CLEAN WATER LAND & LEGACY AMENDMENT

Rum River Comprehensive Watershed Management Plan

Final Plan - April 29, 2022

Thank You and Acknowledgments

Rum River Watershed One Watershed, One Plan Partnership (Partnership)

*Members of the Planning Team

- Aitkin County
- Aitkin Soil and Water Conservation District
- Anoka Conservation District*
- Benton County
- Benton Soil and Water Conservation District
- Crow Wing County
- Crow Wing Soil and Water Conservation District
- Isanti County
- Isanti Soil and Water Conservation District*
- Kanabec County
- Kanabec County Soil and Water Conservation District
- Lower Rum River Watershed Management Organization
- Mille Lacs County
- Mille Lacs County Soil and Water Conservation District*
- Morrison County
- Morrison Soil and Water Conservation District
- Sherburne County
- Sherburne Soil and Water Conservation District*
- Upper Rum River Watershed Management Organization

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Technical Advisory Committee (TAC)

*Members of the Planning Committee

In addition to representatives from the organizations below, the TAC also includes representatives from each of the organizations listed in the Partnership

- Anoka County
- Metropolitan Council
- Mille Lacs Band of Ojibwe
- Minnesota Board of Water and Soil Resources*
- Minnesota Department of Agriculture
- Minnesota Department of Health
- Minnesota Department of Natural Resources
- Minnesota Department of Transportation
- Minnesota Pollution Control Agency
- The Nature Conservancy
- USDA Natural Resources Conservation Service

Land and Water Resources: Appendix D
Special thanks to the Mille Lacs County staff for writing this section of the plan.

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Executive Summary

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EXECUTIVE SUMMARY

The Rum River Comprehensive Watershed Management Plan (Plan) is a unifying strategy for water management in the Rum River Watershed (Watershed). It was developed by, and will be implemented by, local and tribal government units across the Watershed, as well as their partners from state and federal agencies, non-profits, citizens, and other stakeholders. The top priorities identified in this plan are to restore degraded waters and protect high water quality resources. The Plan also places major emphasis on outreach and engagement as a critical element in removing barriers to adopting conservation practices. Other priority issues include protecting groundwater quality and restoring and protecting upland and aquatic habitat. The plan includes holistic watershed management, with many activities that have multiple ecological benefits.

Vision and mission statements were developed and adopted at the beginning of the planning process to guide planning efforts.

MISSION STATEMENT

- Coming together to identify shared goals.
- Planning together to leverage unique capacity.
- Working together to achieve results.

VISION STATEMENT

- Clean, abundant water for consumption, recreation, and habitat.
- Collaborative partnership among communities, working together towards a common goal.
- Community members and decision makers understand the challenges and opportunities facing the Watershed.
- Innovative strategies to meet our goals.

The Plan was prepared as the result of nineteen local governmental units entering into a Memorandum of Agreement to develop a plan to improve watershed management coordination and outcomes. The Plan prioritizes issues, targets the investment of resources, and streamlines programs to facilitate progressive protection of high quality resources and restoration of impaired and degraded resources.

PLANNING TERMINOLOGY

A set of planning terms were adopted at the beginning of the planning process to ensure consistency and application of planning terms. These definitions, adapted from BWSR guidance materials, are provided in the sidebar throughout the Plan and in the Glossary.

WATERSHED OVERVIEW

The Watershed is 1,584 square miles in size, and stretches from Mille Lacs Lake in the north, the headwaters of the Rum River, to the City of Anoka in the south, the location of the confluence of the Rum and Mississippi Rivers. The Watershed covers portions of ten (10) counties (see Figure 0.1).

1,584
Square Miles
in 10 Counties

163,496
Acres of Public
Water Basins

679
Miles of Public
Watercourses

212
Lakes

Resource (n.):
A natural, economic, educational, biotic, aesthetic or similar asset. Resources are generally considered something that can be 'managed' and are generally broad, such as surface water, groundwater, or education and outreach.

Measurable Goals + Targeted Implementation Actions

A significant amount of data gathering and a series of meetings, both in-person and online, were conducted to gather a wide net of information, data, and recommendations, to consolidate them into identifiable and measurable goals and targets.

KEY

- Rum River
- Public Watercourse
- Watershed
- Counties
- Mille Lacs Band of Ojibwe Reservation
- Anoka County

Planning Partners

- Aitkin SWCD
- Anoka Conservation District
- Benton SWCD
- Crow Wing SWCD
- Isanti SWCD
- Kanabec SWCD
- Mille Lacs SWCD
- Morrison SWCD
- Sherburne SWCD
- Lower Rum River Watershed Management Organization
- Upper Rum River Watershed Management Organization
- Aitkin County
- Benton County
- Crow Wing County
- Isanti County
- Kanabec County
- Mille Lacs County
- Morrison County
- Sherburne County

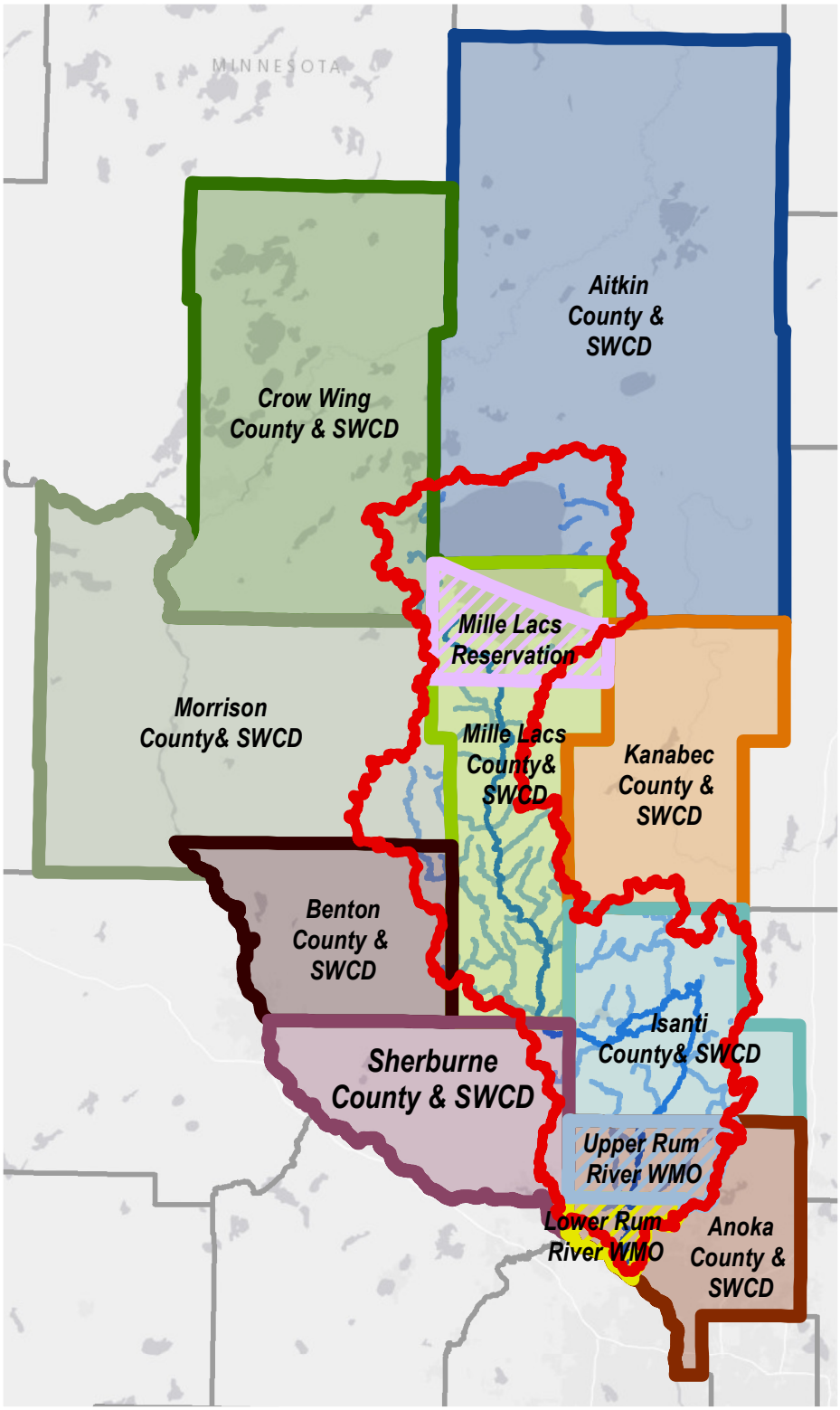


Figure 0.1: Planning boundary and planning stakeholder jurisdictions. The map indicates the Mille Lacs Band of Ojibwe Reservation boundary as acknowledged by Federal and State governments.

ROLES AND RESPONSIBILITIES

The development of the Plan was a collaborative effort by all members of the Partnership. Committees were established to facilitate the creation of plan content as well as manage day to day operations. Advisory committees provided important input and feedback on the plan direction and content to the partnership. Committee membership is detailed in **Appendix A**.

Figure 0.2: These committees were created by the Partnership to develop the Plan.

Target (n.):

There are three facets to targeting implementation activities:

ACTIVITY TYPE

The BMPs, conservation practices, outreach and education, monitoring, technical assistance or other action that will be the most effective in addressing the prioritized issues.

TIMING

The scheduling of implementation activities across the 10-year plan period, based on which priority issues will be addressed in which order.

LOCATION

The area where a specific activity will be implemented to address a priority issue. Sometimes, the location of the implementation activity will not be the same location of the priority resource that is being addressed. For instance, reducing sediment concentrations in the main stem of a river may require actions to be taken at the headwaters of minor watersheds.

Priority Issue (n.):

The agreed upon issues that are identified as the focus of the Plan through a prioritization process.

PLANNING REGIONS

The Watershed is divided into eight geographic management zones (GMZs). These zones are defined based on similar physical, social, and economic characteristics as well as resource concerns. The table below describes key characteristics of each management zone.

Table 0.1: Geographic Management Zones

Region	
1	MILLE LACS LAKE The headwaters of the Rum River and includes the largest body of water within the watershed.
2	ONAMIA The most forested area within the watershed.
3	MILACA The area where land use transitions from forests and wetlands to cultivated crops and pasture land.
4	WEST BRANCH RUM RIVER The most significant area of farmed land within the watershed.
5	STANCHFIELD CREEK The least populated zone within the watershed.
6	PRINCETON-CAMBRIDGE The second most populated zone with significant agricultural land use.
7	ST. FRANCIS The most populated zone in the watershed with predominant wetlands and where the Rum River outlets to the Mississippi River.
8	CEDAR CREEK The smallest zone with wetlands as the primary land use.

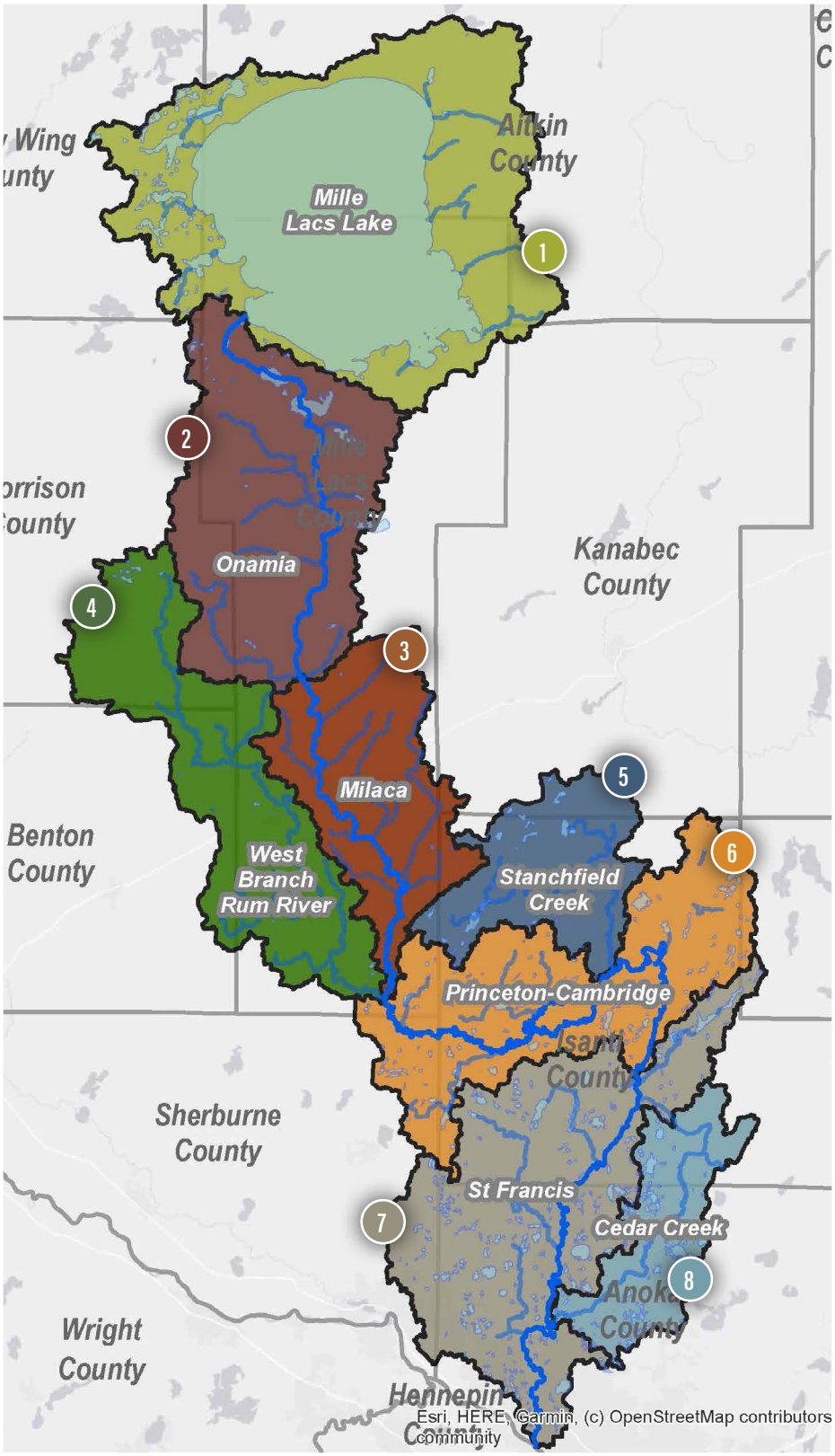


Figure 0.3: Rum River Watershed Geographic Management Zones

KEY

- Rum River
- Public Watercourse
- Mille Lacs Lake
- Onamia
- Milaca
- West Branch Rum River
- Stanchfield Creek
- Princeton-Cambridge
- St. Francis
- Cedar Creek

Resource Concern (n.):

A physical, biological, chemical, or geological subset or component of a resource. Resource concerns are typically a refinement of a resource. For example, the resource surface water can be refined into several resource concerns, including streams, lakes, rivers, and wetlands.

Outcome (n.):

The specific result of an implementation activity. Collectively, the outcomes from plan activities should achieve the stated measurable goals. Outcomes may also express changes in knowledge or behavior which lead to actions that contribute to measurable goals.

Figure 0.4: Princeton area kickoff meeting

Figure 0.5: Mille Lacs area kickoff meeting

Figure 0.6: Anoka area kickoff meeting

PLAN DEVELOPMENT AT A GLANCE

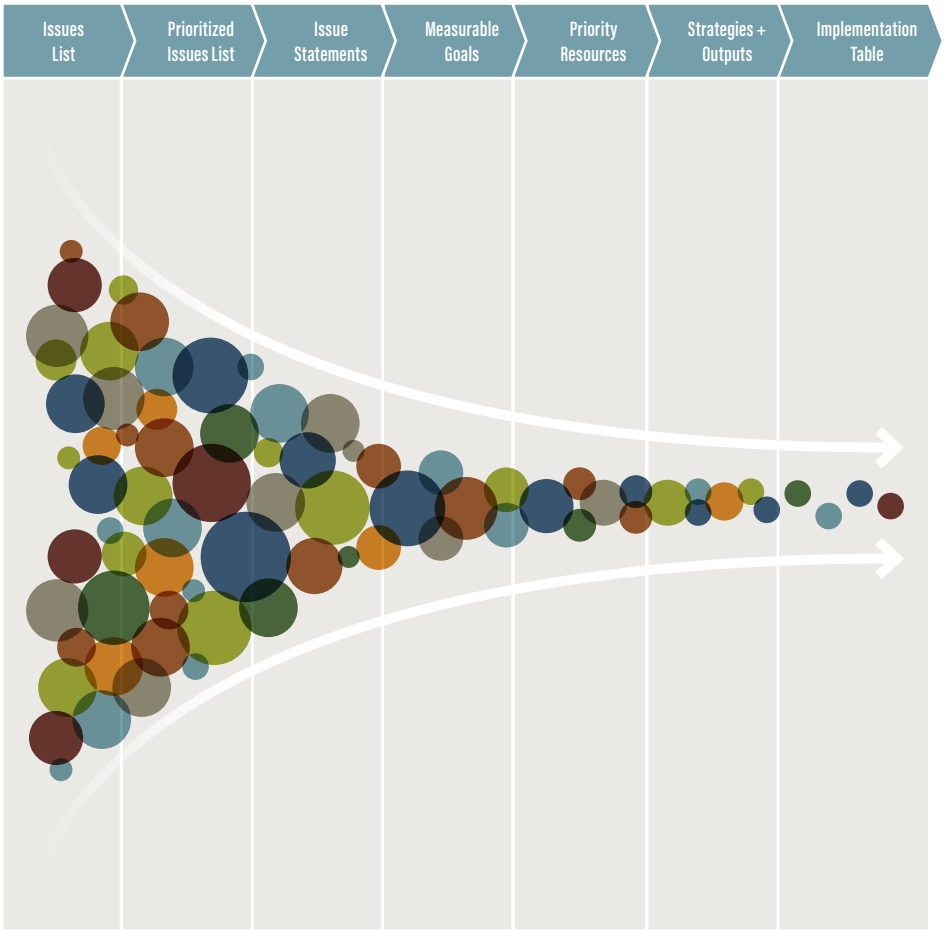


Figure 0.7: This graphic represents the process of gathering, refining, and prioritizing issues, resources, and implementation actions items throughout the planning process.

COMMUNITY ENGAGEMENT

PUBLIC NOTICES

This Plan is governed by Minnesota Statute 103B and all statutory requirements regarding notification of the initiation of the planning process were followed. The official 60-day public notice and comment period began on March 8, 2019 and ended on May 15, 2019. In total, eight comment letters were received. A final public notice and comment period was held from September 27, 2021 to November 27, 2021 and a public hearing on the draft plan was held January 10, 2022. These comment periods were used for gathering up-front input prior to plan implementation.

WORKSHOPS

Three workshops were held across the watershed to kick off the planning process and were held at Anoka City Hall on July 31st, Princeton Library on August 1st, and Onamia Rolf Olsen Center on August 3rd, 2019. A vast spreadsheet of gathered data and input was constructed to capture information and begin the process to filter it into a working plan that took all input into consideration.

PRIORITIZED ISSUES LIST

The issues for the Rum River Watershed were generated and prioritized with a variety of input from the general public, the TAC, the Policy Committee, state agencies, and existing local and regional plans.

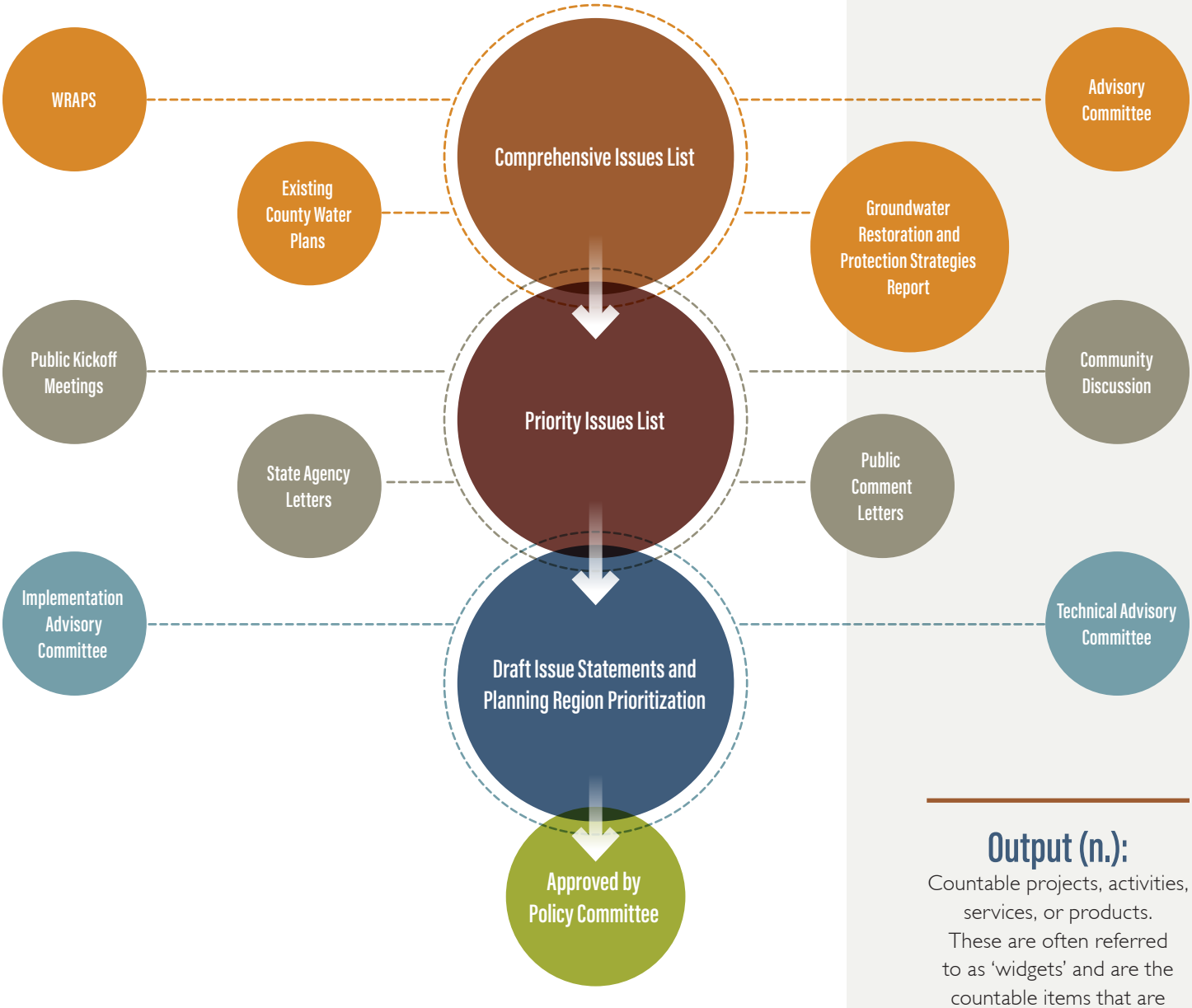


Figure 0.8: Prioritized Issue List

Prioritize (v.):

Determining the relative importance and precedence of the resources and issues in the Rum River 1WIP.

Output (n.):

Countable projects, activities, services, or products. These are often referred to as 'widgets' and are the countable items that are useful for tracking the steps towards achieving the goals. Outputs are not goals in and of themselves because they do not quantify a change in the resource condition.

Measurable Goal (n.):

The Rum River IWIP 10-year plan goal; the quantifiable change in resource condition expected after implementation of the 10-year plan. The measurable goal should relate to the desired future condition (DFC), and express what percent of progress toward the DFC is intended to be made during the plan period.

Resource Issue (n.):

A factor, stressor or difficulty resulting in an adverse consequence for a resource concern. A resource concern can have one or many issues. For instance, elevated levels of total phosphorus could be a priority issue affecting a resource concern (i.e. lakes).

RESOURCE CATEGORIES

All of the comments and data that were gathered during the data aggregation process was grouped according to the type of resource the data concerned. Three broad resource types were identified: surface water, groundwater, and natural resources

Within each resource type, data were categorized according to major themes, such as the quality or quantity of the resource. Finally, each comment and data point was further classified as a value, concern, or strategy.

The values and concerns for each resource category were considered in drafting the issue statements. Strategies were considered after the preliminary goals were established.

 SURFACE WATER	• Quantity • Quality • Restoration • Protection
 GROUNDWATER	• Drinking water • Groundwater quality • Knowledge and data
 NATURAL RESOURCES	• Habitat • Invasive species and protection • Management • Restoration

Figure 0.9: Word clouds of key values, concerns, and strategies for each resource type

Strategy (n.):

A chosen approach that a person or entity implements to accomplish a goal.

Value (n.):

A resource or a resource use that a person or local government is invested in protecting, conserving, or restoring.

Hydrologic Simulation Program Fortran (HSPF) (n.):

The water quality model application used by the MPCA in watersheds across the state of Minnesota. The model application for the Rum River Watershed has been calibrated to monitoring data through 2015.

Scenario Application Manager (SAM) (n.):

A simple-to-use interface tool that allows the user to analyze the HSPF model results and develop implementation scenarios with selected BMPs to evaluate the results and better target implementation activities.

For this Plan, HSPF-SAM was used to evaluate nutrient and sediment loading on a subwatershed scale and then determine the most cost effective BMPs that would result in a 5% nutrient and sediment reduction in the Rum River. This information was used to develop the actions and priority subwatersheds in the Surface Water - Protect implementation table.

PRIORITY ISSUE STATEMENTS AND GOALS

Fifteen draft issue statements addressing surface water, groundwater, and natural resource categories were developed. Upon consideration of existing information and the ability to influence resource outcomes, these issue statements were refined to eight issue statements and ranked according to priority order.

The issue statements were also grouped by priority level to indicate which priorities will be funded with BWSR watershed based implementation funding (WBIF) first; with Level A coming before Level B, which comes before Level C. Implementation actions that address multiple benefits for issues across all priority levels will be prioritized.

Goals and preliminary measurable outcomes for each issue statement were established to guide the development of strategies and implementation action items. A number of subwatershed assessments have been completed in this Watershed. These subwatershed assessments include a study to characterize water quality issues, determine water quality status and trends, identify implementation projects that address issues, and rank projects according to benefits, costs, and other measures. These subwatershed assessments, as well as other similar studies, such as the Rum River Forest Stewardship plan, provided the foundation of the implementation table action items. Outputs from the Hydrologic Simulation Program – Fortran (HSPF) Scenario Application Manager (SAM) provided subwatershed level assessment and targeting of sediment and phosphorus actions to address the Surface Water - Protect priority issue goal of reducing downstream nutrient loading to the Rum River by 5%. Existing and desired level of effort was used to estimate measurable outcomes for action items that lack appropriate models or studies, such as is the case with outreach and education as well as groundwater quality actions. Once the implementation tables were assembled, the goals and measurable outcomes were refined to better align with the anticipated level of effort and corresponding investment level for each action item.

As the Partnership moved through the process of developing and refining the implementation tables, it became increasingly evident that outreach and engagement action items needed to be elevated from a program element that was part of a larger activity to a coordinated program that is cohesively delivered. Therefore, a comprehensive outreach and engagement plan with its own measurable outcomes and implementation table was developed. Details for each priority issue, including outreach and engagement, are provided in Chapter 4.

LEVEL A PRIORITY ISSUES

Outreach and Engagement	
Issue Statement	The success of the entire Plan implementation will largely come down to how the local partnership engages with and involves local stakeholders, from residents to policy makers.
Goal	Increased awareness of watershed issues, a greater sense of community support, and expanded technical resources will translate to more active resource stewardship.
Measurable Outcome	Hiring and maintaining the positions detailed in the outreach plan, conducting 10 outreach efforts every biennium, engaging at least 25 new stakeholders or groups in the implementation of the plan over the 10-year plan period, and producing one annual outreach report.

Surface Water - Restore (SW-R)	
Issue Statement	The lakes and streams are threatened or impaired due to excess pollution including E. coli, nutrients, chemicals, and sediment. These excess pollutants can cause low oxygen and eutrophication, impact aquatic life and recreational use opportunities, and degrade downstream resources.
Goal	Improve water quality of impaired lakes and streams.
Measurable Outcome	Reduce total phosphorus (TP) loading to priority waterbodies by 2,500 pounds over the life of the Plan.

Surface Water - Protect (SW-P)	
Issue Statement	There are many high-quality water resources in the Rum River watershed that are threatened by changing land use, changes to the landscape that impact runoff and the ability for water to soak into the ground, and pollution. Protecting these high-quality resources from the threat of degradation is of primary concern.
Goal #1	Maintain or enhance watershed-based ecosystems to maintain water quality.
Measurable Outcome	Increase in number of acres in protection 5% over current levels in priority subwatersheds.
Goal #2	Keep healthy lakes and streams healthy.
Measurable Outcome	No new impairments on priority water bodies. 5% reduction in total suspended solids (TSS) and total phosphorus (TP) at permanent monitoring sites along the Rum River.

LEVEL B PRIORITY ISSUES

Surface Water - Quantity (SW-Q)	
Issue Statement	Human-caused changes to the landscape have modified flow rate, volume, and water storage causing flooding, streambank erosion, and low base flow. This risk may be compounded due to the effects of a changing climate.
Goal	To prevent flooding, erosion, and water quality degradation, there will be no net increase in discharge from each management zone.
Measurable Outcome	Implement actions that prevent increased surface water runoff and provide 100 acre-feet of storage over the life of the Plan.

Groundwater and Drinking Water - Quality (GW-Q)	
Issue Statement	Groundwater and drinking water quality are negatively impacted by human actions, including manure and nitrogen fertilizer application, use of chlorides from salt, land management, non-compliant septic systems, pesticides, and contaminants of public health concern.
Goal #1	Decrease the risk of nitrate contamination in groundwater.
Measurable Outcome	The concentration and occurrence of excessive nitrates in groundwater is reduced. An increase in knowledge of and an expanded awareness of groundwater vulnerabilities and the actions that can be taken to reduce the threat of groundwater risks.
Goal #2	Decrease the risk of groundwater contamination from septic systems.
Measurable Outcome	Replace or upgrade 30 septic systems.

Natural Resources – Protection, Management, and Restoration of Upland Habitat (NR-U)	
Issue Statement	Habitat is critical for wildlife, water quality, and quality of life. Existing habitat areas have been or are at risk of being reduced in size and quality due to fragmentation, pollution, invasive species, intensifying land use, and lack of management. Habitats with high ecological value, particularly those that provide habitat for rare and endangered species, should be protected. Degraded habitats should be restored, especially when water quality benefits could also be achieved.
Goal #1	Define, identify, and rank high value areas.
Measurable Outcome	High value areas are identified and ranked.
Goal #2	Increase upland habitat acreage, quality, and connectivity, as well as resilience to changing precipitation and climate patterns.
Measurable Outcome	Critical upland habitat patches will grow in size and be connected by corridors of sufficient size to enable movement by the majority of wildlife species likely to use the habitat component. Completed actions will work towards increasing upland habitat resiliency to changes in precipitation and climate. Increase the amount of acres permanently protected by RIM easements from approximately 2,800 to approximately 9,200 acres. Increase the amount of permanent or semi-permanently protected land by 175 acres.

LEVEL C PRIORITY ISSUES

Natural Resources – Restore Degraded and Protect High Quality Aquatic Habitat in and Around Lakes, Streams, Rivers, and Wetlands (NR-A)	
Issue Statement	Aquatic habitats are threatened by increased frequency and volume of precipitation, increasing pollutant loads, excess sediment, degraded shoreline, and barriers to fish passage. Degraded aquatic habitats should be restored and high-quality habitats protected, especially when water quality benefits can also be achieved.
Goal #1	Protect and restore critical aquatic and shoreland habitat areas.
Measurable Outcome	Restore, enhance, and protect aquatic habitat areas by 180 acres.
Goal #2	Increase connectivity for desirable aquatic species.
Measurable Outcome	Increase river miles without barriers of human-constructed obstructions. Increase baseflow in streams where low baseflow has been identified as a primary stressor to aquatic life.

Groundwater - Knowledge and Data Regarding Groundwater (GW-KD)	
Issue Statement	There is not enough awareness or understanding of groundwater quantity or quality. More information is needed to protect vulnerable areas and provide local governments and communities with the information needed to take action.
Goal #1	Advance technical and scientific knowledge regarding groundwater availability and quality issues and implement programs that protect groundwater resources into the future.
Measurable Outcome	Completion of the Mille Lacs County geologic atlas and other measures to be developed throughout the life of the plan. Increase decision maker and technical staff knowledge of where drinking water contaminants exist and knowledge of potential negative impacts of groundwater-surface water interaction.

Natural Resources – Invasive Species (NR-IS)	
Issue Statement	Invasive species threaten the health and quality of upland, wetland, shoreland, and aquatic ecosystems. Their spread needs to be prevented and existing infestations controlled to mitigate their impacts.
Goal #1	Reduction of acres and population size of current invasive species.
Measurable Outcome	One invasive species management plan completed and presented to weed management authorities for consideration. Recommendations developed for cooperative weed management areas.
Goal #2	Reduce new infestations of invasive species.
Measurable Outcome	Early detection and rapid response plans for new terrestrial and aquatic invasive species are developed for each county and compared to increase coordination.

IMPLEMENTATION ACTIONS AND PROGRAMS

The activities that will be undertaken to address the priority issues are presented in the Plan and tables 0.2 through 0.4, according to on-the-ground implementation, technical assistance, land use management, and data and studies program areas. Additionally, each action is categorized according to the targeted resource for that action item.

Implementing most of the actions identified in the Plan will require additional staff capacity and external funding from state, federal, or other sources. Actions that address multiple priority issues and provide multiple benefits will be prioritized during the annual workplan development process.

Progress towards measurable outcomes will be evaluated by documenting annual workplan accomplishments. Progress towards overall goal achievement will include tracking numerical goals, such as the number of septic system fixes; estimating pollution reductions using calculators, models and tools; or verifying outcomes using evidence-based data collection.

PLAN ADMINISTRATION AND COORDINATION

Once the Plan is state approved and locally adopted, the focus will shift to implementing the actions that work toward accomplishing the Plan goals. The Partnership entities that worked together to develop the plan have agreed to enter into a Joint Powers Agreement (JPA) for the purpose of establishing a Joint Powers Entity (JPE), which will operate autonomously from its members and be responsible for overseeing the implementation of the Plan. The Rum River Plan's JPE Board will be responsible for approving the budget, identifying a fiscal agent, and establishing committees as necessary to implement the plan and will operate under the provisions of yet to be established bylaws. The JPA calls for the establishment of the Implementation Planning Committee (IPC), which will be responsible for drafting the annual implementation plan and budget for the Rum River Plan's JPE Board's review and consideration. One staff member from each JPA party will constitute the voting members of the IPC. Ex officio members of the IPC will include representatives from state agencies, conservation organizations, local governments, and others on an as needed basis. The role and responsibilities of IPC ex officio members is similar to the role of the TAC during plan development.

The Partnership recognizes the benefit of obtaining efficiencies through shared service delivery. Outreach and education are a major program focus of this Plan and will be implemented using a coordinated delivery of services. Throughout the implementation of the Plan, and particularly at the biennial planning and 5-year evaluation benchmarks, the Rum River Plan's JPE Board will assess appropriate use of shared services to ensure goals are achieved.

Table 0.2: Primary Benefits of On-The-Ground Implementation Actions

Category	Strategy	SW-R	SW-P	SW-Q	GW-Q	GW-KD	NR-A	NR-IS	NR-U
Agricultural Areas	Improve irrigation water management through smart technology and other strategies				●				
	Improve soil health	●	●						
	Install agriculture BMPs	●			●				
Agricultural Areas; Wetlands and Floodplains	Restore wetlands	●	●	●			●		
Drainage Systems	Drainage system management	●	●	●			●		
Forestry	Maintain and create healthy forests								●
	Private forest management		●	●					●
	Promote sustainable agroforestry and silvopasture		●						
Groundwater	Seal unused or abandoned wells				●				
Habitat	Restore or maintain healthy habitat								●
Habitat; Land Protection	Expand existing habitat and improve connectivity, protect remaining isolated and high value areas								●
Land Protection	Increase conservation easements for shorelands, wetlands, and forested lands		●						
Land Protection; Waterbodies	Create new habitat and increase habitat connectivity						●		
Shorelands	Subsurface sewage treatment system (SSTS) fix up	●	●		●				
Urban Areas	Implement Urban Storage BMPs			●					
Waterbodies	Collaborate with MNDNR Clean Water Team on river and stream projects	●							
	Implement Ag Storage BMPs			●					
	Install BMPs from scientific and prioritizing studies	●	●						
	Reduce lake internal loading	●	●						
	Restore meandering channels for streams and ditches	●	●				●		
	Study feasibility of and implement projects that improve fish passage while reducing vulnerability to invasive species migration						●		
	Incorporate culvert improvements with road projects						●		

Table 0.3: Primary Benefits of Technical Assistance Implementation Actions

Category	Strategy	SW-R	SW-P	SW-Q	GW-Q	GW-KD	NR-A	NR-IS	NR-U
Agricultural Areas	Build staff capacity	●							
Invasive Species	Control and reduce existing aquatic invasive species							●	
	Coordinate habitat restoration activities with county forester and county agriculture inspector, and local weed authorities							●	
	Develop early detection and rapid response plans for new AIS							●	
	Develop early detection and rapid response plans for new terrestrial invasive species							●	

Table 0.4: Primary Benefits of Land Use Management Implementation Actions

Category	Strategy	SW-R	SW-P	SW-Q	GW-Q	GW-KD	NR-A	NR-IS	NR-U
Urban Areas; Shorelands; Land Protection	Compare regulatory approaches across LGUs and consider updates for watershed level consistency	●	●				●		
Land Protection	Protect habitat in developed and developing areas								●
	Protect vulnerable recharge areas				●				
Shorelands	Septic systems regulatory consistency				●				

Table 0.5: Primary Benefits of Data and Studies Implementation Actions

Category	Strategy	SW-R	SW-P	SW-Q	GW-Q	GW-KD	NR-A	NR-IS	NR-U
Agricultural Areas	Establish Discovery Farm sites	●							
Groundwater	Development of the Mille Lacs County Geologic Atlas					●			
	Evaluate recharge areas and potential risk					●			
Habitat	Identify and rank high value areas								●
Invasive Species	Develop invasive species management plans							●	
Monitoring	Acquire Surface Water - Quantity data			●					
	Water quality monitoring	●	●						
Shorelands	Protect shoreline habitat								●
Waterbodies	Complete a culvert inventory						●		
	Complete scientific and prioritizing studies	●	●				●		
	Evaluate opportunities to provide storage and flood prevention benefits			●					
	Lake internal loading feasibility study	●							
	Nutrient source investigation					●			
	Prioritize and target shoreline and lakeshore restoration areas		●						
Wetlands and Floodplains	Maintain naturally functioning floodplains			●					

CHAPTER 1.0

Land and Water Resources Summary

1.0 Land and Water Resources Summary

SUMMARY

The Watershed is situated within the Upper Mississippi River Basin in central Minnesota. The watershed is 1,584 square miles in size, and stretches from Mille Lacs Lake in the north, the headwaters of the Rum River, to the City of Anoka in the south, the location of the confluence of the Rum and Mississippi Rivers. The Watershed covers portions of ten (10) counties; Aitkin, Crow Wing, Morrison, Mille Lacs, Kanabec, Benton, Isanti, Chisago, Sherburne, and Anoka. The full Land and Water Resources narrative is in Appendix D. This chapter provides an overview of surface water and groundwater resources because the Plan primarily focuses on these resources.

1,584
Square Miles

10
Counties

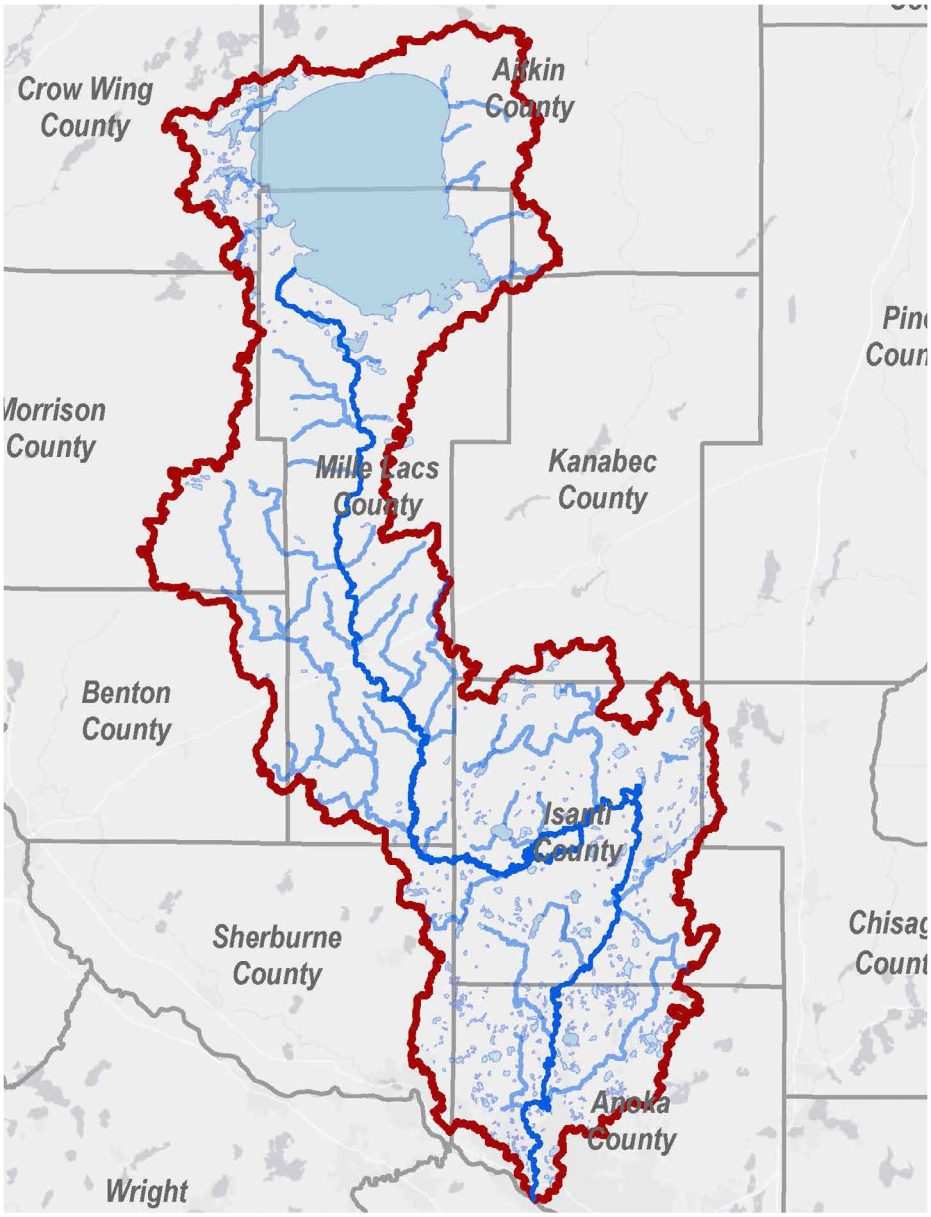


Figure 1.1: Rum River watershed planning boundary

CULTURAL HERITAGE

This Plan sets the course to improve and restore natural resources in the Watershed for future generations. In planning for the future, it's also important to remember that the resources within the Watershed have been important to past generations. These vital resources have provided a continuum of use for generations and have endured in shaping environmental, social, and economic drivers for the region.

The Minnesota Department of Natural Resources' Mille Lacs Kathio State Park website states that Mille Lacs—a French term used by early European explorers and fur traders—means 1,000 lakes, and refers to the region. The area was inhabited by many who used the areas natural resources for survival. The park is one of the most significant archaeological sites in Minnesota, with 30 sites identified.

The earliest site at Mille Lacs Kathio State Park dates from the Paleo period (approximately 12,000 years ago), shows evidence of traditional copper tool manufacturing. Hundreds of years before European settlement, the Dakota people established permanent villages along the shores of Ogechie Lake and the Rum River. These people came to be known as the Mdewakanton, which translated means Water of the Great Spirit. Late in the Dakota period, Father Louis Hennepin, a Recollect priest and one of the earliest European explorers to visit Minnesota, traveled through this region. He lived with the Dakota for six months in 1680 on a point of land where the Rum River leaves the park on the southeastern boundary. The French explorer, Daniel Greysolon, Sieur duLuth (after whom the city of Duluth was named) is also known to have visited this region in 1679.

Many changes came during the 18th century as many bands of Dakota had relocated on the prairies, and near the lakes and rivers of what is now southern Minnesota. Simultaneously, Ojibwe Indians entered the region from the east. Ojibwe oral tradition, recorded by historian William Warren, tells of a massive, three-day "Battle of Kathio" in which the victorious Ojibwe forever drove the Dakota from the area. Archaeological evidence suggests that despite small skirmishes, the Dakota migration was well under way when the Ojibwe entered the region. The Ojibwe brought a rich cultural tradition with them from the east and settled along the shore of Mille Lacs. Abundant natural resources continued to supply the needs of various groups of people, providing wild rice, fish, waterfowl, and other foods. Loggers came to the area in the 1850s, and within 50 years, the vast forest of white and red pine had largely been logged.

Source: Minnesota Department of Natural Resources, April 21, 2021. Mille Lacs Kathio State Park | Minnesota DNR, https://stateparks.com/mille_lacs_kathio_state_park_in_minnesota.html

LAND USE

Land use varies greatly throughout the Watershed. The upper third of the Watershed is dominated by hardwood forests and large wetland complexes. This area is home to Mille Lacs Lake, a recreation and tourism destination with high-density shoreland development around much of its perimeter. The middle third of the Watershed is a transitional area, changing from hardwood forests and wetland complexes in the north, to increasingly intensive agricultural use in the south. The lower third is the most-densely populated, starting with small-acreage suburban development and trending towards more urbanized development patterns near the Rum River's confluence with the Mississippi in Anoka.

The USDA estimates that approximately 92% of the land in the Watershed is privately owned. Public lands account for approximately 7% of total watershed acres. Most of these publicly owned lands are located in the northern third of the Watershed, with many large state and federal land holdings in northern Mille Lacs County and southern Aitkin County.

Agricultural land use accounts for approximately 38% of the total watershed acres. A majority of these agricultural lands are used for hay or pasture. The United States Department of Agriculture (USDA) estimates that there are 2,153 farms in the Watershed. Many of these are small-acreage operations; 69% of the operations are less than 180 acres in size. In comparison, the average farm size statewide is 371 acres. Approximately half of the 2,134 operators are full-time agricultural producers not reliant on off-farm income.

There are 275 feedlots in the Rum River Watershed. Approximately 95% of the feedlots have 300 animal units or less, and there is only one concentrated animal feeding operation (CAFO). While the total number of feedlots appears to be decreasing, the size of those that remain is growing. Mille Lacs County is home to nearly half (48%) of all feedlots in the Watershed. The only CAFO is in Isanti County.

Anticipated land use changes in the Watershed include the development of housing in areas within commuting distance of the Twin Cities and regional population centers. The population growth trend is well above the state average in Anoka and Sherburne Counties.

However, population projections appear to signify a coming end to this trend. Projections of migration patterns at the county level, covered in more detail in the demographics section of this document, appear to show a net loss in many of those counties previously associated with sprawling suburban development. Instead, these projections appear to show increases in migration to the metropolitan counties.

Another emerging trend is the redevelopment of lakeshore properties. According to Minnesota Lakes and Rivers, in the last two decades the average age of the lake home and cabin owner in Minnesota has increased ten (10) years, from 58 to 68. A growing number of these owners are retiring and choosing to convert their seasonal property to a full-time residence.

275
Feedlots

1
CAFO

7%
Public Land

92%
Privately Owned Land

2ND
Largest Landowner of the Watershed after privately owned land is the State of Minnesota with 6.5%

Feedlot(n.):

Feedlot (n): a building or lot area where animals are kept and raised in confinement for 45 days or more in a 12 month period and where ground cover is not sustained over more than 50 percent of the confinement area.

CAFO (n.):

Concentrated Animal Feeding Operation

A type of feedlot with the capacity to house over 1,000 or more animal units (a unit of measure rather than number of animals) and must obtain a federal permit to operate.

212
Lakes

3 LAKES
are over 1,000 Acres in Size

MILLE LACS LAKE
is over 200 Square Miles in Surface Area

158
Stream Segments Exceeding 680 Stream Miles

151 MILES
from Rum River Headwaters at the Outlet of Mille Lacs Lake to the City of Anoka Where it Enters the Mississippi River

DESIGNATED
Rum River
Wild and Scenic River

These once seasonal retreats, now serve as full-time residences and are increasing redevelopment and new development intensity. The size and scope of these impacts, coupled with their proximity to sensitive and important natural resources, may result in irreparable degradation to these resources.

SURFACE WATER

The Watershed has many outstanding surface water resources, including 212 lakes and 158 stream segments. The Watershed's namesake, the Rum River, works its way through the Watershed starting at Mille Lacs Lake and ending in the Mississippi River, traveling 151 stream miles (see Appendix D). The Rum River has been designated as a State Water Trail and State Wild, Scenic and Recreational river, offering excellent canoing, tubing, and kayaking opportunities. Fishing is another recreational opportunity, with anglers catching smallmouth bass, northern pike, and walleye.

Other major rivers and streams include the West Branch of the Rum River, Stanchfield Creek, Cedar Creek, Estes Brook, and Bogus Brook. In total, the 158 public water stream segments in the Watershed exceed 680 stream miles. The area has an abundance of high-quality lakes, three (3) of which, Mille Lacs, Onamia, and Borden, are over 1,000 acres in size. Mille Lacs Lake is the second largest lake in Minnesota.

Wetlands account for approximately 24% of the total land area. Nearly one-half of these wetlands are classified as emergent wetlands, dominated by herbaceous perennial plants (e.g. grasses, sedges, etc.). The remainder are scrub shrub or forested wetlands, with a small percentage of deep water habitats. There are approximately 240,438 acres of wetland in the Rum River Watershed, which represent a 30% loss from the estimated historical wetland acreage of 345,032 (BWSR, 2020a).

Surface Water - Quantity

Stream flow data on the Rum River can be used to assess Surface Water - Quantity watershed wide. The United State Geological Survey (USGS) maintains a streamflow gaging station on the Rum River in St. Francis. Stream flow data from 1934 to 2017 indicates that annual mean discharge, a product of water velocity and volume, is increasing over time.

Stream discharge and lake levels are directly related to flooding concerns in many areas of the Watershed. As a result, many communities participate in the National Flood Insurance Program (NFIP). This program aims to reduce the impact of flooding by providing flood insurance and promoting sound floodplain management. The Federal Emergency Management Agency (FEMA) is responsible for oversight of the NFIP program and has created Flood Insurance Rate Maps (FIRM) to identify areas that are susceptible to flooding.

The FIRM maps include multiple flood zones, based on the probability of a flood event occurring in a single year. The most common category, known as the base flood, is the 1% annual chance flood zone, otherwise known as the 100-year flood. FIRM data accuracy and availability varies by location, as the maps are completed on a county basis. Data is unavailable for Aitkin, Kanabec, and Morrison County; Morrison County's map is expected to be updated and available before the end of 2021.

Surface Water Quality

Surface waters in the Rum River Watershed are generally of high quality, especially in the northern end of the watershed. It is estimated that approximately 40% of Minnesota's lakes and streams are impaired; in the Rum River watershed that figure is less than 10% of assessed lakes and streams. It is also important to note, however, that only 22% of lakes and 24% of stream reaches have been assessed for impairments. The waterbodies that do not meet state water quality standards for aquatic life and aquatic recreation are listed in **Tables 1.1 and 1.2** with the locations provided in **Figure 1.2**. There are some water bodies that do not meet federal water quality standards for aquatic life, aquatic consumption, or aquatic recreation, with quality generally declining from north to south. Excess phosphorus, causing eutrophication, is the main pollutant.

In 2013, the Minnesota Pollution Control Agency (MPCA) initiated a water quality assessment of the Rum River Watershed, conducting biological, chemistry, and flow monitoring on key stream segments. A full Watershed Restoration and Protection Strategy Report (WRAPS) was released in July, 2017. The report identified, on a sub-watershed basis, restoration and protection strategies. These strategies were developed through a combination of public input and analysis of existing data on the quality of waterbodies to identify the strategies and future actions that make sense to address water quality issues. These range from protecting existing high-quality areas to prioritizing restoration of areas that have already experienced impacts.

The WRAPS report identifies a number of management priorities in addition to impaired waters. For example, the watershed has one lake with declining water quality, Lake George in Anoka County. There are also a number of lakes that exceed the water quality standard for total phosphorus, but are not listed as impaired according to the MPCA because the listing is new and not included in the biennial submission to the EPA or because the lake does not exceed standards for at least one of the two requirements which are transparency and chlorophyll *a*.

Maintaining the good water quality of the Rum River is critically important because the quality of the water as the Rum River enters the Mississippi influences the quality of drinking water available to downstream users. For instance, the St Paul Regional Water Service relies on surface water to supply drinking water to approximately 450,000 residents. The Rum River watershed ranks in the top six of all watersheds in the mid-west's Upper Mississippi Basin that are important for drinking water supply and are threatened with development pressure (Barnes, 2009).

Indicator (n.):

A metric, benchmark, or measuring stick used to determine progress towards goals. In some cases, when a metric is not clear or feasible, the indicator might be the number of inputs or outputs themselves.

Table 1.1: Impaired lakes and streams in the Rum River Watershed (does not include mercury or PCBs)

Water Body	Year Added	County	Affected Use	Pollutant Or Stressor
Lake Baxter	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Bogus Brook	2016	Mille Lacs	Aquatic Recreation	*Escherichia coli*
Borden Creek	2010	Aitkin	Aquatic Life	Dissolved oxygen
Cedar Creek	2016	Anoka	Aquatic Recreation	*Escherichia coli*
Cedar Creek (Little River)	2010	Mille Lacs	Aquatic Life	Dissolved oxygen
Crooked Brook	2006	Anoka	Aquatic Life	Dissolved oxygen
East Hunter Lake	2016	Sherburne	Aquatic Recreation	Nutrient/eutrophication biological indicators
Estes Brook	2016	Mille Lacs	Aquatic Life	Aquatic macroinvertebrate bioassessments
	2016	Mille Lacs	Aquatic Recreation	*Escherichia coli*
Lake Fannie	2008	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Lake Francis	2016	Isanti	Aquatic Life	Fishes bioassessments
	2002	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Green Lake	2016	Isanti	Aquatic Life	Fishes bioassessments
	2008	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Isanti Brook	2016	Isanti	Aquatic Life	Aquatic macroinvertebrate bioassessments
	2016	Isanti	Aquatic Life	Fishes bioassessments
Little Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Long Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Mahoney Brook	2016	Anoka	Aquatic Life	Fishes bioassessments

Table 1.1 Continued: Impaired lakes and streams in the Rum River Watershed (does not include mercury or PCBs)

Water Body	Year Added	County	Affected Use	Pollutant Or Stressor
Malone Creek (Thains Creek)	2012	Mille Lacs	Aquatic Life	Dissolved oxygen
North Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Rum River, West Branch	2016	Mille Lacs	Aquatic Life	Aquatic macroinvertebrate bioassessments
	2016	Mille Lacs	Aquatic Recreation	*Escherichia coli*
Seelye Brook	2016	Anoka	Aquatic Recreation	*Escherichia coli*
Lake Skogman	2008	Chisago	Aquatic Recreation	Nutrient/eutrophication biological indicators
South Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Stanchfield Creek	2016	Isanti	Aquatic Life	Fishes bioassessments
Tennyson Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Tibbetts Brook	2016	Morrison	Aquatic Life	Fishes bioassessments
Trott Brook	2016	Anoka	Aquatic Life	Aquatic macroinvertebrate bioassessments
	2016	Anoka	Aquatic Life	Dissolved oxygen
	2016	Anoka	Aquatic Life	Fishes bioassessments
Twelve Lake	2016	Morrison	Aquatic Recreation	Nutrient/eutrophication biological indicators
Unnamed Creek	2016	Morrison	Aquatic Life	Aquatic macroinvertebrate bioassessments
Vondell Brook (County Ditch 11)	2016	Mille Lacs	Aquatic Life	Fishes bioassessments
Washburn Brook (Judicial Ditch 3)	2016	Mille Lacs	Aquatic Life	Fishes bioassessments
West Hunter Lake	2016	Sherburne	Aquatic Recreation	Nutrient/eutrophication biological indicators

Aquatic Life Impairments:

- Dissolved Oxygen: Low Dissolved Oxygen
- Aquatic macroinvertebrate bioassessments: poor biological quality for macroinvertebrates
- Fishes bioassessments: poor biological quality for fish

Aquatic Recreation Impairments

- Nutrient/eutrophication biological indicators: low transparency, algal blooms, excess phosphorus
- Escherichia coli: excess E. coli, a bacteria used to identify water contaminated with human or animal waste

KEY

- Rum River
- Public Watercourse
- Public Water Basins
- Impaired Waters
- Watershed
- Counties

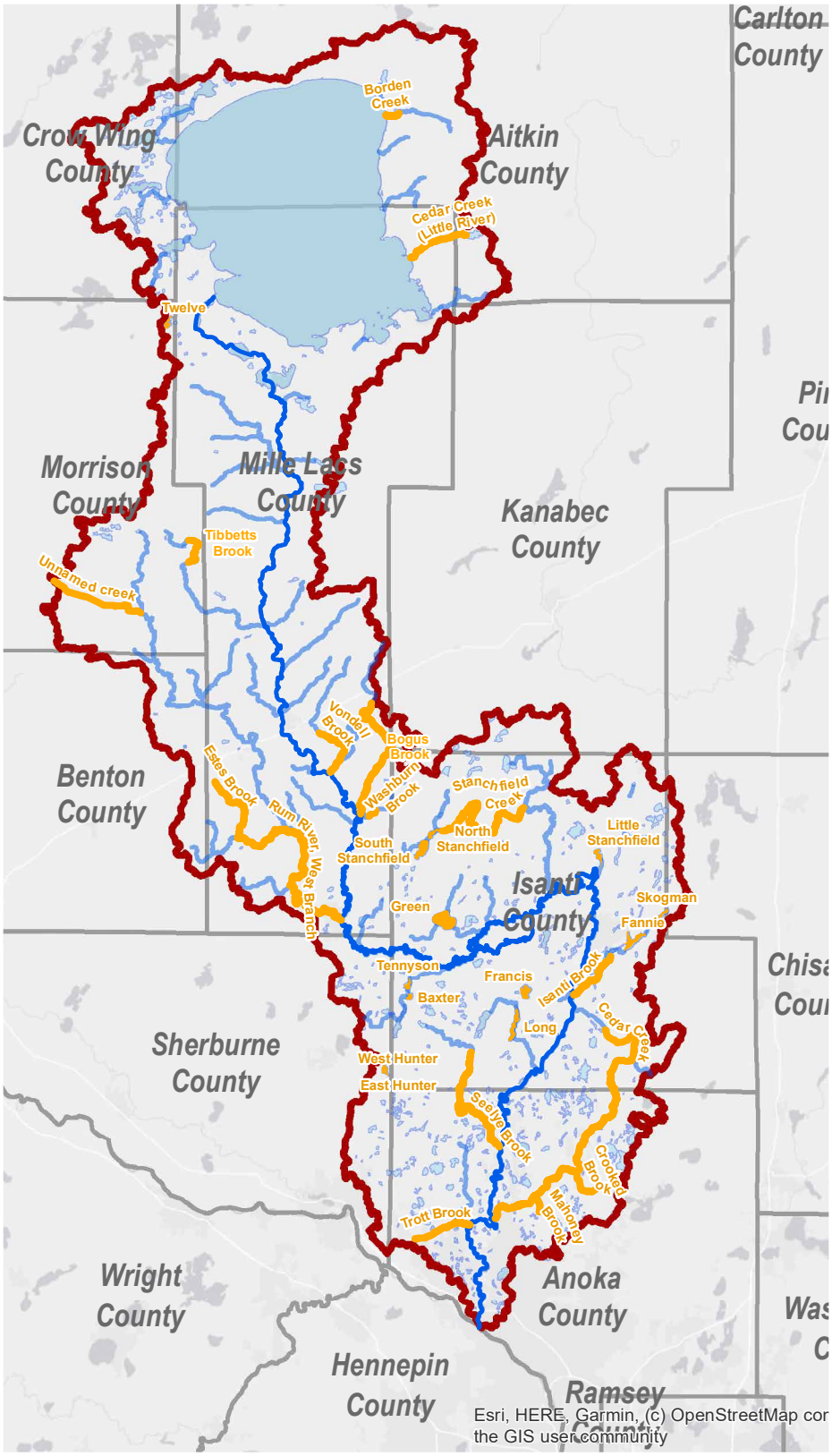


Figure 1.2: Impaired waters

Information in this section is summarized from the Land and Water Resources Report in Appendix D, unless otherwise noted.

