Missouri River Watershed Comprehensive Watershed Management Plan (2019-2028)

MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan

CLEAN WATER LAND & LEGACY AMENDMENT

June 2019: Draft Plan for BWSR Board Review

Prepared for: Missouri River Watershed One Watershed, One Plan Planning Group

Prepared by: Houston Engineering, Inc.

Funding for this project was provided by the Clean Water, Land and Legacy Amendment

Table of Contents

APPENDICES

PLAN ABBREVIATIONS

1W1P	One Watershed, One Plan
ACOE	Army Corps of Engineers
AIS	Aquatic Invasive Species
AUID	Assessment Unit Identification Number
BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
DWSMA	Drinking Water Supply Management Area
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FEMA	Federal Emergency Management Agency
GRAPS	Groundwater Restoration and Protection Strategies
HSPF	Hydrologic Simulation Program--Fortran
HUC	Hydrologic Unit Code
LBSR	Lower Big Sioux River Planning Region
LGU	Local Government Unit
LSR	Little Sioux River Planning Region
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MnDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency

MRW	Missouri River Watershed
NGO	Non-Governmental Organization
NRCS	Natural Resources Conservation Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PF	Pheasants Forever
PTMApp	Prioritize, Target, Measure Application
PWS	Public Water Supplier
RR	Rock River Planning Region
SNA	Scientific and Natural Areas
SOM	Soil Organic Matter
SSTS	Subsurface Sewage Treatment Systems
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TP	Total Phosphorus
TU	Trout Unlimited
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UBSR	Upper Big Sioux River Planning Region
WASCOB	Water and Sediment Control Basin
WRAPS	Watershed Restoration and Protection Strategy

GLOSSARY

- **Measurable Goal –** A statement of intended accomplishment for each priority issue. Goals are meant to be simply stated and achievable, can be quantitative or qualitative, long or short-term, and are meant to be measurable through the implementation of actions to attain a desired outcome.
- **Metric –** A feature, attribute, characteristic, amount, or quantity which forms the unit by which progress is measured towards attaining a measurable goal in a given time frame. For this plan two time frames are used: short-term (covering the 10-year plan period) and long-term (following the 10-year plan period).
- **Priority Issue –** Issues categorized, through the prioritization process (Section 2.0), as Priority Level A or B issues. Priority issues will be the focus of this comprehensive plan.
- **Resource Category–** A resource category, or "resource" is defined as a natural, economic, educational, biotic, aesthetic, land, or similar asset. Resources are generally considered something that can be managed, and are generally broad, such as surface water, groundwater, or education and outreach.
- **Resource Concern** – A resource concern, or "concern" is defined as a physical, biological, chemical, or geological subset or component of a resource. For example, the resource "surface water" can be further refined into several components, including streams and rivers, lakes, and wetlands.
- **Resource Issue** – A resource issue, or "issue" affecting a concern is defined as a factor, stressor, or difficulty resulting in an adverse consequence for a concern. A concern can have one or many issues. For instance, nitrate-nitrogen causing the contamination of drinking water supply could be an issue (e.g. nitrate-nitrogen) affecting a concern (e.g. drinking water supplies).

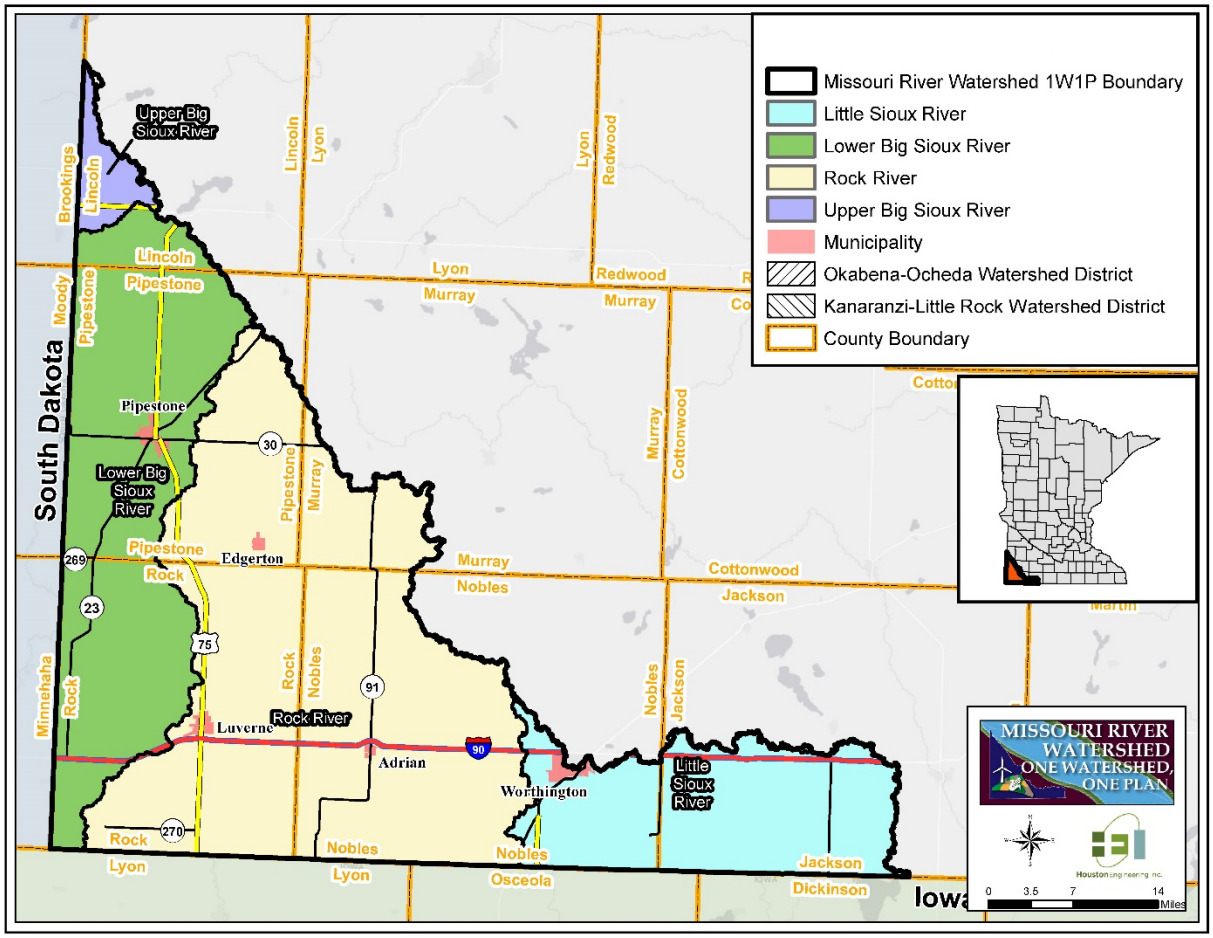
EXECUTIVE SUMMARY

The Missouri River Watershed (MRW) One Watershed, One Plan (1W1P) planning area is in the southwestern corner of Minnesota, encompassing all or portions of Rock, Pipestone, Nobles, Jackson, Lincoln, and Murray counties and the Kanaranzi-Little Rock and the Okabena-Ocheda watershed districts. This area of Minnesota has very fertile soils and has an important agricultural economy rich in crop production and livestock operations. The high ground that separates the Missouri River Basin from the Minnesota River Basin is also a prime place for wind turbines. The MRW 1W1P planning area drains 1.1 million acres (or 1,783 square miles) of predominately agricultural land. There are 25 towns and cities within the MRW, with populations clustered in its largest cities of Worthington, Luverne, and Pipestone.

A watershed is defined as an area where all the surface water drains into the same place—a river, stream or lake (MPCA, 2018a). Based on this definition, the MRW 1W1P planning area is hydrologically unique. As the MRW is in the corner of the state, four major watersheds are aggregated into the MRW 1W1P planning area, including the Upper Big Sioux River (Hydrologic Unit Code (HUC) 10170202), Lower Big Sioux River (HUC 10170203), Rock River (HUC 10170204), and Little Sioux River (HUC 10230003) watersheds. These watersheds are referred to as "planning regions" throughout this document and are shown in **Figure ES-1**.

In 2017, the members of the six counties, six soil and water conservation districts, and two watershed districts within the MRW joined together to create the MRW 1W1P Planning Group. The purpose of the MRW 1W1P Planning Group was to unite local entities that would otherwise have separate local plans under one comprehensive watershed management plan, creating a cohesive vision for implementing actions to improve locally prioritized issues. This plan is the result of that vision, and the first step toward accelerating prioritized, targeted, and measurable implementation efforts in the MRW.

Figure ES 1: Location of the Missouri River Watershed 1W1P Plan Area and Planning Regions



IDENTIFYING AND PRIORITIZING ISSUES

The MRW is home to a diverse range of resources, including:

- a large network of streams, rivers, and agricultural drainage systems;
- 40 lakes, primarily in the eastern half of the watershed;
- over 20,000 acres of wetland;
- habitat areas for both aquatic and terrestrial species; and
- urban and rural land uses.

With all these resources, there are many issues to manage. In recognition of staff, time, and resource limitations, the MRW 1W1P Planning Group needed to prioritize issues as the focus of implementation efforts during the 10-year lifespan of this plan.

The MRW 1W1P Planning Group developed a comprehensive inventory of 15 resources and 65 issues impacting the watershed using a combination of existing reports, data, and stakeholder input. This comprehensive inventory was used to prioritize priority issues for implementation efforts. Issues were prioritized and designated as an A, B, C, D, or E priority tier based on stakeholder input.

From this initial inventory, 27 issues emerged as "priority issues" (shown as either A or B Priority Tier) (**Table ES-1**). These issues were assigned a measurable goal and will be considered the focus for initial implementation efforts. Those issues designated as Tier C, D, and E are not anticipated to be directly addressed within this plan.

Table ES 1: Priority issues for the Missouri River Watershed 1W1P

Resource Concern	Issue	Priority Tier
	Groundwater	
Drinking Water	Elevated **nitrate-nitrogen** in groundwater wells	A
	Elevated bacteria (i.e. *Escherichia coli (E. coli)* and fecal coliform) in groundwater wells	B
	Land use changes where water enters aquifers, including Wellhead Protection Areas (WPAs) or Drinking Water Supply Management Areas (**DWSMAs**)	A
	Sustainable quantities of **groundwater supplies** for drinking water use with suitable water quality	A
	Surface Waters	
Streams and Rivers	Elevated suspended solids (**sediment**) and **phosphorus** levels	A
	Elevated bacteria (i.e. *E. coli* and fecal coliform) levels	B
	Elevated **nitrate-nitrogen** levels	B
	Increased spread of **aquatic invasive species**	B
	Land use changes contributing to **wind and overland runoff**	A
	Streambank/riverbank erosion causing loss of bank sediment	A
Lakes	Elevated phosphorus concentrations in the water and increased risk of **algal blooms**	B
Surface Runoff	Land use changes leading to loss of **vegetative cover and field residue**	A
	Land use changes leading to loss of **natural storage**	A
Wetlands	Loss of functioning **wetlands**	A
Agricultural Drainage Systems	Presence, width, and quality of **vegetated** areas alongside **ditches**	B
	Fish and Wildlife Habitat	
Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life	Habitat loss from **bank erosion** in creeks, streams, and rivers	A
	Aquatic and **riparian habitat loss** from development and intense drainage	B
Terrestrial Habitat for Wildlife	Terrestrial **habitat fragmentation** and loss	B
	Local Knowledge Base and Technical Capacity	
Landowner, Producer and Lake Shore Owner Engagement in Water Management	Lack of watershed-wide **education and outreach** on management and structural best management practices (**BMPs**) and their impact on farm profitability and the environment	B
Technology, Tools, Funding, and Existing Capabilities	Lack of **understanding**, agreement, and consensus about the hydrologic impacts of **tile drainage** and the benefits to producers	B
	Piecemeal approach and lack of long term and **consistent funding** for water management programs at the local level	A
	Local Development and Land Stewardship	
Rural Land Stewardship	Decreased agricultural **soil health**	A
	Increased **sheet, rill, and wind erosion**	B
	Manure application and disposal	B
Riparian Stewardship	**Undercut and unstable streambanks**	B
	Livestock accessibility to streams and rivers	B
	Vegetated buffer along streams and rivers	B

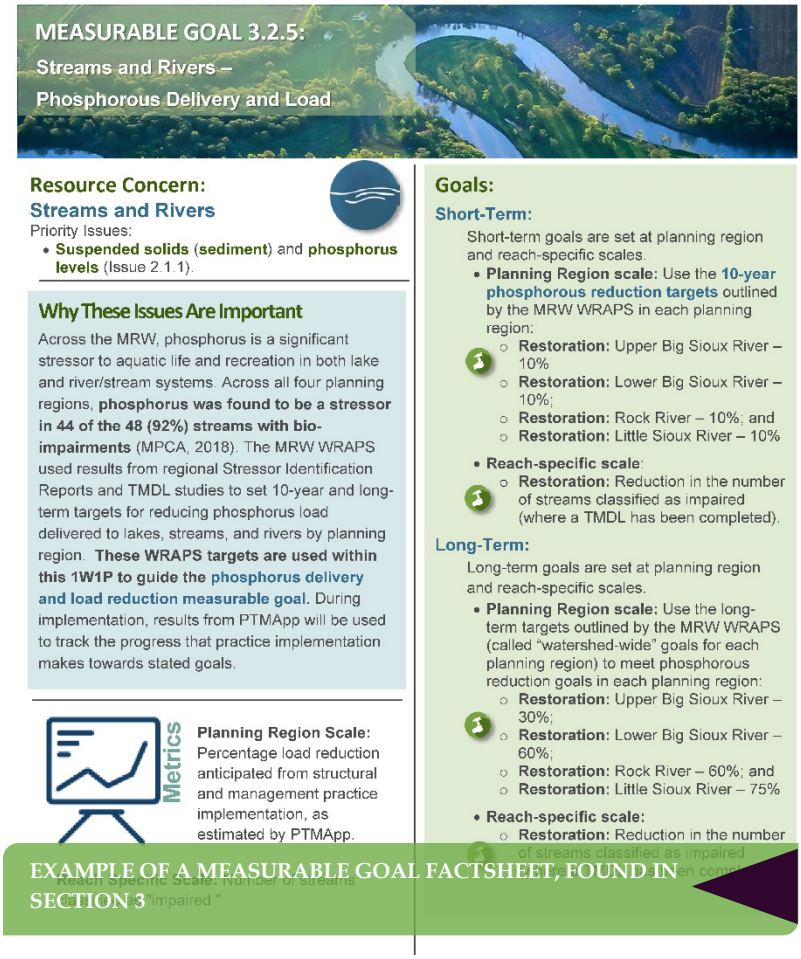
ESTABLISHING MEASURABLE GOALS

Measurable goals were established to address each MRW priority issue. Measurable goals describe a desired condition for a resource being impacted by an issue and are presented as either short-term or long-term goals:

- Short-term measurable goals describe the interim conditions to accomplish or make progress toward during the 10-year lifespan of this plan.
- Long-term measurable goals describe the desired future condition to accomplish, regardless of timeframe.

In some instances, measurable goals are focused on either protecting resources in good condition or restoring resources that have deteriorated. Short-term and long-term goals set milestones for resource improvement and allow for resource management flexibility during implementation efforts. They were designed to align with Missouri River Basin Watershed Restoration and Protection Strategy (WRAPS) efforts. As the four MRW planning regions have a unique set of resources and issues associated with them, the WRAPS set many goals at a watershed planning region scale. This plan mirrors that approach.

This plan outlines and describes the **19 measurable goals for this comprehensive plan in a series of easy-to-understand factsheets**, which collectively provide background for and address all priority issues. A single measurable goal may apply to one priority issue or to several priority issues. For a full list of plan measurable goal factsheets, see Section 3.



EXAMPLE OF A MEASURABLE GOAL FACTSHEET, FOUND IN SECTION 3

TARGETING IMPLEMENTATION EFFORTS AND IMPLEMENTATION PROGRAMS

Targeting means implementing the most cost-effective and measurable actions to make progress toward measurable goals. Targeted actions are housed within the **targeted implementation schedule**, which contains:

- A brief description of each action;
- The planning region where the action occurs;

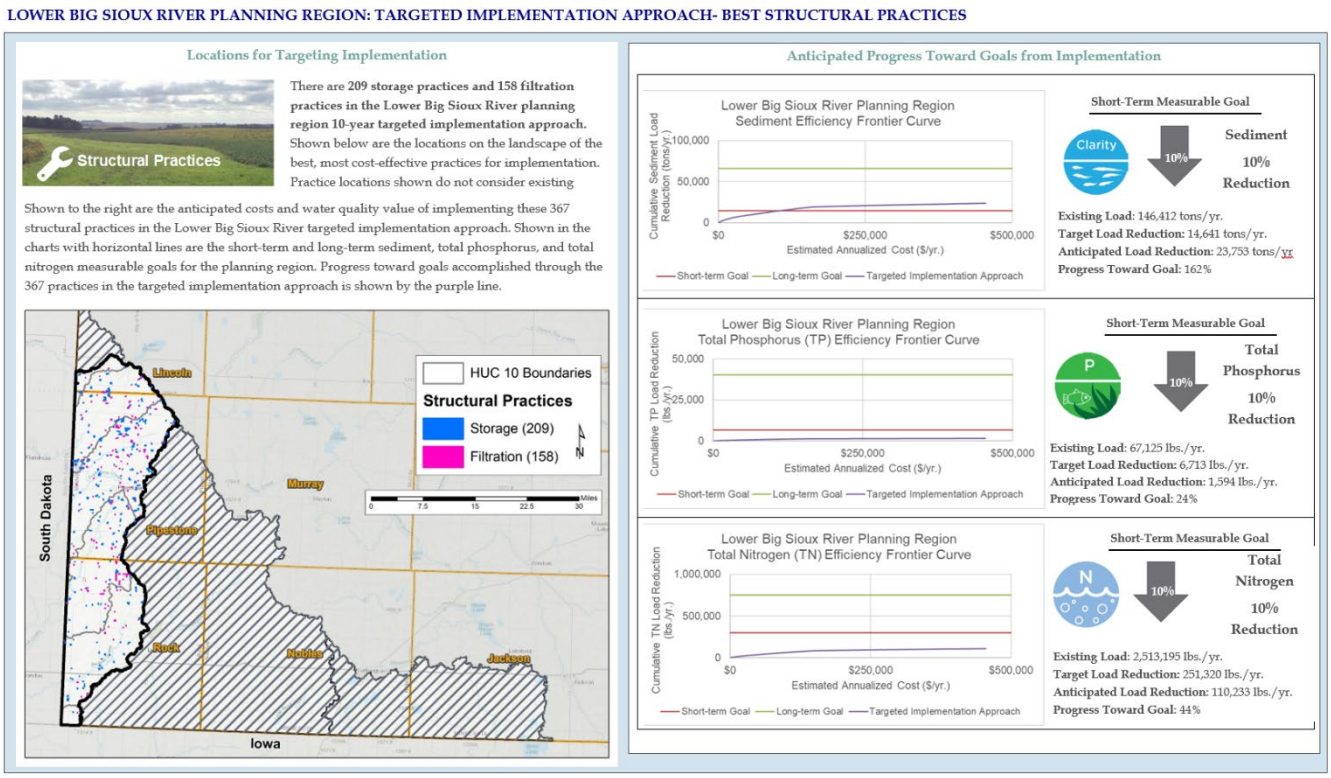
- How much of the action will be implemented;
- How the action will be measured;
- When implementation will occur within the 10-year timeframe of the plan;
- The entities responsible and their role in implementing the action;
- Estimated cost of the action; and
- The measurable goal corresponding to the action.

Many kinds of actions can be implemented in the MRW to make progress toward goals. These actions are grouped into one of six categories, including:

- Implementation of ***structural practices,*** such as water and sediment control basins (WASCOBS), grade stabilization structures, filter strips, and grassed waterways;
- Implementation of ***management practices,*** including planting cover crops, using conservation tillage methods, and fertilizer management methods;
- Delivering ***education and outreach*** to increase public engagement, improve communication, and increase understanding;
- Developing information to fill ***data gaps*** and complete ***research***, and continue monitoring efforts;
- Executing local or state ***regulatory*** responsibilities; or
- Implementation of large, physical ***capital improvement*** projects**.**

Actions pertaining to education and outreach, data gaps and research, regulatory, and capital improvement are implemented watershed-wide, to create consistency and opportunity for shared services. Actions dealing with structural and management practices vary by MRW planning region because the physical landscape and measurable goals differ among the planning regions. **Planning region implementation profiles (Figure ES-2)** summarize current planning region resource conditions and present information about the number, type, and location of structural and management practices for each planning region. These profiles also present information about the relationship between the cost to implement practices and the progress practices make toward measurable goals.

Figure ES-2: An example planning region implementation profile for the Lower Big Sioux River Planning Region



The ability to achieve measurable goals—and the speed at which they are realized—largely depends on the amount of funding available to implement actions. However, the amount of funding for implementing this plan is uncertain. To address this challenge, there is more than one implementation funding scenario summarized in the targeted implementation schedule.

- The **targeted implementation approach** is the focus of this plan. This funding scenario assumes funding is like current (2017) funding focused on water issues within the plan area. Actions identified as a "targeted implementation approach" action level are the highest priority for plan implementation.
- If more funds are available for implementation, more actions within the targeted implementation schedule can be implemented, and more progress can be made toward measurable goals. Actions in the "**moderate increased funding scenario**" have a greater priority than those in the "**large increased funding scenario**," and would be implemented first if additional dollars become available.

In Section 4, all three implementation funding scenarios show increases in funding and relative increased progress toward plan goals.

The MRW 1W1P Planning Group used the **Prioritize, Target, and Measure Application (PTMApp)** to estimate the locations, annual cost, water quality value (sediment, total nitrogen, and total phosphorous load reductions) and progress toward measurable goals arising from implementing the "best" structural practices which make up the targeted implementation approach. The MRW 1W1P targeted implementation approach was designed to select the most cost-effective practices for removing sediment

and nutrients (total phosphorus and total nitrogen) at the field edge, until the cost of practices equaled what planning partners are currently spending annually on structural projects within each planning region.

The MRW 1W1P Planning Group also designed the targeted implementation approach to select the practices most likely to be implemented based on landowner acceptance and history. Examples of locally accepted practices include storage practices (such as water and sediment control basins and grade stabilization) and filtration practices (such as grassed waterways). Designing the targeted implementation approach in this way identifies the most cost-effective practices in the plan area that are most likely to lead to voluntary implementation.

The results for implementing structural practices in the targeted implementation approach are summarized by planning region in **Table ES-2**. The environmental benefits arising from increasing soil health through management practices (such as cover crops and tillage management) are estimated using literature values. These are summarized elsewhere within Section 4.

Table ES-2: Structural practices in the targeted implementation approach and progress made towards short-term measurable goals for sediment, total phosphorus, and total nitrogen.

Planning Region	Treatment Group & Number of Structural Practices	Estimated Annualized Cost	Parameter	Unit	Existing Load Leaving Planning Region	Average Existing Load / Acre	Short-Term Measurable Goal		Load Reduction Expected from Implementation	Load Reduction Expected from Implementation (%)	Progress towards Short-Term Goal (%)
							Annual Load Reduction (%)	Target Load Reduction			
Upper Big Sioux River	Storage (19) Filtration (12)	$36,663	Sediment	tons/yr.	25,059	1.0	Protection (Non-degradation)	N/A	1,414	5.6%	100+
			Total Phosphorus	lbs./yr.	7,647	0.3	10%	765	95	1.2%	12%
			Total Nitrogen	lbs./yr.	284,814	11.0	7%	19,937	7,238	2.5%	36%
Lower Big Sioux River	Storage (209) Filtration (158)	$457,487	Sediment	tons/yr.	146,412	0.4	10%	14,641	23,753	16.2%	162%
			Total Phosphorus	lbs./yr.	67,125	0.2	10%	6,713	1,594	2.4%	24%
			Total Nitrogen	lbs./yr.	2,513,195	7.7	10%	251,320	110,233	4.4%	44%
Rock River	Storage (461) Filtration (250)	$812,958	Sediment	tons/yr.	233,893	0.4	15%	35,084	47,394	20.3%	135%
			Total Phosphorus	lbs./yr.	172,711	0.3	10%	17,271	3,011	1.7%	17%
			Total Nitrogen	lbs./yr.	7,180,413	12.2	10%	718,041	222,575	3.1%	31%
Little Sioux River	Filtration (161) Storage (70)	$286,926	Sediment	tons/yr.	122,892	0.6	7%	8,602	28,158	22.9%	327%
			Total Phosphorus	lbs./yr.	55,893	0.3	10%	5,589	2,078	3.7%	37%
			Total Nitrogen	lbs./yr.	2,750,094	13.7	10%	275,009	157,294	5.7%	57%

Green cells indicate achievement of short-term measurable goal through implementation of structural practices in the targeted implementation approach

Estimated number of practices, annualized cost, and progress toward achieving short-term measurable goals by planning region, based on implementing the "best", most cost-effective structural practices as defined by the MRW 1W1P Planning Work Group. Estimates developed using the Prioritize, Target and Measure Application (PTMApp). Existing loads determined at the outlet(s) of each planning region. Load reduction benefits from practice implementation are summarized at the edge of the field, are cumulative, and do not consider implementation of upstream practices, and therefore are likely high. Benefits arising from implementation of management practices are not evaluated in this table.

Table Interpretation (top row): In the Upper Big Sioux River planning region, 19 storage practices and 12 filtration practices will cost an estimated $36,663 annually to implement and maintain. Upon implementation of those 31 structural practices, PTMApp estimates that the sediment load delivered to surface waters in the planning region will be reduced by 1,414 tons/yr., or 5.6% from existing conditions. As this planning region has a nondegradation (protection) measurable goal, this sediment load reduction corresponds to over 100% of the target load reduction goal.

If the actions of the targeted implementation approach could be successfully completed, they would result in the implementation and anticipated load reduction benefits from all structural practices within each planning region shown in **Table ES-2**. Actions in the targeted implementation approach are also inclusive of actions to implement management practices, develop a consistent education and outreach program for the watershed area, implement research to close data gaps and expand monitoring efforts, continue regulatory implementation, and construct capital improvement projects.

The anticipated cost for implementing the targeted implementation approach is shown in **Table ES-3**. Again, the targeted implementation approach was designed to fund plan implementation at a cost at or near the estimated current (2017) funding focused on water issues within the plan area. Each action is funded by an implementation program, as described in Section 5 and summarized in **Table ES-3**.

Table ES-3: Annualized and total plan cost for actions within the targeted implementation approach

Implementation Action		Funded By (See Section 5)	Annualized Cost	Total Plan Cost (Over 10 Years)
Implementation	Structural Practices[1]	*Structural and Management Practices Cost-Share Program*	$1,815,400	$18,154,000
	Management Practices[2]	*Structural and Management Practices Cost-Share Program*	$460,000	$4,600,000
	Education and Outreach[3]	*Education and Outreach Implementation Program*	$40,000	$400,000
	Data Gaps and Research[3]	*Data Gaps and Research Implementation Program*	$92,000	$920,000
	Regulatory[3]	*Regulatory Administration Implementation Program*	$330,000	$3,300,000
	Capital Improvement[4]	*Capital Improvement Implementation Program*	$500,000	$5,000,000
Additional Expenses				
Plan Administration[5]		*Existing Budget*	$323,740	$3,237,400
Total Estimated Funding Needs				
			$3,561,140	$35,611,400

[1] Includes total cost of targeted implementation approach plus an additional 10% for technical assistance
[2] Assumes additional cost of $10/acre for field walkovers
[3] Assumes annualized cost similar to estimated current (2017) local funding level
[4] Assumes two large investment projects ($2,500,000 each)
[5] Administration costs can be up to 10% of overall plan cost

The MRW 1W1P Planning Group previously entered into a formal agreement through a Memorandum of Agreement to lead the 1W1P planning process for the MRW. The parties will be entering into an agreement for purposes of implementing this plan. Expectations are that the roles of the local Policy Committee, Planning Work Group, and Advisory Committee will shift and change focus during plan implementation. **Table ES-4** shows the probable roles and functions related to plan implementation.

Table ES-4: Anticipated roles for the Missouri River Watershed 1W1P 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 Planning Work Group priority issue recommendations* ▪ *Direction to Planning Work Group on addressing emerging issues* ▪ *Approve plan amendments* ▪ *Implement county ordinances and state statutory responsibilities separately from plan implementation* ▪ *Approve grant applications* ▪ *Approve annual assessment*
Advisory Committee	▪ *Review and provide input for the annual work plan* ▪ *Review and identify collaborative funding opportunities* ▪ *Recommendations to Planning Work Group on program adjustments* ▪ *Assist with execution of the targeted implementation schedule*
Planning Work Group	▪ *Review the status of available implementation funds from plan participants* ▪ *Review opportunities for collaborative grants* ▪ *Review annual fiscal reports* ▪ *Review annual reports submitted to BWSR* ▪ *Annual review and confirmation of priority issues* ▪ *Evaluate and recommend response to emerging issues* ▪ *Prepare plan amendments* ▪ *Implement the targeted implementation schedule*
Local Fiscal/Administrative Agent	▪ *Convene committee meetings* ▪ *Prepare the annual work plan* ▪ *Prepare and submit grant applications/funding requests* ▪ *Research opportunities for collaborative grants* ▪ *Compile annual results for annual assessment*

SECTION 1.0 INTRODUCTION

The Missouri River Watershed (MRW) One Watershed, One Plan (1W1P) represents an evolution in traditional water planning for southwestern Minnesota.

The 1W1P is a statewide effort, aimed at transforming the way local entities plan for resource management. The implementation-focused 1W1P combines local entities that would otherwise have separate local plans into one combined planning effort to address resource issues that are most important locally.

In the Missouri River Watershed, this process brings six counties, six soil and water conservation districts, and two watershed districts together into one cohesive and comprehensive water planning document.

The MRW 1W1P planning area is located in the southwestern corner of Minnesota, encompasses all or portions of Rock, Pipestone, Nobles, Jackson, Lincoln, and Murray counties and the Kanaranzi-Little Rock and the Okabena-Ocheda watershed districts. The planning area drains 1.1 million acres or 1,783 square miles. A map of the planning area is shown in **Figure ES-1**.

The MRW 1W1P planning area is unique to the state of Minnesota. Four major (HUC 8) watersheds are aggregated into the MRW 1W1P planning area, including the Upper Big Sioux River (10170202), Lower Big Sioux River (10170203), Rock River (10170204), and Little Sioux River (10230003) watersheds. These watersheds form the basis of "planning regions" within this 1W1P, providing a finer scale to summarize issues, goals, and actions for the MRW 1W1P planning area (**Figure ES-1**). These planning regions will be referred to throughout this document.

Diffuse runoff and small, oftentimes spring-fed tributaries join to create streams in these planning regions. Most of these streams flow directly west into South Dakota or south to Iowa. The largest river in the MRW is the Rock River, which flows south into the Big Sioux River in Iowa before entering the Missouri River. Lakes are not a prominent feature of the MRW and all but one is in the eastern portion of the plan area.

This area includes all or portions of 25 towns and cities with a total population of roughly 30,000 people (MPCA, 2018b). The MRW is predominately rural, with populations clustered in its largest cities of Worthington (12,764), Luverne (4,745), and Pipestone (4,317) (U.S. Census Bureau, 2010). Current land use in the MRW is similar to other regions in southern and western Minnesota. Land use is dominated by

warm-season, annual, cultivated, row crops, of which 59% are corn, 39% are soybeans, 2% are alfalfa/hay, and <1% of crops are small grains/other (MPCA, 2018b).

The Land and Water Resources Inventory (LWRI) (**Appendix A**) provides a comprehensive review of the characteristics of the MRW 1W1P planning area.

PLAN OVERVIEW

The MRW 1W1P process is intended to result in a more unified, effective, and science-based approach to address resources and issues that are most important locally. The information contained within this plan came from a compilation of existing local water management plans, studies, reports, models, scientific data, and state strategy documents. This comprehensive plan addresses more than just surface water management, also considering groundwater, water quantity, habitat and natural features, local knowledge, and land stewardship. There are a wide variety of actions included in the plan's targeted implementation schedule, aimed to protect and improve these resources and make progress toward stated goals.

This plan is organized into five plan sections:

- ***Section 1: Introduction*** *contains background information about the 1W1P, the Missouri River Watershed, and the plan development process;*
- ***Section 2: Identification and Prioritization of Resource Categories, Concerns, and Issues****, summarizes priority issues that will be addressed within the lifespan of the plan;*
- ***Section 3: Establishment of Measurable Goals****, assigns measurable goals to each priority issue;*
- ***Section 4: Targeted Implementation*** *contains the "to-do" list of actions within the plan, which includes a description of the actions, where and when actions will occur, who will implement the action, the cost of implementation, and how progress will be measured towards goals; and lastly,*
- ***Section 5: Implementation Programs*** *describes the overarching implementation programs that will be used to fund and support the implementation of actions included within the plan.*

PLANNING PARTNERS AND PLAN DEVELOPMENT

The MRW 1W1P Planning Group includes all local planning partners primarily involved in developing the MRW 1W1P. The MRW 1W1P Planning Group was developed under and through a Memorandum of Agreement (MOA) (**Appendix B**) adopted by the governing boards of the participating entities:

- *The counties of Rock, Pipestone, Nobles, Jackson, Lincoln, and Murray by and through their respective County Board of Commissioners;*
- *The Rock, Pipestone, Nobles, Jackson, Lincoln, and Murray Soil and Water Conservation Districts (SWCDs), by and through their respective SWCD Board of Supervisors; and*
- *The Kanaranzi-Little Rock and the Okabena-Ocheda watershed districts, by and through their Board of Managers.*

During plan development, the MRW 1W1P Planning Group was subdivided into three local planning committees:

1. The Planning Work Group (PWG),
2. The Advisory Committee (AC), and

3. The Policy Committee (PC).

The PWG was responsible for preparing the plan. The PWG was composed of local SWCD, county, and watershed district staff, regional BWSR staff, and consultant planning staff. State agency staff also attended and participated in PWG meetings. The PWG was responsible for the logistical and day-to-day decision-making in the planning process. Members of the PWG were responsible for providing information needed for the planning process, reviewing and approving draft plan related information, and assisting in plan development. The MRW 1W1P Planning Group contracted with Houston Engineering, Inc. (HEI) to assist with meeting facilitation for all committees, plan assessment, and plan writing.

The AC served to make recommendations on plan content and the planning process, including processes for identifying the range of resource categories, concerns, and issues, prioritizing issues, and defining implementation actions and strategies. The AC was composed of 29 representatives from the State's main water and/or plan review agencies, representatives from agricultural and tourism groups, local land owners, and municipalities. AC members were expected to communicate plan-related activities to their respective organizations and identify practical concerns during the plan development process. Members also served a role in speaking about the plan within the community and assisting the PC in ensuring a credible process.

The PC was made up of 14 primary members and 14 alternate members. The primary committee members included one County Commissioner and one SWCD Board Supervisor, appointed from each of the participating counties in the watershed, plus a manager from each of the watershed districts. The PC made all final decisions about the content of the plan and its submittal to and approval by BWSR. The PC retained ultimate responsibility for plan direction, decisions, and content.

Lastly, the public played an essential role during the development of the MRW 1W1P. The public were primarily engaged through initial public kick-off meetings, the final public hearing, and the planning website.

The intent of the public kick-off meetings, held on August 22, 2017 (Worthington, MN) and August 23, 2017 (Pipestone, MN), was to ensure the development of a complete list of resource issues and concerns and the public's rank of issues impacting the community and the watershed. An additional role of the public is to review and comment on the final plan before its adoption. The public was also represented during the planning process through the inclusion of 1W1P updates at local county and SWCD board meetings.

INCORPORATING COMMENTS INTO THE PLAN

The MRW 1W1P Participation Plan (**Appendix C**) was developed to create a clear process for soliciting input and obtaining comments during plan development. Throughout plan development, comments received from the general public and local committees were documented and used to guide adjustments in plan content. For a list of all comments received and responses, see **Appendix D**.

SECTION 2.0 IDENTIFICATION AND PRIORITIZATION OF RESOURCE CATEGORIES, CONCERNS, AND ISSUES

According to BWSR *One Watershed, One Plan: Plan Content Requirements* version 1.0 (**Appendix E**), the resource and issue identification and prioritization section of the plan is intended to "*summarize the process that the planning partners used to reach agreement on the watershed resource issues that will be addressed within the lifespan of the plan. Prioritizing is needed because not all identified issues can be addressed in the timeframe of a ten-year plan – some items will be addressed before others*" (BWSR, 2016).

In adherence to this guidance, this plan section identifies the following:

- The steps used to identify resource categories, concerns, and issues;
- A list of the resource categories, concerns, and issues considered for prioritization;
- A final list of agreed upon priority issues; and
- The reasons for selecting those priority issues.

The outcome from these efforts is a targeted implementation schedule focused on achieving goals associated with the prioritized issues.

DEFINITIONS

The following definitions are developed to establish a common language for communicating information within this plan section:

- **Resource Category–** A resource category, or "resource" is defined as a natural, economic, educational, biotic, aesthetic, land, or similar asset. Resources are generally considered something that can be managed, and are generally broad, such as surface water, groundwater, or education and outreach.
- **Resource Concern –** A resource concern, or "concern" is defined as a physical, biological, chemical, or geological subset or component of a resource. For example, the resource "surface water" can be further refined into several components, including streams and rivers, lakes, and wetlands.
- **Resource Issue –** A resource issue, or "issue" affecting a concern is defined as a factor, stressor, or difficulty resulting in an adverse consequence for a concern. A concern can have one or many issues. For instance, nitrate-nitrogen causing the contamination of drinking water supply could be an issue (e.g. nitrate-nitrogen) affecting a concern (e.g. drinking water supplies).

2.1 IDENTIFICATION AND SUMMARY OF RESOURCE CATEGORIES, CONCERNS, AND ISSUES

The process for identifying and describing the resource categories, concerns, and issues included gathering and reviewing the following:

- Existing management plans, studies, reports, data, and other information; including those within the Missouri River Basin Watersheds of Minnesota Restoration and Protection Strategies (WRAPS), drafted excerpts from the Missouri River Basin Watersheds of Minnesota Groundwater Restoration and Protection Strategies (GRAPS), the Missouri River Basin Hydrology, Connectivity, and

Geomorphology Assessment Report, existing Total Maximum Daily Load (TMDL) reports, existing county water plans, watershed district plans, and similar documents (**Appendix F)**;

- Comment letters provided by state and federal agencies (**Appendix G)**;
- Input from members of the Advisory Committee, Policy Committee, and the Planning Work Group; and
- The knowledge of local water and resource managers, including county, SWCD, and watershed district staff.

Resource categories, concerns, and issues were identified and inventoried in no particular order within an "Issues Table," prior to prioritization. The Issues Table (**Table 2-1)** illustrates how resource concerns are refinements of a resource category, and how multiple issues can impact each resource concern. The Issues Table was used to confirm that all issues impacting resources within the MRW were identified prior to issue prioritization. **Table 2-1** shows the complete list of all resource categories, concerns, and issues that were inventoried and considered for plan development. For technical descriptions of all issues and references, see **Appendix H**.

Maps were developed for each mappable resource concern and issue identified within the Issues Table. This mapping was done to tell a story of the watershed and its issues, geographically map where resource categories, concerns, and issues were located, and allow for the development of a targeted implementation schedule focused on specific locations of issues and resources on the landscape. For readability purposes, these maps are included at the end of this plan section (**Figures 2-1 through 2-12**).

The issue prioritization process and the resulting priority issues are provided in the following subsections.

Table 2-1: Resource categories, resource concerns, and issues affecting those resource concerns within the Missouri River Watershed 1W1P planning area.

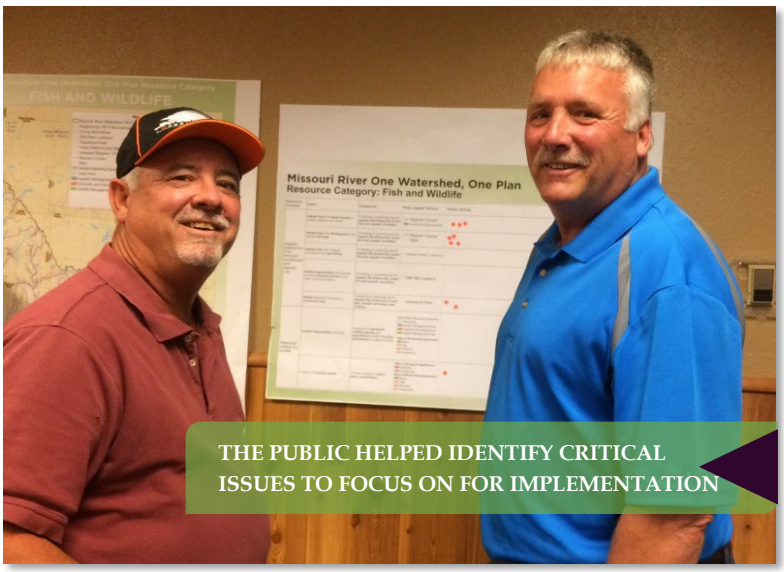
Resource Category	Resource Concern	Issue	Issue Impact
1. Groundwater: Water which is held underground within the pores of rocks and soils and which reaches the ground surface			
1. Groundwater	1.1 Drinking Water	1.1.1: Elevated nitrate-nitrogen in groundwater wells	Risk to human health and significant cost to the local economy to treat.
		1.1.2: Elevated bacteria (i.e. *Escherichia coli* (*E. coli*) and fecal coliform) in groundwater wells	Risk to human health and significant cost to the local economy to treat
		1.1.3: Elevated levels of dissolved minerals (sulfate, iron, manganese) in groundwater wells	Objectional for human consumption and costly to the local economy to treat
		1.1.4: Elevated arsenic in groundwater wells	Risk to human health and significant cost to the local economy to treat
		1.1.5: Unsealed abandoned wells and gravel pits	Groundwater aquifer contamination; risk to human health
		1.1.6: Land use changes where water enters aquifers, including Wellhead Protection Areas (WPAs) or Drinking Water Supply Management Areas (DWSMAs)	Risk to human health and significant cost to the local economy to treat when contaminated
		1.1.7: Sustainable quantities of groundwater supplies for drinking water use with suitable water quality	Risks to drinking water availability and local economy if access becomes limited
	1.2 Supplies for Non-Potable Use (Quantity)	1.2.1: Land use changes in primary aquifer recharge areas	Rate of aquifer recharge
		1.2.2: Insufficient knowledge of groundwater resource/supply condition	Groundwater aquifer quantity/quality; addressing groundwater management
2. Surface Waters: Water resulting from excess precipitation leaving the landscape and collecting in streams, rivers, creeks, wetlands, lakes and ponds			
2. Surface Waters	2.1 Streams and Rivers	2.1.1: Elevated suspended solids (sediment) and phosphorus levels	Protecting or improving use for aquatic life and recreation
		2.1.2: Elevated bacteria (i.e. *E. coli* and fecal coliform) levels	Protecting or improving use for aquatic recreation
		2.1.3: Elevated nitrate-nitrogen levels	Protecting suitable conditions for aquatic life
		2.1.4: Low dissolved oxygen (DO) concentrations	Protecting or improving suitable conditions for aquatic life
		2.1.5: Increased spread of aquatic invasive species	Protecting or improving use for aquatic life and recreation
		2.1.6: Land use changes contributing to wind and overland runoff	Pollutant loading to surface waters
		2.1.7: Streambank/riverbank erosion causing loss of bank sediment	Degradation of water quality and aquatic habitat
	2.2 Lakes	2.2.1: Phosphorus concentrations in the water and increased risk of algal blooms	Protecting or improving aquatic recreation and public health
		2.2.2: Increased spread of aquatic invasive species	Protecting or improving use for aquatic life and recreation
		2.2.3: Lake levels controlled by water control structures	Fish and wildlife, development, recreation, and economy
	2.3 Surface Runoff	2.3.1: Changes in drainage management	Timing and intensity of runoff delivery
		2.3.2: Land use changes (loss of vegetative cover and field residue)	Increased volume and speed of water flows and levels impacting streams and causing flooding
		2.3.3: Land use changes (loss of natural storage)	Increased volume and speed of water flows and levels impacting streams and causing flooding
	2.4 Wetlands	2.4.1: Loss of functioning wetlands	Water storage, water filtering, groundwater recharge, and habitat
	2.5 Agricultural Drainage Systems	2.5.1 Presence, width, and quality of vegetated areas alongside ditches	Ditch stability and water quality
		2.5.2 Neglected or improper ditch maintenance	Ditch functionality
3. Fish and Wildlife Habitat: Natural features and characteristics of the landscape which support aquatic life and terrestrial wildlife.			
3. Fish and Wildlife Habitat	3.1 Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life	3.1.1: Habitat loss from bank erosion in creeks, streams, and rivers	Protecting or improving use for aquatic life and aquatic recreation
		3.1.2: Habitat loss from development and intense drainage	Protecting or improving use for aquatic life and aquatic recreation
		3.1.3: Habitat loss from channel succession and pool filling	Protecting or improving use for aquatic life and aquatic recreation
		3.1.4: Habitat segmentation and access loss from physical barriers (e.g. water control structure)	Protecting or improving use for aquatic life and aquatic recreation
		3.1.5: Habitat loss from reduction in calcareous fens	Protecting or improving use for aquatic life, aquatic recreation, and hunting
	3.2 Terrestrial Habitat for Wildlife	3.2.1: Habitat fragmentation and loss	Reduction in terrestrial wildlife species and populations; smaller hunting populations for game animals
		3.2.2: Presence of noxious weeds	Threaten quality of native plant communities
4. Local Knowledge Base and Technical Capacity: The collective understanding of water related matters within the community and the ability to respond to and resolve water related issues.			
	4.1 Public Knowledge of and Behavior Relative to Water Issues	4.1.1 Lack of a watershed-wide education and outreach on watershed management issues focused on the next generation	Public awareness and engagement; education programs
		4.1.2 Lack of watershed-wide education and outreach on watershed management issues focused on the general public	Public awareness and engagement; education programs

Resource Category	Resource Concern	Issue	Issue Impact
4. Local Knowledge Base and Technical Capacity		4.1.3 Lack of watershed-wide education and outreach on watershed managements for local government units (LGU) staff and elected public officials	Public awareness and engagement; education programs
		4.1.4 Frequency of use of recreational resources along waterbodies and other natural resources	Public awareness and engagement; education programs
	4.2 Landowner, Producer and Lake Shore Owner Engagement in Water Management	4.2.1 Lack of watershed-wide education and outreach programs focused on cost-share programs and their benefits to landowners	Public awareness and engagement; education programs
		4.2.2 Lack of watershed education and outreach on management and structural best management practices (BMPs) and their impact on farm profitability and the environment	Public awareness and engagement; education programs
	4.3 Technology, Tools, Funding, and Existing Capabilities	4.3.1 Local technical capacity to use emerging technologies	Program implementation
		4.3.2 Lack of clarity about roles and responsibilities among local, state, and federal agencies	Program implementation and funding
		4.3.3 Lack of understanding, agreement, and consensus about the hydrologic impacts of tile drainage and the benefits to producers	Program implementation and landowner discussions
		4.3.4 Piecemeal approach and lack of long-term and consistent funding for water management at the local level	Program implementation and funding
		4.3.5 Lack of consistent and effective watershed-wide approach to a regulatory program, including ordinances and rules	Program implementation
		4.3.6 Identification and examination of aquifer vulnerabilities within DWSMAs and the needed state and federal support to LGUs to enforce regulations and provide cost-share/other incentives	Program implementation and funding
		4.3.7 Need to improve tools that link surface hydrology and surface conservation practices with groundwater hydrology	Program implementation
5. Local Development and Land Stewardship: The management of urban and rural land use through sustainable development			
5. Local Development and Land Stewardship	5.1 Urban Land Stewardship	5.1.1 Increased impervious surfaces	Increased sediment and nutrient loading in surface waters; reduced aquifer recharge; reduced and disconnected wildlife habitat
		5.1.2 Increased construction and development	Increased sediment and nutrient loading in surface waters; reduced aquifer recharge; reduced and disconnected wildlife habitat
		5.1.3 Wastewater treatment facility compliance and impact to water quality	Increased sediment and nutrient loading in surface waters; impacts to local economy and public health
		5.1.4 Fertilizers and pesticides applied on urban landscapes	Increased nutrient loading in surface waters; potential aquifer contamination
		5.1.5 Disposal of solid waste, household hazardous waste, and household drugs	Groundwater and surface water contamination; protecting or improving aquatic recreation
	5.2 Rural Land Stewardship	5.2.1 Decreased agricultural soil health	Reduced agricultural productivity and water holding capacity; increased risk for sediment erosion
		5.2.2 Increased sheet, rill, and wind erosion	Reduced agricultural productivity; negative impact on surface water quality; cost to replace topsoil
		5.2.3 Developmental pressures from expanding operations and residences	Loss of terrestrial and aquatic habitat and wildlife
		5.2.4 Increased demand for irrigation water	Groundwater and surface water supply; aquifer capacity for supplying domestic drinking water
		5.2.5 Pesticide application and disposal	Groundwater aquifer contamination; negative impacts on surface water quality
		5.2.6 Manure application and disposal	Groundwater aquifer contamination; negative impacts on surface water quality
		5.2.7 Subsurface sewage treatment system (SSTS) adequacy and efficiency	Groundwater aquifer contamination; negative impacts on surface water quality
		5.2.8 Mining and processing of aggregate and other natural construction materials	Native habitats and wildlife where extracted; local economy for product needs
	5.3 Riparian Stewardship	5.3.1: Increased development along lakes	Loss of native and perennial shoreland plants and habitat; increased sediment and nutrient loading to lake
		5.3.2: Undercut and unstable streambanks	Increased stream/river erosion; loss of aquatic habitat; property loss
		5.3.3: Barriers to fish migration, typically by man-made water control structures.	Loss in ecosystem services and aquatic populations
		5.3.4 Improperly sized roadway crossing	Reduced geomorphic stability; risk to safe travel on roadway
		5.3.5: Insufficient stream channel volume	Bank overtopping during large storm events
		5.3.6 Livestock accessibility to streams and rivers	Increased streambank erosion from sloughing
		5.3.7: Presence, width and quality of vegetated buffer along streams and rivers	Sediment and nutrient loading to stream/river; wildlife habitat connectivity

2.2 ISSUE PRIORITIZATION PROCESS

As described by BWSR guidance, this plan is not expected to address all identified issues during its ten-year lifespan. This plan does not "reject" any identified issues, but rather places issues into priority tiers based on importance or impact to resources in the watershed.

These priority tiers are used to guide creation of measurable goals aimed at priority issues (**Section 3**), and the timeline and aggressiveness of implementation within the targeted implementation schedule (**Section 4**).



THE PUBLIC HELPED IDENTIFY CRITICAL ISSUES TO FOCUS ON FOR IMPLEMENTATION

During plan development, participants followed a thorough and rigorous process to prioritize the identified issues within **Table 2-1**. Issues were prioritized by soliciting stakeholders' preference on which issues were most important to them.

This preference was solicited through in-person voting. To cast the net widely and solicit as much feedback as possible, multiple meetings were hosted to solicit involvement from diverse stakeholder groups, including:

- Members of the public during public meetings in Worthington, MN (August 22, 2017) and Pipestone, MN (August 23, 2017);
- Members of the Planning Work Group during a September 13, 2017 meeting and with absentee votes following the meeting;
- Members of the Advisory Committee during a September 13, 2017 meeting and with absentee votes following the meeting; and
- Members of the Policy Committee during an October 11, 2017 meeting.

At each meeting, participating stakeholders could cast up to 10 votes to express his/her preference for the importance of one or more issues. A voter could choose to cast all 10 votes for a single issue, or could spread out his/her votes among up to 10 different issues. A total of 697 votes were cast, 120 by members of the Planning Work Group, 211 by members of the Advisory Committee, 90 by members of the Policy Committee, and 276 by other public citizens. Tallied votes for each issue were then ranked evenly across all voting groups (i.e. the public, Planning Work Group, Advisory and Policy Committees) and sorted into priority tiers based on total number of votes.

Priority tiers represented breaks in total votes as outlined in **Table 2-2**.

Table 2-2: Priority tiers (A and B) and other tiers (C, D, and E), and the ranks used to determine how issues were attributed to each tier.

Priority Tier	Rank of Issue Votes
Priority Tier A	Above 80th percentile
Priority Tier B	60th - 80th percentile
Tier C	40th - 60th percentile
Tier D	20th - 40th percentile
Tier E	below 20th percentile

The Planning Work Group reviewed the preliminary prioritization results and provided a recommendation for the Policy Committee to establish the final plan priorities. The Policy Committee unanimously voted to consider all stakeholder participant groups with equal weight, and to assign final priority tiers based on the rank of all stakeholder participant groups aggregated together.

The plan establishes priority issues consistent with guidance provided by BWSR. As a result of issue prioritization, each issue was designated as an A, B, C, D, or E tier issue. While all issues are important and worthy of local management efforts, limited resources for implementing solutions are available and not all issues can be addressed within the timeframe of a ten-year plan. Therefore, priority tiers designate the timeline or aggressiveness of addressing issues with the plan. Those issues identified as Priority Tier A and B will be assigned measurable goals and will be the focus of initial implementation efforts. Those issues designated as Tier C, D, and E are not anticipated to be directly addressed within this plan.

2.3 PRIORITY CONCERNS AND ISSUES

2.3.1 PRIORITY ISSUES

Priority Tier A issues were placed in the highest tier, indicating the highest expressed preference during the issue prioritization process, and were confirmed as the highest priority by the Policy Committee (**Table 2-3**). These issues will be assigned a measurable goal and will be considered the focus for initial implementation efforts.

Table 2-3: Issues placed in the highest tier, Priority Tier A, during the issue prioritization process. Each of these issues will have a measurable goal established to address it.

Resource Category	Resource Concern	Issue
1. Groundwater	1.1 Drinking Water	1.1.1 Elevated **nitrate-nitrogen** in groundwater wells
		1.1.6 **Land use changes** where water enters aquifers, including Wellhead Protection Areas (WPAs) or Drinking Water Supply Management Areas (**DWSMAs**)
		1.1.7 Sustainable quantities of **groundwater supplies** for drinking water use with suitable water quality
2. Surface Waters	2.1 Streams and Rivers	2.1.1 Elevated suspended solids (**sediment**) and **phosphorus** levels
		2.1.6 Land use changes contributing to **wind and overland runoff**
		2.1.7 **Streambank/riverbank erosion** causing loss of bank sediment
	2.3 Surface Runoff	2.3.2 Land use changes leading to loss of **vegetative cover and field residue**
		2.3.3 Land use changes leading to loss of **natural storage**
	2.4 Wetlands	2.4.1 Loss of functioning **wetlands**
3. Fish and Wildlife Habitat	3.1 Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life	3.1.1 Habitat loss from **bank erosion** in creeks, streams, and rivers
4. Local Knowledge Base and Technical Capacity	4.3 Technology, Tools, Funding, and Existing Capabilities	4.3.4 Piecemeal approach and lack of long term and **consistent funding** for water management programs at the local level
5. Local Development and Land Stewardship	5.2 Rural Land Stewardship	5.2.1 Decreased agricultural **soil health**

Priority Tier B issues are considered the second priority for implementation (**Table 2-4**). These priority issues received the second highest proportion of votes during the prioritization process and were confirmed by the Policy Committee as having the second highest priority. Much like the Priority Tier A issues, these issues will also be assigned measurable goals, and actions within the targeted implementation schedule.

Table 2-4: Issues placed in the second highest tier, Priority Tier B, during the issue prioritization process. Each of these issues will have a measurable goal established to address it.

Resource Category	Resource Concern	Issue
1. Groundwater	1.1 Drinking Water	1.1.2 Elevated bacteria (i.e. *Escherichia coli (E. coli)* and fecal coliform) in groundwater wells
2. Surface Waters	2.1 Streams and Rivers	2.1.2 Elevated bacteria (i.e. *E. coli* and fecal coliform) levels
		2.1.3 Elevated **nitrate-nitrogen** levels
		2.1.5 Increased spread of **aquatic invasive species**
	2.2 Lakes	2.2.1 Elevated phosphorus concentrations in the water and increased risk of **algal blooms**
	2.5 Agricultural Drainage Systems	2.5.1 Presence, width, and quality of **vegetated** areas alongside **ditches**
3. Fish and Wildlife Habitat	3.1 Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life	3.1.2 Aquatic and **riparian habitat loss** from development and intense drainage
	3.2 Terrestrial Habitat for Wildlife	3.2.1 Terrestrial **habitat fragmentation** and loss
4. Local Knowledge Base and Technical Capacity	4.2 Landowner, Producer and Lake Shore Owner Engagement in Water Management	4.2.2 Lack of watershed-wide **education and outreach** on management and structural best management practices (**BMPs**) and their impact on farm profitability and the environment
	4.3 Technology, Tools, Funding, and Existing Capabilities	4.3.3 Lack of **understanding**, agreement, and consensus about the hydrologic impacts of **tile drainage** and the benefits to producers
5. Local Development and Land Stewardship	5.2 Rural Land Stewardship	5.2.2 Increased **sheet, rill, and wind erosion**
		5.2.6 **Manure application and disposal**
	5.3 Riparian Stewardship	5.3.2 **Undercut and unstable streambanks**
		5.3.6 **Livestock accessibility** to streams and rivers
		5.3.7 **Vegetated buffer** along streams and rivers

2.3.2 LOWER TIER ISSUES

Tier C, D, and E issues are considered the third, fourth, and fifth priorities (**Table 2-5**). These issues received the lowest proportion of votes during the issue prioritization process and were confirmed by the Policy Committee as having a lower priority. As these issues were not designated as a priority (either A or B tiers), measurable goals will not be established for these issues, and actions will not be included in the targeted implementation schedule to directly address these issues.

Table 2-5: Issues placed in Tier C, D, and E during the issue prioritization process. Measurable goals will not be established for these issues as they were not identified as priority issues.

Resource Category	Resource Concern	Issue	Tier
1. Groundwater	1.1 Drinking Water	1.1.3 Elevated levels of dissolved minerals (sulfate, iron, manganese) in groundwater wells	E
		1.1.4 Elevated arsenic in groundwater wells	E
		1.1.5 Unsealed abandoned wells and gravel pits	D
	1.2 Supplies for Non-Potable Use (Quantity)	1.2.1: Land use changes in primary aquifer recharge areas	C
		1.2.2 Sustainable quantities of groundwater supplies for drinking water use with suitable water quality	D
2. Surface Waters	2.1 Streams and Rivers	2.1.4 Low dissolved oxygen (DO) concentrations	E
	2.2 Lakes	2.2.2 Increased spread of aquatic invasive species	E
		2.2.3 Lake levels controlled by water control structures	E
	2.3 Surface Runoff	2.3.1: Changes in drainage management	C
	2.5 Agricultural Drainage Systems	2.5.2 Neglected or improper ditch maintenance	D
3. Fish and Wildlife Habitat	3.1 Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life	3.1.3 Habitat loss from channel succession and pool filling	E
		3.1.4 Habitat segmentation and access loss from physical barriers (e.g. water control structure)	E
		3.1.5 Habitat loss from reduction in calcareous fens	D
	3.2 Terrestrial Habitat for Wildlife	3.2.2: Presence of noxious weeds	C
4. Local Knowledge Base and Technical Capacity	4.1 Public Knowledge of and Behavior Relative to Water Issues	4.1.1 Lack of watershed-wide education and outreach on watershed management issues focused on the next generation	E
		4.1.2 Lack of watershed-wide education and outreach on watershed management issues focused on the general public	C
		4.1.3 Lack of watershed-wide education and outreach on watershed managements for local government unit (LGU) staff and elected public officials	D
		4.1.4 Frequency of use of recreational resources along waterbodies and other natural resources	E

Resource Category	Resource Concern	Issue	Tier
	4.2 Landowner, Producer and Lake Shore Owner Engagement in Water Management	4.2.1 Lack of watershed-wide education and outreach on cost-share programs and their benefits to landowners	E
	4.3 Technology, Tools, Funding, and Existing Capabilities	4.3.1 Local technical capacity to use emerging technologies	D
		4.3.2 Lack of clarity about roles and responsibilities among local, state and federal agencies	C
		4.3.5 Lack of consistent and effective watershed-wide approach to a regulatory program, including ordinances and rules	E
		4.3.6 Identification and examination of aquifer vulnerabilities within DWSMAs and the needed state and federal support to LGUs to enforce regulations and provide cost-share/other incentives	C
		4.3.7: Need to improve tools that link surface hydrology and surface conservation practices with groundwater hydrology	C
5. Local Development and Land Stewardship	5.1 Urban Land Stewardship	5.1.1 Increased impervious surface	D
		5.1.2 Increased construction and development	C
		5.1.3 Wastewater treatment facility compliance and impact to water quality	D
		5.1.4 Fertilizers and pesticides applied on urban landscapes	C
		5.1.5 Disposal of solid waste, household hazardous waste, and household drugs	E
	5.2 Rural Land Stewardship	5.2.3 Developmental pressures from expanding operations and residences	D
		5.2.4 Increased demand for irrigation water	C
		5.2.5 Pesticide application and disposal	D
		5.2.7 Subsurface sewage treatment system (SSTS) adequacy and efficiency	D
		5.2.8 Mining and processing of aggregate and other natural construction materials	E
	5.3 Riparian Stewardship	5.3.1 Increased development along lakes	E
		5.3.3 Barriers to fish migration, typically by man-made water control structures	E
		5.3.4 Improperly sized roadway crossings	E
		5.3.5 Insufficient stream channel volume	D

The Policy Committee established this plan's priority issues, reflecting their responsibility in developing this locally-focused plan. However, as many issues are interconnected, this plan will have benefits to lower tier issues as well. An example is useful for illustration purposes. Low dissolved oxygen levels in streams and rivers was identified as a Tier E issue, meaning it was not given a high priority and will not have a measurable goal established to address it. Low oxygen levels in streams, though, is worsened by high sediment and nutrient loading. Reducing stream sediment and nutrient loading are both identified as Priority Tier A or B issues. In addition, increasing vegetative cover (identified as a Priority Tier A issue) will also act to reduce in-stream water temperature, thereby increasing the oxygen holding capacity of the water. Therefore, actions focused on these Priority Tier A or B issues will have positive impacts toward improving other issues not explicitly prioritized.

2.4 EMERGING ISSUES

Emerging issues include more extreme weather events and invasive species threatening MRW's prize lakes.

This section presents an assessment of reasonably foreseeable or "emerging" issues. Emerging issues are those that lack detailed information, which are sometimes prominent in the media, and may affect the resources within the MRW at some time in the future.

The assessment of emerging issues has been compiled from a variety of sources including:

- A review of previous studies, reports, and scientific papers;
- The collective experience of staff and technical advisors; and
- Specific requests from the members of the MRW 1W1P Planning Group.

The detail describing emerging issues varies depending on the source of the information. An emerging issue is described in greater detail when the source of information is a final scientific study or report. The amount of detail can be considerably less when the source of information is firsthand observation or previous experience with an issue. Therefore, many of the emerging issues are only generally described to indicate the lack of detailed information.

The identification of emerging issues affects the content of this plan. Action items are included within the targeted implementation schedule (**Section 4**) to provide better clarity about the technical data needed to address emerging issues. Emerging issues are expected to be periodically monitored by plan participants, with respect to how they may affect plan implementation.

This section lays out a framework for addressing emerging issues during the lifespan of the plan. These issues include scientific and technical matters influencing the priority issues established by the plan;

potential administration and fiscal limitations and barriers for implementing actions identified within the targeted implementation schedule; and improved water and resource policy to aid with plan implementation.

2.4.1 SCIENTIFIC AND TECHNICAL EMERGING ISSUES

2.4.1.1 Extreme Weather Events and Infrastructure Resilience

According to the National Climatic Data Center, Minnesota's average temperature has increased about one tenth of a degree every decade, from 1895 to 1970. Since 1970, the rise has been more dramatic, about a half a degree every decade.

