into the upper-most aquifer on a watershed scale. This information can be used to prioritize areas and target implementation activities.

- A figure titled "Leech Lake River Watershed - Pollution Sensitivity of Wells". This map illustrates areas in the watershed that are most geologically sensitive based on the vulnerability of the aquifers in which wells are completed. This information can be used for targeting implementation activities based on the pollution sensitivity of drinking water sources.

- A figure titled "Leech Lake River Watershed - Pollution Sensitivity of Wells and Nitrate Results". This map indicates what we know about the sensitivity of wells to contamination and combines it with nitrate results to highlight areas of the watershed

where there is known nitrate contamination of drinking water wells. This figure can help target implementation activities aimed at reducing nitrate levels in the sources of drinking water.

- A figure titled "Leech Lake River Watershed - Arsenic Results". This map shows where wells in the watershed contain elevated arsenic levels.

Efforts are currently underway to provide this information in an ArcGIS shapefile format for use in analyzing, prioritizing, and targeting implementation activities.

Lastly, the MDH, along with its state agency partners, are developing a Groundwater Restoration and Protection Strategies (GRAPS) report for the Leech Lake River Watershed. GRAPS will provide information and strategies on groundwater and drinking water supplies to help inform the local decision-making process of the 1W1P.

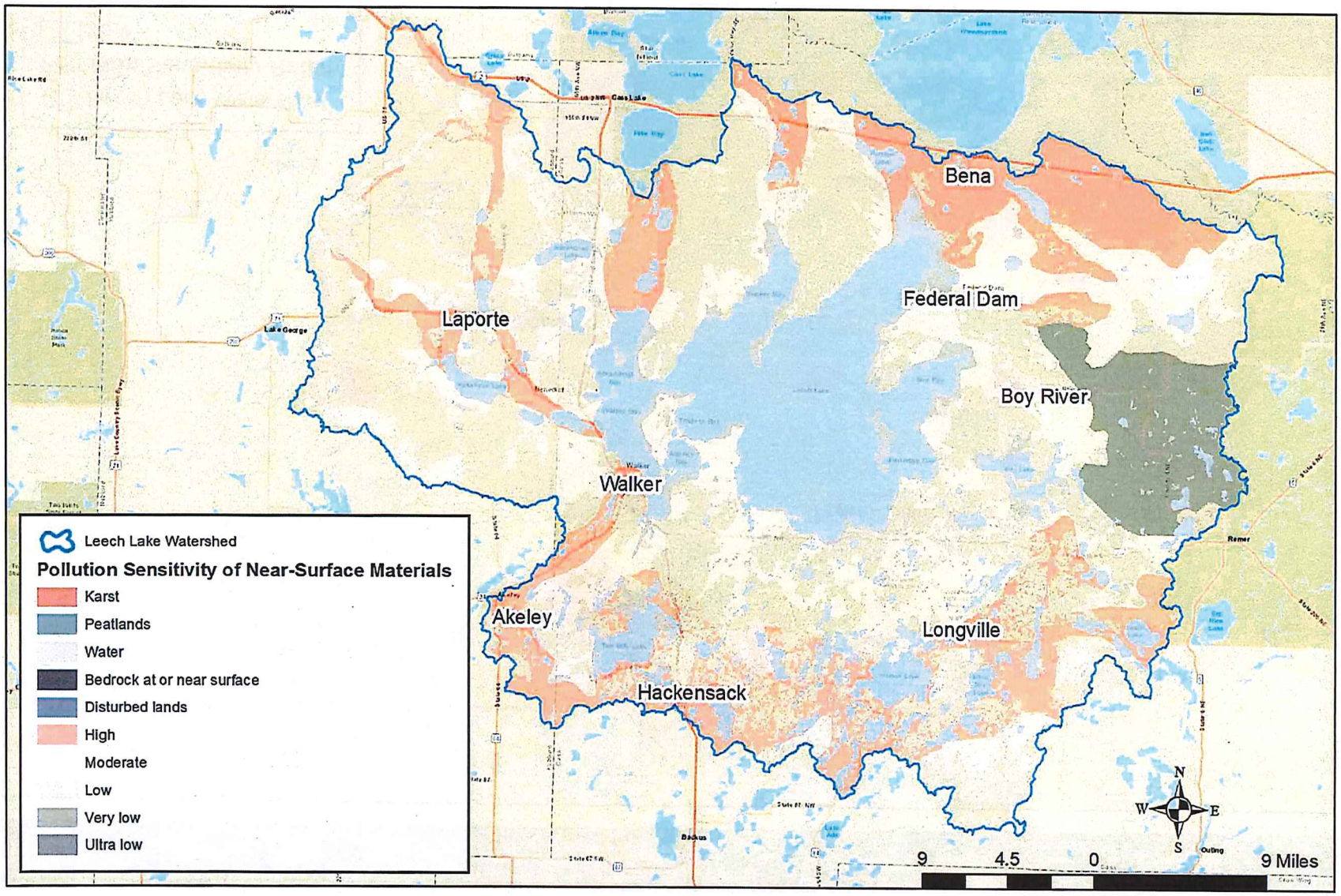
Thanks for the opportunity to provide initial comments on MDH watershed priorities.

Chris Parthun

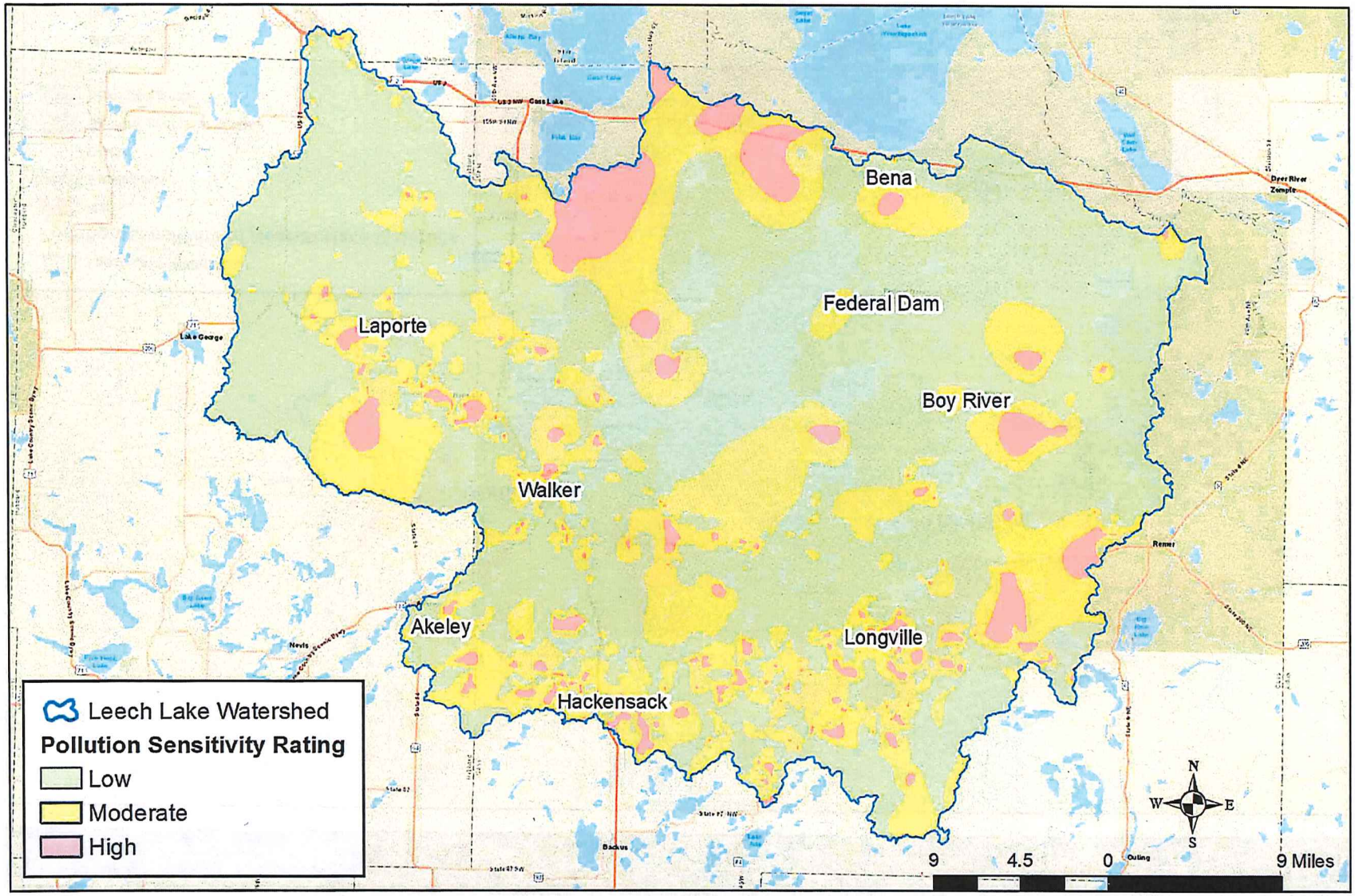
Christopher E. Parthun
Principal Planner
Source Water Protection Unit
Environmental Health Division

CC via email:
Maggie Leach, BWSR
Jeff Hrubes, BWSR
Phil Votruba, MPCA
Annette Drewes, DNR
Luke Stuewe, MDA

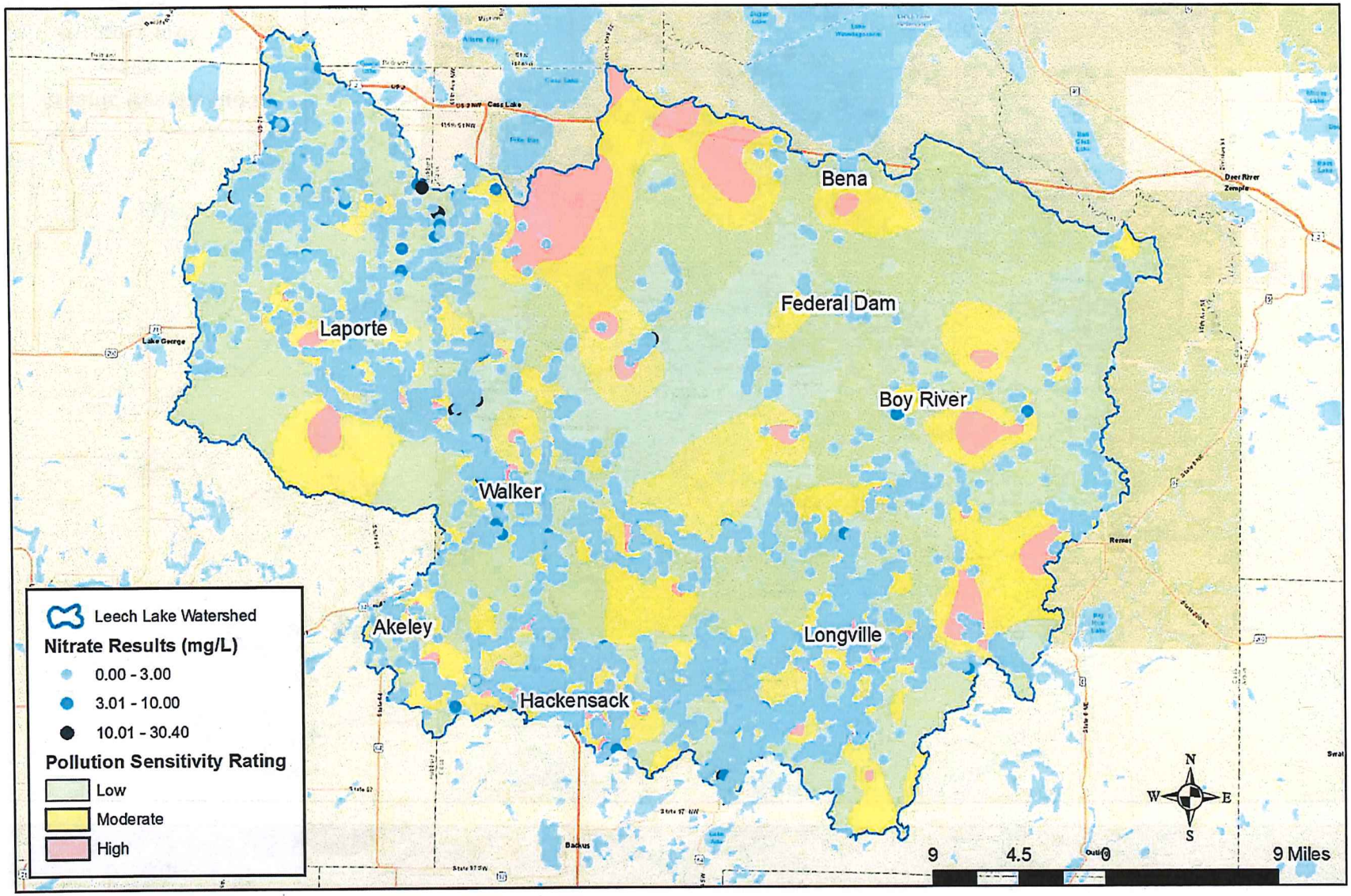
Leech Lake River Watershed - Pollution Sensitivity of Uppermost Aquifers



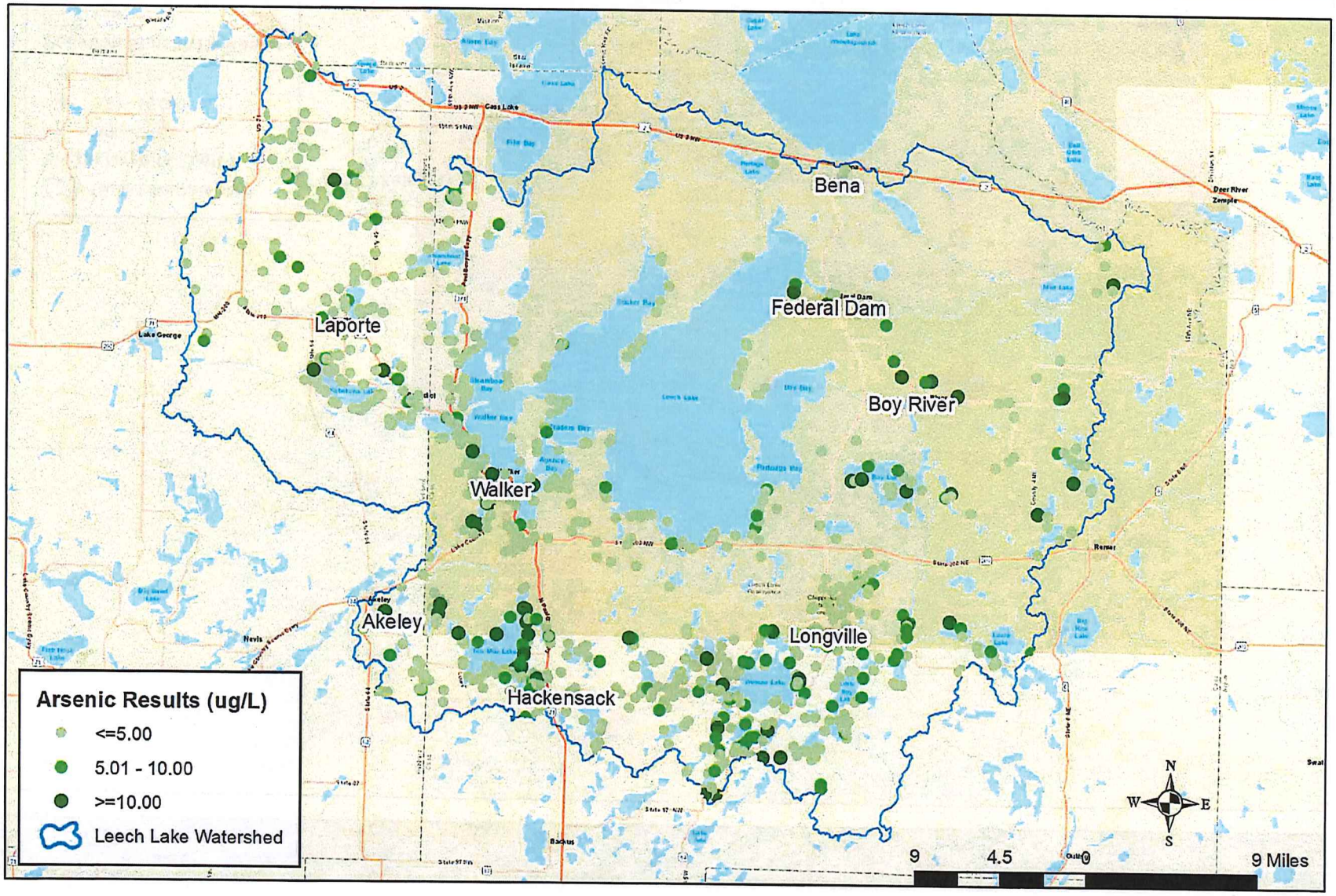
Leech Lake River Watershed - Pollution Sensitivity of Wells



Leech Lake River Watershed - Pollution Sensitivity of Wells and Nitrate Results



Leech Lake River Watershed - Arsenic Results



HUBBARD COUNTY HC COLA
P.O. BOX 746
PARK RAPIDS, MN 56470
www.HubbardCOLAmn.org HCCOLAmn@gmail.com

September 5, 2017

John Ringle
Director, Cass County Environmental Services Dept
Cass County Courthouse
P.O. Box 3000
Walker, MN 56484

Subject: Water Management Issues to Address In the Leech Lake River 1W1P

Dear John,

The Hubbard County Coalition of Lake Associations (HC COLA) discussed the water management issues that we feel the process and resulting plan should address and our expectations for the Leech Lake River One Watershed One Plan (1W1P) at our August 31st meeting.

The following is our water management issues list:

Aquatic Invasive Species (AIS)
Septic Systems
Sediment Runoff
Stormwater
Climate Change Affecting Tulibee Refuge Lakes and Other Lakes by Warming Water
Winter Salt and Summer Chlorides on Roads

For Lakes, Rivers, Streams, Groundwater, Drinking Water in Private Wells and Public Wells:
- Nitrates
- Pesticides
- Fungicides
- Herbicides
- E-Coli

For Groundwater Depletion:
- Drinking Water Availability in Private Wells and Public Wells
- Lake, River and Stream Levels

Hubbard County Coalition of Lake Associations ("HC COLA") is a coalition of 30 lake associations and their approximate 2,100 members. HC COLA's mission is to protect and enhance the quality of our lakes and rivers, preserve the economic, recreational and natural environmental values of our shore lands and promote the responsible use of our waters and related habitats. HC COLA's mission enhances, promotes and protects the interests of lakeshore property owners, lake associations, local government, the general public and future generations.

If you have any questions or want to discuss these matters further, please contact our current HC COLA President, Sharon Natzel, at email address hccolamn@gmail.com.

Sincerely,
The Hubbard County Coalition of Lake Associations Board of Directors
The Hubbard County Coalition of Lake Associations Board of Directors

CC: Julie Kingsley, Hubbard County Soil and Water Conservation District (HC SWCD) Manager

From: Stuewe, Luke (MDA) <luke.stuewe@state.mn.us>
Sent: Tuesday, August 22, 2017 10:10 AM
To: john.ringle@co.cass.mn.us
Cc: julie.kingsley@mn.nacdnet.net; Julie A. Blackburn <Julie.Blackburn@respec.com>; Wagner, Margaret (MDA) <margaret.wagner@state.mn.us>
Subject: MDA Leech Lake River 1W1P Initial 60 day Comment Letter

Good Morning John,

On behalf of the Minnesota Department of Agriculture, thank you for the Leech Lake River 1W1P notification letter. We appreciate the invitation to submit water management issues and concerns. As a first step to planning for the 1W1P, we have compiled the following information for use by the team.

Minnesota Department of Agriculture Pesticide Water Quality Monitoring

The Minnesota Department of Agriculture (MDA) has been conducting pesticide monitoring in ground water since 1985, and in surface waters since 1991. Annually, the MDA completes approximately 250 sample collection events from ground water and 800 sample collection events from rivers, streams, and lakes across the state. In general, the MDA collects water samples from agriculture and urban areas of Minnesota and analyzes water for up to approximately 140 different pesticide compounds that are widely used and/or pose the greatest risk to water resources. All groundwater monitoring is conducted by MDA staff. Surface water monitoring is conducted by MDA and local organizations. All monitoring is completed following annual work plans and standard operating procedures (SOP's) developed by the MDA.

The purpose of the MDA's pesticide monitoring program is to determine the presence and concentration of pesticides in Minnesota waters, and present long-term trend analysis. Trend analysis requires a long-term investments in monitoring within the MDA's established networks. The MDA releases an annual water quality monitoring report that includes all pesticide water quality data and long term trends available at www.mda.state.mn.us/monitoirng. The MDA will continue to conduct statewide pesticide monitoring in the future and will provide additional information related to the occurrence of pesticides in Minnesota waters.

Nitrogen and Pesticide Use

The MDA surveys farmers through the National Agricultural Statistics Service (NASS). A summary of the data is attached as a PDF to this email. The most recent nitrogen use survey was for the 2014 crop year and the most recent pesticide use survey was for the 2013 crop year. For reference, the University of Minnesota fertilizer recommendations are found here:

http://www.extension.umn.edu/agriculture/nutrient-management/nutrient-lime-guidelines/fertilizer-recommendations-for-agronomic-crops-in-minnesota/index.html

Fertilizer Recommendations for Agronomic Crops in ...

www.extension.umn.edu

Fertilizer Recommendations for Agronomic Crops in Minnesota. Daniel E. Kaiser, Extension Soil Scientist; John A. Lamb, Extension Soil Scientist; and Roger ...

The attached nitrogen use information is from the 2014 nitrogen use report, specifically the Irrigated and Non-Irrigated Sandy Soils BMP regions. Based on the information attached, the MDA would suggest that nutrient management be encouraged as a strategy to meet water quality goals. This would encouraging producers to collect soil nutrient samples, and to test their manure, to identify the N & P that could be credited. Nitrates are a priority resource concern for MDA in this region primarily for groundwater, due to the high hydrologic conductivity of the sandy soils, but also for runoff contributions to surface water.

The attached pesticide use information is from the 2013 pesticide use report, specifically Area 4 – Central Sands.

Groundwater

The MDA has not conducted any groundwater monitoring in this watershed nor does it expect to begin in the near future.

Surface Water

The MDA completed five pesticide water quality sample collection events from three different lakes in the Leech Lake River watershed from 2007-2012. Given the low agricultural land use density, MDA does not have immediate plans to add surface water monitoring locations in the Leech Lake River watershed in the near future.

Agricultural Edge-of-Field

The MDA has not conducted any edge-of-field monitoring in the Leech Lake River Watershed nor does it expect add any sites in the near future.

Township Testing Program

The Leech Lake River Watershed does not have any townships which fall within MDA's Township Testing Program. The MDA has identified townships throughout the state that are vulnerable to groundwater contamination and have significant row crop production. More than 70,000 private well owners will be offered nitrate testing in over 300 townships per 2019. The sample schedule can be found on a handout downloadable here, which includes more background information. MDA sampled six (6) vulnerable townships in 2016 in Hubbard County, but they are all to the southwest of the Leech Lake River watershed. We do not have any plans for sampling in Cass County. An overview of the Hubbard County nitrate levels can be obtained

at this link:
http://www.mda.state.mn.us/~/media/Files/protecting/cwf/hubbard2016initial.pdf

Additional MDA Resources

Since there is a significant portion of the watershed in agricultural production, we would like to bring to your attention a couple resources, listed below, that we encourage you to reference during the planning process.

The Ag BMP Handbook (*currently in the process of updating the 2012 edition*) provides a comprehensive summary of BMPs that are practical for Minnesota: http://www.mda.state.mn.us/protecting/cleanwaterfund/research/agbmphandbook.aspx

The 2015 Nitrogen Fertilizer Management Plan (NFMP): http://www.mda.state.mn.us/nfmp

A couple opportunities for BMP funding or cost-share:
The Minnesota Agricultural Water Quality Certification Program (MAWQCP) is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect our water. Those who implement and maintain approved farm management practices will be certified and in turn obtain regulatory certainty for a period of ten years. This is a planning program that should be included in the IWIP because it is an opportunity for agricultural producers to evaluate nutrient and field management practices within the Leech Lake River Watershed to reduce losses. There is currently one (1) certified producer in the Leech Lake River Watershed, totaling 600 acres.
http://www.mda.state.mn.us/awqcp

The AgBMP Loan Program is a water quality program that provides low interest loans to farmers, rural landowners, and agriculture supply businesses. The purpose is to encourage agricultural Best Management Practices that prevent or reduce runoff from feedlots, farm fields and other pollution problems identified by the county in local water plans.
http://www.mda.state.mn.us/agbmploans

The Nutrient Management Initiative (NMI) assists farmers and crop advisers in evaluating nutrient management practices on their own fields. This is a great opportunity for crop advisers to promote new management strategies and equipment that is available to boost yields and fertilizer efficiency for farmers, which will help reduce unnecessary losses to our water resources. http://www.mda.state.mn.us/nmi

We look forward to being involved in the 1W1P process. I will be the MDA representative on the team. If you have any questions please do not hesitate to contact me directly via the information listed below.

Thank you for your coordination,

Luke

Luke A. Stuewe
Hydrologist
Pesticide & Fertilizer Management Division
801 Roosevelt Ave; Box 3
Detroit Lakes, MN 56501
O: 218-846-7425
C: 218-850-9454
Nitrogen Fertilizer Management Plan: http://www.mda.state.mn.us/nfmp

Aug 1, 2017

Mr. John Ringle

I am writing this as a representative of the Boy and Swift Lake Association with interest in Your "One Watershed one plan" as published in the local paper.

Our lake association is focusing on watershed, water quality, and fishing only. We are monitoring through RMB labs, Zebra Mussle traps, and member input.

As a matter of financial resources and efficiency we would ~~~~ like to work in harmony with your efforts. The water bodies that have the Boy River running through them should all have a vested interest in its water quality.

We welcome any information, suggestions, ideas you can provide as we all have a common interest.

We would also like to have a chance to share and discuss our plans to assure our resources are used wisely. Thanks-

HANK DUERKOP 218-889-241
V. Pres Boy + Swift Lk Assn
2140 82nd ST. N.E.
Boy River, MN 56672

Wabedo-Little Boy-Cooper-Rice (WLBCR) Lakes Association August 23, 2017
P.O. Box 133
Longville, MN 56655

Subject: One Watershed, One Plan for Leech Lake River Watershed

To: John Ringle, Cass County ESD

We have received your letter dated July 10, 2017 in which you ask for input regarding the issues and expectations of the proposed new watershed plan. We have reviewed the issues and would like to submit the following for your consideration.

AIS (invasive species) prevention should be a prominent issue with serious consideration given to required decontamination prior to any boat launch in the watershed. A program modeled after the Wright County pilot program (but on a larger watershed level) could be a good start. The voluntary approach to AIS prevention in place today has been shown to be of limited value since new lakes are infested every year. Mandatory boat decontaminations with healthy penalties for non-compliance would be a far better solution. Expectations include an updated Cass County AIS plan, associated ordinances and processes.

Retaining our pristine water quality in this watershed benefits land owners, business owners, governments, etc. Priority should be given to ensuring excellent water quality through shoreline/forest preservation/conservation, revised land controls for riparian and near-riparian areas, and additional monies to fund these activities. Ordinance changes should include staffing/funding to provide for compliance checks on variance conditions (setbacks, etc.) at periodic times throughout the variance.

In order to protect our valuable watershed resources, pipelines, mining, and related activities that have the potential to cause long-term damage if accidents occur should be prohibited. If not prohibited, they should only be allowed if all damages can be mitigated and end of life removal costs are addressed prior to permitting these activities and project benefits for the watershed should be required to be shown to be higher than potential damages if accidents occur. Ordinances and review processes should be created/revised.

Groundwater should also be protected by reviewing any proposed uses for long-term effects and ordinance revisions should be considered to further protect this resource. Ordinance changes should include staffing/funding to provide for mandatory septic inspections every 5-10 years as well as review of practices like irrigation on sandy soils which could deplete groundwater supplies over long periods.

Fish and wildlife habitat should be protected by ensuring aquatic vegetation protection as well as forest and riparian protections.

Consideration should be given to limiting water uses, number/size of boats and motors, etc. on smaller water bodies that may not be able to sustain those activities.

This new plan should utilize input from the PCA WRAP process, the MN DNR sensitive shoreline process, the current Cass County AIS plan, the current Cass County Water Plan, as well as other related documents.

Thank you for your consideration,

Ron Stokesbary, WLBCR Lakes Association

APPENDIX D

PUBLIC COMMENTS

Table D-1. Summary of Public Comments Received (Page 1 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
Natural World	Lake water quality - noxious weeds, protecting, monitoring, improving AIS protection	1	fish, property, swim, drink, property values	buffer zone, stop chloride on roads, more monitoring capabilities, moving boats lake to lake enforcement of existing lakes
	Calcium chloride next to lakes - goes in lake and doesn't dissolve	1	fish becoming sterile	not to use close to lakes, move road away from lake, judicious use of chloride
	Invasive Species - introduction and impact to ecology	1	changes health of lake, economic impacts	education, more equipment
	Invasive Species in lake - changes water quality	1	maintain quality, sand for feet, biology, swimming	education, keep them out, eradication, prevention
	Groundwater - Nitrates	1	Tastes terrible	monitoring
	Forestry - clear cutting, converting to agriculture, management practices	1	reforestation, water quality, clean air, important economically, retaining habitat	more regulations, enforcement of regs, converting private land to public land
	Making new roads impacting buffers - no buffer law	1	nitrates in water	county needs to obey laws too
	Sensitive shore buffer - preserving what's already there	1	fish habitat, clean water, future generations	prevent runoff, zoning
	Quality of ground water - what and how to preserve	1	we are drinking it	testing to confirm chloride, change pattern of run off, add natural wetland filter, reduce contaminants
	Lake Water - deterring Invasive species, sustainability of water, temperature, integrity, clarity, composition of water	1	Keeping or maintaining native species, ecological balance of fish and vegetation depends on it	Monitoring, education
	Bacteria in rivers - cattle in Kabekona river, *E.coli*	1	people getting sick	moving cattle away, monitoring farmers
	Drinking water - maintain, prevent contamination nitrates	1	what we drink, personal health	lake setbacks, outdated septics
	Forest lands - protects water quality and habitat, etc.	1	clear cutting is a problem	reforestation, reduce harvest- FML, shoreline management plan
	Land vegetation, forested areas, over-development	1	forested areas keep things in balance	limited areas for development, increase state forests, protect areas with vegetation (> 60% protection)
	Pipes flowing into marina, storm water runoff, neighborhood dumps into lake (historical lake dumps-still doing it) - chlorine, sand, etc. into marina/Leech Lake dumping	1	lake becoming polluted, nitrates	city should clean boat slips, rain water gardens, drain ponds, talk to SWCD
	Preservation of lakes habitat and water quality - at risk because of first three	1	enjoyment of what we currently have, grandkids can go fish	education in classroom, protect forests
	Shoreland - no filtration, city launch fertilized	1	polluter, kills natural species, jeopardizes habitat	zoning, plantings, more buffer, setbacks, rip rap
	Wildlife - habitat	1	enjoyment and taking care of the planet	watch quality of water, air, and components of land and forests

Table D-1. Summary of Public Comments Received (Page 2 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
	AIS - new species into lakes	1	tourism, enjoyment of lakes future	
	Shoreland development/ over development - septic, fertilizer, altered hydrology, habitat loss	1	pollutes lakes, groundwater and surface water exchange	education, shoreland development plan
	Control any aquatic invasive species entering the watershed - Harm to the existing water ecosystem and balance	2	Maintain quality of the lakes and environment.	Increasing AIS inspector coverage, strengthening laws for violators, increasing boat decontaminating stations
	Commercial wells - lake level drop, private wells going dry	2	maintain high surface water levels, decrease property values, water impairment	set ordinances, limit the amount
	Control AIS, non-natives threaten natives	2	AIS have no natural predators to control them	Quarantine infested lakes and decontaminate all boats coming out of infested lakes.
	Invasive Species - water quality, habitat loss, reduce recreation	2	reduced fishery, reduced quality of shoreline, reduced recreational quality	quarantine infested lake (fast response), required decontaminations
	Protect surface and ground water - Deep wells for ag threaten ground water	2	Ground water is our drinking water	Limit deep wells for agriculture
	Preserving Habitat - good land is gone, wetlands need to be preserved	2	keep questionable land from being developed and impairing water	ordinances to prevent development and enforcement of rules
	Preserve prime habitat - loss of forest land that helps filter water for lakes	2	will help clean water	preserve forest land through purchase or easement
	Reduced winter kill of invasive species from warmer winters - fast spread of invasive species	2	degrades landscape	
Climate and Risk	Water is getting to warm, fire risks - fish disappear, more vegetation, affects tree species, changing species	1	lose fishing and hunting, habitats change, nothing is safe anymore	limit development, control burns, awareness & education
	Tree species getting hit with invasive species/how climate will affect forests - ground water/lakes impacted, climate change	1		cut ash species, big trees not little ones
	Natural resource knowledge and caring - ignorant or arrogant to the issues, risk to the resources	1	if you don't care nothing is going to change	education, personal responsibility
	Air quality - climate variability, straight line winds	1	air quality issues, respiration and allergies, sanitation work on fire burns	education, more long-lived species
	Invasive species both terrestrial and aquatic - affects lakes, trees, etc.	1	destroys lakes and trees, fire hazard	enforce existing laws, education, strengthen laws about transportation, legislature

Table D-1. Summary of Public Comments Received (Page 3 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
	Lowland water is gone - they were feeder buffer, no more not filtering	1	water not as clean	divert water from culverts running into lakes
	AIS - bringing other species into lakes	1	natural species have no defense	monitoring boats, docks, etc. educate public
	Destroying of forests for agriculture purposes - removal of forests for activity that is impacting	1	loss of trees, O_2/CO_2, good buffer, air quality/ water quality	sustainable forest/working policies, easements, tough regulations
	Wildlife Species - threatened due to climate factor	1	less warblers, less eagles nests	individual commitment, education, watch drainage, fertilizers, composts, chloride on roads, mowing water edge
	Feedlots or row crop irrigation	1		
	Wildlife - dependent on maintaining existing climate	1	maintain ecology and natural environment (unique environment & ecosystem), 25% world's Muskies	license fees, recognize problems, be proactive, prevent over fishing
	invasive species	1		
	health of food chain in lake	1		
	Warming climate will cause loss of red pine forests - forests help clean the water	2	preserve water quality	reduced fossil fuel use
	Assess/plan for climate threat - need to be proactive for these changes	2	climate change is happening	?
	Warming of lakes will alter regime of fish - reduced fisheries	2	to preserve water quality	reduce fossil fuel use
	Air Quality - more people affected	2	natural life without medication	industrial regulations
	Prepare for short term effects - flooding, stronger storms	2	help to minimize damages	?
	Can we plan for less rain and snow?	2		put pressure on core of engineers for water
	Intense rainfalls lead to more flooding and degraded water quality - degraded water quality	2	water with high quality supports good quality of life	reduced fossil fuel use
	Pipelines through sensitive areas, pipeline harming ecology - build through least sensitive areas	2	concern that not necessary to come through	keep them away, dept. of commerce said no need
	Reduced winter kill of invasive species from warmer winters - fast spread of invasive species	2	degrades landscape	reduced fossil fuel use
Quality of Life	Economic prosperity improved, sustainable standard of living - lack of employment opportunity, affordability of housing, remoteness of transport	1	drain of young people to cities, we need to retain skilled professionals	improve internet connections, enables work from home - remote business, more state funding, improve health care cost by reducing them

Table D-1. Summary of Public Comments Received (Page 4 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
	Stormwater runoff - chloride sand in water	1		settling ponds, rain gardens
	Lakes - preserve recreational aspect of lake	1	leave something important for future generations	education, reuse (not throw away), promotion of resources
	Sustainable minimal impact development - habitat loss, water quality degraded	1	keep high quality of water	enforce ordinances, zoning changes, establish carrying capacities for water ways
	Open space/green space - quality of life, tranquility, recreational value	1	maintain connection to natural world, human health and wellness, sustain economy	wise planning, good law enforcement, education, conservation easements, MN Land Trust
	Surface water quality - algae is ugly	1	ends up in our streams and lakes	education, zoning, alternative to salt on roads,
	Attitudes - humans are biggest threat to nature	1	caring for planet	stewardship, churches (sermons on gifts of nature, "Care of Creation")
	Promoting the area	1		
	Trace Pharmaceutical in ground water - heavy metals	1	health and safety of humans and others	proper disposal
	Youth - Not being exposed to the outdoors	1	too much time on black top, future decision makers	Get into nature through exposure and away from electronics or introduce electronics into nature (balance) ex. Geocaching
	Is there adequate monitoring sewage from treatment plant	1	should watershed be more inept then city areas	
	Biking/Hiking Trails- Transportation - enhance preserve, promote networks	1	brings people into area winter or summer	maintain, expansion, promote, more people that use will take more
	Development - too many variances	1	doesn't protect what its meant to	enforce what's there , better landscape planning for future generations
	Sustaining mineral impact development - think at maximum now, so how to support 60% more	1	loss of nature	foundations purchase lake shore to habitat to prevent, surrounded with canopies, (Grace Lake example)
	Trail/land impacts from ATV/OTV - damage to trails and environment	1	takes away from others, spends DNR co resources, costs money to maintain, erosion impacts waters and plants	more enforcement, reduced tire lugs, education (signs & youth), environmental education
	Farmland - need to eat & shouldn't kill us	1	better food and clean water are needed	get cattle out of stream
	Protecting quality of lake & water quality - keeping lake and water quality clean	1		lake association monitoring friends
	Quality Housing for Senior living - limited availability	2	want to stay in area	working w/ community, attitudes, posts/no fences, blend resources into natural setting
	Stimulate minimal impact develop - only "less desirable" land still available	2	these "less desirable" lands needed for water filters	zoning ordinances
	Geothermal use - in homes	2	overtaxing city water system	closed system of water heating, etc. soil temps not as overheated

Table D-1. Summary of Public Comments Received (Page 5 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
	Low population - keep population low	2	don't have to look at homes	maintain that 60% of shoreline
	Limit shoreline development (size and # of docks) - too many docks on lake degrading shoreline and habitat	2	habitat is valuable and should be protected	phase in ordinances to remove docks
	Preserve local character - maintaining "up north" feel	2	that is reason many of us bought here	zoning ordinances
	Use more green space - enhancing public property	2	enjoyment of life	
	Limit horsepower on motors -	2		
	Too much power is given to resort owners, not enough to cabin owner -	2		
Leadership	Money/funding - putting money to focus on bad water or continue helping to preserve good water	1	we want money for protection of water	
	Everyone wants clean lakes, etc., how do we get volunteers - how do we get people to do more than just like idea, how do we care about lakes	1	need to get next generation involved, older folks get younger folks involved	"future watershed leaders", Facebook, internet, more effective use of social media
	Broaden and increase level of concern for natural resources - not a lot of people tuned in, hard to care about what you don't know	1	knowledge carries weight, ignorance is terrible	communicate to a younger generation
	Watersheds - sustainability	1	quality of life	meetings like this, policies to standardize for 1w1p, watershed view helps avoid duplication of efforts and costs, best practice sharing, avoid duplication of efforts
	Leadership lacks interest - get townships involved in decisions, don't express enough conservation issues	1	keep govt locally involved, leadership doesn't always represent the population	hold local townships and communities on topic of interest
	Make sure that legislators adhere to state laws/regs - Morrison co, for example, letting buffers beginning	1	don't let counties have exemptions to buffer laws	effective leadership, more tax for usage, future watershed leaders
	Supporting of lake associations and volunteers - not caring, seasonal vs. permanent, limited involvement	1	without those people caring no one may be out there caring, working together to get more done	recruitment, season people have to inform legislators from their homes, fair representation by legislators
	Get youth involved - not involved	1	future custodians	freshwater festival in Hubbard County, cooperation w/ schools, hands on education, incorporate technology and manage a watershed in classroom
	Age, younger people not coming in -	1		

Table D-1. Summary of Public Comments Received (Page 6 of 6).

Value	Issue	Priority (1, 2, 3)	Comments	Possible Solution(s)
	Getting tribe to become more involved - some of lakes, etc. polluted	1		talk to them, get them involved. can't really tell them what to do
	Monitor or measuring progress - how do we measure; how do we know what is done or when you are improving	1		water monitoring program
	Non-funded implementation of studies - studies are done, solutions are identified but no money is available to implement a solution	1	nothing is done to improve water quality following study	have funds available to implement solutions
	Money - Difficult to raise	1	dedication of funds	needs to go where it is needed like Lessard sums does
	No young people involved in natural resource preservation - next generation less involved and aware	2	ongoing preservation	make an app to get younger people involved
	New leaders, recruit new members - who is going to take our place	2	sustainability	recruit, encourage, educate
	Promote effective leadership - leaders not knowledgeable enough about water-related issues	2	need to take actions now	solicit/elect knowledgeable leaders
	Elected and volunteer leadership is not effective - rules to do don't get implemented or enforced	2	nothing gets done to help preserve natural resources	more education and outreach
	Individual Commitment, not only county, state, etc.	2		

APPENDIX E

MOA

MEMORANDUM OF AGREEMENT

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

The Minnesota Counties of Cass and Hubbard by and through their respective County Board of Commissioners, and the Cass and Hubbard 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 Leech Lake 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, 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 Leech Lake 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 Leech Lake 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

date of the Board of Water and Soil Resources Grant Agreement, unless cancelled according to the provisions ofthis 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, 2017. 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. **Withdraw 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 ofleaving 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 purposed ofliability, as set forth in Minnesota Statutes § 471.59, subd. 1a(a), it is the intent that the Parties are considered a single governmental unit and 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 Cass 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)

by the Policy Committee with final Approval by the Hubbard 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 alternative(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. Also, Parties may appoint 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 alternative(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, 2017 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 Party's respective 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 provided notice of plan adoption pursuant to Minnesota Statues Chapters 103B and 103D.
7. **Fiscal Agent:** Cass County Soil and Water Conservation District will act as the fiscal agent for the purposes of this Agreement and agrees to:
    a. Accept all responsibility 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.

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 for both Parties).

8. **Grant Administration:** Cass 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:** Hubbard County Soil and Water Conservation District will act as the secretary for the purposes of this Agreement and agrees to provide the following services:
   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**
Neal Gaalswyk
County Commissioner
Cass County Courthouse
P.O. Box 3000, Walker MN 56468
(218)547-7204

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

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

Hubbard County
Ed Smith
County Commissioner
10099 130th Street
Park Rapids, MN 56470
(218)732-9249

Hubbard SWCD Supervisor
Lynn Goodrich
SWCD Supervisor and Chair
28933 State Hwy 87
Nevis, MN 56467
(218) -652-3130

Hubbard SWCD District Manager
Julie Kingsley
District Manager, Hubbard SWCD
603 Central Ave. N. Suite 100
Park Rapids MN 56470
(218)732-0121

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

PARTNER: _____

Ed Smith Date
Hubbard County Commissioner

PARTNER: _____

Hubbard SWCD Chair Date

PARTNER: _____

Julie Kingsley Hubbard SWCD District Manager Date

APPROVED:

BY: _____

Hubbard County Board Chair Date

APPROVED AS TO FORM *(use if necessary):*

BY: _____

Hubbard County Attorney Date

IN TESTIMONY WHEREOF the Parties have duly executed this agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: _____ 4-4-2017
Neal Gaalswyk, Cass County Board — Date

PARTNER: _____ 4-6-2017
Jane Ekholm, Cass SWCD Supervisor — Date

PARTNER: _____ 4-6-2017
John Ringle, Cass District Manager/Administrator — Date

APPROVED:

BY: _____ 4/4/2017
Cass County Board Chair — Date

APPROVED AS TO FORM *(use if necessary)*:

BY: _____

Cass County Attorney — Date

APPENDIX F

BYLAWS

Policy Committee Bylaws of the LLR One Watershed One Plan

Cass County Commissioner
Hubbard County Commissioner
Cass SWCD Supervisor
Hubbard SWCD Supervisor

ADOPTED May 24, 2017

These bylaws establish rules governing the conduct of business by the Policy Committee of the LLR One Watershed One Plan.

ARTICLE I: PURPOSE

1. The purpose of the Policy Committee is to make and carry out policy according to MN Statute §103B.101 subd 14 for One Watershed One Plans pertaining to that area within the LLR watershed.
2. The Policy Committee operates under a Memorandum of Agreement. The Member local units of government are Cass County; Cass SWCD; Hubbard County; and Hubbard County SWCD.

ARTICLE II: MEMBERSHIP PROVISIONS

1. The membership of the Policy Committee shall be comprised of at least four (4) members as designated by the governing board of each member local unit of government to include one County Commissioner from both Cass and Hubbard County with an alternate designated in case the original member cannot attend; one SWCD Supervisor from both Cass and Hubbard SWCD's with an alternate designated in case the original member cannot attend; and both District Managers for Cass and Hubbard County SWCD's with an alternate designated in case the original member cannot attend which are non-voting staff and offer support for the Policy Committee.
2. The membership of the policy committee, at the time of establishment, is comprised of the following six individuals: Neal Gaalswyk – Cass County Commissioner; Jane Ekholm – Cass County SWCD; John Ringle – Manager Cass County ESO/SWCD; Ed Smith – Hubbard County Commissioner; Lynn Goodrich – Hubbard SWCD; and Julie Kingsley – District Manager Hubbard County SWCD.
3. Members of the Policy Committee shall serve until the expiration of the Memorandum of Agreement for the LLR One Watershed One Plan Planning agreement to run concurrently with each Policy Committee member's term on his/her respective board.
4. In the event that a member of the Policy Committee resigns or is otherwise unable to complete his or her term, the member shall notify his or her appointing authority of the vacancy as soon as practicable. The local unit of government shall appoint a replacement member as soon as possible.
5. A Policy Committee member shall not take any action that may materially benefit the financial interest of that member, a member's family member, or a member's close associate, unless and until that member first discloses that interest for the record. The member who so discloses an interest may be present to answer questions related to that interest, but shall not advocate for nor vote on the action. If a Policy Committee member concludes that his or her interest does not create a conflict, but that there may be an appearance of a conflict, he or she shall disclose the interest for the record before participating in discussion or voting on an action.

ARTICLE III: OFFICERS

1. The Officers of the Policy Committee shall consist of a Chairperson, Vice Chairperson, and a Secretary elected by members of the Policy Committee at their first meeting
    a. The Chairperson shall:
        i. Serve as Chairperson for all meetings; and

ii. Sign and deliver in the name of the Partnership any correspondence pertaining to the business of the Partnership.

b. The Vice Chairperson shall:

i. Discharge the Chairperson's duties in the event of the absence or disability of the Chairperson.

c. The Secretary shall:

i. Maintain records of the Partnership.

ii. Certify records and proceedings of the Partnership.

iii. Ensure that minutes of all Policy Committee meetings are recorded and made available in a timely manner to the Policy Committee, and maintain a file of all approved minutes including corrections and changes.

iv. Provide for proper public notice of all meetings.

v. The Secretary may delegate a representative to record the minutes and perform other duties of the Secretary. The elected Secretary will sign the official minutes of all meetings following approval by the Policy Committee.

2. An Officer will serve until replaced by the election of a successor. No Policy Committee member may hold more than one office at a time.
3. In the event that an Officer cannot complete his or her term of office, the Policy Committee shall immediately elect from among its members an individual to fill the vacant position. The individual to be elected may not already be serving as an officer of the Policy Committee.
4. The Policy Committee will request the respective local unit of government participant to replace their representative member if that representative member misses two (2) consecutive meetings without notice to the Chairperson.