GROUNDWATER

The Watershed crosses three (3) of Minnesota's six (6) groundwater provinces. Traveling north to south these are the Arrowhead, Central, and Metro provinces. Groundwater availability is good to moderate in most of the Watershed area, except in the Arrowhead province region where availability is limited.

Aquifers in the Watershed are generally at a medium level of contamination risk. However, there are areas of both high and low risk scattered throughout the Watershed.

GROUNDWATER QUALITY

Reliance on groundwater as a drinking water resource makes groundwater quality of utmost importance. The MPCA's Ambient Groundwater Monitoring Program monitors trends in groundwater quality statewide, including 18 monitoring wells within the Watershed. The Minnesota Department of Health (MDH) also monitors groundwater quality, analyzing test data from the construction of new wells. Public water suppliers also monitor the water quality of their wells.

The majority of the MPCA's monitoring wells (15) are in areas served by subsurface sewage treatment systems (SSTS), also known as septic systems. The areas served by SSTS were identified to have higher percentages of contaminants of emerging concern (CECs) than those in urbanized areas. CECs demonstrate effects at very low levels of exposure, as such there is no standard limit for contamination. CECs are often manmade chemicals, including pharmaceuticals, pesticides, and detergents.

Other concerning contaminants include chloride, sodium, nitrate, and arsenic. A summary of these contaminants are provided below, additional details can be found in Appendix D.

- Chloride was detected in 93.9% of all samples, with 10 occurrences exceeding the secondary maximum contaminant level of 250 milligrams per liter, a point at which the contaminant is noticeable for aesthetic considerations, but not presenting a risk to human health.
- Sodium was found in wells 98.7% of the time; there is no drinking water standard for sodium.
- Nitrate was detected in 95.2% of the samples obtained from MPCA Ambient Monitoring Wells, which are typically shallower and at greater risk of contamination than drinking water wells in the watershed, but only three (3) samples were found to exceed the maximum contaminant level of 10 milligrams per liter. The results from all 3 of the wells that MDA sampled exceed the drinking water standard for nitrate (MDH, 2020). This contaminant level was set for the concern of methemoglobinemia (blue-baby syndrome) in infants under the age of six (6) months. Of the drinking water wells sampled, only 3% of had detectable levels of nitrate above 3 mg/L which is considered anthropogenic (caused by humans).
- Arsenic is a naturally occurring contaminant that can be harmful to human health if too much is consumed. Arsenic has been found to exceed the maximum contaminant level of 10 micrograms per liter in 4.1% of all wells installed between 2008 and 2015 (MDH). Individual county information within the Watershed was found to range from 0 to 10%, low in comparison to statewide data.

KEY

- Rum River
- Public Watercourse
- Public Water Basins
- MPCA Ambient Groundwater Monitoring Wells
- Watershed
- Counties

Water Table Aquifer Vulnerability

- High
- Medium
- Low
- Unrated

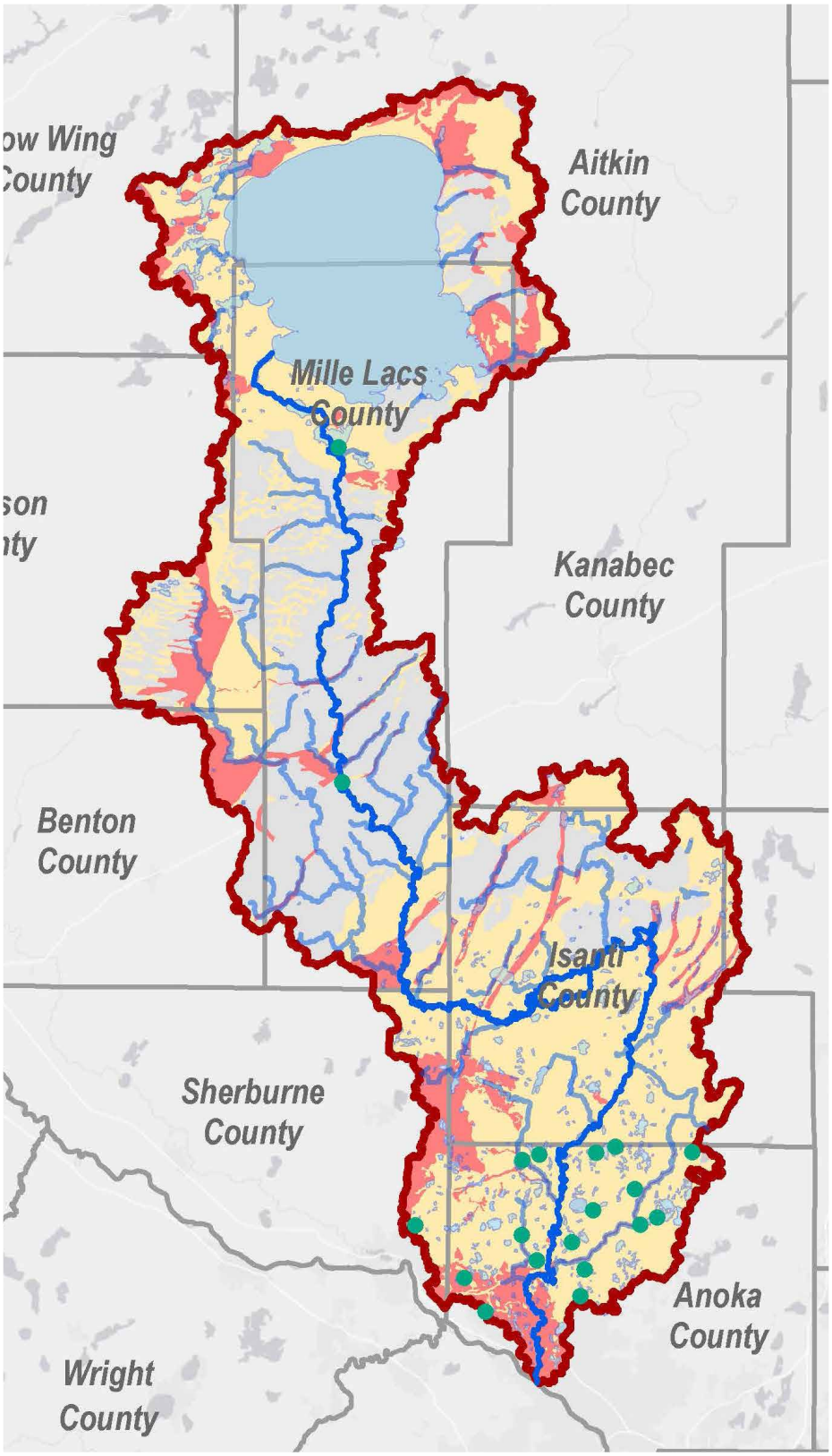


Figure 1.3: Aquifer Vulnerability and MPCA Well Locations

GROUNDWATER USE AND RECHARGE

Total groundwater withdrawals within the watershed increased from approximately 2.5 billion gallons of water in 1994 to 3.3 billion gallons of water in 2013. The most significant increase was for agricultural and non-agricultural irrigation use. From 1994 to 2013, both crop and non-crop irrigation has increased significantly. Most of the irrigation withdrawals are taking place in the southern third of the watershed, where irrigation of sandy soils typically improves crop production.

1 BILLION GALLONS
Increase in Groundwater Withdrawals within the Watershed

Groundwater recharge is an important consideration when evaluating the ability of the aquifers to support withdrawals. Annual potential recharge rate in the Watershed is estimated to be an average of 6.4 inches per year, which is higher than the statewide average of approximately four (4) inches per year.

Actual recharge rates can be evaluated by reviewing withdrawals and groundwater aquifer elevations. The MNDNR tracks the elevations of groundwater aquifers across the state using various monitoring wells. This data provides the elevations of groundwater aquifers, reflecting the fluctuations of the water table as it rises and falls. While fluctuations in the water table elevations are evident, there is no statistical trend in depth to groundwater.

Figure 1.4: Crop irrigation of sandy soils is a major contributor to groundwater withdrawals in the Watershed; image by Chris Happel

CHAPTER 2.0

Geographic Management Zones

2.0 Geographic Management Zones

The Plan is organized according to geographic management zones (GMZs). These zones are defined based on similar physical, social, and economic characteristics as well as natural resource concerns. This section describes these geographic management zones.

The GMZs in this plan are similar to the hydrologic unit code (HUC 10) subwatersheds that were used in the Rum River WRAPS (MPCA, 2017b). The names have been changed to clarify the planning region. Additionally, one of the HUC 10 subwatersheds, the Upper Rum River, was split into two management zones, Onamia and Milaca, for the purposes of this plan.

Table 2.1: Geographic Management Zones

Region	
1	MILLE LACS LAKE The headwaters of the Rum River and includes the largest body of water within the watershed.
2	ONAMIA The most forested area within the watershed.
3	MILACA The area where land use transitions from forests and wetlands to cultivated crops and pasture land.
4	WEST BRANCH RUM RIVER The most significant area of farmed land within the watershed.
5	STANCHFIELD CREEK The least populated zone within the watershed.
6	PRINCETON-CAMBRIDGE The second most populated zone with significant agricultural land use.
7	ST. FRANCIS The most populated zone in the watershed with predominant wetlands and where the Rum River outlets to the Mississippi River.
8	CEDAR CREEK The smallest zone with wetlands as the primary land use.

A map and an informational snapshot on the characteristics and qualities of each GMZ is provided in the following pages. While the process for prioritizing specific lake and stream resources is discussed in Chapter 4, the prioritized resources for each GMZ is indicated in the following information for ease of reference.

Average annual sediment, total phosphorus, and total nitrogen loading rates (in pounds per acre lbs/ac) are presented for each GMZ. These loading rates are long-term mean annual values obtained from the Rum River HSPF model. Annual Discharge is the long-term mean discharge from each GMZ, as taken from the Rum River HSPF model. Discharge is represented in inches over the entire GMZ, which is calculated as the total GMZ discharge divided by GMZ area (Lupo, C., 2016a, 2016b, 2016c).

Hydrologic Unit Code (HUC):

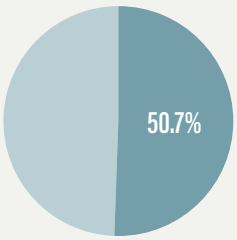
Hydrologic Unit Codes (HUC) are a sequence of numbers that identify a hydrologic feature or drainage area. HUC Level drainage units (commonly known as subwatersheds).

AREA
415.4 mi^2
(Rank 1 of 8)

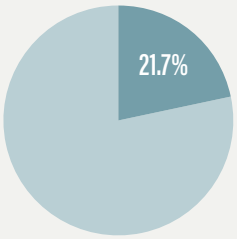
POPULATION (2010 CENSUS)
6,611
(Rank 6 of 8)

MILLE LACS BAND OF OJIBWE TRIBAL AREA
Approximately 22% of the land area

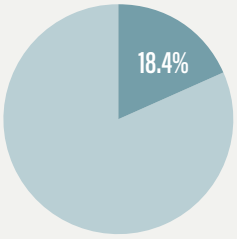
DOMINANT LAND COVER



Open Water



Wetlands



Forest

1 MILLE LACS LAKE

- Largest of the eight GMZs
- Second largest inland lake in MN behind Red Lake
- 50% open water land cover
- Biggest fishing destinations in MN for both open water and ice fishing
- 55% of Mille Lacs Lake Subwatershed Area

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.1.

Table 2.2: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Mille Lacs Lake		●	●	●
Round Lake (Aitkin County)		●	●	●
Lake Borden			●	●

ANNUAL LOADING AND DISCHARGE

Table 2.3: Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
64.5	0.16	3.69	6.6

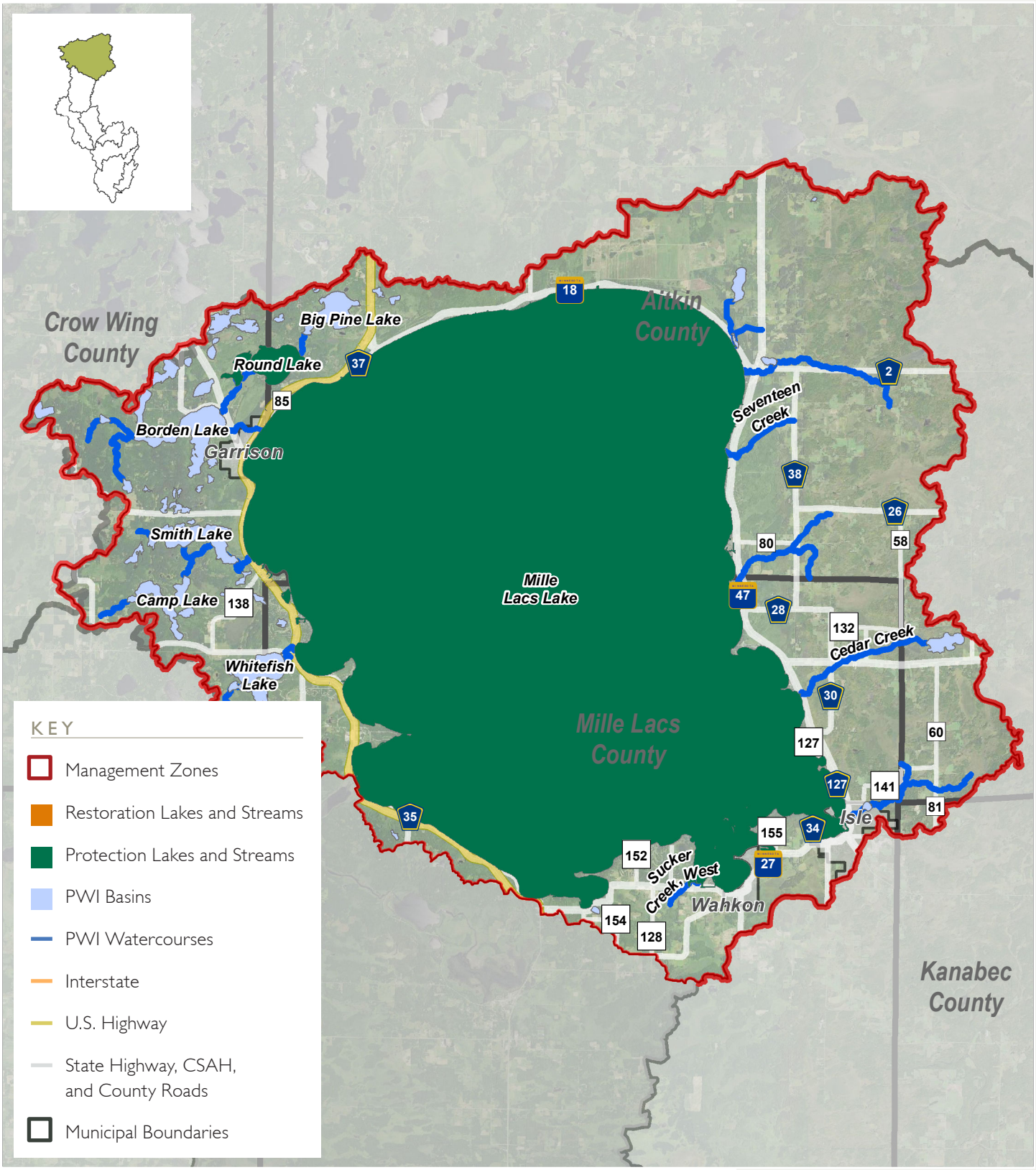


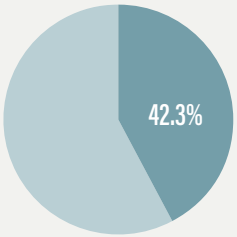
Figure 2.1: Mille Lacs Lake geographic management zone

AREA
220.5 mi²
(Rank 3 of 8)

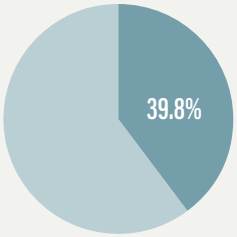
POPULATION (2010 CENSUS)
3,194
(Rank 7 of 8)

MILLE LACS BAND OF OJIBWE TRIBAL AREA
(46.6 mi², 21% of the management area)

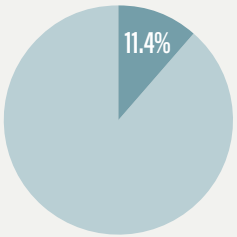
DOMINANT LAND COVER



Forest



Wetlands



Hay/Pasture

2 ONAMIA

- Contains the uppermost reach of the Rum River
- Land cover is dominated by forest and wetlands
- Over 25% of the forest land cover and nearly one quarter of the wetland land cover for the entire Rum River Watershed
- Highest concentration of wetland land cover of all GMZs

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.2.

Table 2.4: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Shakopee Lake	●		●	●
Lake Ogechie		●	●	●
Lake Onamia	●			
Rum River		●		
Tibbets Brook		●	●	●

ANNUAL LOADING AND DISCHARGE

Table 2.5 Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
57.7	0.18	3.23	6.9

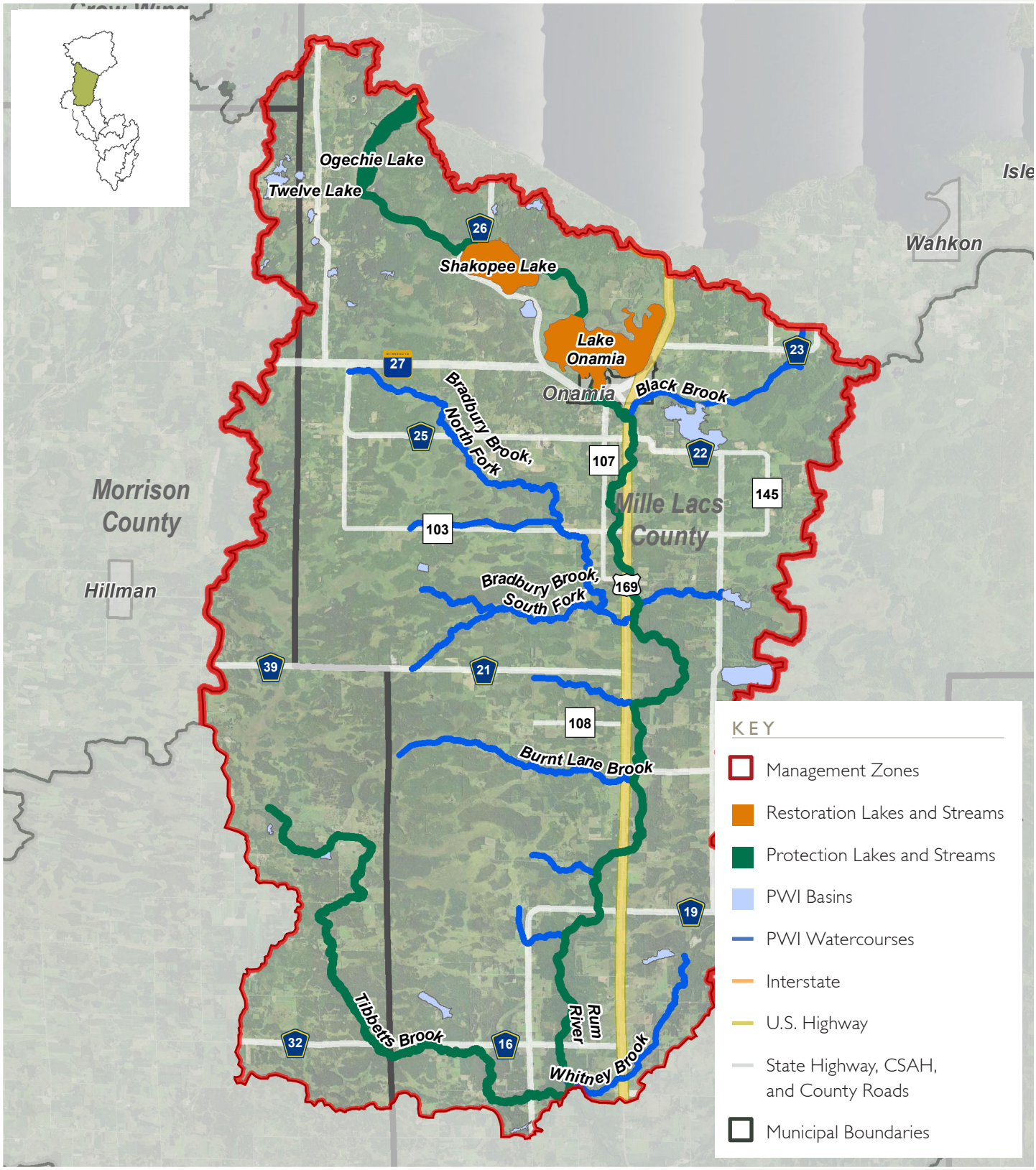
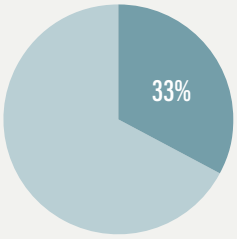


Figure 2.2: Onamia geographic management zone

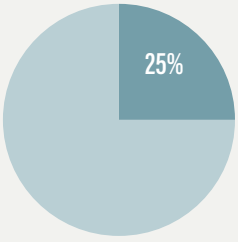
AREA
135.6 mi^2
(Rank 6 of 8)

POPULATION (2010 CENSUS)
8,720
(Rank 4 of 8)

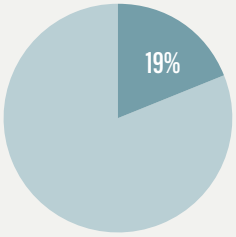
DOMINANT LAND COVER



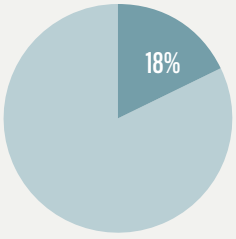
Cultivated Crops



Hay/Pasture



Forest



Wetlands

3 MILACA

- Just upstream of the confluence with the West Branch of the Rum River
- Dominated by cultivated crops and hay/pasture
- Transitional area to more agricultural land uses

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.3.

Table 2.6: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Bogus Brook	●			
Vondell Brook			●	●

ANNUAL LOADING AND DISCHARGE

Table 2.7: Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
67.0	0.32	4.43	7.6

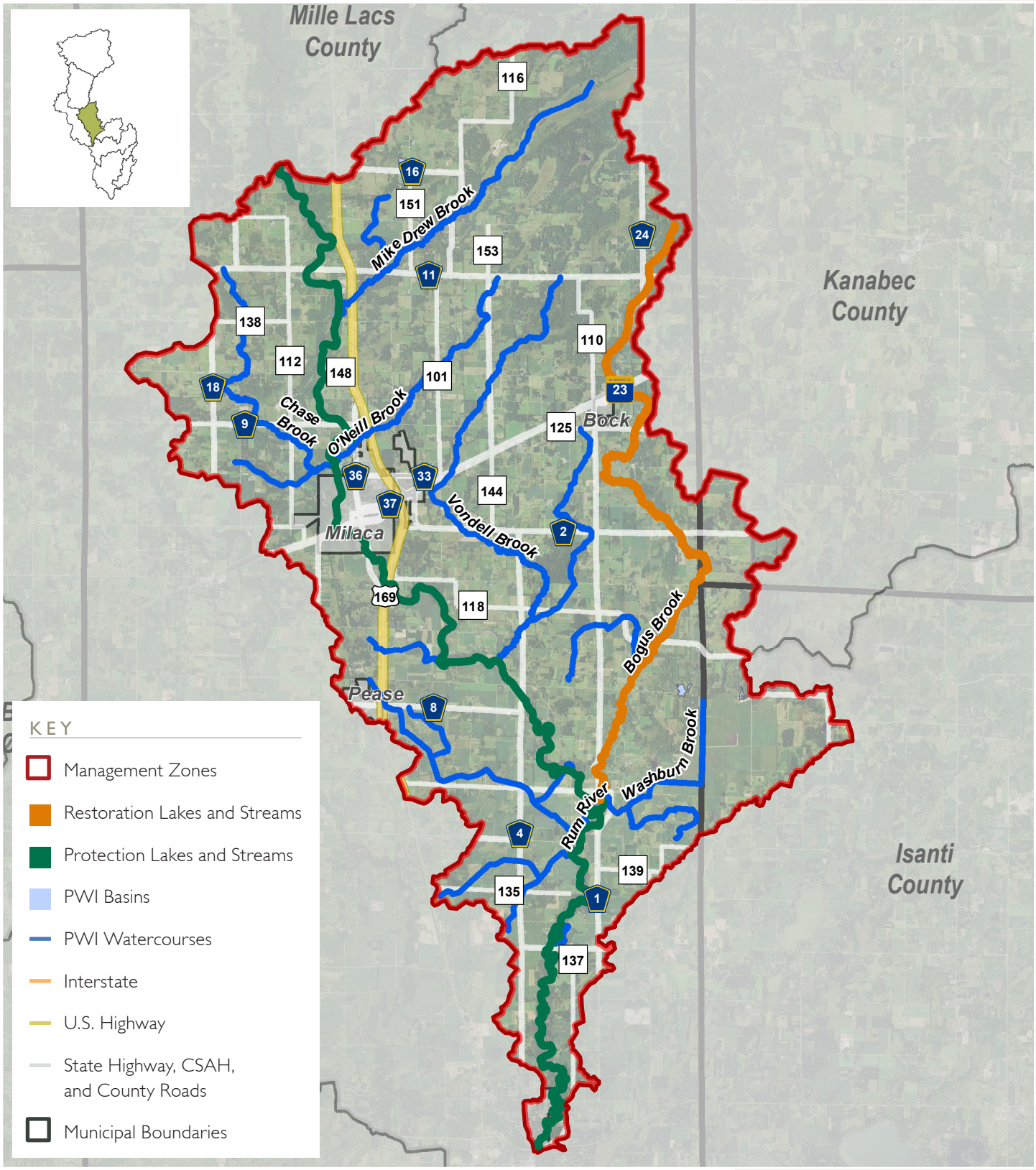
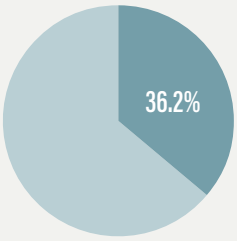


Figure 2.3: Milaca geographic management zone

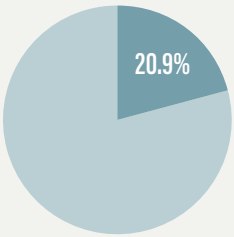
AREA
184.8 mi²
(Rank 5 of 8)

POPULATION (2010 CENSUS)
7,278
(Rank 5 of 8)

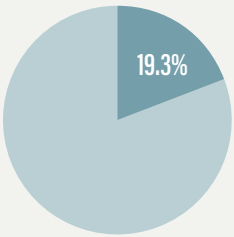
DOMINANT LAND COVER



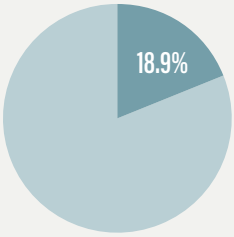
Cultivated Crops



Wetlands



Hay/Pasture



Forest

4 WEST BRANCH RUM RIVER

- Headwater watershed draining to the West Branch of the Rum River
- Low development

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.4.

Table 2.8: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
West Branch Rum River	●	●	●	●
Unnamed Creek (07010207-532/533)		●	●	●
Prairie Brook		●	●	●
Estes Brook	●		●	●

ANNUAL LOADING AND DISCHARGE

Table 2.9 Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
97.3	0.29	4.64	7.6

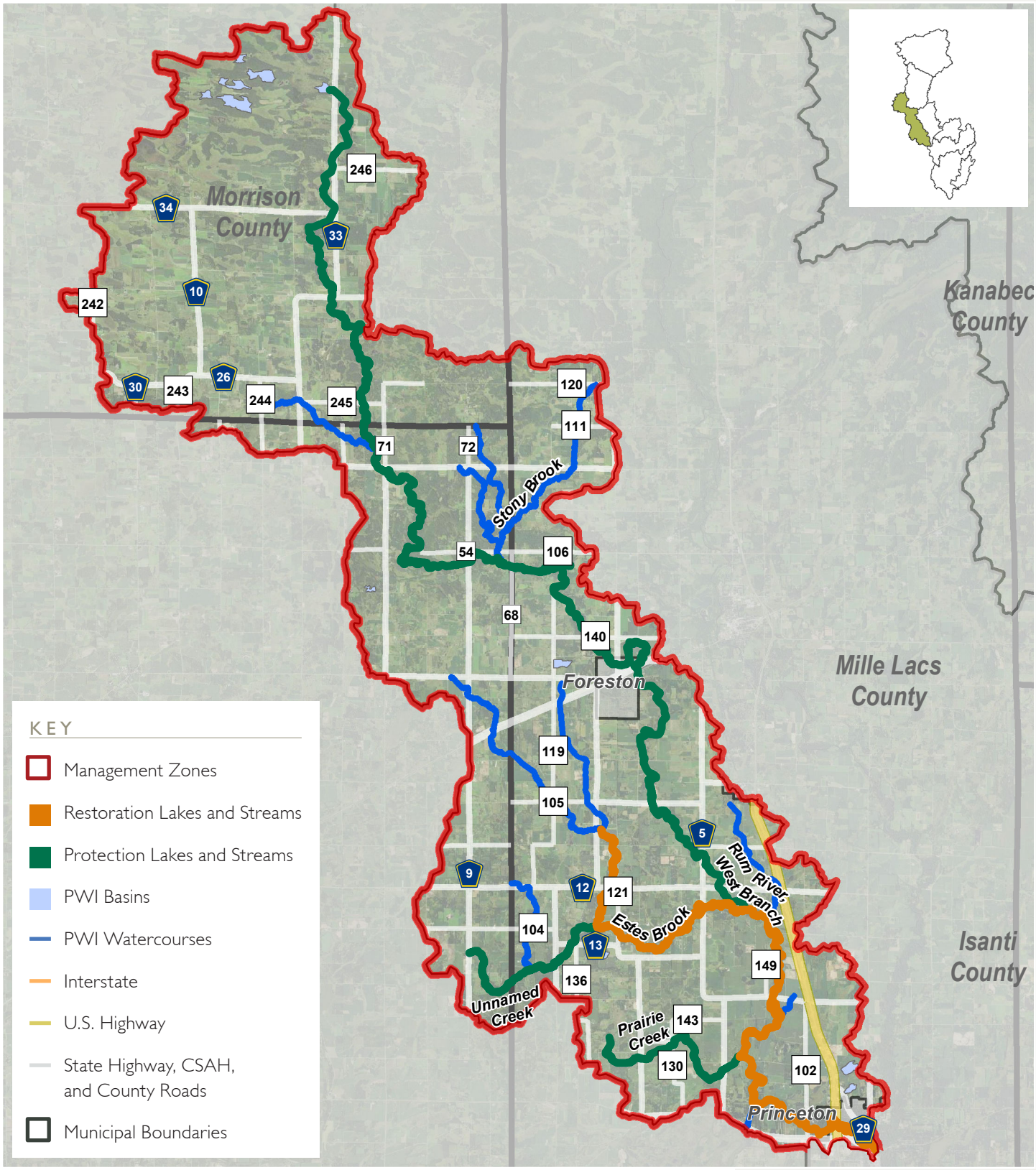
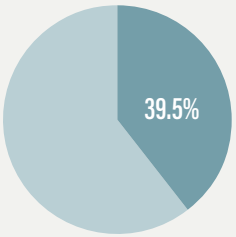


Figure 2.4: West Branch Rum River geographic management zone

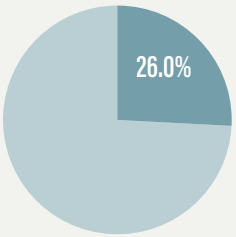
AREA
96.4 mi^2
(Rank 7 of 8)

POPULATION (2010 CENSUS)
2,378
(Rank 8 of 8)

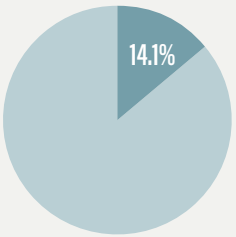
DOMINANT LAND COVER



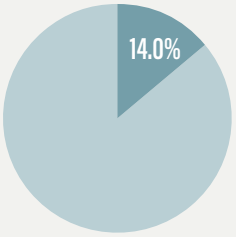
Cultivated Crops



Wetlands



Forest



Hay/Pasture

5 STANCHFIELD CREEK

- Least populated GMZ
- Dominant land covers are cultivated crops
- Highest area of cultivated crops (39.5%) of the GMZs

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.5.

Table 2.10: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
South Stanchfield Lake	●			
Lewis Lake		●		
North Stanchfield Lake	●			
Stanchfield Creek	●	●	●	●

ANNUAL LOADING AND DISCHARGE

Table 2.11: Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
61.3	0.26	4.23	6.9

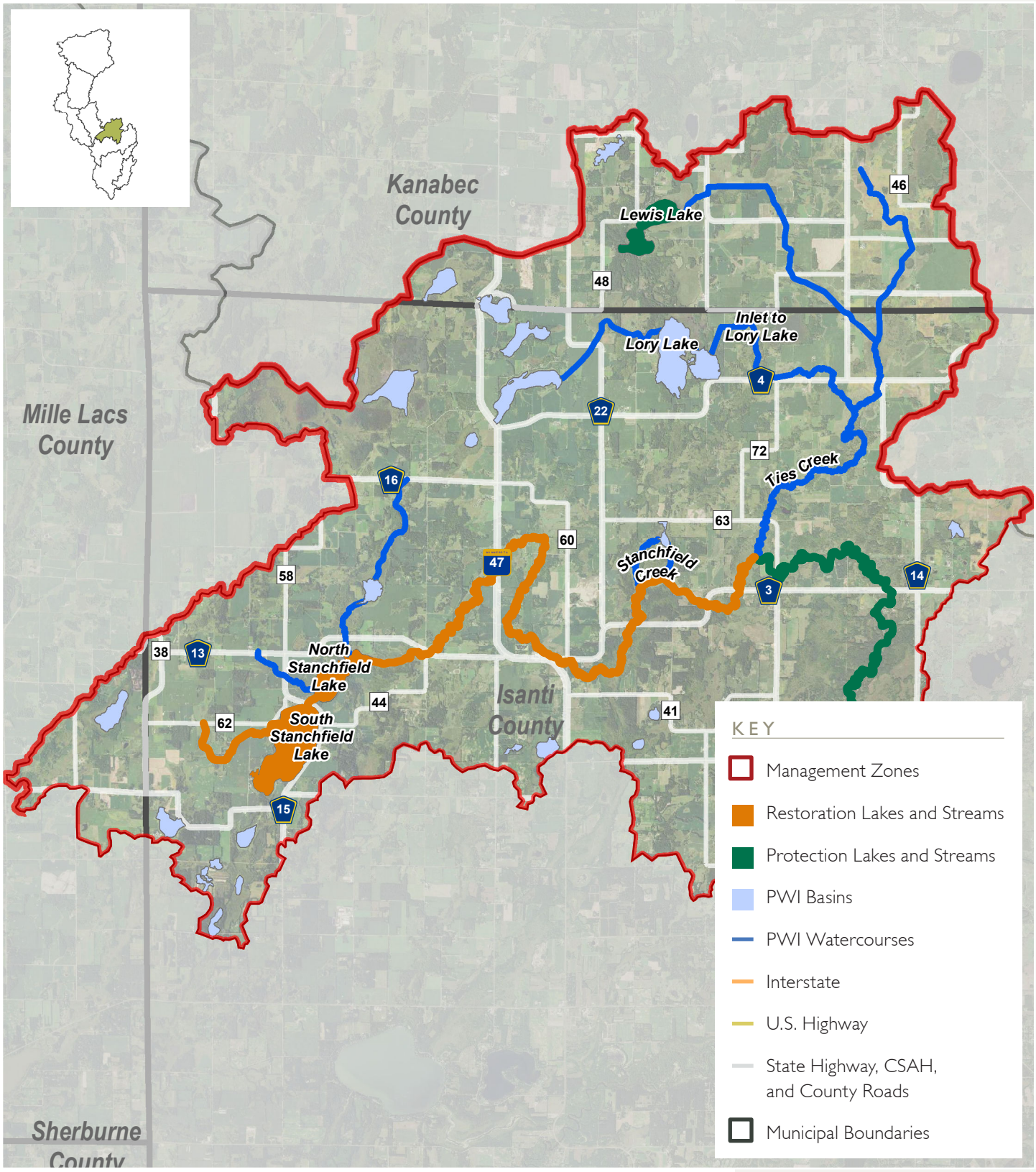
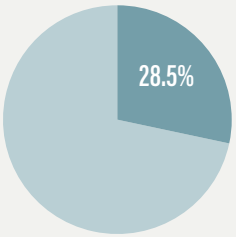


Figure 2.5: Stanchfield Creek geographic management zone

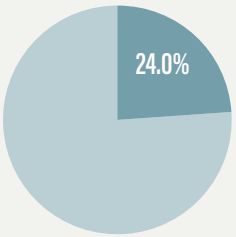
AREA
198.0 mi^2
(Rank 4 of 8)

POPULATION (2010 CENSUS)
23,430
(Rank 2 of 8)

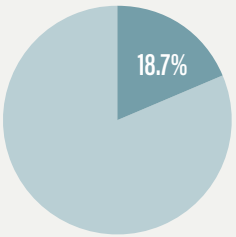
DOMINANT LAND COVER



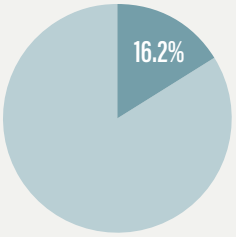
Cultivated Crops



Wetlands



Forest



Hay/Pasture

6 PRINCETON-CAMBRIDGE

- Transitions towards a more urbanized area in the southern portion of the Watershed
- Second most populated GMZ

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.6.

Table 2.12: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Blue Lake		●		
Francis Lake			●	●
Spectacle Lake		●		
Little Stanchfield			●	●
Green Lake	●		●	●
Rum River		●	●	●

ANNUAL LOADING AND DISCHARGE

Table 2.13: Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
70.8	0.59	1.14	10.3

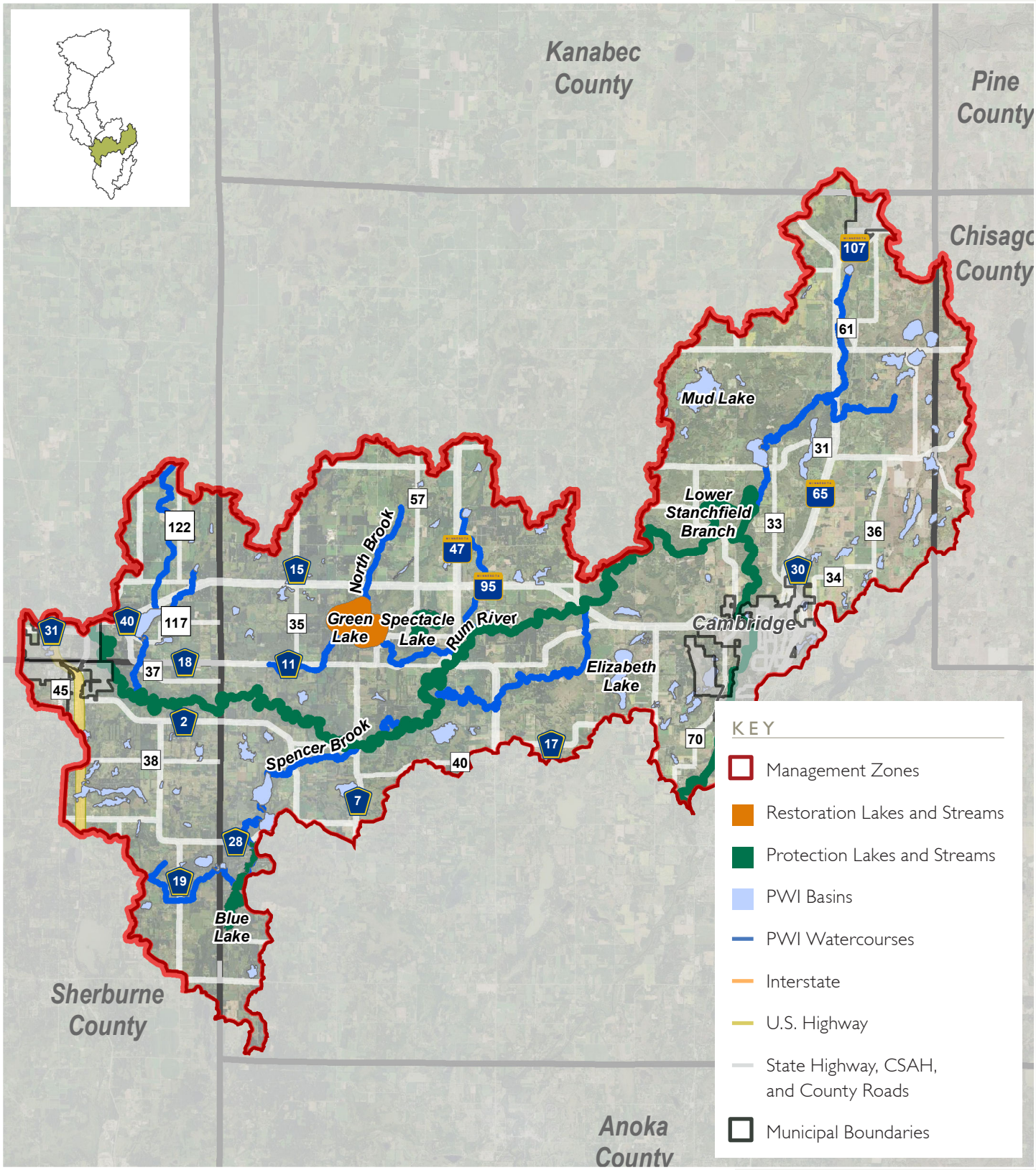
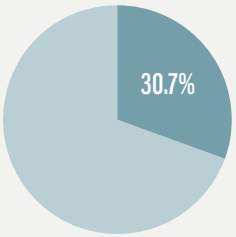


Figure 2.6: Princeton-Cambridge geographic management zone

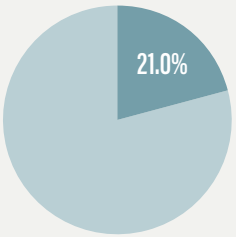
AREA
81.3 mi^2
(Rank 8 of 8)

POPULATION (2010 CENSUS)
15,082
(Rank 3 of 8)

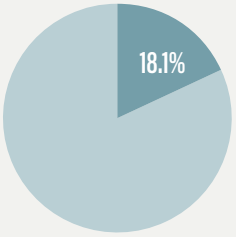
DOMINANT LAND COVER



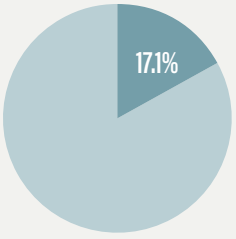
Wetlands



Forest



Cultivated Crops



Hay/Pasture

7 CEDAR CREEK

- Smallest GMZ by area
- Empties into the Rum River
- Third most populous GMZ
- Home to the 9+ square mile University of Minnesota Ecosystem Science Reserve

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.7.

Table 2.14: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Cedar Creek		●	●	●

ANNUAL LOADING AND DISCHARGE

Table 2.15: Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
80.6	0.22	4.06	8.0

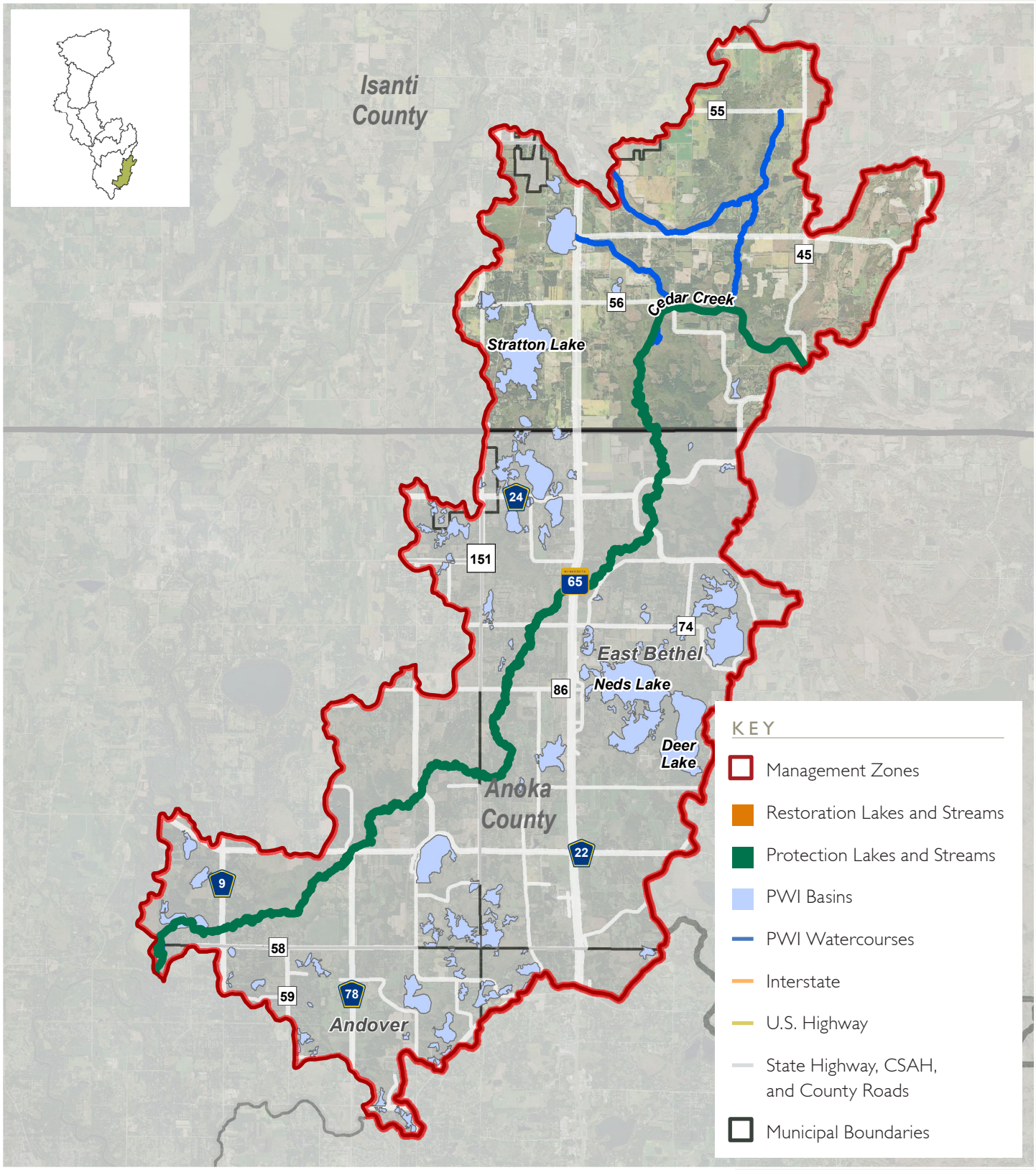
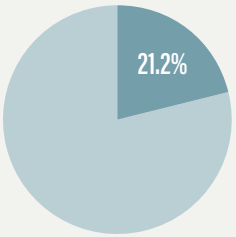


Figure 2.7: Cedar Creek geographic management zone

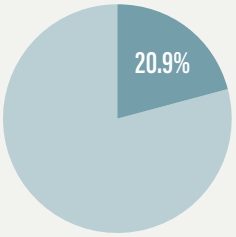
AREA
248.3 mi²
(Rank 2 of 8)

POPULATION (2010 CENSUS)
76,808
(Rank 1 of 8)

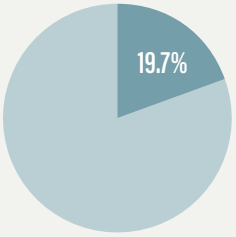
DOMINANT LAND COVER



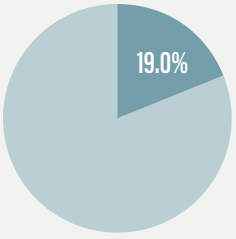
Wetlands



Forest



Hay/Pasture



Cultivated Crops

8 ST. FRANCIS

- Most developed GMZ
- Confluence with the Mississippi River
- Most populous GMZ

PRIORITY RESOURCES

The table below shows the identified priority waterbodies for this GMZ. Surface Water - Restore and Surface Water - Protect priority lakes and streams are indicated in Figure 2.8.

Table 2.16: Identified priority waterbodies

	Surface Water		Natural Resources	
	Restore	Protect	Aquatic Habitat	Invasive Species
Skogman Lake	●		●	●
Florence/Elms Lake		●		
Fannie Lake	●		●	●
Pickerel Lake		●		
Long Lake	●			
Lake George		●	●	●
East Twin Lake		●		
Easter Hunter Lake		●	●	●
Rum River		●	●	●
West Hunter Lake			●	●
Ford Brook		●		
Seelye Brook	●		●	●
Trott Brook			●	●

ANNUAL LOADING AND DISCHARGE

Table 2.17 Average annual loading rates for this GMZ

Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
89.5	0.83	1.30	10.7

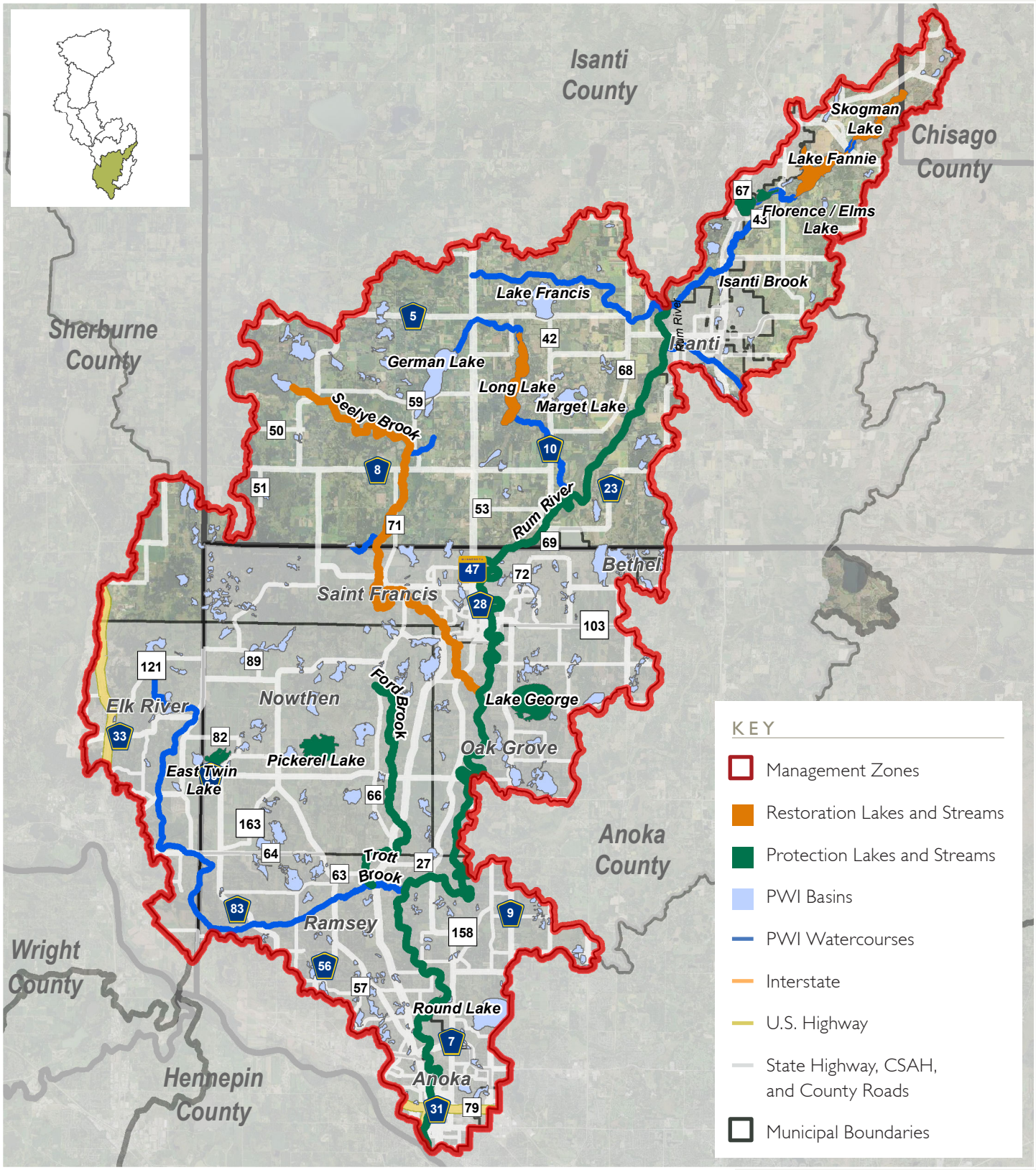


Figure 2.8: St. Francis geographic management zone

ANNUAL LOADING AND DISCHARGE OVERVIEW

Table 2.18: Annual Loading and Discharge Overview

Region	Sediment Loads (lb/ac)	TP Loads (lb/ac)	TN Loads (lb/ac)	Annual Discharge (in)
1 MILLE LACS LAKE	64.5	0.16	3.69	6.6
2 ONAMIA	57.7	0.18	3.23	6.9
3 MILACA	67.0	0.32	4.43	7.6
4 WEST BRANCH RUM RIVER	97.3	0.17	4.64	7.6
5 STANCHFIELD CREEK	61.3	0.26	4.23	6.9
6 PRINCETON-CAMBRIDGE	70.8	0.59	1.14	10.3
7 ST. FRANCIS	80.6	0.22	4.06	8.0
8 CEDAR CREEK	89.5	0.83	1.30	10.7

CHAPTER 3.0

Priority Issues

3.0 Priority Issues

INTRODUCTION

This chapter covers the information and data used, the process applied, and results of identifying priority issues. The specific process to identify priority resources is outlined in Chapter 4, according to each issue statement. In addition to stakeholder identified priority issues and concerns, existing data and studies were used to the extent possible to create an understanding of the context of resource conditions. With this understanding, priority issues and resources were determined using a systematic vetting process. First defined criteria were established and then recommendations were developed at a small group level by applying the criteria to the issue or resource category. Recommendations were promoted from these small work groups to the entire TAC, prior to submitting recommendations to the Policy Committee. The IAC reviewed the recommendations at key points throughout the prioritization process to provide further refinement of the TAC recommendations.

ISSUE PRIORITIZATION PROCESS

Numerous sources of information were used to compile and evaluate a list of potential values, concerns, and strategies for issue prioritization in the Watershed. Sources include related documents and reports as well as comment letters from local stakeholders and notes from a series of kickoff meetings.

DOCUMENTS AND REPORTS

Documents and reports reviewed include the Rum River Watershed Monitoring and Assessment Report [MPCA, 2016a], the Rum River Watershed Stressor Identification Report [MPCA, 2016b], the Rum River Watershed TMDL [MPCA, 2017a], the Rum River Watershed Restoration and Protection Strategy Report [MPCA, 2017b], the Rum River Watershed Fish Based Lake IBI Stressor Identification Report [MNDNR, 2016], and the Groundwater Report: Rum River Watershed [MPCA, 2016c]. Additionally, local county and city water management plans were summarized from Aitkin County (June, 2009), Anoka SWCD [2017], Benton County (2018), Crow Wing County (2013), Isanti County [2018], Kanabec County (2019), Mille Lacs County [2018], Morrison County (2017), Sherburne County (2018), and the City of Anoka [2015]. Watershed report cards, climate summaries, applicable legislation, a series of retrofit assessments and diagnostic studies, and numerous other water resources reports were also reviewed for the prioritization analysis.

MEETINGS

Kickoff meetings were held in Anoka (July 31, 2019), Princeton (August 1, 2019), and Onamia, MN (August 3, 2019). Attendees were asked about qualities and characteristics valued in their community and natural environment, about major concerns and issues facing the natural resources in their community, and what strategies/future actions they think would best address challenges and achieve desired future conditions. These open-ended questions resulted in a wide range of comments to assist in the evaluation and summarization of priorities in the watershed [Freshwater, 2019]. Attendee comments included values and concerns around groundwater, surface water quality, Surface Water - Quantity, and natural resources, as well as strategies and considerations for social systems.

DATA COLLECTION

Reports

Meetings

Comment Letters

RESOURCE CATEGORIES

Emerging Issues

Groundwater

Leadership

Natural Resources

Quality of Life

Surface Water

Process

REPRESENTING

Values

Concerns

Strategies

3
Kick-Off Meetings

Emerging Issue (n.):
An issue that lacks the detailed information that is necessary to assess the current or imminent impact to the resources in the Rum River watershed.

Desired Future Condition (n.):

The long-term outcome or goal; the attributes (water quality, water availability, habitat quality), the partners are striving to attain, regardless of the time frame. The desired future condition (DFC) sets the direction for planning and future management. It should be described for priority water resources and reflect stakeholder interests.

OFFICIAL COMMENT LETTERS

Additionally, comment letters with priority concerns were collected from stakeholders and state agencies. Comments were received from the Minnesota Board of Water & Soil Resources (BWSR), the Minnesota Department of Agriculture (MDA), the Minnesota Department of Health (MDH), the Metropolitan Council (MetCouncil), Minnesota Department of Natural Resources (MNDNR), Minnesota Pollution Control Agency (MPCA), and the Nature Conservancy.

Issues, resources, and priorities gathered from all these documents, reports, comment letters, and kickoff meetings were coded as representing either a value, concern, or strategy. The values and concerns for each resource category were considered in drafting the issue statements. Strategies were considered later in the watershed management plan development process.

Issues were also classified by resource category and subcategory. Occasionally, an issue fell under multiple resource categories and was assigned to all appropriate categories. Categories included Emerging Issues, Groundwater, Leadership, Natural Resources, Quality of Life, Surface Water, and Process. Subcategories for each of these are listed in Tables 3.1 to 3.6 with the number of occurrences of each.