Precipitation has been increasing across the state as well. In Worthington, the average annual precipitation has increased from 26.75 inches (1961-1990 average) to 28.05 inches (1971-2000 average), a 4.9% increase (MN State Climatology, 2017). Minnesota has also seen an increase in the severity and frequency of storm events. The Minnesota Department of Natural Resources (DNR) defines "mega-rain" events as "events in which six inches of rain covers more than 1,000 square miles and the core of the event topped eight inches." Minnesota has seen a sharp increase in these events since 2000, with 2016 being the first year on record with two mega-rains in the state (MnDNR, 2017).

If the climate warms, ice-cover of lakes and streams may melt earlier. Some lakes in Minnesota are showing that over the past century, the average ice-out is occurring about a week earlier. In turn, earlier snowmelt runoff would cause stream flows to peak sooner in the spring, leading to baseflow conditions earlier in the year.

It is important to understand these changes in regional climatic trends because they impact water resources and their management as well as shifts in habitat and economics. Increased storm intensities result in increased soil erosion and increased runoff. Also, the Minnesota Pollution Control Agency (MPCA) warns that these more frequent, intense precipitation events may increase flooding (MPCA, 2013).

This plan recognizes the potential implications of climate change by encouraging the use of updated design standards for water resource infrastructure, based on National Oceanic and Atmospheric Administration (NOAA) Atlas 14.

2.4.1.2 Contaminants of Emerging Concern

A contaminant can generally be defined as a substance in a place where it doesn't belong. According to the Minnesota Department of Health (MDH), contaminants of emerging concern are substances that have been released to, found in, or have the potential to enter Minnesota waters (groundwater or surface water) and do not have Minnesota human health-based guidance (how much of a substance is safe to drink), pose a real or perceived health threat, or have new or changing health or exposure information (MDH, 2016).

In the last decade, national and statewide studies have revealed that many contaminants of emerging concern are found in the aquatic environment. They can include pharmaceuticals, pesticides, industrial effluents, personal care products that are washed down drains and processed by municipal wastewater treatment plants, and others (MDH, 2016). These contaminants are being found in Minnesota's waters, in part because there are better methods for finding substances at lower levels, additional substances are

being looked for, new substances are being used, and old substances are being used in new ways (MDH, 2016). There is a growing concern that even at low concentrations, these contaminants, or mixtures of them, may adversely affect fish, wildlife, ecosystems, and possibly human health.

Plan participants recognize the need to provide public water supplies free from contaminants of emerging concern. The plan addresses this emerging issue through 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.

2.4.1.3 Invasive Species

INVASIVE SPECIES COULD POSE A THREAT TO WATERS VALUED IN MRW

Invasive species are species that are not native to the ecosystem under consideration, and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health. These species are aggressive competitors, threatening the quality of high biodiversity areas and native communities. Invasive species can be aquatic or terrestrial in nature. In Minnesota, present and actively managed aquatic invasive species include, but are not limited to Eurasian watermilfoil, purple loosestrife, zebra mussels, spiny water fleas, and invasive carp. Terrestrial invasive species in Minnesota include common buckthorn, gypsy moth, and white nose syndrome of bats.

While recreational lakes are not in abundance within the MRW planning area, it is important to consider the potential impacts of the spread of aquatic invasive species (AIS) to all the planning area's surface water resources. Minnesota has several state laws intended to minimize the introduction and spread of invasive species of wild animal and aquatic plants in the state. It is illegal to transport any prohibited invasive species, such as Eurasian watermilfoil or zebra mussels, or to launch a boat or trailer with these species attached. The MnDNR is the main stakeholder statewide that addresses aquatic invasive species issues, including educational and enforcement measures. In 2012, a statewide AIS Advisory Committee was created by MnDNR designed to involve local stakeholders across the state in guiding legislative policy initiatives. Within the MRW planning area, involvement of local stakeholders is needed for effective prevention and/or control efforts.

This plan recognizes the importance of managing and preventing the spread of both terrestrial and aquatic invasive species. The plan addresses this emerging concern through implementation programs that protect surface water resources and wildlife habitat.

2.4.2 NOTED IMPEDIMENTS TO EFFECTIVE WATER PLAN MANAGEMENT

2.4.2.1 Funding for Plan Implementation

Funding is one of the primary constraints on implementing a plan. This plan shows that the ability to execute actions within the targeted implementation schedule and achieve the measurable goals requires more fiscal and staff resources at the local level than is available to the MRW 1W1P Planning Group (**Section 4**). The MRW 1W1P Planning Group is expected to carry more of the responsibility to implement state and federal goals (e.g., attaining state water quality standards). An expectation that this group will achieve these common goals without additional funding seems unreasonable.

Because of their connection to landowners, the State envisions that the SWCDs, Counties, and watershed districts are a critical partner and the implementing agent as envisioned in WRAPS, TMDLs and Clean Water Legacy Act. The targeted implementation schedule in this plan represents a coherent, comprehensive approach to mark progress towards measurable goals. Raising cost share dollars for state and federal grants is problematic. Relying on competitive grants to achieve the measurable goals seems unreasonable and makes success tenuous. Therefore, non-competitive watershed-based funding on an annual basis is needed. This plan includes actions to achieve a consistent funding mechanism and reasonably ensure implementation success.

2.4.2.2 Conservation Practice Delivery Mechanism

An improved means of effectively delivering conservation programs is needed. Both technical and financial resources at the local level to implement conservation programs are limited. Some agricultural policies encourage the agricultural producer to maximize yield, in conflict with other policies. This plan recognizes the need to improve conservation delivery through implementation programs aimed to increase engagement with agricultural landowners, producers, and lake shore owners within the plan area.

2.4.2.3 Inconsistent Administration and Enforcement of MN Rules and Statutes

Administration and enforcement of Minnesota Administrative Rules and statutes is an important aspect of managing and protecting the State's water quality. Examples of these rules and statutes include, but are not limited to, the regulation of animal feedlots (Minnesota Administrative Rules Chapter 7020), and shoreland and floodplain management (Minnesota Administrative Rules Chapter 6120). Local governments provide for the administration and enforcement of these rules and statutes, however, there is commonly inconsistent administration and enforcement of these rules between jurisdictional boundaries. Negligent administration and enforcement in one jurisdictional boundary may negatively impact water quality and quantity of jurisdictional boundaries downstream.

Planning partners within the MRW recognize the value that consistent application of Minnesota Rules and Statutes can have on water quality and quantity at a major watershed scale. The plan addresses this emerging issue in the targeted implementation schedule, with actions that focus on identifying problem areas with the MRW, and the consistent application of existing rules and statues within the entire plan area.

2.4.2.4 Farm Law Legislation (National and International)

Changes to international and national legislation has large ramifications on the types, magnitude, and profitability of crops produced in Minnesota. For example, legislation promoting corn growth for ethanol production may impact the amount of corn and rotation of crops in an agricultural area. Conversely, legislation incentivizing production of alternative crops (i.e. switchgrass) for alternative fuels may also impact cropping practices. Types and productivity of crops may also be impacted by legislative changes to crop insurance support (i.e. the farm bill).

This plan recognizes the impact that national and international legislation has on local agricultural production and the producer's economic vitality. The plan addresses this emerging issue by supporting standard practices for all producers (i.e. managing for good soil health) and is addressed throughout the plan by programs that encourage this.

2.4.2.5 Renewable Energy Legislation (State and National)

State and national renewable energy policy has the potential to affect the economies and land use patterns of counties with high potential capacities. Information summarizing renewable energy sectors in the six counties within the MRW are outlined below:

- According to the Minnesota Department of Revenue, the six MRW 1W1P counties generated 6.12 billion kilowatt hours (KWH) of energy from wind in 2016 (http://www.revenue.state.mn.us). This accounted for 58.2% of total wind energy production in Minnesota in 2016.
- Solar photovoltaic capacity continues to expand in Minnesota, with much of this growth occurring in rural portions of the state according to the Minnesota Department of Commerce (https://mn.gov/commerce/).
- Existing biofuel refineries in Rock and Jackson Counties (Luverne and Heron Lake, respectively) have a 68-million-gallon annual production capacity, utilizing approximately 26 million bushels of corn (https://www.mda.state.mn.us).

Paramount to the MRW 1W1P planning area will be ensuring that land use changes resulting from renewable energy policy initiatives balance the potential environmental risks of renewable energy production with the economic and environmental benefits the production of renewables could provide. Potential environmental risks include but are not limited to wetland impacts, fish and wildlife habitat fragmentation, aquifer depletion, and threats to avian species such as eagles and bats. This plan addresses the issue of concern through implementation programs that protect surface water resources and wildlife habitat.

2.4.3 PROCESS FOR ADDRESSING EMERGING ISSUES AND DATA GAPS

Inevitably, issues emerge that lack sufficient data, research, or information. While a substantial effort was made to develop a comprehensive list of existing and emerging resource categories, concerns, and issues, it is possible that some issues were missed or that new issues emerge during the lifespan of the plan. Examples include the discovery of a new contaminant or aquatic invasive species within the MRW, or a change in the policies or administration of a member local government unit. Should an unanticipated issue emerge during the lifespan of the plan, the issue will be considered and addressed as necessary through annual evaluations and local work plan development (see **Section 5**). If the emerging issues are substantial enough, plan amendments will be considered based on procedures laid out in **Section 5** of this plan.

Gaps in technical knowledge continually need to be closed. Rather than delaying planning or implementation actives when these gaps arise, the MRW 1W1P Planning Group will consider these gaps during self-assessments and develop action(s) to address them on an as-needed basis. These actions(s) could be things such as specific implementation activities, support of additional research or data monitoring and collection, or increased education and outreach.

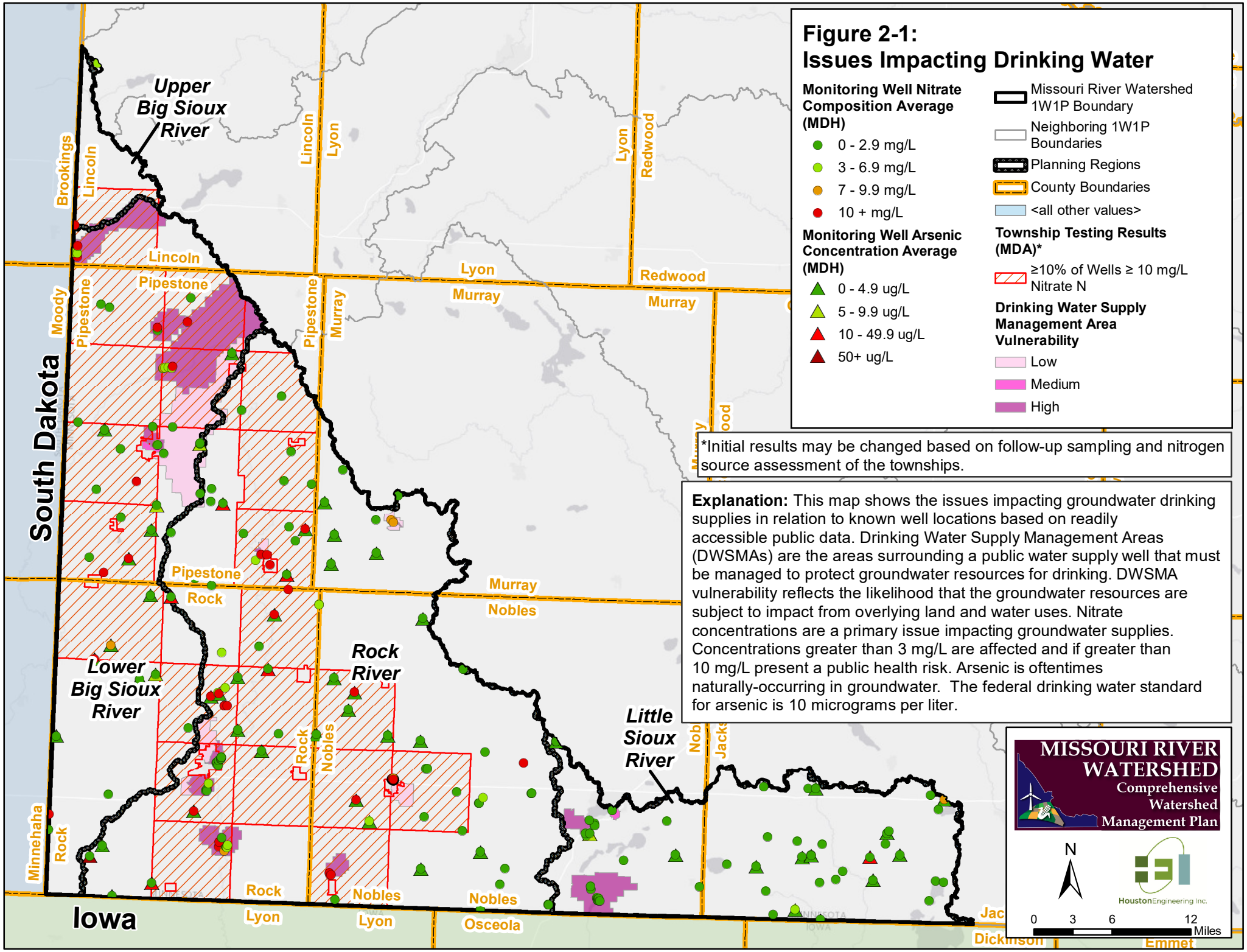


Figure 2-1:
Issues Impacting Drinking Water
Monitoring Well Nitrate Composition Average (MDH)
0 - 2.9 mg/L
3 - 6.9 mg/L
7 - 9.9 mg/L
10 + mg/L
Monitoring Well Arsenic Concentration Average (MDH)
0 - 4.9 ug/L
5 - 9.9 ug/L
10 - 49.9 ug/L
50+ ug/L
Missouri River Watershed 1W1P Boundary
Neighboring 1W1P Boundaries
Planning Regions
County Boundaries
<all other values>
Township Testing Results (MDA)*
≥10% of Wells ≥ 10 mg/L Nitrate N
Drinking Water Supply Management Area Vulnerability
Low
Medium
High
*Initial results may be changed based on follow-up sampling and nitrogen source assessment of the townships.
Explanation: This map shows the issues impacting groundwater drinking supplies in relation to known well locations based on readily accessible public data. Drinking Water Supply Management Areas (DWSMAs) are the areas surrounding a public water supply well that must be managed to protect groundwater resources for drinking. DWSMA vulnerability reflects the likelihood that the groundwater resources are subject to impact from overlying land and water uses. Nitrate concentrations are a primary issue impacting groundwater supplies. Concentrations greater than 3 mg/L are affected and if greater than 10 mg/L present a public health risk. Arsenic is oftentimes naturally-occurring in groundwater. The federal drinking water standard for arsenic is 10 micrograms per liter.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Moody
Pipestone
Rock
Minnehaha
Lyon
Redwood
Murray
Nobles
Osceola
Dickinson
Emmet
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

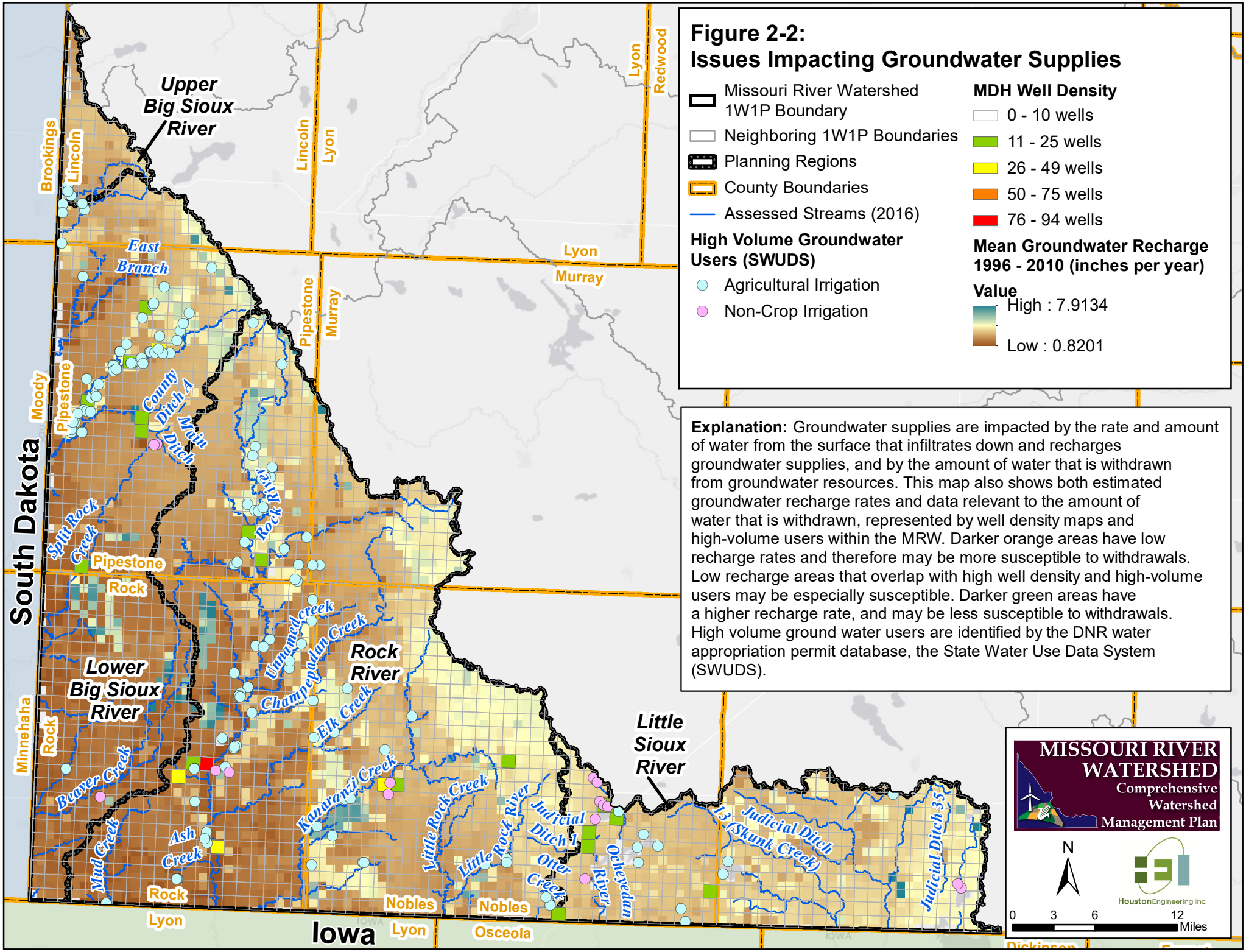


Figure 2-2:
Issues Impacting Groundwater Supplies
Missouri River Watershed 1W1P Boundary
Neighboring 1W1P Boundaries
Planning Regions
County Boundaries
Assessed Streams (2016)
High Volume Groundwater Users (SWUDS)
Agricultural Irrigation
Non-Crop Irrigation
MDH Well Density
0 - 10 wells
11 - 25 wells
26 - 49 wells
50 - 75 wells
76 - 94 wells
Mean Groundwater Recharge 1996 - 2010 (inches per year)
Value
High : 7.9134
Low : 0.8201
Explanation: Groundwater supplies are impacted by the rate and amount of water from the surface that infiltrates down and recharges groundwater supplies, and by the amount of water that is withdrawn from groundwater resources. This map also shows both estimated groundwater recharge rates and data relevant to the amount of water that is withdrawn, represented by well density maps and high-volume users within the MRW. Darker orange areas have low recharge rates and therefore may be more susceptible to withdrawals. Low recharge areas that overlap with high well density and high-volume users may be especially susceptible. Darker green areas have a higher recharge rate, and may be less susceptible to withdrawals. High volume ground water users are identified by the DNR water appropriation permit database, the State Water Use Data System (SWUDS).
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Lyon
Redwood
Murray
Pipestone
Moody
Minnehaha
Rock
Nobles
Osceola
Dickinson
East Branch
County Ditch A
Main Ditch
Rock River
Split Rock Creek
Unnamed creek
Champepadan Creek
Elk Creek
Beaver Creek
Mud Creek
Ash Creek
Kanaranzi Creek
Little Rock Creek
Little Rock River
Judicial Ditch 1
Otter Creek
Ocheyedan River
13 (Skunk Creek)
Judicial Ditch
Judicial Ditch 35
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

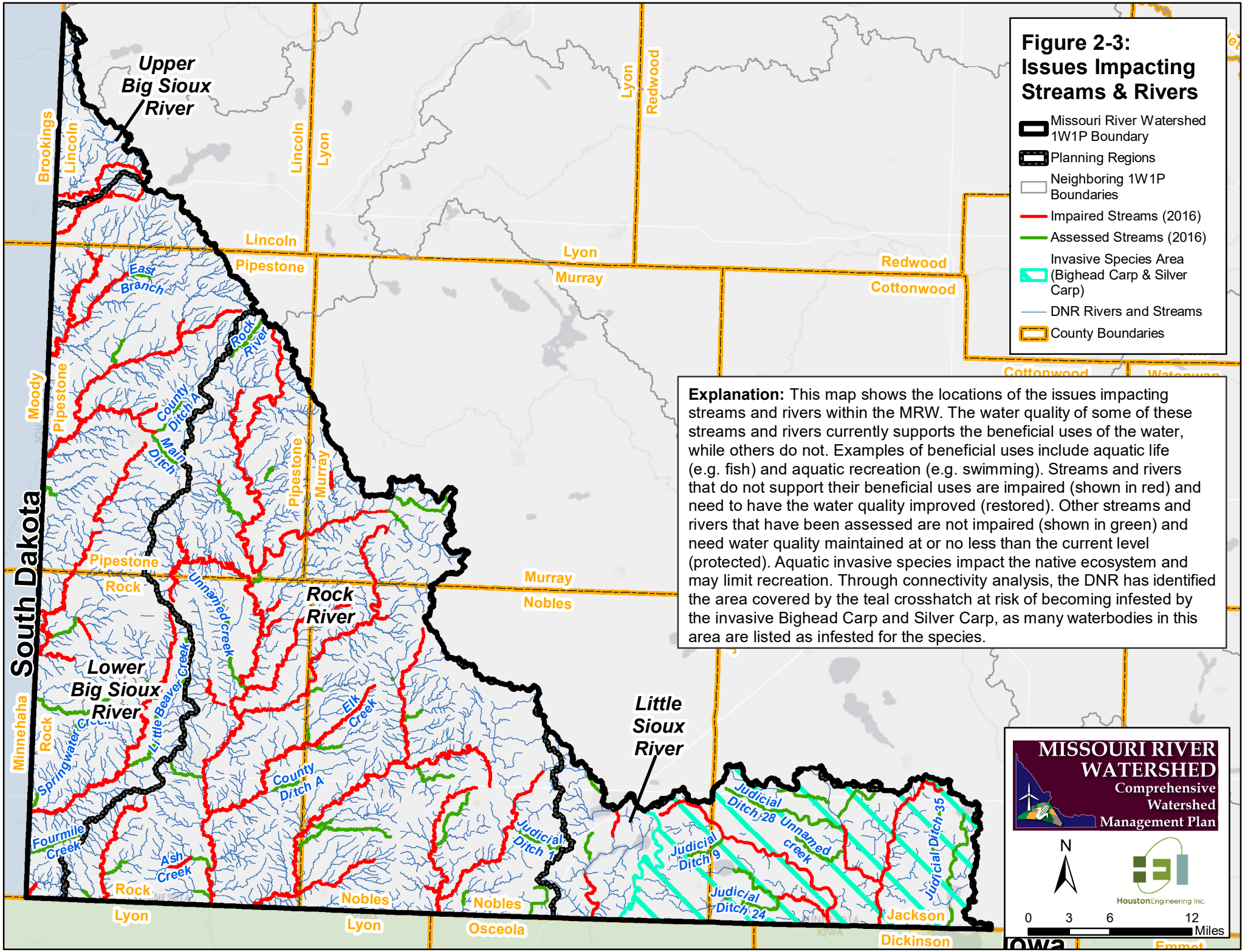


Figure 2-3:
Issues Impacting Streams & Rivers
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
Impaired Streams (2016)
Assessed Streams (2016)
Invasive Species Area (Bighead Carp & Silver Carp)
DNR Rivers and Streams
County Boundaries
Explanation: This map shows the locations of the issues impacting streams and rivers within the MRW. The water quality of some of these streams and rivers currently supports the beneficial uses of the water, while others do not. Examples of beneficial uses include aquatic life (e.g. fish) and aquatic recreation (e.g. swimming). Streams and rivers that do not support their beneficial uses are impaired (shown in red) and need to have the water quality improved (restored). Other streams and rivers that have been assessed are not impaired (shown in green) and need water quality maintained at or no less than the current level (protected). Aquatic invasive species impact the native ecosystem and may limit recreation. Through connectivity analysis, the DNR has identified the area covered by the teal crosshatch at risk of becoming infested by the invasive Bighead Carp and Silver Carp, as many waterbodies in this area are listed as infested for the species.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Minnesota
Brookings
Lincoln
Lyon
Redwood
Pipestone
Murray
Cottonwood
Moody
Rock
Nobles
Jackson
Osceola
Dickinson
Minnehaha
East Branch
Rock River
County Ditch A
Main Ditch
Unnamed Creek
Little Beaver Creek
Springwater Creek
Fourmile Creek
Ash Creek
Elk Creek
Judicial Ditch 1
Judicial Ditch 9
Judicial Ditch 24
Judicial Ditch 28
Unnamed creek
Judicial Ditch 35
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

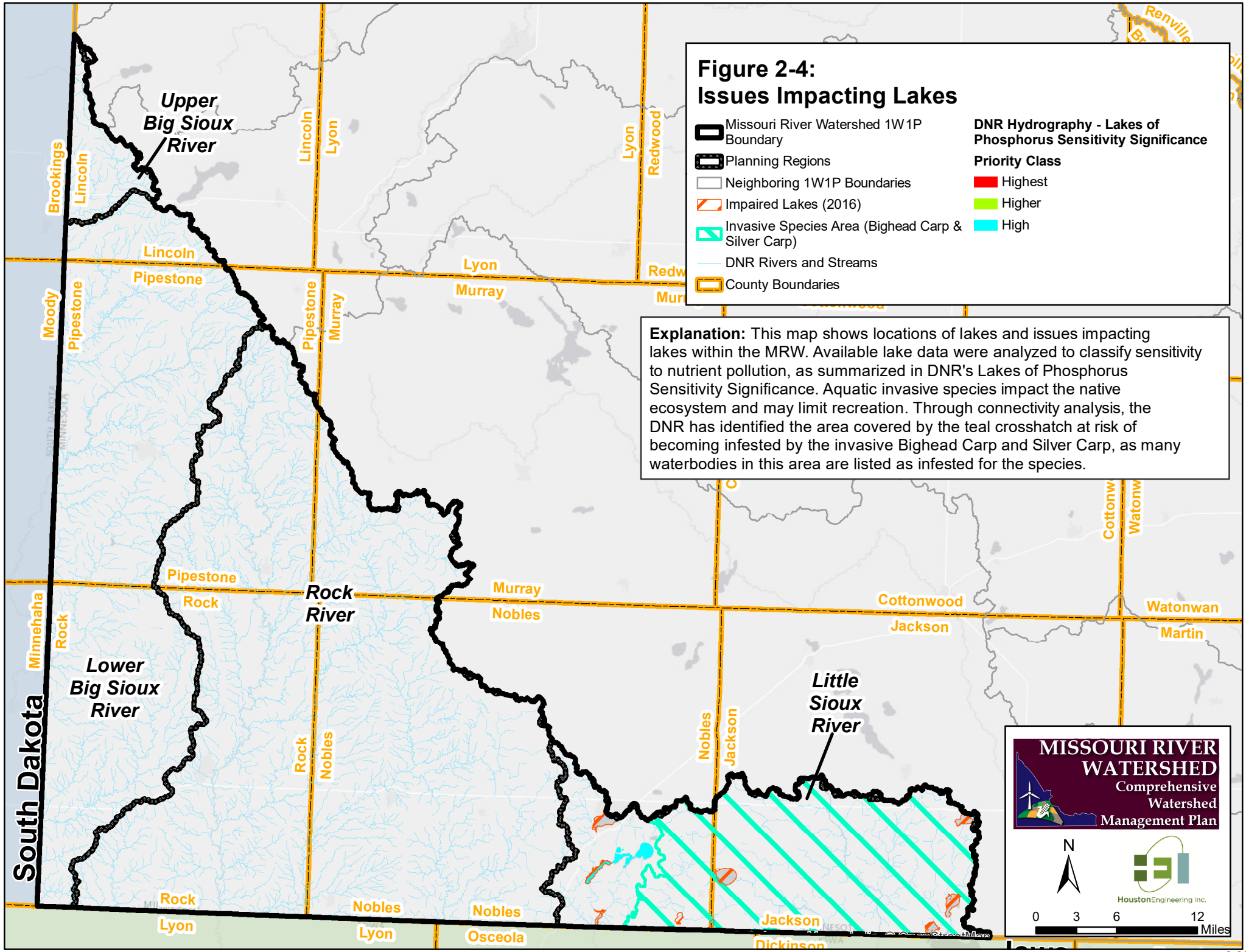


Figure 2-4:
Issues Impacting Lakes
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
Impaired Lakes (2016)
Invasive Species Area (Bighead Carp & Silver Carp)
DNR Rivers and Streams
County Boundaries
DNR Hydrography - Lakes of Phosphorus Sensitivity Significance
Priority Class
Highest
Higher
High
Explanation: This map shows locations of lakes and issues impacting lakes within the MRW. Available lake data were analyzed to classify sensitivity to nutrient pollution, as summarized in DNR's Lakes of Phosphorus Sensitivity Significance. Aquatic invasive species impact the native ecosystem and may limit recreation. Through connectivity analysis, the DNR has identified the area covered by the teal crosshatch at risk of becoming infested by the invasive Bighead Carp and Silver Carp, as many waterbodies in this area are listed as infested for the species.
Upper Big Sioux River
Rock River
Lower Big Sioux River
Little Sioux River
South Dakota
Brookings
Lincoln
Moody
Pipestone
Minnehaha
Rock
Nobles
Murray
Lyon
Redwood
Cottonwood
Watonwan
Jackson
Martin
Osceola
Dickinson
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

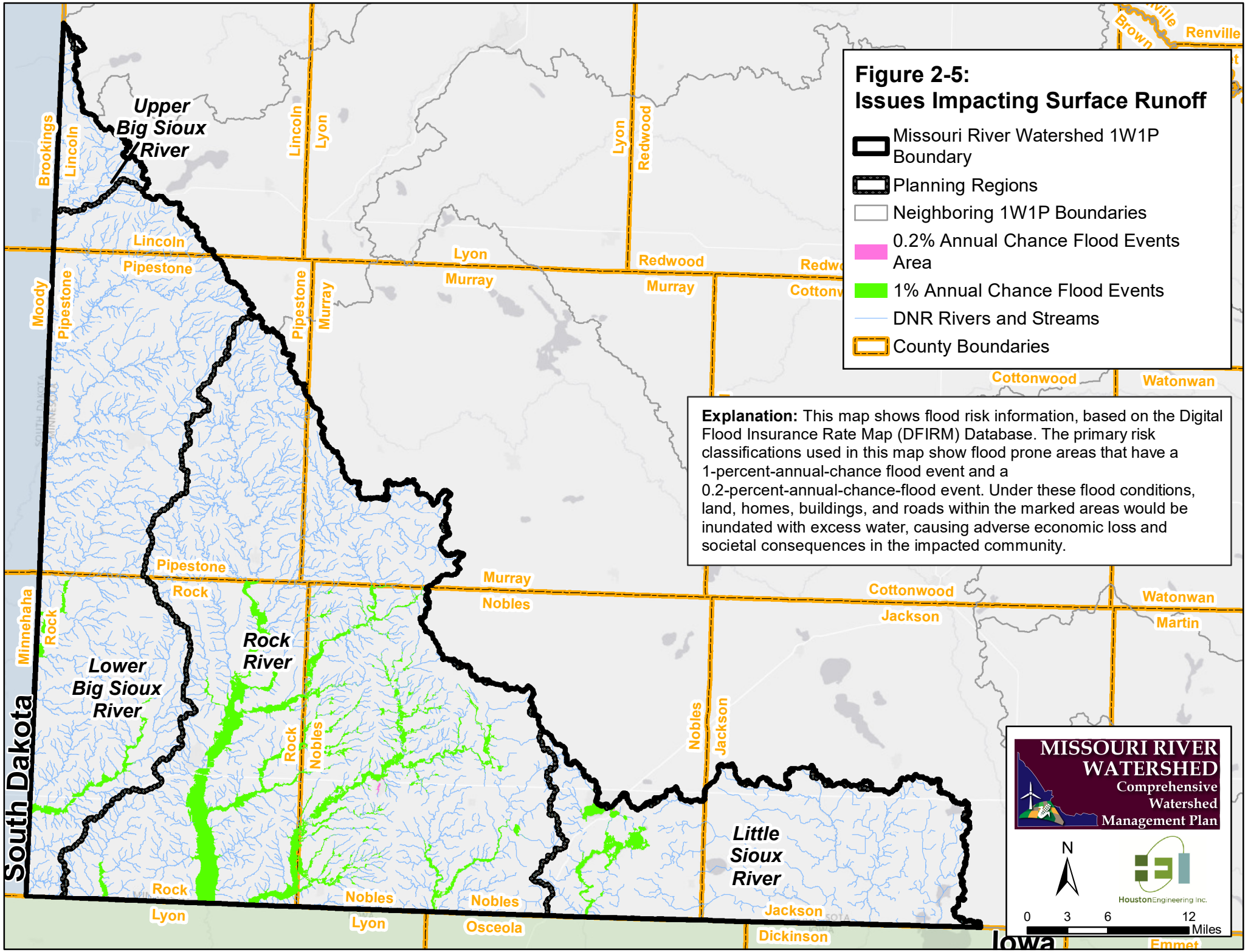


Figure 2-5:
Issues Impacting Surface Runoff
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
0.2% Annual Chance Flood Events Area
1% Annual Chance Flood Events
DNR Rivers and Streams
County Boundaries
Explanation: This map shows flood risk information, based on the Digital Flood Insurance Rate Map (DFIRM) Database. The primary risk classifications used in this map show flood prone areas that have a 1-percent-annual-chance flood event and a 0.2-percent-annual-chance-flood event. Under these flood conditions, land, homes, buildings, and roads within the marked areas would be inundated with excess water, causing adverse economic loss and societal consequences in the impacted community.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Moody
Minnehaha
Pipestone
Rock
Murray
Nobles
Lyon
Redwood
Cottonwood
Jackson
Watonwan
Martin
Osceola
Dickinson
Emmet
Renville
Brown
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

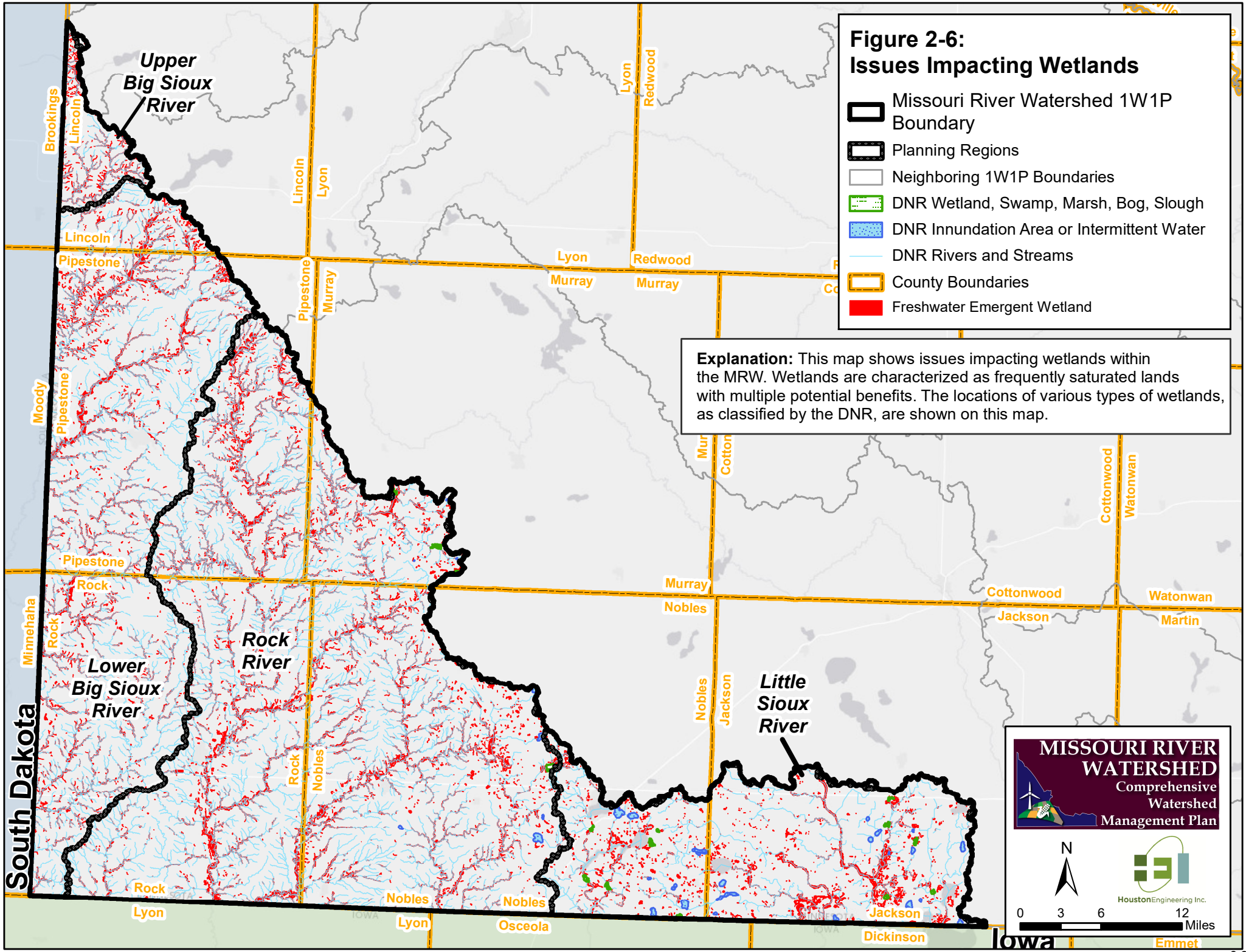


Figure 2-6:
Issues Impacting Wetlands
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
DNR Wetland, Swamp, Marsh, Bog, Slough
DNR Innundation Area or Intermittent Water
DNR Rivers and Streams
County Boundaries
Freshwater Emergent Wetland
Explanation: This map shows issues impacting wetlands within the MRW. Wetlands are characterized as frequently saturated lands with multiple potential benefits. The locations of various types of wetlands, as classified by the DNR, are shown on this map.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Lyon
Redwood
Pipestone
Murray
Moody
Minnehaha
Rock
Nobles
Jackson
Cottonwood
Watonwan
Martin
Osceola
Dickinson
Emmet
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

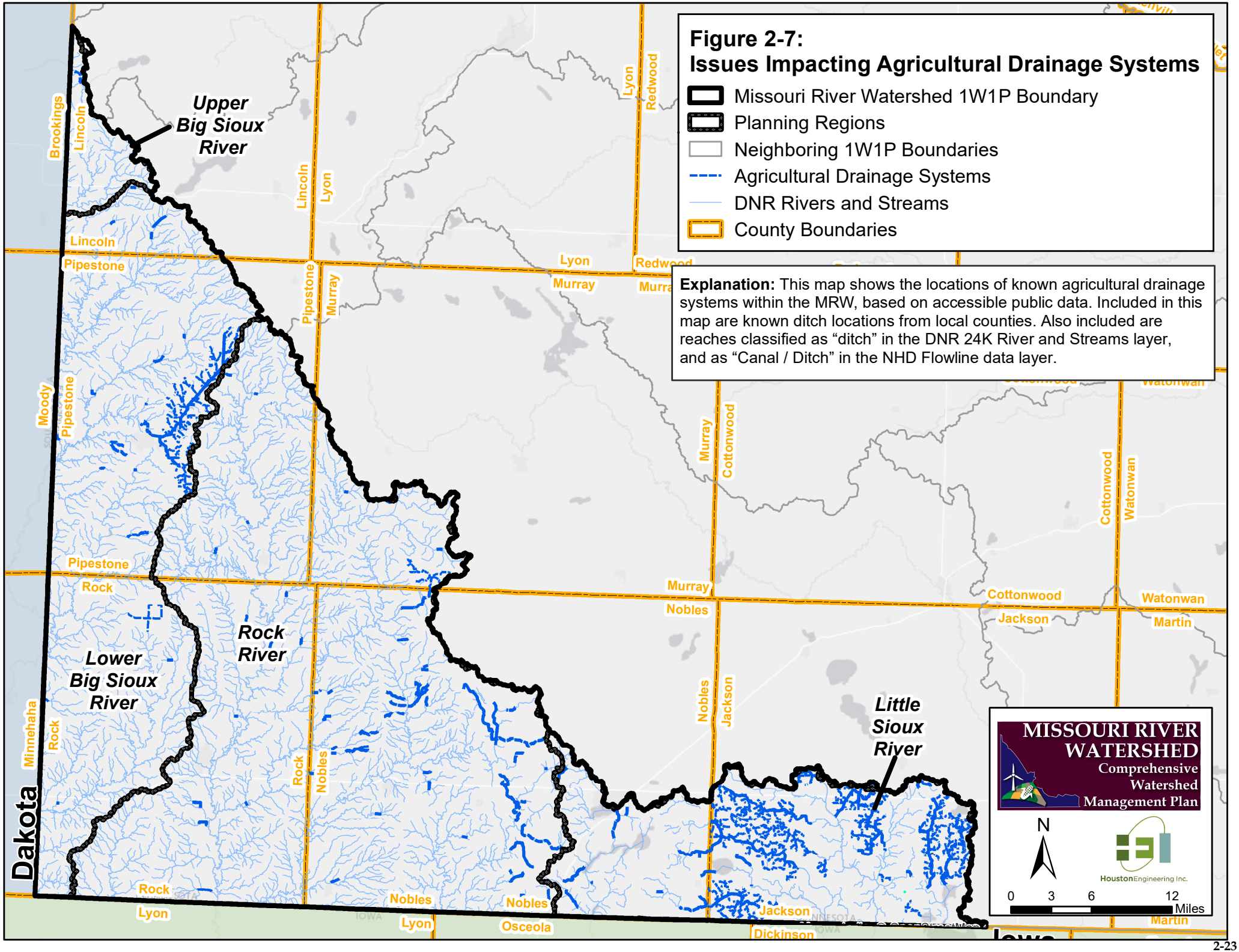


Figure 2-7:
Issues Impacting Agricultural Drainage Systems
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
Agricultural Drainage Systems
DNR Rivers and Streams
County Boundaries
Explanation: This map shows the locations of known agricultural drainage systems within the MRW, based on accessible public data. Included in this map are known ditch locations from local counties. Also included are reaches classified as “ditch” in the DNR 24K River and Streams layer, and as “Canal / Ditch” in the NHD Flowline data layer.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
Dakota
Brookings
Lincoln
Lyon
Redwood
Pipestone
Murray
Moody
Cottonwood
Watonwan
Rock
Nobles
Jackson
Martin
Minnehaha
Osceola
Dickinson
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

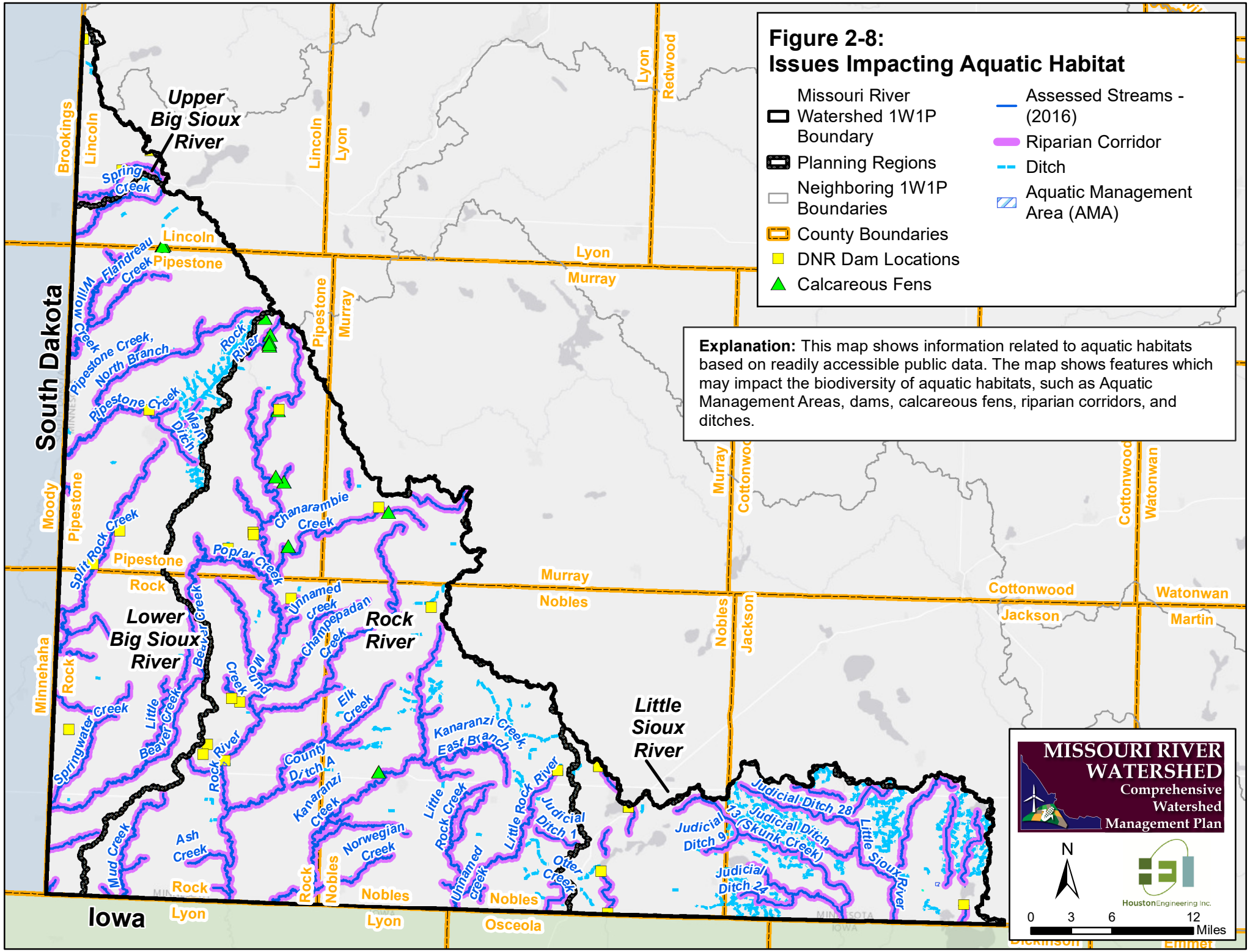


Figure 2-8:
Issues Impacting Aquatic Habitat
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
County Boundaries
DNR Dam Locations
Calcareous Fens
Assessed Streams - (2016)
Riparian Corridor
Ditch
Aquatic Management Area (AMA)
Explanation: This map shows information related to aquatic habitats based on readily accessible public data. The map shows features which may impact the biodiversity of aquatic habitats, such as Aquatic Management Areas, dams, calcareous fens, riparian corridors, and ditches.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Minnesota
Brookings
Lincoln
Lyon
Redwood
Pipestone
Murray
Moody
Minnehaha
Rock
Nobles
Jackson
Cottonwood
Watonwan
Martin
Osceola
Dickinson
Emmet
Spring Creek
Flandreau Creek
Willow Creek
Pipestone Creek, North Branch
Pipestone Creek
Rock River
Main Ditch
Chanarambie Creek
Split Rock Creek
Poplar Creek
Unnamed creek
Champepadan Creek
Beaver Creek
Mud Creek
Springwater Creek
Little Beaver Creek
Elk Creek
Kanaranzi Creek, East Branch
County Ditch A
Kanaranzi Creek
Ash Creek
Norwegian Creek
Little Rock Creek
Little Rock River
Judicial Ditch 1
Otter Creek
Judicial Ditch 9
Judicial Ditch 28
Judicial Ditch 73 (Skunk Creek)
Judicial Ditch 24
Little Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

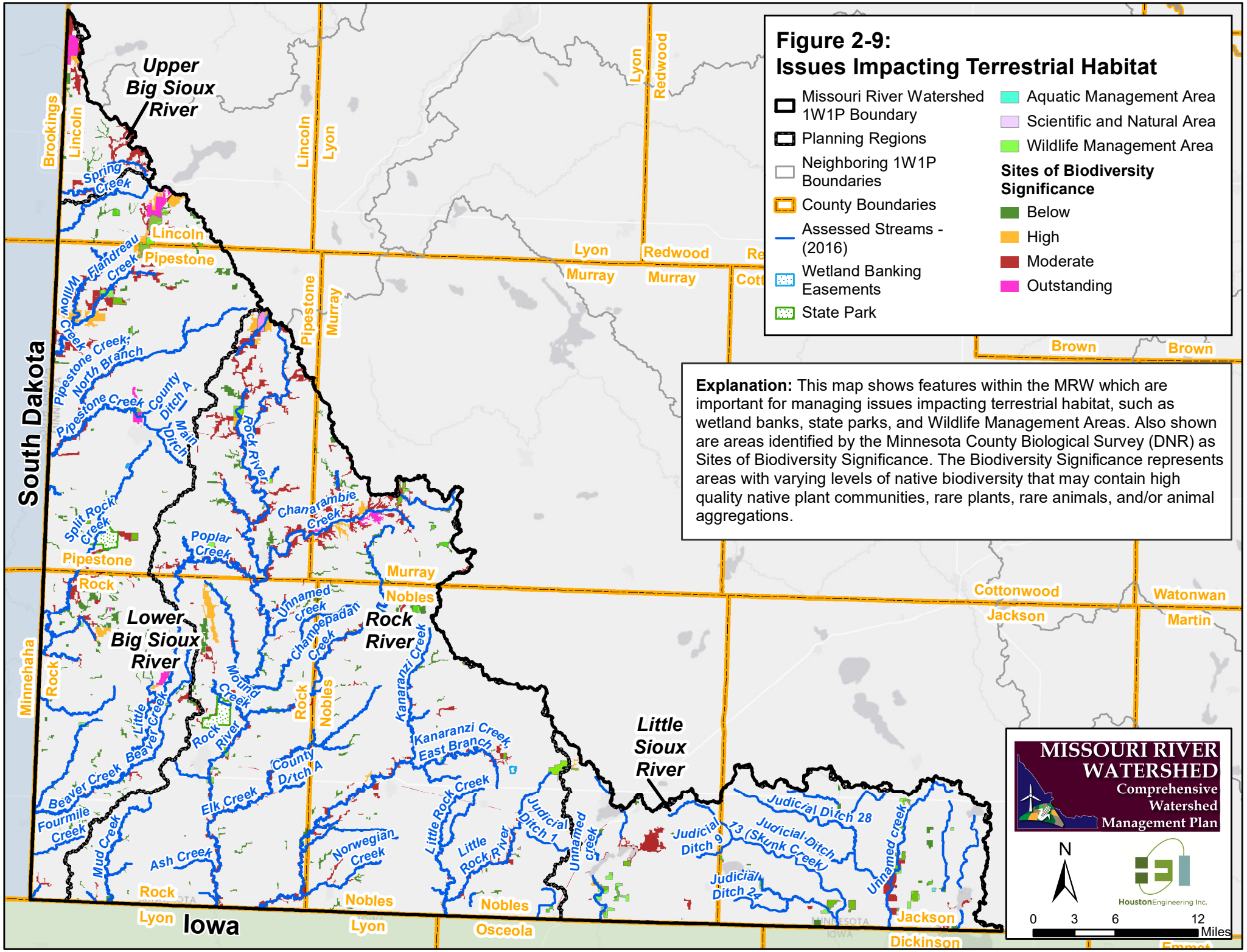


Figure 2-9:
Issues Impacting Terrestrial Habitat
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
County Boundaries
Assessed Streams - (2016)
Wetland Banking Easements
State Park
Aquatic Management Area
Scientific and Natural Area
Wildlife Management Area
Sites of Biodiversity Significance
Below
High
Moderate
Outstanding
Explanation: This map shows features within the MRW which are important for managing issues impacting terrestrial habitat, such as wetland banks, state parks, and Wildlife Management Areas. Also shown are areas identified by the Minnesota County Biological Survey (DNR) as Sites of Biodiversity Significance. The Biodiversity Significance represents areas with varying levels of native biodiversity that may contain high quality native plant communities, rare plants, rare animals, and/or animal aggregations.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Minnesota
Brookings
Lincoln
Lyon
Redwood
Murray
Pipestone
Rock
Nobles
Cottonwood
Jackson
Watonwan
Martin
Brown
Minnehaha
Osceola
Dickinson
Emmet
Spring Creek
Flandreau Creek
Willow Creek
Pipestone Creek; North Branch
Pipestone Creek County Ditch A
Main Ditch
Rock River
Chanarambie Creek
Split Rock Creek
Poplar Creek
Unnamed Creek
Champepadan Creek
Kanaranzi Creek
Kanaranzi Creek East Branch
Mound Creek
Little Beaver Creek
Beaver Creek
Fourmile Creek
Mud Creek
Ash Creek
Elk Creek
County Ditch A
Norwegian Creek
Little Rock Creek
Little Rock River
Judicial Ditch 1
Unnamed creek
Judicial Ditch 9
Judicial Ditch 13 (Skunk Creek)
Judicial Ditch 28
Judicial Ditch 24
Unnamed creek
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

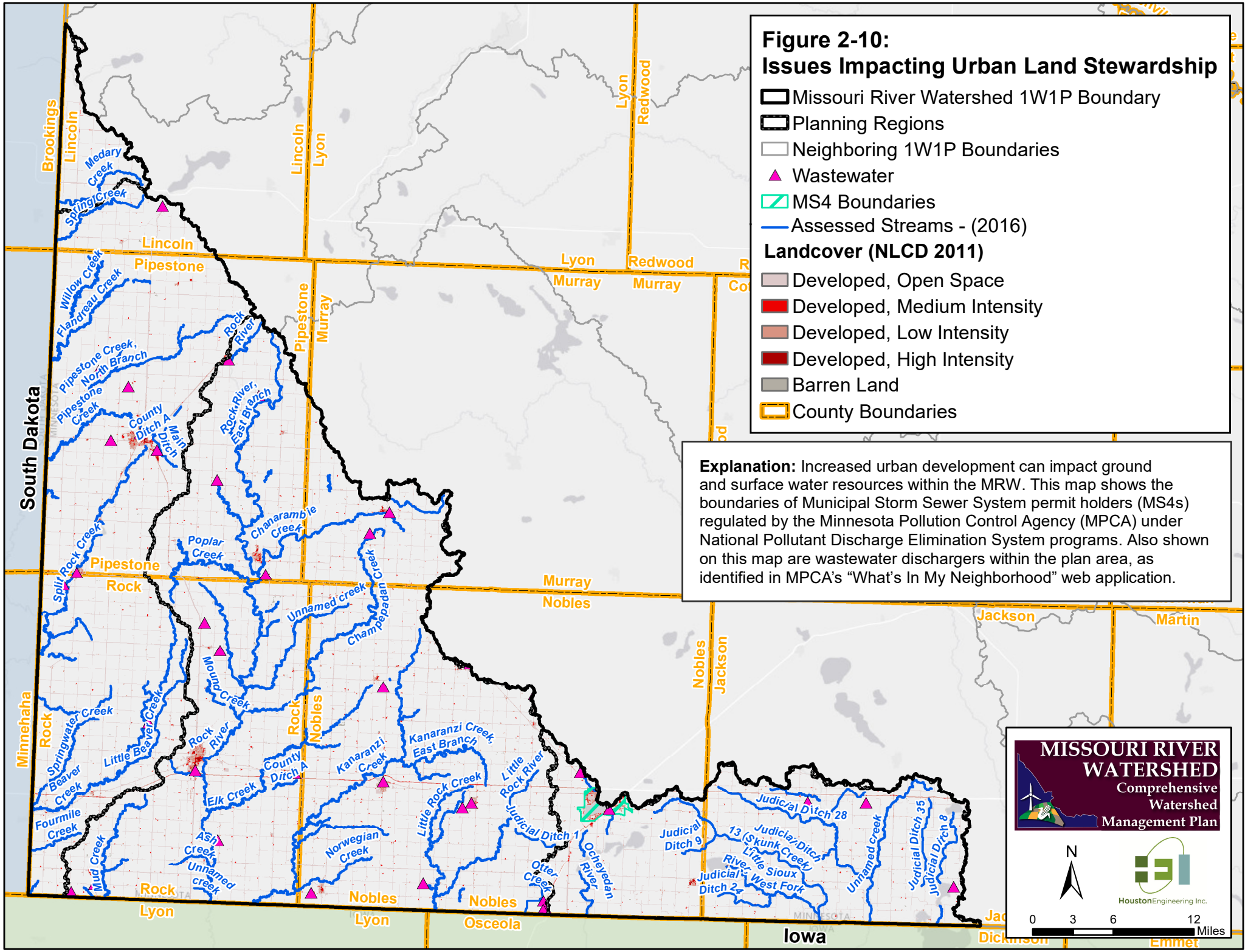


Figure 2-10:
Issues Impacting Urban Land Stewardship
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
Wastewater
MS4 Boundaries
Assessed Streams - (2016)
Landcover (NLCD 2011)
Developed, Open Space
Developed, Medium Intensity
Developed, Low Intensity
Developed, High Intensity
Barren Land
County Boundaries
Explanation: Increased urban development can impact ground and surface water resources within the MRW. This map shows the boundaries of Municipal Storm Sewer System permit holders (MS4s) regulated by the Minnesota Pollution Control Agency (MPCA) under National Pollutant Discharge Elimination System programs. Also shown on this map are wastewater dischargers within the plan area, as identified in MPCA's "What's In My Neighborhood" web application.
South Dakota
Iowa
Brookings
Lincoln
Pipestone
Rock
Minnehaha
Lyon
Redwood
Murray
Nobles
Jackson
Martin
Osceola
Dickinson
Emmet
Medary Creek
Spring Creek
Willow Creek
Flandreau Creek
Pipestone Creek, North Branch
Pipestone Creek
County Ditch A
Main Ditch
Rock River
Rock River, East Branch
Split Rock Creek
Poplar Creek
Chanarambie Creek
Unnamed creek
Champepadan Creek
Mound Creek
Springwater Creek
Little Beaver Creek
Beaver Creek
Fourmile Creek
Elk Creek
Ash Creek
Unnamed creek
Mud Creek
Kanaranzi Creek
Kanaranzi Creek, East Branch
Little Rock Creek
Little Rock River
Judicial Ditch 1
Norwegian Creek
Otter Creek
Ocheyedan River
Judicial Ditch 9
Judicial Ditch 28
Judicial Ditch 13 (Skunk Creek)
Little Sioux River, West Fork
Judicial Ditch 2
Unnamed creek
Judicial Ditch 35
Judicial Ditch 8
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

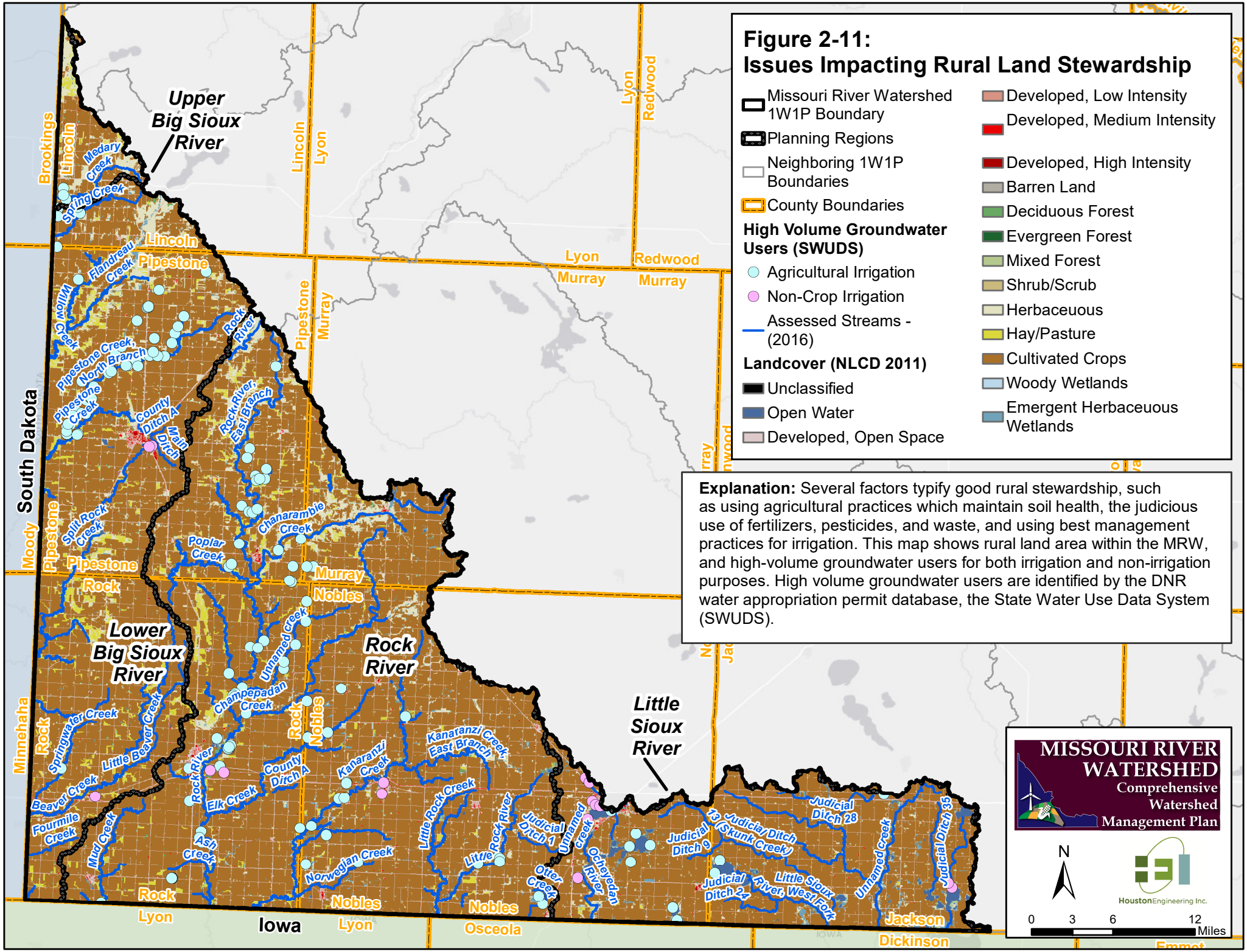


Figure 2-11:
Issues Impacting Rural Land Stewardship
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
County Boundaries
High Volume Groundwater Users (SWUDS)
Agricultural Irrigation
Non-Crop Irrigation
Assessed Streams - (2016)
Landcover (NLCD 2011)
Unclassified
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceuous
Hay/Pasture
Cultivated Crops
Woody Wetlands
Emergent Herbaceuous Wetlands
Explanation: Several factors typify good rural stewardship, such as using agricultural practices which maintain soil health, the judicious use of fertilizers, pesticides, and waste, and using best management practices for irrigation. This map shows rural land area within the MRW, and high-volume groundwater users for both irrigation and non-irrigation purposes. High volume groundwater users are identified by the DNR water appropriation permit database, the State Water Use Data System (SWUDS).
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12 Miles

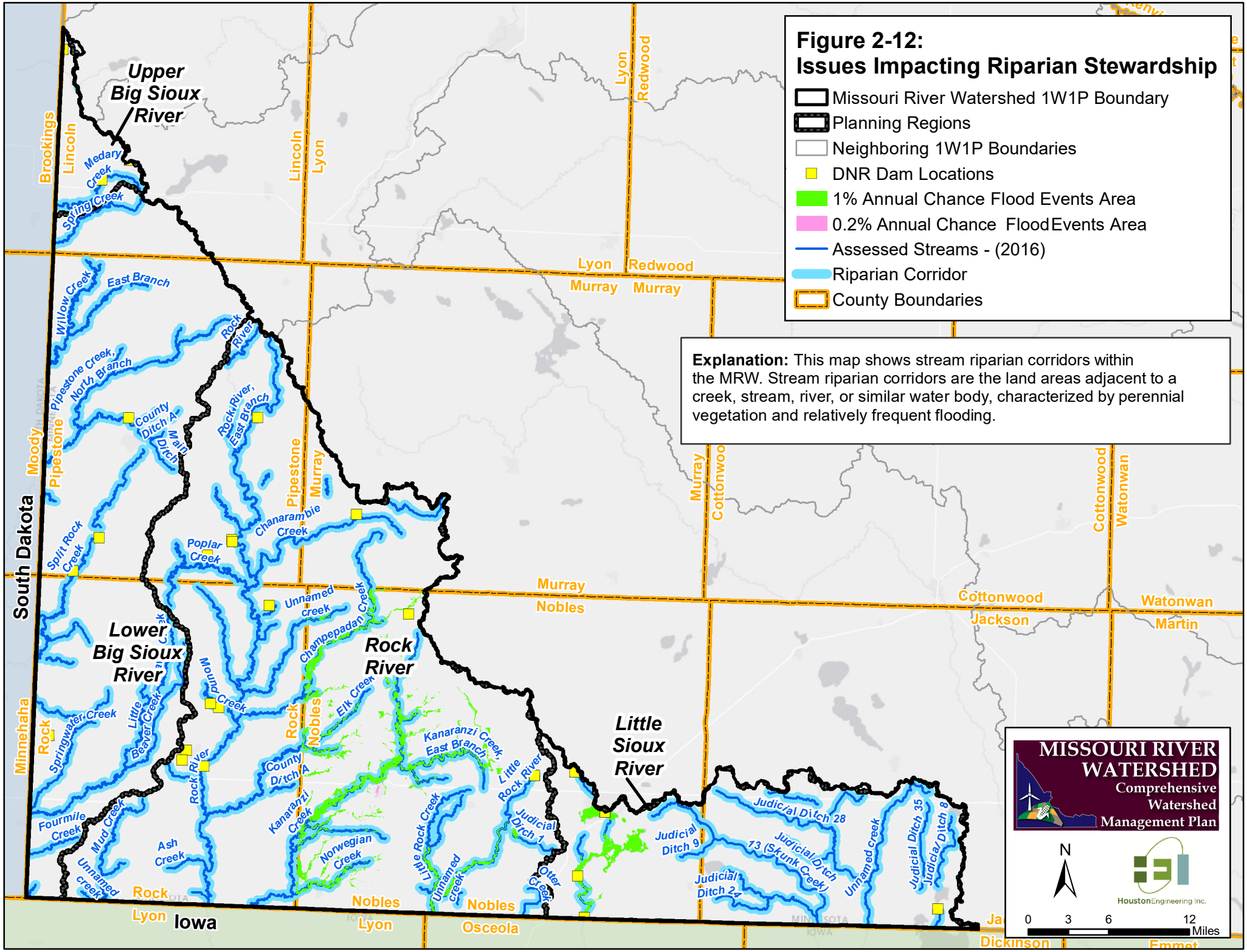


Figure 2-12:
Issues Impacting Riparian Stewardship
Missouri River Watershed 1W1P Boundary
Planning Regions
Neighboring 1W1P Boundaries
DNR Dam Locations
1% Annual Chance Flood Events Area
0.2% Annual Chance Flood Events Area
Assessed Streams - (2016)
Riparian Corridor
County Boundaries
Explanation: This map shows stream riparian corridors within the MRW. Stream riparian corridors are the land areas adjacent to a creek, stream, river, or similar water body, characterized by perennial vegetation and relatively frequent flooding.
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Lyon
Redwood
Moody
Pipestone
Murray
Nobles
Rock
Minnehaha
Cottonwood
Watonwan
Jackson
Martin
Dickinson
Osceola
Emmet
Medary Creek
Spring Creek
Willow Creek
East Branch
Pipestone Creek, North Branch
Rock River
Rock River, East Branch
County Ditch A
Main Ditch
Split Rock Creek
Poplar Creek
Chanarambie Creek
Unnamed creek
Champepadan Creek
Elk Creek
Mounds Creek
Springwater Creek
Little Beaver Creek
Fourmile Creek
Mud Creek
Ash Creek
Unnamed creek
Kanaranzi Creek
Kanaranzi Creek, East Branch
Norwegian Creek
Little Rock Creek
Unnamed creek
Little Rock River
Otter Creek
Judicial Ditch 1
Judicial Ditch 9
Judicial Ditch 28
13 (Skunk Creek)
Judicial Ditch
Unnamed creek
Judicial Ditch 35
Judicial Ditch 8
Judicial Ditch 24
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

SECTION 3.0 ESTABLISHMENT OF MEASURABLE GOALS

DEFINITIONS

The following definitions were developed to establish a common language for communicating information:

- **Priority Issue** – Issues categorized, through the prioritization process (**Section 2.0**), as Priority Level A or B issues. Priority issues will be the focus of this comprehensive plan.
- **Measurable Goal** – A statement of intended accomplishment for each priority issue. Goals are meant to be simply stated and achievable, can be quantitative or qualitative, long or short-term, and are meant to be measurable through the implementation of actions to attain a desired outcome.
- **Metric** – A feature, attribute, characteristic, amount, or quantity which forms the unit by which progress is measured towards attaining a measurable goal in a given time frame. For this plan two time frames are used: short-term (covering the 10-year plan period) and long-term (following the 10-year plan period).

