Middle -Snake- Tamarac RIVERS CWMP

Middle-Snake-Tamarac Rivers Comprehensive Watershed Management Plan

2022-2032

Funded by: CLEAN WATER LAND & LEGACY AMENDMENT

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Acknowledgements

Local Planning Partners
Marshall County
Marshall Soil and Water Conservation District
Polk County
West Polk Soil and Water Conservation District
Middle-Snake-Tamarac Rivers Watershed District

Advisory Committee
Pennington SWCD
Kittson SWCD
United States Fish and Wildlife Service
Natural Resource Conservation Service
Minnesota Board of Water and Soil Resources
Minnesota Department of Agriculture
Minnesota Department of Health
Minnesota Department of Natural Resources
Minnesota Pollution Control Agency
Marshall/ Polk Rural Water
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Local Agronomists
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Contributors
Red River Valley Conservation Service Area

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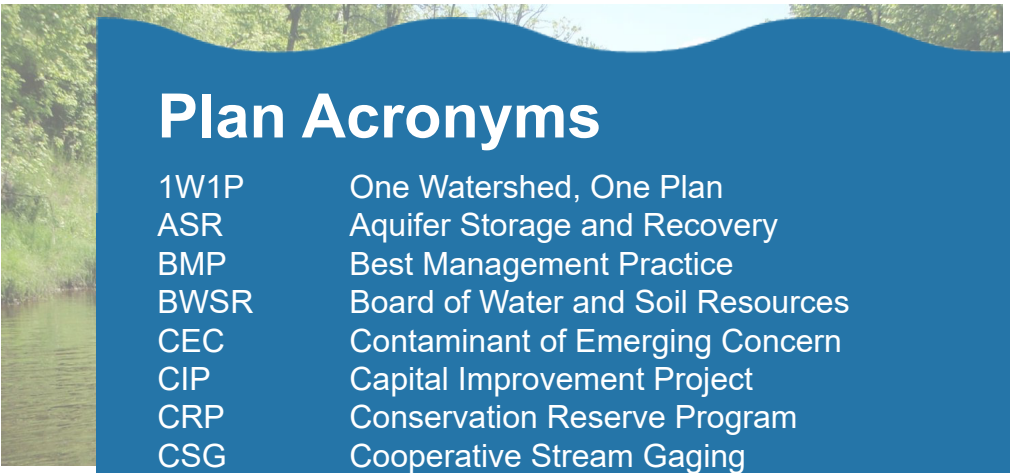
Middle -Snake- Tamarac RIVERS CWMP

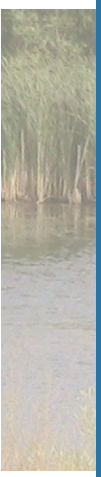
Middle Snake Tamarac Rivers Comprehensive Watershed Management Plan

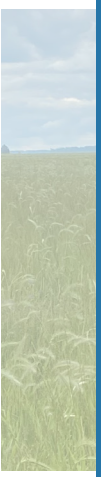
Table of Contents

Middle -Snake- Tamarac RIVERS CWMP

Middle Snake Tamarac Rivers Comprehensive Watershed Management Plan








Plan Acronyms

1W1P	One Watershed, One Plan
ASR	Aquifer Storage and Recovery
BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
CEC	Contaminant of Emerging Concern
CIP	Capital Improvement Project
CRP	Conservation Reserve Program
CSG	Cooperative Stream Gaging
CSP	Conservation Stewardship Program
CWF	Clean Water Fund
CWMP	Comprehensive Watershed Management Plan
DNR	Minnesota Department of Natural Resources
DO	Dissolved Oxygen
DWSMA	Drinking Water Supply Management Area
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FSA	Farm Service Agency
GAM	Grants Administration Manual
HUC	Hydrologic Unit Code
IGRAC	International Groundwater Resources Assessment Centre
IWI	International Water Institute
LGU	Local Government Unit
LSOHC	Lessard-Sams Outdoor Heritage Council
LTFS	Long Term Flood Solutions
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MOA	Memorandum of Agreement
MPCA	Minnesota Pollution Control Agency
MRWA	Minnesota Rural Water Association
MSTR	Middle-Snake-Tamarac Rivers
MSTRWD	Middle-Snake-Tamarac Rivers Watershed District
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWS	National Weather Survey
PFA	Public Facilities Authority

Middle -Snake- Tamarac RIVERS CWMP

Middle Snake Tamarac Rivers Comprehensive Watershed Management Plan

PFAS	Per- and polyfluoroalkyl substances
PPCP	Pharmaceuticals and personal care products
PTMApp	Prioritize, Target, and Measure Application
RCPP	Regional Conservation Partnership Program
RIM	Reinvest in Minnesota
RRBC	Red River Basin Commission
RRMB	Red River Management Board
RRRA	Red River Retention Authority
RRVCSA	Red River Valley Conservation Service Area
RRWMB	Red River of the North Watershed Management Board
SSTS	Subsurface Sewage Treatment System
SWCD	Soil and Water Conservation District
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TP	Total Phosphorus
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WBIF	Watershed-based Implementation Funding
WCA	Wetland Conservation Act
WD	Watershed District
WMA	Wildlife Management Area
WMD	Watershed Management District
WPLMN	Watershed Pollutant Load Monitoring Network
WPP	Wellhead Protection Plan
WRAPS	Watershed Restoration and Protection Strategy Reports
WRP	Wetlands Reserve Program
WWTF	Wastewater Treatment Facilities

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Executive Summary

1. Executive Summary

Beginning 10,000 years ago, the retreat of Glacial Lake Agassiz created the fertile soils, beach ridges, and great plains that define the Red River Basin. As part of the Red River Basin, the Middle, Snake, and Tamarac Rivers drain an agricultural landscape that is home to approximately 9,500 residents (United States Census, 2019).

Because water flowing over the landscape is blind to political boundaries, recent resource management approaches aim to manage land and water according to watershed boundaries rather than political ones. A watershed "contains all the land and water features that drain excess surface water to a specific location on the landscape" (DNR, 2021a). The Middle-Snake-Tamarac Rivers (MSTR) Watershed planning area is unique, as it includes all or portions of three major (HUC-8) watersheds:

- The Snake River Watershed - Red River Basin,
- Part of the Red River of the North - Tamarac River Watershed, and
- Part of the Red River of the North - Grand Marais Creek Watershed

The MSTR Watershed planning boundary (**Figure 1-1**) nearly aligns with that of the Middle-Snake-Tamarac Rivers Watershed District (MSTRWD). The MSTR Watershed encompasses 1,476 square miles (944,640 acres) of land on the Minnesota side of the Red River Basin. Three major rivers, the Tamarac, Middle, and Snake, drain waters within the MSTR Watershed west to the Red River of the North. Counties in the watershed include Marshall, Polk, Kittson, Pennington, and Roseau. Primary towns include Alvarado, Argyle, Holt, Middle River, Newfolden, Oslo, Stephen, Strandquist, Viking, and Warren.

The Middle-Snake-Tamarac Rivers Comprehensive Watershed Management Plan (CWMP) was developed in 2020-2022 through the One Watershed, One Plan (1W1P) program administered by the Board of Water and Soil Resources (BWSR), Minnesota Statutes §103B.801. The purpose of this plan is to guide watershed managers (local counties, Soil and Water Conservation Districts [SWCDs], and the MSTRWD) as they work with landowners and communities to protect and restore the watershed's resources.

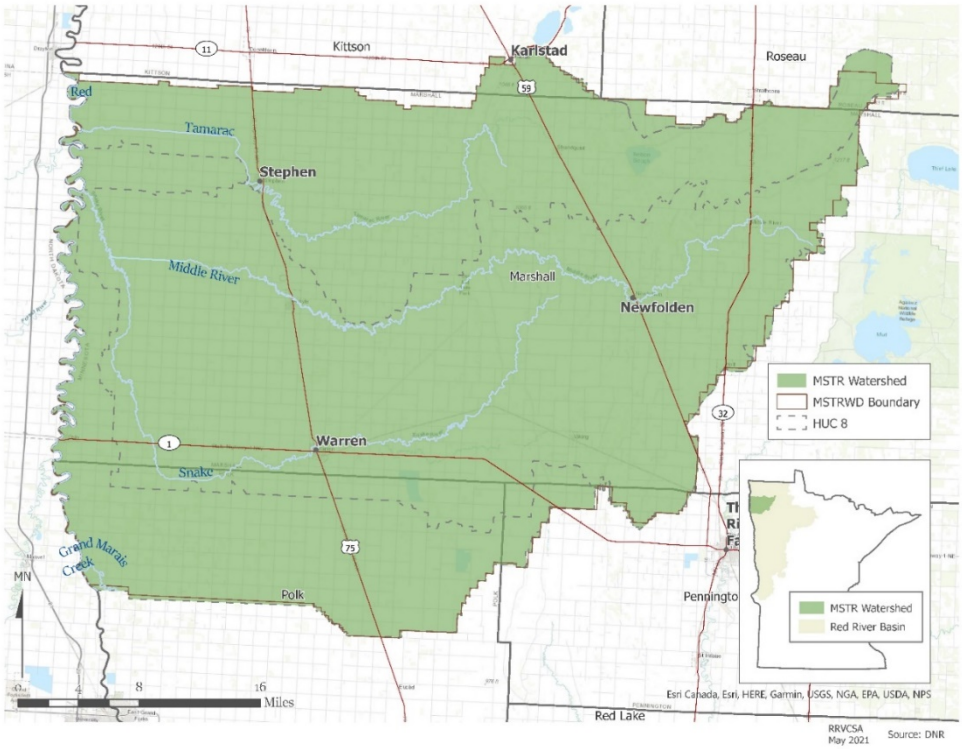


Figure 1-1: The Middle-Snake-Tamarac Rivers Watershed

Committees Serving the Plan

During the Planning Process…

The MSTR 1W1P planning process began with a memorandum of agreement (MOA) (**Appendix A**) between participating governmental entities in the watershed, including:

- Marshall County and Marshall County SWCD,
- Polk County and West Polk County SWCD, and
- the MSTRWD.

Three planning committees served the development of this plan: The Steering Committee, the Advisory Committee, and the Policy Committee (**Figure 1-2**). The Policy Committee, made up of one representative from each entity in the MOA, formed the decision-making body for this plan. The Steering Committee consisted of local staff from each of the entities in the MOA and generated the content in this plan. The Advisory Committee consisted of state agencies and local stakeholders and contributed to plan content in an advisory role. More information about committee roles and responsibilities during the planning process can be found in **Appendix B**.

During Plan Implementation…

The entities implementing this CWMP are collectively known as the Middle-Snake-Tamarac Rivers Watershed Partnership (Partnership). The Steering and Advisory Committees of the planning process were consolidated for purposes of plan implementation. The Policy Committee continues to function as the decision-making body of plan implementation, with roles summarized in **Figure 1-2** and expanded on in **Section 7- Plan Administration and Coordination**. Successful implementation will depend on continuing and building partnerships in the watershed with landowners, planning partners, state agencies, and organizations.

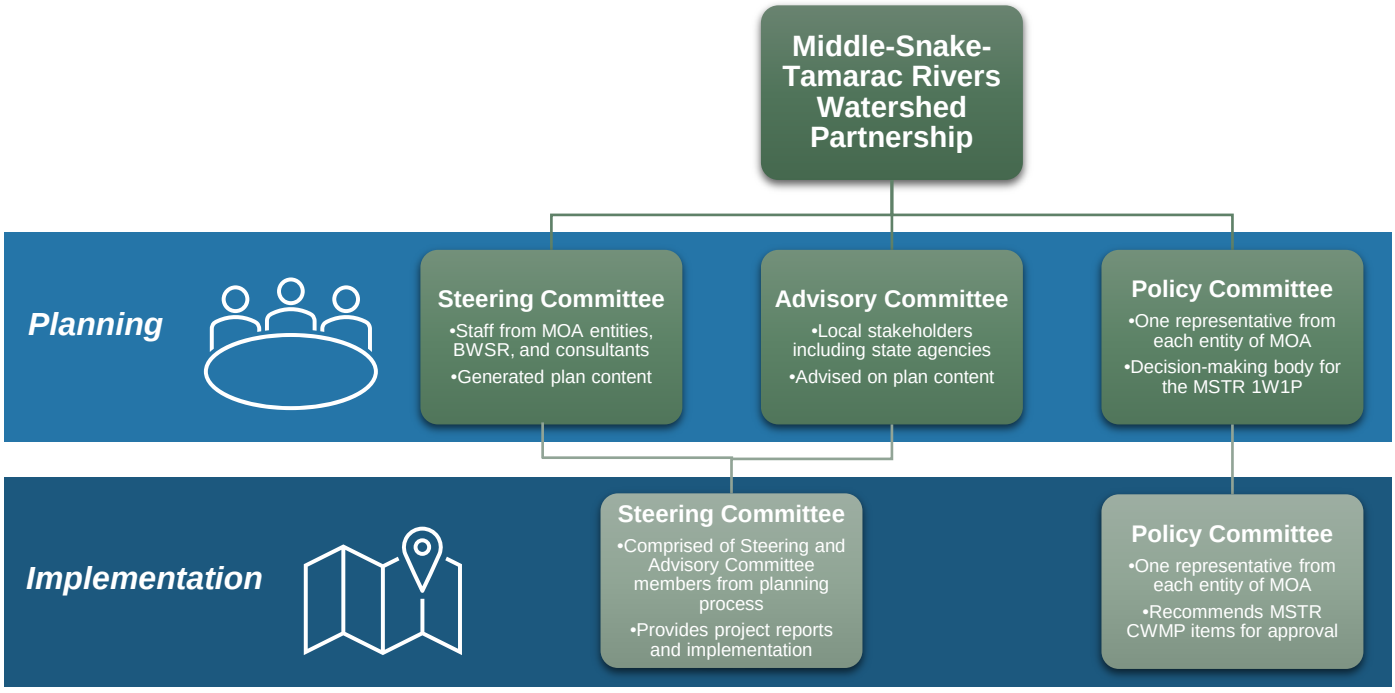


Figure 1-2: Local committee roles for planning and implementing the MSTR CWMP

Planning Regions

The topography, soils, and land use patterns of the MSTR Watershed change as one moves from the lake basin region in the west up into the higher headwaters region to the east. As such, resources and the issues impacting them also change from west to east. To accommodate this, four smaller planning regions were defined to focus planning on specific issues impacting specific regions of the watershed (**Figure 1-3**). These regions were defined based on land use, hydrology, geology, and vegetation. They provide the framework for this CWMP on how issues are identified and prioritized.

1. **Headwaters:** The Headwaters Planning Region contains natural areas and streams, beach ridges, and prairie. Here, management is focused on surface water storage and protection for water quality and flood control.
2. **Lower Tamarac:** The Lower Tamarac Planning Region is largely agricultural and channelized. Management focus here is centered on drainage and sediment reduction.
3. **Lower Middle:** Like the Lower Tamarac, management efforts in the Lower Middle Planning Region focuses on drainage and sediment reduction.
4. **Snake River:** The Snake River Planning Region has some beach ridges, which are prime locations for the preservation of prairie remnants. Here, management focus combines that of the Headwaters and Lower Middle and Tamarac Planning Regions.

More information about natural resources within the MSTR Watershed can be found in **Section 2- Land and Water Resources Narrative**.

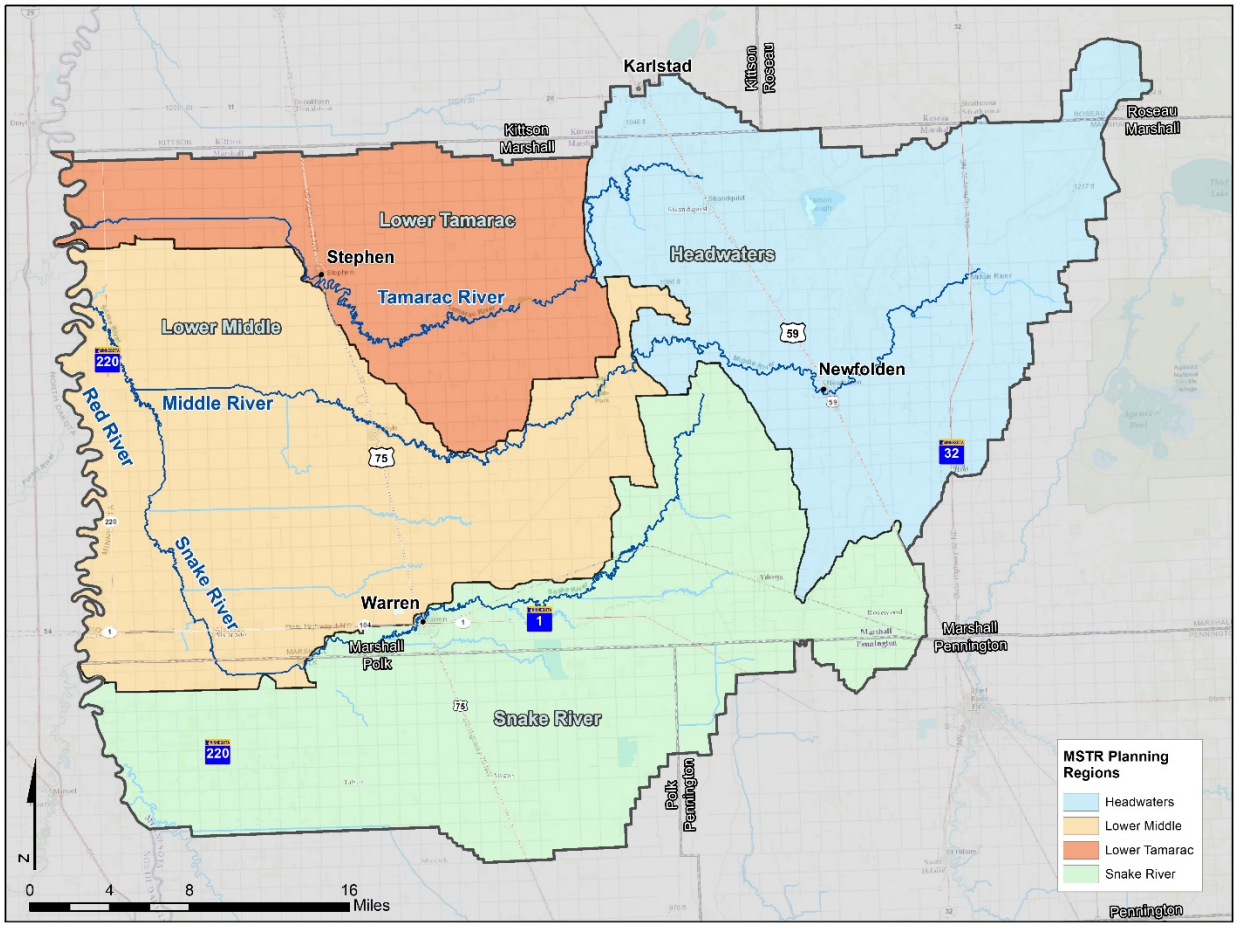


Figure 1-3: Planning regions in the Middle-Snake-Tamarac Rivers Watershed

Community Engagement and Issue Prioritization

Feedback from the public is critical in creating a plan that reflects the community it serves. As such, the Partnership started the planning process with a public meeting to hear from the residents about the resources and issues important to them. A survey was provided in-person for meeting attendees and was available online for those who could not attend the event.

After review and consolidation of public feedback, local water plans and studies, 1W1P notification responses, and committee input, **17 issues** were identified in the MSTR Watershed. For ease, planning partners organized issues into one of four resource categories:

Groundwater | **Surface Water** | **Land Stewardship** | **Habitat**

Because not all issues can be addressed in a 10-year plan, issues are prioritized to focus time, energy, and funding during implementation. Members of the Steering and Advisory Committees used input from the public meeting to prioritize issues by planning region. Other considerations included the location of water quality impairments, groundwater monitoring results, land use data, and existing local capacity. Each issue was categorized as either a Priority A, B, or C. Priority A and B issues are the focus of this CWMP and are detailed on the following pages and in **Section 3- Priority Issues**.

Plan Issues and Why They Matter

Altered Hydrology and Flood Damage Reduction

Flooding is a prominent issue in the watershed, impacting safety and crop productivity. Adding storage to the landscape in the form of retention basins or wetlands and maintaining drainage systems can help mediate these issues.

Habitat

In-stream, riparian, upland, and wetland habitat can provide numerous benefits including filtering pollutants, storing flood waters, and providing recreation such as fishing and hunting.

Erosion

Erosion is a natural process that humans have amplified by altering the landscape. Reducing erosion helps keep healthy soils in place, improves water quality and habitat, and decreases the need for drinking water treatment.

Phosphorus

Phosphorus is the main nutrient that feeds plants and algae in lakes and streams. Excess amounts of it causes harmful algae to grow and cuts off oxygen to other aquatic species.

Groundwater Quantity and Quality

Groundwater and surface water are connected so when contaminants end up in one, they can travel to the other. All drinking water in the MSTR comes from groundwater, so keeping it clean and conserving supplies improves health and reduces costs.

Bacteria (specifically *Escherichia coli*, or *E. coli*)

E. coli in water comes from human and animal fecal matter, which can cause illness. Preventing fecal contamination allows us to swim and eat from our local streams.

Priority A Issues

These issues are the highest priority in this CWMP and are the focus of initial implementation efforts. They have priority resources, goals, and actions assigned to them.

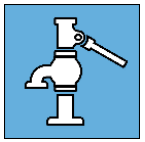
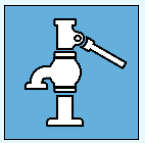
= High Priority = Medium Priority = Low Priority

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Streams, Drainage Systems	Upland erosion and runoff from non-point sources delivering **excess sediment** to drainage systems and streams	
	Streams	Streambank and i**n-channel erosion and channel instability** impacting water quality and habitat	
	Drainage Systems	**Drainage system** instability and inadequacy, and need for **management and maintenance**	
	Agricultural Land	Inadequate **drainage of agricultural lands** impacting crop productivity	
	Land	Economic and ecological impacts of **flooding** on the landscape	

Priority B Issues

Priority B Issues are shown below in no order of priority. These issues will be addressed during implementation and have priority resources, goals, and actions assigned to them.

= High Priority = Medium Priority = Low Priority

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Drinking Water Quality	Contaminants in **groundwater**	
	Groundwater Supplies	Protection of shallow and deep **groundwater supplies** from overuse and loss of recharge	
	Streams	**Excess bacteria** (specifically *Escherichia coli*, or *E. coli*) due to fecal contamination impacting safe access to surface waters	
	Streams and Reservoirs	Increased **phosphorus loading** from non-point sources causing algal blooms, impacting aquatic life and recreation	

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Streams	**Altered hydrology and inconsistent flow** impacting geomorphology and aquatic life	
	Agricultural Land	Decreased **soil health** and wind erosion and its impact on productivity	
	Wetlands, Prairie, Wooded Areas	Loss of **upland and wetland habitat** impacting species richness and diversity, water storage, and water quality	
	Riparian Habitat	Loss of **riparian habitat** and **inadequate buffer areas**	

Measurable Goals

Good resource management – and the ability to demonstrate progress– relies on setting measurable goals for locally important issues and resources. Measurable goals in this plan establish a desired future condition (long-term goal) and what is feasible to achieve in a 10-year timeframe (short-term goal) in terms of specific, measurable outcomes.

In this plan, nine goals address the 13 Priority A or B issues. Because strategies to address issues can be similar, some goals address multiple issues. Multiple datasets and models were used to determine goals and to target where practices would be most effective.

The Prioritize, Target, and Measure Application (PTMApp) is a geographic information system (GIS) tool that was used to identify the types and locations of practices that would be most effective as well as the benefits that could be expected in the course of 10 years of plan implementation. PTMApp was used to define realistic short-term goals for issues related to excess sediment, soil health, phosphorus loading, and altered hydrology and flooding. Local experts familiar with the landscape and problem areas identified priority streams and drainage systems to address for the stream stability / riparian habitat and drainage systems goals. The groundwater goal was informed by datasets from the State of Minnesota that locate areas sensitive to groundwater contamination and recharge. The *Minnesota Prairie Conservation Plan* (DNR, 2018) was developed to prescribe management strategies for prairies and wetlands in the region and was used to determine the upland and wetland habitat goal. Both the Watershed Restoration and Protection Strategy (WRAPS) and Total Maximum Daily Load (TMDL) reports were utilized to identify water quality impairments in the MSTR Watershed, including for *E. coli*, phosphorus, and sediment.

Table 1-1 shows a summary of the goals established by this CWMP, as well as some of the actions that will address each goal based on watershed need and funding. Example of actions include best management practices (BMPs), projects, educational or regulatory measures, or data collection that helps to address watershed concerns in an efficient and cost-effective manner. The Partnership will work collaboratively with local agencies, organizations, residents, and landowners to implement these actions over the next 10 years.

Example

Measurable Goal: Soil Health

Short-Term Goal:

New soil health practices are implemented on 9,600 farmed acres in the watershed over the ten-year plan

- Metric: Acres of soil health practices implemented

Long-Term Goal:

Soil health practices are implemented in all critical soil loss areas to promote productivity and prevent wind erosion.

What Can Be Done?

Cover crops
Reduced tillage
Tree planting and windbreaks
Regenerative farming and carbon credits

Table 1-1: Plan goals, issues, and actions within the MSTR Watershed

Goal Category	Short-Term Goal	Resource	Priority Issue Statement	Example Actions
Excess Sediment	Overland runoff sediment loading is **reduced by 11%** watershed-wide.		Upland erosion and runoff from nonpoint sources delivering **excess sediment** to drainage systems and streams.	Grade stabilizations and side water inlets Infiltration basins Cover crops Reduced till
Stream Stability and Riparian Habitat	**Stabilize**: 15 miles of prioritized channels are stabilized **Enhance**: 20 miles of prioritized channels are enhanced		Streambank and i**n-channel erosion and channel instability** impacting water quality and habitat	Channel restoration Bank stabilization Buffer installation/expansion Process to prioritize stream reaches
			Loss of **riparian habitat** and **inadequate buffer areas**	
Drainage Systems	**Stabilize or Repair**: 20 miles of prioritized drainage systems are stabilized or repaired **Enhance***:* 27 miles of prioritized drainage systems are enhanced		**Drainage system** instability and inadequacy, and need for **management and maintenance**	Large repairs and stabilization Rock structures Culvert replacement Debris removal Multipurpose drainage management
			Inadequate **drainage of agricultural lands** impacting crop productivity	
Altered Hydrology and Flood Damage Reduction	Attain **12,660 acre-feet of additional water storage** to make 7% progress toward goals established by the RRBC LTFS Basin-Wide Flow Reduction Strategy		**Altered hydrology and inconsistent flow** impacting geomorphology and aquatic life	Capital Improvement Projects (impoundments) Grade stabilization Wetland restoration Agricultural levee maintenance
			Economic and ecological impacts of **flooding** on the landscape	

Goal Category	Short-Term Goal	Resource	Priority Issue Statement	Example Actions
Groundwater	On average, **10 unused wells are sealed per year**, prioritizing locations near Drinking Water Supply Management Areas A **drought plan or research plan is developed** for the planning area	 	Contaminants in **groundwater** Protection of shallow and deep **groundwater supplies** from overuse and loss of recharge	Drought contingency plan Sealing abandoned wells Prioritize outreach for CRP in recharge areas Well testing clinics
Excess Bacteria *(E.coli)*	Implement **eight *E. coli*fecal contamination management projects** at locations identified as likely sources of impairments		**Excess bacteria (specifically *E. coli* due to fecal contamination)** impacting safe access to surface waters	Cattle fencing Manure management Upgrade septic systems Updating small municipal wastewater systems
Phosphorus Loading	Overland phosphorus loading is **reduced by 7%** watershed-wide		Increased **phosphorus loading** from non-point sources causing algal blooms, impacting aquatic life and recreation	Infiltration basins Cover crops Reduced tillage Nutrient management
Soil Health	New soil health practices are implemented on **9,600 farmed acres** in the watershed over the ten-year plan		Decreased **soil health** and wind erosion and its impact on productivity	Reduced tillage Tree planting Regenerative farming and carbon credits
Upland and Wetland Habitat	**2,150 acres of expired land** remain in protection programs using incentives, focusing outreach efforts within the Prairie Core and Corridor areas		Loss of **upland and wetland habitat** impacting species richness and diversity, water storage, and water quality.	Maintenance and management of invasive species Perennial cover Wetland banking

Targeting Implementation

As part of the 1W1P process, the planning partners devised a series of Action Tables that outline each action that will be taken to address issues in the watershed, where and when actions will be targeted, how those actions will be measured, and how much it will cost. Action Tables can be found in **Section 5 – Targeted Implementation**. Similar types of actions are grouped into one of five implementation programs, as shown in **Figure 1-4,** and described in **Section 6 – Plan Implementation Programs**.

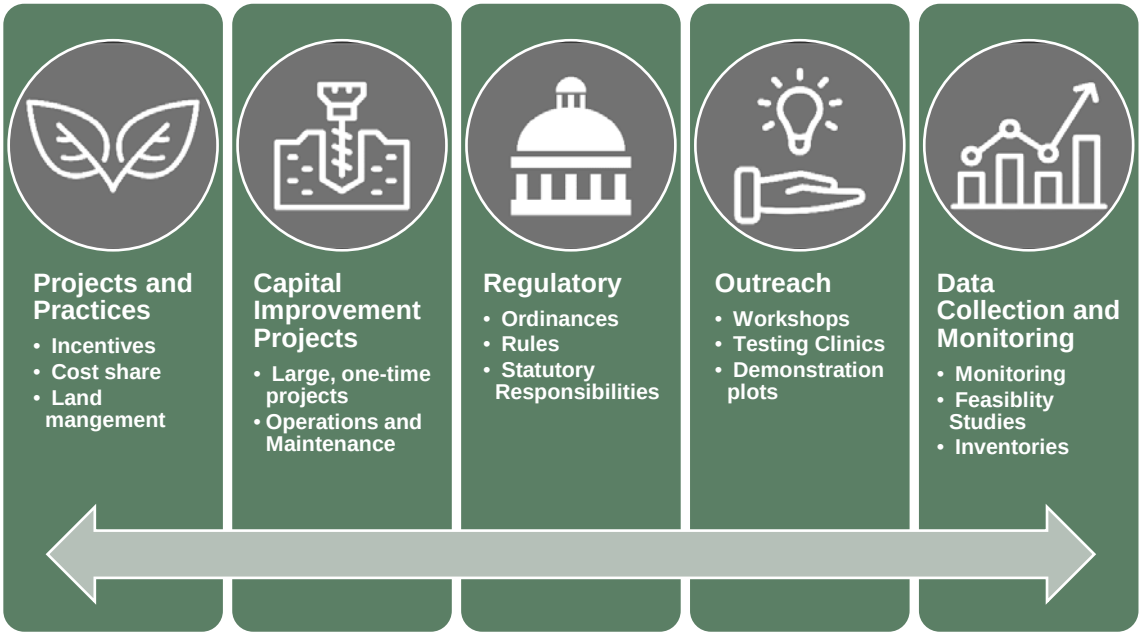


Figure 1-4: Implementation Programs for the MSTR CWMP

This plan will be implemented to the degree that additional funding is acquired, and at a locally determined pace of progress. Outreach and incentives will be used to assist with voluntary implementation of plan actions on private lands.

Partners established three Funding Levels to estimate allocations to each implementation program and associated actions:

- **Funding Level 1 (Current Funding):** Assumes plan funding is similar in magnitude to current funding focused on water issues within the plan area.
- **Funding Level 2 (Current + Watershed Based Implementation Funding [WBIF]):** This level assumes plan funding is like current funding focused on water issues within the plan area (Level 1), plus an additional $1,100,000 per biennium (or $550,000/year) from WBIF dollars.
- **Funding Level 3: (Partner and Other Funding):** This funding level recognizes that there are other organizations and agencies doing work in the watershed that can help make progress towards plan goals. This level contains additional implementation activities identified during the plan development process that are the responsibility of agencies and organizations better suited in the watershed.

Throughout implementation of the MSTR CWMP, the Partnership expects to operate at Level 2 funding. **Figure 1-5** shows the estimated costs for implementing actions in the plan for Level 2 (Current Funding + WBIF). Costs are also included for the operations and maintenance of waterways at or near their current levels, for regulatory actions, and for plan administration and administrative costs related to implementation. This plan assumes local, state, and/or federal fiscal support remains unchanged.

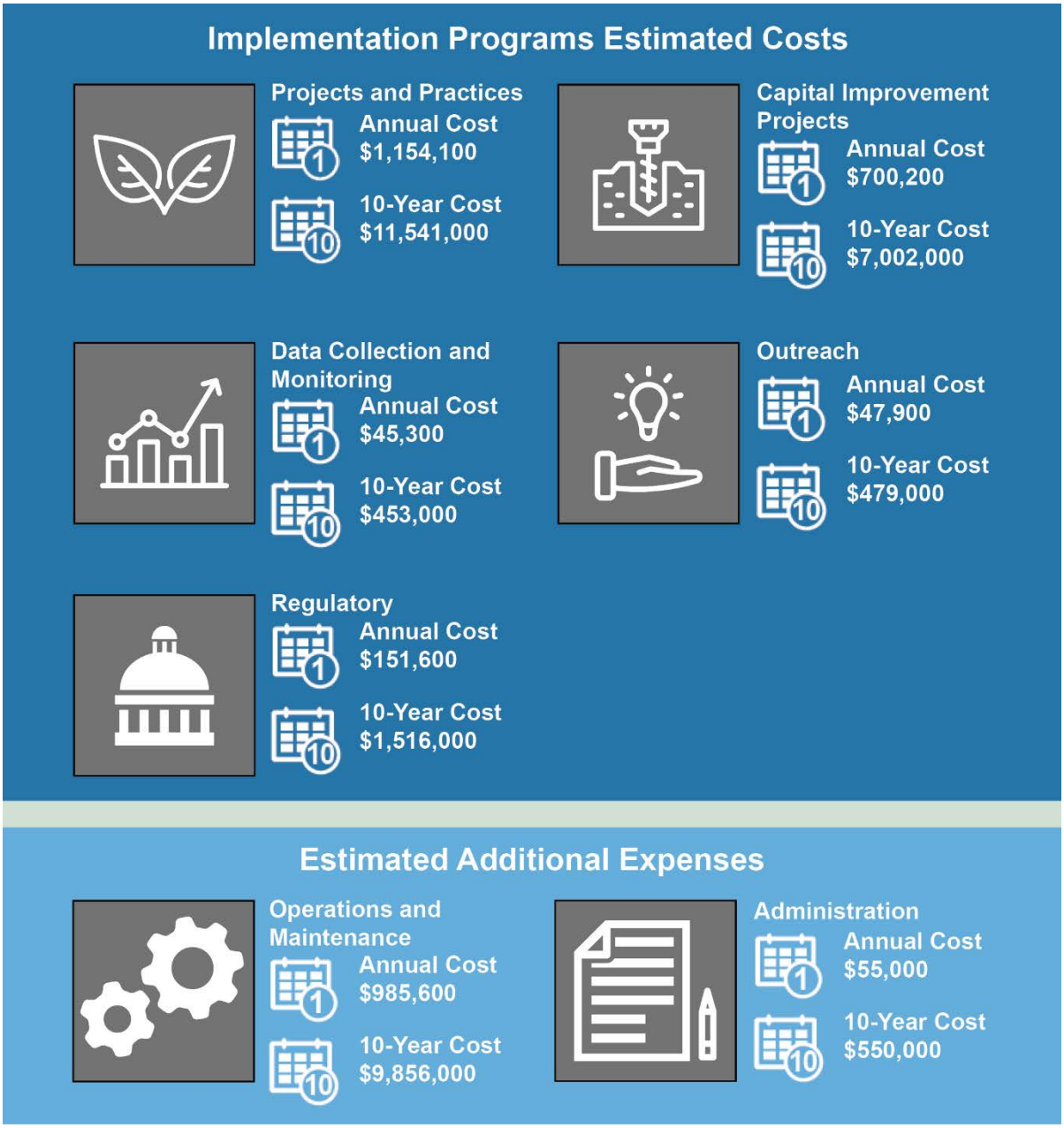


Figure 1-5: Plan budget for Funding Level 2 to implement the MSTR CWMP

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CWMP

Land and Water Resources Narrative

2. Land and Water Resources Narrative

The Middle-Snake-Tamarac Rivers (MSTR) Watershed encompasses 1,476 square miles (944,640 acres) of land on the Minnesota side of the Red River Basin. Three major rivers, the Tamarac, Middle, and Snake, comprise the MSTR Watershed, draining west to the Red River of the North. Counties in the watershed include Marshall, Polk, Kittson, Pennington, and Roseau. Primary towns include Alvarado, Argyle, Holt, Middle River, Newfolden, Oslo, Stephen, Strandquist, Viking, and Warren (**Figure 2-1**).

This largely rural watershed offers a quality of life that is developed around its fertile soils. Historical prairie landscapes within the Red River Basin have always been a part of the natural heritage of the community, connecting people to the land. What was once tall grasses of prairie is now a landscape rich with agriculture.

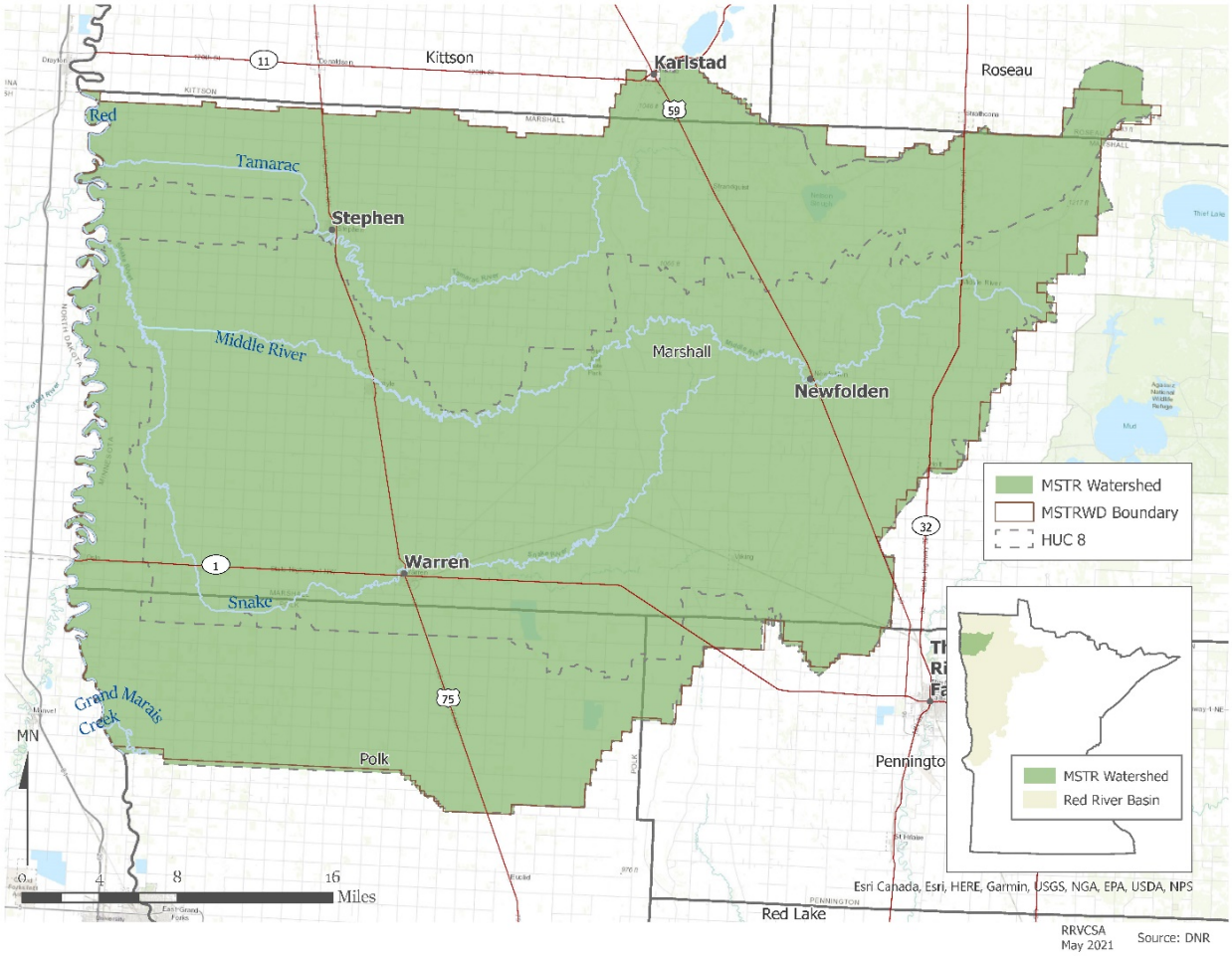

Figure 2-1: Middle-Snake-Tamarac Rivers Watershed planning area

Geology and Land Use

Soils and topography within the MSTR Watershed were defined by glacial activity. The fertile soils characteristic of the Red River Basin is a remnant of Glacial Lake Agassiz, formed nearly 14,000 years ago (DNR, 2021b). As Lake Agassiz retreated north through the MSTR Watershed, it left behind clayey silt and till in the western portion of the watershed, which is conducive to agriculture today. The retreat also left beach ridges in its wake, which can still be seen as north/south transects of sandy soil in the middle and northeastern portions of the watershed.