ARTICLE IV: MEETINGS

1. All meetings of the Policy Committee will comply with statutes and rules requiring open and public meetings.
2. The conduct of all meetings of the Policy Committee shall be generally governed by the most recent edition of Robert's Rules of Parliamentary Law.
3. A quorum of the Policy Committee shall consist of a simple majority of the members.
4. All votes by Policy Committee members shall be made in person, and no member may appoint a proxy for any question coming before any meeting for a vote.
5. Notice of Policy Committee meetings and a proposed agenda shall be mailed to all Policy Committee members not less than seven days prior to the scheduled meeting date of the Policy Committee.
6. The minutes of any meeting shall be made available to all Policy Committee members prior to the next meeting.

ARTICLE V – VOTING

1. A motion or resolution shall be approved by a favorable vote of a simple majority of the members present, provided enough members are present to make a quorum.
2. A supermajority vote of 75 percent of those members present shall be required for final plan approval for submittal to review.
3. A tie vote will be considered a "NO" vote. In case of a stalemate the issue will be referred to the respective county boards.

ARTICLE VI – COMPENSATION

1. Policy Committee members may be compensated by the member local unit of government they represent for meetings and expenses incurred, according to the policies of the local unit of government.
2. Policy Committee members may not be compensated for meeting time and expenses using funds granted by the state for the purpose of developing the *One Watershed, One Plan*.

ARTICLE VII – SUBCOMMITTEES OF THE POLICY COMMITTEE AND OTHER COMMITTEES

1. The Policy Committee may appoint subcommittees for the purpose of assisting the Policy Committee in the performance of its duties. Except for a Policy Committee member appointed to a subcommittee, no other member of a subcommittee shall be able to make motions for consideration to the Policy Committee, or vote on matters put before the Policy Committee.
2. The Policy Committee shall appoint an Advisory Committee and act to approve all Advisory Committee members. The Advisory Committee will routinely advise the Policy Committee on the content and development of the *One Watershed, One Plan,* on plan implementation, and on issues of policy and administration related to the plan.
    a. A member of the Policy Committee or an alternate will be assigned by the Chairperson to meet with the Advisory Committee as an ex-officio member.
    b. Each Partnership member local government unit shall designate a representative to the Advisory Committee.
    c. The Advisory Committee shall also include representatives from Minnesota's principal water management or plan review state agencies (Board of Water and Soil Resources, Department of Agriculture, Department of Health, Department of Natural Resources, and Pollution Control Agency). Each agency will designate a lead contact person from its agency to participate on the Advisory Committee. Additional agency or other persons may participate as Advisory Committee members depending on the desire of the Policy Committee or the needs of the Advisory Committee.
    d. The term of membership of the Advisory Committee shall be for the duration of the Planning Phase of the LLR One Watershed One Plan grant.
    e. The members of the Advisory Committee shall elect a chairperson, a vice chairperson, and a recording secretary to serve for the duration of the Planning Phase.

f. The Advisory Committee may form subcommittees to increase Advisory Committee effectiveness or to address specific topics or project areas. Each subcommittee shall report to the Advisory Committee.

ARTICLE VIII: MEETING LOCATION

1. All regular meetings of the Policy Committee will be held at a location within the LLR watershed.

ARTICLE IX: MISCELLANEOUS

1. Portions of these bylaws may be suspended temporarily by a two-thirds vote of the Policy Committee.
2. Addition to, alteration, or repeal of any part of these bylaws by the Policy Committee may be made at any meeting by a majority of the full membership, provided that thirty (30) days advance written notice of the proposed change has been given to each member of the Policy Committee.
3. The Policy Committee's official records and the requirements of the BWSR grant agreement shall be maintained by the fiscal agent,Cass County Environmental Services. The maintenance and disposition of these records shall be in accordance with applicable laws.
4. All expenses incurred by the Policy Committee or the Advisory Committee must have prior approval of the Policy Committee, and include a signed claim form itemizing expenses that is submitted to the Policy Committee for approval at their next meeting. All claims must be submitted no more than thirty (30) days after the month in which they were incurred.
5. These bylaws are intended to be consistent with applicable provisions of Minnesota Statutes Chapters 103B, 103C, and 103D. In all cases of omission or error, Minnesota Statutes Chapters 103B, 103C, and 103D will govern.

ARTICLE X – CERTIFICATION

1. These By-laws were adopted by a vote of 4 ayes and 0 nays by the members of the Policy Committee on May 24, 2017

_____

Neal Gaalswyk, Cass County Commissioner/Secretary LLR 1W1P.

APPENDIX G

COMMITTEE MEMBERS

APPENDIX G: COMMITTEE MEMBERS

Policy Committee

Jane Ekholm, Cass County Soil and Water Conservation District
Neal Gaalswyk, Cass County
Lynn Goodrich, Hubbard County Soil and Water Conservation District
Ed Smith, Hubbard County

Advisory Committee

Ben Benoit, Leech Lake Band of Ojibwe
Terry Bjorklund, City of Walker
Linda Blake, Association of Cass County Lakes
Levi Brown, Leech Lake Band of Ojibwe
Annette Drewes, Minnesota Department of Natural Resources
John Eaton, Leech Lake Association
Pat Gendron, City of LaPorte
Todd Holman, The Nature Conservancy
Darrin Hoverson, Minnesota Department of Natural Resources
Lindsey Ketchel, Leech Lake Area Watershed Foundation
Scott Kittleson, Natural Resources Conservation Service
Eric Krumm, Leech Lake Band of Ojibwe
Mark Lohmeier, Hubbard County Land Commissioner
Sharon Natzel, Hubbard Coalition of Lake Associations
Chris Parthun, Minnesota Department of Health
Timm Rennecke, United States Army Corps of Engineers
Todd Tisler, United States Forest Service
Phil Votruba, Minnesota Pollution Control Agency
Cindy Wannarka, Leech Lake Chamber of Commerce
Tim Terrill, Mississippi Headwaters Board

Planning Work Group

Kelly Condiff, Cass County Soil and Water Conservation District
Jeff Hrubes, Minnesota Board of Water and Soil Resources
Julie Kingsley, Hubbard County Soil and Water Conservation District
Chris Pence, Minnesota Board of Water Resources
John Ringle, Cass County Environmental Services

APPENDIX H

NATURAL WORLD VALUE MANAGEMENT LEVELS

Table H-1. High Quality Lakes

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
This category includes: High Water Quality Sensitive Lakes Cisco/Tullibee Wild Rice Declining/Threshold Lakes of Biological Significance DNR Sensitive Shorelines	• Protect high quality lakes, P-sensitive lakes through watershed pollutant management, shoreline management and invasive species control. • Enhance protection through non-implementation programs (A)			
	IMPLEMENTATION PROGRAMS • Encourage landowners in already defined priority areas of the watershed to participate in the Easement Program • Lake associations are engaged in insuring septic system compliance surveys and provide education on proper maintenance for riparian and non-riparian SSTS; provide low-interest loans and other incentive programs for non-compliant systems **(also, education, regulatory, incentives).** • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law. **(also, regulatory).**	IMPLEMENTATION PROGRAMS • The management team addresses priority actions addressed within local plans (e.g., WRAPS, County Water Plan, LLBO Plan, etc.). • Expand on Shoreline Project Implementation (pollinators) • Focus on the 14 Oligotrophic lakes identified within the WRAPS. • Expand programs to target 20 of the 51 Sensitive lakes identified within the WRAPS. • Additional focus on water temperature BMPs for the 12 Cisco Lakes within WRAPS. • Active water level management for wild rice stands within the WRAPS. • Expand programs to target the 39 Sensitive lakes identified within the WRAPS with focus on Highly Sensitive-ranked locations. • Focus on implementation related to fisheries management within Benedict, Garfield, Kabekona, Shingobee lakes • 25% Expansion of protection programs (e.g., forest & shoreline easements; SFIA). • Multiple-value implementation strategy prioritization. • Implementation of all projects within priority subwatershed identified as top priority within WRAPS (sections 3.2 and 3.4). • Periodically (as opportunities arise) acquire properties in fee title (AMA, WMA, etc.) to protect critical aquatic habitat, sensitive shorelands or identified spawning areas. • All acquired AMAs provide angling access. Some provide access for boats or small watercraft. • Freshwater protection is accomplished by spill and leak diversion systems, spill prevention plans, and cleanup. **(this may belong to another category)**	IMPLEMENTATION PROGRAMS • The management team addresses *additional recommended actions* addressed within local plans and additional strategies. • Expand on Shoreline Project Implementation (pollinators) • Expanded implementation across watershed as identified in WRAPS (section 3.4). • Expand programs to include the remaining 31 sensitive lakes as well as those lakes unevaluated in the WRAPS that have been determined to be Sensitive Lakes (10). • Expand BMPs to all Cisco lakes for water quality and temperature control. • Wild rice restoration on private and public lands. *(DNR wild rice management program – beaver control)* • Expand programs to target the additional Shoreline Sensitive with Moderate to Highly-sensitive ranking from DNR assessment. • 50% expansion of protection programs (e.g., forest & shoreline easements; SFIA). • Adaptive management within priority subwatersheds given results of monitoring (i.e., for any lakes not previously identified in the WRAPS as high-water quality). • Integrate Municipalities into programming. **(move to leadership)**	IMPLEMENTATION PROGRAMS • Full implementation across watershed as defined within WRAPS. • Adaptive management across watershed given results of monitoring. • Expand programs to additional Sensitive lakes (in addition to the 61 lakes evaluated, identified in the WRAPS). • Complete protection of all Moderate to Highly-sensitive lakeshores within the DNR assessment.
	A. See *Regulatory Controls and Enforcement, Operation and Maintenance, Outreach and Education, Research/Data Collection/Monitoring, and Funding programs section.* B. Does the management team control invasive species already in the lake? C. Does the management team effectively eliminate existing invasive species and ensure that invasive species stay out of the lake?			

Table H-2. Recreational Lakes

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
Recreational	•			
	IMPLEMENTATION PROGRAMS • Lake associations are engaged in insuring septic system compliance surveys and provide education on proper maintenance for riparian and non-riparian SSTS; provide low-interest loans and other incentive programs for non-compliant systems. **(also, education, regulatory, incentives).** • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law. **(also, regulatory).**	IMPLEMENTATION PROGRAMS • Determine best uses and resolve conflicts for targeted lakes. • Prioritize management efforts • Initiate management efforts • Incorporate the 10 identified lakes within the Park Rapids Fisheries Management Area portion of the LLR watershed not included in WRAPS report as priority lakes but have had Fisheries surveys conducted and Lake Management Plans completed. Most of those are smaller sized, often undeveloped or lightly developed. Many of the lakes that were identified as High Value/Priority could also be described as Recreational	IMPLEMENTATION PROGRAMS • Expand on management efforts within currently managed lakes and expand to new lakes.	IMPLEMENTATION PROGRAMS • Complete coverage of management for recreation in targeted lakes.
	Pleasant, Birch, Woman, Girl, Leech, Garfield, Web and other lakes with community beach areas. Pleasant Lake in Hackensack currently has the lowest percentage of watershed protection of any lake in the watershed. Leech Lake is a major concern (watershed protection, public access, permits for harbors, wild rice management, wave action, threat to spawning habitat, etc.).			

Table H-3. Impoundments

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
Impoundments	• Understand and plan for the effects of dam management within the Mississippi River • Preserve floodplain functions by maintaining optimal floodplain connection via flow control. • Manage impoundments for controls related to climate/flood risk. • Manage impoundments for controls related to recreation opportunity. • Manage temporal controls as related to macrohabitat, mesohabitat and microhabitat needs of fisheries. • Remove barriers to fish migration or provide bypasses. • Manage water quality of impoundments			
	IMPLEMENTATION PROGRAMS • As projects come forward and, in the Necktie, consider where improvements to water level management can be obtained. • Corps Mississippi flood control plan coordination (kicks in regularly during annual flooding at Aitkin; Impacts upstream as all other upstream lakes become storage reservoirs; this impacts spawning, aquatic vegetation issues, erosion). • Abandon improperly designed or functioning county ditches (Cass CD 13 is a priority). • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law. **(also, regulatory).** • Townships working with DNR on high water overflows to avoid blow-outs.	IMPLEMENTATION PROGRAMS • Implementation of priority projects related to mitigation of existing adverse impacts on flooding, water quality and recreational opportunities. Replace/resize culverts where needed on important road crossings in the watershed. Remove or modify dams top restore fish passage and stream hydrology. • Develop a Beaver management plan • Work with transportation authorities to implement a comprehensive culvert sizing and replacement program as part of road projects that effect priority water resources • Establish USFS partnership on culvert, water quality and other beneficial projects (as per what's being done in Itasca County). • Partner with USFS on earthen dam removal. • Define "impoundment" – categorize by type, ownership and management class. • Identify and define where improvements for water level management can be made that allows for meeting multiple goals such as wildlife management, streambank erosion, sediment movement, aquatic vegetation management, and flooding. • Assess impacts of infrastructure on bank and bed scour, flooding, floodplain connectivity, temporal habitat quantity/quality/connectivity and wild rice habitat. • Prioritize projects that benefit climate/flood risk management, recreational opportunity, habitat and water quality.	IMPLEMENTATION PROGRAMS • Implementation of hydraulic control projects that improve macrohabitat, mesohabitat, and microhabitat while addressing flood control. • Implementation of priority projects related to removal of fish barriers and protection from aquatic invasive species. • Work with transportation authorities to implement a comprehensive culvert sizing and replacement program as part of every road project	IMPLEMENTATION PROGRAMS • Implement a basin wide integrated reservoir management plan that focus on multiple benefits
	10 Year Opportunity Statements • Corps – Originally authorized for navigation purposes but now is utilized for flood control; Lake Pokegama becoming active – but haven't reached out to other lakes. The cost benefit analysis for an Aitkin "flood control project" was limited to the Aitkin area and did not consider upstream impacts, damages or opportunities. A cost benefit ratio would improve significantly if the entire upstream basin could work together to develop a feasibility study that considers upstream benefits for an Aitkin Area flood control project that could lead to combined funding sources for cost share opportunities, with the outcome of improving upstream flood impacts benefitting property damage reduction and enhancing natural resource management, outcomes, etc. • USFS – has worked in partnership w/Itasca county partnership regarding culverts, gave nearly $1M for AOP, water quality, and other benefited projects. They have replaced 30+ pipes since 2008. Can bring that over to Cass County/LLR watershed			

Table H-4. Impaired Lakes

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
Impairments	**Restore Hart Lake through focused work in the watershed and its main tributary**			
	IMPLEMENTATION PROGRAMS • This impairment will be addressed through DNR's Necktie priority habitat project.	**IMPLEMENTATION PROGRAMS** • Expand implementation on Hart Lake (address 15% of target load, with focus on Necktie River) and Enhance/Protect lakes (15% load reduction	**IMPLEMENTATION PROGRAMS** • Expand implementation on Hart Lake (address 50% of target load, with focus on Necktie River) and Enhance/Protect lakes (50% load reduction).	**IMPLEMENTATION PROGRAMS** • Complete implementation on Enhance/Protect lakes

Table H-5. High Value, Priority Rivers and Streams

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
Prior Designations by DNR and MPCA for High Quality recreation and Ecological Value Exceptional/Outstanding Water Trout/Groundwater-dependent Wild Rice	• Address stressors on high value/priority streams. • Preserve floodplain functions by limiting development and the impacts of development to maintain water management capacities and capabilities.			
	IMPLEMENTATION PROGRAMS • Incorporation of completed Habitat and Access Improvement work on Kabekona Creek (2017). Ongoing habitat and access improvements on Kabekona River done in cooperation with DNR fisheries and Trout Unlimited • Lake associations are engaged in insuring septic system compliance surveys and provide education on proper maintenance for riparian and non-riparian SSTS; provide low-interest loans and other incentive programs for non-compliant systems. **(education, regulatory, incentives programs as well).** • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law. **(regulatory program)** **Suggestions to consider** Avoid or mitigate impacts. Avoid or limit new development within the design frequency 3' above ordinary high or highest known elevation for waterways of all sizes, unless the project is water-dependent infrastructure that must cross or be adjacent to a waterway. Design water-dependent infrastructure to minimize flood impacts or waterway crossings. Project should maintain pre-development storage and should not increase flood events. (A)	**IMPLEMENTATION PROGRAMS** • Work with landowners on cattle exclusion from rivers Implementation focus on DNR and MPCA identified high quality recreation and ecological value resources identified within the WRAPS that need improvement. • Implementation focus on Trout Streams, and their un-named tributaries, of high value (Bungashing Creek, Kabekona River and Necktie River). • Prioritize those streams whose condition is projected to that adversely affect Wild Rice habitat (flow issues, not sulfates) • Periodically (as opportunities arise) acquire conservation easements along high priority trout streams. Easements provide angler access, protect riparian areas, and allow access for fisheries management **(also, in quality of life – recreation)** • Develop a Beaver management plan. Enhance connectivity and in channel sediment transport (connectivity/bedload). Modify or remove structures such as culverts that inadvertently trap sediment and to allow fish passage through project reach. If repeatedly damaged structures are in project reach, they are removed or modified to reduce the potential for flood damages. (A, B, C, D, E, F) **Suggestions to consider** Improve infiltration and water quality. Limit or eliminate the use of impervious surfaces to allow for groundwater infiltration. Maintain or enhance vegetation and soil protection zones. Impacts from overall site development shall not decrease the capacity of the floodplain riparian vegetation and soil protection zone to support the desired vegetation. Take into consideration possible beneficial use of stormwater runoff. (A, B)	**IMPLEMENTATION PROGRAMS** • Expand implementation focus to Kawishiwash Creek, Pokety Creek, Stall Creek. **Suggestions to consider** Enhance riparian and aquatic habitat. Maintain or enhance the riparian and in-channel physical and vegetative habitat to support threatened and endangered or otherwise desirable species. (A, B, C, D)	**IMPLEMENTATION PROGRAMS** • Expand implementation on high quality recreation and ecological value resources identified within the WRAPS and other studies to full protection levels.
	A. Does the project avoid or limit new development within the design frequency floodplain for waterways of all sizes (unless the project is water-dependent infrastructure that must cross a waterway) or is the water dependent infrastructure designed to minimize floodplain impacts or waterway crossings? B. Does the project maintain pre-development floodplain infiltration and water quality? C. Does the project maintain or enhance riparian and aquatic habitat and the riparian and in-channel physical and vegetative habitat to support threatened and endangered or otherwise desirable species? D. Has a flood emergency plan been prepared for all infrastructure in the floodplain, accounting for emergency operations and/or evacuation? E. Does the project maintain or enhance aquatic habitat connectivity and sediment transport? F. Is infrastructure subject to frequent damage by floods being modified or removed?			

Table H-6. Declining, Impaired or Channelized Rivers and Streams

Value	1 - Maintain	2 – Improve	3 – Restore	4 – Protect
Impaired Streams Channelized Streams	• Restore the ecosystem functions of streams and their riparian areas. • Preserve floodplain functions by limiting development and the impacts of development to maintain water management capacities and capabilities.			
	IMPLEMENTATION PROGRAMS • Work with the partners on disturbed channel restoration. • Stream exclusion of livestock; pasture and manure management; and rotational grazing. Where possible, encourage incentives for producers. • Lake associations are engaged in insuring septic system compliance surveys and provide education on proper maintenance for riparian and non-riparian SSTS; provide low-interest loans and other incentive programs for non-compliant systems **(also, education, regulatory, incentives).** • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law **(also regulatory).** **Suggestions to consider** Enhance one ecosystem function. Maintain or enhance one ecosystem function. (A, B,) Avoid or mitigate impacts. Avoid or limit new development within the design frequency 3' above ordinary high or highest known elevation for waterways of all sizes, unless the project is water-dependent infrastructure that must cross or be adjacent to a waterway. Design water-dependent infrastructure to minimize flood impacts or waterway crossings. Project should maintain pre-development storage and should not increase flood events. (F)	**IMPLEMENTATION PROGRAMS** • Develop an active management plan for ditches and other public drainage systems. • Expand implementation to additional resources identified as Enhance/Protect Focus on water resources impaired for aquatic life (Kabekona River, Spring Creek, Un-named 07010102-612, Lower LLR). • Expand implementation targeting Rivers/Streams whose health has been identified as direct contributor to lake water quality or Wild Rice habitat decline. • Develop a Beaver management plan. **Suggestions to consider** Enhance three ecosystem functions. Maintain or enhance three ecosystem functions. (A, B, and C or D) Maintain infiltration and water quality. Limit or eliminate the use of impervious surfaces to allow for groundwater infiltration. Maintain or enhance vegetation and soil protection zones. Impacts from overall site development shall not decrease the capacity of the floodplain riparian vegetation and soil protection zone to support the desired vegetation. Take into consideration possible beneficial use of stormwater runoff. (F, G)	**IMPLEMENTATION PROGRAMS** • Restore meanders to channelized 3+ miles of the Necktie River (pending DNR feasibility study). • Restore additional channelized streams where beneficial and feasible. **Suggestions to consider** Restore ecosystem function. All four functions are maintained or enhanced and restored to have a fully functioning aquatic and riparian ecosystem. (A, B, C, D, E) Enhance riparian and aquatic habitat. Prepare flood emergency plan for floodplain infrastructure. Maintain or enhance the riparian and in-channel physical and vegetative habitat to support threatened and endangered or otherwise desirable species. Emergency operation and/or evacuation plans are prepared for all infrastructure in floodplains. (F, G, H, I) Enhance connectivity and sediment transport. Modify or remove structures frequently damaged by floods. The project is designed to not inadvertently trap sediment and to allow fish passage through project reach. If repeatedly damaged structures are in project reach, they are removed or modified to reduce the potential for flood damages. (F, G, H, I, J, K)	**IMPLEMENTATION PROGRAMS** • Restore LLR outlet
	A. Does the project maintain or enhance hydrologic connection? B. Does the project maintain or restore sediment transport including bed and bank equilibrium? C. Does the project maintain or enhance water quality? D. Does the project maintain or enhance habitat? E. Does the project maintain all four ecosystem functions and fully restore any disturbed functions? F. Does the project avoid or limit new development within the design frequency floodplain for waterways of all sizes (unless the project is water-dependent infrastructure that must cross a waterway) or is the water dependent infrastructure designed to minimize floodplain impacts or waterway crossings? G. Does the project maintain pre-development floodplain infiltration and water quality? H. Does the project maintain or enhance riparian and aquatic habitat and the riparian and in-channel physical and vegetative habitat to support threatened and endangered or otherwise desirable species? I. Has a flood emergency plan been prepared for all infrastructure in the floodplain, accounting for emergency operations and/or evacuation? J. Does the project maintain or enhance aquatic habitat connectivity and sediment transport? K. Is infrastructure subject to frequent damage by floods being modified or removed?			

Table H-7. Wetlands

Value	1 - Maintain	2 – Improve	3 – Enhance	4 – Protect
Shallow Lakes White Cedar Wetlands High Value Wetlands P-Source/Sink Effect Connectivity with Lakes	• Maintain and restore the ecosystem functions of wetlands their transitional and upland buffer areas. • Protect, buffer, enhance, and restore areas designated as high value wetlands, White Cedar wetlands. shorelines, and shallow lakes by providing natural buffer zones, vegetation, and soil-protection zones.			
	IMPLEMENTATION PROGRAMS • Lake associations are engaged in insuring septic system compliance surveys and provide education on proper maintenance for riparian and non-riparian SSTS; provide low-interest loans and other incentive programs for non-compliant systems. **(also, education, regulatory, incentives).** • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law (**also regulatory).** • Expand on knowledge of White Cedar - consider Hydrology impacts for development project. Suggestions to consider **Enhance one ecosystem function.** Maintain or enhance one ecosystem function.	IMPLEMENTATION PROGRAMS • Prioritize wetland restoration implementation plan. Implement top priorities. (ditch abandonment) Suggestions to consider **Enhance three ecosystem functions.** Maintain or enhance three ecosystem functions.	IMPLEMENTATION PROGRAMS • Expand on top priority wetland restorations to fullest extent. • Creation Cass/Hubbard county wetland bank Suggestions to consider **Restore ecosystem function.** All four functions are maintained or enhanced and restored to have a fully functioning aquatic and riparian ecosystem.	IMPLEMENTATION PROGRAMS •

Table H-8. Groundwater

Value	1 - Maintain	2 – Improve	3 – Restore	4 – Protect
Quantity/Quality and surface water - ground water connectivity	**IMPLEMENTATION PROGRAMS** • Well Sealing Program maintains current level of effort • Expand investigation on quantity, quality and surface water connectivity. • Maintain vegetated shorelines and vegetated littoral zones; establish and maintain 50-foot buffers on all riparian lands in compliance with State buffer law **(also regulatory).**	**IMPLEMENTATION PROGRAMS** • Increase conservation irrigation services to include irrigation scheduling and equipment calibration and other technology improvements to include Cass County • Expand Well Sealing Program • Prioritize implementation strategies based on future studies Geologic Atlas (both pending), water quality testing, withdrawal effects and local groundwater plans. • Implement sourcewater/groundwater supply easement program in areas identified as being highly vulnerable • Nitrogen Management Plan voluntary practices	**IMPLEMENTATION PROGRAMS** • Expand on Well Sealing Program • Provide soil moisture sensors to all irrigators involved in irrigation scheduling program • Expand sourcewater/groundwater supply easement program in areas identified as being medium to highly vulnerable	**IMPLEMENTATION PROGRAMS** •

Table H-9. Upland Resources – Working Lands

Value	1 - Maintain	2 – Improve	3 – Restore	4 – Protect
Forests	• **Avoid placing development and the site compound/temporary works on land that has been identified as being of high ecological value or as having species of high value**			
	IMPLEMENTATION PROGRAMS • Tree planting program maintains current level of effort • DNR Forestry – Private Forest Management Foresters with focus on select watersheds and in promoting tax incentives for added value. (Cass is county-wide; Hubbard is in select watersheds) • 75% Watershed Management Framework for Lakes • Promotion of sustainable and selective harvesting practices. • Make sure that we talk about Federal, State, Local forests **Suggestions to consider** **Avoid development.** The project has avoided development of land that is judged to be prime habitat, including, but not limited to, patches of old-growth forest; land of high ecological value or home to species of high value; monuments, and forests; wildlife refuges; wildlife preserves; wild and scenic rivers; and other protected areas. (A)	**IMPLEMENTATION PROGRAMS** • Expand on tree planting program • Increase acres enrolled in SFIA by 15% (remove percentages for now – implementation strategies) • Reduce habitat fragmentation by 25% by consolidating county and state owned forested acres through planned acquisition and divesture • Complete a Landscape stewardship plan • Develop scoring system to look at minor watershed to determine targeting of parcels for easement/acquisition. (RAQ scoring system) • Jack Pine/Red Pine management (also in climate change) **<u>Habitat (include all aspects of habitat)</u>** **Suggestions to consider** **No development.** Any soils designated as prime forest soils, unique forest areas, or forests of statewide importance found on the site are not developed. Credit is also earned if the owner and the management team can show that meaningful efforts were made to avoid the development of prime forest lands during the site selection process. (A, B)	**IMPLEMENTATION PROGRAMS** • Expand on tree planting program • Increase acres enrolled in SFIA by 15% • Reduce habitat fragmentation by 50% by consolidating county and state owned forested acres through planned acquisition and divesture **Suggestions to consider** **Restore habitat.** Project significantly increases the area of prime habitat and connectivity. This involves the restoration of habitat as determined by a qualified ecosystem professional. The habitat produced can be part of a protective buffer zone and can be at the site of the project or adjacent to the site. (A, B, C)	**IMPLEMENTATION PROGRAMS** • Buffer prime forest habitat from habitat fragmentation by implemented forest easement programs of at least 500' around consolidated county and state-owned forest acres. **Suggestions to consider** **Protection of existing and restored habitat.** Adoption of regulatory language to provide protection of existing and restored habitat. The project establishes a minimum 300-foot natural buffer zone around all areas deemed "prime habitat". Exceptions are possible if developed sites not within the project scope exist within the minimum distance.
	A. Does the project avoid development on land that is judged to be prime habitat by a third par ty (including SFI, FSC, or CSA Z809)? B. Does the project preserve, at a minimum, an appropriately sized buffer zone of undeveloped land or other habitat protection and connectivity according to the specified width around all prime habitat areas? C. Does the project significantly increase the area of prime habitat through the restoration of vegetation and habitat connectivity to a degree suitable as habitat (as determined by a qualified habitat restoration professional), either as par t of the protective buffer zone or adjacent to the site?			
Wildlife	• **Protect biodiversity by preserving and restoring species and habitats.**			
	IMPLEMENTATION PROGRAMS • Assemble wildlife/habitat data, issues/stressors, stakeholders and goals. • Continued implementation of the Wildlife Habitat Action Plan • Implement easement and landowner programs for pollinators and Golden-winged Warbler **Suggestions to consider** **Identify and protect habitat.** Management team works with state and local agencies to identify existing habitats in or near the project site, ensuring that existing habitats are not harmed and compensating for losses. Mitigation measures maintain net habitat quality and area and provide a means for animals to access pre-development habitat after development is complete. (A)	**IMPLEMENTATION PROGRAMS** • Prioritize community assemblages and evaluate habitat suitability across the watershed (if not already completed). • Identify priority areas needing 1. Improvement, and 2. Restoration, and use suitability indices (used in HIS analysis) to guide implementation design. • Implement strategies in priority improvement areas in conjunction with greater watershed value goals in mind. **Suggestions to consider** **Improve habitat.** The management team works with state and local agencies to identify existing habitats in or near the project site. During the project, efforts are made to not only protect existing habitats, but also to upgrade them. Efforts are made to plant appropriate vegetation, improve and expand wildlife corridors, and link existing habitats. Projects can preserve portions of the site, which are contiguous to natural areas outside of the site, in an	**IMPLEMENTATION PROGRAMS** • Implement strategies in priority restoration areas in conjunction with greater watershed value goals in mind. **Suggestions to consider** **Restore and create habitats.** The management team works with state and local agencies to identify existing habitats in or near the project site. During the course of the project, efforts are made to not only protect and upgrade existing habitats, but also to connect, restore, and create new habitats. Efforts are made to reinstate appropriate vegetation, improve and expand wildlife corridors, and link existing habitats. (A, B, C)	**IMPLEMENTATION PROGRAMS** **Suggestions to consider** **Protection of existing and restored habitat.** Adoption of regulatory language to provide protection of existing and restored habitat. The project establishes a minimum 300-foot natural buffer zone around all areas deemed "prime habitat". Exceptions are possible if developed sites not within the project scope exist within the minimum distance.

		undisturbed condition; create new connections between areas of important habitat; or remove existing barriers to movement. (A, B)		
	A. Does the project demonstrate that it does not impact natural habitat and movement corridors or that it will mitigate adverse impacts of development? B. Does the project facilitate movement between habitats, provide new connections, remove barriers, or otherwise improve existing habitat?			
Working Lands (define)	• **Identify and protect soils designated as prime farmland, unique farmland, or farmland of statewide importance.**			
	IMPLEMENTATION PROGRAMS • Review County Comprehensive Plans and update, if needed. **Suggestions to consider** **95% Protection.** The management team designates at least 95% of prime farmland as a vegetation and soil protection zone (VSPZ). Construction impacts from overall site development shall not decrease the capacity of the VSPZ to support the desired vegetation. No more than 10% of the total area of the VSPZ can contain development. (A, B)	IMPLEMENTATION PROGRAMS • Provide incentives to keep agricultural land in grazing and haying operations (easements/annual payments/etc.) • BMPs for grazing/haying as well as ag BMPs (cover crop	IMPLEMENTATION PROGRAMS • **Suggestions to consider** **Restore prime farmland.** Previously developed areas deemed prime farmland are restored to a productive state. (A, B, C)	IMPLEMENTATION PROGRAMS
	A. Have the project owner and the management team assessed the project site and determined whether or not onsite soils have been identified as prime farmland, unique farmland, or farmland of statewide importance to conserve for future generations? B. To what extent is prime farmland, unique farmland, or farmland of statewide importance to conserve for future generations protected or preserved by this project? C. To what extent has farmland, unique farmland, or farmland of statewide importance to conserve for future generations been restored by this project?			
Cities/Towns (Townships)	• **Conserve undeveloped land by locating development on previously-developed greyfields and/or sites classified as brownfields.** • **Minimize the impact of infrastructure on stormwater runoff quantity and quality.** • **Reduce non-point-source pollution by reducing the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers.** • **Preserve freshwater resources by incorporating measures to prevent pollutants from contaminating surface and groundwater and monitor impacts over operations.** • **Restore soils that were disturbed during construction and previous development to bring back ecological and hydrological functions.**			

	IMPLEMENTATION PROGRAMS
	• Focus implementation on retrofitting to achieve 60% TP reduction at/by:
	  ○ Outfall locations
	  ○ Publicly-owned lands
	  ○ Modification of existing ponding to include WQ treatment
	• New construction to meet regulatory standards
	
	Suggestions to consider
	At least 50% greyfield.
	At least 50% of the developed area of the project is to be located on a greyfield.
	(A)
	
	Extended storage capacity.
	The target water storage capacity for greyfields is a 60% improvement in water storage capacity. For brownfields,
		IMPLEMENTATION PROGRAMS
		• Focus implementation on retrofitting:
		  ○ Residential neighborhood-scale, single treatment BMPs by 60% TP reduction
		  ○ Residential right of way BMPs to achieve at least 30% TP treatment by neighborhood
		  ○ Institutional properties by 60% TP reduction
		• New construction to meet regulatory standards
		• Road maintenance: road and ATV trail maintenance to minimize nutrient runoff (including salt/deicers) and erosion.
		
		Suggestions to consider
		Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update
		Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at lowest level.
		
		Surface Water Management Plan Adoption
			IMPLEMENTATION PROGRAMS
			• Focus implementation on retrofitting to achieve at least 30% TP treatment in:
			  ○ Commercial districts
			  ○ Industrial districts
			• New construction to meet regulatory standards
			
			Suggestions to consider
			Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update
			Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at mid-level.
			
			Remediate a brownfield.
			The project is located on a brownfield site; a site documented as contaminated by means of an American Society for Testing and Materials (ASTM) E1903-11 Phase II Environmental Site Assessment, Canadian Council of Ministers of the Environment (CCME) National
				IMPLEMENTATION PROGRAMS
				• New construction to meet regulatory standards
				
				Suggestions to consider
				Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update
				Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at highest level.
				
				Remediate existing contamination.
				The project prevents future contamination by cleaning up previously contaminated land, restoring wellhead protection, and installing land-use controls to prevent future contamination. Restoration also may include removal of materials storage piles, rerouting

	40% improvement. Greenfield site maintains 100%.
	(D)
	
	Application management.
	Operational policies and programs are designed to control the application of pesticides and fertilizers, so they are not over applied. Runoff controls are put in place to minimize contamination of groundwater and surface water.
	(F, G)
	
	Design for response.
	Protection is accomplished by spill and leak diversion systems, spill prevention plans, and cleanup.
	(J, K)
	
	On-site monitoring.
	Measures have been incorporated into the design and operation of the project to enable onsite water quality monitoring and reporting. Monitoring will include surface and groundwater quantity and quality. Monitored data include water quality data and temperature data.
	(J, K)
		Development and adoption of surface water management plans to include:
		• Drainage analysis
		• System inventory
		• System Operation and Maintenance Plan
		• Road Maintenance Plan
		• SSTS Inventory and Update Plan
		• Capital Improvement Plan
		• Regulatory Activities
		  ○ Stormwater Management Program
		  ○ Standards for Stormwater Management for New Construction
		  ○ Illicit Dumping and Illegal Discharge Program
		  ○ Emergency Preparedness Program (spill and flood response)
		  ○ Coordination Agreements (MOUs) with Other Agencies
		
		Sustainable stormwater management.
		The target water storage capacity for greyfields, is 90% improvement in water storage capacity. For brownfields, 60% improvement. Greenfields maintain the pre- development water storage capacity.
		(D)
		
		Pesticide, herbicide, and fertilizer selection.
		The management team designs the landscaping to incorporate plant species that require less use of fertilizers and pesticides. Management programs are established to select pesticides and fertilizers with low toxicity, persistence, and bioavailability. Programs are designed to control and reduce fertilizer use by increasing use of compost.
		(F, G, H)
		
		Better selection, lower use.
		The management team reduces the potential negative impacts of pesticide and fertilizer use by a combination of plant species that need little or no fertilizers and pesticides and by increasing the use of pesticides and fertilizers with low toxicity, persistence, and bioavailability.
		(F, G, H)
		
		Design for prevention.
		During the design stage, the location of equipment and facilities containing potentially polluting substances are located away from sensitive environments. Runoff interceptors and drainage channels are designed to accommodate pollutants in stormwater runoff or ice melt, potential spills, and leakage. Spill prevention and response plans are in place. During operation, methods to monitor and minimize pollutants in stormwater runoff or ice melt are used.
		(J, K, L)
		
		Construction restoration.
		Restore 100% of soils disturbed during construction in the site's vegetated area. Soils must be reused for functions comparable to their original function (i.e., topsoil is used as topsoil, subsoil as subsoil, or subsoil is amended to become functional topsoil).
			Classification System for Contaminated Sites PN 1403, or a local voluntary cleanup program; or defined as a brownfield by a local, state, or federal government agency. Remediation measurers should be sufficient for the planned future use of the site.
			(A, B, C)
			
			Enhanced stormwater management.
			Runoff is maintained on site and/or restores the hydrologic conditions of the undeveloped regional ecosystem. Stormwater management programs and stormwater handling structures are designed to capture and repurpose more than 100% of stormwater on site as part of overall water management regime.
			(E)
			
			No pesticide, herbicide, or fertilizer use.
			The management team designs landscaping to incorporate plant species that require no pesticides, herbicides, and fertilizers. Increased use of composting; integrated pest management is practiced.
			(I)
			
			Design for source elimination.
			Designers focus on eliminating potentially polluting substances from operations. If unable to do so, designers seek to recycle the substances, keeping them within the operation or sending them off site for use in other applications. Designers continue to address prevention measures by identifying equipment and facilities containing potentially polluting substances and locating them away from sensitive environments.
			(J, K, L)
			
			Previous development restoration.
			Restore 100% of soils disturbed as a result of previous development. Soils must be reused for functions comparable to their original function (i.e., topsoil is used as topsoil, subsoil as subsoil, or subsoil is amended to become functional topsoil).
			(N, O)
				of surface runoff, or restoring groundwater infiltration patterns.
				(J, K, L, M)

		(N)		
	A. Is the project located on a site that was previously developed, and what percentage of the project site was previously developed? B. Is the project located on a site where all or part of it is documented as contaminated or on a site deemed a brownfield by local, state/provincial, or federal government agencies? C. Has a brownfield remediation plan been prepared using approved methods? D. What percentage of improvement for a greyfield or brownfield site does the site's proposed water storage, infiltration, evapotranspiration, and/or water harvesting capacity achieve or does the site maintain a greenfield site water storage capacity? E. Is 100% of the target water storage capacity achieved for greyfield and brownfield sites or does the greenfield site exceed 100% target water capacity to mitigate the impact of adjacent developed sites? F. What operational policies will be put in place to control the application fertilizers and pesticides? G. What runoff controls will be installed to minimize groundwater and surface water contamination? H. Has the management team selected pesticides and fertilizers that have low toxicity, persistence, and bioavailability? I. Has the management team designed landscaping to incorporate plant species that require no pesticides, herbicides, and fertilizers or to use integrated pest management approaches? J. Have adequate and responsive surface and groundwater quantity and quality monitoring systems been incorporated into the project design? K. Have spill and leak prevention and response plans and designs been incorporated into the design? L. Has the management team reduced or eliminated potentially polluting substances from construction and operation of the completed project? M. Has the management team sought to reduce future contamination by cleaning up areas of contamination and instituting land use controls to limit the introduction of future contamination sources? N. Have 100% of soils disturbed during construction been restored and reused properly? O. Have 100% of soils disturbed by previous development been restored and reused properly?			

Table H-10. Upland Resources – Cities and Townships

Value	1 – Maintain	2 – Improve	3 – Restore	4 -Protect
Cities/Towns	• Conserve undeveloped land by locating development on previously-developed greyfields and/or sites classified as brownfields. • Minimize the impact of infrastructure on stormwater runoff quantity and quality. • Reduce non-point-source pollution by reducing the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers. • Preserve freshwater resources by incorporating measures to prevent pollutants from contaminating surface and groundwater and monitor impacts over operations. • Restore soils that were disturbed during construction and previous development to bring back ecological and hydrological functions			
	IMPLEMENTATION PROGRAMS • Focus implementation on retrofitting to achieve 60% TP reduction at/by: • Outfall locations • Publicly-owned lands • Modification of existing ponding to include WQ treatment • New construction to meet regulatory standards • Road maintenance: road and ATV trail maintenance to minimize nutrient runoff (including salt/deicers) and erosion.	IMPLEMENTATION PROGRAMS • Focus implementation on retrofitting: • Residential neighborhood-scale, single treatment BMPs by 60% TP reduction • Residential right of way BMPs to achieve at least 30% TP treatment by neighborhood • Institutional properties by 60% TP reduction • New construction to meet regulatory standards • Road maintenance: road and ATV trail maintenance to minimize nutrient runoff (including salt/deicers) and erosion. • Rural road management guidelines for dust control and fines retainment. • Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update - Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at lowest level. • Surface Water Management Plan Adoption - Development and adoption of surface water management plans to include: o Drainage analysis o System inventory o System Operation and Maintenance Plan o Road Maintenance Plan o SSTS Inventory and Update Plan o Capital Improvement Plan o Regulatory Activities » Stormwater Management Program » Standards for Stormwater Management for New Construction » Illicit Dumping and Illegal Discharge Program » Emergency Preparedness Program (spill and flood response) » Coordination Agreements (MOUs) with Other Agencies	IMPLEMENTATION PROGRAMS • Focus implementation on retrofitting to achieve at least 30% TP treatment in: • Commercial districts • Industrial districts • New construction to meet regulatory standards • Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update - Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at mid-level.	IMPLEMENTATION PROGRAMS • New construction to meet regulatory standards • Stormwater, Land Development, Shoreline and Wetland Ordinance Adoption/Update - Adoption of MPCA Minimal Impact Design Standards within Community Design Assistance Package at highest level.

APPENDIX I

NWV 1 PRIORITY LAKES

APPENDIX I: NATURAL WORLD VALUE 1: HIGH QUALITY LAKES SUBWATERSHED SCREENING AND SCORING CRITERIA

High Quality Lakes

Eight metrics were chosen to screen for opportunities to protect and/or manage high quality lakes. A summary of each of these screening criteria and scoring breakpoints are outlined below. The values for each lake metric were summed. The HUC12 score was determined by summing the values of all lake in each HUC12. Maps that displaying the results from each scoring criteria and a table listing each lake's ranking on the 8 scoring criteria follow the narrative description.

1. **Coldwater Habitat Presence**
    - What – Coldwater habitats support fisheries that depend on cold, well-oxygenated water (i.e., trout/salmon family: species such as brook, brown, and lake trout as well as cisco and lake whitefish).
    - Why – Coldwater habitats are somewhat rare in the LLR watershed, limited to a few streams and the deeper parts of large lakes. Fishing opportunities for some of these coldwater species is limited in the watershed. In addition, coldwater habitats serve as a barometer of watershed health in relation to impacts on groundwater recharge (overuse of groundwater for irrigation can reduce stream base flow temperature) and overland stormwater flows (conversion of native landscapes to crops or impervious cover can increase temperatures in streams in addition to transmitting sediment and other pollutants).
    - Data Source – LLR WRAPS
2. **P-Sensitivity Lake Presence**
    - What – Phosphorus sensitivity was estimated by the MPCA for lakes in Minnesota by predicting how much water clarity would be reduced with additional phosphorus loading to the lake. A phosphorus sensitivity significance index was formulated to prioritize lakes as they relate MPCA policy objective of focusing on high quality, unimpaired lakes at greatest risk of becoming impaired. The phosphorus sensitivity significance index, which is a function of phosphorus sensitivity, lake size, lake total phosphorus concentration, proximity to MPCA's phosphorus impairment thresholds, and watershed disturbance, was used to determine the lake's Priority Class (MPCA).
    - Why – The LLR watershed has tremendous lake water quality, though it is important to understand which lakes are at the greatest risk of continued, or increased, phosphorus input. Understanding which lakes that are most sensitive to phosphorus pollution allows managers to initially focus efforts in the highest risk subwatersheds.
    - Data Source – Lake phosphorus sensitivity data (Minnesota Department of Natural Resources, 2011b).
3. **WQ Trend**
    - What – the MPCA monitors water quality data in both lakes and streamflows to evaluate historic and current conditions. From these data, trends are identified that reflect both

historic management successes as well as inform the continuing challenge of controlling the more diffuse "nonpoint" polluted runoff sources and the impacts of increased water volumes from artificial drainage practices.

- Why – As noted for the preceding metric, the LLR watershed has tremendous water quality in its lakes and rivers. However, it some water resources are either currently declining in water quality trend or are at risk of future impacts as the watershed develops through time. Increased nutrient, contaminant, and sedimentation loading from stormwater runoff from development and other non-point sources was identified within the WRAPS for this watershed. Understanding which resources that currently are experiencing a declining trend in water quality allows stakeholders to initially focus efforts in these subwatersheds. Regional and national studies have also shown a direct correlation between property values and lake water quality.
- Data Source – MPCA lake water quality monitoring data (Minnesota Pollution Control Agency, 2014).

4. **Forest**
    - What – Forests provide fundamental watershed health functions including timber products, wildlife habitat water quality protection and cultural benefits. The Forest Legacy Program and Minnesota Forests for the Future Program are conservation programs administered by the DNR to encourage the protection of privately owned forest lands through conservation easements or land purchases. Scoring was developed considering (1) potential project size, (2) strategic location, (3) recreational opportunities, (4) timber and other economic benefits, (5) ecological and habitat values, (6) other considerations.
    - Why – Conversion of forest to developed lands and potato farming have been identified as significant risks to plan for with the LLR watershed. Loss of forested areas poses an increasing threat to the watershed's natural resources. If these forests are fragmented, their benefits are diminished. Understanding the current condition as well as future conversion risk, allows stakeholders to identify the needs for targeted forest management strategies. For instance, by providing economic incentives and technical services to developed private forest stewardship lands to landowners to keep their forests as forests, we encourage sustainable forest management and support strong markets for forest products, maintain connected and healthy wildlife habitat, protect water quality and preserve cultural benefits.
    - Data Source – Forests for the Future data (Minnesota Department of Natural Resources, 2008a and Minnesota Department of Natural Resources, 2017a).

5. **Terrestrial Biodiversity**
    - What - Healthy watersheds sustain dynamic, resilient ecosystems teeming with terrestrial life. Ecosystems in a watershed are strengthened by habitat and biological diversity. More diverse ecosystems have been found to be more resilient to disturbance (e.g. flood, fire, drought, outbreaks, overgrazing) and are more productive. Ecosystem biodiversity is crucial to the LLR watershed stakeholder's welfare because ecosystems provide:

- Marketable values: derived goods and products essential to life, including food, medicine, and industrial products, genetic resources for crop breeding, and natural pest control services from ecosystems.
- Ecosystem services: flows of energy (photosynthetic & chemical) and materials (nutrients, water) between the biotic community and the water, air, and soil that provide greenhouse gas regulation, water treatment, erosion control, soil quality control, and plant growth. Ecosystem services can also include cultural benefits, such as religious, aesthetic, recreational, or inspirational values that humans derive from ecosystems.

- Why – Habitat degradation and loss is a risk associated with the future development of the LLR watershed. Loss of shoreline and aquatic habitat due to development and population growth of up to 60% projected for the watershed by 2030 (according to Minnesota State Demographers, as identified within the WRAPS. The WRAPS also specifically identified loss of biodiversity due to competition from invasive species; though the WRAPS focused on aquatic biodiversity, stakeholders identified terrestrial biodiversity as an additional priority to protect.
- Data Source – DNR Watershed Health Assessment Framework (Minnesota Department of Natural Resources, 2018b) and Leech Lake River Watershed Restoration and Protection Strategies Report (LLR WRAPS; Minnesota Pollution Control Agency, 2017).