Measurable goals were established for each Missouri River Watershed priority tier A and B issue (herein "priority issues"). A variety of information sources were utilized in the development of the measurable goals, including:

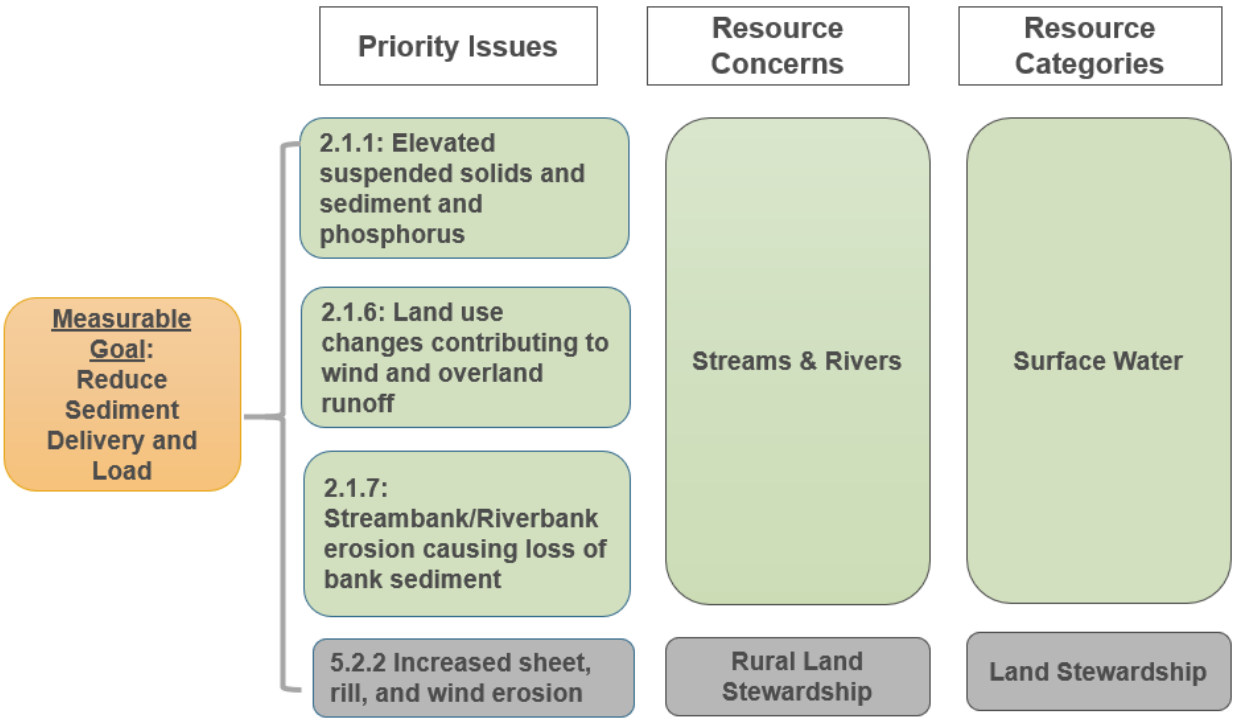
- Goals from existing management plans, studies, reports, data, and information, including the WRAPS, GRAPS, TMDLs, local water plans, state strategies, and similar documents (**Appendix F**);
- Results from the Prioritize, Target, and Measure Application (PTMApp);
- Input from Advisory Committee members;
- Input from Policy Committee members; and
- The knowledge of local water and resource managers provided by the Planning Work Group.

This section outlines and describes the **19 measurable goals for this comprehensive plan**, which collectively address all priority issues. A single measurable goal may apply to one priority issue or to several priority issues.

3.1 MEASURABLE GOAL DEVELOPMENT

Figure 3-1 provides a visual for measurable goals (using an example measurable goal from the plan) and the relationship to priority issues, resource concerns, and resource categories. Each priority issue is addressed by a measurable goal, but one measurable goal may address several priority issues. Grouping measurable goals in this way reduces redundancy in the plan and recognizes the multiple benefits of actions implemented to improve resources.

Figure 3-1: Organizational structure of measurable goals, and relation to plan priority issues, resource concerns, and resource categories.



3.2 PRIORITY ISSUE MEASURABLE GOALS

Measurable goals describe a desired state or condition for a resource being impacted by a priority issue. For purposes of this plan, measurable goals are presented as either short-term or long-term goals, as defined below:

- **Short-Term Goal(s):** Interim conditions to accomplish or make progress towards during the 10-year lifespan of this plan;
- **Long-Term Goals(s):** The desired future condition to accomplish, regardless of time frame.

Short-term and long-term goals are presented to align with WRAPS efforts, set milestones for resource improvement, and allow for resource management flexibility during implementation efforts.

In some instances, measurable goals are framed around the concepts of "protection" and "restoration." A priority issue is assigned a protection measurable goal when the condition of the resource currently or during the ten-year duration of this plan:

- Is better than the minimum condition defined by state or federal environmental standards and criteria (e.g., numeric water quality standards); or
- Is a component of the landscape, present in a limited amount, and provides essential ecosystem function and services at the landscape scale (e.g., habitat).

Priority issues are assigned a restoration measurable goal when the resource condition currently, or during the ten-year duration of this plan:

- Is poorer than the minimum condition defined by local, state or federal environmental standards and criteria (e.g., fails to meet numeric water quality standards); or
- Is a component of the landscape present in a limited amount and is providing an amount of essential ecosystem function and services below the needed amount at the landscape scale, and is therefore degraded (e.g., habitat fragmentation).

Defining protection and restoration is especially important for streams and rivers in the MRW 1W1P plan area, in order to identify resource management needs and align efforts with state funding priorities. The *Nonpoint Priority Funding Plan for Clean Water Funding Implementation* and Minnesota's Clean Water Roadmap place priority on protection and restoration activities focused on stream and river reaches that are nearly and barely impaired. To meet local needs of aligning implementation efforts with state-level funding priorities, protection and restoration categories and subcategories for streams and rivers were developed and mapped for use within this plan. Priority implementation for streams and rivers can be led by maps identifying reaches that are nearly or barely impaired, therefore aligning with the *Nonpoint Priority Funding Plan*.

Protection and restoration categories and subcategories were based on a statistical evaluation of available water quality monitoring data. The monitoring data is based on stream or river segments, called Assessment Unit Identification Numbers (AUIDs). Monitoring data and management strategies are commonly specific to a particular water quality parameter (e.g. total suspended solids, *E.coli*). Therefore, protection and restoration categories and subcategories are defined for each AUID, based on monitoring data for each water quality parameter.

Streams and rivers in the "protection" category are broken down into three subcategories:

1. **Above-Average Quality:** Portions of a stream or river in this subcategory exhibit water quality conditions that are significantly better than numeric water quality standards for a given parameter (**Figure 3-2)**.
2. **Potential Impairment Risk:** Portions of a stream or river in this subcategory exhibit conditions "near" but not exceeding numeric water quality standards for a given parameter (**Figure 3-3**).
3. **Threatened Impairment Risk:** Lastly, stream or river reaches in this subcategory are very near exceeding water quality standards, and run the greatest risk of becoming impaired (**Figure 3-4**).

Streams and rivers in the "restoration" category are further broken down into two subcategories:

1. **Low Restoration Effort:** Portions of a stream or river in the Low Restoration Effort subcategory exhibit water quality conditions near designated numeric water quality standards for a given parameter, therefore requiring relatively low efforts for restoration (**Figure 3-5**).
2. **High Restoration Effort:** Conversely, stream or river reaches in the High Restoration Effort subcategory exhibit water quality conditions that are no longer near designated numeric water quality standards for a given parameter, therefore requiring relatively high efforts for restoration (**Figure 3-6**).

The following pages highlight the 19 measurable goals for this comprehensive plan, which collectively address all the locally- prioritized issues.

MEASURABLE GOAL 3.2.1:

Groundwater – Manage Supply Sources and Nitrate-Nitrogen

Resource Concern:

Drinking Water

Priority Issues:

- Elevated **nitrate-nitrogen** in groundwater wells (Issue 1.1.1); and
- Land use changes where water enters aquifers, including Wellhead Protection Areas (WPAs) or Drinking Water Supply Management Areas (DWSMAs) (Issue 1.1.6).

Goals:

Short-Term:

Install structural or management practices within DSWMAs that promote soil health and nutrient management (e.g. cover crops, nutrient management plans, perennial crops) in areas at the highest risk of nitrate-nitrogen infiltration, therefore protecting groundwater drinking supplies. Goal acreage for structural and management practice implementation are set at the planning region scale:

- Upper Big Sioux River – 8 acres;
- Lower Big Sioux River – 1,483 acres;
- Rock River – 174 acres; and
- Little Sioux River – 227 acres.

Long-Term:

Protection Goal: Maintain unaffected private and public drinking water supply wells with nitrate-nitrogen concentrations at or near a concentration representative of background and transitional levels (< 3 mg/l).

Protection Goal: Reduce the number of public and private drinking water supplies that have nitrate-nitrogen concentrations considered moderately elevated above

Why These Issues Are Important

The U.S. Environmental Protection Agency (EPA) **standard for nitrate in drinking water is 10 milligrams of nitrate (measured as nitrate-nitrogen) per liter of drinking water (mg/L)**. Consumption of too much nitrate can be harmful to human health, especially infants (MDH, 2018). **DWSMAs, and the wellhead protection areas within them, are areas surrounding public water supply wells which are most vulnerable to contaminating drinking water sources**. One way to protect MRW community groundwater drinking water sources is by managing risks from land use activities within these areas. This can be accomplished through promotion of specific management practices or structural best management practices (BMPs) that reduce the amount of nitrogen introduced to the environment in vulnerable areas or by treating/containing contaminated water in those areas before it can infiltrate down to groundwater supplies.

A **Nitrogen Infiltration Risk Map** was developed for this plan to show areas on the landscape that have relatively high, medium, or low risk for nitrogen to reach and impact groundwater supplies, based on land use and the potential for denitrification as water infiltrates down (Methodology- Appendix I). The map is used to identify areas of high risk (where potential recharge and nitrogen loads are high) and low risk (where nitrogen loads are low). The MRW 1W1P short-term goal for managing sources of nitrate-nitrogen uses this map to **identify areas of "high"**

*MDH, 1998

background concentrations (**≥ 3 mg/l but < 7 mg/l**).

High Priority Protection Goal: Reduce the number of private and public drinking water supplies that have **nitrate-nitrogen** concentrations representing a possible future health concern (**≥ 7 mg/l to < 10 mg/l**)

High Priority Restoration Goal: Restore private and public drinking water supplies that have **nitrate-nitrogen** concentrations that currently represent a health concern (**≥ 10 mg/l**)

Metrics

Number of private and public water supplies with **nitrate-nitrogen** concentrations in each category of protection or restoration.

nitrogen risk that overlay DWSMA boundaries by planning region. There are 18,910 acres in the MRW that are "high" nitrogen risk and overlay DWSMAs (Upper Big Sioux River- 75 acres; Lower Big Sioux – 14,827 acres; Rock River – 1,740 acres; Little Sioux River 2,268 acres). This information will be used to **guide the location and quantity of management practices and structural BMPs that can be implemented to protect groundwater supplies from nitrate-nitrogen. Additional emphasis will be given to projects that enroll permanent easements for practices in DWSMAs**.

The Minnesota Department of Health's (MDH) Source Water Protection Unit, as part of its *Guidance for Mapping Nitrates in Minnesota Groundwater* report, developed risk categories for nitrate-nitrogen contamination of groundwater. The MRW 1W1P long-term goals have been drafted to align with these categories (**Figure 3-7**). Groundwater resources that need protection include public and private drinking water supplies with nitrate-nitrogen concentrations equal to or less than natural background and transitional levels, which may or may not represent human influence (< 3.0 mg/l) (MDH, 1998). Protection is also needed when nitrate-nitrogen concentrations are considered moderately elevated above transitional concentrations (≥ 3 mg/l but < 7 mg/l). **The highest priority for protection efforts occurs when nitrate-nitrogen concentrations represent a possible future health concern** (≥ 7 mg/l to < 10 mg/l). Groundwater resources that need restoration include public and private drinking water supplies with nitrate-nitrogen concentrations that currently represent a health concern (≥ 10 mg/l). This risk category represents the highest priority for restoration efforts as part of this plan.

MEASURABLE GOAL 3.2.2:

Groundwater – Assess Threat from Bacteria

Resource Concern:

Drinking Water

Priority Issue:

- Elevated **bacteria** (i.e. ***Escherichia coli*** (***E. coli***) and **fecal coliform**) in **groundwater wells** (Issue 1.1.2).

Goals:

Short-Term:

Develop and implement an action plan to establish a baseline evaluation of **bacteria** (**fecal coliform** or ***E. coli***) levels in **public and private wells** within the plan area.

Long-Term:

Maintain zero **public and private wells** that test positive for **fecal coliform** or ***E. coli***.

Short-term Goal: Baseline evaluation of bacteria (fecal coliform or *E. coli*) levels in public and private wells following completion of an action plan.

Long-term Goal: Number of public and private wells that test positive for fecal coliform or *E. coli*.

Why These Issues Are Important

Bacterial contamination in drinking water wells can lead to several waterborne diseases and is a threat to human health from both operational and nonoperational wells (MDH, 2005). Nonoperational wells are wells that have outlived their useful lives but may still pose a risk to drinking water sources by providing an open channel for bacteria to reach aquifers if wells remain unsealed. Due to a **lack of existing data on the extent of bacterial contamination in drinking water throughout the MRW, a comprehensive action plan is needed** to better establish the extent of the problem across the plan area. A comprehensive action plan is also necessary to:

- Determine the number of operational wells with samples that have tested positive for fecal coliform or *E. coli*;
- Assess the number of nonoperational, unsealed wells posing a risk to drinking water sources; and
- Identify actions to ensure drinking water free of bacterial contamination.

MEASURABLE GOAL 3.2.3:

Groundwater – Sustain Quality and Quantity

Resource Concern:

Drinking Water

Priority Issue:

- **Sustainable quantities** of groundwater supplies for drinking water use with **suitable water quality** (Issue 1.1.7).

Goals:

Short-Term:

Install structural or management practices within DSWMAs that promote groundwater recharge in areas at the lowest risk of nitrogen infiltration, thereby promoting healthy groundwater recharge. Goal acreage for structural BMP and management practice implementation are set at the planning region scale:

- Upper Big Sioux River – 24 acres;
- Lower Big Sioux River – 484 acres;
- Rock River – 380 acres; and
- Little Sioux River – 141 acres.

Long-Term:

Install additional structural or management practices within low risk areas in DWSMAs by planning region:

- Upper Big Sioux River – 122 acres;
- Lower Big Sioux River – 2,422 acres;
- Rock River – 1,901 acres; and
- Little Sioux River – 704 acres.

Why This Issue is Important

DWSMAs, and the wellhead protection areas within them, are areas surrounding public water supply wells which are most vulnerable to contaminating drinking water sources. These sources supply drinking water to many communities, and it is paramount these communities can access safe drinking water sources for their personal use. Groundwater resources are also used for other purposes, most notably irrigation to improve crop production. **It's important that groundwater sources are actively "recharged" with clean water** to ensure all users can safely access supplies to meet their needs**. This can be accomplished through promotion of specific management practices or structural BMPs** that encourage clean water to infiltrate down to replenish groundwater supplies.

There are 10,296 acres in the MRW that are **"low" nitrogen risk and overlay DWSMAs** (Upper Big Sioux River – 243 acres; Lower Big Sioux – 4,843 acres; Rock River – 3,802 acres; Little Sioux River 1,408 acres). These areas can be **targeted for management practices or structural BMPs to promote recharge of clean water.**

Number of acres subject to structural or management practices that promote safe groundwater recharge.

MEASURABLE GOAL 3.2.4:

Streams and Rivers – Sediment Delivery and Load

Resource Concerns:

Streams and Rivers
Rural Land Stewardship

Priority Issues:

- **Suspended solids** (**sediment**) and **phosphorus levels** (Issue 2.1.1);
- Land use changes contributing to wind and overland **runoff** (Issue 2.1.6);
- Streambank/Riverbank **erosion** causing loss of bank sediment (Issue 2.1.7); and
- Increased sheet, rill, and wind **erosion** (Issue 5.2.2).

Goals:

Short-Term:

Short-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the **10-year sediment reduction targets** outlined by the MRW WRAPS in each planning region:
  - **Protection:** Upper Big Sioux River – Protect (i.e. no increase);
  - **Restoration:** Lower Big Sioux River – 10%;
  - **Restoration:** Rock River – 15%; and
  - **Restoration:** Little Sioux River – 7%
- **Reach-specific scale**:
  - **Restoration:** Reduction in the number of streams classified as impaired by meeting a load allocation (where a TMDL has been completed).

Long-Term:

Long-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the long-term sediment reduction targets outlined by

Why These Issues Are Important

This goal focuses on reducing elevated levels of suspended solids and sediment in rivers and streams by addressing upstream impacts that intensify water and sediment erosion on the landscape. **By addressing these issues, streambank and riverbank erosion will also be reduced through a decrease in peak discharge events.**

Stressor Identification Reports developed across the MRW identified **sediment as a stressor in 61% of stream reaches** with biological impairments (MPCA, 2018b). The MRW WRAPS notes that "of the stream reaches monitored to assess if sediment is a pollutant, 28 were impaired, one was supporting, and 41 were inconclusive." (MPCA, 2018b). Sediment is a significant threat to aquatic life across the MRW, with impairments in all but the Upper Big Sioux River planning region. The MRW WRAPS used results from regional Stressor Identification Reports and Total Maximum Daily Load (TMDL) studies to set 10-year and long-term targets for reducing sediment load within each planning region. **These WRAPS targets are used within this 1W1P to guide the sediment delivery and load reduction measurable goal**. During implementation, results from PTMApp will be used to track the progress that practice implementation makes towards stated goals.

the MRW WRAPS (called “watershed-wide” goals for each planning region) in each planning region:

- **Protection:** Upper Big Sioux River – Protect (i.e. no increase);
- **Restoration:** Lower Big Sioux River – 45%;
- **Restoration:** Rock River – 65%; and
- **Restoration:** Little Sioux River – 35%

- **Reach-specific scale:**
  - **Restoration:** Reduction in the number of streams classified as impaired by meeting a load allocation (where a TMDL has been completed).

Planning Region Scale: Percentage load reduction anticipated from structural BMP and management practice implementation, as estimated by PTMApp.

Reach Specific Scale: Number of streams classified as "impaired."

MEASURABLE GOAL 3.2.5:

Streams and Rivers – Phosphorous Delivery and Load

Resource Concern:

Streams and Rivers

Priority Issues:

- **Suspended solids** (**sediment**) and **phosphorus levels** (Issue 2.1.1).

Why These Issues Are Important

Across the MRW, phosphorus is a significant stressor to aquatic life and recreation in both lake and river/stream systems. Across all four planning regions, **phosphorus was found to be a stressor in 44 of the 48 (92%) streams with bio-impairments** (MPCA, 2018b). The MRW WRAPS used results from regional Stressor Identification Reports and TMDL studies to set 10-year and long-term targets for reducing phosphorus load delivered to lakes, streams, and rivers by planning region. **These WRAPS targets are used within this 1W1P to guide the phosphorus delivery and load reduction measurable goal**. During implementation, results from PTMApp will be used to track the progress that practice implementation makes towards stated goals.

Planning Region Scale: Percentage load reduction anticipated from structural and management practice implementation, as estimated by PTMApp.

Reach Specific Scale: Number of streams classified as "impaired."

Goals:

Short-Term:

Short-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the **10-year phosphorous reduction targets** outlined by the MRW WRAPS in each planning region:
  - **Restoration:** Upper Big Sioux River – 10%
  - **Restoration:** Lower Big Sioux River – 10%;
  - **Restoration:** Rock River – 10%; and
  - **Restoration:** Little Sioux River – 10%
- **Reach-specific scale**:
  - **Restoration:** Reduction in the number of streams classified as impaired (where a TMDL has been completed).

Long-Term:

Long-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the long-term targets outlined by the MRW WRAPS (called "watershed-wide" goals for each planning region) to meet phosphorous reduction goals in each planning region:
  - **Restoration:** Upper Big Sioux River – 30%;
  - **Restoration:** Lower Big Sioux River – 60%;
  - **Restoration:** Rock River – 60%; and
  - **Restoration:** Little Sioux River – 75%
- **Reach-specific scale:**
  - **Restoration:** Reduction in the number of streams classified as impaired (where a TMDL has been completed).

MEASURABLE GOAL 3.2.6:

Streams and Rivers – Bacterial Delivery and Load

Resource Concern:

Streams and Rivers

Priority Issues:

- Elevated **bacteria** (i.e. ***E. coli*** and **fecal coliform**) levels (Issue 2.1.2).

Why These Issues Are Important

Fecal bacteria in stream and river systems may lead to illnesses that make waterbodies unsafe for those that come in contact. **Regional Stressor Identification Reports conducted in the MRW monitored 34 stream reaches for bacteria and found 94% (32 of 34) of these reaches were impaired (MPCA, 2018b).** The MRW WRAPS set 10-year and long-term targets for reducing bacterial load delivered to streams and rivers by planning region. **These WRAPS targets are used within this 1W1P to guide the bacterial delivery and load reduction measurable goal.**

Metrics

Planning Region Scale: Percentage decrease in length of stream and river reaches classified as impaired.

Reach Specific Scale: Number of streams classified as "impaired."

Goals:

Short-Term:

Short-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the 10-year targets outlined by the MRW WRAPS to meet short-term bacteria reduction goals in each planning region:
  - **Protection:** Upper Big Sioux River – - Protect (i.e., no increase);
  - **Restoration:** Lower Big Sioux River – 10%;
  - **Restoration:** Rock River – 15%; and
  - **Restoration:** Little Sioux River – 10%

Goals will be met through an equivalent percentage decrease in streams and rivers categorized as impaired in each planning region.

- **Reach-specific scale**:
  - **Restoration:** Reduction in the number of streams classified as impaired.

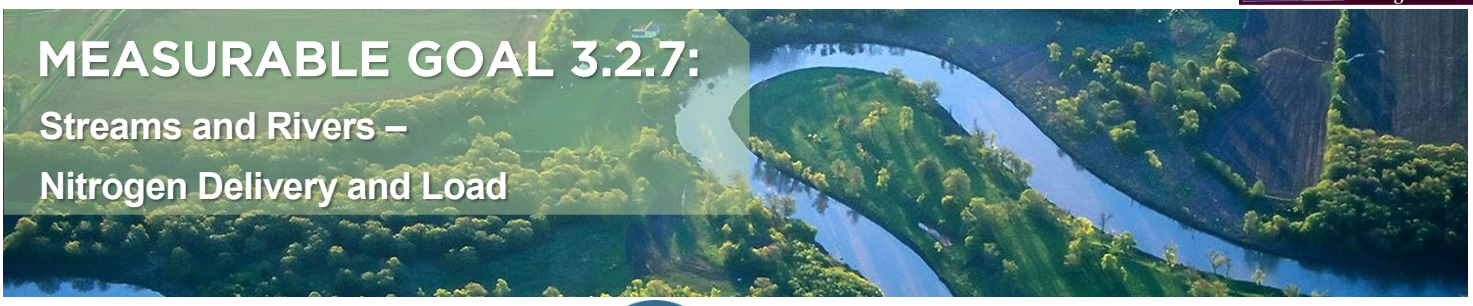
Long-Term:

Long-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the long-term targets outlined by the MRW WRAPS (called "watershed-wide" goals for each planning region) to meet phosphorous reduction goals in each planning region:
  - **Protection:** Upper Big Sioux River – Protect (i.e., no increase);
    Restoration: Lower Big Sioux River – 70%;
  - **Restoration:** Rock River – 70%; and
  - **Restoration:** Little Sioux River – 50%

Goals will be met through an equivalent percentage decrease in streams and rivers categorized as impaired in each planning region.

- **Reach-specific scale:**
  - **Restoration:** Reduction in the number of streams classified as impaired.



MEASURABLE GOAL 3.2.7:

Streams and Rivers – Nitrogen Delivery and Load

Resource Concern:

Streams and Rivers

Priority Issues:

- Elevated **nitrate-nitrogen** levels (Issue 2.1.3).

Goals:

Short-Term:

Short-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the 10-year nitrogen reduction targets outlined by the MRW WRAPS in each planning region:
  - **Restoration:** Upper Big Sioux River – 7%;
  - **Restoration:** Lower Big Sioux River – 10%;
  - **Restoration:** Rock River – 10%; and
  - **Restoration:** Little Sioux River – 10%.
- **Reach-specific scale**:
  - **Restoration:** Reduction in the number of streams classified as impaired.

Long-Term:

Long-term goals are set at planning region and reach-specific scales.

- **Planning Region scale:** Use the long-term targets outlined by the MRW WRAPS (called "watershed-wide" goals for each planning region) to meet phosphorous reduction goals in each planning region:
  - **Restoration:** Upper Big Sioux River – 20%;
    Restoration: Lower Big Sioux River – 25%;
  - **Restoration:** Rock River – 30%; and
  - **Restoration:** Little Sioux River – 30%
- **Reach-specific scale:**
  - **Restoration:** Reduction in the number of streams classified as impaired.

Why These Issues Are Important

Locally, excess nitrogen in streams and rivers can be toxic to macroinvertebrate and fish populations and, when used as a drinking water source, can be harmful to humans (especially infants) at concentrations greater than 10 mg/l. **Regionally and nationally, nitrogen transported via stream and river systems is a significant cause of eutrophication in major waterbodies such as the Gulf of Mexico.**

In the MRW, **nitrogen was found to be a stressor in 73% (36 of 49) of streams and rivers** with known biological impairments (MPCA, 2018b). The MRW WRAPS used results from regional Stressor Identification Reports and TMDL studies to set 10-year and long-term targets for reducing nitrogen load delivered to streams and rivers by planning region. **These WRAPS targets are used within this 1W1P to guide the nitrogen delivery and load reduction measurable goal.** During implementation, results from PTMApp will be used to track the progress that practice implementation makes towards stated goals.

Planning Region Scale: Percentage load reduction anticipated from BMP implementation, as estimated by PTMApp.

Reach Specific Scale: Number of streams classified as "impaired."

MEASURABLE GOAL 3.2.8:

Streams and Rivers – Aquatic Invasive Species

Resource Concern:

Streams and Rivers

Priority Issues:

- Increased spread of **aquatic invasive species** (Issue 2.1.5).

Goals:

Short-Term:

Restoration and protection goals are proposed across the plan area:

- **Restoration:** Manage aquatic invasive species in the Little Sioux River planning region and ensure no net increase in the infested water area.
- **Protection**: Ensure no additional areas in the MRW plan area become infested with invasive species currently in the Little Sioux River planning region or with other aquatic invasive species, including (but not limited to) invasive carp, Eurasian watermilfoil, purple loosestrife, zebra mussels, and spiny water fleas.

Long-Term:

Consider extending short-term goal for another 10 years.

Why These Issues are Important

Through a connectivity analysis, the MnDNR has identified a **40-square-mile area in the Little Sioux River planning region as infested with invasive Bighead Carp and Silver Carp.** These carp infest both lakes and the streams connecting these lakes and have steadily moved upstream on the Missouri River over several years. Currently they maintain reproducing populations on the Little Sioux River and many other tributaries to the Missouri River (Invasive Carp Work Group, Draft, 2014). As these reproducing populations are isolated only to a portion of the Little Sioux River planning region, **it's important this 40-square-mile area is either maintained or reduced to protect local fish and other aquatic communities in the plan area.**

Area (in square miles) of "infested water areas."

MEASURABLE GOAL 3.2.9:

Lakes – Phosphorous Delivery and Load

Resource Concern:

Lakes

Priority Issues:

- **Phosphorus concentrations** in the water and increased risk of algal blooms (Issue 2.2.1).

Goals:

Short-Term:

Goals for reducing phosphorous in lakes are split into restoration and protection categories:

- **Protection** (If lake is designated as a LPSS): Meet phosphorus target load reduction goals established by the MnDNR;
- **Protection** (If lake is not designated as a LPSS): Maintain existing loads entering the lake, as estimated by PTMApp (nondegradation);
- **Restoration** (If TMDL is completed for lake): Decrease the number of impaired lakes. Use TMDL load allocation as whether a lake achieves the goal; and
- **Restoration** (If TMDL is not completed for lake): Decrease annual phosphorus loads entering the lake by 10% (as estimated by PTMApp).

Long-Term:

Consider extending short-term goal for another 10 years.

Why These Issues Are Important

There are 40 lakes in the MRW, primarily located within the eastern half of the watershed (MPCA, 2018b). Twelve lakes in the MRW had some monitoring data with nine of them having sufficient monitoring data for assessment. All nine of the assessed lakes were determined to be impaired with phosphorus as a pollutant (MPCA, 2018b). **Too much phosphorus is also a primary cause of algal blooms in lakes, which can negatively impact aquatic recreation.** For the limited number of lakes in the plan area, goals for reducing phosphorus load and delivery are set based on whether:

- A lake is designated as a Lake of Phosphorus Sensitivity Significance (LPSS) by MnDNR; or
- A lake has a completed TMDL, and therefore a phosphorus load allocation.

- **Protection** (If lake is designated as a LPSS): Number of unimpaired or unassessed lakes;
- **Protection** (If lake is not designated as a LPSS): Phosphorus load delivered to the lake as estimated by PTMApp;
- **Restoration** (If TMDL is completed for lake): Number of impaired or unassessed lakes; and
- **Restoration** (If TMDL is not completed for lake): Phosphorus load delivered to the lake as estimated by PTMApp.

MEASURABLE GOAL 3.2.10:

Surface Runoff – Restore Natural Storage and Hydrology

Resource Concerns:

Surface Runoff
Aquatic Habitat for Fish, Macroinvertebrates, and Aquatic Life

Priority Issues:

- **Land use changes** (loss of **vegetative cover** and **field residue**) (Issue 2.3.2);
- **Land use changes** (loss of **natural storage**) (Issue 2.3.3); and
- **Habitat loss** from development and intense drainage (Issue 3.1.2).

Goals:

Short-Term:

Achieve progress towards the altered hydrology storage goal. Achieve 0.1 inches of water storage across the watershed, or 9,510 acre-feet of storage across the watershed.

Long-Term:

Achieve the altered hydrology storage goal. Achieve 0.5 inches of water storage across the watershed, or 47,550 acre-feet of storage across the watershed.

Metrics

Acre-feet of volume reduced through structural and management practice implementation.

Why These Issues are Important

Excess surface water runoff leads to accelerated bank erosion and stream channel movement, increased movement of sediment, and the loss of aquatic habitat. Excess surface runoff can also lead to road overtopping, washouts, and damage to land and buildings. **The term "altered hydrology" is commonly used in Minnesota to describe changes in the amount and pathways that water moves through the landscape.** Altered hydrology is a known stressor to supporting both habitat and aquatic life within the MRW (MPCA, 2018b).

An altered hydrology analysis (Methodology-Appendix J) was completed for the MRW for two main purposes:

1. To define if and how hydrology in its current form has been changed or altered from its natural flow regime within the watershed, and;
2. To establish a measurable goal (storage goal) for addressing altered hydrology.

For the purposes of this analysis, altered hydrology is defined as a discernable change in specific metrics derived from stream discharge, occurring through an entire annual hydrologic cycle, which exceed the measurement error, compared to a benchmark condition (HEI, 2017). For the MRW altered hydrology analysis, five different USGS gages were used to define if hydrologic changes occurred between a benchmark and current condition: two on Little Sioux River (USGS # 06605850 and 06606600),

one on Split Rock River (USGS # 06482610), one on Rock River (USGS # 06483500), and one on the Big Sioux River (USGS # 06485500). **The weight-of-evidence analysis concluded that hydrology was altered in all five stations evaluated.**

As part of the altered hydrology analysis, a storage goal was drafted for addressing the change in hydrology within the MRW. **For planning purposes, a representative storage goal for Minnesota's portion of the MRW is 0.5 inches of water across the basin, or 47,550 acre-feet of storage across the watershed.** The actual amount of mitigation needed may exceed the estimated range, as the methods used to achieve the goal are not expected to be 100% effective. The means to achieve the estimated mitigation goal may include the use of structural and management practices and should be specifically evaluated through completion of a hydrologic study or the use of appropriate tools and models.

MEASURABLE GOAL 3.2.11:

Wetlands – Restore Degraded and Lost Wetland Acreage

Resource Concern:

Wetlands

Priority Issues:

- Loss of **functioning wetlands** (Issue 2.4.1).

Goals:

Short-Term:

Use PTMApp results and/or other datasets (e.g. MnDNR Restorable Depressional Wetland Inventory) to locate restorable wetland opportunities and install 500 acres of wetlands and generate progress towards altered hydrology storage goal.

Long-Term:

Use PTMApp results and/or other datasets (e.g. MnDNR Restorable Depressional Wetland Inventory) to locate and install additional acres of restorable wetland to generate progress towards altered hydrology storage goal.

Why These Issues are Important

Wetlands serve many ecological and environmental purposes, including:

- establishing and maintaining healthy ecosystem functioning, especially aquatic and terrestrial habitat;
- improving groundwater quality and quantity and reducing overland sediment, nutrient, and bacterial runoff; and
- providing additional live storage, thereby reducing downstream flood risk.

Wetland loss and modification is an ongoing concern and focus of several local, state, and federal agencies as well as non-profit organizations. **The measurable goal for this comprehensive plan is centered on increasing quality wetland areas, focusing on restoring previously existing wetlands.**

Acres of new / restored wetland.

MEASURABLE GOAL 3.2.12:

Aquatic Habitat for Fish, Macroinvertebrates and Aquatic Life – Restore Lost Habitat and Promote Vegetated Banks and Buffers

Resource Concerns:

Aquatic Habitat for Fish, Macroinvertebrates, and Aquatic Life Agricultural Drainage Systems

Priority Issues:

- Presence, width, and quality of vegetated areas alongside ditches (Issue 2.5.1); and
- Habitat loss from bank erosion in creeks, streams, and rivers (Issue 3.1.1).

Goals:

Short-Term:

Use the 10-year targets outlined by the MRW WRAPS to meet short-term habitat goals in each planning region:

- Restoration: Upper Big Sioux River – 5%;
- Restoration: Lower Big Sioux River– 10%;
- Restoration: Rock River – 10%; and
- Restoration: Little Sioux River – 10%,

These goals will be measured by an increase in the mean MPCA Stream Habitat Assessment Score across assessed ditches, streams, and rivers in the planning region.

Long-Term:

Planning Region scale: Use the long-term targets outlined by the MRW WRAPS (called "watershedwide" goals for each planning region) to meet habitat goals in each planning region:

- Restoration: Upper Big Sioux River– 10%;
- Restoration: Lower Big Sioux River– 35%;
- Restoration: Rock River – 30%; and
- Restoration: Little Sioux River – 60%,

These goals will be measured by an increase in the mean MPCA Stream Habitat Assessment Score across assessed ditches, streams, and rivers in the planning region.

Why These Issues are Important

Healthy aquatic habitat supports many life cycle processes across food chains and improves aquatic recreation opportunities. Protection of healthy aquatic habitat is also important for threatened or endangered species, such as the Topeka shiner. Conversely, a loss of habitat by redevelopment or instability can stress aquatic populations and affect the biological integrity of surface waters.

In the MRW plan area, regional Stressor Identification Reports found **degraded habitat was a stressor in 32 of 49 (65%) of biologically impaired stream reaches**. An MPCA Stream Habitat Assessment conducted in the MRW found most stream reaches had "fair" or "poor" habitat scores (MPCA, 2018b).

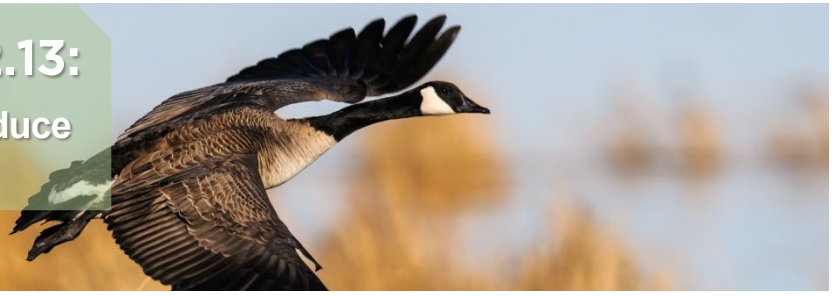
Within the WRAPS, a lack of riparian vegetation, channel instability, and excessive sediment were identified as the primary causes for low habitat scores (MPCA, 2018b).

Goals were proposed in the WRAPS to bring the mean Stream Habitat Assessment in each planning region to "good" scores. These targets are used within this 1W1P to guide the aquatic habitat measurable goal.

MPCA Stream Habitat Assessment Score.

MEASURABLE GOAL 3.2.13:

Terrestrial Habitat for Wildlife – Reduce Habitat Fragmentation and Loss



Resource Concern:

Terrestrial Habitat for Wildlife

Priority Issues:

- Habitat fragmentation and loss (Issue 3.2.1).

Goals:

Short-Term:

Create one 6- to 9-square-mile complex annually (60% cropland, 30% grasslands, 10% wetlands, no forests). Priority for complex locations are areas identified in the MN Wildlife Action Plan, as shown in **Figure 3-8**.

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension. Use both land acquisition and easements as necessary.

Metrics

Square mileage of habitat complexes created annually.

Why These Issues are Important

Habitat provides food, shelter, terrestrial ecological corridors, and breeding territory for animals. There is a general desire by members of the Planning Work Group and Advisory Committee **to protect and enhance habitat for pheasants, waterfowl, and pollinators while protecting and preserving native prairies and road-side habitat**. Many locations within the MRW also provide habitat for unique and rare plant (i.e. Western prairie fringed orchid) and animal species (i.e. Blanding Turtle, Dakota Skipper). Because of their uniqueness, there is a general desire to preserve and enhance these habitats.

The Prairie Coteau Conservation Focus Area (PCCFA) was established under the MN Wildlife Action Plan 2015-2025 to facilitate targeting of habitat conservation projects aimed at reducing ecological threats, improving ecosystem function, and increasing the populations of designated Species in Greatest Conservation Need and other priority wildlife (**Figure 3-8**). **Targeting habitat conservation projects to areas identified in the Wildlife Action Plan** increases the potential to realize the highest benefit from dollars invested in conservation and create multiple benefits, including cleaner water.

MEASURABLE GOAL 3.2.14:

Landowner, Producer, and Lake Shore Owner Engagement in Water Management – Provide Additional Education and Outreach Opportunities to Highlight and Promote Economic and Environmental Benefits of BMPs

Resource Concern:

Landowner, Producer, and Lake Shore Owner Engagement in Water Management

Priority Issue:

- Lack of watershed **education and outreach** on **management and structural best management practices (BMPs)** and their impact on farm profitability and the environment (Issue 4.2.2).

Goals:

Short-Term:

Host 15 events per year across MRW 1W1P area focused on networking, education and demonstrations including programming on:

- soil health,
- altered hydrology,
- residential stormwater,
- septic systems, and
- manure management.

Use field walkovers and BMP demonstrations as a means of increasing farmer awareness of BMPs, cost share programs, and conservation delivery. Goal is to complete 100 walkovers per year, or 1,000 during plan duration. This amount may include walkovers conducted as part of MDA Minnesota Agricultural Water Quality Certification Program (MAWQCP) (or similar program) enrollment process.

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension.

Why These Issues are Important

Approximately 80% of the area in the MRW is privately owned agricultural lands. Agricultural conservation is vital to ensuring healthy lakes, streams, rivers, and communities in the watershed.

Better communicating the environmental and economic benefits of structural BMPs and improved farm management practices is an important avenue to increasing participation in local, state, and federal programs that provide cost share to landowners and lake shore owners to implement BMPs.

Number of events hosted as well as number of field walkovers completed.

MEASURABLE GOAL 3.2.15:

Technology, Tools, Funding, and Existing Capabilities – Tile Drainage

Resource Concern:

Technology, Tools, Funding, and Existing Capabilities

Priority Issues:

- **Lack of understanding, agreement, and consensus** about the hydrologic impacts of **tile drainage** and the benefits to producers (Issue 4.3.3).

Goals:

Short-Term:

Host one event per year across the MRW 1W1P area specifically addressing drainage, landowner and drainage authority rights, and opportunities to improve water quality while maintaining drainage capacity. These events could be either informational—such as to landowners, staff, or elected officials—or promotional, such as field walkovers to display positive results of installed practices.

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension.

Metrics

Number of events hosted.

Why These Issues are Important

Subsurface (tile) drainage is used in Minnesota and locally within the MRW to provide drainage for agricultural lands. Proper soil drainage has demonstrated the capacity to improve agricultural production by ensuring timely planting and field operations, minimizing soil compaction and buildup of salts, promoting conditions for good seedbed establishment and germination, and minimizing high water table stresses to growing crops (Sands, 2016). However, these drainage systems may have impacts on the natural hydrology of the landscape. These changes may alter the timing and magnitude of the delivery of water, at times decreasing base flow of streams, and at times increasing peak discharge and the likelihood of flooding.

According to a GIS analysis presented in the WRAPS, 17% of agricultural land in the MRW is likely tile drained, with an estimated 27% of the Little Sioux River planning region tile drained (MPCA, 2018b).

This measurable goal is aimed at learning the current extent and conditions of subsurface drainage within the watershed area, understanding the fiscal benefits of subsurface drainage systems provided to producers, and promoting implementation of innovative practices to curb potential hydrologic impacts of existing subsurface drainage systems.

MEASURABLE GOAL 3.2.16:

Technology, Tools, Funding, and Existing Capabilities – Secure a Long-Term Funding Source

Resource Concern:

Technology, Tools, Funding, and Existing Capabilities

Priority Issues:

- Piecemeal approach and lack of long-term and consistent funding for water management at the local level (Issue 4.3.4).

Goals:

Short-Term:

Conduct the following activities:

- Secure at least one additional long-term funding strategy (e.g. dedicated grant to implement 1W1P priority strategies, etc.)

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension.

Metrics

Number of dollars secured annually for funding plan implementation.

Why These Issues are Important

One of the guiding principles of the 1W1P approach is to develop consistent local water management across a single, major watershed.

To implement actions aimed at achieving stated short-term and long-term measurable goals, the MRW will require consistent funding. Relying on competitive grants to achieve the measurable goals seems unreasonable and makes success tenuous. Therefore, grant funding on an annual basis is needed.

*MDH, 1998

MEASURABLE GOAL 3.2.17:

Rural Land Stewardship – Improve Agricultural Soil Health

Resource Concern:

Rural Stewardship

Priority Issues:

- Decreased agricultural soil health (Issue 5.2.1); and
- Manure application and disposal (Issue 5.2.6).

Goals:

Short-Term:

Draft watershed wide geospatial information that summarizes:

- Locations of manure application; and
- Estimated annual rates of application (where they exist).

Implement management practices in 0.65% (6,150 acres) of all cropland areas in the watershed to increase Soil Organic Matter (SOM) content 1%. Areas to be managed are cropland areas categorized as rural stewardship "Probability Low" and "Probability Depends on Practice Effectiveness" that have SOM content > 1% and =< 4 %.

Long-Term:

Implement management practices in 45% (430,900 acres) of all cropland areas in the watershed to increase SOM content 1%. Areas to be managed are cropland areas categorized as rural stewardship "Probability Low" and "Probability Depends on Practice Effectiveness" that have SOM content > 1% and =< 4 %.

Percentage of applicable cropland acres treated with management practices

Why These Issues are Important

For purposes of this plan, "rural land stewardship" is defined by creating solutions to water quality and quantity challenges using a combination of structural and management practices to increase soil health, thereby accruing positive environmental benefits and positive value propositions in terms of benefits for a producer or landowner.

Soil health is an important factor for both maintaining soil productivity and for reducing overland erosion on agricultural fields. **Therefore, benefits to farmers that preserve healthy soils on their fields are both environmental and economical.**

Management practices such as cover crops, conservation tillage, nutrient management and permanent cover have consistently been found to be some of the most cost-effective options to reduce sediment and nutrient erosion and increase soil health.

A suite of criteria has been established for this plan to define rural land stewardship, estimate the current proportion of the plan area meeting rural stewardship, establish a watershedwide rural stewardship measurable goal and assess progress during plan implementation (**Methodology-Appendix K**). These criteria were used to place a field in one of three stewardship categories:

1. Rural stewardship "Probability Low";
2. Rural stewardship "Probability Depends on Practice Effectiveness"; and
3. Rural stewardship "Probability Likely."

(cont.)

The rural land stewardship measurable goal is focused on increasing the portion of the plan area that meets principles of rural stewardship, thus focusing only on those acres in the rural stewardship categories "Probability Low" and "Probability Depends on Practice Effectiveness."

Protecting and improving soil health is a key component of rural stewardship. The Soil Organic Matter (SOM) content is used as a surrogate for soil health. The rural stewardship measurable goal is focused on cropland with estimated SOM > 1% and =< 4 %.

Based on the MRW 1W1P rural stewardship analysis, **there are 430,900 acres of cropland in the watershed area that are in rural stewardship categories of "Probability Low" and "Probability Depends on Practice Effectiveness" which also have SOM content > 1% and =< 4 %**. Management practices such as cover crops, conservation tillage to increase residue, and permanent cover (e.g., alfalfa, prairie grass) can be implemented to improve soil health, or the SOM content. The long-term measurable goal for rural land stewardship is aimed at **implementing these management practices in cropland areas with rural stewardship categories of "Probability Low" and "Probability Depends on Practice Effectiveness" to increase SOM content by 1%**

MEASURABLE GOAL 3.2.18:

Riparian Stewardship – Limit Livestock Accessibility to Streams and Rivers

Resource Concern:

Riparian Stewardship

Priority Issues:

- Livestock accessibility to streams and rivers (Issue 5.3.6).

Goals:

Short-Term:

Develop a cost share to provide farmers with incentive to prohibit livestock from accessing streams and rivers, including dollars to install riparian fencing, create a secondary water source for the livestock, and develop a rotational grazing system. Use program to increase stream miles treated with practices to restrict livestock from accessing streams by planning region:

- Upper Big Sioux River – 0.6 miles;
- Lower Big Sioux River – 11.4 miles;
- Rock River – 10.5 miles; and
- Little Sioux River – 0.2 miles.

Direct benefits include decrease bank erosion and in-stream defecation (with immediate bacterial and nutrient inputs to the waterway. Indirect benefits include increase riparian vegetation and decrease sediment, nutrient, and bacterial runoff.

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension.

Why These Issues are Important

Riparian areas are the land adjacent to a creek, stream, river, or similar waterbody characterized by perennial vegetation and relatively frequent flooding. **Frequent access of cattle into streams and** riparian **areas can increase the abundance of bacteria in surface waters (DNR, 2014) and lead to the trampling of streambanks, causing excessive erosion and widening of streams (MPCA, 2018b).**

A land use analysis was used to estimate the number of stream miles within each planning region where cattle likely have access to watercourses. Below are the number of watercourse miles (rivers, streams, and ditches) that intersect pastureland by planning region (**Figure 3-9**):

- **Upper Big Sioux:** 11.4 miles
- **Lower Big Sioux:** 227.8 miles
- **Rock River:** 209.2 miles
- **Little Sioux River:** 3.3 miles

Metrics

Number of stream miles treated with practices to restrict livestock from accessing streams and rivers.

MEASURABLE GOAL 3.2.19:

Riparian Stewardship – Meet Riparian Buffer Requirements

Resource Concern:

Riparian Stewardship

Priority Issues:

- Undercut and unstable streambanks (Issue 5.3.2); and
- Presence, width, and quality of vegetated buffer along streams and rivers (Issue 5.3.7).

Goals:

Short-Term:

Implement 10 miles annually of additional filter strips/buffers on waters not covered by the Buffer Law.

Long-Term:

Reevaluation and assessment of resource/activity every 10 years to consider further extension.

Metrics

Miles of filter strips/ buffers implemented annually.

Why These Issues are Important

The Buffer and Soil Loss Legislation (Minnesota Statute 2014, section 103B.101), commonly referred to as the Minnesota Buffer Law, was signed into law in June of 2015 and was amended in April of 2016.

The legislation requires a 50-foot average continuous buffer of perennial vegetation with a 30-foot minimum width around all public waters and a 16.5-foot minimum width continuous buffer of perennial vegetation along all public drainage systems.

The SWCDs will be relied on for implementation and assessing compliance of the buffer legislation. SWCDs are also likely to provide technical assistance and provide guidance about financial assistance options. **Landowners also have the option of working with their SWCD to determine if other alternative practices aimed at protecting water quality can be used, rather than a buffer.**

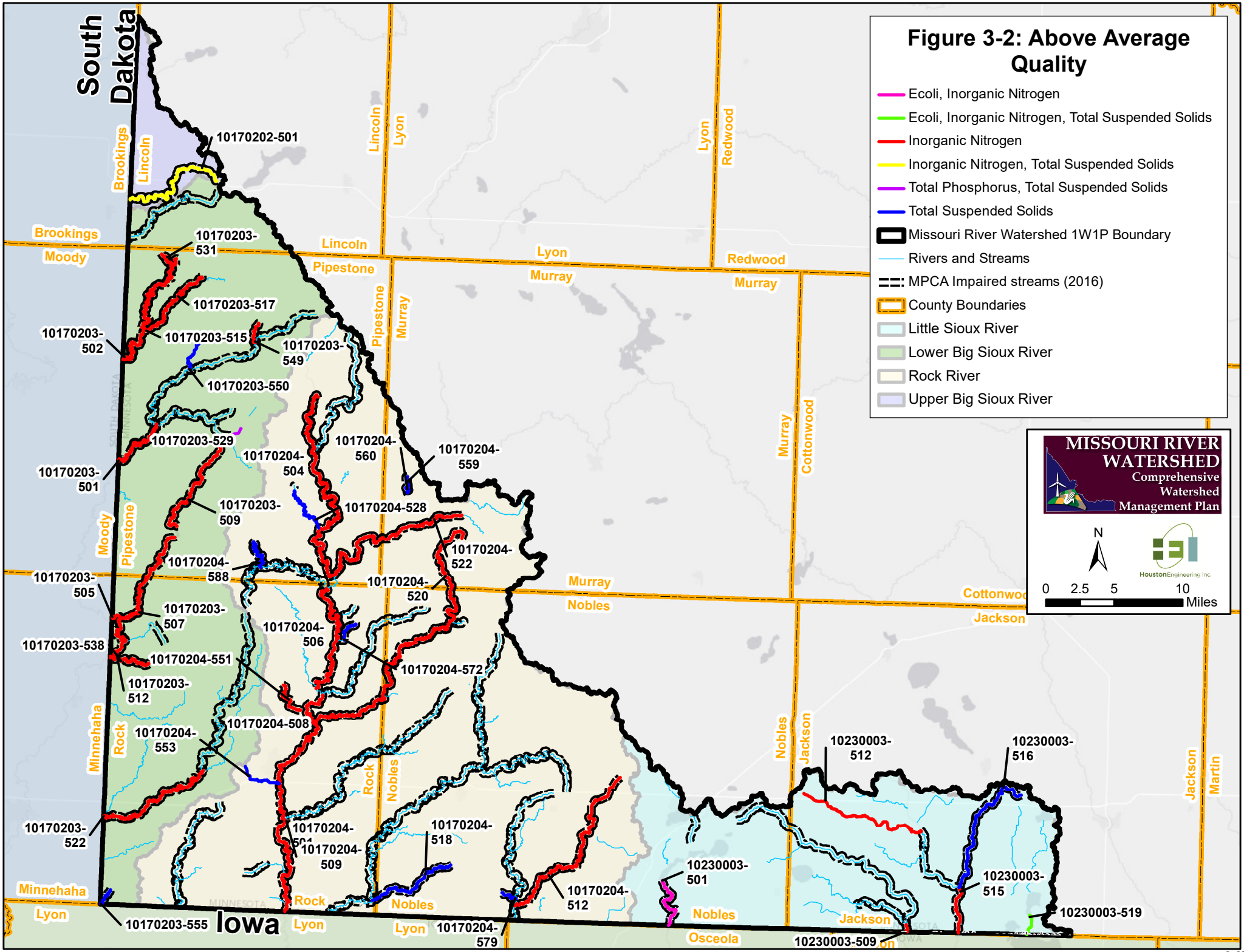


Figure 3-2: Above Average Quality
Ecoli, Inorganic Nitrogen
Ecoli, Inorganic Nitrogen, Total Suspended Solids
Inorganic Nitrogen
Inorganic Nitrogen, Total Suspended Solids
Total Phosphorus, Total Suspended Solids
Total Suspended Solids
Missouri River Watershed 1W1P Boundary
Rivers and Streams
MPCA Impaired streams (2016)
County Boundaries
Little Sioux River
Lower Big Sioux River
Rock River
Upper Big Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
HoustonEngineering Inc.
0 2.5 5 10
Miles
South Dakota
Iowa
10170202-501
10170203-531
10170203-517
10170203-515
10170203-549
10170203-550
10170203-502
10170203-529
10170203-501
10170203-509
10170203-505
10170203-507
10170203-538
10170203-512
10170203-522
10170203-555
10170204-560
10170204-559
10170204-504
10170204-528
10170204-522
10170204-588
10170204-520
10170204-506
10170204-572
10170204-551
10170204-508
10170204-553
10170204-501
10170204-509
10170204-518
10170204-512
10170204-579
10230003-501
10230003-512
10230003-516
10230003-515
10230003-519
10230003-509
Brookings
Moody
Lincoln
Pipestone
Lyon
Murray
Redwood
Cottonwood
Nobles
Jackson
Rock
Minnehaha
Osceola
Martin

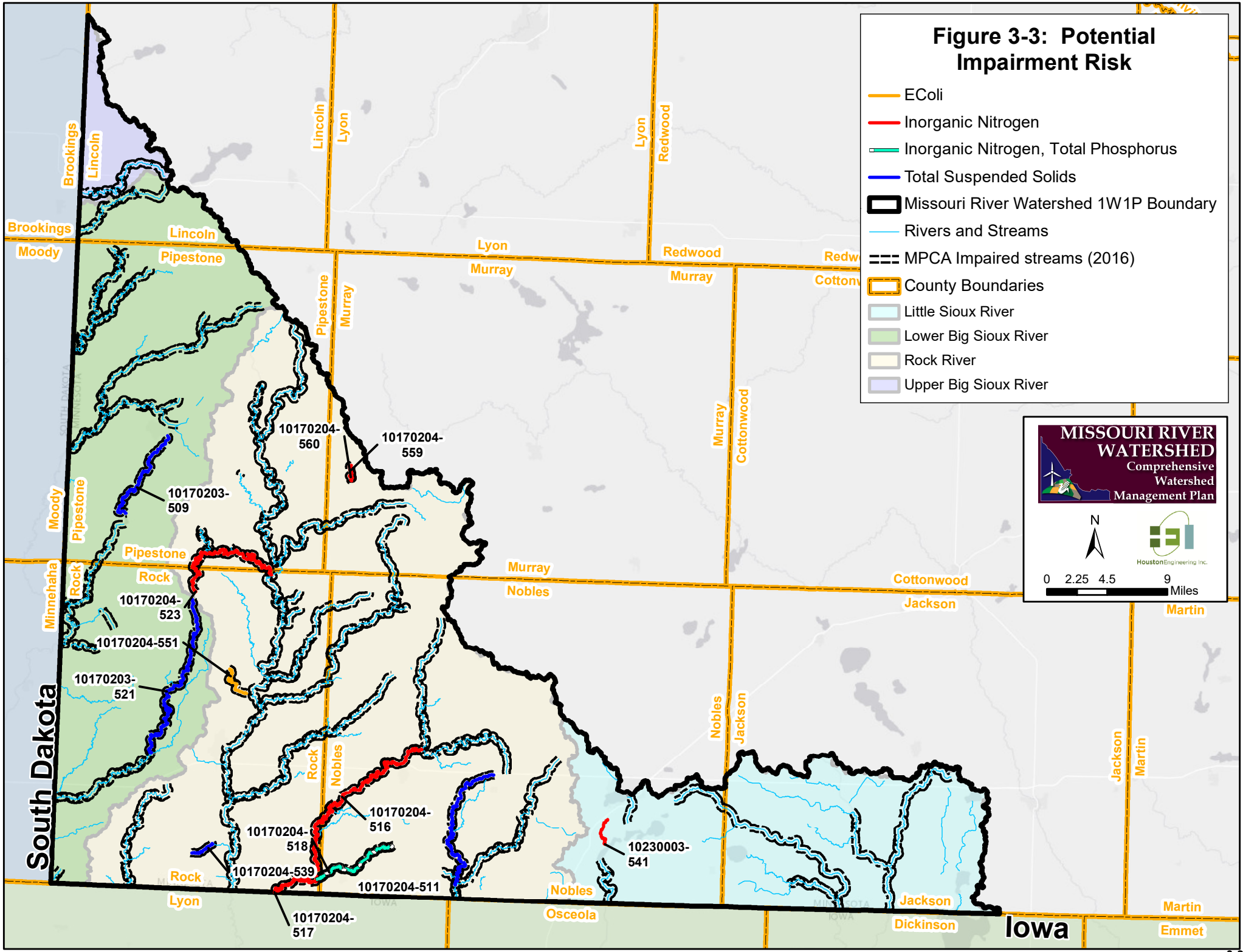


Figure 3-3: Potential Impairment Risk
EColi
Inorganic Nitrogen
Inorganic Nitrogen, Total Phosphorus
Total Suspended Solids
Missouri River Watershed 1W1P Boundary
Rivers and Streams
MPCA Impaired streams (2016)
County Boundaries
Little Sioux River
Lower Big Sioux River
Rock River
Upper Big Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 2.25 4.5 9
Miles
South Dakota
Iowa
10170204-560
10170204-559
10170203-509
10170204-523
10170204-551
10170203-521
10170204-516
10170204-518
10170204-539
10170204-511
10170204-517
10230003-541
Brookings
Lincoln
Moody
Pipestone
Lyon
Murray
Redwood
Cottonwood
Rock
Nobles
Jackson
Martin
Osceola
Dickinson
Emmet
Minnehaha