Figure 3.1: Bank erosion on the Rum River, image courtesy of the Sherburne County SWCD

Table 3.1: Surface water related comments tallied

Surface Water	COUNT
Altered Hydrology	33
Drainage System Management	21
Erosion and Sediment Control	66
Flooding and Floodplain	20
Protect Surface Water Resources	26
Stormwater Management	56
Surface Water Quality	**190**
Water Rate and Quantity	15
Other	18

Table 3.2: Leadership related comments tallied

Leadership	COUNT
Administrative Priorities	25
Collaboration	24
Financing	26
Maintenance	9
Policy and Regulation (Land Use Management)	**108**
Public Outreach	95
Stakeholder Involvement	43
Other	18

Table 3.3: Quality of life related comments tallied

Quality of Life	COUNT
Aquatic Consumption	10
Aquatic Recreation	**63**
Public Safety	7
Other	18

Table 3.4: Natural resource related comments tallied

Natural Resources	COUNT
Manage, Enhance, and Restore Habitat	**107**
Fish Habitat	16
Wetland Habitat	22
Upland Habitat	29
Invasive Species	44
Preserve Prime Farmland	11
Preserve Sites of High Ecological Value	45
Protect Soil Health	3
Other	18

Table 3.5: Groundwater related comments tallied

Groundwater	COUNT
Drinking Water Supply	28
Groundwater Quality	**29**
Groundwater Quantity	6
Infiltration and Recharge	8
Protect Groundwater Resources	25
Other	18

Table 3.6: Emerging issues related comments tallied

Emerging Issues	COUNT
Chlorides	8
Changing Climate and Resilience	19
Contaminants of Emerging Concern	11
Land Development and Changes	**70**
Reduce Pesticide and Fertilizer Impacts	34
Other	18

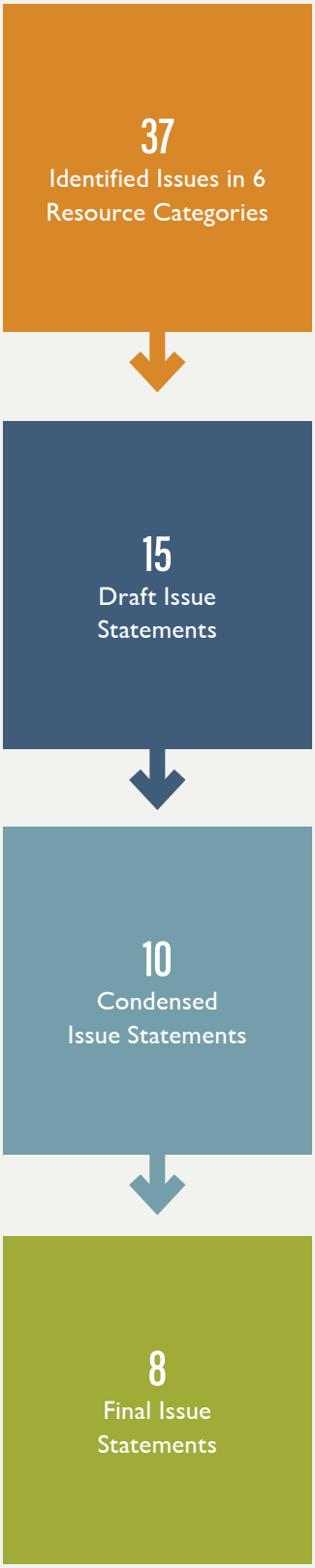


Figure 3.2

PRIORITY ISSUES AND ISSUE STATEMENTS

Fifteen draft issue statements were developed for the three resource categories and provided to the TAC in advance of their October 14, 2019 meeting. Of the fifteen statements, eight were for Surface Water, three were for Groundwater, and five were for Natural Resources categories. At the October 14 meeting, the TAC provided feedback regarding what they liked, disliked, and what needed to be changed or added to the draft issue statements. The draft issue statements were revised based on the feedback provided, ten issue statements were divided between the three categories with three for Surface Water, three for Groundwater, and four for Natural Resources, and were submitted to the TAC for review at the November 6, 2019 meeting where several small changes were made. The TAC merged the original 15 draft statements into eight condensed statements.

Issue statements were not developed for the Emerging Issues, Quality of Life, and Leadership resource categories. These categories are more relevant to address the issue statements for the physical resources (surface water, groundwater, and natural resources). Generally, where issue statements may be relevant for the Emerging Issues, Quality of Life, and Leadership categories, these issues are already addressed in the existing issue statements.

In prioritizing the issue statements, each was weighted against the others using a Q-sort process. In the Q-sort process, issue statements were presented in paper format, with one issue statement per sheet of paper. TAC members representing geographical areas worked together discuss, decide, and arrange on tabletops, the ranking of issue statements from most important to least important. The ranking scale only allowed for two potential options for most important issue and one option for least important. At the conclusion of the process, it was determined that there was general agreement of the priority ranking order of the issue statements. Minor adjustments were made to the ranking of the priority issues after the priority resources were identified and the implementation strategies and actions were developed. These adjustments were made to better align the priorities with the realities and constraints implementing the actions necessary to achieve measurable goals.

As the implementation tables were being developed, it was clear that a comprehensive and well coordinated outreach and engagement plan was critical to achieving plan goals. Therefore, outreach and engagement were added as a Priority Level A issue.

The issue statements were also grouped by priority level to indicate which priorities will be funded with BWSR watershed based implementation funding (WBIF) first; with Level A coming before Level B, which comes before Level C. Implementation actions that address multiple benefits for issues across all priority levels will be prioritized.

Table 3.7: Priority Issues and issue statements

Priority Level A	Issue Statement
Outreach and Engagement	The success of the entire Plan implementation will largely come down to how the local partnership engages with and involves local stakeholders, from residents to policy makers.
Surface Water - Restore (SW-R)	Lakes and streams are threatened or impaired due to excess pollution including E. coli, nutrients, chemicals, and sediment. These excess pollutants can cause low oxygen and eutrophication, impact aquatic life and recreational use opportunities, and degrade downstream resources.
Surface Water Protect (SW-P)	There are many high-quality water resources in the Rum River watershed that are threatened by changing land use, changes to the landscape that impact runoff and the ability for water to soak into the ground, and pollution. Protecting these high-quality resources from the threat of degradation is of primary concern.
Priority Level B	**Issue Statement**
Surface Water - Quantity (SW-Q)	Human-caused changes to the landscape have modified flow rate, volume, and water storage causing flooding, streambank erosion, and low base flow. This risk may be compounded because of a changing climate.
Groundwater - Drinking Water and Groundwater Quality (GW-Q)	Groundwater and drinking water quality are negatively impacted by human actions, including manure and nitrogen fertilizer application, use of chlorides from salt, land management, non-compliant septic systems, pesticides, and contaminants of public health concern.
Natural Resources - Protection, management, and restoration of upland habitat (NR-U)	Habitat is critical for wildlife, water quality, and quality of life. Existing habitat areas have been, or are at risk of being reduced in size and quality due to fragmentation, pollution, invasive species, intensifying land use, and lack of management. Habitats with high ecological value, particularly those that provide habitat for rare and endangered species, should be protected. Degraded habitats should be restored, especially when water quality benefits could also be achieved.
Priority Level C	**Issue Statement**
Natural Resources - Restore degraded and protect high quality aquatic habitat in and around lakes, streams, rivers and wetlands. (NR-A)	Aquatic habitats are threatened by increased frequency and volume of precipitation, increasing pollutant loads, excess sediment, degraded shoreline, and barriers to fish passage. Degraded aquatic habitats should be restored and high-quality habitats protected, especially when water quality benefits can also be achieved.
Groundwater - Knowledge and Data Regarding Groundwater (GW-KD)	There is not enough awareness or understanding of groundwater quantity or quality. More information is needed to protect vulnerable areas and provide local governments and communities with the information needed to act.
Natural Resources - Invasive Species (NR-IS)	Invasive species threaten the health and quality of upland, wetland, shoreland, and aquatic ecosystems. Their spread needs to be prevented and existing infestations controlled to mitigate their impacts.

What are contaminants of emerging concern (CECs)?

These contaminants include pharmaceuticals, personal care products, and laboratory-derived chemicals. These contaminants can make their way into surface waters and groundwaters and pose a threat to plants, animals, and humans.

EMERGING ISSUES

This Plan is based on data, knowledge, and evaluation that was current at the time the Plan as developed. However, emerging issues may require a shift in focus or may influence the implementation plan priorities and actions. There were five general categories of emerging issues that were identified in the aggregated data (Table 3.8). Three emerging issues, chlorides, contaminants of emerging concern and pesticide and fertilizer impacts were deemed to be priorities. However, these issues lack sufficient data to assess the extent and nature of the problem and are beyond the authorities or resources of the Partnership to investigate. The Partnership will invite state agencies responsible for monitoring these emerging concerns to provide updates and recommendations to the IPC. The IPC will develop recommended actions and work to quickly adapt implementation actions to address new concerns as needed.

The Partnership integrated action items that address a changing climate and land development throughout the implementation tables. These action items include establishing flood forecasting stations, establishing flow monitoring stations, implementing water storage projects, and seeking to adopt development standards that minimize stormwater impacts and preserve natural areas.

PRIORITY EMERGING ISSUES

- Chlorides
- Contaminants of Emerging Concern
- Pesticide and Fertilizer Impacts

Table 3.8: Priority emerging issues

Emerging Issues	Count
Chlorides	8
Changing Climate and Resilience	19
Contaminants of Emerging Concern	11
Land Development and Changes	70
Reduce Pesticide and Fertilizer Impacts	33
Other	1

CHAPTER 4.0

Priority Issue Goals and Implementation

4.0 Priority Issue Goals and Implementation

INTRODUCTION

Once the priority issues were established, a framework for each issue was developed that includes the issue statement, desired future condition, goal with associated measurable outcome, strategies, priority resources, maps, and the targeted implementation schedule. This schedule details what actions will be taken when, by whom, the estimated costs, and whether outside funding is necessary to implement the action.

The process that was used to develop the implementation schedule began with first identifying strategies to address issues which were then expanded into detailed actions. A comprehensive list of implementation actions was assembled for each issue statement. The Partnership members for each GMZ worked together to select the implementation actions that were suitable for each priority resource. Implementation action items for Surface Water - Restore and Surface Water Protect that are included in a subwatershed assessment (SWA) or similar study are grouped together as one action item rather than listed individually. The Planning Team led the development of consistent costs, descriptions, and reporting outcomes. Each Partnership member estimated the level of effort and 10-year plan outcome for each action item based on their current level of effort and potential for future funding.

Cost estimates are presented in 2021 value and will be updated to reflect the current costs during the development of the annual workplan. Unless otherwise noted, on-the-ground implementation actions include the costs for project specific technical assistance, design, permitting, easements, landowner contribution, and other direct project related costs.

As the Partnership moved through the process of developing and refining the implementation tables, it became increasingly evident that outreach and engagement action items needed to be elevated from a program element that was part of a larger activity to a coordinated program that is cohesively delivered. Therefore, a comprehensive outreach and education plan with associated outcomes and implementation table have been developed and are presented before the surface water, groundwater, and natural resource priority issue goals and implementation tables.

Priority Issue Quick Reference Guide

Priority Level A

Priority Level B

Priority Level C

Plan Administration

FUNDING HIERARCHY AND TARGETING

The issues and resources that have been prioritized for this Plan are the guideposts for implementation actions. For instance, actions that address the Tier 1 priority issues of Surface Water Protect and restoration will be accomplished first in most cases and with WBIF when available. Tier 1 priority resources will be addressed before Tier 2 or Tier 3 resources. Even so, additional prioritization will need to occur during the plan implementation. The Partnership will use the following criteria to select implementation actions on an annual planning basis.

- Project readiness
  - Has a diagnostic study or subwatershed analysis been completed?
  - Is there a willing landowner and/or local buy-in?
  - Is there capacity to do the work?
- Obtains multiple benefits, including non-top priority items
- Supports high priority outputs that accelerate implementation actions
- Addresses a priority site as identified by the diagnostic study or subwatershed analysis
- Cost/benefit analysis completed and supports investment
- Riskiness of investment/likelihood of success
- Degree to which the action moves needle towards 10-year goal

A generalized example of prioritizing implementation actions is as follows:

- Tier A: Outreach, Soil Health, Wetland Restorations, forest health, prioritization and diagnostic studies, lake and stream BMPs
- Tier B: Shoreline BMPs
- Tier C: SSTS, Invasive Species, Dam Modification

The site-specific locations for many of the implementation actions in Surface Water - Restore and Surface Water Protect have been or will be identified in the subwatershed assessments or similar studies. Site specific locations for other actions will be determined through existing or planned studies, applying GIS analysis to identify suitable sites, or through input from state agencies, conservation organizations, and local partners. For example, locations for stream restorations will be determined during Phase 2 of the MPCA intensive watershed monitoring scheduled for 2024, priority locations for wetlands will be identified using existing tools complimented by local data, and drainage projects will be identified in multipurpose drainage management plans. Studies and other prioritization processes that will be undertaken during the 10-year plan are listed in the implementation tables.

Dam Modification: (v.):

For the purposes of this plan, this definition refers to changes, not necessarily including removal, to existing water structures like dams, spillways, and culverts. These projects are often done to improve native fish passage or deter invasive species passage.

Outreach + Engagement Program

PURPOSE + PRINCIPLES

The success of the entire Plan implementation will largely come down to how the local partnership engages with and involves local stakeholders, from residents to policy makers. The purpose of this engagement plan is to provide guidance to the local partnership on how to best approach engagement—work that will ultimately result in relationships and buy-in that supports behavior change and implementation of priority actions, now and in future years. This engagement plan has been drafted based on input of participants throughout the planning process and is framed around the following core principles:

- Focus locally to support watershed improvements.
- Ensure people impacted by an issue are included in the decision-making process.
- We all have something to contribute and something to learn, and sharing that knowledge is important as we work towards a shared understanding of the challenges, opportunities, and steps we can take to benefit the health of the watershed.
- All participants in the decision-making process are accountable for contributing resources to solve the problem—this could include time/energy, knowledge, connections, and/or capital.
- Decisions are made transparently—even if people are not directly involved in the decisions being made, there is clear understanding of the process or criteria used before and after.
- All participants in the decision-making process are responsible for producing plans that they have the authority to act on and evaluating the outcomes of their actions in light of the common good.
- The approach and the ways engagement happen can evolve over time as new understandings emerge.

Behavior Change:

Social psychology which indicates that initiatives to promote behavior change are often most effective when they are carried out at the community level and involve direct contact with people. There is a growing understanding that programs that rely exclusively on media advertising can be effective in creating public awareness and understanding of issues related to the natural resource protection, but are limited in their ability to foster a change in current behavior that would result in the taking of action needed to effectively implement this plan. Behavior change is applicable to many aspects of life. As it applies here, the education and outreach plan is designed to promote landowners discovering new technology and processes that allow for wiser and sustainable management of natural resources.

ISSUE STATEMENT

The success of the entire Plan implementation will largely come down to how the local partnership engages with and involves local stakeholders, from residents to policy makers.

GOAL

Increased awareness of watershed issues, a greater sense of community support, and expanded technical resources will translate to more active resource stewardship.

MEASURABLE OUTCOME

Hiring and maintaining the positions detailed in the outreach plan, conducting 10 outreach efforts every biennium, engaging at least 25 new stakeholders or groups in the implementation of the plan over the 10-year plan period, and producing one annual outreach report.

Figure 4.1: Engagement meeting

GENERAL APPROACH

The Plan has already identified priority issues and priority locations. In most cases, it is also clear who needs to be involved in implementation, such as farmers, lakeshore residents, policy makers, or urban residents. As such, outreach will be targeted to:

- Prioritize engaging particular populations in the watershed, including those who will be relied upon as partners in implementing plan priorities and those who will be impacted by decisions.
- Prioritize engagement in particular areas of the watershed as identified in the implementation table.

This outreach will need to focus both on priorities in the current year as well as on building relationships necessary for success in future years, as it can take time to build the buy-in necessary to move someone from a prospective partner to a committed partner. For this reason, this engagement plan focuses on three types of outreach which will engage stakeholders in different ways in order to meet the diverse needs of the watershed partners.

OUTREACH AND ENGAGEMENT TYPES

Type A: Outreach and engagement which supports raising awareness and behavioral change

Not everyone in the watershed may be aware of current issues impacting water in their area, and as a result may not be inclined to take new actions or shift behaviors in a way that protects and improve water quality. Directing outreach efforts toward educating the public about watershed issues may help improve stakeholder awareness and lead to public activation and, where needed, behavioral change. This type of outreach means creating consistent watershed-wide messaging, which all partners can use when targeting particular strategies and areas. The focus here will be based on annual priorities as established by the IPC and include a holistic ecosystem approach to watershed management.

Type B: Outreach and engagement which supports community organizing and community buy-in

While the dissemination of information is vitally important to achieve an educated populous, people rarely base their decisions or behaviors on new information alone. Therefore, outreach which works to build community relationships and a sense of ownership or investment is also important to getting Plan actions implemented. This type of outreach involves staff getting out in the community and forming authentic relationships with stakeholders who may be relied upon as partners to help work toward plan objectives. Forming such relationships builds trust, not only in the plan process, but in government-citizen relations which may last far beyond the life of the Plan.

Type C: Outreach and engagement which supports technical assistance and project development

For a stakeholder to take certain types of actions, greater technical knowledge or skills may be required. Technical assistance and project development staff may engage in outreach to assist stakeholders in installing an appropriate BMP, or they may be the ones to conduct a septic assessment on a stakeholder's property. This type of outreach may be the work of existing LGU staff as they implement specific actions from the plan.

These three methods of outreach and engagement are all important and necessary to achieve the goals in the Plan. However, since not all members of the planning partnership have the funding or staff capacity necessary to effectively engage in these types of outreach, there is a need to fund additional staff time. The following section outlines staff to be hired or further funded in various areas of the watershed to support the different types of outreach, and the primary roles these staff will play.

OUTREACH STAFF + ROLES

Type A: Outreach staff who will support raising awareness and behavioral change:

Who will do this work?

Existing LGU staff, and further funding for outreach staff time to support this work

Primary roles of Type A outreach staff:

- Develop creative, engaging programming and materials that can be distributed to all local staff involved with engagement, working with them to refine materials based on stakeholder input and local needs.
- Create a catalog of stories sharing personal narratives about projects implemented across the watershed.
- Write and distribute periodic communications sharing success stories, resources, and other information for both the general public and tailored to specific audiences.
- Promote and host informational workshops, seminars, and other activities for the public to encourage behavioral change that accomplishes the Plan goals.
- Compile annual reports which assess progress on implementing the strategic engagement framework with local staff in the watershed.

What is a Landscape Stewardship Plan?

The USDA Forest Service recognized the extensive threats to the nation's forests and the ecosystem services they provide. They developed a vision for landscape scale conservation to address these threats. In Minnesota, the MNDNR and BWSR have teamed up with local partners and watershed groups to develop watershed based landscape stewardship plans in forested areas of the state, including the Rum River Watershed.

Source: Rum River Watershed Landscape Steward Plan, MN BWSR, 2020.

Type B: Outreach staff who will support community organizing and community buy-in:

Who will do this work?

Hire a forestry coordinator and direct outreach and engagement coordinator based in Mille Lacs County. The coordination approach will use direct outreach and community organizing to foster community co-creation and implementation of solutions. The coordination role will also support and collaborate with existing LGU staff.

Primary roles of Forestry Coordinator:

- Work to build relationships with stakeholders in the watershed to promote and help with implementation of forestry actions.
- Implement the Rum River Watershed Landscape Stewardship Plan

Primary roles of Direct Outreach and Engagement Coordinator

- Collaborate with planning partnership to identify priorities for each year considering targeted outreach needed now in order to be successful in future biennia.
- Work to build relationships with appropriate staff members in each county in the watershed and support them in enhancing engagement within their own areas through co-designed solutions.
- Work to build relationships with key stakeholders in the watershed who are interested in partnering to design and implement strategies that can address plan priorities.
- Work with identified key stakeholders to reach others in their networks, refine communications language, and identify practices they are interested in that can lead to water and natural resources improvement.
- Provide civic leadership development support to the key stakeholders who will help lead engagement in partnership with local staff.

Type C: Outreach staff who will support technical assistance and project development:

Who will do this work?

Existing LGU staff, along with support from forestry coordinator for forestry related projects

Primary role of Type C outreach staff:

- Provide technical assistance to stakeholders once they begin to implement plan actions.

While there are three distinct types of outreach identified in this plan, the staff supporting the work of each type shouldn't be expected to operate in silos. All three types of outreach staff identified above will need to work together and share resources in order to maximize their collective reach in disseminating information, building buy-in, and supporting stakeholder implementation of the plan actions.

TIMELINE

Many of the actions prioritized for the first two years were chosen because of existing relationships and local interest, including the presence of willing landowners. While directed engagement to identify new projects for the first two years will not be as much of a priority, there will be work needed to begin laying the foundation for years 3 – 10 of the plan. For the first two years, local staff should anticipate working on the following tasks:

- Create and support the new outreach staff positions
    - Manage the hiring processes for the new outreach staff
    - Onboard the new outreach staff hires
        - » Introductions to planning partnership staff
        - » Familiarization with the principles of the engagement plan and Plan
        - » Refinement of their annual work plans for first two years
- Coordinated communications across the planning area until the new outreach hires are up to speed
- Stakeholder identification and early relationship-building efforts
- Capture local success stories
- Move outreach forward to implement plan actions as appropriate for years 1-2

It is anticipated that after the new outreach staff are hired, they will work with existing local staff to develop a more fine-tuned work plan. This should include learning from, and being informed by, local staff members' knowledge about what has worked well (and not) in their areas.

OUTREACH AND ENGAGEMENT STRATEGIES BY TYPE

Over the course of the planning process, a multitude of suggestions were given as to how to engage the public during plan implementation. Since the actual design of engagement processes or techniques will be set by stakeholders and outreach staff during the implementation of the plan, high-level categories of engagement options are listed below to provide a place for LGUs to start their outreach work. It is anticipated that through conversations with stakeholders more ideas for engagement will be added (and some may not be used).

The following tables highlight potential outreach strategies based on the different types of outreach identified in this plan.

Type A: Outreach strategies to support raising awareness and behavioral change

A key part of the planning process included gathering comments and feedback from stakeholders about strategies they believe would be effective in implementing the Plan. Table 4.1 includes verbatim stakeholder comments suggesting ways that LGUs could effectively share information with and engage the public, thereby raising awareness about watershed issues and promoting action and behavioral change.

Table 4.1: Stakeholder comments

Type A Outreach Strategies	Potential Measurable Outputs Which Could Be Used To Track Type A Strategies:
Make up literature to send out to home owners, put on city newsletters and webpages, county fairs	# of events held # of participants/project partners identified # of messages created # of assessments # of teachers and classrooms engaged # of publications written # of fundraisers # of meetings attended # of workshops and seminars given Membership and activity increases for citizen led groups including Friends of the Rum River, lake groups, or others Targeted activities to increase their role advising plan implementation; diversify membership to include citizens, LGUs and industry; raise funds; and advocate for plan goals
Provide clear and accessible educational resources. Conduct city-wide conservation seminars.	
Participate in meetings: city councils, League of Women Voters, other organizations, Chamber of Commerce	
Provide focused educational outreach – proper ice salt distribution and fertilizer use, for starters	
Education and data collection of work/studies already accomplished and discussion creating ideas	
Engage teachers to include natural resource topics in their classrooms	
Adapt education to the educated - teach at a level that applies	
Being open to public opinion regarding custom implementation of solutions that would solve a local problem	
Distill data and analytics down to digestible communication	
Have fund raising events to minimize cost to tax payers	
More education or encouragement for lakes to form citizen initiated organizations	
Develop a watershed-wide program to assist landowners to make small steps/ projects with improvements to water quality/nutrient reduction and loading	
Encourage and help landowners solve their own local natural resource issues and helping them implement their own solutions to their property issues/problems. Letting people "own" their own solutions.	
Outreach and support citizen led groups that do input gathering and decision-making around resource goals.	
Provide education on prevention of groundwater contamination.	
Conduct shoreline restoration outreach and awareness campaigns.	
Develop outreach message about forestry management practices that improve habitat targeted to local foresters and local communities.	

Type B: Outreach strategies to support community organizing and community buy-in

Table B includes strategies which may help to build buy-in, collaboration, and partnerships with stakeholders. These strategies would primarily be carried out by the hired forestry coordinator and direct outreach coordinator as described in the "Outreach Staff + Roles" section.

Table 4.2: Outreach strategies

Type B Outreach Strategies	Potential Measurable Output
Identify who (which people or particular populations) are needed to support an idea/ need in the community. These would be people who can do something the LGU cannot do.	# of new potential partners
Confirm who identifies with the need for the proposed strategy (these may be your key stakeholders)	# of stakeholders who agree with the need for the strategy and/or # of stakeholders who will take the next step and plan to contribute time, knowledge or money toward the strategy and keep in touch
Meet regularly to support ongoing work of interested stakeholders	# of stakeholder group meetings that have a recurring format (demonstrates an ongoing relationship)
Identify strategic role for ALL (LGUs role & the key stakeholders contributions)	# of contributions by stakeholders (excluding public funding—contributions could be $, hours, or other stakeholders they identify who are willing to contribute)
Track progress with your key stakeholders	# of stakeholders (other than the LGU) contributing to outreach or implementation

Type C: Outreach strategies to support technical assistance and project development

Table 4.3 includes strategy suggestions that emerged through the planning process from the Partnership's TAC and Policy Committee. These strategies relate to support and technical aid for stakeholders trying to carry out actions in the plan, and may include strategies which could be supported by the Type A and Type B outreach staff in order to work towards plan implementation. Additionally, the suggested strategies are split up by issue area.

Table 4.3: Outreach strategies

Associated Issue Area	Type C Outreach Strategies	Potential Measurable Output
Surface Water	Conduct outreach and offer resources to help farmers with agricultural BMPs. This may include soil health initiatives, cover crops, perennial cover, WASCOBs, participation in EQIP, nutrient and animal waste management and other BMPs.	# of farms using BMPs # of farmers engaged # of events held # of ordinances updated # of participants/project partners identified # of comprehensive nutrient management plans created # of acres under comprehensive nutrient management plans # of feet of shoreline restored # of acres under fertilizer management plans # of testing clinics # of operations certified # of assessments
	Conduct outreach to keepers of small numbers of animals that are not subject to feedlot rules to encourage voluntary BMPs.	
	Promote the restoration of shorelines and work with shoreline property owners to maintain natural riverbank/shoreline vegetation and structure.	
	Encourage installation of perennial vegetation buffers and filters for private ditches, including during ditch cleaning/maintenance projects.	
	Promote sustainable agroforestry practices	
	Raise awareness about the impact of road salt on freshwater resources with an aim to minimize its use	
	Ensure recent precipitation data is used by promoting the use of Atlas 14: NOAA (or successor) precipitation frequency estimates.	
	Provide septic assessments (on lakes) and education for better compliance	
	Protect existing wetlands by providing targeted outreach to specific audiences to prevent violations	

Table 4.3 (Continued): Outreach strategies

Associated Issue Area	Type C Outreach Strategies	Potential Measurable Output
Groundwater	Support using land use planning tools or passage of ordinances that improve protection in prioritized areas and infiltration practices where suitable.	# of farms using BMPs # of farmers engaged # of events held # of ordinances updated # of participants/project partners identified # of comprehensive nutrient management plans created # of acres under comprehensive nutrient management plans # of feet of shoreline restored # of acres under fertilizer management plans # of testing clinics # of operations certified # of assessments
	Conduct outreach and offer technical and financial assistance to producers in prioritized areas to encourage BMP installation.	
	Encourage cover crops and other BMPs to reduce nitrate loss to groundwater.	
	Provide a suite of manure spreading recommendations and technical assistance for livestock owners of all sizes.	
	Conduct outreach and offer technical and financial assistance to golf course operators in prioritized areas to encourage BMP installation.	
	Conduct education and outreach programs on conservation irrigation with irrigators.	
	Conduct education and outreach programs to homeowners on septic system operation and maintenance.	
	Host well testing clinics.	
Natural Resources	Conduct outreach and awareness campaigns about the control and reduction of existing invasive species, both aquatic and terrestrial.	
	Conduct noxious weed certification and outreach regarding cleaning of construction equipment between work sites.	
	Build buy-in and interest in the Forest Stewardship Plan and Forest Stewardship Council certification.	

Table 4.4: Outreach and Education Implementation Table

Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas													
Target Outreach and Education to Priority Waterbodies	Provide Outreach and Education to Address Watershed Priority Issues and Goals	Fund Positions to Provide Watershed Wide Outreach Coordination, Forestry Stewardship Coordination, and Provide Local Outreach Support	Hire and Maintain Positions Detailed in the Outreach Plan Conduct 10 Outreach Efforts Such as Events, Publications, Videos, Personal Communications to a Target Audience, or Other Outreach Efforts (Every 2 Years) At Least 25 New Stakeholders or Groups Engaged in Plan Implementation Through Partnership with LGU (Over 10 Years) One Outreach Report (Annually)	Education + Outreach	●	●	●	●	●	$2,034,000 ($380,000 per biennium in wages and related + $26,800 per biennium in supplies and consultants)	✓	SWCDs	

KEY

- Below $50K
- $51K - $75K
- >$75K - $150K
- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

Rum River Comprehensive Watershed Management Plan

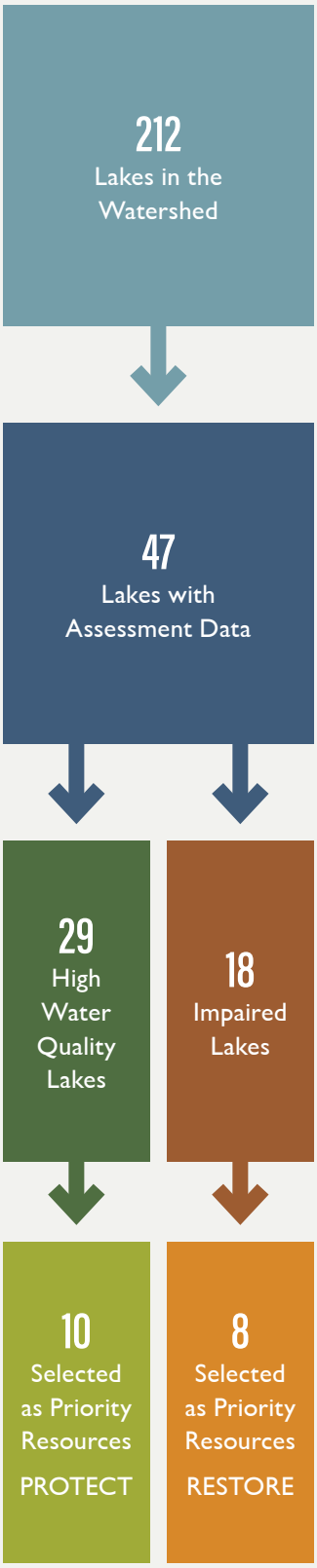


Figure 4.2: Selection for protect and restore lakes

SURFACE WATER QUALITY PRIORITIZATION

The process for identifying priority restore and protect lakes and streams was conducted simultaneously. Therefore, the prioritization process is presented before issue statement frameworks and the implementation table.

IDENTIFYING AND EVALUATING CANDIDATE LAKES

There are 212 lakes greater than 10 acres in size within the Watershed. Forty-seven of these lakes have enough data that the MPCA and MNDNR have completed an assessment of each lake's sensitivity to phosphorus and have predicted total phosphorous (TP) loading and load reduction goals. Since these 47 lakes had a sufficient level of baseline information available to evaluate, they were deemed eligible for prioritization. Two sets of metrics were evaluated to prioritize lakes. The first set of metrics are based on physical characteristic and the second is based on professional knowledge.

Physical Metrics

- Lake size to drainage area
- Lake watershed land use disturbance
- Lake phosphorus levels as compared to the water quality standard
- Percent deviation from the standard mean for Phosphorus (P)
- Phosphorus sensitivity (the lake's vulnerability to having reduced transparency with increased phosphorus levels)
- Water clarity trend
- Biological significance
- Public access (based on number of ramps and parking spaces)
- Connectivity (based on number of prioritization lakes upstream and downstream of each lake)

Professional Knowledge Metrics

- Momentum towards the goal
- Local support
- Political support
- Readiness

The average score for the seven physical metrics and a percent rank for the average score for the four professional knowledge metrics were averaged. The average was used to rank the lakes. The 47 lakes were categorized according to impaired restore or unimpaired protect status. The ranking scores for each lake were averaged and then ranked against the lakes in their respective restore or protect category.

IDENTIFYING AND EVALUATING CANDIDATE STREAMS

There are 43 assessed stream reaches in the Watershed. However, these streams typically lacked the robust datasets that are useful for evaluating and ranking according to metrics. Therefore, baseline information and resource characteristics were summarized and then the TAC used this information to evaluate candidate stream reaches.

The ten restore stream reaches included impairments due to excessive E. coli, elevated nutrients, or low dissolved oxygen. The information assembled to evaluate and rank the stream reaches included identification of downstream priority lakes and rivers, especially if an impaired reach flowed directly into a priority high-quality lake or unimpaired assessed stream reach; if the streams had multiple pollutants; known stressors for biological impairments to better target restoration efforts; and, if there already were restoration strategies that had been identified in the WRAPS.

For protection streams, the TAC adopted the priority ranking for 18 stream reaches in the Watershed that was developed by the MPCA in collaboration with the MNDNR, BWSR, MDH, and MDA. The ranking quantified the protection priority of streams based on risk and protective factors in the riparian and watershed areas, as well as the quality of the biological community. This analysis makes the connection between land disturbances, existing land that is already protected, and water quality to identify what streams are at greatest risk of becoming impaired. Since the identification of these streams is based on land risk or protection status, the location of these streams is useful in targeting protection efforts. In addition to this ranking, priority status was automatically assigned to any stream that is upstream from a lake that was determined to be a priority.

SELECTION OF PRIORITY LAKES AND STREAMS

After candidates were identified and ranked based on selected metrics across the entire watershed, the TAC prioritized resources on a GMZ basis. Working with TAC partners within the same GMZ, members evaluated each candidate resource according to the considerations listed below. If more than one lake or stream resource was identified as a priority, the resources were then ranked in priority order. GMZ work groups also could request a resource be elevated to a watershed-wide priority. During this process, Ford Brook and Prairie Creek were added to the list of protection streams because of local priorities, increasing land use pressure, and pending subwatershed assessments. The results of this process are provided according to issue statement in the following two sections.

SCREENING CRITERIA TO PRIORITIZE CANDIDATE LAKES AND STREAMS WITHIN GMZS

How achievable is it to meet the goal or to make meaningful progress in 10 years?

- Has this resource been assessed or studied already and identified as a priority?
- Is this a priority resource for a study yet to be completed?
- Is there local interest and support from community members or partner groups for addressing this resource already?
- Are there anticipated threats to the resource within the next 10 years?

Figure 4.3: Selection for protect and restore streams

Surface Water - Restore (SW-R)

DESIRED FUTURE CONDITION

Lakes and streams meet or exceed water quality standards (except mercury, which is being addressed at the state-wide level).

MEASURABLE OUTCOME

Reduce total phosphorus (TP) loading to priority waterbodies by 2,500 pounds over the life of the Plan.

ISSUE STATEMENT

The lakes and streams are threatened or impaired due to excess pollution including E. coli, nutrients, chemicals, and sediment. These excess pollutants can cause low oxygen and eutrophication, impact aquatic life and recreational use opportunities, and degrade downstream resources.

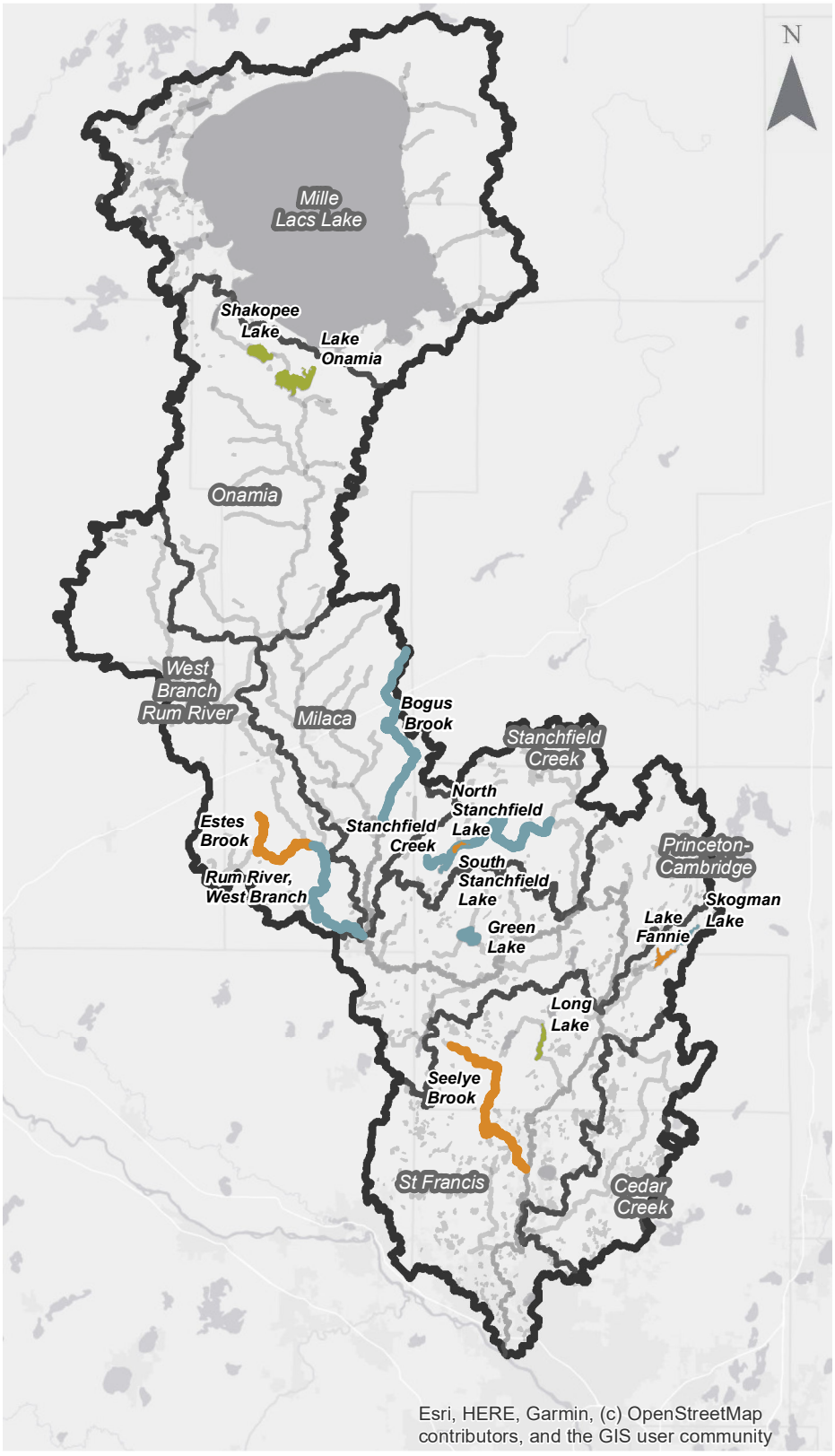
GOAL #1

Improve the water quality of impaired lakes and streams.

Table 4.5: Prioritized resources for implementation activities

Tier	Lake	Management Zone
1	Green*	Princeton-Cambridge
	Skogman	St. Francis
	South Stanchfield	Stanchfield Creek
2	Fannie	St. Francis
	North Stanchfield	Stanchfield Creek
3	Onamia	Onamia
	Long	St. Francis
	Shakopee	Onamia
Tier	**Stream**	**Management Zone**
1	West Branch Rum*	West Branch Rum
	Bogus Brook*	Milaca
	Stanchfield Creek	Stanchfield Creek
2	Estes Brook	West Branch Rum
	Seelye Brook	St. Francis

*Watershed-wide priority



KEY

- Public Watercourse
- Watershed
- Management Zones
- Public Water Basins
- Tier 1
- Tier 2
- Tier 3

Figure 4.4: Priority restore lakes and streams

Table 4.6: Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (See Table 4.6)											Actions in All Priority Areas (See Table 4.5)			
SW-R.1	Target Priority Restore Waterbody Subwatershed Areas	Build Staff Capacity	Build Staff Capacity to Design and Implement Agricultural Practices (Training, Joint Approval Authority (JAA), Funding)	Staff with JAA in 3/4 of Isanti, Mille Lacs, Benton, Morrison Counties/SWCDS		●					$20,000	✗	JPE	
SW-R.2	Target Priority Restore Waterbody Subwatershed Areas	Restore Wetlands	Implement Wetland Restoration and Wetland Banks Identify and Prioritize Sites Using the Restorable Wetland Prioritization Tool (www.wetlandrestore.org) and Other Local Data	60 Acres of Restored Wetlands Across all Issue Statements Excluding Onamia Zone		●	●	●	●	●	$480,000*	✓	SWCDs	Counties USFWS TNC BWSR
SW-R.3	Target Priority Restore Waterbody Subwatershed Areas	SSTS Fix Up	Fund Replacement or Repair of Septic Systems for Low Income or Other Disadvantaged Owners	30 SSTS Upgraded in Riparian Areas and those that have Direct Contribution to Priority Waters		●	●	●	●	●	$420,000*	✓	SWCDs or Counties	MPCA
SW-R.4	Target Priority Resources	Collaborate with MNDNR Clean Water Team	Meet with the MNDNR Clean Water Team and other applicable MNDNR staff to Review Stream and River Projects to Determine if Condition is Localized or has Water Quality Impact (Applies for Streams Only)	As Needed When Stream Projects are Being Considered		●	●	●	●	●	$1,000	✗	SWCDs/ WMOs or Drainage Authorities	MNDNR
SW-R.5	Target Priority Resources	Drainage System Management	SWCD/WMO Provides Input on Public Ditch Projects Early in the Process	Established SWCD Notification Protocol in Each County		●	●	●	●	●	$10,000	✗	SWCDs/ WMOs	Drainage Authorities
SW-R.6	Target Priority Restore Waterbody Subwatershed Areas	Soil Health	Implement Soil Health Practices Including Tillage and Residue Management, Cover Crops, and Perennial Crops	1,000 Acres		●	●	●	●		$140,000 *	✓	SWCDs	NRCS TNC MDA

KEY

- Below $50K
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- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Rum River Comprehensive Watershed Management Plan

Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (See Table 4.6)											Actions in All Priority Areas (See Table 4.5)			
SW-R.7	Target Priority Restore Waterbody Subwatershed Areas	Establish Discovery Farm Sites	Establish Discovery Farms Sites to Monitor Edge-Of-Field TP, N, and Chloride Losses	2 Sites Established			● ●	●	●		$88,000	✓	SWCDs	MDA
SW-R.8	Target Priority Restore Waterbody Subwatershed Areas	Compare Regulatory Approaches Across LGUs and Recommend Updates for Watershed Level Consistency	Encourage Adoption of Development Standards that Minimize Stormwater Runoff and Preserve Natural Areas	Comparison Study and Policy Committee Recommendations to LGUs			●				$5,000	✓	JPE	IPC
SW-R.9	Watershed Wide	Compare Regulatory Approaches Across LGUs and Recommend Updates for Watershed Level Consistency	Regulatory Comparison for Zoning Regulations such as Shoreline Ordinances	Comparison Study and Policy Committee Recommendations To LGUs			●				$5,000*	✓	JPE	IPC
SW-R.10	Locations determined from WRAPS - See Figures 5.11 and 5.12	Water Quality Monitoring	Collect Water Quality Parameters Every 3rd Year, Monitoring Each Priority Restoration Waterbody And Rum River. See the Rum River WRAPS for Recommended Rum River Monitoring Sites and Methodology Monitor at Least Every 3rd Year when Water Quantity Monitoring Occurs	3 Years Monitoring			●	●		●	$141,000 *	✓	SWCDs	MPCA Met Council
SW-R.11	Priority Locations Determined from 2024 Intensive Watershed Monitoring Study, MNDNR Input, and Field Investigation	Restore Meandering Channels for Streams and Ditches	Restore Natural Channel Patterns, Profiles, Cross Sections, and Stability in Altered Watercourses	1 Project or 0.75 Miles of Stream Restored					● ● ● ●		$1,000,000*	✓	SWCDs	MNDNR

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Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Onamia														
SW-R.12	Shakopee Lake (Tier 3) Onamia Lake (Tier 3)	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments (or Similar) to Prioritize Water Quality Improvements	1 Study Completed	Studies + Data			●			$5,000	✓	MLBO	SWCD
SW-R.13		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	4 Lb TP Reduction	On-The-Ground Implementation Education + Outreach				●	●	$80,000	✓	SWCD	MLBO
SW-R.14		Complete Scientific and Prioritizing Studies	Complete Diagnostic and Targeting Studies to More Accurately Quantify P Loading from Tributaries and Wetlands, Reductions Needed, and/or BMP Locations	1 Study Completed	Studies + Data					●	$25,000	✓	MLBO	SWCD
Milaca														
SW-R.15	Bogus Brook (Tier 1)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.25 Mile Buffers Installed at 16.5' Wide Average on Both Sides Of Ditch, Or 1 Acre	On-The-Ground Implementation Technical Assistance Education + Outreach	●	●				$10,000	✓	SWCD	
SW-R.16		Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments (or Similar) to Prioritize Water Quality Improvements	1 Study Completed	Studies + Data		●				$30,000	✓	SWCD	
SW-R.17		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	4 BMPs	On-The-Ground Implementation Technical Assistance Education + Outreach			●	●●		$100,000	✓	SWCD	

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- Technical Assistance
- Education + Outreach

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Rum River Comprehensive Watershed Management Plan

Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
West Branch Rum River														
SW-R.18	Estes Brook (Tier 2)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.25 Mile Buffer Installed at 16.5' Wide Average on Both Sides of Ditch, Or 1 Acre		●	●				$10,000	✓	SWCD	
SW-R.19		Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments (or Similar) to Prioritize Water Quality Improvements Including Feedlot Best Practices	One Study Completed for Either West Branch or Estes Brook (Impaired Reach)				●			$30,000	✓	SWCD	
SW-R.20	West Branch Rum River - Upper (Tier 2)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	4 BMPs					●	●	$100,000	✓	SWCD	

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*Costs included across multiple issue statement implementation action items.

Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost Total for 10-year plan period	Is outside funding necessary to meet goal? Over and above local contribution	Lead Entity	Supporting Entities
Stanchfield Creek														
SW-R.21	South Stanchfield Lake (Tier 1)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.5 Mile Buffer Installed at 16.5' Wide Average on Both Sides of Ditch, or 4 Acres		●	●	●	●	●	$34,200	✓	Isanti SWCD	Isanti County
SW-R.22	North Stanchfield Lake (Tier 2)	Install BMPs From Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	South Stanchfield: 55 Lb TP Reduction North Stanchfield: 29 Lb TP Reduction				● ●	● ●	● ●	$300,000	✓	Isanti SWCD	Isanti County
SW-R.23	Stanchfield Creek - Upper (Tier 1)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.25 Mile Buffer Installed at 16.5' Wide Average on Both Sides of Ditch, or 2 Acres		●	●	●	●	●	$14,200	✓	Isanti SWCD	Counties
SW-R.24		Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed for Stanchfield Creek (Impaired Reach)					●		$20,000	✓	Isanti SWCD	
SW-R.25		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Stanchfield Creek (Upper): 20 Lb TP Reduction						● ●	$100,000	✓	Isanti SWCD	
SW-R.26		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans	1 MDM Plan					●		$10,000	✓	Isanti SWCD	Isanti County Ditch Authority
SW-R.27		Drainage System Management	Install Projects Identified in MDM Plan	1 BMP						● ●	$100,000	✓	Isanti SWCD	Isanti County Ditch Authority

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- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Rum River Comprehensive Watershed Management Plan

Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Princeton-Cambridge														
SW-R.28	Green Lake (Tier 1)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	Green Lake: 300 Lbs TP Reduction		●	●	●	●	●	$1,500,000	✓	Isanti SWCD	Green Lake Improvement District
SW-R.29		Drainage System Management	Install Projects Identified in MDM Plan			●	●				$300,000	✓	Isanti SWCD	Isanti County Ditch Authority
SW-R.30		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.5 Mile of Buffer Install at 16.5' Wide Average on Both Sides of Ditch, of 4 Acres		●	●	●	●	●	$34,200	✓	Isanti SWCD	Isanti County
SW-R.31		Lake Internal Loading Feasibility Study	Collect Data to Quantify Internal Loading: e.g., Feasibility Study to Include Sediment Cores, Alum Dosing, and Estimated Costs.	Feasibility Study Completed					●		$20,000	✓	Isanti SWCD	Green Lake Improvement District
SW-R.32		Reduce Internal Loading	Perform Alum Treatment or Other Methods Identified in Feasibility Studies to Reduce Internal Loading	Green Lake: 1,000 Lb TP Reduction						●	$750,000	✓	Isanti SWCD	Green Lake Improvement District

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- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
St. Francis														
SW-R.33	Skogman Lake (Tier 1) Fannie Lake (Tier 2)	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments (or Similar) to Prioritize Water Quality Improvements	Updated SWA For Skogman-Fannie Lake Chain Due To Development		●					$5,000	✓	Isanti SWCD	
SW-R.34		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Skogman Lake: 60 Lbs TP Reduction Fannie Lake: 33 Lbs TP Reduction		●	●	●	●	●	$609,194	✓	Isanti SWCD	City of Cambridge
SW-R.35		Complete Scientific and Prioritizing Studies	Complete Diagnostic and Targeting Studies to More Accurately Quantify P Loading from Tributaries And Wetlands, Internal Contributions and Reductions Needed, and/or BMP Locations	1 Study Completed				●			$25,000	✓	Isanti SWCD	Lake Groups
SW-R.36		Lake Internal Loading Feasibility Study	Collect Data to Quantify Internal Loading: i.e. Feasibility Study to Include Sediment Cores, Alum Dosing, and Estimated Costs	1 Feasibility Studies Completed					●		$20,000	✓	Isanti SWCD	Lake Groups
SW-R.37		Reduce Internal Loading	Perform Alum Treatment or Other Methods Identified in Feasibility Studies to Reduce Internal Loading	Based on Feasibility Study						●	$500,000	✓	Isanti SWCD	Lake Groups

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- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

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Table 4.6 (Continued): Surface Water - Restore Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
St. Francis														
SW-R.38	Seelye Brook (Tier 3)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	2 Miles of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 8 Acres		●	●				$45,200	✓	Anoka SWCD Isanti SWCD	Counties
SW-R.39		Complete Scientific and Prioritizing Studies	Complete Diagnostic and Targeting Studies to More Accurately Quantify P Loading from Tributaries and Wetlands, Reductions Needed, and/or BMP Locations.	1 Study Completed			●	●			$15,000	✓	Anoka SWCD Isanti SWCD	
SW-R.40		Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments (or Similar) to Prioritize Water Quality Improvements	1 Report Completed					●		$37,049	✓	Anoka SWCD Isanti SWCD	
SW-R.41		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	2 BMPs						● ●	$75,000	✓	Anoka SWCD Isanti SWCD	
SW-R.42	Long Lake (Tier 3)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Long Lake: 10 Lbs TP Reduction						● ● ●	$100,000	✓	Isanti SWCD	Long Lake Improvement District Isanti County

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- Policy
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*Costs included across multiple issue statement implementation action items.

DESIRED FUTURE CONDITION

Water quality is the same or better in waters that meet state standards.

The Rum River is suitable for use as a public water supply.

MEASURABLE OUTCOME

Increase the number of acres in protection 5% over current levels in priority subwatersheds.

Protection (n.):

In the context of this Plan, protection is defined as public lands, public waters, wetlands on private lands, or private lands held in a conservation easement, or enrolled in a program such as the Sustainable Forest Incentive Act, which provides tax benefits to promote long-term forest sustainability..

Surface Water Protect (SW-P)

ISSUE STATEMENT

There are many high-quality water resources in the Rum River watershed that are threatened by changing land use, changes to the landscape that impact runoff, and the ability for water to soak into the ground, and pollution. Protecting these high-quality resources from the threat of degradation is of primary concern.

GOAL #1	Maintain or enhance watershed-based ecosystems to maintain water quality.

PRIORITIZED GEOGRAPHIC AREAS FOR IMPLEMENTATION ACTIVITIES

*Adapted from the Rum River Watershed Landscape Stewardship Plan (LSP) target areas.

Onamia Management Zone

- Establish 50 forestry management plans and promote forest protection program enrollment.
- Increase forest land protection from 43% to 48% focusing on parcels with high RAQ scores located on Rum River corridor around Rum River State Forest and the nearby wildlife management area.

Cedar Creek Management Zone

- Establish two forestry management plans and promote forest protection program enrollment.
- Increase forest land protection from 38% to 43% focusing on parcels with high RAQ scores located in priority minor subwatersheds.

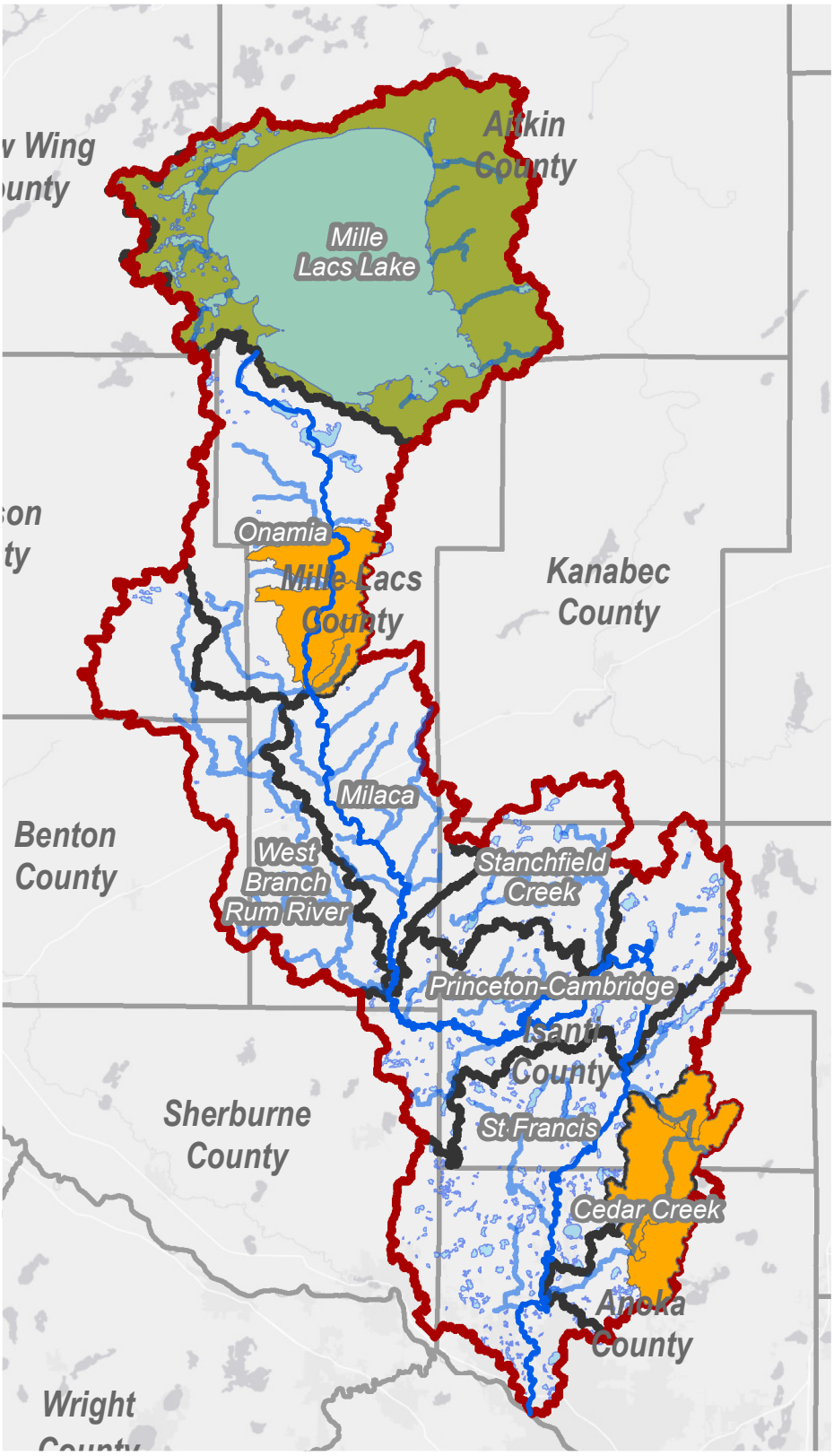
Mille Lacs Lake Management Zone

- Maintain watershed land protection of at least 75% . The protection level has been achieved and should continue to be monitored.

Table 4.7: Prioritized geographic areas for implementation activities

Management Zone	Total Area (Acres)	Current Protected Area (Acres)	10-Year Plan Goal Protected Area (Acres)	Actual Acre Goals	Goal Percent Increase in Protected Area	Long-Term Protected Area Goal (Acres)
Onamia/Milaca	227,951	98,715 (43%)	103,651 (48%)	4,936	5%	139,965 (61%)
Cedar Creek	53,826	20,156 (37%)	21,164 (43%)	1,008	5%	23,145 (43%)

*The priority areas are located in the Onamia GMZ, however the Onamia and Milaca GMZ areas are considered to be the Upper Rum River Subwatershed according to the LSP.



KEY

- Rum River
- Public Watercourse
- Priority Minor 5 Subwatersheds for Increased Land Protection
- Maintain Land Protection
- Watershed
- Management Zones
- Counties

Figure 4.5: Priority Minor 5 Subwatersheds

DESIRED FUTURE CONDITION

Lakes and streams meet or exceed water quality standards (except mercury, which is being addressed at the state-wide level).

MEASURABLE OUTCOMES

No new impairments on priority water bodies (Conventional pollutants: lakes - nutrients, streams - E. Coli, TP, TSS).

5% reduction in TSS and TP at permanent monitoring sites along the Rum River.