6. **WRAPS Priority Lake**
   - What – The LLR WRAPS developed a priority lake screening of over 700 lakes to prioritize 61 over a 10-year implementation period. Priority lakes were those having one or more of the following criteria:
     - One of the top 25 largest lakes in the LLR Watershed by surface area;
     - Water quality data and/or lakeshed evaluations and protection assessments where available;
     - DNR designated tullibee (cisco) refuge lakes, trout lakes, and critical wild rice lakes;
     - Lakes among the DNR's priority fisheries management focus;
     - MPCA/DNR lakes of highest sensitivity to additional phosphorus loading (Phosphorus Sensitivity Significance);
     - Lakes included in the Cass County Large Lakes Assessment;
     - DNR Shoreline Sensitivity Assessments completed;
     - Lakes of critical importance to the US Forest Service or Leech Lake Band of Ojibwe;
     - Lakes included in Hydrologic Simulation Program Fortran (HSPF) modeling;
     - Lakes with an active lake association;
     - Lakes of biological significance;
   - Why – As the One Watershed, One Plan acts as a comprehensive implementation plan for the watershed, it was crucial to include priorities identified within the WRAPS. Though some overlap of screening metrics between the WRAPS criteria and the One Watershed, One Plan subwatershed screening criteria was observed (e.g., water quality data, cisco, trout and wild

rice habitats, P-sensitivity), retention of the overall scoring system was retained given (1) not all WRAPS-identified lakes had multiple criteria met nor were evaluated by the WRAPS process beyond those described above, (2) it was important to maintain, rather than disassemble, the WRAPS evaluation, and (3) it was assumed that this approach would not significantly alter the screening process results.

- Data Source – LLR WRAPS (Minnesota Pollution Control Agency, 2017.

7. **Lakes of Biological Significance**
    - What – The DNR's Lake of Biological Significance classification system identifies lakes meeting objective criteria for four community types (aquatic plants, fish, amphibians, birds). The goal of this list was to identify lakes that exhibit the highest quality features within any of the four assessed biological communities (as opposed to identification of lakes that exhibit diversity across communities). Unique plant or animal presence was the primary measure of a lake's biological significance. Lakes were assigned one of three biological significance classes (outstanding, high, or moderate). It is important to note that many LLR watershed lakes have not been sampled for plants and/or animals, so this list of lakes will be periodically revised by the DNR as additional biological data become available.
    - Why – The risk of impacts to the LLR watershed's aquatic plant, fish, amphibian, and bird communities was necessary to identify needs for protection. Protection ranked very highly in stakeholder values as well as within the WRAPS and State and Federal goals. It is expected that careful development planning can mitigate for impacts to these significant areas to preserve the biologically rich watershed.
    - Data Source – LLR WRAPS (Minnesota Pollution Control Agency, 2017) and DNR Lakes of Biological Significance (Minnesota Department of Natural Resources, 2011a).
8. **Wild Rice Lakes**
    - What – Many lakes and wetlands within the LLR Watershed continue to produce a rich wild rice crop. Wild rice is a unique resource in the Leech Lake Watershed and is important culturally as well as to migrating waterfowl and other wildlife. Twenty-five lakes were identified with the WRAPS as supporting wild rice. It is important to note that this classification was derived from a DNR report from 2008 and did not assess each potential lake or wetland habitat within the Leech Lake watershed. It is also important to note that wild rice within river and stream systems were accounted for under the Natural World Value *High Value/Priority Rivers and Streams*, below.
    - Why - Although many of the larger wild rice beds are actively managed, there is a perception that rice abundance and distribution have declined over time, especially in many of the smaller beds along the margins of lakes and streams. Wild rice is also proven to be highly sensitive to hydrologic and water quality disturbances and the risks associated with land development and encroaching agriculture dictated inclusion of it as a screening metric.
    - Data Source – MNDNR Wild Rice Study (Minnesota Department of Natural Resources, 2008b), Wild Rice Lakes Identified by DNR Wildlife (Minnesota Department of Natural Resources, 2014), DNR Wild Rice Management Webpage (Minnesota Department of Natural Resources,

2018c) and Local Preference data from LLR WRAPS (Minnesota Pollution Control Agency, 2017).

Table I-1. Summary of High Quality Lakes Scoring Criteria and Breakpoints.

Priority Value Metric	Data Analysis	Scoring
1a) Coldwater Habitat Presence	The presence or absence of designated aquatic habitats by HUC12.	Yes = 1, No = 0.01
1b) P-Sensitivity Lake Presence	MPCA/DNR classification of lakes as "Highest, Higher, High and Impaired". "Impaired" was eliminated from consideration for this metric's scoring.	0.33, 0.66 and 1.0 (high, higher highest, respectively)
1c) WQ Trend	Lakes were classified as "Close to Threshold, Declining Trend, No Trend, and Improving." Data source: 2017 MPCA Secchi disk trends and MPCA "nearly/barely" list.	1, 0.66, 0.33, and 0.01 (Close to Threshold, Declining trend, No Trend, and Improving, respectively).
1d) Forest	DNR Forest for the Future scores for each HUC12 were compared to the mean value of the entire watershed (99.08). Each HUC12 was assigned a value of either a 1.0 or 0.01 depending on its individual mean value was above or below the overall watershed mean.	Composite score above mean = 1 (X=99.08; range = 15 – 175). Score below the mean: 0.01.
1e) Terrestrial Biodiversity	Lake designations of Biological Significance status within the WRAPS, summed by HUC12. "Moderate, High, Outstanding".	0.33, 0.66 and 1.0 (Moderate, High, Outstanding, respectively).
1f) WRAPS Priority Lake	WRAPS-identified priority lakes summed for each HUC12.	Yes = 1, No = 0.01
1g) Lakes of Biological Significance	WRAPS-identified lakes of biological significance summed for each HUC12.	Outstanding =1 High = 0.66 Moderate = 0.33
1h) Wild Rice Lake	Lakes identified by a combination of DNR Top 350 Wild Rice Lakes and locally prioritized lakes from the Wild Rice Shoreland Protection Project.	High = 1 (local = high and/or on DNR's top 350 list) Moderate = 0.66 Low = 0.33 No data or zero value = 0.01

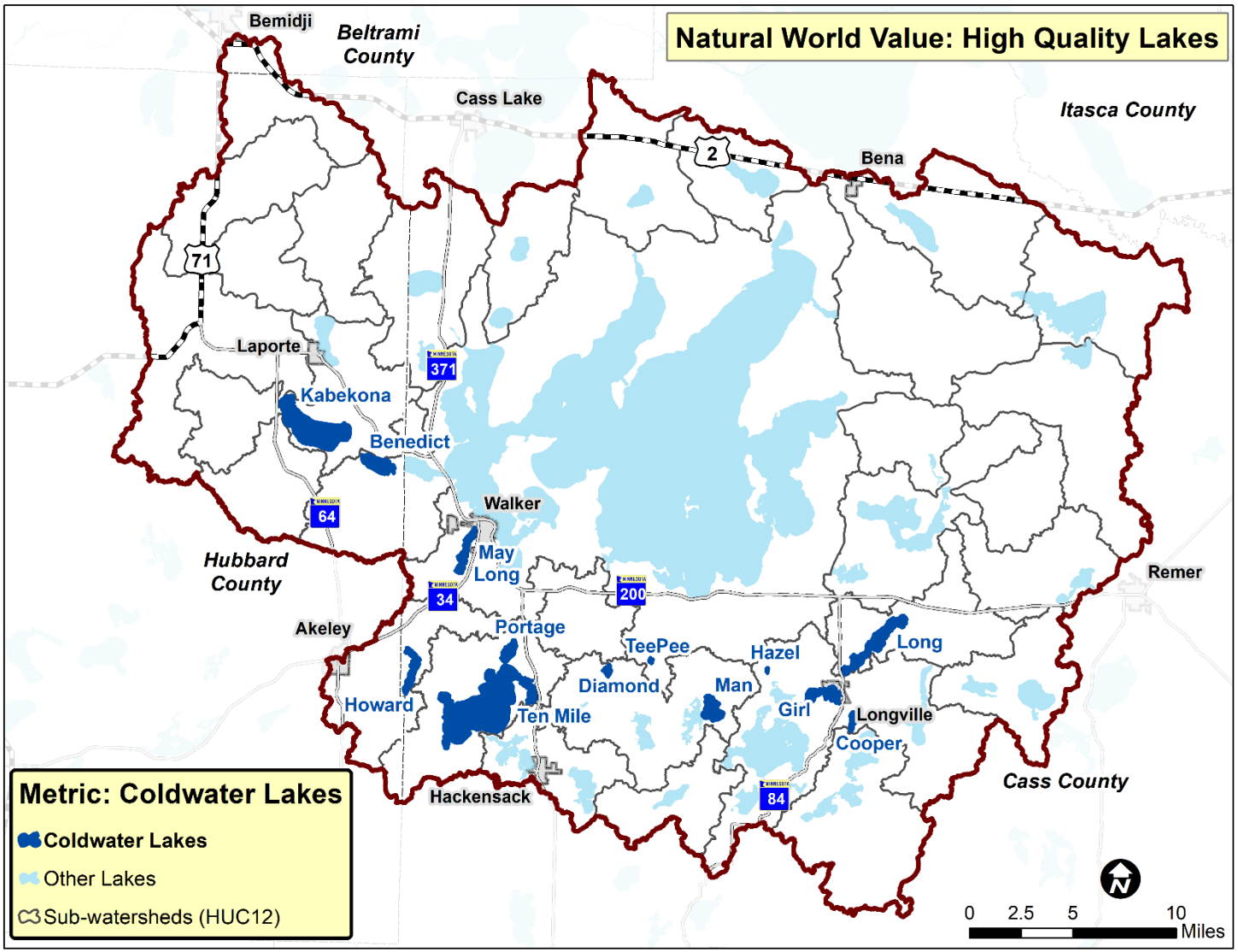


Figure I-1. Coldwater Lakes in the Leech Lake River Watershed.

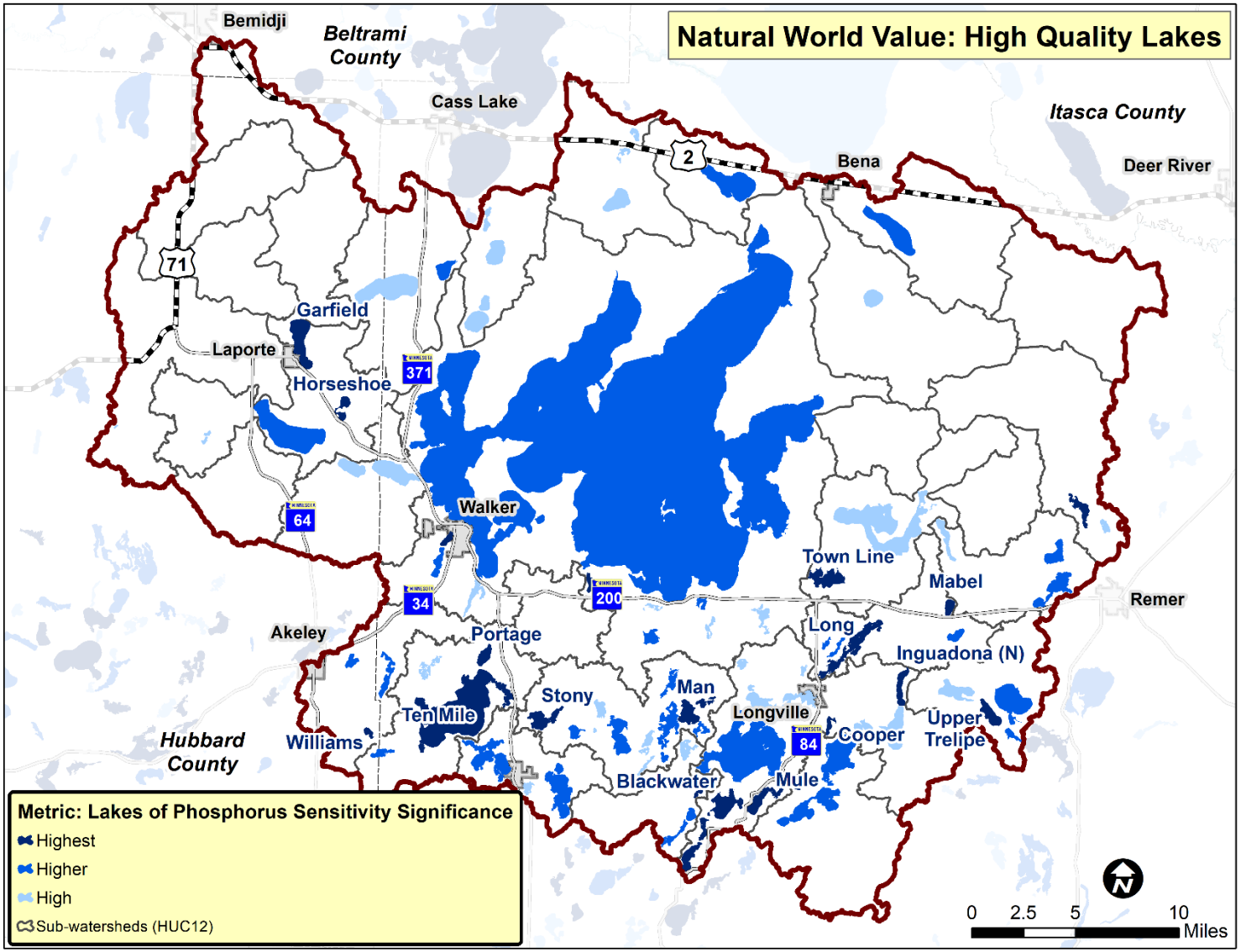


Figure I-2. Phosphorus Sensitivity of Lakes in the Leech Lake River Watershed.

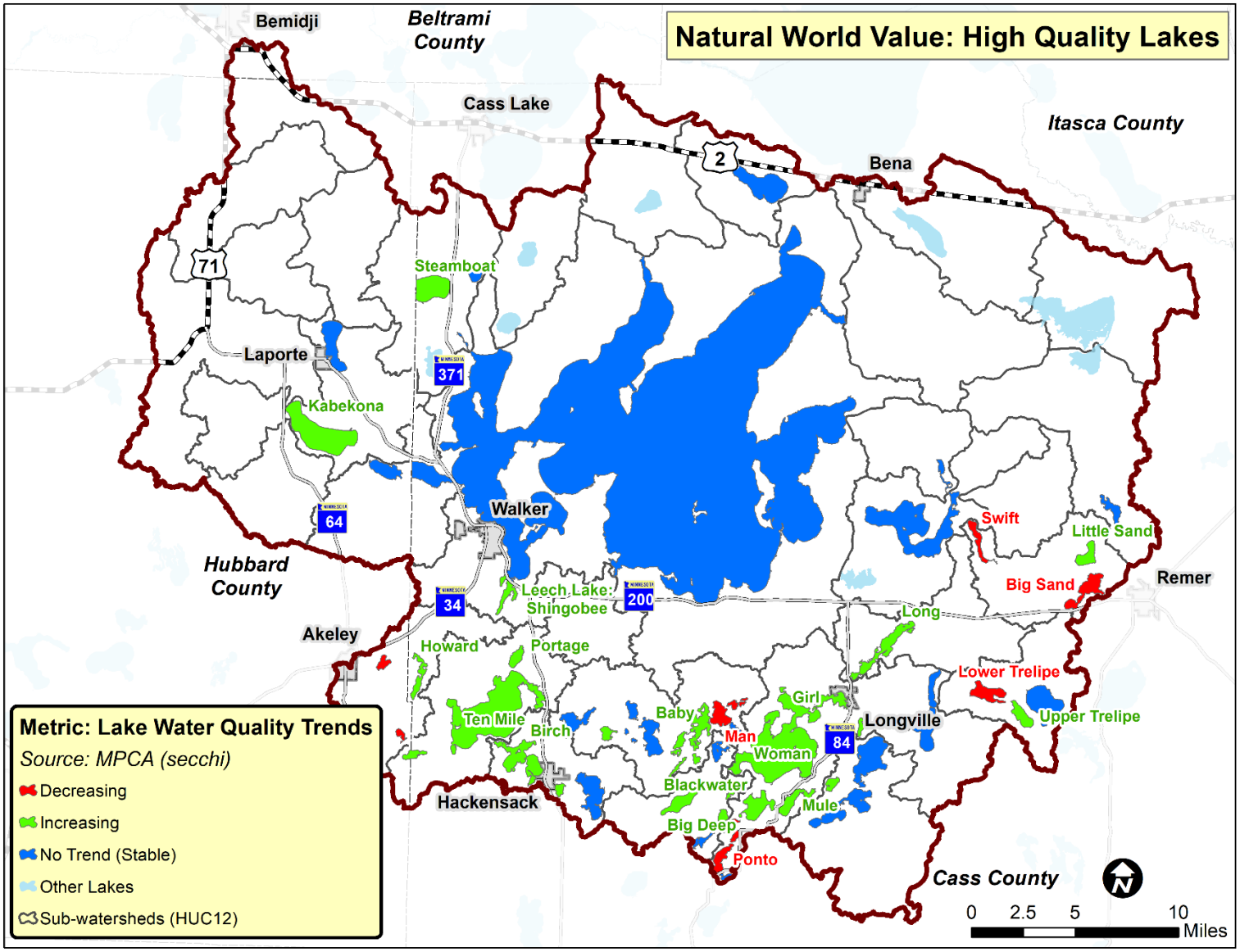

Natural World Value: High Quality Lakes
Bemidji
Beltrami County
Cass Lake
Itasca County
Bena
2
71
Steamboat
Laporte
371
Kabekona
64
Walker
Hubbard County
Swift
Little Sand
Big Sand
Remer
34
Leech Lake: Shingobee
200
Long
Akeley
Howard
Portage
Lower Trelipe
Girl
Ten Mile
Birch
Baby
Man
Longville
Upper Trelipe
84
Woman
Blackwater
Mule
Hackensack
Big Deep
Ponto
Cass County
Metric: Lake Water Quality Trends
Source: MPCA (secchi)
Decreasing
Increasing
No Trend (Stable)
Other Lakes
Sub-watersheds (HUC12)
0 2.5 5 10
Miles

Figure I-3. Water Quality Trends for Lakes in the Leech Lake River Watershed.

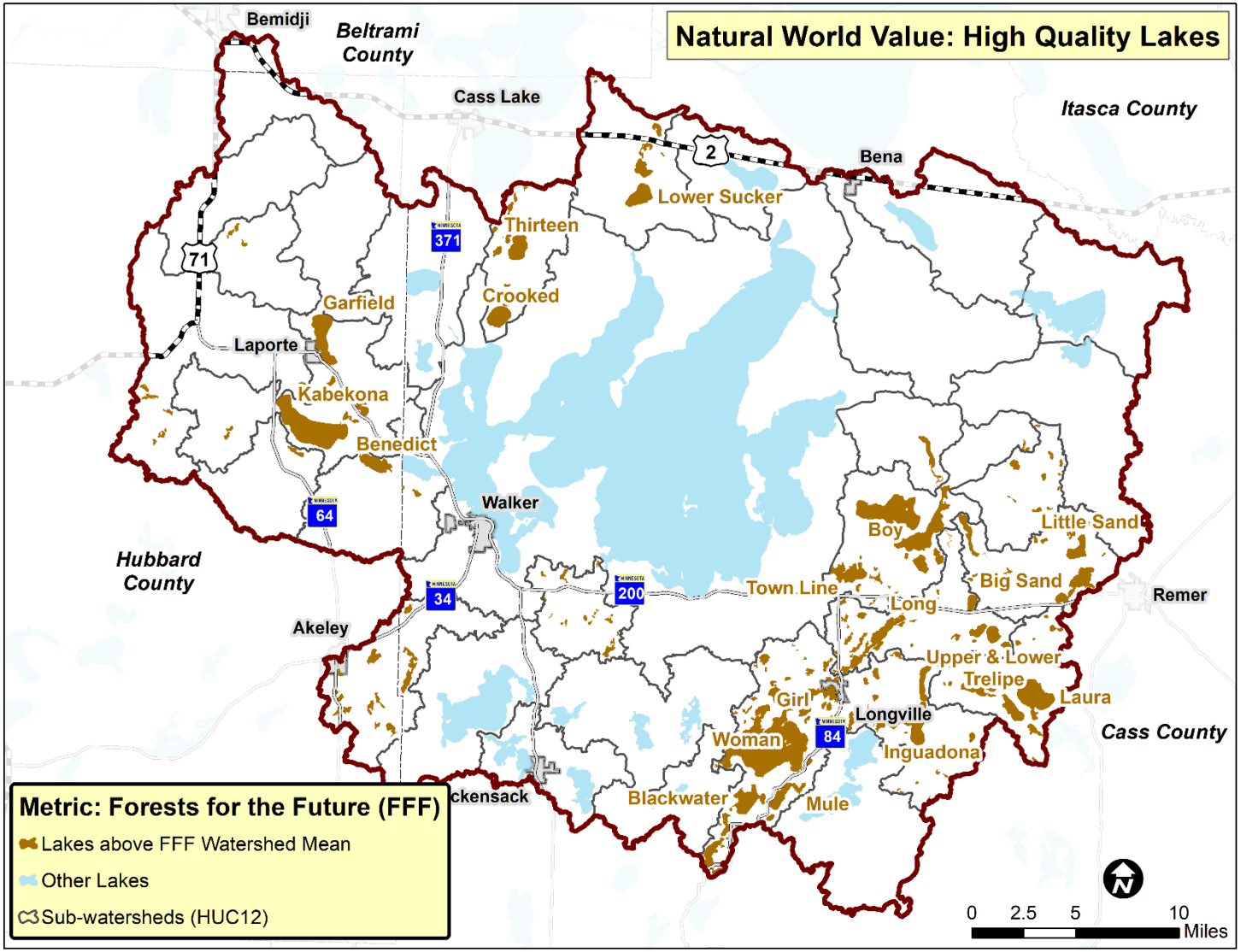


Figure I-4. Lakes Above the Forest for the Future Watershed Mean in the Leech Lake River Watershed.

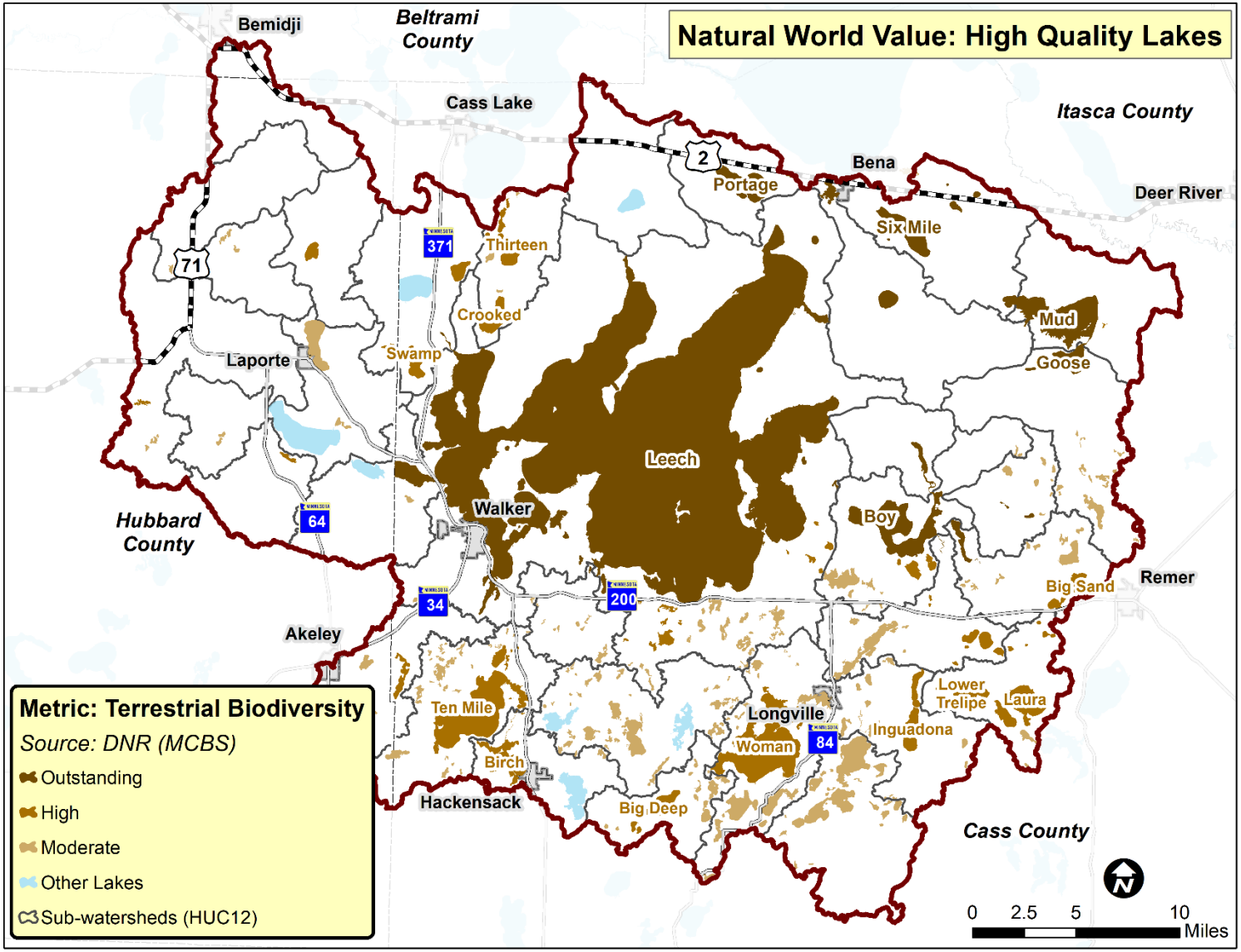


Figure I-5. Terrestrial Biodiversity Ratings for Lakes in the Leech Lake River Watershed.

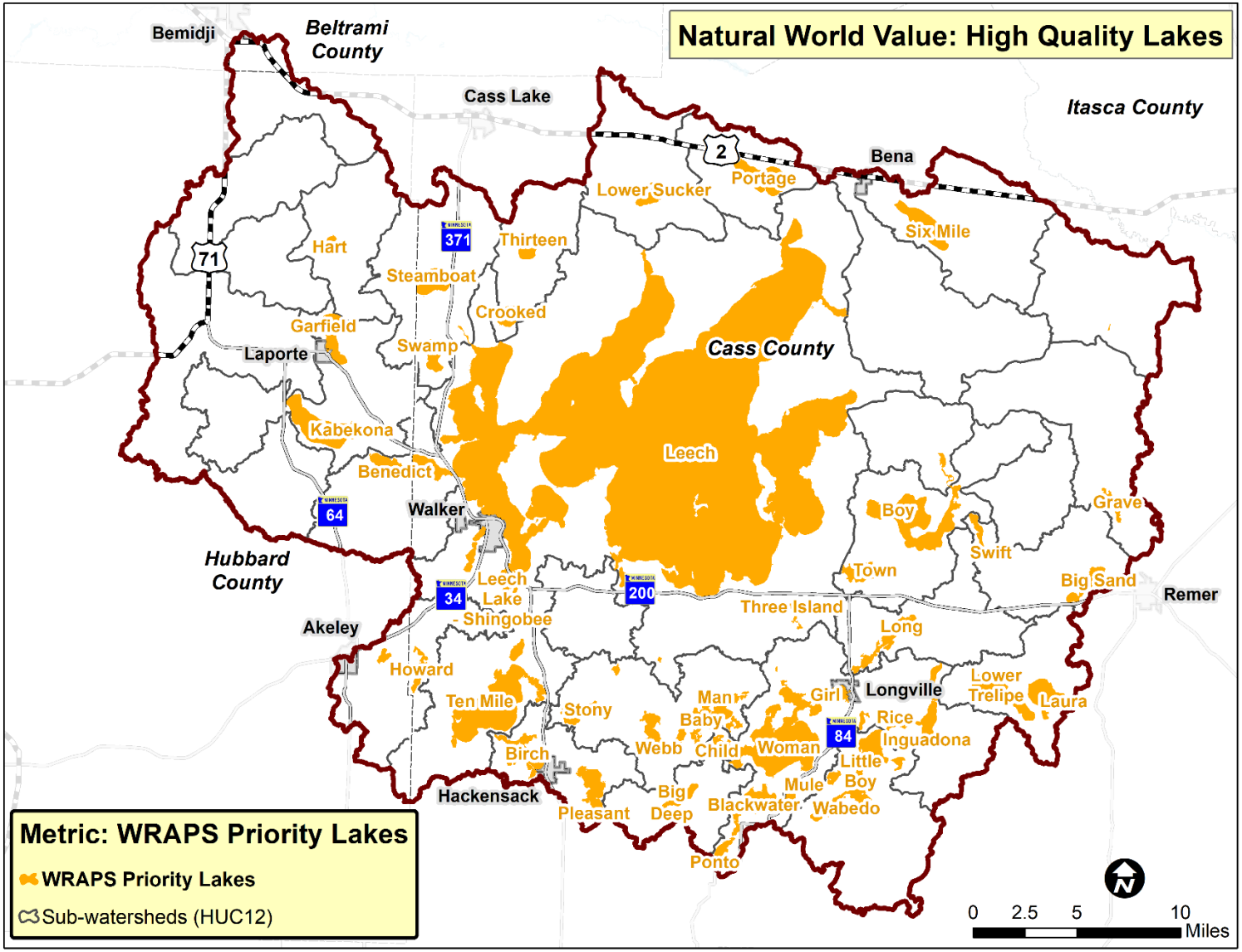


Figure I-6. Watershed Restoration and Protection Strategy (WRAPS) Priority Lakes in the Leech Lake River Watershed.

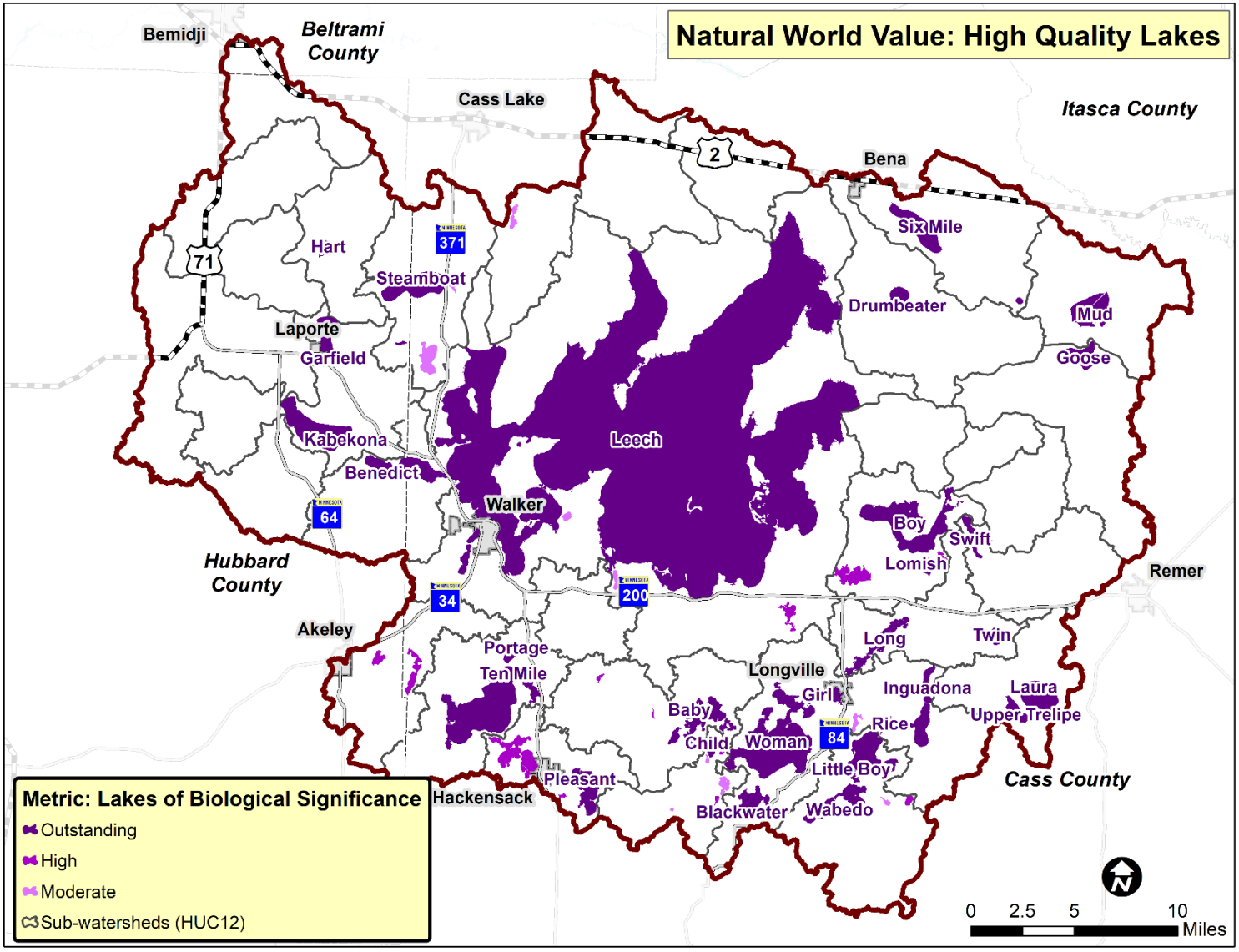


Figure I-7. Lakes of Biological Significance in the Leech Lake River Watershed.

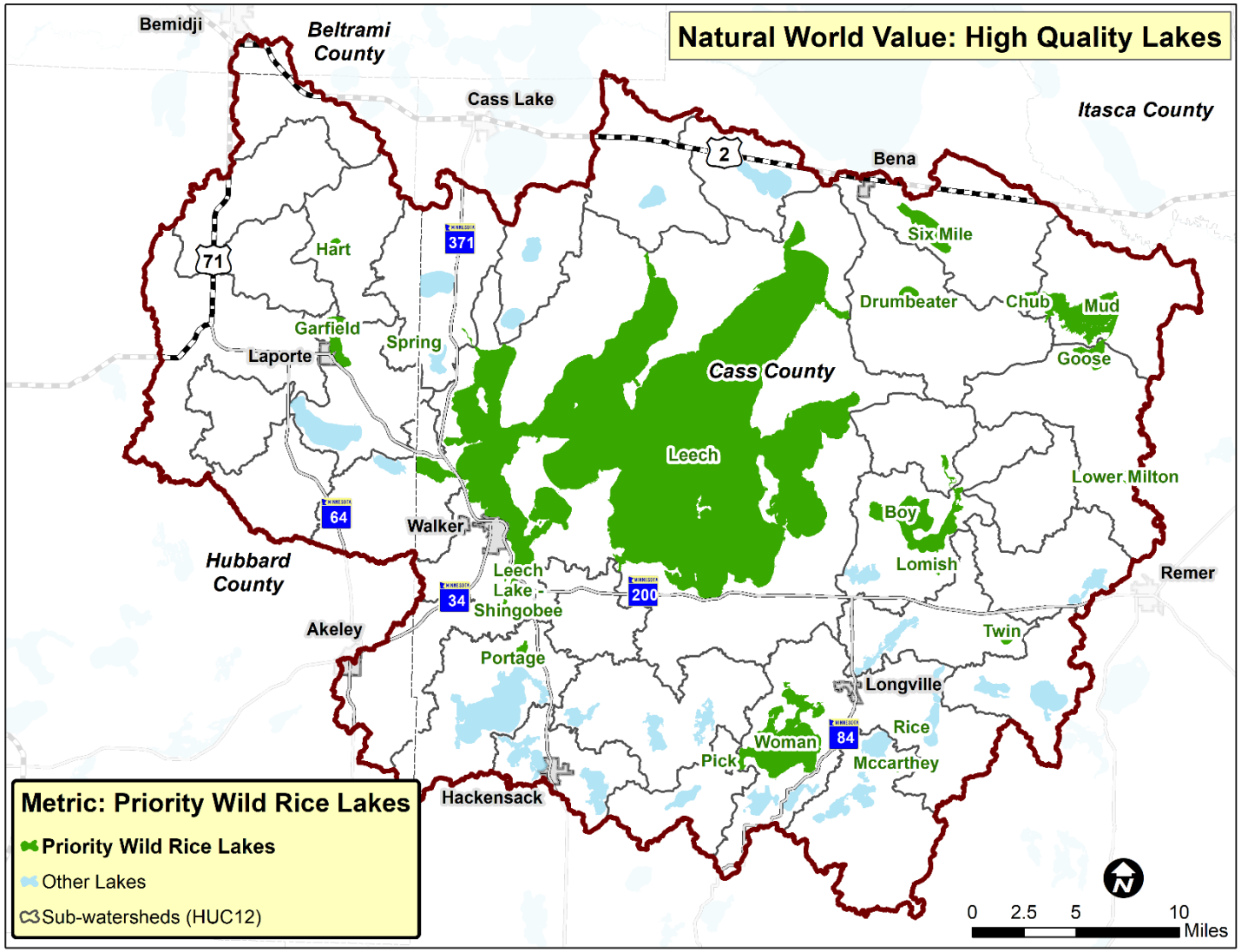


Figure I-8. Priority Wild Rice Lakes in the Leech Lake River Watershed.

Table I-2. Individual Metric and Sum Scoring for High Quality Lakes in the Leech Lake River Watershed.

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020102	Kimball	29013900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020102	DeHart	29013700	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020102	Knutson	29007600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020103	Hatchers	29013500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020103	Upper Thatcher	29013400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020103	Horsehead	29013600	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020104	Hart	29006300	0.01	0.01	0.33	0.01	0.66	1	1	1	4.02
70101020105	Spring	29005400	0.01	0.01	0.01	0.01	0.66	0.01	1	1	2.71
70101020105	Steamboat Lake	11050400	0.01	0.33	0.01	0.01	0.01	1	1	0.01	2.38
70101020105	Swamp Lake	11048300	0.01	0.01	0.01	0.01	0.66	1	0.33	0.33	2.36
70101020105	Portage Lake	11049000	0.01	0.66	0.33	0.01	0.66	0.01	0.01	0.33	2.02
70101020105	Steamboat River	11125300	0.01	0.33	0.01	0.01	0.66	0.01	0.01	0.01	1.05
70101020201	Sheridan	29015500	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020201	Island	29012800	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020201	Teepee	29015400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020201	Willow	29005800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020201	Shanty	29021800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020201	Gillett	29012600	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020202	Nelson	29013100	0.01	0.33	0.33	1	0.33	0.01	0.01	0.01	2.03
70101020202	Twenty-One	29013000	0.01	0.33	0.33	1	0.33	0.01	0.01	0.01	2.03
70101020203	Lester	29004900	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020204	Garfield	29006100	0.01	1	0.33	1	0.33	1	1	1	5.67
70101020204	Kabekona	29007500	1	0.66	0.01	1	0.01	1	1	0.01	4.69
70101020204	Horseshoe	29005900	0.01	1	0.33	1	0.01	0.01	0.01	0.01	2.38
70101020204	Oak	29006000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020204	Unnamed	29005700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020301	Portage Lake	11047600	1	1	0.01	0.01	0.66	1	1	1	5.68
70101020301	Ten Mile Lake	11041300	1	1	0.01	0.01	0.66	1	1	0.01	4.69
70101020301	Boy River	11120900	0.01	0.33	0.01	1	1	0.01	0.01	0.01	2.38
70101020301	Boy River	11120900	0.01	1	0.01	0.01	0.66	0.01	0.01	0.01	1.72
70101020301	Bass Lake	11047400	0.01	0.33	0.33	0.01	0.33	0.01	0.01	0.66	1.69
70101020301	Boy River	11120900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020301	Boy River	11120900	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020301	Crystal Lake	11050200	0.01	0.66	0.01	0.01	0.33	0.01	0.01	0.01	1.05
70101020301		11052100	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020301	Boy River	11120900	0.01	0.66	0.01	0.01	0.01	0.01	0.01	0.01	0.73
70101020301	Lake Erin	11052300	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020301		11052200	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020301		11098100	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020301	Boy River	11120900	0.01	0.66	0.01	0.01	0.01	0.01	0.01	0.01	0.73
70101020301	Boy River	11120900	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020301	Million Lake	11089200	0.01	0.01	0.33	0.01	0.33	0.01	0.01	0.01	0.72
70101020301	Little Bass Lake	11047700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Chub Lake	11045700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Gadbolt Lake	11047500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11089000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Wheeler Lake	11047800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Cripple Lake	11047300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Muskrat Lake	11047900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11088800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Cyphers Lake	11052700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11054400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11084200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11089100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Mary Norton Lake	11052800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11088700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11052500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11052400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11054500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11088900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Scoffner Lake	11130800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301		11052000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Lost Lake	11089300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020301	Boy River	11120900	0.01	0.33	0.01	0.01	0.01	0.01	0.01	0.01	0.4
70101020301		11054600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020301		11084400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020301		11052600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020301		11054600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302	Pleasant Lake	11038300	0.01	0.66	0.33	0.01	0.01	1	1	0.01	3.03
70101020302	Birch Lake	11041200	0.01	0.66	0.01	0.01	0.66	1	0.66	0.01	3.02
70101020302	Boss Lake	11038200	0.01	0.66	0.33	0.01	0.01	0.01	0.01	0.01	1.05
70101020302	Mud Lake	11038500	0.01	0.01	0.01	0.01	0.01	0.01	0.66	0.01	0.73
70101020302		11084500	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020302	Paquet (One) Lake	11038100	0.01	0.33	0.01	0.01	0.01	0.01	0.01	0.01	0.4
70101020302	Horseshoe Lake	11037700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020302	Long Lake	11038400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302	Perry Lake	11045800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302	Peterson Lake	11038000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302	Young Lake	11054800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302	Highbank Lake	11051500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11055100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11054900	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11055200	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11093300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11084100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11055300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11084900	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11084800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020302		11055000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303	Man Lake	11028200	1	1	0.66	0.01	0.01	1	1	0.01	4.69
70101020303	Mckeown Lake	11026100	0.01	0.66	0.33	0.01	0.33	1	1	0.01	3.35
70101020303	Barnum Lake	11028100	0.01	1	0.66	0.01	0.33	1	0.01	0.01	3.03
70101020303	Baby Lake	11028300	0.01	0.66	0.01	0.01	0.01	1	1	0.01	2.71
70101020303	Stony Lake	11037100	0.01	1	0.33	0.01	0.01	1	0.01	0.01	2.38
70101020303	Kid Lake	11026200	0.01	0.33	0.01	0.01	0.01	1	1	0.01	2.38
70101020303	Diamond Lake	11039600	1	0.01	0.01	0.01	0.33	1	0.01	0.01	2.38
70101020303	Webb Lake	11031100	0.01	0.66	0.33	0.01	0.33	1	0.01	0.01	2.36
70101020303	Kerr Lake	11026800	0.01	0.66	0.01	0.01	0.01	1	0.01	0.01	1.72
70101020303	Lost Lake	11026900	0.01	0.33	0.01	0.01	0.01	1	0.01	0.01	1.39
70101020303	Moccasin Lake	11029600	0.01	0.66	0.33	0.01	0.01	0.01	0.01	0.01	1.05
70101020303	Larson Lake	11037400	0.01	0.66	0.01	0.01	0.33	0.01	0.01	0.01	1.05

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020303	Bluebill Lake	11039700	0.01	0.01	0.01	0.01	0.33	0.01	0.66	0.01	1.05
70101020303		11085200	0.01	0.01	0.01	0.01	0.33	0.01	0.66	0.01	1.05
70101020303	Little Webb Lake	11038700	0.01	0.33	0.33	0.01	0.33	0.01	0.01	0.01	1.04
70101020303	Surprise Lake	11037500	0.01	0.33	0.33	0.01	0.33	0.01	0.01	0.01	1.04
70101020303	Trillium(Lizard) Lake	11027000	0.01	0.33	0.01	0.01	0.33	0.01	0.01	0.01	0.72
70101020303	Blueberry Lake	11037600	0.01	0.01	0.33	0.01	0.33	0.01	0.01	0.01	0.72
70101020303	Long Lake	11039500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Sylvester Lake	11037300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Three Island Lake	11084700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Fish Lake	11037900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11085100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Goose Lake	11029800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11091200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11094200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11093700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11087800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Cub Lake	11039900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11026000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11085000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11087700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Tower Lake	11037200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Woodchuck Lake	11037800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11086800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11055600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Lake Four One Eight	11039800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11084600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11087600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Bass Pond	11130400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303		11098200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020303	Cranberry Lake	11059500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303	Oak/weed Lake	11087500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303	Popple Lake	11087400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303		11085300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020303	Twin Lake	11093800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303	Twin Lake	11093800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020303	Shadow Lake	11130000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020304	Child Lake	11026300	0.01	0.33	0.33	0.01	0.01	1	1	0.01	2.7
70101020304	Big Deep Lake	11027700	0.01	0.01	0.01	0.01	0.66	1	0.01	0.01	1.72
70101020304	Squaw Lake	11026500	0.01	0.01	0.01	0.01	0.01	1	0.66	0.01	1.72
70101020304	Widow Lake	11027300	0.01	1	0.01	0.01	0.33	0.01	0.33	0.01	1.71
70101020304	Pick Lake	11026700	0.01	0.01	0.01	0.01	0.33	0.01	0.33	1	1.71
70101020304	Long Lake	11025800	0.01	0.66	0.33	0.01	0.01	0.01	0.01	0.01	1.05
70101020304	Lower Sand Lake	11027900	0.01	0.66	0.01	0.01	0.33	0.01	0.01	0.01	1.05
70101020304	Upper Sand Lake	11027500	0.01	0.01	0.01	0.01	0.33	0.01	0.66	0.01	1.05
70101020304		11027800	0.01	0.01	0.01	0.01	0.66	0.01	0.33	0.01	1.05
70101020304	Little Bay Lake	11036900	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020304	Blind Lake	11031000	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020304	Ixl Lake	11027200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304		11055400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304	Little Deep Lake	11027600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304		11093600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304	Round Lake	11037000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304	Pancake Lake	11027100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304		11084000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020304		11056100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020304	Squeedunk Lake	11026600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020305	Girl Lake	11017400	1	0.33	0.01	1	0.33	1	1	0.01	4.68
70101020305	Woman Lake	11020100	0.01	0.66	0.01	1	0.66	1	1	1	5.34
70101020305	Blackwater Lake	11027400	0.01	1	0.01	1	0.33	1	1	0.01	4.36
70101020305	Island Lake	11025700	0.01	1	0.66	1	0.33	1	0.01	0.01	4.02
70101020305	Ponto Lake	11023400	0.01	1	0.66	1	0.01	1	0.01	0.01	3.7
70101020305	Mule Lake	11020000	0.01	1	0.01	1	0.33	1	0.01	0.01	3.37
70101020305	Hazel Lake	11029500	1	0.01	0.01	1	0.33	1	0.01	0.01	3.37
70101020305	Silver Lake	11020200	0.01	0.33	0.33	1	0.33	0.01	0.01	0.01	2.03
70101020305	Jack Lake	11016400	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020305	Swede Lake	11016500	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020305	Tamarack Lake	11086600	0.01	0.66	0.01	1	0.01	0.01	0.01	0.01	1.72

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70101020305	One Lake	11024400	0.01	0.01	0.33	1	0.33	0.01	0.01	0.01	1.71
70101020305	Boxell Lake	11018300	0.01	0.33	0.01	1	0.01	0.01	0.01	0.01	1.39
70101020305	Donkey Lake	11028000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305	Primer Lake	11025900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305	Canoe Lake	11029900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11086900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11086700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11055500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11079600	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11075300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11086500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11095700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11095600	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020305		11079700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Heffron Lake	11016900	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Craig Lake	11018600	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Barrow Lake	11026400	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Carnahan Lake	11018800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Nellie Lake	11018700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305		11056000	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305		11131600	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305		11096500	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020305	Cardarelle Lake	11130100	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020401	Mccarthey Lake	11016800	0.01	0.01	0.33	0.01	0.33	1	1	1	3.69
70101020401	Little Boy Lake	11016700	0.01	0.66	0.33	0.01	0.33	1	1	0.01	3.35
70101020401	Wabedo Lake	11017100	0.01	0.66	0.01	0.01	0.33	1	1	0.01	3.03
70101020401	Hunter Lake	11017000	0.01	1	0.01	0.01	0.33	1	0.01	0.01	2.38
70101020401	Camp Two Lake	11011800	0.01	0.01	0.01	0.01	0.33	0.01	0.66	0.01	1.05
70101020401	Bracket Lake	11017200	0.01	0.01	0.01	0.01	0.33	0.01	0.33	0.01	0.72
70101020401		11091100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Shurd Lake	11016600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Woodcamp Lake	11011900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4