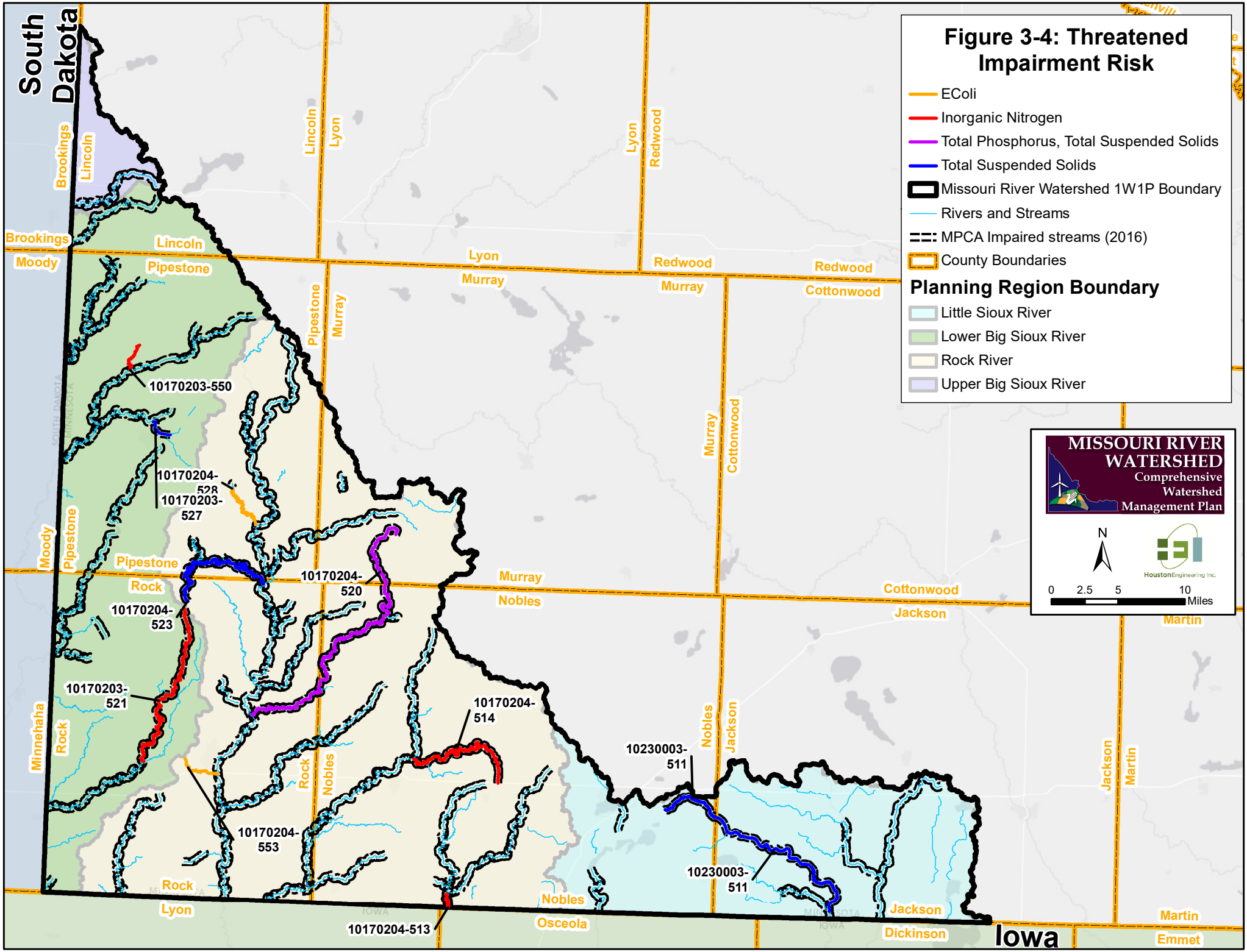


Figure 3-4: Threatened Impairment Risk
EColi
Inorganic Nitrogen
Total Phosphorus, Total Suspended Solids
Total Suspended Solids
Missouri River Watershed 1W1P Boundary
Rivers and Streams
MPCA Impaired streams (2016)
County Boundaries
Planning Region Boundary
Little Sioux River
Lower Big Sioux River
Rock River
Upper Big Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 2.5 5 10 Miles
South Dakota
Iowa
10170203-550
10170204-528
10170203-527
10170204-520
10170204-523
10170203-521
10170204-514
10230003-511
10170204-553
10170204-513
10230003-511
Brookings
Lincoln
Moody
Pipestone
Lyon
Murray
Redwood
Cottonwood
Rock
Nobles
Jackson
Martin
Minnehaha
Osceola
Dickinson
Emmet

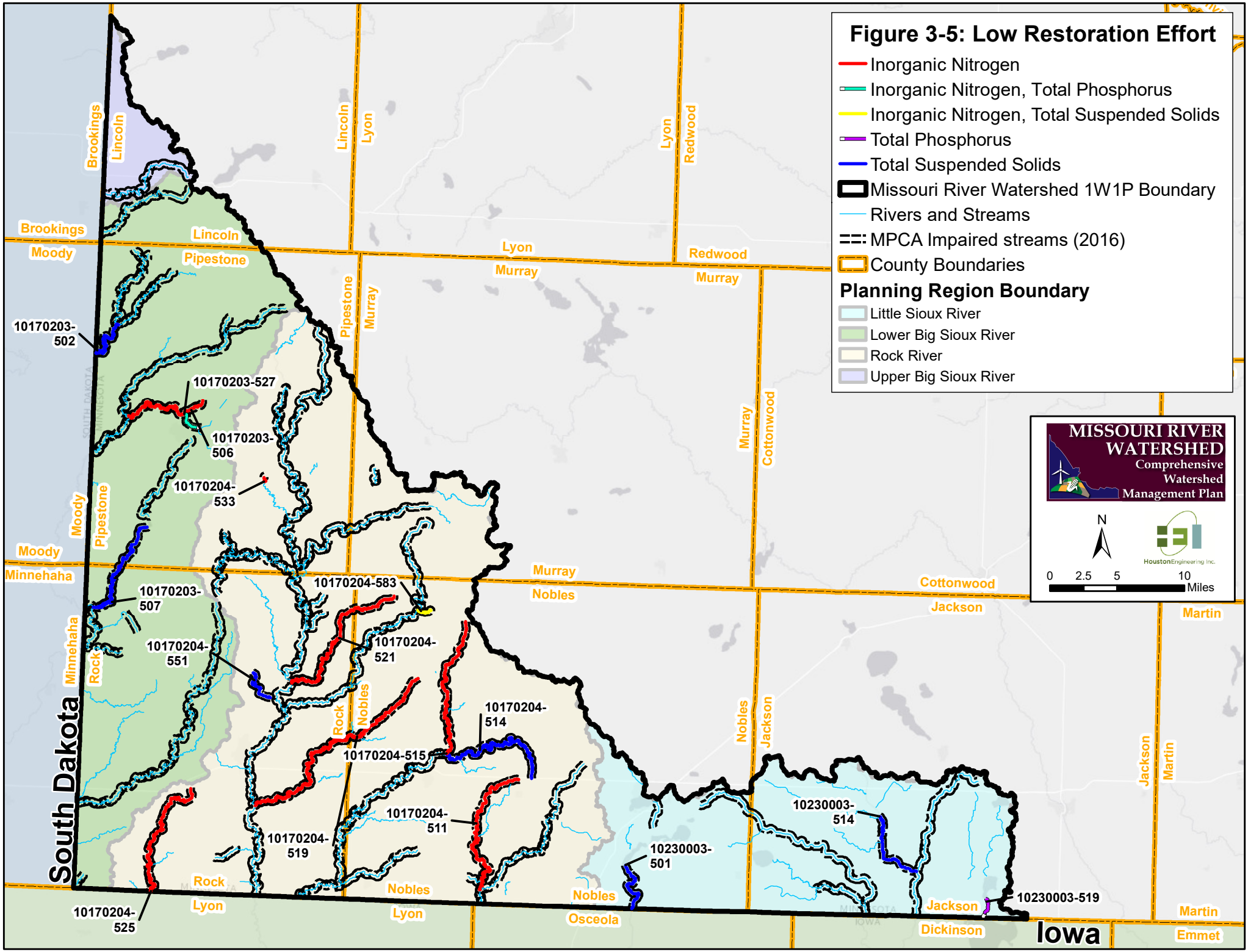


Figure 3-5: Low Restoration Effort
Inorganic Nitrogen
Inorganic Nitrogen, Total Phosphorus
Inorganic Nitrogen, Total Suspended Solids
Total Phosphorus
Total Suspended Solids
Missouri River Watershed 1W1P Boundary
Rivers and Streams
MPCA Impaired streams (2016)
County Boundaries
Planning Region Boundary
Little Sioux River
Lower Big Sioux River
Rock River
Upper Big Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
HoustonEngineering Inc.
0 2.5 5 10
Miles
South Dakota
Iowa
10170203-502
10170203-527
10170203-506
10170204-533
10170203-507
10170204-551
10170204-583
10170204-521
10170204-514
10170204-515
10170204-511
10170204-519
10170204-525
10230003-514
10230003-501
10230003-519
Brookings
Lincoln
Lyon
Redwood
Moody
Pipestone
Murray
Minnehaha
Rock
Nobles
Cottonwood
Jackson
Martin
Osceola
Dickinson
Emmet

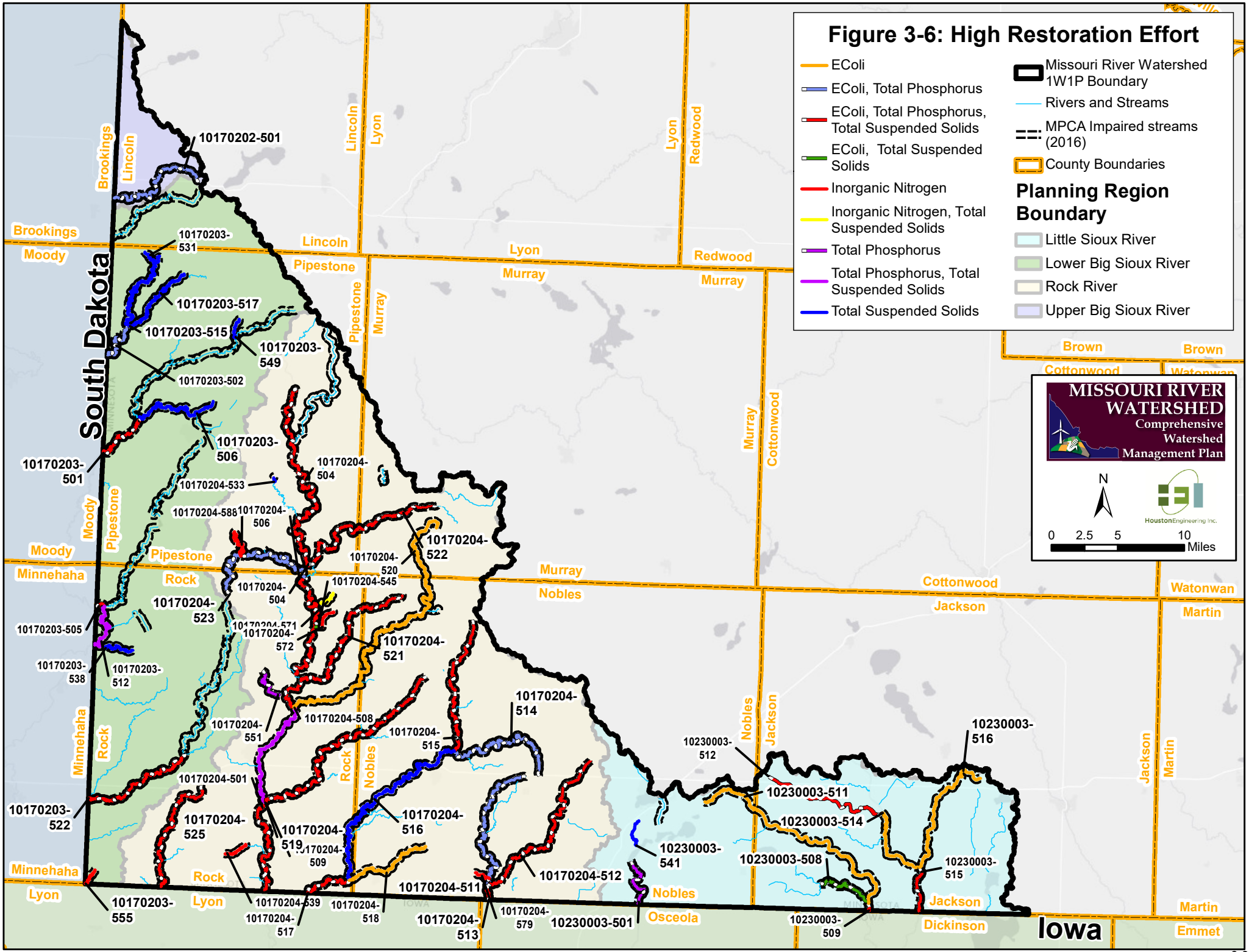


Figure 3-6: High Restoration Effort
EColi
EColi, Total Phosphorus
EColi, Total Phosphorus, Total Suspended Solids
EColi, Total Suspended Solids
Inorganic Nitrogen
Inorganic Nitrogen, Total Suspended Solids
Total Phosphorus
Total Phosphorus, Total Suspended Solids
Total Suspended Solids
Missouri River Watershed 1W1P Boundary
Rivers and Streams
MPCA Impaired streams (2016)
County Boundaries
Planning Region Boundary
Little Sioux River
Lower Big Sioux River
Rock River
Upper Big Sioux River
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
HoustonEngineering Inc.
0 2.5 5 10 Miles
South Dakota
Iowa
10170202-501
10170203-531
10170203-517
10170203-515
10170203-549
10170203-502
10170203-506
10170203-501
10170204-504
10170204-533
10170204-588
10170204-506
10170204-522
10170204-520
10170204-545
10170204-504
10170204-523
10170203-505
10170204-571
10170204-572
10170204-521
10170203-538
10170203-512
10170204-514
10170204-508
10170204-551
10170204-515
10230003-516
10230003-512
10230003-511
10230003-514
10170204-501
10170203-522
10170204-525
10170204-519
10170204-509
10170204-516
10230003-541
10230003-508
10230003-515
10170204-512
10170204-511
10170203-555
10170204-539
10170204-517
10170204-518
10170204-513
10170204-579
10230003-501
10230003-509
Brookings
Moody
Lincoln
Pipestone
Lyon
Murray
Redwood
Brown
Cottonwood
Watonwan
Minnehaha
Rock
Nobles
Jackson
Martin
Osceola
Dickinson
Emmet

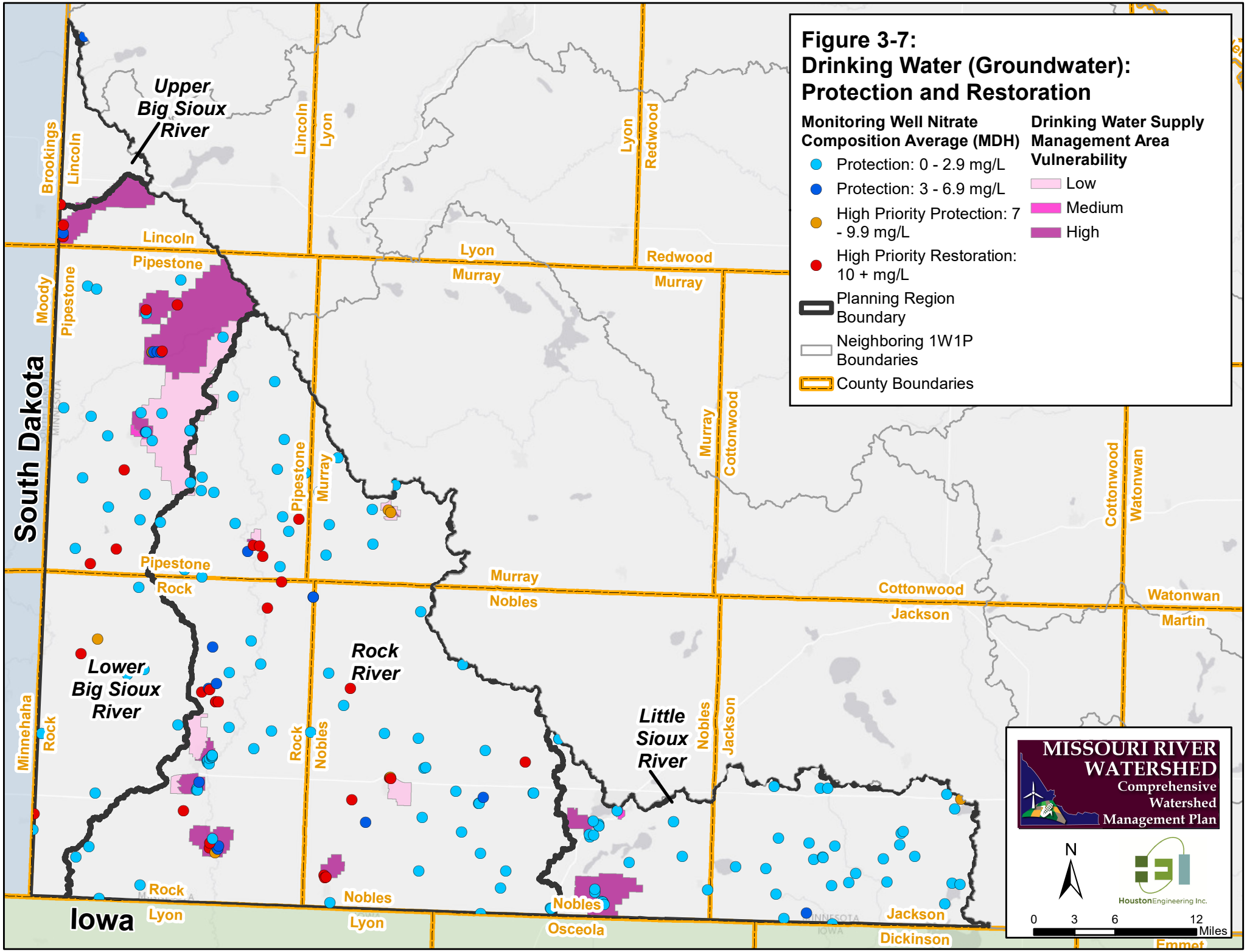


Figure 3-7:
Drinking Water (Groundwater):
Protection and Restoration
Monitoring Well Nitrate Composition Average (MDH)
Protection: 0 - 2.9 mg/L
Protection: 3 - 6.9 mg/L
High Priority Protection: 7 - 9.9 mg/L
High Priority Restoration: 10 + mg/L
Planning Region Boundary
Neighboring 1W1P Boundaries
County Boundaries
Drinking Water Supply Management Area Vulnerability
Low
Medium
High
Upper Big Sioux River
Lower Big Sioux River
Rock River
Little Sioux River
South Dakota
Iowa
Brookings
Lincoln
Moody
Pipestone
Lyon
Redwood
Murray
Cottonwood
Watonwan
Martin
Jackson
Nobles
Rock
Minnehaha
Osceola
Dickinson
Emmet
MISSOURI RIVER WATERSHED
Comprehensive Watershed Management Plan
N
Houston Engineering Inc.
0 3 6 12
Miles

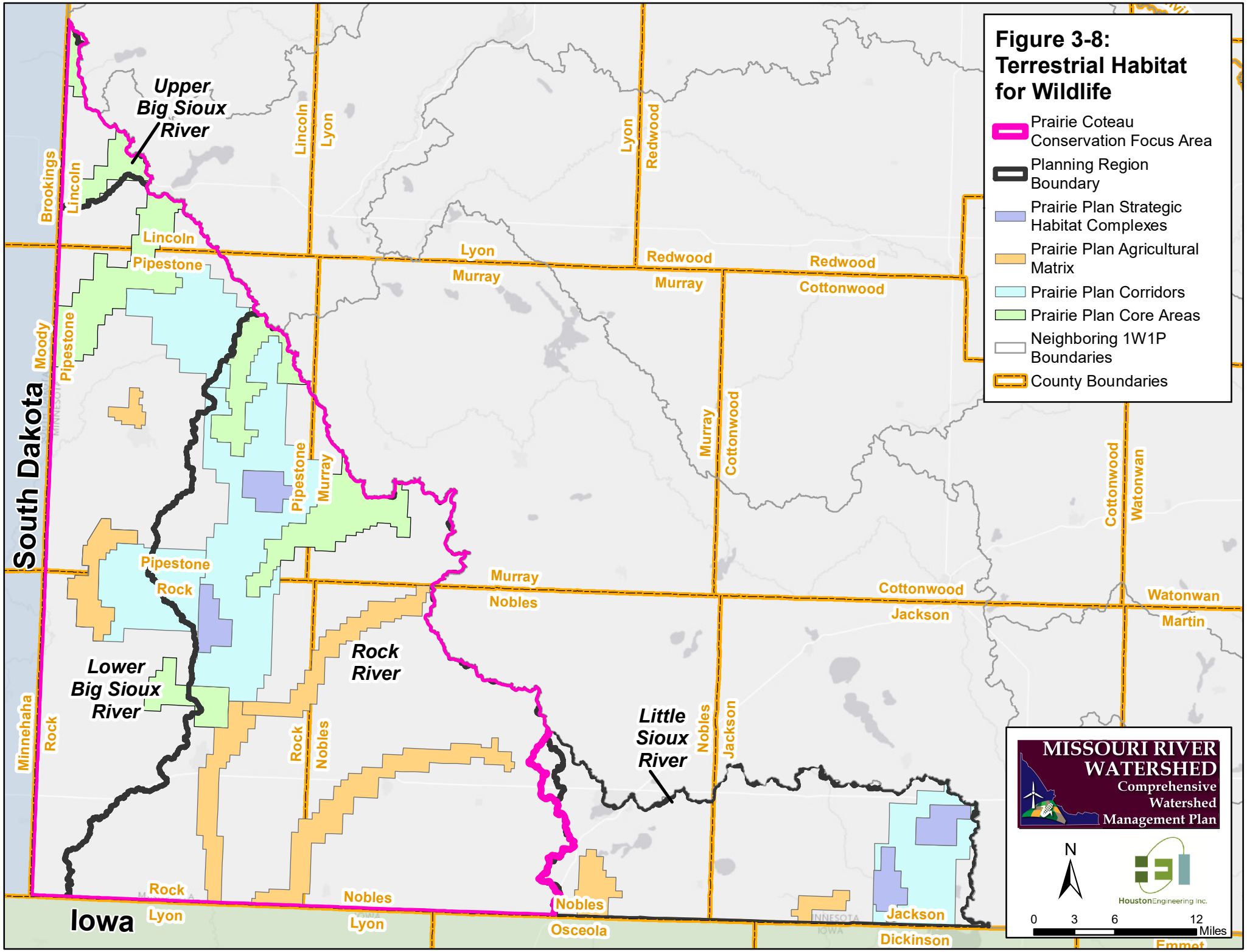
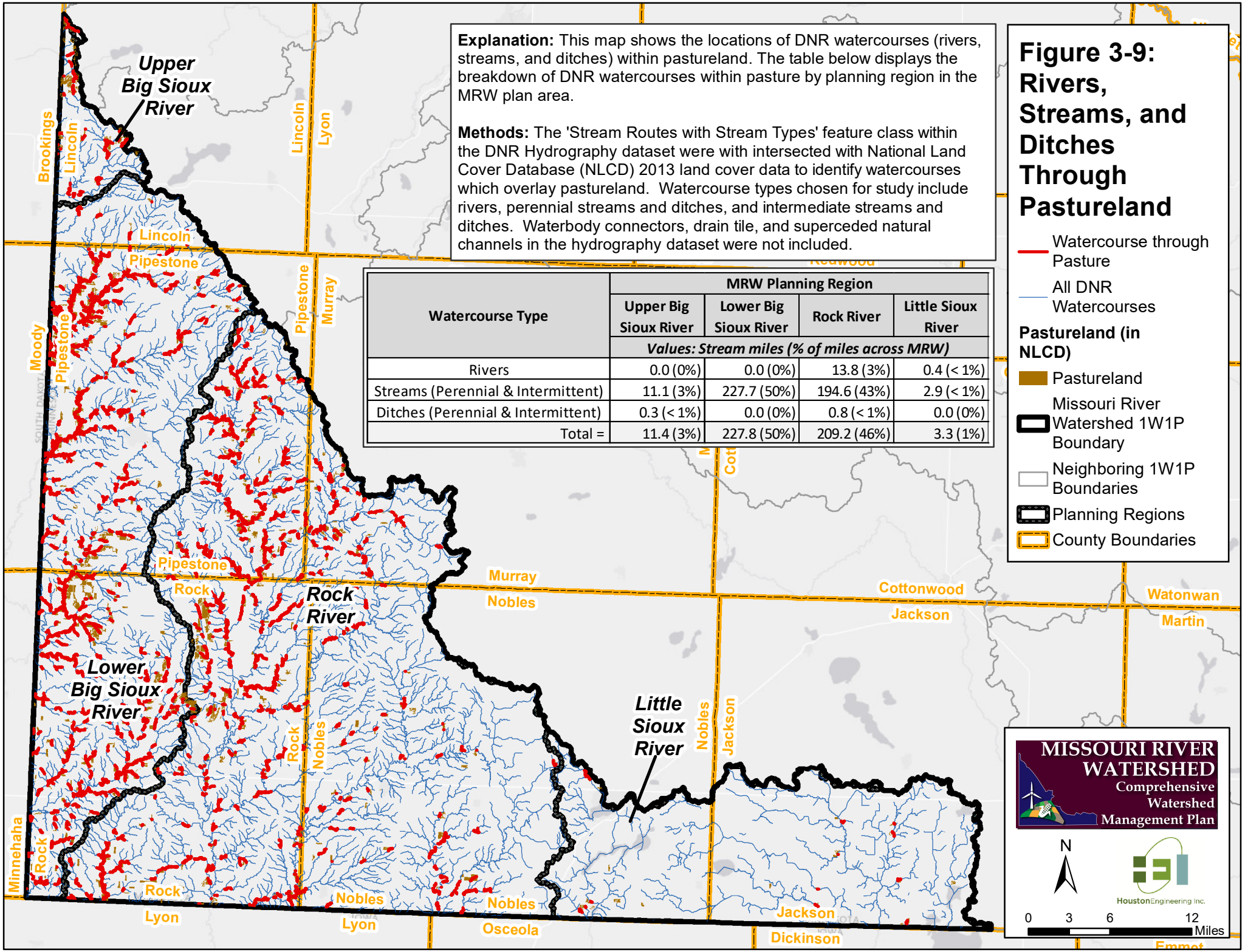


Figure 3-8:
Terrestrial Habitat
for Wildlife
Prairie Coteau
Conservation Focus Area
Planning Region
Boundary
Prairie Plan Strategic
Habitat Complexes
Prairie Plan Agricultural
Matrix
Prairie Plan Corridors
Prairie Plan Core Areas
Neighboring 1W1P
Boundaries
County Boundaries
Upper
Big Sioux
River
Lower
Big Sioux
River
Rock
River
Little
Sioux
River
South Dakota
Iowa
Brookings
Lincoln
Moody
Pipestone
Rock
Minnehaha
Lyon
Redwood
Murray
Cottonwood
Watonwan
Nobles
Jackson
Martin
Osceola
Dickinson
Emmet
MISSOURI RIVER
WATERSHED
Comprehensive
Watershed
Management Plan
N
HoustonEngineering Inc.
0 3 6 12
Miles



Explanation: This map shows the locations of DNR watercourses (rivers, streams, and ditches) within pastureland. The table below displays the breakdown of DNR watercourses within pasture by planning region in the MRW plan area.

Methods: The 'Stream Routes with Stream Types' feature class within the DNR Hydrography dataset were with intersected with National Land Cover Database (NLCD) 2013 land cover data to identify watercourses which overlay pastureland. Watercourse types chosen for study include rivers, perennial streams and ditches, and intermediate streams and ditches. Waterbody connectors, drain tile, and superceded natural channels in the hydrography dataset were not included.

Watercourse Type	MRW Planning Region			
	Upper Big Sioux River	Lower Big Sioux River	Rock River	Little Sioux River
	Values: Stream miles (% of miles across MRW)			
Rivers	0.0 (0%)	0.0 (0%)	13.8 (3%)	0.4 (< 1%)
Streams (Perennial & Intermittent)	11.1 (3%)	227.7 (50%)	194.6 (43%)	2.9 (< 1%)
Ditches (Perennial & Intermittent)	0.3 (< 1%)	0.0 (0%)	0.8 (< 1%)	0.0 (0%)
Total =	11.4 (3%)	227.8 (50%)	209.2 (46%)	3.3 (1%)

Figure 3-9: Rivers, Streams, and Ditches Through Pastureland

- Watercourse through Pasture
- All DNR Watercourses

Pastureland (in NLCD)

- Pastureland
- Missouri River Watershed 1W1P Boundary
- Neighboring 1W1P Boundaries
- Planning Regions
- County Boundaries

SECTION 4.0 TARGETED IMPLEMENTATION

4.1 PURPOSE AND STRUCTURE

Targeting implementation is defined in this plan as the process of identifying and implementing the most cost-effective and measurable actions to make progress toward achieving short-term and long-term measurable goals. To meet BWSR Plan Content Requirements, actions are housed within a **targeted implementation schedule**, which contains:

- A brief description of each action;
- The planning region where the action predominantly occurs (if applicable);
- How much of the action will be implemented (i.e. "measurable output");
- How the action will be measured (i.e. "metric");
- When implementation will occur within the 10-year timeframe of the plan;
- The entities responsible and their role in implementing the action;
- Estimated cost of the action; and
- The measurable goal corresponding to the action.

Many kinds of actions can be implemented to make progress toward plan goals. To organize this section, like actions are grouped into one of six separate targeted implementation schedules, reflecting how each action makes progress toward goals:

1. ***Structural Practices*:** Actions focused on implementing structural conservation practices. Typical structural practices include water and sediment control basins (WASCOBS), grade stabilization structures, filter strips, and grassed waterways.
2. ***Management Practices*:** Actions focused on implementing nonstructural conservation practices. Management practices describe an activity, technique, or methodology that can be thought of as an industry or sector accepted standard operating procedure and can include planting cover crops, using conservation tillage methods, and fertilizer management methods.
3. ***Education and Outreach***: Actions intended to increase public engagement, improve communication, and increase understanding.
4. ***Data Gaps and Research***: Actions focused on activities including studies to close a data gap identified within the plan and continue existing monitoring activities.

5. ***Regulatory***: Actions related to common and consistent administration and enforcement of statutory responsibilities, local regulations, and local ordinances.
6. ***Capital Improvement:*** Actions that consist of a major non-recurring expenditure for the construction, repair, retrofit, or increased utility or function of physical facilities, infrastructure, or environmental features, such as a major dam repair.

Actions may occur across the watershed (i.e., be watershed-wide) or targeted within a specific planning region. Actions in the education and outreach, data gaps and research, regulatory, and capital improvement implementation components are implemented watershed-wide, to ensure consistency and create the opportunity for shared services at a watershed-scale (**Section 4.4**). However, actions dealing with structural and management practices vary by planning region because the physical landscape and measurable goals differ among the planning regions. Numbers and locations for implementing structural and management practices are geographically defined within each planning region implementation section (**Section 4.3**).

Implementation programs are described in **Section 5** to explain how actions will be funded. The ability to achieve measurable goals—and the speed at which they are realized—largely depends on the amount of funding available for plan implementation. However, as the amount of funding for implementing this plan is uncertain, the level of effort for implementation (i.e., numbers of actions and practices) is also uncertain.

To address this challenge, there is more than one implementation funding scenario provided in this plan (see **Section 4.6**).

- The **targeted implementation approach** is the greatest focus of this plan's targeted implementation schedule. This funding scenario assumes plan funding is similar in magnitude to current funding focused on water issues within the plan area. Actions identified as a "targeted implementation approach" action level are the highest priority for plan implementation.
- Actions in the **moderate increased funding scenario** and **large increased funding scenario** are also summarized in this plan's targeted implementation schedule. If more funds are available for implementation, more actions within the targeted implementation schedule can be implemented, and more progress can be made toward measurable goals. Actions in the "moderate increased funding scenario" have a greater priority than those in the "large increased funding scenario," and would be implemented first if additional dollars become available.

Roles and responsibilities for implementation are identified by assigning a "lead" (local, state, or federal), a "lead entity," and "partners" to each action. Acronyms for these entities is available in the plan glossary.

- **Implementation Lead:** The "lead" designates whether the responsibility for implementing an action is at the local government or some other level (i.e., by a state agency, federal agency or NGO collaborator).
- **Implementation Lead Entity:** The "lead entity" is the specific agency, entity, or local governmental unit responsible for implementing the action, but does not assume sole responsibility for completing the action.

- **Implementation Partners:** "Partners" are also assigned to recognize collaborative efforts for implementation. Listed partner entities within the targeted implementation schedule are not all-inclusive.

The implementation schedule includes actions intended to be completed by other plan partners, including state agencies, federal agencies, and non-governmental organizations (NGOs). It is important to include actions that other groups will complete as part of the planning process, as it recognizes the work of others and clarifies roles. The targeted implementation schedule has been adjusted to reflect the anticipated combined local, state, federal, and NGO fiscal and technical commitments. To execute actions described within the plan, all participants will need to exercise considerable coordination and cooperation.

There are considerable similarities between the priority issues established by this plan and the priorities, goals, and objectives of plan partners. This plan represents an opportunity to clarify roles and facilitate the cooperation and the streamlining of implementation efforts to improve local resources. Although this plan largely reflects local priorities, the plan is not intended to supplant or replace efforts of other organizations with complementary goals and objectives. The work of other organizations is expected to continue during plan implementation and into the future and is reflected within the targeted implementation schedule. The MRW 1W1P Planning Group will continue to foster an environment that enhances cooperation and coordination with other organizations to the maximum extent possible throughout the implementation of the plan (**Section 5.3.2**).

The state has invested in the completion of multiple studies, reports, and strategies which are pertinent to the plan area. This investment has generated valuable information, which has been heavily leveraged in the development of this plan. **Table 4-1** summarizes the resulting state documents and how they have been considered and incorporated into the plan.

Table 4-1: **State documents and relation to the Missouri River Watershed 1W1P**.

State Agency	Document Name	Use in the Plan
Minnesota Department of Agriculture	Minnesota Nitrogen Fertilizer Management Plan	▪ Actions for nutrient management and reduction
Minnesota Pollution Control Agency	Missouri River Basin Monitoring and Assessment Report	▪ Monitoring data ▪ Condition of surface waters
Minnesota Pollution Control Agency	Watershed Biotic Stressor Identification Report	▪ Biotic community and diversity
Minnesota Pollution Control Agency	Missouri River Basin Total Maximum Daily Load	▪ Surface water goals
Minnesota Pollution Control Agency	Missouri River Basin Watershed Restoration and Protection Strategy (WRAPS)	▪ Issues impacting water quality potential and priority concerns ▪ Actions within targeted implementation schedule
Minnesota Department of Health	Missouri River Basin Watersheds of Minnesota Groundwater Restoration and Protection Strategies Report (GRAPS)	▪ Actions for protection and restoration of groundwater quality and supplies
Minnesota Department of Natural Resources	Missouri River Basin Hydrology, Connectivity, and Geomorphology Assessment Report	▪ Actions and goals for hydrology and bank stabilization

4.2 IDENTIFYING CONSERVATION PRACTICE OPPORTUNITIES USING THE PRIORITIZE, TARGET, AND MEASURE APPLICATION

The MRW 1W1P Planning Group used the Prioritize, Target, and Measure Application (PTMApp) to prioritize and target the possible locations of structural and management practices identified within each planning region. The underlying theory, algorithms, and application of PTMApp is documented on the PTMApp website[1]. PTMApp requires several data inputs, including a hydro-conditioned Digital Elevation Model (DEM). Detailed hydro-conditioning and the PTMApp analysis was completed during the 2017 *Missouri River Basin Hydro Conditioning, BMP Targeting, and 1W1P Acceleration* accelerated implementation grant.

The standard information products from PTMApp can be used in many business workflows **(Figure 4-1)**. The business workflows are tasks that the MRW 1W1P Planning Group might undertake as part of daily work to prioritize and target locations of structural and management practices which provide measurable water quality value. These workflows, or subset of the workflows, might be completed for creating an implementation strategy for an annual work plan, refining the WRAPS implementation approach, and assembling grant funding requests (i.e., future accelerated implementation grants).

Examples of these products for the Rock River planning region are presented in **Appendix L**. The standard information products are categorized according to their use in a typical watershed planning process (see **Figure 4-1**). These uses include:

- Describing conditions within the watershed;
- Prioritizing the locations of water quality concerns;
- Completing a source assessment to identify the largest source of sediment and nutrients;
- Evaluate potential locations where structural and management practices appear to be technically feasible;
- Estimate the water quality benefits of specific structural and management practices; and
- Target the preferred locations for practices based on cost-effectiveness, cost, absolute load reduction or some other metric.

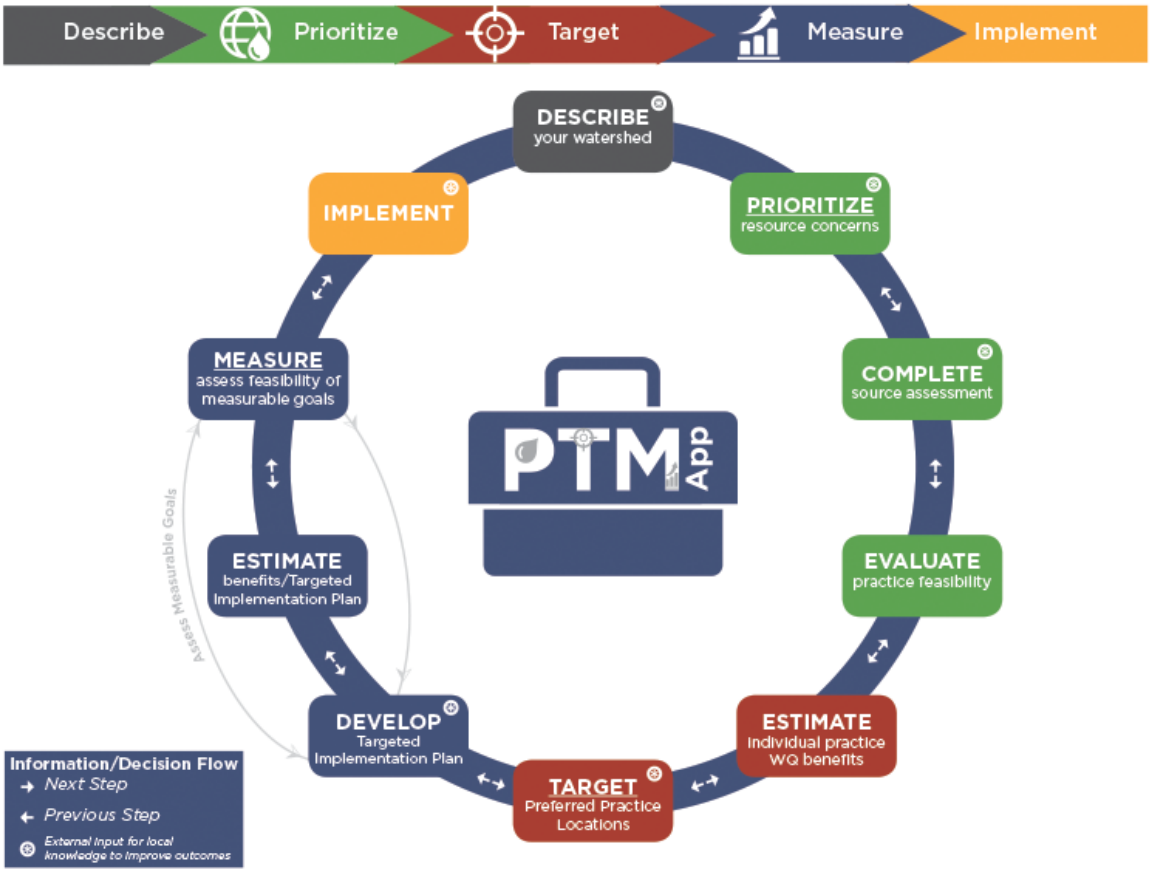
The standard information products can then be assembled during the watershed planning process to:

- Develop a targeted implementation approach identifying probable management and structural practice locations and make deliberate conservation recommendations;
- Estimate the combined water quality benefits for all the practices working together, expressed as annual estimated load reduction;
- Estimate the amount of progress that can be made toward the water quality goals for many locations within the watershed, from the entire set of management and structural practices; and
- Estimate the total cost for implementation.

Several of these standards products for the MRW 1W1P targeted implementation approach are summarized within each planning region implementation section in **Section 4.3.**

[1] https://ptmapp.bwsr.state.mn.us

Figure 4-1: Business workflows addressed and guided by PTMApp Desktop.



The products from PTMApp can be generated at the field scale and used during conversations with landowners to facilitate discussions about opportunities to implement conservation. These products are suitable for describing the movement of water across the land, locations where practices are feasible, the benefits of practices and the probable concept level cost of practices. Maps showing the estimated amount of sediment and nutrients that leave the field by surface flow, the amount which reaches the edge of field and the feasibility for implementing structural and management practices, can be used to guide discussions aimed to increase implementation of voluntary practices on the ground. Five maps showing example products representing different business needs have been generated using an example field within the Rock River planning region. They are presented in **Appendix L.**

Structural and management practices within PTMApp are placed into one of six "treatment groups," including: (1) storage; (2) filtration; (3) biofiltration; (4) infiltration; (5) protection; and (6) source reduction. Within this plan, structural practices include storage, filtration, biofiltration, infiltration, and protection practices. Management practices are summarized by source reduction practices. Examples of practices in each treatment group are shown in **Table 4-2**.

Table 4-2: Structural and management practice PTMApp treatment groups

Treatment Group	Primary Treatment Process	Form of Treatment	Examples of Practices
Storage	Sedimentation	Particulate	▪ WASCOB ▪ Wetland Restoration ▪ Pond for Water Use
Filtration	Sedimentation	Particulate	▪ Grassed Waterways ▪ Filter Strips ▪ Conservation Cover Easements
Bio-Filtration	Sedimentation & biological	Particulate	▪ Saturated buffers ▪ Denitrifying Bioreactor
Infiltration	Volume abstraction	Dissolved	▪ Alternative Tile Intakes
Protection	Physical protection of the landscape	Total (Dissolved & Particulate)	▪ Grade Stabilization Structure ▪ Critical Area Planting ▪ Streambank and Shoreline Protection
Source Reduction	Reduction of Mass Potential	Total (Dissolved & Particulate)	▪ Conservation Tillage ▪ Nitrogen Management Plan ▪ Cover Crops

Structural and management practices were then assigned a probable concept level cost. Costs calculated within PTMApp were based on estimated 2016 lifecycle costs representative of each PTMApp treatment group (Tyndall, J., and T. Bowman, 2016) and adjusted based on local experience (**Table 4-3)**. Presented costs are annualized lifecycle costs, inclusive of design, construction (earthwork, piping, etc.), installation, operation and maintenance, land cost, and lost crop opportunity costs from crops removed from production. The cost estimations provided herein should not solely be utilized for distribution of funds that may become available because of this plan.

Table 4-3: Structural and management practice PTMApp treatment group costs

Treatment Group	Annualized Life Cycle Costs	Rationale
Storage	$0.10 per cubic foot	Based on costs for a pond: $0.10 per cubic foot = $4,356 per acre foot
Filtration	Unit cost ($307.40/acre) with annualized flat rate costs: <= 2 acres: $487.50; 2 – 10 acres: $527.50	Adjusted to reflect local costs of filter strips and grass waterways w input from Rock County

Treatment Group	Annualized Life Cycle Costs	Rationale
	>= 10 acres: $57.50	
Bio-Filtration	$40 per cubic yard	Based on costs for Denitrifying (Woodchip) Bioreactor (NRCS Code PC 747)
Infiltration	$2,000 + $27.60 per treated cubic foot	Based on costs for Infiltration BMP (e.g. Rain Garden)
Protection	$2,133.35 per acre	Based on costs for critical plantings
Source Reduction	$65 per acre	Based on costs for cover crops-cereal rye (NRCS Code PC 340)

4.2.1 ADDRESSING PTMAPP LIMITATIONS

While the best available data and information have been used to develop this plan, no plan is perfect. There are limitations with this plan and recognizing these limitations is important because they influence implementation. For example, PTMApp was not programmed to analyze bacterial issues impacting surface and groundwater resources. For this reason, bacteria was not included in PTMApp assessment.

Another important limitation is that PTMApp only analyzes sediment and nutrient sources from the surface of the land, and does not consider near channel sediment sources, shoreland erosion, point sources, or contributions from subsurface sewage treatment systems (SSTS). Many of the action items within the targeted implementation schedule are focused on implementing structural and management practices to reduce the amount of sediment and nutrients leaving the landscape, and entering drainage systems, streams and rivers. Action items focused on mitigating surface runoff are also expected to provide benefits in reducing the amount of near channel sediment, although the amount is not quantified within the plan.

PTMApp creates geospatial water quality products specific to surface water hydrology and can be used to estimate infiltration, but does not model or analyze groundwater. Elevated levels of nitrate-nitrogen and sustainable groundwater supplies are two priority issues within this plan. To guide implementation aimed at these issues, a Nitrogen Infiltration Risk Map was created as an implementation aid to inform the placement of structural and management practices that (1) promote groundwater supplies by encouraging recharge and (2) protect groundwater quality by treating nitrogen-rich waters before the contaminated water can reach drinking water (groundwater) supplies. These maps are presented in each planning region implementation profile.

The analysis performed to create this map considers the estimated nitrogen input on the landscape based on land use and the potential for denitrification as water infiltrating from the surface travels through surficial materials (for methodology, see **Appendix I**). Nitrogen Infiltration Risk Maps show relative risk of areas on the landscape regarding the amount of nitrogen potentially reaching groundwater. Maps can be used during plan implementation to manage the protection of groundwater quality and supplies. Specifically, structural and management practice location products created through PTMApp can be overlaid with the Nitrogen Infiltration Risk Map to provide a relative sense of where infiltration and non-

infiltration practices should go to protect both groundwater quality and supplies. Infiltration structural practices can be targeted to those areas with low nitrogen infiltration risk to encourage groundwater recharge, and their use minimized on areas with high nitrogen infiltration risk.

4.3 PLANNING REGION IMPLEMENTATION

4.3.1 RESOURCE CONDITIONS AND TARGETED IMPLEMENTATION APPROACH

This section summarizes current resource conditions and presents information about the number, type, and geographic location of structural and management practices in the targeted implementation approach for each planning region. This section also presents information about the relationship between the fiscal investment to implement structural and management practices relative to the life cycle cost[2], and the progress implementation makes toward plan measurable goals. This information is useful for understanding whether short and long-term measurable goals are achievable through activities that affect surface water runoff with structural and management practices in the targeted implementation approach.

Existing loads and water quality value arising from implementation of structural practices is estimated through PTMApp. These values are expressed as the mass load of sediment, total phosphorus, or total nitrogen prior to, and following practice implementation. To be consistent with MPCA WRAPS documents, existing loads are summarized as loads leaving each planning region. Load reduction benefits are summarized at the edge of the field. However, load reduction benefits can be evaluated for any of the 176 priority resource points within the MRW planning boundary (**Appendix M**).

To create the list of the "best" structural practices comprising the targeted implementation approach, structural practices in each planning region were ranked from most cost effective to least cost-effective. The MRW 1W1P targeted implementation approach was designed to select the most cost-effective practices for removing sediment, total phosphorus, and total nitrogen at the field edge, until the cost of practices equaled what planning partners are currently spending annually on projects within each planning region. The MRW 1W1P Planning Group also designed the targeted implementation approach to select the practices most likely to be implemented based on landowner acceptance and history (storage and filtration practices). Designing the targeted implementation approach in this way identifies the most cost-effective practices in the plan area that are most likely to lead to voluntary implementation.

The Upper Big Sioux, Little Big Sioux, and Rock River planning regions all considered sediment, total phosphorus, and total nitrogen load reductions to be of equal importance when identifying the most cost-effective practices. Due to the large presence of lakes in the Little Sioux planning region, this area placed a higher value on total phosphorus cost efficiency than sediment and total nitrogen (50%, 25%, and 25% respectively).

"Efficiency frontier curves" were developed to provide a picture of the relationship between the estimated annualized cost of implementation in the planning region versus the anticipated cumulative load reduction, compared to a measurable goal. The efficiency frontier curves also show if

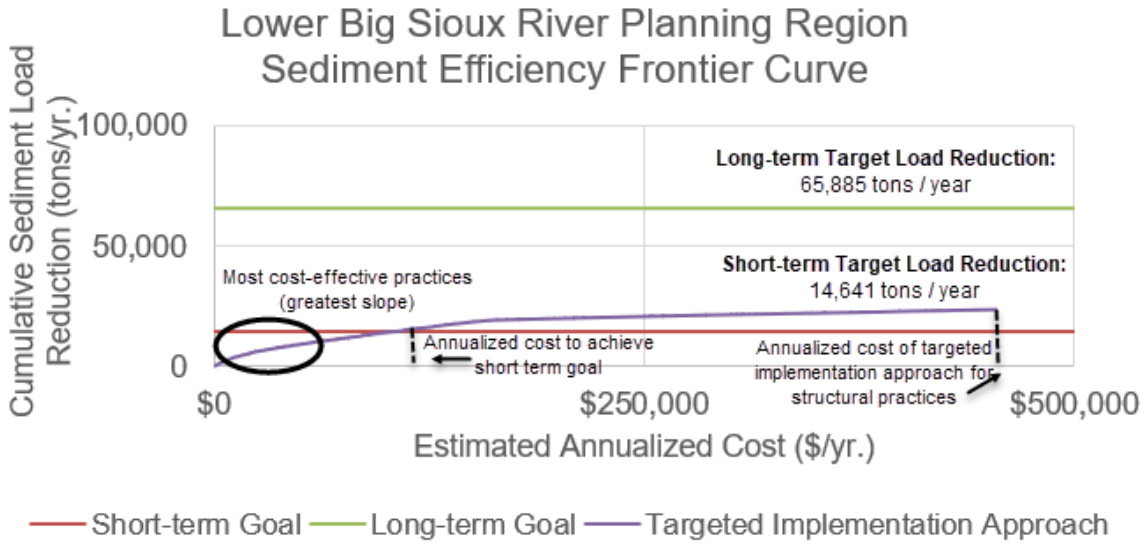
[2] Costs calculated within PTMApp were based on estimated 2016 lifecycle costs representative of each PTMApp treatment group (Tyndall, J., and T. Bowman, 2016) and adjusted based on local information. Presented costs are annualized lifecycle costs, inclusive of design, construction (earthwork, piping, etc.), installation, operation and maintenance, land cost, and lost crop opportunity costs from crops removed from production.

implementation of the best, most cost-effective practices in the targeted implementation approach can attain short and long term load reduction goals through treatment of surface runoff alone. **Figure 4-2** provides an example of an efficiency frontier curve, and how to interpret the results. Curves were also generated to show the benefit of the moderate and large increased funding scenarios and are represented in **Appendix N**. The curves represent the ideal condition between the cumulative estimated annual life cycle cost and annual estimated load reductions. Practically the effectiveness of implementation will operate below this curve. Therefore, other lines of evidence including continued water quality monitoring at the field edge and watershed scales will be needed to assess and confirm progress toward measurable goals. It also means more dollars will need to be spent and more practices implemented than shown to achieve the goal.

The types, numbers, and locations of structural practices in the targeted implementation approach will inevitably shift during plan implementation. Factors that may cause the types, locations, and numbers of structural practices for implementation to shift include, but are not limited to:

- Voluntary participation by landowners and residents;
- Amount of funding available for implementation;
- New data on resource conditions;
- Proximity to streams that are nearly or barely impaired;
- Proximity to Drinking Water Supply Management Areas (DWSMAs);
- Ability to store water along a public drainage system while accruing water quality benefits (multipurpose drainage management);
- Practices/projects ready to implement; and
- Effectiveness of education and outreach and research initiatives.

Figure 4-2: Interpretation of a planning region efficiency frontier curve



The water quality value from implementation of management practices is estimated for each planning region. Implementation of management practices (e.g. annual cover crops, conservation tillage, permanent vegetative cover) is directly related to the rural stewardship measurable goal established in **Section 3.** Water quality and runoff reductions benefits are gained through improving soil health by increasing Soil Organic Matter (SOM) content.

The science surrounding the benefits of improving soil health and SOM continues to emerge. Research shows the relationship between yield and SOM can vary depending on a variety of field conditions, including soil texture, field slope, and drainage condition. Other factors within the soil may limit crop yields. Similarly, research suggests that the proportion of dissolved phosphorus in surface water runoff can increase with an increase in SOM, but total phosphorus will decline because of a lower runoff volume. The relationship between the water holding capacity of soil is also related to several factors including soil texture and drainage condition.

For the purposes of this plan, the environmental benefits of increasing soil health include a reduction in sediment and nutrient (i.e. total phosphorus) loss from fields because of reduced tillage or the use of cover crops. This plan assumes the use of management practices reduces sediment loss from a field by reducing soil detachment and transport by 40%. This plan assumes the reduction in total phosphorus loss is 20%. These were selected because they tend to be on the low end of the anticipated load reduction benefit.

In addition to sediment and nutrient benefits, this plan also presents volume reduction benefits arising from implementation of management practices. Based on literature from the NRCS, a 1% increase in SOM (i.e., from 2% to 3%) reduces runoff volume by ¼-inch to ½-inch. Therefore, the estimated reduction in runoff volume from improving soil health can be estimated. This plan uses a ¼-inch runoff volume reduction to estimate benefits of improving soil health, again because it is on the low end of the anticipated benefit.

Improving soil health, or rural stewardship, is presented in this plan as one portion of a possible solution to improving water quality and managing surface water runoff, founded in the value proposition of the agricultural producer. Achieving plan measurable goals will require the use of both structural and management practices. It is important to note that improvements in surface and groundwater quality will require time. Typically, the amount of time required to see improvements is long and can take decades.

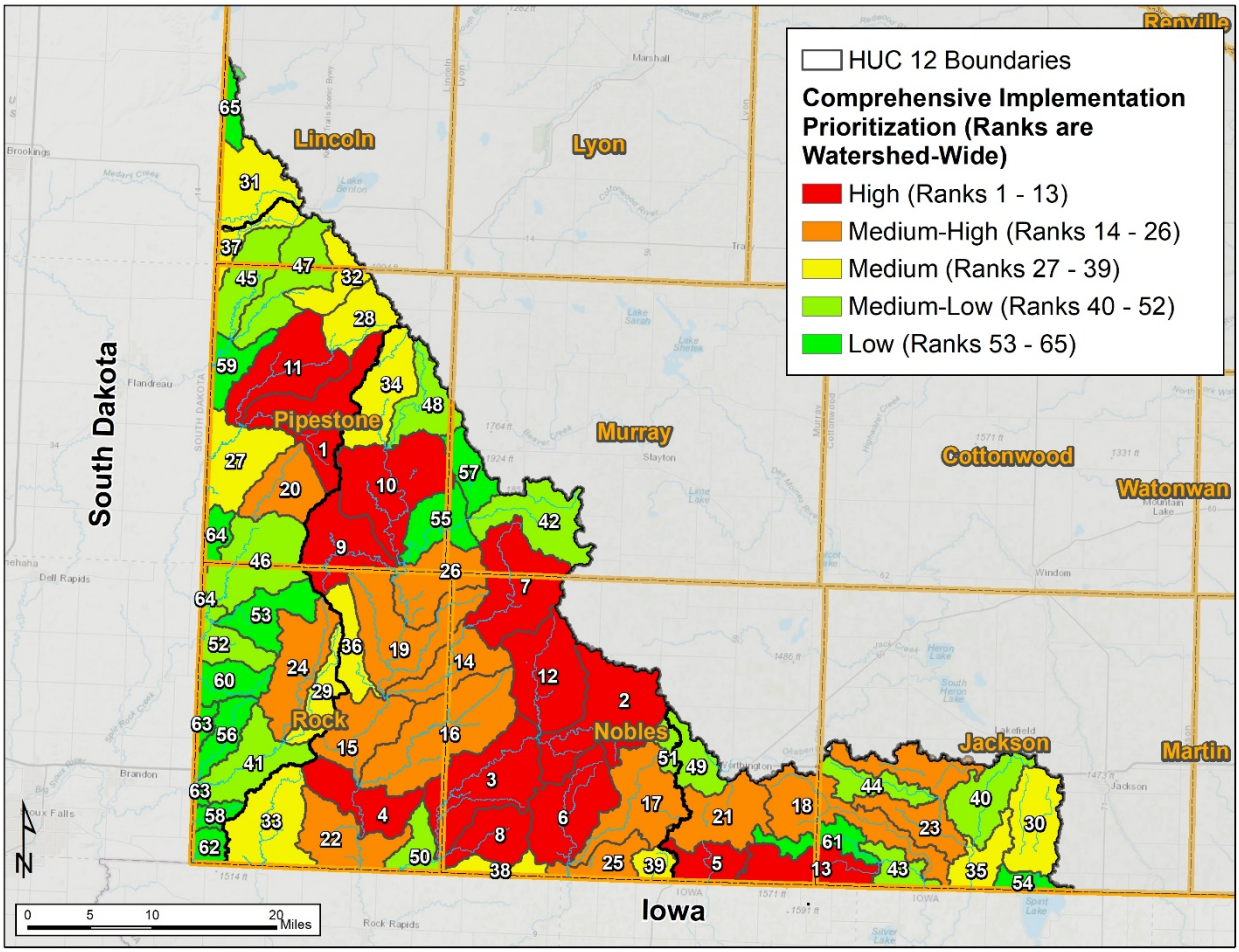
4.3.2 SUBWATERSHED COMPREHENSIVE IMPLEMENTATION PRIORITIZATION

To bridge efforts from planning to implementation, the MRW 1W1P Planning Group needed a way to identify where to start implementation work within the large planning area. The MRW 1W1P Planning Group concluded that this implementation-focused subwatershed prioritization should occur at a HUC-12 scale, consistent with other local planning and implementation work.

For ease of implementation, the group sought one composite ranking to prioritize subwatersheds within the MRW 1W1P plan area. The composite ranking encompassed the most pertinent factors used in the issue prioritization and goal setting process relevant to surface water, groundwater, local development and stewardship, fish and wildlife habitat, and the targeted implementation approach. Ranking criteria were not meant to be comprehensive representations of plan issues and goals but were meant to be simple representations using the best available geospatial data. A full list of the comprehensive subwatershed prioritization ranking criteria and methodology are shown in **Appendix O**.

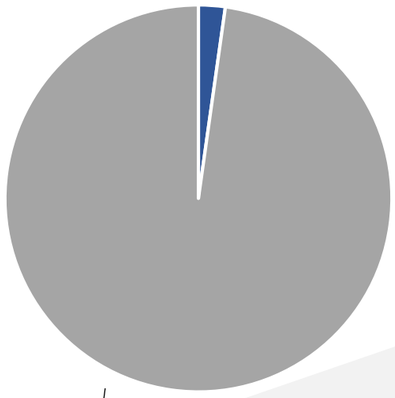
Figure 4-3 shows the comprehensive implementation rank of subwatersheds (HUC 12 scale) within the MRW 1W1P plan area, relative to all other subwatersheds in the plan area. These rankings are further broken down by planning region in the following section. This prioritization will be used to guide efforts during plan implementation but will not be the only factor considered. As shown in the following sections, actions may still be pursued in subwatershed areas that are not high-ranking.

Figure 4-3: Subwatershed Comprehensive Implementation Prioritization Ranks for the MRW 1W1P Plan Area



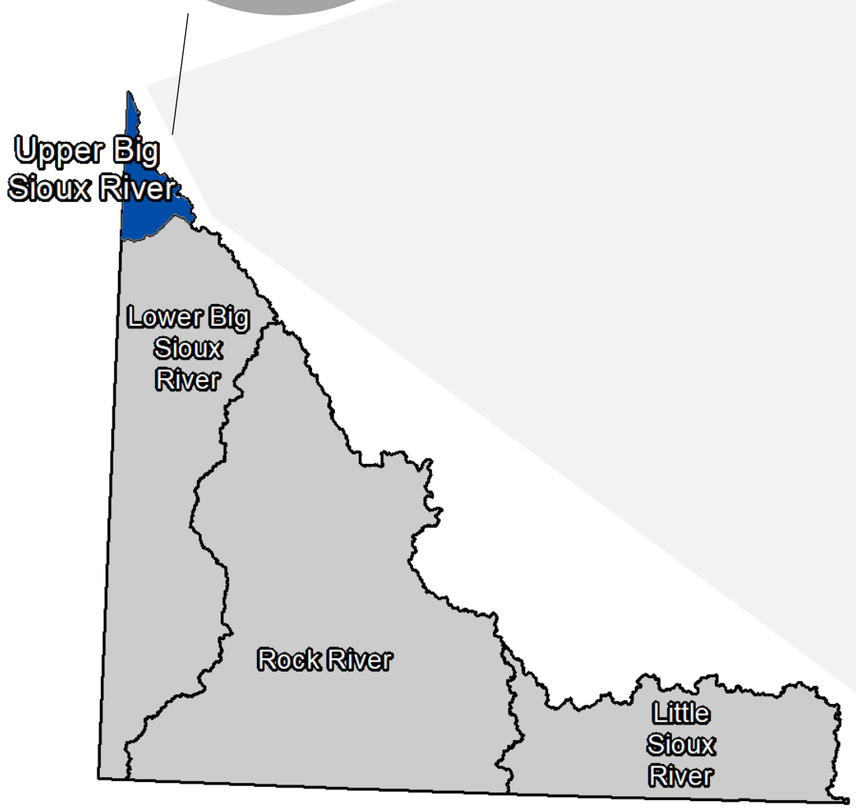
THE UPPER BIG SIOUX RIVER PLANNING REGION

Upper Big Sioux River



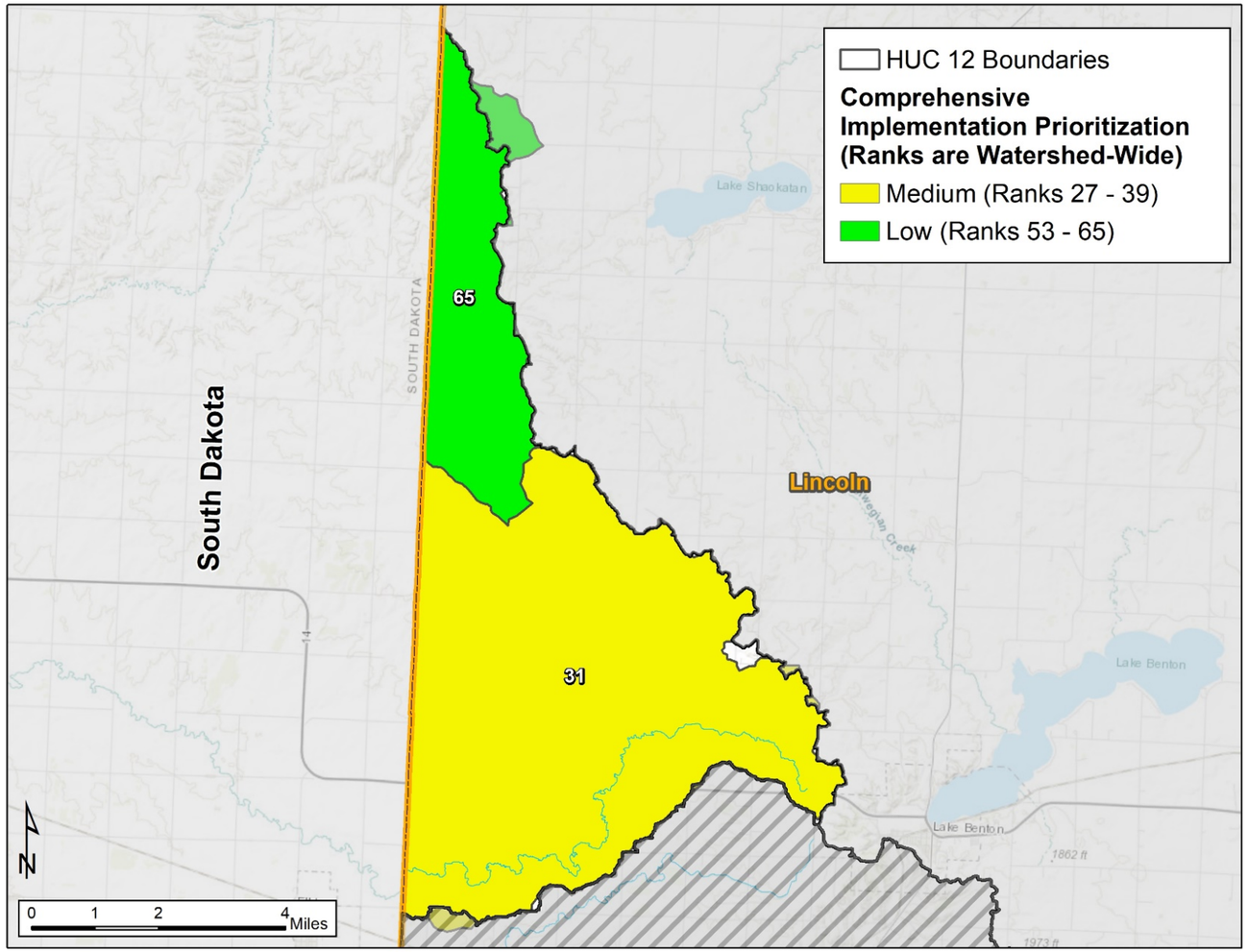
26,008 Acres

2.3% of Plan Area



Comprehensive Implementation Prioritization

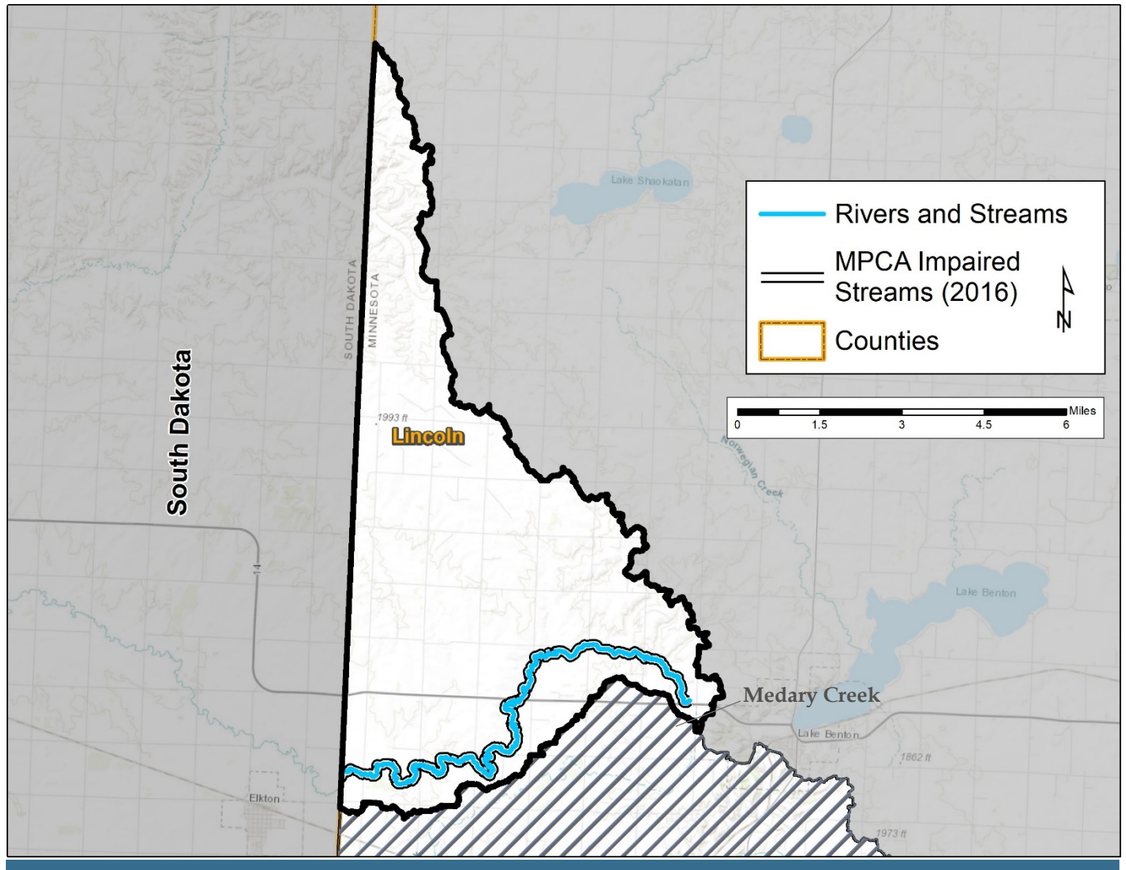
The Upper Big Sioux River is the smallest planning region within the Missouri River Watershed 1W1P planning area. As presented in the following pages, the planning region does not have any water quality impairments, contains only a portion of one highly vulnerable Drinking Water Supply Management Area (DWSMA), and contains cost-effective structural and management practices as part of the targeted implementation approach. Considering these and other factors (**Appendix O**), the image below shows the comprehensive implementation rank of subwatersheds (HUC 12 scale) within the Upper Big Sioux River planning region, relative to all other subwatersheds in the plan area.