GOAL #2

Keep Healthy Lakes And Streams Healthy

Table 4.8: Priority waterbodies

Tier	Lake	Management Zone
1	Mille Lacs*	Mille Lacs
	Blue	Princeton-Cambridge
	George*	St. Francis
2	Round (Aitkin County)	Mille Lacs
	Ogechie	Onamia
	Spectacle	Princeton-Cambridge
	Pickerel	St. Francis
3	Florence/Elms	St. Francis
	East Twin	St. Francis
	Lewis	Stanchfield Creek
Tier	**Stream**	**Management Zone**
1	Rum River*	Princeton-Cambridge
	Rum River*	St. Francis
	Stanchfield Creek	Stanchfield Creek
2	Rum River	Onamia
	West Branch Rum River	West Branch Rum
	Cedar Creek	Cedar Creek
3	Tibbets Brook	Onamia
	Ford Brook	St. Francis
	Unnamed Creek (07010207-532/533)	West Branch Rum
	Prairie Creek (07010207-684/685)	West Branch Rum

*Watershed-wide priority

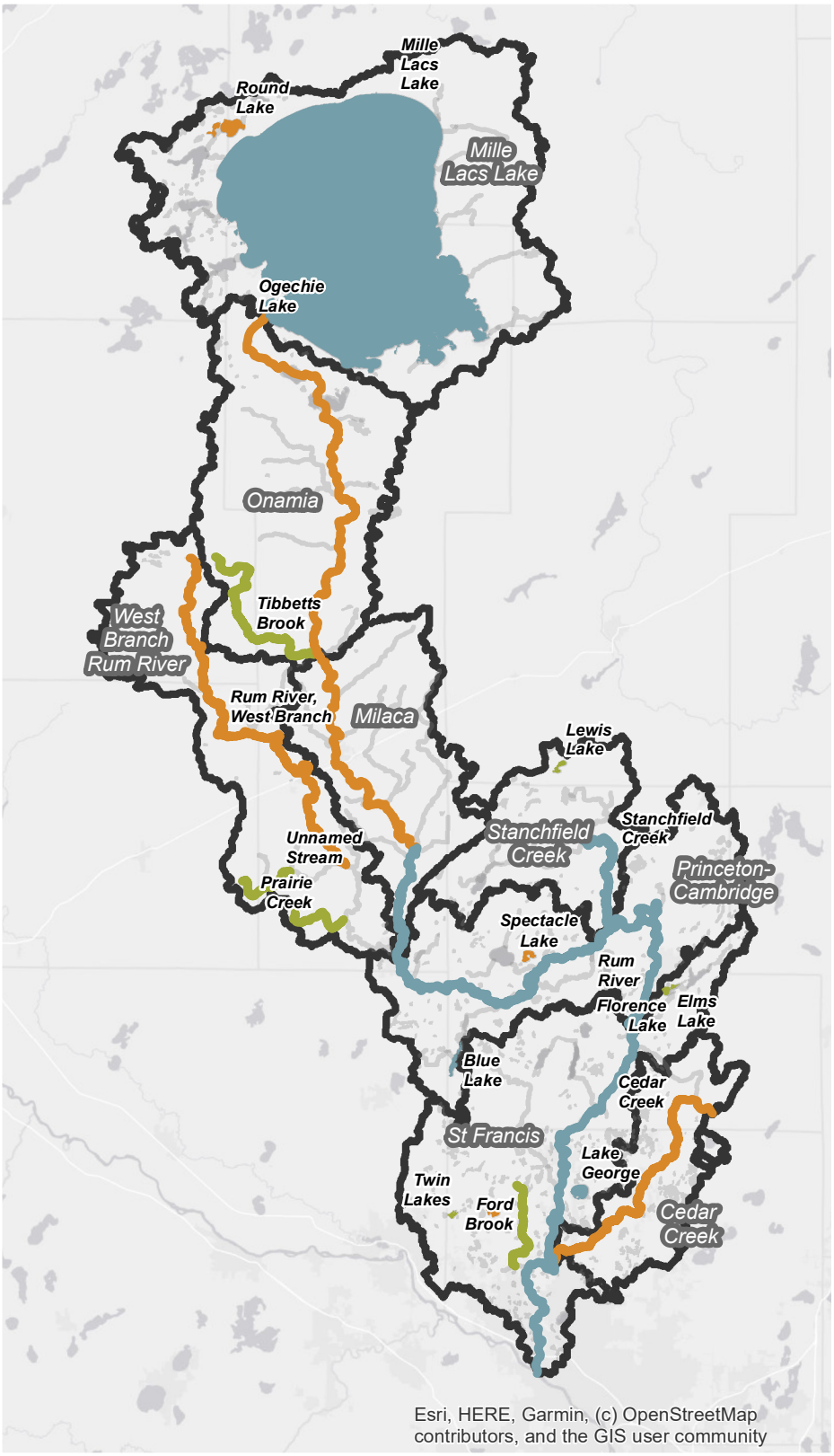


Figure 4.6: Priority Protection Lakes and Streams

Table 4.9: Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (see Tables 4.8 and 4.9)														
SW-P.1	Target Priority Protect Waterbody Subwatershed Areas	Restore Wetlands	Implement Wetland Restoration and Wetland Banks Identify and Prioritize Sites Using The Restorable Wetland Prioritization Tool (www.wetlandrestore.org) and Other Local Data	60 Acres of Restored Wetlands Across all Issue Statements Excluding Onamia Zone.		●●●	●●●	●●●	●●●	●●●	$480,000*	✓	SWCDs	Counties USFWS TNC BWSR
SW-P.2	Target Priority Protect Waterbody Subwatershed Areas	SSTS Fix Up	Fund Replacement or Repair of Septic Systems for Low Income or Other Disadvantaged Owners	30 SSTS Upgraded In Riparian Areas and those that have Direct Contribution to Priority Waters		●●●	●●●	●●●	●●●	●●●	$420,000*	✓	SWCDs or Counties	MPCA
SW-P.3	Target Priority Protect Waterbody Subwatershed Areas	Soil Health	Promote and Install Soil Health BMPs	1,000 Acres		●●	●●	●●	●●		$140,000*	✓	SWCDs	TNC MDA
SW-P.4	Locations determined from WRAPS - See Figures 5.11 and 5.12	Water Quality Monitoring	Collect Water Quality Parameters Every 3rd Year, Monitoring Each Priority Protection Waterbody and Rum River See the Rum River WRAPS Recommended Rum River Monitoring Sites and Methodology Monitor at Least Every 3rd Year when Water Quantity Monitoring Occurs	3 Years Monitoring			●●	●●		●●	$130,500	✓	SWCDs	MPCA Met Council
SW-P.5	Watershed Wide	Compare Regulatory Approaches Across LGUs and Recommend Updates for Watershed Level Consistency	Regulatory Comparison for Development Standards that Minimize Stormwater Runoff and Preserve Natural Areas	Comparison Study and Policy Committee Recommendations to LGUs			●				$5,000*	✓	JPE	IPC

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

KEY

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- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (see Tables 4.8 and 4.9)														
SW-P.6	Target Priority Protect Waterbody Subwatershed Areas	Increase Conservation Easements for Shorelands, Wetlands, and Forested Lands	Acquire Conservation Easements	6,403 Acres Protected			●	●	●		$8,049,276	✓	SWCDs	TNC, BWSR, MLT
SW-P.7	Target Priority Protect Waterbody Subwatershed Areas	Promote Sustainable Agroforestry and Silvopasture	Promote Sustainable Agroforestry and Silvopasture	40 Acres Implemented				●	●	●	$120,000	✓	SWCDs	TNC
SW-P.8	Priority locations determined from 2024 Intensive Watershed Monitoring Study, MNDNR Input, and Field Investigation	Restore Meandering Channels for Streams and Ditches	Restore Natural Channel Patterns, Profiles, Cross Sections, and Stability in Altered Watercourses.	1 Project or 0.75 Mile of Stream Restored						●	$1,000,000*	✓	SWCD	MNDNR

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*Costs included across multiple issue statement implementation action items.

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Mille Lacs														
SW-P.9	Mille Lacs Lake (Tier 1) Round Lake (Tier 2)	Complete Scientific and Prioritizing Studies	Analyze, Update where Necessary, and Prioritize Protection Practices for Mille Lacs Lake and Round Lake from PTMApp Data	2 Studies Completed		●	●				$90,000	✓	Aitkin SWCD MLBO	Mille Lacs SWCD Crow Wing SWCD
SW-P.10		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	Mille Lacs and Round: 96 Lb TP Reduction		●●●●	●●●●	●	●	●	$1,100,000	✓	Mille Lacs SWCD Aitkin SWCD	Crow Wing SWCD MLBO
SW-P.11		Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size.	25 Plans Completed for Forest Protection		●	●	●	●	●	$32,000	✓	Aitkin SWCD	Mille Lacs SWCD MLBO
SW-P.12		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	1 Mile of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 4 Acres		●			●		$28,400	✓	Aitkin SWCD	

KEY

- Below $50K
- $51K - $75K
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- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Onamia														
SW-P.13	Rum River - Priority Subwatersheds 21019, 21021, and 21027 in Upper Rum River Subwatershed (HUC 701020702)	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size	50 Plans Completed for Forest Protection		●	●	●	●	●	$40,000	✓	SWCD	
SW-P.14	Rum River (Onamia Subwatershed) (Tier 2) Tibbets Brook (Tier 3)"	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed		●					$35,000	✓	SWCD	
SW-P.15		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	2 BMPs		●	●	●	●	●	$335,000	✓	SWCD	
SW-P.16		Drainage System Management	Incentivize Establishment and Installation of Buffers On Private Ditches and Buffer Enhancements on Public and Private Ditches	1 Mile of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 4 Acres				●	●	●	$34,200	✓	SWCD	

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Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Milaca														
SW-P.17	Rum River (Milaca Subwatershed) (Downstream Protection) (Tier 2)	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed		●	●				$30,000	✓	SWCD	
SW-P.18		Drainage System Management	Incentivize Establishment and Installation of Buffers On Private Ditches and Buffer Enhancements on Public and Private Ditches	1 Mile of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 4 Acres		●	●				$28,400	✓	SWCD	
SW-P.19		Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size	8 Plans or 20 Acres Managed for Forest Protection		●	●	●	●	●	$40,000	✓	SWCD	
SW-P.20		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans	1 MDM Plan For Milaca And West Branch GMZs			●				$15,000	✓	County	
SW-P.21		Drainage System Management	Install Projects Identified in MDMs	1 BMPs From Study for Milaca and West Branch GMZs					● ● ●		$100,000	✓	County	
SW-P.22		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Rum River: 4 Lbs TP Reduction					●	● ●	$150,000	✓	SWCD	

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*Costs included across multiple issue statement implementation action items.

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
West Branch Rum River														
SW-P.23	West Branch Rum River - Upper (Tier 2); Unnamed Creek (Tier 3); Prairie Creek (Tier 3)	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed		●	●				$30,000	✓	SWCD	
SW-P.24		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	1 Mile of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 4 Acres		●	●	●	●	●	$45,800	✓	SWCD	
SW-P.25		Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size	8 Plans or 20 Acres Managed for Forest Protection		●	●	●	●	●	$40,000	✓	SWCD	
SW-P.26		Install BMPs From Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	West Branch Rum River, Unnamed Creek, and Prairie Creek: 5 Lb TP Reduction			●	●	●	●	$330,000	✓	SWCD	
SW-P.27		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans	1 MDM Plan for Milaca and West Branch GMZs			●				$15,000*	✓	County	
SW-P.28		Drainage System Management	Install Projects Identified in MDMs	1 BMP From Study for Milaca and West Branch GMZs					●		$100,000*	✓	County	

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Rum River Comprehensive Watershed Management Plan

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Stanchfield Creek														
SW-P.29	Stanchfield Creek - Lower (Tier 1)	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size	5 Plans or 717 Acres Managed for Forest Protection		●	●	●	●	●	$3,680	✓	SWCDs	Local forest Technical Team
SW-P.30		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.5 Miles of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 2 Acres		●	●	●	●	●	$39,400	✓	SWCDs	Counties
SW-P.31		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans If Ditch Maintenance Activities are Proposed	1 MDM Plan					●		$10,000	✓	Isanti SWCD	Isanti County Ditch Authority
SW-P.32		Drainage System Management	Install Projects Identified in MDM Plan	1 BMP						● ● ●	$100,000	✓	Isanti SWCD	Isanti County Ditch Authority
SW-P.33	Lewis Lake (Tier 3)	Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed			●				$11,000	✓	Kanabec SWCD	
SW-P.34		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	Lewis: 10 Lbs. TP Reduction				●	●		$50,000	✓	Kanabec SWCD	

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Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Princeton-Cambridge														
SW-P.35	Blue Lake (Tier 1) Spectacle Lake (Tier 2)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.5 Miles of Buffers Installed at 16.5' Wide Average on Both Sides of Ditch, or 2 Acres (Blue Lake Only)	On-The-Ground Implementation	●	●	●	●	●	$25,800	✓	Isanti and Sherburne SWCDs	Isanti County
SW-P.36		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Blue: 20 Lbs. TP Reduction Spectacle: 2 Lbs. TP Reduction	On-The-Ground Implementation	●	●				$256,000	✓	Isanti and Sherburne SWCDs	
SW-P.37		Reduce Internal Loading	Perform Alum Treatment, or Other Methods Identified in Feasibility Studies to Reduce Internal Loading	Blue Lake: 360 Lbs. TP Reduction	On-The-Ground Implementation	●	●				$464,888	✓	Isanti SWCD	Blue Lake Improvement District
SW-P.38	Rum River (Princeton Cambridge Subwatershed) (Tier 1)	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of Any Size	9 Plans or 1,396 Acres Managed for Forest Protection	On-The-Ground Implementation	●	●	●	●	●	$7,200	✓	SWCDs	Local forest Technical Team
SW-P.39		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.5 Miles of Buffers Installed at 16.5' Wide Average on Both Sides or Ditch, or 2 Acres	On-The-Ground Implementation	●	●	●	●	●	$25,800	✓	Isanti and Sherburne SWCD	Isanti County
SW-P.40		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans if Ditch Maintenance Activities are Proposed	2 MDM Plans	Studies + Data			●			$20,000	✓	Isanti SWCD	Isanti County Ditch Authority
SW-P.41		Drainage System Management	Install Projects Identified in MDM Plan	2 BMPs	On-The-Ground Implementation				●		$200,000	✓	Isanti SWCD	Isanti County Ditch Authority

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*Costs included across multiple issue statement implementation action items.

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Cedar Creek														
SW-P.42	Cedar Creek (Rum River - Downstream Protection) (Tier 2)	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs For Tracts of any Size.	2 Plans or 285 Acres Managed for Forest Protection		●	●	●	●	●	$1,740	✓	SWCDs	MNDNR
SW-P.43		Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	1 Mile of Buffers Installed At 16.5' Wide Average on Both Sides of Ditch, or 4 Acres		●	●				$15,000	✓	SWCD	NRCS

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Rum River Comprehensive Watershed Management Plan

Table 4.9 (Continued): Surface Water - Protect Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
St. Francis														
SW-P.44	Lake George (Tier 1)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	George: 11 Lbs. TP Reduction			●●●●	●●●●			$487,844	✓	Anoka CD	
SW-P.45	Pickerel Lake (Tier 2)	Prioritize and Target Shoreline and Lakeshore Restoration Areas	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements.	2 Shoreline Inventories Completed for Pickerel and East Twin Lakes		●					$6,900	✓	SWCDs	
SW-P.46	East Twin Lake (Tier 3)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified Through Targeting and Prioritization Process (SWAs or Other)	1 BMP - Pollutant Reduction to be determined in Prioritization Study			●	●			$45,000	✓	Anoka CD	
SW-P.47	Florence/ Elms Lake (Tier 3)	Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Florence/Elms: 2 Lbs. TP Reduction					●●	●●	$37,401	✓	Isanti SWCD	
SW-P.48	Rum River (St. Francis Subwatershed) (Tier 1) Ford Brook (Tier 3)	Drainage System Management	Incentivize Establishment and Installation of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	2 Miles of Buffers Installed at 16.5ft Wide Average on Both Sides of Ditch, or 8 Acres		●	●				$15,000	✓	SWCDs	NRCS
SW-P.49		Complete Scientific and Prioritizing Studies	Complete Targeted Subwatershed Assessments, Shoreline Inventories (or Similar) to Prioritize Water Quality Improvements	1 Study Completed			●●				$60,000	✓	SWCDs	
SW-P.50		Install BMPs from Scientific and Prioritizing Studies	Install BMP Practices or Shoreline Restorations Identified through Targeting and Prioritization Process (SWAs or Other)	Rum River and Ford Brook: 30 Lbs TP Reduction			●●●●	●●	●●		$1,200,000	✓	SWCDs, Anoka CD	
SW-P.51		Drainage System Management	Complete Multi-Purpose Drainage Management (MDM) Plans if Ditch Maintenance Activities are Proposed	1 MDM Plan					●		$10,000	✓	Isanti SWCD	Drainage Authority
SW-P.52		Drainage System Management	Install Projects Identified in MDM Plan	1 BMP					●●		$100,000	✓	SWCDs	Counties

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- Education + Outreach

*Costs included across multiple issue statement implementation action items.

DESIRED FUTURE CONDITION

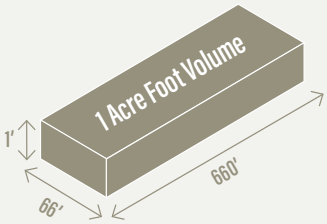
5-year average water rate and volume have not increased (relative to precipitation) at the Anoka Dam on the Rum River.

MEASURABLE OUTCOME

Implement actions that prevent increased surface water runoff and provide 100 acre-feet of storage over the life of the plan.

Acre-Feet (n.):

A unit of water that is enough to cover one acre of area in one-foot of water.



Surface Water - Quantity (SW-Q)

ISSUE STATEMENT

Human-caused changes to the landscape have modified flow rate, volume, and water storage causing flooding, streambank erosion, and low base flow. This risk may be compounded due to the effects of a changing climate.

GOAL #1	To prevent flooding, erosion, and water quality degradation, there will be no net increase in discharge from each management zone.

PRIORITY RESOURCES AND TARGETING

The MNDNR is currently completing its Evaluation of Hydrologic Change (EHC) report for the Watershed and preliminary results have been shared with the Partnership. This study analyzed precipitation and discharge information for the period 1934 to 2019 to better understand hydrological changes in the watershed, set water storage goals, and target implementation actions. The draft EHC Technical Summary suggested an initial long-term storage goal of 99,686 acre-feet of storage to mitigate for the increase in runoff relative to precipitation beginning in the post-1998 period (Carlson, 2021). This period was determined to be the breakpoint where there was a statistical change in the relationship between precipitation in the Watershed and discharge from the Rum River. The Partnership adopted a 10-year plan goal of creating 100 acre-feet of storage. The Partnership will also consider the storage benefits from practices that are not primarily storage focused, such as cover crops that improve soil health and soil water holding capacity. Additionally, the Partnership intends to work through its outreach and education program to influence stakeholders to adopt land use management controls and other programs that mitigate development impacts.

Priority areas to implement water storage activities are the Milaca, West Branch Rum River, and Princeton-Cambridge GMZs as determined by best professional knowledge of issues and opportunities. The implementation table includes multiple opportunities to acquire and integrate new information as it becomes available to target actions to address storage and water quantity rate and volume reduction.

Figure 4.7: Rum River at the Anoka Dam, image courtesy of Anoka Conservation District

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Table 4.10: Surface Water - Quantity Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas														
SW-Q.1	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Restore Wetlands	Implement Wetland Restoration and Wetland Banks. Identify and prioritize sites using the Restorable Wetland Prioritization Tool (www.wetlandrestore.org) and Other Local Data.	60 Acres of Restored Wetlands Across All Issue Statements Excluding Onamia Zone.		●●●	●●●	●●●	●●●	●●●	$480,000*	✓	SWCDs	Counties, USFWS, TNC, BWSR
SW-Q.2	Locations determined from WRAPS - See Figures 5.11 and 5.12	Acquire Surface Water - Quantity Data	Establish Permanent Streamflow Monitoring Locations at Geographic Management Zone Outlets or the 8 Locations Identified in the Rum River WRAPS (2 Already Exist). See the Rum River WRAPS for Recommended Rum River Monitoring Sites and Methodology. Monitor at Least Every Third Year When Water Quality Monitoring Occurs.	6 New Hydrology Monitoring Stations		●●●	●●●	●●●	●●●	●●●	$90,000	✓	SWCDs	MPCA
SW-Q.3	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of any Size.	109 Plans Completed for Forest Protection		●●●	●●●	●●●	●●●	●●●	$170,820*	✓	SWCD, Forestry Stewardship Coordinator	MLBO
SW-Q.4	West Branch Rum River, Cedar Creek, and Stanchfield Creek Mainstems and Tributaries	Maintain Naturally Functioning Floodplains	Complete Culvert Inventories	Inventories Completed for Mainstems and Tributaries of West Branch Rum, Cedar Creek and Stanchfield.			●●	●●			$125,000*	✓	SWCD or County	MNDNR
SW-Q.5	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Acquire Surface Water - Quantity Data	Establish Flood Forecasting Locations	New Flood Forecasting Location			●				$20,000	✓	JPE	NWS

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

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Rum River Comprehensive Watershed Management Plan

Table 4.10 (Continued): Surface Water - Quantity Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas														
SW-Q.6	Milaca, West Branch Rum River, St. Francis, and Princeton-Cambridge GMZ	Evaluate Opportunities to Provide Storage and Flood Prevention Benefits	Identify Subwatersheds within Milaca, West Branch, St. Francis, and Princeton Cambridge Geographic Management Zones where Storage is Needed for Flood Prevention	List of Subwatersheds where Storage is Needed for Flood Prevention			●				$45,000	✓	SWCDs	MNDNR
SW-Q.7	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Urban Storage BMPs	Install BMPs Identified through Targeting and Prioritization Process (SWAs or Other)	10-Acre Feet			●●			●●	100,000	✓	SWCDs	Counties Cities
SW-Q.8	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Agricultural Storage BMPs	Implement Water Storage BMPs Including on Private Ditches	30-Acre Feet				●●	●●		$300,000	✓	SWCDs	TNC
SW-Q.9	Milaca, West Branch Rum River, and Princeton-Cambridge GMZ	Maintain Naturally Functioning Floodplains	Communication with Road Authorities Regarding Stream Crossing, Culvert Function, Design, and Replacement	Annual Communication with Counties on Project Opportunities					●		$5,000	✓	Outreach Coordinator	

KEY

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Groundwater, Drinking Water, and Groundwater - Quality (GW-Q)

DESIRED FUTURE CONDITION

Groundwater is safe to drink.

ISSUE STATEMENT

Groundwater and drinking water quality are negatively impacted by human actions, including manure and nitrogen fertilizer application, use of chlorides from salt, land management, non-compliant septic systems, pesticides, and contaminants of public health concern.

GOAL #1	Decrease the risk of nitrate contamination in groundwater.
GOAL #2	Decrease the risk of groundwater contamination from septic systems.

GOAL #1 MEASURABLE OUTCOME

The concentration and occurrence of excessive nitrates in groundwater is reduced.

An increase in knowledge of and an expanded awareness of groundwater vulnerabilities and the actions that can be taken to reduce the threat of groundwater risks.

GOAL #2 MEASURABLE OUTCOME

Replace or upgrade 30 septic systems.

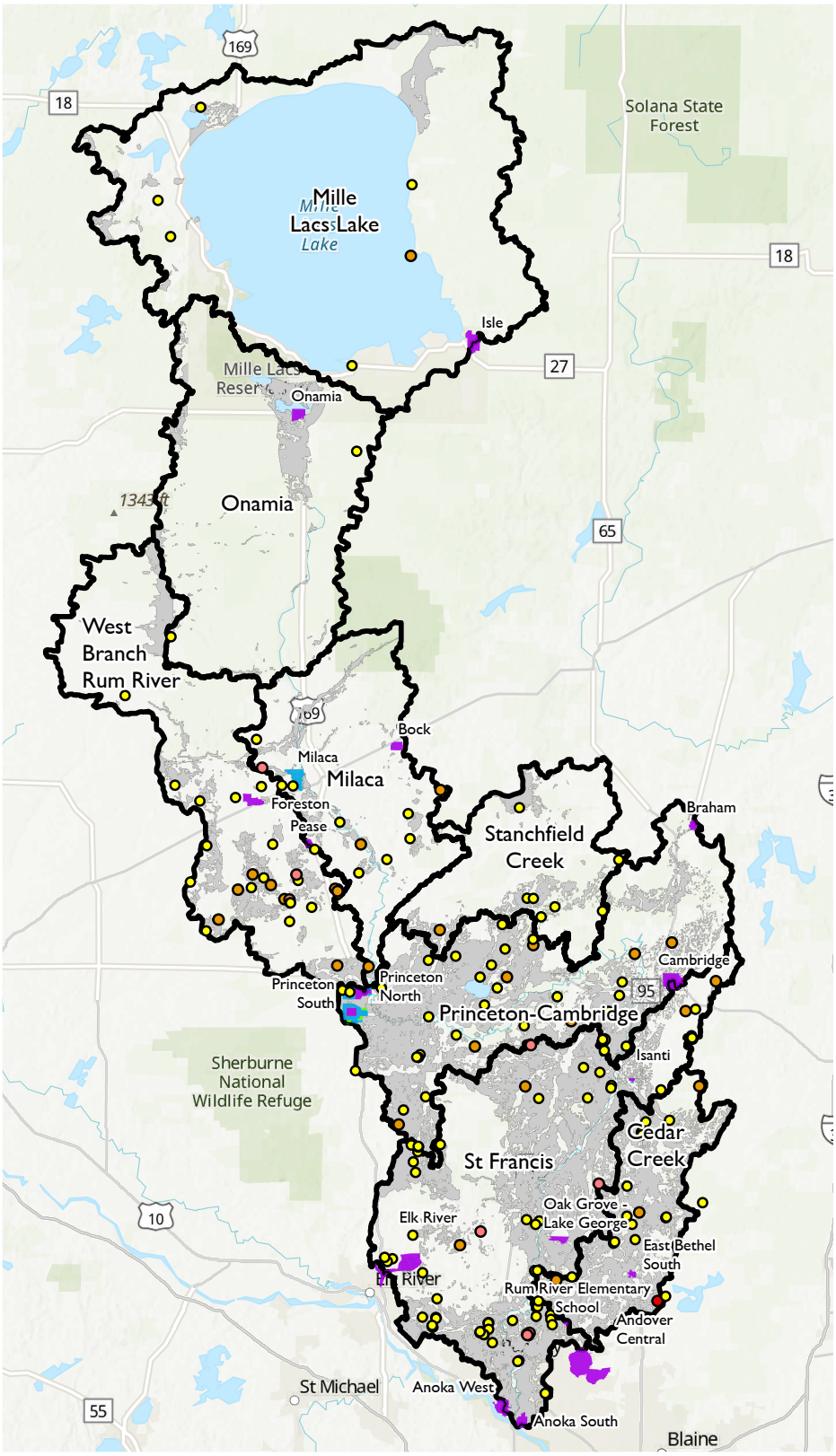
PRIORITIZED GEOGRAPHIC AREAS FOR IMPLEMENTATION ACTIVITIES

This is a watershed wide priority directed to locations that meet the criteria below. The geographical areas that correspond to criteria 1 through 3 are identified in Figure 4.9.

1. Drinking water supply management area (DWSMA) vulnerability is moderate, high, or very high; or
2. Pollution sensitivity to near surface materials is high; or
3. Well testing shows ≥ 5 mg/L nitrate.

Additionally, in lieu of a completed geologic atlas in Mille Lacs County, priority locations include those areas where shallow bedrock is within 30 feet of the surface. Bedrock within 30 feet of the surface will only be used to prioritize in Mille Lacs County. Lake and shoreland areas are also a risk-based criterion that can be applied when targeting activities regarding septic systems. Finally, as unsealed wells can be a contamination risk to any groundwater supply, well sealing is a watershed wide activity that does not require additional screening criteria.

Figure 4.8: Unsealed wells pose a risk to groundwater quality. Image courtesy of Julie Blackburn



KEY

Management Zones

Wells
(Average NO3 (mg/L))

- 100-1,000
- 20-100
- 10-20
- 5-10

Drinking Water Supply Vulnerability

- Very High
- High
- Moderate

Pollution Sensitivity Near Surface Materials

- High

Figure 4.9: Priority geographical areas to address Groundwater Issue Statement #1: Groundwater and Drinking Water Quality.

Table 4.11: Groundwater and Drinking Water Quality Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions Watershed Wide Meeting Prioritization Criteria (See Figure 4.9)											Actions Watershed Wide Meeting Prioritization Criteria			
GW-Q.1	Watershed Wide Meeting Prioritization Criteria	SSTS Fix Up	Fund Replacement or Repair of Septic Systems for Low Income or Other Disadvantaged Owners	30 SSTS Upgraded		●	●	●	●	●	$420,000*	✓	SWCDs Counties	MPCA
GW-Q.2	Watershed Wide Meeting Prioritization Criteria	Seal Unused or Abandoned Wells	Well Sealing	70 Wells Sealed		●	●	●	●	●	$189,000	✓	SWCDs	BWSR MDH
GW-Q.3	Watershed Wide Meeting Prioritization Criteria	Install Ag BMPs that Address N	BMPs Including but not Limited to On-Site Manure Management, Feedlot Inspections, Comprehensive Nutrient Management Plans, Cover Crops, Soil Health Practices, and Waste Pit Closures	40 Practices that Reduce Nitrogen			●	●	●	●	$400,000	✓	SWCDs	NRCS BWSR MDA
GW-Q.4	Watershed Wide Meeting Prioritization Criteria	Improve Irrigation Water Management Through Smart Technology and Other Strategies	Incentivize Adoption and Implementation of Conservation Irrigation Technology Tools	500 Acres of Agricultural Lands and 100 Acres of Residential, Commercial, or Institutional Producers using Conservation Irrigation Public Outreach Promoting Completed BMPs			●	●	●		$187,500	✓	SWCDs	NRCS MDA
GW-Q.5	Watershed Wide Meeting Prioritization Criteria	Protect Vulnerable Recharge Areas	Encourage Adoption of Land Use Planning Tools or Passage of Ordinances that Improve Protection in Prioritized Areas	Summary of Tools and Policy Committee Recommendations to LGUs			●				$6,000	✓	JPE Counties	SWCDs
GW-Q.6	Watershed Wide	Septic Systems Regulatory Consistency	Comparison Study of where Point of Sale or Building Permits do not Trigger SSTS Inspections	Evaluation Completed and Policy Committee Recommendation to LGUs			●				$6,000	✓	JPE	Counties SWCDs

KEY

- Below $50K
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- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Natural Resources - Protection, Management, and Restoration of Upland Habitat (NR-U)

DESIRED FUTURE CONDITION

All current sites of high ecological value are maintained or expanded

There are interconnected hubs and corridors of habitat throughout the watershed.

Habitat with greater resiliency to changing precipitation and climate patterns.

ISSUE STATEMENT

Habitat is critical for wildlife, water quality, and quality of life. Existing habitat areas have been or are at risk of being reduced in size and quality due to fragmentation, pollution, invasive species, intensifying land use, and lack of management. Habitats with high ecological value, particularly those that provide habitat for rare and endangered species, should be protected. Degraded habitats should be restored, especially when water quality benefits could also be achieved.

GOAL #1	Define, identify, and rank high value areas

MEASURABLE OUTCOME

High value areas are identified and ranked.

PRIORITY LOCATIONS

While there are numerous datasets that can be used to assess and evaluate upland habitat, the Partnership determined that the local values were not adequately represented by these criteria. Therefore, the TAC recommended an interim prioritization scheme, outlined in Goal 2, be used until a prioritization process can be completed. The prioritization process would include working with communities to identify resources and geographical areas such as parks, trails, cultural resources, or other features that enhance quality of life, and integrate those criteria with habitat criteria. This action is identified in the implementation table.

The Partnership will identify priority locations using a process that first defines 'high value areas', then identifies, and finally ranks locations according to agreed upon criteria. The definition of high value upland habitat will include wildlife, water quality, and quality of life (cultural, parks, etc.) considerations. Using this definition, the high value areas will be mapped. The ranking criteria may include those used in the Riparian-Adjacency-Quality (RAQ) assessment.

What is an RAQ Assessment?

This assessment methodology was developed by the MNDNR and BWSR. The purpose is to establish the connection between forest land cover and water quality and then to identify priority lakes, and parcels to be protected.

R = parcel proximity to riparian areas

A = adjacency to public land

Q = habitat quality

GOAL #2

Increase upland habitat acreage, quality, and connectivity, as well as resilience to changing precipitation and climate patterns

PRIORITY LOCATIONS

The interim upland habitat criteria consist of applying a terrestrial habitat quality index value filter of greater than 60 to the MNDNR's Regionally Significant Ecological Areas and Native Plant Communities data layers. The priority geographic areas identified in Surface Water - Protect, Goal 1 are also eligible for implementation actions (see Figures 4.11-4.13). Existing permanently protected habitat areas that are eligible for restoration and enhancement resources include lands owned or easements held by the state of Minnesota, non-profit easements, and Anoka County Park, as well as other county and local jurisdictions.

Mapped areas that indicate priority critical habitat but are not permanently protected are eligible for protection as well as restoration and enhancement activities.

Figure 4.10: Native Prairie Restoration. Image courtesy of the Sherburne County SWCD

DESIRED FUTURE CONDITION

Increase in percent of permanent and maintain, or increase semi-permanent protected land by HUC12 subwatershed throughout the Rum River Watershed.

MEASURABLE OUTCOME

Critical upland habitat patches will grow in size and be connected by corridors of sufficient size to enable movement by the majority of wildlife species likely to use the habitat component. Completed actions will work towards increasing upland habitat resiliency to changes in precipitation and climate.

Increase the amount of acres permanently protected by RIM easements from approximately 2,800 to approximately 9,200 acres.

Increase the amount of permanent or semi-permanently protected land by 175 acres.

KEY

- Management Zones
- Priority Critical Habitat
- BWSR RIM/CREP Easements
- BWSR Wetland Bank Easements
- Anoka County Parks
- UMN Ecosystem Science Reserve
- Wildlife Management Area
- Scientific and Natural Area
- Aquatic Management Area
- State Forest
- Other Forest Land
- State Park
- Public Watercourse
- Public Water Basins

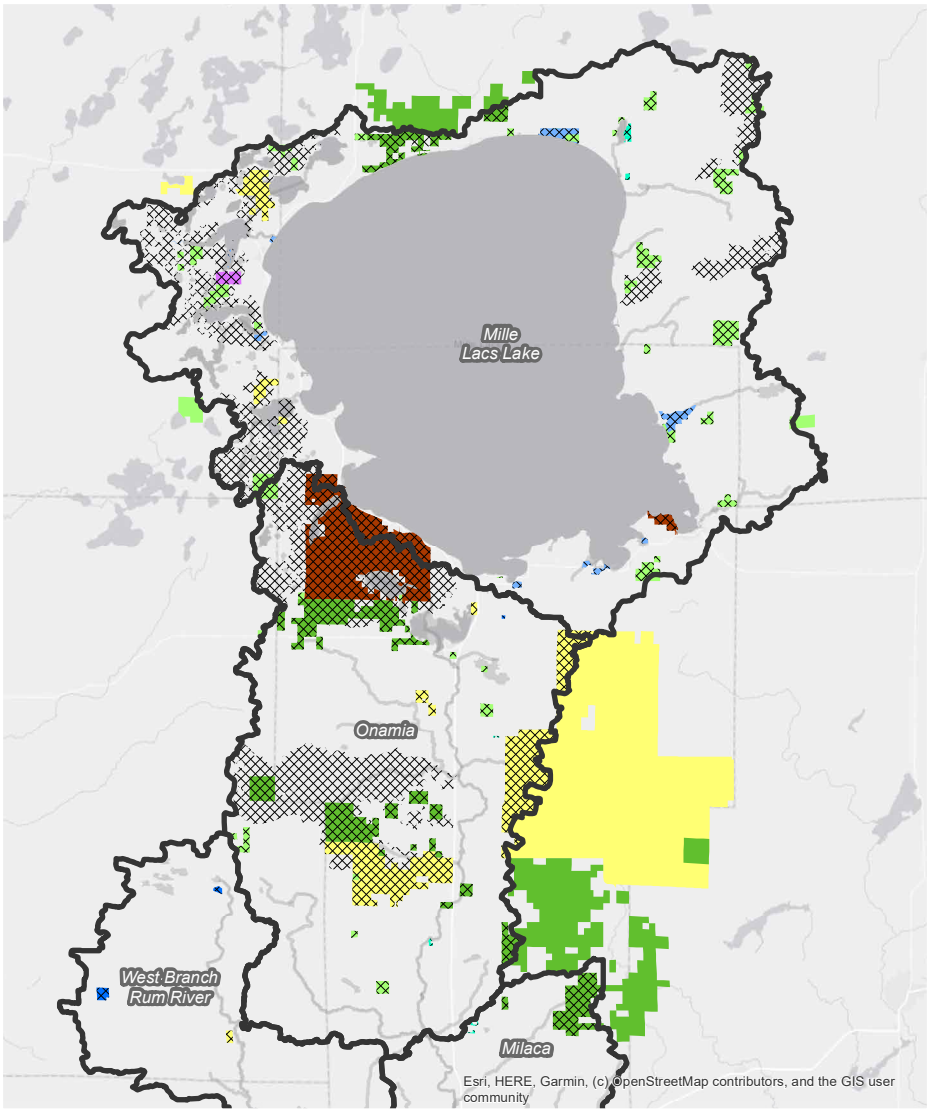
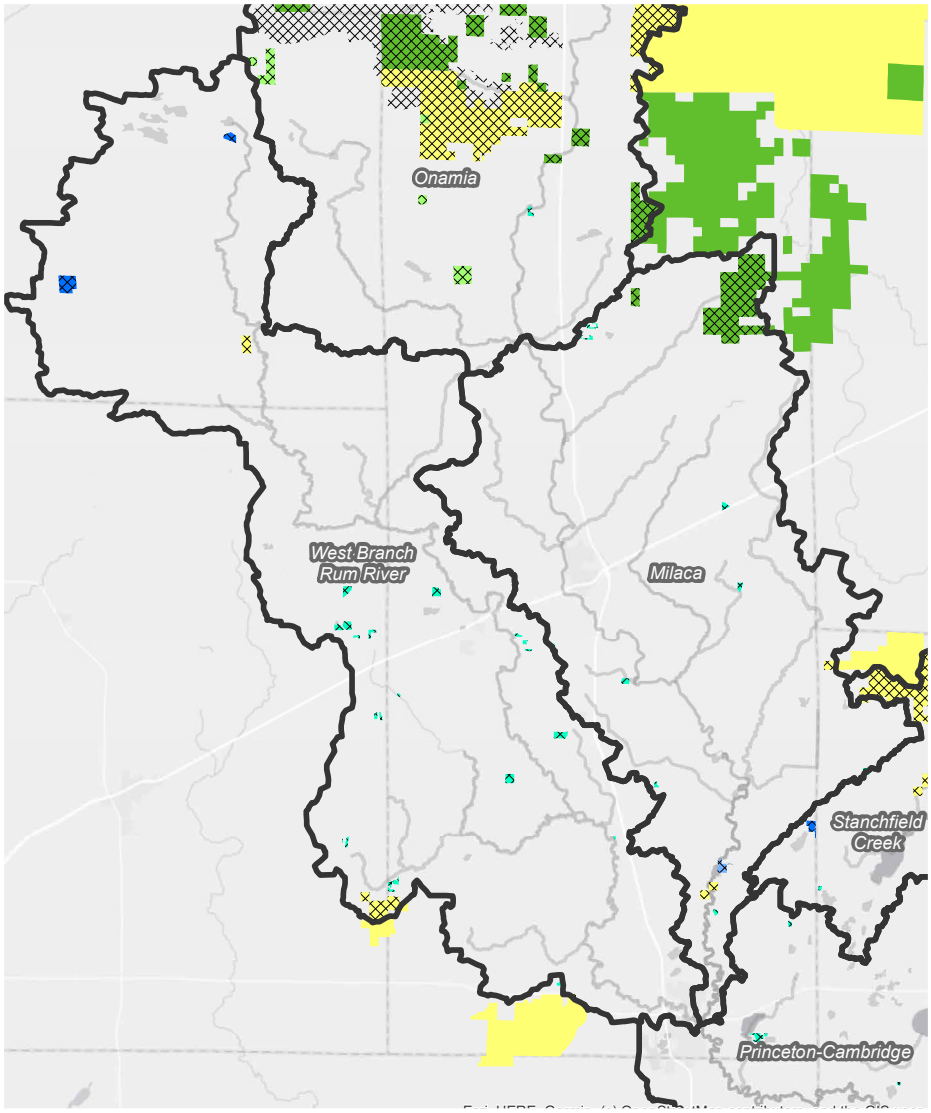


Figure 4.11: Targeted priority habitat (North)



KEY

- Management Zones
- Priority Critical Habitat
- BWSR RIM/CREP Easements
- BWSR Wetland Bank Easements
- Anoka County Parks
- UMN Ecosystem Science Reserve
- Wildlife Management Area
- Scientific and Natural Area
- Aquatic Management Area
- State Forest
- Other Forest Land
- State Park
- Public Watercourse
- Public Water Basins

Figure 4.12: Targeted priority habitat (Central)

KEY

- Management Zones
- Priority Critical Habitat
- BWSR RIM/CREP Easements
- BWSR Wetland Bank Easements
- Anoka County Parks
- UMN Ecosystem Science Reserve
- Wildlife Management Area
- Scientific and Natural Area
- Aquatic Management Area
- State Forest
- Other Forest Land
- State Park
- Public Watercourse
- Public Water Basins

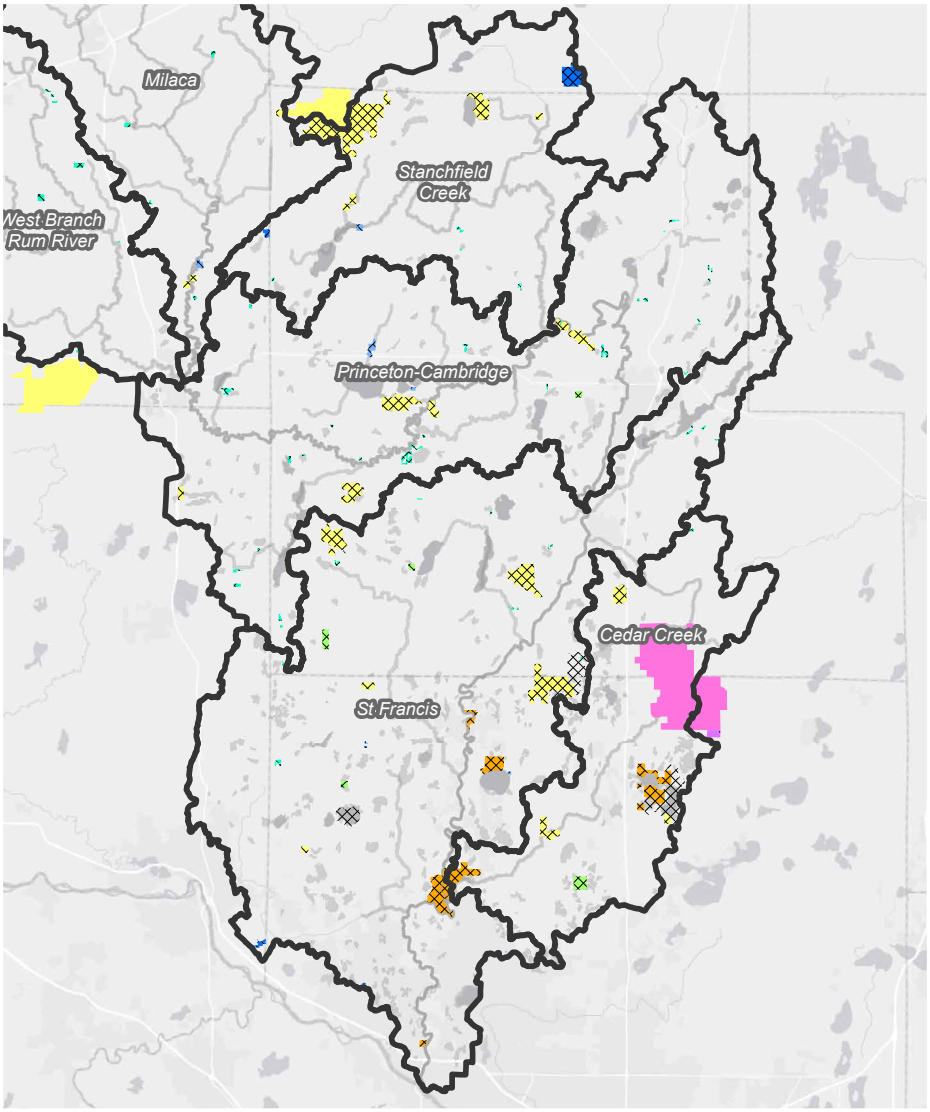


Figure 4.13: Targeted priority habitat (South)

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Table 4.12: Natural Resources - Upland Habitat Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in Upland Habitat Priority Areas														
NR-U.1	Watershed Wide	Identify and Rank High Value Areas	Identify and Rank High Value Natural Resources of Cultural or Biological Significance	Priority Areas Mapped		●					$70,000	✗	MLBO SWCDs	
NR-U.2	Target Priority Upland Habitat Areas	Maintain and Create Healthy Forests	Coordinate with MNDNR on Forest Resilience Planning in the Watershed	Annual Meeting with MNDNR Foresters		●	●	●	●	●	$5,000	✗	Forest Stewardship Coordinator	SWCDs MNDNR
NR-U.3	Target Priority Upland Habitat Areas	Maintain and Create Healthy Forests	Create Forests in Critical Conservation Corridors that were Historically Forested	1,045 Acres Created		●	●	●	●	●	$365,750	✓	SWCDs	BWSR LCCMR Grant
NR-U.4	Target Priority Upland Habitat Areas	Restore or Maintain Healthy Habitat	Conduct Habitat Enhancement Activities in Critical Conservation Corridors or as Identified in the Anoka Sandplain Strategic Plan	2,000 Acres Enhanced		●	●	●	●	●	$8,000,000	✓	Anoka Sandplain Partnership	
NR-U.5	Target Priority Upland Habitat Areas	Expand Existing Habitat and Improve Connectivity Protect Remaining Isolated And High Value Areas	Install Woody or Herbaceous Habitat Corridors or Similar Practices to Connect Habitat Patches	2 Miles of Habitat Corridor Installed or 12 Acres			●	●	●		$67,800	✓	SWCDs	TNC
NR-U.6	Target Priority Upland Habitat Areas	Expand Existing Habitat and Improve Connectivity Protect Remaining Isolated and High Value Areas	Acquire Conservation Easements	175 Acres Protected			●	●	●		$233,176	✓	SWCDs	
NR-U.7	Target Priority Upland Habitat Areas	Maintain and Create Healthy Forests	Support Collective Forestry Harvesting Options	Develop Cooperative Forestry Outreach Program				●	●	●	$5,000	✓	Forest Stewardship Coordinator	
NR-U.8	Target Priority Upland Habitat Areas	Protect Habitat in Developed and Developing Areas	Encourage LGUs to Promote or Use Conservation Land Use Planning Looking at Land Natural Resource Value Before Development Occurs	1 Entity Engaged				●			$20,000	✓	SWCD, Forest Stewardship Coordinator	

Rum River Comprehensive Watershed Management Plan

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

KEY

- Below $50K
- $51K - $75K
- >$75K - $150K
- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Table 4.12 (Continued): Natural Resources - Upland Habitat Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Mille Lacs														
NR-U.9	Mille Lacs Lake (Tier 1) Borden Lake (Tier 3)	Maintain and Create Healthy Forests	Restore Areas and Species of Cultural Significance (Such as sugar maple)	20 Acres Restored		●	●	●	●		$7,000	✓	MLBO	Mille Lacs SWCD
Onamia														
NR-U.10	Rum River (Tier 1) Ogechie Lake (Tier 1) Shakopee Lake (Tier 1) Tibbets Brook (Tier 2)	Maintain and Create Healthy Forests	Restore Areas and Species of Cultural Significance (Such as sugar maple)	20 Acres Restored		●	●	●	●		$7,000	✓	MLBO	Mille Lacs SWCD
Princeton-Cambridge														
NR-U.11	Francis Lake (Tier 3) Little Stanchfield Lake (Tier 3)	Protect Shoreline Habitat	Conduct Inventory of Streams and Lakes to Identify and Rank for Restoration	Baseline Data Collected			●				$14,000	✗	SWCD	
St. Francis														
NR-U.12	East Hunter Lake (Tier 3)	Protect Shoreline Habitat	Conduct Inventory of Streams and Lakes to Identify and Rank for Restoration	Baseline Data Collected		●					$7,000	✓	Sherburne SWCD	
NR-U.13	West Hunter Lake (Tier 3)	Private Forest Management	Implement Private Forest Management Practices Including Tree and Shrub Establishment BMPs for Tracts of any Size	2 Plans Completed for Forest Protection			●				$6,200	✓	Sherburne SWCD	

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*Costs included across multiple issue statement implementation action items.

DESIRED FUTURE CONDITION

The Rum River Watershed's lakes, streams, and wetlands provide connected high-quality habitats.

MEASURABLE OUTCOME

Restore, enhance, and protect aquatic habitat and shoreland areas by 180 acres.

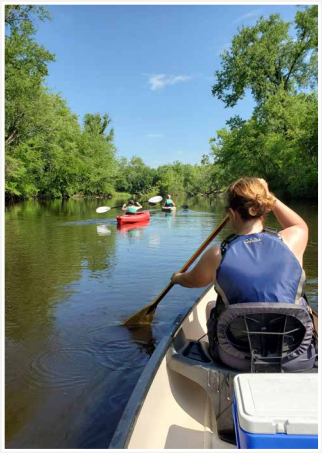

Figure 4.14: Paddling on the Rum River, image courtesy of the Anoka Conservation District.

Natural Resources - Restore Degraded and Protect High Quality Aquatic Habitat In and Around Lakes, Streams, Rivers, and Wetlands. (NR-A)

ISSUE STATEMENT

Aquatic habitats are threatened by increased frequency and volume of precipitation, increasing pollutant loads, excess sediment, degraded shoreline, and barriers to fish passage. Degraded aquatic habitats should be restored and high-quality habitats protected, especially when water quality benefits can also be achieved.

GOAL #1	Protect and restore critical aquatic and shoreland habitat areas

PRIORITY RESOURCES AND TARGETING

The criteria used for identifying candidate lake and stream resources for aquatic habitat "restore and protect" included numerous reports and designations, such as biological significance, trout or cisco, wild rice, and wild and scenic designations. Additionally, any lake or stream that was identified as a priority resource for any of the surface water quality issue statements was a candidate. Once this information was assembled the TAC selected the priority resources and assigned the associated tier levels based on best professional judgment, local resource knowledge, and the likelihood of restoration or protection success. Details on the prioritization criteria can be found in Appendix C.

There were 27 lakes that were identified as candidate resources according to the selected criteria, including six priority restoration lakes and seven priority protection lakes. Further screening by the TAC resulted in the selection of 13 priority lakes and each were assigned a tier level.

There were 11 streams that were identified as candidate resources, including two priority restoration streams and seven priority protection streams. All 11 streams were deemed priority resources and were assigned a tier level.

Candidate wetland resources were not identified due to insufficient and relevant data availability. However, prioritizing wetlands to better target restoration and activities is included in the implementation table.

Table 4.13: Prioritized resources for implementation activities

Tier	Lake	Management Zone
1	Mille Lacs	Mille Lacs
	Ogechie	Onamia
	Shakopee	Onamia
	George	St Francis
2	Green	Princeton-Cambridge
	Skogman	St Francis
	Fannie	St Francis
3	Round (Aitkin County)	Mille Lacs
	Borden	Mille Lacs
	Francis	Princeton-Cambridge
	Little Stanchfield	Princeton-Cambridge
	East Hunter	St Francis
	West Hunter	St Francis
Tier	**Stream**	**Management Zone**
1	Cedar Creek	Cedar Creek
	Rum River	Princeton-Cambridge St. Francis Onamia
	Stanchfield Creek	Stanchfield Creek
	West Branch Rum	West Branch Rum
2	Tibbets Brook	Onamia
	Seelye Brook	St Francis
	Estes Brook	West Branch Rum
3	Vondell Brook	Milaca
	Trott Brook	St Francis
	Unnamed Creek (531/532/533)	West Branch Rum
	Prairie Brook	West Branch Rum

MEASURABLE OUTCOME

Increase river miles without barriers of human-constructed obstructions.

Increase baseflow in streams where low baseflow has been identified as a primary stressor to aquatic life.

GOAL #2

Increase connectivity for desirable aquatic species

PRIORITY RESOURCES AND TARGETING

Identification of priority resources for this goal was focused on physical barriers, such as dams and culverts, as well as the habitat barriers of insufficient or low flow conditions, which restrict the movement of aquatic life.

PHYSICAL BARRIERS

Culverts

There is a lack of information and data regarding the condition of culverts. However, the MNDNR has been working to complete an inventory of culverts located within the public right of way. To ensure that this assessment is completed, and potentially extend the assessment to include private lands when private landowners provide approval, completing culvert inventories and prioritizing restoration actions is included in the implementation table.

In addition to prioritizing culverts based on a systematic analysis, the plan calls for correcting culverts opportunistically in cooperation with road authorities as roads are being constructed or repaired. The extent of habitat lift – or improvement – for these opportunities will be evaluated prior to cost sharing or supporting culvert replacement. Only when there is sufficient improvement as evaluated by technical staff, will cost-sharing or technical assistance be provided.

Dams

There are twenty-two dams in the watershed. Information on the dams was assembled and provided to the TAC. Upon review of the existing information and based on the MNDNR Priority Concerns Letter, the dam near the outlet of the Rum River in Anoka was determined to be a barrier to fish passage and the only impediment disconnecting the Mississippi River from Mille Lacs Lake. While the TAC recognized the potential controversy that may arise regarding this dam, they felt it was important to keep the opportunity open for continued conversations exploring and assessing mutually beneficial alternatives.

HABITAT BARRIERS

There are three candidate resources with low baseflow that could be improved for increased connectivity. These resources have been identified in existing research and studies and were already identified as priority surface water resources. After consideration of restoration opportunity and feasibility, the TAC ranked these resources as outlined below.

- West Branch Rum River, Tier 1
- Stanchfield Creek, Tier 1
- Tibbets Brook, Tier 2

Table 4.14: Priority strategies and waterbodies

Tier	Measure 1: Increase river miles without barriers
1	Complete Culvert Inventory
	Correct identified problem culverts
2	Correct culverts opportunistically based on road work
3	Explore feasibility of projects to improve native fish passage except at the Anoka Dam
Tier	**Measure 2: Increase baseflow**
1	West Branch Rum River
	Stanchfield Creek
2	Tibbets Brook

Table 4.15: Natural Resources - Aquatic Habitat in Lakes, Streams, Rivers, and Wetlands Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (See Table 4.13)														
NR-A.1	Target Aquatic Habitat Priority Waterbody Subwatershed Areas West Branch Rum River, Stanchfield Creek and Tibbets Brook Subwatershed	Restore Wetlands	Wetland Restoration and Wetland Banks Identify and Prioritize Sites using the Restorable Wetland Prioritization Tool (www.wetlandrestore.org) and Other Local Data	60 Acres Restored Across all Issue Statements Excluding Onamia Zone		●	●	●	●	●	$480,000*	✓	SWCDs	Counties USFWS TNC BWSR
NR-A.2	Target Aquatic Habitat Priority Waterbody Subwatershed Areas	Create New Habitat and Increase Habitat Connectivity	Acquire Conservation Easements	180 Acres Protected			●	●	●		$239,837	✓	SWCDs	
NR-A.3	West Branch Rum River, Cedar Creek, and Stanchfield Creek Mainstems and Tributaries	Complete a Culvert Inventories	Complete Culvert Inventories	Inventories Completed for Mainstems and Tributaries of West Branch Rum River, Cedar Creek, and Stanchfield Creek			●	●			$125,000*	✓	SWCDs Counties	MNDNR
NR-A.4	Watershed Wide Priority Resources	Compare Regulatory Approaches Across LGUs and Consider Updates for Watershed Level Consistency	Regulatory Comparison for Zoning Regulations such as Shoreland, Bluffs, and Floodplains	Comparison Study Completed and Policy Committee Evaluation to LGUs				●			$7,000	✓	JPE	SWCDs Counties
NR-A.5	Target Aquatic Habitat Priority Waterbody Subwatershed Areas	Incorporate Culvert Improvements with Road Projects	Address Connectivity with Road Projects	A List of Culverts with Connectivity Problems Presented to the Road Authority					●	●	$100,000	✓	Road Authorities	Counties

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- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Table 4.15 (Continued): Natural Resources - Aquatic Habitat in Lakes, Streams, Rivers, and Wetlands Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (See Table 4.13)														
NR-A.6	Target Aquatic Habitat Priority Waterbody Subwatershed Areas	Create New Habitat and Increase Habitat Connectivity	Restore Aquatic, Riparian, and Shoreline Areas	7000 Linear Feet Restored in Areas Identified as High Priority through Targeting or Other Prioritization Studies such as SWAs						●	$500,000	✓	MLBO	TNC
NR-A.7	Priority Locations Determined from 2024 Intensive Watershed Monitoring Study, MNDNR Input, and Field Investigation	Restore Meandering Channels for Streams and Ditches	Restore Natural Channel Patterns, Profiles, Cross Sections, and Stability in Altered Watercourses	1 Project Or 0.75 Mile of Stream Restored						●	$1,000,000*	✓	SWCDs	MNDNR
Mille Lacs														
NR-A.8	Mille Lacs Lake (Tier 1)	Complete Scientific and Prioritizing Study	Complete Targeted Assessment to Prioritize Protection of Existing Wild Rice or to Restore Wild Rice in Areas Identified as High Value	1 Plan Completed			●				$35,000	✓	MLBO	MNDNR
NR-A.9	Borden Lake (Tier 3) Round Lake (Tier 3)	Install BMPs from Assessment and Prioritizing Studies	Install Wild Rice Protection Practices Identified through Assessment and Prioritization Process (or Others)	To be Determined from Assessment or Prioritization Study				●			$25,000	✓	MLBO	
Onamia														
NR-A.10	Ogechie Lake (Tier 1)	Complete Scientific and Prioritizing Study	Complete Targeted Assessment to Prioritize Protection of Existing Wild Rice or to Restore Wild Rice in Areas Identified as High Value	1 Plan Completed			●				$35,000	✓	MLBO	MNDNR
NR-A.11	Shakopee Lake (Tier 1)	Install BMPs from Assessment and Prioritizing Studies	Install Wild Rice Protection Practices Identified through Assessment and Prioritization Process (or Others)	To be Determined from Assessment or Prioritization Study				●			$25,000	✓	MLBO	

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- Technical Assistance
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*Costs included across multiple issue statement implementation action items.

Table 4.15 (Continued): Natural Resources - Aquatic Habitat in Lakes, Streams, Rivers, and Wetlands Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost Total for 10-year plan period	Is outside funding necessary to meet goal? Over and above local contribution	Lead Entity	Supporting Entities
Princeton-Cambridge														
NR-A.12	Vondell Brook (Tier 3)	Drainage System Management	Incentivize Establishment of Buffers on Private Ditches and Buffer Enhancements on Public and Private Ditches	0.25 Mile Buffers Installed Beyond 16.5 Required Buffer on Both Sides of Ditch, or 1 Acre		●	●				$10,000	✓	SWCD	
Stanchfield Creek														
NR-A.13	Stanchfield Creek (Tier 1)	Nutrient Source Investigation	Ensure Sewage Treatment Ponds are not a Source of Nutrients (Stanchfield)	Investigation Completed			●				$700	✗	Isanti SWCD	MPCA
St. Francis														
NR-A.14	Rum River (Tier 1)	Study Feasibility of and Implement Projects that Improve Fish Passage While Reducing Vulnerability to Invasive Species Migration	Feasibility studies for the purpose of improving native fish passage	One Feasibility Study						● ●	$80,000	✓	MNDNR	
NR-A.15		Study Feasibility of and Implement Projects that Improve Fish Passage While Reducing Vulnerability to Invasive Species Migration	Dam and Culvert Modification	One Modification to Remove Barriers and Increase Stream Connectivity						● ●	$150,000	✓	MNDNR	

4.0 Priority Issue Goals and Implementation

Final Plan - April 29, 2022

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Rum River Comprehensive Watershed Management Plan

Groundwater - Knowledge and Data Regarding Groundwater (GW-KD)

DESIRED FUTURE CONDITION

People understand their impact on groundwater and participate in activities that minimize or mitigate their impact on groundwater quantity and quality.