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70101020401		11055700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Charles Lake	11014100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Little Lake	11131500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401		11097900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Lake Louise	11057300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Crooked Lake	11057400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Bass Lake	11075400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Lake Thirty-six	11017300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401		11057500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401		11075200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401	Buck Lake	11055800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020401		11010800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11010900	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11058100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11057900	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11074900	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11058000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11074800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11074400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020401		11057800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020402	Laura Lake	11010400	0.01	0.66	0.33	1	0.66	1	1	0.66	5.32
70101020402	Upper Trelipe Lake	11010500	0.01	1	0.01	1	0.66	1	1	0.33	5.01
70101020402	Lower Trelipe Lake	11012900	0.01	0.33	0.66	1	0.66	1	0.01	0.33	4
70101020402	Little Bass Lake	11006300	0.01	0.66	0.33	1	0.33	0.01	0.01	0.01	2.36
70101020402	Oxbow Lake	11007500	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402	Peterson Lake	11010600	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402		11013000	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402	Ododikossi Lake	11007400	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402		11056700	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402	Bailey Lake	11007600	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020402		11056800	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403	Induadona Lake	11012000	0.01	1	0.01	1	0.66	1	1	0.01	4.69

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70101020403	Cooper Lake	11016300	1	1	0.01	1	0.33	1	0.33	0.01	4.68
70101020403	Rice Lake	11016200	0.01	0.33	0.33	1	0.33	1	1	0.66	4.66
70101020403	Rice Lake	11016200	0.01	0.01	0.33	1	0.01	1	0.01	1	3.37
70101020403	Tamarack Lake	11018900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.33	1.71
70101020403	Giijk Lake	11018500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11076100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403	Cedar Lake	11078900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403	Bullhead Lake	11018400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11076200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11075500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403	Ford Lake	11079000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11057000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11057100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020403		11076000	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020403		11075900	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020403		11075800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020403	Blueberry Lake	11057200	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020403	Echo Lake	11075600	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404	Long Lake	11014200	1	1	0.01	1	0.33	1	1	0.01	5.35
70101020404	Twin Lake	11012300	0.01	0.01	0.01	1	0.66	0.01	1	1	3.7
70101020404	West Twin Lake	11012500	0.01	0.66	0.33	1	0.66	0.01	0.01	0.01	2.69
70101020404	Mabel Lake	11012100	0.01	1	0.33	1	0.01	0.01	0.01	0.01	2.38
70101020404	Kego Lake	11018200	0.01	0.66	0.33	1	0.01	0.01	0.01	0.01	2.04
70101020404	Wax Lake	11012400	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020404	Maple Lake	11018100	0.01	0.66	0.01	1	0.01	0.01	0.01	0.01	1.72
70101020404	Lost Girl Lake	11012800	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020404		11012200	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020404	Phelon Lake	11012600	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020404		11053500	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020404	Lundeen Lake	11018000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020404		11053800	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020404	Johnson Lake	11054000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020404	Football Lake	11017800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404		11012700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020404		11095400	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404	Tadpole Lake	11053600	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404	Red's Pond	11079100	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404		11078800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020404		11079200	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020405	Swift Lake	11013300	0.01	0.33	0.66	1	1	1	1	0.66	5.66
70101020405	Swift Lake	11013300	0.01	0.33	0.66	1	1	1	0.01	0.66	4.67
70101020405	Swift Lake	11013300	0.01	0.33	0.66	1	1	1	0.01	0.66	4.67
70101020405	Swift Lake	11013300	0.01	0.33	0.66	1	1	1	0.01	0.66	4.67
70101020405	Big Sand Lake	11007700	0.01	0.66	0.66	1	0.66	1	0.01	0.66	4.66
70101020405	Little Sand Lake	11009200	0.01	0.66	0.01	1	0.33	0.01	0.01	0.01	2.04
70101020405		11095200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405	Little Swift Lake	11013100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405	Wahneshin Lake	11008800	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405		11091900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405		11091600	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405	Green Lake	11009100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405		11091800	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405		11091700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020405	Moon Lake	11007800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020405		11054100	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020406	Tobique Lake	11013200	0.01	0.01	0.01	1	1	0.01	0.01	0.33	2.38
70101020406	Grass Lake	11009000	0.01	0.01	0.01	1	1	0.01	0.01	0.01	2.06
70101020406	Lucille Lake	11010700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406	Taylor Lake	11009500	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406	Dewey Lake	11008400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406	Tamarack Lake	11008300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406	Bebow Lake	11008900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406	Mink Lake	11054300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406		11054200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020406		11092900	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020407	Boy Lake	11014300	0.01	0.33	0.33	1	1	1	1	1	5.67
70101020407	Town Line Lake	11019000	0.01	1	0.33	1	0.33	1	0.66	0.01	4.34
70101020407	Lomish Lake	11013600	0.01	0.01	0.01	1	0.66	0.01	1	1	3.7

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70101020407	Portage Lake	11013400	0.01	0.01	0.01	1	0.66	0.01	0.66	0.33	2.69
70101020407	Rabbitt Lake	11013500	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020407		11053900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407		11095300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407		11093000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407	Crown Lake	11017900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407		11093100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407	County Lake	11053700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407		11079300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407	Laabs Lake	11131700	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020407		11080700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020407		11078700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020407		11080800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020408	Skelly Lake	11099900	0.01	0.01	0.01	1	1	0.01	0.01	0.01	2.06
70101020501	Benedict	29004800	1	0.33	0.33	1	0.01	1	1	0.01	4.68
70101020501	Cedar Lake	11048100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020501		11051800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020502	Crooked Lake	11049400	0.01	0.33	0.33	1	0.66	1	0.01	0.01	3.35
70101020502	Thirteen Lake	11048800	0.01	0.33	0.33	1	0.66	1	0.01	0.01	3.35
70101020502	Welsh Lake	11049300	0.01	0.33	0.33	1	0.66	0.01	0.01	0.33	2.68
70101020502	Twin Lake	11048400	0.01	0.33	0.33	1	0.66	0.01	0.33	0.01	2.68
70101020502	Little Twin Lake	11048700	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020502	Camp Lake	11049600	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020502	Hessie Lake	11048600	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020502		11092000	0.01	0.01	0.01	1	0.66	0.01	0.01	0.01	1.72
70101020502	Little Moss Lake	11048900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020502	Faherty Lake	11049200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020502	Experiment Lake	11041600	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020503	Howard Lake	11047200	1	0.66	0.01	1	0.66	1	0.66	0.01	5
70101020503	Shingobee	29004300	0.01	0.66	0.66	1	0.33	1	0.66	0.01	4.33
70101020503	Williams	29001500	0.01	1	0.66	1	0.01	0.01	0.01	0.01	2.71
70101020503	Anoway Lake	11046900	0.01	0.01	0.01	1	1	0.01	0.33	0.01	2.38
70101020503	Pauls Lake	11047100	0.01	0.01	0.01	1	1	0.01	0.01	0.01	2.06
70101020503	Steel	29002200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39

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70101020503	Mary	29001300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020503	Island	29000700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Lake Alice	11046800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Mastny	29000800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Robinson	29002300	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Gauldin	29001000	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Mud	29004400	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Unnamed	29002400	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020503	Lake Thirty-four	11047000	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020504	Lower Sucker Lake	11031300	0.01	0.33	0.33	1	0.01	1	0.01	0.33	3.02
70101020504	Grass Lake	11031500	0.01	0.33	0.01	1	0.01	0.01	0.01	0.01	1.39
70101020504	Upper Sucker Lake	11031600	0.01	0.33	0.01	1	0.01	0.01	0.01	0.01	1.39
70101020504	Middle Sucker Lake	11031700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020504	Foot Lake	11054700	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020504	Tank Lake	11040800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020505	Nomad Lake	11040500	0.01	0.01	0.01	1	1	0.01	0.01	0.01	2.06
70101020505	Hovde Lake	11039400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505	Turtle Lake	11040100	0.01	0.01	0.33	1	0.01	0.01	0.01	0.01	1.39
70101020505	Spruce Lake	11039200	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505	Hanson Lake	11038900	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505	Bag Lake	11039300	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505	Big Hanson Lake	11039100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505	Tanglewood Lake	11088100	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505		11088400	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505		11053000	0.01	0.01	0.01	1	0.33	0.01	0.01	0.01	1.39
70101020505		11088000	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020505	Little Turtle Lake	11038800	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020505		11087900	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07
70101020506	Portage Lake	11020400	0.01	0.66	0.33	0.01	1	1	0.01	0.01	3.03
70101020506		11091000	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020506		11092100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020506	Little Portage Lake	11030200	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	May Lake	11048200	1	1	0.33	0.01	0.01	1	1	0.01	4.36

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70101020507	Jack Lake	11040000	0.01	1	0.33	0.01	1	1	0.33	0.66	4.34
70101020507	Long Lake	11048000	1	0.66	0.33	0.01	0.01	1	1	0.01	4.02
70101020507	Leech Lake - Shingobee	11020304	0.01	0.33	0.01	0.01	1	1	0.01	1	3.37
70101020507	Three Island Lake	11017700	0.01	0.33	0.33	0.01	0.33	1	0.66	0.66	3.33
70101020507	Teepee Lake	11031200	1	0.01	0.01	0.01	0.33	1	0.01	0.01	2.38
70101020507	Pine Lake	11029200	0.01	0.66	0.33	0.01	0.66	0.01	0.01	0.66	2.35
70101020507	Lost Lake	11089800	0.01	0.01	0.01	0.01	1	0.01	1	0.01	2.06
70101020507	Rice Lake	11040200	0.01	0.66	0.01	0.01	1	0.01	0.33	0.01	2.04
70101020507	Horseshoe Lake	11028400	0.01	0.66	0.33	0.01	0.33	0.01	0.01	0.33	1.69
70101020507	Rat Lake	11028500	0.01	0.33	0.01	0.01	0.66	0.01	0.01	0.33	1.37
70101020507	Gould Lake	11041400	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Hole-in-bog Lake	11019700	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Blackduck Lake	11019200	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Wabegon Lake	11040300	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Bobolink Lake	11053100	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Deep Lake	11040400	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507		11081000	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020507	Iverson Lake	11019400	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Camp Lake	11019500	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507		11093900	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Haynes Lake	11028600	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Aultman Lake	11019600	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Mad Dog Lake	11019300	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507		11087100	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Shell Lake	11039000	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507		11053300	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Current Lake	11080900	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
70101020507	Cedar Lake	11028900	0.01	0.33	0.01	0.01	0.33	0.01	0.01	0.01	0.72
70101020507	Ten Lake	11046700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.33	0.72
70101020507	Mud Lake	11029000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Wawa Lake	11028800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507		11094300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Fifth Lake	11046600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4

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70101020507	South Stocking Lake	11029700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Blot Lake	11080000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Spearns Lake	11029300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Hagen Lake	11029100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	North Stocking Lake	11087300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Pollywog Lake	11029400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Marshall Lake	11079900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Conklin Lake	11052900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Lauer Lake	11028700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507		11098300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Ivins Lake	11053400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507		11098400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Sixth Lake	11130600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020507	Life Raft Lake	11040600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Fourth/upper Fifth Lake	11046500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Third Lake	11046400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Gooseberry Lake	11017500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Haugen Lake	11019100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11017600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11079400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Fourth/upper Fifth Lake	11046500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11091300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11091300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Little Bass Lake	11089600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11088300	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11079500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Lembke Lake	11089700	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11088200	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Emery Lake	11087200	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Haugen Lake	11019100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Stanley Lake	11089500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020507		11089400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11087000	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11093400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11095500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11079800	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507		11094600	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020507	Ulland Lake	11130500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020601	Leech Lake	11020300	0.01	0.66	0.01	0.01	1	1	1	1	4.69
70101020601	Drumbeater Lake	11014500	0.01	0.33	0.01	0.01	1	0.01	1	1	3.37
70101020601		11092200	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020602	Six Mile Lake	11014600	0.01	0.66	0.33	0.01	1	1	1	1	5.01
70101020602	Chub Lake	11051700	0.01	0.01	0.01	0.01	1	0.01	1	1	3.05
70101020602	Nushka Lake	11013700	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020602	Rice Lake	11013800	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020602	Blacksmith Lake	11019800	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020602	Demro Lake	11051600	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020602		11092300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Goose Lake	11009600	0.01	0.01	0.01	0.01	1	0.01	1	1	3.05
70101020603	Grave Lake	11008600	0.01	1	0.33	0.01	0.33	1	0.01	0.01	2.7
70101020603	Lower Milton Lake	11008000	0.01	0.01	0.01	0.01	0.33	0.01	0.01	1	1.39
70101020603	Upper Milton Lake	11008100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	1	1.39
70101020603		11094800	0.01	0.01	0.01	0.01	1	0.01	0.01	0.01	1.07
70101020603	Knight Lake	11008700	0.01	0.33	0.33	0.01	0.01	0.01	0.01	0.01	0.72
70101020603	Wilson Lake	11009300	0.01	0.01	0.33	0.01	0.01	0.01	0.01	0.01	0.4
70101020603	Tidd Lake	11009400	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Sullivan Lake	11008500	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Chain O Lakes	11009900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603		11080600	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603		11080300	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Cedar Lake	11008200	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Upper Menton Lake	11009700	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603	Lower Menton Lake	11009800	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603		11095100	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4

HUC12	Lake Name	DNR Lake Number	Coldwater Habitat Presence Score	P-Sensitivity Lake Presence Score	WQ Trend Score	Forest Score	Terrestrial Biodiversity Score	WRAPS Priority Lake Score	Lakes of Biological Significance Score	Wild Rice Lake Score	SUM
70101020603	Chain O Lakes	11009900	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.4
70101020603		11080500	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020603		11080400	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
70101020604	Mud Lake	11010000	0.01	0.01	0.01	0.01	1	0.01	1	1	3.05
70101020604	Mud Lake	11010000	0.01	0.01	0.01	0.01	1	1	0.01	1	3.05
70101020604		11090300	0.01	0.01	0.01	0.01	0.66	0.01	0.01	0.01	0.73
<Null>	<Null>	<Null>	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	1.07

APPENDIX J

NWV 2 RECREATIONAL LAKES

APPENDIX J: NATURAL WORLD VALUE 2: RECREATIONAL LAKES SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

Four metrics were chosen to screen for opportunities to protect and/or manage recreational lakes. A summary of each of these screening criteria and scoring breakpoints are outlined below. The values for each lake metric were summed. The HUC12 score was determined by summing the values of all lake in each HUC12. Maps that displaying the results from each scoring criteria and a table listing each lake's ranking on the 4 scoring criteria follow the narrative description.

- **Use Classification**
  - What – Lakes classified as General Use and Recreational Uses, with boat launches, were considered Recreational Lakes for this plan.
  - Why – Recreational lakes provide an important source for local access to boating, swimming and fishing and provide critical quality of life and economic value to the LLR watershed. High quality recreational lakes facilitate for the long-term sustainability of these values and are the pride and joy of the region. Active protection and management of these vital resources will provide multiple values to the watershed and its residents.
  - Data Source – Minnesota Department of Natural Resources, 2018a.
- **Lake Access**
  - What – Lakes were evaluated for the number of boat launches for this plan.
  - Why – The availability and quantity of access points to lakes helps this plan identify where both the greatest opportunities for recreation occur as well as where to focus aquatic invasive species management efforts exist.
  - Data Source – Minnesota Department of Natural Resources, 2017b.
- **Current Shoreline Development**
  - What – The extent of current shoreline development was evaluated by quantifying the sum of property values for each lake. The greater the sum, the greater the assumed potential impact to shoreline integrity and water quality.
  - Why – Shoreline development can have an adverse effect on plant community and animal biodiversity, shore stability and water quality. Regional and national studies have also shown a direct correlation between property values and lake water quality.
  - Data Source – Watts, J., 2018b and Hubbard County, 2018b.
- **Future Shoreline Development**
  - What – The relationship between the amount of potentially developable private parcels and lake size was evaluated to inform management strategies for lakes susceptible to altered shorelines. This evaluation was performed for General Use and Recreational Use lakes only.

- Why – As noted above, lakeshore development can have adverse effects on water and natural resources. The LLR Watershed is expected to dramatically increase its development footprint in the immediate future and it will be important to develop shorelines in ways that minimize their effects on its resources.
- Data Source – Watts, J., 2018b and Hubbard County, 2018b.

Table J-1. Summary of Recreational Lakes Scoring Criteria and Breakpoints

Priority Value Metric	Data Analysis	Scoring
2a) Lake Classification	Lakes were scored by their DNR Use Classification with preference to General Development lakes.	General Development = 1 Recreational Development = 0.66 Natural Environment = 0.01
2b) Lake Access	The total number of access points were counted per lake, including trailer and carry-down accesses.	>3 = 1, 2 = 0.66, 1 = 0.33, 0 = 0.01
2c) Current Shoreline Development	Sum of property values (land + building) for all riparian shoreline parcels.	> $2,500,000 = 1.0, $1,000,000–2,500,000 = 0.66, $500,000–1,000,000 = 0.33, <$500,000 = 0.01
2d) Future Shoreline Development	For each lake, the acres of private lots without bldg. values was divided by the total lake size (in acres). GD and RD lakes only. Lots with > 50% wetlands were also removed.	>0.5 = 1.0, 0.25-0.5 = 0.66, 0.10-0.25 = 0.33, <0.10 = 0.01

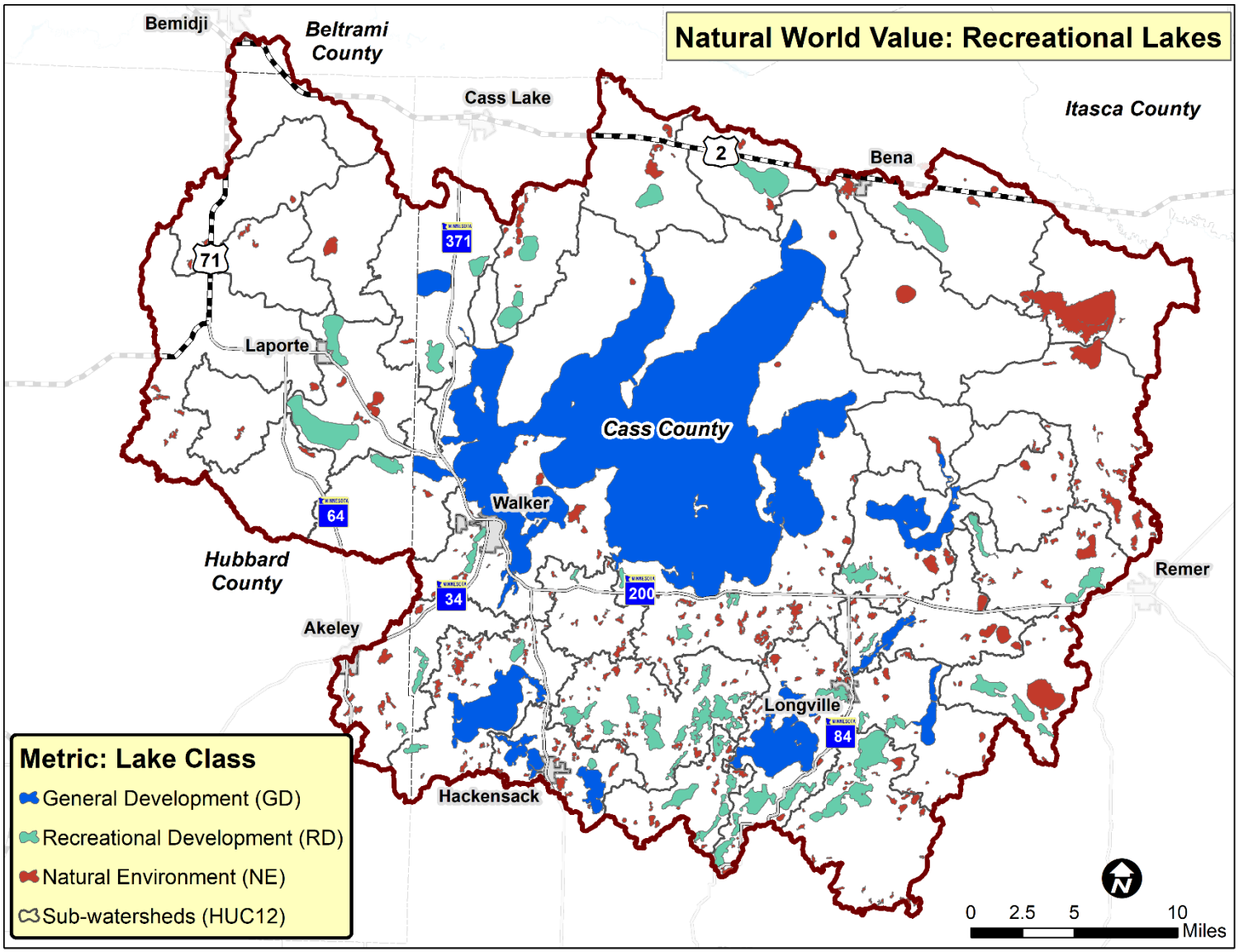

Figure J-1. Minnesota Department of Natural Resources Designated Classification of Lakes in the Leech Lake River Watershed.

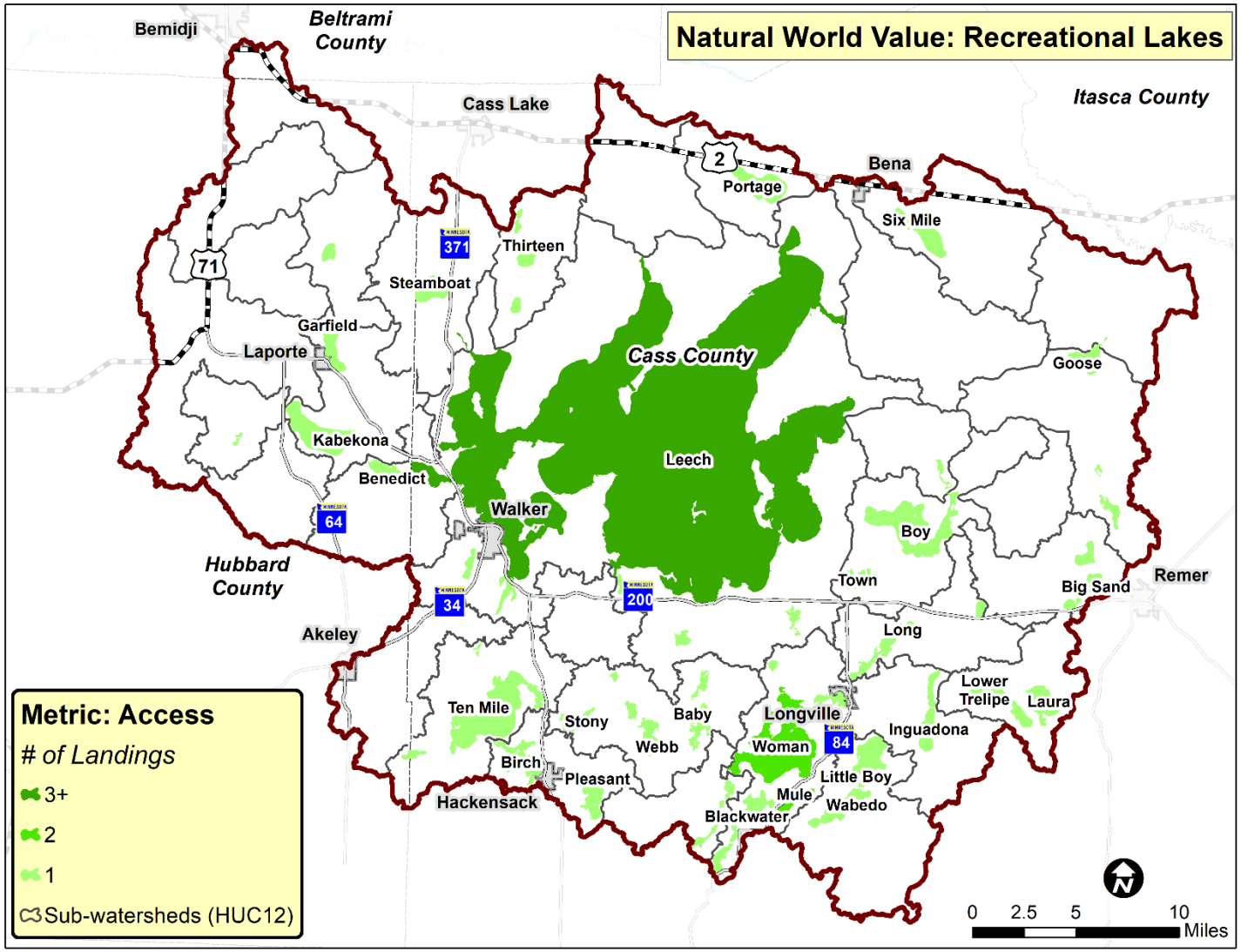

Figure J-2. Number of Public Landings on Lakes in the Leech Lake Watershed.

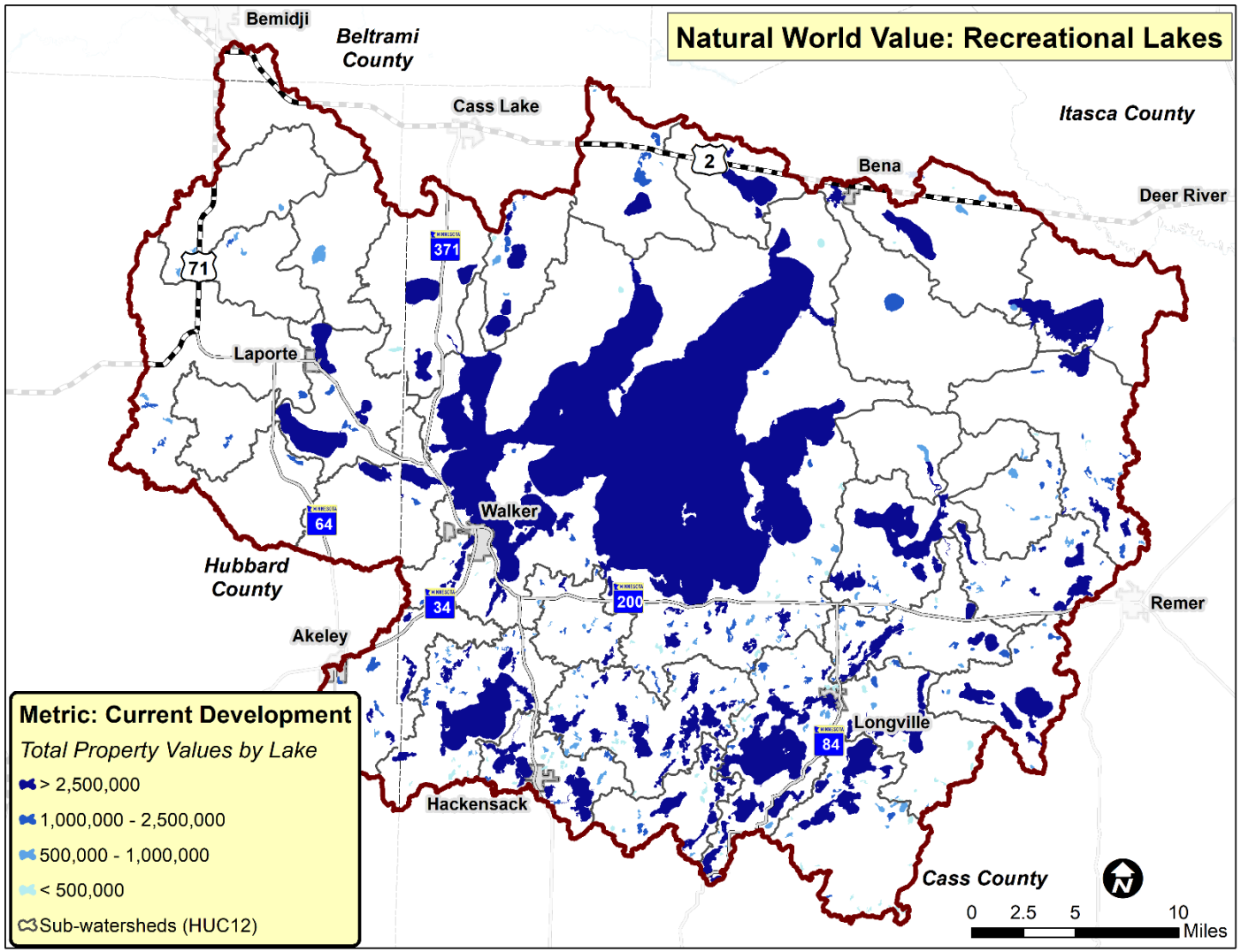

Figure J-3. Current Development on Lakes in the Leech Lake River Watershed, Based on Total Property Value.

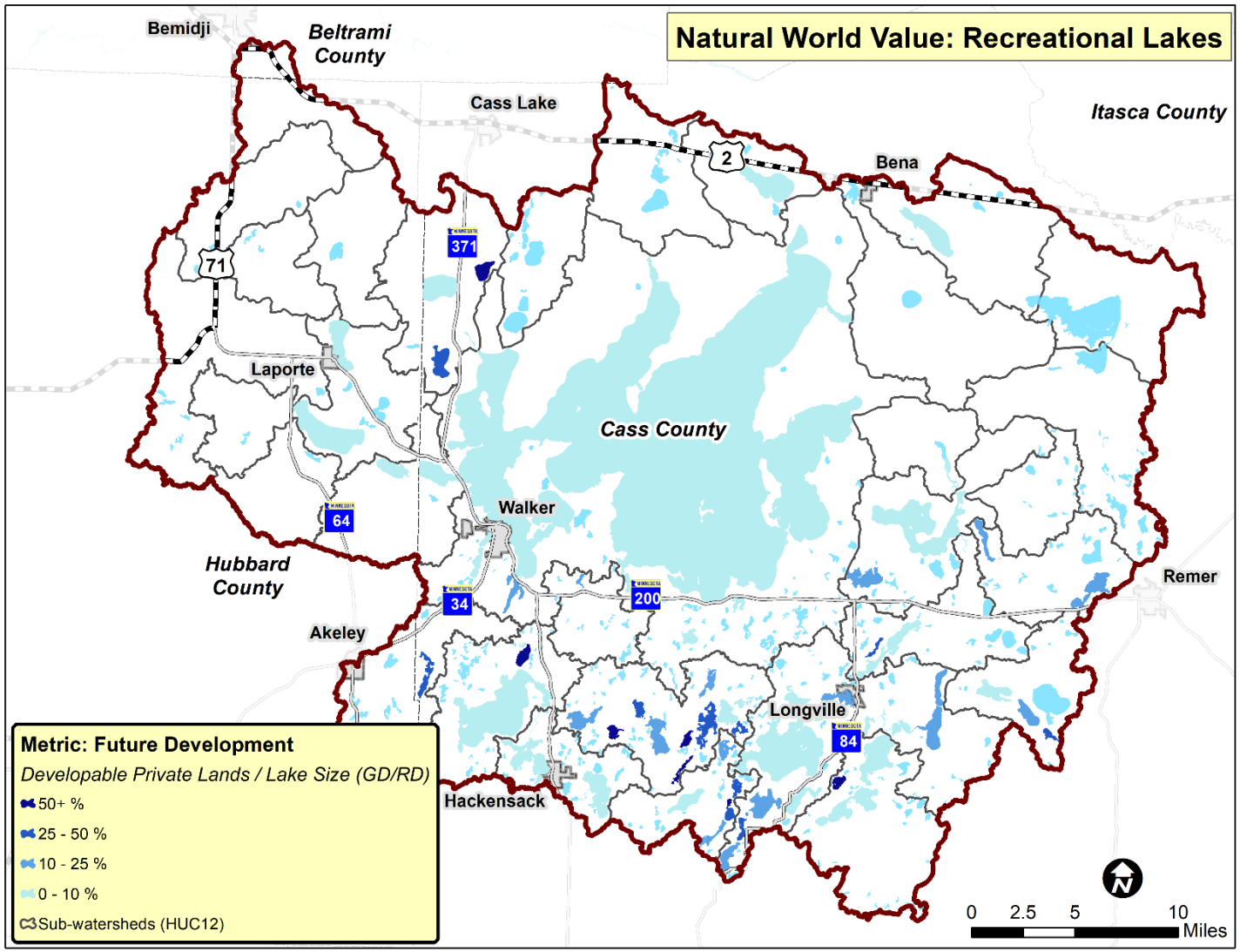

Figure J-4. Potential Future Shoreline Development of Lakes In the Leech Lake R iver Watershed.

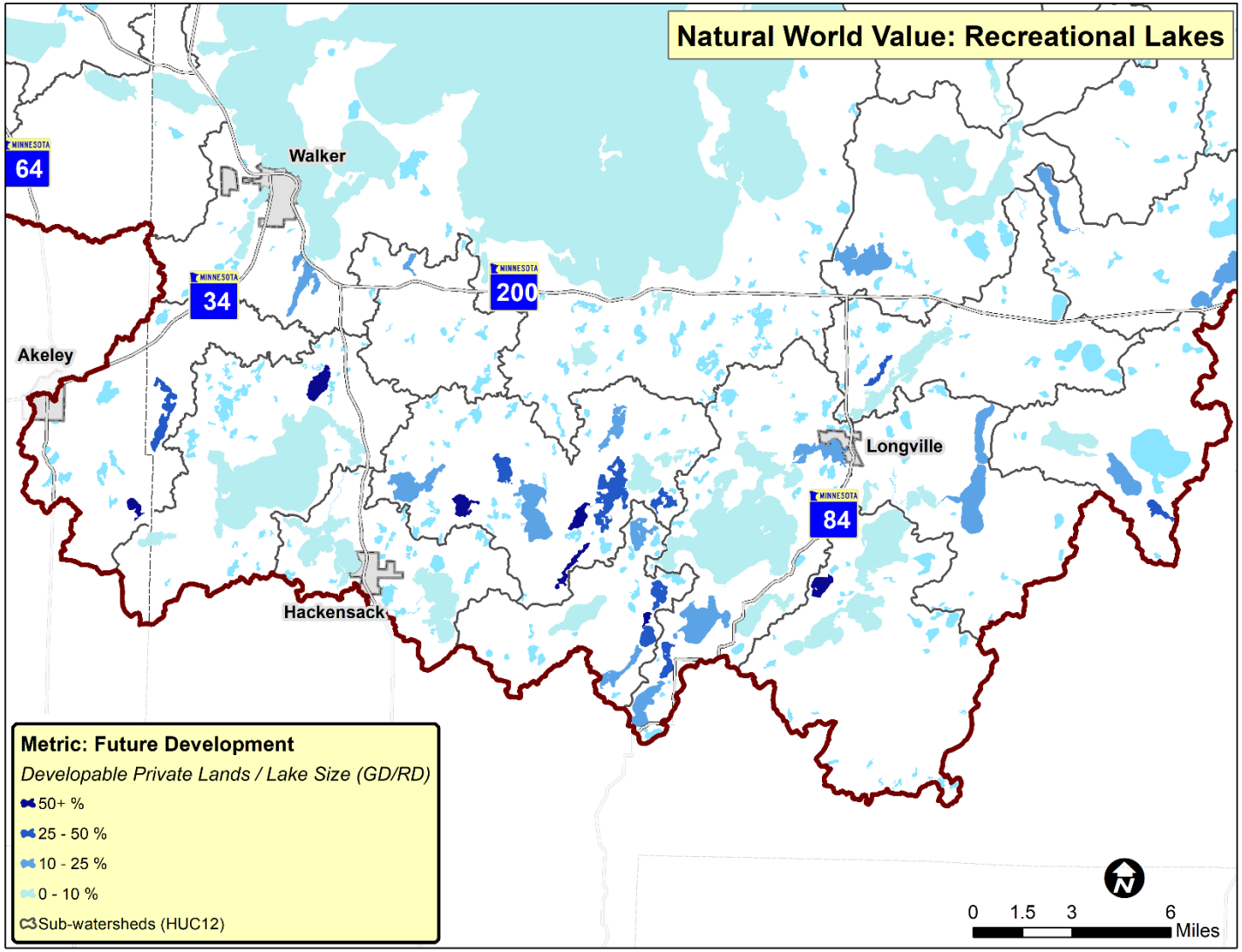

Figure J-5. Potential Future Shoreline Development of Lakes in the Southern Portion of the Leech Lake River Watershed.

Table J-2. Individual Metric and Sum Scoring for Recreational Lakes in the Leech Lake River Watershed.

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020102	DeHart	29013700	0.01	0.01	0.33	0.01	0.36
70101020102	Kimball	29013900	0.01	0.01	0.33	0.01	0.36
70101020102	Knutson	29007600	0.01	0.01	0.33	0.01	0.36
70101020103	Hatchers	29013500	0.01	0.01	0.66	0.01	0.69
70101020103	Upper Thatcher	29013400	0.01	0.01	0.33	0.01	0.36
70101020103	Horsehead	29013600	0.01	0.01	0.33	0.01	0.36
70101020104	Hart	29006300	0.01	0.33	0.33	0.01	0.68
70101020105	Steamboat Lake	11050400	1	0.33	1	0.01	2.34
70101020105	Swamp Lake	11048300	0.66	0.01	1	0.66	2.33
70101020105	Portage Lake	11049000	0.66	0.01	1	1	2.67
70101020105	Spring	29005400	0.01	0.01	0.01	0.01	0.04
70101020105	Steamboat River	11125300	0.01	0.01	0.66	0.01	0.69
70101020201	Willow	29005800	0.01	0.01	0.66	0.01	0.69
70101020201	Sheridan	29015500	0.01	0.01	0.66	0.01	0.69
70101020201	Island	29012800	0.01	0.01	0.66	0.01	0.69
70101020201	Shanty	29021800	0.01	0.01	0.33	0.01	0.36
70101020201	Gillett	29012600	0.01	0.01	0.33	0.01	0.36
70101020201	Teepee	29015400	0.01	0.01	0.66	0.01	0.69
70101020202	Nelson	29013100	0.01	0.33	0.66	0.01	1.01
70101020202	Twenty-One	29013000	0.01	0.33	0.66	0.01	1.01
70101020203	Lester	29004900	0.01	0.01	0.66	0.01	0.69
70101020204	Kabekona	29007500	0.66	0.33	1	0.01	2
70101020204	Garfield	29006100	0.66	0.33	1	0.01	2
70101020204	Horseshoe	29005900	0.01	0.01	1	0.01	1.03
70101020204	Oak	29006000	0.01	0.01	0.66	0.01	0.69
70101020204	Unnamed	29005700	0.01	0.01	0.66	0.01	0.69
70101020301	Ten Mile Lake	11041300	1	0.33	1	0.01	2.34
70101020301	Bass Lake	11047400	0.01	0.01	1	0.01	1.03
70101020301	Portage Lake	11047600	0.66	0.01	1	1	2.67
70101020301	Crystal Lake	11050200	0.66	0.33	1	0.01	2
70101020301	Little Bass Lake	11047700	0.01	0.01	0.66	0.01	0.69
70101020301	Chub Lake	11045700	0.01	0.01	0.01	0.01	0.04
70101020301	Gadbolt Lake	11047500	0.01	0.33	1	0.01	1.35
70101020301		11052100	0.01	0.01	1	0.01	1.03

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020301		11089000	0.01	0.01	0.66	0.01	0.69
70101020301	Wheeler Lake	11047800	0.01	0.01	0.66	0.01	0.69
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Cripple Lake	11047300	0.01	0.01	0.33	0.01	0.36
70101020301		11054600	0.01	0.01	0.33	0.01	0.36
70101020301	Muskrat Lake	11047900	0.01	0.01	0.66	0.01	0.69
70101020301	Million Lake	11089200	0.01	0.01	0.66	0.01	0.69
70101020301		11088800	0.01	0.01	0.66	0.01	0.69
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Cyphers Lake	11052700	0.01	0.01	0.66	0.01	0.69
70101020301		11054400	0.01	0.01	0.01	0.01	0.04
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301		11084400	0.01	0.01	0.01	0.01	0.04
70101020301		11084200	0.01	0.01	0.01	0.01	0.04
70101020301		11052600	0.01	0.01	0.66	0.01	0.69
70101020301		11089100	0.01	0.01	0.33	0.01	0.36
70101020301	Mary Norton Lake	11052800	0.01	0.01	0.66	0.01	0.69
70101020301		11088700	0.01	0.01	0.33	0.01	0.36
70101020301		11052500	0.01	0.01	0.33	0.01	0.36
70101020301		11052400	0.01	0.01	0.33	0.01	0.36
70101020301		11054500	0.01	0.01	0.01	0.01	0.04
70101020301		11088900	0.01	0.01	0.33	0.01	0.36
70101020301	Lake Erin	11052300	0.01	0.01	0.66	0.01	0.69
70101020301	Scoffner Lake	11130800	0.01	0.01	0.66	0.01	0.69
70101020301		11052200	0.01	0.01	0.66	0.01	0.69
70101020301		11052000	0.01	0.01	0.33	0.01	0.36
70101020301		11054600	0.01	0.01	0.33	0.01	0.36
70101020301	Lost Lake	11089300	0.01	0.01	0.33	0.01	0.36
70101020301		11098100	0.01	0.01	0.66	0.01	0.69
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020301	Boy River	11120900	0.01	0.01	1	0.01	1.03
70101020302	Birch Lake	11041200	1	0.33	1	0.01	2.34
70101020302	Pleasant Lake	11038300	1	0.33	1	0.01	2.34

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020302	Paquet (One) Lake	11038100	0.01	0.01	1	0.01	1.03
70101020302	Boss Lake	11038200	0.66	0.01	1	0.01	1.68
70101020302	Long Lake	11038400	0.01	0.01	0.33	0.01	0.36
70101020302	Horseshoe Lake	11037700	0.01	0.01	0.66	0.01	0.69
70101020302	Mud Lake	11038500	0.01	0.01	0.66	0.01	0.69
70101020302	Perry Lake	11045800	0.01	0.01	0.66	0.01	0.69
70101020302	Peterson Lake	11038000	0.01	0.01	0.01	0.01	0.04
70101020302	Young Lake	11054800	0.01	0.01	0.33	0.01	0.36
70101020302	Highbank Lake	11051500	0.01	0.01	0.66	0.01	0.69
70101020302		11055100	0.01	0.01	0.01	0.01	0.04
70101020302		11054900	0.01	0.01	0.01	0.01	0.04
70101020302		11055200	0.01	0.01	0.01	0.01	0.04
70101020302		11093300	0.01	0.01	0.01	0.01	0.04
70101020302		11084100	0.01	0.01	0.01	0.01	0.04
70101020302		11055300	0.01	0.01	0.01	0.01	0.04
70101020302		11084900	0.01	0.01	1	0.01	1.03
70101020302		11084800	0.01	0.01	0.01	0.01	0.04
70101020302		11055000	0.01	0.01	0.01	0.01	0.04
70101020302		11084500	0.01	0.01	0.01	0.01	0.04
70101020303	Webb Lake	11031100	0.66	0.33	1	0.33	2.32
70101020303	Baby Lake	11028300	0.66	0.33	1	0.66	2.65
70101020303	Stony Lake	11037100	0.66	0.33	1	0.33	2.32
70101020303	Man Lake	11028200	0.66	0.01	1	0.01	1.68
70101020303	Moccasin Lake	11029600	0.66	0.33	1	0.33	2.32
70101020303	Little Webb Lake	11038700	0.66	0.33	1	0.66	2.65
70101020303	Larson Lake	11037400	0.66	0.01	1	1	2.67
70101020303	Kid Lake	11026200	0.66	0.01	1	1	2.67
70101020303	Mckeown Lake	11026100	0.66	0.01	1	0.66	2.33
70101020303	Trillium(Lizard) Lake	11027000	0.66	0.01	1	1	2.67
70101020303	Barnum Lake	11028100	0.66	0.01	1	0.01	1.68
70101020303	Diamond Lake	11039600	0.01	0.33	1	0.01	1.35
70101020303	Kerr Lake	11026800	0.01	0.01	1	0.01	1.03
70101020303	Lost Lake	11026900	0.01	0.01	0.66	0.01	0.69
70101020303	Long Lake	11039500	0.01	0.01	1	0.01	1.03
70101020303	Sylvester Lake	11037300	0.01	0.01	0.33	0.01	0.36
70101020303	Bluebill Lake	11039700	0.01	0.01	1	0.01	1.03

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020303	Three Island Lake	11084700	0.01	0.01	0.33	0.01	0.36
70101020303	Fish Lake	11037900	0.01	0.01	0.33	0.01	0.36
70101020303		11085100	0.01	0.01	0.01	0.01	0.04
70101020303	Goose Lake	11029800	0.01	0.01	0.66	0.01	0.69
70101020303		11091200	0.01	0.01	0.66	0.01	0.69
70101020303	Surprise Lake	11037500	0.01	0.01	0.33	0.01	0.36
70101020303	Blueberry Lake	11037600	0.01	0.01	0.01	0.01	0.04
70101020303		11094200	0.01	0.01	0.66	0.01	0.69
70101020303	Cranberry Lake	11059500	0.01	0.01	0.66	0.01	0.69
70101020303		11085200	0.01	0.01	0.66	0.01	0.69
70101020303		11093700	0.01	0.01	1	0.01	1.03
70101020303		11087800	0.01	0.01	0.66	0.01	0.69
70101020303	Cub Lake	11039900	0.01	0.01	0.66	0.01	0.69
70101020303	Oak/weed Lake	11087500	0.01	0.01	0.33	0.01	0.36
70101020303		11026000	0.01	0.01	0.33	0.01	0.36
70101020303		11085000	0.01	0.01	0.01	0.01	0.04
70101020303		11087700	0.01	0.01	0.33	0.01	0.36
70101020303	Popple Lake	11087400	0.01	0.01	0.01	0.01	0.04
70101020303	Tower Lake	11037200	0.01	0.01	0.01	0.01	0.04
70101020303	Woodchuck Lake	11037800	0.01	0.01	0.33	0.01	0.36
70101020303		11085300	0.01	0.01	0.01	0.01	0.04
70101020303		11086800	0.01	0.01	0.33	0.01	0.36
70101020303		11055600	0.01	0.01	0.01	0.01	0.04
70101020303	Lake Four One Eight	11039800	0.01	0.01	0.33	0.01	0.36
70101020303		11084600	0.01	0.01	0.01	0.01	0.04
70101020303	Twin Lake	11093800	0.01	0.01	1	0.01	1.03
70101020303	Twin Lake	11093800	0.01	0.01	1	0.01	1.03
70101020303		11087600	0.01	0.01	0.33	0.01	0.36
70101020303	Bass Pond	11130400	0.01	0.01	0.33	0.01	0.36
70101020303		11098200	0.01	0.01	0.33	0.01	0.36
70101020303	Shadow Lake	11130000	0.01	0.01	0.01	0.01	0.04
70101020304	Big Deep Lake	11027700	0.66	0.01	1	0.01	1.68
70101020304	Child Lake	11026300	0.66	0.01	1	0.33	2
70101020304	Long Lake	11025800	0.66	0.33	1	0.33	2.32
70101020304	Widow Lake	11027300	0.66	0.33	1	0.66	2.65
70101020304	Lower Sand Lake	11027900	0.66	0.01	1	0.66	2.33