UPPER BIG SIOUX RIVER PLANNING REGION: SNAPSHOT OF CURRENT CONDITIONS

Surface Water Quality

The highest priority for implementation efforts aimed at protecting or restoring streams reaches are targeted toward those streams that are nearly (threatened impairment risk) or barely (low restoration effort) impaired. Streams within the Upper Big Sioux River planning region have been assessed by water quality parameter based on available water quality monitoring data, with full results presented in Section 3. While there are no streams in the nearly or barely impaired category, there is one impairment within the planning region, meriting restoration efforts. The Medary Creek (AUID 10170202-501) at the headwaters of the Minnesota and South Dakota border does not meet state water quality standards for aquatic life and is listed as impaired.

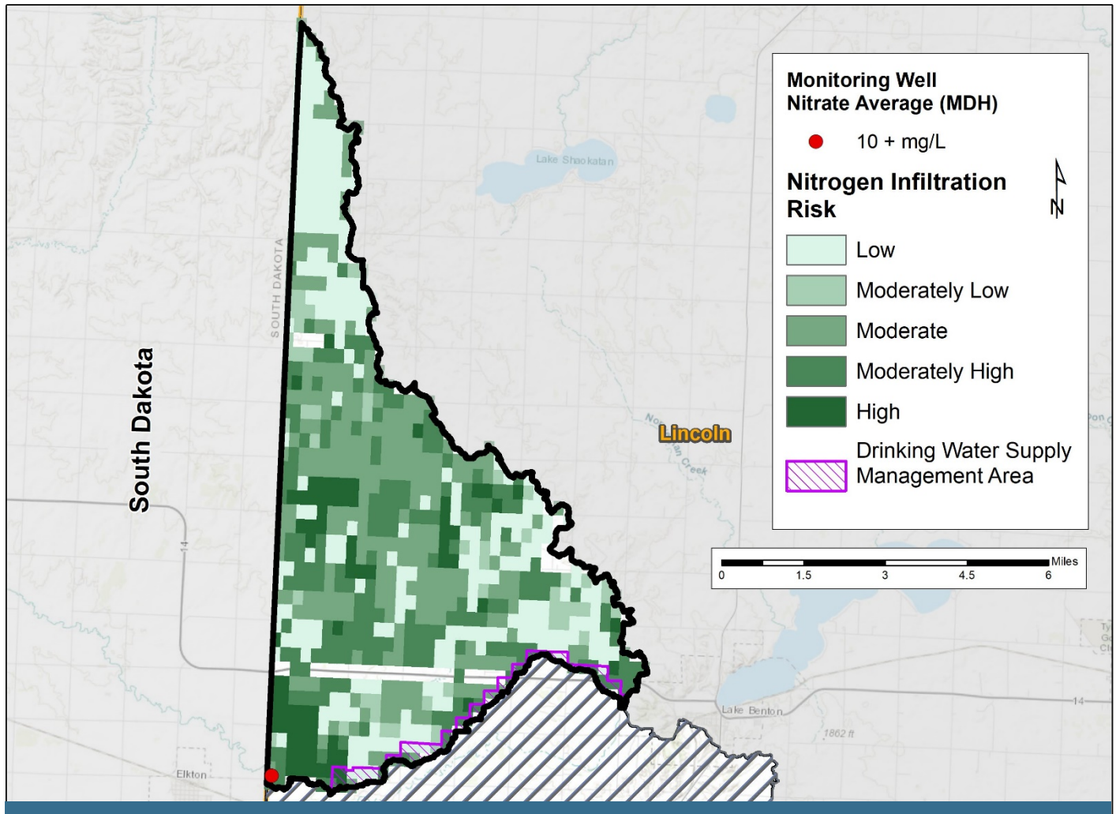


The Medary Creek has been identified as a key stream requiring attention, as it does not meet Minnesota water quality standards for aquatic life.

Groundwater

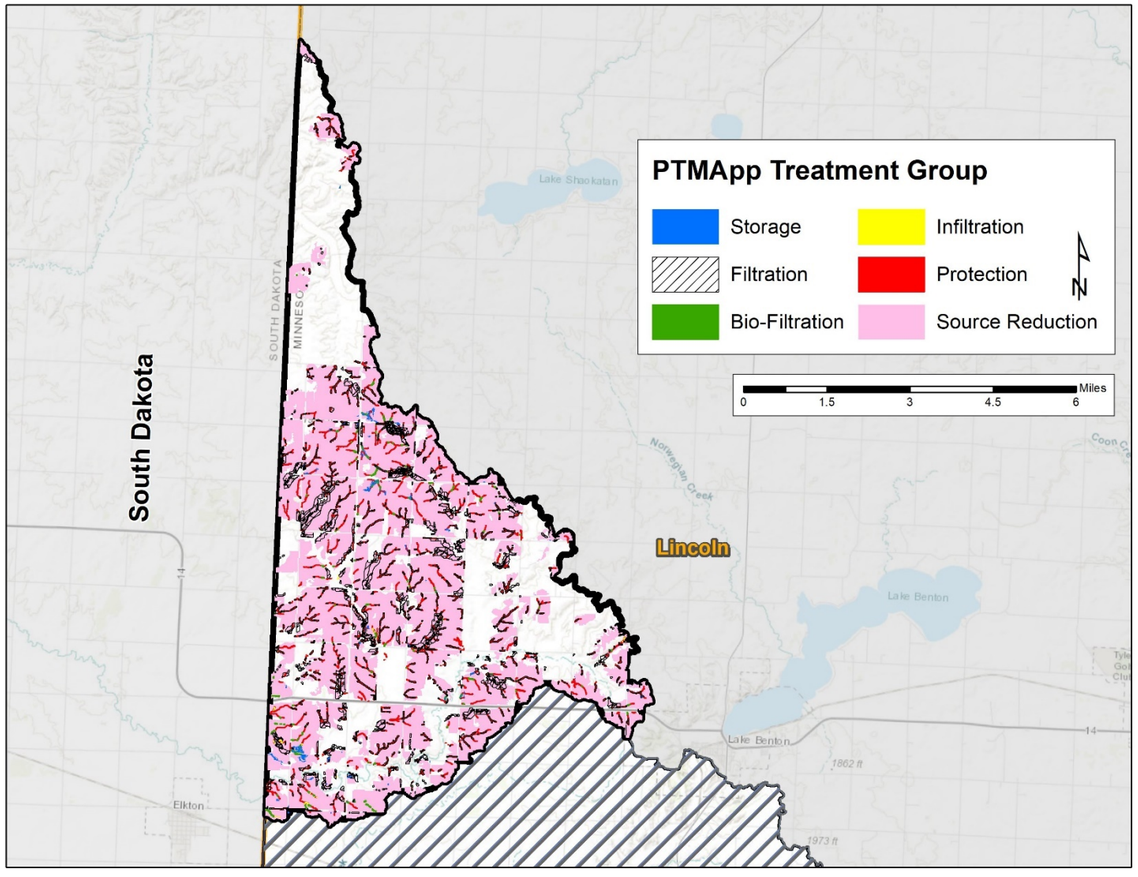
There is one publicly available monitoring well in the Upper Big Sioux River planning region. This well is in the highest priority for groundwater restoration efforts in the planning region, as average nitrate-nitrogen concentrations currently represent a health concern (≥ 10 mg/l, shown by **red** dot).

On the southern boundary of the planning region is a portion of a highly vulnerable Drinking Water Supply Management Area (DWSMA). Risk should be managed within this area to protect public water supplies. One means of managing risk within DWSMAs is through implementation of structural or management practices that promote soil health and nutrient management (e.g. cover crops, nutrient management plans, perennial crops) in areas at the highest risk of nitrate-nitrogen infiltration. Areas of high risk are shown through the Nitrogen Infiltration Risk Map. Low-risk areas may be targeted for structural and management practices to promote groundwater recharge of clean water.



The dark green areas show where drinking water is at risk. Action is needed to protect these critical sources. Management tactics may include cover crops or nutrient management plans on local land.

UPPER BIG SIOUX RIVER PLANNING REGION: FEASIBLE STRUCTURAL AND MANAGEMENT PRACTICE LOCATIONS



Feasible Structural and Management Practices

	PTMApp Treatment Group	Practice Type		Number in Planning Region
		Structural	Management	
	Storage *(e.g. ponds, WASCOBs)*	●		75
	Filtration *(e.g. filter strips, grassed waterways)*	●		557
	Bio-Filtration *(e.g. bioreactors, saturated buffers)*	●		123
	Infiltration *(e.g. infiltration trenches)*	●		16
	Protection *(e.g. stream protection, critical area planting)*	●		358
	Source Reduction *(e.g. cover crops, conservation tillage)*		●	493

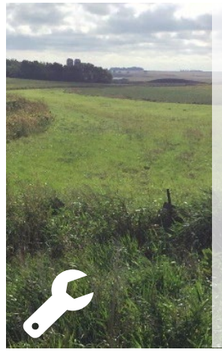
Feasible Structural and Management Practices in the Upper Big Sioux

Implementation of structural and management practices make progress toward several plan measurable goals. There are many locations feasible for implementation of these practices within the Upper Big Sioux River planning region. Locations technically feasible for structural and management practices are summarized and shown in the table and map to the left.

There are many more practices summarized here than can realistically be implemented within the 10-year lifespan of this plan. The number and type of practices which can be implemented is largely influenced by the amount of funding available, and by what practices are most locally accepted by the community for voluntary implementation. For purpose of this plan, this large list of feasible practices is narrowed down by identifying what practices will be the focus of plan implementation efforts assuming funding for implementation largely remains unchanged from current levels. These practices are part of the "**targeted implementation approach**," and are included in the targeted implementation schedule.

Structural Practices in the Targeted Implementation Approach

As of 2017, approximately $37,000 per year is spent in the Upper Big Sioux River planning region on structural practices alone. The most locally accepted structural practices for voluntary implementation efforts are storage practices (WASCOBs and grade stabilization) and filtration practices (such as grassed waterways), encompassing 75% and 25% of all structural practice implementation costs respectively. Therefore, prioritized structural practices in the targeted implementation approach are the most cost-effective[1] storage and filtration practices within the Upper Big Sioux planning region, up to a maximum annual cost of $37,000.

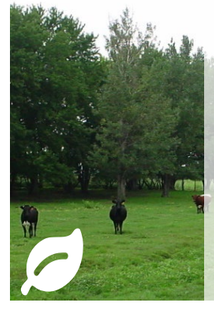


Quick Summary:

- WASCOBS, grade stabilization, and waterways
- Most cost-efficient
- **Maximum annual cost = $37,000**

Management Practices in the Targeted Implementation Approach

As of 2017, approximately $9,200 per year is spent in the planning region on management practices alone. Practices that increase soil health (cover crops, tillage management) and implementing rotational grazing methods are the primary focus of the targeted implementation approach within the Upper Big Sioux planning region.



Quick Summary:

- Cover crops, tillage management, rotational grazing
- Targeted to areas of highest soil loss
- **Maximum annual cost = $9,200**

[1] *Based upon the estimated cost per unit of sediment and nutrient which no longer reach the edge of the field following implementation.*

UPPER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR STRUCTURAL PRACTICES

Location: Upper Big Sioux Planning Region (26,008 Acres)

Action Level	PTMApp	Action #		Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline					Implementation Responsibility			Measurable Goals																
							2019-20	2021-22	2023-24	2025-26	2027-28	Lead	Lead Entity	Partner	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Storage*	UBSR SP-1	Implement existing practices to store excess water, such as **WASCOBS, terraces, retention ponds, and grade stabilization structures.**	**T: 19 Practices** *M: 33 Practices* *L: 41 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $27,497 / year** *M: $50,650 / year* *L: $81,700 / year*	x	x	x	x	x	Local	SWCD	NRCS, BWSR				x	x		x		x	x								
		UBSR SP-2	Create or restore **wetlands**.						x	x		Local	SWCD	NRCS, BWSR	x		x	x	x		x		x	x	x							
		UBSR SP-3	Implement **drainage water management BMPs and conservation drainage practices** to control ground water elevation, reduce water volume yield, and remove pollutants from tile discharge prior to entering surface waters and groundwater.						x	x		Local	SWCD	County, Township, NRCS, BWSR	x		x	x	x		x		x			x			x			
		UBSR SP-4	Implement practices that provide protection for agricultural lands, including **upland and floodplain storage** projects, conservation, and/or flowage easements.				x	x	x			Local	SWCD	NRCS, DNR, BWSR				x	x		x		x	x	x		x	x				
T	*Filtration*	UBSR SP-5	Implement practices (e.g. **filter strips, grassed waterways**) within priority locations that reduce sediment and nutrient loading to waterbodies by treating surface runoff before entering ditches and streams.	**T: 12 Practices** *M: 22 Practices* *L: 34 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $9,166 / year** *M: $18,000 / year* *L: $27,100 / year*	x	x	x	x	x	Local	SWCD	NRCS, BWSR				x	x	x	x		x	x		x	x	x				x
		UBSR SP-6	Implement practices within riparian areas (e.g. **riparian herbaceous cover, riparian forest buffer**) that improve connectivity within riparian corridors and floodplains.							x	x	Local	SWCD	NRCS, DNR, NGOs, USFWS				x	x	x	x		x	x		x	x					x
		UBSR SP-7	Implement practices **(e.g. riparian herbaceous cover)** that provide perennial vegetative cover within riparian corridors to increase stream roughness and decrease bank erosion.				x					Local	SWCD	County, BWSR				x	x				x	x		x						x
M	*N/A*	UBSR SP-8	Implement practices (e.g. **wood chip bioreactor, saturated buffers**) that reduce nutrient loading to waterbodies by treating shallow sub-surface runoff before entering ditches and streams.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, BWSR												x							
M		UBSR SP-9	Implement **animal waste management systems** and manage water using **runoff control measures** in accordance with accepted design standards and practice	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, Crop Advisors, BWSR, MPCA	x	x		x	x	x	x		x								x		
L	*N/A*	UBSR SP-10	Facilitate **protection of natural and pervious lands** through such programs as acquisition, property tax credits and easements (e.g. CREP, CRP, RIM, etc.).	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	DNR, TNC, NRCS, USFWS, BWSR, PWS	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
L		UBSR SP-11	Implement **protection of lands** identified as habitat complexes in the Prairie Coteau Conservation Focus Area and/or areas identified as MBS Sites of Biodiversity Significance and Native Plant Communities, through such programs as acquisition, property tax credits and easements.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, DNR, TNC, USFWS				x						x			x				x		
L		UBSR SP-12	Implement practices **that promote recharge (e.g. infiltration trench).**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	County, City, NRCS, MDH, BWSR			x							x				x					
L		UBSR SP-13	Proactively **cleanout** build-up of **debris from control structures and stormwater ponds**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	DNR, County, City, MPCA, BWSR				x	x				x										

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

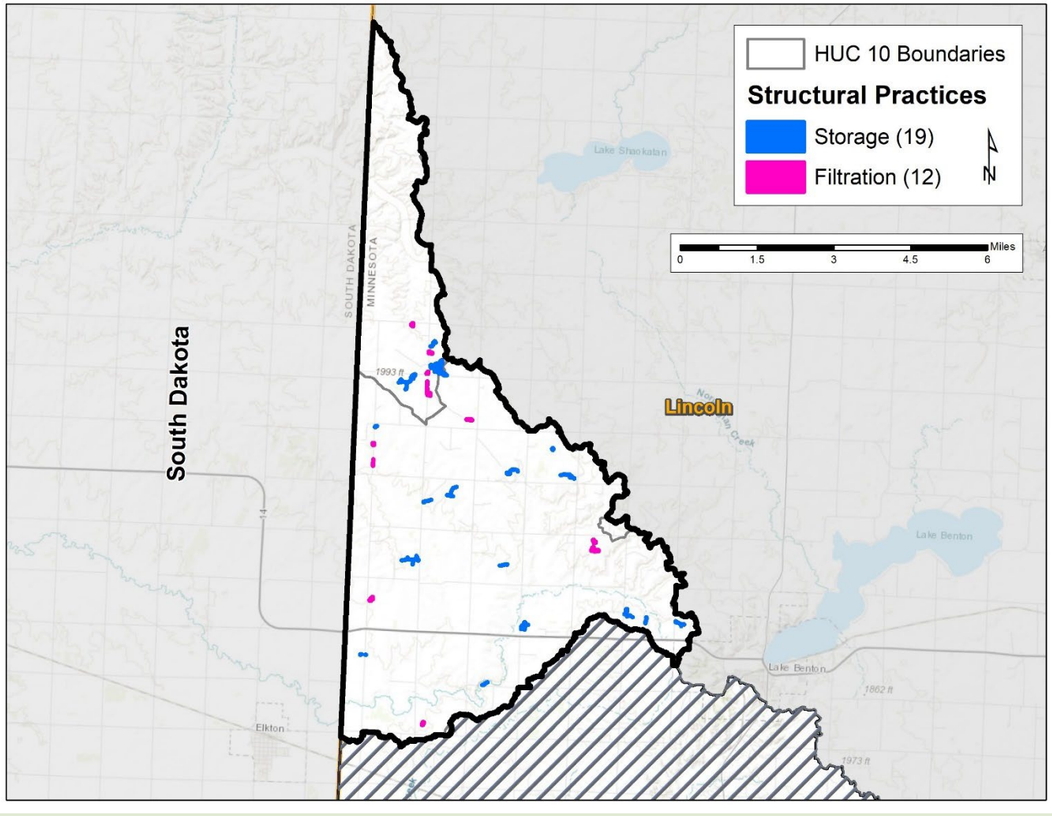
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

UPPER BIG SIOUX RIVER PLANNING REGION: STRUCTURAL PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH

Locations for Targeting Implementation

There are **19 storage practices and 12 filtration practices in the Upper Big Sioux River 10-year targeted implementation approach**. Shown below are the locations on the landscape of the best, most cost-effective practices for implementation. Practice locations shown do not consider existing practices or factors like landowner willingness.

Shown to the right are the anticipated costs and water quality value of implementing these 31 structural practices in the Upper Big Sioux River 10-year targeted implementation approach. Shown in the charts with horizontal lines are the short-term and long-term sediment, total phosphorus, and total nitrogen measurable goals for the planning region. Progress toward goals accomplished through the 31 practices in the targeted implementation approach is shown by the purple line.



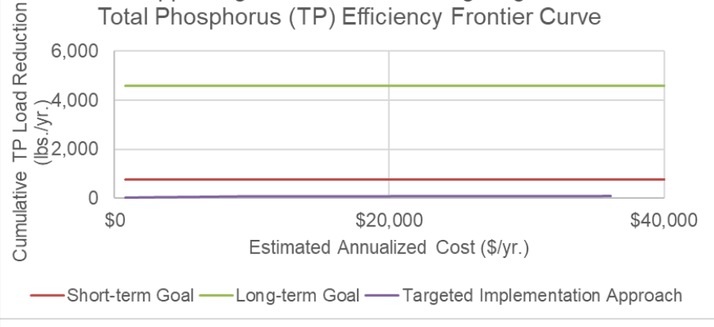
Anticipated Progress Toward Goals from Implementation

No load reduction goal target, therefore an efficiency frontier curve was not generated.

Short-Term Measurable Goal

Clarity — 0% — **Sediment 0% Reduction** — Nondegradation

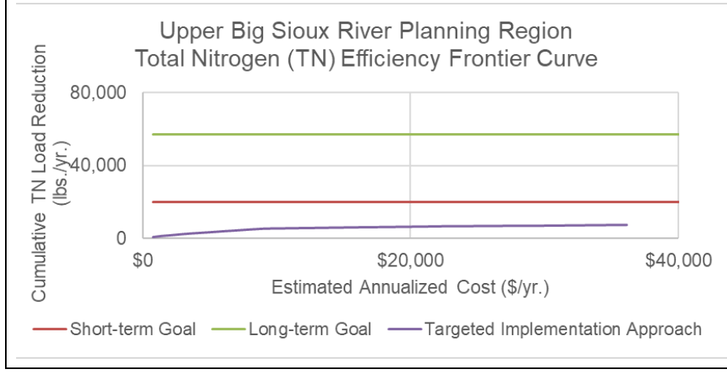
Existing Load: 25,059 tons/yr.
Target Load Reduction: 0 tons/yr.
Anticipated Load Reduction: 1,414 tons/yr.
Progress Toward Short-Term Goal: + 100%



Short-Term Measurable Goal

P — 10% — **Total Phosphorus 10% Reduction**

Existing Load: 7,647 lbs./yr.
Target Load Reduction: 765 lbs./yr.
Anticipated Load Reduction: 95 lbs./yr.
Progress Toward Short-Term Goal: 12%



Short-Term Measurable Goal

N — 7% — **Total Nitrogen 7% Reduction**

Existing Load: 284,814 lbs./yr.
Target Load Reduction: 19,937 lbs./yr.
Anticipated Load Reduction: 7,238 lbs./yr.
Progress Toward Short-Term Goal: 36%

UPPER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR MANAGEMENT PRACTICES

Location: Upper Big Sioux Planning Region (26,008 Acres)

Action Level	PTMApp	Action #	Management Practices	Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline: 2019-20	2021-22	2023-24	2025-26	2027-28	Implementation Responsibilities: Lead	Lead Entity	Partner	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Source Reduction*	UBSR MP-1	Implement practices which are focused on and maintain soil health, including but not limited to **conservation tillage and residue management, crop rotation methods, and/or the use of cover crops**.	**T: 142 Acres** *M: 283 Acres* *L: 12,327 Acres*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $9,200/ year** *M: $18,395 / year* *L: $801,255 / year*	x	x	x	x	x	Local	SWCD	NRCS, Crop Advisors, BWSR	x	x	x	x	x	x	x		x	x						x		
		UBSR MP-2	Develop and implement **nutrient and/or manure management plans** for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.				x					Local	SWCD	MDA, NRCS, Crop Advisors, Counties, BWSR, MPCA	x	x			x		x		x					x			x		
		UBSR MP-3	Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation **irrigation water management practices**, such as variable rate application and low flow drop nozzles.				x		x		x	Local	SWCD	NCRS, County, DNR	x		x											x					
		UBSR MP-4	Use managed and **rotational grazing methods** to manage animal wastes and prevent livestock entry into surface waterbodies.				x	x	x	x	x	Local	SWCD	MDA, NRCS, Extension, MPCA				x	x	x				x		x		x				x	
		UBSR MP-5	**Encourage use of conservation easement programs** in marginal, erodible land.				x	x	x			Local	SWCD	DNR, TNC, NRCS, USFWS, BWSR				x						x		x	x				x		
		UBSR MP-6	Provide one-on-one consultations with landowners and producers (i.e. **field walkovers**) about agricultural BMPs, field productivity benefits of BMPs, alternative crops and land uses, and available financial incentive options for funding them.				x	x	x			Local	SWCD	NRCS, MDA, Extension	x	x	x	x	x	x	x		x	x				x		x			
		UBSR MP-7	Encourage the use of **precision agriculture** through education, technical, and financial assistance based on the economic and environmental capacity of each area of a field.						x			Local	SWCD	NRCS, Extension, Crop Advisors, MDA	x	x		x	x	x	x		x					x			x		
M	*N/A*	UBSR MP-8	**Develop a cost share** to supply landowners with dollars to implement strategies **prohibiting livestock access to streams, rivers, and lakes**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	County	SWCD, WD, DNR, BWSR, MDA, NRCS				x	x	x	x		x			x		x			x	x	
L	*N/A*	UBSR MP-9	Promote the development of **pesticide management plans** which follow operational best management practice recommendations, including Licensed Applicators Statute.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, Crop advisors														x			x		
L	*N/A*	UBSR MP-10	**Protect and restore grassland and forested areas** with focused effort on increasing native species populations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	TNC, BWSR, PF, County, DNR, USFWS				x						x			x						

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

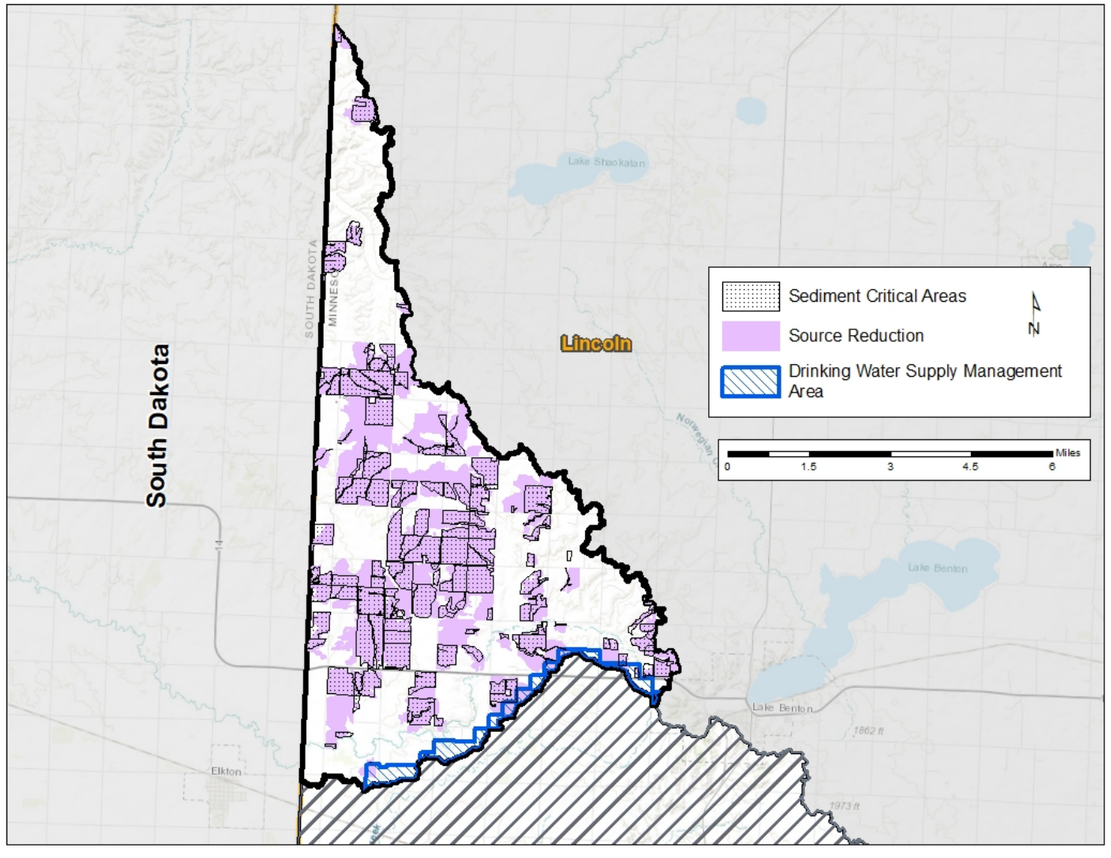
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

UPPER BIG SIOUX RIVER PLANNING REGION: MANAGEMENT PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH

Locations for Targeting Implementation

There are **142 acres of management practices in the Upper Big Sioux River planning region 10-year targeted implementation approach**. These management practices are geared toward improving soil health, and include practices like cover crops, tillage management, and rotational grazing methods.

Shown on the map below are the best fields for implementing management practices in the Upper Big Sioux River planning region. These fields are technically feasible for management practices (referred to as "source reduction" within PTMApp). In addition, these fields have disproportionately high sediment loss defined as sediment critical areas. Therefore, these are the fields that would benefit the most from management practice implementation.



Anticipated Progress Toward Goals from Implementation

Below is a summary of the water quality benefits of implementing management practices within the targeted implementation approach for the Upper Big Sioux River planning region.

Short-Term Measurable Goal

Sediment

0% Reduction

Existing Load: 25,059 tons/yr.
Target Load Reduction: 0 tons/yr.
Anticipated Load Reduction: 108 tons/yr.
Progress Toward Short-Term Goal: N/A

Total Phosphorus

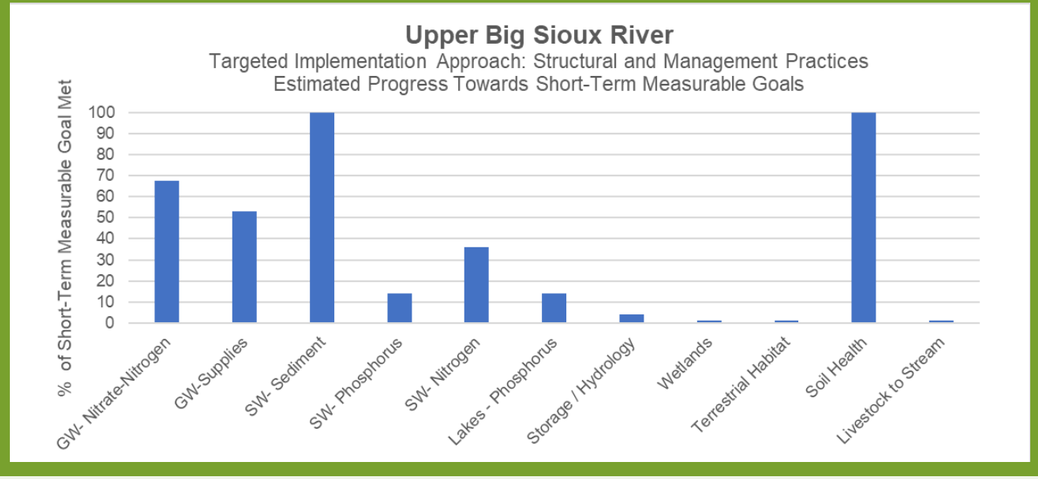
10% Reduction

Existing Load: 7,647 lbs./yr.
Target Load Reduction: 765 lbs./yr.
Anticipated Load Reduction: 9.7 lbs./yr.
Progress Toward Short-Term Goal: 1.27%

STRUCTURAL *AND* MANAGEMENT PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH:

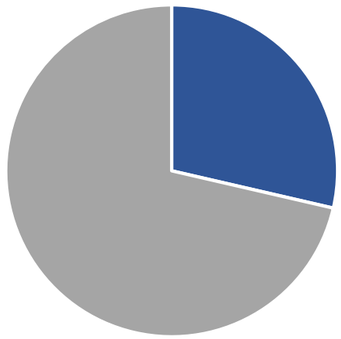
Combined Progress Toward Short-Term Measurable Goals

While it is important to understand the individual benefits of structural and management practices separately, it is also important to understand the cumulative benefits these practices can generate toward plan measurable goals. Shown in the figure below are all plan measurable goals that relate to the implementation of structural and management practices. The estimated cumulative benefit of implementing all structural and management practices in the Upper Big Sioux River planning region targeted implementation approach are shown.



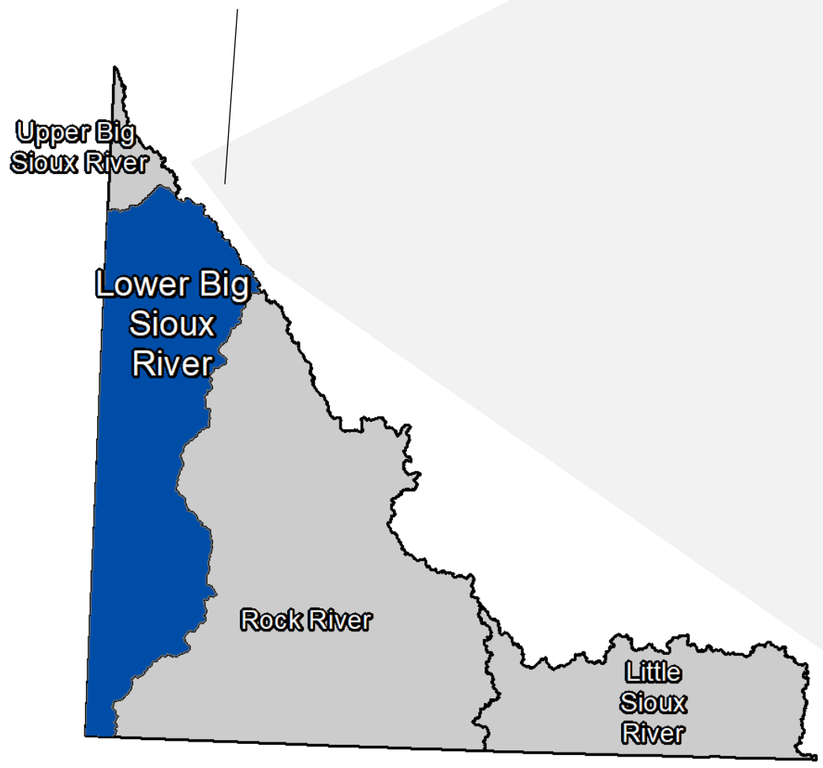
THE LOWER BIG SIOUX RIVER PLANNING REGION

Lower Big Sioux River



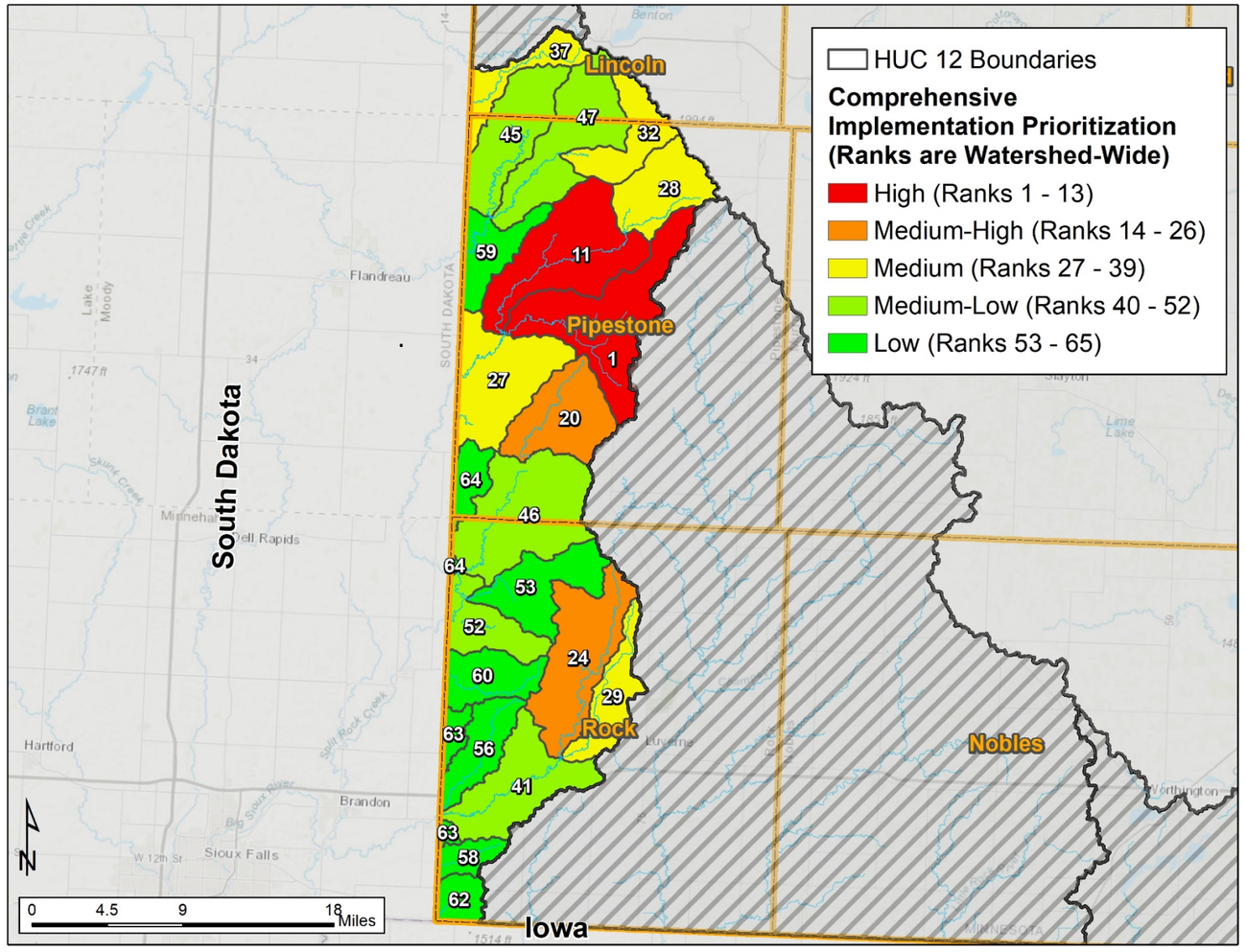
326,035 Acres

28.6% of Plan Area



Comprehensive Implementation Prioritization

The Lower Big Sioux River is the second-largest planning region within the Missouri River Watershed 1W1P planning area. As presented in the following pages, the planning region contains six stream reaches that are "nearly" or "barely" impaired, contains all or portions of four Drinking Water Supply Management Areas, and contains cost-effective structural and management practices as part of the targeted implementation approach. Considering these and other factors (**Appendix O**), the image below shows the comprehensive implementation rank of subwatersheds (HUC 12 scale) within the Lower Big Sioux River planning region, relative to all other subwatersheds in the plan area.

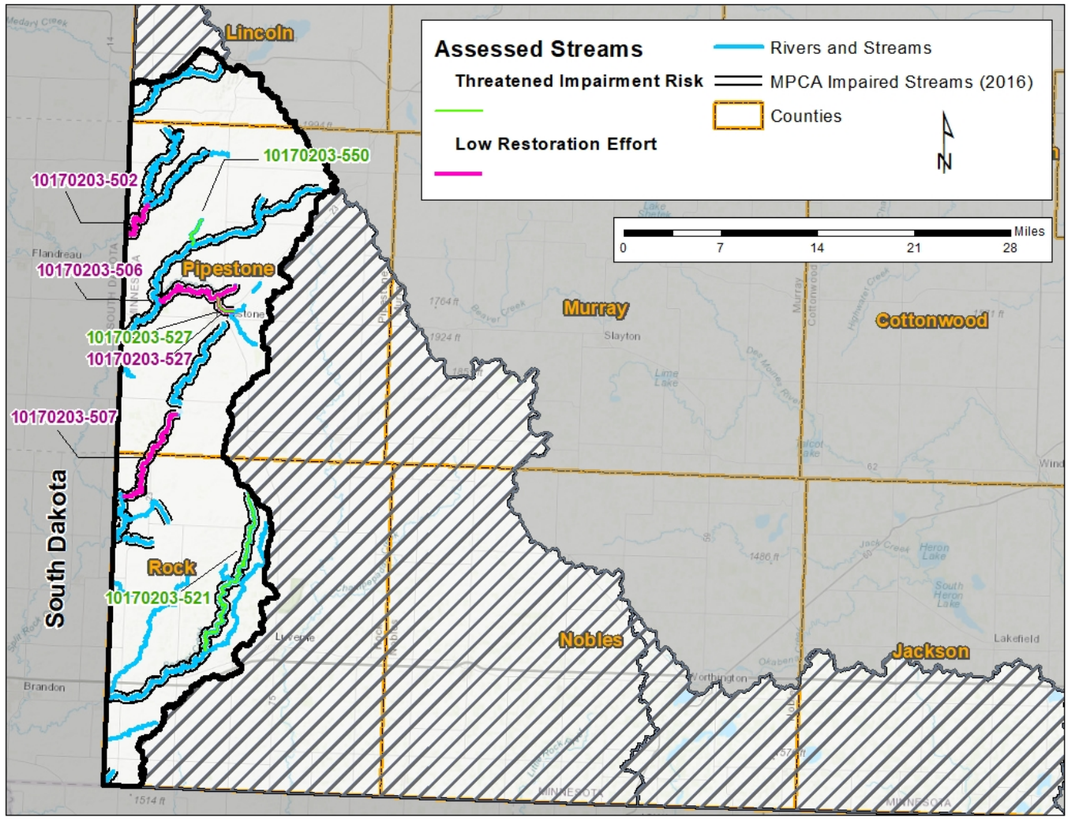


LOWER BIG SIOUX RIVER PLANNING REGION: SNAPSHOT OF CURRENT CONDITIONS

Surface Water Quality

The highest priority implementation efforts aimed at protecting or restoring streams reaches are targeted toward those streams that are nearly (threatened impairment risk) or barely (low restoration effort) impaired. Streams within the Lower Big Sioux (HUC 10170203) planning region have been assessed by water quality parameter based on available water quality monitoring data, with full results presented in **Section 3**. Streams that are nearly or barely impaired for a particular water quality parameter are summarized in the table below. Please note that a stream could be listed as "impaired" for one parameter (e.g. turbidity) but merit protection for another (e.g. total phosphorus).

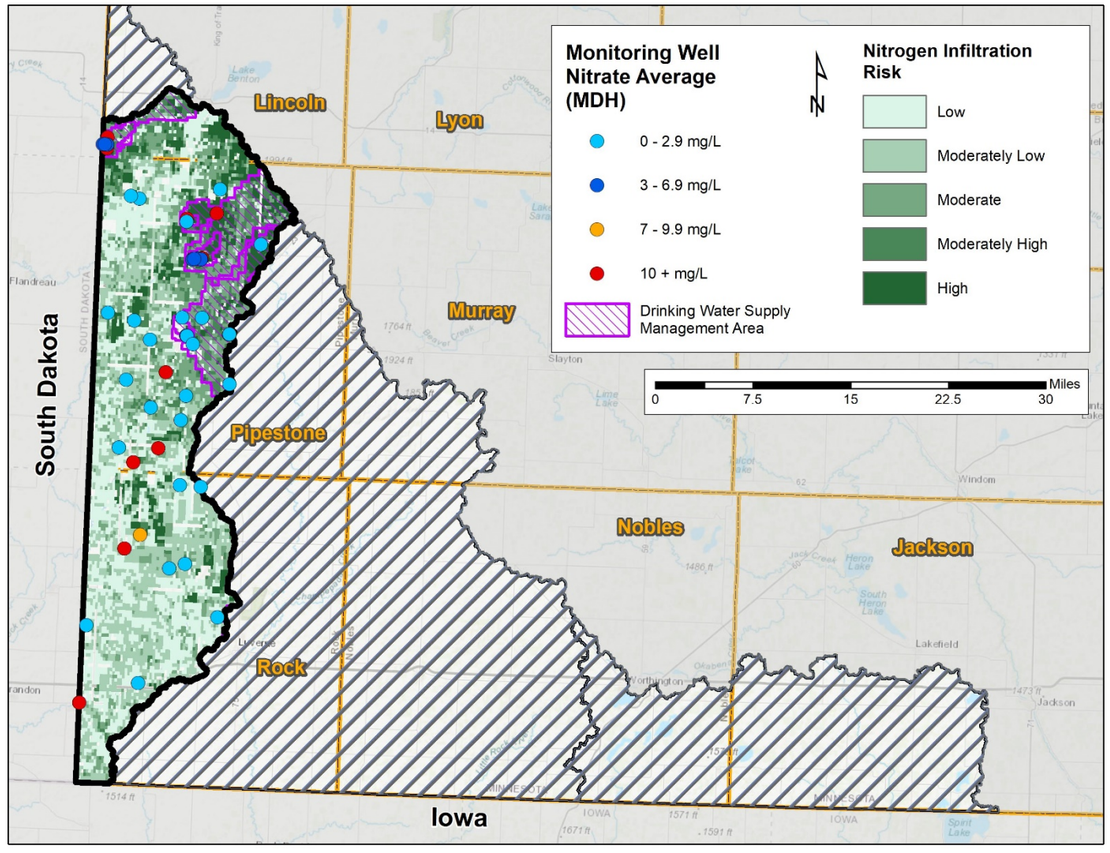
Stream ID	Impairment	Threatened Impairment Risk	Low Restoration Effort
-502	E. coli; Fishes Bio	*None*	Total Suspended Solids
-506	Fishes Bio; Invert Bio	*None*	Inorganic Nitrogen
-550	*None*	Inorganic Nitrogen	*None*
-527	Fecal Coliform; Turbidity	Total Suspended Solids	Inorganic Nitrogen, TP
-507	Dissolved Oxygen; Fishes Bio; Invert Bio	*None*	Total Suspended Solids
-521	Invert Bio	*None*	*None*



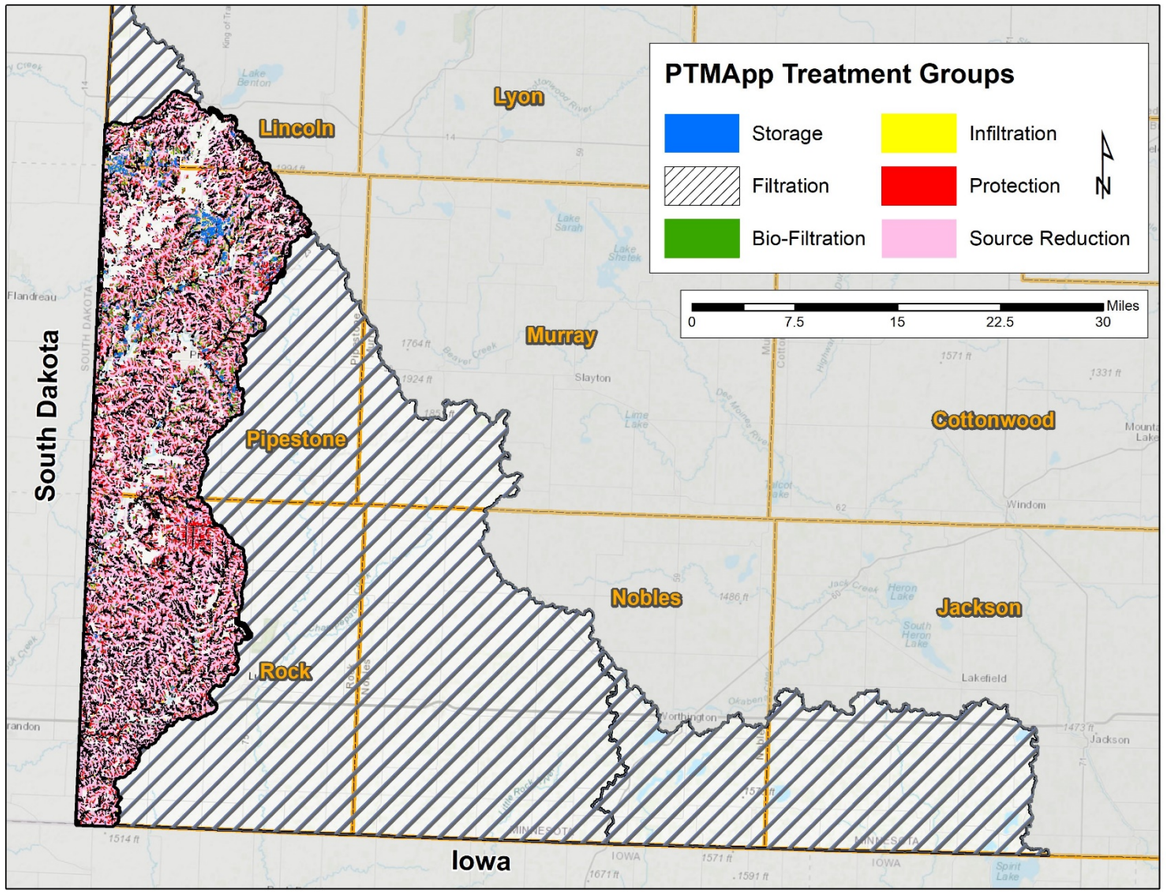
Groundwater

Several monitoring wells exist in the Lower Big Sioux River planning region. These are useful to understand where to target protection and restoration efforts focusing on groundwater resources. The highest priority for protection efforts occurs when nitrate-nitrogen concentrations represent a possible future health concern (≥ 7 mg/l to < 10 mg/l, shown by **orange** dot). The highest priority for restoration efforts occur when nitrate-nitrogen concentrations currently represent a health concern (≥ 10 mg/l, shown by **red** dot).

There are 4 Drinking Water Supply Management Areas (DWSMAs) partially or entirely within the Lower Big Sioux River planning region (shown in **purple**). Risk should be managed within these areas to protect public water supplies. One means of managing risk within DWSMAs is through implementation of structural or management practices that promote soil health and nutrient management (e.g. cover crops, nutrient management plans, perennial crops) in areas at the highest risk of nitrate-nitrogen infiltration. Areas of high risk are shown through the Nitrogen Infiltration Risk Map. Areas of low risk may be targeted for structural and management practices to promote groundwater recharge of clean water supplies.



LOWER BIG SIOUX RIVER PLANNING REGION: FEASIBLE LOCATIONS FOR STRUCTURAL AND MANAGEMENT PRACTICES



Feasible Structural and Management Practices

	PTMApp Treatment Group	Practice Type		Number in Planning Region
		Structural	Management	
	Storage *(e.g. ponds, WASCOBs)*	●		**1,696**
	Filtration *(e.g. filter strips, grassed waterways)*	●		**7,392**
	Bio-Filtration *(e.g. bioreactors, saturated buffers)*	●		**2,961**
	Infiltration *(e.g. infiltration trenches)*	●		**608**
	Protection *(e.g. stream protection, critical area planting)*	●		**5,631**
	Source Reduction *(e.g. cover crops, conservation tillage)*		●	**7,818**

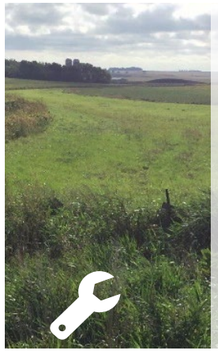
Feasible Structural and Management Practices in the Lower Big Sioux River

Implementation of structural and management practices make progress toward several plan measurable goals. There are many locations feasible for implementation of these practices within the Lower Big Sioux River planning region. Locations technically feasible for structural and management practices are summarized and shown in the table and map to the left.

There are many more practices summarized here than can realistically be implemented within the 10-year lifespan of this plan. The number and type of practices which can be implemented is largely influenced by the amount of funding available, and by what practices are most locally accepted by the community for voluntary implementation. For purpose of this plan, this large list of feasible practices is narrowed down by identifying what practices will be the focus of plan implementation efforts assuming funding for implementation largely remains unchanged from current levels. These practices are part of the "**targeted implementation approach**," and are included in the targeted implementation schedule.

Structural Practices in the Targeted Implementation Approach

As of 2017, approximately $458,000 per year is spent in the Lower Big Sioux River planning region on structural practices alone. The most locally accepted structural practices for voluntary implementation efforts are storage practices (WASCOBs and terraces) and filtration practices (grassed waterways), encompassing 67% and 33% of all structural practice implementation costs respectively. Therefore, prioritized structural practices in the targeted implementation approach are the most cost-effective[1] storage and filtration practices within the Lower Big Sioux planning region, up to a maximum annual cost of $458,000.

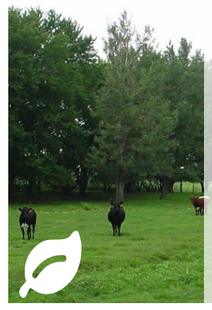


Quick Summary:

- WASCOBS, terraces, and waterways
- Targeted to most cost-efficient
- **Maximum annual cost = $458,000**

Management Practices in the Targeted Implementation Approach

As of 2017, approximately $114,800 per year is spent in the planning region on management practices alone. Practices that increase soil health (cover crops, tillage management) and implementing rotational grazing methods are the primary focus of the targeted implementation approach within the Lower Big Sioux planning region.



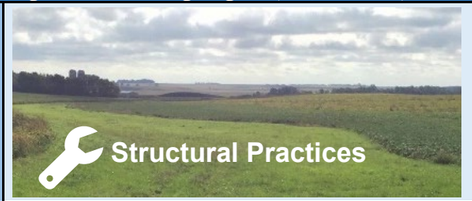
Quick Summary:

- Cover crops, tillage management, rotational grazing
- Targeted to areas of highest soil loss
- **Maximum annual cost = $114,800**

[1] *Based upon the estimated cost per unit of sediment and nutrient which no longer reach the edge of the field following implementation.*

LOWER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR STRUCTURAL PRACTICES

Location: Lower Big Sioux Planning Region (326,035 acres)

Action Level*	PTMApp	Action #		Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline: 2019-20	2021-22	2023-24	2025-26	2027-28	Implementation Responsibility: Lead	Lead Entity	Partner	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Storage*	LBSR SP-1	Implement practices to store excess water, such as **WASCOBS, terraces, and grade stabilization structures.**	**T: 209 Practices** *M: 358 Practices* *L: 474 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $304,229 / year** *M: $604,700 / year* *L: $912,500/ year*	x	x	x	x	x	Local	SWCD	NRCS				x	x		x		x	x									
		LBSR SP-2	Create or restore **wetlands**.				x	x	x	x	x	Local	SWCD	NRCS	x		x	x	x		x		x	x	x								
		LBSR SP-3	Implement practices to store excess water that provide a minimum 10-year protection for agricultural lands, including **upland and floodplain storage projects, retention ponds**, conservation, and/or flowage easements.						x		x	Local	SWCD	NRCS				x	x		x		x	x									
T	*Filtration*	LBSR SP-4	Implement practices (e.g. **filter strips, grassed waterways**) within priority locations that reduce sediment and nutrient loading to waterbodies by treating surface runoff before entering ditches and streams.	**T: 158 Practices** *M: 309 Practices* *L: 459 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $153,258 / year** *M: $306,200 / year* *L: $459,400 / year*	x	x	x	x	x	Local	SWCD	NRCS				x	x	x	x		x	x		x	x	x					x
		LBSR SP-5	Implement practices within riparian areas (e.g. **riparian herbaceous cover, riparian forest buffer**) that improve connectivity within riparian corridors and floodplains.					x		x		Local	SWCD	NRCS, DNR, NGOs, USFWS				x	x	x	x		x	x		x	x						x
		LBSR SP-6	**Implement urban BMPs** that reduce the delivery of sediment, nutrients, and pesticide loads to surface water by treating runoff through filtration and uptake.							x	x	Local	City	SWCD, WD, County, MPCA, BWSR			x	x	x		x		x	x									
M	*N/A*	LBSR SP-7	Promote practices that enhance hydrologic storage and stream stability by increasing **perennial native vegetation in upland and riparian areas.**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS				x						x	x	x							x
M		LBSR SP-8	Implement practices which control ground water elevation, reduce water volume yield, and remove pollutants before entering ditches, streams, and groundwater **(e.g. drainage water management, conservation drainage, woodchip bioreactor, saturated buffers).**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	County, Township, NRCS	x		x	x	x		x		x			x			x				
M		LBSR SP-9	Implement **animal waste management systems** and manage water using **runoff control measures** in accordance with accepted design standards and practice.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, County, Crop Advisors	x	x		x	x	x	x		x							x			
M		LBSR SP-10	Inspect, maintain and **improve the integrity of existing urban structures** that route and treat stormwater runoff to prevent downstream stream erosion and flooding while improving water quality.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City	County, MPCA, ACOE				x	x		x		x	x									
M		LBSR SP-11	**Promote urban BMPs for lawn and managed green spaces** (parks, golf courses) that include soil testing and proper use, amount, method and timing of fertilizer/pesticide application.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City	SWCD, County, MPCA				x	x		x		x	x									
L	*N/A*	LBSR SP-12	Facilitate **protection of natural and pervious lands** through such programs as acquisition, property tax credits and easements (e.g. CREP, CRP, RIM, etc.)	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	DNR, TNC, NRCS, USFWS, NGOs, PWS	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
L		LBSR SP-13	Implement **protection of lands** identified as habitat complexes in the Prairie Coteau Conservation Focus Area and/or areas identified as MBS Sites of Biodiversity Significance and Native Plant Communities, through such programs as acquisition, property tax credits and easements.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, DNR				x						x			x			x	x		
L		LBSR SP-14	Implement practices **that promote recharge (e.g. infiltration trench).**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	County, City, NRCS, MDH			x							x				x					

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

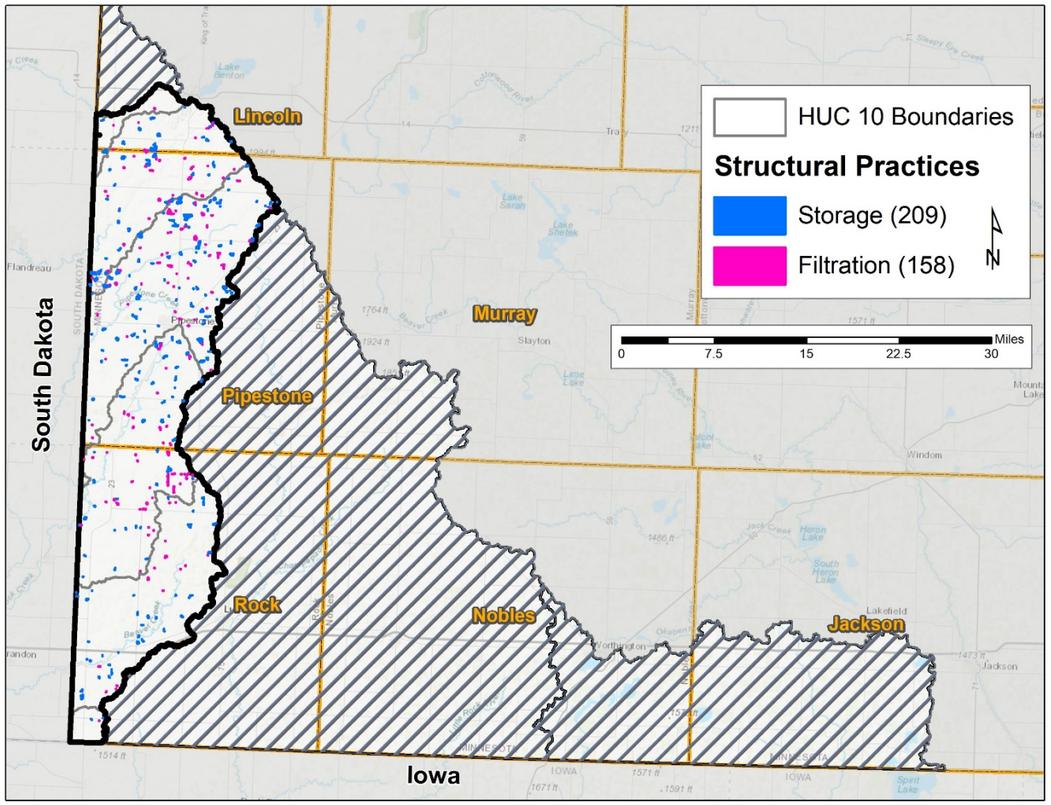
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

LOWER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST STRUCTURAL PRACTICES

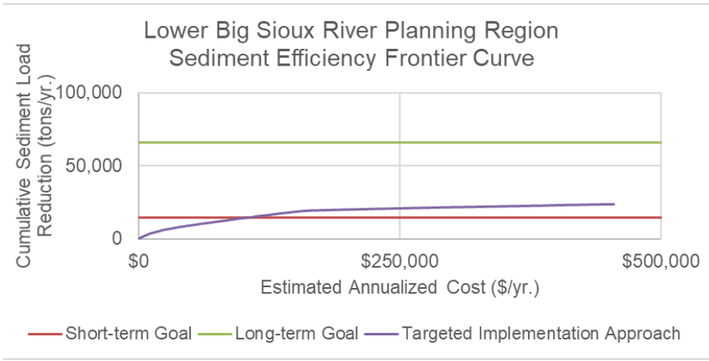
Locations for Targeting Implementation

There are **209 storage practices and 158 filtration practices in the Lower Big Sioux River planning region 10-year targeted implementation approach.** Shown below are the locations on the landscape of the best, most cost-effective practices for implementation. Practice locations shown do not consider existing

Shown to the right are the anticipated costs and water quality value of implementing these 367 structural practices in the Lower Big Sioux River targeted implementation approach. Shown in the charts with horizontal lines are the short-term and long-term sediment, total phosphorus, and total nitrogen measurable goals for the planning region. Progress toward goals accomplished through the 367 practices in the targeted implementation approach is shown by the purple line.