Every local government has a clear understanding of their local groundwater picture and what is needed to protect groundwater.

MEASURABLE OUTCOME

Completion of the Mille Lacs County geologic atlas; other measures to be developed throughout the life of the plan.

Increase decision maker and technical staff knowledge of where drinking water contaminants exist and knowledge of vulnerabilities of groundwater-surface water interaction.

ISSUE STATEMENT

There is not enough awareness or understanding of groundwater quantity or quality. More information is needed to protect vulnerable areas and provide local government and communities with the information needed to take action.

GOAL #1	**Advance technical and scientific knowledge regarding groundwater availability and quality issues and implement programs that protect groundwater resources into the future.**

PRINCIPLES

Since Minnesota state agencies are responsible for groundwater monitoring and there is a need to support these efforts, as well as integrate the resulting data into the programs that address groundwater, the Rum River Partnership has adopted the following principles:

- Support state agency groundwater quality and quantity monitoring efforts
- Advocate for expanded diagnostic monitoring as needed to evaluate groundwater contamination
- Incorporate new groundwater to surface water interaction data into processes for targeting implementation actions as it becomes available
- Adaptively manage implementation efforts to mitigate groundwater contamination based on monitoring results.

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Table 4.16: Groundwater - Knowledge and Data Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost Total for 10-year plan period	Is outside funding necessary to meet goal? Over and above local contribution	Lead Entity	Supporting Entities
Actions Watershed Wide														
GW-KD.1	Mille Lacs County	Development of the Mille Lacs County Geologic Atlas	Support Mille Lacs County in Completing the Geologic Atlas, Should County Elect to Proceed	Completed Geologic Atlas		●					$30,000	✓	Mille Lacs SWCD County	MNDNR MGS
GW-KD.2	Watershed Wide	Evaluate Recharge Areas and Potential Risk	Pursue a Study to Define and Map Important Recharge Areas by State or Regional Agency	Mapped Recharge Areas				●			$5,000	✗	JPE	MNDNR MGS Met Council
GW-KD.3	Watershed Wide	Increase LGU Staff Knowledge of Groundwater Issues and Surface Water - Groundwater Connectivity	Host 3 Workshops, Each Specific to a Different Groundwater Topic and Related to the Plan's Goals and BMP Establishment	3 Workshops Held			●	●	●		$9,000	✓	Outreach Coordinator	MNDNR MDA MDH USGS
GW-KD.4	Watershed Wide	Provide Education and Resources for Elected Officials Whose Decisions May Impact Groundwater Quality or Quantity	Host 3 Workshops for Elected Officials, Promoting Topics that are Relevant to Groundwater and Local Decision-Making	3 Workshops Held				●	●	●	$6,000	✓	JPE	MNDNR MDA MDH

KEY

- Below $50K
- $51K - $75K
- >$75K - $150K
- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Natural Resources - Invasive Species (NR-IS)

DESIRED FUTURE CONDITION

Habitats are minimally impacted by invasive species.

ISSUE STATEMENT

Invasive species threaten the health and quality of upland, wetland, shoreland, and aquatic ecosystems. Their spread needs to be prevented and existing infestations controlled to mitigate their impacts.

PRIORITY RESOURCES AND TARGETING

Several potential criteria for identifying candidate resources were considered for both goals regarding reducing the impact of invasive species. The TAC recognized that addressing invasive species could result in the diversion of energy and resources from higher priority issues and that existing programs, such as county foresters and agricultural inspectors, are actively working on invasive species control. Ultimately the TAC recommended the continued focus on the containment and control of resources that have already been prioritized in other issue statements.

GOAL #1 MEASURABLE OUTCOME

One invasive species management plan completed and presented to weed management authorities for consideration.

Recommendations developed for cooperative weed management areas.

GOAL #1	Reduction of acres and population size of current invasive species

- Priority species to be addressed include Emerald Ash Borer, Buckthorn, and Zebra Mussels.

GOAL #2 MEASURABLE OUTCOME

Early detection and rapid response plans for new terrestrial and aquatic invasive species are developed for each county and compared to increase coordination.

GOAL #2	Reduce new infestations of invasive species

PRIORITIZING IMPLEMENTATION ACTIVITIES

- Priority species include Knotweed, non-native Phragmites, Starry Stonewort, and Emerald Ash Borer

Table 4.17: Prioritized resources for implementation activities

Tier	Lake	Management Zone
1	Mille Lacs	Mille Lacs
	Ogechie	Onamia
	Shakopee	Onamia
	George	St Francis
2	Green	Princeton-Cambridge
	Skogman	St Francis
	Fannie	St Francis
3	Round (Aitkin County)	Mille Lacs
	Borden	Mille Lacs
	Francis	Princeton-Cambridge
	Little Stanchfield	Princeton-Cambridge
	East Hunter	St Francis
	West Hunter	St Francis
Tier	**Stream**	**Management Zone**
1	Cedar Creek	Cedar Creek
	Rum River	Princeton-Cambridge St. Francis Onamia
	Stanchfield Creek	Stanchfield Creek
	West Branch Rum	West Branch Rum
2	Tibbets Brook	Onamia
	Seelye Brook	St Francis
	Estes Brook	West Branch Rum
3	Vondell Brook	Milaca
	Trott Brook	St Francis
	Unnamed Creek (-531-/532/533)	West Branch Rum
	Prairie Brook	West Branch Rum

Table 4.18: Natural Resources - Invasive Species Implementation Table

Unique Action ID	Prioritized Watershed or Waterbody	Strategy	Implementation Action	10-Year Measurable Output/Outcome	Program	Timeframe and Level of Effort: 2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Estimated Cost (Total for 10-year plan period)	Is outside funding necessary to meet goal? (Over and above local contribution)	Lead Entity	Supporting Entities
Actions in All Priority Areas (see Table 4.17)														
NR-IS.1	Target Invasive Species	Develop Invasive Species Management Plans	Develop Invasive Species Management Plan for Priority Species	One Plan Completed and Presented to Weed Management Authorities for Consideration		●	●				$7,000	✗	Ag Inspectors	MDA
NR-IS.2	Target Invasive Species	Control and Reduce Existing Aquatic Invasive Species	Compare AIS Plans and Look for Watershed Wide Collaboration Opportunities	Comparison Study and Policy Committee Recommendations to LGUs			●				$7,000	✗	County AIS Leads	SWCD
NR-IS.3	Target Invasive Species	Develop Early Detection and Rapid Response Plans for New AIS	Develop, Compare, and Coordinate Early Detection and Rapid Response Plan for AIS Using MNDNR Protocol	Plans for Each County Across the Watershed Complete and Compared			●				$7,000	✗	County AIS Leads	MNDNR
NR-IS.4	Target Invasive Species	Coordinate Habitat Restoration Activities with County Forester, County Ag Inspector, and Local Weed Authorities	Create Recommendations for Coordinated Efforts Across Public and Private Land	Recommendations for Cooperative Weed Management Areas.				●			$7,000	✗	SWCDs Ag Inspectors	
NR-IS.5	Target Invasive Species	Develop Early Detection and Rapid Response Plans for New Terrestrial Invasive Species	Develop, Compare and Coordinate Early Detection and Rapid Response Plans for New Terrestrial Invasive Species	Plans for Each County Across the Watershed Complete and Compared				● ●			$56,000	✓	Ag Inspectors	County Boards MDA

KEY

- Below $50K
- $51K - $75K
- >$75K - $150K
- >$150K < $300K
- On-The-Ground Implementation
- Policy
- Studies + Data
- Technical Assistance
- Education + Outreach

*Costs included across multiple issue statement implementation action items.

Plan Administration

In order to implement the plan, the Board may contract with a party or parties to implement projects as well as provide coordination, operations, administration, legal, or expert services. These services will be critical to ensure that day to day operations, work plan developing, meeting coordination, and reporting are intentionally planned and well executed. Plan Administration may also include the costs incurred for procuring insurance and completing plan amendments, including plan writing and public noticing.

Table 4.19: Plan Administration Implementation table

Implementation Action	Plan Administration
Timeframe	Across the 10-year plan timeframe
Estimated cost	5% of the annual budget, to be determined on an annual basis
Is outside funding over and above the local contribution necessary to meet goal?	✓
Lead Entity	JPE

CHAPTER 5.0

Plan Implementation Programs

5.0 Plan Implementation Programs

There are programs that support the implementation actions and are necessary to ensure that the Plan goals are accomplished. These programs are described in this chapter, except for Outreach and Education, which was outlined in Chapter 4.

INCENTIVE PROGRAMS

Incentive programs are formal programs used to promote specific actions or behaviors. Various mechanisms can be used for conducting incentive programs, including financial assistance or providing benefits for enrolling in programs. The IPC and Partnership organizations will strive to coordinate incentive programs to provide consistency across the watershed.

COST SHARE PROGRAMS

In a cost-share program, the costs of systems or practices are designed to protect and improve water quality, groundwater, habitat, forest health, and soil-and-water resources are shared between the landowner and a sponsoring entity, such as the state, local, or federal government. The BMPs and conservation practices (CPs) typically eligible are those that avoid, control, and trap nutrients, sediment, and E. coli from entering surface water and groundwater. Structural practices that may be eligible include sediment-control structures or streambank stabilization projects. Nonstructural practices that may be eligible include soil health, cover crops, forest management and manure management planning services as well as implementation of those plans. Eligibility may vary depending on local priorities and needs. The Minnesota Department of Agriculture's Nutrient Management Program (NMP) is an example of a cost share program.

MINNESOTA AGRICULTURAL WATER QUALITY CERTIFICATION PROGRAM

The Minnesota Agricultural Water Quality Certification Program (MAWQCP) provides an opportunity for producers to voluntarily enroll in this program. By enrolling, producers agree to implement and maintain approved farm management practices and obtain certification that their operation protects surface waters from the impacts of agricultural practices. Technical and financial assistance is prioritized for those who enroll but are not yet certified. After participants have been certified, they obtain regulatory certainty for a period of 10 years.

FEE DISCOUNTS

Local governments or nonprofit entities may offer reduction in fees for implementing projects and practices that align with program goals; for instance, public-drainage authorities could offer discounted permit application, review, and inspection fees if the landowner voluntarily implements a rate reduction project, or stormwater fees could be reduced if a landowner voluntarily converts cropped acres to a permanent vegetative cover.

LOW INTEREST LOANS

Low interest loans may be available through various state agencies to landowners for agricultural best management practices, septic system replacement, or other projects that meet funding eligibility criteria.

MAWQCP Numbers

Presently, in the MAWQCP, there are 25 producers farming 160 fields totaling 5,095 acres.

Additionally another 138 fields have been assessed totaling 6,070 acres.

The producers have implemented 92 new practices including 1,733 acres of new cover crop planting.

Source: Laacouri, Aicam; Personal Communication, Tuesday, June 1, 2021 11:58:35 AM

Figure 5.1: Shoreland Restoration; image by: Julie Blackburn

CAPITAL IMPROVEMENT PROGRAMS

For the purposes of this plan, capital improvement projects are those projects that are larger scaled, more expensive, and have a longer effective life than the projects typically funded through incentive and cost-share programs. The types of projects eligible to be considered as a capital improvement typically provide significant, regional benefits and may require feasibility studies before design and construction. These projects require operations and maintenance (O&M) plans for the life of the project including inspection plans to ensure project effectiveness. An easement and or land acquisition are both feasible components of capital improvement projects, or may constitute a capital improvement project on their own. These projects are often completed in cooperation with multiple entities and are good candidates for state or federal grant funding.

Watershed wide collaboration is already taking place through the Reinvest in Minnesota (RIM) program in which a $3 million legislative appropriation was made to secure permanent easements on sensitive lands particularly along the main stem of the Rum River, as well as the West Branch Rum River, and Mille Lacs Lake. Capital improvement project examples for the Rum River watershed include habitat protection, stream restoration, increasing water storage, water quality protection, urban stormwater treatment, and culvert, bridge, or dam modifications to increase connectivity or reduce the likelihood of invasive species migration.

Opportunities to implement large scale drainage projects will be considered based on the results of multi-purpose drainage management plans that will be developed. The Plan calls for SWCDs, conservation districts, and watershed management organizations to be involved early in the drainage project development process to ensure that these projects are developed consistent with Plan goals.

Figure 5.2: Urban stormwater pond; image courtesy of the Isanti County SWCD.

OPERATIONS AND MAINTENANCE PROGRAM

After BMP and capital improvement projects have been completed, regular inspections and maintenance will be performed to keep the project functioning at its design capacity and life expectancy. The parties responsible for Operations and Maintenance (O&M) inspection procedures and enforcement will vary based on the type of project, funding entity, and contractual requirements. O&M plans will be prepared before construction. The O&M plan should include expected activities, timing of activities, and an inspection schedule. Information should also be developed on the procedure to be followed if the inspection determines maintenance is required or if required maintenance has not been performed, including potential penalties or enforcement actions. Minnesota State Rules 8400.1700 and 8400.1750 outline program requirements for 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 a written record, photographs, and a report regarding the status of the practice and outline repairs or maintenance required. Inspection records should be kept throughout the life of the practice to verify maintenance activities. BWSR's recommended inspection plans are as follows:

- Conservation practice with a minimum effective life of 10 years: the years that end in 1, 3, and 9 following the certified completion.
- Capital-improvement projects having a minimum effective life of 25 years: the years that end in 1, 8, 17, and 24 following 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 governmental units, as well as state and funding agencies, will be used to compel compliance.

Mille Lacs Band of Ojibwe

The Mille Lacs Band of Ojibwe are a sovereign nation with their own laws and regulatory authority with respect to natural resources management. The Mille Lacs Department of Natural Resources develops and implements wildlife, fish, and forestry improvement activities, regulates hunting, fishing, and gathering on the reservation, enforces regulations related to conversation, environmental protection, and natural resource permits.

For more information, see the Mille Lacs Band of Ojibwe's website at *millelacsband.com*

LAND USE MANAGEMENT

Planning for growth and land uses according to the suitability of the resource condition is an important way in which natural resources in the Watershed will be protected against impacts due to unintended consequences of growth. Federal, state, and local land use management control programs provide the regulatory mechanisms that support land use planning activities by outlining compliance criteria for associated land use actions. This section outlines both land use management planning and land use management control programs within the Watershed.

LAND USE MANAGEMENT PLANS

County and municipal comprehensive or land use management plans are important tools that guide future land management activities to prevent harmful impacts to environmental and economic concerns. These plans indicate where orderly growth will occur and must include goals for protecting open space and the environment. The goals and objectives contained in comprehensive plans are reflected in the zoning ordinances, permit standards, and conditional use criteria that the county or municipality employs to ensure the comprehensive land use management plan goals are obtained. The date of the most recent comprehensive land use management plans for each county is listed in Table 5.1, except for Anoka County, in which each city has its own plan.

Table 5.1: County Comprehensive Land Use Plans and Adoption Dates.

County	Date of Comprehensive Plan Adoption
Aitkin County	April 2000
Anoka County	All planning and zoning is handled by municipalities.
Benton County	June 2019
Crow Wing County	2003
Isanti County	February 2009
Kanabec County	All planning and zoning is handled by townships.
Mille Lacs County	November 2013
Morrison County	2016
Sherburne County	September 2011

LAND USE MANAGEMENT CONTROLS

Local units of government, including counties, cities, townships, and watershed management organizations (WMOs), are responsible for regulating land-use controls and implementing various state programs and legislation, such as the MNDNR Shoreland Management Program and Minnesota's Wetland Conservation Act. In addition to local controls, federal and state laws, regulations, and rules are in place that relate to watershed and natural resource management. The Upper Rum and Lower Rum Watershed Management Organizations regulatory controls are focused on wetland protection, stormwater, and flood prevention and mitigation. A summary of the regulatory controls most related to watershed management follows and a table of current, locally enforced regulatory controls can be found in Appendix B. Local governments can provide up-to-date information regarding regulatory controls.

RECOMMENDATIONS

A key aspect of a successful land use management programs is the consistent application of standards and criteria in planning, zoning, and permitting as well as enforcement of land use management controls. Opportunities exist for land use authorities to achieve consistency and manage planning for the long-term protection of watershed resources in a way that balances economic growth with ecological and environmental needs. The following land use management planning and control recommendations are included in the implementation tables:

- Comparison of the following zoning regulations and ordinances:
  - SSTS inspection triggered by building permits
  - Comparison of shoreland, bluff, and floodplain ordinances
- Alignment of the following zoning regulations and ordinances:
  - Shoreline ordinances
  - Development standards to minimize runoff
  - Preservation of natural areas
- Adoption of land use planning tools or ordinances to protect prioritized areas
- Promote and employ land use planning to determine natural resource value before development occurs
- Communication with road authorities regarding stream crossing, culvert function, design, and replacement

INFLUENCING STATE POLICY

The Partnership members are eligible to participate in their respective associations: Minnesota Association of Soil and Water Conservation Districts (MASWCD) and Association of Minnesota Counties (AMC). Each association has a resolution and policy process and platform. The JPE will review issues of significant importance, and brainstorm potential policies to improve regulatory support on an annual basis. The planning partners will seek opportunities to improve watershed management programs through various channels including local, regional, and statewide organizations.

Check it out!

See page 138 for more information on **Table 4.12:** Natural Resources - Upland Habitat Implementation Table

EXISTING LAND USE MANAGEMENT CONTROLS

Wetland Management

There are regulatory controls regarding discharge of dredged or fill materials into waters of the United States including wetlands. USACE and the EPA share responsibilities for implementing Section 404 of the Clean Water Act. 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. USDA implements the Federal Farm Bill policies regarding draining or filling wetlands for farm program participation. Minnesota also has the Wetland Conservation Act (WCA) that is intended to result in no-net loss of wetlands through various mitigation, replacement, and permitting activities. BWSR administers the program, however it is implemented through local governments. WCA entities within the Rum River Watershed are Aitkin, Benton, Crow Wing, Isanti, Kanabec, Mille Lacs, and Sherburne Counties; Morrison SWCD; and the Lower Rum River WMO. The wetland management authority for the Upper Rum River WMO portion of Anoka County is the cities - Bethel, East Bethel, Ham Lake, Nowthen, Oak Grove, and St. Francis.

Wetland Regulations

Minnesota State Statute 103G

MN Rules Chapter 8420

Floodplain Management

The Federal Emergency Management Agency (FEMA) administers federal floodplain management, mapping, insurance, and flood-assistance programs. At the state level, MNDNR oversees the state program and administers the National Flood Insurance Program for the state. Local zoning regulations identify permitted land use in the floodway, flood fringe, and floodplain. At the time of the plan development, Digital Flood Insurance Rate Maps (DFIRMs) have been completed for Anoka, Benton, Crow Wing, Isanti, Mille Lacs, and Sherburne Counties, but only paper maps exist for Aitkin, Kanabec, and Morrison Counties.

Shoreland Management

Minnesota has shoreland management standards that are identified in rules and are overseen by MNDNR. 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. Aitkin, Crow Wing, Kanabec, and Morrison Counties have shoreland ordinances that are more restrictive than the state minimum; however, the requirements of their ordinances are not consistent.

Buffer Management

Buffers are required on public waters and drainage systems. Legislation enacted in 2015 requires perennial vegetation buffers on public waters (an average width of 50 feet and minimum of 30 feet) and public drainage systems (16.5 feet). 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 EQIP; public-water accesses; and municipalities that follow federal and state stormwater requirements. BWSR is the regulatory authority of this program, although counties and watershed districts may choose to elect jurisdiction over the buffer law within their boundaries. Aitkin, Anoka, Benton, Isanti, Mille Lacs, and Morrison Counties elected jurisdiction over the buffer law. Crow Wing and Mille Lacs Counties and Aitkin, Anoka, and Morrison SWCDs have approved buffer ordinances. LRRWMO and URRWMO also have approved buffer ordinances.

Buffer Compliance

As of June 2021, buffer compliance within the watershed was estimated to be at 95-100% according to BWSR

Point Source Pollution Regulations

Mandates regulating point sources of pollution were a major component of the Clean Water Act, which was passed in 1972. The U.S. Environmental Protection Agency is responsible for regulating point sources through the National Pollutant Discharge Elimination System (NPDES). The MPCA implements this program, which includes municipal sewage treatment plants, industrial discharges, concentrated animal feeding operations (CAFOs), and stormwater at the state level. Minnesota has general permits that govern activities such as CAFOs and the standards are outlined in state rules.

Municipal Separate Storm Sewer Systems (MS4)

Discharges from certain municipal separate storm sewers system (MS4s) are regulated under the NPDES which was developed as a result of the federal Clean Water Act. There are a total of 15 MS4 systems wholly or partially within the Watershed area: the cities of Andover, Anoka, Cambridge, Coon Rapids, East Bethel, Elk River, Ham Lake, Isanti, Nowthen, Oak Grove, Ramsey, and Saint Francis; Anoka and Sherburne Counties; and MNDOT Metro District.

MS4 Regulations

MN Rules Chapter 7090.

Wellhead Protection

Protection of community drinking water sources is accomplished using wellhead protection areas to identify areas in a well recharge zone that are susceptible to contamination. Wellhead protection plans are written according to 1986 amendments to the federal Safe Drinking Water Act. There are 30 wellhead protection areas wholly or partially within the Plan area, the largest of which are Elk River (partially in the Plan area), Andover Central (partially in the Plan area), Milaca, Princeton South, Saint Francis, and Cambridge.

Wellhead Protection Regulations

MN Statutes 1031.101, Subd. 5, MN Rules Chapter 4720.

Subsurface Sewage Treatment Systems

The goal of the Subsurface Sewage Treatment Systems (SSTS) program is to protect 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. Counties in the Plan area may have SSTS upgrade low-interest loans available, as well as grant funding, for individuals that meet limited income qualifications.

Subsurface Sewage Treatment Systems Regulations

MN Statutes 115.55 and 115.56, MN Rules Chapters 7080, 7081, 7082, 7083.

Waste Management

Waste management permitting and regulatory programs are implemented by the MPCA. These programs include hazardous waste, storage tanks, and solid waste. Local land-use and zoning controls may regulate whether waste storage and handling facilities are a compatible use. Waste from areas within the watershed is disposed of at several landfills, one north of Elk River, one east of Cambridge, and one on the south side of Ramsey. Residents should to contact their county solid waste office for current information on disposal of household hazardous waste.

Waste Management Regulations

MN Statutes 115.55, MN Rules Chapters 7001, 7035, 7045, 7150, 7151, 9215, 9220.

Groundwater/Surface Water Use

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

MNDNR Authorities

State statute 84D; Minnesota Rules Chapter 6216. Noxious weeds and pests: MN State Statute 18G

Invasive Species

The MNDNR has regulatory authority over aquatic plants and animals, and terrestrial vertebrates. The Minnesota Department of Agriculture (MDA) has regulatory authority over terrestrial plants (noxious weeds) and plant pests. Each county has either an agricultural inspector or designated employee who is responsible for ensuring all laws and rules related to noxious weeds are carried out. There is no counterpart for aquatic plants and animals or terrestrial vertebrates.

Feedlot Regulations

MN Rules Chapter 7020

Feedlots

The MPCA administers feedlot regulations in Minnesota. Additionally, counties in the state may be delegated by the MPCA to administer the program for feedlots that are not required to have a state or federal permit (see Point Source Pollution Regulations in Section 5.6.3.5). The feedlot regulations are administered by the MPCA in all counties in the Plan area except Morrison County. Morrison County is an MPCA feedlot delegated county and as such manages its own program. Their program must include permitting, inspection, and registration, and they will maintain delegated authority during the plan implementation.

Public Waters Regulations

MN Statute 103G.245

Public Waters

The MNDNR administers the Public Waters Work Permit Program which regulates activities below the Ordinary High-Water Level (OHWL) in public waters and wetlands. There are many activities that are required to be permitted prior to beginning work. These activities may include excavation, dredging, filling, putting in structures, and shore protection measures.

Extraction/Extractive Use Regulations

Minn. Stat. §§ 394.25

Extraction/Extractive Use

Counties are responsible for administering land use controls for extraction. Extractive use means the use of land for the removal of surface or subsurface sand, gravel, rock, industrial minerals, a nonmetallic mineral, or peat not regulated by Minn. Stat. §§ 394.25 and amendments. Extractive use mining may include construction sand and gravel used in concrete, aggregates, concrete products, asphalt, road base, fill, snow and ice control, and other miscellaneous uses.

Publicly Managed Drainage Systems

Artificial drainage (subsurface drainage tile and open ditches) was used historically to increase the amount of arable land. Over the past several decades, more extensive tiling (pattern tiling) has been used to optimize crop production by ensuring soil moisture does not prevent planting at the optimal time or create undesired crop stress due to excess soil/surface moisture. Publicly managed drainage systems provide outlets for private tile and ditches. Management of publicly managed drainage systems is provided by drainage authorities (typically counties or watershed districts) and is governed by Minn. Stat. §§ 103E. Drainage authorities work with landowners to ensure adequate drainage and enforcement of relevant regulations (e.g. buffer requirements). There are 10 public drainage authorities within the Rum River Watershed: Aitkin, Anoka, Benton, Crow Wing, Isanti, Kanabec, Mille Lacs, Morrison, and Sherburne Counties, and the Lower Rum River Watershed Management Organization. Many public drainage systems in the Plan area have not been regularly maintained since their construction in the early 1900s. Efforts are currently underway in some counties to modernize drainage records and develop inspection and maintenance programs to ensure adequate drainage.

Regulations

Minn. Stat. §§ 103E

Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 governs the protection of cultural resources. The NHPA requires federal agencies to consider the effect of their activities on historic properties; in practice this is achieved in partnership with State/ Tribal Historic Preservation Offices. Minn. Stat. §§ 138 designates the commissioner of the Department of Administration as the Historic Preservation Officer and assigns responsibility for the program with the State Historic Preservation Office (SHPO). The Minnesota Field Archaeology Act mandates licensing for archaeological work on non-federal public land and requires state agencies to coordinate with the State Archaeologist, SHPO, and the Minnesota Indian Affairs Council for review when working in areas of known or suspected archaeological sites. The Minnesota Historic Sites Act establishes the State Historic Sites Network and the State Register of Historic Places and requires state agencies to consult with the SHPO before undertaking or licensing projects that may affect listed properties. Other pertinent regulations come from The Minnesota Private Cemeteries Act, which protects all human remains on public or private land in Minnesota; the Minnesota Environmental Right Act; and MN Environmental Quality Board rules regarding Environmental Assessment Worksheets and Environmental Impact Statements.

Cultural Resources Regulations

Minn. Stat. §§ 138

Figure 5.3: Lynx

Figure 5.4: Rusty patched bumble bee; image by Heather Holm

Figure 5.5: Gray wolf

Endangered and Threatened Species

Minn. Stat. §§ 88.0895 governs protection of threatened and endangered species and defines species with special protection as follows: endangered species are those threatened with extinction throughout all or a significant portion of its range; threatened species are those likely to become endangered within the foreseeable future throughout all or a significant portion of its range; and species of special concern are those that are not endangered or threatened, but are extremely uncommon in Minnesota or have unique or highly specific habitat requirements and deserve careful monitoring. MNDNR is required to adopt rules designating species as endangered, threatened, or species of special concern. Species are also protected at the federal level and their protection status is determined by the US Fish and Wildlife Service (USFWS). Species with protection status at the federal level (as listed by USFWS) are shown in the table below. With respect to the Northern long-eared bat (NLEB), USFWS may regulate tree removal or other activities if they are conducted:

- Within 1/4 mile of an entrance to a known NLEB hibernaculum (a cave, mine, or other feature in which NLEBs have been documented to overwinter)
- Within 150 feet of a known NLEB maternity roost tree (a tree in which a female NLEB has been documented to roost)

Table 5.2: List of federally protected species within counties wholly or partially within the Rum River Watershed (USFWS, 2018)

Species	Status	Location (Counties)
Rusty patched bumble bee	Endangered	Chisago Sherburne
Canada lynx	Threatened	Aitkin
Gray wolf	Threatened	Aitkin Crow Wing Kanabec Mille Lacs Morrison Sherburne
Northern long-eared bat	Threatened	All
Bald eagle	Protected	All

One additional species, the insect Karner blue, is listed by MNDNR as federally protected and is present in the Rum River Watershed. The MNDNR does not include the Rusty patched bumble bee, Canada lynx, and Gray wolf as species present in the Rum River Watershed. A summary of the number of species in the Rum River Watershed by type and state-designated protection status is listed in the table below.

Table 5.3: Number of MNDNR-designated species by species type and protection status (MNDNR, 2020)

Species Type	Endangered	Threatened	Protected	Total
Amphibian	0	0	1	1
Bird	1	1	8	10
Fish	0	1	2	3
Fungus	1	0	2	3
Insect	3	0	4	7
Mammal	0	0	4	4
Mussel	0	0	2	2
Reptile	0	2	2	4
Spider	0	1	4	5
Vascular plant	8	16	15	39
Total	13	21	44	78

Figure 5.6: Twisted Yellow-eyed Grass; image by Scott A. Milburn

Figure 5.7: Twisted Yellow-eyed Grass; image by Robert H. Read, WI State Herbarium

Figure 5.8: Cross-leaved Milkwort; image by Michael Hough

Figure 5.9: Tall Nutrush; image by Dwight Lauer

Figure 5.10: Yellow Bartonia; image by Arthur Haines

MONITORING PLANING

MPCA Intensive Watershed Monitoring Strategy (10 years)

Flood analysis

Local focused monitoring

Chloride testing

ADDITIONAL RESOURCES

Summary information and several in-depth reports can be found on the MPCA website. To find the MPCA's Rum River watershed page, open a web browser and enter the search term, *MPCA Rum River*. Some of the information on the MPCA site includes:

The Rum River Watershed Monitoring and Assessment Report

The Rum River Watershed Stressor Identification Report

Rum River Watershed HSPF Model Scenario Report

Rum River Watershed WRAPS (Watershed Restoration and Protection Strategies) Report

Rum River Bacteria and Nutrients TMDL

MONITORING PROGRAM

An important component of watershed management is understanding watershed conditions and trends. It is also important to gain knowledge about our lesser understood resources. Data obtained through data acquisition and monitoring programs provides 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 and identifies potential future data gathering and research efforts.

Data collected through locally led efforts will use industry standard methods and protocols and will be integrated in locally led modeling and resource management projects. Data acquired though local efforts will be submitted to the appropriate agency. Agencies are responsible for updating state sponsored modeling and resource assessment efforts, such as the Hydrological Simulation Program – Fortran (HSPF) and WRAPS programs, with the data acquired through local efforts.

SURFACE WATER

LGU staff adopted the surface water monitoring plan that was developed in the Rum River Watershed Restoration and Protection Strategy Report (MPCA, 2017b). This monitoring plan incorporates a combination of local monitoring with existing larger-scale monitoring programs. The MPCA's Intensive Watershed Monitoring (IWM) Strategy is scheduled to provide monitoring on this watershed every 10 years; with the next monitoring timeframe estimated to occur in 2024. In addition, local water planning agencies will conduct focused monitoring efforts. A list of recommended water monitoring sites was identified and includes the following types of monitoring:

- Grab sampling
- Real-time hydrology
- Water quality and data-logged stage
- Water quality and real time hydrology

Larger recreational lakes, outfalls of larger streams into the Rum River, and smaller streams identified as significant by local water planners will be included in locally led water monitoring efforts, subject to available funding and staffing resources. Testing for chlorides will also be incorporated into the monitoring plan following MPCA's monitoring protocols. Collaboration with the U.S. Geological Survey, MNDNR, and MPCA regarding flood analysis will also be conducted. All data collected through locally led efforts will use industry standard methods and protocols and will be submitted to the appropriate agency.

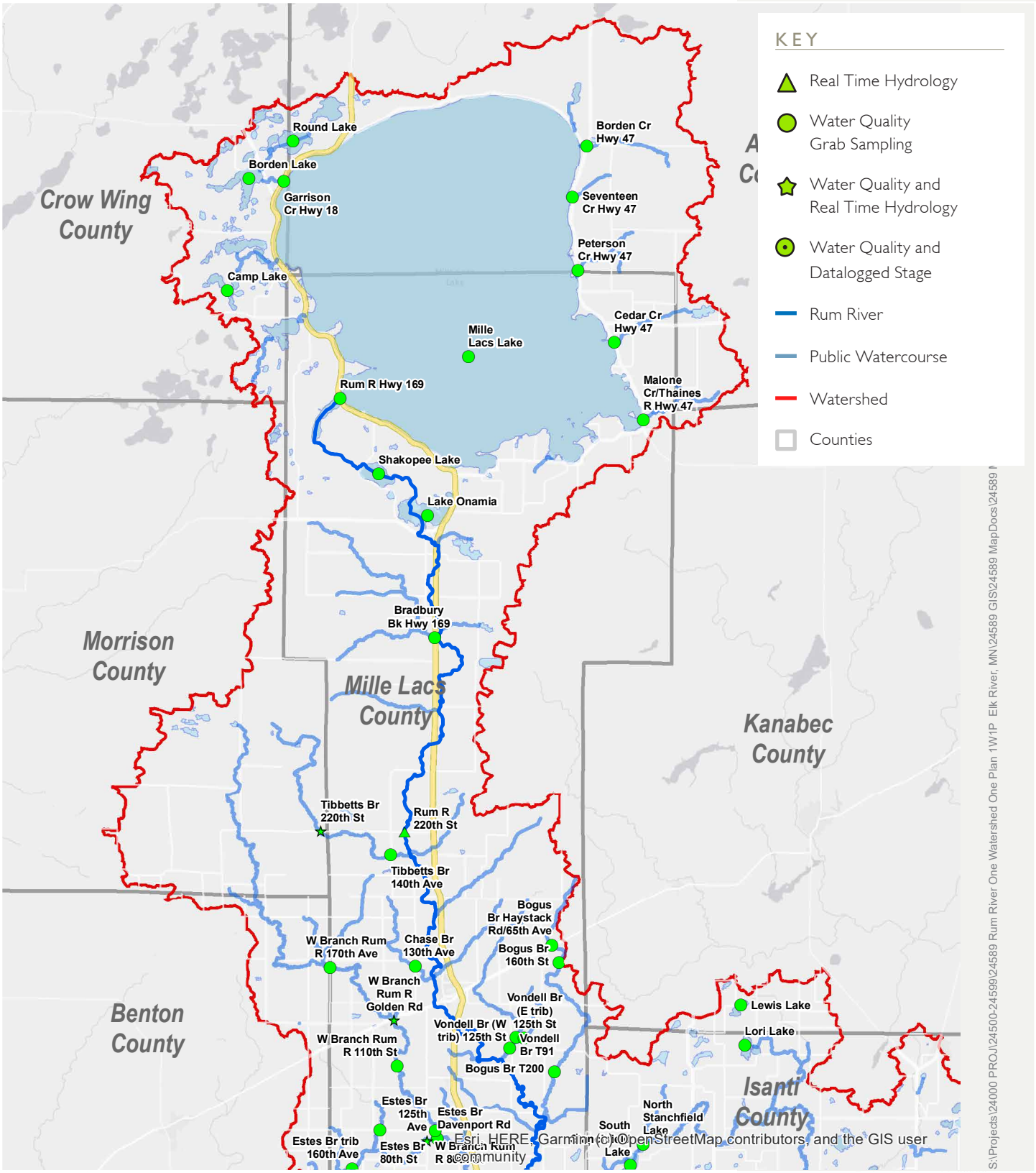

Figure 5.11: North Monitoring Plan

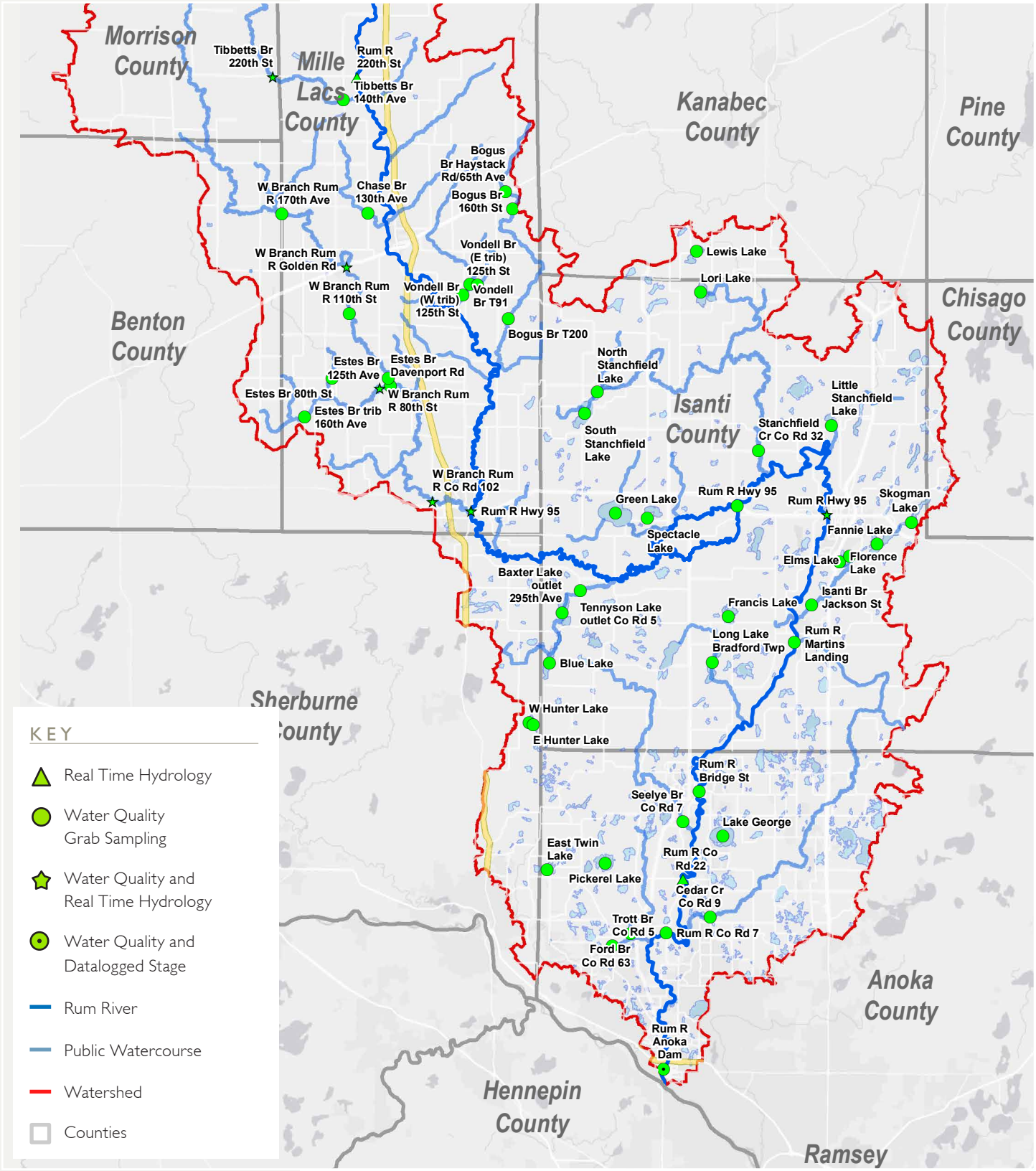

Figure 5.12: South Monitoring Plan

GROUNDWATER

There are several organizations involved in monitoring groundwater quality and quantity. Figure 5.13 provides a graphical overview of the state agencies involvement in monitoring groundwater. Additional monitoring is provided at the local level by SWCDs. The MPCA monitors water quality conditions at 18 wells (17 monitoring and one domestic) in the Rum River Watershed (MPCA, 2016a). Most of the wells are in the southern portion of the watershed, which is more urbanized and has a high prevalence of sandy soils. MDH focuses on proper well construction, assessing health risks related to groundwater, and protecting drinking water supplies. MDH requires all new wells are tested for coliform bacteria, nitrate, and arsenic, which has only been required since August of 2008. The MDA is responsible for monitoring for pesticides and nitrate in the agricultural areas of the state. Some counties and SWCDs provide well water testing for residents.

Groundwater quantity is monitored through the MNDNR's Cooperative Groundwater Monitoring Program. As a part of this program, SWCDs under contract with the MNDNR measure static water levels at established observation wells over time, typically on a monthly or quarterly basis. Readings are also collected by SWCDs and volunteers at some of the wells. The data is used to monitor aquifer levels, groundwater recharge, interpret impacts of pumping and climate, plan for water conservation, and evaluate water conflicts. There are Cooperative Groundwater Monitoring wells in each of the counties in the Rum River CWMP area. The most active counties in the Cooperative Groundwater Monitoring program in the Rum River Watershed are in Anoka County (7 wells), Mille Lacs County (8 wells), and Isanti County (11 wells).

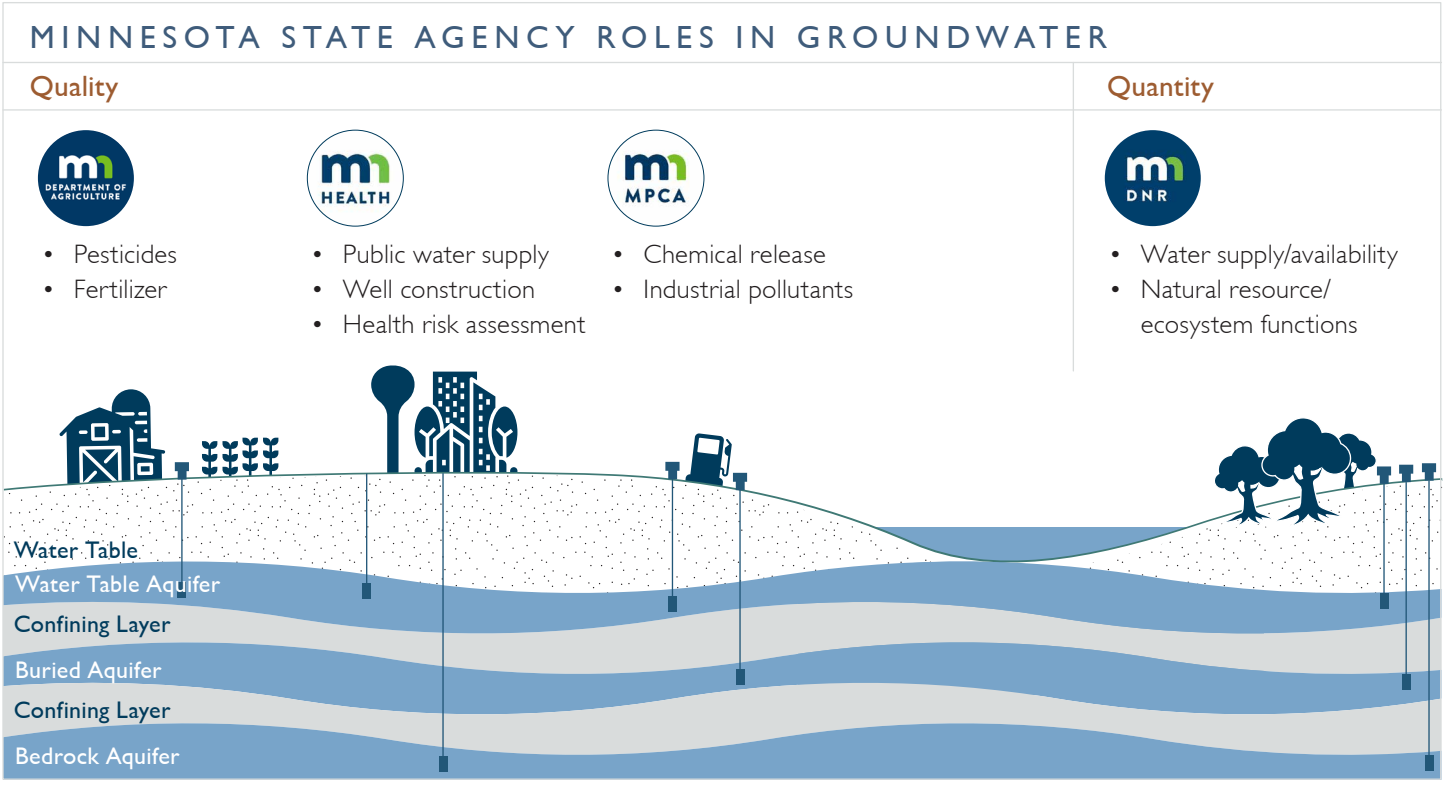

Figure 5.13: Minnesota State Agency Roles in Groundwater

HABITAT

Forest habitat, including species composition and changes since resettlement, is described in the Rum River Landscape Stewardship Plan (BWSR, 2020). The county biological survey and important bird area (IBA) inventories exist and there are species specific inventories. However, there is no summary assessment available. Aquatic habitat is evaluated during the MPCA's IWM strategy. The results of the MPCA's evaluation are provided in the monitoring and assessment report as well as the stressor identification report.

FUTURE MONITORING AND DATA COLLECTION EFFORTS

Additional data, information, and studies are needed to better assess watershed conditions, detect trends, and fill data gaps. These efforts, aimed at better quantified watershed conditions, will provide the information needed for future restoration and protection efforts. A summary of the monitoring, data acquisition, and studies anticipated over the 10-year plan period are indicated in table 5.4. Additional details for these monitoring activities are provided in the implementation schedule, located in Chapter 4.

Table 5.4: Future monitoring and data collection efforts

Area	Effort
Agricultural Areas	Establish Discovery Farm sites
Groundwater	Development of the Mille Lacs County Geologic Atlas
	Evaluate recharge areas and potential risk
Habitat	Identify and rank high value areas
Invasive Species	Develop invasive species management plans
Monitoring	Acquire Surface Water - Quantity data
Shorelands	Conduct inventories to identify high priority areas to restore and protect
Waterbodies	Complete a culvert inventory
	Complete scientific and prioritizing studies
	Evaluate opportunities to provide storage and flood prevention benefits.
	Lake internal loading feasibility study
	Nutrient source investigation
	Prioritize and target shoreline and lakeshore restoration areas
	Water quality monitoring
Wetlands and Floodplains	Complete culvert inventory and identify opportunities to maintain naturally functioning floodplains

CHAPTER 6.0

Plan Administration and Coordination

6.0 Plan Administration and Coordination

This section describes how the watershed partners will work together, how the Plan will be administered, implemented, monitored, and funded.

DECISION-MAKING AND STAFFING

While a planning Memorandum of Agreement (MOA) was established by the local units of government for development of the Rum River Comprehensive Water Management Plan (Plan), the Policy Committee recommended the establishment of a Joint Powers Entity (JPE) named Rum River Watershed Implementation Partnership (WIP), with the powers and authorities outlined in the Joint Powers Agreement (JPA). The JPA for the Plan implementation establishes a new entity with a governing board that operates autonomously from the members. The JPA, once finalized, is legally binding and must meet the requirements of Minnesota Statute 471.59.

The JPA calls for the creation of the new entity and associated committees to implement the Plan. As such, all of the committees that were established for the development of the Plan will terminate at the conclusion of the planning process (see MOA).

BOARD

The JPA details the governing structure and defines the Rum River WIP Board's (Board) powers, terms, vacancies, officers, openings, operations, budgeting, fiscal agent, committees, and compliance with open meeting laws. The Draft JPA states that the Board will meet twice per year or more often as deemed necessary. The Board is responsible for approving the budget and identifying a fiscal agent and will establish committees as necessary to implement the Plan. The Board does not have the authority to directly hire staff but may contract for coordinating or other services. The Board will establish an Implementation Planning Committee (IPC) and appoint its members.

IMPLEMENTATION PLANNING COMMITTEE

The IPC consists of one staff member from each party of the JPA and may also have ex officio members to assist the committee in its efforts. Ex officio members may include representatives from organizations and entities that participated in an advisory capacity during Plan development. Ex officio members do not have voting authority on the IPC. Ex Officio members can be engaged by providing applicable information necessary to advise the IPC to carry out their primary responsibility of drafting a yearly implementation plan and budget. Ex officio members will be communicated with at least annually.

COORDINATION OF SHARED SERVICES

The partners recognize the benefit of obtaining efficiencies through shared service delivery. Education and outreach, as well as forestry technical services will be coordinated through shared services. Throughout the implementation of the plan, and particularly at the biennial planning and 5-year evaluation benchmarks, the Board will assess appropriate use of shared services to ensure goals are achieved. Ex officio members will be communicated with at least annually.

KEY TOPICS OF DECISION-MAKING AND STAFFING

Purpose

Party Eligibility

Powers and Formation of Governing Board

Powers

Terms and Termination

General Provisions

POTENTIAL EX OFFICIO MEMBERS

Others to be determined by the IPC

BWSR

MNDNR

MetCouncil

Mille Lacs Band of Ojibwe

MDA

MDH

MNDOT

MPCA

NRCS

The Nature Conservancy

COLLABORATION WITH OTHER UNITS OF GOVERNMENT

The Board and IPC will actively seek opportunities for early coordination and collaboration with other units of government including cities, townships, state and federal agencies, and special purpose joint powers boards. Governmental units, including drainage authorities, that are not part of the formal joint powers association will be invited to participate in implementation activities where those activities are relevant to their own goals or implementation measures. Collaboration with regional and state agencies such as the Metropolitan Council, BWSR, MDA, MDH, MPCA, and MNDNR are critical for executing the programs and projects in the Plan. Federal government partners, including the US Forest Service (USFS), US Fish and Wildlife Service (USFWS), US Army Corp of Engineers (USACE), US Geologic Survey (USGS), Natural Resources Conservation Service (NRCS), and Farm Service Agency (FSA), are not required participants, but their programs and staff expertise are necessary components to fulfilling Plan goals. The IPC members may collaborate with NRCS and the FSA to convene local working groups to align Federal and Plan priorities and actions.

COLLABORATION WITH OTHERS

To a large degree, the success in achieving the Plan goals will depend on the local support at the individual to community level because implementation of the strategies is voluntary. The Partnership is committed to proactively working with nongovernmental entities including individual and coalitions of lake associations, civic groups, nonprofit entities, public and private schools, universities, and private businesses, volunteers, individuals, and foundations, many of which are already involved in protecting and improving Rum River Watershed's resources.

WORK PLAN DEVELOPMENT

The development of the annual work plan will begin with a review of recent efforts so that work is accomplished in a meaningful fashion and adjustments are made in consideration of existing conditions and circumstances. Following a review, the process for developing and approving the annual work plan begins with IPC developing a draft annual plan based on the items identified in the implementation section of the plan. With representation from each party of the JPA, the IPC will solicit interest from JPA members to request funding for programs and projects they would like to be considered for funding. Programs are selected based on scheduling, prioritization, and criteria identified in the Plan (e.g., readiness, site design, etc.). Each annual work plan will include an entity operating budget, BWSR's Watershed-based Implementation Funding (WBIF) bi-annual work plan (every other year), and an implementation tracking chart.

Once drafted, the Board will provide an initial review and direction on any necessary changes. Next, feedback is solicited from the governing boards of the JPA. The IPC will update the annual work plan with the feedback received as well as their own recommendations. Once updated, the Board will conduct a second review and update accordingly prior to taking action to approve the annual work plan. According to the JPA, for the annual work plan to be adopted, a 75% approval of a quorum of the Board is necessary prior to submitting the funding request to BWSR. The JPE will adopt the annual work plan for all Plan activities. The JPE will submit a funding request to BWSR for the clean water activities in the Plan Biennially.

ANNUAL WORK PLAN COMPONENTS

Entity Operating Budget

WBIF Work Plan

Implementation Tracking

Figure 6.1: Annual work plan process

PLAN AMENDMENTS

This Plan is in effect for 10 years after obtaining state approval and local adoption. The activities described in this Plan are voluntary, not prescriptive, and are meant to allow flexibility in implementation. During the time that this Plan is in effect, new data will be generated that will provide a better understanding of watershed issues and solutions. Administrative authorities, state policies, and resource concerns may also change. Changes, additions, or clarifications to the Plan may be necessary to address the new and changing information. A plan amendment will be required when the requested change to the Plan includes revising a goal or deletion or adding a priority area, this does not include adding PTM information to an already identified priority area. Revision requests that will not warrant an amendment process are listed below.

- Formatting or reorganization of the Plan;
- Revision of a procedure meant to streamline plan administration;
- Clarification of existing plan goals or policies;
- Inclusion of additional data not requiring interpretation;
- Expansion of public process;
- Adjustments to how activities will be carried out within the discretion of the JPA, including adding more specific prioritized, targeted, or measurable locations and outcomes for activities; substituting different activities to achieve a plan goal; or removing activities deemed infeasible;
- References to or incorporation of prioritization studies completed since Plan approval.

If amendments are required or requested by a member of the JPA, the Board will initiate a plan amendment process following the procedures outlined in the JPA agreement and bylaws. Any party to the agreement may recommend a plan amendment. Any such recommendation will be reviewed by the implementation planning committee, whose findings will be provided to the Board. The partnership will consult with their BWSR staff to determine if an amendment is needed when revisions are being considered. The Board will make a determination using the process specified in the bylaws regarding whether to proceed with the amendment.

Any proposed amendment must undergo a 60-day comment period by all parties to the agreement and all ex-officio members of the IPC. The amendment must include a copy of plan pages showing stricken, added, and changed text and figures. Changes may be shown with callouts, notes, or other means. The amendment will be approved by PC vote after the comment period. After approval the amended Plan will be distributed to all parties and ex-officio members of the implementation planning committee.

Expenses will be paid by the parties only as allowed in the JPA. When the PC determines that a proposed amendment is solely for the purposes of two or fewer parties (e.g., a county and an SWCD) at least one of whom have adopted the CWMP to replace their local water plan, then the cost of the amendment process will be borne by that LGU.

ASSESSMENT AND EVALUATION

ACCOMPLISHMENT ASSESSMENT

The IPC will develop and at least annually populate the implementation tracking chart with accomplishments. The tracking sheet will align anticipated outcomes contained in the annual work plan to measure progress towards planned implementation goals. An annual assessment of progress will be made at the beginning of the annual work plan development cycle to evaluate progress and adjust as needed based on identified implementation barriers, changes in capacity, and the adoption and success of practices and projects.

Progress towards overall goal achievement will include tracking numerical goals, such as the number of septic system fixes; estimating pollution reductions using calculators, models and tools; or verifying outcomes using evidence-based data collection.

PARTNERSHIP ASSESSMENT

The partnership will regularly assess their performance in implementing the programs and activities in the Plan and achieving goals throughout the life of the Plan in informal and formal ways. Informally, the IPC will make adjustments as needed to leverage the partnership's collective and individual strengths as funding and collaborative opportunities arise. Formally, the IPC and the Board will assess the degree to which goals were achieved and how to best organize and align efforts to fulfill Plan goals on a biennial basis. Any revisions to the roles and responsibilities amongst the JPE organizations will be reflected in the biennial workplan.

FIVE YEAR EVALUATION

Every five years, the Board will conduct a thorough evaluation of overall progress towards the 10-year and long-term goals. The IPC, including ex officio members representing state agency and other stakeholder groups, will conduct the evaluation. The evaluation will begin with an assessment of new data, information, and trends that may require a shift in the focus of implementation efforts. New data and information will include the monitoring and assessment report, as well as the WRAPS and TMDL reports and models developed as a result of the 2024 WRAPS Cycle 2 process. An assessment will be made as to whether 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 Board will initiate a Plan amendment process.

REPORTING

The fiscal agent is responsible for submitting all required reports and completing annual reporting requirements for the Plan as required by state law and policy. The JPE organizations will assist in the development of the required reports and will continue to file their own reports as required.

Table 6.1: Local funding
Source: BWSR One Watershed, One Plan Guidebook. http://bwsr.state.mn.us/sites/default/files/2020-12/WP_1W1P_guidebook.pdf

Citation	Applies To	Summary
§103B.245	Watershed districts and watershed management organizations (metro)	May establish a watershed management tax district within the watershed to pay the costs of: planning required under §§103B.231 and 103B.235, the capital costs of water management facilities described in the capital improvement program of the plans, and normal & routine maintenance of the facilities.
§103B.251	Watershed districts and watershed management organizations (metro), counties	May certify for payment by the county all or any part of the cost of a capital improvement contained in the capital improvement program of plans developed in accordance with §103B.231. Counties may issue general obligation bonds to pay all or part of the cost of project. The county may pay the principal and interest on the bonds by levying a tax on all property located in the watershed or subwatershed in which the bonds are issued. Loans from counties to watershed districts for the purposes of implementing this section are not subject to the loan limit set forth in §103D.335
§103E.601	Drainage Authorities	Drainage System Costs: 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.
§103E.011, Subd. 5		External Sources of Funding: A drainage authority can accept and use funds from sources other than assessments from benefited landowners for the purposes of flood control, wetland restoration, or water quality improvements. Additionally, 103E.015, Subd.1a requires drainage authorities to investigate potential use of external funding for the purposes identified in 103E.011, Subd. 5.
§103B.331 Subdivisions 3 & 4	Counties	(3) May charge users for services provided by the county necessary to implement the local water management plan. (4) May establish one or more special taxing districts within the county and issue bonds to finance capital improvements under the Comprehensive Local Water Management Act. After adoption of the resolution, a county may annually levy a tax on all taxable property in the district.
§103B.555 Subdivisions 1 & 3		(1) May establish a Lake Improvement District and impose service charges on the users of lake improvement district services within the district. May levy an ad valorem tax solely on property within the lake improvement district for projects of special benefit to the district; may impose or issue any combination of service charges, special assessments, obligations, and taxes. (3) A tax under Subd. 1 may be in addition to amounts levied on all taxable property in the county for the same/similar purposes.
§103B.355		Water Planning Authority for Special Projects: Counties have authority to levy funds for priority projects and to assist SWCDs with program implementation.
§103C.331 Subdivision 16	County boards on behalf of soil and water conservation districts	May levy an annual tax on all taxable real property in the district for the amount that the board determines is necessary to meet the requirements of the district.
§462.358 Subdivision 2b(c)	Municipalities	May accept a cash fee for lots created in a subdivision or redevelopment that will be served by municipal sanitary sewer and water service or community septic and private wells. May charge dedication fees for the acquisition and development or improvement of wetlands and open space based on an approved parks and open space plan.
§444.075		Stormwater Utility Fee: 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.

FUNDING

Table 6.1 and the following sections discuss current local funding, needs, and potential funding sources. The extent to which the Plan goals can be accomplished is dependent on the level of funding that is available. The variance between current and needed funding is expected to be filled primarily with funds from the Clean Water, Land, and Legacy Amendment and other external sources.

CURRENT LOCAL FUNDING AND TOTAL PLAN COST

The estimated total Plan cost is outlined in Table 6.2. The current funding level has been calculated to average approximately $1.9 million per year, based on MPCA spending for watershed implementation project data for non-point projects (https://www.pca.state.mn.us/water/spending-watershed-implementation-projects), average spending from 2010-2019, and accounting for local contribution. It is expected that the current level of investment by each local government unit and established annual BWSR and other state agency program funds will remain at the current level throughout the 10 year life of the Plan. The estimated annual cost of $3.5 million is an average of all 10 years of the Plan implementation. However, the actual amount needed to implement the Plan will vary year to year. External funding sources, including BWSR Watershed Based Implementation Funds (WBIF) is a primary source of funding. Funding will support Priority Level A actions first. Level B and Level C actions will be implemented if and to the degree in which funding is secured. All figures are rounded to simplify funding estimates. External funding sources, including BWSR Watershed Based Implementation Funds (WBIF) is a primary source of funding.