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020304	Ixl Lake	11027200	0.01	0.01	1	0.01	1.03
70101020304	Little Bay Lake	11036900	0.01	0.01	0.66	0.01	0.69
70101020304	Squaw Lake	11026500	0.01	0.01	1	0.01	1.03
70101020304		11055400	0.01	0.01	0.01	0.01	0.04
70101020304	Upper Sand Lake	11027500	0.66	0.33	1	1	2.99
70101020304	Blind Lake	11031000	0.01	0.01	0.66	0.01	0.69
70101020304	Pick Lake	11026700	0.01	0.01	1	0.01	1.03
70101020304	Little Deep Lake	11027600	0.01	0.01	0.01	0.01	0.04
70101020304		11093600	0.01	0.01	0.33	0.01	0.36
70101020304	Round Lake	11037000	0.01	0.01	0.01	0.01	0.04
70101020304		11056100	0.01	0.01	0.33	0.01	0.36
70101020304	Pancake Lake	11027100	0.01	0.01	0.01	0.01	0.04
70101020304	Squeedunk Lake	11026600	0.01	0.01	1	0.01	1.03
70101020304		11084000	0.01	0.01	0.33	0.01	0.36
70101020304		11027800	0.01	0.01	1	0.01	1.03
70101020305	Woman Lake	11020100	1	0.66	1	0.01	2.67
70101020305	Blackwater Lake	11027400	0.66	0.33	1	0.33	2.32
70101020305	Mule Lake	11020000	0.66	0.66	1	0.01	2.33
70101020305	Girl Lake	11017400	0.66	0.33	1	0.33	2.32
70101020305	Ponto Lake	11023400	0.66	0.33	1	0.33	2.32
70101020305	Island Lake	11025700	0.66	0.33	1	0.66	2.65
70101020305	Silver Lake	11020200	0.01	0.33	0.66	0.01	1.01
70101020305	Jack Lake	11016400	0.01	0.01	0.33	0.01	0.36
70101020305	Boxell Lake	11018300	0.01	0.01	1	0.01	1.03
70101020305	One Lake	11024400	0.01	0.01	1	0.01	1.03
70101020305		11079700	0.01	0.01	0.66	0.01	0.69
70101020305	Donkey Lake	11028000	0.01	0.01	0.33	0.01	0.36
70101020305	Heffron Lake	11016900	0.01	0.01	1	0.01	1.03
70101020305	Craig Lake	11018600	0.01	0.01	0.01	0.01	0.04
70101020305	Primer Lake	11025900	0.01	0.01	0.01	0.01	0.04
70101020305	Swede Lake	11016500	0.01	0.01	0.33	0.01	0.36
70101020305	Barrow Lake	11026400	0.01	0.01	0.66	0.01	0.69
70101020305	Carnahan Lake	11018800	0.01	0.01	0.66	0.01	0.69
70101020305	Nellie Lake	11018700	0.01	0.01	0.01	0.01	0.04
70101020305	Canoe Lake	11029900	0.01	0.01	1	0.01	1.03
70101020305		11086900	0.01	0.01	0.33	0.01	0.36

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020305	Hazel Lake	11029500	0.01	0.01	0.33	0.01	0.36
70101020305		11086700	0.01	0.01	0.01	0.01	0.04
70101020305		11056000	0.01	0.01	0.01	0.01	0.04
70101020305	Tamarack Lake	11086600	0.01	0.01	0.66	0.01	0.69
70101020305		11055500	0.01	0.01	0.33	0.01	0.36
70101020305		11079600	0.01	0.01	0.66	0.01	0.69
70101020305		11075300	0.01	0.01	0.01	0.01	0.04
70101020305		11086500	0.01	0.01	0.01	0.01	0.04
70101020305		11095700	0.01	0.01	0.01	0.01	0.04
70101020305		11131600	0.01	0.01	0.33	0.01	0.36
70101020305		11096500	0.01	0.01	0.33	0.01	0.36
70101020305	Cardarelle Lake	11130100	0.01	0.01	0.01	0.01	0.04
70101020305		11095600	0.01	0.01	0.33	0.01	0.36
70101020401	Little Boy Lake	11016700	0.66	0.33	1	0.01	2
70101020401	Wabedo Lake	11017100	0.66	0.33	1	0.01	2
70101020401	Hunter Lake	11017000	0.66	0.01	1	1	2.67
70101020401	Mccarthey Lake	11016800	0.01	0.01	1	0.01	1.03
70101020401	Camp Two Lake	11011800	0.01	0.01	0.33	0.01	0.36
70101020401		11091100	0.01	0.01	0.66	0.01	0.69
70101020401	Shurd Lake	11016600	0.01	0.01	1	0.01	1.03
70101020401	Bracket Lake	11017200	0.01	0.01	0.33	0.01	0.36
70101020401	Woodcamp Lake	11011900	0.01	0.01	0.01	0.01	0.04
70101020401		11010800	0.01	0.01	0.01	0.01	0.04
70101020401		11055700	0.01	0.01	0.33	0.01	0.36
70101020401	Charles Lake	11014100	0.01	0.01	0.33	0.01	0.36
70101020401		11010900	0.01	0.01	0.01	0.01	0.04
70101020401	Little Lake	11131500	0.01	0.01	0.66	0.01	0.69
70101020401		11097900	0.01	0.01	0.01	0.01	0.04
70101020401		11058100	0.01	0.01	0.66	0.01	0.69
70101020401	Lake Louise	11057300	0.01	0.01	0.66	0.01	0.69
70101020401		11057900	0.01	0.01	0.01	0.01	0.04
70101020401	Crooked Lake	11057400	0.01	0.01	0.01	0.01	0.04
70101020401		11074900	0.01	0.01	0.01	0.01	0.04
70101020401		11058000	0.01	0.01	0.01	0.01	0.04
70101020401	Bass Lake	11075400	0.01	0.01	0.66	0.01	0.69
70101020401	Lake Thirty-six	11017300	0.01	0.01	0.33	0.01	0.36

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020401		11057500	0.01	0.01	0.01	0.01	0.04
70101020401		11074800	0.01	0.01	0.01	0.01	0.04
70101020401		11074400	0.01	0.01	0.01	0.01	0.04
70101020401		11075200	0.01	0.01	0.01	0.01	0.04
70101020401	Buck Lake	11055800	0.01	0.01	0.01	0.01	0.04
70101020401		11057800	0.01	0.01	0.01	0.01	0.04
70101020402	Laura Lake	11010400	0.01	0.33	1	0.01	1.35
70101020402	Lower Trelipe Lake	11012900	0.66	0.33	1	0.01	2
70101020402	Upper Trelipe Lake	11010500	0.66	0.33	1	0.33	2.32
70101020402	Little Bass Lake	11006300	0.66	0.01	1	0.66	2.33
70101020402	Oxbow Lake	11007500	0.01	0.01	0.66	0.01	0.69
70101020402	Peterson Lake	11010600	0.01	0.01	0.66	0.01	0.69
70101020402		11013000	0.01	0.01	0.33	0.01	0.36
70101020402	Ododikossi Lake	11007400	0.01	0.01	0.33	0.01	0.36
70101020402		11056800	0.01	0.01	0.33	0.01	0.36
70101020402		11056700	0.01	0.01	0.66	0.01	0.69
70101020402	Bailey Lake	11007600	0.01	0.01	0.33	0.01	0.36
70101020403	Induadona Lake	11012000	1	0.33	1	0.33	2.66
70101020403	Rice Lake	11016200	0.66	0.01	1	0.01	1.68
70101020403	Cooper Lake	11016300	0.66	0.01	1	0.01	1.68
70101020403	Giijk Lake	11018500	0.01	0.01	0.66	0.01	0.69
70101020403		11076100	0.01	0.01	0.01	0.01	0.04
70101020403	Cedar Lake	11078900	0.01	0.01	0.66	0.01	0.69
70101020403	Tamarack Lake	11018900	0.01	0.01	0.33	0.01	0.36
70101020403	Bullhead Lake	11018400	0.01	0.01	0.01	0.01	0.04
70101020403		11076200	0.01	0.01	0.01	0.01	0.04
70101020403		11076000	0.01	0.01	0.01	0.01	0.04
70101020403		11075900	0.01	0.01	0.01	0.01	0.04
70101020403		11075800	0.01	0.01	0.33	0.01	0.36
70101020403		11075500	0.01	0.01	0.01	0.01	0.04
70101020403	Blueberry Lake	11057200	0.01	0.01	0.01	0.01	0.04
70101020403	Echo Lake	11075600	0.01	0.01	0.01	0.01	0.04
70101020403	Ford Lake	11079000	0.01	0.01	0.01	0.01	0.04
70101020403		11057000	0.01	0.01	0.33	0.01	0.36
70101020403		11057100	0.01	0.01	0.01	0.01	0.04
70101020403	Rice Lake	11016200	0.66	0.01	1	0.01	1.68

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020404	Long Lake	11014200	1	0.33	1	0.01	2.34
70101020404	Twin Lake	11012300	0.01	0.01	1	0.01	1.03
70101020404	West Twin Lake	11012500	0.01	0.01	1	0.01	1.03
70101020404	Mabel Lake	11012100	0.01	0.33	1	0.01	1.35
70101020404	Kego Lake	11018200	0.66	0.01	1	0.66	2.33
70101020404	Wax Lake	11012400	0.01	0.01	0.66	0.01	0.69
70101020404	Maple Lake	11018100	0.01	0.01	1	0.01	1.03
70101020404	Lundeen Lake	11018000	0.01	0.01	0.66	0.01	0.69
70101020404	Football Lake	11017800	0.01	0.01	0.66	0.01	0.69
70101020404		11012700	0.01	0.01	0.66	0.01	0.69
70101020404		11095400	0.01	0.01	0.33	0.01	0.36
70101020404	Lost Girl Lake	11012800	0.01	0.01	0.33	0.01	0.36
70101020404		11012200	0.01	0.01	0.01	0.01	0.04
70101020404	Tadpole Lake	11053600	0.01	0.01	0.33	0.01	0.36
70101020404		11053800	0.01	0.01	0.01	0.01	0.04
70101020404	Phelon Lake	11012600	0.01	0.01	0.66	0.01	0.69
70101020404	Red's Pond	11079100	0.01	0.01	0.66	0.01	0.69
70101020404		11078800	0.01	0.01	0.66	0.01	0.69
70101020404	Johnson Lake	11054000	0.01	0.01	0.33	0.01	0.36
70101020404		11053500	0.01	0.01	0.33	0.01	0.36
70101020404		11079200	0.01	0.01	0.01	0.01	0.04
70101020405	Big Sand Lake	11007700	0.66	0.33	1	0.33	2.32
70101020405	Little Sand Lake	11009200	0.01	0.33	1	0.01	1.35
70101020405	Swift Lake	11013300	0.66	0.01	1	0.33	2
70101020405	Moon Lake	11007800	0.01	0.01	1	0.01	1.03
70101020405		11095200	0.01	0.01	0.33	0.01	0.36
70101020405	Little Swift Lake	11013100	0.01	0.01	0.66	0.01	0.69
70101020405	Wahneshin Lake	11008800	0.01	0.01	0.66	0.01	0.69
70101020405		11091900	0.01	0.01	0.33	0.01	0.36
70101020405		11091600	0.01	0.01	1	0.01	1.03
70101020405	Green Lake	11009100	0.01	0.01	0.66	0.01	0.69
70101020405		11091800	0.01	0.01	0.66	0.01	0.69
70101020405		11091700	0.01	0.01	0.33	0.01	0.36
70101020405		11054100	0.01	0.01	0.66	0.01	0.69
70101020405	Swift Lake	11013300	0.66	0.01	1	0.33	2
70101020405	Swift Lake	11013300	0.66	0.01	1	0.33	2

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020405	Swift Lake	11013300	0.66	0.01	1	0.33	2
70101020406	Lucille Lake	11010700	0.01	0.01	0.33	0.01	0.36
70101020406	Grass Lake	11009000	0.01	0.01	0.33	0.01	0.36
70101020406	Taylor Lake	11009500	0.01	0.01	0.66	0.01	0.69
70101020406	Dewey Lake	11008400	0.01	0.01	0.66	0.01	0.69
70101020406	Tamarack Lake	11008300	0.01	0.01	0.66	0.01	0.69
70101020406	Tobique Lake	11013200	0.01	0.01	0.33	0.01	0.36
70101020406		11092900	0.01	0.01	0.01	0.01	0.04
70101020406	Bebow Lake	11008900	0.01	0.01	0.33	0.01	0.36
70101020406	Mink Lake	11054300	0.01	0.01	0.33	0.01	0.36
70101020406		11054200	0.01	0.01	0.66	0.01	0.69
70101020407	Boy Lake	11014300	1	0.33	1	0.01	2.34
70101020407	Town Line Lake	11019000	0.66	0.33	1	0.33	2.32
70101020407	Lomish Lake	11013600	0.01	0.01	1	0.01	1.03
70101020407	Portage Lake	11013400	0.01	0.01	1	0.01	1.03
70101020407		11053900	0.01	0.01	0.66	0.01	0.69
70101020407		11095300	0.01	0.01	0.33	0.01	0.36
70101020407	Rabbitt Lake	11013500	0.01	0.01	0.66	0.01	0.69
70101020407		11093000	0.01	0.01	0.33	0.01	0.36
70101020407	Crown Lake	11017900	0.01	0.01	0.66	0.01	0.69
70101020407		11093100	0.01	0.01	0.33	0.01	0.36
70101020407		11080700	0.01	0.01	0.33	0.01	0.36
70101020407	County Lake	11053700	0.01	0.01	0.33	0.01	0.36
70101020407		11079300	0.01	0.01	0.66	0.01	0.69
70101020407		11078700	0.01	0.01	0.66	0.01	0.69
70101020407		11080800	0.01	0.01	0.66	0.01	0.69
70101020407	Laabs Lake	11131700	0.01	0.01	0.01	0.01	0.04
70101020408	Skelly Lake	11099900	0.01	0.01	0.33	0.01	0.36
70101020501	Benedict	29004800	0.66	0.33	1	0.01	2
70101020501	Cedar Lake	11048100	0.01	0.01	0.66	0.01	0.69
70101020501		11051800	0.01	0.01	1	0.01	1.03
70101020502	Crooked Lake	11049400	0.66	0.01	1	0.01	1.68
70101020502	Thirteen Lake	11048800	0.66	0.33	1	0.01	2
70101020502	Welsh Lake	11049300	0.66	0.33	1	0.01	2
70101020502	Twin Lake	11048400	0.01	0.33	1	0.01	1.35
70101020502	Little Twin Lake	11048700	0.01	0.01	0.66	0.01	0.69

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020502	Little Moss Lake	11048900	0.01	0.01	0.33	0.01	0.36
70101020502	Camp Lake	11049600	0.01	0.01	0.66	0.01	0.69
70101020502	Hessie Lake	11048600	0.01	0.01	0.01	0.01	0.04
70101020502	Faherty Lake	11049200	0.01	0.01	0.33	0.01	0.36
70101020502	Experiment Lake	11041600	0.01	0.01	0.66	0.01	0.69
70101020502		11092000	0.01	0.01	0.01	0.01	0.04
70101020503	Howard Lake	11047200	0.66	0.01	1	0.66	2.33
70101020503	Shingobee	29004300	0.01	0.01	0.66	0.01	0.69
70101020503	Williams	29001500	0.66	0.01	1	1	2.67
70101020503	Island	29000700	0.01	0.01	1	0.01	1.03
70101020503	Lake Alice	11046800	0.01	0.01	1	0.01	1.03
70101020503	Steel	29002200	0.01	0.01	0.66	0.01	0.69
70101020503	Mastny	29000800	0.01	0.01	0.33	0.01	0.36
70101020503	Robinson	29002300	0.01	0.01	0.33	0.01	0.36
70101020503	Gauldin	29001000	0.01	0.01	0.01	0.01	0.04
70101020503	Mud	29004400	0.01	0.01	0.66	0.01	0.69
70101020503	Mary	29001300	0.01	0.01	0.33	0.01	0.36
70101020503	Unnamed	29002400	0.01	0.01	0.33	0.01	0.36
70101020503	Lake Thirty-four	11047000	0.01	0.01	0.33	0.01	0.36
70101020503	Anoway Lake	11046900	0.01	0.01	0.66	0.01	0.69
70101020503	Pauls Lake	11047100	0.01	0.01	0.33	0.01	0.36
70101020504	Lower Sucker Lake	11031300	0.66	0.01	1	0.01	1.68
70101020504	Middle Sucker Lake	11031700	0.01	0.01	0.66	0.01	0.69
70101020504	Grass Lake	11031500	0.01	0.01	0.66	0.01	0.69
70101020504	Upper Sucker Lake	11031600	0.01	0.01	0.66	0.01	0.69
70101020504	Foot Lake	11054700	0.01	0.01	0.33	0.01	0.36
70101020504	Tank Lake	11040800	0.01	0.01	0.33	0.01	0.36
70101020505	Hovde Lake	11039400	0.01	0.01	1	0.01	1.03
70101020505	Turtle Lake	11040100	0.66	0.01	1	0.33	2
70101020505		11088000	0.01	0.01	0.66	0.01	0.69
70101020505	Spruce Lake	11039200	0.01	0.01	0.33	0.01	0.36
70101020505	Little Turtle Lake	11038800	0.01	0.01	0.66	0.01	0.69
70101020505	Hanson Lake	11038900	0.01	0.01	0.33	0.01	0.36
70101020505	Nomad Lake	11040500	0.01	0.01	0.66	0.01	0.69
70101020505	Bag Lake	11039300	0.01	0.01	0.66	0.01	0.69
70101020505	Big Hanson Lake	11039100	0.01	0.01	0.66	0.01	0.69

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020505		11087900	0.01	0.01	0.66	0.01	0.69
70101020505	Tanglewood Lake	11088100	0.01	0.01	0.66	0.01	0.69
70101020505		11088400	0.01	0.01	0.33	0.01	0.36
70101020505		11053000	0.01	0.01	0.33	0.01	0.36
70101020506	Portage Lake	11020400	0.66	0.33	1	0.01	2
70101020506		11092100	0.01	0.01	1	0.01	1.03
70101020506	Little Portage Lake	11030200	0.01	0.01	1	0.01	1.03
70101020506		11091000	0.01	0.01	0.01	0.01	0.04
70101020507	Leech Lake - Shingobee	11020304	1	0.33	1	0.33	2.66
70101020507	Long Lake	11048000	0.66	0.33	1	0.01	2
70101020507	Rice Lake	11040200	0.01	0.01	1	0.01	1.03
70101020507	Three Island Lake	11017700	0.01	0.33	1	0.01	1.35
70101020507	Pine Lake	11029200	0.66	0.33	1	0.01	2
70101020507	Mud Lake	11029000	0.01	0.01	1	0.01	1.03
70101020507	Horseshoe Lake	11028400	0.66	0.01	1	0.01	1.68
70101020507	Jack Lake	11040000	0.66	0.33	1	0.01	2
70101020507	May Lake	11048200	0.66	0.01	1	0.01	1.68
70101020507	Cedar Lake	11028900	0.01	0.01	0.66	0.01	0.69
70101020507	Gould Lake	11041400	0.01	0.01	1	0.01	1.03
70101020507	Rat Lake	11028500	0.01	0.01	1	0.01	1.03
70101020507	Wawa Lake	11028800	0.01	0.01	1	0.01	1.03
70101020507	Iverson Lake	11019400	0.01	0.01	0.33	0.01	0.36
70101020507	Hole-in-bog Lake	11019700	0.01	0.01	0.01	0.01	0.04
70101020507		11094300	0.01	0.01	0.33	0.01	0.36
70101020507	Camp Lake	11019500	0.01	0.01	0.33	0.01	0.36
70101020507		11093900	0.01	0.01	0.01	0.01	0.04
70101020507	Fifth Lake	11046600	0.01	0.01	1	0.01	1.03
70101020507	Blackduck Lake	11019200	0.01	0.01	0.66	0.01	0.69
70101020507	Wabegon Lake	11040300	0.01	0.01	0.66	0.01	0.69
70101020507	South Stocking Lake	11029700	0.01	0.01	0.66	0.01	0.69
70101020507	Life Raft Lake	11040600	0.01	0.01	0.01	0.01	0.04
70101020507	Blot Lake	11080000	0.01	0.01	0.33	0.01	0.36
70101020507	Bobolink Lake	11053100	0.01	0.01	0.66	0.01	0.69
70101020507	Spearns Lake	11029300	0.01	0.01	0.01	0.01	0.04
70101020507	Deep Lake	11040400	0.01	0.01	0.66	0.01	0.69

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020507	Fourth/upper Fifth Lake	11046500	0.01	0.01	1	0.01	1.03
70101020507	Haynes Lake	11028600	0.01	0.01	0.66	0.01	0.69
70101020507		11081000	0.01	0.01	0.01	0.01	0.04
70101020507	Third Lake	11046400	0.01	0.01	1	0.01	1.03
70101020507	Hagen Lake	11029100	0.01	0.01	0.33	0.01	0.36
70101020507	North Stocking Lake	11087300	0.01	0.01	0.66	0.01	0.69
70101020507	Pollywog Lake	11029400	0.01	0.01	0.66	0.01	0.69
70101020507	Aultman Lake	11019600	0.01	0.01	0.01	0.01	0.04
70101020507	Lost Lake	11089800	0.01	0.01	0.66	0.01	0.69
70101020507	Marshall Lake	11079900	0.01	0.01	0.66	0.01	0.69
70101020507	Ten Lake	11046700	0.01	0.01	0.66	0.01	0.69
70101020507	Gooseberry Lake	11017500	0.01	0.01	0.01	0.01	0.04
70101020507	Conklin Lake	11052900	0.01	0.01	0.33	0.01	0.36
70101020507	Lauer Lake	11028700	0.01	0.01	0.66	0.01	0.69
70101020507	Mad Dog Lake	11019300	0.01	0.01	0.01	0.01	0.04
70101020507	Teepee Lake	11031200	0.01	0.01	0.66	0.01	0.69
70101020507	Haugen Lake	11019100	0.01	0.01	0.66	0.01	0.69
70101020507		11087100	0.01	0.01	0.66	0.01	0.69
70101020507		11017600	0.01	0.01	0.01	0.01	0.04
70101020507		11079400	0.01	0.01	0.66	0.01	0.69
70101020507	Fourth/upper Fifth Lake	11046500	0.01	0.01	1	0.01	1.03
70101020507	Shell Lake	11039000	0.01	0.01	0.01	0.01	0.04
70101020507		11053300	0.01	0.01	0.01	0.01	0.04
70101020507		11098300	0.01	0.01	0.01	0.01	0.04
70101020507		11091300	0.01	0.01	0.66	0.01	0.69
70101020507		11091300	0.01	0.01	0.66	0.01	0.69
70101020507	Ivins Lake	11053400	0.01	0.01	0.66	0.01	0.69
70101020507	Little Bass Lake	11089600	0.01	0.01	0.33	0.01	0.36
70101020507		11088300	0.01	0.01	0.33	0.01	0.36
70101020507	Current Lake	11080900	0.01	0.01	0.01	0.01	0.04
70101020507		11079500	0.01	0.01	0.33	0.01	0.36
70101020507	Lembke Lake	11089700	0.01	0.01	0.33	0.01	0.36
70101020507		11088200	0.01	0.01	0.66	0.01	0.69
70101020507	Emery Lake	11087200	0.01	0.01	0.33	0.01	0.36

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020507	Haugen Lake	11019100	0.01	0.01	0.66	0.01	0.69
70101020507	Stanley Lake	11089500	0.01	0.01	1	0.01	1.03
70101020507		11089400	0.01	0.01	0.01	0.01	0.04
70101020507		11087000	0.01	0.01	0.01	0.01	0.04
70101020507		11093400	0.01	0.01	0.01	0.01	0.04
70101020507		11095500	0.01	0.01	0.01	0.01	0.04
70101020507		11079800	0.01	0.01	0.33	0.01	0.36
70101020507		11094600	0.01	0.01	0.01	0.01	0.04
70101020507	Ulland Lake	11130500	0.01	0.01	0.01	0.01	0.04
70101020507		11098400	0.01	0.01	0.01	0.01	0.04
70101020507	Sixth Lake	11130600	0.01	0.01	0.01	0.01	0.04
70101020601	Leech Lake	11020300	1	1	1	0.01	3.01
70101020601	Drumbeater Lake	11014500	0.01	0.01	0.66	0.01	0.69
70101020601		11092200	0.01	0.01	1	0.01	1.03
70101020602	Six Mile Lake	11014600	0.66	0.33	1	0.01	2
70101020602		11092300	0.01	0.01	0.66	0.01	0.69
70101020602	Nushka Lake	11013700	0.01	0.01	0.33	0.01	0.36
70101020602	Rice Lake	11013800	0.01	0.01	0.33	0.01	0.36
70101020602	Chub Lake	11051700	0.01	0.01	0.33	0.01	0.36
70101020602	Blacksmith Lake	11019800	0.01	0.01	0.01	0.01	0.04
70101020602	Demro Lake	11051600	0.01	0.01	0.01	0.01	0.04
70101020603	Goose Lake	11009600	0.01	0.33	1	0.01	1.35
70101020603	Grave Lake	11008600	0.01	0.33	1	0.01	1.35
70101020603	Knight Lake	11008700	0.01	0.01	1	0.01	1.03
70101020603	Wilson Lake	11009300	0.01	0.01	0.66	0.01	0.69
70101020603	Lower Milton Lake	11008000	0.01	0.01	0.66	0.01	0.69
70101020603	Tidd Lake	11009400	0.01	0.33	0.66	0.01	1.01
70101020603		11094800	0.01	0.01	0.66	0.01	0.69
70101020603	Sullivan Lake	11008500	0.01	0.01	0.66	0.01	0.69
70101020603	Upper Milton Lake	11008100	0.01	0.01	0.66	0.01	0.69
70101020603	Chain O Lakes	11009900	0.01	0.01	0.66	0.01	0.69
70101020603		11080600	0.01	0.01	0.33	0.01	0.36
70101020603		11080300	0.01	0.01	0.33	0.01	0.36
70101020603		11080500	0.01	0.01	1	0.01	1.03
70101020603	Cedar Lake	11008200	0.01	0.01	0.33	0.01	0.36
70101020603	Upper Menton Lake	11009700	0.01	0.01	0.01	0.01	0.04

HUC12	Lake Name	DNR Lake Number	Lake Classification Score	Lake Access Score	Current Shoreline Development	Future Shoreline Development Score	SUM
70101020603		11080400	0.01	0.01	0.66	0.01	0.69
70101020603	Lower Menton Lake	11009800	0.01	0.01	0.66	0.01	0.69
70101020603		11095100	0.01	0.01	0.66	0.01	0.69
70101020603	Chain O Lakes	11009900	0.01	0.01	0.66	0.01	0.69
70101020604	Mud Lake	11010000	0.01	0.01	1	0.01	1.03
70101020604		11090300	0.01	0.01	0.33	0.01	0.36
70101020604	Mud Lake	11010000	0.01	0.01	1	0.01	1.03

APPENDIX K

NWV 4 IMPAIRED LAKES

APPENDIX K: NATURAL WORLD VALUE 4: IMPAIRED LAKES SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

One metric was used to screen for opportunities to restore impaired lakes. A summary of the screening criteria and scoring breakpoints are outlined below. Maps that displaying the results from the scoring criteria follow the narrative description.

Impairment Status

- What – Impaired waters are those waters not currently supporting designated uses/functions as the result of documented stressors such as nutrient enrichment or excess sedimentation. Any resource listed as impaired was flagged and scored to identify subwatersheds in need of restorative management practices.
- Why – Though the LLR watershed is celebrated as nearly pristine it is not without localized stressors on its water resources. Identifying where impairments currently exist in the watershed allows local and State managers to focus efforts to provide functional lifts to resources in need that will enhance environmental, social and economic values.
- Data Source – Minnesota Pollution Control Agency, 2018.

Priority Value Metric	Data Analysis	Scoring
4a) Listing Status	WRAPS-identified impaired lakes were summed for each HUC12.	Status: Yes = 1, No = 0.1

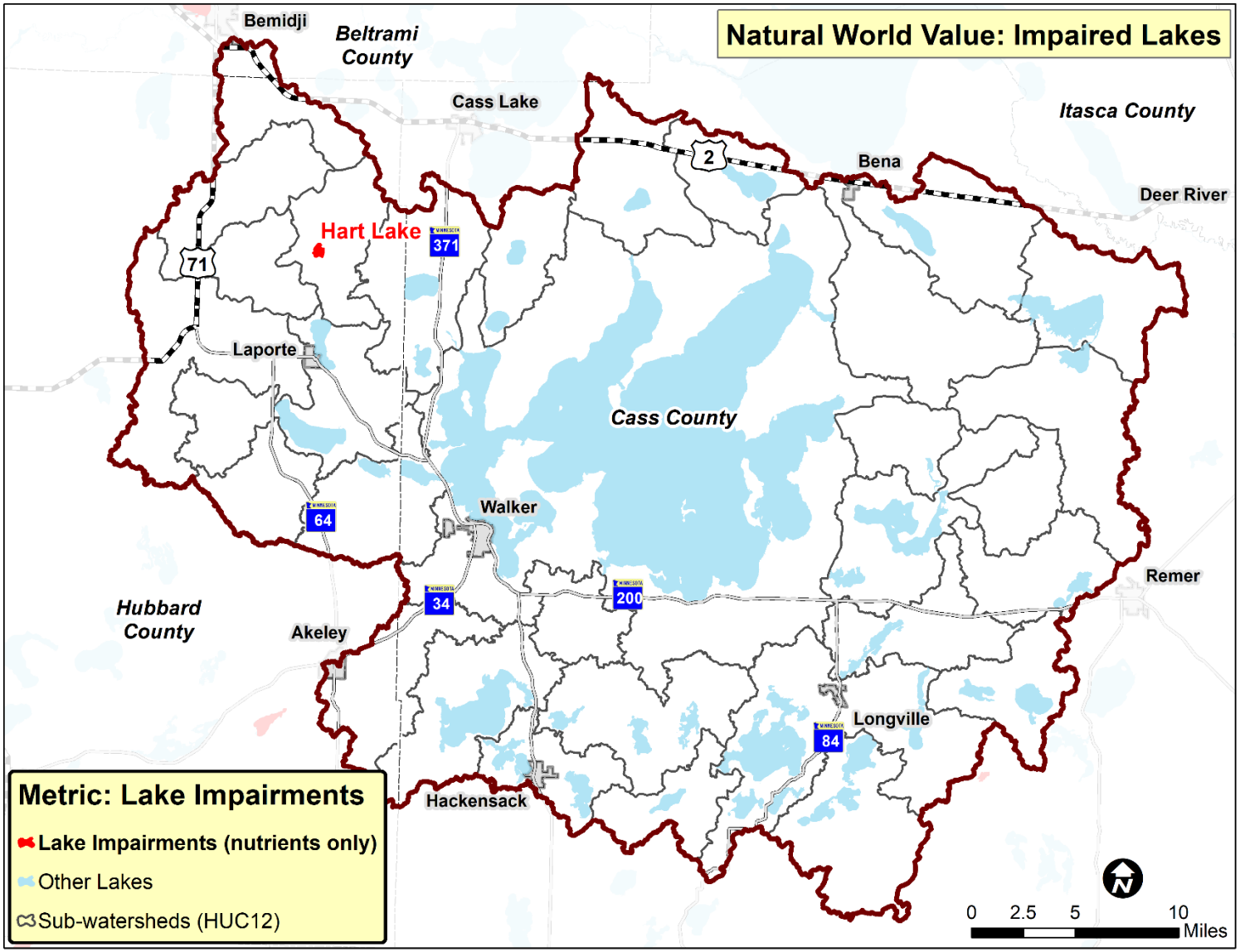

Figure K-1. Nutrient Impaired Lakes in the Leech Lake River Watershed.

APPENDIX L

NWV 5 HIGH VALUE STREAMS

APPENDIX L: NATURAL WORLD VALUE 5: HIGH VALUE AND HIGH PRIORITY RIVER AND STREAMS SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

Three metrics were chosen to screen for opportunities to protect and/or manage high value and priority rivers and streams. A summary of each of these screening criteria and scoring breakpoints are outlined below. The values for each lake metric were summed. The HUC12 score was determined by summing the values of all lake in each HUC12. Maps that displaying the results from each scoring criteria and a table listing each lake's ranking on the 4 scoring criteria follow the narrative description.

- **PCA-DNR Stream Ranking Status**
  - What – The MPCA and MNDNR worked with local managers to assess rivers and streams functionality to arrive at a prioritized and targeted set of resources to address. Priority rankings were generated after evaluation of each resource's threat of impairment, the risks to the riparian zones within each river's valley, upstream watershed risks related to altered hydrology and sediment sources/transport, and the current level of resource protection in place.
  - Why – An evaluation of the drivers of river and stream health and future informs a prioritized and informed selection of management strategies. Incorporation of previous prioritization information retains stakeholder needs.
  - Data Source – Minnesota Pollution Control Agency (PCA) - Minnesota Department of Natural Resources (DNR), 2017.
- **Wild Rice Stream**
  - What - This evaluation was expended on with the inclusion of known wild rive streams as well as with current DNR mapping of forest disturbance. Wild rice rivers/streams were scored highly in this evaluation.
  - Why – Inclusion of rivers/streams that support wild rice acknowledges currently-expressed desires by the Advisory Community and the community for the need to further prioritize this valuable cultural and wildlife value.
  - Data Source – Minnesota Department of Natural Resources, 2008b, Minnesota Department of Natural Resources, 2014, Minnesota Department of Natural Resources, 2018c and stakeholder input.
- **Years Since Forest Disturbance**
  - What - High resolution, spatial forest disturbance data was scored in relation to the year of disturbance and acreage. In this evaluation, years since forest disturbance was used as a risk assessment with scoring designed to quickly flag forest management needs.
  - Why – An expanded evaluation of forest integrity allowed for an updated prediction of forest disturbance risks to rivers and streams. For this updated evaluation, more recent disturbances with larger contiguous acreage was considered a risk to rivers as both hydrology and sediment export to rivers/streams is increased resulting in increases to in-channel hydraulic force. This then leads to channel adjustment via bed elevation adjustments and meander migration (bank

failure) as well as aquatic habitat loss. In addition, the risks associated with flooding increase potentially affecting road, culvert, utility and property impacts.

- Data Source – Corcoran, J., 2018.

Table L-1. Individual Metric and Sum Scoring for High Quality and High Priority Streams in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
5a) PCA-DNR Ranking Status	The PCA-DNR ranking scores were assigned screening scores prioritizing B-ranking streams.	B-ranking stream = 1 C-ranking stream = 0.50 none = 0.01
5b) Wild Rice Stream	Wild rice streams identified by DNR, Cass and Hubbard staff were prioritized.	Wild Rice Stream = 1 Non-wild rice stream = 0.1
5c) Years Since Forest Disturbance	DNR forest disturbance data was screened by years since disturbance (prorated from 0-20 years, assuming full functions are restored 20 years following). This adjusted disturbance value was multiplied by the acreage and then all disturbances were totaled by HUC 12. This system scores the risk of altered hydrology and sediment transport higher in more recently disturbed areas than re-established areas. Type of disturbance was not differentiated in this scoring. *Example*: A 10-acre disturbance occurring 5 years ago would result in an Adjusted Disturbed Acre value of 7.5 acres (5 years divided by 20 years resulted in a 2.5-acre credit assuming some vegetation re-establishment). Each disturbed area's adjusted disturbed acres were then summed by HUC12.	Summed Adjusted Disturbed Acres Values >500 acres = 0.01 250-500 acres = 0.33 100-250 acres = 0.66 <100 acres = 1.00 (breakpoints made based on relative natural breaks within data)

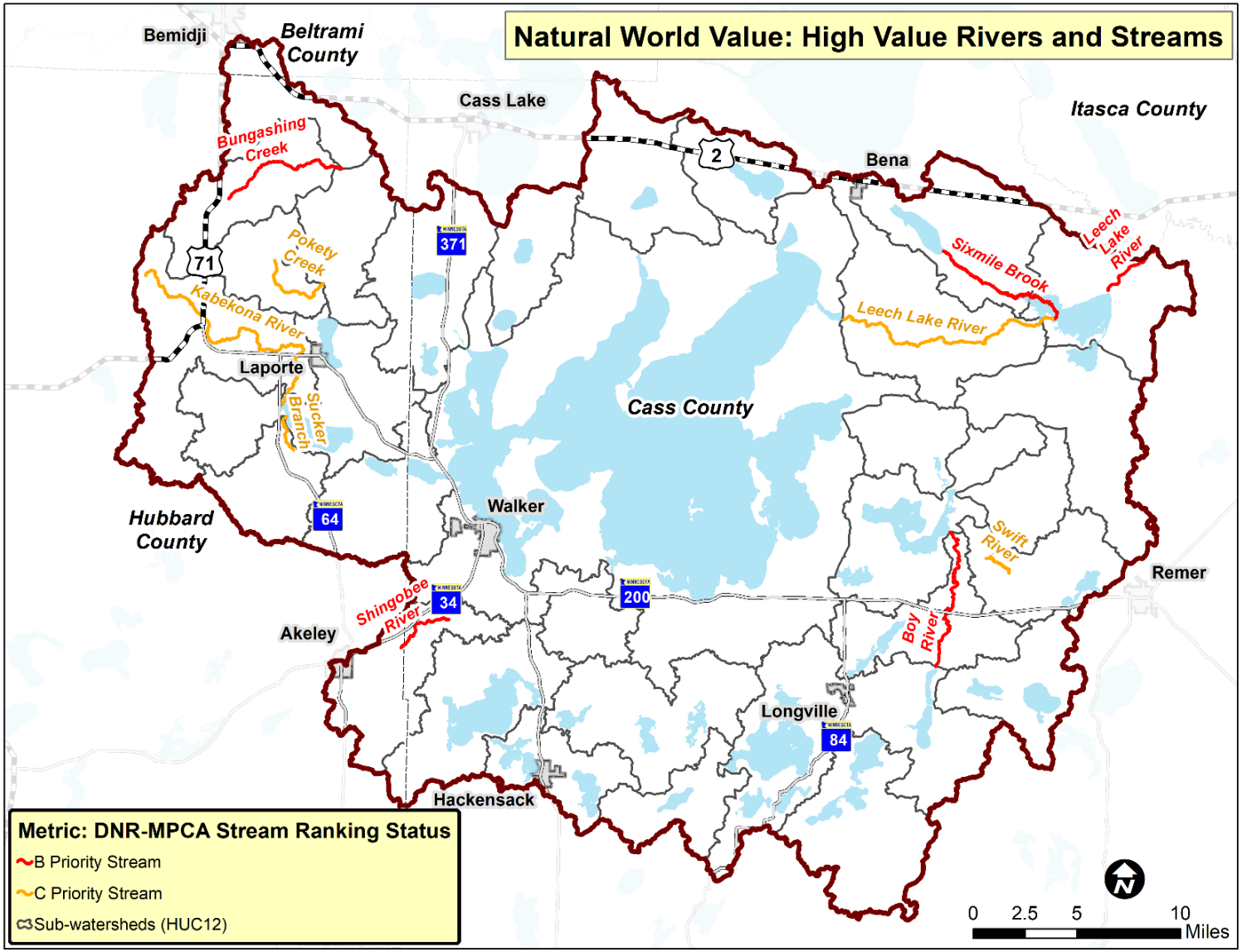

Figure L-1.. DNR and MPCA Stream Ranking Status in the Leech Lake River Watershed.

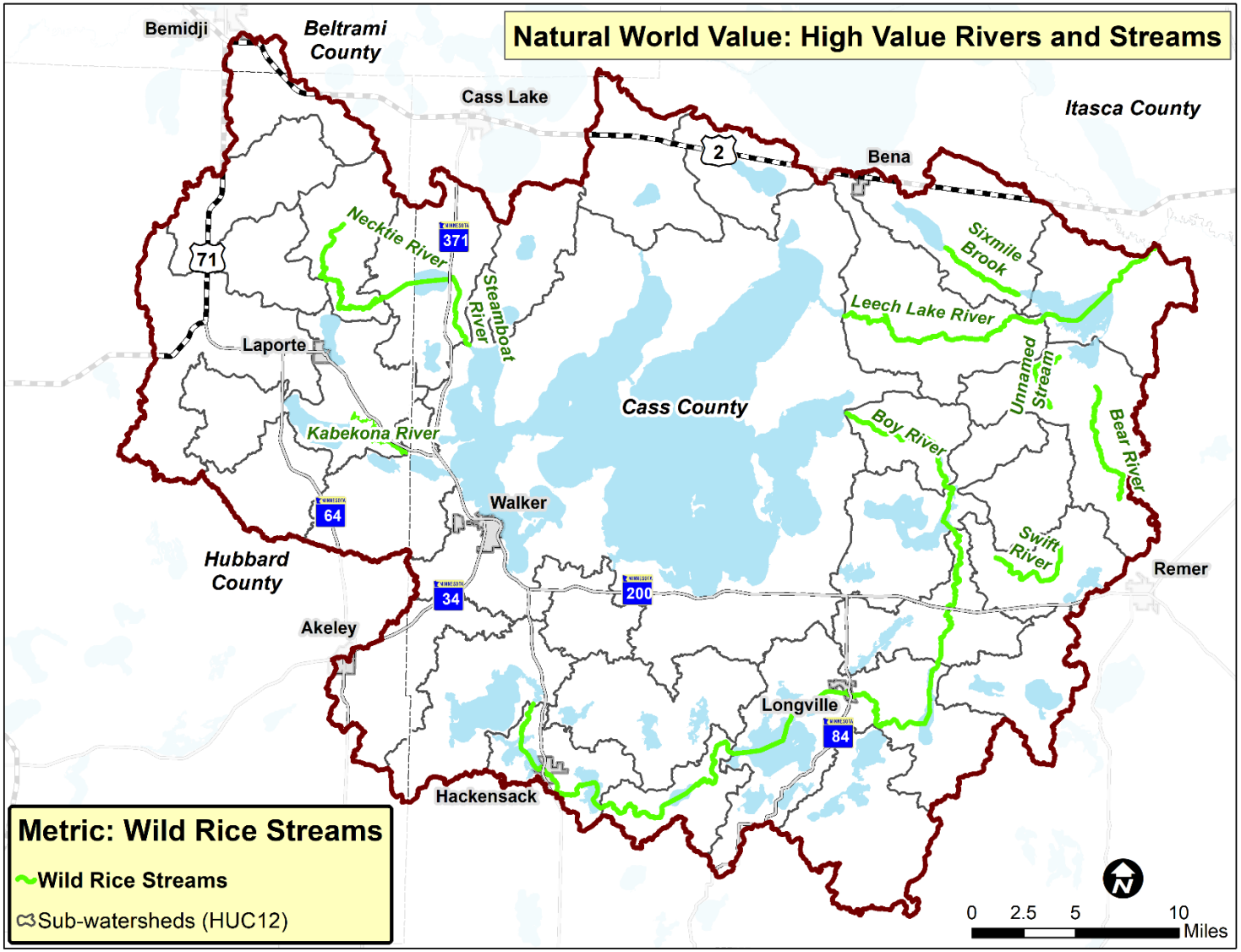

Figure L-2. Wild Rice Streams in the Leech Lake River Watershed.

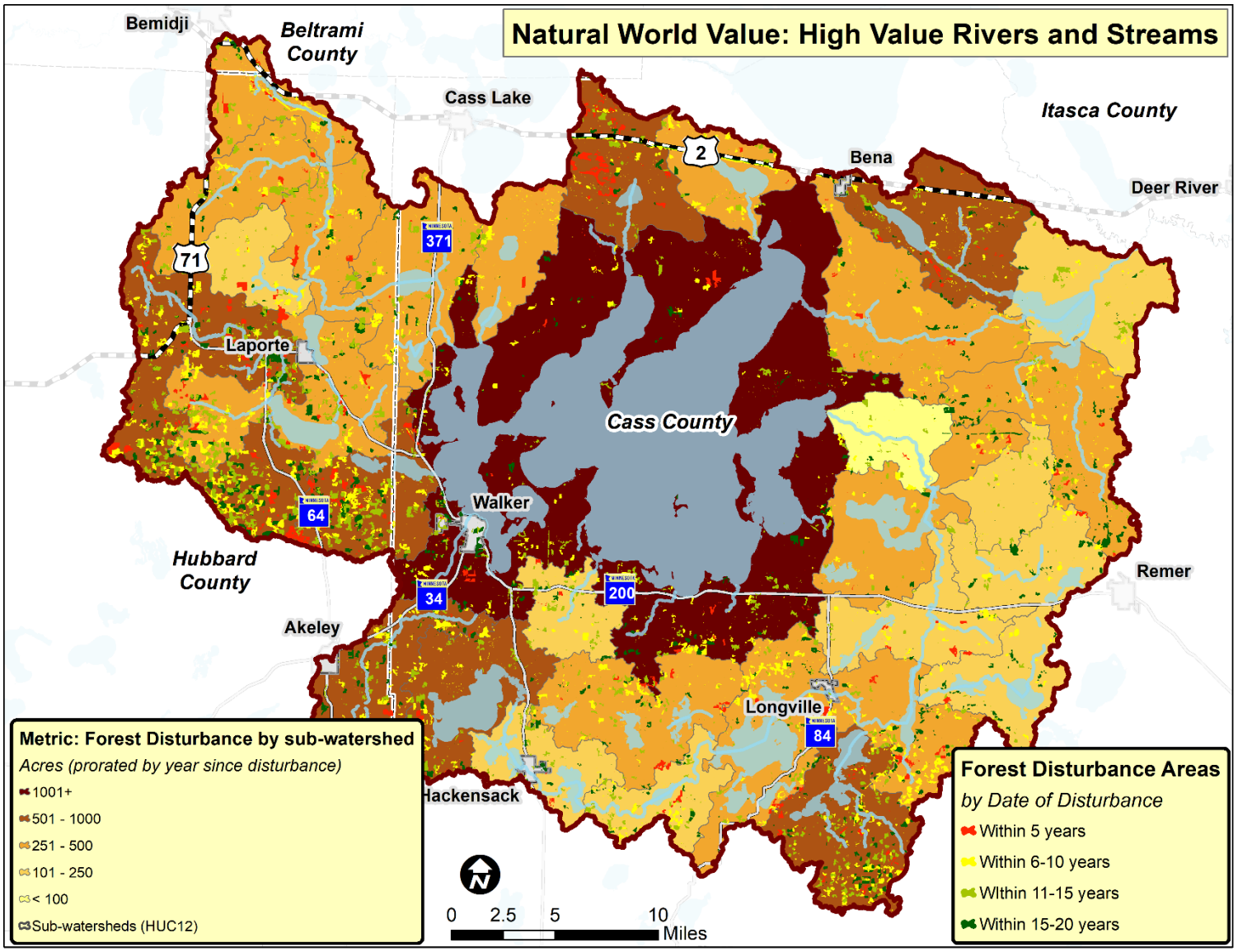

Figure L-3. Forest Disturbance in the Leech Lake River Watershed.