The beach ridge transect serves as a boundary to create three unique topographic regions within the watershed (**Figure 2-2**). The western portion of the watershed is commonly referred to as the lake basin area, characterized as extremely flat with a slight decrease in elevation from east to west and lacking in significant natural drainage. The transitional area represents the gradual transition from the lake basin to the upland, headwaters area which increases in elevation from west to east. The headwaters area includes beach ridges and is the highest elevation of the watershed, characterized by rolling prairie with scattered areas of sharply rolling hills interspersed with ponds, wetlands, and bogs.

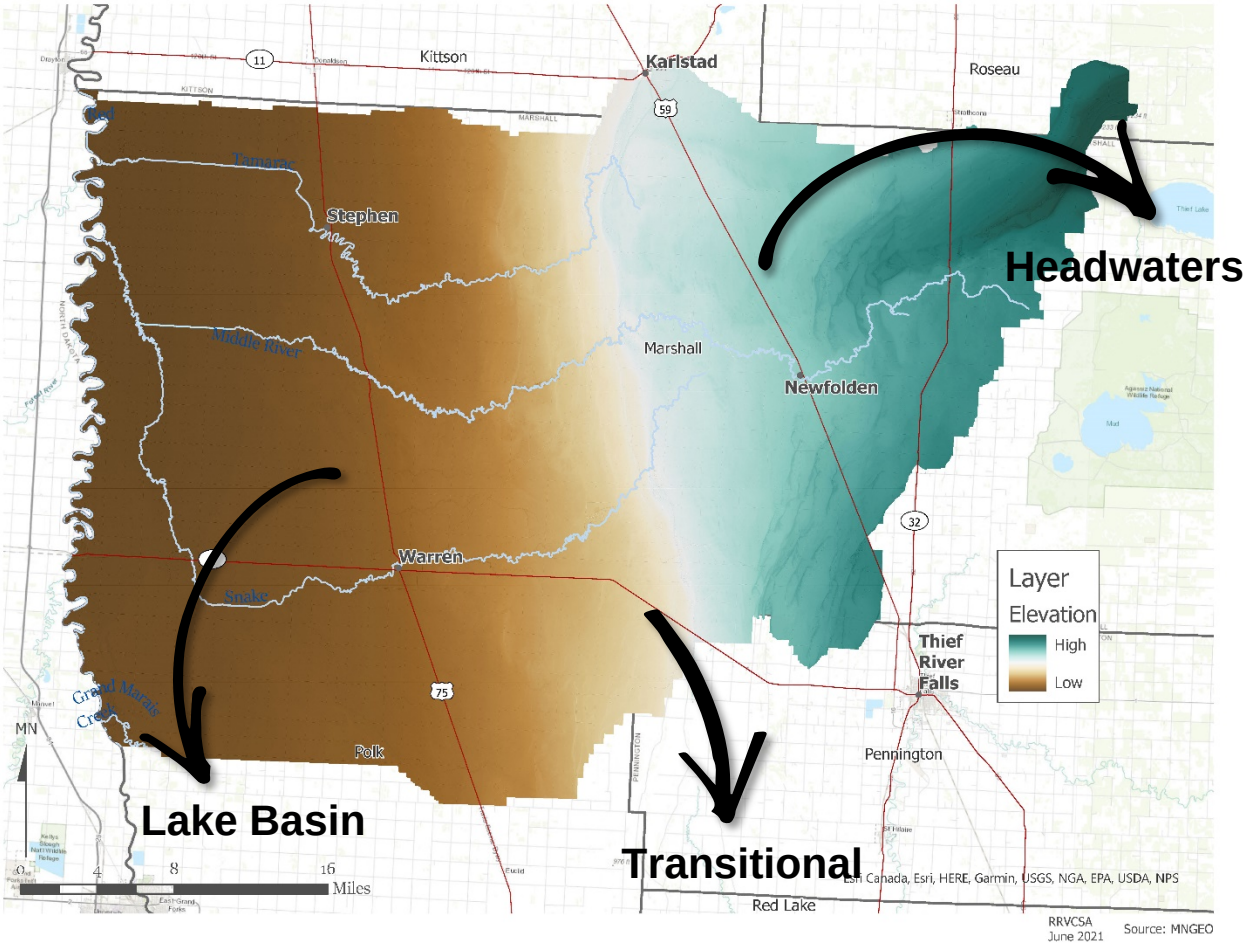

Figure 2-2: Elevation and topographic regions within the MSTR Watershed

Historically, land cover in the MSTR was almost entirely prairie (87% of the watershed). Prior to European settlement, approximately 5% of the watershed was represented by river bottom forest, with riparian forest bordering either side of the Red, Middle, Snake, and Tamarac rivers. Aspen, birch, and oak lands were prominent in the northeastern portion of the watershed, surrounding open muskeg and conifer bogs and swamps. In the 1800s, large groups of European settlers migrated to the region following the oxcart

trails carved into the landscape by Métis and French-Canadian fur traders travelling between the Red River Colony (Winnipeg) and Saint Paul (Even, 2017). Prairie landscapes were soon turned into agricultural fields by early settlers.

Today, land cover transitions from west to east, roughly following the three topographic regions (**Figure 2-3**). Agricultural production is the predominate land cover in the watershed, with approximately 70% of the MSTR Watershed farmed predominantly in the lake basin region (USDA-NASS, 2019). Moving east through the watershed to the transitional and headwaters area, large swaths of wetlands become more prominent. A total of 20% of the watershed's land cover is occupied by these herbaceous and woody wetlands (USDA-NASS, 2019).

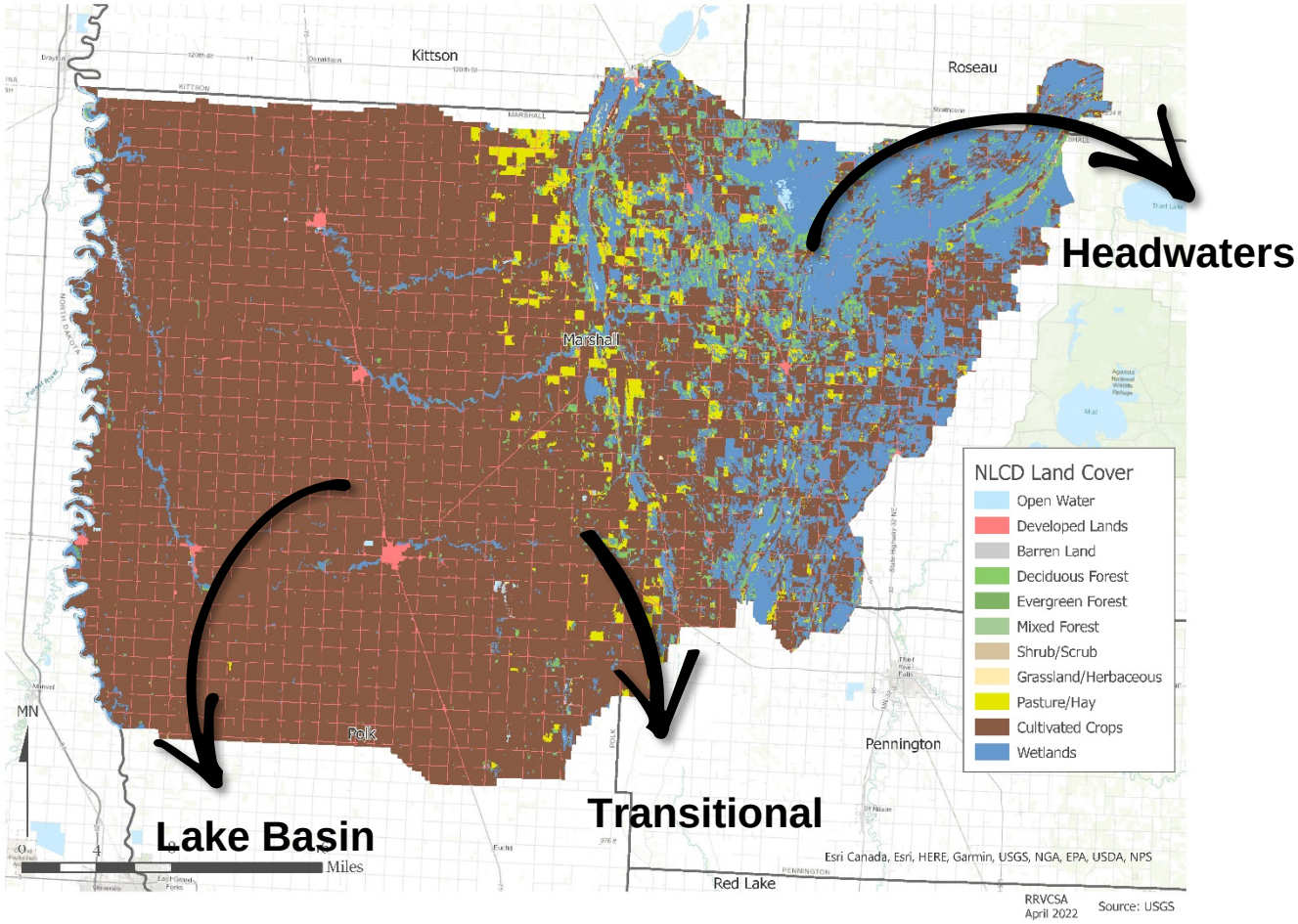

Figure 2-3: Current land cover (NLCD 2016) within the MSTR Watershed

Surface Waters

There are approximately 400 miles of public waters in the MSTR Watershed. The Tamarac, Middle, and Snake are the major rivers within the watershed, each flowing westerly to join the Red River of the North. The northern portion of Grand Marais Creek and its tributaries also cross the watershed boundary from the south but terminate at the Red River of the North a few miles later.


Credit: MPCA

The Tamarac River begins in the eastern beach ridges just west of the East Park Wildlife Management Area where the deciduous conifer tamarack trees might traditionally be found in the marshes of the north. The river moves westerly until it empties north of the Snake into the Red River of the North. The word tamarack (or Tamarac) derives from the Algonquin word akemantak meaning “wood used for snowshoes” (British Columbia, 2021), a fitting purpose for a cold climate.

The Middle River flows from east to west in the middle of the watershed before joining the Snake River on its way to the Red River of the North. The Middle River was named by fur traders who crossed it as they traveled on the Pembina Trail, an ox-cart trading route that meandered through the prairie grasses (Upham, 1920) (Even, 2017).

The Snake River originates in Marsh Grove Township and flows southwest before it turns north to collect from the Middle River. The name for this river is a translation of Ginebigo zibi, the Ojibwe word for snake (Upham, 1920).

Most streams and ditches in the watershed are intermittent and dry up in the summer (MSTRWD, 2011). Intermittent streams and ditches are prominent in MSTR Watershed, with the three main rivers and their tributaries representing most perennial waterways in the region.

The MSTR Watershed would lay claim to having no natural lakes if it were not for Horseshoe Lake, an oxbow lake along the Red River of the North (MPCA, 2019). This lake is classified as a natural environment lake by the Minnesota Department of Natural Resources (DNR) shoreland classification system (DNR, 2021c). Natural Environment lakes are generally less appealing for water recreation but serve as valuable fish and wildlife habitat. While not a natural lake, the Florian Reservoir, southwest of the town of Florian and along the Tamarac River, provides recreational reprieve for locals and contains a park, campground, trails, and other amenities.

Surface Water Quality

Surface water quality is a major concern in the MSTR Watershed. The MSTR Watershed is composed of three major (HUC-8) watersheds: the Snake River Watershed - Red River Basin, Red River of the North - Tamarac River Watershed, and Red River of the North - Grand Marais Creek Watershed. As a result, the MPCA and local entities recently completed three Watershed Restoration and Protection Strategy (WRAPS) Reports, one for each of these three watersheds.

The WRAPS summarizes conditions of surface water bodies, identifies water bodies that do not meet their designated use (e.g., aquatic life, recreation) and are deemed impaired, and describes strategies to fix them. A total of 63 impairments in 27 water bodies are recorded within the MSTR Watershed boundary on the approved 2020 Impaired Waters List (**Figure 2-4**). Common causes or indications of impairments

are elevated levels of *E. coli* and suspended sediment and poor assemblages of aquatic bugs and fish. The 2022 Impaired Water List remained the same except for one water body which was removed for an impairment due to chlorpyrifos (**Appendix C**).

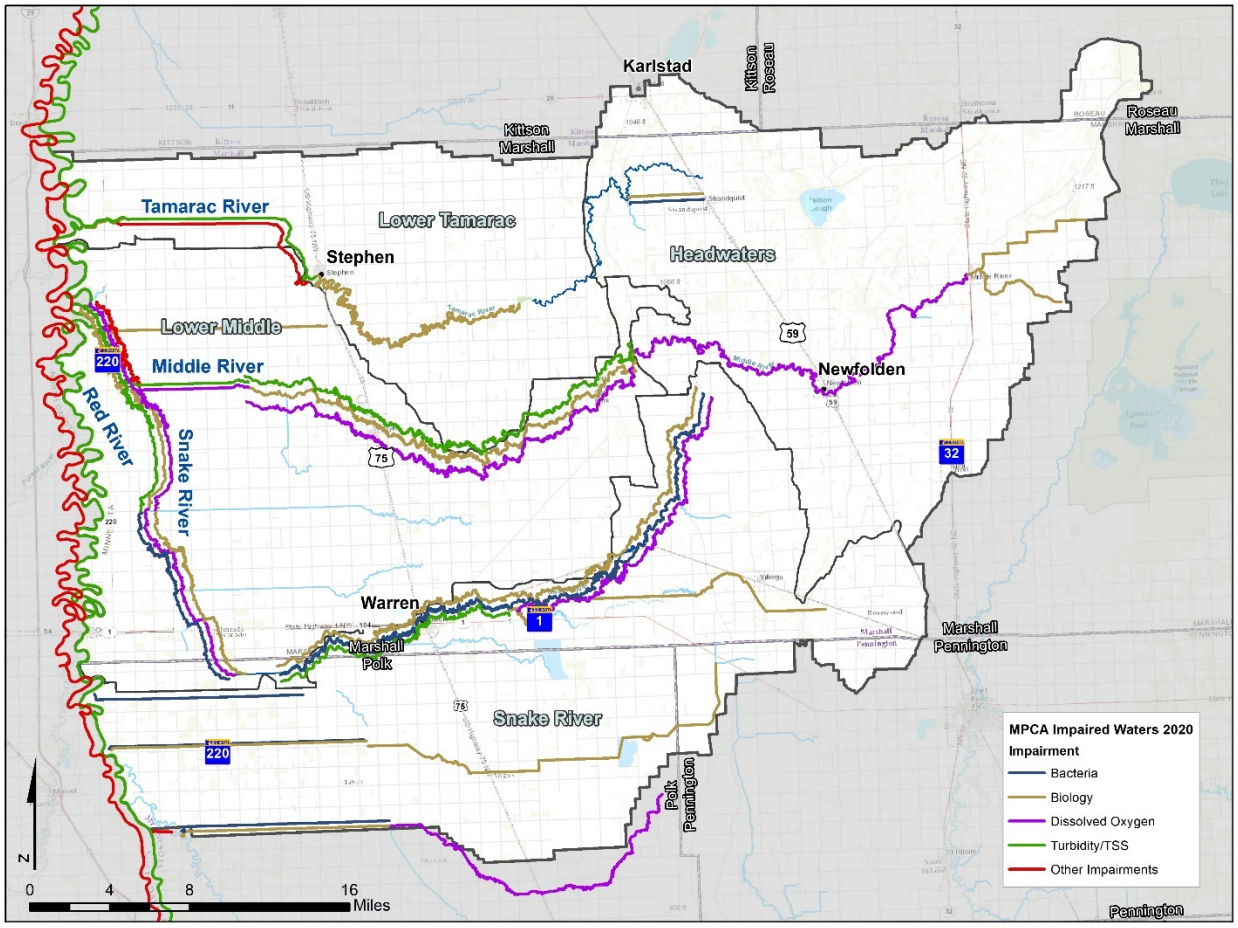

Figure 2-4: Surface water impairments within the MSTR Watershed (MPCA, 2020). Note: Parallel lines intended to illustrate multiple impairments.

Five water bodies in the MSTR Watershed are impaired due to excessive mercury, however, these impairments are addressed by the statewide mercury Total Maximum Daily Load (TMDL) (MPCA, 2019).

Drainage Systems

The Snake, Middle, and Tamarac rivers and Grand Marais Creek drain more than 700 miles of artificial drainage ditches and tile drainage. Most ditches are intermittent. Draining the land allows for fields to be planted where they might not otherwise support agricultural production. These ditched drainage systems along with dams and culverts has changed the amount and speed at which that water flows across the watershed. These changes contribute to what is sometimes referred to as altered hydrology. When water is drained more quickly, it can cause more nutrients and sediment to move into the streams and rivers. This sediment can affect habitat quality for fish and wildlife, including covering habitat structures such as rubble and woody debris and causing fluctuations in dissolved oxygen (DO) and increased turbidity.

Flooding

Like much of the Red River Basin, residents in the MSTR Watershed regularly battle flooding. The Middle-Snake-Tamarac Watershed District (MSTRWD), whose boundary reflects that of the MSTR Watershed, is a part of the Red River of the North Watershed Management Board (RRWMB). The RRWMB takes a basin-wide perspective to fund flood control projects, including research and planning. In 1998, the RRWMB was part of a mediated agreement between local stakeholders to include natural resource planning and enhancement within flood control projects (MSTRWD, 2011).

Agassiz Valley Water Resource Management Project

The flood-fighting efforts of the MSTRWD and the RRWMB are ongoing. Flooding in the MSTR Watershed causes a significant financial burden for transportation (roads, culverts, bridge repairs) and especially for the agricultural sector (MSTRWD, 2011). Continued funding for and construction of these flood protection projects is a priority for watershed residents.

Groundwater

The aquifers in the lake basin area to the west consist primarily of deep-water lake deposits of clay, with layers of silt and very fine sand. Deposits are largely impermeable but transmit some water and range in thickness from 0-100 feet. The clay in this area yields no water to wells and the wells screened in the clay commonly go dry during the summer months. The groundwater quality is poor, often high in chloride and sulfate, and unsuitable for domestic use (MSTRWD, 2011).

The aquifers in the transitional area consist of shallow water and shoreline deposits interbedded with clay, silt, and fine sand. These aquifers range in thickness from 0-30 feet and will yield little to no water in most places. The groundwater quality in the area near the lake basin is generally poor to fair because the water is hard and commonly high in chloride; however, in the area near the till upland, the groundwater is hard, but low in chloride (MSTRWD, 2011).

Aquifers in the headwaters area to the east are generally in till, a heterogenous mixture of clay, silt, sand, and gravel. These aquifers range in thickness from 0-300 feet and generally yield little water. The quality is hard water with a high iron content and low in chloride (MSTRWD, 2011).

Groundwater sensitivity areas mapped by the DNR show the areas on the landscape most sensitive to potential groundwater pollution based on water table depths and soil textures. The beach ridge areas have the highest sensitivity to pollution, followed by the headwaters area (**Figure 2-5**). In general, groundwater pollution sensitivity is low in the lake basin area. The planning area has 10 Drinking Water Supply Management Areas (DWSMAs): Argyle, Viking, Karlstad, Strandquist, Holt, Newfolden, Middle River and Warren, and two for Marshall-Polk Rural Water System that are located east of Warren.

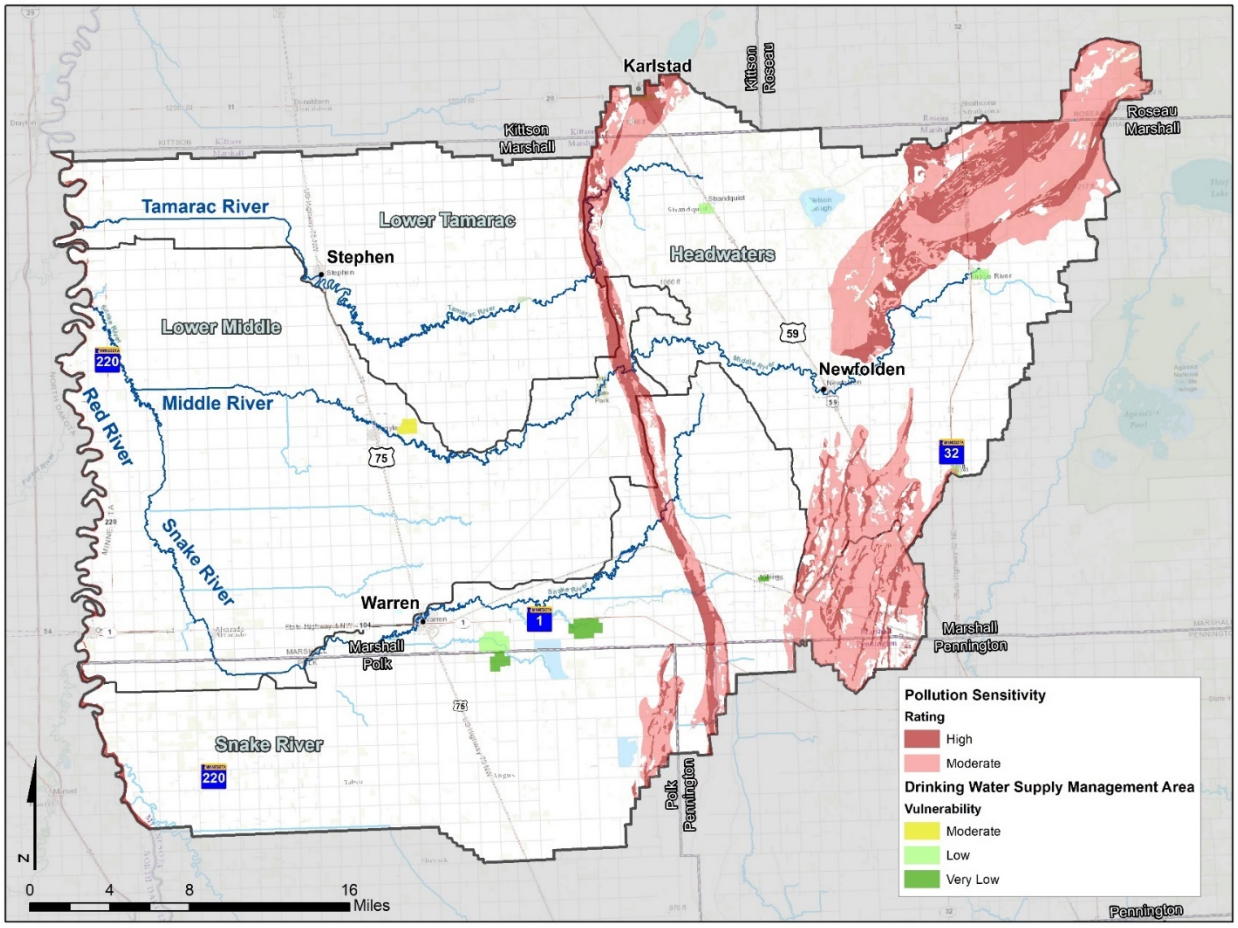

Figure 2-5: Pollution sensitivity of near surface materials and DWSMAs within the MSTR Watershed

Climate and Precipitation

For residents in the MSTR Watershed, much of the way of life is determined by the local climate. Residents here are accustomed to hard winters and short growing seasons. Extreme variations in temperature and moderate precipitation are evident in historical weather data (MSTRWD, 2011). The local continental climate is characterized by cold, polar air masses that move into the area during the winter months and warm, moist air from the Gulf of Mexico during the summer months. The average dates of last and first frosts in the region, respectively, are May 15 and September 21 (MSTRWD, 2011).

Minnesota DNR's Watershed Health Assessment Framework provides watershed reports on climate and precipitation for each of the three major watersheds in the MSTR Watershed (DNR, 2019a). For purposes of this narrative, the Snake River Watershed is used as a proxy for the MSTR Watershed as a whole. Average annual precipitation for the 1989-2018 period in the Snake River Watershed is 21.4 inches (DNR, 2019). The average annual temperature in the Snake River Watershed is 39.6°F.

Recent observations of the 30-year average temperature compared to the entire historical climate record (1895-2018) shows that in the Snake River watershed, there is an average annual departure from historical average of +1.5°F (DNR, 2019a). At the same time, local climate stations show a precipitation departure from historical annual average of +0.9 inches. Farmers in Minnesota are already preparing and adapting for the possibility of these trends continuing or worsening.

Protected Areas and Habitat

Despite a high degree of land conversion in the MSTR Watershed, the region contains many ecologically significant and protected areas that are largely centralized in the northeast (**Figure 2-6**). There are 18 wildlife management areas (WMA) in the watershed, with the largest (the Thief Lake WMA) being 185 square miles. Some protected lands occur in other locations, with the Alvarado WMA in the southwest, and the Red River of the North WMA in the northwest. Old Mill State Park is also located in the center of the watershed. Some lands managed by the National Wildlife Refuge system exist in the northeast of the watershed, including the Agassiz National Wildlife Refuge.

Because of their prime habitat, protected areas serve as ideal locations for rare, threatened, and endangered (T&E) species. There are five federally listed T&E species with the potential to exist in the watershed and 19 migratory birds on the United States Fish and Wildlife Service (USFWS) Birds of Conservation Concern list potentially inhabiting the watershed (USFWS). A full inventory of state listed T&E species is made available by the DNR.

Federally Listed Threatened and Endangered Species in the Watershed:

- **Canada lynx**
- **Grey wolf**
- **Northern long-eared bat**
- **Whooping crane**
- **Poweshiek skipperling butterfly**
- **Western prairie fringed orchid**

The Minnesota Biological Survey (MBS) assigns a biodiversity significance rank to various sites throughout a watershed (DNR, 2021d). The ranking is based on rare species populations, the size and condition of native plant communities, and the landscape context of the site. Large tracts of the northeastern watershed have been rated as having outstanding, high, or moderate biodiversity significance.

In addition, four calcareous fens occur in the central beach ridges. A calcareous fen is a type of wetland that relies on calcium-rich groundwater upwelling to support a highly diverse and unique ecosystem (DNR, 2018). Calcareous fens are granted special state protection due to being one of the rarest natural communities in the county and providing habitat to a large number of rare plant species. Only one of these fens is contained within a protected area, the Florian WMA.

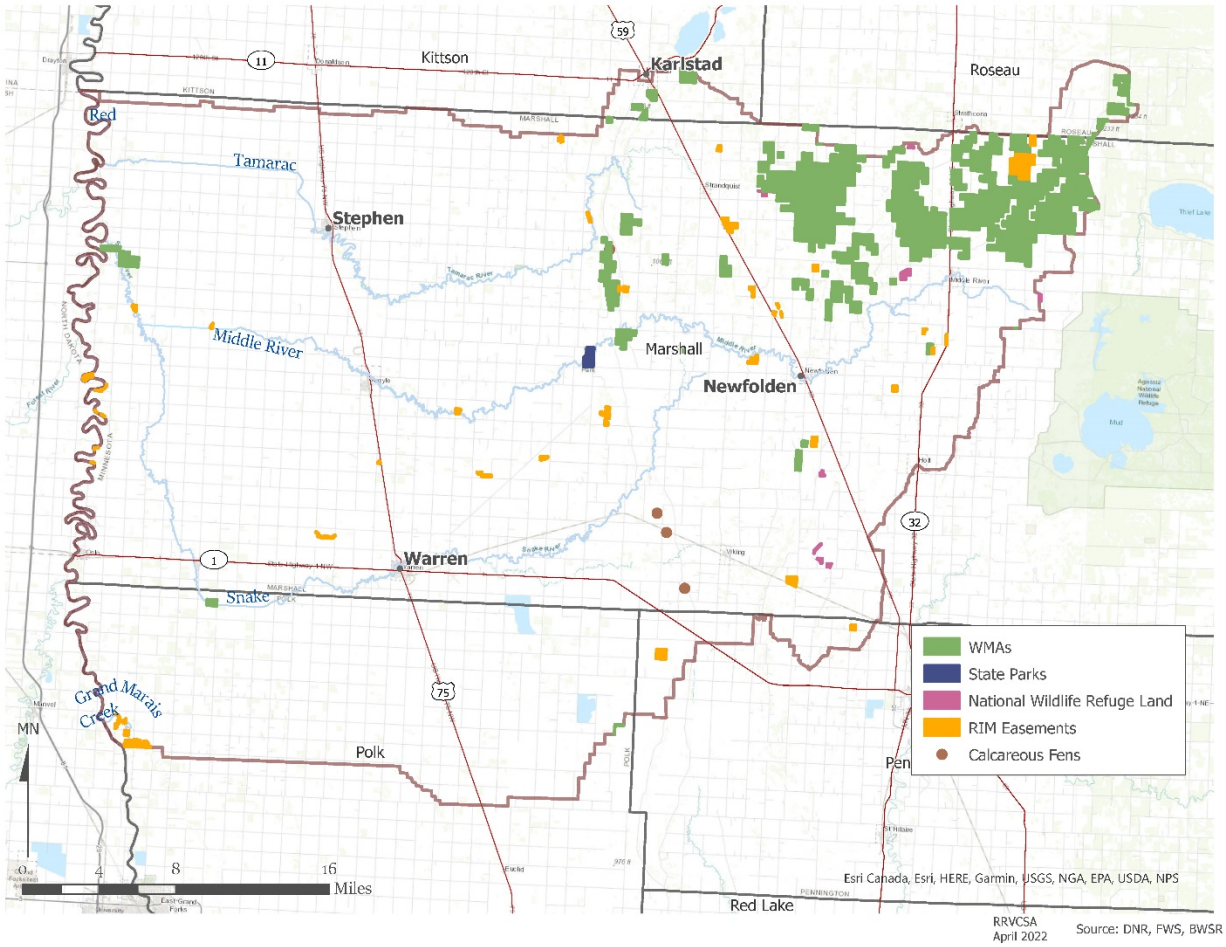

Figure 2-6: Protected lands and habitat within the MSTR Watershed

Local Economy and Population

Agriculture, and its associated economic activities, is the primary force behind the economy of the MSTR Watershed (MSTRWD, 2011). Farmers in Marshall, Polk, Kittson, Roseau, and Pennington counties manage the land for future generations while supporting local and national economies. Approximately 36% of fields in the MSTR Watershed are planted with soybeans, followed closely behind with nearly 34% of the watershed in spring wheat (USDA-NASS, 2019). These numbers do not account for seasonal or annual variation.

Figure 2-7 shows a further breakdown of 2019 crop types in the watershed.

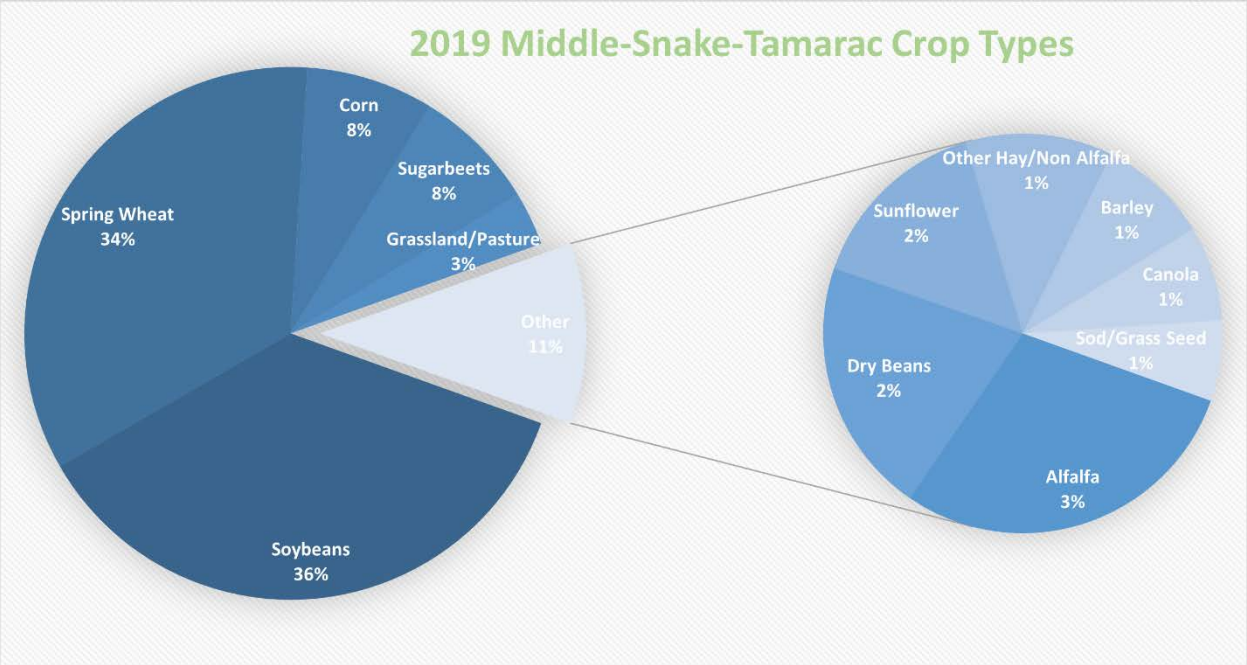

Figure 2-7: MSTR Watershed Crop Types

Approximately 9,500 people live in the watershed (United States Census Bureau, 2019). Cities within the watershed include Alvarado, Argyle, Holt, Middle River, Newfolden, Oslo, Stephen, Strandquist, Viking, and Warren. The combined, estimated 2019 population of these towns is 4,672, with Warren having the largest population at 1,700 (United States Census Bureau, 2019). The watershed is nearly evenly divided between rural- and city-dwellers, with estimates of approximately 49% and 51%, respectively.

Though the MSTR Watershed is largely held under private ownership due to the agricultural industry, several recreational opportunities exist. Some protected areas and Old Mill State Park provide residents with opportunities for hiking, wildlife viewing, swimming, and camping (MSTRWD, 2011). At least 10 parks are maintained in area cities, providing picnicking and camping. Snowmobiling, hunting, and ATV 4-wheeling are also popular parts of the local recreational economy, with many non-agricultural private lands managed as deer hunting camps (MSTRWD, 2011).

The MSTR Watershed offers a quality of life that developed around the land and its resources. This plan aims to summarize and prioritize issues impacting those resources, set goals, and assign actions to protect and restore the resources of the watershed for current and future generations.

Middle
-Snake-
Tamarac
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Priority Issues

3. Priority Issues

An “issue” is a problem, risk, or opportunity related to a resource’s condition. A “resource” is a feature on the landscape such as a lake, stream, productive soil, or forest. This section summarizes the comprehensive list of issues impacting resources within the MSTR Watershed and highlights the prioritized issues that are the focus of this plan. The next sections (**Section 4 - Measurable Goals**, **Section 5 - Targeted Implementation**) summarize what resources and subwatersheds the implementation efforts should focus on, and what can be done to protect or restore natural resource assets within the MSTR Watershed.

Issues by Planning Region

The watershed’s topography, soils, and land use patterns change as one moves from the lake basin region in the west up into the higher headwaters region to the east. As such, resources and the issues impacting them also change from west to east. To accommodate this, four smaller planning regions were defined to focus planning on specific issues impacting specific regions of the watershed (**Figure 3-1**). These regions were defined based on land use, hydrology, geology, and vegetation. They provide the framework for this plan section on how issues are identified and prioritized.

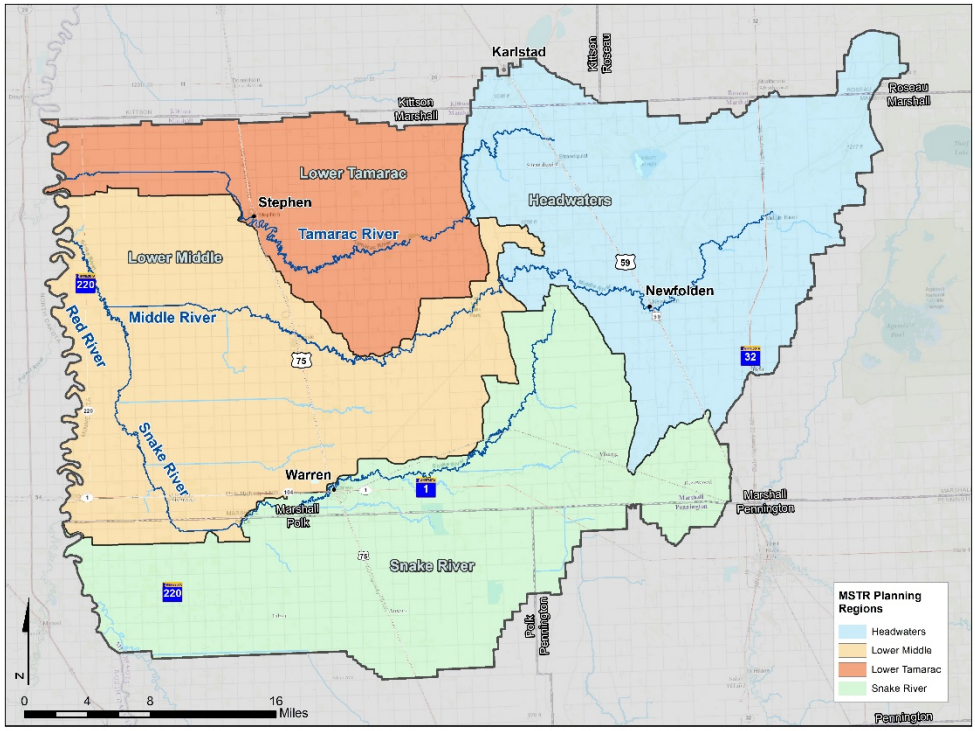


Figure 3-1: Middle-Snake-Tamarac Rivers Watershed planning regions

Headwaters

Contains forest, prairie, and wetland and includes unique features such as the beach ridges. The Tamarac and Middle rivers begin in this region.

Lower Tamarac

Includes the majority of the Tamarac River as it flows to the Red River of the North in this agricultural planning region.

Lower Middle

Includes the Middle and Snake rivers before reaching the Red River of the North, along with a network of drainage ditches that regulate water in agricultural fields.