Table 6.2: Estimated cost for implementing the Plan, according to priority level and priority issue.

Priority Level	Priority Issue	Estimated Cost
Level A	Outreach and Engagement	$2,034,000
	Surface Water - Restore	$6,834,043
	Surface Water - Protect	$13,996,229
Level B	Surface Water - Quantity	$1,165,000
	Groundwater - Quality	$788,500
	Natural Resources - Upland Habitat	$8,807,926
Level C	Natural Resources - Aquatic Habitat	$1,187,537
	Groundwater - Knowledge and Data	$50,000
	Natural Resources - Invasive Species	$84,000
	Total Estimated Plan Cost	**$34,947,325**

*Plan administration estimated cost is 5% of the annual work plan

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, and the Minnesota Deer Hunters Association. These organizations acquire funding of their own and may have project dollars and technical assistance that can be leveraged. Finally, major cooperators and funding sources are private landowners, who typically contribute 25% of project costs and may donate land, services, or equipment for projects or programs.

Collaborative Grants

The WIP IPC will develop grant applications and seek funding from various governmental and nongovernmental agencies to address and advance action on plan priorities. 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 parties implementing the Plan.

Potential funding sources for implementing the Plan and the types of activities supported by each source are outlined in **Tables 6.3, 6.4 and 6.5**.

LOCAL FUNDING

Local funds may include general funds, landowner contributions, or are those which are derived from the local tax base, including in-kind contribution of personnel whose position is funded through locally derived funds. Local funds will be used to fund local priorities and programs such as when these local priorities are misaligned with state or federal funded program requirements as well as to provide required or additional match for grant programs. Other funding mechanisms will be explored as appropriate.

STATE FUNDING

The state of Minnesota has the responsibility to fund watershed management programs through various capacities, programs, and agencies. The Non-point Priority Funding Plan outlines a criteria-based process to prioritize Clean Water Fund investments. These high-level state priority criteria include:

- Restore those waters that are closest to meeting state water quality standards
- Protect those high-quality unimpaired waters at greatest risk of becoming impaired
- Restore and protect 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 RIM. Grants are available from BWSR, MPCA, MNDNR, MDH, and MDA to fund programs, practices, and projects. Grants are also available 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.

FEDERAL FUNDING

Federal agencies expected to partner and from which funds will be sought include USFS, USFWS, USACE, USGS, NRCS, FSA, and EPA. Dam improvement programs that address habitat and connectivity concerns may involve partnering with USACE. USGS will likely provide support for data acquisition and monitoring programs while USFWS may provide land retirement program funds.

NON-REGULATORY ECOSYSTEM SERVICE PROGRAMS

Most ecosystem service trading programs are currently facilitated through regulatory permits and programs, such as wetland and stream banking. However, demand is increasing to provide payment for implementing ecosystem service projects that are not regulatory in scope. Funding initiatives that may be available might focus on increasing or protecting habitat for particular species, such as endangered or threatened species, or for increasing or protecting habitat for a particular ecosystem, such as increasing habitat for pollinators. Funders of these programs could come from federal, state, nonprofits, or foundations.

Table 6.3: Potential state funding sources

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	●		●	●
	BWSR	Reinvest In Minnesota (RIM)	Financial	Easement	●			
	BWSR	Natural Resources Block Grant (NRBG)	Financial	Grant		●	●	●
	BWSR	SWCD Local Capacity Service Grants	Financial	Grant	●	●	●	●
	BWSR	Erosion Control and Management Program	Financial	Grant	●			
	MNDNR	Conservation Partners Legacy	Financial	Grant	●			
	MNDNR	Aquatic Invasive Species Control	Financial/ Technical	Grant				●
	MNDNR	Forest Stewardship Program	Technical	Cost Share	●			
	MNDNR	Aquatic Management Area, Wildlife Management Area, Scientific and Natural Area	Financial	Fee Title Acquisition	●			
	MNDNR/ Revenue	Sustainable Forest Incentive Act	Financial	Tax Incentive	●			
	MPCA	Clean Water Partnership	Financial	Loan	●			
	MPCA	State Revolving Fund	Financial	Loan	●			
	MPCA	Surface Water Assessment Grant (SWAG)	Financial	Grant			●	
	MDH	Source Water Protection Grant	Financial	Grant	●			
	MDH	Nitrate Testing	Technical	Monitoring			●	
	MDH	Accelerated Implementation Grant - Groundwater Protection	Technical	Grant	●	●	●	●
	MDA	Ag BMP Loan Program	Financial	Loan	●			
	MDA	Nutrient Management Initiative	Financial/ Technical	Grant	●			
	MDA	Minnesota Agricultural Water Quality Certification Program	Technical	Certification	●			
	LSOHC	Outdoor Heritage Funds	Financial	Grant	●			
	LCCMR	Environmental Trust Fund	Financial	Grant	●		●	●
	Legislature	Bonding	Financial	Bond	●			

Table 6.4: Potential federal funding sources

Source	Organization	Program/Fund Name	Type of Assistance	Form of Assistance	Conservation	Land Use Management	Monitoring, Data Acquisition, Studies	Education and Outreach
Federal Funding	FSA	Conservation Reserve Program (CRP)	Financial	Cost Share	●			
	FSA	Grassland Reserve Program	Financial	Cost Share	●			
	RCPP (grant)	Conservation Innovation Grant	Financial	Grant	●		●	●
	NRCS	Environmental Quality Incentives Program (EQIP)	Financial	Cost Share	●			
	USGS	Stream Gaging Network	Technical	Monitoring			●	
	USACE	Planning Assistance	Technical	Planning			●	
	USEPA	State Revolving Fund	Financial	Loan	●			
		319 (administered by the MPCA)	Financial	Grant	●	●		●
		Small Watersheds Grant	Financial	Loan	●	●		●
	USFWS	Wetland Restoration/ Private Lands Program	Financial	Grant	●	●		●

Table 6.5: Other potential funding sources

Source	Organization/ Program/Fund Name	Type of Assistance	Form of Assistance	Conservation	Land Use Management	Monitoring, Data Acquisition, Studies	Education and Outreach
Other Funding	Ducks Unlimited	Financial/Technical	Easement/ Cost Share	●			
	Trout Unlimited	Financial/Technical	Easement/ Cost Share	●			
	Minnesota Deer Hunters Association	Financial/Technical	Easement/ Cost Share	●			
	The Nature Conservancy	Financial	Easement/ Cost Share	●			
	Minnesota Land Trust	Financial	Easement	●			

CHAPTER 7.0

References

7.0 References

SOURCES

Aitkin County Water Management Plan June 2009
https://aitkincountyswcd.files.wordpress.com/2020/02/waterplan6-24-09-1.pdf

Anoka County Soil and Water Conservation District, 2017. Anoka Conservation District Comprehensive Plan 2015-2019, prepared by Anoka County SWCD, Ham Lake, MN.

Barnes, M. C., & United States. State and Private Forestry. Northeastern Area. (2009). Forests, water and people : drinking water supply and forest lands in the northeast and midwest united states (Ser. Na-fr, 01-08). United States Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. https://usforestserv.on.worldcat.org/v2.

Benton County Comprehensive Local Water Management Plan 2018-2028
https://static1.squarespace.com/static/60b8cd227b2d9777a8b31cbb/t/60d33356aae08236786f6661/1624454008923/Benton_WP.pdf

City of Anoka, 2015. City of Anoka Local Surface Water Management Plan July 2015, prepared by the City of Anoka, Anoka, MN.

Crow Wing County Local Comprehensive Water Plan 2013-2023
https://www.crowwing.us/241/Water-Quality-and-Water-Plan (scroll down to link to each chapter separately)

Freshwater, 2019. Public Kickoff Events Summary. Prepared by Freshwater Society, Saint Paul, MN, accessed January 8, 2020 from https://www.millelacsswcd.org/wp-content/uploads/2019/11/Public-Kickoff-Events-Summary_Fresh-Water-Society.pdf

Isanti County, 2018. Isanti County Local Water Management Plan 2018-2028, prepared by Isanti County Zoning Office, Cambridge, MN with assistance from Isanti Soil and Water Conservation District, Cambridge, MN.

Kanabec County Water Plan 2019-2028
http://www.kanabecswcd.org/wp-content/uploads/2019/02/2019-WP-draft-2-022619.pdf

Lupo, C., 2016a. Delineation Refinement for the Rum River Watershed, RSI(RCO)-2146/6-16/27, prepared by RESPEC, Rapid City, SD for C. Regan, Minnesota Pollution Control Agency, St. Paul, MN, June 30.

Lupo, C., 2016b. Model Extension and Review for the Mississippi Headwaters, Leech Lake, Mississippi-Grand Rapids, Mississippi-Brainerd, Pine River, Crow Wing, Redeye, Long Prairie, Mississippi-Sartell, Sauk, Mississippi-St. Cloud, North Fork Crow, South Fork Crow, and Rum River Watersheds, RSI(RCO)-2146/6-16/26, prepared by RESPEC, Rapid City, SD for C. Regan, Minnesota Pollution Control Agency, St. Paul, MN, June 30.

Lupo, C., 2016c. Model Recalibration for the Mississippi River Headwaters, Leech Lake, Pine River, South Fork Crow, and Rum River Watersheds, RSI(RCO)-2146/6-16/32, prepared by RESPEC, Rapid City, SD, for C. Regan, Minnesota Pollution Control Agency, St. Paul, MN, June 30.

Mille Lacs County, 2018. Mille Lacs County Local Water Management Plan November 2018-October, 2017, prepared by Mille Lacs County, Milaca, MN.

Minnesota Board of Water and Soil Resources (BWSR), 2020b. Rum River Watershed Landscape Stewardship Plan, prepared for the Minnesota Board of Water and Soil Resources, St. Paul, MN.

Minnesota Board of Water and Soil Resources (BWSR), 2020a, Comprehensive Plan to Assess and Prioritize Wetland Restoration Opportunities in the Middle Mississippi River Watershed, St Paul, MN

Minnesota Department of Health (MDA) 2020. "Rum River Watershed Groundwater Restoration and Protection Strategies Report." GRAPS Report #11, St. Paul, MN

Minnesota Department of Natural Resources (MNDNR) 2018. Lakes of Phosphorus Sensitivity Significance {Data file}. accessed <Month, day, year>, from https://gisdata.mn.gov/dataset/env-lakes-phosphorus-sensitivity.

Minnesota Department of Natural Resources, May, 2021. Draft Rum River Watershed Evaluation of Hydrologic Change Technical Summary, prepared by Jason Carlson.

Minnesota Board of Water and Soil Resources, 2013. One Watershed, One Plan Guiding Principles, prepared by the Minnesota Board of Waters and Soil Resources, St. Paul, MN.

Minnesota Department of Natural Resources, 2016. Rum River Watershed Fish Based Lake IBI Stressor Identification Report, prepared by Minnesota Department of Natural Resources, St. Paul, MN

Minnesota Department of Natural Resources, April 21, 2021. Mille Lacs Kathio State Park | Minnesota DNR, https://stateparks.com/mille_lacs_kathio_state_park_in_minnesota.html

Minnesota Pollution Control Agency, 2016a. Rum River Watershed Monitoring and Assessment Report, prepared by Minnesota Pollution Control Agency, St. Paul, MN.

Minnesota Pollution Control Agency, 2016b. Rum River Watershed Stressor Identification Report, prepared by Minnesota Pollution Control Agency, St. Paul, MN.

Minnesota Pollution Control Agency, 2016c. Groundwater Report, Rum River Watershed, prepared by Minnesota Pollution Control Agency, St. Paul, MN.

Minnesota Pollution Control Agency, 2017a. Final Rum River Watershed Total Maximum Daily Load, prepared by RESPEC, St. Paul, MN for Minnesota Pollution Control Agency, St. Paul, MN.

Minnesota Pollution Control Agency, 2017b. Rum River Watershed Restoration and Protection Strategy Report, prepared for Minnesota Pollution Control Agency, St. Paul, MN.

Morrison County Comprehensive Local Water Plan 2017-2022 https://www.co.morrison.mn.us/DocumentCenter/View/1346/LWP-Update-2017-2022

Sherburne County Local Water Management Plan 2018-2028 http://www.sherburneswcd.org/uploads/4/2/4/7/42475907/sherburnecounty_lwmp_2018-2028_1of2_plan.pdf

CHAPTER 8.0

Acronyms and Glossary

8.0 Acronyms and Glossary

ACRONYMS

Acronym	Definition
1W1P	**One Watershed, One Plan**
Anoka CD	Anoka Conservation District
AIS	Aquatic Invasive Species
AUID	Assessment Unit Identification Number
BMP	Best Management Practice
BWSR	Board of Waters and Soil Resources
BLID	Blue Lake Improvement District
CWMP	Comprehensive Water Management Plan
CRP	Conservation Reserve Program
DWSMA	Drinking Water Supply Management Area
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FSA	Farm Service Agency
GMZ	**Geographic Management Zone**
GLID	Green Lake Improvement District
GRAPS	Groundwater Restoration and Protection Strategies
HSPF	Hydrologic Simulation Program—Fortran
HUC	Hydrologic Unit Code
IBI	Index of Biological Integrity
IPC	Implementation Planning Committee
JPA	Joint Powers Agreement
JPE	Joint Powers Entity
LGU	Local Government Unit
LiDAR	Light Detection and Ranging
LSOHC	Lessard-Sams Outdoor Heritage Council
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MGS	Minnesota Geological Survey

Acronym	Definition
MLBO	Milles Lacs Band of Ojibwe
MNDNR	Department of Natural Resources
MLT	Minnesota Land Trust
MOA	Memorandum of Agreement
MPCA	Minnesota Pollution Control Agency
N	Nitrates
NOAA	National Oceanic and Atmospheric Administration
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
RIM	Reinvest in Minnesota
SFIA	Sustainable Forest Incentive Act
SSTS	Subsurface Sewage Treatment System
SWA	Subwatershed Assessment
SWCD	Soil and Water Conservation District
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
WBIF	Watershed-based Implementation Funding
WMO	Watershed Management Organization
WRAPS	Watershed Restoration and Protection Strategies

GLOSSARY

Term	Definition
Desired Future Condition	The long-term outcome or goal; the attributes (water quality, water availability, habitat quality), the Rum River 1WIP partners are striving to attain, regardless of the time frame. The desired future condition (DFC) sets the direction for planning and future management. It should be described for priority water resources and reflect stakeholder interests.
Emerging Issue	An issue that lacks the detailed information that is necessary to assess the current or imminent impact to the resources in the Rum River watershed.
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.
HSPF (Hydrological Simulation Program – FORTRAN)	A model for simulation of watershed hydrology and water quality for pollutants. This model was run for the Rum River Watershed during the 2017 Watershed Restoration and Protection Strategy (WRAPS).
Impairment	Waterbodies are listed as impaired if they do not meet the state water quality standard for designated uses including aquatic life, aquatic recreation, and aquatic consumption.
Index of Biological Integrity (IBI)	A way of measuring the biological community (fish and aquatic macroinvertebrates) in the water body. The index is a scale of 0 to 100, with 0 being the lowest quality and 100 being the highest quality.
Indicator	A metric, benchmark, or measuring stick used to determine progress towards goals. In some cases, when a metric is not clear or feasible, the indicator might be the number of inputs or outputs themselves.
Judicial Ditch	A ditch that crosses county lines.
Measurable Goal	The Rum River CWMP 10-year Plan goal; the quantifiable change in resource condition expected after implementation of the 10-year Plan. The measurable goal should relate to the DFC, and express what percent of progress toward the DFC is intended to be made during the Plan period.
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.
Outcome	The specific result of an implementation activity. Collectively, the outcomes from Plan activities should achieve the stated measurable goals. Outcomes may also express changes in knowledge or behavior which lead to actions that contribute to measurable goals.
Output	Countable projects, activities, services, or products. These are often referred to as 'widgets' and are the countable items that are useful for tracking the steps towards achieving the goals. Outputs are not goals in and of themselves because they do not quantify a change in the resource condition.
Prioritize	Determining the relative importance and precedence of the resources and issues in the Rum River 1WIP.

Term	Definition
Priority Issue	The agreed upon issues that are identified as the focus of the Rum River CWMP through a prioritization process.
Protect (Management Focus)	A minor or subwatershed where the natural resources are generally in good condition, risks to natural resources are low, and the management focus is to maintain and increase protection levels with strategies, such as private forest stewardship and conservation easements.
Protected	Protected land uses include public lands, public waters, wetlands on private lands, buffers required through the buffer law, easements, other conservation lands, Sustainable Forest Incentive Act (SFIA). The SFIA provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped. Private landowners can receive a payment for each acre of qualifying forest land they enroll in SFIA.
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.
PTMApp	The Prioritize, Target, Measure Application is a tool that enables practitioners to build prioritized and targeted implementation scenarios, measure the cost-effectiveness of the scenario for improving water quality, and report the results to pursue funds for project implementation.
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	A natural, economic, biotic, aesthetic, or similar asset. Resources are generally considered something that can be 'managed' and are generally broad, such as surface water or groundwater.
Resource Concern	A physical, biological, chemical, or geological subset or component of a resource. Resource concerns are typically a refinement of a resource. For example, the resource surface water can be refined into several resource concerns, including streams, lakes, rivers, and wetlands.
Resource Goals	Specific goals related to an individual resource need.
Silvopasture	The deliberate integration of trees and grazing livestock operations on the same land. These systems are intensively managed for both forest products and forage, providing both short- and long-term income sources.
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 non-pollutant sources or factors (e.g., altered hydrology, dams preventing fish passage) that adversely impact aquatic life.

Term	Definition
Target	There are three facets to targeting implementation activities: 1. Activity type 2. Timing 3. Location ACTIVITY TYPE The BMPs, conservation practices, outreach and education, monitoring, technical assistance or other action that will be the most effective in addressing the prioritized issues. TIMING The scheduling of implementation activities across the 10-year Plan period, based on which priority issues will be addressed in which order. LOCATION The area where a specific activity will be implemented to address a priority issue. Sometimes, the location of the implementation activity will not be the same location of the priority resource that is being addressed. For instance, reducing sediment concentrations in the main stem of a river may require actions to be taken at the headwaters of minor watersheds.
TMDL (Total Maximum Daily Load)	The amount of a particular pollutant that a body of water can handle without violating state water quality standards.
Watershed	A land area that channels rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean.
WRAPS (Watershed Restoration and Protection Strategy)	A watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands implemented by the Minnesota Pollution Control Agency on a 10-year cycle (https://www.pca.state.mn.us/water/watershed-approach-restoring-and-protecting-water-quality).
Watershed-Wide Priority	A watershed-wide priority initiative is considered to be a priority for all GMZs with a focus on the priority areas within each GMZ.

Appendix

APPENDIX

A

Committee Members

Appendix A: Committee Members

POLICY COMMITTEE

LGU	Authorized Representative	Alternate Authorized Representative
Aitkin County	Laurie Westerlund	Don Niemi
Aitkin Conservation District	Bob Janzen	Bob Roseberg
Anoka Conservation District	Colleen Werdien (current) Steve Laitinen (former)	Jim Lindahl
Benton County	Ed Popp	Steve Heinen
Benton SWCD	Wade Bastian	Jake Scherer
Crow Wing County	Bill Brekken	Paul Koering
Crow Wing SWCD	Diane Jacobson	Jim Chamberlin
Isanti County	Greg Anderson	Terry Turnquist
Isanti SWCD	Al Koczur	Jerry Schaubach
Kanabec County	Dennis McNally	
Kanabec SWCD	Kim Johnson (current) Kevin Belkholm (former)	Jon Sanford
Lower Rum River WMO	Debra Musgrove (current), Todd Haas (former)	
Mille Lacs County	Genny Reynolds	Timothy Wilhelm
Mille Lacs SWCD	Jake Janski	Dan Campbell (current) Kurt Beckstrom (former)
Morrision County	Randy Winscher	
Morrison SWCD	Dale Scholl	Dr. Bill Faber
Sherburne County	Lisa Fobbe	Barbara Burandt
Sherburne SWCD	Kerry Saxton (current) Roger Nelson (former)	Shelly Binsfeld
Upper Rum River WMO	Matt Downing	Lan Tornes

PLANNING TEAM

LGU	Authorized Representative
Anoka Conservation District	Jamie Schurbon
Board of Water and Soil Resources	Jason Weinerman
Board of Water and Soil Resources	Barb Peichel
Freshwater	Jen Kader
Freshwater	Lila Franklin
Isanti SWCD	Tiffany Determan
ISG	Gina Cooper
ISG	Bailey Griffin
ISG	Julie Blackburn
Mille Lacs County	Dilan Christanson (current), Dillon Hayes (former)
Mille Lacs SWCD	Susan Shaw
Mille Lacs SWCD	Harmony Maslowski
Sherburne SWCD	Dan Cibulka

CONSULTANTS

Firm	Authorized Representative
ISG	Julie Blackburn
ISG	Gina Cooper
Freshwater	Lila Franklin
ISG	Bailey Griffin
Freshwater	Jen Kader

STEERING COMMITTEE

Member Organization	Authorized Representative
Aitkin Conservation District	Steve Hughes
Aitkin Conservation District	Sam Seybold
Anoka County	Abby Shea
Anoka Conservation District	Jamie Schurbon
Benton County	Mark McNamara
Benton SWCD	Kendra Sommerfeld (current) Amanda Guertin (former)
Board of Water and Soil Resources	Jason Weinerman
Board of Water and Soil Resources	Barb Peichel
Chisago County	Susanna Wilson
Chisago SWCD	Craig Mell
Crow Wing County	Jacob Frie
Crow Wing SWCD	Mellissa Barrick
Isanti County	Darrick Wotachek
Isanti SWCD	Tiffany Determan
Kanabec County	Teresa Wickeham
Kanabec SWCD	Deanna Pomije
Kanabec SWCD	Josh Votruba

Member Organization	Authorized Representative
Lower Rum River WMO	Leonard Linton
Mille Lacs County	Dilan Christiansen (current) Dillon Hayes (former)
Mille Lacs SWCD	Susan Shaw
Morrison County	Amy Kowalzek
Morrison SWCD	Shannon Wettstein
Morrison SWCD	Lance Chisholm
Sherburne County	Zach Guttormson
Sherburne SWCD	Dan Cibulka
Upper Rum River WMO	John West

TECHNICAL ADVISORY COMMITTEE

Steering Committee Members are part of the Advisory Committee

Member Organization	Authorized Representative
Board of Water and Soil Resources	Barb Peichel
Board of Water and Soil Resources	Jason Weinerman
MN Department of Health	George Minerich and Carrie Raber
MN Department of Natural Resources	Reid Northwick
MN Pollution Control Agency	Bonnie Finnerty
Metropolitan Council	Emily Resseger
MN Department of Agriculture	Aicam Laacouri
USDA	Josh Bork
The Nature Conservancy	Leah Hall
Mille Lacs Band of Ojibwe	Perry Bunting (co-representative), Chad Weiss (co-representative)
MNDOT	Ben Meister
Policy Liason	Lisa Fobbe
Policy Liason	Matt Downing

*Many different Policy Committee members attended Technical Advisory Committee meetings to act as liaisons.

IMPLEMENTATION ADVISORY COMMITTEE

Stakeholder category	Group name/type	Authorized Representative
Sourcewater	Upper Mississippi River Source Water Protection Project	Marilyn Bayerl/George Kraynick
Lake Associations	Mille Lacs Lake Watershed Management Group	John Pearson
	Isanti County Coalition of Lakes	Chris Lawson
	Lake George Improvement Association	Larry Backlund
Townships	Page Township	Tom Burke
	Stanchfield Township Clerk	Val Anderson
Forestry (Private Lands) Private Forest Land Owners or Private Foresters	Dickson Forestry	Paul Dickson
	MNDNR Forester	Paul Kedrowski
Farmers/Crop Consultants	Farmer	Lane Selin
Cattleman's Associations	Cattleman's Association rep	Clint Kathrein
Business Community	Mille Lacs County Economic Development Mgr	Michael Wimmer
Cities - Public Works Departments	Wahkon - Wastewater Operator	Chris Weinreich
	Cambridge-Public Works&WPTF Member	Todd Schwab
	Princeton - waste water treatment plant	Chris Klinghagen
Public Ditches	Kreger Farms	Reggie Matters
Sporting Groups	National Wild Turkey Federation - Rum River Longbeards	Greg Brink
	Isanti County Sportsman Club - MN Deer Hunters	Kevin Kriesel
	Rum River Ducks Unlimited	Brian Sorenson
Environmental Interest	Isanti County Environmental Coalition (ICEC)	Mike Mueller
	Cedar Creek Ecosystem Science Reserve (Education and Outreach Coordinator)	Caitlin Potter
County Water Plan Task Force Members	Community and Veterans Services (Public Health)	Kay Nastrom /Sierra Cotter
		Todd Schwab/Val Anderson

APPENDIX

B

Local Regulatory Controls

Appendix B: Local Regulatory Controls

Table B.1: Local Regulatory Controls

Regulatory Concern	Aitkin County	Aitkin SWCD	Anoka CD	Benton County	Benton SWCD	Crow Wing County	Crow Wing SWCD	Isanti County	Isanti SWCD	Kanabec County	Kanabec SWCD	Mille Lacs County	Mille Lacs SWCD	Morrison County	Morrison SWCD	Sherburne County	Sherburne SWCD	URRWMO	LRRWMO
Wetland Management	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Floodplain Management	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Shoreland Management	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Buffer Management	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Subsurface Sewage Treatment Systems	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Groundwater/Surface Water Use	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Terrestrial Invasive Species	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Feedlots	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Extraction	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Soil Loss	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Stormwater	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

KEY

- ● Exceeds State Standards
- ● Meets State Standards
- ● Not Applicable

APPENDIX

C

Resource Prioritization

Appendix C: Resource Prioritization

APPENDIX: RESOURCE PRIORITIZATION

SURFACE WATER ISSUE STATEMENT 1: QUANTITY

The DNR is currently completing its Evaluation of Hydrologic Change (EHC) report for the Watershed and preliminary results have been shared with the Partnership. This study analyzed precipitation and discharge information for the period 1934 to 2019 and identified a break point in the hydrologic record in 1998. This break point showed a statistical change in the relationship between precipitation in the Watershed and discharge from the Rum River to the Mississippi River. As this analysis corresponded to long-term major river gages, the only gage in the Rum River is at the mouth; as such it does not provide insights to more localized changes in Rum River subwatersheds. The breakpoint showed an increase in precipitation beginning in 1998; this increase corresponded to an increase in runoff that was far greater than the runoff to precipitation ratio before 1998.

The draft EHC Technical Summary suggested an initial storage goal of 99,686 acre-feet of storage to mitigate for the increase in runoff relative to precipitation beginning in the post-1998 period. The Technical Summary did note that this is a "simplistic determination of water storage restoration within the Rum River Watershed and would benefit from more detailed watershed wide modeling to further target specific subwatersheds and to apportion the total volume to smaller subwatersheds."

The draft EHC storage goal of 99,686 acre-feet of storage throughout the Watershed was cost prohibitive and was thus reduced to 100 acre-feet. The Partnership will continue to integrate new information as it becomes available to prioritize storage implementation in targeted areas. The Partnership will also consider the storage benefits from practices that are not primarily storage focused, such as cover crops that improve soil health and soil water holding capacity.

SURFACE WATER ISSUE STATEMENTS 2 AND 3: QUALITY

IDENTIFYING CANDIDATE LAKES

DATA SOURCES

The source for all the physical metrics data is the 2019 lake phosphorus sensitivity significance (LPSS), lake cost benefit analysis (LBCA), lake of biological significance (LOBS) spreadsheet provided by the MPCA, which evaluates data collected through 2018. The source for the professional knowledge metrics is the members of the Technical Advisory Committee.

METHODS

Two sets of metrics were evaluated to prioritize impaired lakes. The first set of metrics are based on physical characteristic and include lake size to drainage area, lake land use disturbance, percent mean phosphorus (P) from standard, P sensitivity, water clarity trend, biological significance, public access (based on number of ramps and parking spaces), and connectivity (based on number of prioritization lakes upstream and downstream of each lake). The second set of metrics for prioritizing lakes is based on the professional knowledge of the Technical Advisory Committee. The professional knowledge metrics include Momentum Towards the Goal, Local Support, Political Support, and Readiness. The average score for the seven physical metrics and a percent rank for the average score for the four

professional knowledge metrics were averaged. The average was used to rank the lakes.

A summary of each of these metrics and scoring methods are outlined in Table 1. The values for all lake metrics except trend were scored using a percent rank function. The ranking for each impaired lake according to for each metric is shown in Table 2. All ranking scores were averaged per impaired lake and then ranked according to this average. The final impaired lake ranking based on the physical criteria is shown in Table 3. Table 4 presents the professional knowledge ranking for impaired lakes. Table 5 combines the physical and professional knowledge for an overall ranked scoring for the impaired lakes. Table 6, 7, 8, and 9 provide the same assessment for high water quality lakes.

Table 1. Summary of Lakes Prioritization Criteria and Breakpoints.

Priority Metric Type	Priority Value Metric	Scoring
Physical Metrics	Lake Size to Drainage Area Ratio	Values for "Impaired Lakes" ranged from 3.8 to 484. Values for "High Quality Lakes" ranged from 2.1 to 672. Values were ranked using a percent rank function with low ratios having a higher rank and high ratios having a lower rank between 0 and 1.
	Lakeshed Land-Use Disturbance %	Values for "Impaired Lakes" ranged from 3 to 59%. Values for "High Quality Lakes" ranged from 4% to 53%. Values were ranked using a percent rank function with high percent disturbance having a higher rank and lower percent disturbance having a lower rank between 0 and 1.
	% Mean P from P Standard	Values for "Impaired Lakes" ranged from 6 to 454% above the standard. Values for "High Quality Lakes" ranged from 2% to 75% away from the standard. Values were ranked using a percent rank function.
	P-Sensitivity	Values for "Impaired Lakes" ranged from 0 to 11. Values for "High Quality Lakes" ranged from 0 to 82. Values were ranked using a percent rank function with more P-sensitive lakes given a higher rank and less P-sensitive lakes given a lower rank between 0 and 1.
	Water Clarity Trend	Lakes with an increasing clarity trend were given a rank of 1, lakes with no trend or not enough data for a trend were given a 0.5, and lakes with a decreasing trend were given a 0.
	Lakes of Biological Significance	Biological significance categories for "High Quality Lakes" include outstanding, high, and moderate. Outstanding biologically significant lakes were given a value of 1, moderate a value of 0.66, high a value of 0.33, and if blank a value of zero.
	Public Access	The number or ramps and parking spaces from the MN DNR Lakefinder was summed for a public access score. Where no data were available, an assumption of zero ramps/parking spaces was used. Public access scores ranged from 0 to 42 in "Impaired Lakes." Values were ranked using a percent rank function with lakes having more public access given a higher rank between 0 and 1.
	Connectivity	The number of priority lakes upstream and downstream of each lake was summed to achieve a connectivity number. The connectivity numbers were then ranked from zero to one with lakes having more connectivity receiving a higher score.
Professional Knowledge	Momentum Towards Goals	3 (High) - Studies/project identification/outreach/BMPs have been implemented already; county initiatives have been undertaken that need to be supported with action. 2 (Medium) - Activities listed above have been or are in the planning and development stages, but not yet implemented; funding has been secured. 1 (Low) – No recent activity has taken place.
	Local Support	3 (High) - Landowners are seeking out/taking initiative; there is an active lake association; there are local champions; local match/contribution is secured. 2 (Medium) - Landowners will attend meetings or request information; the lake association is a social group, not particularly interested in environmental issues. 1 (Low) – Low rate or no contact with landowners; no lake association.
	Political Support	3 (High) - Elected officials have provided substantial staff and financial resources, voiced political support, and worked to build community support. 2 (Medium) - Elected officials have provided some staff and financial resources, voiced political support, and worked to build community support. 1 (Low) - Elected officials have voiced political support and worked to build community support.
	Readiness	3 (High) - There is a waiting list of projects; projects have been designed; the permits have been acquired; awaiting funding to implement. 2 (Medium) - Project are identified, concepts are developed, and ranked or prioritized. 1 (Low) - There are no pending projects or landowners ready to implement projects; no project planning scale activities have taken place.

Table 2. Data Used for Ranking of Rum River Watershed Impaired Lakes According to Physical Characteristics.

Lake ID	Lake Name	Lake Size to Drainage Area Ratio	Lake Land-Use Disturbance	Percent from Standard	P Sensitivity	Water Clarity Trend	Biological Significance	Public Access Sites (Ramps and Parking Spaces)	Connectivity
30002200	Skogman	14.76	0.36	-6%	5.55	Increasing trend		6	2
30004300	Fannie	16.89	0.45	-10%	3.30	Increasing trend		11	2
30013600	Green	19.13	0.47	-35%	0.98	No evidence of trend		21	0
01008500	Twenty	51.21	0.06	-90%	2.82		Outstanding	11	4
30007200	Long	19.15	0.46	-76%	0.72	Decreasing trend		19	1
71002200	West Hunter	9.29	0.59	-8%	9.67			5	0
30013800	South Stanchfield	16.22	0.47	-118%	1.04			6	1
30004400	Little Stanchfield	188.42	0.45	-113%	0.20			7	0
49000600	Twelve	6.59	0.03	-74%	10.51		Outstanding	0	3
30014300	North Stanchfield	101.24	0.45	-223%	0.15			0	1
48001200	Shakopee	484.31	0.08	-30%	0.19		Outstanding	21	18
48000900	Onamia	280.31	0.08	-107%	0.33		Outstanding	0	18
71002300	East Hunter	12.34	0.55	-22%	8.07			0	1
30011400	Baxter	91.16	0.27	-73%	0.79			0	3
01008600	Deer	127.03	0.05	-130%	2.17			0	4
30011300	Tennyson	90.70	0.30	-79%	0.69			0	3
30008000	Francis	20.01	0.46	-454%	0.14	Increasing trend		3	0
48000400	Silver	39.67	0.49	-230%	0.32			16	0

Table 3. Results of Ranking Rum River Watershed Impaired Lakes According to Physical Metrics.

Lake ID	Lake Name	Lake Size to Drainage Area Ratio Score	Lakeshed Land-Use Disturbance Score	Percent from Standard Score	P Sensitivity Score	Trend Score	Bio Sig Score	Public Access Score	Connectivity Score	Physical Metric Score
30002200	Skogman	0.82	0.59	1.00	0.82	1	0	0.529	0.529	0.66
30004300	Fannie	0.71	0.41	0.88	0.76	1	0	0.705	0.529	0.62
30013600	Green	0.65	0.18	0.71	0.53	0.5	0	0.941	0	0.44
01008500	Twenty	0.41	0.88	0.41	0.71	0.5	1	0.705	0.823	0.68
30007200	Long	0.59	0.35	0.53	0.41	0	0	0.882	0.294	0.38
71002200	West Hunter	0.94	0.00	0.94	0.94	0.5	0	0.47	0	0.47
30013800	South Stanchfield	0.77	0.24	0.24	0.59	0.5	0	0.529	0.294	0.39
30004400	Little Stanchfield	0.12	0.53	0.29	0.18	0.5	0	0.647	0	0.28
49000600	Twelve	1.00	1.00	0.59	1.00	0.5	1	0	0.647	0.72
30014300	North Stanchfield	0.24	0.47	0.12	0.06	0.5	0	0	0.294	0.21
48001200	Shakopee	0.00	0.77	0.76	0.12	0.5	1	0.941	0.941	0.63
48000900	Onamia	0.06	0.82	0.35	0.29	0.5	1	0	0.941	0.50
71002300	East Hunter	0.88	0.06	0.82	0.88	0.5	0	0	0.294	0.43
30011400	Baxter	0.30	0.71	0.65	0.47	0.5	0	0	0.647	0.41
01008600	Deer	0.18	0.94	0.18	0.65	0.5	0	0	0.823	0.41
30011300	Tennyson	0.35	0.65	0.47	0.35	0.5	0	0	0.647	0.37
30008000	Francis	0.53	0.30	0.00	0.00	1	0	0.411	0	0.28
48000400	Silver	0.47	0.12	0.06	0.24	0.5	0	0.823	0	0.28

Table 4. Results of Rating Rum River Watershed Impaired Lakes According to Professional Knowledge Criteria (3=highest, 1=lowest).

Lake ID	Lake Name	Momentum Towards Goals	Local Support	Political Support	Readiness	Average	Public Knowledge Score
30013600	Green	3	3	3	2	2.75	0.94
30005600	Long	3	3	3	2	2.75	0.94
30004300	Fannie	2	2	2	2	2	0.82
30002200	Skogman	2	2	2	2	2	0.82
30013800	South Stanchfield	2	1	2	2	1.75	0.71
01008500	Twenty	2	1	2	2	1.75	0.71
71002200	West Hunter	1	2	2	1	1.5	0.65
30004400	Little Stanchfield	1	2	1	1	1.25	0.53
30014300	North Stanchfield	2	1	1	1	1.25	0.53
30011400	Baxter	1	1	1	1	1	0
01008600	Deer	1	1	1	1	1	0
71002300	East Hunter	1	1	1	1	1	0
30008000	Francis	1	1	1	1	1	0
48000900	Onamia	1	1	1	1	1	0
48001200	Shakopee	1	1	1	1	1	0
48000400	Silver	1	1	1	1	1	0
30011300	Tennyson	1	1	1	1	1	0
49000600	Twelve	1	1	1	1	1	0

Table 5. Final Ranking of Rum River Watershed Impaired Lakes.

Lake ID	Lake Name	Physical Metric Score	Professional Knowledge Score	Average Score	Final Rank
30002200	Skogman	0.66	0.78	0.72	1
30004300	Fannie	0.62	0.78	0.70	2
30013600	Green	0.44	0.94	0.69	3
01008500	Twenty	0.68	0.67	0.67	4
30007200	Long	0.38	0.94	0.66	5
71002200	West Hunter	0.47	0.61	0.54	6
30013800	South Stanchfield	0.39	0.67	0.53	7
30004400	Little Stanchfield	0.28	0.50	0.39	8
49000600	Twelve	0.72	0.00	0.36	9
30014300	North Stanchfield	0.21	0.50	0.35	10
48001200	Shakopee	0.63	0.00	0.31	11
48000900	Onamia	0.50	0.00	0.25	12
71002300	East Hunter	0.43	0.00	0.22	13
30011400	Baxter	0.41	0.00	0.20	14/15
01008600	Deer	0.41	0.00	0.20	14/15
30011300	Tennyson	0.37	0.00	0.19	16
30008000	Francis	0.28	0.00	0.14	17/18
48000400	Silver	0.28	0.00	0.14	17/18

Table 6. Data Used for Ranking of Rum River Watershed High Quality Lakes According to Physical Characteristics.

Lake ID	Lake Name	Lake Size to Drainage Area Ratio	Lake Land-Use Disturbance	Percent from Standard	P Sensitivity	Clarity Trend	Biological Significance	Public Access Sites (Ramps and Parking Spaces)	Connectivity
48000200	Mille Lacs	2.1	0.09	2%	0	Increasing trend	Outstanding	341	17
01020400	Round (Aitkin)	5.6	0.09	60%	24	Increasing trend	Outstanding	9	7
01015700	Big Pine	3.7	0.10	56%	34	No evidence of trend	Outstanding	15	6
18002000	Borden	16.8	0.07	36%	4	Increasing trend	Outstanding	15	10
30010702	Blue	24.3	0.27	6%	4	Increasing trend		16	3
30013500	Spectacle	3.4	0.33	54%	47	No evidence of trend	Moderate	16	0
02009100	George	3.8	0.39	38%	4	Decreasing trend	High	42	0
18004800	Partridge	2.3	0.13	40%	63		Moderate	1	6
18002800	Smith	6.9	0.06	42%	18	Increasing trend	Outstanding	0	5
18001900	Kenney	12.2	0.12	44%	37	No evidence of trend		0	6
71004000	Sandy	5.2	0.30	63%	82	Increasing trend	High	1	3
01006500	Cedar	4.6	0.10	7%	21			0	4
18003300	Scott	2.5	0.11	28%	54		Moderate	0	6
30003500	Florence	62.8	0.48	39%	7	No evidence of trend		13	2
18000100	Whitefish	9.9	0.04	36%	9	Increasing trend		0	4
18002900	Holt	65.5	0.06	29%	7	No evidence of trend		0	6
30008300	Elizabeth	6.0	0.49	75%	43			0	0
30005600	Long	7.0	0.35	51%	25	Increasing trend		0	0
02013000	Pickerel	2.6	0.17	60%	40	Increasing trend		26	0
02013300	East Twin	4.9	0.26	47%	53	Increasing trend		16	0
18001800	Camp	11.9	0.06	52%	15	Increasing trend		15	5
48001400	Ogechie	672.0	0.09	27%	1		Moderate	0	18
02008900	Round (Anoka Co)	6.1	0.53	33%	20	Increasing trend		16	0
18002100	Miller	3.7	0.09	42%	60	Decreasing trend		0	5
33003200	Lewis	9.0	0.34	33%	19	Decreasing trend	High	9	0
30010000	German	5.9	0.45	52%	16			3	1
30009600	Lory	18.7	0.52	35%	11			5	0
30011700	Mud	12.6	0.21	48%	22			0	0
02006700	Minard	12.6	0.47	52%	4			0	0

Table 7. Results of Ranking Rum River Watershed High Quality Lakes According to Physical Metrics.

Lake ID	Lake Name	Lake Size to Drainage Area Ratio Score	Lakeshed Land-Use Disturbance Score	Percent from Standard Score (closer to = higher score)	P Sensitivity Score	Trend Score	Bio Sig Score	Public Access Score	Connectivity Score	Physical Metric Score
48000200	Mille Lacs	1.00	0.75	1.00	0.00	1	1	1.00	0.96	0.84
01020400	Round (Aitkin)	0.61	0.79	0.07	0.61	1	1	0.57	0.89	0.69
01015700	Big Pine	0.82	0.64	0.14	0.68	0.5	1	0.68	0.71	0.65
18002000	Borden	0.18	0.86	0.64	0.18	1	1	0.68	0.93	0.68
30010702	Blue	0.11	0.39	0.97	0.11	1	0	0.79	0.46	0.48
30013500	Spectacle	0.86	0.32	0.18	0.82	0.5	0.33	0.79	0.00	0.47
02009100	George	0.75	0.22	0.61	0.14	0	0.66	0.96	0.00	0.42
18004800	Partridge	0.97	0.54	0.54	0.96	0.5	0.33	0.43	0.71	0.62
18002800	Smith	0.47	0.93	0.47	0.43	1	1	0.00	0.61	0.61
18001900	Kenney	0.29	0.57	0.43	0.71	0.5	0	0.00	0.71	0.40
71004000	Sandy	0.64	0.36	0.04	1.00	1	0.66	0.43	0.46	0.57
01006500	Cedar	0.72	0.68	0.93	0.54	0.5	0	0.00	0.54	0.49
18003300	Scott	0.93	0.61	0.86	0.89	0.5	0.33	0.00	0.71	0.60
30003500	Florence	0.07	0.11	0.57	0.25	0.5	0	0.64	0.43	0.32
18000100	Whitefish	0.36	1.00	0.68	0.29	1	0	0.00	0.54	0.48
18002900	Holt	0.04	0.97	0.82	0.21	0.5	0	0.00	0.71	0.41
30008300	Elizabeth	0.54	0.07	0.00	0.79	0.5	0	0.00	0.00	0.24
30005600	Long	0.43	0.25	0.32	0.64	1	0	0.00	0.00	0.33
02013000	Pickerel	0.89	0.50	0.11	0.75	1	0	0.93	0.00	0.52
02013300	East Twin	0.68	0.43	0.39	0.86	1	0	0.79	0.00	0.52
18001800	Camp	0.32	0.89	0.25	0.36	1	0	0.68	0.61	0.51
48001400	Ogechie	0.00	0.82	0.89	0.04	0.5	0.33	0.00	1.00	0.45
02008900	Round (Anoka Co)	0.50	0.00	0.79	0.50	1	0	0.79	0.00	0.45
18002100	Miller	0.79	0.72	0.50	0.93	0	0	0.00	0.61	0.44
33003200	Lewis	0.39	0.29	0.75	0.46	0	0.66	0.57	0.00	0.39
30010000	German	0.57	0.18	0.22	0.39	0.5	0	0.50	0.39	0.34
30009600	Lory	0.14	0.04	0.72	0.32	0.5	0	0.54	0.00	0.28
30011700	Mud	0.25	0.47	0.36	0.57	0.5	0	0.00	0.00	0.27
02006700	Minard	0.22	0.14	0.29	0.07	0.5	0	0.00	0.00	0.15

Table 8. Results of Rating Rum River Watershed High Quality Lakes According to Professional Knowledge Criteria (3=highest, 1=lowest).

Lake ID	Lake Name	Momentum Towards Goals	Local Support	Political Support	Readiness	Average	Public Knowledge Score
48000200	Mille Lacs	3	3	3	3	3	0.96
01020400	Round (Aitkin)	3	3	3	3	3	0.96
30010702	Blue	3	3	3	2	2.75	0.89
30013500	Spectacle	3	3	3	2	2.75	0.89
01015700	Big Pine	3	3	2	2	2.5	0.82
02009100	George	3	3	2	2	2.5	0.82
18001900	Kenney	3	2	1	3	2.25	0.79
18002000	Borden	2	2	2	2	2	0.75
30003500	Florence	2	2	2	1	1.75	0.64
18004800	Partridge	2	2	1	2	1.75	0.64
18002800	Smith	2	2	1	2	1.75	0.64
01006500	Cedar	1	2	2	1	1.5	0.54
30008300	Elizabeth	2	2	1	1	1.5	0.54
71004000	Sandy	2	2	1	1	1.5	0.54
18002900	Holt	1	2	1	1	1.25	0.39
30005600	Long	2	1	1	1	1.25	0.39
18003300	Scott	1	2	1	1	1.25	0.39
18000100	Whitefish	1	2	1	1	1.25	0.39
18001800	Camp	1	1	1	1	1	0.00
02013300	East Twin	1	1	1	1	1	0.00
30010000	German	1	1	1	1	1	0.00
33003200	Lewis	1	1	1	1	1	0.00
30009600	Lory	1	1	1	1	1	0.00
18002100	Miller	1	1	1	1	1	0.00
30011700	Mud	1	1	1	1	1	0.00
02009100	Ogechie	1	1	1	1	1	0.00
02006700	Minard	1	1	1	1	1	0.00
02013000	Pickerel	1	1	1	1	1	0.00
02008900	Round (Anoka Co)	1	1	1	1	1	0.00

Table 9. Final Ranking Scores for Rum River High Quality Lakes

Lake ID	Lake Name	Physical Metric Score	Public Knowledge Score	Average Score	Final Rank
48000200	Mille Lacs	0.84	0.96	0.90	1
01020400	Round (Aitkin)	0.69	0.96	0.83	2
01015700	Big Pine	0.65	0.85	0.75	3
18002000	Borden	0.68	0.78	0.73	4
30010702	Blue	0.48	0.89	0.68	5/6
30013500	Spectacle	0.47	0.89	0.68	5/6
02009100	George	0.42	0.89	0.65	7
18004800	Partridge	0.62	0.67	0.64	8/9
18002800	Smith	0.61	0.67	0.64	8/9
18001900	Kenney	0.40	0.81	0.61	10
71004000	Sandy	0.57	0.56	0.56	11
01006500	Cedar	0.49	0.56	0.52	12
18003300	Scott	0.60	0.41	0.51	13
30003500	Florence	0.32	0.67	0.49	14
18000100	Whitefish	0.48	0.41	0.44	15
18002900	Holt	0.41	0.41	0.41	16
30008300	Elizabeth	0.24	0.56	0.40	17
30005600	Long	0.33	0.41	0.37	18
02013000	Pickerel	0.52	0.00	0.26	19/20/21
02013300	East Twin	0.52	0.00	0.26	19/20/21
18001800	Camp	0.51	0.00	0.26	19/20/21
48001400	Ogechie	0.45	0.00	0.22	22/23/24
02008900	Round (Anoka Co)	0.45	0.00	0.22	22/23/24
18002100	Miller	0.44	0.00	0.22	22/23/24
33003200	Lewis	0.39	0.00	0.20	25
30010000	German	0.34	0.00	0.17	26
30009600	Lory	0.28	0.00	0.14	27
30011700	Mud	0.27	0.00	0.13	28
02006700	Minard	0.15	0.00	0.08	29

IDENTIFYING CANDIDATE STREAMS

There are a total of 43 assessed stream reaches in the Rum River Watershed. However, these streams typically lacked the robust datasets that are useful for evaluating and ranking according to metrics. Therefore, baseline information and resource characteristics were summarized and then the TAC used this information to evaluate candidate stream reaches.

The ten impaired stream reaches included impairments due to excessive E. coli, elevated nutrients, or low dissolved oxygen. The information assembled to evaluate and rank the stream reaches included identification of downstream priority lakes and rivers especially if an impaired reach flowed directly into a priority high-quality lake or unimpaired assessed stream reach, if the streams has multiple pollutants, known stressors for biological impairments to better target restoration efforts, and if there already were restoration strategies that had been identified in the WRAPS. This information is provided in Table 10.

For protection streams, the TAC adopted the priority ranking for 18 stream reaches in the Rum River 1W1P that was developed by the MPCA in collaboration with the MNDNR, BWSR, MDH, and MDA. The ranking quantified the protection priority of streams based on risk and protective factors in the riparian and watershed areas, as well as the quality of the biological community. This analysis makes the connection between land disturbances, existing land that is already protected, and water quality to identify what streams are at greatest risk of becoming impaired. Because the identification of these streams is based on land risk or protection status, the location of these streams is useful in targeting protection efforts. In addition to this ranking, priority status was automatically be assigned to any stream that is upstream from a lake that was determined to be a priority. This information is provided in Table 11.

Table 10. Rum River Impaired Streams

Stream	AUID	Management Zone	Year of Listing	Flows into Assessed Unimpaired Stream	Pollutant or stressor	Candidate Stressors on Biology	WRAPS Strategies
Bogus Brook	07010207-523	Upper Middle Rum River	2016	Yes	Escherichia coli (E.coli)	-	Monitoring, SSTS management, livestock management
Vondell Brook	07010207-567	Upper Middle Rum River	2016	Yes	Fish bioassessments	Flow alteration, elevated TP, lack of physical habitat	Streambank/shoreline protection, ditch mapping, livestock management
Vondell Brook	07010207-687	Upper Middle Rum River	2016	Yes	Fish bioassessments	Flow alteration, elevated TP, lack of physical habitat	Streambank/shoreline protection, ditch mapping, livestock management
Rum River, West Branch	07010207-525	West Branch Rum River	2016	Yes	Benthic macroinvertebrates	Flow alteration, elevated TP	Streambank/shoreline protections, investigate historic impoundments at Bogus Brook, wetland restoration/creation
					Escherichia coli (E.coli)	-	Streambank/shoreline protections, livestock management, manage gravel extractions, manage brownfields, WWTP infrastructure upgrades
Estes Brook	07010207-679	West Branch Rum River	2016	-	Benthic macroinvertebrates	Flow alteration, elevated TP, elevated TN	Streambank/shoreline protection
					Escherichia coli (E.coli)	-	Livestock management
Stanchfield Creek	07010207-520	Stanchfield Creek	2016	Yes	Fish bioassessments	Low DO, flow alteration, elevated TP	Wetland restoration, streambank/shoreline protection, acquire easements around Dalbo WMA, evaluate Dalbo sewage treatment ponds as source of high TP
Seelye Brook	07010207-528	Lower Rum River	2016	Yes	Escherichia coli (E.coli)	-	Establish easements, livestock management, wetland restoration/creation, urban stormwater management, streambank/shoreline protection
Trott Brook	07010207-680	Lower Rum River	2016	Yes	Benthic macroinvertebrates	Low DO, flow alteration, elevated TP	Wetland restoration/creation, urban stormwater management
					Fish bioassessments		
					Dissolved oxygen	-	
Mahoney Brook	07010207-682	Cedar Creek	2016	-	Fish bioassessments	Low DO, elevated TP	Livestock management
Crooked Brook	07010207-575	Cedar Creek	2006	-	Dissolved oxygen	-	Wetland restoration/creation

Table 11. Stream Risk, Current Protection Level, and Protection Priority Rank

Priority Protection AUID	Priority Protection Stream Name	Riparian Risk	Watershed Risk	Current Protection Level	Protection Priority Rank	Protection Priority Class	Priority Protection Subwatershed	Minor Watershed
07010207-518	Stanchfield Creek	med/high	high	low	3.5	A	Stanchfield Creek	21067
07010207-521	Cedar Creek	medium	high	low	4	A	Cedar Creek	21097, 21089, 21102
07010207-677	Tibbetts Brook	medium	med/low	low	5.5	A	Upper Rum River	21022
07010207-527	Rum River, West Branch	med/high	high	low	7	A	West Branch Rum River	21048, 21053, 21055
07010207-533	Unnamed creek	med/high	high	low	7	A	West Branch Rum River	21046
07010207-510	Rum River	high	medium	low	8	A	Upper Rum River	21034, 21049, 21026
07010207-537	Mike Drew Brook	med/high	high	med/low	8	A	Upper Rum River	21028
07010207-504	Rum River	high	high	low	9	A	Lower Rum River/Middle Rum River	21087, 21086, 21071, 21072
07010207-666	Rum River	high	high	low	9	A	Lower Rum River	21101
07010207-689	Chase Brook	high	high	low	9	A	Upper Rum River	21025
07010207-502	Rum River	med/high	high	low	10.5	A	Lower Rum River	21100
07010207-503	Rum River	med/high	high	low	10.5	A	Lower Rum River	21095
07010207-509	Rum River	med/high	medium	medium	11	A	Upper Rum River	21021, 21019, 21018
07010207-511	Rum River	medium	medium	med/low	11	A	Upper Rum River	21034
07010207-564	Black Brook	med/high	med/high	low	12	B	Upper Rum River	21016
07010207-515	Lower Stanchfield Branch	med/low	high	low	13.5	B	Middle Rum River	21068, 21063
07010207-540	Bradbury Brook	high	med/low	low	13.5	B	Upper Rum River	21050
07010207-512	Rum River	med/low	med/high	low	15	B	Middle Rum River	21078, 21077, 21038

NATURAL RESOURCES ISSUE STATEMENT 1: AQUATIC HABITAT

GOAL 1: PROTECT AND RESTORE CRITICAL AQUATIC AND SHORELAND HABITAT AREAS

Candidate resources to be considered for prioritization are listed in Tables 12 (lakes) and 13 (streams + rivers). Most of the criteria used for identifying candidates were identified in April 2020 by the Natural Resources subcommittee. These have been outlined in the Issue Statement Framework since that time. Additionally, any lake/stream/river resource that was identified as a priority resource for surface water protection or restoration was identified, along with the ranked tier. When completed, 6 out of 8 priority restoration lakes and 7 out of 10 priority protection lakes as well as 2 out of 6 priority restoration rivers and 7 out of 9 priority protection rivers were identified as candidates for this issue statement and goal. The TAC could prioritize these already identified priority resources, or select other resources based on the criteria, outlined below. Candidate wetland resources have not been identified as relevant and sufficient data is not available. However, BWSR indicated in their plan notification letter that the state is embarking on a new wetland prioritization plan to guide mitigation in the future and that wetland restoration and preservation priorities in this plan may be eligible for inclusion in this statewide plan in the future. They also commented that the plan should address effort to retain the intact and significant portion of the historic wetlands in the upper part of the watershed.

Lake Resource Criteria

- Biological Significance Rating
- DNR Identified Priority Resource (as outlined in their official comment letter)
- MPCA Lake Stressor IBI Report
- MPCA's Watershed Monitoring Report
- Trout/Cisco Designation
- Wild Rice Designation

Stream + River Resource Criteria

- DNR Identified Priority Resource (as outlined in their official comment letter)
- Wild & Scenic Designation
- Stream habitat and geomorphology assessment results
    - MPCA Stream Habitat Assessment (MSHA)
    - Channel Condition and Stability Index (CCSI)

Table 12: Candidate Lakes and Assigned Prioritization Tiers for Natural Resource Issue Statement #1, Goal 1.

Lake	Tier	Prioritized Surface Water Resource Tier	Biological Significance	DNR Identified Priority Resource	MPCA Lake Stressor IBI Completed	Trout/Cisco	Wild rice	Other [1]
Mille Lacs	Tier 1	Protect 1	Outstanding			Cisco		
Blue		Protect 1			Priority Protection Lake			Yellow Bullhead and common carp
George	Tier 1	Protect 1	High		Priority Protection Lake			Considered vulnerable due to overall fish diversity and abundance; exceptional plant community
Ogechie	Tier 1	Protect 2	Moderate				Yes	Exceptional Plant Community
Round (Aitkin Cty)	Tier 3	Protect 2	Outstanding			Cisco		Only lake in this GMZ that is oligotrophic
Spectacle		Protect 2	Moderate	Yes				Relatively diverse fish population; healthy aquatic plants
Lewis		Protect 3	High					Plant Community indicates healthy water quality
Shakopee	Tier 1	Restore 1	Outstanding				yes	Exceptional Plant Community
Green	Tier 2	Restore 1			Priority Impaired Lake			Poor fish community; lack of complex of nearshore habitat; poor aquatic vegetation
Skogman	Tier 2	Restore 1		Yes				Poor fish community; healthy aquatic vegetation
North Stanchfield		Restore 2		Yes				Shallow basin; poor aquatic plant community
Fannie	Tier 2	Restore 2		Yes				Low density fish population
Onamia		Restore 3	Outstanding				Yes	Exceptional Plant Community
Big Pine			Outstanding					
Borden	Tier 3		Outstanding			Trout	Yes	Fish survey did not collect any cisco for 1st time since 1972
East Hunter	Tier 3			yes				
Francis	Tier 3				Priority Impaired Lake			
Kenney						Cisco		
Little Stanchfield	Tier 3			Yes				Shallow basin; relatively diverse fish population; aquatic plants - rich taxa, poor quality index
Partridge			Moderate					
Sandy			High					Plant Community indicates healthy water quality
Scott			Moderate					
Smith			Outstanding			Cisco		
Twelve			Outstanding				Yes	Does not meet aquatic recreation standards
Twenty			Outstanding					
West Hunter	Tier 3			yes				
Whitefish						Cisco		

(1) MPCA Rum River Monitoring and Assessment Report, Oct 2016

Table 13: Candidate Streams and Assigned Prioritized Tiers for Natural Resource Issue Statement #1, Goal 1.