Table L-2. Individual Metric and Sum Scoring for High Quality and High Priority Streams in the Leech Lake River Watershed

HUC12	Name	MPCA-DNR Priority Score	Wild Rice Stream Score	Forest Disturbance Score	SUM
70101020101	Headwaters Necktie River	0.01	0.01	0.33	0.35
70101020102	Bungashing Creek	1	0.01	0.33	1.34
70101020103	Pokety River	0.5	0.01	0.66	1.17
70101020104	Necktie River	0.01	1	0.33	1.34
70101020105	Steamboat River	0.01	1	0.33	1.34
70101020201	Headwaters Kabekona River	0.5	0.01	0.01	0.52
70101020202	Gulch Creek	0.01	0.01	0.33	0.35
70101020203	Sucker Branch	0.5	0.01	0.01	0.52
70101020204	Kabekona River	0.01	1	0.33	1.34
70101020301	Tenmile Lake	0.01	0.01	0.01	0.03
70101020302	Pleasant Lake-Boy River	0.01	1	0.66	1.67
70101020303	Man Lake	0.01	0.01	0.33	0.35
70101020304	Big Deep Lake-Boy River	0.01	1	0.66	1.67
70101020305	Woman Lake	0.01	1	0.33	1.34
70101020401	Little Boy Lake	0.01	0.01	0.01	0.03
70101020402	Trelipe Creek	0.01	0.01	0.66	0.68
70101020403	Inguadona Lake-Boy River	0.01	1	0.33	1.34
70101020404	Long Lake-Boy River	1	1	0.66	2.66
70101020405	Swift Lake	0.01	1	0.66	1.67
70101020406	Tobique Lake	0.01	0.01	0.66	0.68
70101020407	Boy Lake	0.01	1	0.33	1.34
70101020408	Boy River	0.01	1	1	2.01
70101020501	Kabekona Bay	0.01	0.01	0.01	0.03
70101020502	Crooked Lake	0.01	0.01	0.33	0.35
70101020503	Shingobee River	1	0.01	0.01	1.02
70101020504	Sucker Creek	0.01	0.01	0.01	0.03
70101020505	Urem Bay	0.01	0.01	0.66	0.68
70101020506	Portage Creek	0.01	0.01	0.33	0.35
70101020507	Leech Lake	0.01	0.01	0.01	0.03
70101020601	Drumbeater Lake-Leech River	0.5	1	0.33	1.83
70101020602	Sixmile Brook	1	1	0.01	2.01
70101020603	Bear River	0.01	1	0.33	1.34
70101020604	Leech River	1	1	0.66	2.66

APPENDIX M

NWV 6 IMPAIRED, DECLINING STREAMS

APPENDIX M: NATURAL WORLD VALUE 6: DECLINING, IMPAIRED, AND CHANNELIZED RIVERS AND STREAMS SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

Two metrics were chosen to screen for opportunities to protect and/or manage declining, impaired and channelized rivers and streams. A summary of each of these screening criteria and scoring breakpoints are outlined below. The value of '1' was assigned to any HUC12 with one or more impaired, channelized or other priority streams. Maps that displaying the results from each scoring criteria and a table listing each stream's ranking on the 2 scoring criteria follow the narrative description.

- **Stream Impairment or Channelization**
  - What – Rivers and streams listed as functionally impaired were used to prioritize management strategies in this evaluation. Impairments to aquatic insect and fish communities as well as river reaches where alterations to natural channel form via channel straightening were highlighted as priority resources.
  - Why – The LLR watershed has a few rivers and streams impacted by past drainage management activities and land cover conversions. These alterations have adversely affected the ability of certain rivers to provide quality habitat as well as cultural and recreational resources.
  - Data Source – Minnesota Pollution Control Agency, 2017 and stakeholder input.

Table M-1. Individual Metric and Sum Scoring for Declining, Impaired, and Channelized Streams in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
6a) Impairment or Channelized Status	Each HUC12 was evaluated for the total number of declining, impaired and/or channelized streams.	Presence: Yes =1, Limited or None = 0.01
6b) Other Priority Stream	Streams identified within the WRAPS or during Advisory Committee meetings as priority	Priority = 1 None = 0.01

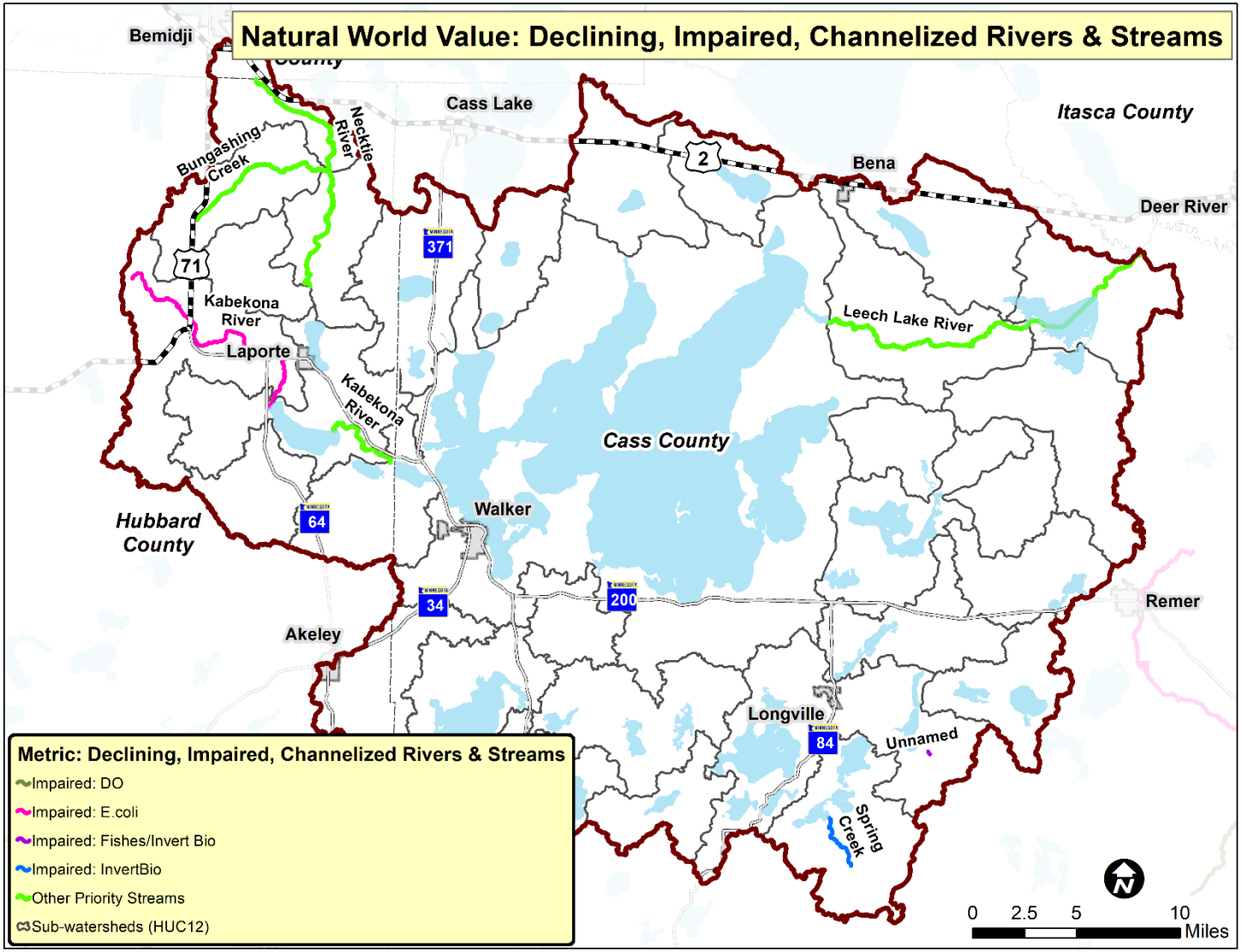

Figure M-1. Impaired, Channelized, and Other Priority Streams in the Leech Lake River Watershed.

Table M-2. Ranking of Impaired, Declining, and Other Priority Streams in the Leech Lake River Watershed.

HUC12	Name	Impairment/ Channelized Score
70101020101	Headwaters Necktie River	1.00
70101020102	Bungashing Creek	1.00
70101020103	Pokety River	0.01
70101020104	Necktie River	1.00
70101020105	Steamboat River	0.01
70101020201	Headwaters Kabekona River	1.00
70101020202	Gulch Creek	0.01
70101020203	Sucker Branch	0.01
70101020204	Kabekona River	1.00
70101020301	Tenmile Lake	0.01
70101020302	Pleasant Lake-Boy River	0.01
70101020303	Man Lake	0.01
70101020304	Big Deep Lake-Boy River	0.01
70101020305	Woman Lake	0.01
70101020401	Little Boy Lake	1.00
70101020402	Trelipe Creek	0.01
70101020403	Inguadona Lake-Boy River	1.00
70101020404	Long Lake-Boy River	0.01
70101020405	Swift Lake	0.01
70101020406	Tobique Lake	0.01
70101020407	Boy Lake	0.01
70101020408	Boy River	0.01
70101020501	Kabekona Bay	0.01
70101020502	Crooked Lake	0.01
70101020503	Shingobee River	0.01
70101020504	Sucker Creek	0.01
70101020505	Urem Bay	0.01
70101020506	Portage Creek	0.01
70101020507	Leech Lake	0.01
70101020601	Drumbeater Lake-Leech River	1.00
70101020602	Sixmile Brook	0.01
70101020603	Bear River	0.01
70101020604	Leech River	1.00

APPENDIX N

NWV 8 GROUNDWATER

APPENDIX N: NATURAL WORLD VALUE 8: GROUNDWATER SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

Two metrics were chosen to screen for opportunities to protect and/or manage groundwater. A summary of each of these screening criteria and scoring breakpoints are outlined below. The values for each groundwater metric were summed. Maps that displaying the results from each scoring criteria and a table listing each HUC12's ranking on the 2 scoring criteria follow the narrative description

- **Abundance of Wells within Sensitive Soils**
    - What – The total number of private wells that occur in groundwater-sensitive soils were used to rank subwatersheds for the risk of groundwater contamination. The greater the number of these wells the higher the subwatershed scoring. It was assumed that wells in sensitive soils areas were shallow wells as there is very limited data available regarding well depth at this point.
    - Why – Shallow wells, in this area, are synonymous with sandy, sensitive wells. These types of wells are at higher risk of contamination from sub-surface sewage treatment systems (SSTS) common in private development that rely on infiltration. As each home has both a well and SSTS, in locations of sensitive soils there is potential risk of SSTS infiltrated water to enter shallow wells possibly delivering contaminants that can affect drinking water quality.
    - Data Source – Parthun, C., 2018 and Natural Resources Conservation Service, 2018.
- **Known Problem Wells**
    - What – At the time a well is installed its water quality is tested for arsenic and nitrates. The total number of documented incidences of wells exceeding State standards was used to score subwatersheds for this metric. It should be noted that private well owners are not required to monitor well water quality after the purchase of a property and there is insufficient data available to update this metric across subwatersheds.
    - Why – Drinking water is a vital resource that affects health risks, quality of life and local economies.
    - Data Source – Berquist, E, 2018.

Table N-1. Individual Metric and Sum Scoring for Groundwater in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
8a) Abundance of Wells Within Sensitive Soils	Number of private wells within moderate or high groundwater sensitive areas (sources: Minnesota Well Index (formerly "County" Well Index) and DNR's "Pollution Sensitivity to Near-surface Materials" layer) per HUC12	>50 = 1 26-50 = 0.66 11 - 25 = 0.33 0 - 10 = 0.01
8b) Known Problem Wells	Total Nitrate and Arsenic wells over the drinking water standard (10 ppm/10ppb respectively) per HUC12	3+ = 1.0, 2 = 0.66, 1 = 0.33, 0 = 0.01

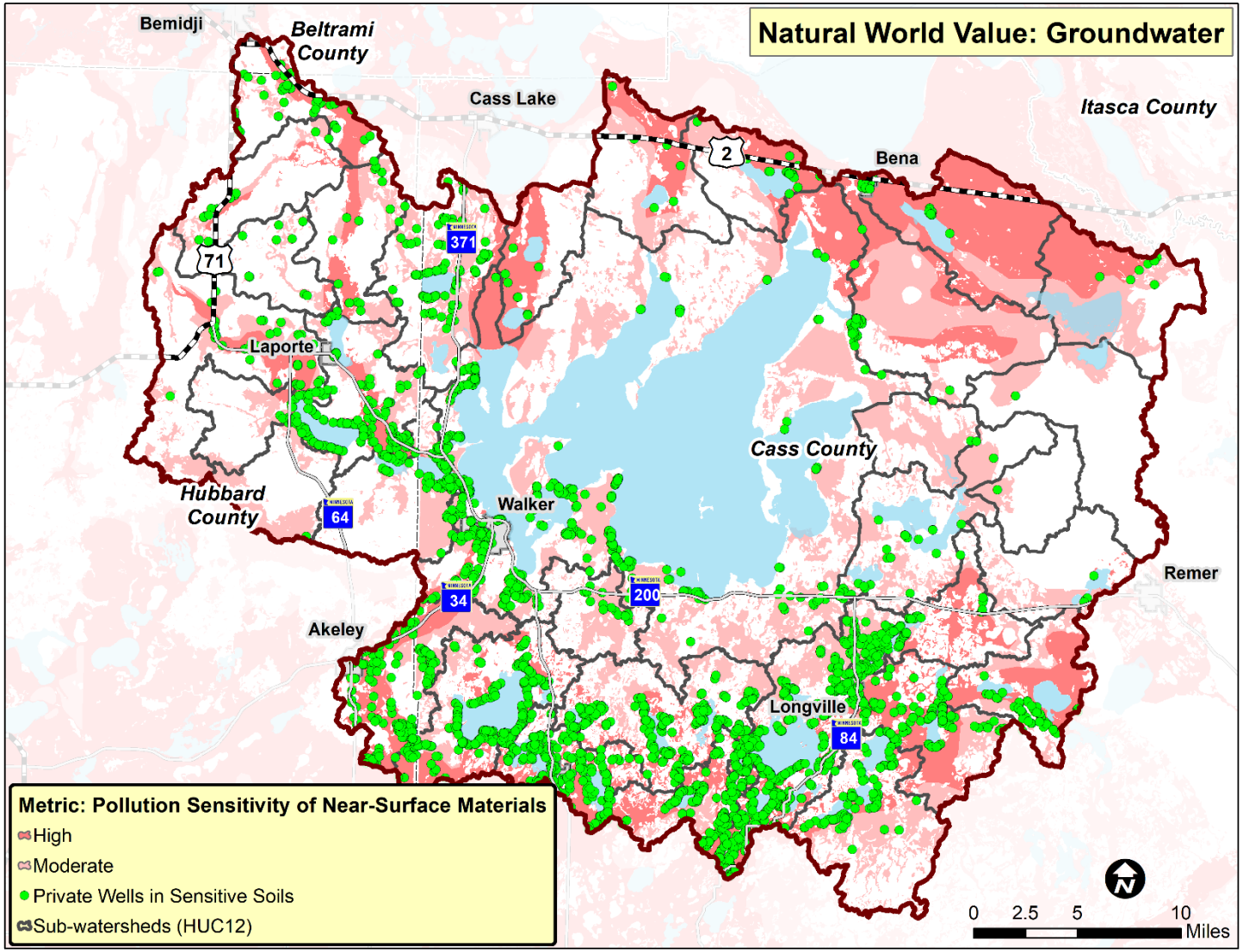

Figure N-1. Pollution Sensitivity of Near Surface Materials in the Leech Lake River Watershed.

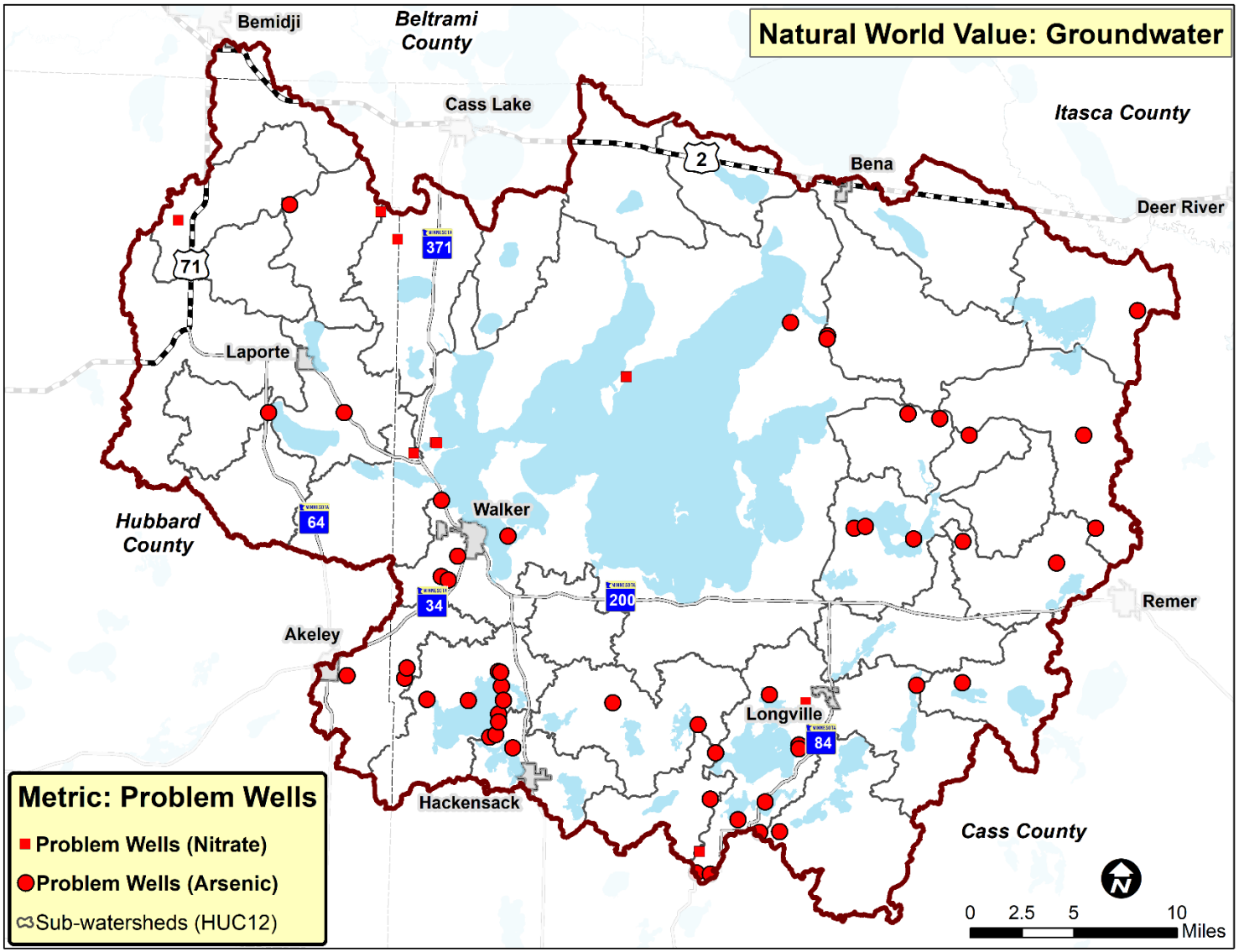

Figure N-2. Nitrate and Arsenic Problem Wells in the Leech Lake River Watershed.

Table N-2. Groundwater Criteria Ranking and Sum Values in the Leech Lake River Watershed

HUC12	NAME	Abundance of Private wells in Sensitive Soils Score	Known Problem Well Abundance Score	SUM
70101020101	Headwaters Necktie River	0.66	0.01	0.67
70101020102	Bungashing Creek	0.01	0.33	0.34
70101020103	Pokety River	0.01	0.01	0.02
70101020104	Necktie River	0.01	0.33	0.34
70101020105	Steamboat River	0.66	0.66	1.32
70101020201	Headwaters Kabekona River	0.66	0.01	0.67
70101020202	Gulch Creek	0.01	0.01	0.02
70101020203	Sucker Branch	0.01	0.01	0.02
70101020204	Kabekona River	0.66	0.66	1.32
70101020301	Tenmile Lake	0.66	1	1.66
70101020302	Pleasant Lake-Boy River	1	0.66	1.66
70101020303	Man Lake	1	0.66	1.66
70101020304	Big Deep Lake-Boy River	0.66	0.66	1.32
70101020305	Woman Lake	1	1	2
70101020401	Little Boy Lake	0.66	0.33	0.99
70101020402	Trelipe Creek	0.33	0.33	0.66
70101020403	Inguadona Lake-Boy River	1	0.33	1.33
70101020404	Long Lake-Boy River	0.66	0.01	0.67
70101020405	Swift Lake	0.01	0.66	0.67
70101020406	Tobique Lake	0.01	0.01	0.02
70101020407	Boy Lake	0.01	1	1.01
70101020408	Boy River	0.01	0.66	0.67
70101020501	Kabekona Bay	0.33	0.33	0.66
70101020502	Crooked Lake	0.01	0.01	0.02
70101020503	Shingobee River	0.66	1	1.66
70101020504	Sucker Creek	0.01	0.01	0.02
70101020505	Urem Bay	0.01	0.01	0.02
70101020506	Portage Creek	0.33	0.01	0.34
70101020507	Leech Lake	1	1	2
70101020601	Drumbeater Lake-Leech River	0.33	0.01	0.34
70101020602	Sixmile Brook	0.33	0.01	0.34
70101020603	Bear River	0.01	0.66	0.67
70101020604	Leech River	0.01	0.33	0.34

APPENDIX O

NWV 9&11 FORESTS AND WORKING LANDS

APPENDIX O: NATURAL WORLD VALUE 9 AND 11: FORESTS AND WORKING LANDS SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

One metric was chosen to screen for opportunities to protect and/or manage forests and two metrics were chosen to screen for opportunities to protect and/or manage working lands. A summary this screening criteria and scoring breakpoints are outlined below. The values for each metric were summed. Maps that displaying the results from each scoring criteria and a table listing each subwatershed ranking on the scoring criteria follow the narrative description. Results for all metrics were summed by HUC12, then combined with results from Natural World Value 9 results to produce summed HUC12 scores. This combined scoring was developed to group non-urban related upland resources.

- **Opportunity to Meet 75% Forest Management**
    - What – The current state of sustainable forest management was evaluated to understand how much land was under permanent protection (e.g., easements) and how much land, and at what costs, will it take to achieve.
    - Why – Understanding the current state of forest management and protection allows an estimate of a subwatershed' s potential to meet the goal for this watershed of sustainable forest management in 75% of total forested cover.
    - Data Source – Minnesota Department of Natural Resources, 2008a and Minnesota Department of Natural Resources, 2017a.

Table O-1. Individual Metric and Sum Scoring for Forests in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
9a) Opportunity to meet 75% Managed Forests	Large-tract private forest lands provide important functions in the watershed. 2017 parcel data and University of MN land cover data was used for this analysis.	Straight percentage of large tract private forest land (>20-acres, less than 50% ag)

- **Current Working Lands**
    - What – Current working lands were defined as those lands producing an annual harvested crop. Pasture lands and forestry practices were not considered in this metric (forestry and pasture management are covered either/both in other screening metrics or implementations strategies). Each subwatershed' s land use data was used to divide the total acres of row crops by subwatershed acres to produce a relative index for scoring purposed. The greater the value, the greater the subwatershed scoring.
    - Why – Row crops have several potential adverse effects on water resources if not managed with current agricultural best management practices. The conversion of native plant communities to row crops increases erosion and sediment transport. Sediment carries with it agricultural chemicals and manure that can be conveyed to rivers, streams, wetland and lakes. Increases in surface water runoff significantly affect river and stream channel stability as the original stream dimensions (i.e., cross sectional profile, meander pattern and stream gradient) were created under unaltered subwatershed characteristics that will then adjust to accommodate altered subwatershed flows. The balance of sediment inputs to a stream and its ability to convey also

affects stream dimensionality and habitat quality, abundance and connectivity. Transport of sediment, nutrients (bound to sediments and in dissolved forms, from fertilizer, manure and streambank and valley soils), and herbicides/pesticides impairs water quality in the stream as well as downstream wetlands and lakes. Row crops, especially corn and potato crops, use tremendous amounts of groundwater to irrigate, which can lead to localized drawdowns of stream base flows and temperatures that can adversely affect fisheries, especially cold-water fisheries. Down-cutting channels resulting from increased hydraulic forces from excessive runoff can have a similar effect.

  - Data Source – University of Minnesota Remote Sensing and Geospatial Analysis Laboratory, 2014.

- **Potential Working Lands**
  - What – For each subwatershed, an existing evaluation by Hubbard County was used that totaled private forest land acreage suitable for agricultural uses divided by subwatershed acreage to generate an index of potential risk associated with land use conversion. The analysis used soils data to generate various use classes.
  - Why – Though not currently known as an agriculture-dominated watershed, LLR's watershed has potential for the introduction of row crops, especially potato farming, in the future. In areas immediately outside of the watershed potato farming is increasing its footprint with adverse effects on cold water streams, especially (e.g., the Straight River, in Hubbard County; a high value trout stream that produces a high Brown trout average size).
  - Data Source – Steinlicht, M., 2018.
- **Risk Classification**
  - What – A second risk assessment was included to accommodate both land cover disturbance and the level of protection of lands within each subwatershed. Results from an assessment previously performed by both Cass and Hubbard Counties was used.
  - Why – Forest disturbances come in several forms and the distribution of natural resource protection is not uniform throughout the LLR watershed. Results from this metric help identify where additional protective measures might be employed in areas seeing greater disturbances.
  - Data Source – Cass County Environmental Services, 2016 and Hubbard County Soil and Water Conservation District, 2016.

Table O-2. Individual Metric and Sum Scoring for Working Lands in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
11a) Current Working Land Abundance	For each HUC12: total row crop acres divided by total HUC12 acres (to determine a relative ratio).	>0.66 = 1 0.66-0.33 = 0.66 0.33-0.01 = 0.33 0.01 = no data or zero value
11b) Potential Working Lands	It is the percentage, expressed as a decimal value, of private forest land that is suitable for agricultural use within each HUC12. Suitability based on soil capability class scores (values 1 through 4) of the NRCS Soils Survey.	>0.66 = 1 0.66-0.33 = 0.66 0.33-0.01 = 0.33 0.01 = no data or zero value
11c) Risk Classification	Risk classes were defined by the Hubbard and Cass County Local Water Plans based on land cover disturbance and protected lands.	High Risk (Enhance) = 1.0, Moderate to High Risk = 0.66, Low to Moderate Risk (Protected) = 0.33 Low Risk (Vigilance)= 0.01

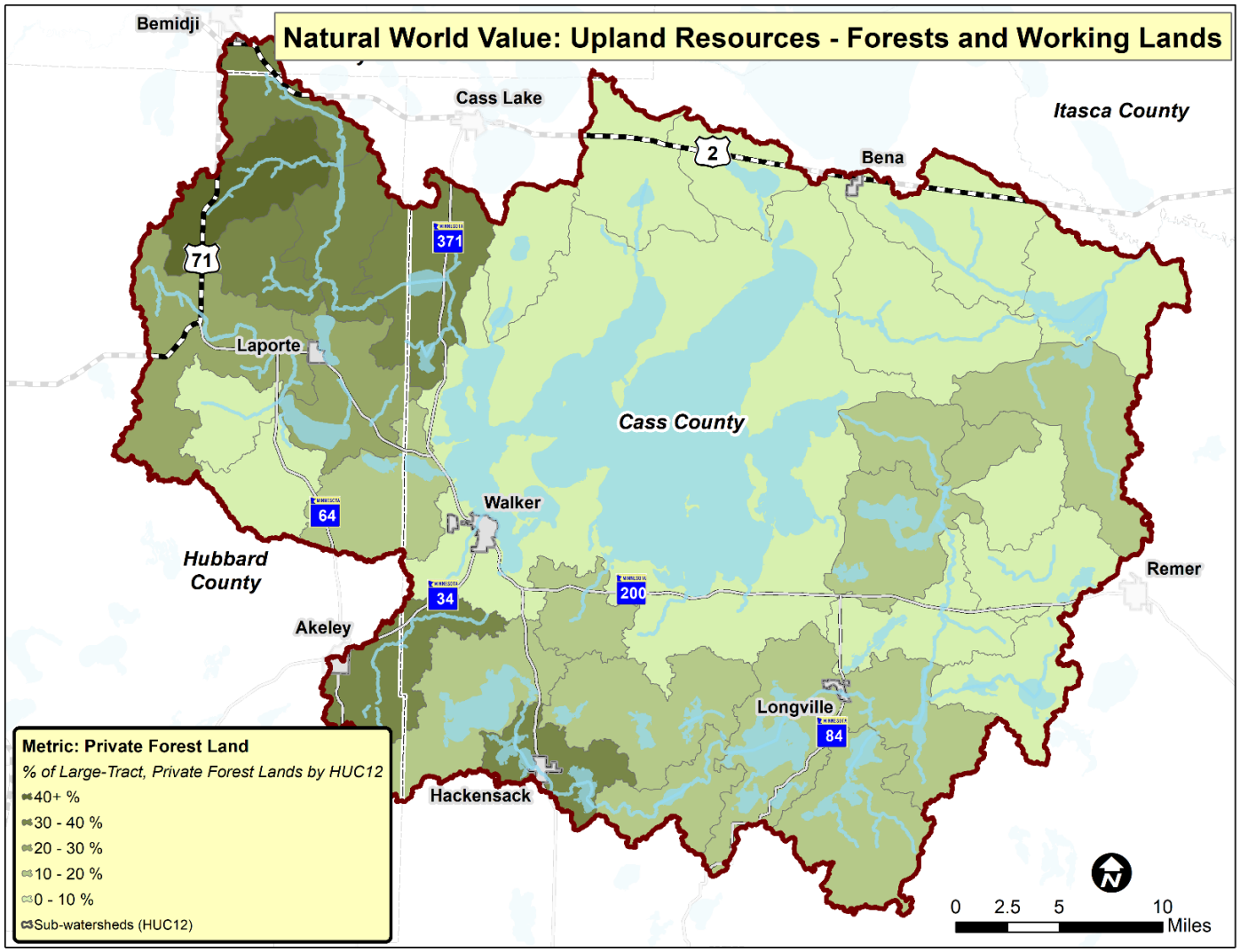

Figure 0-1. Title

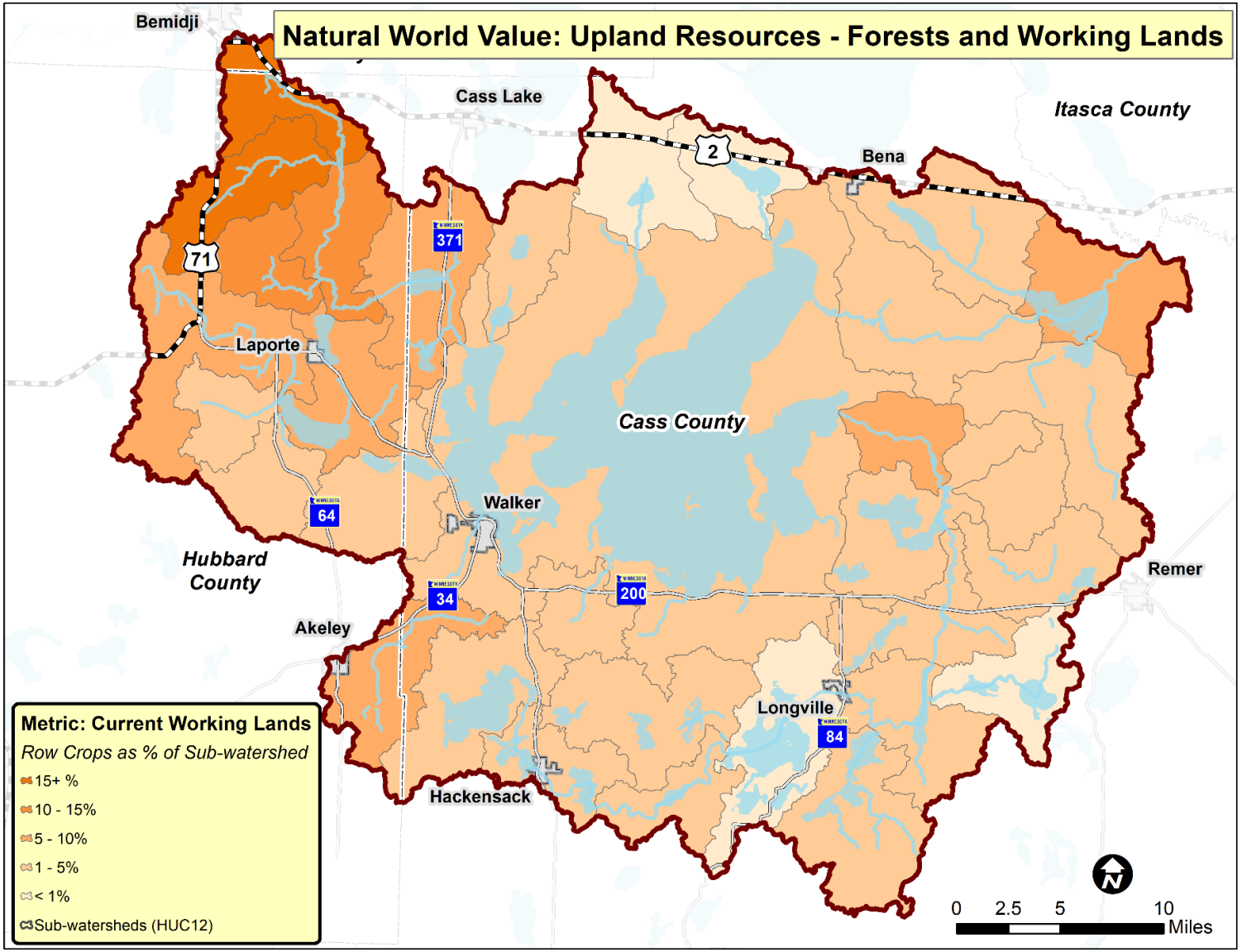

Figure 0-2. Title

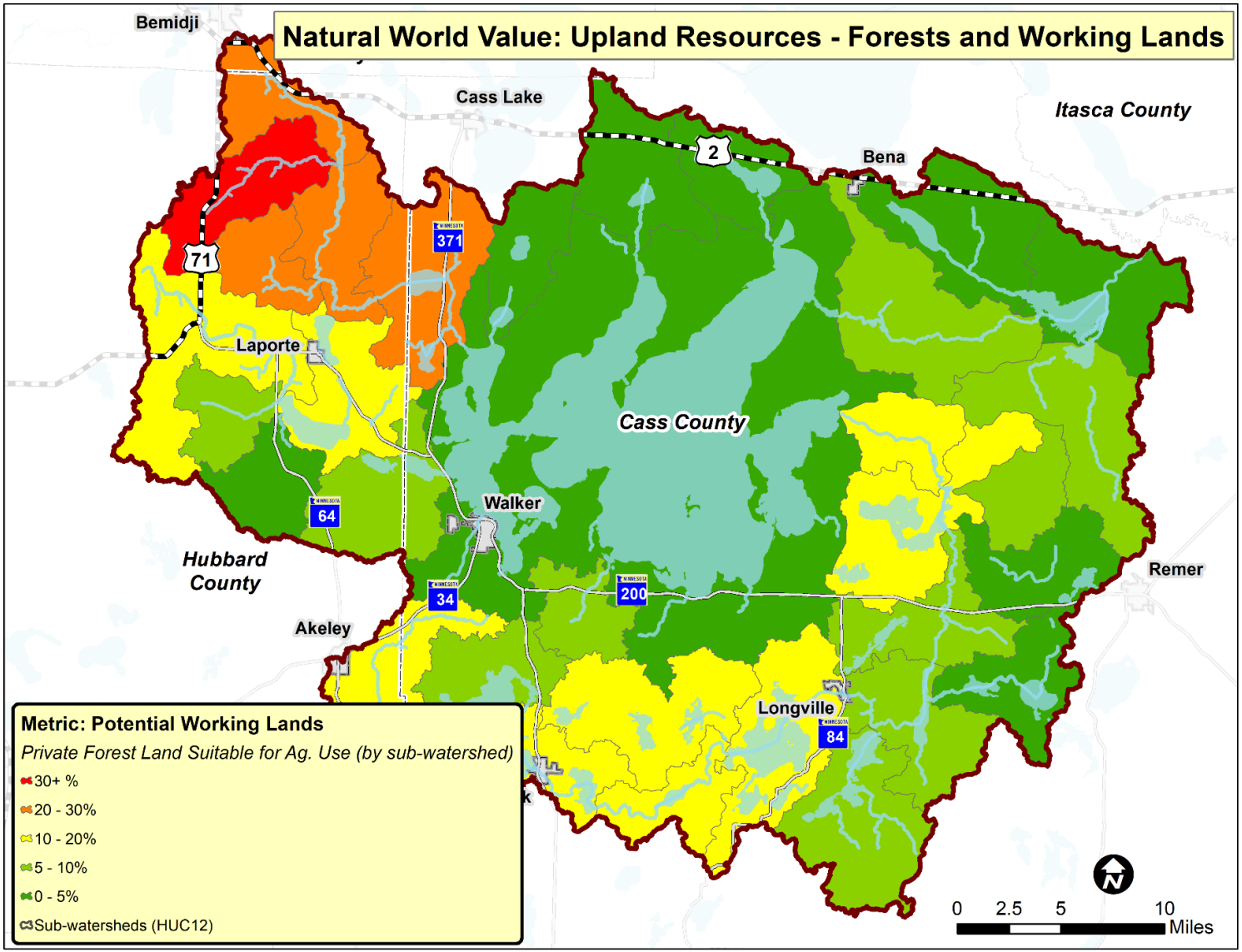

Figure 0-3. Title

Table O-3. Ranking of Forests and Working Lands in the Leech Lake River Watershed

HUC12	Name	Opp. To Meet 75% Managed Forests Score	Current Working Land Abundance Score	Potential Working Land Abundance Score	Risk Class Score	SUM
70101020101	Headwaters Necktie River	0.319703	0.33	0.33	1	1.979703
70101020102	Bungashing Creek	0.442549	0.33	0.66	0.66	2.092549
70101020103	Pokety River	0.399373	0.33	0.33	0.66	1.719373
70101020104	Necktie River	0.393707	0.33	0.33	0.495	1.548707
70101020105	Steamboat River	0.361615	0.33	0.33	0.6625	1.684115
70101020201	Headwaters Kabekona River	0.291814	0.33	0.33	0.116667	1.068481
70101020202	Gulch Creek	0.096703	0.33	0.33	0.01	0.766703
70101020203	Sucker Branch	0.036758	0.33	0.33	0.01	0.706758
70101020204	Kabekona River	0.243889	0.33	0.33	0.335	1.238889
70101020301	Tenmile Lake	0.170204	0.33	0.33	0.33	1.160204
70101020302	Pleasant Lake-Boy River	0.312568	0.33	0.33	0.66	1.632568
70101020303	Man Lake	0.167268	0.33	0.33	0.44	1.267268
70101020304	Big Deep Lake-Boy River	0.188808	0.33	0.33	0.33	1.178808
70101020305	Woman Lake	0.150847	0.01	0.33	0.495	0.985847
70101020401	Little Boy Lake	0.153414	0.33	0.33	0.27	1.083414
70101020402	Trelipe Creek	0.060922	0.01	0.33	0.22333	0.624252
70101020403	Inguadona Lake-Boy River	0.146702	0.33	0.33	0.3325	1.139202
70101020404	Long Lake-Boy River	0.086495	0.33	0.33	0.44	1.186495
70101020405	Swift Lake	0.052619	0.33	0.33	0.33	1.042619
70101020406	Tobique Lake	0.082316	0.33	0.33	0.01	0.752316
70101020407	Boy Lake	0.147467	0.33	0.33	0.33	1.137467
70101020408	Boy River	0.160272	0.33	0.33	0.33	1.150272
70101020501	Kabekona Bay	0.10121	0.33	0.33	0.66	1.42121
70101020502	Crooked Lake	0.043534	0.33	0.33	0.33	1.033534
70101020503	Shingobee River	0.328619	0.33	0.33	0.33333	1.321949
70101020504	Sucker Creek	0.008237	0.01	0.01	0.116667	0.144904
70101020505	Urem Bay	0.137184	0.33	0.33	0.01	0.807184
70101020506	Portage Creek	0.018996	0.01	0.33	0.33	0.688996
70101020507	Leech Lake	0.057323	0.33	0.33	0.331429	1.048752
70101020601	Drumbeater Lake-Leech River	0.061554	0.33	0.33	0.17	0.891554
70101020602	Sixmile Brook	0.004018	0.33	0.01	0.17	0.514018
70101020603	Bear River	0.11024	0.33	0.33	0.116667	0.886907
70101020604	Leech River	0.068268	0.33	0.33	0.01	0.738268

APPENDIX P

NWV 12 CITIES AND TOWNS

APPENDIX P: NATURAL WORLD VALUE 12: CITIES AND TOWNSHIPS SUBWATERSHED SCREENING, SCORING CRITERIA, AND MAPS

Two metrics were chosen to screen for opportunities to protect and/or manage cities and townships. A summary this screening criteria and scoring breakpoints are outlined below. The values for each metric were summed. Maps that displaying the results from each scoring criteria and a table listing each subwatershed ranking on the scoring criteria follow the narrative description.

1. **Current Development**
    - What – Land disturbance from development were evaluated by calculating each sub watershed's impervious cover.
    - Why – Impervious cover (e.g., buildings, roads, parking lots) dramatically increase storm water runoff and pollutant transport to water resources. Increased runoff has adverse effects on river and stream channels, as discussed above relative to altered hydrologic effects. In addition, the presence of roads, ditches and storm pipes act as a direct conduit for hazardous spills to water resources. Results from this metric highlight subwatershed needs for current Stormwater management needs.
    - Data Source – University of Minnesota Remote Sensing and Geospatial Analysis Laboratory, 2014.
2. **Potential Development**
    - What – LLR's watershed is predicted to develop substantially soon. Subwatersheds with the greatest amount of impervious cover scored higher in terms of water resource risk. County E911 data was used to evaluate development trends through time to inform predictions of future development potential. E911 points per square mile density was used to rank subwatersheds.
    - Why – Main corridors, such as county roads and Highway 371, can directly affect the level of development along their roadways. As discussed for Current Development, above, development converts natural land cover to more impervious forms, having potentially adverse effects on water resources. Though not within the scope of this plan, it is important to note that the effects of roadway expansion, particularly Highway 371, can also push some forms of development further away from major corridors and into undeveloped forests, transferring these adverse effects to previously isolated terrestrial and aquatic resources.
    - Data Source – Watts, J., 2018a and Hubbard County, 2018a.

Table P-1. Individual Metric and Sum Scoring for Cities and Townships in the Leech Lake River Watershed

Priority Value Metric	Data Analysis	Scoring
12a) Current Development Density	Impervious surfaces as a percentage of each HUC12 (expressed as a decimal value). Source: University of MN's land cover dataset.	>0.20 = 1 0.10 to 0.19 = 0.66 0.05 to 0.09 = 0.33 10.00 to 0.049 = 0.01
12b) Potential Development Density	The density of E911 address points per sq. mile since 2000 were used as a proxy for other growth and development datasets.	75th percentile = 1.0 50th percentile = 0.66 25th percentile = 0.33 0-25th percentile = 0.01

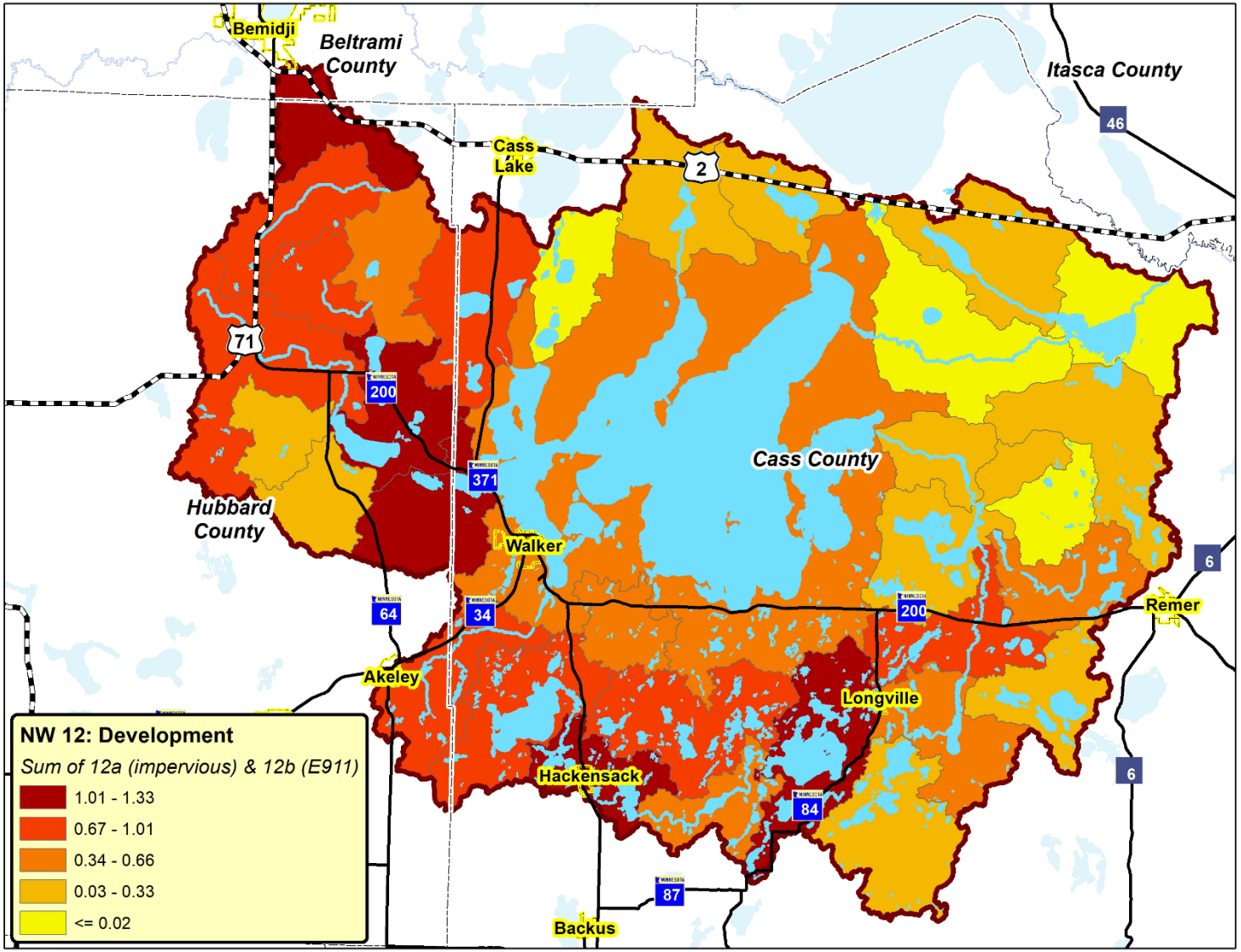

Figure P-1. Imperviousness and Density of E911 Addresses in the Leech Lake River Watershed.

