Two Rivers Plus 1W1P

Two Rivers Plus Comprehensive Water Management Plan

June 2021

Glossary of Abbreviations

1W1P	One Watershed, One Plan
AIS	Aquatic Invasive Species
BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
CAC	Citizen's Advisory Committee
CD	County Ditch
CFMP	Comprehensive Farm Management Plan
CFS	Cubic Feet per Second
CIG	Conservation Innovation Grants
CIP	Capital Improvement Project
COLA	Coalition of Lake Associations
CRP	Conservation Reserve Program
CSP	Conservation Stewardship Program
CWF	Clean Water Fund
CWMP	Comprehensive Watershed Management Plan
DWSMA	Drinking Water Supply Management Area
EA	Environmental Assessment
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
EQIP	Environmental Quality Incentives Program
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
GIS	Geographic Information System
HSPF	Hydrological Simulation Program-FORTRAN
HUC	Hydrologic Unit Code
IJC	International Joint Commission
IWI	International Water Institute
JD	Judicial Ditch
JRWD	Joe River Watershed District
LCCMR	Legislative-Citizen Commission on Minnesota Resources
LGU	Local Government Unit
LMIC	Land Management Information Center
LWRI	Land and Water Resources Inventory
MAWQCP	Minnesota Ag Water Quality Certification Program
MCEA	Minnesota Center for Environmental Advocacy
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MGS	Minnesota Geologic Survey
DNR	Minnesota Department of Natural Resources
MOA	Memorandum of Agreement
MPCA	Minnesota Pollution Control Agency
NGO	Non-Governmental Organization
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PC	Policy Committee
PTMApp	Prioritize, Target, and Measure Application

RRBC	Red River Basin Commission
ROW	Right of Way
SD	State Ditch
SNA	Scientific and Natural Area
ST	Steering Team
SSTS	Subsurface Sewage Treatment Systems
SWCD	Soil and Water Conservation District
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TN	Total Nitrogen
TP	Total Phosphorus
TRP1W1P	Two Rivers Plus One Watershed, One Plan
TRWD	Two Rivers Watershed District
TSS	Total Suspended Solids
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USEPA	Unites States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WCA	Wetland Conservation Act
WEQ	Wind Erosion Equation
WEPS	Wind Erosion Prediction System
WHPA	Well Head Protection Area
WMA	Wildlife Management Area
WPA	Waterfowl Protection Area
WRAPS	Watershed Restoration and Protection Strategy
WRP	Wetland Reserve Program

Definitions

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

Emerging Issue

An issue that lacks detailed information within the watershed, is sometimes prominent in the media, and has the potential to affect the resources within the watershed at some time in the future.

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.

Planning Area

The area encompassed by the entire Two Rivers Plus One Watershed One Plan, consisting of the political boundaries of the Two Rivers Watershed District and the Joe River Watershed District.

Priority Issue

Issues categorized, through the prioritization process (**Section 3**), as High and Medium Priority Issues. Priority issues will be the focus of this comprehensive plan.

Planning Zone

Region of the planning watershed loosely based on the United States Geological Survey (USGS) 10-digit Hydrologic Unit Code (HUC) and adjusted based on PTMApp catchment delineation. The Two Rivers Plus 1W1P plan has eleven planning zones: Direct to Red River, Joe River, Little Joe River, North Branch, Middle Branch, South Branch, Unnamed Coulee, JD 10, SD 72, SD 91, SD 95. Planning zones are used in the plan to describe implementation planning profiles.

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. The resource concerns that are addressed in this plan were grouped into the categories of 1) Surface Water Quality, 2) Hydrology / Flood Damage, 3) Ground Water Quality, 4) Ground Water Quantity, 5) Natural Resources, and 6) Agricultural Productivity.

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.

Short-Term Goal

Interim conditions to accomplish or make progress towards during the 10-year lifespan of this plan.

Long-Term Goal

The desired future condition to accomplish, regardless of time frame.

Section 1: Executive Summary

Two Rivers Plus One Watershed One Plan is a cooperative watershed planning effort between Roseau County, Kittson County, Roseau Soil & Water Conservation District, Kittson Soil & Water Conservation District, and the Two Rivers Watershed District. It is an undertaking accomplished through Minnesota Statute 103B.801 and the planning area is located in the furthest north and west reaches of the State of Minnesota in parts of Kittson, Roseau & Marshall Counties.