Snake River

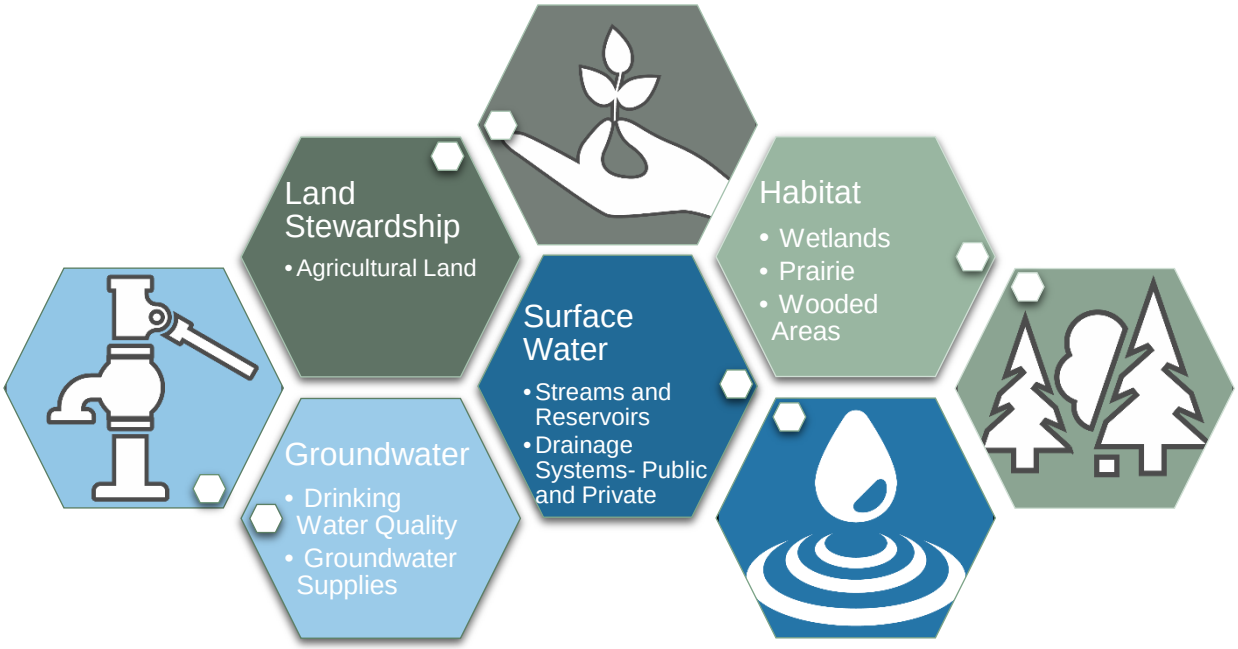
The Snake River begins in this planning region and is joined by several tributaries before reaching the county seat, Warren and flowing north toward the Red River of the North.

Issue and Resource Identification

The first step in prioritizing issues is to identify the comprehensive list of issues impacting resources in the watershed. To do this, the Steering Committee collected existing issues from existing reports, plans, studies, and data, including:

- Local water plans and the Watershed District plan,
- Watershed approach documents, including WRAPS and TMDLs for the area's three major watersheds (the Snake River Watershed - Red River Basin, Red River of the North - Tamarac River Watershed, and Red River of the North - Grand Marais Creek Watershed),
- Red River Basin Flood Damage Reduction reports,
- State and local feedback through the 60-day notification process, and
- Local knowledge from the Steering, Advisory, and Policy Committees.

A total of 17 issues were identified. Each of these issues affects a resource. For ease of planning, committees organized issues into one of four resource categories: groundwater, surface water, land stewardship, and habitat. Each impacted resource belongs to a resource category, as summarized below:



Issue Prioritization

Not all issues can be adequately addressed in a 10-year plan. To focus time, energy, and funding available during implementation, the initial list of issues was prioritized.

Feedback from the public is critical in creating a plan that reflects the community it serves. As such, a public kick-off meeting was held on June 23, 2021, in Warren, MN, at the Marshall County Courthouse. A virtual option was also provided through a link on the MSTRWD website. At the public kick-off event, participants were given the opportunity to mark locations of their priority resources on large maps. In conjunction with the public kick-off, a survey was developed to gain input on what issues were most important to members of the public. The survey was available for those present at the event. To allow

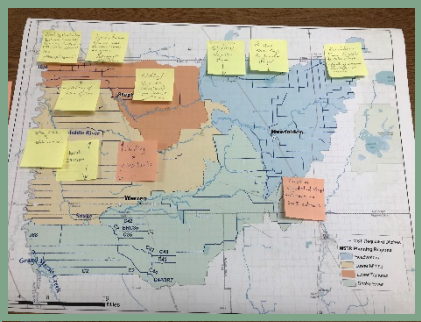
those that were not able to attend the event to provide their input, the survey was also posted on the MSTRWD's web page. A summary of public input is provided in **Appendix D.**

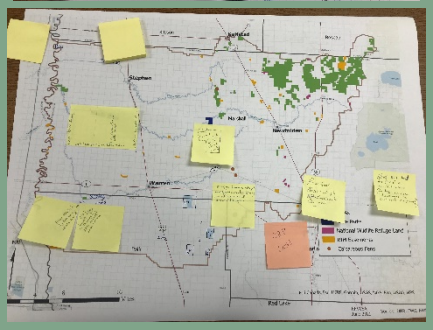
In August and September 2021, members of the Steering and Advisory Committees used input from the public kick-off to prioritize issues by planning region. Additional factors were also considered in the prioritization of issues by planning region, including the location of water quality impairments, groundwater monitoring results, land use, and local capacity. Ultimately, the Steering Committee assigned each issue as one of three priority levels within each planning region:

Priority A: Issues that will be the focus of initial implementation efforts during the 10-year plan.
Priority B: Issues that will be addressed during the 10-year plan, likely with additional funding.
Priority C: Issues that are not the focus of this plan but may be addressed with additional funding.

Any issue that was ranked as "high" priority in at least one of the planning regions is considered a Priority A issue for this plan. Issues that ranked as a "medium" priority in any planning region were considered Priority B issues. Both Priority A and Priority B issues will have resources prioritized and goals developed for addressing them. Issues that had a "low" priority ranking watershed-wide were considered Priority C issues. These issues will not receive associated goals and actions in this 10-year plan. The prioritized issues were approved by the Policy Committee.

Spotlight:
Issue Prioritization





Feedback received during the Public Kickoff in June 2021

Priority A Issues

If any planning region was prioritized as “high” for a given issue, this issue is considered a Priority A Issue. These issues will be the focus of initial implementation efforts, and will have priority resources, goals, and actions assigned to them.

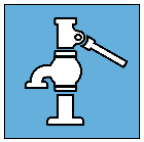
= High Priority = Medium Priority = Low Priority

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Streams, Drainage Systems	Upland erosion and runoff from non-point sources delivering **excess sediment** to drainage systems and streams	
	Streams	Streambank and i**n-channel erosion and channel instability** impacting water quality and habitat	
	Drainage Systems	**Drainage system** instability and inadequacy and the need for **management and maintenance**	
	Agricultural Land	Inadequate **drainage of agricultural lands** impacting crop productivity	
	Land	Economic and ecological impacts of **flooding** on the landscape	

Priority B Issues

Priority B Issues are prioritized as “medium” in any planning region. They are shown below in no order of priority. These issues will be addressed during implementation and will have priority resources, goals, and actions assigned to them.

= High Priority = Medium Priority = Low Priority

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Drinking Water Quality	Contaminants in **groundwater**	
	Groundwater Supplies	Protection of shallow and deep **groundwater supplies** from overuse and loss of recharge	
	Streams	**Excess bacteria** (specifically *E. coli* from fecal contamination) impacting safe access to surface waters	
	Streams and Reservoirs	Increased **phosphorus loading** from non-point sources causing algal blooms, impacting aquatic life and recreation	

Category	Impacted Resource	Issue Statement	Planning Region Priority
	Streams	**Altered hydrology and inconsistent flow** impacting geomorphology and aquatic life	
	Agricultural Land	Decreased **soil health** and wind erosion and its impact on productivity	
	Wetlands, Prairie, Wooded Areas	Loss of **upland and wetland habitat** impacting species richness and diversity, water storage, and water quality	
	Riparian Habitat	Loss of **riparian habitat** and **inadequate buffer areas**	

Priority C Issues

Priority C issues are those that, while important, do not require immediacy in the way that Priority A and B issues do, or are addressed through different plans or funding sources. They may also be addressed through actions focused on other prioritized issues. These issues will not be priorities for this 10-year plan, and therefore will not have prioritized resources, goals, or action items assigned to them. In future plan updates, these issues could be elevated if deemed necessary.

Priority C issues include:

- Management of **gravel pits and aggregate extraction** to ensure best management practices (BMPs) are followed
- Impact of land management in upland areas on downstream **recreational parks**
- Presence of barriers impacting **fish passage and connectivity**
- Threat of **aquatic invasive species** threatening native populations

Spotlight:
Conservation in Action

Snake River Off Channel Floodwater Storage Site (OCFSS)

Emerging Issues

Emerging issues are those that lack detailed information yet may affect the resources within the MSTR Watershed at some time in the future. These issues are expected to be periodically monitored by plan participants with respect to how they may affect plan implementation. Action items are included within the plan (**Section 5- Targeted Implementation**) to clarify the technical data needed to address emerging issues. If new emerging issues are identified during implementation, goals included in this plan may shift.

Climate Change

Extreme weather and other impacts of climate change are already affecting farmers and residents in the MSTR Watershed. However, data is not always available to drive local decisions on how to address this issue directly. Building an adaptive plan for a resilient watershed is key to having the capacity to address future effects of climate change.

Minnesota has seen an approximate 3-inch increase in precipitation since 1895 alongside an approximate 3°F temperature increase over the same period, statewide (1895-2020) (DNR, 2020). Winter is warming faster than summer and nights faster than days (DNR, 2019b) . Temperature and precipitation increases are expected to continue throughout the century (DNR, 2019b). Temperature data from the Snake River Watershed (used as a proxy for the MSTR Watershed) reflects the same trend as Minnesota overall (approximately +3°F), though the precipitation trend is not as obvious (approximately +1.5 in.). **Figure 3-2** shows average annual temperature and precipitation trends for the Snake River Watershed.

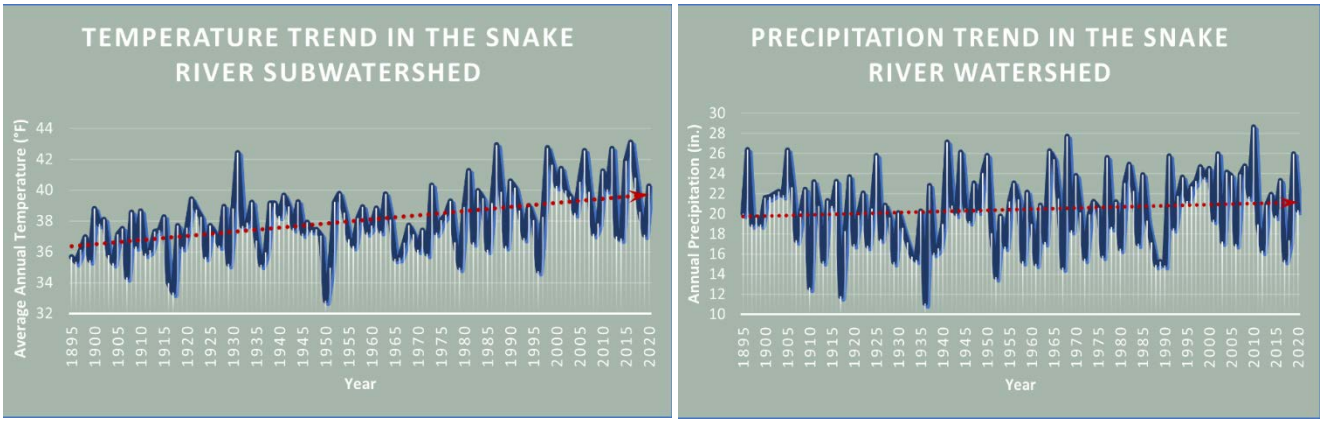


Figure 3-2: Annual temperature trend and annual precipitation trend for the Snake River Watershed, 1895 - 2020 (DNR Climate Data).

These incremental temperature and precipitation changes over a 125-year time are enough to increase flooding, impact agricultural production, disrupt plant and wildlife communities, and affect water quality. Warmer winters can allow for northern encroachment of invasive species and shorten the duration of ice cover in lakes and rivers. Earlier snowmelt can cause stream flows to peak sooner in the spring, leading to baseflow conditions earlier in the year and drier conditions later in the year. The pairing of earlier snow melt with heavier spring rainfall can increase the magnitude and frequency of spring flooding. This also leads to more runoff from the landscape into lakes and streams, having the potential to impact crop yields and water quality.

To address the potential implications of climate change in the watershed, the activities implemented in this plan include both mitigation (practices that mitigate the effects of climate change by storing carbon in the soil) and adaptation (enhancing the resiliency of the watershed to future changes) (BWSR, 2019). Agricultural water management practices can have the added benefits of improving soil health, carbon sequestration, improving food security, and strengthening local economies. Conservation practices in agricultural areas that promote soil health can enhance the ability of soils to capture and store rainfall, store carbon, and decrease heat absorption. Conservation practices that minimize impacts from larger

storms include cover crops, no-till farming, buffer strips, retention areas, and constructed wetlands. Multipurpose drainage practices help make working lands as well as artificial and natural drainage systems more resilient to high intensity rainfall. Actions to protect and store floodplains builds watershed resiliency against floods and keeps downstream properties and communities safe.

Drought and Groundwater Supplies

While climate change predictions anticipate an overall increase in average annual precipitation, the timing and consistency of rainfall will change and drought in Minnesota may become more sustained when it occurs (Askari, 2021). Severe, extreme, and exceptional drought can create major challenges for agricultural producers, electricity suppliers, and drinking water suppliers.

100 percent of residents in the MSTR Watershed obtain their drinking water from groundwater, primarily from private wells or public water supply systems, such as the Marshall-Polk Rural Water System. The Marshall-Polk Rural Water Supply Well East well field data has shown a 110-feet decline in the depth to water since 2009 (**Figure 3-3**). This further indicates the need to plan for drought and groundwater supply resiliency in this CWMP.

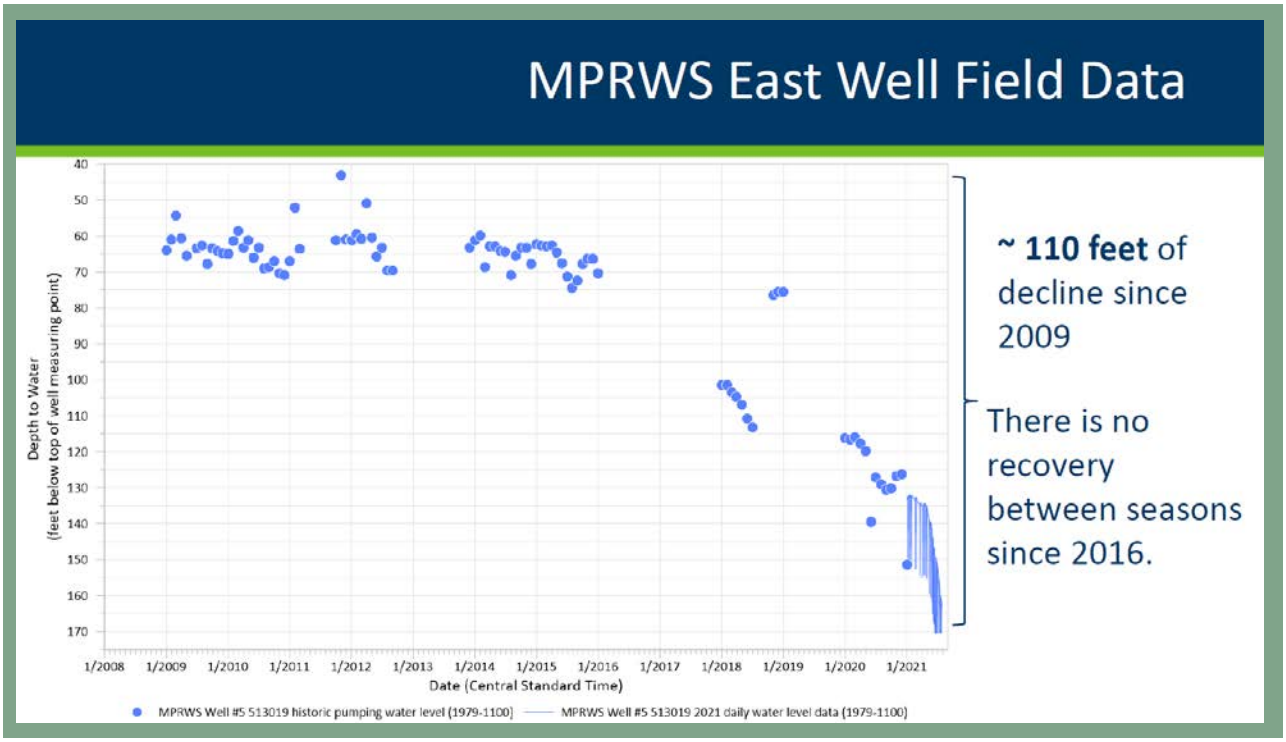


Figure 3-3: Marshall-Polk Rural Water Supply Well East well field data (Source: DNR, 2022)

There are ways to incorporate drought into planning processes that include mitigation and resiliency measures. The Minnesota Statewide Drought Plan calls for water conservation measures from residential, agricultural, and commercial entities as drought stages progress in any given year (DNR, 2009). Further, all water suppliers in Minnesota serving more than 1,000 people submit a water supply plan every 10 years, with the latest round renewed in 2017/2018 (DNR, 2021e). Local governmental units (LGUs) can also create their own drought resiliency plans. In addition to water conservation measures, other drought mitigation opportunities include aquifer recharge through the protection of forest, prairie, and wetlands, and aquifer storage and recovery.

Aquifer storage and recovery involves injecting or pumping water into an aquifer for storage and later use (Texas Living Waters Project, 2017). Numerous projects throughout the world are exploring the role of

aquifer storage and recovery in drought management, including a study in the Oakes Aquifer of southeastern North Dakota published in 1989 (International Groundwater Resources Assessment Centre [IGRAC], 2021). Using methods similar to aquifer storage and recovery, tile and surface drainage can also be captured and stored for later use in-field or on a larger scale.

While drought was not a primary concern for residents in the MSTR Watershed at this time, the committees will reevaluate this issue based on changing local conditions. This plan addresses groundwater supplies, water conservation measures, land protection, and surface water storage in **Section 4- Measurable Goals.**

Contaminants of Emerging Concern

Contaminants of emerging concern (CECs) are designated by the Environmental Protection Agency (EPA) and include pharmaceuticals and personal care products (PPCPs) and the large category of synthetic chemicals known as per- and polyfluoroalkyl substances (PFAS) (EPA, 2020) (MPCA, 2021a). PFAS are used in the manufacturing of consumer and industrial goods such as carpeting, upholstery, cookware, and waterproofing and firefighting products. CECs end up in drinking water and fish, causing hormonal disruptions in humans and aquatic life, and linger in the environment for generations. PPCPs are washed down the drains and toilets at people's homes and are not treated for by wastewater treatment facilities before they end up in surface waters.

Many CECs do not have Minnesota human health-based guidance (how much of a substance is safe) or have new or changing health or exposure information. The State of Minnesota and the Minnesota Pollution Control Agency (MPCA) are in the process of investigating where fish and drinking water have been contaminated in the state and how to address the issue (MPCA, 2021b).

It is important to provide public water supplies free from contaminants of emerging concern. The plan addresses this emerging issue through education and implementation programs that reduce the source of contaminants of emerging concern from entering water resources and reduce the volume of water entering groundwater and surface water resources.

Chloride

Chloride enters surface waters from a variety of sources including road salt, water softeners, WWTFs, fertilizer, manure, and dust suppressant (MPCA). In Minnesota, road salt, fertilizers, and WWTFs are the predominant sources of chloride (MPCA, 2021). The impact of chloride on water quality was not deemed a priority for MSTR Watershed stakeholders because it is an emerging issue and, while important, is less eminent due to the lack of urban population in the watershed. Actions that address chloride mirror those that affect CECs including reducing the amount of chloride that can enter surface and groundwater through stormwater and drainage systems.

Picture: MPCA

Middle -Snake- Tamarac RIVERS

CWMP

Measurable Goals

4. Measurable Goals

Good resource management – and the ability to demonstrate progress– relies on setting measurable goals for locally important issues and resources. As such, measurable goals are set for each priority issue in the MSTR Watershed.

Goals were established for two different time scales:

- **Long-Term** goals describe the desired future condition (water quality, water availability, habitat quality) planning partners are striving to attain, regardless of time frame. This goal sets the direction for planning and future management.
- **Short-Term** goals describe the quantifiable change in resource condition that planning partners expect to achieve during implementation of this 10-year plan.

Information used to develop measurable goals included:

- Goals from existing management plans, studies, reports, data, and information, including the WRAPS, TMDLs, local water plans, and state strategies;
- Results from the Prioritize, Target, and Measure Application (PTMApp); and
- Stakeholder input and interests gathered from public kickoff meetings and Steering, Advisory, and Policy Committee members.

This plan section details the nine measurable goals that collectively address the 13 priority issues of the MSTR Watershed. The measurable goals are presented as a series of factsheets, each summarizing:

- The priority issues the goal addresses;
- The planning region prioritization for each priority issue;
- Background information about the issue and goal;
- The long-term and short-term goals;
- Example actions that can be implemented to make progress toward goals; and
- Specific resources and/or subwatersheds that are prioritized for the goal.

Specific resources and subwatersheds were prioritized based on a review of scientific data and expertise of the Steering and Advisory Committees. They include surface water resources that are impaired, drainage systems that require stabilization or enhancement, and locations most suitable for water storage.

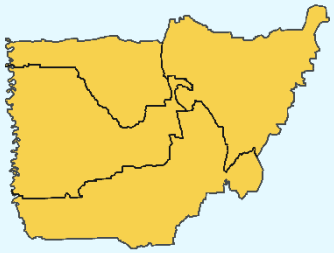
Priority resources also include “nearly” and “barely” impaired resources. The Nonpoint Priority Funding Plan for Clean Water Funding Implementation prioritizes protection and restoration of water bodies that are nearly or barely impaired. To align implementation efforts with state-level funding priorities, protection and restoration categories for streams, rivers, and lakes were mapped to identify resources that are nearly or barely impaired (Minnesota Soybean Research and Promotion Council, 2019). Including these resources in the plan is intentional to align local efforts with the Nonpoint Priority Funding Plan.

The measurable goals outlined in this plan build on the foundation of existing conservation efforts within the watershed. Examples of these conservation efforts are summarized in a spotlight for each measurable goal factsheet. The measurable goals in this plan are future-looking and are intended to build on these existing successes to improve resource conditions.

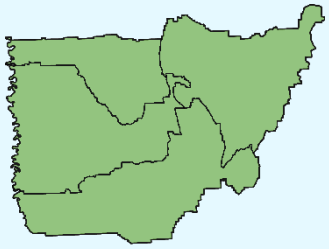
Altered Hydrology and Flood Damage Reduction (FDR)

Issues Addressed

Altered hydrology and inconsistent flow impacting geomorphology and aquatic life



Economic and ecological impacts of **flooding** on the landscape



Measurable Goals

Short-Term:

Attain **12,660 acre-feet of additional water storage** to make 7% progress toward goals established by the RRBC LTFS Basin-Wide Flow Reduction Strategy.

- Metric: Acre-feet storage

Long-Term:

Attain **180,810 acre-feet of additional water storage** to meet the watershed's goal established by the RRBC LTFS Basin-Wide Flow Reduction Strategy.

Why These Issues Matter

As land use changed from prairies to farms, ditches were constructed to drain excess water and increase crop productivity. These drainage ditch systems, along with dams and culverts, change the way water naturally flows on a landscape, which is commonly referred to as altered hydrology. Altered hydrology can decrease flow in some areas or cause water to flow through a system faster than it otherwise would. This can result in flooding and erosion.

Like much of the Red River Basin, the MSTR Watershed regularly battles flooding. Flooding in the MSTR Watershed causes a significant financial burden for transportation (roads, culverts, bridge repairs) and especially for the agricultural sector. Community flood risk has largely been addressed in the watershed, but agricultural inundation remains an issue. Large and small-scale storage and detention projects hold water on the landscape during times of high flows and can help with providing baseflows during drier conditions.

The Red River Basin Commission's (RRBC) Long Term Flood Solutions (LTFS) Basinwide Flow Reduction Strategy Report sets forth a strategy that will mitigate flood risks throughout the basin by reducing flood volumes enough to provide a 20% peak flow reduction on the Red River main stem compared to the 1997 spring flood event. The MSTRWD Expanded Distributed Detention Strategy identifies flood water detention volumes within the MSTR Watershed aimed at meeting these peak flow and volume reduction goals. This plan's long term goal aligns with the overall goal established by the Distributed Detention Strategy, with short-term goals representing realistic progress that can be made in a 10-year timeframe.

Altered Hydrology and FDR (Cont.)

What Can Be Done?

Below are some example actions that can be implemented to address altered hydrology and flooding issues in the watershed. A full list is shown in **Section 5**:

- Capital Improvement Projects (impoundments)
- Grade stabilization
- Wetland restoration
- Agricultural levee maintenance

Where: Prioritized Resources

The Red River Basin Flood Damage Reduction Framework Technical Paper No. 11 (Anderson, C., Kean, Al. 2004) defines three regions in the Red River Basin that contribute peak flows to the Red River of the North during a flood. These regions are based on timing, with waters reaching the Red River of the North either *early* (before the mainstem flood peak), *middle* (during the peak), or *late* (after the peak). In the MSTR Watershed, implementing agricultural and storage conservation practices in the **middle** and **late** areas will reduce downstream flood impacts the most, and are therefore prioritized areas for implementaiton to address flooding.

Floodways, including the large Red River of the North floodplain in the western half of the MSTR Watershed, are prioritized for mapping and maintenance of existing flood protection measures, such as agricultural levees. Major Capital Improvement Projects (CIPs) throughout the watershed have been identified by local experts for acute storage needs, and are shown on the map on the following page.

Spotlight:
Conservation in Action

Angus Oslo #4 Impoundment in the Middle-Snake-Tamarac Rivers Watershed District

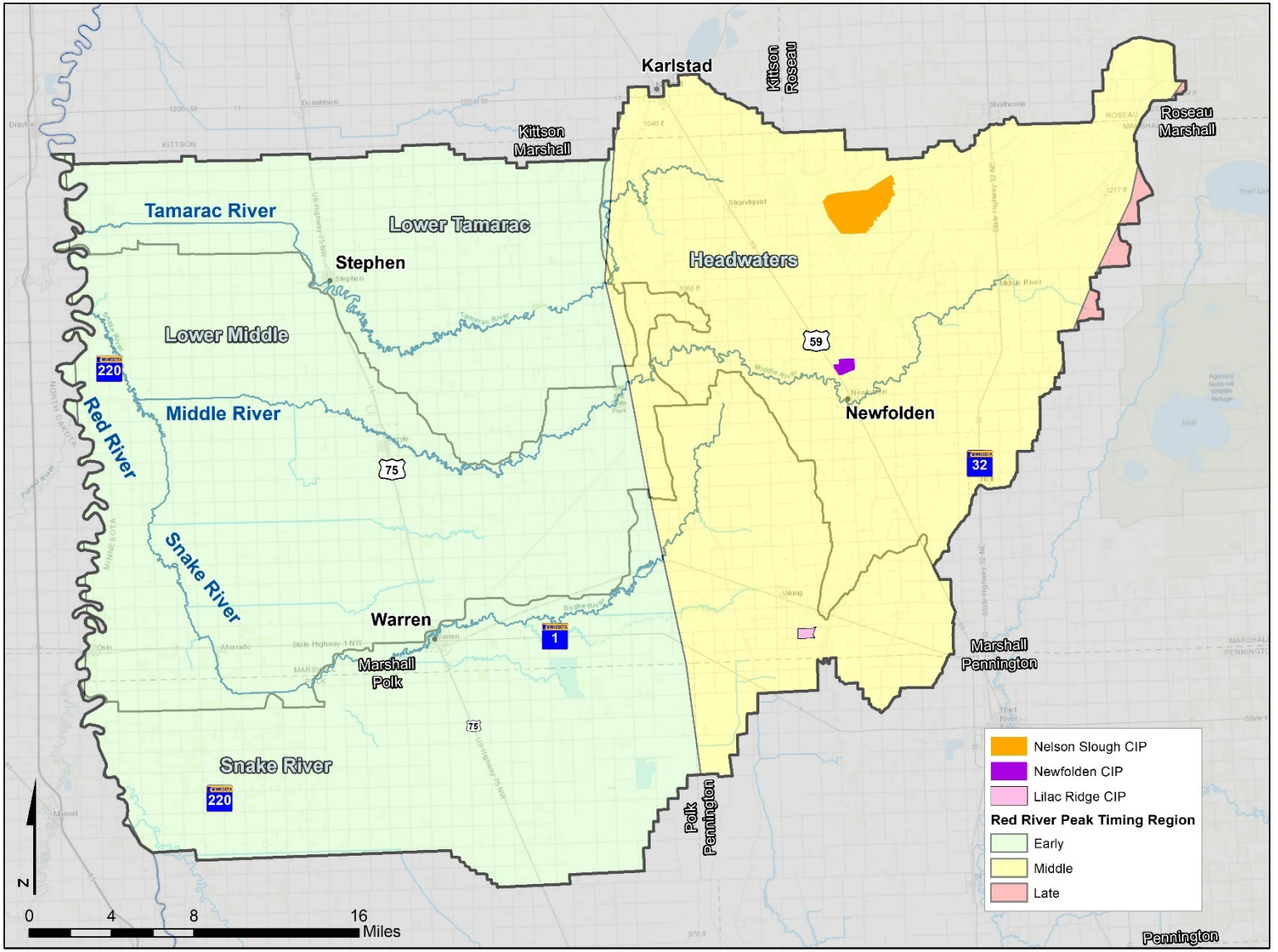
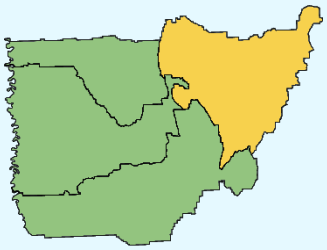


Figure 4-1: Prioritized resources for addressing flood damage reduction and altered hydrology in the MSTR Watershed

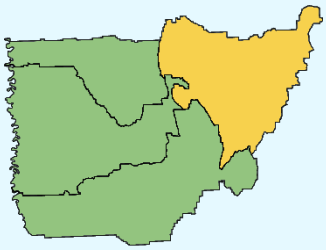
Drainage Systems

Issues Addressed

Drainage system instability and inadequacy, and need for **management and maintenance**



Inadequate **drainage of agricultural lands** impacting crop productivity



Measurable Goals

Short-Term:

Stabilize or Repair: 20 miles of prioritized drainage systems are stabilized or repaired.

Enhanced: 27 miles of prioritized drainage systems are enhanced.

- Metric: Miles of drainage systems stabilized/repaired or enhanced

Long-Term:

All 700 miles of public drainage systems are stable and have the capacity to convey the event the system was designed for.

Why These Issues Matter

There are approximately 700 miles of regulated drainage systems in the watershed, with counties and the MSTRWD sharing responsibility for their management (for a map of drainage authorities, see **Figure 6-2**). Drainage system instability can cause in-channel erosion, sending sediment downstream and impacting agricultural land and water quality. Drainage system inadequacy can lead to saturated fields, reducing crop productivity. Poorly maintained drainage systems can also increase flooding concerns on cropland, homesteads, and in urban areas.

The focus of this plan's goal is to achieve stable drainage systems with adequate capacity. A stabilized drainage system requires less annual maintenance and resists major erosion and sedimentation. For public drainage systems, adequate capacity means the system can convey the event the system was designed for to ensure adequate local drainage without increasing the risks of larger flood peaks downstream.

Drainage Systems (Continued)

What Can Be Done?

Below are some example actions that can be implemented to address drainage system issues in the watershed. A full list is shown in **Section 5**:

- Large repairs and stabilization
- Grade stabilization
- Increase culvert sizes
- Debris removal
- Multipurpose drainage management

Spotlight: Conservation in Action

Judicial Ditch 75 grade stabilization in 2020

Where: Prioritized Drainage Systems

Local experts identified priority drainage systems to address during this 10-year plan. They are organized into three categories to summarize the issue impacting the system and proposed actions to resolve.

Stabilize or Repair

The next page shows a map of drainage systems that have been prioritized for repair or stabilization due to channel or bank sloughing. Sloughing of the banks along these drainage systems and associated rivers is quite severe. Along with decreasing water quality downstream due to erosion, the sloughing is increasing the likelihood of water leaving the channel. Repair consisting of flattening the ditch slopes, creating benches, and installing subsurface seepage drains in major sloughing areas have all been solutions to past sloughing issues. Case specific solutions will be defined for each individual drainage system prioritized in this plan.

Enhance

The next page shows a map of drainage systems that have been prioritized for enhancement to reduce outlet head cutting and erosion. Head cutting and channel erosion is prevalent at the outlets of most ditch systems throughout the watershed. The installation of grade stabilization practices in the ditch bottoms help preserve and enhance the ditch bottom grade. Stabilizing the bottom prevents future erosion and helps mitigate future sloughing issues.

Inadequate drainage of agricultural lands

Inadequate drainage of agricultural lands is especially prominent along the Red River of the North and in the northwest areas of the watershed. Actions to address this include increasing culvert sizing to remove waters before the peak flow arrives, slowing water down from the east through impoundments/culvert sizing, and removing debris to allow for waters to continue downstream. Culvert alterations should only be done on artificial drainage systems and not natural waters.

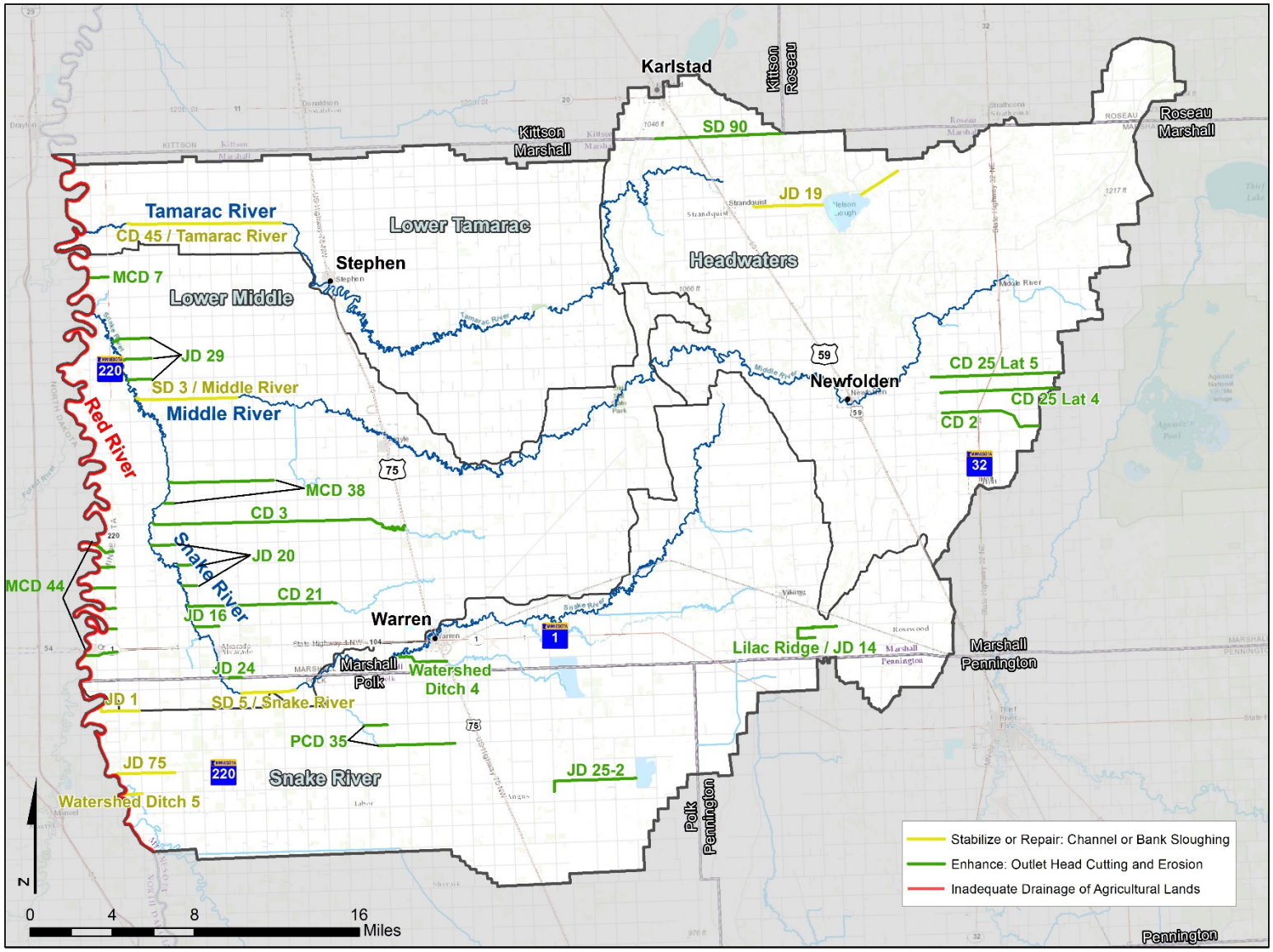
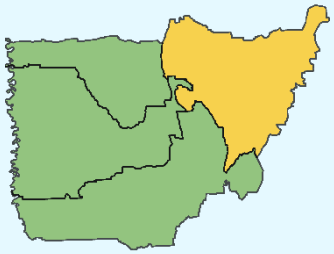


Figure 4-2: Prioritized drainage systems within the MSTR Watershed

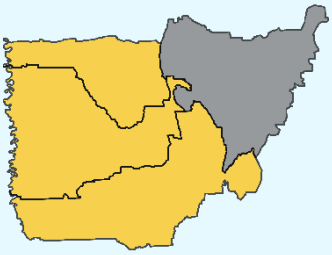
Stream Stability and Riparian Habitat

Issues Addressed

Streambank and **in-channel erosion and channel instability** impacting water quality and habitat



Loss of **riparian habitat** and inadequate **buffer** areas



Measurable Goals

Short-Term:

Stabilized: 15 miles of prioritized channels are stabilized.

Enhanced: 20 miles of prioritized channels are enhanced

- Metric: Miles of channels stabilized or enhanced

Long-Term:

All 400 miles of public waters are stabilized or enhanced, providing improved riparian habitat and water quality conditions.

Why These Issues Matter

In-channel erosion and channel instability can occur both naturally and as a result of human impacts. As land use changed in the MSTR Watershed, many natural streams were channelized to promote agricultural drainage and production. Portions of the Middle, Snake, and Tamarac Rivers have been straightened or modified. These channels now experience increased flow velocities, poor riparian vegetation, and increased headcutting and erosion, leading to large amounts of sediment being moved downstream. Too much sediment movement and deposition can negatively impact agricultural production, degrade water quality and habitat, and damage roads and bridges.

Riparian buffers are an important part of channel stability to prevent erosion and improve habitat. Buffers slow flood waters during peak flows and stabilize stream flow by raising the water table to increase base flow. Riparian habitats also serve as wildlife corridors, connecting protected areas and water sources.

The focus of this plan's goal is to address issues impacting in-channel erosion and channel instability through large stabilization measures or small enhancements. Definitions and examples of projects constituting a stream reach as "stabilized" or "enhanced" is provided on the next page. The short-term goal represents realistic progress that can be made in 10 years towards the long-term goal.

Stream Stability and Riparian Hab. (cont.)

What Can Be Done?