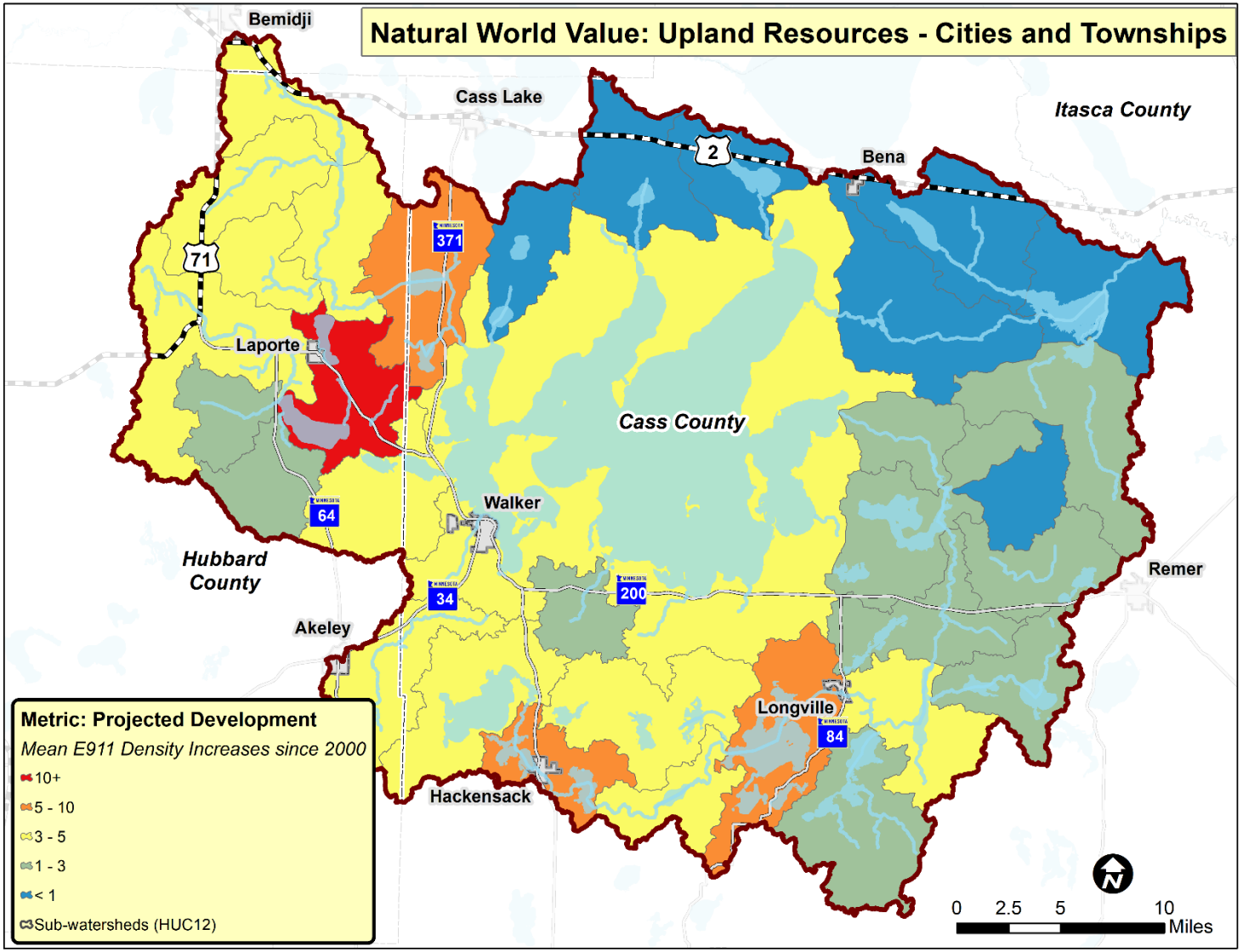

Figure P-2. Projected Development in the Leech Lake River Watershed.

Table P-2. Ranking of Cities and Townships in the Leech Lake River Watershed

HUC12	Name	Current Development Density	Potential Development Density	SUM
70101020101	Headwaters Necktie River	0.66	0.66	1.32
70101020102	Bungashing Creek	0.01	1	1.01
70101020103	Pokety River	0.01	1	1.01
70101020104	Necktie River	0.01	0.66	0.67
70101020105	Steamboat River	0.01	1	1.01
70101020201	Headwaters Kabekona River	0.33	0.66	0.99
70101020202	Gulch Creek	0.01	0.33	0.34
70101020203	Sucker Branch	0.01	0.33	0.34
70101020204	Kabekona River	0.33	1	1.33
70101020301	Tenmile Lake	0.33	0.66	0.99
70101020302	Pleasant Lake-Boy River	0.33	1	1.33
70101020303	Man Lake	0.01	1	1.01
70101020304	Big Deep Lake-Boy River	0.01	0.66	0.67
70101020305	Woman Lake	0.33	1	1.33
70101020401	Little Boy Lake	0.01	0.33	0.34
70101020402	Trelipe Creek	0.01	0.33	0.34
70101020403	Inguadona Lake-Boy River	0.01	0.66	0.67
70101020404	Long Lake-Boy River	0.33	0.66	0.99
70101020405	Swift Lake	0.33	0.33	0.66
70101020406	Tobique Lake	0.01	0.01	0.02
70101020407	Boy Lake	0.01	0.33	0.34
70101020408	Boy River	0.01	0.33	0.34
70101020501	Kabekona Bay	0.33	1	1.33
70101020502	Crooked Lake	0.01	0.01	0.02
70101020503	Shingobee River	0.33	0.66	0.99
70101020504	Sucker Creek	0.33	0.01	0.34
70101020505	Urem Bay	0.33	0.33	0.66
70101020506	Portage Creek	0.33	0.01	0.34
70101020507	Leech Lake	0.01	0.66	0.67
70101020601	Drumbeater Lake-Leech River	0.01	0.01	0.02
70101020602	Sixmile Brook	0.33	0.01	0.34
70101020603	Bear River	0.01	0.33	0.34
70101020604	Leech River	0.01	0.01	0.02

APPENDIX Q

NWVS SUM OF BY EACH METRIC

APPENDIX Q: NATURAL WORLD VALUE PRIORITY MAPS AND SUBWATERSHED RANKING RESULTS.

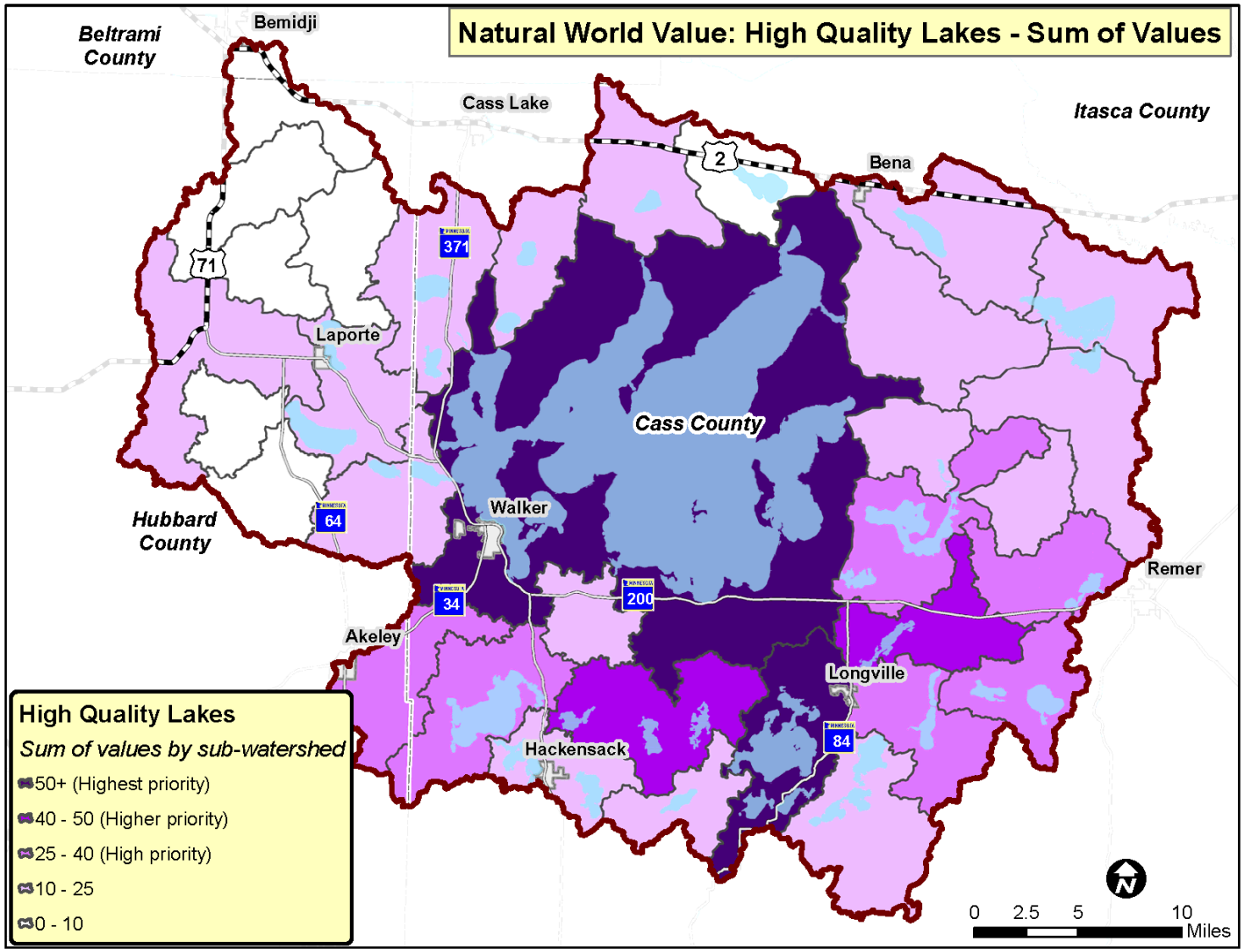

Figure Q-1. Leech Lake River Subwatersheds Prioritized by Summed High Water Quality Lake Value Ranking Criteria.

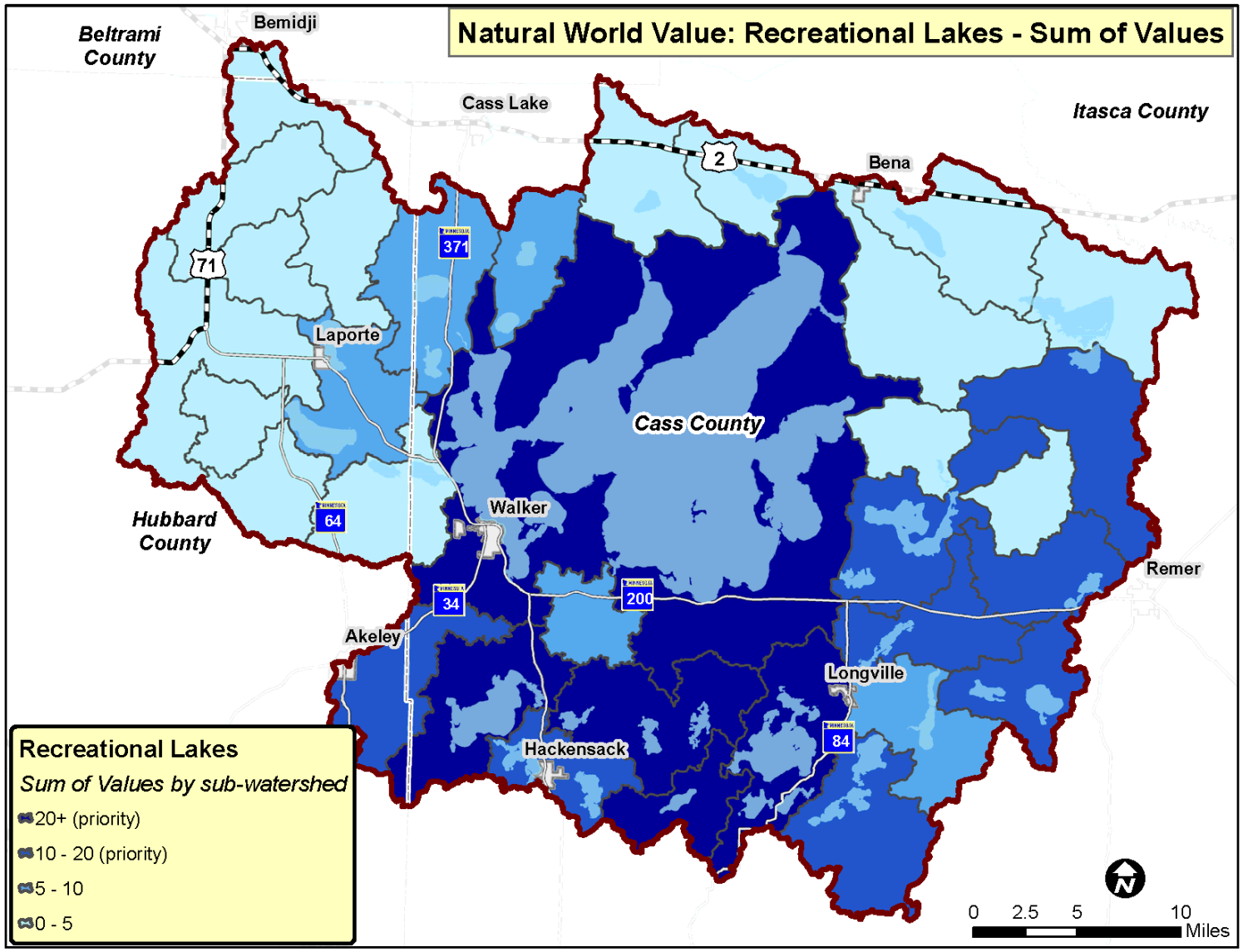

Figure Q-2. Leech Lake River Subwatersheds Prioritized by Summed Recreational Lake Value Ranking Criteria.

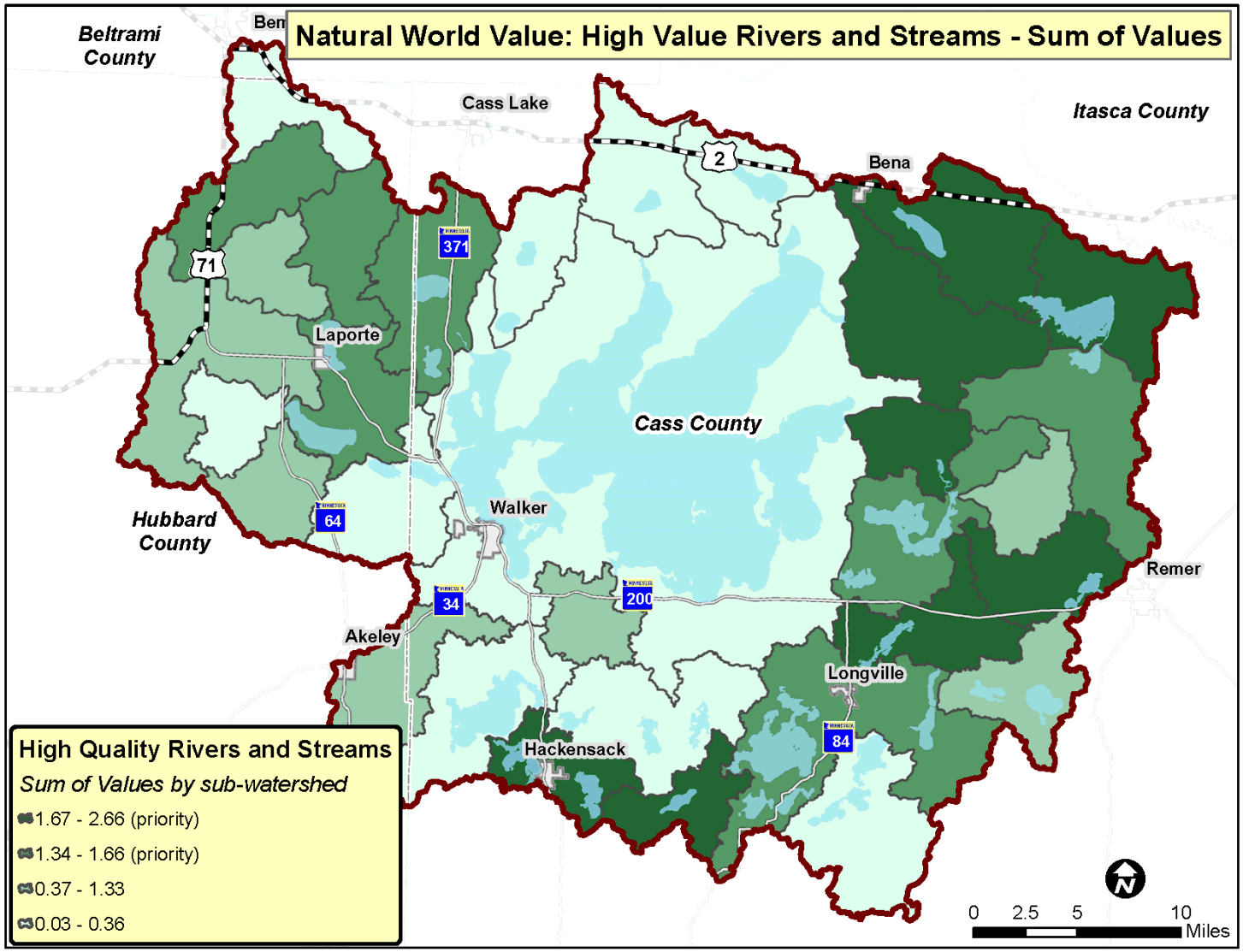

Figure Q-3. Leech Lake River Subwatersheds Prioritized by Summed High Water Quality Stream Value Ranking Criteria.

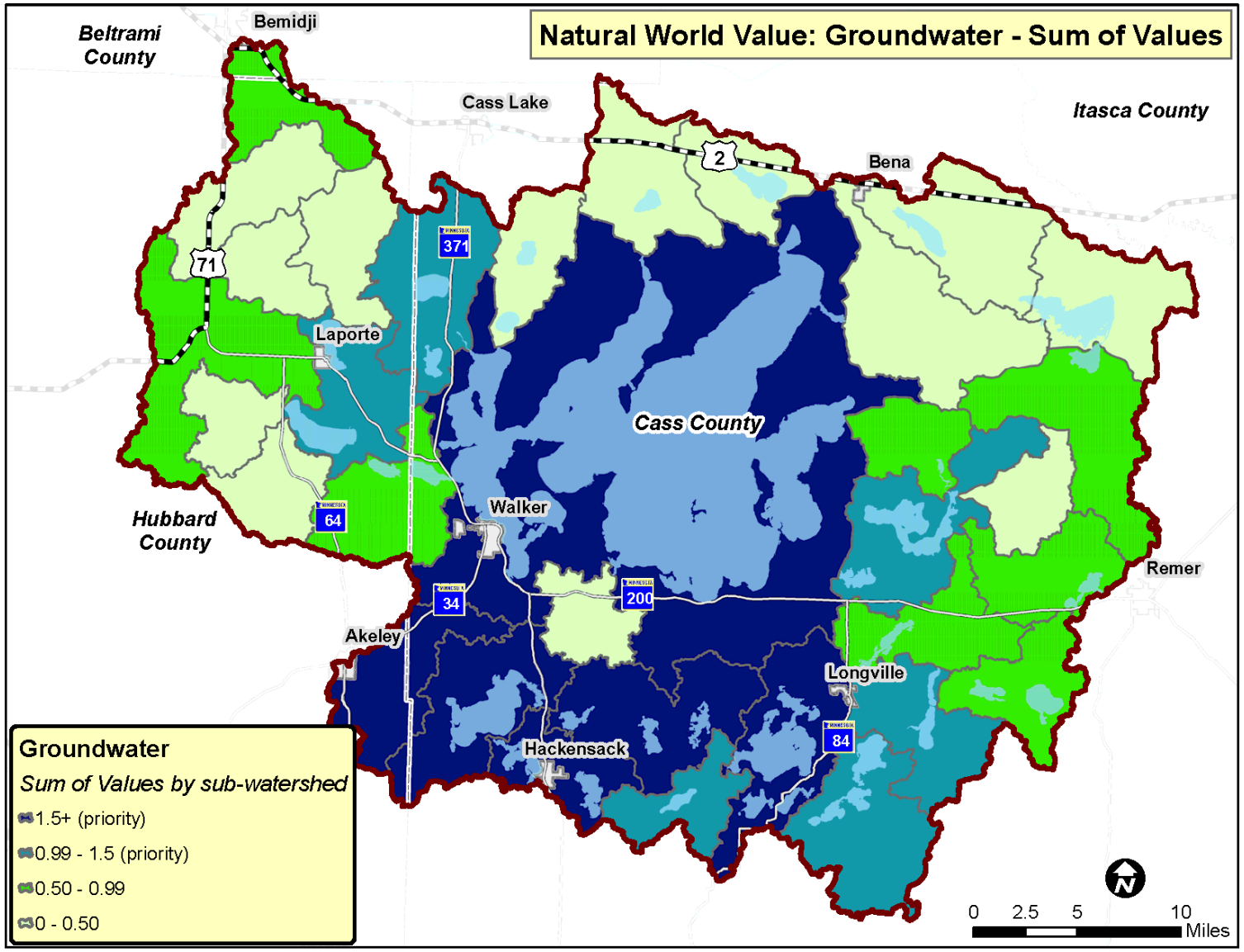

Figure Q-4. Leech Lake River Subwatersheds Prioritized by Summed Declining Stream Quality Value Ranking Criteria.

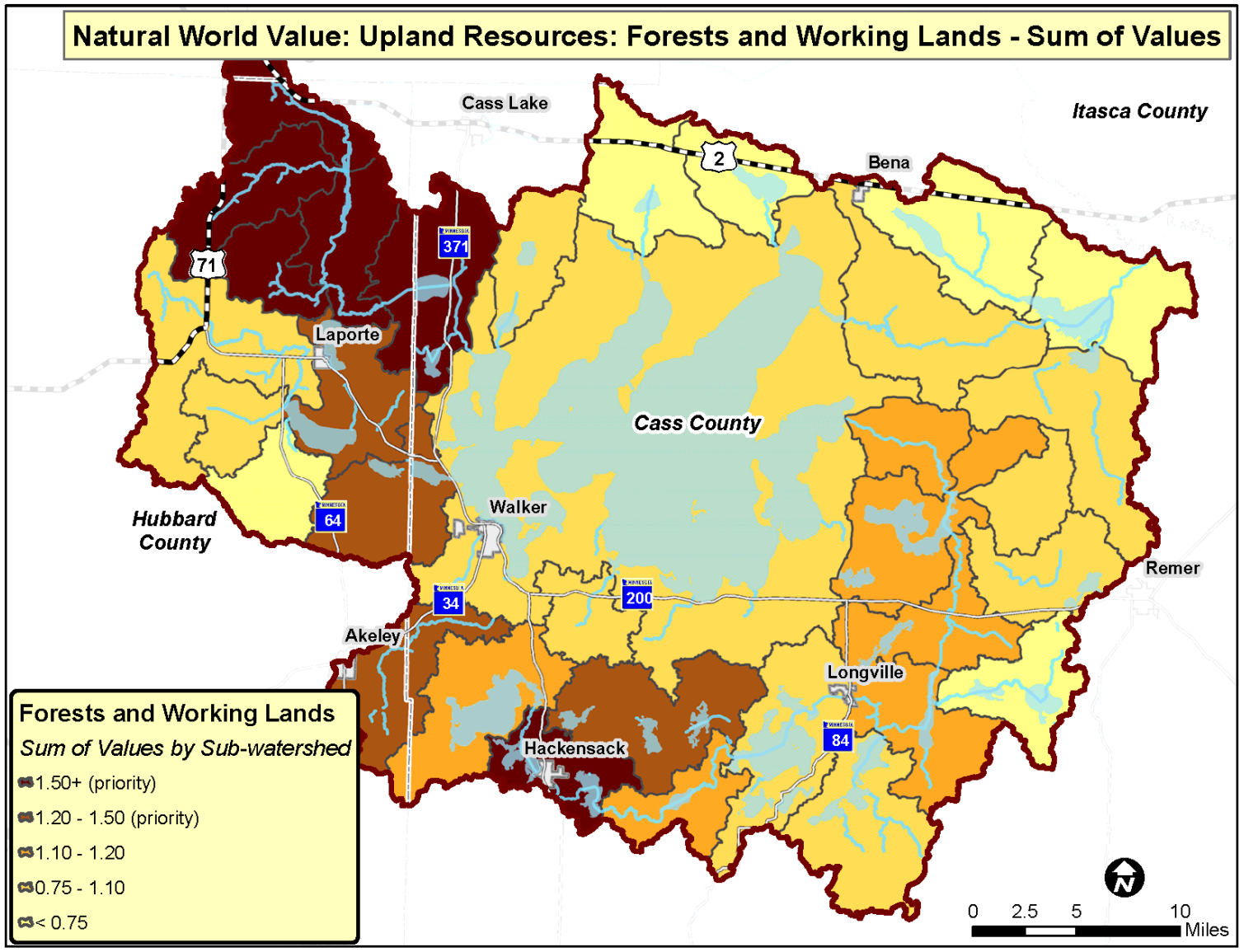

Figure Q-5. Leech Lake River Subwatersheds Prioritized by Summed by Forest and Working Lands Value Ranking Criteria.

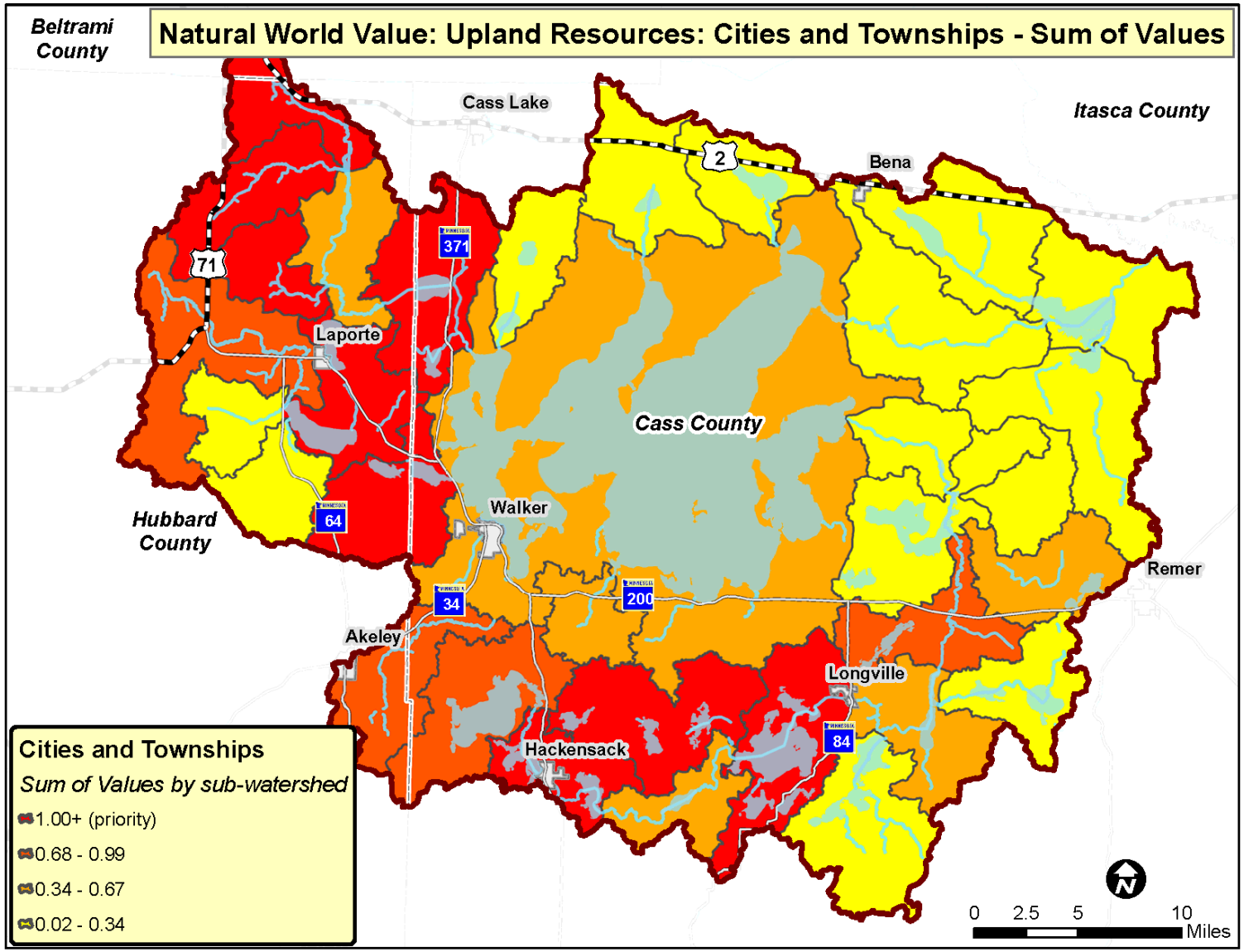

Figure Q-6. Leech Lake River Subwatersheds Prioritized by Summed Cities and Townships Value Ranking Criteria.

Table Q-1. Natural World Value 1: High Quality Lakes Subwatershed Ranking Results. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020305	Woman Lake	79.05
70101020507	Leech Lake	64.91
70101020303	Man Lake	53.26
70101020404	Long Lake-Boy River	45.69
70101020403	Inguadona Lake-Boy River	43.61
70101020405	Swift Lake	40.78
70101020407	Boy Lake	39.95
70101020301	Tenmile Lake	30.51
70101020402	Trelipe Creek	30.49
70101020304	Big Deep Lake-Boy River	28.18
70101020503	Shingobee River	27.97
70101020502	Crooked Lake	26.19
70101020602	Sixmile Brook	24.96
70101020401	Little Boy Lake	23.8
70101020505	Urem Bay	23.6
70101020406	Tobique Lake	22.01
70101020302	Pleasant Lake-Boy River	21.49
70101020604	Leech River	20
70101020105	Steamboat River	18.24
70101020204	Kabekona River	18.22
70101020501	Kabekona Bay	17.09
70101020504	Sucker Creek	16.74
70101020603	Bear River	15.07
70101020408	Boy River	14.43
70101020601	Drumbeater Lake-Leech River	14.2
70101020201	Headwaters Kabekona River	13.46
70101020203	Sucker Branch	7.42
70101020506	Portage Creek	6.28
70101020103	Pokety River	4.2
70101020202	Gulch Creek	4.08
70101020104	Necktie River	4.03
70101020102	Bungashing Creek	0.59
70101020101	Headwaters Necktie River	0

Table Q-2. Natural World Value 2: Recreational Lakes Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020303	Man Lake	44.05
70101020507	Leech Lake	44.01
70101020305	Woman Lake	43.61
70101020301	Tenmile Lake	31.43
70101020304	Big Deep Lake-Boy River	21.74
70101020405	Swift Lake	18.26
70101020404	Long Lake-Boy River	15.86
70101020401	Little Boy Lake	14.54
70101020603	Bear River	13.79
70101020407	Boy Lake	12.7
70101020302	Pleasant Lake-Boy River	12.3
70101020503	Shingobee River	12.02
70101020402	Trelipe Creek	11.51
70101020403	Inguadona Lake-Boy River	10.56
70101020502	Crooked Lake	9.9
70101020505	Urem Bay	9.3
70101020105	Steamboat River	8.07
70101020204	Kabekona River	6.41
70101020601	Drumbeater Lake-Leech River	4.73
70101020406	Tobique Lake	4.6
70101020504	Sucker Creek	4.47
70101020506	Portage Creek	4.1
70101020602	Sixmile Brook	3.85
70101020501	Kabekona Bay	3.72
70101020201	Headwaters Kabekona River	3.48
70101020604	Leech River	2.42
70101020202	Gulch Creek	2.02
70101020103	Pokety River	1.41
70101020102	Bungashing Creek	1.08
70101020203	Sucker Branch	0.69
70101020104	Necktie River	0.68
70101020408	Boy River	0.36
70101020101	Headwaters Necktie River	0

Table Q-3. Natural World Value 4: Impaired Lakes Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020104	Necktie River	1
70101020303	Man Lake	0.01
70101020507	Leech Lake	0.01
70101020301	Tenmile Lake	0.01
70101020305	Woman Lake	0.01
70101020304	Big Deep Lake-Boy River	0.01
70101020405	Swift Lake	0.01
70101020404	Long Lake-Boy River	0.01
70101020401	Little Boy Lake	0.01
70101020603	Bear River	0.01
70101020403	Inguadona Lake-Boy River	0.01
70101020407	Boy Lake	0.01
70101020302	Pleasant Lake-Boy River	0.01
70101020503	Shingobee River	0.01
70101020402	Trelipe Creek	0.01
70101020502	Crooked Lake	0.01
70101020505	Urem Bay	0.01
70101020105	Steamboat River	0.01
70101020204	Kabekona River	0.01
70101020601	Drumbeater Lake-Leech River	0.01
70101020406	Tobique Lake	0.01
70101020504	Sucker Creek	0.01
70101020506	Portage Creek	0.01
70101020602	Sixmile Brook	0.01
70101020501	Kabekona Bay	0.01
70101020201	Headwaters Kabekona River	0.01
70101020604	Leech River	0.01
70101020202	Gulch Creek	0.01
70101020103	Pokety River	0.01
70101020102	Bungashing Creek	0.01
70101020203	Sucker Branch	0.01
70101020408	Boy River	0.01
70101020101	Headwaters Necktie River	0.01

Table Q-4. Natural World Value 5: High Value and High Priority Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020404	Long Lake-Boy River	2.66
70101020604	Leech River	2.66
70101020602	Sixmile Brook	2.01
70101020408	Boy River	2.01
70101020601	Drumbeater Lake-Leech River	1.83
70101020304	Big Deep Lake-Boy River	1.67
70101020405	Swift Lake	1.67
70101020302	Pleasant Lake-Boy River	1.67
70101020104	Necktie River	1.34
70101020305	Woman Lake	1.34
70101020603	Bear River	1.34
70101020403	Inguadona Lake-Boy River	1.34
70101020407	Boy Lake	1.34
70101020105	Steamboat River	1.34
70101020204	Kabekona River	1.34
70101020102	Bungashing Creek	1.34
70101020103	Pokety River	1.17
70101020503	Shingobee River	1.02
70101020402	Trelipe Creek	0.68
70101020505	Urem Bay	0.68
70101020406	Tobique Lake	0.68
70101020201	Headwaters Kabekona River	0.52
70101020203	Sucker Branch	0.52
70101020303	Man Lake	0.35
70101020502	Crooked Lake	0.35
70101020506	Portage Creek	0.35
70101020202	Gulch Creek	0.35
70101020101	Headwaters Necktie River	0.35
70101020507	Leech Lake	0.03
70101020301	Tenmile Lake	0.03
70101020401	Little Boy Lake	0.03
70101020504	Sucker Creek	0.03
70101020501	Kabekona Bay	0.03

Table Q-5. Natural World Value 6: Declining, Impaired, and Channelized Rivers and Streams Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020604	Leech River	1
70101020601	Drumbeater Lake-Leech River	1
70101020403	Inguadona Lake-Boy River	1
70101020201	Headwaters Kabekona River	1
70101020401	Little Boy Lake	1
70101020204	Kabekona River	1
70101020104	Necktie River	1
70101020102	Bungashing Creek	1
70101020101	Headwaters Necktie River	1
70101020404	Long Lake-Boy River	0.01
70101020602	Sixmile Brook	0.01
70101020408	Boy River	0.01
70101020304	Big Deep Lake-Boy River	0.01
70101020405	Swift Lake	0.01
70101020302	Pleasant Lake-Boy River	0.01
70101020305	Woman Lake	0.01
70101020603	Bear River	0.01
70101020407	Boy Lake	0.01
70101020105	Steamboat River	0.01
70101020103	Pokety River	0.01
70101020503	Shingobee River	0.01
70101020402	Trelipe Creek	0.01
70101020505	Urem Bay	0.01
70101020406	Tobique Lake	0.01
70101020203	Sucker Branch	0.01
70101020303	Man Lake	0.01
70101020502	Crooked Lake	0.01
70101020506	Portage Creek	0.01
70101020202	Gulch Creek	0.01
70101020507	Leech Lake	0.01
70101020301	Tenmile Lake	0.01
70101020504	Sucker Creek	0.01
70101020501	Kabekona Bay	0.01

Table Q-6. Natural World Value 8: Groundwater Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	NAME	SUM
70101020305	Woman Lake	2
70101020507	Leech Lake	2
70101020302	Pleasant Lake-Boy River	1.66
70101020503	Shingobee River	1.66
70101020303	Man Lake	1.66
70101020301	Tenmile Lake	1.66
70101020403	Inguadona Lake-Boy River	1.33
70101020304	Big Deep Lake-Boy River	1.32
70101020105	Steamboat River	1.32
70101020204	Kabekona River	1.32
70101020407	Boy Lake	1.01
70101020401	Little Boy Lake	0.99
70101020201	Headwaters Kabekona River	0.67
70101020404	Long Lake-Boy River	0.67
70101020408	Boy River	0.67
70101020405	Swift Lake	0.67
70101020603	Bear River	0.67
70101020101	Headwaters Necktie River	0.67
70101020402	Trelipe Creek	0.66
70101020501	Kabekona Bay	0.66
70101020604	Leech River	0.34
70101020601	Drumbeater Lake-Leech River	0.34
70101020602	Sixmile Brook	0.34
70101020104	Necktie River	0.34
70101020102	Bungashing Creek	0.34
70101020506	Portage Creek	0.34
70101020103	Pokety River	0.02
70101020505	Urem Bay	0.02
70101020406	Tobique Lake	0.02
70101020203	Sucker Branch	0.02
70101020502	Crooked Lake	0.02
70101020202	Gulch Creek	0.02
70101020504	Sucker Creek	0.02

Table Q-7. Natural World Values 9 (Forests) and 11 (Working Lands) Subwatershed Priority Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020102	Bungashing Creek	2.092549
70101020101	Headwaters Necktie River	1.979703
70101020103	Pokety River	1.719373
70101020105	Steamboat River	1.684115
70101020302	Pleasant Lake-Boy River	1.632568
70101020104	Necktie River	1.548707
70101020501	Kabekona Bay	1.42121
70101020503	Shingobee River	1.321949
70101020303	Man Lake	1.267268
70101020204	Kabekona River	1.238889
70101020404	Long Lake-Boy River	1.186495
70101020304	Big Deep Lake-Boy River	1.178808
70101020301	Tenmile Lake	1.160204
70101020408	Boy River	1.150272
70101020403	Inguadona Lake-Boy River	1.139202
70101020407	Boy Lake	1.137467
70101020401	Little Boy Lake	1.083414
70101020201	Headwaters Kabekona River	1.068481
70101020507	Leech Lake	1.048752
70101020405	Swift Lake	1.042619
70101020502	Crooked Lake	1.033534
70101020305	Woman Lake	0.985847
70101020601	Drumbeater Lake-Leech River	0.891554
70101020603	Bear River	0.886907
70101020505	Urem Bay	0.807184
70101020202	Gulch Creek	0.766703
70101020406	Tobique Lake	0.752316
70101020604	Leech River	0.738268
70101020203	Sucker Branch	0.706758
70101020506	Portage Creek	0.688996
70101020402	Trelipe Creek	0.624252
70101020602	Sixmile Brook	0.514018
70101020504	Sucker Creek	0.144904

Table Q-8. Natural World Value 12: Cities and Townships Subwatershed Ranking. Subwatersheds Above The Bold Line Are Priority Subwatersheds For This Natural World Value.

HUC12	Name	SUM
70101020302	Pleasant Lake-Boy River	1.33
70101020501	Kabekona Bay	1.33
70101020204	Kabekona River	1.33
70101020305	Woman Lake	1.33
70101020101	Headwaters Necktie River	1.32
70101020102	Bungashing Creek	1.01
70101020103	Pokety River	1.01
70101020105	Steamboat River	1.01
70101020303	Man Lake	1.01
70101020503	Shingobee River	0.99
70101020404	Long Lake-Boy River	0.99
70101020301	Tenmile Lake	0.99
70101020201	Headwaters Kabekona River	0.99
70101020104	Necktie River	0.67
70101020304	Big Deep Lake-Boy River	0.67
70101020403	Inguadona Lake-Boy River	0.67
70101020507	Leech Lake	0.67
70101020405	Swift Lake	0.66
70101020505	Urem Bay	0.66
70101020408	Boy River	0.34
70101020407	Boy Lake	0.34
70101020401	Little Boy Lake	0.34
70101020603	Bear River	0.34
70101020202	Gulch Creek	0.34
70101020203	Sucker Branch	0.34
70101020506	Portage Creek	0.34
70101020402	Trelipe Creek	0.34
70101020602	Sixmile Brook	0.34
70101020504	Sucker Creek	0.34
70101020502	Crooked Lake	0.02
70101020601	Drumbeater Lake-Leech River	0.02
70101020406	Tobique Lake	0.02
70101020604	Leech River	0.02

APPENDIX R

AGGREGATED NWV SCORES BY SUBWATERSHED

Table R-1. Summed Metric Scoring by Subwatershed

HUC 12	Name	High Quality Lakes Score	Recreational Lakes Score	Impaired Lakes Score	High Value Streams Score	Declining, Impaired Streams Score	Groundwater Score	Forests and Working Lands Score	Cities and Townships Score	Total Number of Priorities
70101020305	Woman Lake	79.05	43.61	0.01	1.34	0.01	2.00	0.99	1.33	5
70101020303	Man Lake	53.26	44.05	0.01	0.35	0.01	1.66	1.27	1.01	5
70101020302	Pleasant Lake-Boy River	21.49	12.30	0.01	1.67	0.01	1.66	1.63	1.33	5
70101020204	Kabekona River	18.22	6.41	0.01	1.34	1.00	1.32	1.24	1.33	5
70101020407	Boy Lake	39.95	12.70	0.01	1.34	0.01	1.01	1.14	0.34	4
70101020403	Inguadona Lake-Boy River	43.61	10.56	0.01	1.34	1.00	1.33	1.14	0.67	4
70101020503	Shingobee River	27.97	12.02	0.01	1.02	0.01	1.66	1.32	0.99	4
70101020105	Steamboat River	18.24	8.07	0.01	1.34	0.01	1.32	1.68	1.01	4
70101020104	Necktie River	4.03	0.68	1.00	1.34	1.00	0.34	1.55	0.67	4
70101020102	Bungashing Creek	0.59	1.08	0.01	1.34	1.00	0.34	2.09	1.01	4
70101020304	Big Deep Lake-Boy River	28.18	21.74	0.01	1.67	0.01	1.32	1.18	0.67	4
70101020507	Leech Lake	64.91	44.01	0.01	0.03	0.01	2.00	1.05	0.67	3
70101020404	Long Lake-Boy River	45.69	15.86	0.01	2.66	0.01	0.67	1.19	0.99	3
70101020405	Swift Lake	40.78	18.26	0.01	1.67	0.01	0.67	1.04	0.66	3
70101020301	Tenmile Lake	30.51	31.43	0.01	0.03	0.01	1.66	1.16	0.99	3
70101020401	Little Boy Lake	23.80	14.54	0.01	0.03	1.00	0.99	1.08	0.34	3
70101020101	Headwaters Necktie River	0.00	0.00	0.01	0.35	1.00	0.67	1.98	1.32	3
70101020402	Trelipe Creek	30.49	11.51	0.01	0.68	0.01	0.66	0.62	0.34	2
70101020604	Leech River	20.00	2.42	0.01	2.66	1.00	0.34	0.74	0.02	2
70101020501	Kabekona Bay	17.09	3.72	0.01	0.03	0.01	0.66	1.42	1.33	2
70101020603	Bear River	15.07	13.79	0.01	1.34	0.01	0.67	0.89	0.34	2
70101020601	Drumbeater Lake-Leech River	14.20	4.73	0.01	1.83	1.00	0.34	0.89	0.02	2
70101020103	Pokety River	4.20	1.41	0.01	1.17	0.01	0.02	1.72	1.01	2
70101020602	Sixmile Brook	24.96	3.85	0.01	2.01	0.01	0.34	0.51	0.34	1
70101020408	Boy River	14.43	0.36	0.01	2.01	0.01	0.67	1.15	0.34	1
70101020201	Headwaters Kabekona River	13.46	3.48	0.01	0.52	1.00	0.67	1.07	0.99	1
70101020502	Crooked Lake	26.19	9.90	0.01	0.35	0.01	0.02	1.03	0.02	0
70101020505	Urem Bay	23.60	9.30	0.01	0.68	0.01	0.02	0.81	0.66	0
70101020406	Tobique Lake	22.01	4.60	0.01	0.68	0.01	0.02	0.75	0.02	0
70101020504	Sucker Creek	16.74	4.47	0.01	0.03	0.01	0.02	0.14	0.34	0
70101020203	Sucker Branch	7.42	0.69	0.01	0.52	0.01	0.02	0.71	0.34	0
70101020506	Portage Creek	6.28	4.10	0.01	0.35	0.01	0.34	0.69	0.34	0
70101020202	Gulch Creek	4.08	2.02	0.01	0.35	0.01	0.02	0.77	0.34	0

Table R-2. Ranked HUC12'S by Total Number of Priorities Met

HUC 12	Name	High Quality Lakes Score	Recreational Lakes Score	Impaired Lakes Score	High Value Streams Score	Declining, Impaired Streams Score	Groundwater Score	Forests and Working Lands Score	Cities and Townships Score	Total Number of Priorities
70101020305	Woman Lake	Yes	Yes		Yes		Yes		Yes	5
70101020303	Man Lake	Yes	Yes				Yes	Yes	Yes	5
70101020302	Pleasant Lake-Boy River		Yes		Yes		Yes	Yes	Yes	5
70101020204	Kabekona River				Yes	Yes	Yes	Yes	Yes	5
70101020407	Boy Lake	Yes	Yes		Yes		Yes			4
70101020403	Inguadona Lake-Boy River	Yes	No		Yes	Yes	Yes			4
70101020503	Shingobee River	Yes	Yes				Yes	Yes		4
70101020105	Steamboat River				Yes		Yes	Yes	Yes	4
70101020104	Necktie River			Yes	Yes	Yes		Yes		4
70101020102	Bungashing Creek				Yes	Yes		Yes	Yes	4
70101020304	Big Deep Lake-Boy River	Yes	Yes		Yes		Yes			4
70101020507	Leech Lake	Yes	Yes				Yes			3
70101020404	Long Lake-Boy River	Yes	Yes		Yes					3
70101020405	Swift Lake	Yes	Yes		Yes					3
70101020301	Tenmile Lake	Yes	Yes				Yes			3
70101020401	Little Boy Lake		Yes			Yes	Yes			3
70101020101	Headwaters Necktie River					Yes		Yes	Yes	3
70101020402	Trelipe Creek	Yes	Yes							2
70101020604	Leech River				Yes	Yes				2
70101020501	Kabekona Bay							Yes	Yes	2
70101020603	Bear River		Yes		Yes					2
70101020601	Drumbeater Lake-Leech River				Yes	Yes				2
70101020103	Pokety River							Yes	Yes	2
70101020602	Sixmile Brook				Yes					1
70101020408	Boy River				Yes					1
70101020201	Headwaters Kabekona River					Yes				1
70101020502	Crooked Lake									0
70101020505	Urem Bay									0
70101020406	Tobique Lake									0
70101020504	Sucker Creek									0
70101020203	Sucker Branch									0
70101020506	Portage Creek									0
70101020202	Gulch Creek									0

APPENDIX S

CLIMATE TRENDS

APPENDIX S: CLIMATE TRENDS IN THE LEECH LAKE RIVER WATERSHED

Climate trends in the LLR Watershed indicate the overall precipitation has decreased and temperatures have increased over the past 30 years. Total precipitation has slightly decreased over the last 30-years based on data analyzed from the Leech Lake Dam weather station (Figure 1). Isolating the growing season (June-September) precipitation totals shows a slightly more significant decreasing trend (Figure 2). Temperature data collected at the Leech Lake Dam shows annual average temperatures have a slight decreasing trend over the past 30 years (Figure 3), but growing season temperatures show an increasing trend in the same time period (Figure 4). The increase in growing season mean temperatures aligns with increases in the average high and average low temperatures for the same time period growing seasons (Figure 5 and Figure 6). Another climate indicator for temperatures is the ice-out date for lakes. As the climate warms, ice-out dates will trend earlier into the spring. Using DNR data for ice-out dates on Leech Lake, ice-out is trending earlier into the spring over the past 30 years indicating warmer temperatures (Figure 7).