This is a more collaborative approach of doing local water management and natural resources planning than past planning efforts. Prior planning efforts in the past were individually done by each entity, resulting in up to 4 or more separate plans for the same area now being considered under this plan. From 2021 through 2030, this new One Watershed One Plan will take the place of 3 previous, individual plans and the planning group will work together with a shared vision for water planning on the local level.

1.1 Issue Prioritization Process

The group utilized the 1W1P processes in statute to consider individual efforts of each local governmental unit and ultimately use those efforts to plan a series of prioritized, targeted and measurable goals to address a set of broad based mutually identified issues. In order to accomplish this large undertaking, the entities entered into a planning agreement and will be able to utilize local and state funding, as well as other sources of funding, to work toward accomplishing the mutual goals.

Besides the participating local government staff and their governing boards, the group convened both a Citizen's Advisory Committee (CAC) and a Technical Advisory Committee (TAC) to provide input and guidance to the process. The CAC was made up of local landowners, township and county officials, and interested groups and individuals. The TAC was made up of local, state, and federal agency staffers with technical knowledge of conservation, engineering, biology, hydrology and ecology.

Input from public input meetings and the advisory committees was used by the planning group to break the planning area down into 11 separate sub watershed areas called planning zones (**Figure 1.1**). Resource issues were identified for each planning zone and goals were written to address the issues. The planning group utilized local knowledge, pertinent models, data and information to determine these issues and goals. The resource concerns that are addressed in this plan were grouped into the categories of 1) Surface Water Quality, 2) Hydrology / Flood Damage, 3) Ground Water Quality, 4) Ground Water Quantity, 5) Natural Resources, and 6) Agricultural Productivity.