Below are some example actions that can be implemented to address stream stability and riparian habitat issues in the watershed. A full list is shown in **Section 5**:

- Channel restoration
- Grade stabilization of watercourses
- Bank stabilization
- Buffer installation/expansion
- Process to prioritize stream reaches

Where: Prioritized Resources

Local experts identified priority channels to address during this 10-year plan. They are organized into two categories to summarize the issue impacting the system and propose actions to resolve, and are shown on the map on the following page.

Stabilize

These channels likely require full channel stabilization or restoration through larger CIPs.

Enhance

These channels likely do not need a full channel restoration to resolve instability issues, but need enhancement through smaller conservation practices. Examples may include, but are not limited to grade stabilization of watercourses, implementation of rock and riffles, bank stabilization, and acquisition of riparian corridors to improve habitat with buffers.

Spotlight:
Conservation in Action

Grand Marais stream restoration, 2014

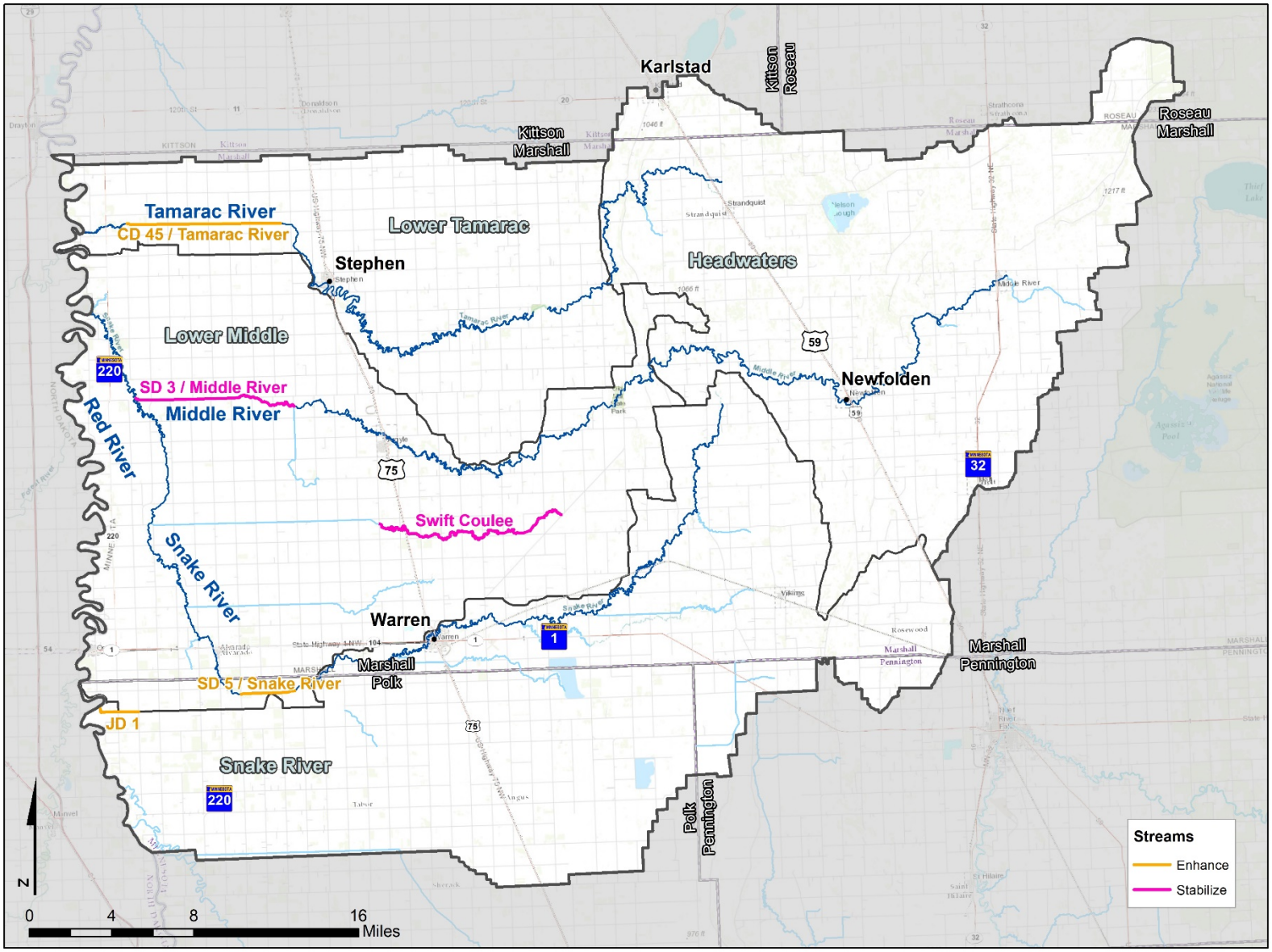
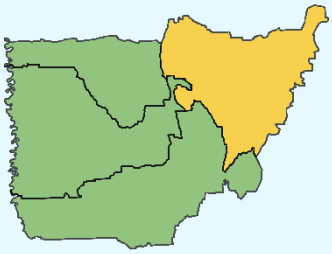


Figure 4-3: Prioritized channels in the MSTR Watershed for stabilization and enhancement

Excess Sediment

Issues Addressed

Upland erosion and runoff from non-point sources delivering **excess sediment** to drainage systems and streams



Measurable Goals

Short-Term:

Overland runoff sediment loading is **reduced by 11% watershed-wide**, or 37,300 tons/year.

- Metric: tons/year

Long-Term:

All waters support aquatic life and recreation thresholds for sediment levels

Why These Issues Matter

This sediment loading goal is focused specifically on upland erosion and runoff. Runoff moves sediment overland and delivers it to lakes, streams, and ditches downstream. The resulting sedimentation impacts aquatic life by burying spawning grounds and reducing the light that reaches aquatic organisms.

In the MSTR Watershed, seven stream reaches (not including the Red River of the North mainstem) are listed as impaired for aquatic life use due to excessive suspended sediment (MPCA, 2020). Each of these stream reaches has an assigned TMDL target, indicating the amount of sediment that must be reduced for the stream to support aquatic life and recreation. Thus, this plan's long-term sediment reduction goals are based on an average reduction of all excess sediment TMDLs within each planning region. A detailed breakdown of this is shown in the TMDL Summary Table on the next page.

This plan's short-term sediment reduction goal represents realistic, incremental progress toward the long-term goal.

Planning Region	Existing Sediment Load* (tons/year)	Short Term Sediment Load Reduction Milestone* (tons/year)	Long Term Goal
Lower Tamarac	58,722	9,290	Reduce by 46%
Lower Middle	115,768	11,378	Reduce by 75%
Snake River	116,390	14,049	Reduce by 39%
Headwaters	30,008	2,651	Reduce by 10%

*As estimated by the Prioritize, Target, Measure Application (PTMApp) at the edge of the field

Excess Sediment (Continued)

TMDL Summary Table*:

Major Watershed and Planning Region	AUID	Reach Name	Reach Description	Percent Reduction**	Existing Load*** (tons/year)	Target Reduction (tons/ year)
09020311 Lower Red River of the North	09020311-503	Tamarac River	Florian Park Reservoir to Stephen Dam	13	3,116	405
	09020311-505*****	Tamarac River	Stephen Dam to Red R	78	6,543	5,104
09020309 Snake-Middle Rivers	09020309-501	Snake River	Middle R to Red R	89	11,946	10,632
	09020309-502	Snake River	CD 3 to Middle R	86	9,604	8,259
	09020309-540	Middle River	Co Rd 114 to T156 R49W S3, north line	51****	1,732	883
	09020309-541	Middle River	Co Rd 114 to T156 R49W S3, north line (cont)	51****	3,936	2,007
09020309 Snake-Middle Rivers	09020309-504	Snake River	S Br Snake R to CD 7	39	4,575	1,784

* The TSS TMDL was developed to addressed the biological impairments.
**Percent reduction as calculated in the TMDL by the mid-range flow reduction, or next highest flow range
*** As estimated at the Prioritize, Target, Measure Application (PTMApp) priority resource point
****- 540 and – 541 combined. -503 not impaired for excess suspended sediment.
*****- 505 has since been split into -562 and -563 on the 2020 and 2022 Impaired Waters List.

What Can Be Done?

Below are some example actions that can be implemented to address overland sediment loading in the watershed. A full list is shown in **Section 5**:

- Grade stabilizations and side water inlets
- Infiltration basins
- Cover crops
- Reduced tillage

Where: Prioritized Resources

The Prioritize, Target, and Measure Application (PTMApp) locates where on the landscape overland sediment is occurring and targets the best places for actions. Subwatersheds (HUC-12) that contribute the highest yield of sediment will be the focus of initial implementation efforts related to this goal.

Other resources that will be the focus of implementation efforts are sediment-impaired streams and streams that are nearly or barely impaired for sediment. These resources are shown in the map on the following page.

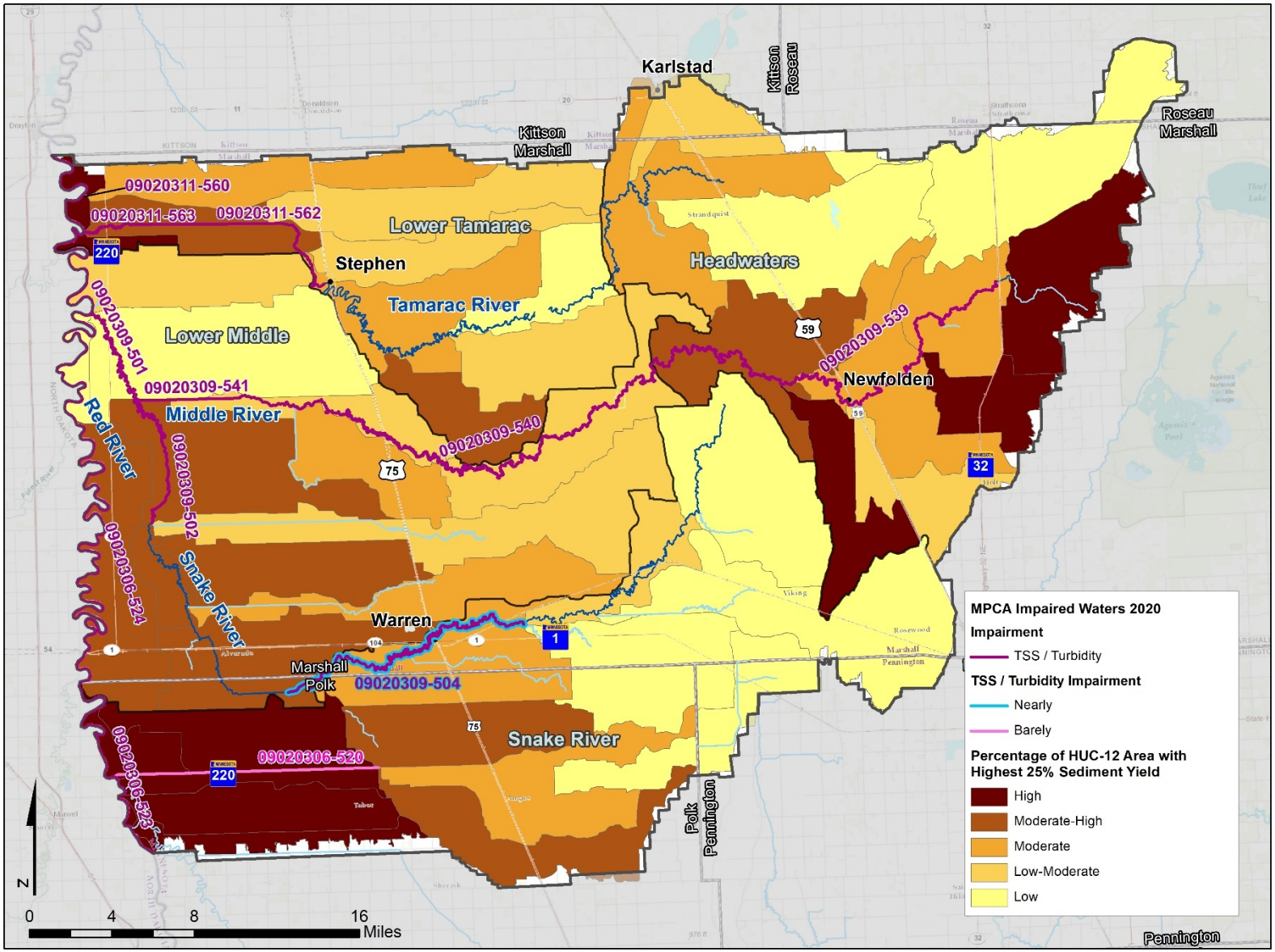
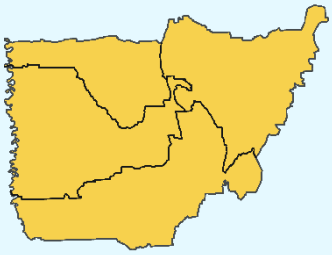


Figure 4-4: Sediment priority resources and subwatersheds within the MSTR Watershed

Soil Health

Issues Addressed

Decreased **soil health** and wind erosion and its impact on productivity



Measurable Goals

Short-Term:

New soil health practices are implemented on **9,600 farmed acres** in the watershed over the ten-year plan.

- Metric: Acres of soil health practices implemented

Long-Term:

Soil health practices are implemented in all critical soil loss areas to promote productivity and prevent wind erosion.

Why These Issues Matter

Agriculture is the cornerstone of the MSTR Watershed, and makes up the majority of land use (72%). As such, soil health is critical for the health and vitality of the community as well as resources downstream. Soil health is defined as the enduring capacity of soil to function as a living ecosystem that sustains plants and animals, including humans (USDA-NRCS, 2021). Weather events, groundwater levels, soil types, rainfall, field methods, nutrient levels, and more determine the health of the soil and its seasonal viability for productive crops.

Topography and vegetation also contribute to the potential for soil loss. The flat topography of the Red River Basin makes land in the MSTR Watershed particularly susceptible to wind erosion, as wind is able to pick up speed and intensity along the flat landscape. In addition, fields that are intensively tilled, have minimal residue or vegetative cover, and support short seasoned crops are especially vulnerable to wind erosion, which can result in loss of valuable and non-renewable topsoil (NDSU, 2011).

Healthy soils can reduce erosion and increase productivity by retaining nutrients on the land. This measurable goal focuses on implementation of soil health practices—such as cover crops, reduced tillage, and tree planting—as a means to keep soil covered, reduce loss of topsoil from wind and overland erosion, and increase productivity.

Soil Health (Continued)

What Can Be Done?

Below are some example “soil health practices” that can be implemented to improve soil health in the watershed. A full list is shown in **Section 5**:

- Cover crops
- Reduced tillage
- Tree planting and windbreaks
- Regenerative farming and carbon credits
- Agricultural Water Quality Certification Program
- Nutrient Management and Pest Management

Where: Prioritized Resources

“Critical soil loss areas” are areas that are most vulnerable to overland erosion. They have been identified and targeted on the landscape (in 40 acre catchment average areas) through use of PTMApp.

During implementation, SWCDs will use this PTMApp data and other information to define problem areas for soil health.

Spotlight:
Conservation in Action

Left: Buffer planted for one year in Marshall County; Right: Tree planting in Marshall County

Phosphorus Loading

Issues Addressed

Increased **phosphorus loading** from non-point sources causing algal blooms and impacting aquatic life and recreation

Measurable Goals

Short-Term:

Overland phosphorus loading is **reduced by 7%,** or 24,250 lbs/year, watershed-wide.

- Metric: lbs/year

Long-Term:

All waters support aquatic recreation thresholds for phosphorus levels, as accomplished by a 10% reduction in overland phosphorus loading watershed-wide.

Why These Issues Matter

Phosphorus is a nutrient that is produced within the natural process of vegetation breaking down. Phosphorus is also applied to fields along with the nitrogen and chemical fertilizers to increase crop productivity.

In surface water, phosphorus feeds algae causing excess growth. Some forms of algae produce toxins that are a safety concern, triggering closures of public beaches and restricting access to aquatic recreation. Once algae begin to grow out of control, they can also block sunlight and decrease the amount of oxygen available to aquatic insects, invertebrates, and fish.

While phosphorus is high in some water bodies in the MSTR Watershed, additional data is needed to determine whether water bodies are impaired due to nutrients. There are, however, eight Dissolved Oxygen (DO) impairments on the 2022 Impaired Waters list (MPCA, 2022). Reducing phosphorus can improve and address DO impairments, thereby improving water quality conditions in the MSTR Watershed.

The Snake-Middle and Grand Marais WRAPS recommend a 10% phosphorus reduction, which is a target proposed by the Minnesota Nutrient Reduction Strategy for the Red River Basin overall (MPCA, 2019; MPCA, 2020). These targets are applied for this plan's phosphorus loading goal watershed-wide, with short-term goal informed by PTMApp estimates for Total Phosphorus (TP) at the edge of the field.

Phosphorus Loading (Continued)

What Can Be Done?

Below are some example actions that can be implemented to address phosphorus loading in the watershed. A full list is shown in **Section 5**:

- Grade stabilizations
- Infiltration basins
- Cover crops
- Reduced tillage
- Nutrient management

Where: Prioritized Resources

PTMApp locates where on the landscape TP is occurring and targets the best places for actions. Catchments (40-acre average) that contribute the highest yield of phosphorus will be the focus of initial implementation efforts related to this goal, and are shown on the map on the following page.

Reaches in the Snake River and Lower Middle Planning Regions are recommended for protection for either TP or DO due to their close proximity to water quality impairment thresholds.

Spotlight:
Conservation in Action

Agricultural field in Marshall County before (top) and after (bottom) grassed waterway

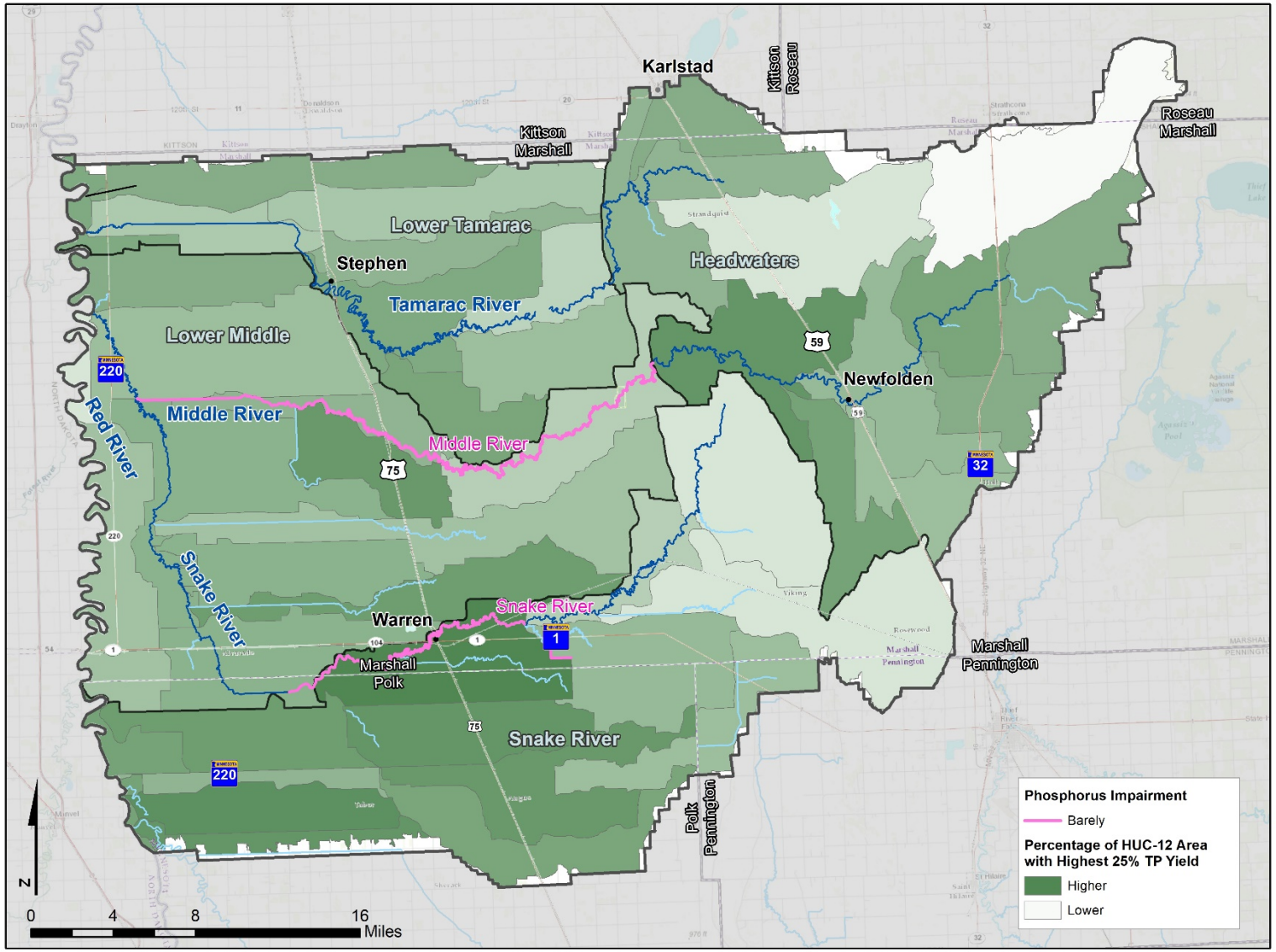
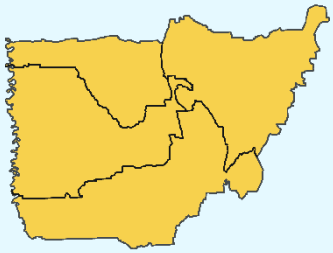


Figure 4-5: Prioritized locations for phosphorus load reduction in the MSTR Watershed . Total Phosphorus (TP) yield information estimated using the Prioritize, Target, and Measure Application (PTMApp) and has not been field-verified.

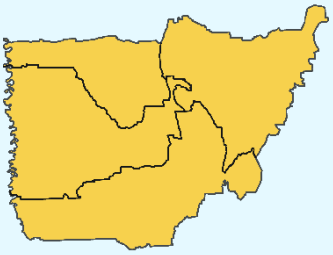
Groundwater

Issues Addressed

Protection of **groundwater supplies** from overuse and loss of recharge



Contaminants in **groundwater**



Measurable Goals

Short-Term:

On average, **10 unused wells are sealed per year**, prioritizing locations near Drinking Water Supply Management Areas.

- Metric: number of wells sealed per year

A **drought plan or research plan is developed** for the planning area to inform decisions related to maintaining sustainable groundwater supplies.

- Metric: Drought plan completed

Long-Term:

All **abandoned and unused wells are sealed**, and all citizens have access to safe and sustainable groundwater supplies throughout the plan area.

Why These Issues Matter

100% of individuals in the MSTR Watershed get their drinking water from groundwater. Some contaminants in drinking water are naturally occurring, such as arsenic. Other contaminants such as nitrogen, metals, bacteria, pesticides, volatile organic compounds (VOCs), and CECs can also seep into drinking water through unused wells or through interactions between groundwater and surface water. These contaminants can have adverse effects to human health when they make their way into drinking water. Currently, ground water quality within the watershed is relatively good. Nitrate concentrations in the planning area are relatively low.

Groundwater aquifers are recharged by surface water that makes its way into the ground in specific regions. For some aquifers, this can take weeks, for others, centuries. Aquifers closer to the surface, like the Middle and Beach Ridge Surficial Aquifers, can contribute water to surface water and are responsible for the base flow in most perennial streams. Overusing this resource can have wide-ranging impacts on human health, crop production, and aquatic habitat and recreation.

In Minnesota's Western Groundwater Province, 16% of observation wells are trending downward in water availability. In this province, this means groundwater use is exceeding the rate of groundwater recharge. Downward trends can result from drier conditions during certain periods, increased groundwater use, or changes in land use where groundwater is recharged (DNR, 2020b).

Groundwater (Continued)

What Can Be Done?

Below are some example actions that can be implemented to address groundwater quality and quantity in the watershed. A full list is shown in **Section 5**:

- Drought contingency plan
- Sealing abandoned wells
- Prioritize outreach for CRP in recharge areas
- Well testing clinics

Where: Prioritized Resources

Beach ridges are special features in the region that are highly sensitive to groundwater contamination due to the depth from the surface to the water table. Prioritizing areas of high pollution sensitivity for groundwater actions will help protect the watershed overall.

DWSMAs are additional regions where plan actions can address groundwater quality issues. DWSMAs protect drinking water by identifying and designating areas surrounding a public water supply well that contributes groundwater to the well. The prioritized areas for groundwater quality include beach ridges near the center of the watershed and in the Headwaters, in DWSMAs, and in private wells across the watershed.

Beach ridge areas also follow where groundwater aquifers used for drinking water and irrigation are recharged. Action focused on groundwater quantity will be prioritized in the beach ridges.

Spotlight:
Conservation in Action

Abandoned wells in Marshall County before (left) and after (right) being sealed

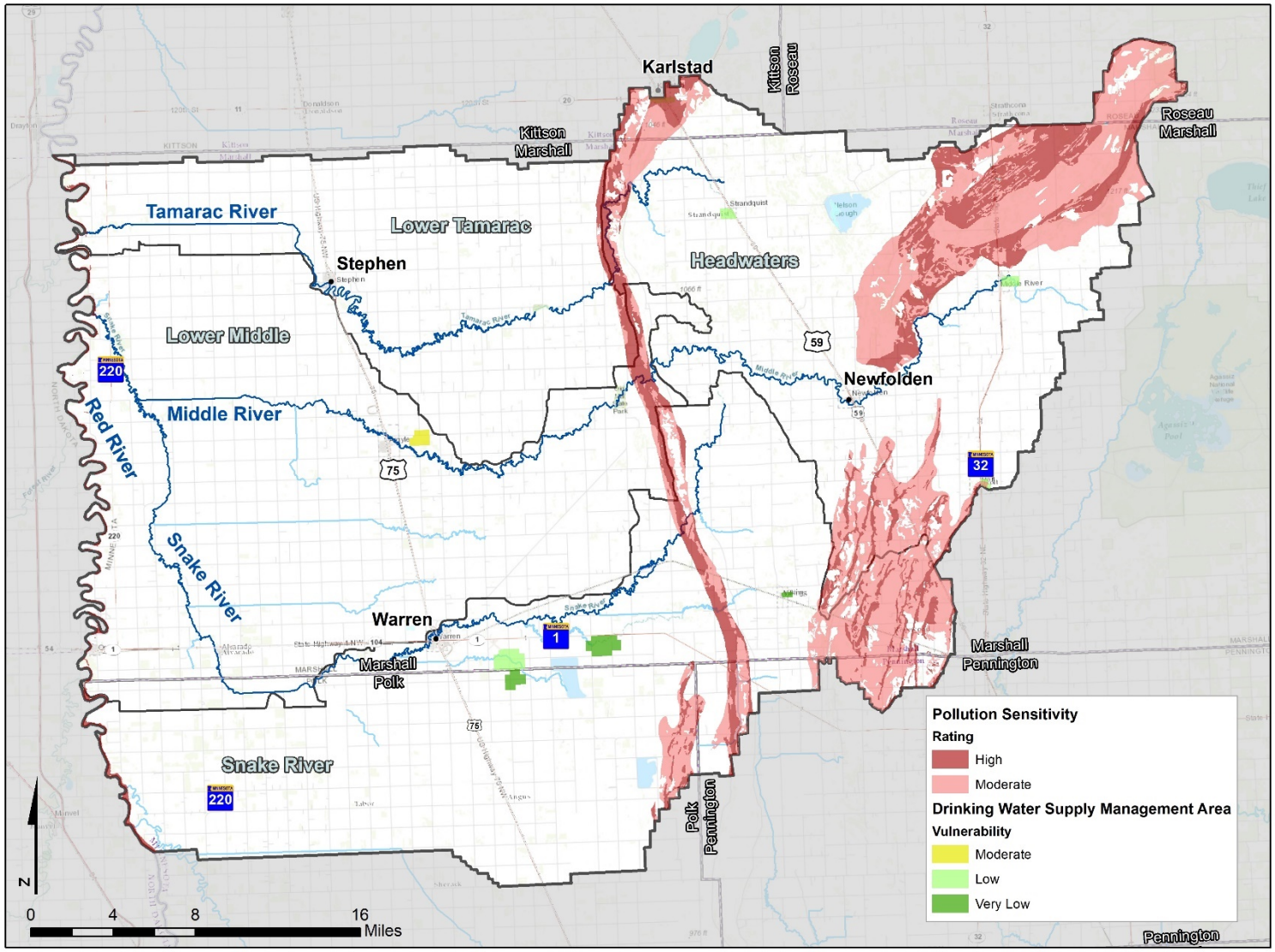
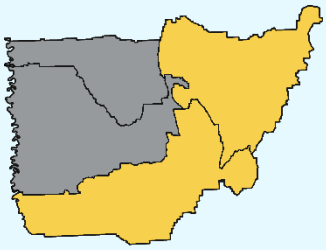


Figure 4-6: Groundwater quality and quantity priority resources within the MSTR Watershed

Upland and Wetland Habitat

Issues Addressed

Loss of **upland and wetland habitat** impacting species richness and diversity, water storage, and water quality



Measurable Goals

Short-Term:

2,150 acres of expired land remain in protection programs using WBIF incentives, focusing outreach efforts within the Prairie Core and Corridor areas.

- Metric: Acres of land re-enrolled

Long-Term:

Maintain all current acres in protection programs.

Why These Issues Matter

Historical land use in the MSTR Watershed was 87% tallgrass prairie, with large wetlands and aspen and oak forests located in the Headwaters. Today, about 3% of the watershed is prairie. Approximately 20% of land area is currently occupied by herbaceous and woody wetlands. Wetlands typically inhabit lowlands on a landscape and include prairie potholes, unique features to the area. Upland habitat is generally found in headwaters upstream of and at higher elevations from low lying areas like the Red River Basin.

Protected acres of habitat contain forests and prairies, surface waters, and groundwater recharge areas. These features store flood waters and allow surface water to infiltrate to aquifers used for drinking water. Wildlife habitat provides recreational opportunities for hunters and bird watchers. Native deep-rooted vegetation also prevents erosion, provides food for fish and wildlife, and serves as a filter to prevent pollutants from making their way into rivers and lakes.

Over the next 5 years, more than 40,000 acres of lands in protection through the Conservation Reserve Program (CRP) are scheduled to expire within MSTR Watershed counties. CRP is a United States Department of Agriculture (USDA) Farm Service Agency (FSA) program that provides financial incentive to farmers who remove environmentally sensitive land from production for 10-15 years to allow historical habitats to become reestablished. This plan aims to assist farmers in keeping their land in protection through incentives.

Upland and Wetland Habitat (Continued)

What Can Be Done?

Below are some example actions that can be implemented to address habitat issues in the watershed. A full list is shown in **Section 5**:

- Watershed-based strategic plan with the Prairie Plan Technical Team
- Maintenance and management of invasive species
- Promotion or incentivizing CRP by reducing landowner costs with WBIF
- Promotion of wetland banking

Where: Prioritized Resources

The Minnesota Prairie Conservation Plan (Prairie Plan) is a habitat plan that prescribes management strategies for prairies and wetlands in the region. Within the Prairie Plan, Core Areas were identified as important places to retain or restore high concentrations of native prairie and grasslands, wetlands, and shallow lakes. Habitat Corridors connect Core Areas to allow for connectivity between habitats for plants and wildlife, which is especially important for biodiversity and species continuity. Prairie Plan Core Areas and Habitat Corridors will be prioritized for actions in this CWMP to address habitat and keep protected areas of land under protection.

Spotlight:
Conservation in Action

A pair of trumpeter swans on Angus Oslo #4 Impoundment

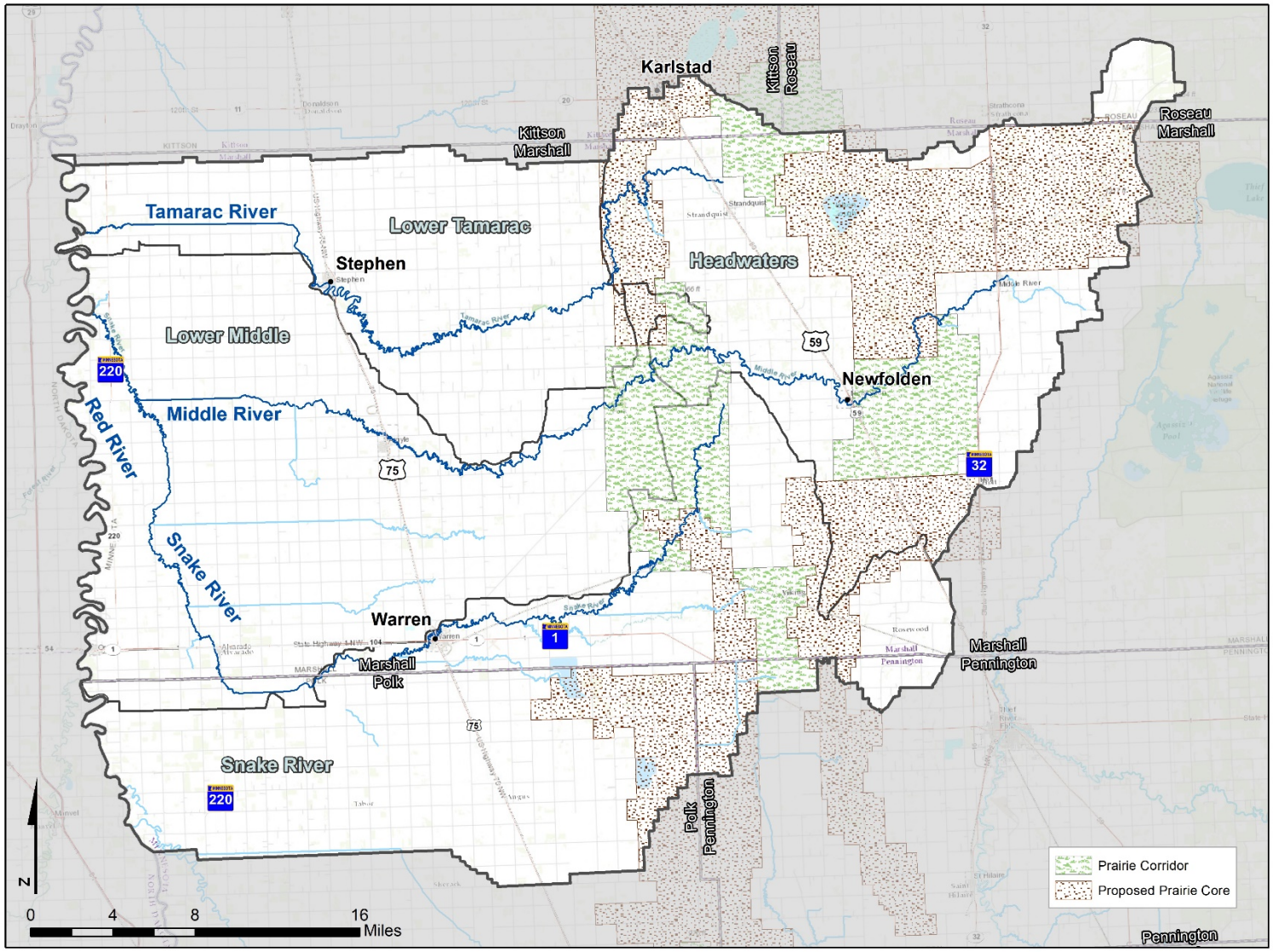
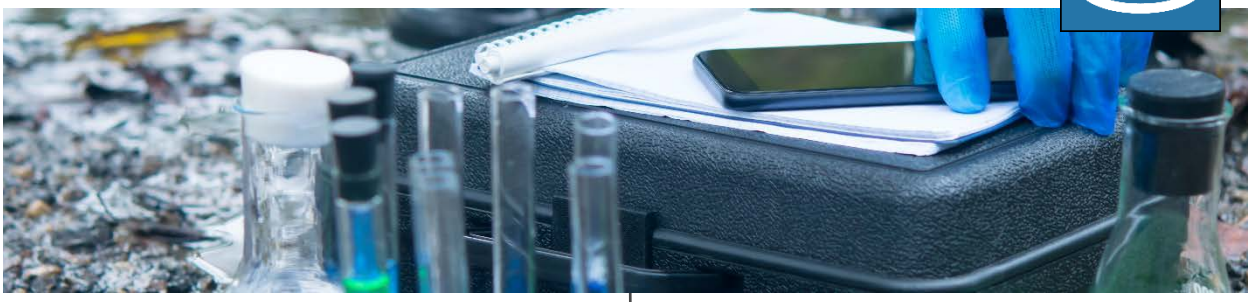


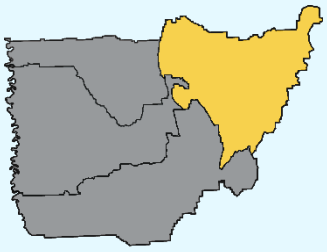
Figure 4-7: Upland and wetland habitat priority resources within the MSTR Watershed

Excess Bacteria (*E. coli*)



Issues Addressed

Excess bacteria (*specifically E. coli from fecal contamination*) impacting safe access to surface waters



Measurable Goals

Short Term:

Implement **eight *E. coli*/fecal contamination management projects** at locations identified as likely sources of impairments.

- Metric: projects implemented

Long Term:

All waters support aquatic recreation thresholds for *E. coli* concentrations and sources of fecal contamination have been identified.

Why These Issues Matter

Excessive bacteria (specifically *E. coli* from fecal contamination) in streams is a public health issue and hinders aquatic recreation, as it is an indication that pathogenic organisms associated with human fecal contamination may be present. *E. coli* contamination is caused when fecal matter from humans, wildlife, and domesticated animals is deposited in waterways. While small amounts of this type of contamination are natural and do not cause problems, levels can reach dangerous amounts for several reasons. High populations of wild and domesticated animals in or near streams, leaking septic systems, and WWTFs are common sources of fecal contamination. Microbial source tracking can help local entities determine whether human or wildlife, livestock, and/or other animals are causing the problem.

Point sources of pollution such as WWTFs and large feedlots are regulated by EPA National Pollutant Discharge Elimination System (NPDES) permits. Implementation efforts can assist in managing nonpoint sources of bacteria by managing cattle access to streams and fixing aging septic systems.

There are seven impairments due to excessive *E. coli* in the watershed. Because *E. coli* loads and consequently load reductions are difficult and expensive to measure, this plan's long-term goal is based on reducing the number of impairments in the watershed. As delisting an impaired stream reach can be a long process, the short-term goal is based on projects that can be implemented to make progress made toward the long-term goal.

Excess Bacteria (*E. coli*) (Continued)

What Can Be Done?

Below are some "*E. coli*/fecal contamination management practices" that will be implemented to address excess *E. coli* in the watershed. A full list is shown in **Section 5**:

- Cattle fencing
- Manure management
- Upgrade septic systems
- Updating small municipal wastewater systems

Where: Prioritized Resources

There are seven impairments due to excessive *E. coli* in the watershed. These channels will be the focus of implementation efforts addressing fecal contamination, as shown on the following page.