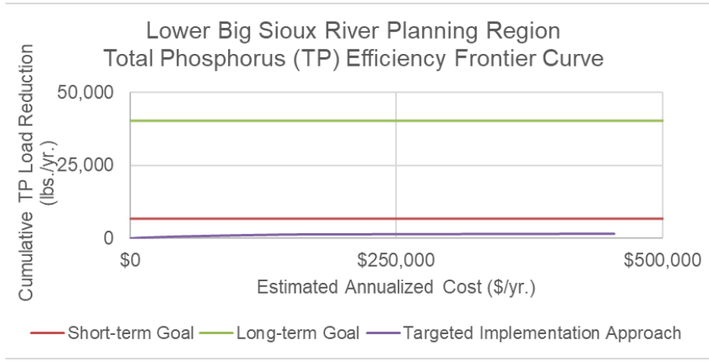
Anticipated Progress Toward Goals from Implementation



Short-Term Measurable Goal

Clarity — 10% — **Sediment 10% Reduction**

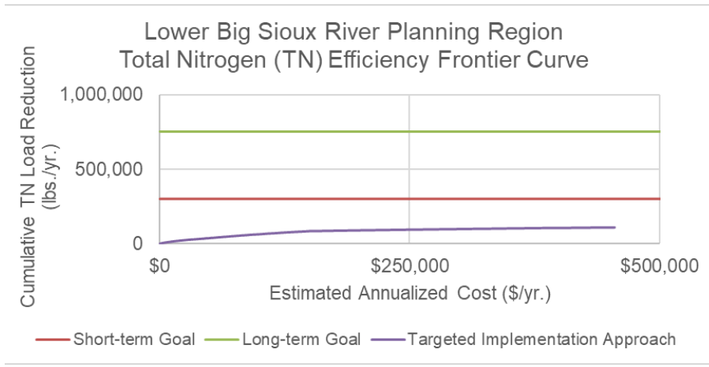
Existing Load: 146,412 tons/yr.
Target Load Reduction: 14,641 tons/yr.
Anticipated Load Reduction: 23,753 tons/yr
Progress Toward Short-Term Goal: 162%



Short-Term Measurable Goal

P — 10% — **Total Phosphorus 10% Reduction**

Existing Load: 67,125 lbs./yr.
Target Load Reduction: 6,713 lbs./yr.
Anticipated Load Reduction: 1,594 lbs./yr.
Progress Toward Short-Term Goal: 24%



Short-Term Measurable Goal

N — 10% — **Total Nitrogen 10% Reduction**

Existing Load: 2,513,195 lbs./yr.
Target Load Reduction: 251,320 lbs./yr.
Anticipated Load Reduction: 110,233 lbs./yr.
Progress Toward Short-Term Goal: 44%

LOWER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR MANAGEMENT PRACTICES

Location: Lower Big Sioux Planning Region (326,035 acres)

Action Level*	PTMApp	Action #	Management Practices	Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline					Implementation Responsibilities			Measurable Goals																	
							2019-20	2021-22	2023-24	2025-26	2027-28	Lead	Lead Entity	Partner	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Source Reduction*	LBSR MP-1	Implement practices which are focused on and maintain soil health, including but not limited to **conservation tillage and residue management, crop rotation methods, and/or the use of cover crops**.	**T: 1,766 Acres** *M: 3,530 Acres* *L: 136,450 Acres*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $114,800/ year** *M: $229,450 / year* *L: $8,869,250 / year*	x	x	x	x	x	Local	SWCD	NRCS, Crop Advisors, PWS	x	x	x	x	x	x	x		x	x							x		
		LBSR MP-2	Use managed and **rotational grazing methods** to manage animal wastes and prevent livestock entry into surface waterbodies.				x	x	x	x	x	Local	SWCD	MDA, NRCS, Extension				x	x	x				x			x				x	
		LBSR MP-3	**Encourage use of conservation easement programs** in marginal, erodible land, especially within DWSMAs and priority recharge areas within wellhead protection areas.				x	x	x	x	x	Local	SWCD	DNR, TNC, NRCS, USFWS, BWSR, PWS	x	x	x	x						x		x	x				x		
		LBSR MP-4	Provide one-on-one consultations with landowners and producers (i.e. **field walkovers**) about agricultural BMPs, field productivity benefits of BMPs, alternative crops and land uses, and available financial incentive options for funding them.				x	x	x	x	x	Local	SWCD	NRCS, MDA, Extension Service, PWS	x	x	x	x	x	x	x		x	x				x		x			
		LBSR MP-5	Encourage the use of **precision agriculture** through education, technical, and financial assistance based on the economic and environmental capacity of each area of a field.						x	x	x	Local	SWCD	NRCS, Extension, Crop Advisors, MDA, PF, PWS	x	x		x	x	x	x		x					x			x		
M	*N/A*	LBSR MP-6	Develop and implement **nutrient and/or manure management plans** for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	MDA, NRCS, Crop Advisors, Counties	x	x			x		x		x					x			x		
M		LBSR MP-7	Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation **irrigation water management practices**, such as variable rate application and low flow drop nozzles.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NCRS, County, Extension Service	x		x											x					
M		LBSR MP-8	**Develop a cost share** to supply landowners with dollars to implement strategies **prohibiting livestock access to streams, rivers, and lakes**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	County	SWCD, WD, DNR, BWSR, MDA, NRCS				x	x	x	x		x			x		x			x	x	
L	*N/A*	LBSR MP-9	Promote the development of **pesticide management plans** which follow operational best management practice recommendations, including Licensed Applicators Statute.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, Crop advisors														x			x		
L		LBSR MP-10	**Protect and restore grassland and forested areas** with focused effort on increasing native species populations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	TNC, BWSR, PF, County, DNR				x						x			x						

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

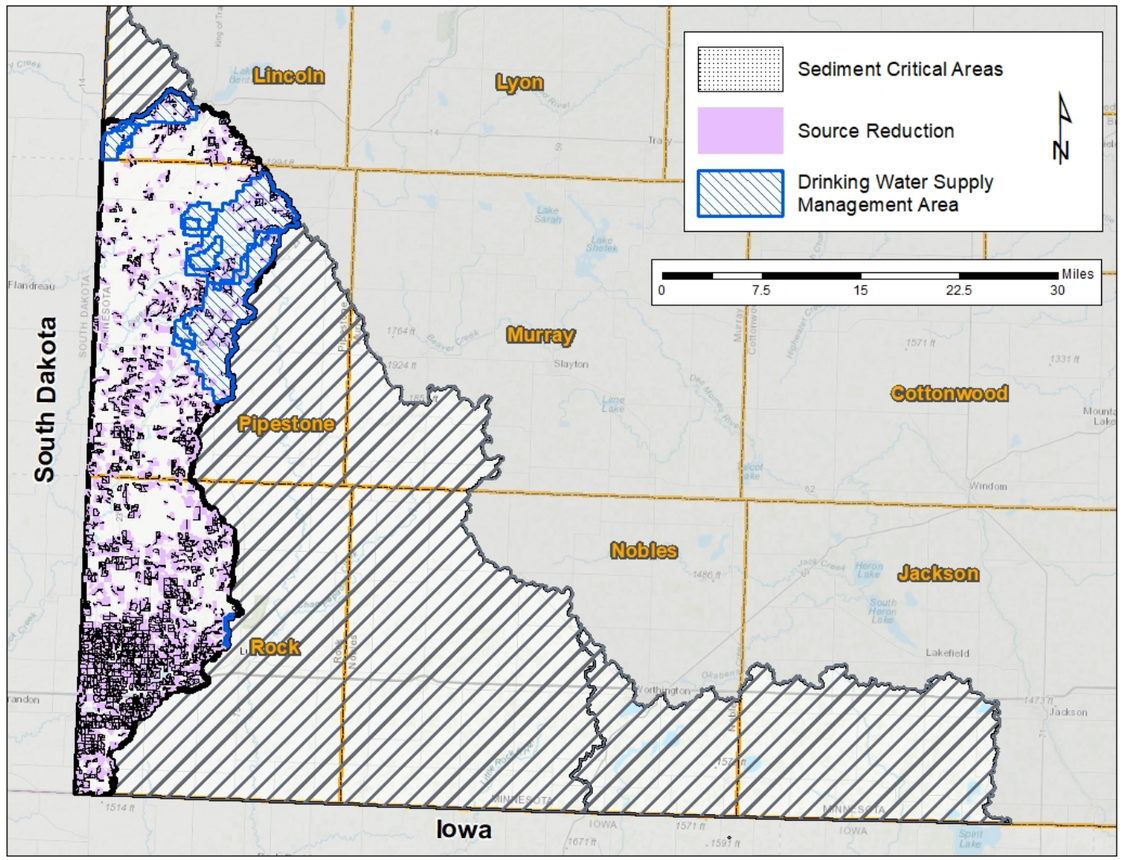
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

LOWER BIG SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST MANAGEMENT PRACTICES

Locations for Targeting Implementation

There are **1,766 acres of management practices in the Lower Big Sioux River planning region 10-year targeted implementation approach**. These management practices are geared toward improving soil health, and include practices like cover crops, tillage management, and rotational grazing methods.

Shown on the map below are the best fields for implementing management practices in the Lower Big Sioux River planning region. These fields are technically feasible for management practices (referred to as "source reduction" within PTMApp). In addition, these fields have disproportionately high sediment loss defined as sediment critical areas and would benefit the most from management practice implementation.



Anticipated Progress Toward Goals from Implementation

Below is a summary of the water quality benefits of implementing management practices within the targeted implementation approach for the Lower Big Sioux River planning region.

Short-Term Measurable Goal

Clarity — 10% — **Sediment 10% Reduction**

- **Existing Load**: 146,412 tons/yr.
- **Target Load Reduction:** 14,641 tons/yr.
- **Anticipated Load Reduction**: 1,446 tons/yr.
- **Progress Toward Short-Term Goal**: 9.8%

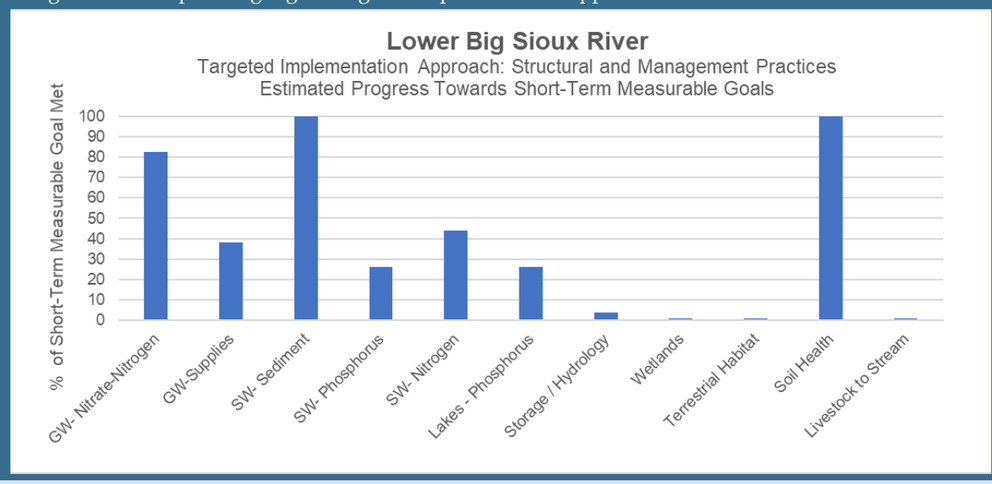
P — 10% — **Total Phosphorus 10% Reduction**

- **Existing Load**: 67,125 lbs./yr.
- **Target Load Reduction:** 6,713 lbs./yr.
- **Anticipated Load Reduction:** 122 lbs./yr.
- **Progress Toward Short-Term Goal:** 1.8%

STRUCTURAL *AND* MANAGEMENT PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH:

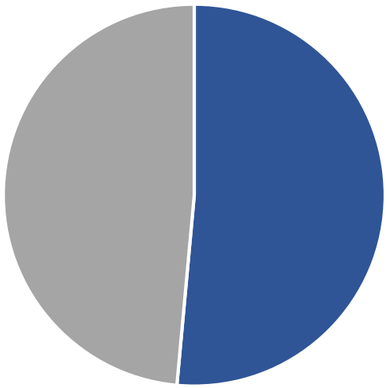
Combined Progress Toward Short-Term Measurable Goals

While it is important to understand the individual benefits of structural and management practices separately, it is also important to understand the cumulative benefits these practices can generate toward plan measurable goals. Shown in the figure below are all plan measurable goals that relate to the implementation of structural and management practices. The estimated cumulative benefit of implementing all structural and management practices in the Lower Big Sioux River planning region targeted implementation approach are shown.



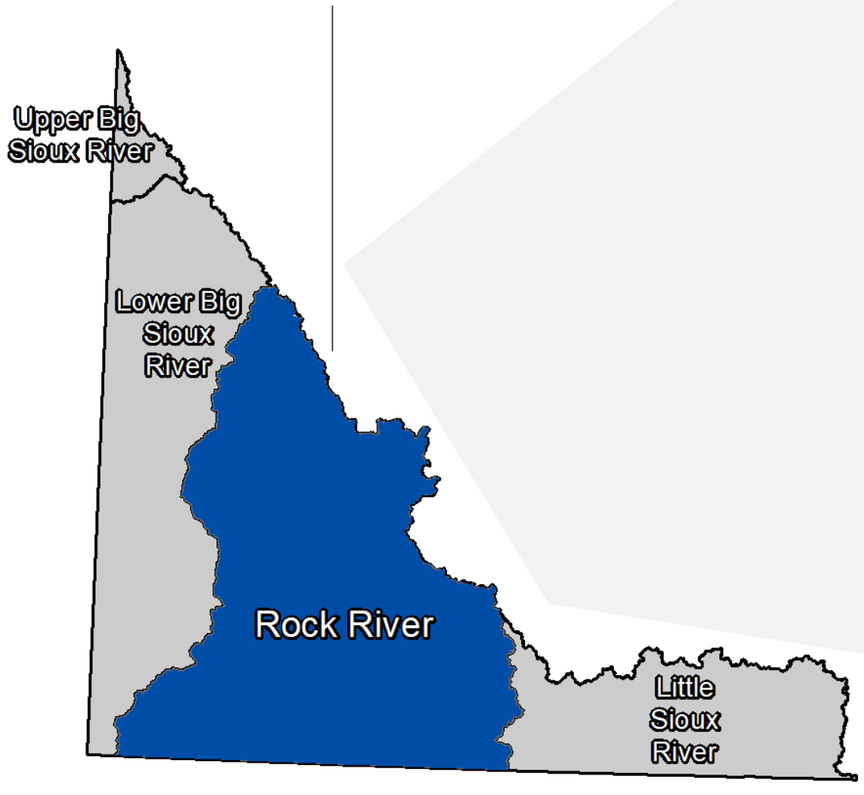
THE ROCK RIVER PLANNING REGION

Rock River



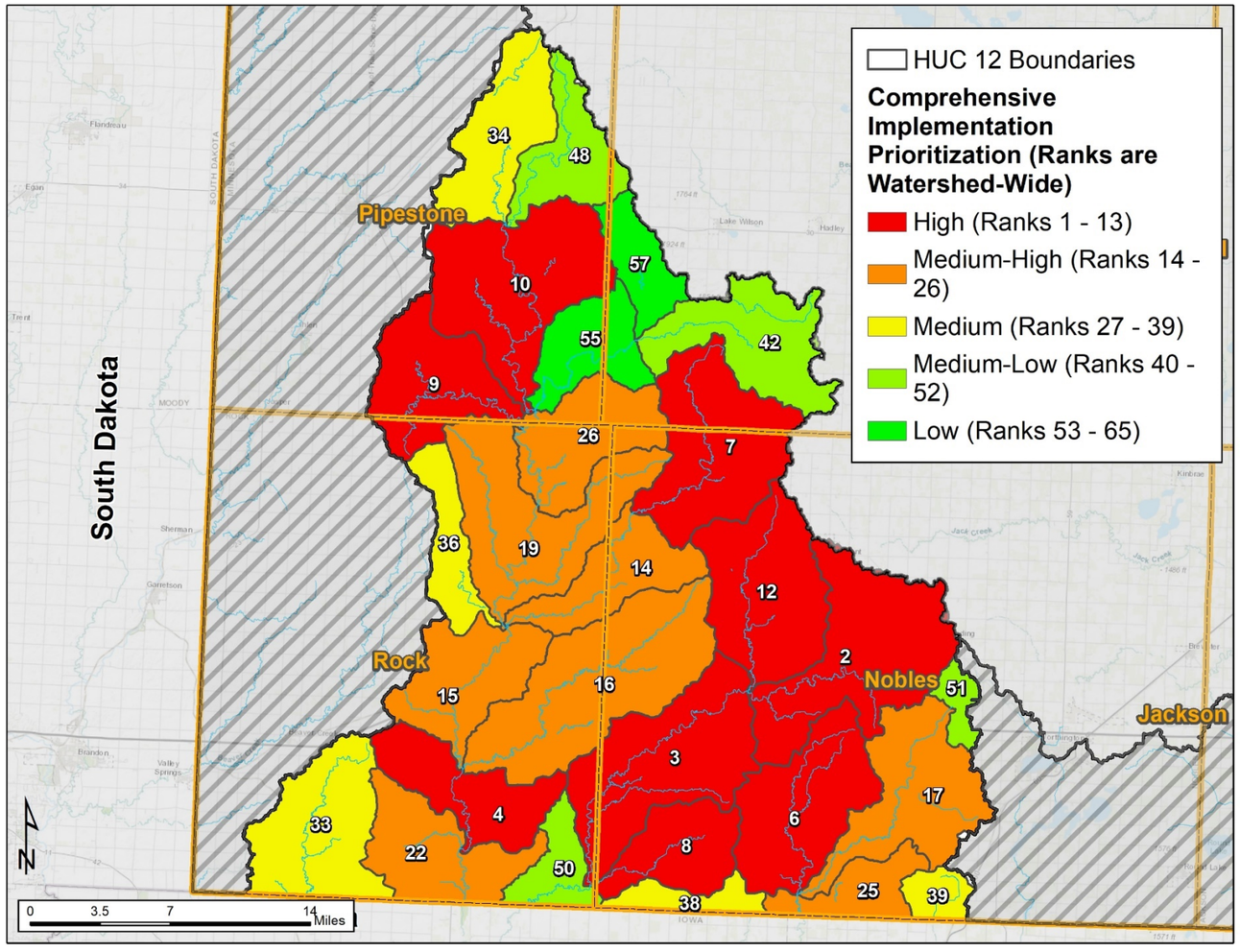
586,309 Acres

51.5% of Plan Area



Comprehensive Implementation Prioritization

The Rock River is the largest planning region within the Missouri River Watershed 1W1P planning area. As presented in the following pages, the planning region contains 14 stream reaches that are "nearly" or "barely" impaired, contains all or portions of nine Drinking Water Supply Management Areas, and contains cost-effective structural and management practices as part of the targeted implementation approach. Considering these and other factors (**Appendix O**), the image below shows the comprehensive implementation rank of subwatersheds (HUC 12 scale) within the Rock River planning region, relative to all other subwatersheds in the plan area.

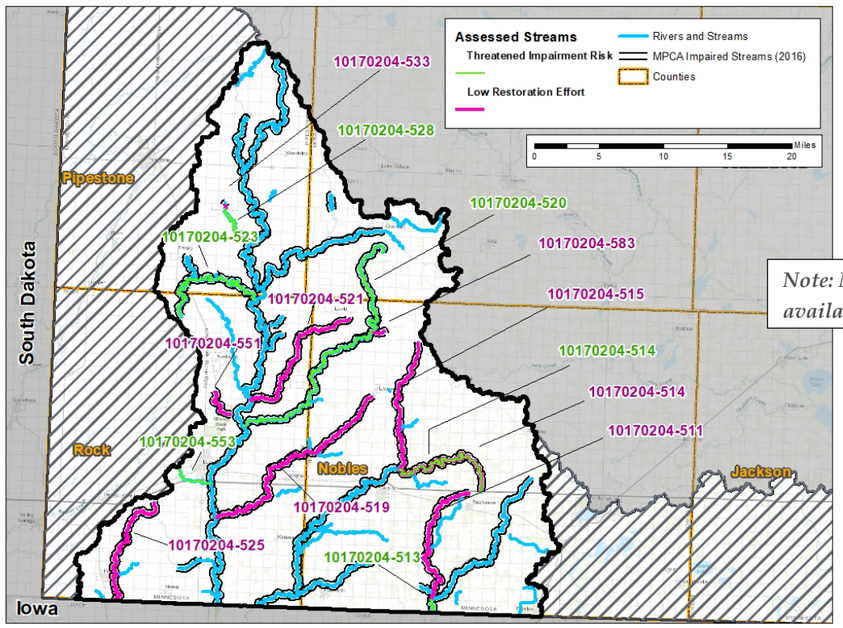


ROCK RIVER PLANNING REGION: SNAPSHOT OF CURRENT CONDITIONS

Surface Water Quality

The highest priority implementation efforts aimed at protecting or restoring streams reaches are targeted toward those streams that are nearly (threatened impairment risk) or barely (low restoration effort) impaired. Streams within the Rock River (HUC 10170204) planning region have been assessed by water quality parameter based on available water quality monitoring data, with full results presented in **Section 3**. Streams that are nearly or barely impaired for a particular water quality parameter are summarized in the table below. Please note that a stream could be listed as "impaired" for one parameter (e.g. turbidity) but merit protection for another (e.g. total phosphorus).

Stream ID	Impairment	Threatened Impairment Risk	Low Restoration Effort
-533	Fishes Bio; Invert Bio	*None*	Inorganic Nitrogen
-528	*None*	E. coli	*None*
-523	Fishes Bio; Invert Bio, E. coli, TSS	Total Suspended Solids (TSS)	*None*
-521	E. coli	*None*	Inorganic Nitrogen
-551	E. coli	*None*	Total Suspended Solids
-520	Fishes Bio; Invert Bio, E. coli, TSS	Total Phosphorus (TP), TSS	*None*
-583	Invert Bio	*None*	Inorganic Nitrogen, TSS
-553	*None*	E. coli	*None*
-525	Fishes Bio; Invert Bio, E. coli, TSS	*None*	Inorganic Nitrogen
-519	Fishes Bio; Invert Bio, E. coli, TSS	*None*	Inorganic Nitrogen
-515	Fishes Bio; Invert Bio, E. coli	*None*	Inorganic Nitrogen
-514	Fishes Bio; Invert Bio, E. coli, TSS	Inorganic Nitrogen	Total Suspended Solids
-511	Fishes Bio; Invert Bio, TSS	*None*	Inorganic Nitrogen
-513	Fishes Bio; Invert Bio, E. coli, TSS	Inorganic Nitrogen	*None*

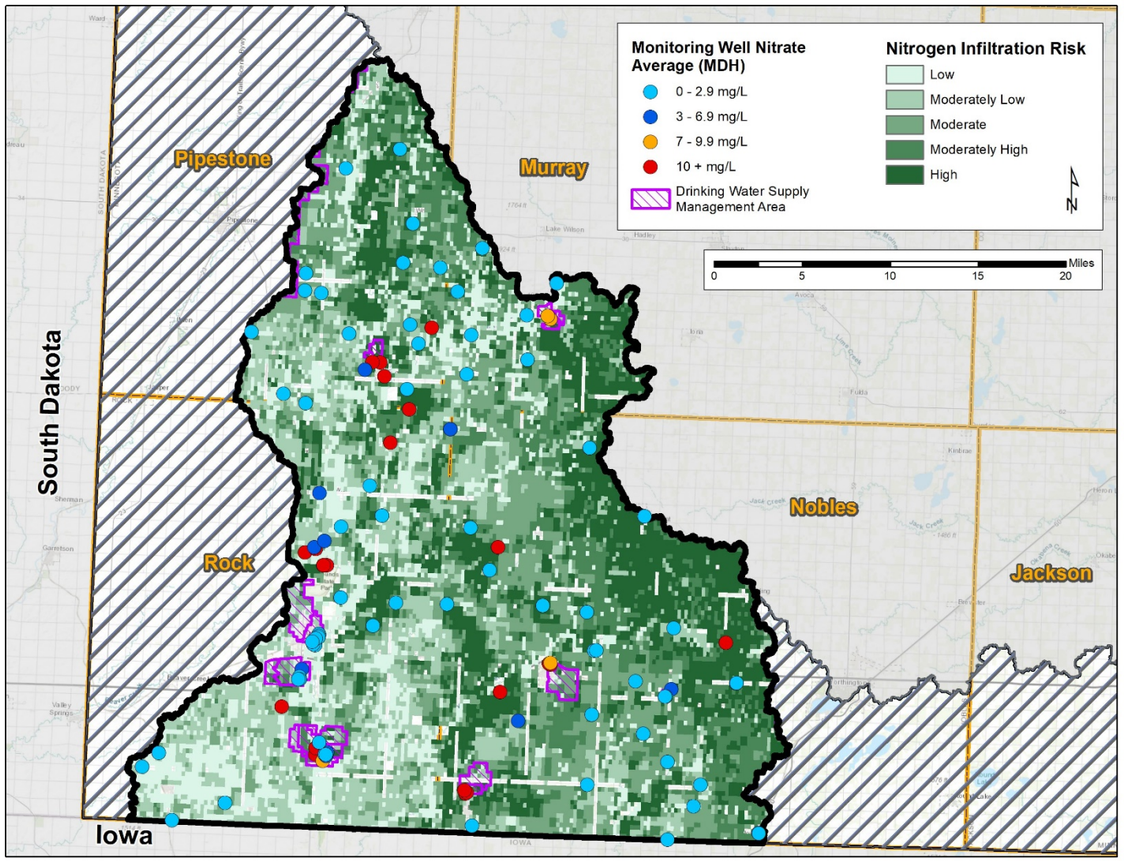


Note: Monitoring data is not available for all streams.

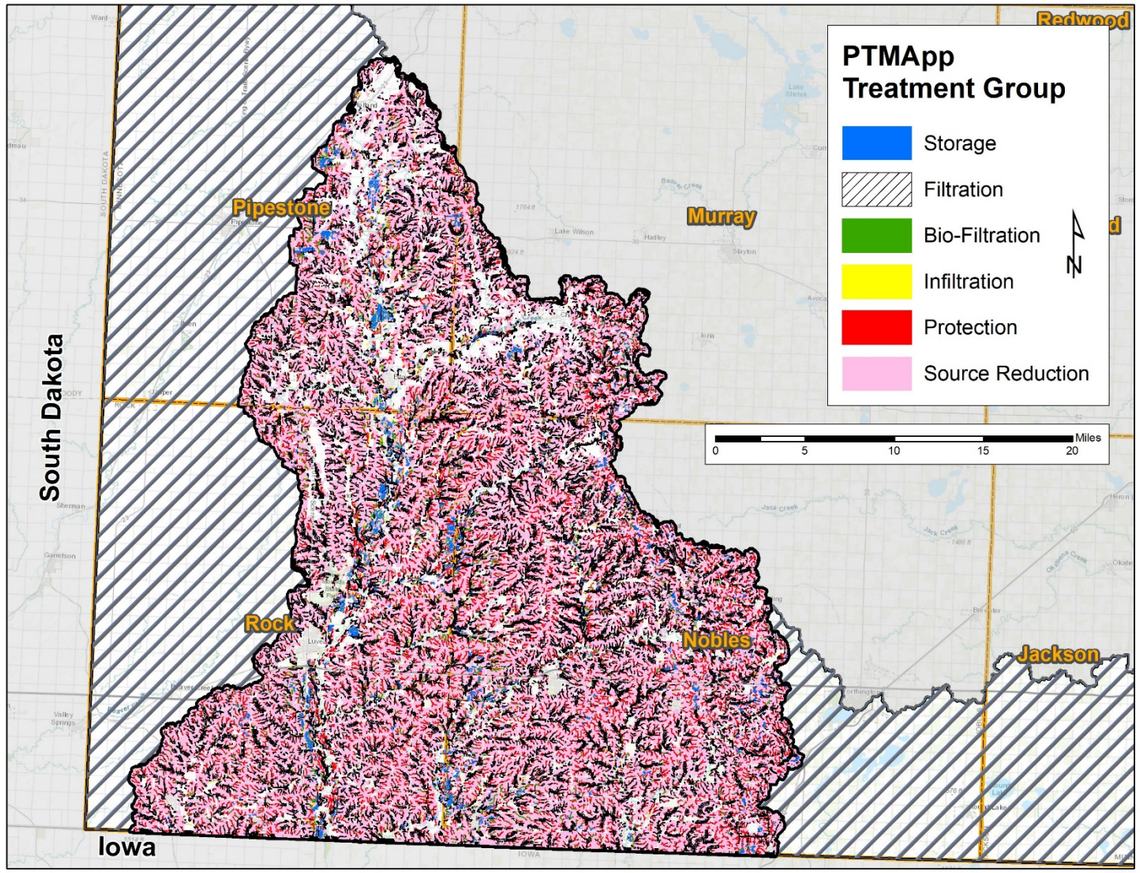
Groundwater

Several monitoring wells exist in the Rock River planning region. These are useful to understand where to target protection and restoration efforts focusing on groundwater resources. The highest priority for protection efforts occurs when nitrate-nitrogen concentrations represent a possible future health concern (≥ 7 mg/l to < 10 mg/l, shown by **orange** dot). The highest priority for restoration efforts occur when nitrate-nitrogen concentrations currently represent a health concern (≥ 10 mg/l, shown by **red** dot).

There are 9 Drinking Water Supply Management Areas (DWSMAs) partially or entirely within the Rock planning region (shown in **purple**). Risk should be managed within these areas to protect public water supplies. One means of managing risk within DWSMAs is through implementation of structural or management practices that promote soil health and nutrient management (e.g. cover crops, nutrient management plans, perennial crops) in areas at the highest risk of nitrate-nitrogen infiltration. Areas of high risk are shown through the Nitrogen Infiltration Risk Map. Areas of low risk may be targeted for structural and management practices to promote groundwater recharge of clean water supplies.



ROCK RIVER PLANNING REGION: TECHNICALLY FEASIBLE STRUCTURAL AND MANAGEMENT PRACTICES



Feasible Structural and Management Practices

	PTMApp Treatment Group	Practice Type		Number in Planning Region
		Structural	Management	
	Storage *(e.g. ponds, WASCOBs)*	●		**3,558**
	Filtration *(e.g. filter strips, grassed waterways)*	●		**14,667**
	Bio-Filtration *(e.g. bioreactors, saturated buffers)*	●		**4,248**
	Infiltration *(e.g. infiltration trenches)*	●		**1,044**
	Protection *(e.g. stream protection, critical area planting)*	●		**10,834**
	Source Reduction *(e.g. cover crops, conservation tillage)*		●	**14,581**

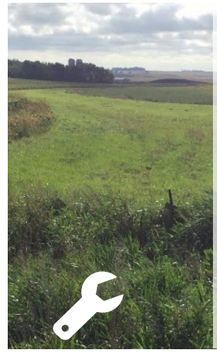
Feasible Structural and Management Practices in the Rock River

Implementation of structural and management practices make progress toward several plan measurable goals. There are many locations feasible for implementation of these practices within the Rock River planning region. Locations technically feasible for structural and management practices are summarized and shown in the table and map to the left.

There are many more practices summarized here than can realistically be implemented within the 10-year lifespan of this plan. The number and type of practices which can be implemented is largely influenced by the amount of funding available, and by what practices are most locally accepted by the community for voluntary implementation. For purpose of this plan, this large list of feasible practices is narrowed down by identifying what practices will be the focus of plan implementation efforts assuming funding for implementation largely remains unchanged from current levels. These practices are part of the "**targeted implementation approach**," and are included in the targeted implementation schedule.

Structural Practices in the Targeted Implementation Approach

As of 2017, approximately $813,000 per year is spent in the Rock River planning region on structural practices alone. The most locally accepted structural practices for voluntary implementation efforts are storage practices (WASCOBs and terraces) and filtration practices (grassed waterways), encompassing 69% and 31% of all structural practice implementation costs respectively. Therefore, prioritized structural practices in the targeted implementation approach are the most cost-effective[1] storage and filtration practices within the Rock River planning region, up to a maximum annual cost of $813,000.

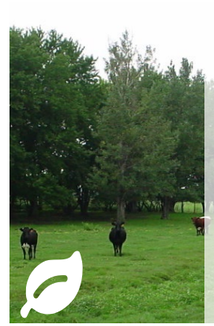


Quick Summary:

- WASCOBS, terraces, and waterways
- Targeted to most cost-efficient practices
- **Maximum annual cost = $813,000**

Management Practices in the Targeted Implementation Approach

As of 2017, approximately $204,000 per year is spent in the planning region on management practices alone. Practices that increase soil health (cover crops, tillage management) and implementing rotational grazing methods are the primary focus of the targeted implementation approach within the Rock River planning region.



Quick Summary:

- Cover crops, tillage management, rotational grazing
- Targeted to areas of highest soil loss
- **Maximum annual cost = $204,800**

[1] *Based upon the estimated cost per unit of sediment and nutrient which no longer reach the edge of the field following implementation.*

ROCK RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR STRUCTURAL PRACTICES

Location: Rock River Planning Region (586,309 Acres)

Action Level*	PTMApp	Action #		Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline: 2019-20	2021-22	2023-24	2025-26	2027-28	Implementation Responsibility: Lead	Lead Entity	Partner	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage/ Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Storage*	RR SP-1	Implement practices to store excess water, such as **WASCOBS, terraces, and grade stabilization structures.**	**T: 461 Practices** *M: 710 Practices* *L: 949 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $560,941 / year** *M: $1,121,000 / year* *L: $1,661,700 / year*	x	x	x	x	x	Local	SWCD	NRCS				x	x		x		x	x									
		RR SP-2	Implement practices to store excess water that provide a minimum 10-year protection for agricultural lands, including **upland and floodplain storage projects, retention ponds**, conservation, and/or flowage easements.						x		x	Local	SWCD	NRCS				x	x		x		x	x									
		RR SP-3	Create or restore **wetlands**.				x	x	x	x	x	Local	SWCD	NRCS	x		x	x	x		x		x	x	x								
T	*Filtration*	RR SP-4	Implement practices (e.g. **filter strips, grassed waterways**) that reduce sediment and nutrient loading to waterbodies by treating surface runoff before entering ditches and streams.	**T: 250 Practices** *M: 471 Practices* *L: 712 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $252,017 / year** *M: $500,600 / year* *L: $753,700 / year*	x	x	x	x	x	Local	SWCD	NRCS				x	x	x	x		x	x		x	x	x					x
		RR SP-5	Implement practices within riparian areas (e.g. **riparian herbaceous cover, riparian forest buffer**) that improve connectivity within riparian corridors and floodplains.					x		x		Local	SWCD	NRCS, DNR, NGOs, USFWS				x	x	x	x		x	x		x	x						x
		RR SP-6	**Implement urban BMPs** that reduce the delivery of sediment, nutrients, and pesticide loads to surface water by treating runoff through infiltration, filtration, and uptake.							x	x	Local	City	SWCD, WD, MPCA, BWSR				x	x		x		x	x									
M	*N/A*	RR SP-7	Promote practices that enhance hydrologic storage and stream stability by increasing **perennial native vegetation in upland and riparian areas.**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS				x						x	x	x							x
M		RR SP-8	Implement practices which control ground water elevation, reduce water volume yield, and remove pollutants before entering ditches, streams, and groundwater **(e.g. drainage water management, conservation drainage, woodchip bioreactor, saturated buffers).**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	County, Township, NRCS	x		x	x	x		x		x			x			x				
M		RR SP-9	Implement **animal waste management systems** and manage water using **runoff control measures** in accordance with accepted design standards and practice.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, County Crop Advisors	x	x		x	x	x	x		x								x		
M		RR SP-10	Inspect, maintain and **improve the integrity of existing urban structures** that route and treat stormwater runoff to prevent downstream stream erosion and flooding and improve water quality.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City, SWCD, WD	County, MPCA, ACOE				x	x		x		x	x									
M		RR SP-11	**Promote urban practices for lawn and managed green spaces** (parks, golf courses) that include soil testing and proper use, amount, method and timing of fertilizer/pesticide application.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City	SWCD, WD, County, MPCA				x	x		x		x	x									
L		RR SP-12	Facilitate **protection of natural and pervious lands** through such programs as acquisition, property tax credits and easements (e.g. CREP, CRP, RIM, etc.).	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD / WD	DNR, TNC, NRCS, USFWS, NGO, PWS	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
L		RR SP-13	Implement **protection of lands** identified as habitat complexes in the Prairie Coteau Conservation Focus Area and/or areas identified as MBS Sites of Biodiversity Significance and Native Plant Communities, through such programs as acquisition, property tax credits and easements.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD / WD	NRCS, DNR				x						x			x			x			
L		RR SP-14	Implement practices **that promote recharge (e.g. infiltration trench).**	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	County, City, NRCS, WD,			x							x				x					

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

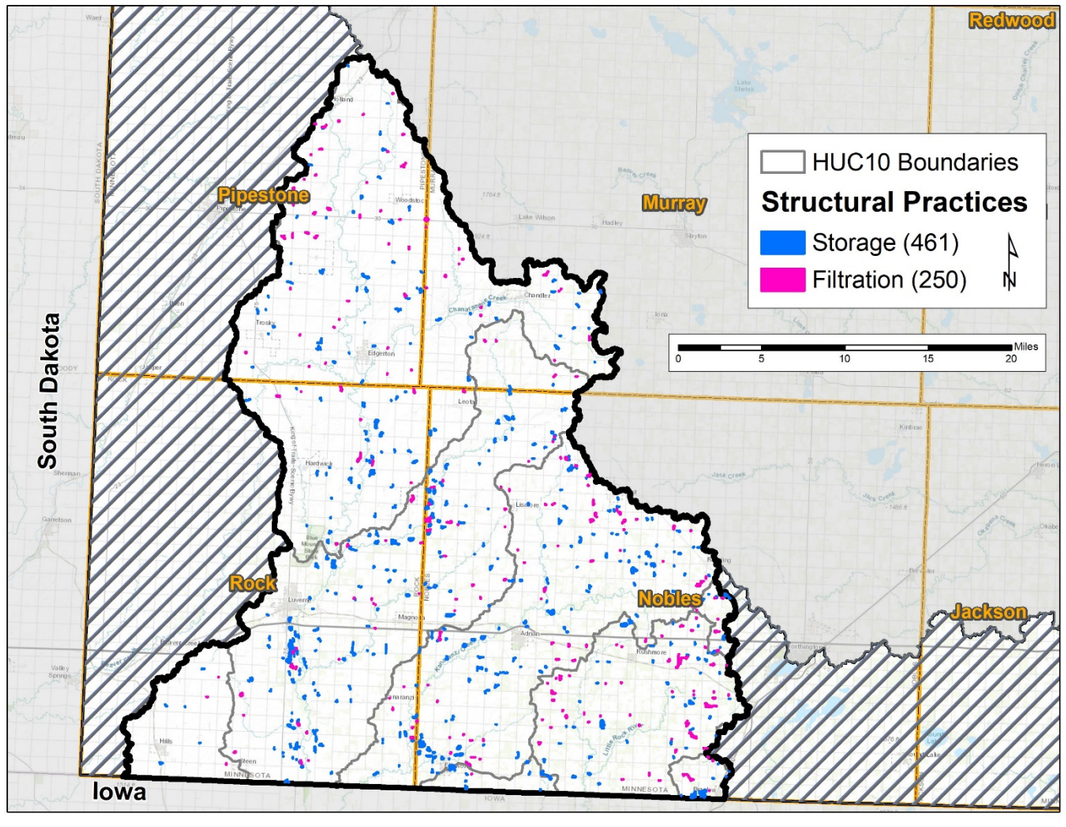
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

ROCK RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST STRUCTURAL PRACTICES

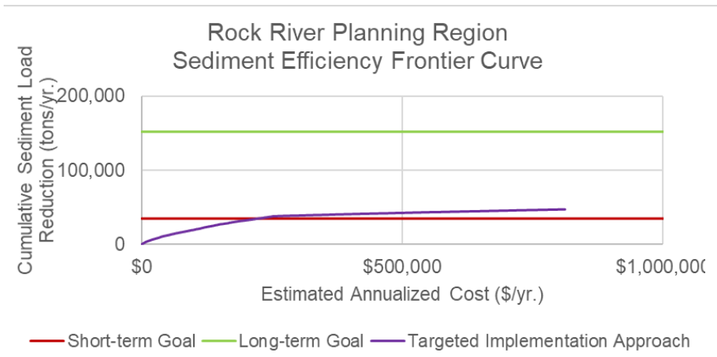
Locations for Targeting Implementation

There are **461 storage practices and 250 filtration practices in the Rock River planning region 10-year targeted implementation approach**. Shown below are the locations on the landscape of the best, most cost-effective practices for implementation. Practice locations shown do not consider existing practices or factors like landowner willingness.

Shown to the right are the anticipated costs and water quality value of implementing these 711 structural practices in the Rock River targeted implementation approach. Shown in the charts with horizontal lines are the short-term and long-term sediment, total phosphorus, and total nitrogen measurable goals for the planning region. Progress toward goals accomplished through the 711 practices in the targeted implementation approach is shown by the purple line.



Anticipated Progress Toward Goals from Implementation



Short-Term Measurable Goal

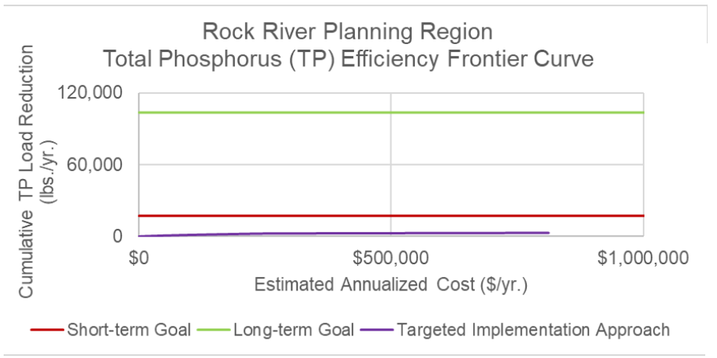
Clarity

15%

Sediment 15% Reduction

Existing Loads

Existing Load: 233,893 tons/yr.
Target Load Reduction: 35,084 tons/yr.
Anticipated Load Reduction: 47,394 tons/yr.
Progress Toward Short-Term Goal: 135%



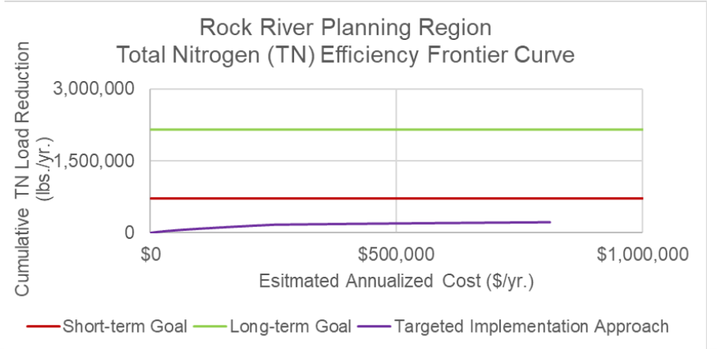
Short-Term Measurable Goal

P

10%

Total Phosphorus 10% Reduction

Existing Load: 172,711 lbs./yr.
Target Load Reduction: 17,271 lbs./yr.
Anticipated Load Reduction: 3,011 lbs./yr.
Progress Toward Short-Term Goal: 17%



Short-Term Measurable Goal

N

10%

Total Nitrogen 10% Reduction

Existing Loads

Existing Load: 7,180,413 lbs./yr.
Target Load Reduction: 718,041 lbs./yr.
Anticipated Load Reduction: 222,575 lbs./yr.
Progress Toward Short-Term Goal: 31%

ROCK RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR MANAGEMENT PRACTICES

Location: Rock River Planning Region (586,309 Acres)

Action Level*	PTMApp	Action #	Management Practices	Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline: 2019-20	2021-22	2023-24	2025-26	2027-28	Implementation Responsibilities: Lead	Lead Entity	Partner	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Source Reduction*	RR MP-1	Implement practices which are focused on and maintain soil health, including but not limited to **conservation tillage and residue management, crop rotation methods, and/or the use of cover crops**.	**T: 3,139 Acres** *M: 6,273 Acres* *L: 222,776 Acres*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $204,000 / year** *M: $407,700 / year* *L: $14,480,440 / year*	x	x	x	x	x	Local	SWCD	NRCS, Crop Advisors, WD, PWS	x	x	x	x	x	x	x		x	x				-		-	x		
		RR MP-2	Use managed and **rotational grazing methods** to manage animal wastes and prevent livestock entry into surface waterbodies.				x	x	x	x	x	Local	SWCD / WD	MDA, NRCS, Extension				x	x	x				x		x		x				x	
		RR MP-3	**Encourage use of conservation easement programs** in marginal, erodible land, especially within DWSMAs and priority recharge areas within wellhead protection areas.				x	x	x	x	x	Local	SWCD	DNR, TNC, NRCS, USFWS, BWSR, PWS	x	x	x	x						x		x	x				x		
		RR MP-4	Provide one-on-one consultations with landowners and producers (i.e. **field walkovers**) about agricultural BMPs, field productivity benefits of BMPs, alternative crops and land uses, and available financial incentive options for funding them.				x	x	x	x	x	Local	SWCD	NRCS, MDA, Extension, WD, PWS	x	x	x	x	x	x	x		x	x				x		x				
		RR MP-5	Encourage the use of **precision agriculture** through education, technical, and financial assistance based on the economic and environmental capacity of each area of a field.						x	x	x	Local	SWCD	NRCS, Extension, Crop Advisors, MDA, PF, PWS	x	x		x	x	x	x		x					x				x		
M	*N/A*	RR MP-6	Develop and implement **nutrient and/or manure management plans** for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	MDA, NRCS, Crop Advisors, Counties	x	x			x		x		x					x			x			
M	*N/A*	RR MP-7	Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation **irrigation water management practices**, such as variable rate application and low flow drop nozzles.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, County, Extension	x		x											x						
M	*N/A*	RR MP-8	**Develop a cost share** to supply landowners with dollars to implement strategies **prohibiting livestock access to streams, rivers, and lakes**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	County	SWCD, WD, DNR, BWSR, MDA, NRCS				x	x	x	x		x			x		x			x	x	
L	*N/A*	RR MP-9	Promote the development of **pesticide management plans** which follow operational best management practice recommendations, including Licensed Applicators Statute.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, Crop advisors													x					x		
L	*N/A*	RR MP-10	**Protect and restore grassland and forested areas** with focused effort on increasing native species populations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	TNC, BWSR, PF, County, DNR				x						x				x						

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

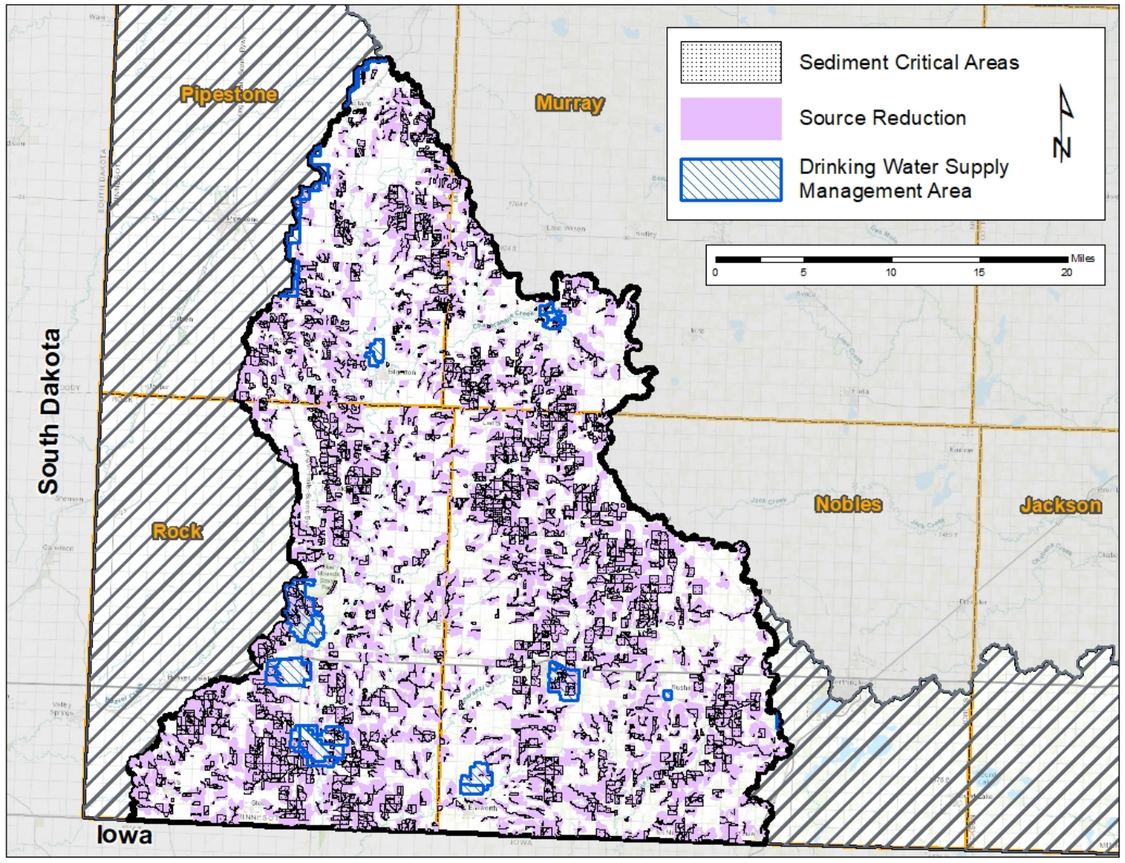
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

ROCK RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST MANAGEMENT PRACTICES

Locations for Targeting Implementation

There are **3,139 acres of management practices in the Rock River planning region 10-year targeted implementation approach.** These management practices are geared toward improving soil health, and include practices like cover crops, tillage management, and rotational grazing methods.

Shown on the map below are the best fields for implementing management practices in the Rock River planning region. These fields are technically feasible for management practices (referred to as "source reduction" within PTMApp). In addition, these fields have disproportionately high sediment loss defined as sediment critical areas and would benefit the most from management practice implementation.



Anticipated Progress Toward Goals from Implementation

Below is a summary of the water quality benefits of implementing management practices within the targeted implementation approach for the Rock River planning region.

Short-Term Measurable Goal

Clarity — 15% — **Sediment**

15% Reduction

Existing Load: 233,893 tons/yr.
Target Load Reduction: 35,094 tons/yr.
Anticipated Load Reduction: 2,708 tons/yr.
Progress Toward Short-Term Goal: 7.7%

P — 10% — **Total Phosphorus**

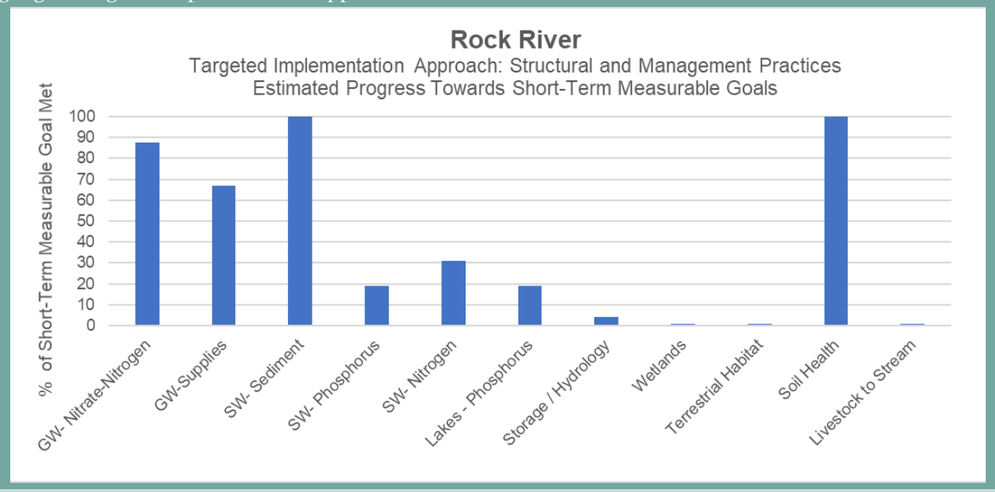
10% Reduction

Existing Load: 172,711 lbs./yr.
Target Load Reduction: 17,271 lbs./yr.
Anticipated Load Reduction: 219 lbs./yr.
Progress Toward Short-Term Goal: 1.3%

STRUCTURAL *AND* MANAGEMENT PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH:

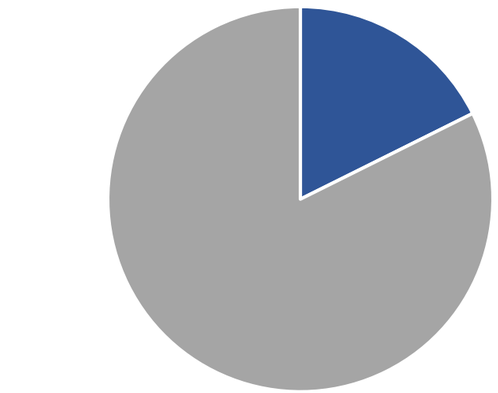
Combined Progress Toward Short-Term Measurable Goals

While it is important to understand the individual benefits of structural and management practices separately, it is also important to understand the cumulative benefits these practices can generate toward plan measurable goals. Shown in the figure below are all plan measurable goals that relate to the implementation of structural and management practices. The estimated cumulative benefit of implementing all structural and management practices in the Rock River planning region targeted implementation approach are shown.



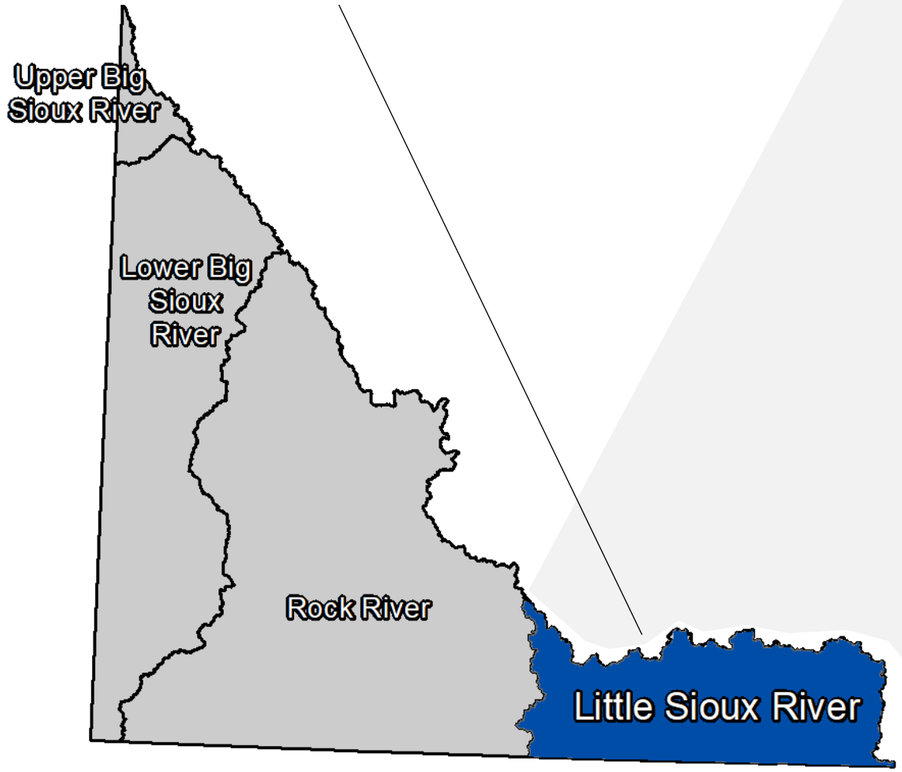
THE LITTLE SIOUX RIVER PLANNING REGION

Little Sioux River



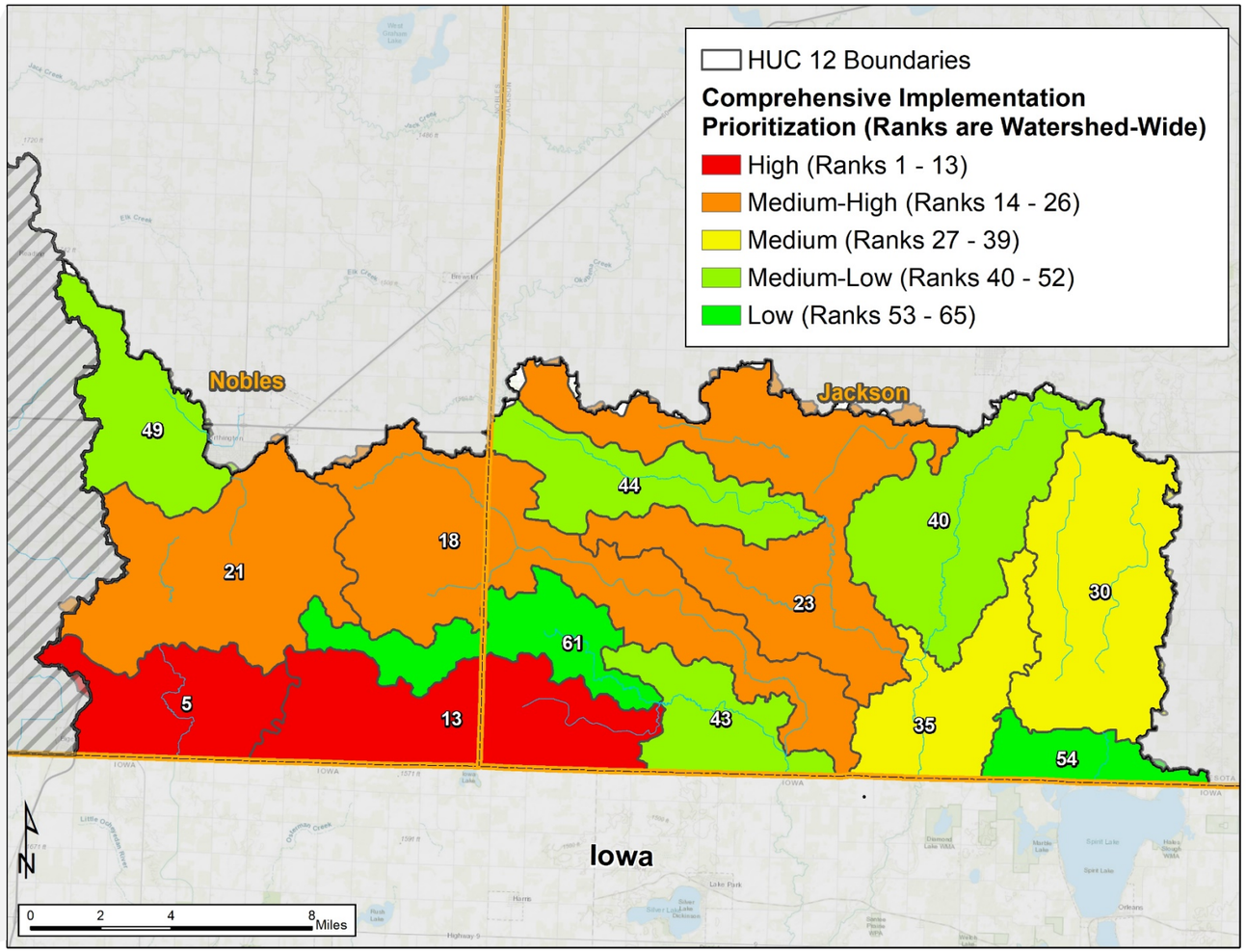
201,176 Acres

17.7% of Plan Area



Comprehensive Implementation Prioritization

The Little Sioux River is the second smallest planning region within the Missouri River Watershed 1W1P planning area. As presented in the following pages, the planning region contains four stream reaches that are "nearly" or "barely" impaired, contains all or portions of three Drinking Water Supply Management Areas, and contains cost-effective structural and management practices as part of the targeted implementation approach. Considering these and other factors (**Appendix O**), the image below shows the comprehensive implementation rank of subwatersheds (HUC 12 scale) within the Little Sioux River planning region, relative to all other subwatersheds in the plan area.

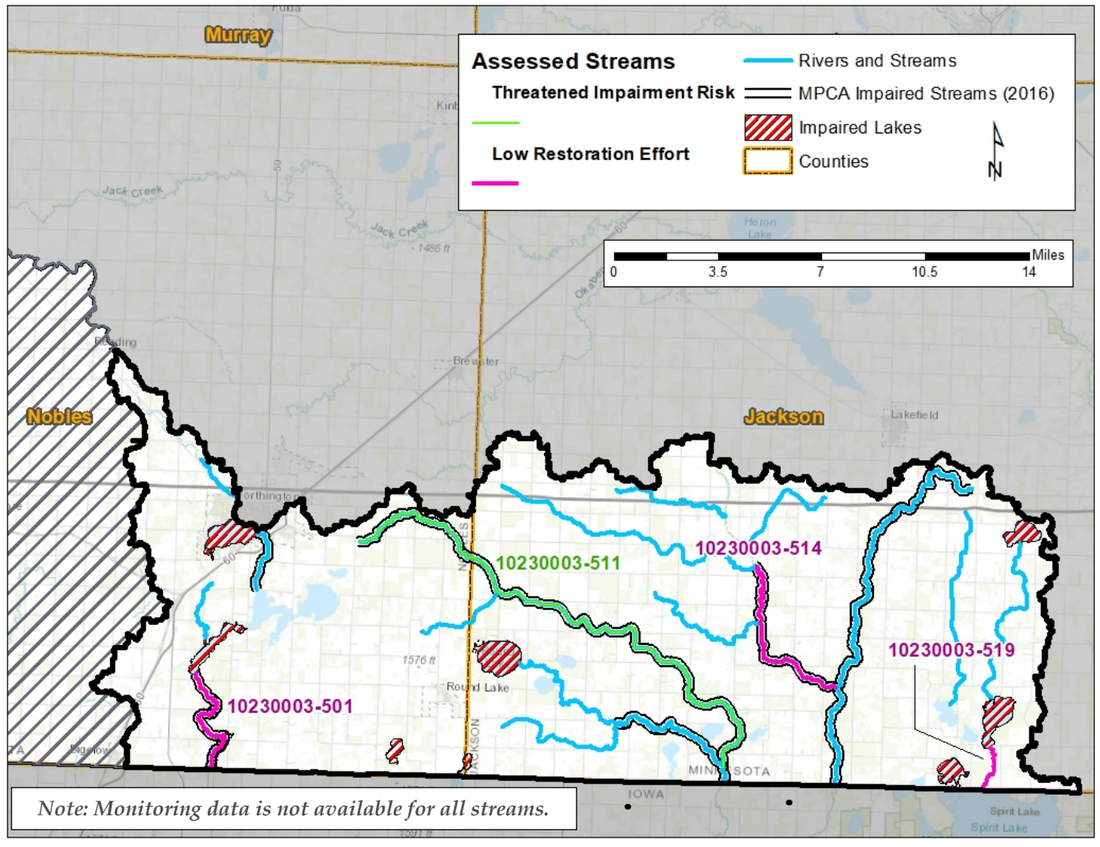


LITTLE SIOUX PLANNING REGION: SNAPSHOT OF CURRENT CONDITIONS

Surface Water Quality

The highest priority implementation efforts aimed at protecting or restoring streams reaches are targeted toward those streams that are nearly (threatened impairment risk) or barely (low restoration effort) impaired. Streams within the Little Sioux River (HUC 1023003) planning region have been assessed by water quality parameter based on available water quality monitoring data, with full results presented in **Section 3**. Streams that are nearly or barely impaired for a particular water quality parameter are summarized in the table below. Please note that a stream could be listed as "impaired" for one parameter (e.g. turbidity) but merit protection for another (e.g. total phosphorus).