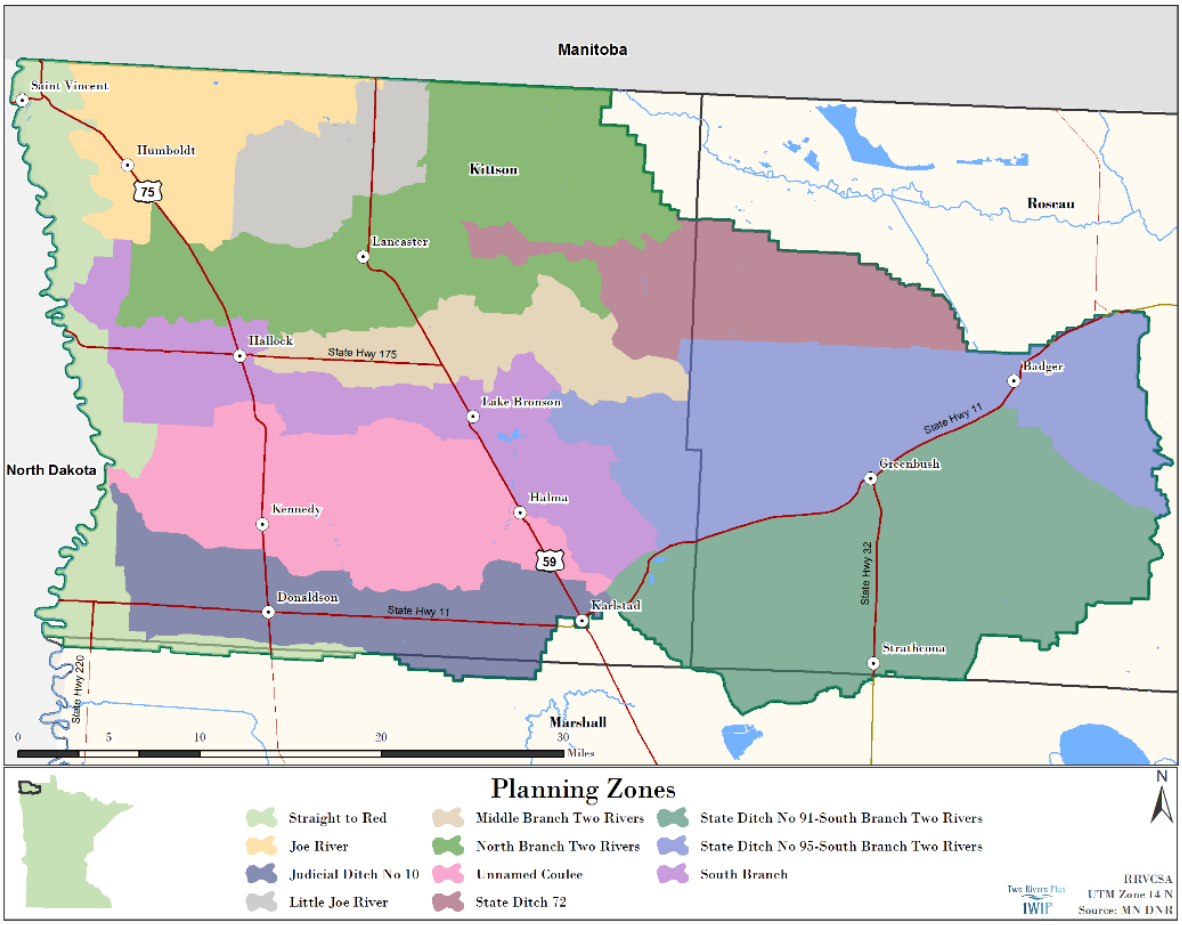


Figure 1.1: Two Rivers Plus Planning Zones.

The issues identified for each category were considered within each planning zone. Once the concerns were identified and the goals written, the planning group applied them to each of the eleven sub-watershed planning zones. The issues were ranked in each zone as high, medium, or low and the decision was made to focus efforts on the high and medium issues. **Table 1.1** below shows the composite prioritization and rankings across all planning zones. Specific's on the prioritization process and ranking can be found in **Section 3: Issue Prioritization**.

Resource Concern	Issue	Two Rivers Plus Planning Zones										
		Straight to Red	Joe River	Judicial Ditch No 10	Little Joe River	Middle Branch Two Rivers	North Branch Two Rivers	Unnamed Coulee	State Ditch 72	State Ditch 91 - South Branch Two Rivers	State Ditch 95 - South Branch Two Rivers	South Branch Two Rivers
Surface Water Quality	Excessive sediment loading to surface waters	High	Medium	High	Low	Medium	Medium	High	Medium	High	High	High
	Excessive nutrient loading to surface waters	High	High	Medium	Medium	Medium	Medium	Medium	Low	High	High	Medium
	Excessive bacteria loading to surface waters	Low	Low	Low	Low	Medium	Low	Low	Low	Medium	Medium	Medium
	Low dissolved oxygen in surface waters	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Medium
	Instability of all types of watercourses	Medium	Low	Medium	Medium	Low	Medium	Medium	Low	Medium	Medium	High
Hydrology/Flood Damage	Inadequate conveyance capacity of all types of watercourses	High	Medium	Medium	High	Medium	Medium	High	High	High	High	Medium
	Flood damage to communites, public infrastructure and rural homesteads	High	Medium	High	Medium	Medium	Medium	Medium	High	High	High	Medium
	Flood damage to farmland	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium
	Extreme flow fluctuations (highs too high and lows too low)	Medium	Medium	Medium	Medium	High	High	Medium	Medium	Medium	Medium	High
Groundwater Quality	Nitrate, arsenic, and other types of groundwater contamination	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
	Unused, Unsealed wells act as a contamination condult to drinking water supply	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
Groundwater Quantity	Groundwater quantity levels	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
Natural Resources	Degraded wetland habitat	Low	Low	Low	Medium	Low	Medium	Low	Medium	Medium	Medium	Low
	Degraded aquatic habitat in watercourses	Low	Low	Low	Low	Medium	Medium	Low	Low	Medium	Medium	High
	Loss of longitudinal connectivity	Low	Medium	Low	Low	Medium	High	Low	Low	Low	Low	High
	Degraded riparian habitats	Low	Medium	Low	Medium	Medium	Medium	Low	Low	Medium	Medium	Medium
	Degraded terrestrial habitats	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium	Medium
	Algae blooms in Lake Bronson	Low	Low	Low	Low	Low	Low	Low	Low	High	High	High
Agricultural Productivity	Reduced soil organic matter/infiltration rates/water holding capacity	High	High	High	Medium	Medium	Medium	High	Low	Medium	Medium	High
	Excessive salinity in soils	Medium	Medium	Medium	Low	Low	Medium	Medium	Low	Low	Low	Low
	Inadequate feed/water supply/waste management	Low	Low	Low	High	High	High	Low	Medium	Medium	Medium	Medium
	Inadequate field drainage system outlets and/or improper management of drainage systems including tile line management	Medium	Medium	High	Medium	Medium	Medium	High	High	High	High	Medium
	Excessive wind erosion	High	High	High	Medium	Medium	Medium	High	Low	Medium	Medium	High
	Excessive water erosion	High	Medium	High	Medium	Medium	Medium	High	Medium	High	High	High