Spotlight:
Conservation in Action

Subsurface Sewage Treatment System (SSTS) at grade construction in Polk County

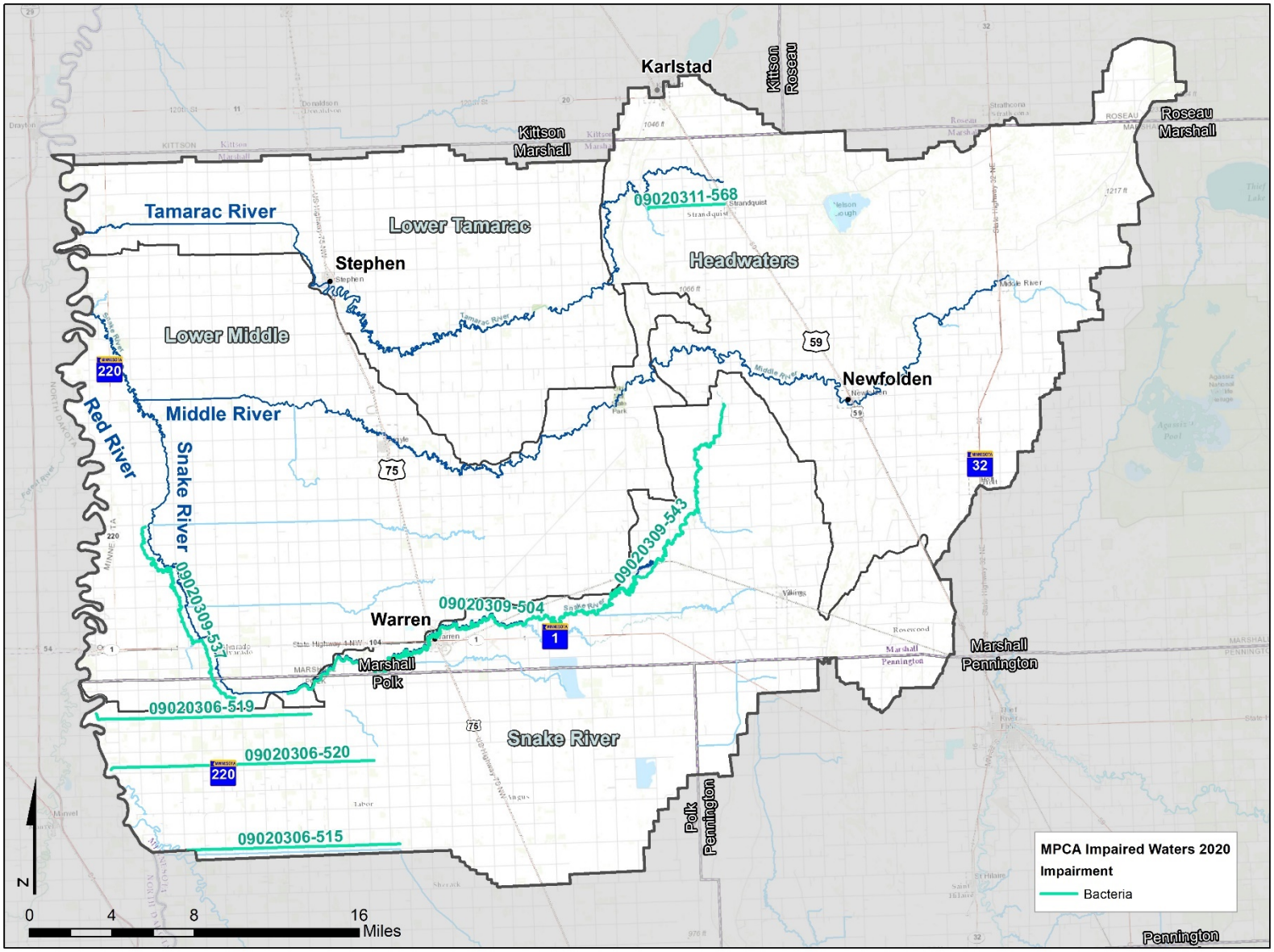


Figure 4-8: Bacteria (specifically E. coli from fecal contamination) priority resources within the MSTR Watershed

Middle
-Snake-
Tamarac
RIVERS
CWMP

Targeted Implementation

5. Targeted Implementation

This section of the plan identifies the targeted actions that will be implemented in the next 10 years to address priority issues and make progress toward measurable goals. This includes information about each action, where and when actions will be targeted, how those actions will be measured, and how much it will cost.

Making progress toward goals is largely dependent on funding, as more actions can be implemented with more funding. As such, this plan recognizes three funding levels (**Table 5-1**). Participants in the 1W1P planning process are eligible to receive non-competitive Watershed-Based Implementation Funding (WBIF) through BWSR once the plan is approved. In recognition of this important source of funding, funding levels are organized in terms of current funding, current funding with WBIF, and what actions will be pursued with partners or through other competitive funding programs. Actions pursued under Funding Level 2 (Current Funding + WBIF) are the focus of this plan section.

Table 5-1: Funding Levels for the Middle-Snake-Tamarac Rivers Watershed

Funding Level	Name	Description
1	**Current Funding**	This level assumes plan funding is similar in magnitude to current funding focused on water issues within the plan area.
2	**Current Funding + WBIF**	This level assumes plan funding is like current funding focused on water issues within the plan area (Level 1), plus an additional $1,100,000 per biennium (or $550,000/year) from WBIF dollars.
3	**Partner and Other Funding**	This funding level recognizes that there are other organizations and agencies doing work in the watershed that can help make progress towards plan goals. This level contains additional implementation activities identified during the plan development process that are the responsibility of agencies and organizations better suited in the watershed.

Actions in this plan section include activities that will be implemented by partner organizations, including state agencies, federal agencies, and non-governmental organizations (NGOs). It is important to identify actions that other groups will complete, as it recognizes the work of others and clarifies roles.

Building on Existing Conservation Action

This plan is forward-looking, and recognizes the conservation action that landowners, residents, and business owners in the MSTR Watershed have already implemented in their fields and on their properties. Conservation action described in this plan for the next 10-years builds on this foundation of work.

The map to the right shows where existing conservation practices are concentrated in the watershed (by HUC-12) according to the MPCA Healthier Watersheds database for the years 2004-2020. **Table 5-2** shows common practices implemented in the MSTR Watershed, using the Snake River HUC-8 Watershed as an example.

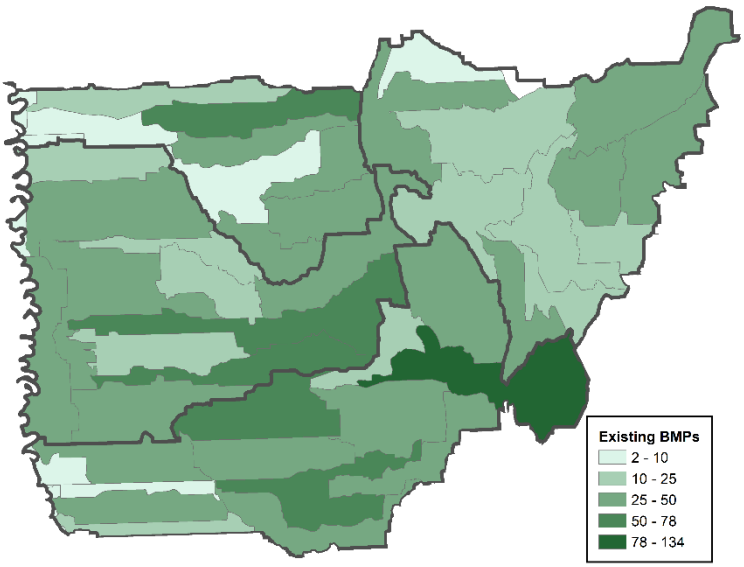


Table 5-2: Existing Conservation Practices in the Snake River Watershed (MPCA, 2004 – 2020)

Practice Name	Amount of Conservation Watershed-Wide
Reduced Till, No Till, Mulch Till	91,021 acres
Nutrient Management	16,722 acres
Cover Crops	6,877 acres
Prescribed Grazing	1,386 acres
Grade Stabilization Structure	68 practices
Streambank and Shoreline Protection	634 feet
Water Control Structure	8 practices
Field Border	6 acres
Grassed Waterway	5 acres
WASCOBs	7 practices
Septic System Improvement	8 practices
Converting Land to Perennials	136 acres
Riparian Buffers and Filter Strips	48 acres
Crop Rotation	38 acres
Prescribed Grazing	350 acres
Fencing	122,029 feet
Forage Planting and Management	1173 acres
Forest management Plan	1 practice
Livestock Pipeline	59,448 feet
Well Decommissioning	74 practices
Watering Facility	54 practices
Windbreak/Shelterbelt Establishment	314,353 feet

Looking Forward: Targeting Conservation Action

To effectively target actions over the next 10 years, planning partners need information about where new conservation practices are feasible, how much implementation will cost, what the estimated water quality benefit is, and how much progress implementation of that action can make toward goals. This plan leverages PTMApp to target the most effective conservation practices to the most effective places.

PTMApp estimates existing pollutant loads and water quality benefits for a wide range of conservation practices (full list shown in **Appendix E**). Pollutant loads and water quality benefits are expressed in terms of annual load reductions of sediment, total phosphorus (TP), and total nitrogen (TN) that result from implementing the practice. The practices included in this plan's Action Tables were selected to align with voluntary local implementation trends and have the highest cost-benefit ratios for reducing sediment, with benefits measured at the edge of the field. For more information about how PTMApp was used to inform implementation and benefits (sediment, TP, and TN) arising from PTMApp practices, see **Appendix E.**

The numbers, cost, and locations of practices in the Action Tables represent a best-case scenario for planning. Due to voluntary participation, field verification, and funding availability, prioritized projects may not be feasible, in which case the next highest priority project will be targeted. In addition, projects may emerge that were not identified in the Action Tables and supporting maps. These projects will still be pursued if environmental and economic benefits are comparable to those identified in the Action Tables.

A variety of factors will ultimately determine where implementation occurs, including but not limited to the following:

- Voluntary participation by landowners and residents
- Field verification of practice type and location
- Amount of funding available for implementation
- New data on resource conditions
- Emerging practices
- Practices/projects ready to implement
- Effectiveness of education and outreach and research initiatives

Implementation Programs

This plan contains five different Action Tables that group similar action types together in five implementation programs (**Figure 5-1**). Implementation programs are the funding mechanism to implement actions. Actions within the Capital Improvements Projects, Regulatory, Outreach, and Data Collection and Monitoring implementation programs are implemented watershed-wide. Actions within the Project and Practices Implementation Program are targeted to a planning region scale to reflect changing issues and priorities from one planning region to the next. For more details on each of these implementation programs, see **Section 6- Plan Implementation Programs.**

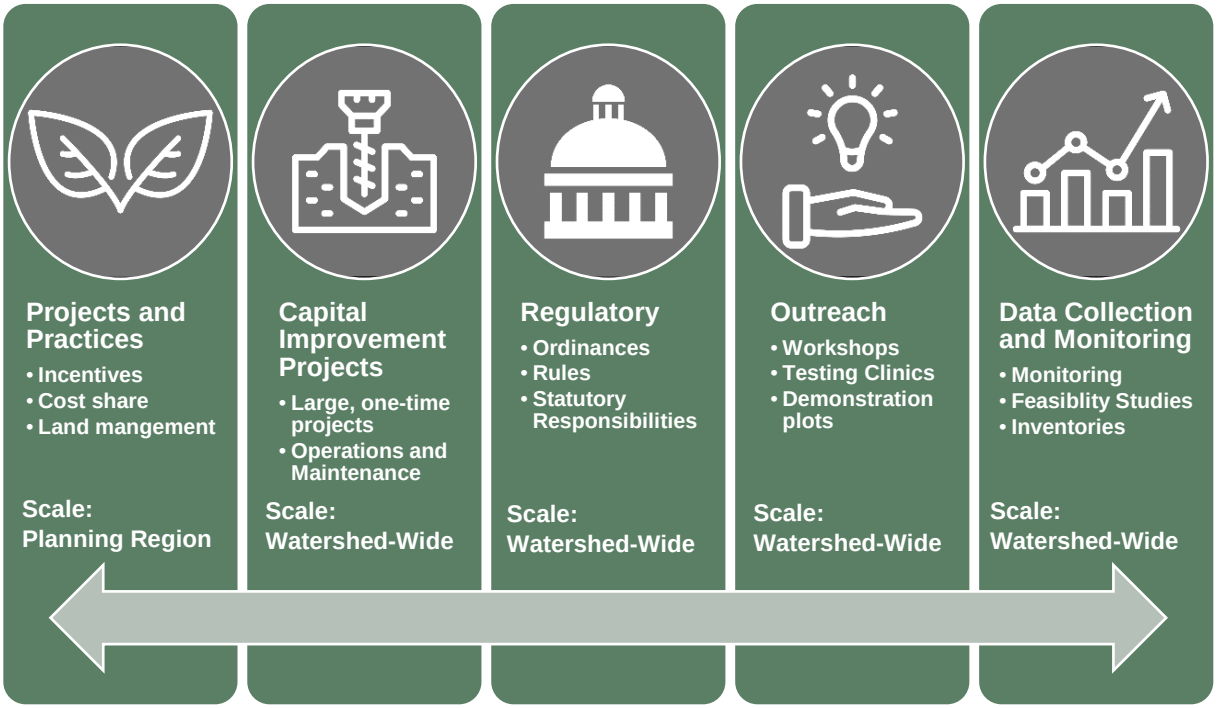


Figure 5-1: Implementation programs for the MSTR Watershed Comprehensive Watershed Management Plan

This plan aims to put the most effort and funding in the areas that need it most. Projects and Practices is the only implementation program that functions at the planning region scale. Therefore, planning partners need an agreed-upon strategy for distributing the Projects and Practices plan budget within the four planning regions. To do so, the Steering Committee considered planning region sediment yields coming off the landscape and planning region land area to arrive at the breakdown for distribution of Projects and Practices funds between the planning regions shown in **Figure 5-2**.

Actions for Projects and Practices by planning region are summarized first in the following planning region summaries.

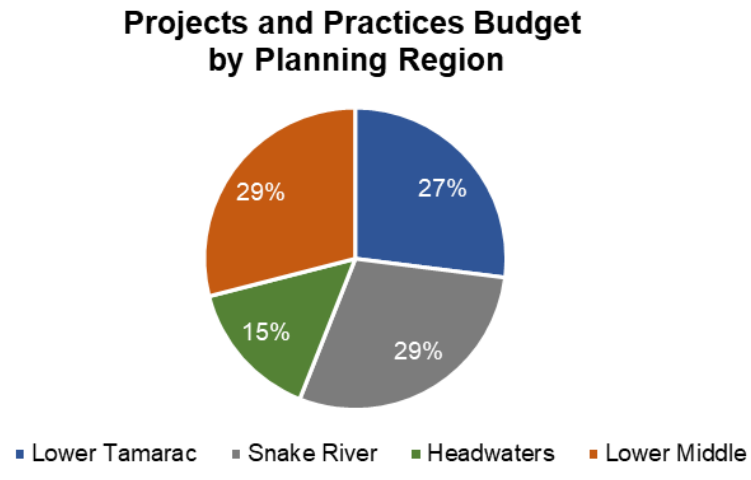
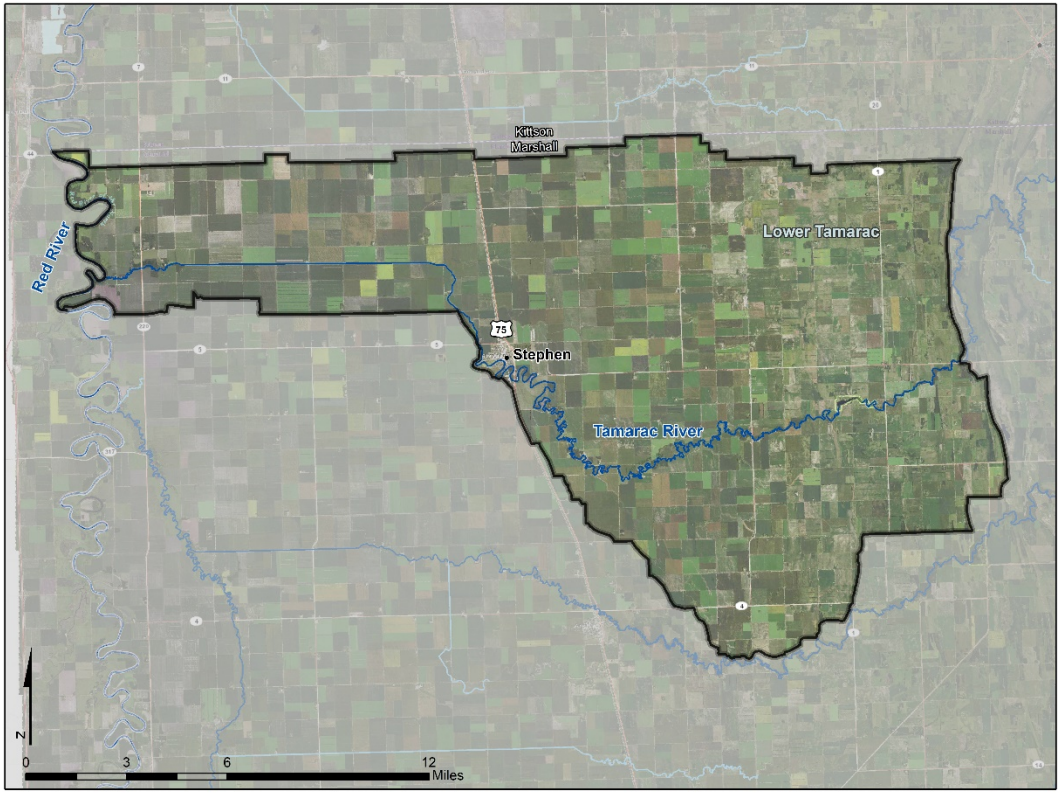


Figure 5-2: Funding distribution for Projects and Practices implementation program between planning regions

Lower Tamarac River Planning Region



Planning Region Overview

The Lower Tamarac River Planning Region is a flat, agricultural region characteristic of the Red River Valley. The entirety of the Lower Tamarac lies within Marshall County. The town of Stephen contains most of the planning region's population, with about 700 people. Local events and activities that characterize the area include Stephen Days in July, participating in the Curling Club, or camping at Northwest Acres Campground. Hunters also utilize neighboring WMAs during deer and duck seasons. Prominent natural resources in the area include the Tamarac River, wetlands along the Beach Ridges, and family farms.

Plan Area

15%
of Watershed

Size

220
Sq. Miles

Land Use

87%
Agricultural

Communities

Stephen
Florian

Counties

Marshall

Priority Issues

High Priority

- Excess sediment
- Drainage systems
- Altered hydrology and flood damage reduction
- Stream stability and riparian habitat

Med Priority

- Groundwater
- Phosphorus loading
- Soil health

Lower Tamarac River Planning Region

Projects and Practices Action Table

The table below summarizes actions for implementing new structural and soil management practices. These actions will be funded by the Projects and Practices Implementation Program, described more in **Section 6**. Practices will be targeted to prioritized resources, shown by maps on the following two pages. Outputs and costs show what will be accomplished with Level 2 (Current Funding + WBIF) funding, and what will be pursued under Level 3 (Partner and Other Funding).

			Measurable Goals										Timeline						
Action	**Prioritized Resources**	**Metric**	**Altered Hydrology and FDR**	**Drainage Systems**	**Stream Stability and Riparian Habitat**	**Excess Sediment**	**Soil Health**	**Phosphorus Loading**	**Groundwater**	**Upland and Wetland Habitat**	**Excess *E. coli***	**Implementation Lead (in bold) and Partners**	**2023-2024**	**2025-2026**	**2027-2028**	**2029-2030**	**2031-2032**	**Annual Cost for Years Implemented**	**Total 10-Year Cost Level 2 (Current+WBIF)**
Storage and Protection Conservation Practices (e.g., Drainage Water Management [using water control structures to manage the water discharged from agricultural drainage systems], Wetland Restorations, Infiltration Basins, Grade Stabilizations, and Side Water Inlets)	Field-Scale Practices (Pg. 5-7)	6,191 tons sediment / year 5,769 lbs TP / year 104,335 lbs TN / year	●	o	●	●		●	o	o	o	**SWCDs**, **MSTRWD,** NRCS, BWSR**,** MDA	●	●	●	●	●	$185,470	$1,854,700
Soil Management Practices (e.g., Cover crops, reduced tillage, regenerative farming and carbon credits, windbreaks, MAWQCP, and prescribed grazing)	Locally Defined using PTMApp Data	2,595 acres treated 3,099 tons sediment / year 496 lbs TP / year 9,997 lbs TN / year	o	o	o	●	●	●	o	o	o	**SWCDs**, MSTRWD**,** NRCS, BWSR**,** MDA	●	●	●	●	●	$46,720	$467,200
Stream channel enhancement projects (e.g., grade stabilization of watercourses, rock riffles, and bank stabilization)	Stream - Enhance: County Ditch 45/Tamarac River (Pg. 5-8)	10 miles of stream enhanced	o		●	o		o				**MSTRWD**, SWCDs, DNR	●	●	●	●	●	$50,000	$500,000
Seal abandoned wells	DWSMAs	2 wells sealed / year							●			**SWCDs**, MDH, Counties	●	●	●	●	●	$1,600	$16,000
Land protection programs incentivized with WBIF (e.g., CRP, RIM)	Prairie Core Areas (Pg. 5-8)	500 acres re-enrolled	o	o	●	o	o	o	o	●	o	**SWCDs**, MSTRWD, NRCS, TNC, DNR, BWSR	●	●	●	●	●	$30,000	$300,000
Federal land protection programs	Prairie Core Areas (Pg. 5-8)	**Funding Level 3**	o	o	●	o	o	o	o	●	o	USDA, NPS, USFWS, DOI	●	●	●	●	●	**Funding Level 3**	As funds are available
Update small municipal wastewater systems	*E. coli* Impaired Reaches	**Funding Level 3**						o	o		●	**MPCA**, **Counties**, BWSR	●	●	●	●	●	**Funding Level 3**	As funds are available
***E. coli*/fecal contamination management practices** (e.g., cattle fencing, SSTS, manure management, and feedlot runoff controls)	*E. coli* Impaired Reaches	2 projects	o		●	o		●			●	**SWCDs**, **Counties**, **MPCA**, NRCS, BWSR		●	●	●	●	$1,880	$15,000
																		Total 10-Year Cost for Level 2 (Current + WBIF)	**$3,152,900**

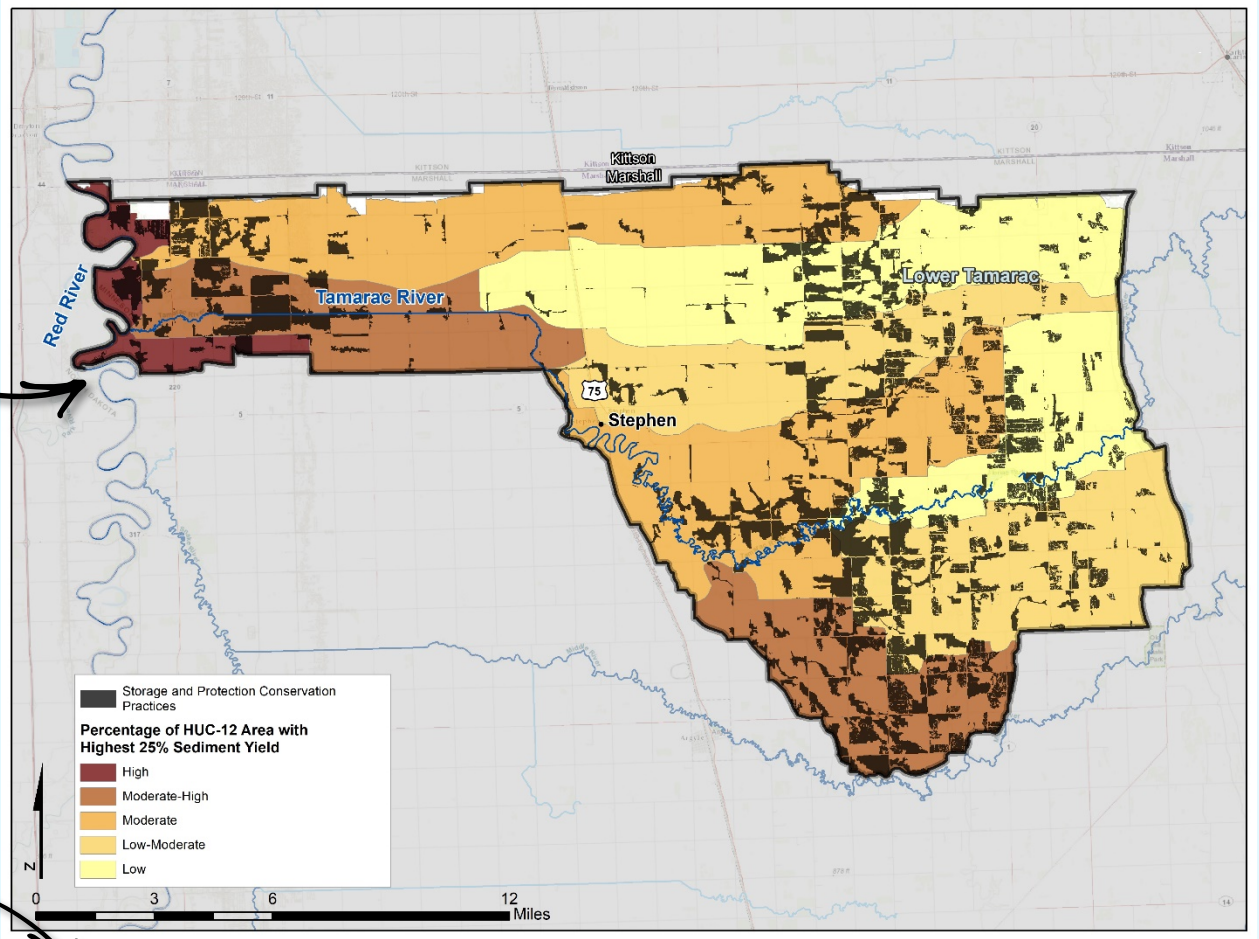
● = *Direct Impact; o = Indirect Impact*

Lower Tamarac River Planning Region

Field-Scale Practices

Shown on the map are the specific field-scale **storage and protection conservation practices** (shown in black) and the **subwatershed areas that experience the most sediment loss** (shown in red) in the planning region. Implementing practices in these locations will make the most progress towards plan measurable goals.

Planning partners recognize that implementing storage and protection conservation practices is voluntary. To allow for flexibility during implementation, the **average costs and benefits for storage and protection conservation practices in the Lower Tamarac Planning Region is provided here**, as estimated by PTMApp at the edge of the field.



NRCS Practice Type	Average Load Reduction Per Practice			Average Cost ($)
	Sediment (tons/yr)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	
Drainage Water Management (Treats 50 Acres)	9	10	184	$576
Large Wetland Restoration	41	62	1,959	$150,764
Infiltration Trench/Small Infiltration Basin	25	43	724	$146,039
Grade Stabilization	3.8	0.4	7	$4,000

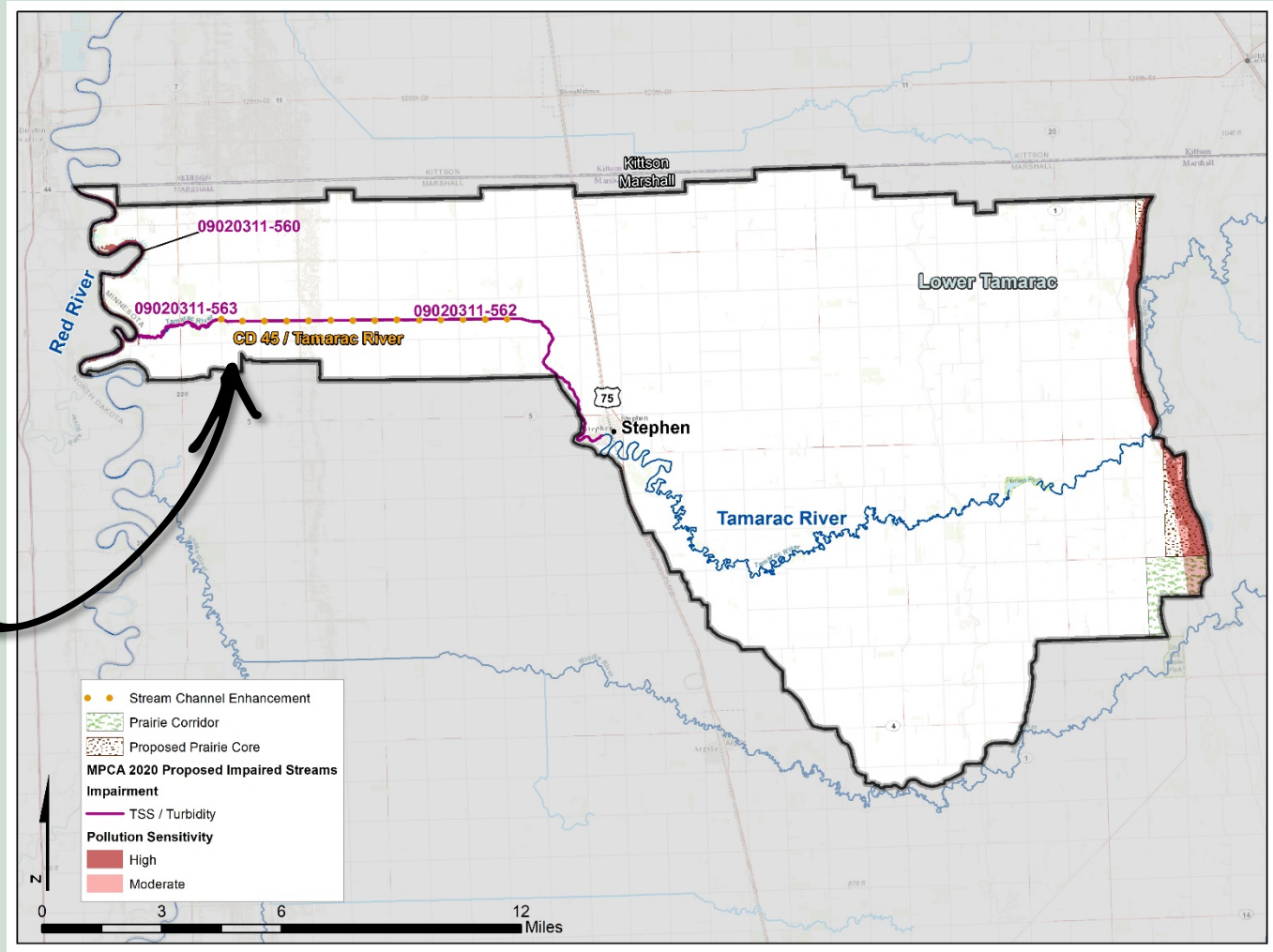
Lower Tamarac River Planning Region

Prioritized Resources

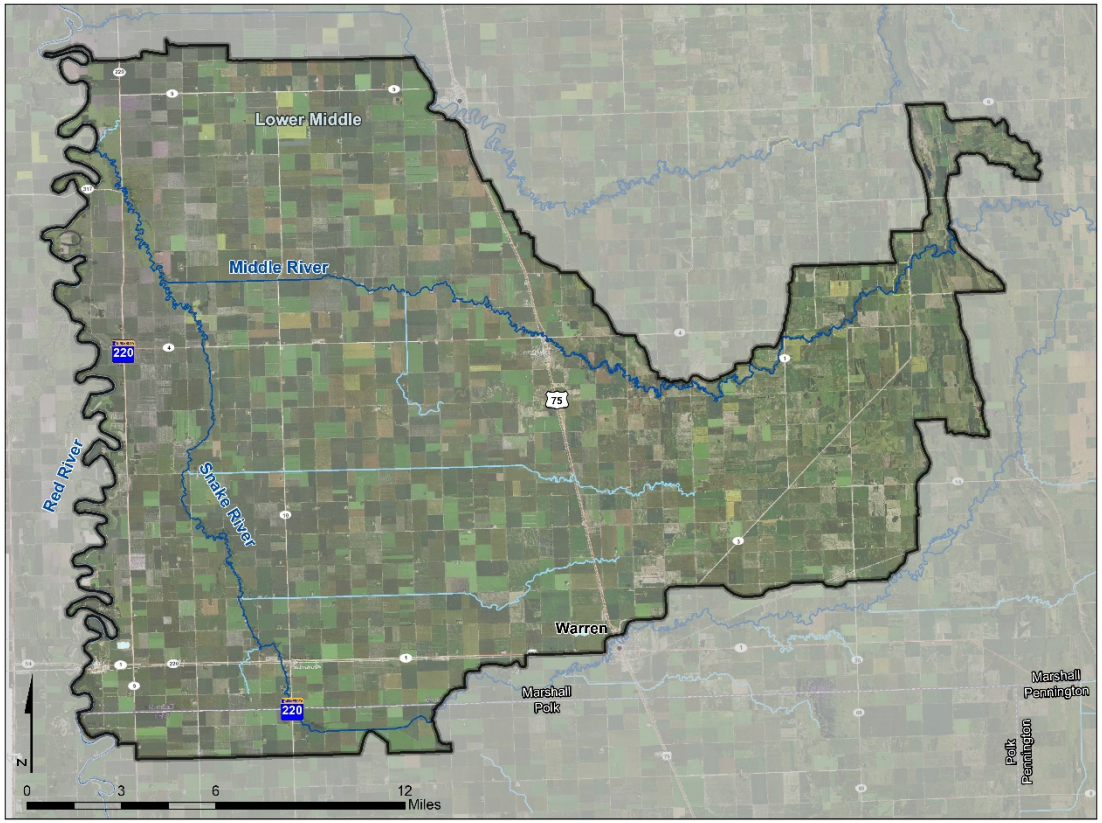
The Action Table for the Lower Tamarac Planning Region contains actions beyond just storage and protection conservation practices targeted by PTMApp. These remaining **actions are targeted to the priority resources** identified by measurable goal in Section 4.

Priority resources that fall within the Lower Tamarac River Planning Region are summarized by name within the Action Table and are shown visually on this map.

For example, stream channel enhancement projects will be targeted to County Ditch 45/Tamarac River.



Lower Middle River Planning Region



Planning Region Overview

The Lower Middle River Planning Region is a flat, agricultural region that is comprised of parts of three HUC-10 subwatersheds. There are three cities within this planning region, with Argyle being the second largest in the watershed. Residents of Argyle enjoy the nearby Old Mill State Park, which offers a chance to camp and hike in the riparian forests along the Middle River. Oslo, Alvarado, and Warren are part of the same school district, with all three cities located along State Highway 1. Oslo is often impacted by flooding with its location near the Red River of the North. The very southern extent of the Lower Middle River Planning Region lies in Polk County. The dominant economic driver of the Lower Middle River Planning Region is agriculture, which comprises 90% of land area in this planning region.

Plan Area

29%
of Watershed

Size

430
Sq. Miles

Land Use

90%
Cultivated Crops

Communities

Argyle
Alvarado
Oslo

Counties

Marshall
Polk

Priority Goals

High Priority

- Altered Hydrology and Flood Damage Reduction
- Drainage Systems
- Stream Stability and Riparian Habitat
- Excess Sediment

Med Priority

- Soil Health
- Phosphorus Loading
- Groundwater

Lower Middle River Planning Region

Projects and Practices Action Table

The table below summarizes actions for implementing new structural and soil management practices. These actions will be funded by the Projects and Practices Implementation Program, described more in **Section 6**. Practices will be targeted to prioritized resources, shown by maps on the following two pages. Outputs and costs show what will be accomplished with Level 2 (Current Funding + WBIF) funding, and what will be pursued under Level 3 (Partner and Other Funding).

			Measurable Goals										Timeline						
Action	**Prioritized Resources**	**Metric**	**Altered Hydrology and FDR**	**Drainage Systems**	**Stream Stability and Riparian Habitat**	**Excess Sediment**	**Soil Health**	**Phosphorus Loading**	**Groundwater**	**Upland and Wetland Habitat**	**Excess *E. coli***	**Implementation Lead (in bold) and Partners**	**2023-2024**	**2025-2026**	**2027-2028**	**2029-2030**	**2031-2032**	**Annual Cost for Years Implemented**	**Total 10-Year Cost Level 2 (Current+WBIF)**
Storage and Protection Conservation Practices (e.g., drainage water management, wetland restorations, infiltration basins, grade stabilizations, and side water inlet)	Field-Scale Practices (Pg. 5-11)	7,857 tons sediment / year 6,312 lbs TP / year 115,535 lbs TN / year	●	o	●	●		●	o	o	o	**SWCDs,** MSTRWD, NRCS, BWSR, MDA	●	●	●	●	●	$200,050	$2,000,500
Soil Management Practices (e.g., cover crops, reduced tillage, regenerative farming and carbon credits, windbreaks, MAWQCP, and prescribed grazing)	Locally Defined using PTMApp Data	2,781 acres treated 3,521 tons sediment / year 532 lbs TP / year 10,719 lbs TN / year	o	o	o	●	●	●	o	o	o	**SWCDs**, MSTRWD**,** NRCS, BWSR**,** MDA	●	●	●	●	●	$50,070	$500,700
Ditch system enhancement projects (e.g., grade stabilization structures in ditch bottom)	Ditch - Enhance: County Ditch (CD) 21, Judicial Ditch (JD) 16, JD 20, JD 24, JD 29, MCD 7, MCD 38, MCD 44, CD 3 (Pg. 5-12)	11 miles of ditch systems enhanced	●	●		o		o				**MSTRWD**, **Counties**, SWCDs	●	●	●	●	●	$44,000	$440,000
Stream channel enhancement projects (e.g., grade stabilization of watercourses, rock riffles, and bank stabilization)	Stream - Enhance: State Ditch 5/Snake River (Pg. 5-12)	2.6 miles of stream enhanced	o		●	o		o				**MSTRWD**, SWCDs, DNR	●	●	●	●	●	$13,200	$132,000
Seal abandoned wells	DWSMAs (Pg. 5-12)	3 wells sealed / year; or 30 wells							●			**SWCDs**, MDH, Counties	●	●	●	●	●	$2,400	$24,000
Land protection programs incentivized with WBIF (e.g., CRP)	Prairie Core Areas (Pg. 5-12)	450 acres of land re-enrolled	o	o	●	o	o	o	o	●	o	**SWCDs**, MSTRWD, NRCS, TNC, DNR, BWSR	●	●	●	●	●	$27,000	$270,000
Federal land protection programs	Prairie Core Areas (Pg. 5-12)	**Funding Level 3**	o	o	●	o	o	o	o	●	o	*USDA, NPS, USFWS, DOI*	●	●	●	●	●	**Funding Level 3**	As funds are available
Update small municipal wastewater systems	Snake River (Pg. 5-12)	**Funding Level 3**						o	o		●	***Counties***, ***MPCA***, *BWSR*	●	●	●	●	●	**Funding Level 3**	As funds are available
***E. coli*fecal contamination management practices** (e.g., cattle fencing, SSTS, manure management, and feedlot runoff controls)	Snake River (Pg. 5-12)	2 projects	o		●	o		●			●	**SWCDs**, **Counties**, **MPCA**, NRCS, BWSR		●	●	●	●	$1,800	$15,000
																		Total 10-Year Cost for Level 2 (Current + WBIF)	**$3,382,300**

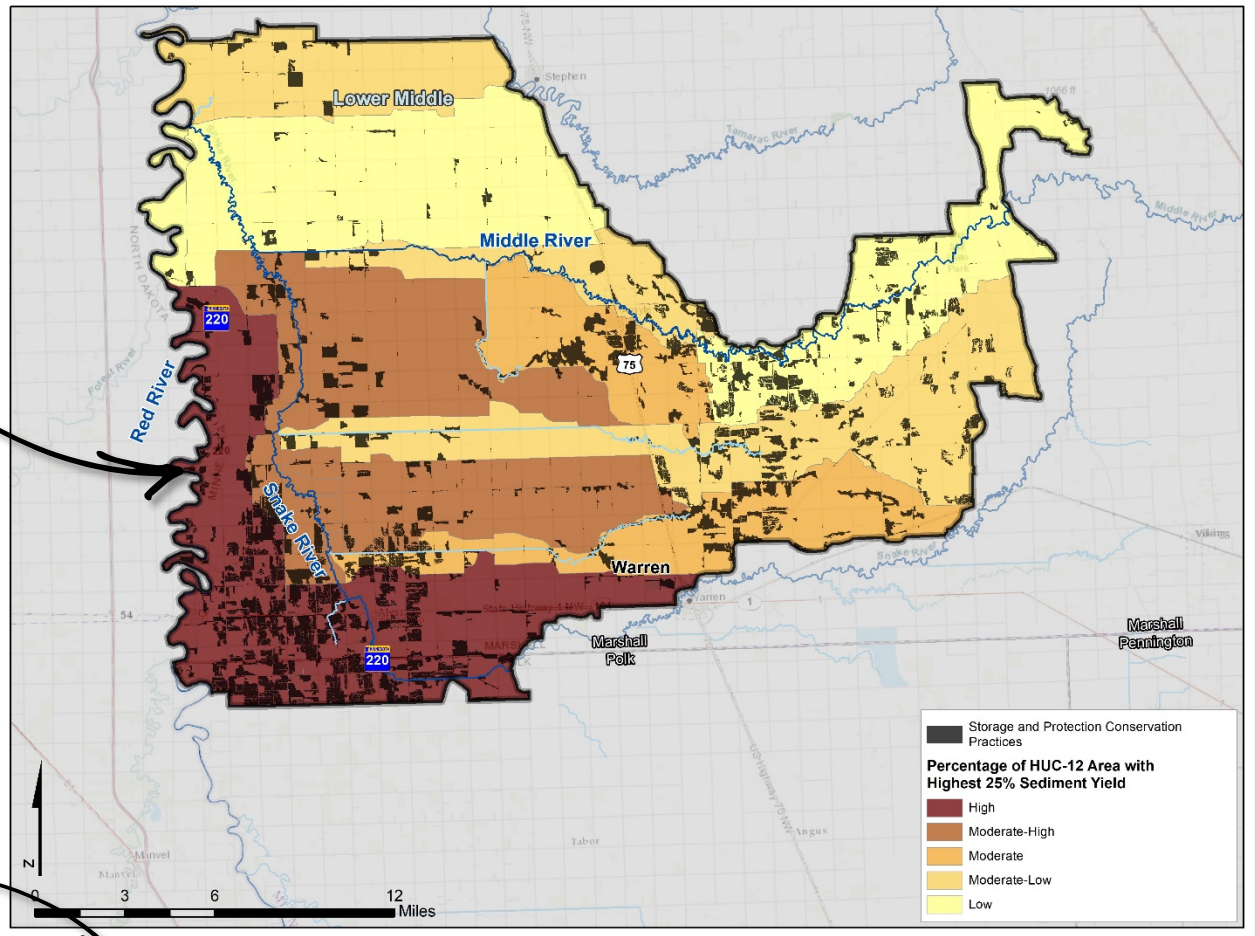
● = *Direct Impact; o = Indirect Impact*

Lower Middle River Planning Region

Field-Scale Practices

Shown on the map are the specific field-scale **storage and protection conservation practices** (shown in black) and the **subwatershed areas that experience the most sediment loss** (shown in red) in the planning region. Implementing practices in these locations will make the most progress towards plan measurable goals.