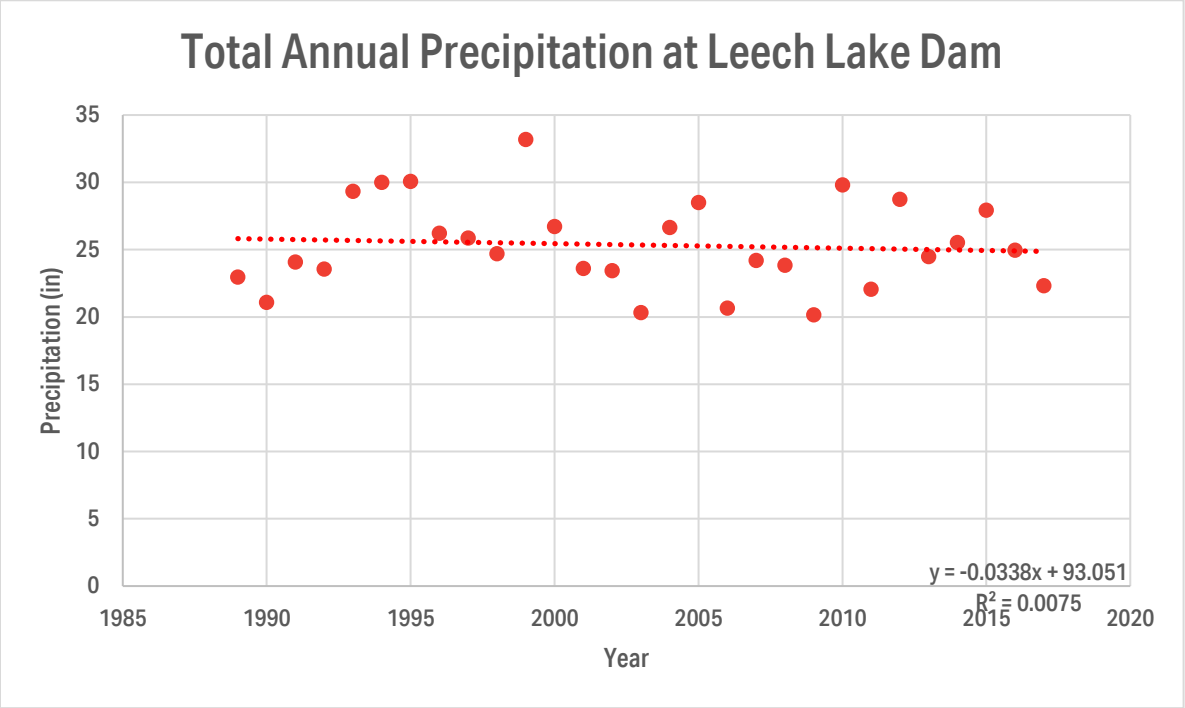

Figure S-1. Total Annual Precipitation at Leech Lake Dam.

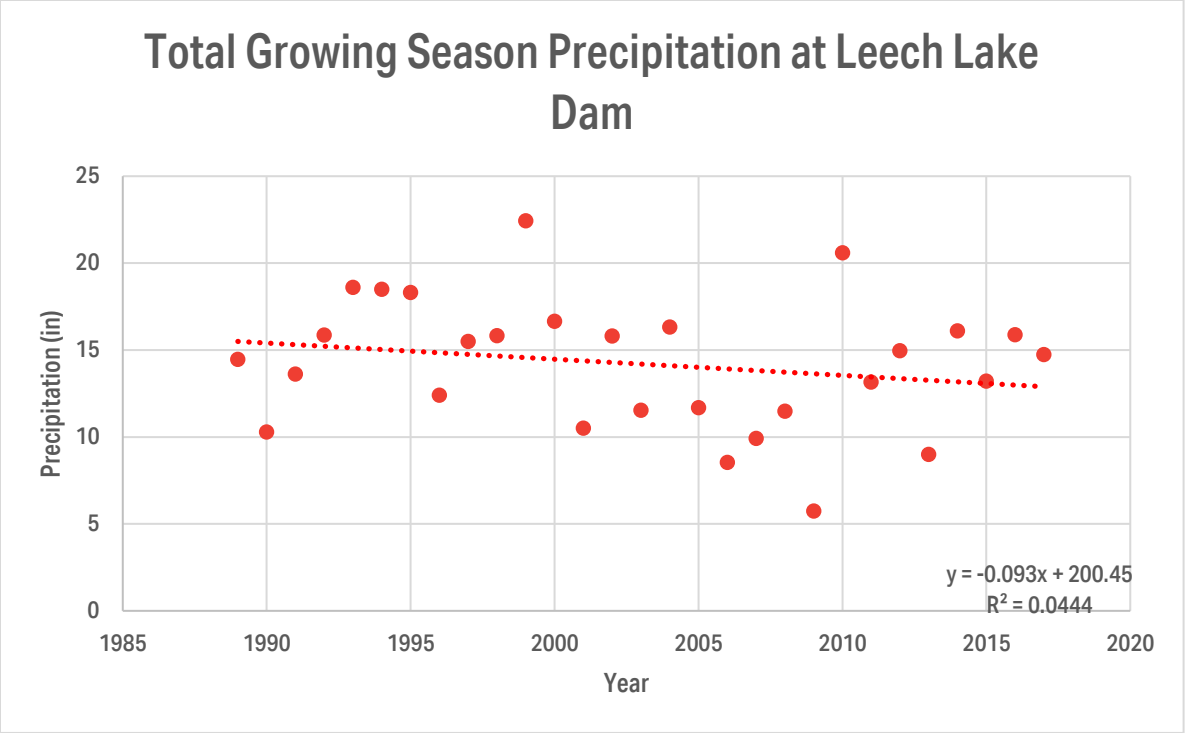

Figure S-2. Total Growing Season Precipitation at Leech Lake Dam.

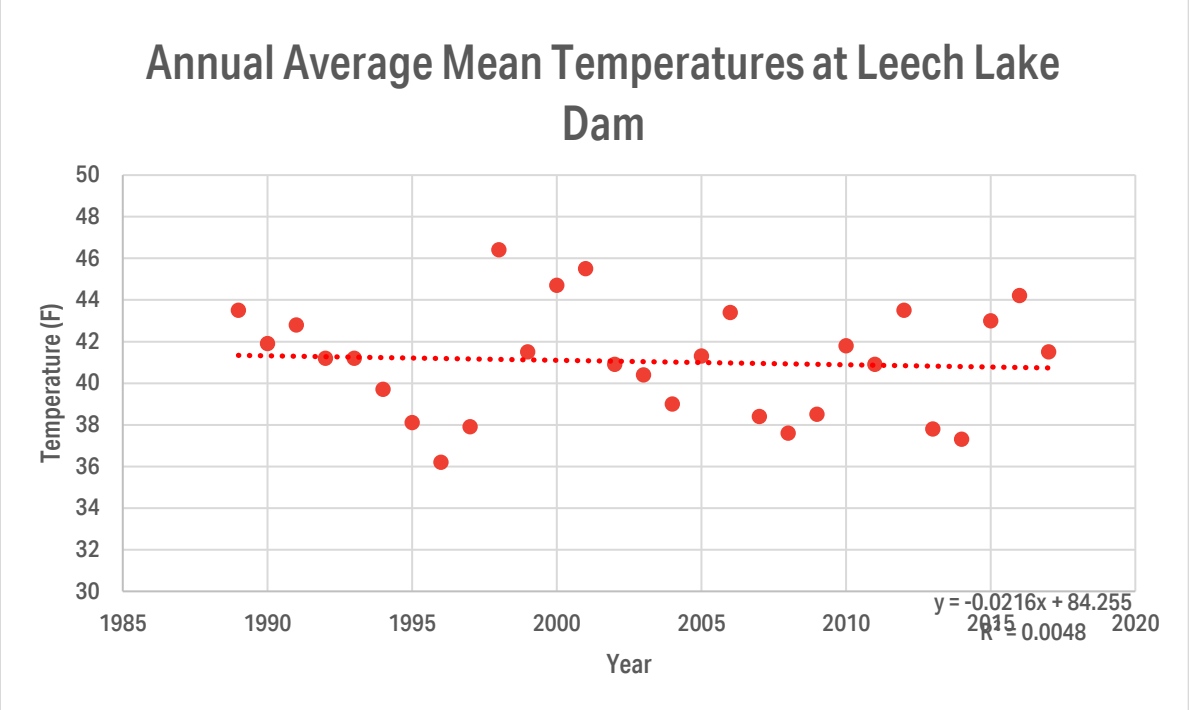

Figure S-3. Annual Average Mean Temperatures at Leech Lake Dam.

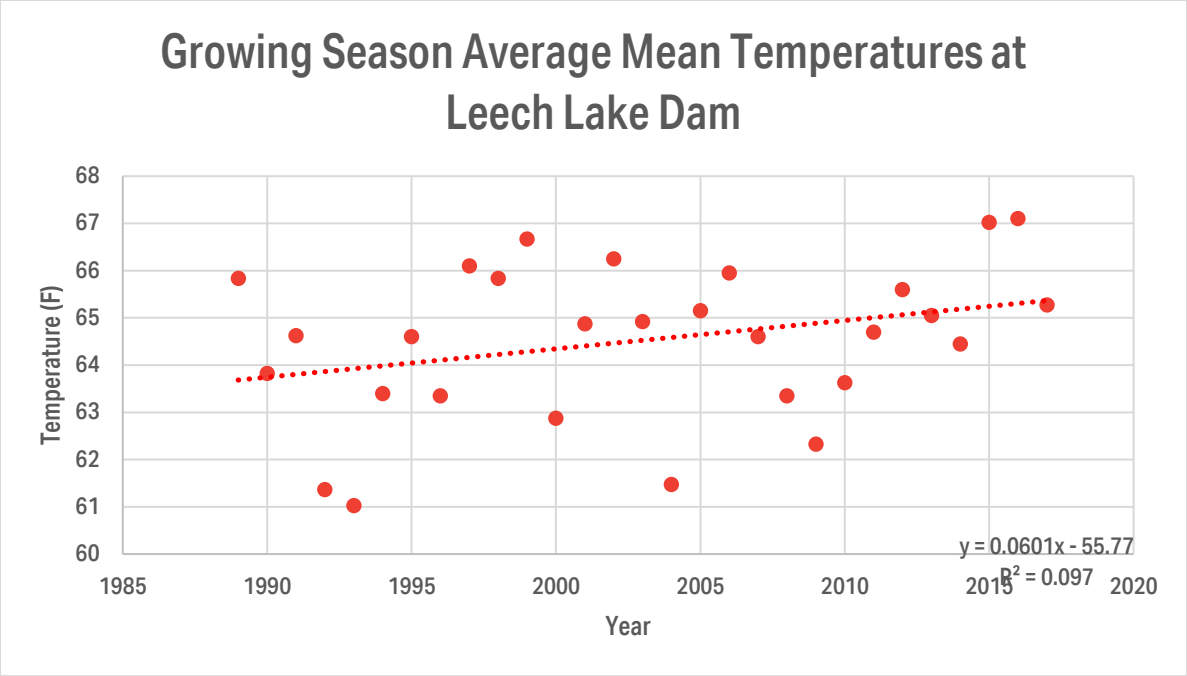

Figure S-4. Growing Season Average Mean Temperatures at Leech Lake Dam.

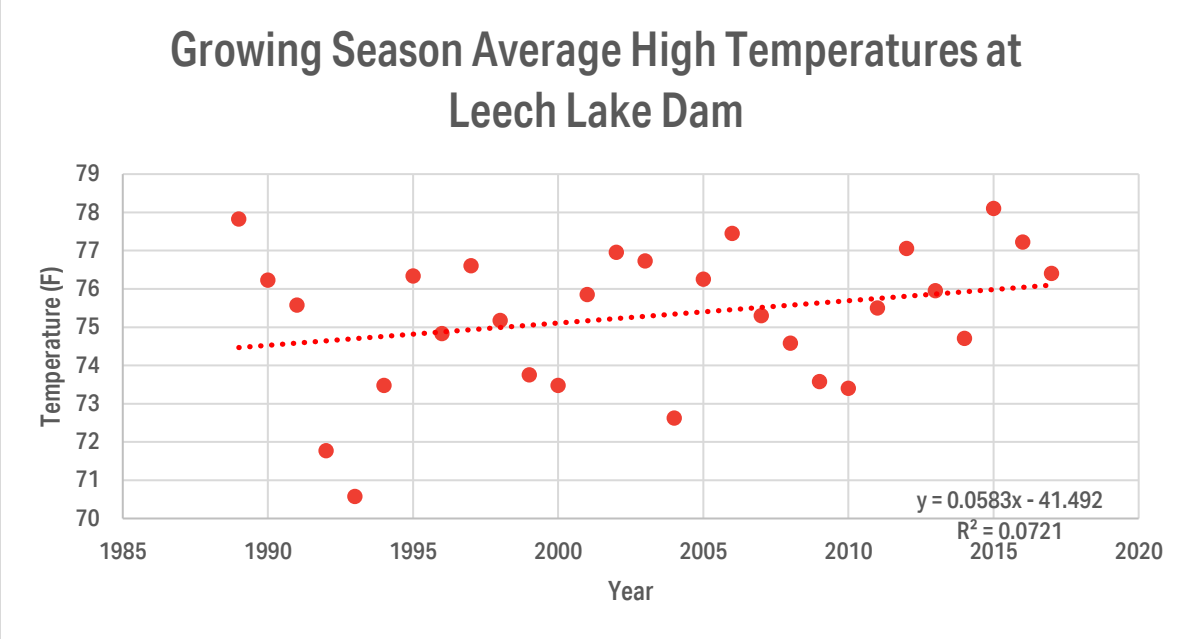

Figure S-5. Growing Season Average High Temperatures at Leech Lake Dam.

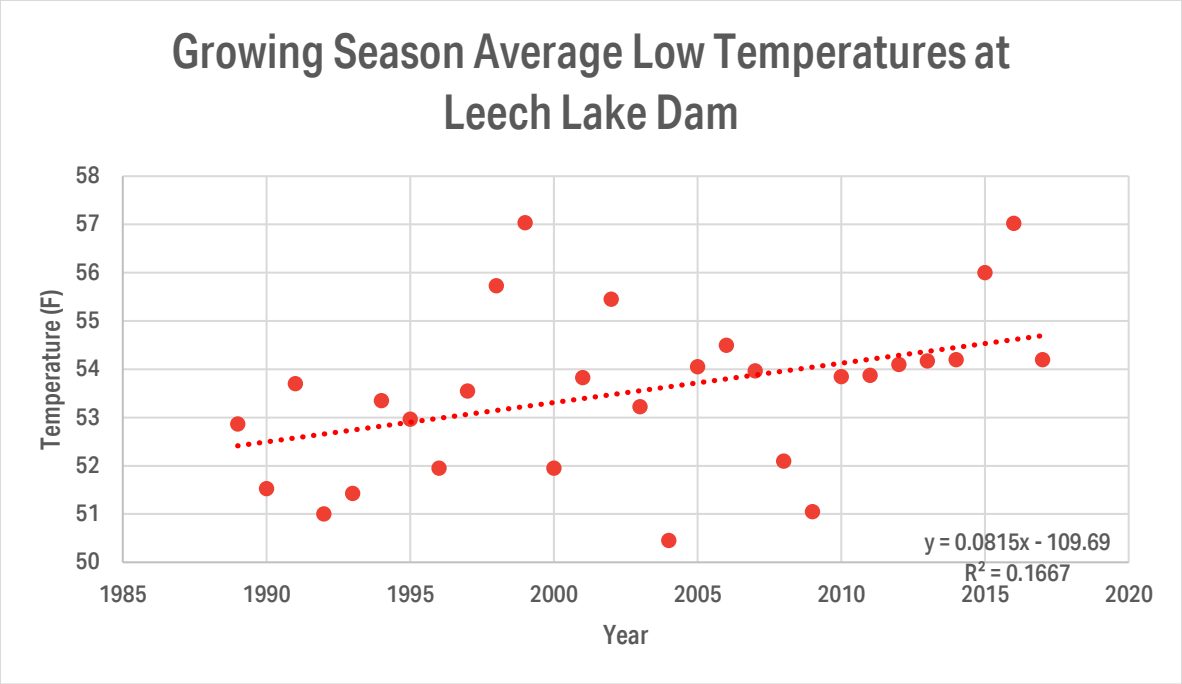

Figure S-6. Growing Season Average Low Temperatures at Leech Lake Dam.

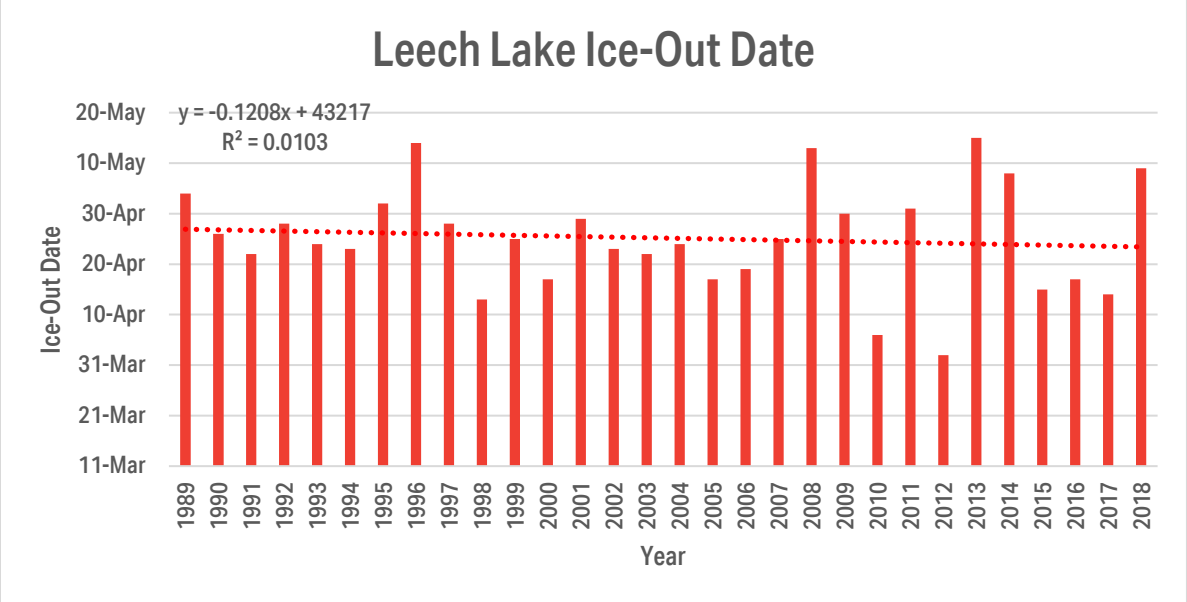

Figure S-7. Leech Lake Ice-Out Date.

APPENDIX T

ADDED VALUE SCREENING CRITERIA

QUALITY OF LIFE VALUE PROJECT SCREENING CRITERIA

1. Improve Community Quality of Life

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Improve Community Quality of Life	**Internal focus.** The project team has located and reviewed the most recent community planning information. Some, but not systematic, outreach to stakeholders and decision makers has taken place. Some relatively easy, but not particularly important or meaningful, changes made to the project. No serious adverse community effects are caused by the project. (A, B, C, D)	**Community linkages.** More efforts to locate, review, assess, and incorporate the needs, goals, and plans of the host community to the project. Most potential negative adverse impacts of the project on the host community are reduced or eliminated. Key stakeholders are involved in the project decision-making process. (A, B, C, D) **Broad community alignment.** All community plans are reviewed and verified through stakeholder input. The project team works to achieve good project alignment with community plans, recognizing that the scope of the project is a limiting factor. Potential negative impacts on nearby affected communities are reduced or eliminated. (A, B, C, D)	**Holistic assessment and collaboration.** The project makes a positive contribution to the quality of life of the host and nearby affected communities. The project team makes a holistic assessment of community needs, goals, and plans, incorporating meaningful stakeholder input. Project meets or exceeds important identified community needs and long-term requirements for sustainability. Remaining adverse impacts are minimal, mostly accepted as reasonable trade-offs for benefits achieved. The project has broad community endorsement. (A, B, C, D, E)	**Community renaissance.** Through rehabilitation of important community assets (e.g., upgraded and extended access, increased safety, improved environmental quality, and additional infrastructure capacity) the project substantially reinvigorates the host and nearby communities. Working in genuine collaboration with stakeholders and community decision makers, the project owner and the project team scope the project in a way that elevates community awareness and pride. Overall quality of life in these communities is markedly elevated. (A, B, C, D, E, F)

A. Has the project team identified and taken into account community needs, goals, and issues?
B. Has the project team sought to align the project vision and goals to the needs and goals of the host and affected communities?
C. Has the project team sought to identify and address potential adverse impacts to the host and affected communities?
D. Have the affected communities been meaningfully engaged in the project design process?
E. Are the affected communities satisfied that the project is addressing their immediate and long-term issues, needs, and goals?
F. Have the project owner and the project team designed the project in a way that improves existing community conditions and rehabilitates infrastructure assets?

2. Stimulate Sustainable Growth and Development

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Stimulate Sustainable Growth and Development	**Project only focus.** Community growth and development is measurable but confined to the economic contribution of the delivery of a single project. The economics of the project are the only contribution to economic growth and development. That contribution primarily consists of jobs created during design and construction. (A)	**Significant and desirable development.** The completed project contributes to community growth and development by adding a new operating capacity or increasing the quality of existing capacity. Capacity additions can apply to business and industry. They also can apply to the public in terms of cultural and recreational facilities and infrastructure. Additional jobs are created because of this development. (A, B) **Improving local productivity.** Additional access and increases in the number and quality of choices are sufficient to substantially increase local productivity. Need for repair or refurbishment of existing infrastructure is considered. Cost-effective access to business and industry-related infrastructure increases productivity. The completed project fosters an expansion of the local skill base. (A, B, C)	**Business and people attractiveness.** The completed project is designed to contribute substantially to community attractiveness for compatible businesses and industries by improving the overall business environment. This may include increased productivity, cost- effective access to facilities and infrastructure, and enhanced cultural and recreational opportunities. People want to live and work in the community. (A, B, C, D)	**Developmental rebirth.** During early development stages, the project owner and project team work with the community to identify existing community assets in the natural or built environment that, if restored, would improve the economic growth and development capacity of the community. The completed project improves attractiveness through restoration of existing infrastructure, including physical, knowledge, and social assets. It is adaptive to changing conditions. (A, B, C, D, E)

A. Does the project create a significant number of new jobs during its design, construction, and operation?
B. Does the completed project create new capacity or increase the quality of existing, operating, recreational or cultural capacity for business, industry, or the public?
C. Does the completed project measurably improve community productivity?
D. Does the project improve community attractiveness for compatible businesses and industries, improve recreational opportunities, and generally improve the socioeconomic conditions of the community?
E. As part of the delivery of the completed project, does the project rehabilitate, restore, create, or repurpose existing community infrastructure assets in the natural and/or built environment, and, in doing so, improve community prospects for sustainable economic growth and development?

3. Enhance Public Health and Safety

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Enhance Public Health and Safety	**Assessment of new requirements.** In addition to the health and safety plans and programs put in place as required by law and regulation, the owner and the project team identify, assess, and institute new standards, methods, and procedures to address any additional risks and exposures created by the application of new technologies, materials, equipment, and methodologies. Requirements are passed down to the construction contractor in the form of construction specifications. (A, B, C)	N/A	**Excellence in all categories.** The project team puts in place health and safety plans and programs that substantially exceed all applicable regulations. Explicit and comprehensive consideration given to the application of new technologies, materials, equipment, and methodologies and the corresponding new health and safety requirements and considerations. (A, B, C)	N/A

A. Have the project owner and the project team assessed the exposures and risks created by the application of new and/or nonstandard technologies, materials, equipment, and methodologies to be used in the project?
B. Have the project owner and the project team assessed and made appropriate changes to the project design to reduce the risk to public and worker health and safety to acceptable levels and received approval and sign-off by the appropriate environmental and public health and safety officials?
C. Have the project owner and the project team instituted the appropriate health and safety methodologies and protocols during construction?

4. Preserve Historic and Cultural Resources

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Preserve Historic and Cultural Resources	**Initial efforts.** The project team works with the community and required regulatory and resource agencies to identify historic and cultural resources in and around the project site and develop approaches to avoid, minimize, and mitigate impacts to those resources. A feasibility analysis is conducted to understand the feasibility and practicality of incorporating preservation and enhancement to the project. (A, B)	**Stakeholder consultation.** Potential stakeholders are consulted early in the project's development. Opportunities to preserve and protect cultural and heritage sites are taken based on feasibility. The project team works with historic/ cultural stakeholders to develop a sensitive design approach. (A, B, C)	**Preservation and conservation.** The project is designed to fully preserve the character-defining features of that resource. The project is developed in close coordination with all stakeholders and likely will involve a variety of interests ranging from local, state/provincial, national, public, regulatory, nonprofit, and private interests. (A, B, C)	**Conservation and restoration.** The project is designed to fully preserve the character-defining features of that resource and enhances the resource in a significant manner. Examples may include rehabilitation in accordance with the Secretary of Interior Standards, restoration of lost features such as a historic landscape or green spaces, upgrade and expansion of recreational facilities, or a publicly accessible educational or museum site in accordance with historic/cultural stakeholder wishes. (A, B, C, D)

A. Has the project team worked with the community and required regulatory and resource agencies to identify historic and cultural resources?
B. Has the project team conducted a feasibility analysis to determine the feasibility of incorporating preservation or enhancement of these resources to the project?
C. Has the project team worked with historic/cultural stakeholders to develop a sensitive design and approach with the goal of avoiding all historic/cultural resources or fully preserving the character-defining features of that resource?
D. Has the project team given special consideration to enhancing or restoring historic/cultural resources?

5. Preserve Views and Local Character

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Preserve Views and Local Character	**Understanding and balance.** A public view plan is developed and the project adheres to existing policies and regulations regarding its fit with local character. The plan takes into consideration the preservation of natural landscape features. Balances the need for safety measures and barriers against the desire for protection or enhancement of views. (A, B, C)	**Alignment with community values.** As part of the stakeholder consultation process, the project team identifies community values and concerns regarding protection and enhancement. Based on evaluations, the project team submits a plan for how views will be protected and enhanced, important natural landscape or community features are preserved, and the overall placement in landscape or urban context is considered. Aesthetic quality of the project beyond regulations is considered. (A, B, C, D) **Community preservation and enhancement.** A public view plan implemented with little to no deviation. Contract includes clauses on the preservation of high-value landscapes and landscape features. This includes the handling of onsite trees, vegetation, and other features. Project implements significant measures to fit with local character. (A, B, C, D, E)	**Community connections and collaboration.** The project team assists the local community to establish or enhance the regulations, policies, and standards on view corridors, views from public/open spaces, views of features associated with community identity, or natural features. Fit with local character is considered a key aspect of the project and alternatives are developed and implemented in collaboration with community stakeholders. Significant efforts are made in siting the project and during design and construction to preserve landscape features. (A, B, C, D, E, F)	**Restoration of community and character.** Where appropriate, the owner seeks to improve the local character of the natural landscape or urban fabric through restorative action as part of the project. This may include removing barriers, structures, or vegetation to restore views; restoring lost or damaged natural landscape features; and designing the project to restore lost character features within the community. (A, B, C, D, E, F)

A. Has the project team made a reasonable determination of the local character of the project setting?
B. Has the project team developed or adopted existing public view plans and design guidelines to preserve important view sheds and local character?
C. Does the final design preserve views and local character, taking into account community plans and guidelines for views and local character?
D. Has the project team worked with local officials, communities, and decision makers to obtain input and alignment with views and local character?
E. Does the construction contract include clauses on the preservation of high-value landscapes and landscape features, including stated penalties for noncompliance and programs to inspect outcomes and to enforce?
F. Has the project team aided local communities in developing or improving local policies and regulations regarding views and fit with local character?

LEADERSHIP VALUE PROJECT SCREENING CRITERIA

1. Provide Effective Leadership and Commitment

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Provide Effective Leadership and Commitment	**Limited commitment.** General sustainability policy statements can be found in organizational literature but are not extensive. Existence of public statements by the organization's leadership about their commitment to sustainability, but not related to the specific project. A few substantive examples of how that commitment to sustainability principles translates into actual practice. (A)	**Better clarity and commitment.** Commitment to sustainability has moved beyond general statements to more specific statements. Organizational demonstration of commitment is backed up by several, but not extensive, examples of activities undertaken, and performance achieved. (A)	**"Walking the talk."** Significant commitment across the organization with a few exceptions. Improvement programs are underway. Organizational demonstration of commitment includes various examples of activities undertaken or performance achieved focused on this project. Commitment is backed up by numerous and wide-ranging examples of activities undertaken and performance achieved. Sustainability performance of the organization is reported regularly through annual reports. (A)	**Sustainability is a core value.** Sustainability is a core value of the organization and the project team as demonstrated by their policies, activities, and performance. Apparent full commitment by all parties to address all aspects of the triple bottom line as they apply to the project. Understanding of the issues and problems associated with sustainability. Explicit recognition of the need for action to address the consequences of operating in a non-sustainable environment. (A)
A. To what level and extent have the project owner and the project team made public commitments, both organizational and project specific, to improve sustainable performance?				

2.0 Foster Collaboration and Teamwork

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Foster Collaboration and Teamwork	**Random acts of sustainability.** No particular process or methodologies to incorporate sustainability into the design. Sustainability features are added as opportunities arise. The owner and the project team have expressed a desire to improve sustainable performance, but the approach taken is not systematic. "Green" features are added to the project, but in a relatively haphazard fashion. (A)	**Taking a systems view.** The project team approaches the project as a system or set of systems interconnected with other systems. The owner and the project team recognize the importance of addressing infrastructure projects in the context of the entire community or city infrastructure. The resulting systems view is seen as important to optimizing the overall performance of the community/city infrastructure. (A)	**Sustainable design as a team sport.** The project owner and the project team recognize the importance of working together as a team to achieve high levels of sustainable performance. Team chartering sessions are to be conducted with the owner and the multidisciplinary project team. Project management processes are collaborative. Design charrettes are to be held and involve a broad set of stakeholders. The project owner is willing to share risk and rewards with the project team, recognizing that achieving higher levels of performance may involve incorporation of new and relatively untried technologies. (A, B)	**Whole systems design and delivery.** Whole systems design processes, procedures, and methodologies are incorporated into the overall project delivery process. The multidisciplinary project team works together to find ways to improve sustainable performance commensurate with the owner's goals and objectives, technical feasibility, costs, and appetite for risk. Design considerations include reducing sources of demand, using recycled and/or renewable resource supplies and excess resources generated within the system and eliminating design conflicts and duplicate functions or unnecessary redundancies. Risk/reward sharing is part of the owner's contract with the design team. (A, B)
A. To what extent has the project team incorporated the principles of collaboration, teamwork, and whole systems design in the execution of the project? B. To what extent has meaningful risk and reward sharing been made part of the contract between the project owner and the project team?				

3.0 Provide for Stakeholder Involvement

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Provide for Stakeholder Involvement	**Information transfer.** A limited program is established for stakeholder communication and information transfer. Programs provide a basic exchange of information about the project. Lines of communication are established. There is some community involvement, but it is limited. There is feedback to the community, but it is essentially a summary of community input. Some planning and commitment to action exists. Actions are taken based on input received. (A, B)	**Active engagement and dialogue.** Communication with and feedback from project stakeholders and the affected public are important elements of the project. A lead person from the project team works with stakeholder groups to understand communication needs and the desire for, and scope of involvement. Active engagement and dialogue is planned. The feedback received is compared to impacts to the project. Actions taken are based on a combination of stakeholder feedback and practical project considerations. (A, B)	**Open to a wider community.** Engagements expand to a wider community, including people and relevant groups that are affected by, or have an interest in, the project. There is frequent communication with the public and stakeholders throughout significant project phases. Feedback is obtained through solid, credible programs for obtaining stakeholder and community feedback. Feedback is assessed and applied to project decisions. Actions taken are based on community/stakeholder feedback and are modified by feasibility and practicality. Public and stakeholder groups see sufficient and credible opportunities for involvement in project decision making. The project team demonstrates to stakeholders and the public that the public participation process is transparent and that they have an opportunity to provide meaningful input. (A, B, C)	**Community relationship building.** Communication programs and exercises are designed to develop relationships with key stakeholders and give them involvement in the project decision-making processes. Solid, credible programs are established for soliciting feedback from the public and key stakeholders regarding communications and public involvement in the project decision-making processes. The project can demonstrate specific and significant case(s) in which changes were made based on feedback. Given the likely broad array of issues and positions, the project team not only focuses on obtaining meaningful input, but also making the process for project decisions fair and equitable. Built properly, these relationships can assist in breaking project logjams. Feedback programs are designed to give complete credible feedback regarding the communications and public involvement processes. Project decisions incorporate fairness and equity. (A, B, C, D)

A. What is the scope and extent to which key stakeholders have been identified and characterized and key concerns and issues identified?
B. To what extent has the project team solicited and assessed stakeholder issues and concerns through meetings and information exchanges?
C. To what extent have the project owner and the project team incorporated stakeholder input into project plans and decision making?
D. Have stakeholder participation and communication programs been established on the project to facilitate stakeholder communication and feedback?

4.0 Improve Infrastructure Integration

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Improve Infrastructure Integration	**Narrow optimization focus.** Project performance improvements in the triple bottom line, including resource conservation and use of renewable resources. Protection of environmental, economic, and social systems are substantive, but are confined to individual components. Individual gains are present but are suboptimal because of the lack of component integration. Little or no exploration of synergies among components. (A)	**Internal systems focus.** Project owner and designer look at the project and its delivered works as a system. Triple bottom line project performance improvements are significant because of efforts to optimize performance across the entire project and its delivered works. Efforts are made to integrate the design, to eliminate design conflicts, and to find system synergies that enhance overall performance. (A) **Infrastructure bundling and synergies.** Project is planned and designed with other related community infrastructure taken into account (i.e., how its design and operation will work in harmony with other infrastructure elements external to the project). Additional investments are planned to create linkages and improve synergies and, by doing so, improve overall performance. Infrastructure deficit (i.e., need to repair and refurbish existing infrastructure) is factored in. (A, B)	**Full infrastructure integration.** The project owner and designer place the project in a community context and participate in multisectoral regional strategic planning for integrated community sustainability plans. They assess the existing community's physical infrastructure as well as its nonphysical assets. Project is planned and designed to take into account not only physical infrastructure, but also related community infrastructure. The project incorporates and takes advantage of valuable community assets (e.g., knowledge and social capital). The project integrates with the community's asset management program. (A, B)	**High performance through restorative actions.** Early in project development, the project owner and project team work with the community to identify existing community assets in the natural or built environment that, when restored, would improve the economic growth and development capacity of the community. The project incorporates restoration of those assets as part of a comprehensive strategic sustainability plan. The project takes into account other related community infrastructure as well as sustaining and/or restoring community assets to enhance overall community efficiencies and effectiveness. There is integration with, and restoration of, natural systems, resources, community knowledge, and social capital assets. (A, B, C)

A. To what extent did the project team seek to improve project sustainability performance through project-wide systems integration?
B. Has the project team sought to improve sustainable performance of infrastructure through community-wide infrastructure systems integration?
C. Has the project team sought to restore existing community infrastructure assets for the purpose of achieving higher performance through community-wide infrastructure systems integration and restoration?

5.0 Plan for Long-term Monitoring and Maintenance

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Plan for Long-term Monitoring and Maintenance	**Plan outline.** A limited outline of the maintenance and monitoring plan exists, extending monitoring and maintenance activities beyond regulatory requirements. If positions are identified, authorities for effective implementation are unclear. No resources or skills in place before the end of construction. (A, B)	**Working plan.** Owner has developed a working plan for long-term monitoring and maintenance and has identified personnel and resources to make it happen. (A, B)	**Comprehensive long-term plan.** A comprehensive maintenance and monitoring plan has been prepared well in advance of project completion. The owner recognizes that attention to implementation during early stages is important to ensure that resources are available and that the personnel assigned understand their responsibilities. (A, B)	N/A
A. Is there a clear and comprehensive plan in place for long-term monitoring and maintenance of the completed project? B. Have sufficient resources been allocated for monitoring and maintenance of the completed project?				

6.0 Address Conflicting Regulations and Policies

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Address Conflicting Regulations and Policies	**Initial search.** Basic searches and assessments are conducted. Applicable regulations are identified and there is some effort to correlate requirements to sustainability objectives. Responsible regulators and organizations are identified but identification is not complete; primarily a general assessment. (A)	**More investigation.** Systematic assessment of the laws, regulations, policies, and standards applicable to the project. Regulating and standard-setting groups and the decision makers within those groups are identified. The owner and the project team assess potential conflicts, devise alternatives, and set priorities. Resolution of those conflicts is sought at all levels of the regulating or standard-setting organization. (A, B)	**Increased resolve.** Extensive and more complete assessment of the laws, regulations, policies, and standards applicable to the project that unintentionally run counter to sustainability goals, objectives, and practices. The owner and the project team approach decision makers, identifying conflicts over current laws, regulations, policies, and standards that run counter to efforts to improve sustainable performance. Resolution of those conflicts is sought at all levels of the regulating or standard- setting organization. (A, B)	**Collaborative resolution.** Extensive assessments conducted, but with an eye toward structural change. Laws, standards, regulations, and policies that unintentionally run counter to sustainability objectives and practices are addressed broadly with the intent of changing overall approaches and philosophies. The owner and the project team offer a view of how overall design and construction standards and practices need to be changed to address new problems arising from sustainability issues. (A, B)
A. What is the scope, extent, and assessment of negative impacts from conflicting regulations and policies? B. What is the extent to which the project team worked with regulators to mitigate the negative effects?				

CLIMATE AND RISK VALUE PROJECT SCREENING CRITERIA

1.0 Assess Climate Threat

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Assess Climate Threat	N/A	N/A	**Impact assessment and adaptation plan.** A comprehensive climate impact assessment and adaptation plan has been developed. The plan should include the following components: •Vulnerability assessment, •Risk assessment, and •Adaptation assessment. The process should include collaborations with the local emergency management department and meetings with the local community. (A)	N/A
A. Has the project team created a Climate Impact Assessment an Adaptation Plan that identifies climate change risks and possible responses?				

2.0 Avoid Traps and Vulnerabilities

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Avoid Traps and Vulnerabilities	**Basic evaluation.** During the conceptual or preplanning phase, the project team conducts a survey of possible resource constraints and vulnerabilities that the community could face in the future, including those expected because of climate change. The team identifies potential approaches and practices to address. The team also reviews appropriate local regulations and standards. Some consideration in the project design stage to address issues. (A)	**High-level review.** The project team works with the community at the conceptual stages of the project and conducts a high-level review of projected resource demands and supplies, resource and infrastructure traps, and vulnerabilities. Its purpose is to understand how the project might affect community vulnerabilities and resource dependencies. An assessment is made of the associated long-term risks. Project-specific issues are raised. Basic plans are developed to address issues. (A) **Detailed evaluation.** The project owner and the team work more directly with community decision makers and stakeholders, taking a fresh look at potential resource issues, vulnerabilities, and risks. The parties conduct a more integrated risk assessment of community vulnerabilities and resource dependencies, and determine ways that design changes in the project can result in significant risk reductions. Alternatives are developed and discussed. Detailed plans are developed to address issues. (A, B)	**Comprehensive assessment.** Work with community decision makers and stakeholders to make a full and comprehensive assessment of resource demands and supplies, resource and infrastructure traps, and vulnerabilities. Use the assessment as a basis for making changes to the project design. Considerations include how the project contributes to the community's assessment of resource demands and supplies, as well as resource and infrastructure traps, and vulnerabilities. (A, B, C)	**Robust and resilient.** Work with community decision makers and stakeholders to make a comprehensive and long-term assessment of the community's resiliency (i.e., resource demands and supplies, resource and infrastructure traps, and vulnerabilities). Assess long-term risks and consider alternatives. Convert that assessment into design criteria for this project and make recommendations regarding the design criteria for future infrastructure. (A, B, C)
A. Has the project team identified and assessed possible changes in key engineering design variables? B. Has the project team assessed potential traps and vulnerabilities and their associated potential costs and risks? C. Does the project avoid, alleviate, or eliminate significant infrastructure traps (e.g., high and long-term operational costs and/or vulnerabilities)?				

CR 3.0 Prepare for Short-term Hazards

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Prepare for Short-term Hazards	**Hazards assessment.** Thorough analysis of likely natural and human-induced hazards in the project area, including analysis and projections for at least the next 25 years. (A)	**Preparation for 1-in-50-year hazards.** Plans and designs have been created and implemented to prepare for short-term hazards that have a 1-in-50-year or better chance of occurring, including direct and indirect impacts. Designs may limit the hazard itself, fortify against the hazard, or allow the project to adapt to the direct or indirect impacts of the hazards. (A, B)	**Preparation for 1-in-100- year hazards.** Plans and designs have been created and implemented to prepare for short-term hazards that have a 1-in-100-year or better chance of occurring, including direct and indirect impacts. Designs may limit the hazard itself, fortify against the hazard, or allow the project to adapt to the hazard. (A, B)	**Restore environments that reduce risk.** Many hazards may be worsened by degraded environments. Restore and rehabilitate natural systems to minimize risks of natural hazards, such as restoring wetlands to accommodate flooding or lessen the effects of hurricanes. (A, B, C)
A. Has the project team considered which types of natural and human- induced hazards are possible in the region and researched how the frequency and severity of these disasters may change over the life of the project? B. Has the project team incorporated design strategies into the project to safeguard against these natural hazards? C. Does the project restore habitats in a way that reduces the impacts of future short-term disasters?				

4.0 Prepare for Long-Term Adaptability

Value	1 – Maintain	2 – Improve	3 – Enhance	4 – Protect
Prepare for Long-term Adaptability	N/A	N/A	**Highly resilient and adaptive.** Plans and designs have been created and implemented to prepare for long-term climate change, including the effects of increased intensity and frequency of extreme weather events, water scarcity, sea level rise, extended droughts and heat waves, and increased ambient temperature. (A)	**Recovery from adverse effects.** Restore and rehabilitate the effects of long-term change, including desertification, beach erosion, and loss of wetlands. As a bonus, many shoreline restoration activities minimize the effects of climate change on inland populations, including flooding and extreme weather events. (A, B)
A. Has the project team selected the site and designed the infrastructure project and its related systems to be resilient and adaptive to these changes and function under altered climate conditions, supply shortfalls, or other significant long-term changes in operational or environmental conditions? B. Has the project team made substantial efforts to restore or rehabilitate any existing effects of long-term change (e.g., desertification, beach erosion, and loss of wetlands)?				

APPENDIX U

REGULATORY CONTROLS

Table T-1. Land Use Authority and Regulatory Control Matrix

General Ordinance Standards	Cass County	Hubbard County	Comments
WCA Ordinance	YES - Exceeds	NO	Cass - Local ordinance that exceeds MN Rules 8420; Hubbard Follows MN Rules 8420
DNR Approved Shoreland Ordinance	YES	YES	Cass - 1,320 feet to all public waters; Hubbard - 1,000' Lakes and Mississippi, 500' to streams and rivers
County Wide Zoning Ordinance	YES	NO	Cass - County Wide in 1998
SSTS Ordinance	YES - Exceeds	YES - Exceeds	Cass and Hubbard have SSTS Ordinances that exceed minimums in MN Rules 7080
Subdivision Ordinance	YES	YES	Cass - up to nine lots meeting zoning district is minor subdivision; Hubbard - refer to Subdivision Ord. for details
Shoreland Standards			
Allowable # mooring spaces	NO	YES	Cass - Based upon need for resorts & commercial PUD; Hubbard - one slip for each riparian lot in tier one of a PUD
Boardwalks (to cross riparian wetlands)	YES	YES	Cass - 6 feet wide and needs permit; Hubbard 4 feet and no permit needed
Controlled Access Lots [1]	YES	YES	Neither allow Controlled Access Lots
Dirt Moving - CUP/Var (Beyond Building Setback)	YES - Exceeds	NO	Cass- > 200 yards needs CUP
Dirt Moving - CUP/Var (Shore Impact)	YES - Exceeds	YES - Exceeds	Cass - >50 yards needs CUP; Hubbard >10 yards needs variance
Dirt Moving - no permit	NO	YES	Cass - Any dirt moving requires a permit; Hubbard 5 yards no permit
Dirt Moving - Permit (Shore Impact Zone)	YES - Exceeds	YES - Exceeds	Cass - 0-50 yards needs permit; Hubbard 5-10 yards needs permit
Dirt Moving - no permit - (Shore Impact Zone 2)	NA	YES	Hubbard splits SIZ in 2 - no permit needed for up to 10 yards, 10-50-yard needs permit, >50 yards is variance
Dirt Moving -no permit (Building Setback)	NO	YES	Cass-Any needs a permit; Hubbard - no permit beyond building setback
Dirt Moving - Permit (Beyond Building setback)	YES - Exceeds	NO	Cass - 0-200 yards needs permit
Dock (Setbacks Only)	YES	NO	Cass - 10-foot side yard setback; Hubbard - not regulated
Fences	YES	YES	Cass - 8-foot-tall; Hubbard <8 foot no permit
Ice Ridge -Historic	YES	NO	Cass - Ice ridge modification 20 feet wide; Hubbard not allowed
Ice Ridge -Seasonal	YES	YES	Cass - permit to restore; Hubbard - Notice to ESD before work starts
Meets minimum Lot Size Requirements	YES-Exceeds	YES	Cass - GD Lakes 30,000 Square feet; Hubbard GD Lakes 20,000 Square feet
Meets Minimum OHW Setbacks [1]	YES	YES	Minimum Standards in MN Rules 6120 are followed
Meets Minimum SSTS OHW Setbacks	YES	YES - Exceeds	150-foot setback on all lakes and rivers
Patios in Setback Area	YES	No	Cass - Allows 400 square foot patio - 15% of existing building setback - closest is 40 feet; Hubbard - not allowed
Retaining Walls	YES	YES	Cass - 4-foot height limit without engineered plan; Hubbard - allowed via permit or variance depending on proposed dirt amounts
Riprap	YES	YES	Permit needed from both counties; Cass requires a 10-foot buffer also
Sand Blankets	YES	NO	Cass - 20 feet wide - 50 yards with permit; Hubbard - No new beaches, allow 5 cubic yards sand for existing legal non-conformities

Shoreline Recreation Area	YES	YES	Cass - 20 feet Wide; Hubbard - 10-30 feet wide and 15 feet deep depending on lake/river class
Stairway Lifts Landings [1]	YES	YES	Both - 4' wide, 32 square platforms
Stormwater / Buffers	YES-Exceeds	YES	Cass - at discretion of PC/BOA/ESD using the Shoreline Rapid Assessment Model for permits, CUP variance plats; Hubbard - Generic Reference
Vegetation Removal - Bluff/Steep Slopes [1]	YES - Exceeds	YES - Exceeds	Both - no vegetation removal allowed except for walkway/stairway lifts landings with permit
Vegetation Removal - SIZ 1	YES - Exceeds	YES	Cass - 20-foot-wide path only with permit; Hubbard - no clear cut and permit needed
Vegetation Removal - SIZ 2	YES - Exceeds	YES	Cass - 25% tree removal and 30% shrubs with permit; Hubbard - no clear cut and permit needed
Walkway/Access Path	YES	YES	Cass - 4-foot-wide; Hubbard 6 foot wide
Water Oriented Structures	YES	YES	Cass - 150 Square foot Platform 10-foot setback (Res) and 250 square foot shed 20-foot setback (Com); Hubbard - 48 square feet 20-foot setback
Watercraft Access Ramps	YES	YES	Cass - Allowed on lakes without public access with permit; Hubbard - residential needs variance and public needs CUP
Non-Shoreland Standards			
Accessory Structure Requirements	YES - Exceeds	YES	Cass - Size limited to lot size; Hubbard size limited to lot impervious coverage limits
Buildable/Suitable Area Standards [1]	YES - Exceeds	YES - Exceeds	Cass and Hubbard both require new lots to have minimum buildable/suitable area
Building Height	YES	YES	Cass - 30 feet; Hubbard - 35 feet - State Standard - 25 feet
Conservation Design Standards	YES	NO	Cass Conservation Design Bonus Density
Dirt Moving - CUP (Non-Shoreland)	YES - Exceeds	NO	Cass - > 1000 yards needs CUP
Dirt Moving - Permit (Non-Shoreland)	YES - Exceeds	NO	Cass - > 200 yards needs permit
Geothermal	NO	YES	Cass - not regulated; Hubbard - regulated
Guest Cottage/Guest Quarters	NO	YES	Cass - allowed on any lot size; Hubbard allowed on any lot size per conditions of ordinance
Meets Minimum Land Uses Requirements	YES	YES	Permitted, allowable, and conditional use requirements
Planned Unit Developments (PUD's)	NO	YES	Cass - no provision; Hubbard - allowed by ordinance
Decision Making Authority			
Planning Commission Roles	YES	YES	Cass - PC Final Decision on CUP, Plats, EAW, EIS; Hubbard - recommendation to County Board except for minor subdivisions
1) Ordinance Provisions are Similar			