Stream ID	Impairment	Threatened Impairment Risk	Low Restoration Effort
-501	Fishes Bio; Invert Bio	*None*	Total Suspended Solids
-511	E. coli; TSS	Total Suspended Solids	*None*
-514	E. coli	*None*	Total Suspended Solids
-519	*None*	*None*	Total Phosphorus

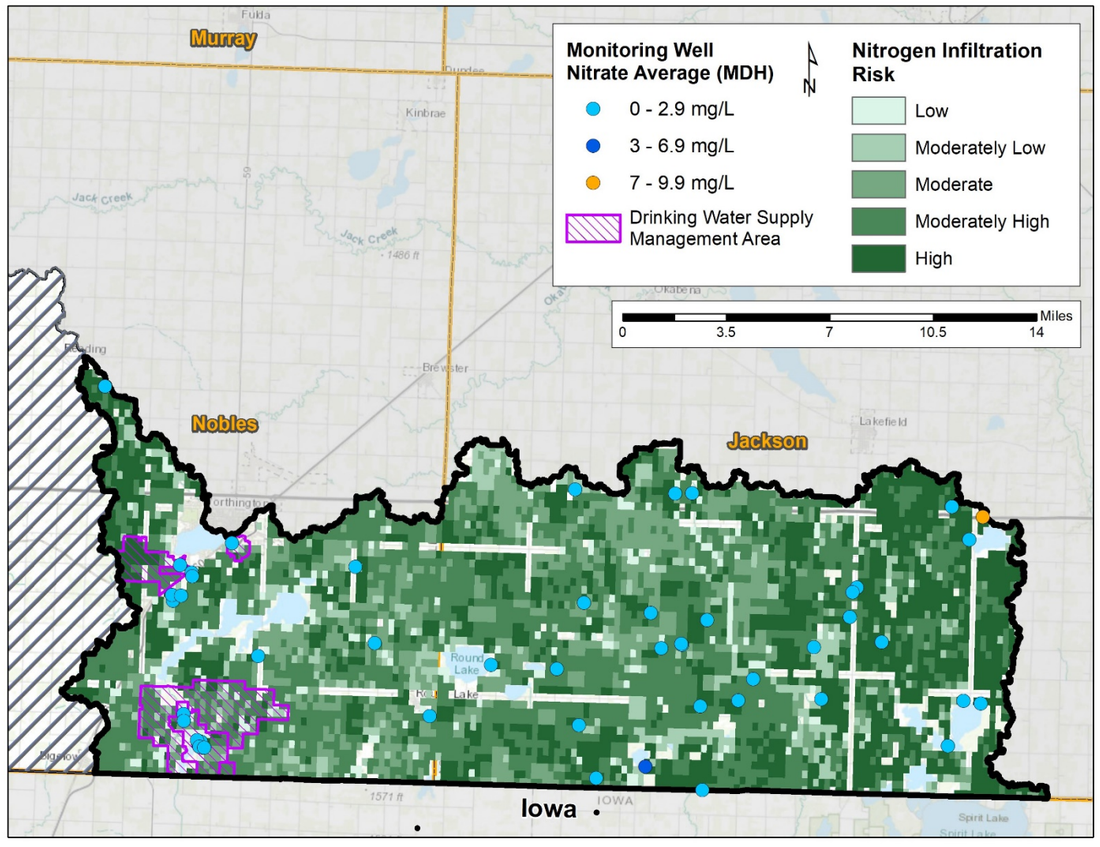


Note: Monitoring data is not available for all streams.

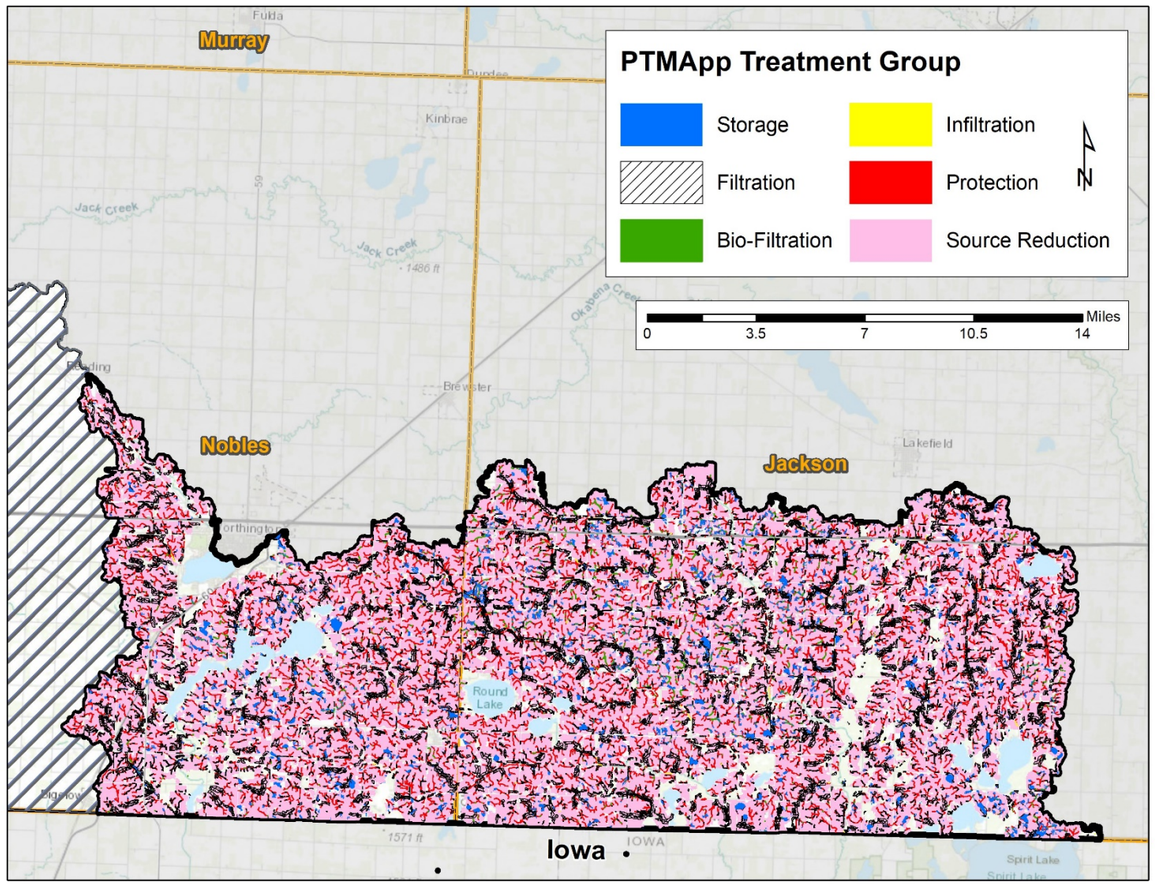
Groundwater

Several monitoring wells exist in the Little Sioux River planning region. These are useful to understand where to target protection and restoration efforts focusing on groundwater resources. The highest priority for protection efforts occurs when nitrate-nitrogen concentrations represent a possible future health concern (≥ 7 mg/l to < 10 mg/l, shown by **orange** dot). One well in the northeast corner of the Little Sioux planning region falls within this average nitrate-nitrogen concentration range, meriting high-priority protection efforts.

There are 3 Drinking Water Supply Management Areas (DWSMAs) partially or entirely within the Little Sioux River planning region (shown in **purple**). Risk should be managed within these areas to protect public water supplies. One means of managing risk within DWSMAs is through implementation of structural or management practices that promote soil health and nutrient management (e.g. cover crops, nutrient management plans, perennial crops) in areas at the highest risk of nitrate-nitrogen infiltration. Areas of high risk are shown through the Nitrogen Infiltration Risk Map. Areas of low risk may be targeted for structural and management practices to promote groundwater recharge of clean water supplies.



LITTLE SIOUX PLANNING REGION: FEASIBLE LOCATIONS FOR STRUCTURAL AND MANAGEMENT PRACTICES



Feasible Structural and Management Practices

	PTMApp Treatment Group	Practice Type		Number in Planning Region
		Structural	Management	
	Storage *(e.g. ponds, WASCOBs)*	●		**2,206**
	Filtration *(e.g. filter strips, grassed waterways)*	●		**4,961**
	Bio-Filtration *(e.g. bioreactors, saturated buffers)*	●		**1,207**
	Infiltration *(e.g. infiltration trenches)*	●		**141**
	Protection *(e.g. stream protection, critical area planting)*	●		**3,609**
	Source Reduction *(e.g. cover crops, conservation tillage)*		●	**4,911**

Feasible Structural and Management Practices in the Little Sioux River

Implementation of structural and management practices make progress toward several plan measurable goals. There are many locations feasible for implementation of these practices within the Little Sioux River planning region. Locations technically feasible for structural and management practices are summarized and shown in the table and map to the left.

There are many more practices summarized here than can realistically be implemented within the 10-year lifespan of this plan. The number and type of practices which can be implemented is largely influenced by the amount of funding available, and by what practices are most locally accepted by the community for voluntary implementation. For purpose of this plan, this large list of feasible practices is narrowed down by identifying what practices will be the focus of plan implementation efforts assuming funding for implementation largely remains unchanged from current levels. These practices are part of the "targeted implementation approach," and are included in the targeted implementation schedule.

Structural Practices in the Targeted Implementation Approach

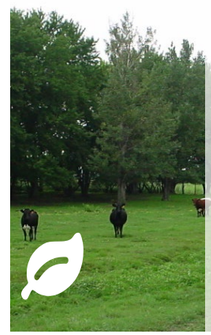
As of 2017, approximately $287,000 per year is spent in the Little Sioux River planning region on structural practices alone. The most locally accepted structural practices for voluntary implementation efforts are filtration practices (grassed waterways and filter strips) and storage practices (WASCOBs and grade stabilization), encompassing 60% and 40% of all structural practice implementation costs respectively. Therefore, prioritized structural practices in the targeted implementation approach are the most cost-effective[1] filtration and storage practices within the Little Sioux River planning region, up to a maximum annual cost of $287,000.

Quick Summary:

- Waterways, filter strips, WASCOBS, and grade stabilization
- Targeted to most cost-efficient practices
- **Maximum annual cost = $287,000**

Management Practices in the Targeted Implementation Approach

As of 2017, approximately $72,000 per year is spent in the planning region on management practices alone. Practices that increase soil health (cover crops, tillage management) and implementing rotational grazing methods are the primary focus of the targeted implementation approach within the Little Sioux River planning region.



Quick Summary:

- Cover crops, tillage management, rotational grazing
- Targeted to areas of highest soil loss
- **Maximum annual cost = $72,000**

[1] *Based upon the estimated cost per unit of sediment and nutrient which no longer reach the edge of the field following implementation.*

LITTLE SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR STRUCTURAL PRACTICES

Location: Little Sioux River Planning Region (201,176 Acres)

Action Level*	PTMApp	Action #		Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline					Implementation Responsibilities			Measurable Goals																	
							2019-20	2021-22	2023-24	2025-26	2027-28	Lead	Lead Entity	Partner	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Filtration*	LSR SP-1	Implement practices (e.g. **filter strips, grassed waterways**) that reduce sediment and nutrient loading to waterbodies by treating surface runoff before entering ditches and streams.	**T: 161 Practices** *M: 283 Practices* *L: 392 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $172,156 / year** *M: $342,200 / year* *L: $513,300 / year*	x	x	x	x	x	Local	SWCD	NRCS				x	x	x	x		x	x		x	x	x					x
		LSR SP-2	Implement practices within riparian areas (e.g. **riparian herbaceous cover, riparian forest buffer**) that improve connectivity within riparian corridors and floodplains.							x	x	Local	SWCD / WD	NRCS, DNR, NGOs, USFWS				x	x	x	x		x	x		x	x						x
		LSR SP-3	**Implement urban practices** that reduce the delivery of sediment, nutrients, and pesticide loads to surface water by treating runoff through filtration and uptake.							x	x	Local	City	SWCD, WD, County, MPCA, BWSR			x	x	x		x		x	x								
T	*Storage*	LSR SP-4	Implement practices to store excess water and stabilize ravines, gullies, and gully heads, such as **WASCOBS, terraces, and grade stabilization structures.**	**T: 70 Practices** *M: 99 Practices* *L: 133 Practices*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $114,770 / year** *M: $207,800 / year* *L: $330,000 / year*	x	x	x	x	x	Local	SWCD / WD	NRCS				x	x		x		x	x									
		LSR SP-5	Implement practices to store excess water, such as **retention ponds.**							x	x	Local	SWCD / WD	NRCS				x	x		x		x	x								
		LSR SP-6	Create or restore **wetlands**.				x	x	x	x	x	Local	SWCD	WDs, NRCS	x		x	x	x		x		x	x	x							
		LSR SP-7	Implement **drainage water management and conservation drainage practices** to control ground water elevation, reduce water volume yield, and remove pollutants from tile discharge prior to entering surface waters and groundwater.						x	x	x	Local	SWCD / WD	County, Township, NRCS	x		x	x	x		x		x			x			x			
		LSR SP-8	Implement practices that provide a minimum 10-year protection for agricultural lands, including **upland and floodplain storage** projects, conservation, and/or flowage easements.				x	x	x			Local	SWCD / WD	NRCS, DNR				x	x		x		x	x	x		x	x					
		LSR SP-9	Implement practices that **reduce infiltration** within Drinking Water Supply Management Areas (**DWSMAs**) or other priority areas that are "**high" nitrogen infiltration risk**.					x			x	Local	SWCD	County, City, NRCS, WD, MDH	x	x																	
		LSR SP-10	Implement practices that enhance hydrologic storage and stream stability by increasing **perennial native vegetation in upland and riparian areas.**				x	x	x			Local	SWCD / WD	NRCS				x							x	x	x						x
M	*N/A*	LSR SP-11	Implement practices **(**e.g. **wood chip bioreactor, saturated buffers**) that reduce nutrient loading to waterbodies by treating shallow sub-surface runoff.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS												x							
M		LSR SP-12	Implement **animal waste management systems** and manage water using **runoff control measures**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, County Crop Advisors	x	x		x	x	x	x		x								x		
M		LSR SP-13	Facilitate **protection of natural and pervious lands** through such programs as acquisition, property tax credits and easements (e.g. CREP, CRP, RIM, etc.).	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD / WD	DNR, TNC, NRCS, USFWS, PWS	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
L	*N/A*	LSR SP-14	Implement **protection of lands** identified as MBS Sites of Biodiversity Significance and Native Plant Communities, through such programs as acquisition, property tax credits and easements.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD / WD	NRCS, DNR				x						x			x				x		
L		LSR SP-15	Inspect, maintain and **improve the integrity of urban structures** that route and treat stormwater runoff to prevent downstream stream erosion, flooding, and improve water quality.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City, SWCD, WD	County, MPCA, ACOE				x	x		x		x	x									
L		LSR SP-16	**Promote urban BMPs for lawn and managed green spaces** that include soil testing and proper use, amount, method and timing of fertilizer/pesticide application.	*N/A: Moderate or Large Increased Funding Scenario*								Local	City	SWCD, WD, County, MPCA				x	x		x		x	x									
L		LSR SP-17	Implement practices **that promote recharge (e.g. infiltration trench)** within areas with **"low" nitrogen infiltration risk**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD / WD	County, City, NRCS, MDH			x						x				x						
L		LSR SP-18	Proactively **cleanout** build-up of **debris from control structures and stormwater ponds**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	DNR, County, City				x	x				x										

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

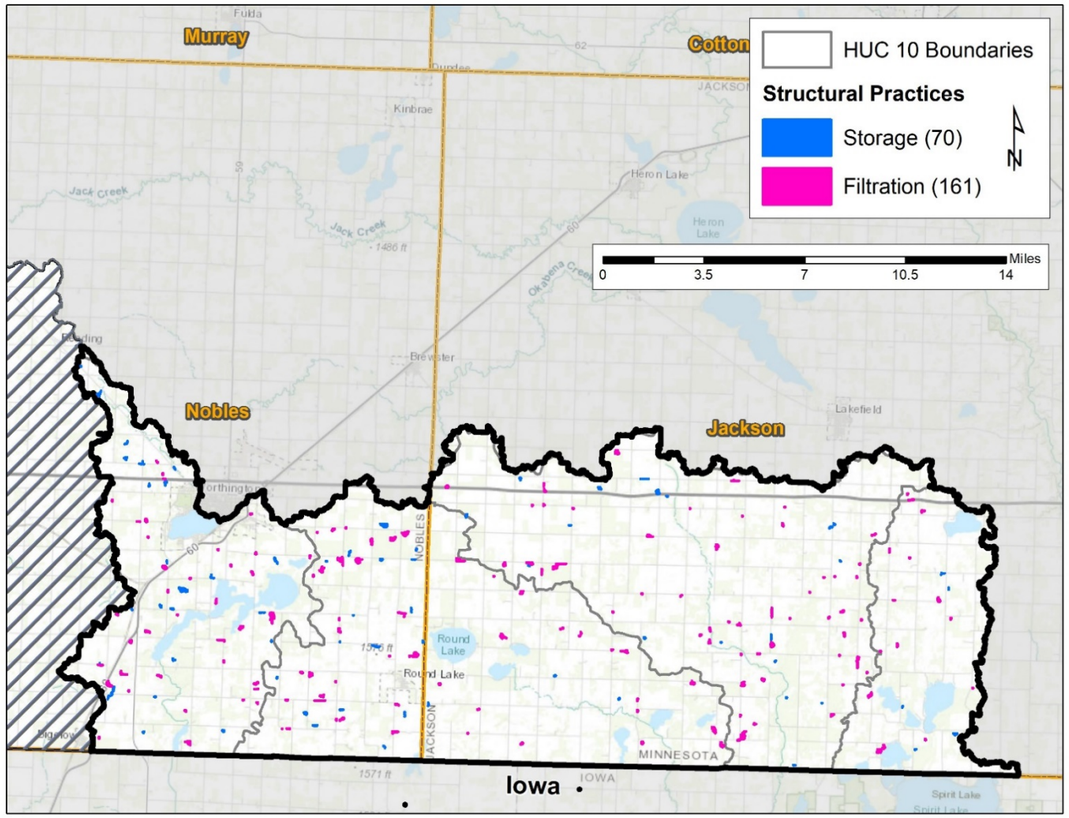
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

LITTLE SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST STRUCTURAL PRACTICES

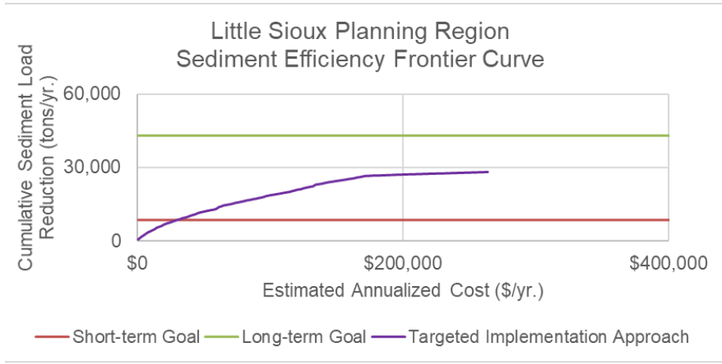
Locations for Targeting Implementation

There are **161 filtration practices and 70 storage practices in the Little Sioux River planning region 10-year targeted implementation approach**. Shown below are the locations on the landscape of the best, most cost-effective practices for implementation. Practice locations shown do not consider existing practices or factors like landowner willingness.

Shown to the right are the anticipated costs and water quality value of implementing these 231 structural practices in the Little Sioux River targeted implementation approach. Shown in the charts with horizontal lines are the short-term and long-term sediment, total phosphorus, and total nitrogen measurable goals for the planning region. Progress toward goals accomplished through 231 practices in the targeted implementation approach is shown by the purple line.



Anticipated Progress Toward Goals from Implementation



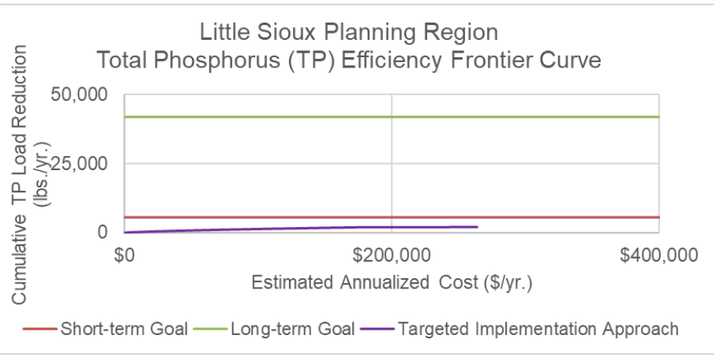
Short-Term Measurable Goal

Clarity

7%

Sediment 7% Reduction

Existing Load: 122,892 tons/yr.
Target Load Reduction: 8,602 tons/yr.
Anticipated Load Reduction: 28,158 tons/yr.
Progress Toward Short-Term Goal: 327%



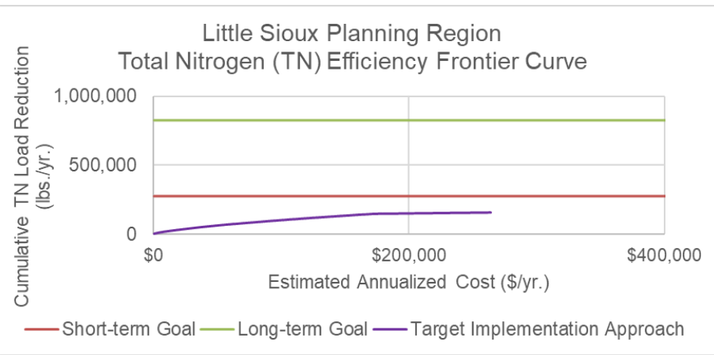
Short-Term Measurable Goal

P

10%

Total Phosphorus 10% Reduction

Existing Load: 55,893 lbs./yr.
Target Load Reduction: 5,589 lbs./yr.
Anticipated Load Reduction: 2,078 lbs./yr.
Progress Toward Short-Term Goal: 37%



Short-Term Measurable Goal

N

10%

Total Nitrogen 10% Reduction

Existing Load: 2,750,094 lbs./yr.
Target Load Reduction: 275,009 lbs./yr.
Anticipated Load Reduction: 157,294 lbs./yr.
Progress Toward Short-Term Goal: 57%

LITTLE SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION SCHEDULE FOR MANAGEMENT PRACTICES

Location: Little Sioux River Planning Region (201,176 Acres)

Action Level*	PTMApp	Action #	Management Practices	Measurable Output (For Lifespan of Plan)	Metric	Estimated Cost	Timeline: 2019-20	2021-22	2023-24	2025-26	2027-28	Implementation Responsibilities: Lead	Lead Entity	Partner	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	*Source Reduction*	LRS MP-1	Implement practices which are focused on and maintain soil health, including but not limited to **conservation tillage and residue management, crop rotation methods, and/or the use of cover crops**.	**T: 1,108 Acres** *M: 2,214 Acres* *L: 59,309 Acres*	*See Next Page for Targeted Implementation Approach Benefits*	**T: $72,000 / year** *M: $143,900 / year* *L: $3,855,085 / year*	x	x	x	x	x	Local	SWCD	NRCS, Crop Advisors, WD, PWS, MDA	x	x	x	x	x	x	x		x	x							x		
		LRS MP-2	Develop and implement **nutrient and/or manure management plans** for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.					x	x			Local	SWCD	MDA, NRCS, Crop Advisors, Counties	x	x			x		x		x					x			x		
		LRS MP-3	Use managed and **rotational grazing methods** to manage animal wastes and prevent livestock entry into surface waterbodies.						x			State	MDA	SWCD, WD, NRCS, Extension				x	x	x				x		x		x				x	
		LRS MP-4	**Encourage use of conservation easement programs** in marginal, erodible land, especially within DWSMAs and priority recharge areas within wellhead protection areas.					x		x		Local	SWCD	DNR, TNC, NRCS, USFWS, PWS	x	x	x	x						x		x	x				x		
		LRS MP-5	Provide one-on-one consultations with landowners and producers (i.e. **field walkovers**) about agricultural BMPs, field productivity benefits of BMPs, alternative crops and land uses, and available financial incentive options for funding them.					x	x	x	x	Local	SWCD	NRCS, MDA, Extension Service, WD, PWS	x	x	x	x	x	x	x		x	x				x		x			
		LRS MP-6	Encourage the use of **precision agriculture** through education, technical, and financial assistance based on the economic and environmental capacity of each area of a field.					x	x	x	x	Local	SWCD	NRCS, Extension Service, Crop Advisors, MDA, PWS	x	x		x	x	x	x		x					x			x		
L	*N/A*	LRS MP-7	Promote the development of **pesticide management plans** which follow operational best management practice recommendations, including Licensed Applicators Statute.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	NRCS, Crop advisors, MDA													x			x		
L		LRS MP-8	**Develop a cost share** to supply landowners with dollars to implement strategies **prohibiting livestock access to streams, rivers, and lakes**.	*N/A: Moderate or Large Increased Funding Scenario*								Local	County	SWCD, WD, DNR, BWSR, MDA, NRCS				x	x	x	x		x			x		x			x	x	
L		LRS MP-9	**Protect and restore grassland and forested areas** with focused effort on increasing native species populations.	*N/A: Moderate or Large Increased Funding Scenario*								Local	SWCD	TNC, BWSR, PF, County, DNR				x						x				x					

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

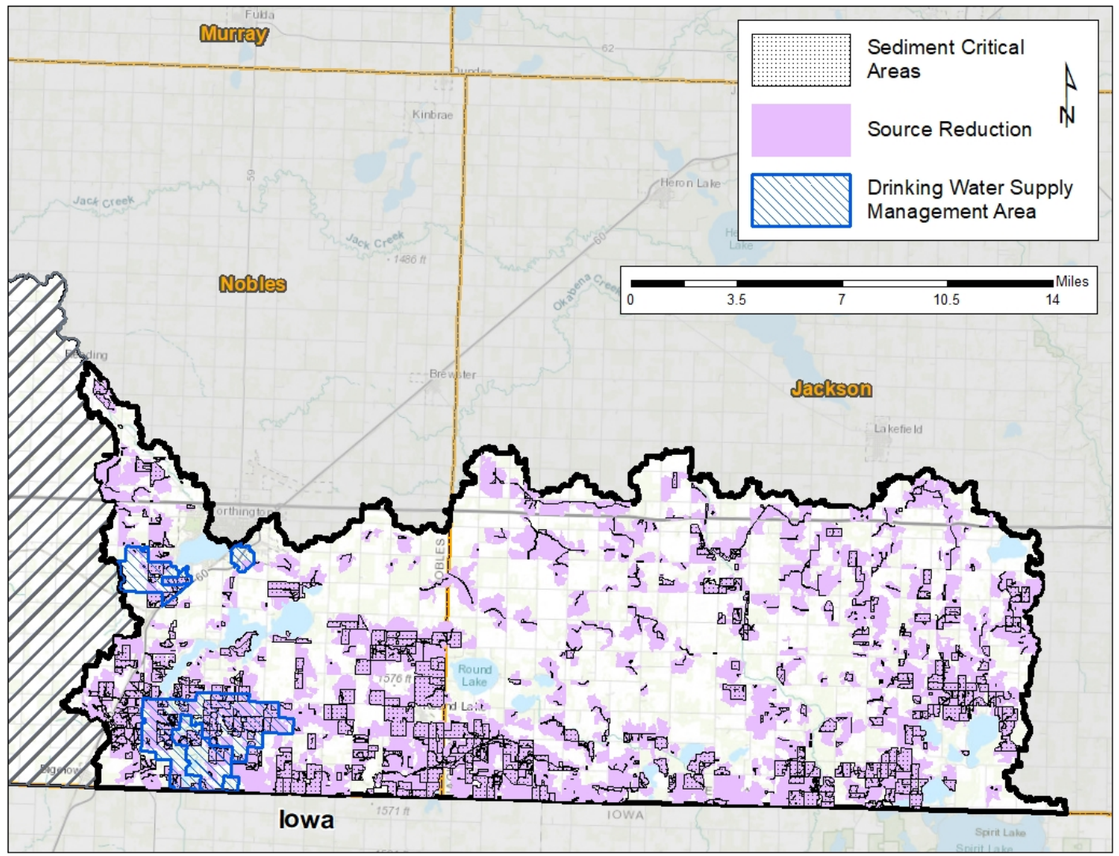
Note: Number and costs of practices in the moderate and large increased funding scenarios are larger in the table than they will be during implementation, as additional actions (labeled Action Level "M" or "L") will also be pursued.

LITTLE SIOUX RIVER PLANNING REGION: TARGETED IMPLEMENTATION APPROACH- BEST MANAGEMENT PRACTICES

Locations for Targeting Implementation

There are 1,108 acres of management practices in the Little Sioux River planning region 10-year targeted implementation approach. These management practices are geared toward improving soil health, and include practices like cover crops, tillage management, and rotational grazing methods.

Shown on the map below are the best fields for implementing management practices in the Little Sioux River planning region. These fields are technically feasible for management practices (referred to as "source reduction" within PTMApp). In addition, these fields have disproportionately high sediment loss defined as sediment critical areas and would benefit the most from management practice implementation.



Anticipated Progress Toward Goals from Implementation

Below is a summary of the water quality benefits of implementing management practices within the targeted implementation approach for the Little Sioux River planning region.

Short-Term Measurable Goal

Sediment
7% Reduction

Existing Load: 122,892 tons/yr.
Target Load Reduction: 8,602 tons/yr.
Anticipated Load Reduction: 831 tons/yr.
Progress Toward Short-Term Goal: 9.6%

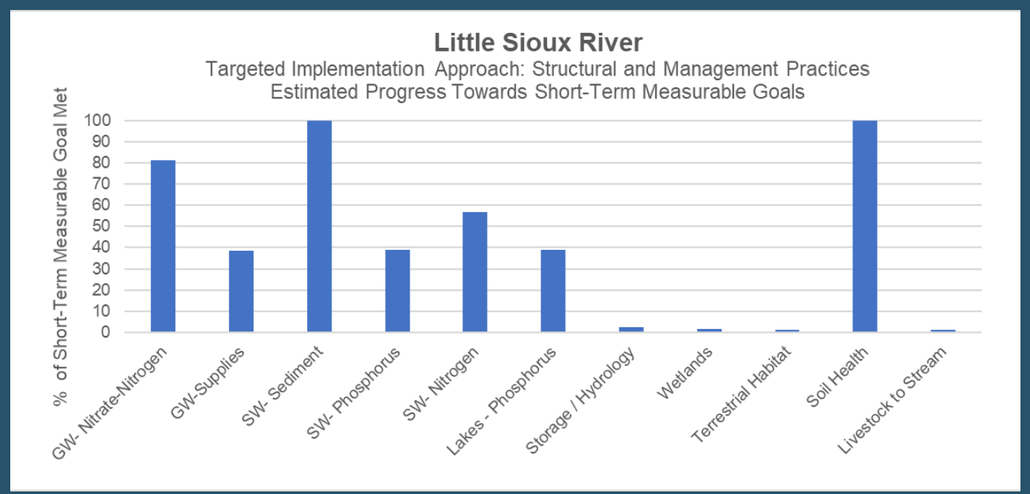
Total Phosphorus
10% Reduction

Existing Load: 55,893 lbs./yr.
Target Load Reduction: 5,589 lbs./yr.
Anticipated Load Reduction: 76 lbs./yr.
Progress Toward Short-Term Goal: 1.4%

STRUCTURAL *AND* MANAGEMENT PRACTICES IN THE TARGETED IMPLEMENTATION APPROACH:

Combined Progress Toward Short-Term Measurable Goals

While it is important to understand the individual benefits of structural and management practices separately, it is also important to understand the cumulative benefits these practices can generate toward plan measurable goals. Shown in the figure below are all plan measurable goals that relate to the implementation of structural and management practices. The estimated cumulative benefit of implementing all structural and management practices in the Little Sioux River planning region targeted implementation approach are shown.



4.4 WATERSHED-WIDE IMPLEMENTATION

Actions dealing with education and outreach, data gaps and research, regulatory, and capital improvement are implemented watershed-wide, to ensure consistency and effectiveness at a watershed-scale.

Presented in the following tables is the targeted implementation schedule for the implementation of these watershed-wide actions within the MRW plan area. Again, more actions are shown than can be realistically implemented as part of the targeted implementation approach. Actions that would be implemented if additional dollars become available are part of the moderate or large increased funding scenarios.

Table 4-4: Education and outreach actions to be implemented watershed-wide as part of the Missouri River Watershed Comprehensive Watershed Management Plan

Location: Watershed-Wide																																			
					Timeline					Implementation Responsibilities and Cost				Measurable Goals																						
Action Level*	Action #	Education and Outreach	Measurable Output	Metric	2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	EO-1	**Perform education and outreach initiatives** targeted to general public / lake shore owners **about threats of invasive species**, and ways to prevent / control them.	1 workshop / county / year	# of workshops	LSR	LSR	LSR	LSR	LSR	Local	SWCD, WD	County, WD, DNR, MDA	$10,000/ year								x						x					
T	EO-2	**Facilitate conversations** with local stakeholders and LGUs in regard to **increased watercraft inspections/monitoring at lake access sites** to promote prevention.	1 workshop / county / year	# of workshops	LSR	LSR	LSR	LSR	LSR	Local	SWCD, WD	County, WD, DNR	$5,000 / year								x						x					
T	EO-3	Encourage local governmental unit staff, local agency staff, and certified crop advisors to **attend trainings on newly developed technology and tools relevant to water resource management**.	1 training / year	# of trainings attended	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD	WD, County, City, Crop Advisors, DNR, MPCA, MDA, BWSR	Existing Budget														x	x				
T	EO-4	**Solicit stakeholder input about plan activities** from a diverse, interdisciplinary group that includes local planning and zoning staff in order **to integrate the economic, environmental and social policies into water resource management**.	1 workshop /year	# of workshops	UBSR, LBSR, RR	LBSR, RR	LBSR, RR, LSR	LBSR, RR	LBSR, RR, LSR	Local	SWCD / County / WD	BWSR, City, DNR, MPCA, MDA	$5,000														x					
T	EO-5	**Promote education and financial incentives for solid and hazardous waste disposal** to reduce chemical and nutrient contamination of water and illicit discharge.	Assistance / county	# of conversations had / dollars cost shared	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	State	MPCA	County, Cities	$5,000	x					x													
T	EO-6	**Promote dialog and relationship-building between agricultural industry and conservation professionals** to identify additional strategies to improve water quality	1 meeting / year	# of meetings	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD	MDA, NRCS, Crop Advisors, Extension	$5,000 / year	x													x					
T	EO-7	**Provide educational and technical assistance to landowners** regarding State and Federal programs to **preserve and restore wetlands**, including the State wetland-banking program.	Assistance / county	Conversations had / dollars cost shared	UBSR, LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	Local	SWCD	DNR, County, Academia, NRCS, USFWS BWSR	$7,500 / year				x	x		x		x	x	x			x					
T	EO-8	**Provide educational materials, consultations, demonstration projects, and workshops** to landowners, agricultural producers, and lake shore	1 workshop / county / year	# of workshops	UBSR, LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	Local	SWCD / WD	NRCS, Academia, Extension, BWSR, MDA, DNR,	$5,000 / year				x	x	x	x		x	x		x	x	x					x

Location: Watershed-Wide

Action Level*	Action #	Education and Outreach	Measurable Output	Metric	Timeline					Implementation Responsibilities and Cost				Measurable Goals																		
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
		owners about **compensation and incentive programs to promote riparian BMPs and shoreland BMPs** (including shoreland restoration and shoreland revegetation).										Crop Advisors																				
T	EO-9	**Provide cooperative education efforts and demonstration projects to promote agricultural BMP's** including, but not limited to: nutrient management, conservation tillage, buffers, soil testing, pesticide application, etc.	1 field demonstration event / county / year	# of field demonstration event	UBSR, LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	Local	SWCD / Extension Service	WD, NRCS, MDA, MPCA, Crop Advisors, PWS	$5,000 / year	x			x	x									x			x		
T	EO-10	**Provide technical or financial assistance to support citizen led initiatives**, such as Farmer Led Councils, lake associations, farmer mentor lists, and local advisory committees, that **promote conservation through peer-based outreach** and performance-based incentives.	2 Citizen-Led Initiative Groups	Each	UBSR, LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	Local	SWCD / WD	NRCS, MDA, Extension, MPCA, Crop Advisors, County, PWS	Existing Budget	x													x					
T	EO-11	**Promote education for solid and hazardous waste disposal** and **awareness of existing regulations**, rules, and ordinances pertaining to proper waste disposal to reduce chemical and nutrient contamination of water.	1 communication / county	# of communication outreach events	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, WD, MPCA	$500 / year																		x		
T	EO-12	**Implement an education/outreach campaign** for the responsible use, storage, and disposal of **pesticides.**	1 campaign	Each	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD	County, City, MDA, Extension	$2,000														x					
T	EO-13	**Promote judicious use of chemical management compounds (fertilizers, herbicides, pesticides, etc.)** to support the function of healthy riparian corridors.	1 communication / county	# of communication outreach events	UBSR, LBSR, RR, LSR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	State	MDA	Crop Advisors, SWCD, NRCS Extension	Existing Budget													x				x		
T	EO-14	Provide **collaborative technical assistance for proposed action items** by maintaining or expanding existing current technical assistance provided in-house, by TSAs, or externally by participating LGUs.	N/A	N/A	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	Local	SWCD / WD	County	*See Structural and Management Practices Cost-Share Program*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
M	EO-15	Use various programs to **provide land owners with economically viable alternatives for use of land in flood prone areas**.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	NRCS	$10,000 / County / Year												x	x						

Location: Watershed-Wide

Action Level*	Action #	Education and Outreach	Measurable Output	Metric	Timeline 2019-2020	Timeline 2021-2022	Timeline 2023-2024	Timeline 2025-2026	Timeline 2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
M	EO-16	**Develop new techniques to promote conservation efforts**, such as administering a local certification training program, certified crop advisor updates/meetings, or partnering with agribusiness retailers to recommend appropriate BMPs.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD / WD	City, County, MDA, Crop Advisors, MPCA, PWS	$40,000	x			x											x			x		
M	EO-17	Implement an **education/outreach campaign to inform public of blue-green (cyanobacterial) algal blooms** containing toxins or other noxious chemicals, how to identify possible toxic algal blooms, and ways to prevent health risks for humans and domestic animals.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	DNR, County, SWCD, Extension, MPCA	$5,000															x					
L	EO-18	Promote natural shorelands and shoreland revegetation by providing **education, technical, and financial assistance to landowners for shoreland stabilization and restoration**	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD, WD	County, DNR, NRCS, Cities	$25,000 / County									x	x					x	x				x
L	EO-19	**Provide technical and financial assistance to lake associations** and other stakeholders for the implementation of **in-lake management efforts** to improve the quality of water resources.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD, WD	DNR, County	$25,000 / County									x						x	x				
L	EO-20	**Perform education and outreach initiatives** targeted to general public / lake shore owners about **impacts of recreational boating motors on the resuspension of lake sediment**.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	County, WD, DNR	$2,500 / County / Year									x											
L	EO-21	**Promote the natural meandering of streams** to decrease stream velocity for reducing flood impacts and enhance recreational and fish and wildlife habitat value.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	SWCD, WD, BWSR, USFWS, TNC	$2,500 / County				x	x					x								x		x
L	EO-22	**Provide educational materials, consultations, and workshops** to landowners and agricultural producers **about public drainage and public water statutes**, including MS 103E.015 subd 1a.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	SWCD, WD, BWSR DNR	$5,000 / County										x		x		x						
L	EO-23	**Promote education about source control** within rural subdivisions and urban areas **to**	*N/A: Moderate or Large Increased Funding Scenario*							Local	City, SWCD	WD, County,	$10,000 / County														x						

Location: Watershed-Wide

Action Level*	Action #	Education and Outreach	Measurable Output	Metric	Timeline: 2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Implementation Responsibilities and Cost: Lead	Lead Entity	Partner	Estimated Cost	Measurable Goals: GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
		promote a reduction of chloride loading to waterbodies. Encourage stormwater chloride source reduction in rural subdivisions and urban areas.										MDH, DNR, MNDOT																					
L	EO-24	**Conduct outreach to promote practices that promote water conservation and efficiency**. Some examples include tiered billing rates that reward conservation, improved meters and leak detection, rebates for water-saving appliances, and irrigation technologies (i.e. water reuse)	*N/A: Moderate or Large Increased Funding Scenario*							Local	City	MDH, SWCD, County, WD, DNR, Extension, PWS	$10,000			x												x					
L	EO-25	**Perform education and outreach initiatives** targeted to general public / landowners about **ecosystem services of undeveloped land**.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	WD, County, NRCS, TNC, BWSR Extension	$5,000	x			x						x	x		x						
L	EO-26	**Educate lake shore landowners** to better **preserve the transition buffer zone and aquatic buffer zones** of their shoreline	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	DNR, WD, County, Lake Associations	$5,000 / year									x			x	x	x					

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

Table 4-5: Data gaps and research actions to be implemented watershed-wide as part of the Missouri River Watershed Comprehensive Watershed Management Plan

Location: Watershed-Wide

Action Level*	Action #	Data Gaps and Research	Measurable Output	Metric / Indicator	Timeline					Implementation Responsibilities and Cost				Measurable Goals																	
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	DGR-1	Implement the **Groundwater Protection Rule and pursue targeted township nitrate testing.**	1 clinic / county / year	Clinic	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	State	MDA	MDH, City, County, Township, SWCD	$10,000 / year	x	x																	
T	DGR-2	**Monitor water quality in private wells (nitrate, arsenic, manganese bacteria, etc.)** by making information available to private well users about local drinking water quality and well testing. Host a well testing clinic or provide resources to well users to have their water tested.	1 clinic / county / year	Clinic	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County / SWCD	MDH, City, Township,	$10,000 / year	x	x																	
T	DGR-3	**Identify future well locations to supply future drinking water needs** which are **less susceptible to contaminant threats.**	5 well locations per 10-year plan	# of water suppliers identified	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	State	MDH	DNR, City, County, SWCD, MGS, WD, Rural Water Suppliers, PWS	$10,000 / Water Supplier	x	x	x																	
T	DGR-4	I**dentify non-conforming feedlots and target to bring into compliance**.	2 feedlots annually	# feedlots brought into compliance	UBSR, LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	Local	County	SWCD, WD, MPCA	$5,000 - $100,000 per feedlot	x	x		x	x	x	x											x	
T	DGR-5	**Monitor precipitation and increase the number of volunteer rain gauge readers** to evaluate short and long-term trends and their relationship to groundwater supplies, river discharge, and lake levels.	1 monitoring station per township	# of monitoring stations	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	LBSR, RR	State	State Climatology	County, SWCD, City	$2,000 / year			x																
T	DGR-6	Identify and prioritize opportunities to **secure long-term and consistent funds** through grants, partnerships, and other sources.	1 annual application	Each	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD	WD, County, City	Existing Budget																x			
T	DGR-7	Identify and address **emerging issues** during the plan's annual evaluation and local work plan development.	1 annual review	Each	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD / WD	BWSR, County, City, DNR, MDH, MDA, MPCA	Existing Budget																			
T	DGR-8	Identify **opportunities to fund sustainable forest management, protection of critical groundwater recharge areas, and prairie, wetland and other natural area preservation and restoration** through grants and partnerships.	1 grant / partnership	Each	UBSR, LBSR	LSR	LSR	LSR	LSR	Local	SWCD	WD, County, NRCS, TNC, BWSR, DNR	Existing Budget										x	x		x			x			
M	DGR-9	Continue research to **map and model groundwater** and **monitor basic groundwater flow.**	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	MGS, SWCD, WD, County, PWS	$100,000	x	x	x																

Location: Watershed-Wide

Action Level*	Action #	Data Gaps and Research	Measurable Output	Metric / Indicator	Timeline					Implementation Responsibilities and Cost				Measurable Goals																	
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
M	DGR-10	Develop and implement an action plan to establish a **baseline evaluation of bacteri**a (fecal coliform or E. coli) levels in public and private wells within the plan area	*N/A: Moderate or Large Increased Funding Scenario*							State	MDA	MDH, MPCA, County, SWCD, PWS	$50,000		x	x																
M	DGR-11	**Maintain and make improvements to the Nitrate Infiltration Risk Map** to increase its utility in guiding management practice and structural BMP implementation decisions.	*N/A: Moderate or Large Increased Funding Scenario*							State	MDH	County, SWCD, PWS, MDA	$5,000	x													x					
M	DGR-12	Support **development of innovative water management solutions** to conventional tile drainage systems.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD / WD	NRCS, MDA	$150,000	x		x	x			x								x				
M	DGR-13	Develop and implement a **program to assess the number of failing and non-conforming SSTSs** within the plan area, and the estimated impact to area water resources.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	SWCD, WD, BWSR, Township, MPCA	$20,000	x	x				x			x										
M	DGR-14	**Define impact of altered hydrology** on surface runoff and water resources within the watershed and utilize results to **generate quantitative storage goals for each planning region** to mitigate impacts of altered hydrology.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	County, DNR, MDA, TNC	$30,000			x	x	x		x		x	x	x								
M	DGR-15	Using the best available hydrology data, **identify and field-verify areas for temporary flood storage**, including the potential temporary storage of floodwaters using the transportation system.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	County, WD, MNDOT, DNR	$20,000				x	x				x	x	x								
M	DGR-16	**Support research that characterizes the quantity and quality of tile drainage** and its impacts on recharge to local groundwater aquifers and **encourage projects that monitor the outfalls of select agricultural tile lines** to better understand effects on ecosystem functions.	*N/A: Moderate or Large Increased Funding Scenario*							State	Academia	Extension Service, County, SWCD, WD, USGS	Existing Budget			x	x	x		x							x	x				
M	DGR-17	**Identify areas adjacent to existing public lands that include recreational and wildlife habitat features** (wetlands, MBS biodiversity sites, priority shallow lakes, etc.) and **prioritize for acquisition** to enhance recreational opportunities.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	WD, City, SWCD, TNC, USFWS, BWSR, PF, DU, PWS	$25,000											x		x							
M	DGR-18	**Develop viable markets for small grains and perennials** to increase implementation of cover crops and less nutrient-demanding cropping systems.	*N/A: Moderate or Large Increased Funding Scenario*							State	MDA	Academia, Extension, SWCD, County, NRCS, Cities, PWS	$15,000	x		x													x			

Location: Watershed-Wide

Action Level*	Action #	Data Gaps and Research	Measurable Output	Metric / Indicator	Timeline					Implementation Responsibilities and Cost				Measurable Goals																	
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
M	DGR-19	Identify and implement opportunities to collect data to **monitor effectiveness of best management practices on nitrate levels in groundwater.**	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	PWS, MDH, MDA	$5,000	x		x											x			x		
L	DGR-20	Develop and maintain a **database of existing and implemented surface water BMPs**, their costs, and their impacts on groundwater **recharge** in different land use patterns and hydrogeologic settings.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	MDA, Extension Service, SWCD, MGS, PWS	$60,000	x	x	x												x				
L	DGR-21	**Fill gaps in the groundwater level observation well network** by installing additional, strategically located long-term groundwater observation wells.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	MGS, MDH, SWCD, PWS	$10,000			x																
L	DGR-22	Develop and apply resources to **assess and estimate wetland loss**.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County / SWCD	BWSR	Existing Budget											x								
L	DGR-23	Identify and maintain a **list of all priority shallow lakes identified by MnDNR for wildlife protection**.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	SWCD, WD, County, City	Existing Budget									x	x									
L	DGR-24	Evaluate **baseline water quality and habitat conditions on priority shallow lakes**.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	SWCD, WD, County, City	$50,000									x	x									
L	DGR-25	**Inventory the locations and cause of unstable stream and river reaches** and **prioritize them for implementation** by addressing the root cause of instability, as well as on-site implementation	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	SWCD, MPCA	$50,000				x	x					x	x								x
L	DGR-26	**Establish a multipurpose drainage management plan** to identify in-line opportunities and other large capital projects, their impact to drainage capacity, and their estimated hydrologic and environmental effects.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County / WD	BWSR, DNR, SWCD	$200,000														x	x				
L	DGR-27	**Define riparian areas and areas subject to frequent flooding as the minimum riparian area to be managed on all rivers and streams**. For public waters and public ditches, the minimum area identified as frequently flooded will be targeted for additional BMP implementation.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	County, WD, SWCD	$10,000				x						x		x							
L	DGR-28	Determine the location and value of **existing barriers relevant to fish management and aquatic invasive species (AIS) control**.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	County, SWCD, Academia	$100,000								x											
L	DGR-29	Pursue collaborative efforts across county lines in **dealing with aquatic invasive species** including education, control, rapid response, and inspections.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	DNR, SWCD, WD	$10,000								x											

Location: Watershed-Wide

Action Level*	Action #	Data Gaps and Research	Measurable Output	Metric / Indicator	Timeline					Implementation Responsibilities and Cost				Measurable Goals																	
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
L	DGR-30	Determine the **location and severity of eroding ravines** within planning regions.	*N/A: Moderate or Large Increased Funding Scenario*							State	DNR	Extension, SWCD, NRCS	$25,000										x									
L	DGR-31	**Obtain soil health information (soil organic matter content) to track progress toward rural stewardship measurable goals** from a soil health and fertility perspective.	*N/A: Moderate or Large Increased Funding Scenario*							State	NRCS	Extension Service, SWCD	$10,000 / County	x			x	x				x								x		
L	DGR-32	**Identify information sources to better classify rural stewardship* within the plan area**, including the locations of existing nutrient management plans, soil health and tillage practices, and irrigation best management practices.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD	NRCS, County, MPCA, MDA Extension	$5,000	x			x											x			x		
L	DGR-33	**Develop a database for sharing and maintaining water resource management data**, including local GIS data layers and local monitoring data.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	SWCD, WD, City, MPCA, PWS	$20,000																x				x
L	DGR-34	**Draft watershed-wide geospatial information on manure application locations and estimated annual rates of application**. Use to identify opportunities for manure management practices (e.g. application rate and timing, waste storage facility, feedlot runoff control).	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	MPCA	$10,000															x		x		
L	DGR-35	Develop and implement an **edge-of-field monitoring network** to get accurate data about loads leaving fields and benefits of implemented practices.	*N/A: Moderate or Large Increased Funding Scenario*							State	MDA	Extension Service, SWCD	$5,000 / field																				
L	DGR-36	**Inventory urban infrastructure** in MS4 communities to assess downstream flooding and water quality degradation from storm events.	*N/A: Moderate or Large Increased Funding Scenario*							Local	City	County, SWCD, MPCA, WD	$20,000				x	x				x										
L	DGR-37	**Target reuse projects** that capture and reuse rainwater (collection of roof runoff) or stormwater runoff.	*N/A: Moderate or Large Increased Funding Scenario*							Local	City	MDH, MPCA, WD, County	$50,000			x																
L	DGR-38	Draft a **pilot area inventory and map of known field tile drainage locations** in the plan area.	*N/A: Moderate or Large Increased Funding Scenario*							Local	SWCD / County	Landowner, WD	$10,000				x	x	x	x							x	x				
L	DGR-39	**Plan for and implement updates for existing public infrastructure** based on **anticipated changes in weather patterns and rainfall intensity** due to extreme weather events (e.g. stormwater)	*N/A: Moderate or Large Increased Funding Scenario*							Local	County / WD / City	SWCD, DNR, State Climatology, Academia	$1,000,000				x	x				x	x		x							
L	DGR-40	**Complete a systematic redetermination of ditch benefits on plan area systems.**	*N/A: Moderate or Large Increased Funding Scenario*							Local	County / WD	BWSR, DNR, SWCD	$1,000,000												x							

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

Table 4-6: Regulatory actions to be implemented watershed-wide as part of the Missouri River Watershed Comprehensive Watershed Management Plan

Location: Watershed-Wide

Action Level*	Action #	Regulatory	Measurable Output	Metric	Timeline					Implementation Responsibilities and Cost				Measurable Goals															
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes – Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	R-1	**Administer adopted land use and zoning ordinances** to manage possible sources of **nitrate contamination** (e.g., subsurface sewage treatment systems; manure management; land development), and **pathogenic bacterial contamination** (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams) and consider potential adverse effects within DWSMAs.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	City, Township, MDA, MDH, MPCA, PWS	Existing Budget	x	x	x		x	x	x		x	x	x							x		
T	R-2	**Plan land use patterns and evaluate zoning changes and project proposals** with the goal of reducing the amount of potential contaminants in sensitive groundwater recharge areas/vulnerable DWSMAs.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	City, Township, MDA, MDH, PWS	Existing Budget	x		x																	
T	R-3	Administer Minnesota Rules Chapter 7080 through 7083 **managing Subsurface Sewage Treatment Systems (SSTSs) to** reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, MPCA, MDA	Existing Budget	x	x			x	x	x		x											
T	R-4	Provide **educational and financial assistance** to promote **maintenance of compliant Subsurface Sewage Treatment Systems** (SSTSs).	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, MPCA, MDA	Existing Budget	x	x			x	x	x		x				x							
T	R-5	Maintain compliance with **National Point Discharge Elimination System (NPDES) permits** for point sources.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	State	MPCA	Facility Owner	Existing Budget		x		x	x	x			x											
T	R-6	**Seal abandoned and unused wells**, particularly those wells which may impact public or private drinking water supplies, such as those found within DWSMAs or multi-aquifer wells.	40 wells	# wells sealed	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD / County	MDA, MDH, NRCS, Water Suppliers	Existing Budget	x	x	x																	
T	R-7	Meet all **statutory requirements** of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of **shorelands of public waters,** in addition to the Riparian Protection and Water Quality Practices Statute (MS 103B.101).	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	SWCD, County, City	DNR, BWSR	Existing Budget				x	x							x					x		
T	R-8	Use the **floodplain management ordinance and land use and zoning approvals** to minimize the likelihood of future flood damages.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	City, WD, DNR, ACOE	Existing Budget										x	x	x	x						
T	R-9	Implement and enforce applicable **county ordinances and the Wetland Conservation Act (WCA)** to retain wetland quantity, function, and value.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, City, DNR, BWSR, ACOE	Existing Budget										x	x		x				x		

Location: Watershed-Wide

Action Level*	Action #	Regulatory	Measurable Output	Metric	Timeline					Implementation Responsibilities and Cost				Measurable Goals																
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes – Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
T	R-10	Protect **calcareous fens** as specified under Minnesota Statute 103G.223.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, City, DNR, BWSR, ACOE	Existing Budget										x	x		x						
T	R-11	Adhere to **Minnesota Statutes and Rules pertaining to invasive species** (Minnesota Statute 84D and Minnesota Rules 6216) and the **Noxious Weed Law** (Minnesota Statutes Sections 18.76 to 18.91).	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County / SWCD	DNR, MDA	Existing Budget								x											
T	R-12	Administer Minnesota Rules Chapter 7020 and maintain county delegation status for **managing feedlots** to protect surface and groundwater quality.	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	LBSR, RR, LSR	Local	County	SWCD, MPCA, Cities	Existing Budget	x	x				x	x		x								x		
T	R-13	**Administer zoning regulations that encourage growth near urban areas** to preserve natural areas and large habitat blocks.	NA-Existing	NA-Existing	LSR	LSR	LSR	LSR	LSR	Local	City	County, WD, SWCD	Existing Budget				x									x					
T	R-14	**Share services** as needed to effectively administer the **MRW Comprehensive Watershed Management Plan** as described in the implementation program portion of the plan	NA-Existing	NA-Existing	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	UBSR, LBSR, RR, LSR	Local	TBD	TBD	**T: $323,740** *M: $584,000 L: $3,960,900*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
M	R-15	**Administer zoning regulations that encourage development practices which preserve public lands**, such as Wildlife Management Areas (WMAs), parks, etc.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	City, WD, SWCD	Existing Budget				x									x					
L	R-16	Encourage **stormwater sediment reduction in existing and developing rural subdivisions and urban areas**, including implementing existing construction stormwater permit programs and installing Minimum Impact Design Standards (MIDS) requirements. **Promote incorporation of MIDs** requirements (or similar) into local zoning ordinances.	*N/A: Moderate or Large Increased Funding Scenario*							Local	City	County, SWCD, WD, MPCA	Existing Budget				x	x													
L	R-17	Administer **zoning regulations** that encourage development practices which **preserve and enhance natural and pervious areas**, such as native prairies.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County, City, SWCD	BWSR	Existing Budget													x					
L	R-18	**Through zoning, protect undeveloped lands** using programs such as acquisition, property tax credits and easements.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	City, WD, BWSR, DNR, NGO's	Existing Budget				x	x		x		x	x		x						
L	R-19	**Lobby for programmatic changes (Farm Bill, crop insurance, etc.) to ensure income and eliminate obstacles to farmers** to implement sustainable practices, support alternative crops, small farms, perennials rural communities, and remove incentives that results in unintended environmental damage.	*N/A: Moderate or Large Increased Funding Scenario*							Local / State	SWCD / MDA	NRCS, FSA	Existing Budget													x		x			

Location: Watershed-Wide

Action Level*	Action #	Regulatory	Measurable Output	Metric	Timeline					Implementation Responsibilities and Cost				Measurable Goals																
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes – Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity –Funding	Soil Health	Livestock to Streams	Riparian Buffers
L	R-20	**Consider new ordinances, additional ordinance review, increased existing ordinance compliance/enforcement**, and consistency of ordinance establishment and enforcement across the watershed.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	City, WD	Existing Budget														x		x			
L	R-21	**Lobby for additional state and/or local staffing capacity to better review manure application records for feedlots** and improve enforcement where necessary.	*N/A: Moderate or Large Increased Funding Scenario*							Local	County	MPCA	Existing Budget																x			
L	R-22	**Mandate manure management plans and soil testing for facilities with less than 300 animal units**, which generally are not mandated to perform those tasks under current rules.	*N/A: Moderate or Large Increased Funding Scenario*							State	MPCA	County	Existing Budget																	x		

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

Table 4-7: Capital improvement actions to be implemented watershed-wide as part of the Missouri River Watershed Comprehensive Watershed Management Plan

Location: Watershed-Wide

Action Level*	Action #	Capital Improvements *For Full List of Specific Projects, See Section 5*	Measurable Output	Metric	Timeline					Implementation Responsibility and Cost				Measurable Goals																	
					2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	Lead	Lead Entity	Partner	Estimated Cost	GW- Nitrate-Nitrogen	GW- Bacteria	GW-Supplies	SW- Sediment	SW- Phosphorus	SW- Bacteria	SW- Nitrogen	Aq. Invasive Species	Lakes - Phosphorus	Storage / Hydrology	Wetlands	Aquatic Habitat	Terrestrial Habitat	BMP Education	Capacity- Tile	Capacity -Funding	Soil Health	Livestock to Streams	Riparian Buffers
L	CI-1	**Stabilize and or restore degraded sections of stream and river reaches** to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	DNR, SWCD, USFWS, TNC	*Section 5*				x	x				x	x		x							x
L	CI-2	Provide technical and financial assistance for **outlet structure reconstruction and improvements on degraded or failing structures**.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	DNR, MPCA, SWCD, MNDOT, City	*Section 5*				x	x														
L	CI-3	**Maintain ditch systems** in accordance with multi-purpose drainage goals as stated in MS 103E.015.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	Drainage Authorities, BWSR, SWCD, DNR	*Section 5*				x	x				x	x		x							
L	CI-4	**Maintain public infrastructure to provide drainage** at the anticipated level of service to **minimize flood damage** to land both upland and downstream of the managed systems.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	DNR, MPCA, SWCD, City, MNDOT, ACOE	*Section 5*				x	x														
L	CI-5	Promote and provide financial assistance to aid small unincorporated communities or small groupings of residences with individual ISTS systems to **construct a regional sewer district to reduce impacts of non-compliant SSTS systems.**	*N/A: Moderate or Large Increased Funding Scenario*				x	x	x	Local	County	City, MCPA	*Section 5*	x	x		x	x	x	x		x										
L	CI-6	**Protect the natural meandering of streams and promote the restoration of straightened streams** to decrease stream velocity for reducing flood impacts and enhance recreational and fish and wildlife habitat value.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	DNR, SWCD, USFWS, TNC	*Section 5*				x	x				x	x		x							x
L	CI-7	Repair, maintain, and implement additional **flood storage practices and larger scale retention projects.**	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	County / WD	SWCD, City, DNR, BWSR, ACOE	*Section 5*				x	x				x	x	x								
L	CI-8	Implement **water level management practices in lakes and wetlands with internal phosphorus loading and a known overpopulation of rough fish species**. Practices may include temporary water level drawdowns to kill rough fish and promote aquatic vegetation growth, and the reintroduction of game fish species to control rough fish reproduction and population size.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	SWCD / WD	County, City, DNR	*Section 5*				x	x				x										
L	CI-9	**Implement in lake practices (e.g. alum) for lakes** with high internal phosphorus loading.	*N/A: Moderate or Large Increased Funding Scenario*		x	x	x	x	x	Local	SWCD / WD	County, City, DNR	*Section 5*				x	x				x										

* Key: **T** = Targeted Implementation Approach **M** = Moderate Increased Funding Scenario **L** = Large Increased Funding Scenario

4.5 COST OF IMPLEMENTING THE TARGETED IMPLEMENTATION APPROACH

The targeted implementation approach is specifically focused on executing the actions within the targeted implementation schedule that address priority issues for each planning region and for the watershed. The targeted implementation approach has been designed to fund plan implementation costs at or near the estimated current (2017) local funding level, recognizing that annual funding may fluctuate greatly between years.

The targeted implementation approach is inclusive of costs needed to develop a consistent education and outreach program for the watershed area and implement data gaps and research actions at or near their current level. The targeted implementation approach assumes local, state, and/or federal fiscal support of statutory obligation and ordinance implementation remains unchanged and includes funding for plan administration costs (assumes up to 10% of overall plan budget) (see **Section 5.2**). Costs also include the construction of two large capital improvement projects, which may or may not be located within a watershed district.

Table 4-8: Annualized and total plan cost for actions within the targeted implementation approach

Implementation Action		Funded By (See Section 5)	Annualized Cost	Total Plan Cost (Over 10 Years)
Implementation	Structural Practices[1]	*Structural and Management Practices Cost-Share Program*	$1,815,400	$18,154,000
	Management Practices[2]	*Structural and Management Practices Cost-Share Program*	$460,000	$4,600,000
	Education and Outreach[3]	*Education and Outreach Implementation Program*	$40,000	$400,000
	Data Gaps and Research[3]	*Data Gaps and Research Implementation Program*	$92,000	$920,000
	Regulatory[3]	*Regulatory Administration Implementation Program*	$330,000	$3,300,000
	Capital Improvement[4]	*Capital Improvement Implementation Program*	$500,000	$5,000,000
Additional Expenses				
Plan Administration[5]		*Existing Budget*	$323,740	$3,237,400
Total Estimated Funding Needs				
			$3,561,140	$35,611,400

[1] Includes total cost of targeted implementation approach plus an additional 10% for technical assistance
[2] Assumes additional cost of $10/acre for field walkovers.
[3] Assumes annualized cost similar to estimated current (2017) local funding level
[4] Assumes two large investment projects ($2,500,000 each)
[5] Administration costs can be up to 10% of overall plan cost

Cumulative benefits relative to the streams and rivers sediment (3.2.4), phosphorus (3.2.5), and nitrogen (3.2.7) delivery and load short and long-term measurable goals are estimated below to illustrate progress toward measurable goals. Anticipated load reduction benefits arising from implementation actions

dealing with education and outreach, data gaps and research, regulatory, and capital improvement are not estimated.

Table 4-9: Illustrative cumulative progress toward plan measurable goals from implementation of actions in the targeted implementation approach.

Planning Region	Progress to Reaching 1W1P Goals* Targeted Implementation Approach					
	Short-Term Goals			Long-Term Goals		
	Sediment	TP	TN	Sediment	TP	TN
Upper Big Sioux	*N/A*	14%	36%	*N/A*	2%	13%
Lower Big Sioux	172%	26%	44%	38%	4%	18%
Rock River	143%	19%	31%	33%	3%	10%
Little Sioux	337%	39%	57%	67%	5%	19%

* Management practices accrue wide ranging progress towards TN goals. For illustrative purposes, progress towards TN goals estimated using structural practices only.