Planning partners recognizes that implementing storage and protection conservation practices is voluntary. To allow for flexibility during implementation, the **average costs and benefits for storage and protection conservation practices in the Lower Middle Planning Region is provided here**, as estimated by PTMApp at the edge of the field.



NRCS Practice Type	Average Load Reduction Per Practice			Average Cost ($)
	Sediment (tons/yr)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	
Drainage Water Management (Treats 50 Acres)	11	11	195	$588
Large Wetland Restoration	17	6	279	$27,316
Infiltration Trench/Small Infiltration Basin	5	4	53	$23,354
Grade Stabilization	5	0	7	$4,000

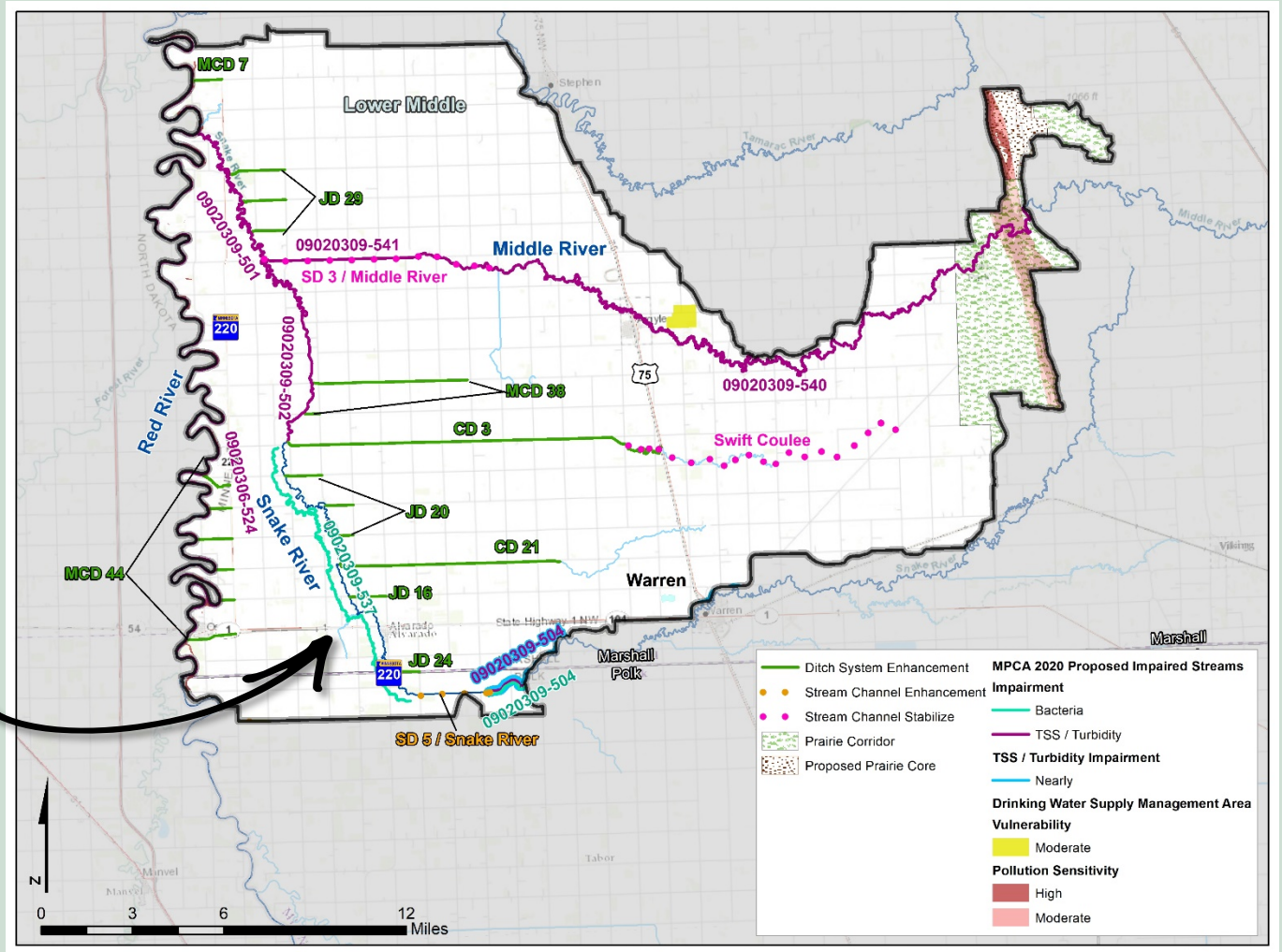
Lower Middle River Planning Region

Prioritized Resources

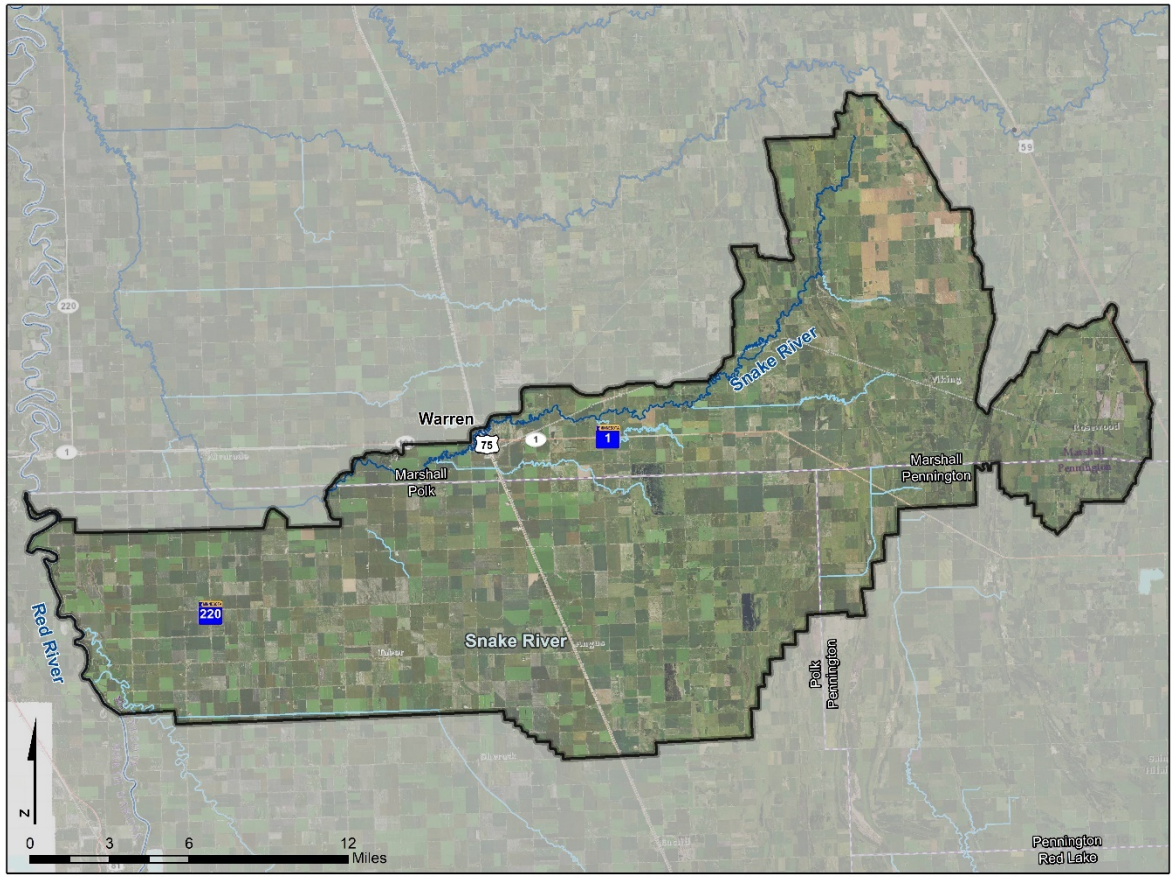
The Action Table for the Lower Middle Planning Region contains actions beyond just storage and protection conservation practices targeted by PTMApp. These remaining **actions are targeted to the priority resources** identified by measurable goal in Section 4.

The priority resources that fall within the Lower Middle River Planning Region are summarized by name within the Action Table and are shown visually on this map.

For example, *E. coli/fecal contamination* management projects will be targeted to the Snake River to make progress towards de-listing it.



Snake River Planning Region



Planning Region Overview

The Snake River Planning Region, like most in the Red River Valley, is a flat, agricultural region which is comprised of four HUC-10 subwatersheds. The most populated city in the MSTR Watershed and the Marshall County seat, Warren, is in the Snake Planning Region, along with the town of Viking. The Marshall County Fair, held in Warren, is a popular attraction every summer. The Holiday Open House commemorates the opening of deer season in the fall. The dominant economic driver of the Snake is agriculture, which comprises 83% of land area in this planning region.

Plan Area

29%
of Watershed

Size

430
Sq. Miles

Land Use

83%
Cultivated Crops

8%
Wetland

Communities

Warren,
Viking

Counties

Marshall
Polk
Pennington

Priority Goals

High

- Altered Hydrology and Flood Damage Reduction
- Drainage Systems
- Stream Stability and Riparian Habitat

Med Priority

- Soil Health
- Excess Sediment
- Phosphorus Loading
- Groundwater
- Upland and Wetland Habitat

Snake River Planning Region

Projects and Practices Action Table

The table below summarizes actions for implementing new structural and soil management practices. These actions will be funded by the Projects and Practices Implementation Program, described more in **Section 6**. Practices will be targeted to prioritized resources, shown by maps on the following two pages. Outputs and costs show what will be accomplished with Level 2 (Current Funding + WBIF) funding, and what will be pursued under Level 3 (Partner and Other Funding).

			Measurable Goals										Timeline						
Action	**Prioritized Resources**	**Output**	**Altered Hydrology and FDR**	**Drainage Systems**	**Stream Stability and Riparian Habitat**	**Excess Sediment**	**Soil Health**	**Phosphorus Loading**	**Groundwater**	**Upland and Wetland Habitat**	**Excess *E. coli***	**Implementation Lead (in bold) and Partners**	**2023-2024**	**2025-2026**	**2027-2028**	**2029-2030**	**2031-2032**	**Annual Cost for Years Implemented**	**Total 10-Year Cost Level 2 (Current+WBIF)**
Storage and Protection Conservation Practices (e.g., Drainage Water Management, Wetland Restorations, Infiltration Basins, Grade Stabilizations, and Side Water Inlets)	Field-Scale Practices (Pg. 5-15)	9,766 tons sediment / year 8,558 lbs TP / year 156,022 lbs TN / year	●	o	●	●		●	o	o	o	**SWCDs**, **MSTRWD,** NRCS, BWSR	●	●	●	●	●	$166,640	$1,666,400
Soil Management Practices (e.g., Cover crops, reduced tillage, regenerative farming and carbon credits, windbreaks, MAWQCP, and prescribed grazing)	Locally Defined using PTMApp Data	2,788 acres treated 4,283 tons sediment / year 538 lbs TP / year 10,854 lbs TN / year	o	o	o	●	●	●	o	o	o	**SWCDs**, MSTRWD**,** NRCS, BWSR**,** MDA	●	●	●	●	●	$50,190	$501,900
Ditch system enhancement projects (e.g., grade stabilization structures in ditch bottom)	Ditch - Enhance: JD 14 - Lilac Ridge, JD 25-2 - Sections 31-32, WD 4, PCD 35 (Pg. 5-16)	10 miles of ditch systems enhanced	●	●		o		o				**MSTRWD**, **Counties**, SWCDs, DNR	●	●	●	●	●	$40,000	$400,000
Stream channel enhancement projects (e.g., grade stabilization of watercourses, rock riffles, and bank stabilization)	Stream - Enhance: JD 1 (Pg. 5-16)	7.5 miles of stream enhanced	o		●	o		o				**MSTRWD**, SWCDs	●	●	●	●	●	$37,500	$375,000
Seal abandoned wells	DWSMAs (Pg. 5-16)	3 wells sealed / year							●			**SWCDs**, MDH, Counties	●	●	●	●	●	$2,400	$24,000
Land protection programs incentivized with WBIF (e.g., CRP)	Prairie Core Areas (Pg. 5-16)	650 acres re-enrolled	o	o	●	o	o	o	o	●	o	**SWCDs**, MSTRWD, NRCS, TNC, DNR, BWSR	●	●	●	●	●	$39,000	$390,000
Federal land protection programs	Prairie Core Areas (Pg. 5-16)	**Funding Level 3**	o	o	●	o	o	o	o	●	o	USDA, NPS, USFWS, DOI	●	●	●	●	●	**Funding Level 3**	As funds are available
Update small municipal wastewater systems	Snake River, JD 75, CD 2, JD 1 (Pg. 5-16)	**Funding Level 3**						o	o		●	Counties, MPCA, BWSR	●	●	●	●	●	**Funding Level 3**	As funds are available
***E. coli*/fecal contamination management practices** (e.g., cattle fencing, SSTS, manure management, and feedlot runoff controls)	Snake River, JD 75, CD 2, JD 1 (Pg. 5-16)	2 projects implemented	o		●	o		●			●	**SWCDs**, **Counties, MPCA**, NRCS, BWSR		●	●	●	●	$1,880	$15,000
																		Total 10-Year Cost for Level 2 (Current + WBIF)	**$3,372,400**

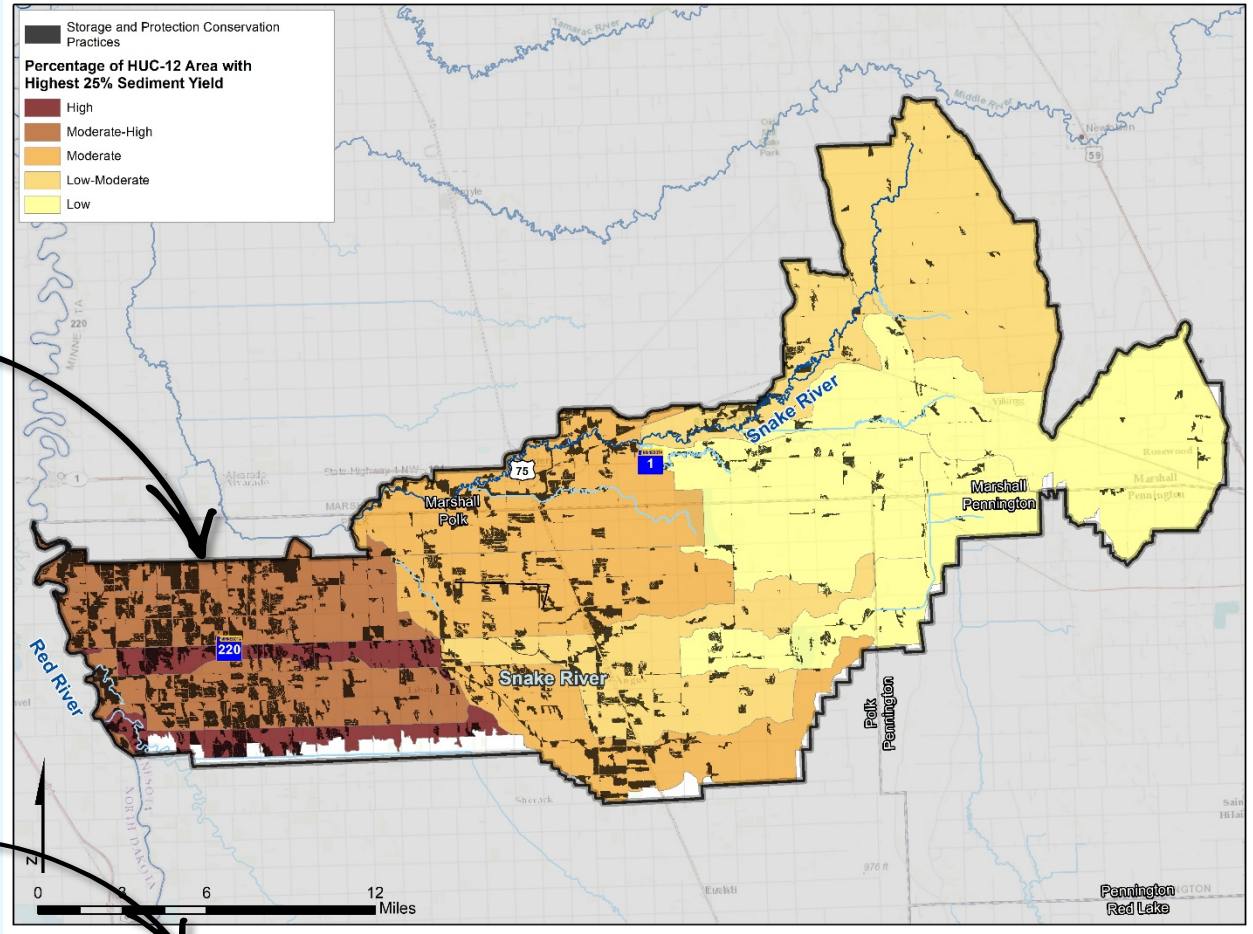
● = *Direct Impact; o = Indirect Impact*

Snake River Planning Region

Field-Scale Practices

Shown on the map are the specific field-scale **storage and protection conservation practices** (shown in black) and the **subwatershed areas that experience the most sediment loss** (shown in red) in the planning region. Implementing practices in these locations will make the most progress towards plan measurable goals.

Planning partners recognizes that implementing storage and protection conservation practices is voluntary. To allow for flexibility during implementation, the **average costs and benefits for storage and protection conservation practices in the Snake River Planning Region is provided here**, as estimated by PTMApp at the edge of the field.



NRCS Practice Type	Average Load Reduction Per Practice			Average Cost ($)
	Sediment (tons/yr)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	
Drainage Water Management (Treats 50 Acres)	16	15	274	$599
Large Wetland Restoration	10	4	158	$32,931
Infiltration Trench/Small Infiltration Basin	9	7	128	$54,492
Grade Stabilization	4	0	8	$4,000

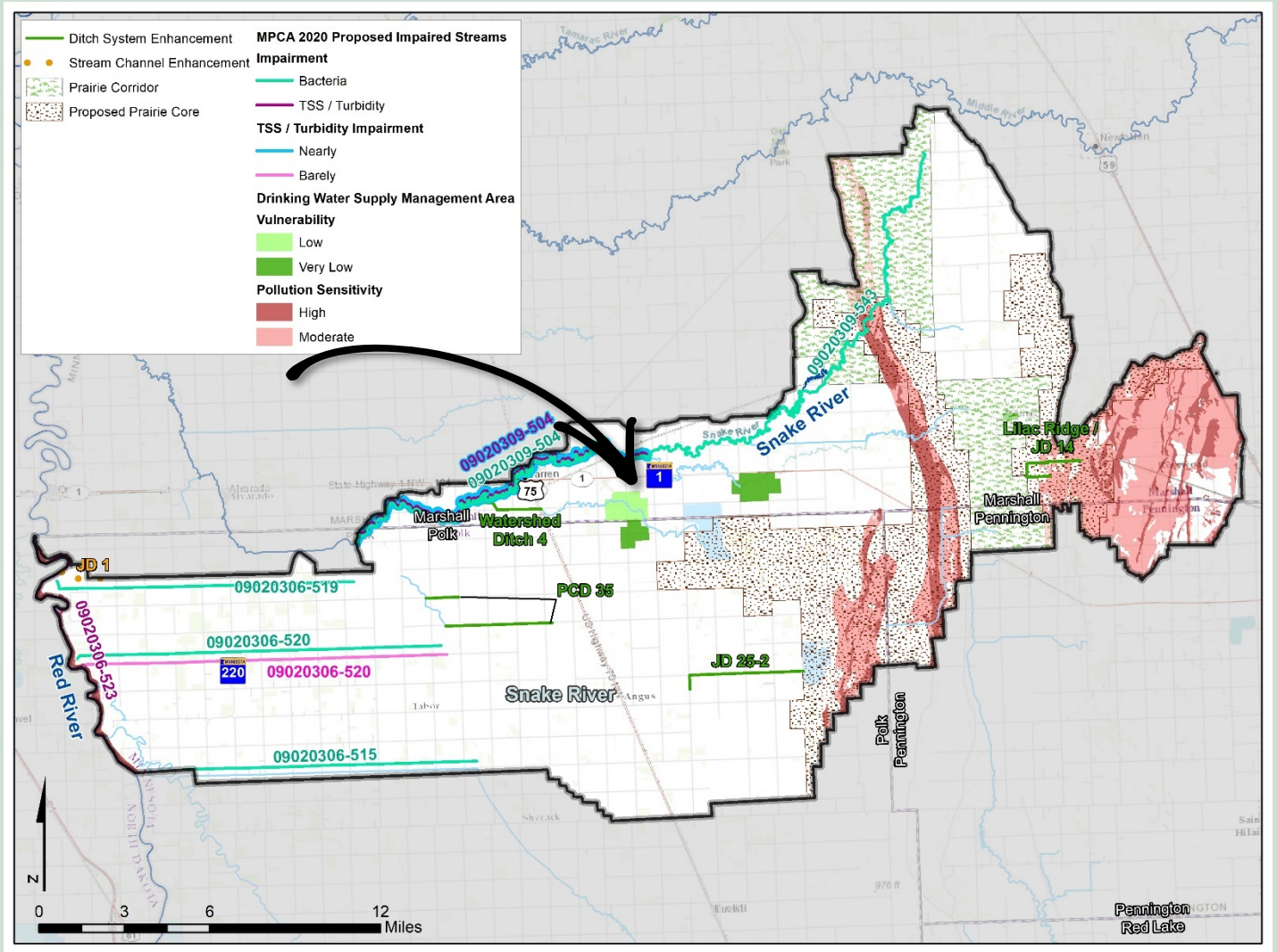
Snake River Planning Region

Prioritized Resources

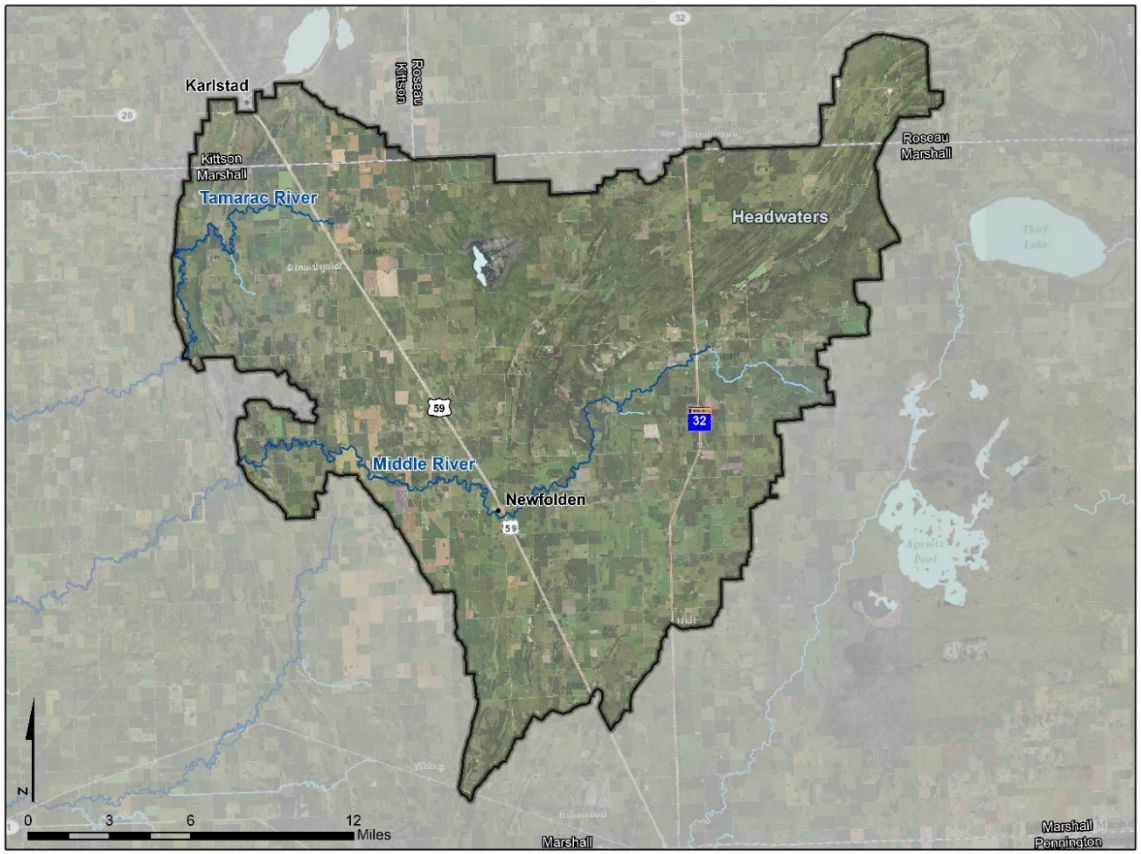
The Action Table for the Snake River Planning Region contains actions beyond just storage and protection conservation practices targeted by PTMApp. These remaining **actions are targeted to the priority resources** identified by measurable goal in Section 4.

The priority resources that fall within the Snake River Planning Region are summarized by name within the Action Table and are shown visually on this map.

For example, sealing abandoned wells will be targeted to Drinking Water Supply Management Areas (DWSMAs), two of which are pointed to by the arrow (DWSMAs shown in green).



Headwaters Planning Region



Planning Region Overview

The Headwaters Planning Region contains the most biodiversity in the MSTR Watershed, with beach ridges, wetlands, and forests. Agriculture comprises about 38% of land area here, with 43% wetlands. Newfolden is the most populous city in the planning region, with around 330 residents, followed by Middle River, Holt, and Strandquist. Residents enjoy hunting, fishing, camping, and wildlife viewing at the many WMAs. Communities in the MSTR Watershed engage in Lion's Club activities, community service days, and pet vaccination clinics, and attending events in local city parks.

Plan Area

27%
of Watershed

Size

390
Sq. Miles

Land Use

33%
Cultivated Crops

43%
Wetland

9%
Forest

6%
Hay/Pasture

Communities

Strandquist
Middle River
Newfolden
Holt

Counties

Marshall
Kittson
Roseau

Priority Goals

High

- Altered Hydrology and Flood Damage Reduction

Med Priority

- Drainage Systems
- Stream Stability and Riparian Habitat
- Excess Sediment
- Soil Health
- Phosphorus Loading
- Groundwater
- Upland and Wetland Habitat

Headwaters Planning Region

Projects and Practices Action Table

The table below summarizes actions for implementing new structural and soil management practices. These actions will be funded by the Projects and Practices Implementation Program, described more in **Section 6**. Practices will be targeted to prioritized resources, shown by maps on the following two pages. Outputs and costs show what will be accomplished with Level 2 (Current Funding + WBIF) funding, and what will be pursued under Level 3 (Partner and Other Funding).

			Measurable Goals										Timeline							
Action	**Prioritized Resources**	**Metric**	**Altered Hydrology and FDR**	**Drainage Systems**	**Stream Stability and Riparian Habitat**	**Excess Sediment**	**Soil Health**	**Phosphorus Loading**	**Groundwater**	**Upland and Wetland Habitat**	**Excess *E. coli***	**Implementation Lead (in bold) and Partners**	**2023-2024**	**2025-2026**	**2027-2028**	**2029-2030**	**2031-2032**	**Annual Cost for Years Implemented**	**Total 10-Year Cost Level 2 (Current+WBIF)**
Storage and Protection Conservation Practices (e.g., Drainage Water Management, WASCOBs, Wetland Restorations, Riparian Buffers, Infiltration Basins, Grade Stabilizations, and Side Water Inlets)	Field-Scale Practices (Pg. 5-19)	1,963 tons sediment / year 1,782 lbs TP / year 34,122 lbs TN / year	●	o	●	●		●	o	o	o	**SWCDs**, **MSTRWD,** NRCS, BWSR	●	●	●	●	●	$81,660	$816,600
Soil Management Practices (e.g., Cover crops, reduced tillage, regenerative farming and carbon credits, windbreaks, MAWQCP, and prescribed grazing)	Locally Defined using PTMApp Data	1,439 acres treated 688 tons sediment / year 271 lbs TP / year 5,461 lbs TN / year	o	o	o	●	●	●	o	o	o	**SWCDs**, MSTRWD**,** NRCS, BWSR**,** MDA	●	●	●	●	●	$25,900	$259,000
Ditch system enhancement projects (e.g., grade stabilization structures in ditch bottom)	Ditch - Enhance: County Ditch 2, County Ditch 25 Lateral 4, County Ditch 25 Lateral 5, State Ditch 90 (Pg. 5-20)	6 miles of ditch systems enhanced	●	●		o		o				**MSTRWD**, **Counties**, SWCDs	●	●	●	●	●	$24,000	$240,000
Seal abandoned wells	DWSMAs (Pg. 5-20)	2 wells sealed / year							●			**SWCDs**, MDH, Counties	●	●	●	●	●	$1,600	$16,000
Land protection programs incentivized with WBIF (e.g., CRP)	Prairie Core Areas (Pg. 5-20)	550 acres re-enrolled	o	o	●	o	o	o	o	●	o	**SWCDs**, MSTRWD, NRCS, TNC, DNR, BWSR	●	●	●	●	●	$33,000	$330,000
Federal land protection programs	Prairie Core Areas (Pg. 5-20)	**Funding Level 3**	o	o	●	o	o	o	o	●	o	USDA, NPS, USFWS, DOI	●	●	●	●	●	**Funding Level 3**	As funds are available
Update small municipal wastewater systems	Judicial Ditch 19 (Pg. 5-20)	**Funding Level 3**						o	o		●	Counties, MPCA, BWSR	●	●	●	●	●	**Funding Level 3**	As funds are available
***E. coli*/fecal contamination management practices** (e.g., cattle fencing, SSTS, manure management, and feedlot runoff controls)	Judicial Ditch 19 (Pg. 5-20)	2 projects implemented	o		●	o		●			●	**SWCDs**, **Counties**, **MPCA**, NRCS, BWSR		●	●	●	●	$1,880	$15,000
																		Total 10-Year Cost for Level 2 (Current + WBIF)	**$1,676,600**

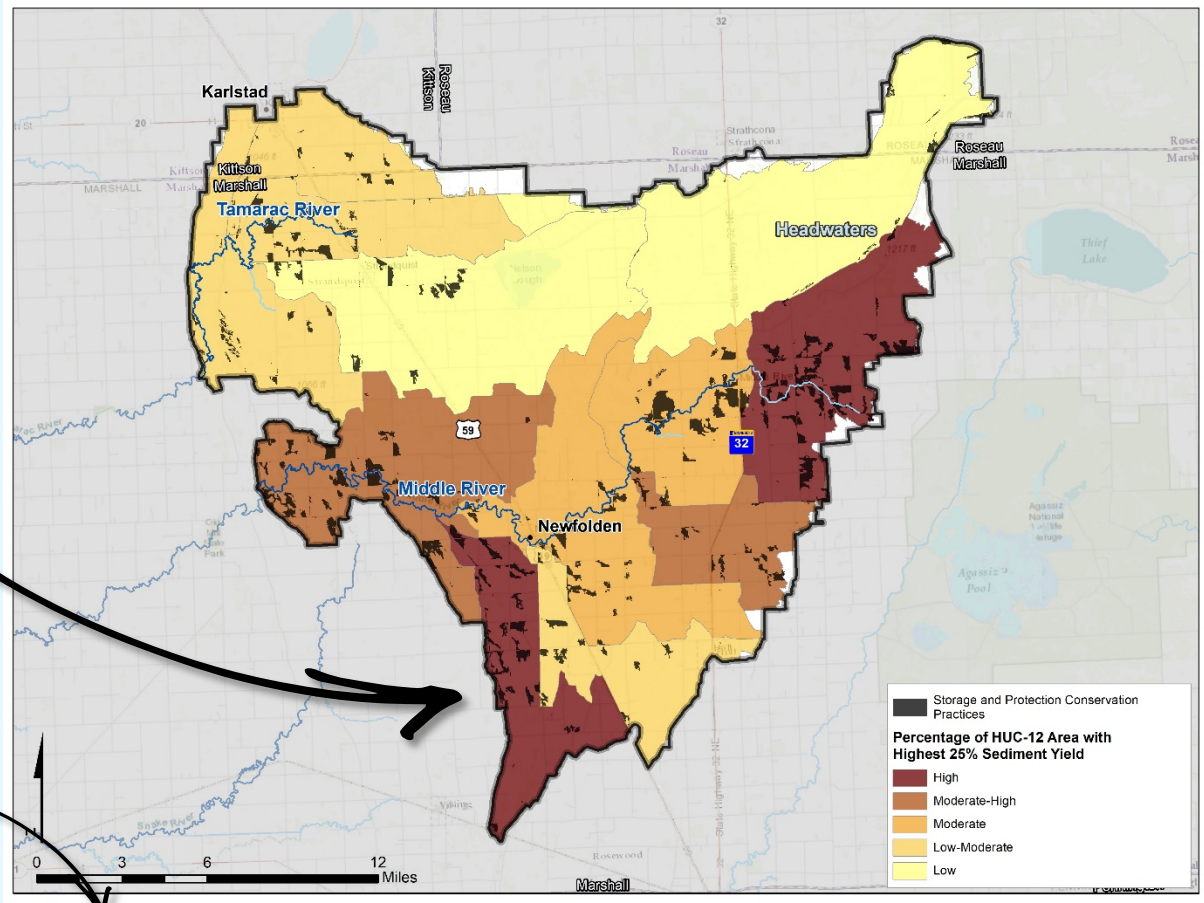
● = *Direct Impact; o = Indirect Impact*

Headwaters Planning Region

Field-Scale Practices

Shown on the map are the specific field-scale **storage and protection conservation practices** (shown in black) and the **subwatershed areas that experience the most sediment loss** (shown in red) in the planning region. Implementing practices in these locations will make the most progress towards plan measurable goals.

Planning partners recognizes that implementing storage and protection conservation practices is voluntary. To allow for flexibility during implementation, the **average costs and benefits for storage and protection conservation practices in the Headwaters Planning Region is provided here**, as estimated by PTMApp at the edge of the field.



NRCS Practice Type	Average Load Reduction Per Practice			Average Cost ($)
	Sediment (tons/yr)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	
Drainage Water Management (Treats 50 Acres)	2	2	45	$554
Water and Sediment Control Basin	3	4	52	$9,000
Large Wetland Restoration	6	6	188	$34,395
Riparian Buffer	2	4	74	$2,363
Grade Stabilization	3	0	8	$4,000
Grassed Waterway	2	1	12	$3,069

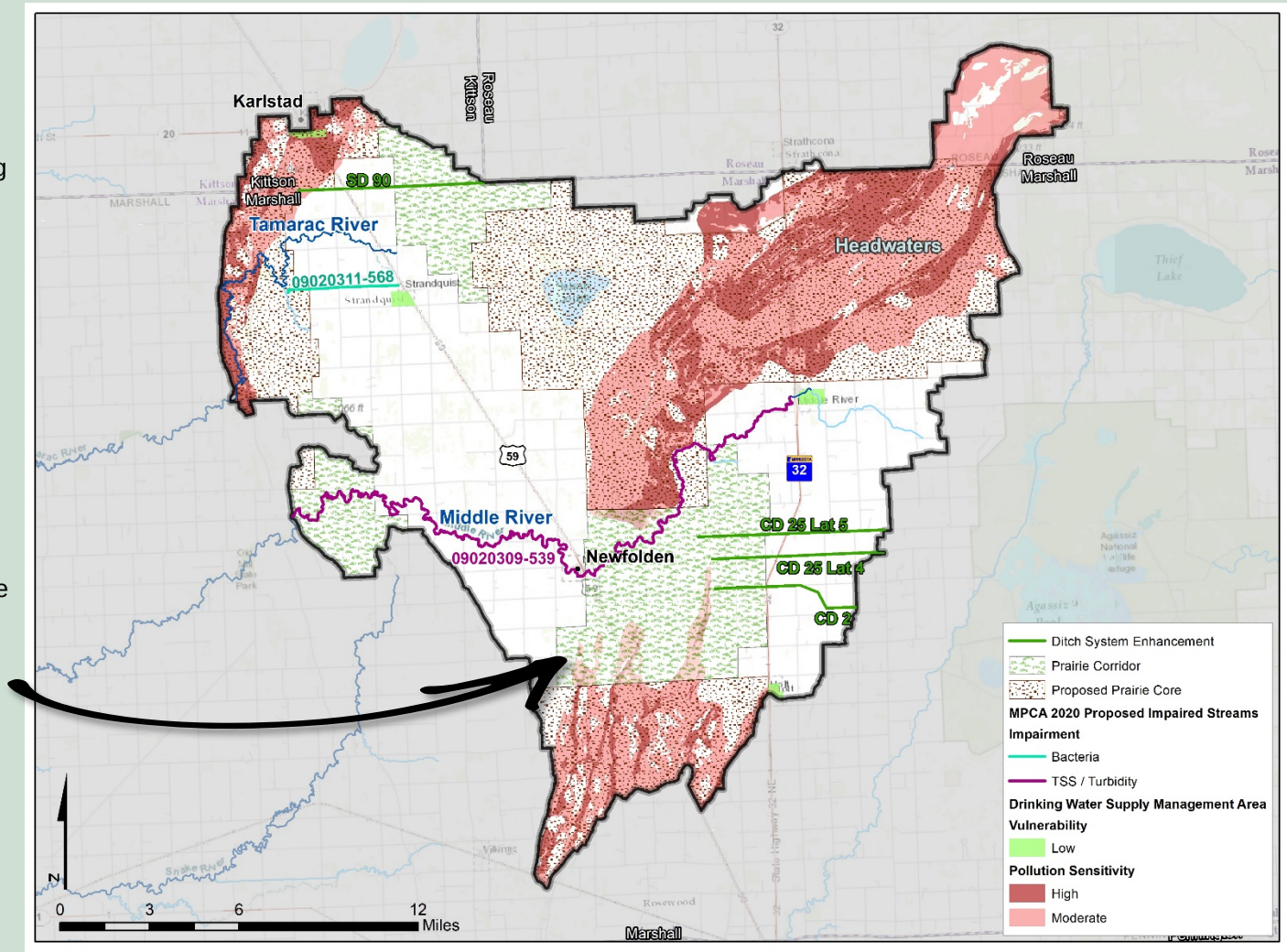
Headwaters Planning Region

Prioritized Resources

The Action Table for the Headwaters Planning Region contains actions beyond just storage and protection conservation practices targeted by PTMApp. These remaining **actions are targeted to the priority resources** identified by measurable goal in Section 4.