Stream	Tier	Prioritized resource Tier	DNR Identified Priority Resource	Other [1]	MPCA Stream Habitat Assessment (MSHA)[1]	Channel Condition and Stability Assessment [1]
Rum River	Tier 1	Protection 1 – PC & St Francis Protection 2 – Onamia		Wild & Scenic	Headwaters: Good Middle Rum: Fair Lower: Good	Headwaters: Stable Middle Rum: Moderately Unstable Lower: Fairly Stable (station 13UM069 - severely unstable)
West Branch Rum	Tier 1	Protection 2 (Upstream) Restoration 1 (Downstream)			Headwaters: Good; Downstream: fair to poor	Fairly stable to moderately unstable
Cedar Creek	Tier 1	Protection 2 (Upstream)			Fair	Moderately Unstable
Tibbets Brook	Tier 2	Protection 1	Yes			
Stanchfield Creek	Tier 1	Protection 1 (Downstream) Restoration 1 (Upstream)			Fair	Fairly Stable
Prairie Brook (-684/685)	Tier 3	Protect 3			Fair	Good cover for fish/ good riparian.
Unnamed Creek (-531/532/533)	Tier 3	Protection 3				
Tibbets Brook	Tier 2	Protect 3	Yes		Fair	Fairly stable
Estes Brook	Tier 2	Restore 2			Good	Moderately Unstable
Seelye Brook	Tier 2	Restore 2	Yes		Fair	Moderately Unstable
Trott Brook	Tier 3				Fair	Fairly stable
Vondell Brook	Tier 3				Fair	Moderately Unstable

(1) MPCA Rum River Monitoring and Assessment Report, Oct 2016

GOAL 2: INCREASE CONNECTIVITY FOR DESIRABLE AQUATIC SPECIES

Measure 1: Because the measure is to increase river miles without barriers and to remove human constructed obstructions, dams and culverts are the structures that are under consideration to address this goal.

- Candidate Dams: There are twenty-two dams in the watershed as identified in Figure 1 and Table 14, which also includes ownership and additional information. There were only two comments submitted regarding dams in the comment period:
    - MN DNR Priority Concerns Letter: the dam near the outlet of the Rum River in Anoka is a barrier to fish passage and the only impediment disconnecting the Mississippi River from Lake Mille Lacs. The DNR would like to encourage a feasibility study investigating strategies for dam removal or alteration to restore connectivity between the Rum and Mississippi Rivers.
    - Princeton kick-off: explore dam removal/replacement with arch ladder
- Candidate Culverts: The DNR has been working on the culvert inventory. So far two townships have been completed but the work was put on hold due to COVID-19. The project will be started up again, but there is uncertainty as to when that will be.

Measure 2: This measure is to increase baseflow for improved connectivity and habitat. There are 3 candidate resources that have been identified in existing research and studies. All 3 of these resources are already identified as priority surface water resources as outlined below:

1. Tibbets Brook:
    a. the only stream in the WRAPS document and implementation table to have strategies listed to increase baseflow (page 35). However, feedback from Mille Lacs County SWCD indicated that there likely is low landowner support for implementing these actions to address this issue.
    b. Protection Priority Resource, Tier 1
2. West Branch Rum River:
    a. channelization in the upstream tributaries and row cropping which reduce recharge as crops become mature (Rum River Watershed Stressor ID Report).
    b. Protection Priority Resource, Tier 2 (upstream)
    c. Restoration Priority Resource, Tier 1 (downstream)
3. Stanchfield Creek:
    a. partially caused by ditching and the loss of wetland storage (Rum River Watershed Stressor ID Report).
    b. Protection Priority Resource, Tier 1 (downstream)
    c. Restoration Priority Resource, Tier 2 (upstream)

These resources were prioritized as follows:

- West Branch Rum River, Tier 1
- Stanchfield Creek, Tier 1
- Tibbets Brook, Tier 2

Note: Dams

On March 11, 1935 the City of Anoka purchased the Anoka Dam from Pillsbury Flour Mills Company and continues to be the sole owner of the Rum River dam. The Rum River dam at Anoka may become a redundant barrier to invasive species, which protects the recreational and economic viability of the upstream resources. Whereas, the City of Anoka will continue to maintain singular control of any and all activities, including future studies being conducted for this structure. Furthermore, as the owner, Anoka remains to be the only government agency to make recommendations on or decisions for this structure now and in the future.

DNR Response: "The Minnesota Department of Natural Resources acknowledges the ownership of the Anoka Dam by the City of Anoka, and the importance of the dam to the community as well as their rights and responsibilities. The Minnesota DNR retains our regulatory jurisdiction and authority with respect to dams and public waters as laid out in existing rule and statute. We support a spirit of collaboration, fostering partnerships with local entities, and working together toward the protection and improvement of watershed resources. In addition, we will continue in our role to study, comment, and make recommendations for the management of our natural resources, including the Anoka Dam."

Figure 1: Candidate Dams for Resources Natural Resource Issue Statement #1, Goal 2 – Increase Connectivity.

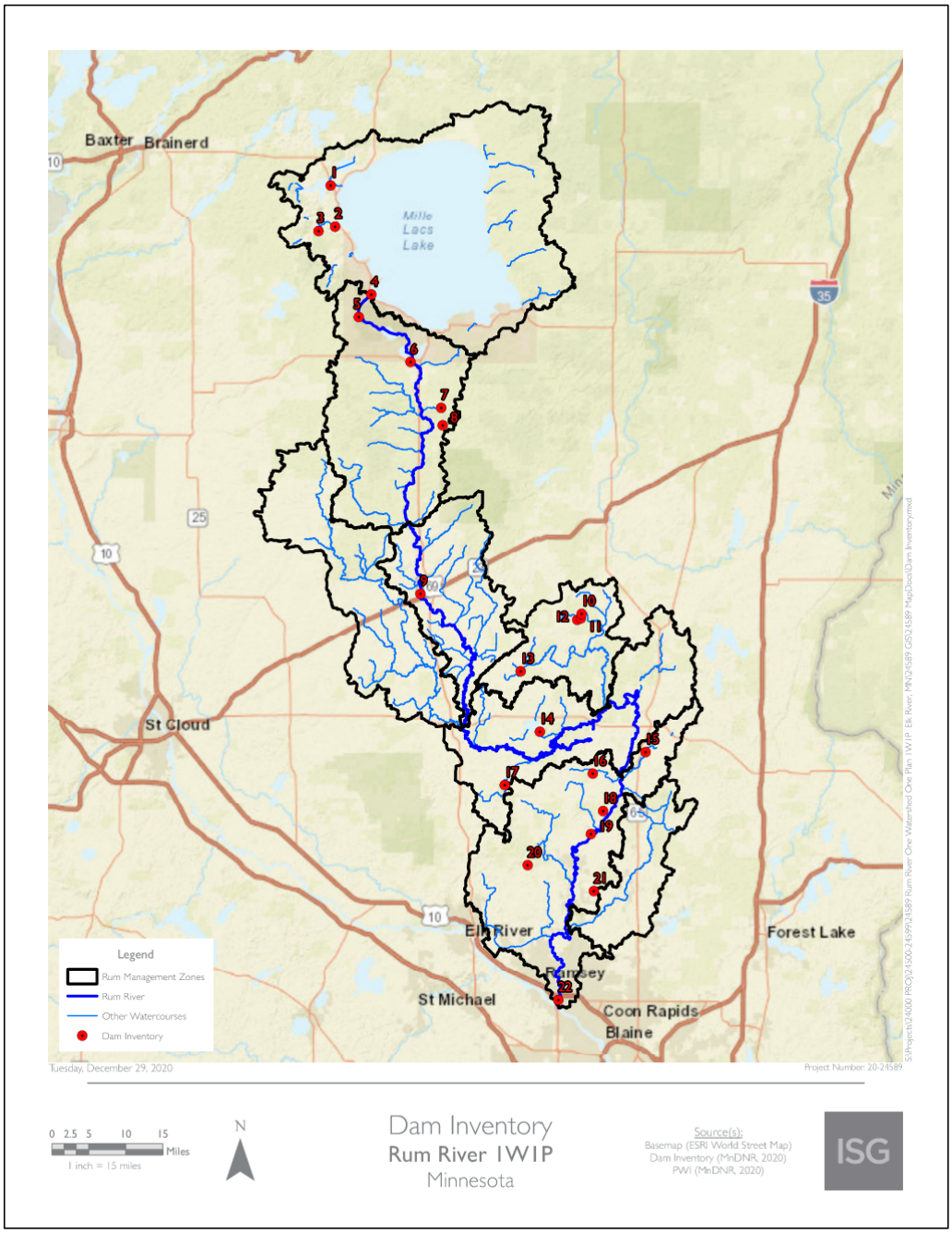

Table 14: Candidate Dams for Resources Natural Resource Issue Statement #1, Goal 2 – Increase Connectivity.

Map ID #	Name	Dam ID #	Owner	Watercourse	Drainage Area (Sq Mi)	Year Completed	Year Last Modified	Last Inspection Date	Condition	Comments	Next Inspection
1	Borden Lake	MN00239	MNDNR-Trails	Garrison Creek	26	1936		4/14/2015	Poor		2023
2	Holt Lake	MN00238	MNDNR	Sequchie Creek	17	1936	1985	6/28/2018	Satisfactory	WPA: Possible frost heave reported by Fisheries in Feb 2017. Recommend survey to verify/confirm.	2026
3	Camp-Humboldt	MN01098	MNDNR		10.5			11/17/2008			
4	Mille Lacs	MN01645	MNDNR	Rum River	415	2015		6/28/2018	Satisfactory	Contact Mille Lacs Band, Parks, and Wildlife prior to inspection	2026
5	Ogechie Lake	MN00250	MNDNR-Parks	Rum River	419	1952	1996	6/28/2018	Satisfactory	Contact Mille Lacs Band, Parks, and Wildlife prior to inspection; WPA	2026
6	Onamia Lake	MN00252	MNDNR-Wildlife	RUM RIVER	457.1	1938	1992	10/21/2007		WPA dam was replaced with a rock weir in 2007.	
7	Korsness Pool	MN00562	MNDNR-Wildlife	Rum River-TR	3.6	1959	2015	6/5/2019	Satisfactory	Other dams upstream of this dam may not be jurisdictional	2027
8	Mikkelson Pool	MN01858	MNDNR-Wildlife								2021
9	Rum River Milaca	MN01265	City of Milaca	RUM RIVER			2013	6/3/2009	Satisfactory	Modified location on 8/17/2011. plans not clear as record drawings but confirmed by Greg Lerud on 1/7/2016	
10	Cranberry WMA North Pool	MN01806	MNDNR-Wildlife	Stanchfield Creek-TR	4	1992	2017	8/21/2019	Satisfactory	Old dam had 1400' dike with 36" CMP and 9' high	2027
11	Cranberry WMA South Pool	MN00984	MNDNR-Wildlife	Stanchfield Creek-TR	6.9	1992	2017	10/20/2016	Poor	Left abutment partial washout in 2014. Repaired in 2017.	
12	Lory Lake Structure 1	MN00529	MNDNR-Wildlife	Ties Creek-TR	4	1962	1992	10/20/2016	Satisfactory		2024
13	South Stanchfield Lake	MN00528	MNDNR	Stanchfield Creek	10	1939		10/24/2012	Satisfactory		2020
14	Green Lake	MN00408	MNDNR	GREEN LAKE BROOK	827	1936	2003	5/23/2008		Dam rebuilt in 2003. The dam is a culvert through a road embankment with a small weir. Head water and tailwater for this dam would be minimal. Exempt the dam per Dan Z on 9/21/2012.	
15	Florence Lake	MN01144	MNDNR	Isanti Brook-TR	13.3			12/5/2016	Satisfactory	WPA:	2024
16	Lake Francis	MN01145	MNDNR		8.42	1938		6/5/2019	Poor	WPA:	2027
17	Blue Lake	MN01143	MNDNR	Spencer Brook-TR	11			12/5/2016	Satisfactory		2024
18	Margaret Lake	MN00475	MNDNR-Wildlife	Rum River-TR	1	1966		12/5/2016	Satisfactory		2024
19	Benson F	MN00476	Bauer, Jenny	RUM RIVER - OS	0.1	1966		12/9/2008			
20	Randy Hansen Wildlife Dam	MN01033	Hansen, Randy	Seelye Brook-TR	0.42	1989		12/5/2016	Fair		2024
21	Lake George	MN01070	MNDNR-Fisheries	COUNTY DITCH NO. 19	9.9	1967		10/11/2013	Fair	Sheet piling is deteriorating	
22	Rum River	MN00549	City of Anoka	Rum River	1590	1853	1969	8/21/2015	Satisfactory		2023

APPENDIX

D

Land and Water Resources

Appendix D: Land and Water Resources

SEPTEMBER 3, 2019

LAND & WATER RESOURCES NARRATIVE

RUM RIVER ONE WATERSHED ONE PLAN

Source: The Land & Water Resources Narrative was written and provided to the Rum River Comprehensive Watershed Management Planning Team by Mille Lacs County staff.

LAND & WATER RESOURCES NARRATIVE

INTRODUCTION

The purpose of this document is to provide a brief summary of land and water resources information to inform and support the development of a comprehensive watershed management plan for the Rum River Watershed. The Rum River Watershed is situated within the Upper Mississippi River Basin in central Minnesota. The watershed is 1,584 square miles in size, and stretches from Mille Lacs Lake in the north, the headwaters of the Rum River, to the City of Anoka in the south, the location of the confluence of the Rum and Mississippi Rivers. The watershed covers portions of ten (10) counties; Aitkin, Crow Wing, Morrison, Mille Lacs, Kanabec, Benton, Isanti, Chisago, Sherburne, and Anoka.

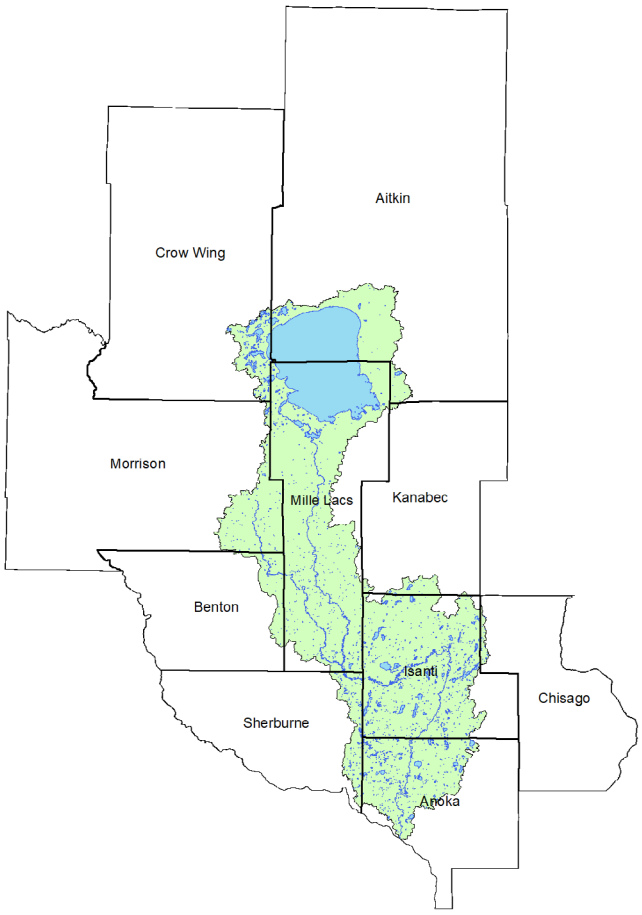

Figure 1: Watershed Map

LAND USE

Land use varies greatly throughout the watershed. The upper third of the watershed is dominated by hardwood forests and large wetland complexes. This area is home to Mille Lacs Lake, a recreation and tourism destination with high-density shoreland development around much of its perimeter. The middle third of the watershed is a transitional area, changing from hardwood forests and wetland complexes in the north, to increasingly-intensive agricultural use in the south. The lower third is the most-densely populated, starting with small-acreage suburban development and trending towards more urbanized development patterns near the Rum River's confluence with the Mississippi in Anoka.

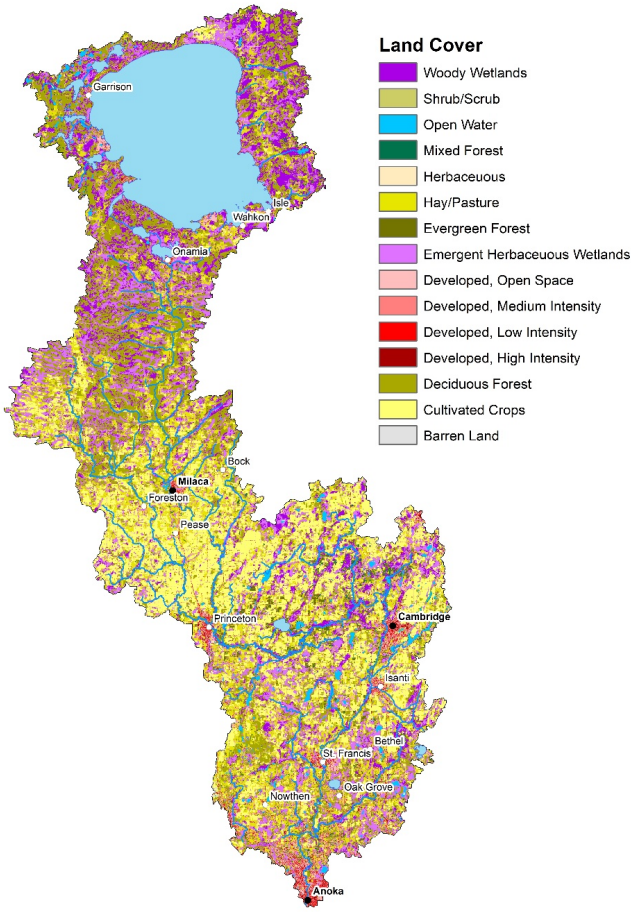

Figure 2: Land Cover (2016 NLCD)

Anticipated land use changes in the watershed include the development of housing in areas within commuting distance of the Twin Cities and regional population centers. This is a re-emerging trend that has resulted in sprawling suburban development of formerly rural areas. The trend is evidenced by population growth in many watershed counties that is well above the State average, and correlating geographically with proximity to the Twin Cities.

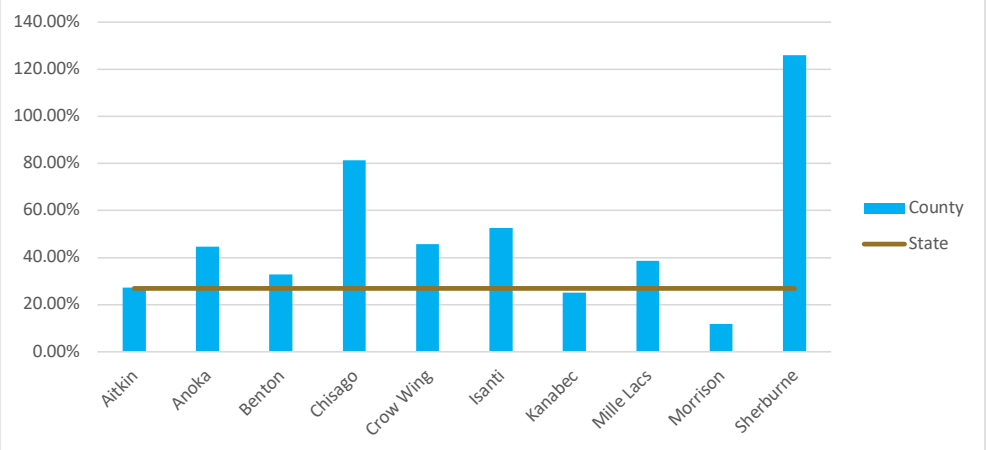

Figure 3: Population Growth 1990 – 2017 (MN State Demographic Center)

However, population projections appear to signify a coming end to this trend. Projections of migration patterns at the county level, covered in more detail in the demographics section of this document, appear to show a net loss in many of those counties previously associated with sprawling suburban development. Instead, these projections appear to show increases in migration to the metropolitan counties. Property values also appear to support this hypothesis with apartment property values increasing by 11.5% in 2018, compared to only 7.1% for residential homesteads according to the Minnesota Department of Revenue.

What is not clear is whether this is indicative of domestic or international migration patterns. Data from the Minnesota State Demographic Center shows that Minnesota has been losing residents as a result of domestic migration. At the same time, Minnesota has been seeing increased migration from international migrants, at a rate much greater than the losses experienced as a result of domestic migration. As a result, it may be that the increases projected in the metropolitan counties are not associated with domestic land use changes, but the settlement patterns and housing preferences of international migrants. As a result, this trend may not have a significant effect on land use changes within the watershed, other than the potential development of additional multi-family housing in the southernmost areas of the watershed.

Another emerging trend that appears to be supported by the migration projections is the redevelopment of lakeshore properties. According to Minnesota Lakes and Rivers, in the last two decades the average age of the lake home and cabin owner in Minnesota has increased ten (10) years, from 58 to 68. A growing number of these owners are retiring and choosing to convert their seasonal property to a full-time residences. This trend appears to be supported by the migratory population increases projected for the northernmost counties in the watershed, those with abundant seasonal recreation resources.

The utilization of these properties, once seasonal retreats, as full-time residences, has resulted in increased redevelopment and new development intensity. The small cabin of yesteryear is being replaced by larger lake homes with all the comfort of the suburbs, including larger footprints and supporting

accessory structures. This is resulting in increased development density and disturbance of natural habitat. The size and scope of these impacts, coupled with their proximity to sensitive and important natural resources, may result in irreparable degradation to the resources that precipitated the development in the first place.

While suburban and lake shore development has accounted for significant land use changes over the past few decades, agricultural land use still accounts for a significant area of the watershed. Agricultural land use occupies approximately 38% of the total watershed acres. The majority of these agricultural lands are utilized for hay or pasture.

The United States Department of Agriculture (USDA) estimates that there are 2,153 farms in the watershed. Many of these are small-acreage operations; 69% of the operations are less than 180 acres in size. In comparison, the average farm size statewide is 371 acres. Approximately half of the 2,134 operators are full time agricultural producers not reliant on off-farm income.

	PUBLIC		PRIVATE		TRIBAL			
LANDCOVER	ACRES	%	ACRES	%	ACRES	%	TOTAL ACRES	%
FOREST	47,793	4.8%	255,930	25.7%	1,257	0.1%	304,981	30.59%
GRASS	4,073	0.4%	198,877	19.9%	76	0.0%	203,026	20.36%
ORCHARDS	0	0.0%	0	0.0%	0	0.0%	0	0.00%
ROW CROPS	1,605	0.2%	179,298	18.0%	29	0.0%	180,933	18.15%
SHRUBS	110	0.0%	2,022	0.2%	0	0.0%	2,133	0.21%
WETLANDS	14,486	1.5%	91,024	9.1%	353	0.0%	105,863	10.62%
RESIDENTIAL/COMMERCIAL	2,103	0.2%	50,344	5.0%	275	0.0%	52,722	5.29%
OPEN WATER[1]	1,861	0.2%	145,427	14.6%	137	0.0%	147,426	14.79%
WATERSHED TOTALS	**72,032**	**7.2%**	**922,924**	**92.6%**	**2,128**	**0.2%**	**997,084**	100%

1. Ownership undetermined.

Figure 4: Ownership/Land Use (USDA, NRCS)

The USDA estimates that approximately 92% of the land in the watershed is privately owned. However, public lands do account for a notable portion of the watershed, approximately 7% of total watershed acres. The majority of these publicly-owned lands are located in the northern third of the watershed, with many large state and federal land holdings in northern Mille Lacs County and southern Aitkin County.

OWNERSHIP TYPE	ACRES	% OF WATERSHED
CONSERVANCY	-	-
COUNTY	1,403	0.1
FEDERAL	283	0
STATE	65,285	6.5
OTHER PUBLIC	5,162	0.5
TRIBAL	2,128	0.2
PRIVATE MAJOR	20	2
PRIVATE	903,089	90.6

Figure 5: Land Ownership (USDA, NRCS)

DEMOGRAPHICS

Demographic characteristics are statistical data relating to a population of people, and the particular groups within it. This data is commonly tabulated based on geopolitical boundaries. As a result, the information that follows is provided for each individual county within the watershed.

The population of the watershed counties varies greatly. The population of the other counties fluctuates accordingly based on proximity to regional population centers and metropolitan areas, with population generally increasing towards the southern end of the watershed. The population of the Rum River Watershed is estimated at 251,686 based on the tabulation of population data from census tracts within the watershed.

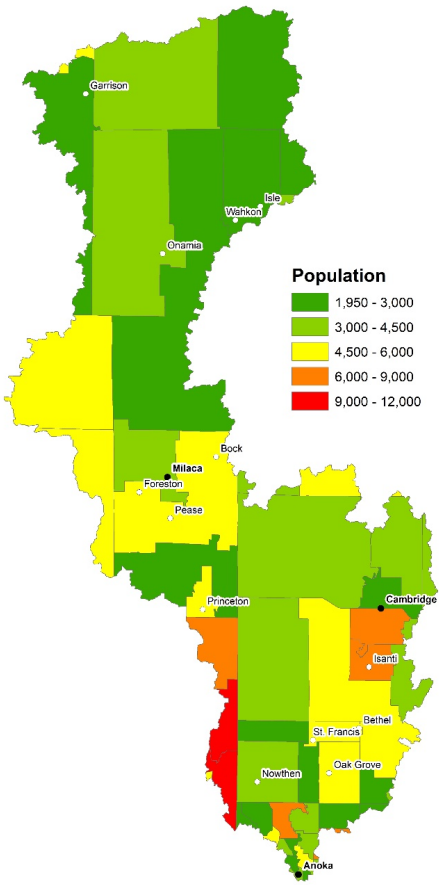

Figure 6: Population by Census Tract (2010 Census)

Statewide, the Minnesota State Demographic Center estimates that total population will continue to grow, exceeding 6 million by 2032. This trend of continued population growth is also evident in the Rum River Watershed counties, which, when aggregated, are projected to increase approximately 12.5% between 2015 and 2050. However, analysis of population projections at the county level reveals distinct differences.

When analyzed collectively, population is projected to increase, but four (4) counties (Aitkin, Kanabec, Mille Lacs, and Morrison) within the watershed are actually expected to experience decreasing population. This change will be most dramatic in Aitkin and Kanabec counties, losing approximately 17.5% and 16%, respectively, of their 2015 population by 2050. The remaining six (6) counties are projected to see population increases, generally increasing in scope with increasing proximity to regional population centers and metropolitan areas.

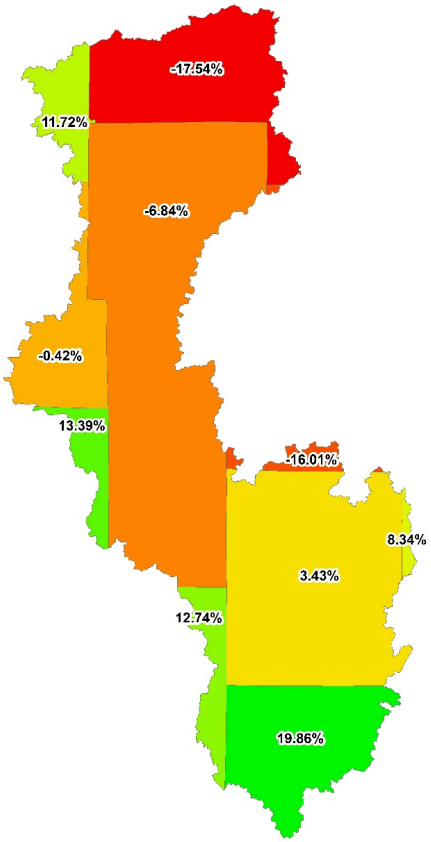

Figure 7: Projected Population Change 2015 – 2050 (2017 MN State Demographic Center)

These projections are a factor of two (2) important measures, natural increase and migration. Natural increase is a factor of births and deaths for a given period of time; a positive value correlates with a greater

number of births than deaths. Migration is a measure of the movement of people from one place to another; a positive value correlates with a net increase in the number of people living in a given area.

Similar to the overall population change projections, four (4) counties have negative values projected for both natural increase and migration. Aitkin (-29.69%) and Kanabec (-9.21%) counties are expected to lose the greatest percentage of their population as a result of natural processes. Mille Lacs (-10.99%) and Kanabec (-6.8%) counties are expected to lose the greatest percentage of their population as a result of migration.

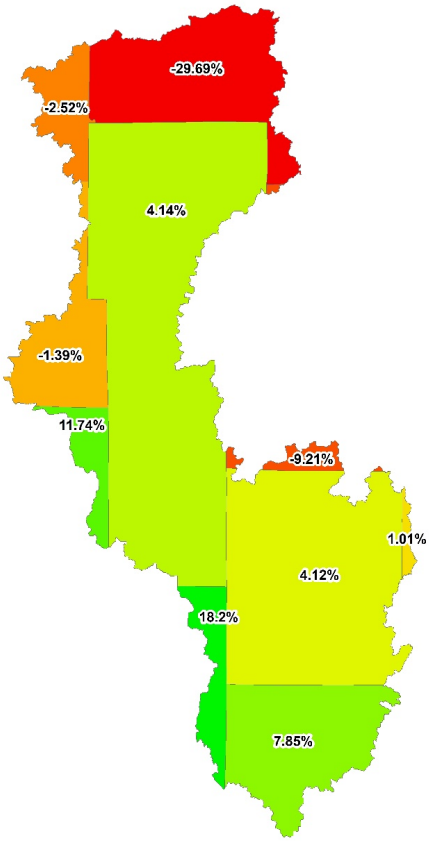

Figure 8: Projected Population Change as a Result of Natural Processes 2015 – 2050 (2017 MN State Demographic Center)

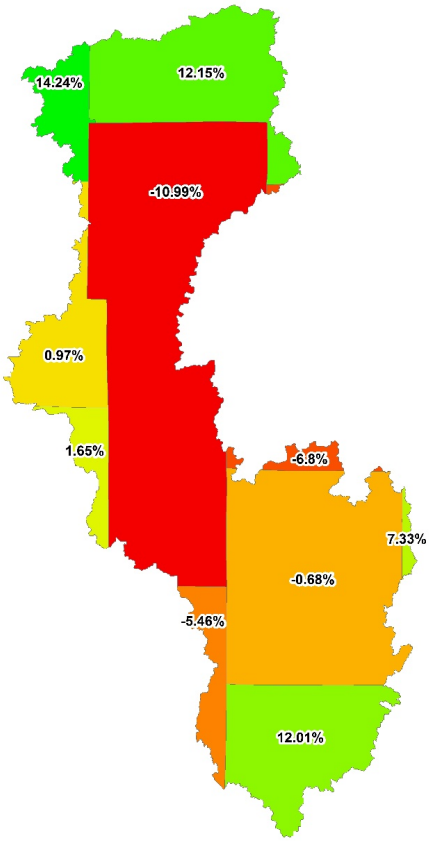

Figure 9: Projected Population Change as a Result of Migration 2015 – 2050 (2017 MN State Demographic Center)

The median age of inhabitants in the watershed counties appears to correlate with projected population changes as a result of natural processes, as the four (4) "oldest" counties are also the four (4) expected to see a net reduction in population as a result of natural processes. Aitkin County has the highest median age (54.5 years of age) and Benton County has the lowest median age (35.6 years of age). However, the average resident in the Rum River Watershed is older than the average Minnesotan, averaging 41.5 years of age in comparison to the Minnesota state-wide average of 37.9 years of age.

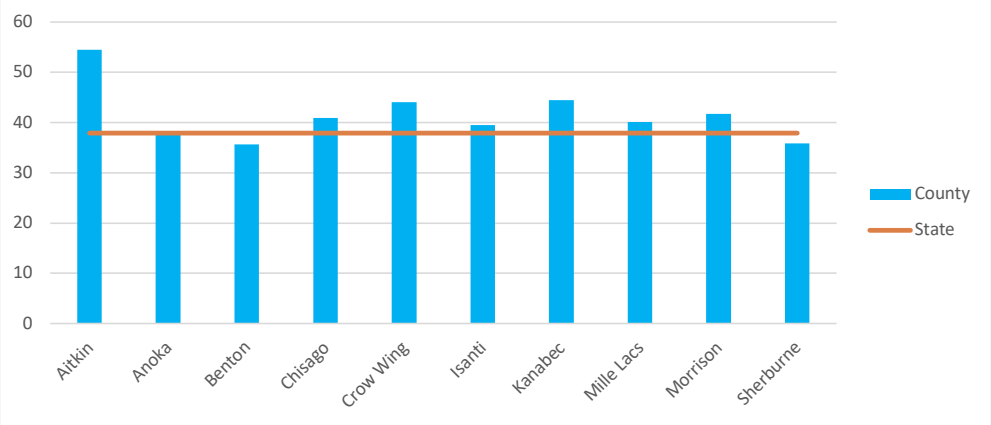

Figure 10: Median Age (2013 – 2017 ACS 5-Year Estimates)

Similar to population, median household income is another area in which the "metro affect" is readily apparent. Average household income in Sherburne County ($83,895) is approximately 83% higher than that of the average Aitkin County household ($45,860). The six (6) counties located furthest from the Twin Cities metro all have median household incomes below the State average.

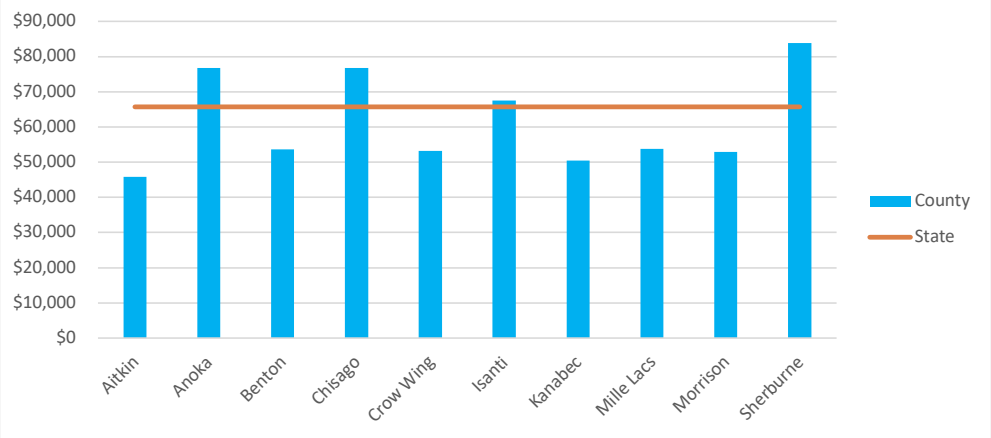

Figure 11: Median Household Income (2013 – 2017 ACS 5-Year Estimates)

A similar trend is apparent in regards to individuals living below the poverty level. The percentage in Benton County (14.10%) is nearly three-times that of the Chisago County (5.40%). The six (6) counties located furthest from the Twin Cities metro have the highest poverty levels.

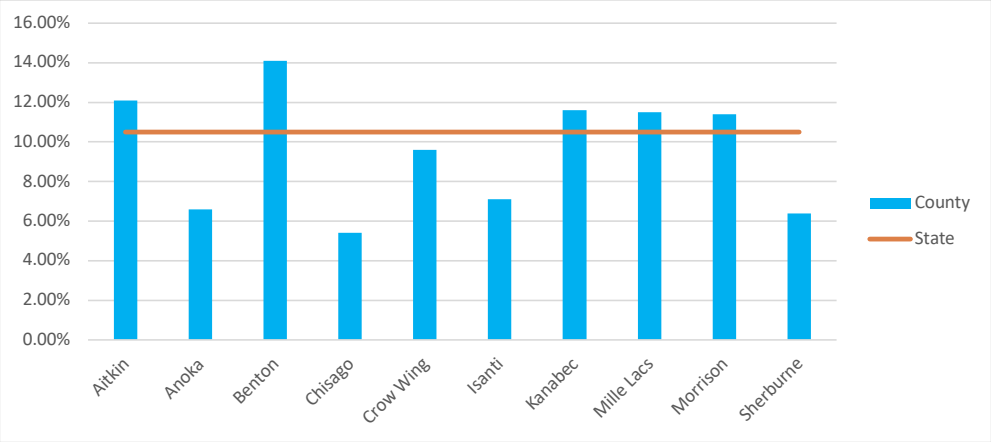

Figure 12: Individuals below Poverty Level (2013 – 2017 ACS 5-Year Estimates)

Demographic and socioeconomic factors impact, and are often impacted by, a host of public sector organizations such as public schools and local units of government. The operation and effectiveness of these organizations is affected by their jurisdiction's net tax capacity, the summation of a jurisdictions total taxable market value multiplied by the corresponding tax rates. The counties in the watershed with a higher net tax capacity generally have a better socioeconomic condition, and vice versa.

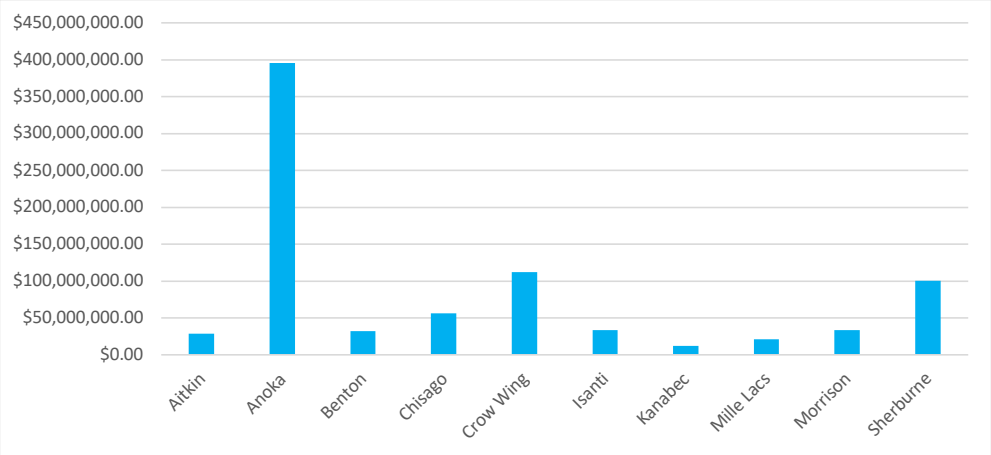

Figure 13: Net Tax Capacity 2018 (MN Department of Revenue)

ECOREGION & SOILS

The Minnesota Department of Natural Resources (DNR) utilizes the Ecological Classification System (ECS) to define distinct areas with uniform ecological characteristics. These characteristics include a number of factors, such as climate, geology, topography, soils, hydrology, and vegetation. Within the ECS there are different units utilized to describe progressively smaller areas of land, starting with provinces, and decreasing in size with sections and subsections.

According to the DNR, approximately one-half of the Rum River Watershed is in the Mille Lacs Uplands subsection, Western Superior Uplands section and Laurentian Mixed Forest province. This area includes a large area of glacial till that was deposited by ice moving out of the Lake Superior basin, taking the form of ground moraines and drumlins. This area includes a large end-moraine that formed the dam that created Mille Lacs Lake, as well as the Pierz Drumlin field. The area has a dense brown and red glacial till, often stony and course in nature, with sandy loams, silt loams, and loamy sands.

The other half of the Rum River Watershed is in the Anoka Sand Plain subsection, Northeast Iowa Morainal section, and Eastern Broadleaf Forest province. This is a transitional area between the prairie to the southwest and mixed conifer-deciduous forests to the northeast. This area was formed by the retreat of the Des Moines ice lobe. This is a sandy lake plain, with gently rolling topography. Soils are often well-drained fine sands.

The ECS provinces, sections, and subsections are based on areas of land with uniform ecological features, including factors such as climate, geology, topography, soils, hydrology, and vegetation. Another classification system, agroecoregions, further refines these areas based on land use, land cover, and soil and water resource concerns. Examples of the factors that differ across agroecoregions include runoff, drainage, erosion, wetland restoration potential, drainage and tiling, agricultural production patterns, and the importance of urban verses agricultural impacts on water quality.

These agroecoregions continue to illustrate the divide between the Mille Lacs Uplands and the Anoka Sandplain, but include additional detail within these areas. The Mille Lacs Uplands in the northern half of the watershed includes areas of drumlins along with steep poorly drained moraine and glacial till. The Anoka Sand Plan in the southern half of the watershed also includes areas of alluvium and outwash steep wetter moraine.

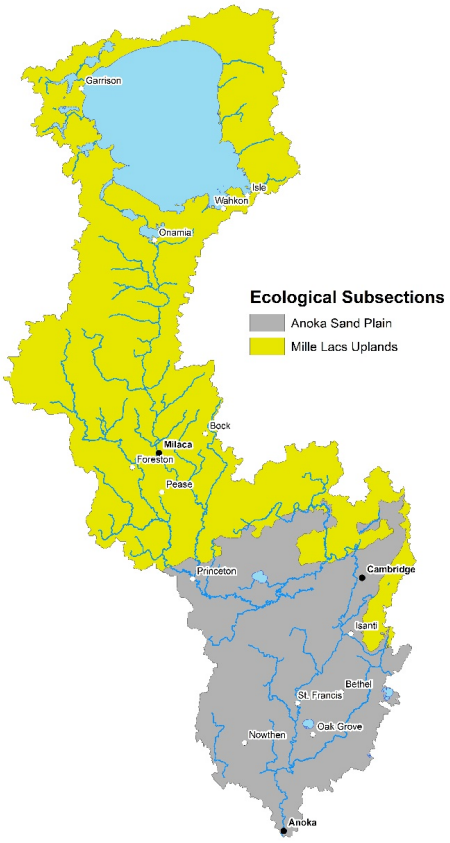

Figure 14: Ecological Subsections (DNR)

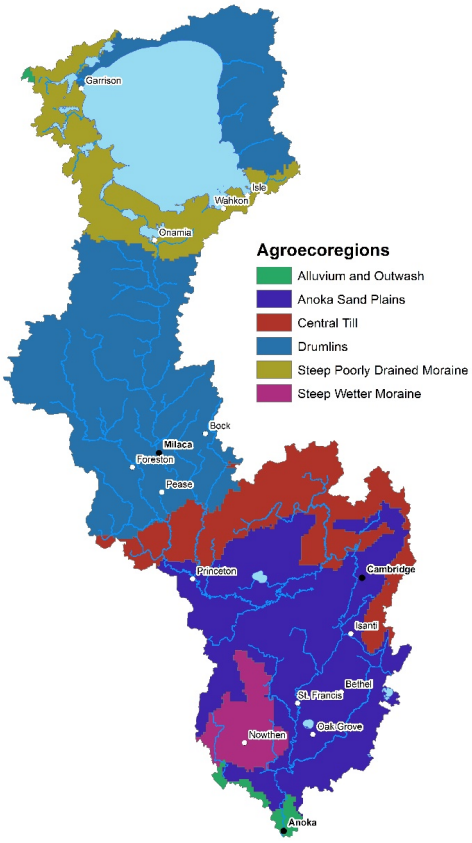

Figure 15: Agroecoregions (MDA)

September 3, 2019 11

CLIMATE

Climate is the prevailing long-term weather conditions that persist in a specific area or region. Minnesota has a continental-type climate with warm summers and cold winters. Watershed-wide, average summer temperatures are near 65°F while average winter temperatures are just over 12°F. Average annual temperatures in the watershed range from approximately 43° F in the southern end of the watershed to 40°F in the northern end of the watershed. However, Minnesota is warming, with temperatures increasing 1° to 3° F statewide, with the greatest changes being felt in northern Minnesota.

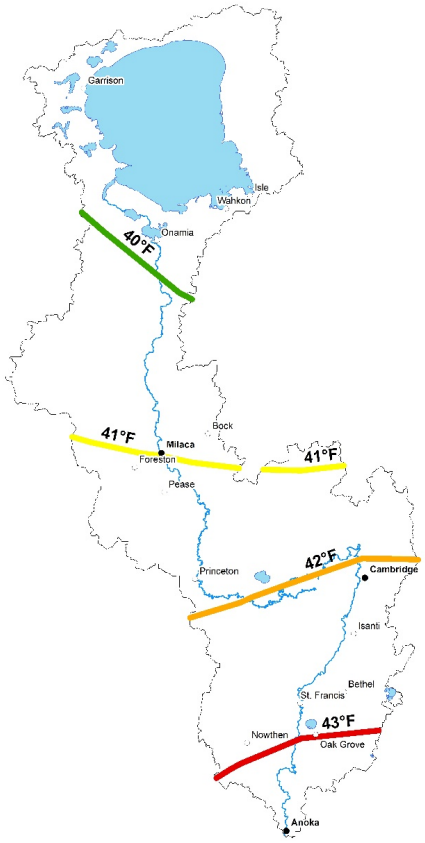

Figure 16: Average Annual Temperature (DNR)

Average annual precipitation in the watershed varies in a similar fashion, with lower annual totals in the northern end of the watershed, increasing towards the southern end of the watershed. Annual average totals, computed over the period from 1971 to 2000, range from approximately 50 inches at the southern end of the watershed, to 35 inches in the north.

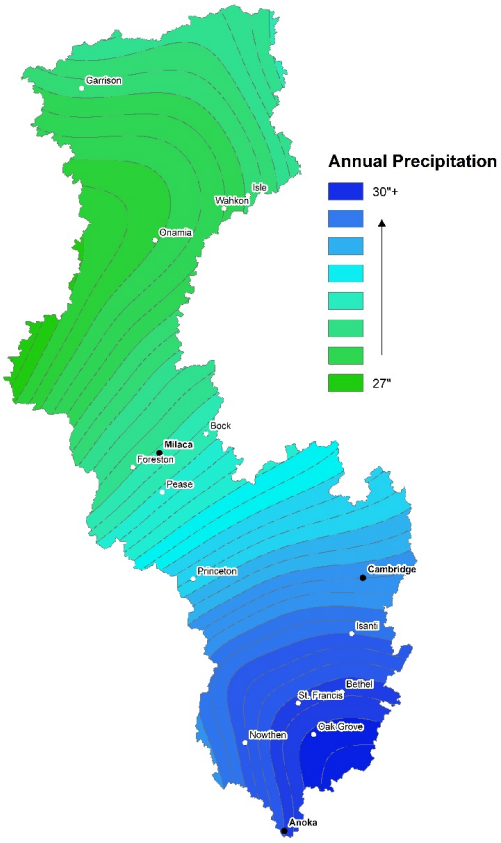

Figure 12: Average Annual Precipitation 1971 – 2000 (NWS & DNR)

However, similar to average annual temperatures, increases in annual precipitation are being observed watershed-wide. These changes appear to be more dramatic in the northern end of the watershed. As a result, the historical difference in precipitation totals is eroding.

Data from the Minnesota State Climatology Office was utilized to review annual precipitation data for locations in Anoka, Milaca, and Garrison. These locations represent, respectively, the southern, central, and northern regions of the watershed. While all three (3) locations appear to be showing an increase, this increase is happening at a higher rate in the northern end of the watershed. The increasing frequency of high-yield precipitation events appears to be a likely culprit for these increases in annual precipitation.

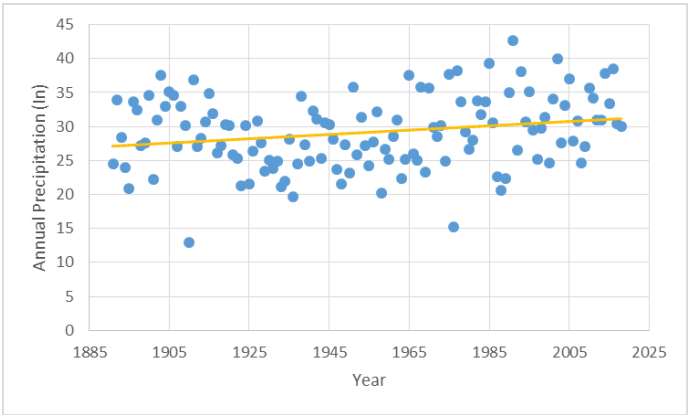

Figure 13: Changes in Annual Precipitation – Anoka (Minnesota State Climatology Office)

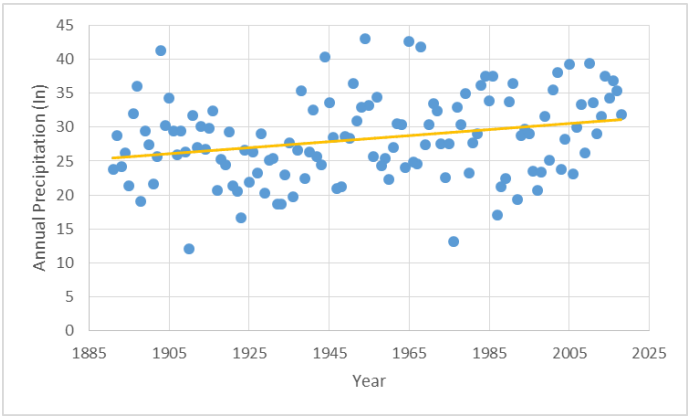

Figure 14: Changes in Annual Precipitation – Milaca (Minnesota State Climatology Office)

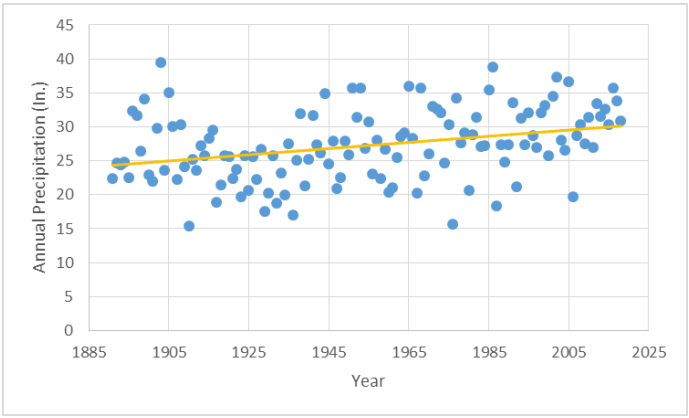

Figure 15: Changes in Annual Precipitation – Garrison (Minnesota State Climatology Office)

GEOLOGY

Geology is the science of the earth's physical structure and substance, including the processes that act on it. A region's geology has a strong impact on groundwater quantity and quality. It also has an impact on land use and development patterns.

Quaternary geology is the study of the most recent geologic period, covering the last 2.6 million years. This period includes the deposition of glacial sediments, currently located above bedrock and below topsoil. In the Rum River Watershed these deposits are commonly the result of either the Superior or Des Moines Lobes.

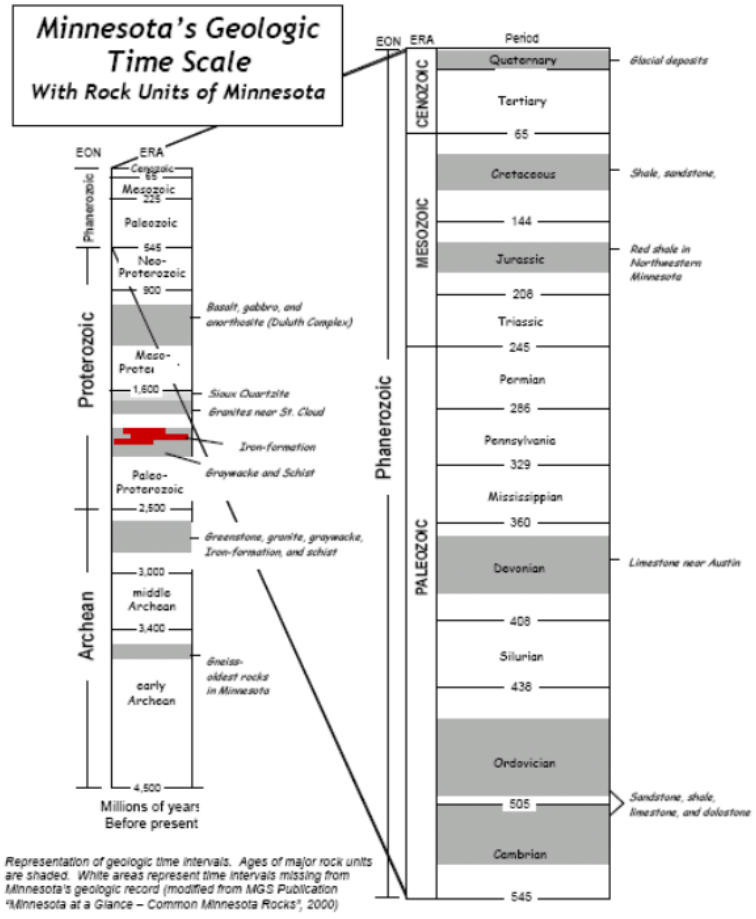

Figure 16: Geologic Time Scale (MNDOT)

These glacial sediments include an area of non-calcareous till in the northern end of the watershed that was left by the Superior Lobe, part of the Mille Lacs-Highland Moraine Association. This is a sandy and stony glacial till. North of Mille Lacs Lake there is a small area of calcareous till, a reddish-brown clayey till left by the Culver Moraine Association, the southeastern edge of the Des Moines Lobe.

In the northern half of the watershed there are intermittent peat deposits. These are large deposits of organic material located in wetlands. The northern half of the watershed also includes areas of sand and gravel deposits. South of Mille Lacs Lake, following larger river channels, these are the result of outwash and scoured bedrock surfaces in meltwater channels from the Superior Lobe. North of Mille Lacs Lake these are the result of glacial lake outwash associated with the Des Moines Lobe.

Similarly, the large sand deposits widespread in the southern half of the watershed are the result of the same glacial outwash associated with the Des Moines Lobe. Deposits at the extreme southern end of the watershed near Anoka are terraced remnants of former channels and floodplains. The calcareous till identified with the Pine City Moraine includes areas of interbedded red and gray drift associated with the incorporation of the underlying Superior-lobe drift. The calcareous till identified with the Culver Moraine is generally a reddish brown clay, with red sediment incorporated from earlier glacial lakes.

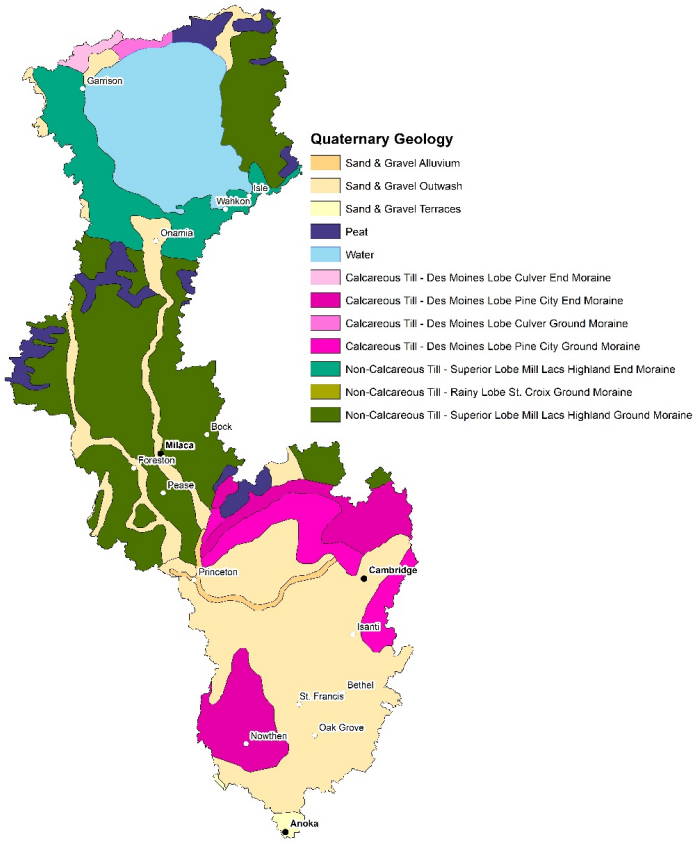

Figure 17: Quaternary Geology (USGS)

Located underneath these glacial sediments is bedrock. Bedrock is the large mass of rocks that form the Earth's surface. In the Rum River Watershed bedrock depth varies, with some areas exhibiting exposed bedrock while others have bedrock that is 400 feet deep or more. According to the Minnesota Geological Survey (MGS) the bedrock geology of the watershed includes Precambrian crystalline rocks in the north and Precambrian and Paleozoic sedimentary rocks in the south.

Paleozoic bedrock formed more recently, approximately 545 to 245 million years ago. This geologic era saw the development of the first land plants and animals. The Precambrian era, immediately preceding the Paleozoic era, began with the formation of earth approximately 4,500 million years ago. This geologic era saw the development of the first multicellular organisms, bacteria, algae, and some invertebrates.

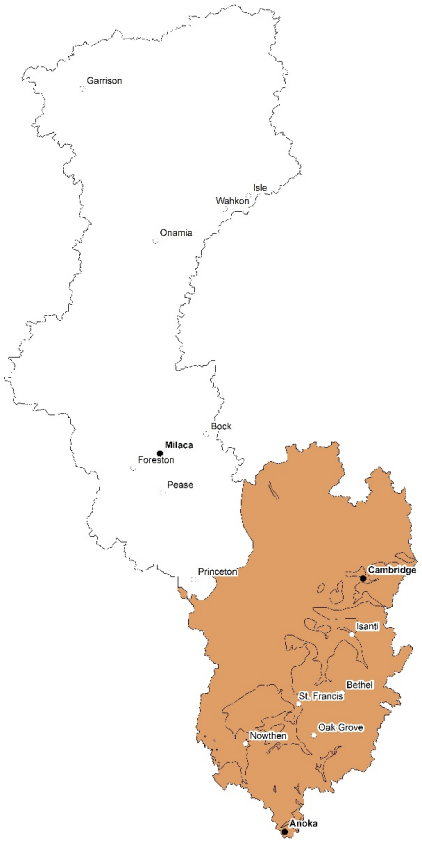

Figure 18: Paleozoic Bedrock (MGS)

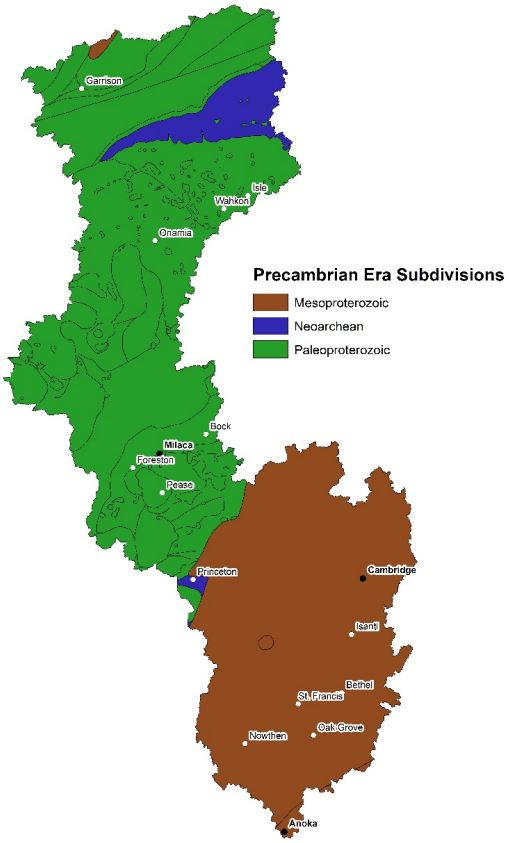

Figure 19: Precambrian Bedrock (MGS)

Moving back to the earth's surface, the elevation of land in the watershed generally decreases from north to south, ranging from approximately 1400 to 800 feet above sea level. The northern end of the watershed has little local relief, nearly level or gently sloping throughout much of the area; drumlins are evident in much of the area. The southern end of the watershed includes nearly level to moderately steep outwash plains and stream terraces.