Table 1.1: Planning Zone Priority Issues

1.2 Measurable Goals

To address issues around the six resource concerns, measurable goals were created dealing with sediment, nutrients, *E. Coli*, channel instability, conveyance capacity, flow extremes, groundwater quality and quantity, wetland habitat, longitudinal connectivity, terrestrial habitat, soil health, soil salinity, and livestock water and feed. Short term and long-term goals were created for each of these items. **Table 1.2** below shows these short- and long-term goals. **Section 4: Measurable Goals** provides details of each issue and highlights the planning zone goal associated with the issue.

Table 1.2: Priority issues and measurable goals.

Goal Categories	Goals	Issues addressed in Goal
Water Quality	1.) **Short Term Goal:** Reduce Sediment delivery to Streams, Lakes and Drainage systems by 2.5% in High priority areas 2% in Medium. **Long Term Goal:** Reduce sediment delivery to streams, lakes and drainage systems to meet the TMDL reduction goal of 78% maximum load	Excessive Sediment Loading to surface waters
	2.) **Short Term/ Long Term:** Reduce nutrient delivery to streams lake and drainage systems based on sediment reduction goal PTMApp results. Specific reduction goal for upstream planning zones of Lake Bronson is 2% TP.	Algae Blooms Lake Bronson
		Excessive Nutrient Loading to surface waters
	3.) **Short Term Goal:** Work towards long term goal. Perform microbial source tracking (MST). **Long Term Goal:** reduce number of *E. Coli* impaired waters (5 Reaches) to less than or equal to the state standard of 126 orgs/100ml	Excessive bacteria loading to surface waters
	4.) **Short Term Goal**: Stabilize all identified ditch bank/stream bank sloughing issues. **Long Term Goal:** Stabilize all ditch and stream banks in planning area Specific issues are detailed and explained in Sections 4 and 5.	Degraded aquatic habitat (watercourses)
		Instability of all types of watercourses
Hydrology/Flooding	5.) **Short Term Goal:** Maintain, modify, construct, improve 10% of all legal ditch systems in High priority areas and 5% in Medium priority areas to provide adequate channel capacity for up to a 10 years runoff event, while ensuring an adequate outlet to prevent downstream adverse impacts. Maintain natural capacity of streams and rivers. **Long Term Goal:** Maintain, modify, construct or improve all legal ditches, road ditches, private ditches to provide adequate channel capacity for up to a 10-year runoff event while ensuring an adequate outlet to prevent downstream adverse impacts. Maintain natural capacity of streams and rivers.	Inadequate conveyance capacity of all types of watercourses

	6.) **Short Term Goal**: In High Priority planning zones is to reduce 1/4" of runoff. In Medium Priority Planning Zones is to reduce 1/8" of runoff. **Long Term Goal:** Reduce peak flood flows on the Red River by 20% by constructing up to 40,000-acre feet of impoundment capacity in Two Rivers WD and up to 5,700 ac ft in Joe River WD.	Flood damage to communities, public infrastructure and rural homesteads
	7.) **Short Term Goal**: Work towards #6 Short Term runoff reduction goal. **Long Term Goa**l: Protect agricultural land from flooding for up to a 10-year runoff event during the growing season.	Flood damage to farmland
		Degraded riparian habitats
	8.) **Short Term Goal**: Work towards #6 Short Term runoff reduction goal. **Long Term Goal:** Maintain minimum flow of 20 CFS on the South Branch Two Rivers and 10 CFS on the Middle Branch Two Rivers	Address extreme flow fluctuations.
		Low dissolved oxygen in surface waters
Groundwater	9.) **Short Term Goal:** Provide 27 Outreach Opportunities over the 10-year plan. **Long Term Goal:** Protect groundwater contamination by developing a "Water Quality Inventory" educational and outreach program to establish a base number of potential wells contaminated and their levels	Nitrate, arsenic, and other types of groundwater contamination
	10.) **Short Term Goal**: Prevent groundwater contamination. **Long Term Goal**: Protect groundwater quality by developing an "Un-used Well Inventory" educational and outreach program to determine a number of well sealing goal	Unused, unsealed wells act as a contamination conduit to drinking water supply
	11.) **Short Term Goal**: Work towards long term goal. **Long Term Goal:** Expand ground water level monitoring program to 3 wells within Planning Area	Groundwater quantity levels
Natural Resources	12.) **Short Term Goal:** Maintain wetland functions within planning area while improving 500 acres of protected wetlands. **Long Term Goal:** Improve quality of 1,000 acres of protected wetlands.	Degraded wetland habitat
	13.) **Short Term Goal:** Remove 25% of barriers including the Northcote Dam. **Long Term Goal:** Increase connectivity by 100% in natural watercourses identified by the Stressor ID Report.	Loss of longitudinal connectivity