The priority resources that fall within the Headwaters Planning Region are summarized by name within the Action Table and are shown visually on this map.

For example, land protection programs will be targeted to prairie corridor and core areas shown in brown and green.



Capital Improvement Projects

The Capital Improvement Projects Action Table summarizes the actions pertaining to the construction, repair, retrofit, or increased utility or function of physical facilities, infrastructure, or environmental features. Capital improvements require external funding. These actions will be implemented watershed-wide, as project footprints and benefits span planning region boundaries. They will be implemented through the Capital Improvement Projects Implementation Program, described further in **Section 6**. Where eligible, the planning partners intend to use approximately 20% of the WBIF (~$110,000/year) to support implementation of these projects.

							Anticipated Benefits		
Project	**Description**	**Lead Entity**	**Information Source**	**Years (Start and End)**	**Status**	**Estimated Cost**	**Storage (Acre-feet)**	**Sediment Reduction (tons/yr)**	**Phosphorus Reduction (lbs/yr)**
Nelson Slough Improvement Project	Improve FDR and wildlife habitat within the Nelson Slough WMA	MSTRWD	Engineers Design Report (2021)	2021-2024	Preliminary design completed, currently going through EAW process	$8.8 Million	4,150	11,903	11,010
Lilac Ridge Water Management Project	Increase capacity through Lilac Ridge and perform grade stabilization within a portion of JD 14 with an off-channel impoundment in Viking Strip Township	MSTRWD	Engineers Design Report (2021)	2022-2025	Preliminary design completed, currently going through EAW process	$6.5 Million	2,853	5,734	6,164
Swift Coulee Channel Restoration	Restoration of Swift Coulee with setback levees and culvert sizing to minimize peak flow impacts and sediment transfer downstream	MSTRWD	Concurrence Point #3 Identification of the Selected Alternative (2021)	2022-2027	Preliminary study completed	$6.5 Million	114	8,273	7,652
City of Newfolden Flood Prevention Project	Remove City of Newfolden from the mapped 100-year floodplain by providing larger bridge structure through the railroad on the Middle River and off-channel impoundment in New Maine Township	MSTRWD	Project Brochure (2021)	2021-2023	Currently going through final design, permitting	$7.4 Million	1,800	5,000	4,625
State Ditch 3/Middle River Restoration	Repair the straightened portion of SD 3/Middle River	MSTRWD	Clean Water Grant Study	2022-2024	Applying for grant	$2 Million	7	9,075	9,756
Judicial Ditch 75 Repair	Repair from Red River of the North upstream 2.5 miles due to bank failures and channel bottom degradation	MSTRWD	District Ditch Inspection Report	2022-2023	Preliminary Design needs to be developed	$750k	12	2,295	2,123
Melgaard Coulee Restoration	Restoration of Melgaard Coulee to minimize peak flow impacts and sediment transfer downstream	MSTRWD	NA	2025-2030	Landowner meeting needed	$7 Million	108	4,614	4,268
City of Stephen Dam	Reduction of downstream erosion and associated stability issues within the City	DNR/City of Stephen	NA	2025-2030	DNR/City meeting needed	$2.5 Million	-	-	-

Capital Improvement Projects

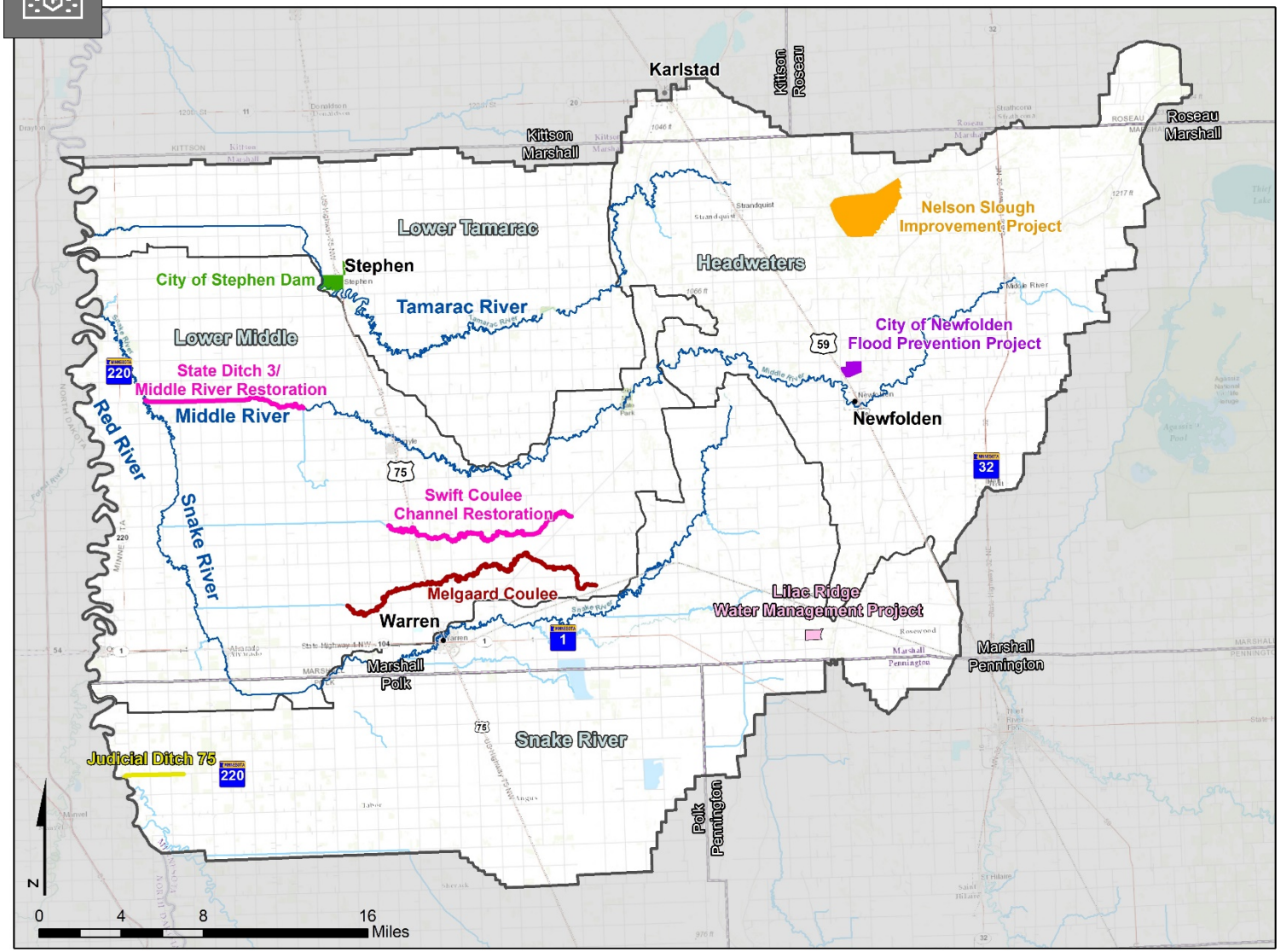


Figure 5-3: Capital Improvement Projects in the MSTR Watershed

Outreach Action Table

The Outreach Action Table summarizes the following types of actions:

- Community events;
- Workshops and demonstration sites; and
- Promotion for conservation action.

These actions will be implemented watershed-wide to promote consistency and sharing of services. They will be funded by the Outreach Implementation Program, described in **Section 6**.

			Measurable Goals									Timeline							
Action	Targeted Resources	Metric	Altered Hydrology and FDR	Drainage Systems	Stream Stability and Riparian Habitat	Excess Sediment	Soil Health	Phosphorus Loading	Groundwater	Upland and Wetland Habitat	Excess *E. coli*	Implementation Lead (in bold) and Partners	2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Annual Cost for Years Implemented	Total 10-Year Cost Level 2 (Current+WBIF)
Continue and expand general education and outreach activities by jurisdictional area	Watershed-wide	Ongoing	o	o	o	o	o	o	o	o	o	**SWCDs**, MSTRWD, Counties		●	●	●	●	$30,000	$300,000
Develop and implement a coordinated education and outreach plan among watershed partners to promote consistent strategies, materials, and messaging	Watershed-wide	1 program	o	o	o	o	o	o	o	o	o	**Plan partners**	●					$25,000	$25,000
Promote and showcase soil health demonstration sites using conservation farming practices (tillage management, cover crops, etc.)	Watershed-wide	1 site / year	o	o	o	●	●	●	o	o	o	**SWCDs**, NRCS, MDA, BWSR	●	●	●	●	●	$2,000	$20,000
Conduct private well water testing clinics	DWSMAs	1 clinic / year							●			**SWCDs**, MDH		●	●	●	●	$2,500	$20,000
Provide guidance on treatment options for groundwater contaminants	DWSMAs	Ongoing							●			**SWCDs**, MDH	●	●	●	●	●	$1,000	$10,000
Increase outreach for CRP incentives	Recharge areas and Prairie Plan areas	Ongoing	o	o	o	o	o	o	o	●	o	**SWCDs**, MSTRWD, NRCS, TNC, DNR, BWSR	●	●	●	●	●	$2,000	$20,000
Promotion of wetland banking	Watershed-wide	Ongoing	●			o		o	●	●	o	**SWCDs**, MSTRWD, DNR, NRCS, TNC	●	●	●	●	●	$2,000	$20,000
Promotion of technology for strategic irrigation management and other conservation outreach related to groundwater supplies	Beach Ridge / Middle River Surficial Aquifers	Ongoing	o	o		o	o	o	●	o	o	**SWCDs**, **MSTRWD**, DNR, MDH	●	●	●	●	●	$1,400	$14,000
Increase awareness of well interference and groundwater impacts in the watersheds	Beach Ridge / Middle River Surficial Aquifers	Ongoing	o	o		o	o	o	●	o	o	**SWCDs**, **MSTRWD**, DNR, MDH	●	●	●	●	●	$1,500	$15,000
Promote local SSTS upgrades through paper advertising and website information	Watershed-wide	Ongoing									●	**Counties**, MPCA	●	●	●	●	●	$2,000	$20,000
Promoting of BMPs for well contamination controls	DWSMAs	Ongoing	o	o		o		o	●	o	o	**SWCDs**, MSTRWD, DNR, MDH	●	●	●	●	●	$1,500	$15,000
																		Total 10-Year Cost for Level 2 (Current + WBIF)	**$479,000**

● = *Direct Impact; o = Indirect Impact*

Data Collection and Monitoring Action Table

The Data Collection and Monitoring Action Table summarizes the following types of actions:

- Closing known data gaps;
- General monitoring efforts; and
- Feasibility studies to better support implementation

These actions will be implemented watershed-wide to promote consistency and sharing of services. They will be funded by the Data Collection and Monitoring Implementation Program, described in **Section 6**.

			Measurable Goals										Timeline							
Action	Targeted Resources	Metric	Altered Hydrology and FDR	Drainage Systems	Stream Stability and Riparian Habitat	Excess Sediment	Soil Health	Phosphorus Loading	Groundwater	Upland and Wetland Habitat	Excess *E. coli*	Implementation Lead (in bold) and Partners	2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	Annual Cost for Years Implemented	Total 10-Year Cost Level 2 (Current+WBIF)
Continue and expand surface water monitoring efforts by jurisdictional area	Watershed wide	Ongoing				●		●			●	**SWCDs**, **MSTRWD**, MPCA, DNR, USGS	●	●	●	●	●	$18,300	$163,000
Develop multipurpose drainage management plans	Watershed wide	1 plan developed	o	●	o	o		o			o	**MSTRWD, Counties**	●					$20,000	$20,000
Develop process to prioritize stream reaches for restoration and enhancement	Watershed wide	Prioritization process developed	o		●	o		o			o	**MSTRWD**, SWCDs, DNR, BWSR	●					$10,000	$10,000
Develop a contingency plan for drought (minimum 2 research papers – one on surficial Beach Ridge / Middle and one for deep aquifer)	Beach Ridge / Middle River Surficial Aquifers	2 research papers developed	o	o					●	o		**MSTRWD**, SWCDs, DNR, BWSR		●	●			$12,500	$50,000
Create a strategic plan with Prairie Plan Technical Team to use to apply for funding	Prairie Plan areas	1 plan developed	o	o	o	o	o	o	o	●	o	**SWCDs**, MSTRWD, DNR	●					$10,000	$10,000
Map 10-year floodplain to inform conservation action / protection programs	Watershed-wide	Floodplain maps complete	●	o	o	o	o	o		o	o	**MSTRWD**, Counties, FEMA, DNR		●				$20,000	$40,000
Lab analysis of DNA of fecal organisms to determine which animal group is the source (Microbial Source Tracking [MST])	Watershed-wide	2 lab analyses									●	**SWCDs**, MSTRWD, MPCA		●				$10,000	$10,000
Develop feasibility studies to provide case specific solutions for ditch systems needing repair	Watershed-wide	2 feasibility studies	o	●						o		**MSTRWD**, Counties, SWCDs, Ditch Authorities	●	●	●	●		$12,500	$100,000
Complete the Geological Atlas	Watershed-wide	Atlas completed							●			**MGS, DNR**, SWCD, Counties				●	●	**Level 3- Partner**	*As funding available*
Groundwater level monitoring and data sharing (quantity, monitor against recharge and discharge)	Beach Ridge / Middle River Surficial Aquifers	Ongoing	o	o	o				●	o		**MPCA, MSTRWD**, **DNR,** SWCDs, IWI, MDH	●	●	●	●	●	$3,000	$30,000
Complete a culvert inventory to identify culverts that are barriers within the watersheds	Watershed-wide	Inventory completed	o		o							**SWCDs**, Counties, DNR	●	●	●	●	●	$2,000	$20,000
● = *Direct Impact; o = Indirect Impact*												**Total 10-Year Cost for Level 2 (Current + WBIF)**							**$453,000**

Regulatory Action Table

The Regulatory Action Table summarizes actions pertaining to the administration of statutory obligations and local ordinances. These actions are implemented watershed-wide to promote consistency and sharing of services. The actions in this table will be funded and guided by the Regulatory Implementation Program. A summary of the implementation program and how each local entity administers statutory obligations and local ordinances is provided in **Section 6 – Plan Implementation Programs**. Local government units may seek opportunities to align specific regulatory standards across county boundaries.

			Measurable Goals										Timeline				
Action	Targeted Resources	Metric	Altered Hydrology and FDR	Drainage Systems	Stream Stability and Riparian Habitat	Excess Sediment	Soil Health	Phosphorus Loading	Groundwater	Upland and Wetland Habitat	Excess *E. coli*	Implementation Lead	2023-2024	2025-2026	2027-2028	2029-2030	2031-2032
Administer shoreland ordinances and permitting programs	Watershed-wide	Ongoing	o	o	o	●		●	o		o	Counties, DNR	●	●	●	●	●
Administer floodplain ordinances and permitting programs	Watershed-wide	Ongoing	●	o	o	o		o	o	o	o	Counties, MSTRWD, DNR	●	●	●	●	●
Administer subsurface sewage treatment system (SSTS) local ordinances, sanitation codes, and zoning requirements	Watershed-wide	Ongoing						●	o		●	Counties	●	●	●	●	●
Administer solid waste management ordinances, zoning requirements, and solid waste comprehensive plans	Watershed-wide	Ongoing						●	o		●	Counties, MSTRWD	●	●	●	●	●
Administer emergency hazard management ordinances and plans	Watershed-wide	Ongoing	●						o	o		Counties	●	●	●	●	●
Administer feedlots in accordance with local ordinances and MN Rules Chapter 7020	Watershed-wide	Ongoing						●	o	o	●	Counties, MPCA	●	●	●	●	●
Administer stream and public water buffers as required by the state buffer law requirements	Watershed-wide	Ongoing	●	●	●	●	o	●	o		●	SWCD, Counties, MSTRWD	●	●	●	●	●
Administer MN Statute Chapter 103E for the management and maintenance of public drainage systems	Watershed-wide	Ongoing	o	●	●	o		o	o	o	o	Counties, MSTRWD	●	●	●	●	●
Administer local land and resource management ordinances related to aggregate management	Watershed-wide	Ongoing	o			o			o	●		Counties	●	●	●	●	●
Administer the Minnesota Wetland Conservation Act	Watershed-wide	Ongoing	●					o	o	●	o	SWCD	●	●	●	●	●
Administer wellhead protection plans and consider groundwater and drinking water resources in land use planning decisions	Watershed-wide	Ongoing							●			Counties, Cities, MDH	●	●	●	●	●
Manage stormwater and construction erosion control in accordance with the National Pollutant Discharge Elimination System (NPDES)	Watershed-wide	Ongoing	o	o	o	●				o		Counties, MSTRWD	●	●	●	●	●
Administer aquatic invasive species permitting programs	Watershed-wide	Ongoing			●					●		Counties, SWCD, MSTRWD	●	●	●	●	●

● = *Direct Impact; o = Indirect Impact*

Estimated Cost of Implementing the Plan

Below are the estimated costs for implementing actions in the plan for Funding Level 2 (Current Funding + WBIF) (**Table 5-3**). Costs are also included for the operations and maintenance of natural and artificial waterways at or near their current levels, for regulatory action, and for plan administration and administrative costs related to implementation. This plan assumes local, state, and/or federal fiscal support remains unchanged.

Table 5-3: Estimated cost of implementing the Middle-Snake-Tamarac CWMP under Funding Level 2 (Current Funding + WBIF).

	Funding Level 2 Current + WBIF	
	Est. Annual Cost	Est. 10-Year Cost
Implementation Programs		
Projects and Practices	$1,154,100	$11,541,000
Capital Improvement Projects	$700,200	$7,002,000
Data Collection and Monitoring	$45,300	$453,000
Outreach	$47,900	$479,000
Regulatory	$151,600	$1,516,000
Additional Expenses		
Operations and Maintenance	$985,600	$9,856,000
Administration	$55,000	$550,000
Total	**$3,139,700**	**$31,397,000**

Plan Benefits

Under Funding Level 2, planning partners aim to achieve the following improvements* in the watershed. This claims the benefits of actions in the Projects and Practices Action Tables. Additional benefits will also be gained from implementation of CIPs, and behavioral changes and informed action associated with Outreach, Data Collection and Monitoring, Regulatory, and Operations and Maintenance activities.

Sediment

37,368 tons/year reduced

Total Phosphorus

24,258 lbs/year reduced

Total Nitrogen

447,045 lbs/year reduced

**As estimated by PTMApp at the edge of the field*

Middle
-Snake-
Tamarac
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CWMP

Plan Implementation Programs






6. Implementation Programs

Implementation programs are the funding mechanism to implement actions in the Action Tables. This plan establishes common implementation programs within the plan area and describes them conceptually in this section. There are five main programs: Projects and Practices, Capital Improvement Projects, Regulatory, Outreach, and Data Collection and Monitoring (**Figure 6-1**).

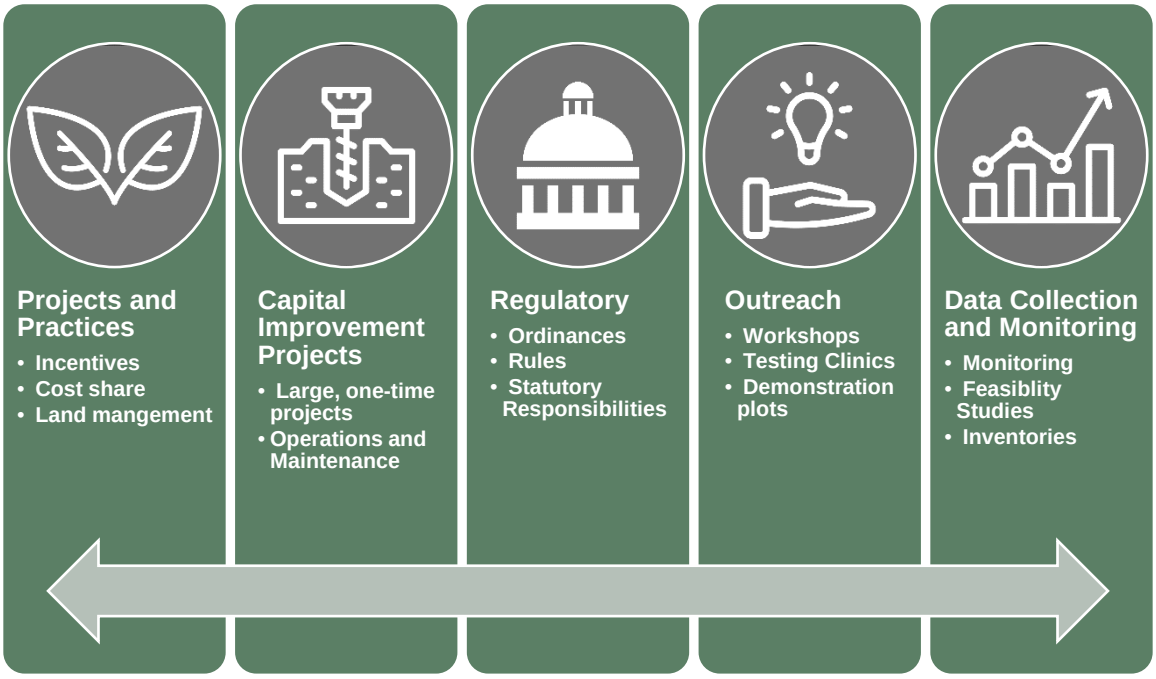


Figure 6-1: Implementation programs for the MSTR Watershed Comprehensive Watershed Management Plan


CRP planted by the Marshall SWCD

Projects and Practices Program

Dollars used to implement conservation practices on the landscape, protect land, and seal wells are funded by the Projects and Practices Program. This implementation is broken into a variety of subprograms: Cost Share Programs, Land Protection Programs, Land Retirement Programs, and Low-Interest Loans. These programs are typically administered by the Soil and Water Conservation Districts (SWCDs) in the watershed. Practices funded through these programs apply to most of the goals established by this plan.

Applicable Plan Goals:

- Altered Hydrology and Flood Damage Reduction
- Drainage Systems
- Stream Stability and Riparian Habitat
- Excess Sediment
- Soil Health
- Phosphorus Loading
- Groundwater
- Upland and Wetland Habitat
- Excess *E. coli*

Cost Share Programs

The purpose of cost-share programs is to financially assist landowner(s) with the cost of installing a project that accrues natural resource benefits. Implementing soil health practices such as cover crops and reduced tillage are applicable examples of practices that could be incentivized through cost share programs. Cost-share programs can also be used for structural practices. Installing structural water and sediment control basins, grade stabilizations, and well sealing are applicable examples that meet the goals of this plan.

During and after installation, regular on-site inspections and maintenance will ensure the project's continued function and success. These details, along with records including notes and photos should be included with each project's Operations and Maintenance Plan. BWSR's recommended inspection plans, according to the Grants Administration Manual (GAM), includes a conservation practice with a minimum effective life of 10 years. With this practice, inspections at the ends of years 1, 3, and 9 after the certified completion are recommended.

Land Protection Programs

Conservation Easements

Conservation easements are voluntary, legal agreements between a landowner and governmental or non-profit organization, whereby land use and development are limited on a property while conserving natural resources on the landscape. The easements are individually tailored agreements with an organization such as BWSR, DNR, the Minnesota Land Trust, or The Nature Conservancy (TNC).

Reinvest in Minnesota (RIM) Reserve Program

BWSR's RIM program aims to improve water quality and flooding through habitat protection on private lands. RIM conservation easements permanently protect, restore, and manage critical resources on economically marginal, flood-prone, environmentally sensitive, or highly erodible lands, while leaving land in private ownership. The RIM program seeks to restore wetlands, grasslands, wildlife habitat complexes, and riparian buffers.

Land Acquisition

For areas with unique and important resources that meet state goals, the DNR, USFWS, counties, cities, townships, the MSTRWD, and other entities may purchase and manage the land. An example includes WMAs that are used for small game hunting and waterfowl migration.

Land Retirement Programs

Conservation Reserve Program (CRP)

CRP is a federally funded program administered by the USDA Farm Service Agency (FSA). CRP is a voluntary program that contracts with agricultural producers so that environmentally sensitive agricultural land is not farmed or ranched, but instead is devoted to conservation benefits. CRP participants establish long-term, resource-conserving plant species to control soil erosion, improve water quality and develop wildlife habitat. In return, FSA provides participants with rental payments and cost-share assistance. Contract duration is 10-15 years.

Wetlands Reserve Program (WRP)

The WRP is a federally funded, voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

Lands eligible for WRP are:

- wetlands farmed under natural conditions;
- farmed wetlands;
- converted cropland;
- farmed wetland pasture;
- certain lands that have the potential to become a wetland as a result of flooding;
- rangeland, pasture, or forest production lands where the hydrology has been significantly degraded and can be restored;
- riparian areas that link protected wetlands;
- lands adjacent to protected wetlands that contribute significantly to wetland functions and values; and
- wetlands previously restored under a local, state, or federal program that need long-term protection.

Low-Interest Loans

Low-interest loans may be made available for projects that reduce existing water quality problems, septic system replacement, small community wastewater systems, agricultural BMPs, and other projects that meet eligibility criteria for funding.

Capital Improvements

A Capital Improvement Project (CIP) is a major non-recurring expenditure for the construction, repair, retrofit, or increased utility or function of physical facilities, infrastructure, or environmental features. CIPs are beyond the “normal” financial means of the Partnership, often exceeding $250,000, and are therefore unlikely to get constructed without external funding.

Applicable Plan Goals:

- Altered Hydrology and Flood Damage Reduction
- Drainage Systems
- Stream Stability and Riparian Habitat
- Excess Sediment
- Phosphorus Reduction

Section 5- Targeted Implementation shows proposed capital improvements within the plan area. Members of the Policy Committee or the Partnership's individual and representative Boards may discuss the means and methods for funding new CIPs with potential funding partners. CIPs completed through this plan will be operated and maintained by their owners for their lifespan.

As highlighted throughout this plan, public drainage systems are prevalent throughout much of the plan area. Drainage authorities help coordinate implementing the targeted implementation schedule to make progress towards measurable goals, including sediment delivery, altered hydrology and flood damage reduction, and ditch stability. Based on this engagement, drainage authorities could access implementation funds to adopt drainage actions in the Action Tables (**Section 5 – Targeted Implementation**) during 103D and 103E processes and procedures when the opportunity arises within the planning area.

Operations and Maintenance Program

Entities within the plan area are engaged in the inspection, operation, and maintenance of CIPs, stormwater infrastructure, public works, facilities, natural and artificial watercourses, and legal drainage systems. The operation and maintenance of natural watercourses, legal drainage systems, impoundments, and small dams will continue under the regular operations and maintenance plans of the entities that have jurisdiction over these systems. Please see **Figure 6-2** for a map of legal drainage system authorities within the MSTR Watershed.

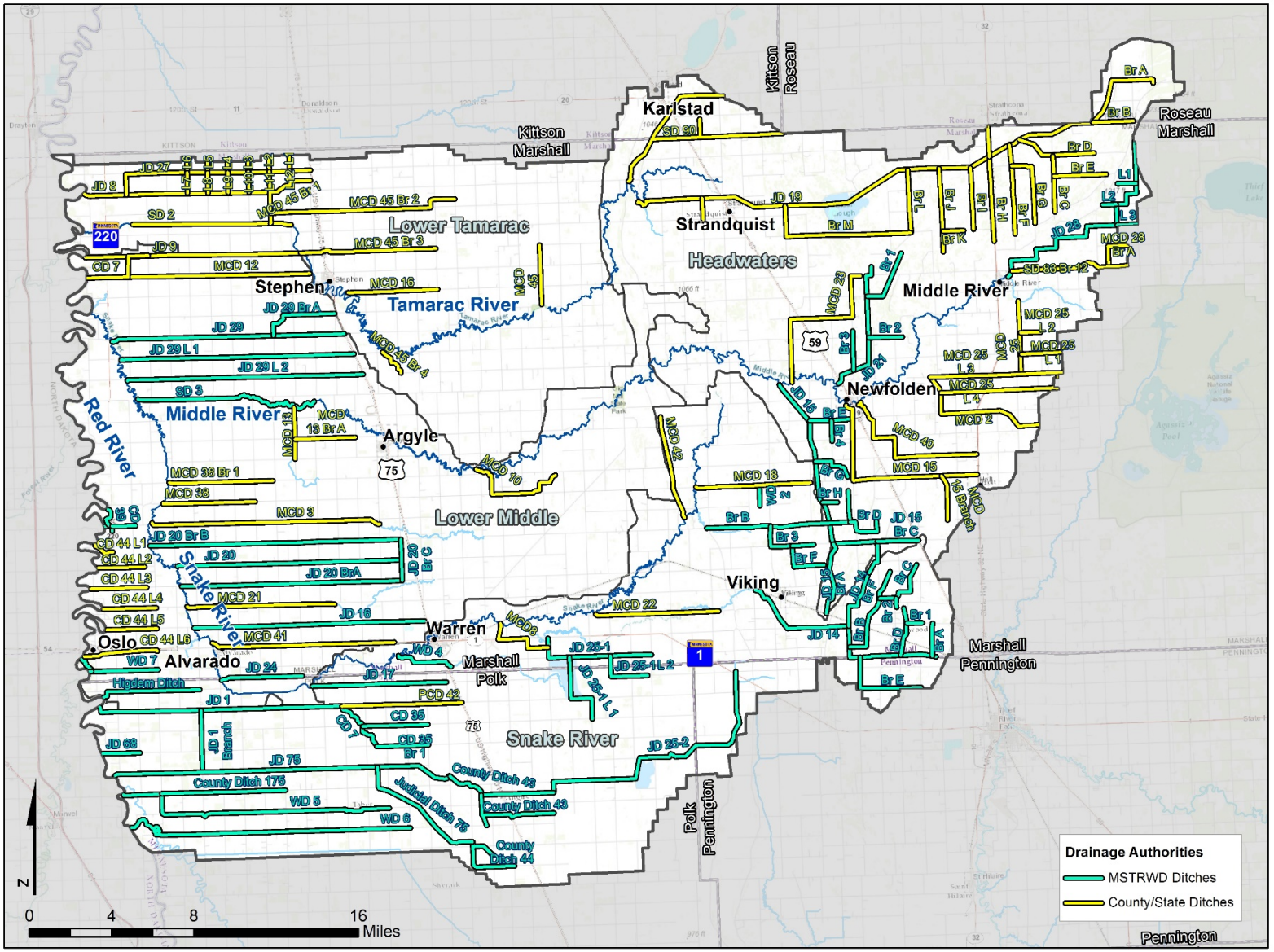


Figure 6-2: Legal drainage system authorities in the MSTR Watershed

Regulatory Program

Many plan issues can be addressed in part through the administration of statutory responsibilities and local ordinances. In many cases, local ordinances have been adopted to conform to (or exceed) the standards and requirements of state statutes. The responsibility for implementing these programs will remain with the respective counties or appointed LGUs. The MSTRWD has rule-making authority per Minnesota Statute 103D.341 and permitting authority per 103D.345. Current rules were adopted in 2021 and could periodically change throughout the life of this plan. The 2021 MSTRWD Rules are available in **Appendix F.** To review current rules, please see the MSTRWD website (www.mstrwd.org).

Counties and the watershed district will meet approximately once a year to discuss ordinances and counties will notify each other of proposed ordinance amendments. These entities will also review similarities and differences in local regulatory administration to identify local successes and identify changes needed in the future to make progress towards goals outlined in this plan. A full comparison of how local ordinances are used to administer statutory responsibilities is provided in **Appendix G.**

Applicable Plan Goals:

- Altered Hydrology and Flood Damage Reduction
- Drainage Systems
- Stream Stability and Riparian Habitat
- Excess Sediment
- Soil Health
- Phosphorus Loading
- Groundwater
- Upland and Wetland Habitat
- Excess *E. Coli*

Aggregate Management

Individual counties manage the development and extraction of aggregate resources through local zoning and ordinances. County governments will remain responsible for this process.

Aquatic Invasive Species

Aquatic invasive species can cause ecological and economic damage to water resources. The DNR has regulatory authority over aquatic plants and animals. Permits are required by the public for transporting and treating invasive species. In Polk County, the County oversees aquatic invasive species programs, whereas in Marshall County, the SWCD fills that role.

Buffers

The Riparian Protection and Water Quality Practices statute (Minnesota Statute 103F.48, commonly referred to as the Buffer Law) requires a 50-foot average continuous buffer of perennial vegetation with a 30-foot minimum width along all public waters and a 16.5-foot minimum width continuous buffer of perennial vegetation along all public drainage systems. Marshall County administers a buffer ordinance through the Highway Department while the state statute is administered through the zoning ordinance in Polk County. The MSTRWD also has jurisdiction through their rules on the drainage systems they manage.

In most situations, landowners have the option of working with their SWCD or watershed district to determine if other alternative practices aimed at protecting water quality can be used in lieu of (or in combination with) a buffer.

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

Construction Erosion Control

Temporary construction erosion control is the practice of preventing and/or reducing the movement of sediment from a site during construction. Projects disturbing one acre or more of land will require a National Pollutant Discharge Elimination System (NPDES) Permit from the MPCA. Polk County has regulations within its local zoning ordinance that address construction erosion control. Marshall County administers this rule through its shoreland ordinance. The MSTRWD regulates construction erosion control through their rules.

- Regulations: Minnesota Rules, Chapter 7090

Feedlots

Feedlot rules, regulations, and programs were established under MN Rules 7020 to govern the collection, transportation, storage, processing, and land application of animal manure and other livestock operation wastes. The program is administered through the MPCA, but local Counties may accept delegation of this authority. Marshall and Polk Counties have accepted this delegation and administer the rule through their feedlot ordinance and zoning ordinance, respectively. West Polk SWCD administers the MPCA Feedlot Program for Polk County.

- Regulations: Minnesota Rules, Chapter 7020

Floodplain Management

Floodplain zoning regulations aim to minimize loss of life and property, disruption of commerce and governmental services, extraordinary public expenditure for public protection and relief, and interruption of transportation and communication. To do this, these regulations are intended to guide development in the floodplain in a way that is consistent with the magnitude of these threats. The DNR and FEMA are in the process of updating floodplain maps on a county basis. Current flood maps can be found on the DNR website at https://www.dnr.state.mn.us/waters/watermgmt_section/floodplain/access-flood-maps.html. Floodplain zoning regulations are enforced through a floodplain ordinance in Marshall County, local zoning ordinance in Polk County, and through the MSTRWD Rules.

- Regulations: Minnesota Statutes 103F, 104, 394

Groundwater Protection Rule

The Minnesota Department of Agriculture (MDA) administers the Groundwater Protection Rule, which went into effect on June 24, 2019. The rule has two parts: Part 1 restricts the application of nitrogen fertilizer in the fall and on frozen soils; Part 2 responds to public water supply wells and elevated nitrate. Counties within the MSTR Watershed are excluded from Part 1 due to climatic conditions; public water supply wells within the watershed have not yet been identified as containing high nitrate levels, per Part 2.

- Regulations: Minnesota Statute 14.16

Groundwater Use

The DNR administers groundwater appropriation permits for all users who withdraw more than 10,000 gallons of water per day or 1 million gallons per year. SWCDs, counties, and municipalities cooperate with the state and are offered the opportunity to comment on landowners' permit applications.

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

Hazard Management

Hazard mitigation may be defined as any action taken to eliminate or reduce the future risk to human life and property from natural- and human-caused hazards. Extreme weather events and infrastructure resilience also play a part in hazard management. These requirements direct the State to administer cost-sharing. Hazard mitigation local emergency management departments are deployed in each of the contributing counties within the plan area.

- Regulations: Minnesota Statute 12

Land Use

Every county has a comprehensive plan that guides development and land preservation within its jurisdiction (see **Table 6-1**). These plans outline the types of ordinances that are used to regulate land use in the county. Marshall County manages their shoreland and septic ordinances through the comprehensive plan while Polk County utilizes it to implement county-wide land use zoning.

- Regulations: Minnesota Statute 473

Noxious Weed Law

Noxious weeds affect the natural, native balance of ecological functions. The Noxious Weed Law in Minnesota is administered by the MDA through SWCDs and counties. The State maintains noxious weed lists of those species to eradicate, control, restrict, and specially regulated plants. The most recent listing of noxious weeds in Minnesota can be obtained from the MDA at https://www.mda.state.mn.us/plants-insects/minnesota-noxious-weed-list.

- Regulations: Minnesota Statute 18

Public Drainage Systems

MN Statue Chapter 103E grants drainage authority to Counties and watershed districts to establish, construct, and in perpetuity maintain public drainage systems. County and watershed district boards serve as the drainage authorities for public drainage systems in Polk and Marshall counties. The MSTRWD has a system of rules and regulations for water management within the district, and a list of actions that require a permit to proceed with work in any public drainage system in the MSTRWD (**Appendix F**).

- Regulations: Minnesota Statute 103E

Shoreland Management

The Minnesota Legislature has delegated responsibility to LGUs to regulate the subdivision, use, and development of shorelands along public waters to preserve and enhance the quality of surface waters, conserve the economic and natural environmental values of shorelands, and provide for the wise use of waters and related land resources. This statute is administered and enforced as a local zoning ordinance for Polk County and as a shoreland ordinance in Marshall County.

- Regulations: Minnesota Statute 103F and Minnesota Rules, Chapter 6120.2500-3900

Solid Waste Management

Minnesota's Waste Management Act has been in place since 1980 and establishes criteria for managing all types of solid waste, including mixed municipal solid waste, construction and demolition waste, and industrial waste. To receive annual grant funding to assist in implementing waste management programs, each county must have an MPCA-approved Solid Waste Management Plan. All Counties in the plan area have approved plans. Counties can also adopt Solid Waste Ordinances to use as a supplement in enforcing MPCA Rules. Polk County administers theirs through a zoning ordinance, and the MSTRWD regulates waste in their rules.

- Regulations: Minnesota Statutes 115A, 400

Subsurface Sewage Treatment Systems

The Subsurface Sewage Treatment System (SSTS) Program is administered by the MPCA to protect public health and environment. SSTS Ordinances are adopted and enforced at the county level to meet state requirements. Marshall County administers Minnesota Rules Chapters 7080 through 7083 for SSTSs through a local ordinance while Polk County administers theirs through the zoning ordinance.

- Regulations: Minnesota Rules, Chapters 7080 through 7083

Wetland Conservation Act

The Minnesota Legislature passed the Wetland Conservation Act (WCA) of 1991 to achieve no net loss of, increase the quantity, quality, and biological diversity of, and avoid direct or indirect impacts to Minnesota's wetlands. LGUs are responsible for administering, regulating, and educating landowners on WCA. The SWCD serves as the WCA LGU for Marshall and Polk counties.