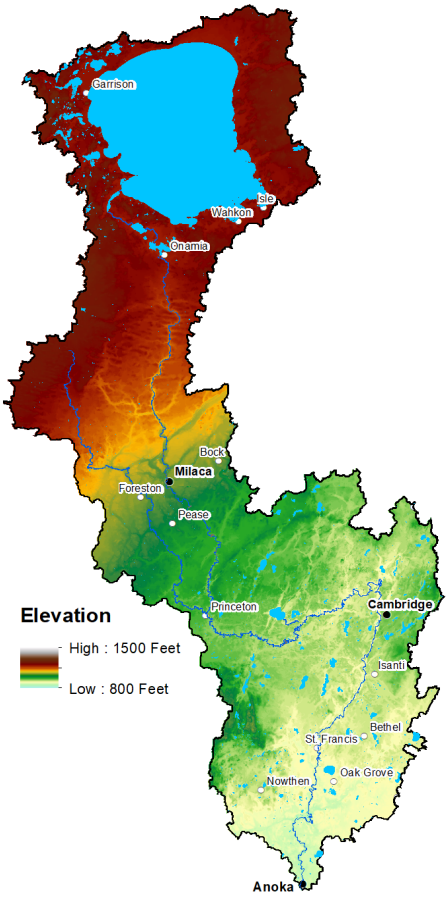

Figure 20: Elevation (USGS)

SURFACE WATER

The Rum River Watershed has many outstanding surface water resources, including 212 lakes and 158 stream segments. The watershed's namesake, the Rum River, works its way through the watershed starting at Mille Lacs Lake and ending in the Mississippi River, traveling 151 stream miles. The Rum River is a great recreational resource; it has been designated as a State Water Trail and State Wild, Scenic and Recreational river, offering excellent canoeing, tubing, and kayaking opportunities. Fishing is another recreational opportunity on the River, with anglers catching smallmouth bass, northern pike, and walleye.

Other major rivers and streams in the watershed include the West Branch of the Rum River, Stanchfield Creek, Cedar Creek, Estes Brook, and Bogus Brook. In total, the 158 public water stream segments in the watershed exceed 680 stream miles. The watershed has an abundance of high-quality lakes, three (3) of which, Mille Lacs, Onamia, and Borden, are over 1,000 acres in size. Mille Lacs Lake in particular is the fifth-largest lake in Minnesota, and offers an ever-expanding list of recreational opportunities.

Figure 21: Public Waters (DNR)

Wetlands are another prevalent surface water resource in the Rum River Watershed, accounting for approximately 24% of the total land area. Nearly one-half of these wetlands are classified as emergent wetlands, dominated by herbaceous perennial plants (e.g. grasses, sedges, etc.). The remainder are scrub shrub or forested wetlands, with a small percentage of deepwater habitats.

Figure 22: National Wetland Inventory (DNR)

DRAINAGE SYSTEMS & WASTE WATER TREATMENT

The Rum River Watershed has many drainage systems and waste water treatment facilities. Reflecting the diverse nature of the watershed, drainage systems in the watershed include both urban stormwater management and agricultural drainage systems. Wastewater treatment facilities include municipal sewer systems, subsurface sewage treatment systems (SSTS), and feedlots.

Urban municipal separate storm sewer systems (MS4s) are publicly-owned stormwater conveyance systems that do not include sewage, and are not part of a publicly-owned treatment system. MS4 systems in urbanized areas are permitted by the MPCA. There are 16 of these systems in the watershed, and all of them are in the southern one-third of the watershed, correlating with areas of high-density development.

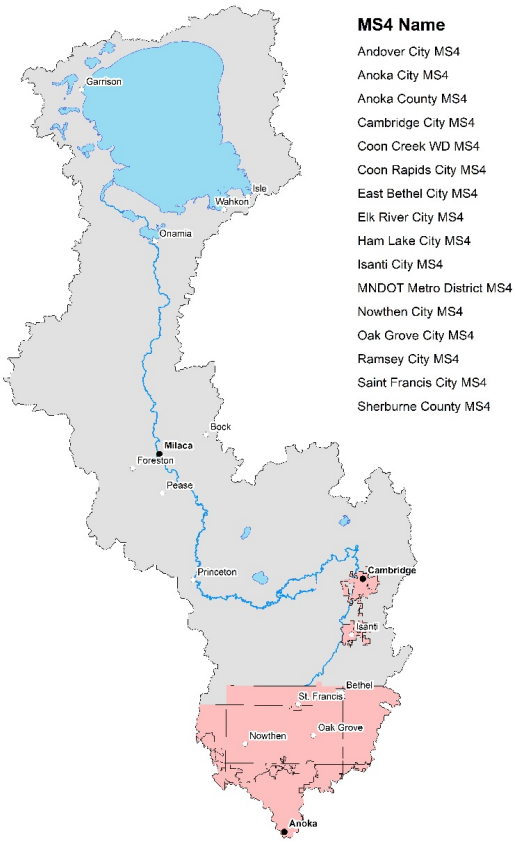

Figure 23: MS4 Boundaries (MPCA)

Urban stormwater conveyance systems are not found in rural areas, but many rural areas still require drainage systems to facilitate effective agricultural production. This drainage is often provided by private and public drainage systems; approximately 27% of the watercourses in the Rum River Watershed are drainage ditches. Many of these are county ditch systems, not roadside ditches, established pursuant to Minnesota Statute 103E and antecedent statutes.

County ditches are managed by drainage authorities, which are generally county boards, watershed district boards, or joint boards thereof in the area served by the drainage system. Funding for these systems is derived from assessments levied against the property owners determined to receive a benefit from the drainage associated with the system's construction, in amounts proportional to the amount of benefit received. There are 236 public ditch segments within the watershed, the majority of which are located in the southern half of the watershed.

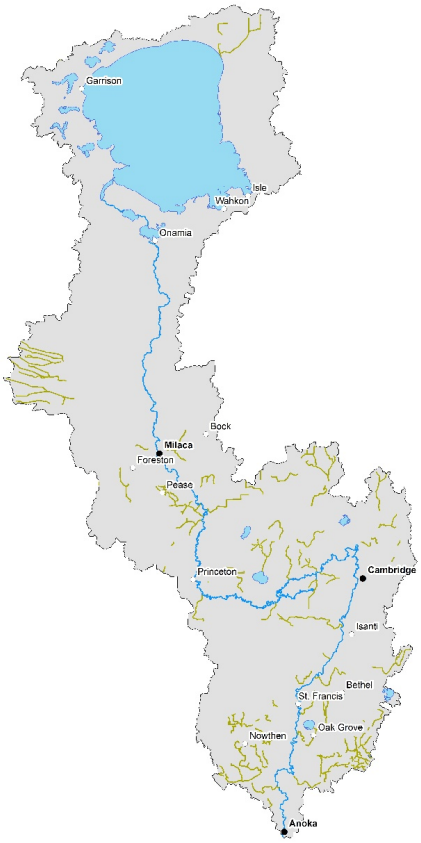

Figure 24: County Ditch Systems (DNR)

Outside of county ditch systems there are many other watercourses that have been altered to provide for additional drainage, including those in both urban and rural areas of the watershed. Altered watercourses were identified and inventoried at a statewide level in 2008 as part of a joint project between the MPCA and the Minnesota Geospatial Information Office (MnGeo). The project categorized streams by category, grouping them as natural, altered, impounded, or no definable channel.

In the Rum River Watershed 51.9% of watercourses were found to be altered. Altered watercourses include those that have been ditched, straightened, or modified. Only 35.8% of watercourses were determined to be in an unaltered natural condition.

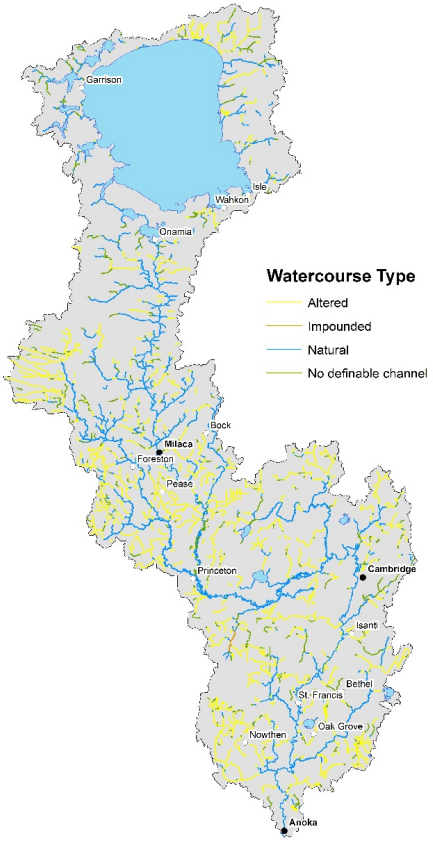

Figure 25: Altered Watercourses (MPCA)

Areas with high-density development often rely on municipal sewer systems to collect and treat wastewater. These systems are often associated with cities, but some have been constructed to serve other areas of high-density development, such as those associated with high-density recreational shoreland development. These systems, along with others that generate and discharge high volumes of wastewater, are permitted by the MPCA through the National Pollution Discharge Elimination System (NPDES) and/or the State Disposal System (SDS). There are 36 of these facilities with current NPDES and/or SDS permits in the watershed; they are generally located in or near regional population centers.

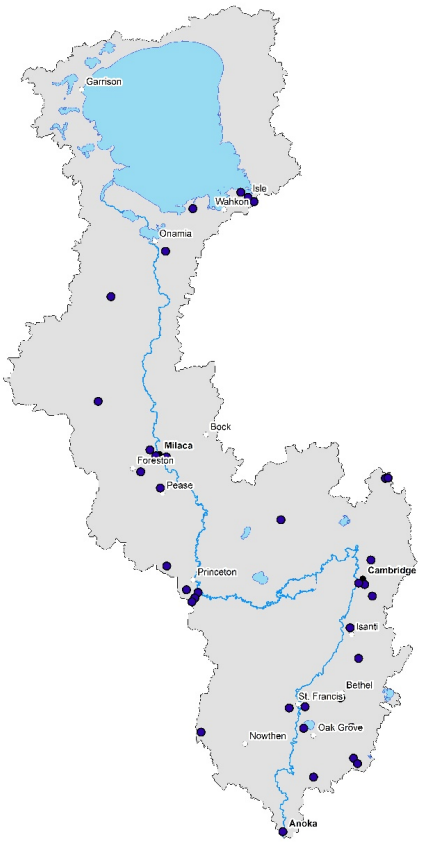

Figure 26: Wastewater Facilities (MPCA)

Instead of large organized collection systems the rural areas of the watershed rely on individual SSTS for wastewater treatment. SSTS are designed and operated in accordance with rules and recommendations from the MPCA and the University of Minnesota. SSTS are permitted locally, typically by counties or townships, although some cities without organized collection and treatment systems do operate their own SSTS programs.

These systems typically rely on treatment and disposal below grade, utilizing aerobic treatment processes in the soil to treat wastewater before discharge to the water table. The Rum River has a shallow water table and dense soils; as a result, many new SSTS are elevated "mound" systems, instead of conventional "trench" systems. As an example, in Mille Lacs County, approximately 76% of all systems are mounds. However, while exact figures are unavailable, it is estimated that there are still many outdated systems that have yet to be replaced with those that are in compliance with current rules and regulations.

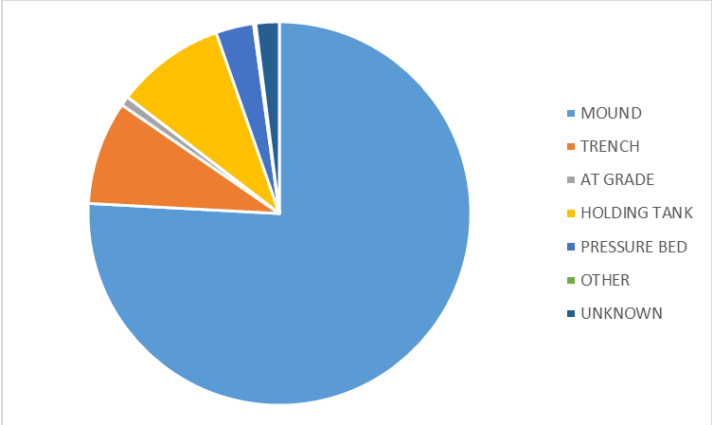

Figure 27: SSTS by System Type – Mille Lacs County (Mille Lacs County Environmental Resources)

Another consideration in regards to waste treatment in rural areas of the watershed is feedlots. The MPCA regulates the collection, transportation, storage, processing, and disposal of animal manure and other livestock wastes. State rules require the registration of all feedlots capable of holding 50 or more animal units (10 in shoreland areas). Animal units are a method of quantifying the waste generated by different animals; one (1) animal unit is equivalent to the amount of waste produced by a typical 1,000 pound steer.

ANIMAL	ANIMAL UNITS
Mature Dairy Cow > 1,000 Lbs.	1.4
Cow/Calf Pair	1.2
Stock Cow/Steer	1.0
Horse	1.0
Diary Heifer	0.7
Swine 55 - 300 Lbs.	0.3
Sheep	0.1
Chicken Broiler (> 5 Lbs., dry manure)	0.005
Turkey > 5 Lbs.	0.018

Figure 28: Animal Units (MPCA)

Manure storage and management requirements associated with feedlot registration and permitting are based on the number of animal units in a feedlot. The enforcement of more restrictive requirements correlates with increased animal units. At 1,000 animal units the feedlot is deemed to be a concentrated animal feeding operation (CAFO). At this threshold additional state and federal permits are required.

There are 275 feedlots in the Rum River Watershed. Approximately 95% the feedlots have 300 animal units or less, and there is only one CAFO. While the total number of feedlots appears to be decreasing, the size of those that remain is growing. This correlates with larger trends in agriculture, in which smaller family farms are being replaced by larger corporate operations. Mille Lacs County is home to nearly half (48%) of all feedlots in the watershed; however, the one CAFO in the watershed is located in Isanti County.

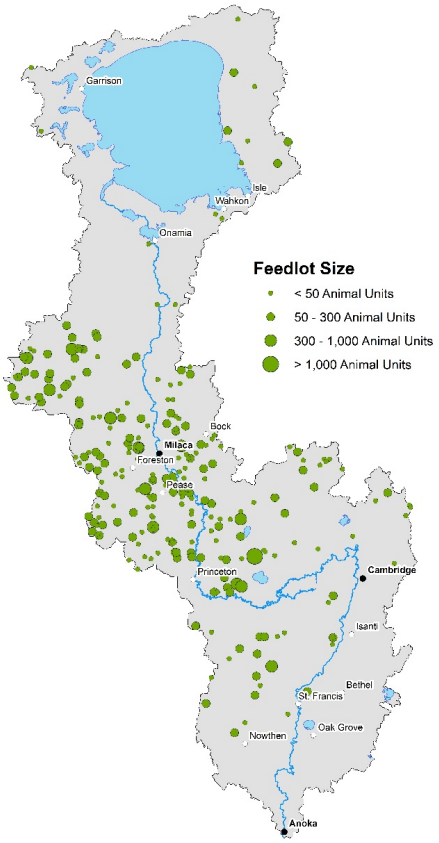

Figure 29: Feedlots (MPCA)

SURFACE WATER QUANTITY

Stream flow data on the Rum River can be utilized as an indicator to assess surface water quantity watershed-wide. The United State Geological Survey (USGS) maintains a streamflow gaging station on the Rum River in St. Francis. Stream flow data is available from 1934 to 2017. This data appears to show that annual mean discharge, a product of water velocity and volume, is increasing over time.

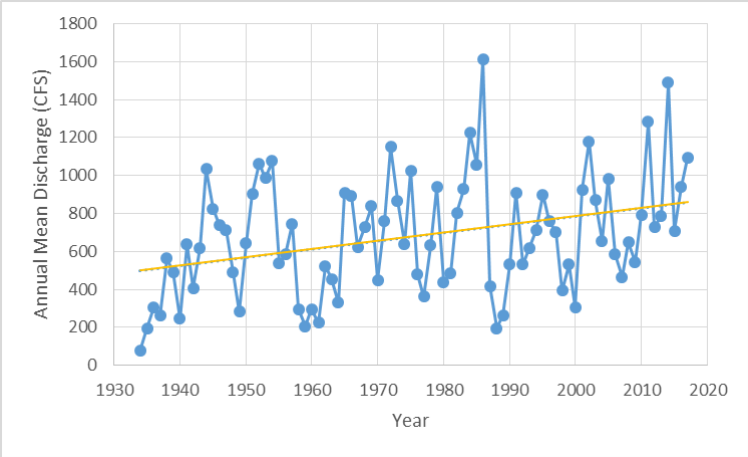

Figure 30: Rum River near St. Francis Annual Mean Discharge (USGS)

Similarly, lake water levels are another useful indicator to assess water quantity. Mille Lacs Lake is the largest lake in the watershed, and the USGS maintains a gage at Cove Bay near Onamia. Lake level data is available from 1992 to 2018. Similar to the Rum River, water levels appear to be increasing, albeit not as dramatically as is exhibited on the river.

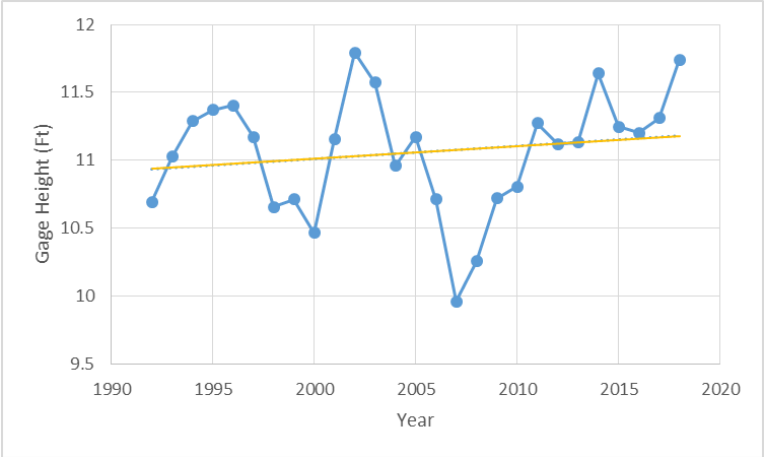

Figure 31: Mille Lacs Lake Water Level (USGS)

Stream discharge and lake levels are directly related to flooding concerns in many areas of the watershed. As a result, many communities participate in the National Flood Insurance Program (NFIP). This program aims to reduce the impact of flooding by providing flood insurance and promoting sound floodplain management. The Federal Emergency Management Agency (FEMA) is responsible for oversight of the NFIP program, and has created Flood Insurance Rate Maps (FIRM) to identify areas that are susceptible to flooding.

The FIRM maps include multiple flood zones, based on the probability of a flood event occurring in a single year. The most common category, known as the base flood, is the 1% annual chance flood zone, otherwise known as the "100-year" flood. FIRM data accuracy and availability varies by location, as the maps are completed on a county basis. Data is unavailable for Kanabec County.

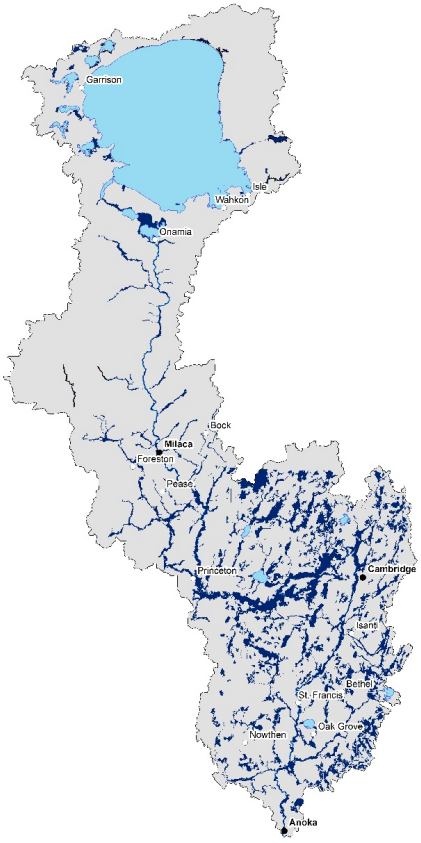

Figure 32: 1% Annual Chance Flood Zones (FEMA/DNR)

SURFACE WATER QUALITY

Surface waters in the Rum River Watershed are generally of high quality, especially in the northern end of the watershed. It is estimated that approximately 40% of Minnesota's lakes and streams are impaired; in the Rum River watershed that figure is less than 10%. However, there are some water bodies that do not meet federal water quality standards for aquatic life, aquatic consumption, or aquatic recreation, with quality generally declining from north to south. It is also important to note that not all water bodies have been assessed for impairments. Mercury in fish tissue and excess phosphorus, causing eutrophication, are the main pollutants.

WATER BODY	YEAR ADDED	COUNTY	AFFECTED USE	POLLUTANT OR STRESSOR
Lake Baxter	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Bogus Brook	2016	Mille Lacs	Aquatic Recreation	Escherichia coli
Lake Borden	2006	Crow Wing	Aquatic Consumption	Mercury in fish tissue
Borden Creek	2010	Aitkin	Aquatic Life	Dissolved oxygen
Cedar Creek	2016	Anoka	Aquatic Recreation	Escherichia coli
Cedar Creek (Little River)	2010	Mille Lacs	Aquatic Life	Dissolved oxygen
Crooked Brook	2006	Anoka	Aquatic Life	Dissolved oxygen
East Hunter Lake	2016	Sherburne	Aquatic Recreation	Nutrient/eutrophication biological indicators
East Twin Lake	2008	Anoka	Aquatic Consumption	Mercury in fish tissue
Estes Brook	2016	Mille Lacs	Aquatic Life	Aquatic macroinvertebrate bioassessments
Estes Brook	2016	Mille Lacs	Aquatic Recreation	Escherichia coli
Lake Fannie	2008	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Lake Francis	2016	Isanti	Aquatic Life	Fishes bioassessments
Lake Francis	2002	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Lake George	1998	Anoka	Aquatic Consumption	Mercury in fish tissue
Green Lake	1998	Isanti	Aquatic Consumption	Mercury in fish tissue
Green Lake	1998	Isanti	Aquatic Consumption	PCB in fish tissue
Green Lake	2016	Isanti	Aquatic Life	Fishes bioassessments
Green Lake	2008	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Isanti Brook	2016	Isanti	Aquatic Life	Aquatic macroinvertebrate bioassessments
Isanti Brook	2016	Isanti	Aquatic Life	Fishes bioassessments
Lewis Lake	1998	Kanabec	Aquatic Consumption	Mercury in fish tissue
Little Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Long Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Mahoney Brook	2016	Anoka	Aquatic Life	Fishes bioassessments
Malone Creek (Thains Creek)	2012	Mille Lacs	Aquatic Life	Dissolved oxygen
Mille Lacs Lake	1998	Aitkin	Aquatic Consumption	Mercury in fish tissue
North Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Round Lake	1998	Aitkin	Aquatic Consumption	Mercury in fish tissue
Rum River	1998	Multiple	Aquatic Consumption	Mercury in fish tissue
Rum River, West Branch	2016	Mille Lacs	Aquatic Life	Aquatic macroinvertebrate bioassessments
Rum River, West Branch	2016	Mille Lacs	Aquatic Recreation	Escherichia coli
Seelye Brook	2016	Anoka	Aquatic Recreation	Escherichia coli
Lake Shakopee	1998	Mille Lacs	Aquatic Consumption	Mercury in fish tissue
Lake Skogman	2008	Chisago	Aquatic Recreation	Nutrient/eutrophication biological indicators
South Stanchfield Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Stanchfield Creek	2016	Isanti	Aquatic Life	Fishes bioassessments
Tennyson Lake	2016	Isanti	Aquatic Recreation	Nutrient/eutrophication biological indicators
Tibbetts Brook	2016	Morrison	Aquatic Life	Fishes bioassessments
Trott Brook	2016	Anoka	Aquatic Life	Aquatic macroinvertebrate bioassessments
Trott Brook	2016	Anoka	Aquatic Life	Dissolved oxygen
Trott Brook	2016	Anoka	Aquatic Life	Fishes bioassessments
Twelve Lake	2016	Morrison	Aquatic Recreation	Nutrient/eutrophication biological indicators
Unnamed creek	2016	Morrison	Aquatic Life	Aquatic macroinvertebrate bioassessments
Vondell Brook (County Ditch 11)	2016	Mille Lacs	Aquatic Life	Fishes bioassessments
Washburn Brook (Judicial Ditch 3)	2016	Mille Lacs	Aquatic Life	Fishes bioassessments
West Hunter Lake	2016	Sherburne	Aquatic Recreation	Nutrient/eutrophication biological indicators

Figure 33: Impaired Waters – 2018 (MPCA)

In 2013 the Minnesota Pollution Control Agency (MPCA) initiated a water quality assessment of the Rum River Watershed, conducting biological, chemistry, and flow monitoring on key stream segments. A full Watershed Restoration and Protection Strategy Report (WRAPS) was released in July, 2017. The report identified, on a sub-watershed basis, restoration and protection strategies. These strategies were developed through a combination of public input and analysis of existing data on the quality of waterbodies to identify the strategies and future actions that make sense to address water quality issues. These range from protecting existing high-quality areas to prioritizing restoration of areas that have already experienced impacts.

Figure 34: Impaired Waters (MPCA)

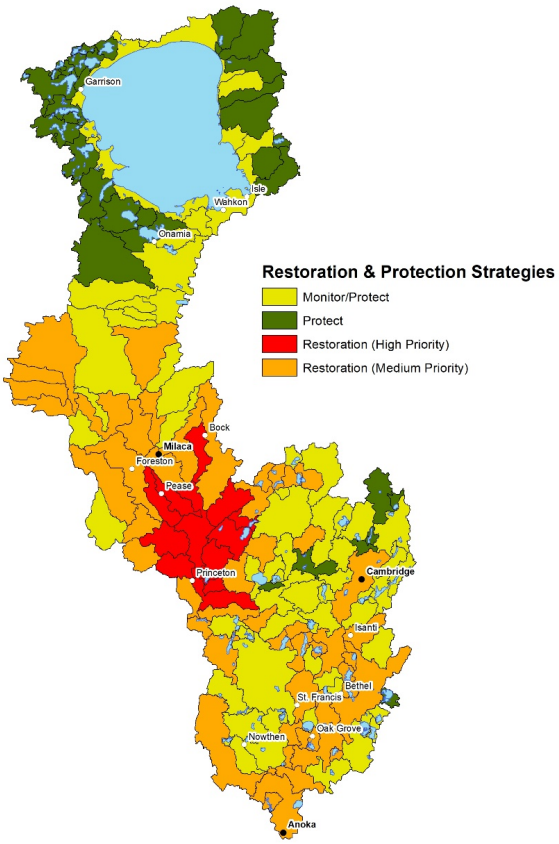

Figure 35: WRAPS Prioritization (MPCA)

The WRAPS report identifies a number of management priorities in addition to impaired waters. For example, the watershed has one lake with declining water quality, Lake George in Anoka County. There are also a number of waters that are close to impairment thresholds including lakes and the Rum River.

GROUNDWATER

Groundwater is one of our most valuable resources. This is the water held underneath the earth's surface in soil pore spaces and fractures in rock formations. Approximately 75% of all Minnesotans rely on groundwater for drinking water.

Wells are located in groundwater aquifers. These are areas in which sufficient quantities of water are readily available, based on the capacity, porosity, and permeability of the applicable sub-surface rock formations. Above the deeper aquifers is the water table, sometimes referred to as the surficial aquifer. This is the upper surface of the saturated area in the ground, in which soils are saturated with groundwater. The surficial aquifer exchanges water with lakes, rivers, and streams.

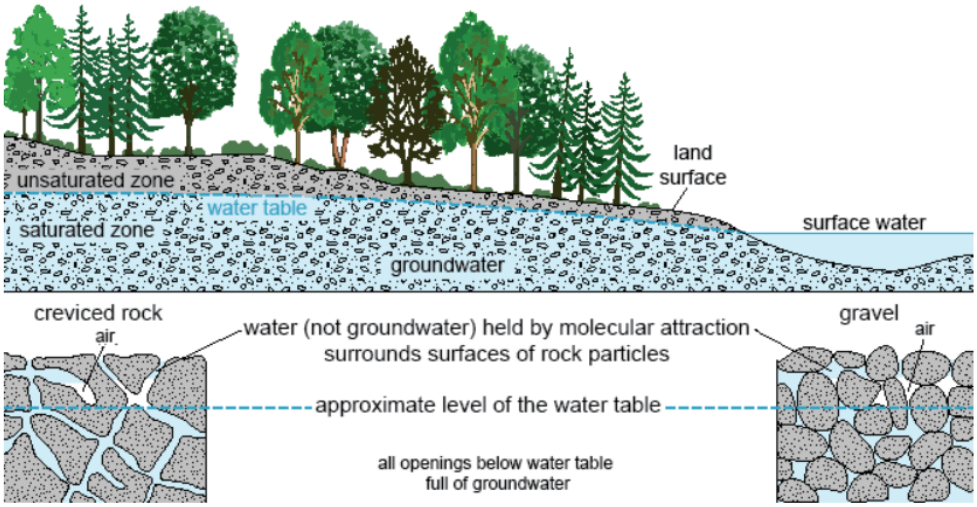

Figure 36: Visualizing Groundwater (USGS)

The availability of groundwater is related to local geologic conditions that determine the type and properties of groundwater aquifers. Based on statewide bedrock and glacial geology Minnesota has been mapped in six (6) groundwater provinces. Within each province, the source and availability of groundwater is similar.

The Rum River Watershed crosses three (3) of Minnesota's six (6) groundwater provinces. Traveling north to south these are the Arrowhead, Central, and Metro provinces. The Arrowhead province has exposed or thinly-covered Precambrian rocks. Groundwater is typically found in faults and fractures.

PROVINCE	SURFICIAL SANDS	BURIED SANDS	BEDROCK
METRO	Moderate	Moderate	Good
CENTRAL	Good	Moderate	Limited
ARROWHEAD	Limited	Limited	Limited

Figure 37: Groundwater Availability by Province & Source (DNR)

Similar characteristics are found in the Central province, which has thick sandy and clayey glacial drift over Precambrian and Cretaceous bedrock. The Metro province has sand aquifers in thick sandy and clayey glacial drift. This is over Precambrian sandstone and Paleozoic sandstone, limestone, and dolostone aquifers.

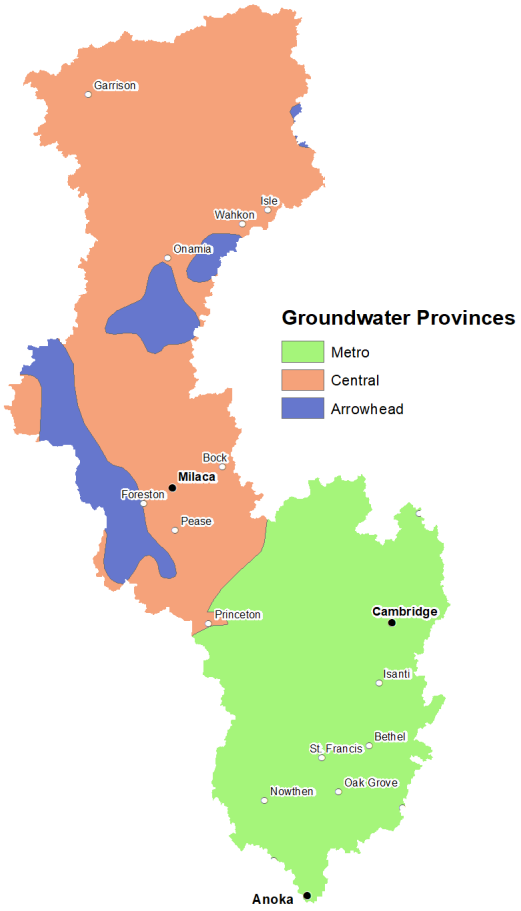

Figure 38: Groundwater Provinces (DNR)

The same geologic factors that influence the availability of groundwater also influence groundwater susceptibility to pollution and contamination. Aquifers that draw from bedrock, covered by thick glacial till, are generally less susceptible to contamination. Those that draw from surficial aquifers covered by sand and gravel have a higher risk.

Based on statewide geomorphology and Quaternary geology the Minnesota Department of Agriculture (MDA) has developed a statewide map illustrating water table aquifer vulnerability. Aquifers in the Rum River Watershed are generally at a medium risk level. However, there are areas of both high and low risk scattered throughout the watershed.

A related factor is water table elevation. The water table is generally within ten (10) feet of the ground surface across the state; however, variations can exist based on local topography and other factors. Within the Rum River Watershed water table depth is generally ten (10) feet deep or less, but deeper water tables are found in some river valleys and floodplain areas.

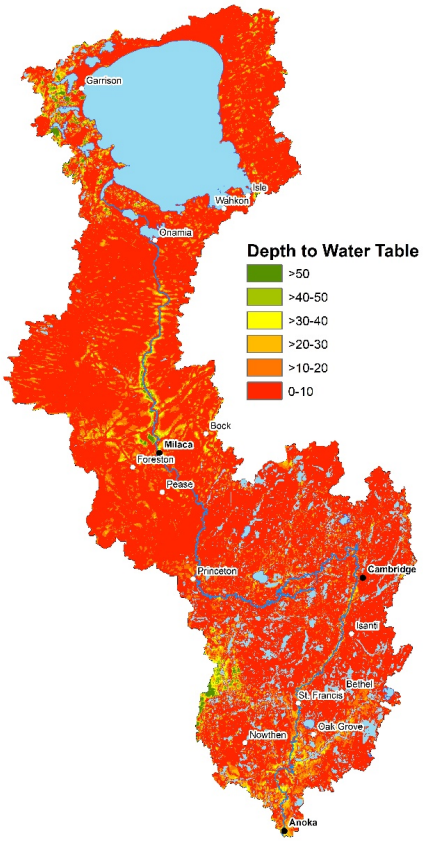

Figure 39: Depth to Water Table (DNR)

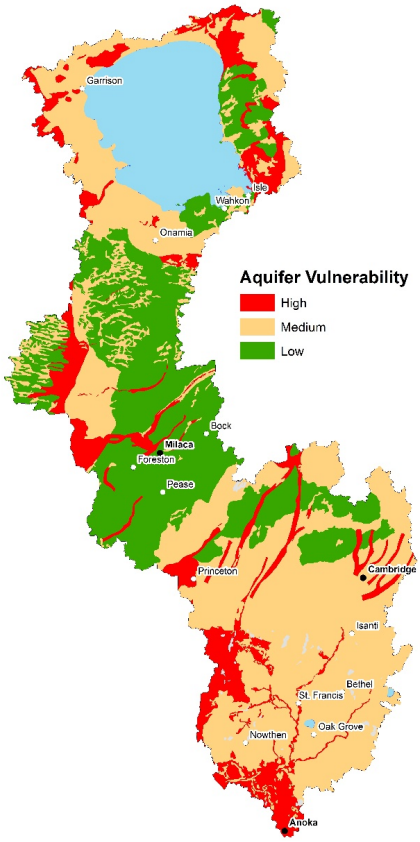

Figure 40: Aquifer Vulnerability (MDA)

While various studies of the geology and aquifers of the region are available, the most recent and comprehensive are County Geologic Atlas'. These are complete or in progress for all counties in the watershed except Mille Lacs. Data is available from the MN Geologic Survey and MN Department of Natural Resources.

GROUNDWATER QUALITY

As a result of our reliance on groundwater as a drinking water resource, quality is of utmost importance. The MPCA's Ambient Groundwater Monitoring Program monitors trends in groundwater quality statewide, including 18 monitoring wells within the Rum River Watershed. The Minnesota Department of Health (MDH) also monitors groundwater quality, analyzing test data from the construction of new wells. Finally, public water suppliers monitor quality of their wells.

The majority of the MPCA's monitoring wells (15) are located in areas served by subsurface sewage treatment systems (SSTS). All but one (1) of the monitoring wells are located in Anoka County. The areas served by SSTS were identified to have higher percentages of contaminants of emerging concern (CECs) than those in urbanized areas CECs demonstrate effects at very low levels of exposure, as such there is no standard "limit" for contamination.

CECs are often manmade chemicals, including pharmaceuticals, pesticides, and detergents. The most common in the Rum River Watershed were sulfadimethoxine, isophorone, and 2-methylanaphthalene. Sulfadimethoxine is an antibiotic. Isophorone is a solvent. 2-methylanaphthalene is a used to make dyes and resins.

Other chemicals of concern include chloride and sodium. Chloride was detected in 93.9% of all samples, with 10 occurrences exceeding the secondary maximum limit, a point at which the contaminant is noticeable for aesthetic considerations, but not presenting a risk to human health. Similarly, sodium was found in wells 98.7% percent of the time; there is no drinking water standard for sodium.

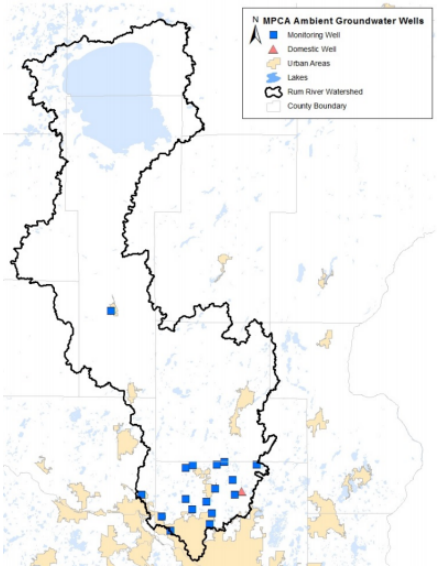

Figure 41: MPCA Ambient Groundwater Monitoring Well Locations (MPCA)

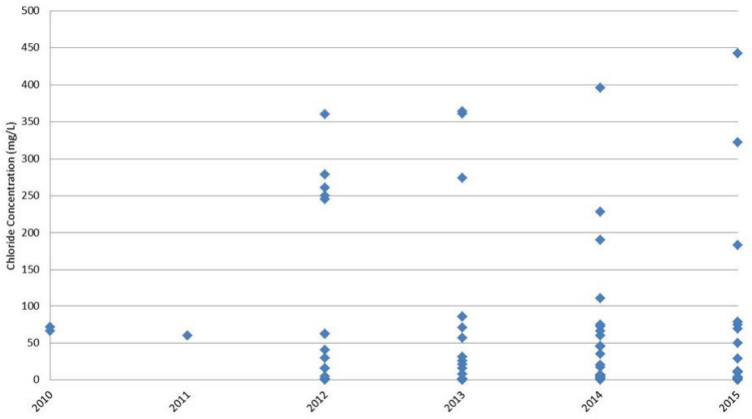

Figure 42: Chloride Detections in Ambient Groundwater Samples 2010 - 2015 (MPCA)

Another chemical of concern is nitrate, a form of nitrogen. Nitrate was detected in 95.2% of the samples, but only three (3) samples were found to exceed the maximum contaminant level of 10 milligrams per liter. This contaminant level was set for the concern of methemoglobinemia (blue-baby syndrome) in infants under the age of six (6) months.

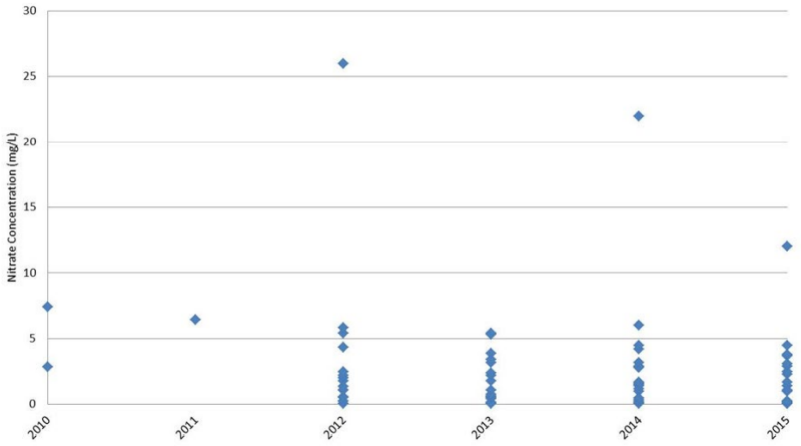

Figure 43: Nitrate Detections in Ambient Groundwater Samples 2010 - 2015 (MPCA)

A naturally-occurring chemical of concern for human consumption is arsenic, which has been found in drinking water wells. Data compiled by MDH from the construction of new wells shows that 10.7% of all wells installed between 2008 and 2015 contains arsenic that is above the maximum contaminant level of 10 micrograms per liter. In the Rum River Watershed individual county information was found to range from 0 to 10%, low in comparison to statewide data.

COUNTY	PERCENTAGE OF WELLS EXCEEDING 10 MICROGRAMS/LITER
Aitkin	5.80%
Anoka	8.80%
Benton	0.80%
Crow Wing	4.30%
Chisago	3.50%
Isanti	2.60%
Kanabec	2.60%
Mille Lacs	0.60%
Morrison	4.10%
Sherburne	2.50%

Figure 44: Percentage of New Wells Exceeding Maximum Arsenic Contamination Levels (MDH)

A contaminant with recently established human health and testing requirements is manganese. Public water suppliers have begun to test for manganese. It does occur at levels exceeding health standards in some areas of the watershed.

GROUNDWATER QUANTITY

Groundwater is not an infinite resource. Groundwater aquifers can be "pumped dry" as a result of human activity when recharge doesn't meet or exceed discharge. As a result, it is important that groundwater volume, recharge, and usage are considered.

As a result, groundwater usage is regulated and monitored statewide. The DNR permits high-capacity ground and surface water withdrawals when pumped volume exceeds 10,000 gallons per day or one million gallons per year. The largest permitted withdrawals in the Rum River Watershed are public and private water supply wells and agricultural irrigation wells.

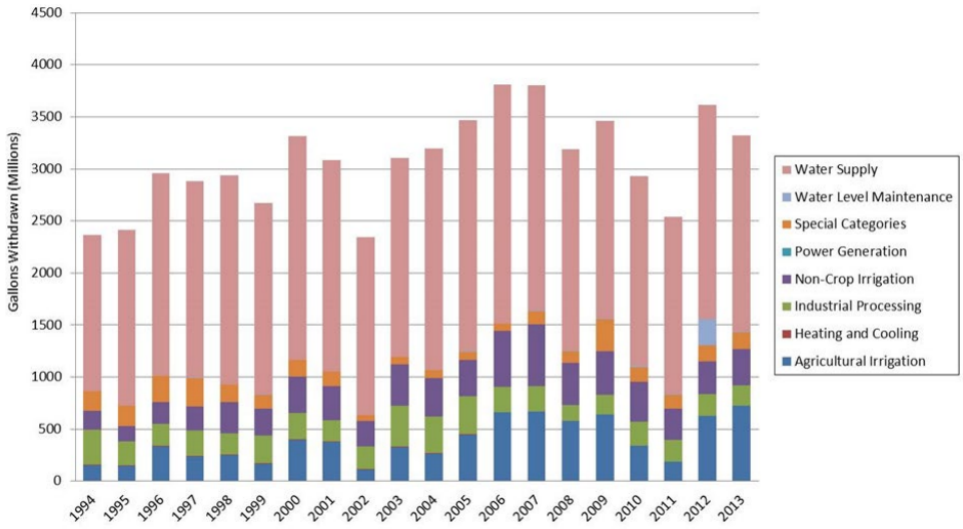

Figure 45: High Capacity Water Withdrawals 1994 – 2013 (MPCA, DNR)

From 1994 to 2013, irrigation, both crop and non-crop, has increased significantly. The other specified uses have not exhibited any significant trends. The majority of the irrigation withdrawals are taking place in the southern third of the watershed, where sandy soils require additional irrigation to provide for effective crop production.

Total groundwater withdrawals tend to be increasing. Total withdrawals increased from approximately 2.5 billion gallons of water in 1994 to 3.3 billion gallons of water in 2013. The most significant increase was for irrigation use. This includes both agricultural and non-agricultural irrigation. A smaller increase was found in surface water withdrawals, which increased from 89.9 million gallons of water in 1994 to 91.4 million gallons of water in 2013.

It is noteworthy that water appropriations data presented here is only for permitted wells. Permits are required only for appropriations of more than 10,000 gallons per day or one million gallons per year. There are many wells, including private residential wells, in the watershed that are excluded from the data presented but cumulatively pump large volumes of groundwater.

It is also noteworthy that some portions of the watershed share aquifers with the larger Twin Cities metropolitan area. Large pumping volumes in the metro could affect aquifers in portions of the watershed that are seemingly distant from the metro. Moreover, rural portions of the Rum River watershed are known to be important areas for recharging aquifers that serve the metro.

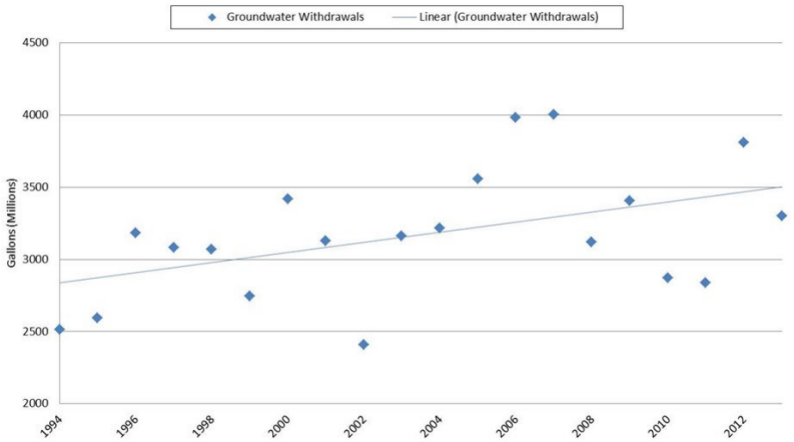

Figure 46: Rum River Watershed Total Annual Groundwater Withdrawals 1994 – 2013 (MPCA)

Groundwater recharge is an important consideration when evaluating the ability of the aquifers to support total withdrawals. Recharge is variable, changing by location and over time. To estimate groundwater recharge, the MPCA, in coordination with the USGS, has developed a statewide estimate of recharge rates.

In the Rum River Watershed the annual potential recharge rate is estimated to be an average of 6.4 inches per year. By comparison, the statewide average is approximately four (4) inches per year. As a result, the Rum River Watershed has a higher than average potential for groundwater recharge.

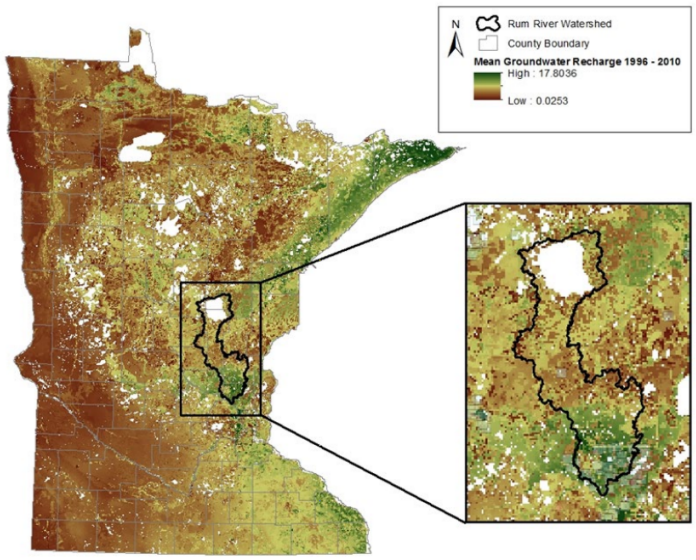

Figure 47: Average Annual Potential Recharge Rate to Surficial Materials 1996 – 2010 (MPCA)

Actual recharge rates can be evaluated by reviewing withdrawals and groundwater aquifer elevations. The DNR tracks the elevations of groundwater aquifers across the state through the use of various monitoring wells. This data provides the elevations of groundwater aquifers, reflecting the fluctuations of the water table as it rises and falls. While fluctuations in the water table elevations are evident, there is no statistical trend in depth to groundwater.

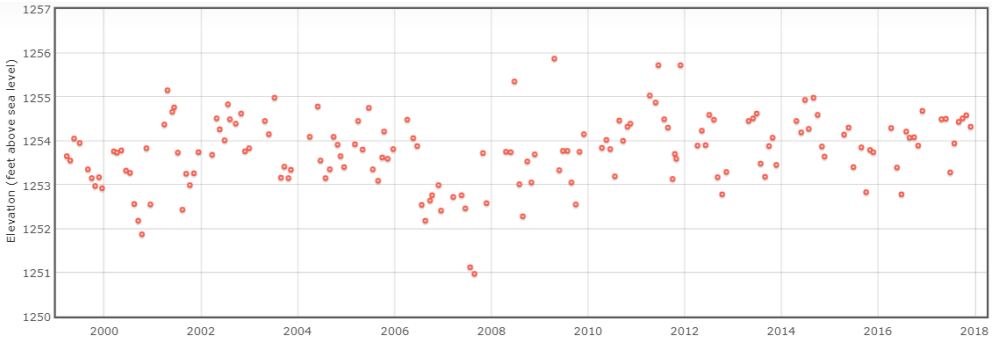

Figure 48: Groundwater Elevations, Wahkon 1998 – 2018 (DNR)

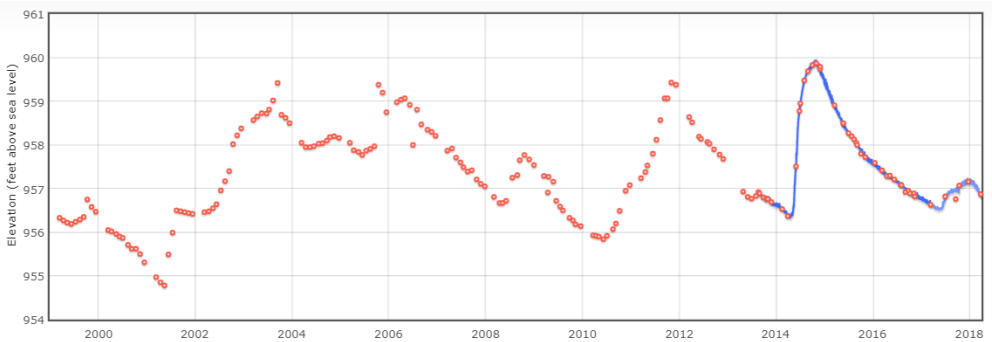

Figure 49: Groundwater Elevations, Princeton 1999 – 2018 (DNR)

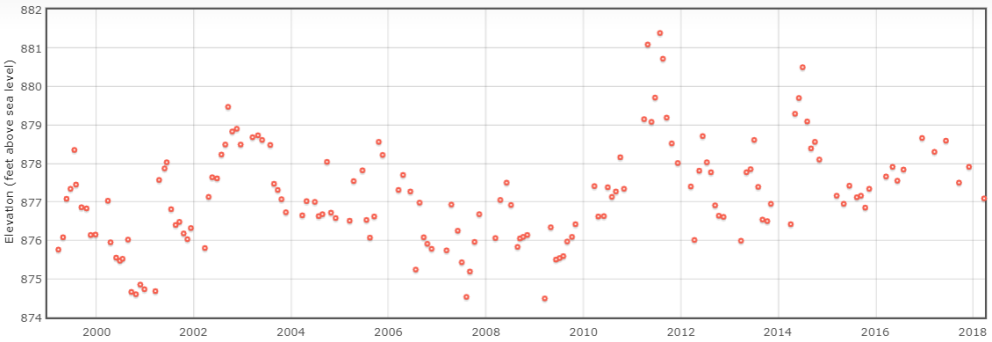

Figure 50: Groundwater Elevations, Oak Grove 1999 – 2018 (DNR)

RECREATION, HABITAT, AND RARE & ENDANGERED FEATURES

In recognition of the Rum River's outstanding scenic, recreational, natural, historical, and scientific values it was added to Minnesota's Wild & Scenic Rivers program in 1978. The Rum River was also designated as a State water trail, offering Class I and Class II rapids for canoers and kayakers throughout the summer. Fishing is another recreational opportunity on the River, with smallmouth bass, northern pike, and walleye being found by anglers in different locations along the River.

Beyond the Rum River recreational opportunities abound. Mille Lacs Lake offers world-class fishing, and was recently ranked as one of the top five bass fishing lakes in the Central region of the United States. The region also offers a plethora of other open-water fishing opportunities, with public water access sites throughout the watershed. Terrestrial recreational opportunities are also available. The watershed has many state parks and state-owned lands that are available for a variety of recreational uses. The watershed also hosts a section of the Soo Line Trail, open for motorized and non-motorized recreation.

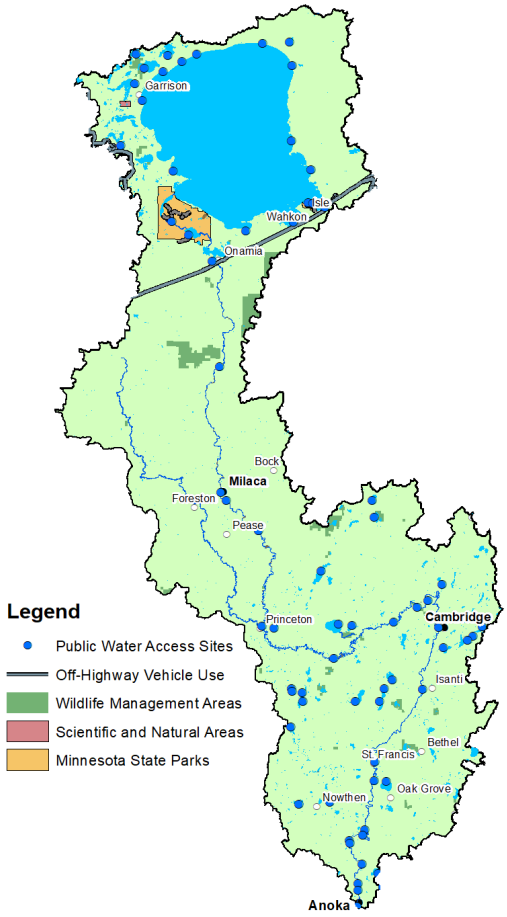

Figure 51: Recreational Resources (DNR)

State and Federal rules require the designation of endangered and threatened species. These include both plants and animals that are protected under the Federal Endangered Species Act. A species is endangered if it is threatened with extinction, a species is threatened if it is likely to become endangered, and a species is of special concern if it has unique or uncommon characteristics that warrant monitoring. There are many listed species within the watershed, including multiple mussel species found in the Rum River.

The Minnesota County Biological Survey (MCBS), a program administered by the DNR, has collected information in select locations on the presence or prevalence of rare plants, animals, and native plant communities. This has been compiled into a statewide dataset with sites ranked based on their importance for the preservation of these species and communities. There are many MCBS sites in the Rum River Watershed, particularly in the north. While many are of moderate significance, or below the minimum threshold for classification as such, there are many large areas of outstanding quality.

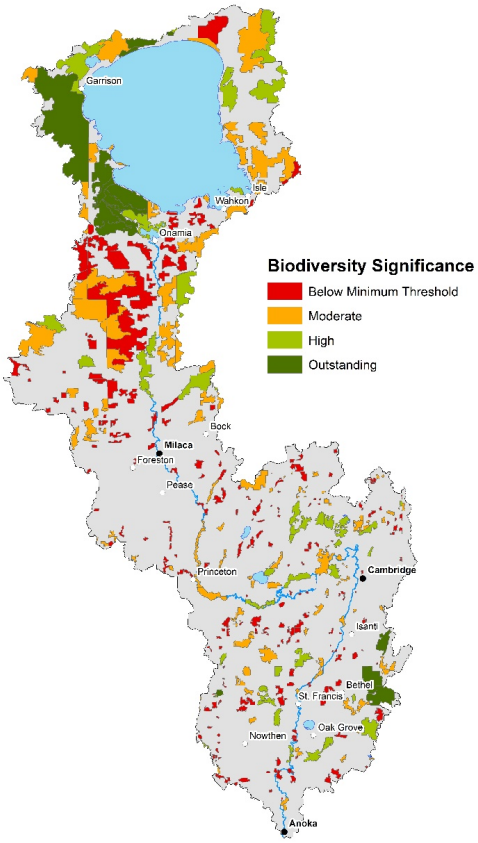

Figure 52: Biodiversity & MBS Ranking (DNR)

REFERENCES

Agency for Toxic Substances and Disease Registry (2005), Public Health Statement Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene. Retrieved from https://www.atsdr.cdc.gov/ToxProfiles/tp67-c1-b.pdf.

Berg, Jim and Minnesota Department of Natural Resources (2001), Minnesota Ground Water Provinces – Generalized Cross Sections. Retrieved from https://files.dnr.state.mn.us/natural_resources/water/groundwater/provinces/gwprvxsec.pdf.

Hobbs, Howard C. and Goebel, Joseph E. (1982), Geologic Map of Minnesota Quaternary Geology. Retrieved from https://conservancy.umn.edu/handle/11299/60085.

Minnesota Department of Agriculture (2015), Minnesota Water Table Aquifer Vulnerability. Retrieved from https://gisdata.mn.gov/dataset/water-aquifer-vulnerability.

Minnesota Department of Natural Resources (2019), Cooperative Groundwater Monitoring (CGM). Retrieved from https://www.dnr.state.mn.us/waters/cgm/index.html.

Minnesota Department of Natural Resources (2019), Groundwater Provinces. Retrieved from https://www.dnr.state.mn.us/groundwater/provinces/index.html.

Minnesota Department of Natural Resources (2019), Minnesota Hydrogeology Atlas (MHA). Retrieved from https://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/mha_wt.html.

Minnesota Department of Natural Resources (2019), Precipitation Data from a Gridded Database. Retrieved from http://climateapps.dnr.state.mn.us/gridded_data/precip/monthly/monthly_gridded_precip.asp.

Minnesota Department of Natural Resources (2016), Water-Table Elevation and Depth to Water Table. Retrieved from https://files.dnr.state.mn.us/waters/groundwater_section/mapping/mha/hg03_report.pdf.

Minnesota Department of Revenue (2019), 2019 Property Values and Assessment Practices Report Assessment Year 2018. Retrieved from https://www.revenue.state.mn.us/sites/default/files/2019-03/2019%20Property%20Values%20and%20Assessment%20Practices%20Report%2002%2028%2019.pdf .

Minnesota Department of Revenue (2019), County Adjusted Net Tax Capacity Study Year 2018. Retrieved from https://www.revenue.state.mn.us/sites/default/files/2019-07/County%20FINAL%20ANTC%2001JUL2019.pdf.

Minnesota Lakes and Rivers (2016), Lake Home and Cabin Ownership Survey in Greater Minnesota. Retrieved from http://www.mnlakesandrivers.org/sites/mnlakesandrivers.org/files/files/Public2016MLRStudyResponses.docx.pdf.

Minnesota Pollution Control Agency (2016), Groundwater Report Rum River Watershed. Retrieved from https://www.pca.state.mn.us/sites/default/files/wq-ws1-11.pdf.

Minnesota Pollution Control Agency (2017), Rum River Watershed Restoration and Protection Strategy Report. Retrieved from https://www.pca.state.mn.us/sites/default/files/wq-ws4-34a.pdf.

Minnesota State Demographic Center (2017), County Population Projections, Totals Only. Retrieved from https://mn.gov/admin/demography/data-by-topic/population-data/our-projections/.

Minnesota State Demographic Center (2017), Components of Change. Retrieved from https://mn.gov/admin/demography/data-by-topic/population-data/our-projections/.

United States Department of Agriculture, Natural Resources Conservation Service (No Date), Rapid Watershed Assessment: Rum River (Wahkon) (MN) HUC: 07010207. Retrieved from https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_022268.pdf.

United States Geological Survey (2019), Aquifers and Groundwater. Retrieved from https://www.usgs.gov/special-topic/water-science-school/science/aquifers-and-groundwater?qt-science_center_objects=0#qt-science_center_objects.

United State Geological Survey (2019), National Water Information System. Retrieved from https://waterdata.usgs.gov/nwis/uv?site_no=05284000 and https://waterdata.usgs.gov/nwis/uv?site_no=05286000.