	14.) **Short Term Goal:** Maintain terrestrial acres and improve quality of 1,000 acres. **Long Term Goal:** Enhance terrestrial acres and improve quality on 10,000 acres.	Degraded terrestrial habitats
Ag Productivity	15.) **Short Term Goal:** Implement best management practices to certify 5,000 acres through the MAWQCP on cropland acres. **Long Term Goal:** Certify all cropland acres in the MN Ag Water Quality Certification Program.	Excessive wind erosion
		Excessive water erosion
		Reduced soil organic matter/infiltration rates/water holding capacity
	16.) **Short Term Goal:** Work towards long term goal. **Long Term Goal:** Reduce soil salinity along the Highway 75 corridor	Excessive salinity in soils
	17.) **Short Term Goal:** Implement 3,200 acres of rotational grazing systems. **Long Term Goal:** Develop rotational grazing systems for all livestock producers.	Inadequate feed/water supply/waste management

1.3 Implementation Schedule and Programs

The Prioritize, Target, and Measure Application (PTMApp), a computer model, was used to identify on the ground practices that would best address the issues and provide cost estimates that could be used to look at short- and long-term funding needs. Three levels of funding scenarios to implement the plan were discussed. Level one being current funding levels, estimated over the 10-year life of the plan to be $10.8 million. Level two assumes additional clean water money that would come from the State for this plan and was estimated at $15.3 million. Level two funding is what this plan utilized for setting its goals. The third level would be to go above and beyond the goals set to accomplish in this plan and is estimated at $16.9 million. **Table 1.3** below shows the projects and practices program implementation actions across the entire planning area of each funding level and how they address the short terms goals set. Specific planning zone profiles have similar action tables that target the high and medium priority issues highlighted in each planning zone. These targeted action tables can be found in **Section 5: Implementation Schedule**. There are other actions besides the projects and practices program that this plan intends to utilize to achieve the goals:

- Capital Improvements,
- Data Collection and Monitoring,
- Outreach and Education, and
- Regulation and Enforcement

Due to the nature of these programs, their intent is not to be implemented in the same fashion as the projects and practices programs within targeted planning zones, instead these programs are to be administered across the entire Two Rivers Plus Planning Area. Details on different projects and programs associated with each of the watershed wide actions can be found in **Section 6: Watershed Wide Actions**.