4.6 INCREASED FUNDING OPPORTUNITIES

The ability to achieve plan measurable goals is largely dependent on the amount of funding available. As shown, the targeted implementation approach assumes funding for plan implementation remains at or near the estimated current amount of dollars available. Increased funding is expected to increase implementation of actions, making further progress toward plan measurable goals. These funds may come from state, federal, NGO, or private funding sources.

To illustrate the impacts of additional funding scenarios, a "moderate" and "large" increased funding scenario are presented below. The water quality value of increasing funding is also shown to illustrate how additional progress can be made toward plan measurable goals.

4.6.1 MODERATE INCREASED FUNDING SCENARIO

The moderate increased funding scenario departs from the targeted implementation approach by assuming the following:

1. The dollars available for implementing structural practices doubles, and the most cost-effective storage and filtration projects are implemented on the ground;
2. Number of acres covered by management practices doubles, increasing from 6,150 acres (100% of short-term and 1.4% of long-term rural stewardship measurable goal) to 12,300 acres (2.9% of long-term rural stewardship measurable goal);
3. Actions in the targeted implementation schedule identified as moderate increased funding scenario action level, or "M," are completed;
4. The construction of one additional capital improvement project, which may or may not be located within a watershed district; and
5. Corresponding increases in plan administration costs, relative to the increases in implementing the additional structural and management practices and capital improvements.

Table 4-10: Annualized and total plan cost for implementing actions within the moderate increased funding scenario

Item		Annualized Cost	Total Plan Cost (Over 10 Years)
Implementation	Structural Practices[1]	$3,630,800	$36,308,000
	Management Practices[2]	$920,070	$9,200,700
	Education and Outreach	$75,550	$755,500
	Data Gaps and Research	$134,000	$1,340,000
	Regulatory	$330,000	$3,300,000
	Capital Improvement[3]	$750,000	$7,500,000
Additional Expenses			
Plan Administration[4]		$584,000	$5,840,000
Total Estimated Funding Needs			
		$6,424,000	$64,244,000

[1] Includes 10% for technical assistance

[2] Assumes additional cost of $10/acre for field walkovers.

[3] Assumes three large investment projects

[4] Administration costs can be up to 10% of overall plan cost

Cumulative benefits relative to the streams and rivers sediment (3.2.4), phosphorus (3.2.5), and nitrogen (3.2.7) delivery and load short and long-term measurable goals are estimated below to illustrate how increased funding can drive progress toward measurable goals. Anticipated load reduction benefits arising from increased spending on education and outreach, data gaps and research, regulatory, and capital improvement are not estimated.

Table 4-11: Illustrative cumulative progress toward plan measurable goals from implementation of actions in the moderate increased funding scenario.

Planning Region	Progress to Reaching 1W1P Goals* Moderate Increased Funding Scenario					
	Short-Term Goals			Long-Term Goals		
	Sediment	TP	TN	Sediment	TP	TN
Upper Big Sioux	*N/A*	23%	59%	*N/A*	4%	21%
Lower Big Sioux	282%	43%	74%	63%	7%	29%
Rock River	238%	31%	51%	55%	5%	17%
Little Sioux	547%	63%	92%	109%	8%	31%

* Management practices accrue wide ranging progress towards TN goals. For illustrative purposes, progress towards TN goals estimated using structural practices only.

4.6.2 LARGE INCREASED FUNDING SCENARIO

The large increased funding scenario departs from the targeted implementation approach by assuming the following:

1. The dollars available for implementing structural practices triples, and the most cost-effective storage and filtration projects are implemented on the ground;
2. Number of acres covered by management practices reaches the stewardship long term measurable goal, increasing from 6,150 acres (1.4% of rural stewardship measurable goal) to 430,900 acres (100% of rural stewardship measurable goal);
3. Actions in the targeted implementation schedule identified as moderate increased funding scenario (i.e. "M") or large increased funding scenario (i.e. "L") action level are completed;
4. The construction of two additional capital improvement project, which may or may not be located within a watershed district; and
5. Corresponding increases in plan administration costs, relative to the increases in practices and capital improvements.

Table 4-12: Annualized and total plan cost for implementing actions within the large increased funding scenario

Item		Annualized Cost	Total Plan Cost (Over 10 Years)
Implementation	Structural Practices[1]	$5,446,200	$54,462,000
	Management Practices[2]	$32,314,575	$323,145,750
	Education and Outreach	$113,000	$1,130,000
	Data Gaps and Research	$405,000	$4,050,000
	Regulatory	$330,000	$3,300,000
	Capital Improvement[3]	$1,000,000	$10,000,000
Additional Expenses			
Plan Administration[4]		$3,960,900	$39,609,000
Total Estimated Funding Needs			
		$43,570,000	$435,700,000

[1] Includes 10% for technical assistance

[2] Assumes additional cost of $10/acre for field walkovers.

[3] Assumes four large investment projects

[4] Administration costs can be up to 10% of overall plan cost

Cumulative benefits relative to the streams and rivers sediment (3.2.4), phosphorus (3.2.5), and nitrogen (3.2.7) delivery and load short and long-term measurable goals are estimated below to illustrate how increased funding can drive progress toward measurable goals. Anticipated load reduction benefits arising from education and outreach, data gaps and research, regulatory, and capital improvement are not estimated.

Table 4-13: Illustrative cumulative progress toward plan measurable goals from implementation of actions in the larg increased funding scenario.

Planning Region	Progress to Reaching 1W1P Goals Large Increased Funding Scenario					
	Short-Term Goals			Long-Term Goals		
	Sediment	TP	TN	Sediment	TP	TN
Upper Big Sioux	*N/A*	139%	82%	*N/A*	23%	29%
Lower Big Sioux	1,112%	193%	98%	247%	32%	39%
Rock River	842%	129%	69%	194%	22%	23%
Little Sioux	1,215%	154%	123%	243%	20%	41%

* Management practices accrue wide ranging progress towards TN goals. For illustrative purposes, progress towards TN goals estimated using structural practices only.

SECTION 5.0 IMPLEMENTATION PROGRAMS

5.1 IMPLEMENTATION PROGRAMS

In Section 4, each action is assigned to either a structural practice, management practice, education and outreach, data gaps and research, regulatory, or capital improvement targeted implementation schedule. These action types correspond to the implementation program which will be used to fund the action.

Implementation programs are the funding mechanism to implement actions and make progress toward achieving plan measurable goals. Previously, implementation programs were used by plan participants across the MRW but lacked commonality.

This plan establishes common implementation programs within the plan area[1], and describes them conceptually in this section. Specific details for execution may be needed before program use.

5.1.1 STRUCTURAL AND MANAGEMENT PRACTICES COST-SHARE PROGRAM

Within the targeted implementation schedule, actions assigned as "management practice" or "structural practice" use the planning, design, and implementation of management practices (i.e. nutrient management, conservation tillage) and structural practices (i.e. grassed waterways, controlled drainage) on the landscape to make progress toward measurable goals. These actions are funded through the Structural and Management Practices Cost-Share Program.

Practices funded by the Structural and Management Practices Cost-Share Program are typically much smaller in size than a capital improvement project. Practices funded by this program are intended to reduce the amount of sediment and nutrients leaving the landscape and delivered downstream, thereby treating runoff near the pollutant source[2]. This cost-share is also used to fund practices that create live storage on the landscape. Any type of assistance (financial incentive, technical assistance, tax exemption,

[1] Plan participants will continue to use financial incentives through their own programs to meet their own individualized needs within their jurisdiction.
[2] For example, the intent is to minimize the likelihood of funding in-lake treatment projects.

conservation easement, land acquisition) can be used to provide the Structural and Management Practices Cost-Share Program, up to the total project or practice cost.

To be suitable for funding under this initiative program, practices must be planned and implemented to a recognized standard, such as the NRCS design standard or guidance found within an urban BMP stormwater manual. A lesser design standard may be used to fund a practice, but the total allotted cost-share amount will be reduced or determined by funding source requirements. If a lesser design standard is used to plan and implement a practice, the burden for replacement is shifted to landowner.

The Structural and Management Practices Cost-Share Program is expected be funded through Clean Water Fund dollars and potentially dollars from federal and foundation grants[3], to pay for eligible activities. Grant applications to fund the Structural and Management Practices Cost-Share Program will be prepared jointly as the MRW 1W1P Planning Group.

Prior to any grant application, each partnering entity will identify the number and locations of practices they wish to implement within a two-year period, consistent with the plan, and according to technical capacity. Funding for Structural and Management Practices Cost-Share Program dollars is preferentially given to projects and practices that adhere to the prioritized numbers, types, and locations of projects and practices identified within the targeted implementation approach (see **Section 4**) and other priority issues established in this plan (e.g. water storage, drinking water, terrestrial habitat).

Grant dollars received by the MRW 1W1P Planning Group will be distributed to plan participants planning, designing, or implementing the prioritized and funded practices. Decisions about practices considered but not funded (perhaps a landowner is unwilling to participate) should be maintained in central location for BWSR reporting. Each plan participant that receives funding is responsible for reporting results and estimated benefits arising from dollars received.

Multipurpose drainage management is an example of an activity identified in this plan which can achieve multiple goals. For example, restored wetlands (Goal 3.2.11) can provide needed aquatic habitat (Goals 3.2.12 and 3.2.15), increased groundwater infiltration (Goals 3.2.1 and 3.2.3), improved surface and subsurface water quality by settling and sequestering sediment and nutrients from runoff (Goals 3.2.4, 3.2.5, 3.2.7, 3.2.9), and can accrue reductions in peak flow (Goal 3.2.10).

[3] Funding from private agribusinesses may be possible, provided the efforts support a sustainability claim.

For this reason, federal and state agencies often specifically identify and promote these practices through various funding sources and programs (e.g. BWSR Clean Water Fund Multipurpose Drainage Management grants). The Structural and Management Practices Cost-Share Program will also prioritize these practices wherever applicable and will weigh the practice's ability to achieve numerous plan goals when determining proportion of project cost to fund.

Field walkovers and consultations to identify critical source areas will be completed free of charge to landowners using the Structural and Management Practices Cost-Share Program, up to a maximum amount as determined by the Planning Work Group.

The purpose of the walkover or consultation is to evaluate how to best plan to fix a problem. Structural and Management Practices Cost-Share Program dollars can then be used to design and implement solutions to problems once identified and evaluate progress towards goals following implementation efforts (i.e. changes to soil health). Walkovers or consultations funded through the program can be performed by any qualified entity that undergoes sufficient training (SWCD or watershed district staff, agronomic advisor, consultant, etc.). The results from field walkover and consultations funded by Clean Water Fund dollars must be reported to BWSR.

The MRW 1W1P Planning Group is responsible for managing process, paper work, and funds (including payment requests) of the Structural and Management Practices Cost-Share Program. The initiative program will be coordinated through local units of government. Additional staff are likely to be needed because the amount of money available and number of practices constructed will increase. Implementing the program will require one or more qualified engineering technicians capable of designing the practices and working with landowners, public works, and/or city engineers.

Table 5-1: Probable list of structural and management practices eligible for funding under the Structural and Management Practices Cost Share Program. This list is not comprehensive. Structural and management practices are grouped by their Prioritize, Target, and Measure Application (PTMApp) treatment group.

Structural or Management Practice	NRCS Code	PTMApp Treatment Group Category						
		Storage	Filtration	Bio-filtration	Infiltration	Protection	Source Reduction	User Defined
Alternative Tile Intake - Dense Pattern Tiling	606				x			
Alternative Tile Intake - Gravel Inlet	606		x					
Alternative Tile Intake - Other Blind Intake	606		x					
Alternative Tile Intake - Perforated Riser Intake	606	x						
Anaerobic Digester	366							x
Bioretention Basin	N/A			x				
Conservation Cover	327						x	
Conservation Crop Rotation	328						x	
Conservation Tillage	329						x	
Constructed Wetlands	N/A	x						
Contour Buffer Strips	332		x					
Contour Farming	330						x	
Cover Crop	340						x	
Critical Area Planting	342					x		
Culvert Sizing	N/A	x						
Dam	402	x						
Drainage Water Management	554	x						
Filter Strips	393		x					
Forage and Biomass Planting	512						x	
Grade Stabilization Structure	410					x		
Grassed Waterways and Swales	412		x			x		
Infiltration Trench	N/A				x			
Irrigation Water Management	442						x	
Lined Waterway or Outlet	468				x			
Multi-stage Ditch	N/A				x			
Nutrient Management	590						x	
Pest management	595							x
Pond for Water Use	378	x						
Prescribed Burning	338							x
Prescribed Grazing	556						x	
Riparian Forest Buffer	391		x					
Riparian herbaceous Cover	322		x					
Roof Runoff Management	558							x
Rotational Grazing	N/A						x	
Sediment Basin	350	x						
Saturated Buffer	N/A			x				
Septic System Improvement	N/A							x
Storm Water Retention Basins	N/A	x						
Stream Channel Stabilization	584					x		
Streambank and Shoreline Protection	580					x		
Strip-cropping	585					x		
Structure for Water Control	587	x						
Terrace	600		x					
Tree/Shrub Establishment	612					x		
Water and Sediment Control Basin	638	x						
Water Reuse	636							x
Wetland Creation	658	x						
Wetland Restoration	657	x						

5.1.2 EDUCATION AND OUTREACH IMPLEMENTATION PROGRAM

FIELD DAYS PROVIDE GREAT LEARNING OPPORTUNITIES

Actions assigned as "education and outreach" use education and outreach to make progress toward a measurable goal.

The Education and Outreach Implementation Program funds the implementation of these actions.

These actions are primarily targeted at two stakeholder groups: (1) the general public; and (2) landowners, producers, and lake shore owners.

Thus, two sub-programs comprise the Education and Outreach Implementation Program to focus efforts on stakeholder groups:

- General Public Program; and
- Landowner, Producer, and Lake Shore Owner Program.

The Education and Outreach Implementation Program is operated through the MRW 1W1P sharing of services. Expectations are that a common set of (template) education and outreach materials will be developed for use across the watershed but delivered by the staff within each county. The implementation program will be locally administered or administered by entities covering a larger plan area, with individual local entities operating as their own respective fiscal agent.

5.1.2.1 GENERAL PUBLIC PROGRAM

The primary purpose of the General Public Program is to create positive and impactful education and outreach experiences for the public.

Plan partners already collaborate with others to increase education and outreach and community engagement within the plan area. Many of these activities are tailored to youth, such as Earth Day programs in Jackson County area schools, environmental fairs for 6th graders in schools throughout the six MRW counties, Household Hazardous Waste Program learning stations for Rock County school's 5th graders, the Prairie Ecology Bus in Murray and Rock County, and the Southwest Minnesota Association of Soil and Water Conservation District's (SWMACDE) Area Envirothon (which many counties participate in). These activities center around educating area youth on the importance of our natural landscape and the environmental issues that impact it.

General public education opportunities span a wide range of in-person activities. Presentations and public discussions are the most common, and include presentations to citizens and policymakers, such as conducting annual presentations to Worthington Kiwanis groups on lake water quality issues and the

status of current and future lake protection projects or annual meetings with township officials to discuss nutrient management programs (Nobles County) and to promote agricultural BMPs (Jackson County). Tours are also very common as a means of educating citizens firsthand on the practices implemented to protect natural and water resources. These include tours conducted by Nobles County staff of the Prairie Wetland Learning Area in Worthington and Prairie Leaning Area in Adrian, which educate over 500 students and citizens about wildlife, wetlands, and native prairie ecosystems. Another example are Okabena-Ocheda Watershed District (OOWD) tours for community college classes and civic groups to explore active and completed District projects as well as better understand issues the District is addressing.

Not all education opportunities need to be in-person, though. Local government unit (LGU) staff has had, and will continue to pursue, opportunities to communicate with and educate citizens through other platforms. Social media is an emerging medium many LGU staff have used with success to educate and inform the general public on resource concerns and what actions are being conducted to protect them. Most commonly, these are Facebook, Twitter, and YouTube. Although many citizens use these platforms as their news and information source, many do not. Therefore, e-mail, website updates, newsletters, news articles, and other releases will remain a priority for communicating water quality, quantity, and conservation issues and concerns with the majority of local citizens. Recent examples of these include a website designed solely for the purpose of promoting and educating citizens within the Rock River Watershed about the Total Maximum Daily Load (TMDL) process and implementation efforts as well as education materials about drinking water sources and quantity in Drinking Water Supply Management Areas (DWSMAs).

Lastly, many counties, watershed districts, public water suppliers, and SWCDs have programs specifically devoted to educating resource concerns and issues with the public. These include programs to manage/mitigate for aquatic and terrestrial invasive species, noxious weeds, land management activities (e.g. smarter urban fertilizer application and/or reduced fall manure applications on agricultural fields) and drinking water resources. Actions resulting from these programs vary greatly, but may include development of educational materials, newsletters, coordination of volunteer activities, school presentations, and public meetings to raise awareness and gain a better understanding of the consequences of individual decisions on water management. Also included are general media campaigns, citizen and LGU surveys, and municipal training.

Consistent across many of these education programs is collaboration between organizations. Plan partners collaborate with others to increase outreach opportunities, share and leverage

resources, and better engage diverse audiences. Organizations that have collaborated with plan partners for education and outreach purposes include but are not limited to the Prairie Wetland Learning Area, the Prairie Leaning Area, Minnesota Agricultural Water Resource Center, Pheasants Forever, Ducks Unlimited, Minnesota Waterfowl Association, Nature Conservancy, and the National Wildlife Federation. Lake improvement associations also provide education and outreach and project implementation assistance. Collaboration with other entities is discussed more in **Section 5.3.2**.

5.1.2.2 LANDOWNER, PRODUCER, AND LAKE SHORE OWNER PROGRAM

The Landowner, Producer, and Lake Shore Owner Program is tailored to agricultural landowners and operators and lake shore property owners within the plan area. The purpose of the Landowner, Producer, and Lake Shore Owner Program is to understand, engage, and communicate with local landowners and agricultural producers to increase understanding of resource issues and the benefits of structural and management practice implementation, ultimately leading to increased adoption of voluntary practices.

There are many education and outreach activities already occurring in the area tailored to landowners, producers, and lake shore property owners. For agricultural producers and feedlot operators, trainings are provided for how to write and implement a nutrient management plan. Local staff have also worked to train professionals that have a history of trusted relationships with producers, such as agronomists and crop consultants, in nutrient management planning. Another example is educating producers on the benefits of restoring wetlands, using the Wetland Reserve Program, Conservation Reserve Program (CRP), and Continuous CRP. For interested landowners, additional staff time is used to facilitate in the restoration process. Lastly, plan partners also provide technical assistance and resources to producers and rural landowners to address on-field erosion, feedlot runoff control, and septic failure. Where necessary, resources are provided to assist landowners with the application process.

For these and other landowners, technical assistance presentations and clinics are also provided covering a variety of topics such as wellhead protection, improvement/replacement of leaky/failing SSTS, manure and fertilizer application, management and structural BMP installation and maintenance, and nitrate testing of drinking water. These presentations have been paired with direct mailings, newsletters, news releases, social media posts, and personal contacts to promote cost-share activities, provide local landowners with resources to pursue conservation, and provide a summary of local efforts to improve/protect water and natural resources.

Several activities are eligible as part the Landowner, Producer, and Lake Shore Owner Program. Eligible activities include production of educational materials, demonstration projects, and workshops tailored to landowners, agricultural producers, and lake shore owners about compensation and incentive programs to promote structural and management practices. Local partners support a shared water resource technician to provide education and outreach to landowners regarding agricultural practices in highly vulnerable drinking water supply management areas. Other activities may include the development of citizen-led initiatives, such as Farmer-Led Councils, farmer mentor lists, and local advisory committees that promote conservation through peer-based outreach and performance-based incentives.

5.1.3 DATA GAPS AND RESEARCH IMPLEMENTATION PROGRAM

Actions categorized as "data gaps and research" use research and monitoring to close information and data gaps and are funded by the Data Gaps and Research Implementation Program. Closing data gaps

allows for the conceptualization of tailored, science-based implementation strategies aimed to develop information to better address priority issues.

Plan participants have and will continue to facilitate the development and assembly of data and information.

A large portion of these data and information are water quality monitoring data. The Data Gaps and Research Implementation Program is dedicated to enhancing and maintaining the monitoring network in the MRW to capture and document measurable water quality changes resulting from watershed implementation activities. Plan partners have a robust surface and groundwater monitoring network in place that continues to be refined.

There are many local plan participants that conduct monitoring in the MRW, including but not limited to the OOWD, Kanaranzi-Little Rock Watershed District (KLRWD) and local SWCDs (e.g. Rock County SWCD, which monitors 13 surface water sites, 3 field tile outlets, and 15 groundwater wells). Both the OOWD and KLRWD work under watershed management plans where monitoring activities are specified. Local entities continue to pursue funding to assess and monitor water quality in the MRW to fill identified data gaps, measure progress toward implementation goals for both protection and restoration and provide the basis for future planning and adaptive management. Periodic analysis of data to meet BWSR requirements for achieving measurable actions and goals will be completed by local and partnering entities.

There are several water quality programs administered by MPCA as part of its watershed approach, which is a 10-year cycle for assessing waters of the state on the level of Minnesota's 80 major watersheds (MPCA, 2018b). Cycle one of the watershed approach started in 2011 for the completion of the Missouri River Basin (MRB) TMDL/WRAPS and will begin the next 10-year cycle two in 2021. The first step of the watershed approach is Intensive Watershed Monitoring (IWM), which provides a "snapshot" of water quality conditions the first two years of the 10-year cycle. The IWM is a joint effort between state and local entities.

As part of the IWM, the MPCA awards Surface Water Assessment Grants (SWAG) to local entities in the plan area for monitoring lake and stream water quality. The goals of these SWAG grants have been to expand the local entities' training programs and outreach efforts enabling organizations to recruit and retain additional citizen volunteers for both lake and stream monitoring in the MRW through the MPCA's Citizen Stream and Lake Monitoring Program (CSLMP). The CSLMP engages local citizen volunteers to become more active in collecting water quality data to enhance and complete datasets for streams and lakes throughout the watershed to evaluate overall water quality. There are currently six CSLMP sites in the MRW (MPCA, 2018b). This represents a small number of sites being monitoring by citizens. Plan participants will engage and encourage citizen volunteers to monitor available lake and stream sites as listed on the MPCA CSLMP webpage.

Another program is the Watershed Pollutant Load Monitoring Network (WPLMN), which provides year around long-term, continuous monitoring of water quality conditions. There are three WPLMN sites (Pipestone Creek, Split Rock Creek, and Rock River) in the MRW that are monitored by the MPCA. Combined, the 134 total biological monitoring sites and 22 water chemistry sites have been monitored to some extent as a part of these programs. The available data has provided the information necessary for

water quality practitioners to properly assess whether MRW waterbodies support their designated uses (MPCA, 2018b). Other existing surface water monitoring sites in the plan area are operated by the MnDNR and the USGS.

The Minnesota Water Resources Center, through its Discovery Farms program, also conducts monitoring in this area on a field in Rock County. This program is distinct as it measures surface and subsurface runoff from the field-edge (as opposed to a river or stream station), providing more information on the impact from farm management activities and conservation on surface runoff.

Monitoring efforts must also support tracking of groundwater supply quantity and quality trends in the MRW. Programs currently monitoring groundwater status and trends include Public Water Supplier Monitoring, MDA's township testing, MPCA's Ambient Groundwater Monitoring Program, MnDNR high capacity permitting program, and MnDNR Observation Well Network (MPCA, 2018b). These programs have provided vital information but are not extensive enough to fully assess the state of groundwater in the region, and certainly do not have the spatial and temporal distribution seen in the surface water quality monitoring programs. For these reasons, expanding groundwater monitoring has been identified both in the priority issues goals (Section 3; Goal 3.2.2) and in several action items in the targeted implementation schedule (Section 4).

During implementation, the Data Gaps and Research Implementation Program will build on the data and information processes already established by plan participants. This program will also be used to fund implementation of actions aimed to build and maintain technical capacity, as summarized in the targeted implementation schedule. The Data Gaps and Research Implementation Program will be operated through the sharing of services. However, activities will be locally-administered and implemented, with individual local entities operating as the fiscal agent.

5.1.4 CAPITAL IMPROVEMENTS IMPLEMENTATION PROGRAM

A capital improvement is defined as a major non-recurring expenditure for the construction, repair, retrofit, or increased utility or function of physical facilities, infrastructure, or environmental features. Capital improvements are beyond the "normal" financial means of the MRW 1W1P Planning Group and therefore require external funding. To be considered a capital improvement for purposes of this plan, a project must have an anticipated cost of at least $250,000.

Table 5-2 shows proposed capital improvements within the MRW. Additional discussions are needed among plan participants to develop the specific process for implementing capital improvements. Specifically, members of the Policy Committee or the Planning Work Group's individual and representative Boards are expected to discuss the means and methods for funding new capital improvements, with potential funding partners, before an implementation timeline can be established.

Capital improvement projects completed through this plan will be operated and maintained by the owner of the project for the lifespan of the project as specified in **Table 5-2.**

Table 5-2: *Potential capital improvement projects in the Missouri River Watershed One Watershed, One Plan Planning Area.*

Capital Improvement Project/Program	Description	Lead Entity	Information Source	Years Start /End	Status	Estimated Cost*
Loon Lake Sewer Infrastructure	Install community wastewater treatment system (i.e. regional district) to reduce TP and bacteria leaching from ISTS's to local lake.	Jackson County Planning and Environmental Services	Jackson County Local Management Plan	2018/2018	Construction scheduled to be complete in 2018	$2,120,000
City of Worthington CD 12 Flood Control	As a flood control, rate control, and water quality measure, finalize City of Worthington CD 12 flood control project.	City of Worthington	Nobles County Local Water Management Plan	2018/2028	Phase 1 construction scheduled for 2018	$9,500,000
Critical area retirement	Pursue land retirement opportunities in identified critical areas.	OOWD	Nobles County Local Water Management Plan	2019/2029	Ongoing	$500,000
Comprehensive Drainage Management Plan (DMP)	Develop a DMP that addresses present and future drainage needs as well as methods to mitigate unintended consequences of ag. drainage on water quality. In addition, hire technical personnel to investigate and provide resources to compete work by present staff.	Pipestone County Environmental Services	Pipestone County Comprehensive Local Water Management Plan	2012/2022	In development	$250,000
City of Pipestone Flood Control	As a flood control, rate control, and water quality measure, work with the City of Pipestone to implement various flood control measures.	Pipestone County	Pipestone County Comprehensive Local Water Management Plan	2010/2025	In development	$300,000
City of Pipestone New Water Supply Well	Due to water quality and quantity results of one of City of Pipestone's wells there may be a need to drill a new city well.	City of Pipestone	MDH	2023/2028	In development	$8,000,000

Capital Improvement Project/Program	Description	Lead Entity	Information Source	Years Start /End	Status	Estimated Cost*
Critical Area Retirement in Rock County Rural Water DWSMA	Along with a land retirement program such as CREP, provide adequate capital to purchase land next to the wells with elevated nitrates and install perennial covers to lower nitrates in Rural water wells.	Rock SWCD/Land Mgt, Rock County Rural Water	Rock SWCD/Land Mgt, Rock County Rural Water, MDH, MDA	2018/2028	Ongoing	$800,000
Village of Ash Creek	Install ISTS systems to reduce TP and bacteria leaching from ISTS's to local aquifer and the Rock River.	Rock SWCD/Land Mgt	Rock SWCD/Land Mgt, MDH, MPCA	2018/2028	Ongoing	$90,000**
Village of Kanaranzi	Install ISTS systems to reduce TP and bacteria leaching from ISTS's to local aquifer.	Rock SWCD/Land Mgt	Rock SWCD/Land Mgt, MDH, MPCA	2018/2028	Ongoing	$300,000
Lake Okabena Water Quality Improvement BMPs	Install water quality ponds and filters in the Sunset Bay subwatershed of Lake Okabena	OOWD	Lake Okabena BMP Feasibility Study - not completed yet	2020/2025	Feasibility study/planning phase	$750,000
City of Worthington Stormwater BMP's	Install stormwater improvement BMPs to treat runoff from downtown Worthington	OOWD	Lake Okabena BMP Feasibility Study - not completed yet	2019/2022	Feasibility study/planning phase	$500,000
Okabena Creek Streambank Stabilization	Stabilize the banks of Okabena Creek within the Worthington city limits to reduce sediment loading to Lake Okabena	OOWD	Technical Service Area Feasibility Study completed	2020/2025	Feasibility study/planning phase	$450,000
City of Troskey	Install a central sewage treatment system to address all non-compliant systems and provide a permanent system to all households.	Pipestone County	Pipestone County/Pipestone SWCD/MPCA	2013/2020	Finalizing plans	$2,500,000

Capital Improvement Project/Program	Description	Lead Entity	Information Source	Years Start /End	Status	Estimated Cost*
LPRW Source Water Development	Identify and develop future well locations for public drinking water needs. Source Water (Verdi) Capacity Study has been approved.	LPRW	LPRW Water Supply Plan	2019/2024	Data collection to begin.	$600,000
LPRW BIOTTTA	Groundwater nitrate removal system to replace current RO. System shutdown due to discharge non-compliance.	LPRW	LPRW Capital Improvement Plan	2020/2027	Identified in Long-Range CIP. No additional work performed.	$3,700,000
Water Storage	Increase in public water storage facilities to meet future demands. Constructed two (2) new 400,000-gallon tanks completed in Fall, 2017 to replace a 100,000-gallon reservoir.	LPRW	LPRW Water Supply Plan	2017/2024	Feasibility study being conducted for additional storage locations.	$2,900,000

*Estimated cost based on best available information at the present time or based on probable number of practices annually implemented.

** Project included regardless of anticipated cost definition, as project is a high local priority.

5.1.5 REGULATORY ADMINISTRATION IMPLEMENTATION PROGRAM

Many of the issues (priority and non-priority) impacting resources in the plan area can be addressed in part through the administration of statutory responsibilities and ordinances. These actions are categorized as "regulatory" in the targeted implementation schedule and are funded by the Regulatory Administration Implementation Program. **Table 5-3** shows the relationship between statutory obligations and ordinances administered by the counties and watershed districts within the MRW.

5.1.5.1 STATUTORY RESPONSIBILITIES

The State statutes administered by the counties and watershed districts involved in this plan are described below. In many cases, local regulations and ordinances have been adopted to conform to the standards and requirements of the state statutes (**Table 5-3**). The responsibility for implementing these programs will remain with the respective counties or appointed LGUs.

RIPARIAN PROTECTION AND WATER QUALITY PRACTICES

During the 2015 legislative session, the State of Minnesota passed legislation creating the Riparian Protection and Water Quality Practices Statute (Minnesota Statue Section 103F.48), commonly referred to as the Minnesota Buffer Law. The legislation requires a 50-foot average continuous buffer of perennial vegetation with a 30-foot minimum width around all public waters and a 16.5-foot minimum width continuous buffer of perennial vegetation along all public drainage systems.

The SWCDs will be relied upon for implementation and assessing compliance of the buffer legislation. SWCDs are also likely to provide technical assistance and provide guidance about financial assistance options. Landowners also have the option of working with their SWCD to determine if other alternative practices aimed at protecting water quality can be used, rather than a buffer.

FEEDLOTS

Feedlot rules, regulations, and programs were established under MN Rules 7020 and are administered through the Minnesota Pollution Control Agency. Counties participating in the 1W1P are delegated by the Minnesota Pollution Control Agency to provide feedlot regulatory oversight and technical assistance programs and maintain a feedlot inventory.

FLOODPLAIN MANAGEMENT

Floodplain zoning regulations are intended to guide development in the floodplain consistent with the magnitude of the flood threat, 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, all of which adversely affect public health, safety, and general welfare. The MnDNR and FEMA are in the process of updating floodplain maps on a county basis. Current flood maps can be found on the MnDNR website at https://www.dnr.state.mn.us/waters/watermgmt_section/floodplain/access-flood-maps.html.

HAZARD MANAGEMENT

Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390, codified at 42 USC Sections 5121 et seq. Hazard Mitigation Planning, 44 CFR Part 201, established criteria for state and local hazard mitigation planning. Counties participating in the 1W1P have developed hazard mitigation plans because of DMA 2000.

SUBSURFACE SEWAGE TREATMENT SYSTEMS (SSTS)

Counties participating in the 1W1P administer Minnesota Rules Chapter 7080 through 7083 for SSTSs. The program provides technical assistance, education, plan review, and inspections to protect water quality, prevent and control water borne diseases, and prevent or eliminate nuisance conditions.

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 zoning ordinance requiring a 50-foot buffer around public waters.

SOLID WASTE MANAGEMENT

Counties participating in the MRW 1W1P operate solid waste management systems as directed by Minnesota Statues Chapters 115A and 400. These programs may include:

- Waste reduction and waste education programs;
- Curbside recycling and publicly-owned and operated recycling center;
- Yard waste composting sites; and
- Regional hazardous waste management facility.

WELLHEAD PROTECTION

The Minnesota Department of Health (MDH) administers the state wellhead protection rule, Minnesota Rules, Chapter 4720.5100 – 4720.5590, that sets standards for wellhead protection planning. Municipalities within the MRW have completed or will be completing wellhead protection plans. The most recent listing of completed wellhead protection plans can be obtained from MDH.

WETLAND CONSERVATION ACT (WCA)

The Minnesota Legislature passed the Wetland Conservation Act of 1991 which is intended to result in "no net loss" of wetlands through filling, draining, excavating, or converting wetlands to other uses. LGUs are responsible for administering, regulating, and educating landowners on WCA.

PUBLIC DRAINAGE SYSTEMS

Drainage authority is granted to counties and watershed districts through MN Statute Chapter 103E to establish, construct, and in perpetuity maintain public drainage systems. County boards serve as the drainage authorities for public drainage systems within all six counties of the Missouri 1W1P plan area (Jackson, Lincoln, Murray, Nobles, Pipestone, and Rock). Nobles County also serves as the drainage authority within the KLRWD and OOWD.

As summarized in **Section 5.1.5.3**, the KLRWD and OOWD have a system of rules and regulations for the management of water within the districts. Related to public drainage systems, each of these actions require a permit to proceed in the OOWD:

- Work in any watercourse or water basin, whether or not water is present at the time of work; including but not limited to excavation, filling, dredging and the placement of structures of any type (OOWD Rule 4.1).
- Work in the right of way of any public drainage system (OOWD Rule 4.2).
- Construction of an open ditch drainage system or dike (OOWD Rule 4.6).

5.1.5.2 LOCAL ORDINANCES

Local ordinances are used by the counties in the MRW to address issues specific to their county. **Table 5-3** shows the counties which have ordinances related to managing water and resources. The responsibility for implementing these ordinances will remain with the respective counties.

AGGREGATE MANAGEMENT

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

BLUFFLAND PROTECTION

MN State Statute (Section 103F.201) requires that local municipalities and counties with shoreland within their jurisdictional boundaries manage development of shoreland areas using ordinances to reduce the negative impacts of development. Many counties specifically target bluffland areas due to their disproportionate impact on sediment erosion when the bluff becomes unstable. Jackson, Lincoln, Murray, and Nobles Counties each address bluffland protections as part of either or both of their shoreland or zoning ordinances.

CONSTRUCTION EROSION CONTROL

Two counties and one watershed district participating in this plan, Jackson, Lincoln, Murray, and Rock Counties and OOWD, have erosion control regulations within their zoning ordinances/rules that address construction and storm water plans. The State of Minnesota also requires permits through the National

Pollutant Discharge Elimination System (NPDES) for all construction on development sites of one acre or more in size.

FORESTLAND MANAGEMENT

Jackson County manages trees and woodland through their zoning ordinances. This includes restrictions for structures being built in a wooded area to preserve trees, and standards for the harvesting of timber and associated reforestation or conversion of forested use to a non-forested use.

LAND USE

Counties and Municipalities within the MRW are responsible for land use planning, which is administered through local zoning ordinances.

WINDPOWER AND RENEWABLE ENERGY MANAGEMENT

Wind power is an important industry in southwestern MN, as evidenced by the considerable number of wind turbines dotting the landscape in the MRW plan area. Installation of these turbines typically requires a local permit to meet ordinance requirements. In Rock County, for example, Section 27 of the Rock County Planning and Zoning Ordinances state specifically the turbine must comply with state and federal codes and standards and meet industry certifications. These are imposed to protect both the local citizens and natural resources surrounding the turbine site.

5.1.5.3 RULES

Portions of the MRW are within the jurisdictional boundary of the OOWD and KLRWD. These districts have a system of rules and regulations for the management of water within the districts. The implementation of existing rules and regulations within the MRW, as well as the development of new ones, will continue through the districts. **Table 5-3** lists existing rules and regulations within the districts, as they relate to statutory responsibilities and local county ordinances. Existing rules and regulations for the watershed districts are also shown in **Appendix P**.

TILE DRAINAGE

REGULATING TILE DRAINAGE HELP PREVENT FLOODING AND IMPROVE WATER QUALITY

Tile drainage is regulated within the rules of the OOWD to preserve drainage capacity, prevent flooding, and improve water quality. Within these rules, permits are required for certain new or expanded tile drainage systems (OOWD Rule 4.5), for installation of new surface intakes (OOWD Rule 4.5), or for projects that drain or fill wetlands (OOWD Rule 4.7).

STORMWATER RUNOFF

Under OOWD rules, stormwater runoff is managed for certain development and redevelopment activities through permits to reduce sediment and nutrient erosion and reduce peak flow volume to mitigate for downstream flooding and streambank and riverbank erosion. Similar rules also exist in the City of Worthington Stormwater Ordinance.

URBAN EXPANSION MANAGEMENT

The City of Worthington has included language in its master development plan to address the potential challenges of urban expansion. These include, but are not limited to, the loss of productive farmland, modified hydrologic cycles, reduced biodiversity, and fragmented wildlife habitat. Jackson, Lincoln, Pipestone, and Rock counties all have similar language.

Table 5-3: Statutory responsibilities and regulations, rules, and ordinances administered by the counties and watersheds districts participating in the Missouri River Watershed One Watershed, One Plan. This list is not intended to be all-inclusive.

	Rule, Ordinance, or Statute Name	Jackson	Lincoln	Murray	Nobles	Pipestone	Rock	KLRWD	OOWD
Statutory Responsibilities	**Riparian Protection and Water Quality Practices**	Jackson County Development Code, Section 736	SWCD- Compliance, County- Enforcement	Murray County Buffer Ordinance	Nobles County Buffer Ordinance Pursuant to Statutes Section 103F.48	Pipestone County Buffer Ordinance	Rock County Buffer Ordinance	Admin by Nobles County	OOWD Rules Section 4
	Feedlots	Jackson County Development Code, Section 727	County Environmental Office Section 8	Murray County Zoning Ordinance	Nobles County Land Use Ordinance Sect. 725	Pipestone County Zoning Ordinance Section 5-12	Section 26 of the Rock County P&Z Ordinance	Admin by Nobles County	Admin by Nobles County
	Floodplain Management	Jackson County Development Code; Section 609	County Environmental Office; Section 3	Murray County Zoning Ordinance	Nobles County Land Use Ordinance Section 611	Pipestone County General Floodplain Ordinance	Section 19 of the Rock County P&Z Ordinance	KLR rules 6.2	N/A
	Hazard Management	Jackson County Solid Waste Ordinance 101	County Environmental Office	Murray County All Hazard Mitigation Plan	Nobles County All Hazard Mitigation Plan	Pipestone County Zoning Ordinance Section 5-13	Rock County Emergency Management Ordinance	Admin by Nobles County	Admin by Nobles County
	Subsurface Sewage Treatment Systems (SSTS)	Jackson County Development Code, Section 716	County Environmental Office Section 14	Murray County Zoning Ordinance	Nobles County Subsurface Sewage Treatment System (SSTS) Ordinance Section 719	Pipestone County Zoning Ordinance Section 5-13	Section 30 of the Rock County P&Z Ordinance and ISTS 2014-01 Ordinance	Admin by Nobles County	Admin by Nobles County
	Shoreland Management	Jackson County Development Code, Section 610	County Environmental office Section 4	Murray County Zoning Ordinance	Nobles County Land Use Ordinance Section 609	Pipestone County Zoning Ordinance Section 5-5	Section 18 of the Rock County P&Z Ordinance	KLR Rules 6.2	OOWD Rules Section 4
	Solid Waste Management	Jackson County Solid Waste Ordinance 101	County Environmental Office Section 10	Murray County Solid Waste Ordinance	Nobles County Solid Waste Management Ordinance	Pipestone County Zoning Ordinance Section 5-13	Rock County Solid Waste Ordinance	Admin by Nobles County	Admin by Nobles County
	Wetland Conservation Act	Minnesota Rule 8420	Lincoln SWCD	Murray SWCD Minnesota Administrative Rule Chapter 8420	Nobles SWCD	Minnesota Rule 8420	Rock County Resolution 2008-02 adopting the MN Wetland Act of 1991	Admin by Nobles SWCD	Admin by Nobles SWCD
	Public Drainage Systems	M.S. 103E	M.S. 103E	M.S. 103E	M.S. 103E	M.S. 103E	M.S. 103E	Admin by Nobles County	OOWD Rules Section 4.6
Local Regulations, Rules, and Ordinances	**Aggregate Management**	Jackson County Development Code, Section 730	County Highway Department	Murray County Zoning Ordinance	Nobles County Land Use Ordinance Section 508	Pipestone County Zoning Ordinance Section 5-2	Section 24&25 of the Rock County P&Z Ordinance	Admin by Nobles County	Admin by Nobles County
	Bluffland Protection	Jackson County Development Code, Section 610	County Environmental Office	Managed through Murray County Zoning Ordinance	Nobles County Shoreland Ordinance Section 609	N/A: No bluff land	N/A: No bluff land	Admin by Nobles County	Admin by Nobles County
	Construction Erosion Control	Jackson County Development Code, Section 710	County Environmental Office & SWCD	Managed through Murray County Zoning Ordinance	Admin by OOWD	N/A	Section 4 Subdivision 7 of the Rock County P&Z Ordinance	N/A	OOWD Rules Sections 4.15 and 4.16 and Appendices A and B Worthington MS4
	Forestland Management	Jackson County Development Code, Section 604 & 709	---------- *No forested areas for management* ----------						
	Land Use	Jackson County Comprehensive Land Use Plan	County Environmental Office	Managed through Murray County Zoning Ordinance	Nobles County Land Use Ordinance	Pipestone County Zoning Ordinance	Rock County P&Z Ordinance	Admin by Nobles County	Worthington Land Use Ordinance
	Stormwater Runoff	Jackson County Development Code Subdivision Regulations	County Environmental, Hwy Department, SWCD	Managed through Murray County Zoning Ordinance	Admin by OOWD	N/A	N/A	N/A	Worthington Stormwater Ordinance
	Tile Drainage	N/A	M.S. 103E	N/A	Admin by OOWD	N/A	N/A	N/A	OOWD Rules Sections 4.4-4.5
	Urban Expansion Management	Jackson County Development Code Subdivision Section 605	County Environmental Office	N/A	N/A	Pipestone County Zoning Ordinance	Section 8 Subdivision 12 of the Rock County P&Z Ordinance	N/A	Worthington Master Development Plan
	Wind Power Management or Renewable Energy	Jackson County Development Code Subdivision Section 734	County Environmental Office & WCA LGU Section 9	Murray County Renewable Energy Ordinance	Nobles County Land Use Ordinance	Pipestone County Zoning Ordinance Section 5-10 and 5-11	Section 27 of the Rock County P&Z Ordinance	N/A	N/A

5.1.5.4 DRAINAGE AUTHORITIES

As highlighted throughout this plan, parts of the Missouri 1W1P plan area have extensive public drainage systems. As such, MRW 1W1P will engage drainage authorities about 1W1P efforts and goals. Drainage authorities will be highly encouraged to coordinate and be involved during implementation of the targeted implementation schedule to make progress towards measurable goals, including sediment delivery, natural storage and hydrology, and aquatic habitat. Based on this two-way engagement, drainage authorities could access implementation funds to adopt drainage actions in the targeted implementation schedule (**Section 4**) specific to measurable goals such as 3.2.10 'natural storage and hydrology' to use during 103E processes and procedures when the opportunity arises for storage mitigation methods within the planning area.

5.2 FUNDING

This section describes how the plan will be funded. Plan participants expect to pursue grant opportunities collaboratively to fund implementation of the targeted implementation schedule. Within the targeted implementation schedule, actions are assigned implementation programs. **Table 5-4** shows the sources of funding that will be used to fund the implementation programs.

This plan sets an ambitious implementation schedule. Local, state, federal, and other funding sources will not be sufficient to meet the targeted implementation schedule. As such, the success of implementing the plan will depend on collaboratively sought competitive state, federal, and private grant dollars. As an alternative to reliance on competitive grants, this plan envisions successful legislation to allow for reliable watershed-based funding implementation dollars for plan implementation.

Table 5-5 shows the most commonly used programs and grants for executing the implementation programs described by this plan and used within the targeted implementation schedule. These funding grants and programs are cross-referenced to plan implementation programs, thereby showing potential sources of revenue for implementation.

Table 5-4. Summarized budget for the Missouri River Watershed (MRW) One Watershed, One Plan (1W1P) targeted implementation approach

Implementation Program	Local		State		Federal		NGOs		All Sources	
	Annual	Total	Annual	Total	Annual	Total	Annual	Total	Annual	Total
Structural and Management Practices Cost-Share Program[1]	$1,527,000	$ 15,270,000	$ 748,000	$ 7,480,000	$1,135,000*	$11,350,000	TBD	TBD	$ 2,275,000	$ 22,750,000
Education & Outreach Implementation Program [2]	$ 4,000	$ 40,000	$ 36,000	$ 360,000	TBD	TBD			$ 40,000	$ 400,000
Data Gaps and Research Implementation Program [2]	$ 9,200	$ 92,000	$ 82,800	$ 828,000	TBD	TBD			$ 92,000	$ 920,000
Regulatory Administration Implementation Program [2]	$ 68,000	$ 680,000	$ 262,000	$ 2,620,000	TBD	TBD			$ 330,000	$ 3,300,000
Capital Improvement Implementation Program [3]	$ 50,000	$ 500,000	$ 450,000	$ 4,500,000	TBD	TBD			$ 500,000	$ 5,000,000
Plan Administration [4]	$ 32,400	$ 324,000	$ 291,400	$ 2,914,000	TBD	TBD			$ 323,800	$ 3,238,000
TOTAL	**$ 1,690,600**	**$16,906,000**	**$ 1,870,200**	**$ 18,702,000**	-	-	-	-	**$3,560,800**	**$ 35,608,000**

[1] Includes total cost of targeted implementation approach plus an additional 10% for technical assistance

[2] Assumes annualized cost similar to estimated current (2017) local funding level, with 10% of the cost matched locally

[3] Assumes two large investment projects ($2,500,000 each) during 10-yr plan period with 10% local match.

[4] Estimated cost assumes approximately 10% of total plan cost with 10% local match

** Note: Federal funding sources are not part of the cost of structural or management practices that comprise the targeted implementation approach or plan budget and are outside of local / state sources.*

Table 5-5: Implementation programs and related funding sources for the Missouri River Watershed (MRW) One Watershed, One Plan (1W1P). Note: This table lists examples of funding sources and is not intended to be all-inclusive.

Source	Organization	Program/ Grant Name	Primary Assistance Type	Structural and Management Practices	Data Gaps and Research	Education and Outreach
Federal	NRCS	Conservation Innovation Grant (CIG)	Financial	x		
		Conservation Stewardship Program (CSP)	Financial/Technical	x		
		Environmental Quality Incentives Program (EQIP)	Financial/Technical	x		
		Agricultural Conservation Easement Program (ACEP)	Easement	x		
	FSA	Conservation Reserve Program (CRP)	Easement	x		
		Conservation Reserve Enhancement Program (CREP)	Easement	x		
		Farmable Wetlands Program (FWP)	Easement	x		
		Grasslands Reserve Program (GRP)	Easement	x		
	FSA/ USDA/ NRWA	Source Water Protection Program (SWPP)	Technical			x
	USFWS	Partners for Fish and Wildlife Program (PFW)	Financial/Technical	x		
	FEMA	Hazard Mitigation Grant Program (HMGP)	Financial	x		
		Pre-Disaster Mitigation (PDM)	Financial	x		
		Flood Mitigation Assistance (FMA)	Financial	x		
		Risk Mapping, Assessment, and Planning	Technical	x		
	EPA	Water Pollution Control Program Grants (Section 106)	Financial			x
		State Revolving Fund (SRF)	Loan	x		
		Drinking Water State Revolving Fund (DWSRF)	Loan	x		
		Section 319 Grant Program	Financial	x	x	
State	MnDNR	Aquatic Invasive Species Control Grant Program	Financial/Technical	x		
		Conservation Partners Legacy Grant Program	Financial	x		
		Pheasant Habitat Improvement Program (PHIP)	Financial	x		
		Flood Hazard Mitigation Grant Assistance	Financial	x		x
		Forest Stewardship Program	Technical	x		
		Aquatic Management Area Program	Easement	x		
		Wetland Tax Exemption Program	Financial	x		

Source	Organization	Program/ Grant Name	Primary Assistance Type	Structural and Management Practices	Data Gaps and Research	Education and Outreach
	BWSR	Clean Water Fund Grants	Financial	x	x	
		Erosion Control and Management Program	Financial	x		
		SWCD Capacity Funding	Financial	x	x	x
		Natural Resources Block Grant	Financial	x		
		Reinvest in Minnesota (RIM)	Financial	x		
	MPCA	Surface Water Assessment Grants (SWAG)	Financial		x	x
		Clean Water Partnership	Loan	x		
	MDH	Source Water Protection Grant Program	Financial	x	x	x
		Public and Private Well Sealing Grant Program	Financial	x	x	
	MDA	Agriculture Best Management Practices (BMP) Loan Program	Financial	x		
		Minnesota Agricultural Water Quality Certification Program	Financial/Technical	x		x
Other	MN Initiative Foundations	MN Thrive, Farmland Retention	Financial	x	x	x
	Pheasants Forever	Pheasants Forever	Financial/Easement	x		x
	Ducks Unlimited	Ducks Unlimited	Financial/Easement	x	x	x

*Disclaimer: This is not an all-inclusive list of funding opportunities, but instead, provides examples of funding opportunities and their primary relation to Missouri River Watershed 1W1P Implementation Programs.

5.2.1 LOCAL FUNDING

The amount of funding needed to implement the targeted implementation approach from local sources is an estimated $1,690,600 annually and $16,906,000 for the ten-year plan life cycle. Local revenue is defined as money derived from either the local property tax base or in-kind services of any personnel funded from the local tax base. Local funding excludes general operating funds obtained from BWSR, fees for service and grants, or partnership agreements with the federal government or other conservation organizations.

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

5.2.2 STATE FUNDING

The amount of funding needed to implement the targeted implementation approach from state sources is $1,870,200 annually and $18,702,000 for the ten-year plan life cycle. State funding includes all funds derived from the State tax base for state cost-share regulatory purposes. State funding excludes general operating funds obtained from BWSR, counties, fees for service and grants, or partnership agreements with the federal government or other conservation organizations.

The MRW 1W1P Planning Group 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 MRW 1W1P as one or more non-competetive watershed-based implementation funding grants. Where the purpose of an intitiative aligns with the objectives of various state, local, non-profit, or private programs, these dollars will be used to help fund the implementation programs described by this plan.

5.2.3 FEDERAL FUNDING SOURCES

Federal funding includes all funds derived from the Federal tax base. For example, this includes programs such as the Environmental Quality Incentives Program (EQIP), CRP, and Conservation Innovation Grants (CIG). The Environmental Protection Agency also has Section 319 funds, which traditionally have been used for implementation to improve water quality. Federal funding excludes general operating funds obtained from BWSR, counties, fees for service and grants or partnership agreements with state government or other conservation organizations.

Federal agencies need to be more effectively engaged following the approval of this plan and prior to implementation, to create an avenue to access federal resources for implementation. An opportunity may exist to leverage state dollars through some form of federal cost-share program. Where the purpose of an implementation program aligns with the objectives of various federal agencies, federal dollars will be used to help fund the implementation programs described by this plan.

5.2.4 OTHER: NON-GOVERNMENTAL ORGANIZATIONS AND PRIVATE ENTITIES

This category of funding excludes general operating funds obtained from BWSR, counties, fees for service, local funding sources, and grants or partnership agreements with the state or federal government or other conservation organizations.

Several non-governmental funding sources may provide technical assistance and fiscal resources to implement the MRW 1W1P targeted implementation schedule. For example, locally-active Pheasants Forever and Ducks Unlimited Chapters are potential funding sources that differ from the other categories. This plan should be provided to all NGOs as a means of exploring opportunities to fund specific aspects of the targeted implementation schedule.

Private sector companies, including those specifically engaged in agribusiness, are often overlooked as a potential source of funding for implementation. Many agribusiness companies are working to improve water quality. Some of the agribusiness companies are providing technical or financial support for the implementation of structural and management practices because they are interested in agricultural sustainability. Most often this is through Field to Market (https://calculator.fieldtomarket.org/fieldprint-calculator/). This plan could be used to explore with private sector companies whether the estimated water quality benefits have monetary value and therefore, may provide access to funding from the private sector.

5.3 PLAN ADMINISTRATION & COORDINATION

5.3.1 DECISION-MAKING AND STAFFING

Presented below **(Table 5-6)** are the probable roles and functions related to plan implementation. Expectations are that the roles of each committee will shift and change focus during implementation. The Missouri River 1W1P 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 central fiscal agent will be revisited by the Planning Work Group on an annual basis.

Table 5-6: Anticipated roles for Missouri River Watershed One Watershed One Plan 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 Planning Work Group priority issue recommendations ▪ Direction to Planning Work Group on addressing emerging issues ▪ Approve plan amendments ▪ Implement county ordinances and state statutory responsibilities separately from plan implementation ▪ Approve grant applications ▪ Approve annual assessment
Advisory Committee	▪ Review and provide input for the annual work plan ▪ Review and identify collaborative funding opportunities ▪ Recommendations to Planning Work Group on program adjustments ▪ Assist with execution of the targeted implementation schedule
Planning Work Group	▪ Review the status of available implementation funds from plan participants ▪ Review opportunities for collaborative grants ▪ Review annual fiscal reports ▪ Review annual reports submitted to BWSR ▪ Annual review and confirmation of priority issues ▪ Evaluate and recommend response to emerging issues ▪ Prepare plan amendments ▪ Implement the targeted implementation schedule
Local Fiscal/Administrative Agent	▪ Convene committee meetings ▪ Prepare the annual work plan ▪ Prepare and submit grant applications/funding requests ▪ Research opportunities for collaborative grants ▪ Compile annual results for annual assessment

5.3.2 COLLABORATION

5.3.2.1 COLLABORATION BETWEEN MRW 1W1P PLANNING PARTNERS

The MRW 1W1P Planning Group recognizes the value in collaboration between planning partners in order to successfully implement this plan. The benefits of successful collaboration between planning partners include consistent implementation of actions watershed-wide, increased likelihood of funding, and resource efficiencies gained. Where possible and feasible, the MRW 1W1P Planning Group will

pursue opportunities for collaboration with fellow planning partners to gain administrative and program efficiencies, pursue collaborative grants, and provide technical assistance. The MRW 1W1P Planning Group will also review similarities and differences in local regulatory administration to identify local successes and identify changes needed in the future to make progress towards goals outlined in this plan.

5.3.2.2 COLLABORATION WITH OTHER UNITS OF GOVERNMENT

The MRW 1W1P Planning Group will continue coordination and cooperation with other governmental units at all levels. This cooperation and coordination is both horizontal and vertical. Vertical coordination between the MRW 1W1P Planning Group and agencies such as BWSR, US Army Corps of Engineers, MnDNR, MDH, and the MPCA are mandated through legislative and permit requirements. Horizontal cooperation between MRW 1W1P Planning Group and comparable units of government such as municipalities, city councils, township boards, county boards, watershed district boards, joint powers boards, and other water management authorities are a practical necessity to facilitate watershed wide activities.

The MRW 1W1P Planning Group will exercise intergovernmental coordination and cooperation as an absolute necessity for it to perform its required functions. The MRW 1W1P Planning Group will continue to foster an environment that enhances coordination and cooperation to the maximum extent possible throughout the implementation of this plan.

The MRW 1W1P Planning Group has identified that agency goals, objectives, directions, and strategies are generally compatible with the content of this plan. The implementation actions and goals were predominantly defined through a collaborative effort. However, some agency goals, objectives, directions, and strategies for resource management within the plan area have not been selected as priority issues. The responsibility for achieving the goals associated with lower priority tier issues remains with the respective agency or organization.

The MRW 1W1P Planning Group will act as the lead for the implementation of this plan's identified priority issues. Due to local funding, technological, and other capacities, the lower ranked issues that were not prioritized are encouraged to be implemented with agency-led efforts, including but not limited to funding. The MRW 1W1P Planning Group will continue to cooperate and collaborate with other governmental units, at all levels, but may retain a cooperator or facilitator role with implementation of addressing issues that were not prioritized by MRW 1W1P Planning Group as "A" or "B" level priority issues.

5.3.2.3 COLLABORATION WITH OTHERS

Plan partners expect to continue and build on existing collaboration with others, including non-governmental organizations, while implementing this plan. Many of these existing collaborations are aimed to increase habitat and hunting opportunities within the plan area, while providing education and outreach opportunities. Partners for these collaborations include, but are not limited to Pheasants Forever, Ducks Unlimited, and the Minnesota Waterfowl Association.

Plan partners currently collaborate with others to increase education and outreach and community engagement within the plan area. Organizations which have collaborated with plan partners include but

are not limited to the Prairie Wetland Learning Area, the Prairie Leaning Area, Nature Conservancy, National Wildlife Foundation, and Sustainable Farming Association of Minnesota.

Lastly, there are many lake associations and other coalitions within the plan area. Planning partners collaborate frequently with these groups for education, outreach, and project implementation.

5.3.3 WORK PLANNING

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

5.3.3.1 LOCAL PURPOSE

An annual work plan will be developed by the Planning Work Group based on the targeted implementation schedule and any adjustments made through self-assessments (see **Section 5.3.4**). 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 targeted implementation schedule.

5.3.3.2 STATE PURPOSE

The Planning Work Group will collaboratively develop, review, and submit a Watershed Based Funding Work Plan Activities summary from this plan to BWSR. This summary will be submitted to and ultimately approved by the Policy Committee, prior to submittal to BWSR. The summary will be developed based on the targeted implementation schedule and any adjustments made through self-assessments (see Section 5.3.4).

5.3.4 ASSESSMENT AND EVALUATION

5.3.4.1 ANNUAL EVALUATION

Each year the Planning Work Group will provide the Policy Committee with an annual update on the progress of the plan's implementation in accordance with BWSR's Level 1 performance standards. During this annual review process, feedback will be solicited from the boards, Policy Committee, and the Advisory Committee. This feedback will be presented to the Policy Committee to set the coming year's priorities for achieving the plan's goals and to decide on the direction for grant submittals. In addition, this feedback will be documented and incorporated into biennial evaluations and five-year evaluations.

5.3.4.2 FIVE-YEAR EVALUATION

This plan has a ten-year life cycle beginning in 2019. 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 the implementation schedule may vary. In addition, new issues may emerge and/or new monitoring data, models, or research may become available. As such, in 2024-25 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 the course of actions is necessary.

5.3.4.3 REPORTING

LGUs have several annual reporting requirements. A number of these reporting requirements will remain a responsibility of the LGUs (**Table 5-7).** However, reporting related to grants and programs developed collaboratively and administered under this plan will be reported by the Planning Work Group. In addition to annual reports, the Planning Working Group will also develop an annual State of the Watershed Report. This report will document progress toward reaching goals and completing the targeted implementation schedule, and will describe any new emerging issues or priorities. The information needed to annually update the State of the Watershed Report will be developed through the annual evaluation process.

Table 5-7: Examples of annual local government unit (LGU) reporting responsibilities.

Report	LGU Responsibility
Annual Report	Grant Administrator
Ditch Buffer Strip Annual Report	County Drainage Authorities
Farm Bill Assistance Report	SWCDs
Financial Reports	Fiscal Agent
Technical Approval Authority (TAA)	SWCDs and NRCS
Website Compliance: (Checklist)	Grant Administrator
WCA Annual Report	County or SWCD
SSTS Report	Counties
Feedlot Report	Counties

5.3.5 PLAN AMENDMENT PROCESS

This plan extends through 2029. 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. Revision may also be needed if issues emerge that are not addressed in the plan.

All amendments to this plan will follow the procedures set forth in this section. This plan will remain in full effect until a revision is approved by BWSR. Plan amendments may be proposed by any agency, person, city, county, or Watershed District to the Policy Committee, but only the Policy Committee can initiate 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 MRW is still maintained. As such, CIPs need only be approved by a local board to be amended to the plan if implementation of the CIP is funded by the local board, 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 Planning Work Group's individual and representative Boards (**Section 5.1.4**).

Preparers of this plan recognize it may need to be periodically amended to remain useful as a long-term planning tool. However, the structure and intent of this plan is to provide flexibility to respond to short-term emerging issues and opportunities. The Policy Committee will review and revise its long-range

work plan and/or implementation programs through the annual budget and Annual and Short-Range Work Plan.

Technical information (especially water quality data) will require frequent updating, such as when new, site-specific data is generated by state, federal, and regional agencies, counties, cities, or individuals. Generally, these technical updates and studies are considered part of the normal course of operations consistent with the intent of this plan and not a trigger for a plan amendment. However, when the technical information results in a policy that is a significant change of direction from the plan, or the implementation of a projects or implementation programs, a plan amendment may be required.

5.3.5.1 CRITERIA AND FORMAT FOR AN AMENDMENT

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 a 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 in the long-range work plan or within this plan;
- The addition or deletion of action items, programs, initiatives or projects, as long as these are generally consistent with the goals this plan, are not capital improvement projects 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.

5.3.5.2 PLAN AMENDMENT PROCESS

If the Policy Committee or BWSR decide that a plan amendment is needed, the plan amendment process, which is the same as the plan review process, is as follows:

- Submit the amendment to all cities, counties, and conservation districts within the plan boundary, the state review agencies (the MnDNR, MPCA, Minnesota Department of Agriculture, and MDH), and BWSR for a 60-day review;
- Respond in writing to any concerns raised by the reviewers;
- Policy Committee is to hold a public hearing on the proposed amendment;
- Submit the revised amendment to the state review agencies and BWSR for a 45-day review; and
- The Policy Committee must submit the final revised amendment to BWSR for approval.

At the discretion of the Policy Committee, drafts of proposed plan amendments may be sent to all plan review authorities for input before beginning the formal review process. Examples of situations where a plan amendment may be required include:

- Addition of a capital improvement project that is not described by the plan;
- Establishment of a water management district(s) to collect revenues and pay for projects initiated through MS 103D. To use this funding method, MS 103D.729 requires that the Planning Work Group (or equivalent) prepare an amendment to its plan;

- Addition of new programs or other initiatives that have the potential to create significant financial impacts or controversy, when inconsistent with the issues, goals, and policies.

Plan amendments will be prepared in a format consistent with 103B.314 subd. 6. Unless the entire plan is re-printed, all adopted amendments must be printed in the form of replacement pages for the plan, each page of which must:

- Show deleted text as stricken and new text as underlined for draft amendments being considered;
- Be renumbered as appropriate; and
- Include the effective date of the amendment.

The Policy Committee will maintain a distribution list for copies of the plan and within 30 days of adopting an amendment distribute copies of the amendment to the distribution list. Generally, electronic copies of the amendment will be provided, or documents made available for public access on the Nobles SWCD (or other participating LGU) website. Printed copies will be made available upon written request and printed at the cost of the requester.

5.3.6 FORMAL AGREEMENTS

The MRW 1W1P Planning Group is a coalition of counties, soil and water conservation districts, and watershed districts within southwest Minnesota. The MRW 1W1P Planning Group previously entered into a formal agreement through a Memorandum of Agreement for planning the 1W1P for the MRW (**Appendix B**). The parties will be entering into an agreement for purposes of implementing this plan and will be known as the Missouri River One Watershed, One Plan (MR 1W1P) Implementation Group.