- Regulations: Minnesota Rules, Chapter 8420

Wellhead Protection

The Minnesota Department of Health (MDH) administers the state wellhead protection rule that sets standards for safe drinking water. Municipalities within the watersheds have completed wellhead protection plans (WPP). The cities of Warren, Argyle, Viking, Holt, Strandquist, Newfolden, Karlstad, and Middle River as well as the Marshall-Polk Rural Water System have WPPs (MDH, 2022).

- Regulations: Minnesota Rules, Chapter 4720.5100 – 4720.5590; Minnesota Rules, Chapter 4725

Comprehensive or Land Use Plans

Counties and municipalities within the MSTR Watershed are responsible for land use planning, which is administered through local zoning ordinances. Comprehensive or land use plans have been adopted by the LGUs within the watershed. From a regulatory perspective, land and resource management may overlap with the local government entities listed below. Therefore, meeting goals and strategies of local planning may also involve other governmental or non-governmental entities. LGUs within the MSTR Watershed that have comprehensive and/or land use plans are provided in **Table 6-1**. Please note this is not intended to be all-inclusive.

Table 6-1: Comprehensive Land Use and Water Management Plans adopted within the MSTR Watershed

Local Governmental Unit	Comprehensive or Land Use Management Plan
Marshall County	Marshall County Comprehensive Land Use Plan (adopted 2000) Marshall County Local Water Management Plan (adopted 2007/updated 2012)
Polk County	Polk County Sustainable Development Comprehensive Plan (adopted 1997/updated 2008) Polk County Water Plan (adopted 2012)
City of Warren	City of Warren Comprehensive Plan (adopted 2014)
Middle-Snake-Tamarac Watershed District	MSTRWD Watershed Management Plan (adopted 2011)

Outreach Program

The Outreach Program funds actions for increasing engagement and understanding about natural resource management in the watershed. The program is operated through local sharing of services. Engaging landowners is critical for understanding issues impacting residents and viable solutions. Activities designed for engaging landowners include the items listed below. These activities will continue to be built upon as part of the Outreach Program.

- Soil demonstration plots
- Field days
- Well testing clinics
- Community education meetings (e.g., Minnesota Agricultural Water Quality Certification meetings and weed management workshops).

This program also builds upon current efforts to engage area youth in natural resource management. The activities listed below are examples of how LGUs in the plan area engage younger residents on the importance of the natural landscape and the environmental issues that impact it.

- Northwest Minnesota Water Festival
- Arbor Day
- Envirothon
- FFA, 4-H

In addition, this program will continue to create materials for public education and outreach. This may include general media campaigns, creation of newsletters and surveys, coordination of volunteer activities, and public meetings and trainings to raise awareness and gain a better understanding of the consequences of individual decisions on water management.

Outreach may also occur virtually. Many local government staff use social media (e.g., Facebook, Twitter, and YouTube) to inform the public on local resource issues and upcoming events they may be interested in. Email, website updates, and other releases are also a priority for communicating water quality, quantity, and conservation issues with local citizens. These platforms serve to communicate information easily and effectively.

Data Collection and Monitoring Program

The Data Collection and Monitoring Program funds actions that close data gaps to allow for tailored, science-based implementation strategies. The program also funds ongoing efforts aimed at the development and assembly of data and information.

Current surface water monitoring programs are led by both local and state entities. The MPCA's Watershed Pollutant Load Monitoring Network (WPLMN) provides continuous monitoring of water quality conditions, with five WPLMN sites in the MSTR Watershed:

- Middle River at Argyle, MN (E68017001; USGS ID 05087500; MPCA ID S000-700)
- Snake River above Warren, MN (E68031002; USGS ID 05085450)
- Snake River near Big Woods, MN220 (H68011001)
- Tamarac River near Florian, CSAH1 (H69036001; USGS ID 05090500; MPCA ID S006-994)
- Tamarac River near Stephen, CSAH22 (H69051001; USGS ID 05091500; MPCA ID S005-788)

The DNR Cooperative Stream Gaging (CSG) database is a shared repository of monitoring data between the DNR, MPCA, United States Geological Survey (USGS), and National Weather Service (NWS). Three additional monitoring sites from the CSG database include:

- Red River of the North at Oslo, MN1 (USGS ID 05083500; DNR ID 67011001)
- Snake River at Alvarado, MN1 (USGS ID 05086000; MPCA ID S004-142; DNR ID 68006001)
- Snake River near Radium, MN (USGS ID 05085420; DNR ID 68032002)

Over time, results from these networks and other ongoing tracking and monitoring programs can be used to document measurable water quality and quantity changes resulting from plan implementation (**Figure 6-3**).

Ongoing monitoring efforts also track groundwater supply quantity and quality trends. Current programs include public water supplier monitoring, MPCA's Ambient Groundwater Monitoring Program, the DNR high capacity permitting program, and the DNR Observation Well Network. These programs have provided valuable information but are not yet extensive enough to fully assess the state of groundwater in the region.

During implementation, the Data Collection and Monitoring Implementation Program will build on the data and information processes already established by plan participants. The Data Collection and Monitoring Implementation Program will be collaborative (especially where efforts cross administrative boundaries), with Partnership entities sharing services wherever possible.

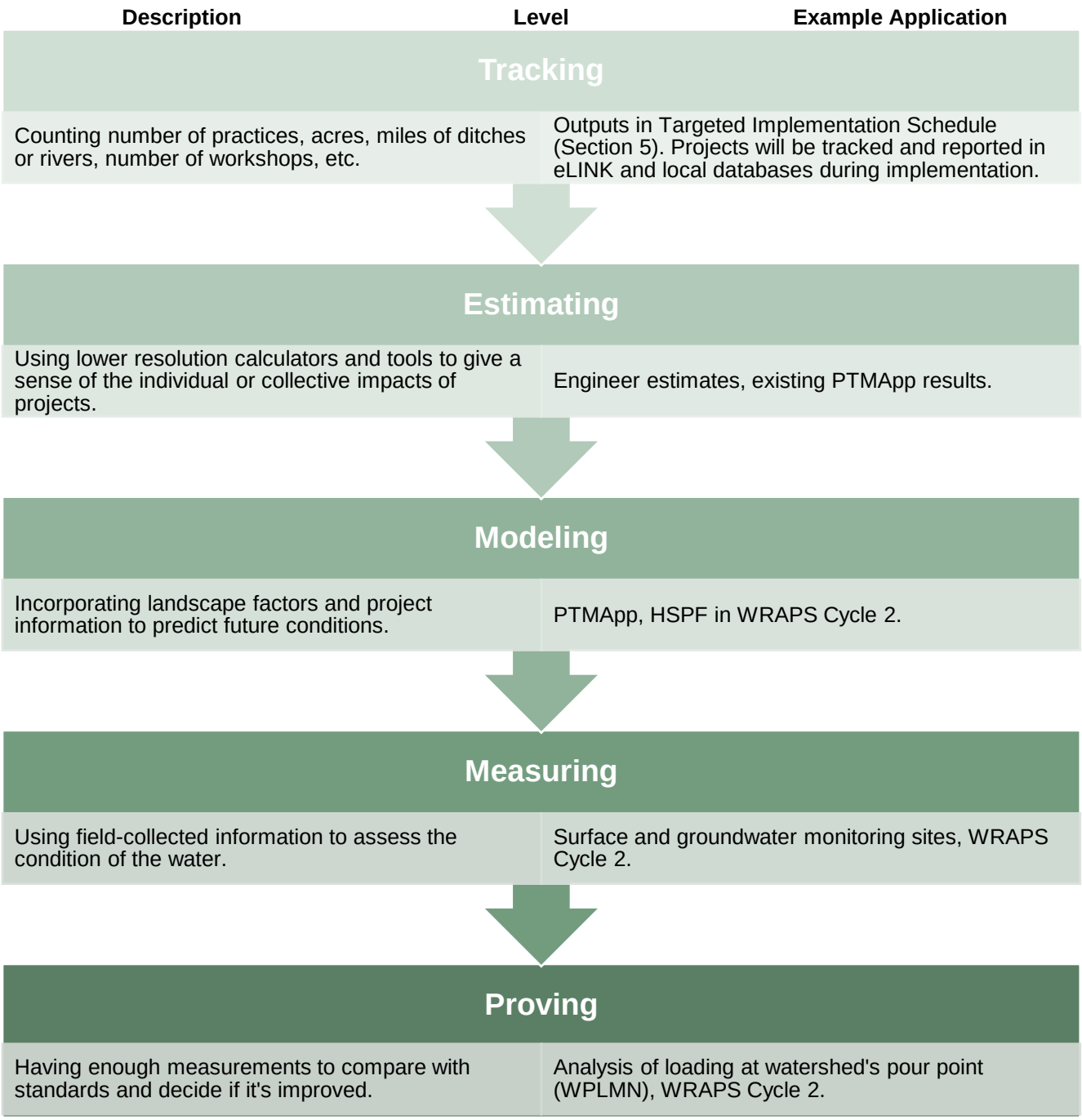


Figure 6-3: Ways to track progress of the projects in the watershed and their resulting improvements in resource conditions

Middle
-Snake-
Tamarac
RIVERS
CWMP

Plan Administration and Coordination






7. Plan Administration and Coordination

This plan section describes how the plan will be implemented and administered, how the watershed partners will work together, how the funding will move between them. The MSTR Watershed CWMP will be implemented through a Joint Powers Collaboration between the following entities:

- Polk County and West Polk SWCD
- Marshall County and SWCD
- Middle-Snake-Tamarac Rivers Watershed District

The entities implementing the plan will collectively be referred to as the Middle-Snake-Tamarac Rivers Watershed Partnership (Partnership).

Decision-Making and Staffing

Implementation of the MSTR CWMP will require increased capacity, funding, and coordination from current levels. Successful implementation will depend on continuing and building on partnerships in the watershed with landowners, planning partners, state agencies, and organizations.

Two committees will serve this plan during implementation:

- **Policy Committee:** Comprised of elected and appointed board members (one County Commissioner and one SWCD Board Supervisor appointed from each of the participating Counties in the watershed, one Manager from the MSTRWD); and
- **Steering Committee:** Comprised of Steering Committee and Advisory Committee members from the planning process (local SWCD, County, and watershed district staff, with local stakeholders and state agencies on an as-needed basis).

Table 7-1 outlines the probable roles and functions of these committees during implementation. Expectations are that the roles of each committee will shift and change focus during implementation. Fiscal and administrative duties will be assigned to a member LGU through a Policy Committee decision as outlined in the formal agreement. Responsibilities for annual work planning and serving as the fiscal agent will be revisited by the Steering Committee on an annual basis.

Table 7-1: Anticipated roles for MSTR CWMP implementation

Committee Name	Primary Implementation Roles/Functions
Policy Committee	• Review the implementation funds from plan participants • Approve the annual work plan • Approve annual fiscal reports • Approve annual reports submitted to BWSR • Annual review and confirmation of priority issue recommendations • Direction to Steering Committee on addressing emerging issues • Approve plan amendments • Implement county ordinances and state statutory responsibilities separately from plan implementation • Approve grant applications • Approve annual assessment
Steering Committee	• Review the status of available implementation funds from plan participants • Review opportunities for collaborative grants • Review annual fiscal reports • Prepare the annual work plan • Review annual reports submitted to BWSR • Biennial review and confirmation of priority issues • Evaluate and recommend response to emerging issues

Committee Name	Primary Implementation Roles/Functions
	• Prepare plan amendments • Implement the Action Tables
Local Fiscal/ Administrative Agent	• Convene committee meetings • Prepare and submit grant applications/funding requests • Compile annual results for annual assessment

Collaboration

Collaboration Between Planning Partners

The benefits of successful collaboration between planning partners include consistent implementation of actions watershed-wide, increased likelihood of funding, and resource efficiencies gained. The Partnership will pursue opportunities for collaboration with fellow planning partners to gain administrative and program efficiencies, pursue collaborative grants, and provide technical assistance.

Planning partners in the MSTR Watershed have an established history of collaboration for technical services in the Red River Valley Conservation Service Area (RRVCSA). This history is summarized below.

Collaboration in the Red River Valley Conservation Service Area

Purpose:
To provide engineering assistance to private landowners via SWCDs, for a variety of non-point water quality management practices.

Program Description:
This program was established in 1994 in conjunction with the Agricultural BMPs and Clean Water Partnership Loan Programs and established an engineering assistance program for SWCDs to provide engineering assistance to landowners for conservation practices. Eight joint powers groups of SWCDs were created statewide in early 1995 to employ professional engineer and technician teams to provide technical assistance in cooperation with member SWCDs. The associated joint powers boards are composed of a supervisor from each of the member SWCDs. One of the member SWCDs serves as the host district and manager for the engineer and technician team employed by the joint powers boards.

Non-point Engineering Assistance teams provide technical assistance through member SWCDs and in cooperation with the NRCS and other local, state, and federal agencies. BWSR provides policy, training, administrative, and technical consultation to the joint powers boards and their staff.

Collaboration with Other Units of Government

The Partnership will continue coordination with other governmental units. This cooperation and coordination occur both at the local level and at the state/federal level. At the state/federal level, coordination between the Partnership and agencies such as BWSR, US Army Corps of Engineers (USACE), DNR, MDH, and the MPCA occur through legislative and permit requirements. Local coordination between the Partnership and comparable units of government such as municipalities, city councils, township boards, county boards, and the MSTRWD Board are a practical necessity to facilitate watershed-wide activities. Examples of collaborative programs in the watershed include Environmental Quality Incentive Program (NRCS), CRP (FSA), Minnesota Agriculture Water Quality Certification (MDA), Farm Bill Biologist (MDA), Wellhead Protection for city DWSMAs (Minnesota Rural Water Association [MRWA] and MDH), and WRAPS (MPCA).

Intergovernmental coordination and cooperation are essential for the Partnership to perform its required functions. The Red River Basin already has a high level of collaboration on a basin-wide scale as outlined below. The Partnership will continue to foster an environment that enhances coordination and cooperation to the maximum extent possible throughout the implementation of this plan.

Collaboration within the Red River Basin

Due to the long history of flooding in the Red River Basin, there has been a significant effort to collaborate basin-wide on projects, including studies, flood damage reduction, retention, and administration. This collaboration crosses state lines with North Dakota and International borders with Canada.

Map credit: Red River Basin Commission

Red River Basin Commission (RRBC)
The RRBC is a charitable, not-for-profit organization designed to help facilitate a cooperative approach to water management within the Basin and is a well-established forum for identifying, developing, and implementing solutions to cross-boundary issues. The RRBC is comprised of local, state, provincial, and First Nation government representation, the environmental community, and at-large members.

Red River Water Management Board (RRWMB)
The RRWMB's jurisdiction and authority encompasses the area managed by the individual watershed districts that have membership on the board. The MSTRWD is a member of the RRWMB.

Red River Retention Authority (RRRA)
The RRRA is comprised of members of the Red River Joint Water Resource District, a North Dakota political subdivision, and the Red River Watershed Management Board, a Minnesota political subdivision. The primary objective of the RRRA is to ensure joint, comprehensive, and strategic coordination of retention projects in the Red River of the North watershed and facilitation implementation and construction of retention in the Red River Valley.

International Water Institute (IWI)
The IWI is a non-profit organization that works with basin partners on research, monitoring, and outreach.

Flood Damage Reduction Work Group (FDRWG)
The FDRWG is a collaboration between the DNR, RRWMB, watershed districts, and USACE. The work group meets to provide guidance and funding to watershed districts for flood resiliency projects in Minnesota's portion of the Red River Basin.

Collaboration with Others

Local support and partnerships will drive the success of implementing this plan. Because this plan's focus is largely on voluntary implementation, collaborations with landowners in the watershed is of utmost importance. There are many actions in the plan that describe working with individual landowners on providing cost share and technical assistance for implementing agricultural conservation practices.

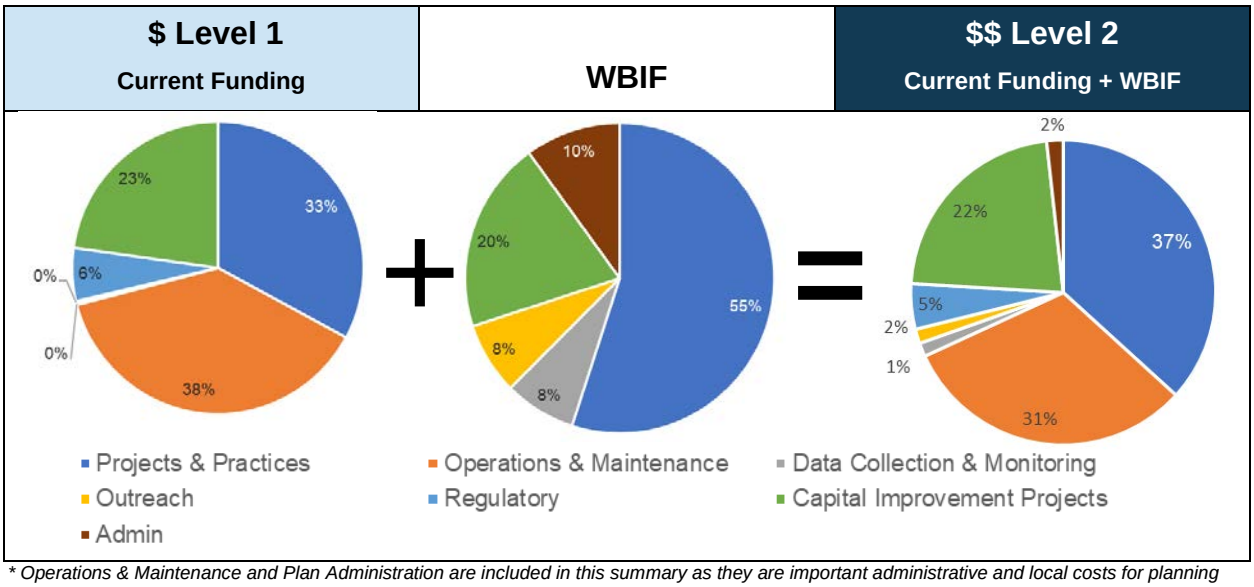
The Partnership also expects to continue to build on existing collaboration with others, including non-governmental organizations, while implementing this plan. Many of these existing collaborations are aimed at increasing habitat and recreational opportunities within the plan area while providing education and outreach opportunities. Partners for these collaborations include, but are not limited to, the IWI, The Nature Conservancy, Ducks Unlimited, MN Deer Hunters Association, Pheasants Forever, Sportsman's Clubs, National Wild Turkey Federation, local co-ops, University of Minnesota Extension, civic groups, private businesses, individuals, and foundations.

Funding

This section describes how the plan will be funded and how that funding will be used. As introduced in **Section 5-Targeted Implementation**, most of the plan funds (59%) will be used for implementing projects on the landscape through the Projects and Practices Program and the Capital Improvements Program. These two programs also include the technical assistance and administration required to implement them.

The current funding level (Level 1) is based on the estimated annual revenue and expenditures for plan participants combined and allocated to the plan area based on the percentage of each county's land area in the MSTR Watershed. Level 1 funding includes local, state, and federal funding, as explained in the following sections. Level 2 funding is Level 1 funding plus the new Watershed-Based Implementation Funding (WBIF; BWSR state funding) that will be available upon completion of this plan (estimated $550,000/ year). Level 3 funding summarizes projects that help make progress to plan goals, but that are not administered by planning partners (counties, SWCDs, MSTRWD). Level 3 includes partner funding through programs such as CRP, RIM, NRCS Regional Conservation Partnership Program (RCPP), and the Lessard-Sams Outdoor Heritage Council (LSOHC) funds.

The figure below shows how implementation programs are funded within this plan under Funding Level 1 and Level 2. Planning partners elected to keep the largest proportion of additional WBIF in implementation of new projects and practices, with 20% of funding going toward Capital Improvement Projects. This plan recognizes the overlap between these two critical programs, where projects (such as side water inlets) are commonly implemented to support larger Capital Improvement Projects.



** Operations & Maintenance and Plan Administration are included in this summary as they are important administrative and local costs for planning partners, but are not implementation programs and therefore do not have corresponding Action Tables*

Figure 7-2: Funding levels for implementation programs

Throughout implementation of the MSTR CWMP, the Partnership expects to operate at Level 2 funding. The totals for each level are summarized in **Table 7-2**.

Table 7-2: Estimated implementation funding for the MSTR CWMP

Funding Level	Description	Estimated Annual Average	Estimated Plan Total (10 years)
1	**Current Funding**	**$2,589,600**	**$25,896,300**
2	**Current Funding + Watershed-Based Implementation Funding**	**$3,139,700**	**$31,397,000**
3	**Partner and Other Funding**	Subject to Change Based on Partner Funding Availability	

Local Funding

Local revenue is defined as money derived from either the local property tax base or in-kind services of any personnel funded from the local tax base. Examples include local levy, county allocations, and local match dollars (see Local Funding Authorities in **Appendix H**).

Local funds will be used for locally focused programs where opportunities for state and federal funding are lacking because of misalignment of a program's purpose with state or federal objectives. These funds will also be used for matching grants.

Water Management Districts

The water management district (WMD) funding option can only be used to collect charges to pay costs for projects initiated under MS 103D.601, 103D.605, 103D.611, or 103D.730. To use this funding method, Minnesota law (MS 103D.729) requires that the WMD includes an identification of the area, the amount to be charged, the methods used to determine the charges, and the length of time the WMD is expected to remain in force.

Description of WMDs and Annual Charge Amount

This plan establishes the four planning regions (**Figure 3-1**) as WMDs. The MSTRWD may create different WMDs under future amendments. The maximum WMD revenue limit within each WMD is based on 0.10% of the taxable market value within each planning region. This value will change each year as property values increase or decrease over time.

Method to Determine Charges

The methods proposed to establish the charges will be based on:

- **Option 1:** the proportion of the total annual runoff volume contributed by a parcel
- **Option 2:** the proportion of the solids load contributed by a parcel
- **Option 3:** combination of **Options 1 and 2**
- **Option 4:** the drainage area of the parcel within a WMD

Option 1: The runoff volume method will:

- Use soils and land use data to determine the existing curve number for each parcel within a WMD;
- Use the curve number and annual average precipitation depth to compute the annual runoff volume for each parcel;
- Sum the annual average runoff volumes for all parcels within a WMD to determine the total annual runoff volume; and
- Compute the percentage of the annual runoff volume from each parcel as the ratio of the annual average runoff volume from the parcel and the total annual average runoff volume for the WMD (i.e., the “runoff ratio”).

Option 2: The solids load contribution method will:

- Use RUSLE (or a similar tool) and a sediment delivery ratio that represents the solids and sediment reaching a watercourse to compute the annual average sediment and solids load for each parcel;
- Sum the annual average solids and sediment loads for all parcels within a WMD to determine the total annual average sediment and solids load; and
- Compute the percentage of the annual average sediment and soils load from each parcel as the ratio of the annual average sediment and solids load from the parcel and the total annual average sediment and soils load for the WMD (i.e., the “sediment ratio”).

Option 3: The combination runoff volume and solids load method is used to consider both runoff volume and solids load contribution. It would follow the methodologies listed in **Options 1** and **2** for both solids contribution and runoff volume.

Calculation of charges for **Options 1-3** would be determined as follows:

- Add the runoff ratio and/or the sediment ratio to determine the charge ratio for each parcel within the WMD. The amount charged to a specific parcel is the sum of the runoff and sediment ratios for the parcel divided by the sum of the runoff and sediment ratios for all parcels within the WMD.
- Apply the charge ratio to the total amount of revenue needed for the WMD to carry out the stormwater-related projects, programs, and activities described by the plan to achieve the stormwater-related goals within that WMD.

Option 4: The drainage area method will determine the drainage area of each parcel of land within the planning region. Calculations would be determined as follows:

- The amount charged to a specific parcel is determined by the charge ratio. The charge ratio is determined by taking the drainage area of that parcel within the planning region divided by the total area of the planning region.

- Apply the charge ratio to the total amount of revenue needed for the WMD to carry out the stormwater-related projects and programs described by the plan to achieve the stormwater related goals within that WMD.

Selecting the process of determining charges will be established and further refined in Step 4 of the process described in **Process to Be Used to Create Water Management Districts**. In recognition of geospatial data limitations, (while not a complete list) common adjustments involve correction of land use geospatial data and developing composite runoff and sediment delivery from common land use classifications, and field verification of project drainage area boundaries.

Duration for Existence of Water Management Districts

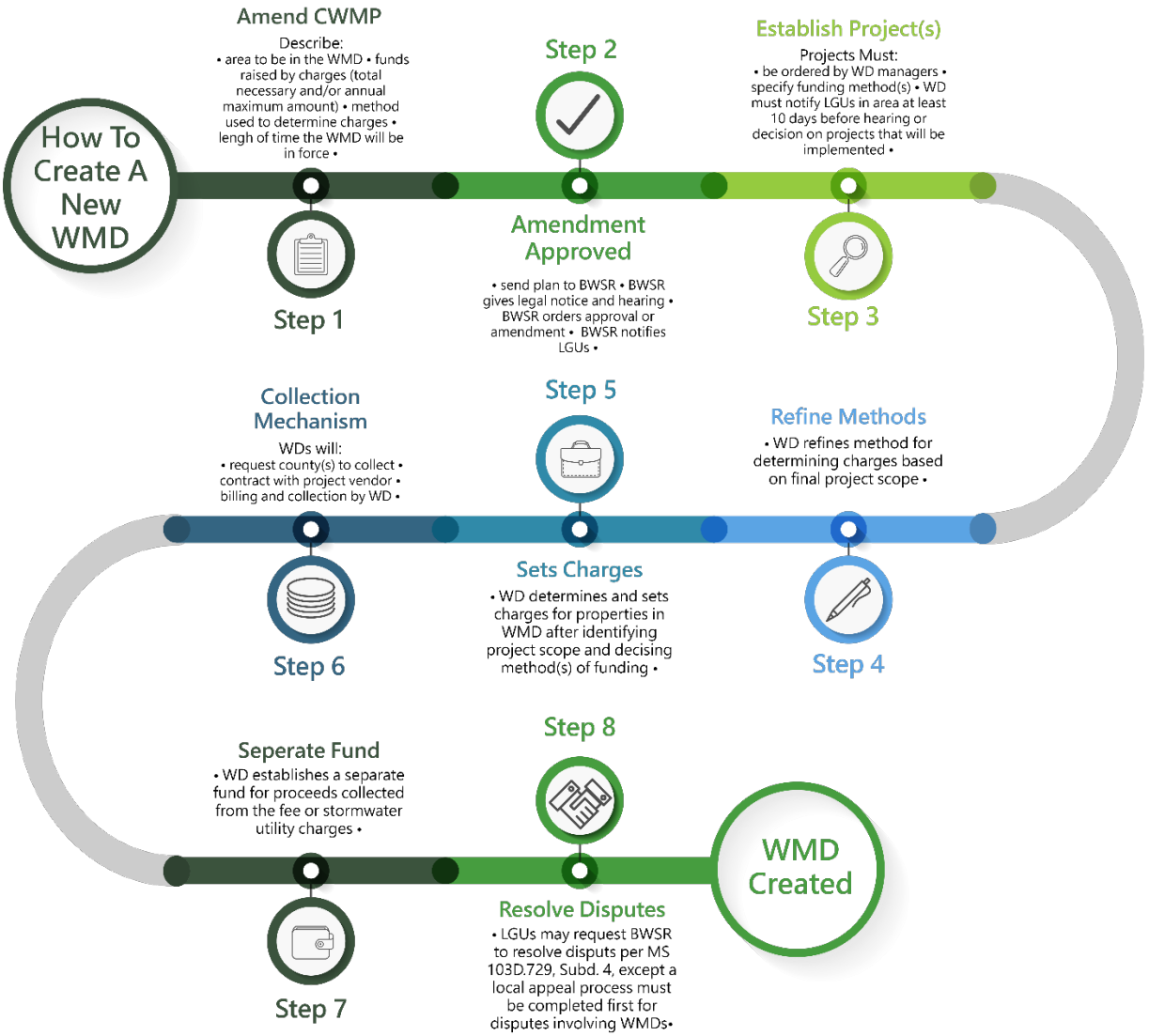
The Policy Committee anticipates that the WMDs will provide funding to assist with implementing a variety of projects. The WMDs will exist in perpetuity (or a lesser duration as determined by the MSTRWD Board). An annual charges assessment could vary from no charges to the maximum WMD revenue limit.

Use of Funds

The primary use of the funds collected from charges within WMDs will support runoff and water quality projects that help achieve the goals of the WMD, which benefits residents within a WMD.

Process to Create Water Management Districts

BWSR has provided guidance as to the process of creating a WMD. The process involves eight steps. The first two steps are addressed through this CWMP. Steps 3 through 8 must be completed prior to any collection of charges in any WMD.



Local Appeal

Because WMDs established under this plan are proposed to be perpetual, the following local appeal procedure is established from the resolution adopting the plan establishing a WMD:

1. Once BWSR approves the plan and a WMD is established, the Watershed District will publish notice of its resolution adopting the plan in a newspaper in general circulation in the 1W1P area.
2. Any landowner affected by the WMD may, within 30 days of the notice of the resolution, appeal the establishment of the WMD to the Watershed District by filing a letter stating the basis for the appeal.
3. Within 30 days of receiving a letter of appeal, the Watershed District shall hold a hearing to give the appellant an opportunity to be heard and to present evidence why the WMD should not be established. The hearing shall be noticed as required for a special meeting under MS 103D.
4. The hearing shall be recorded in order to preserve a record for further review. The record of the appeal shall include the recording, any documentary evidence provided by the appellant, and all records related to the establishment of the WMD.

5. Within 30 days of the hearing, the Watershed District shall adopt and mail findings and an order on the appeal to the appellant and the BWSR.
6. Further appeal, if any, shall be as provided in Statutes Chapter 103D and existing authorities and procedures of the BWSR Board.

State Funding

State funding includes all funds derived from the State tax base. Examples of state funding include conservation delivery, state cost share, Natural Resources Block Grants, Clean Water Funds (CWF), and SWCD Local Capacity Grants.

The planning Partnership will apply as an entity for collaborative grants, which may be competitive or non-competitive. The assumption is that future base support for implementation will be provided to the MSTR Watershed as non-competitive WBIF grants (Level 2). Where the purpose of an implementation program aligns with the objectives of various state, local, non-profit, or private programs, these dollars will be used to help fund the implementation programs described by this plan.

Federal Funding

Federal funding includes all funds derived from the Federal tax base. For example, this includes programs such as EQIP, CRP, and the Conservation Stewardship Program (CSP).

Partnerships with federal agencies are an important resource for ensuring implementation success. An opportunity may exist to leverage state dollars through some form of federal cost-share program. Where the purpose of an implementation program aligns with the objectives of various federal agencies, federal dollars will be used to help fund the implementation programs described by this plan. For example, the NRCS will likely provide support for agricultural conservation practices, while the FSA may provide land-retirement program funds such as CRP.

Additional Funding Sources

Current programs and funding (Level 1) will not be enough to implement the full Action Table. As such, the success of implementing the plan will depend on collaboratively sought competitive state, federal, and private grant dollars, and increased capacity.

Plan participants may pursue grant opportunities collaboratively or individually to fund the Action Table's implementation. Within the Action Table, actions are assigned implementation programs. **Table 7-3** shows the most used state and federal grants for executing the actions described by this plan cross-referenced to plan implementation programs, thereby showing potential sources of revenue for implementation.

Several non-governmental funding sources may also provide technical assistance and fiscal resources to implement the Action Table. This plan should be provided to all non-governmental organizations as a means of exploring opportunities to fund specific aspects of the Action Table.

Private sector companies, including those specifically engaged in agribusiness, are often overlooked as a potential source of funding for implementation. Some agribusiness companies are providing technical or financial implementation support because they are interested in agricultural sustainability. This plan could be used to explore whether the resource benefits arising from implementation have monetary value and therefore, provide access to funding from the private sector.

Table 7-3: Implementation programs and related funding sources for the MSTR Watershed. Note: List is not all-inclusive.

Program / Grant		Primary Assistance Type	Projects & Practices	Capital Improvement Projects	Data Collection & Monitoring	Outreach
Federal Programs / Grants						
NRCS	Conservation Innovation Grant (CIG)	Financial	●			
	Conservation Stewardship Program (CSP)	Financial	●			
	Environmental Quality Incentives Program (EQIP)	Financial	●			
	Agricultural Conservation Easement Program (ACEP)	Easement	●			
FSA	Conservation Reserve Program (CRP)	Easement	●	●		
	Farmable Wetlands Program (FWP)	Easement	●			
	Grasslands Reserve Program (GRP)	Easement	●			
	Wetland Reserve Program (WRP)	Easement	●	●		
FSA/ USDA/ NRWA	Source Water Protection Program (SWPP)	Technical				●
USFWS	Partners for Fish and Wildlife Program	Financial/Technical	●			
FEMA	Hazard Mitigation Grant Program (HMGP)	Financial	●	●		
	Pre-Disaster Mitigation (PDM)	Financial	●	●		
	Flood Mitigation Assistance (FMA)	Financial	●	●		
	Risk Mapping, Assessment, and Planning	Technical	●	●		
EPA	Water Pollution Control Program Grants (Section 106)	Financial				●
	State Revolving Fund (SRF)	Loan	●			
	Drinking Water State Revolving Fund (DWSRF)	Loan	●			

Program / Grant		Primary Assistance Type	Projects & Practices	Capital Improvement Projects	Data Collection & Monitoring	Outreach
	Section 319 Grant Program	Financial	●		●	●
State Programs / Grants						
LSOHF	Lessard-Sams Outdoor Heritage Fund (LSOHF)	Financial	●	●		
DNR	Aquatic Invasive Species Control Grant Program	Financial/Technical	●			●
	Conservation Partners Legacy Grant Program	Financial	●	●		
	Flood Hazard Mitigation Grant Assistance	Financial	●	●	●	●
	Forest Stewardship Program	Technical	●			
	Wetland Tax Exemption Program	Financial	●			
BWSR	Clean Water Fund Grants	Financial	●	●		●
	Erosion Control and Water Management Program	Financial	●			
	SWCD Capacity Funding	Financial	●		●	●
	Natural Resources Block Grant (NRBG)	Financial	●			●
	Reinvest in Minnesota (RIM)	Financial	●	●		●
MPCA	Surface Water Assessment Grants (SWAG)	Financial			●	●
	Clean Water Partnership	Loan	●			
MDH	Source Water Protection Grant Program	Financial	●	●	●	●
	Public and Private Well Sealing Grant Program	Financial	●		●	
MDA	Agriculture BMP Loan Program	Financial	●			
	Minnesota Agricultural Water Quality Certification Program	Financial	●			●

Program / Grant		Primary Assistance Type	Projects & Practices	Capital Improvement Projects	Data Collection & Monitoring	Outreach
PFA	Public Facilities Authority (PFA) Small Community Wastewater Treatment Program	Financial	●	●		
Other Funding Sources						
Red River Watershed Management Board		Financial/Technical	●	●	●	●
Pheasants Forever		Financial/Technical	●	●	●	●
Ducks Unlimited		Financial/Technical	●	●	●	●
The Nature Conservancy		Financial	●	●	●	●
Minnesota Land Trust		Financial	●	●	●	●

Work Planning

Local Work Plan

Annual work planning is envisioned to align the priority issues, availability of funds, and roles and responsibilities for implementation. An annual work plan will be developed by the Steering Committee based on the Action Table and any adjustments made through self-assessments. The annual work plan will then be presented to the Policy Committee, who will ultimately be responsible for approval. The intent of these annual work plans will be to maintain collaborative progress toward completing the Action Tables.

State Funding Request

The Steering Committee will collaboratively develop, review, and submit a watershed-based implementation funding request from this plan to BWSR. This request will be submitted to and ultimately approved by the Policy Committee before submitting to BWSR. The request will be developed based on the Action Table and any adjustments made through self-assessments.

Assessment, Evaluation, and Reporting

Accomplishment Assessment

The Steering Committee will provide the Policy Committee with an annual update on the progress of the plan's implementation. For example, any new projects will be tracked against their goal metrics such as number of *E. coli*/fecal contamination reduction projects and tons of sediment reduced. A tracking system will be used to measure progress and will serve as a platform for plan constituents. Tracking these metrics will also make them available for supporting future work plan development, progress evaluation, and reporting.

Partnership Assessment

Biennially, the Steering Committee will review the MSTR CWMP goals and progress toward implementation, including fulfillment of committee purposes and roles, efficiencies in service delivery, collaboration with other units of government, and success in securing funding. During this review process, feedback will be solicited from SWCDs, the MSTRWD, county boards, and partners such as state agencies and non-governmental organizations. This feedback will be presented to the Policy Committee to set the coming biennium's priorities for achieving the plan's goals and to decide on the direction for grant submittals. Also, this feedback will be documented and incorporated into the 5-year evaluation.

Five-year Evaluation

This plan has a 10-year life cycle beginning in 2022. To meet statutory requirements, this plan will be updated and/or revised every 10 years. Over the course of the plan life cycle, progress towards reaching goals and completing actions may vary. In addition, new issues may emerge and/or new monitoring data, models, or research may become available. As such, in 2027-28 and at every 5-year midpoint of a plan life cycle, an evaluation will be undertaken to determine if the current course of actions is sufficient to reach the goals of the plan or if a change in course of actions is necessary.

Reporting

LGUs have several annual reporting requirements. A number of these reporting requirements will remain a responsibility of the LGUs**.** However, reporting related to grants and programs developed collaboratively and administered under this plan will be reported by the plan coordinator. In addition to annual reports, the Steering Committee may also develop a State of the Watershed Report. This report would document progress toward reaching goals and completing the Action Tables and will describe any new emerging

issues or priorities. The information needed to annually update the State of the Watershed Report will be developed through the annual evaluation process.

The fiscal agent is responsible for submitting all required reports and completing annual reporting requirements for this plan as required by state law and policy. The Steering Committee will assist in developing the required reports as defined in the Joint Powers Collaboration Bylaws.

Plan Amendments

The MSTR CWMP is effective through 2032. Revision of the plan may be needed through an amendment prior to the plan update if significant changes emerge in the:

- priorities,
- goals,
- policies,
- administrative procedures, or
- plan implementation programs.

Revisions may also be needed if issues emerge that are not addressed in the plan.

Plan amendments may be proposed by any agency, person, city, county, SWCD, or watershed district to the Policy Committee, but only the Policy Committee can initiate and pursue the amendment process. All recommended plan amendments must be submitted to the Policy Committee along with a statement of the problem and need, the rationale for the amendment, and an estimate of the cost to complete the amendment. However, the existing authorities of each LGU within the MSTR Watershed is still maintained. As such, CIPs need only be approved by a local board to be amended to the plan if the local board funds the CIP's implementation, with notification to the Policy Committee. CIPs implemented with funding from the plan must follow the means and methods for funding new capital improvements as developed by members of the Policy Committee or the Steering Committee's individual and representative Boards. The establishment of WMDs, by the watershed district, need not follow the amendment procedure herein if the watershed district utilizes the procedure outlined under Minn. Stat. §103D.729.

Plan participants recognize the large work effort required to manage water-related issues. The plan provides the framework to implement this work by identifying priority issues, measurable goals, and action items. No amendment will be required for the following situations:

- Any activity implemented through the "normal" statutory authorities of an LGU, unless the activity is deemed contrary to the intent and purpose of this plan;
- The estimated cost of a non-capital improvement project action item is different than the cost shown within this plan; or
- The addition or deletion of action items, programs, initiatives, or projects, as long as these are:
    - generally consistent with the goals of this plan,
    - are not CIPs as defined by this plan (nor is contemplated by an implementation program), and
    - will be proposed, discussed, and adopted as part of the annual budgeting process, which involves public input.

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