Table 1.3 Planning area wide implementation schedule

Two Rivers Plus Planning Area Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	**Output (Number of Practices)**	**Total 10-Year Cost**	**Lead**	**Partner**	**2021-22**	**2023-24**	**2025-26**	**2027-28**	**2029-30**	**Sediment**	**Nitrogen**	**Phosphorus**	**Bacteria**	**Streambank/ Channel**	**Conveyance Capacity**	**Hydrology/ Flood**	**Groundwater**	**Natural Resource**	**Ag Productivity**
Storage Practices (i.e. Drainage Water Management/ Controlled Drainage; WASCOBS; Wetland Restorations; and Farm Ponds)	**7**	**$70,519**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*14*	*$147,538*																	
Funding Level 3	*25*	*$268,224*																	
Filtration Practices (i.e. Grassed Waterways, Filter Strips)	***25***	**$54,566**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*33*	*$73,713*																	
Funding Level 3	*42*	*$93,922*																	
Non-Structural Land Management Practices	***500***	**$9,500,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*709*	*$13,471,000*																	
Funding Level 3	*770*	*$14,630,000*																	
Protection/Streambank Stabilization	***33***	**$419,415**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*40*	*$508,436*																	
Funding Level 3	*50*	*$636,907*																	
Field Windbreak/Shelterbelt	***5 Miles Field Windbreaks***	**$10,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*10 Miles Field Windbreaks*	*$20,000*																	
Funding Level 3	*15 Miles Field Windbreaks*	*$30,000*																	
Grassland restoration and wildlife habitat management	***1,000 acres***	**$500,000**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*1,550 acres*	*$775,000*																	
Funding Level 3	*1,875 acres*	*$850,000*																	
Well Sealings	***3 Wells sealed/year***	**$30,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*5 wells sealed/year*	*$50,000*																	
Funding Level 3	*8 wells sealed/year*	*$80,000*																	
SSTS Upgrades	***10 System Upgrades***	**$100,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*12 System Upgrades*	*$120,000*																	
Funding Level 3	*15 System Upgrades*	*$150,000*																	
Livestock Exclusion/ Rotational Grazing Systems	***3,200 acres***	**$80,000**	**SWCD**	**NRCS, County, BWSR, MPCA, MDA**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					**X**
Funding Level 2	*4,000 acres*	*$100,000*																	
Funding Level 3	*4,600 acres*	*$105,000*																	
Field Walkover/CFMP	***500 MAWQCP acres/year***	**$15,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					**X**	**X**
Funding Level 2	*1,500 MAWQCP acres/year*	*$45,000*																	
Funding Level 3	*1,750 MAWQCP acres/year*	*$50,500*																	
Total Funding Level 1 10-Year Cost		**$10,779,500**	**Total Level 1 10-Year Progress Toward Goals**							**75%**	**77%**	**78%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$15,310,687*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$16,894,553*	*Total Level 3 10-Year Progress Toward Goals*							*125%*	*112%*	*115%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

1.4 Plan Administration

The planning partners have not developed a specific shared purpose, mission, or vision statement. However, listed below are descriptions of each partner organization, their background, and current focus in the water and natural resources management arena. This information reflects the collective past, present and future commitment of this partnership. It is the intent of these partner organizations to enter into either a memorandum of understanding or possibly a joint powers agreement in order to formally engage each other and accept the state funding that is available to perform implementation activities related to this plan.

Kittson & Roseau Counties

Counties are responsible for numerous areas within water management. Most are involved to some degree with floodplain ordinances, zoning ordinances, roads & bridges, emergency services, hazard mitigation, local water management planning, ditch management under ditch law, and various and sundry other items. Prior to this plan each county had its own individual Local Water Management Plan. The purpose of these plans were to 1) actively work on existing local priority concerns and to identify future potential priority concerns to protect, manage, and develop our water resources, 2) update and continue to develop and apply action plans to promote sound water and related land resource management in each county, 3) continue working toward effective environmental protection and management by focusing on priority concerns and recognizing potential priority concerns.

Kittson & Roseau SWCD's

The Kittson and Roseau County SWCD's operate under Minnesota Statute, Chapter 103C. The SWCD's are committed in addressing issues related to surface water, groundwater, soil and ecological resources by coordinating and joining with local partners for the sustainability and improvement of natural resources. The SWCD's provide technical and financial services to landowners, as well as public outreach to increase awareness and knowledge of important issues and programs.

Two Rivers WD

It is the stated mission of the Board of Managers of the Two Rivers Watershed District *to carry out all facets of the Minnesota Watershed Act as set forth in Minnesota Statute, Chapter 103D. It is the District's further mission to carry forth all activities and powers given under the Minnesota Drainage Code in Minnesota Statute, Chapter 103E. In carrying out its mission, the District will encourage the wise use of the water natural resources within its boundaries and promote the general health and welfare of the citizens residing there.*

The specific powers of watershed districts as set forth under Minnesota Statute 103D.201. General purposes of watershed districts are to conserve the natural resources of the state by land use planning, flood control, and other conservation projects by using sound scientific principles for the protection of the public health and welfare and the provident use of the natural resources.

1.4.1 Existing Water Management Plans & Programs

Numerous plans have been written on the local, state and federal levels to address a number of issues related to our water natural resources. The following is a partial listing of the plans that are most pertinent to northwest Minnesota. This is not a comprehensive list but does show most of the items that were utilized during the 1W1P process and tied into this comprehensive water management plan.

Local:

- County Comprehensive Local Water Plans: These are plans written and maintained by the Soil & Water Conservation Districts for each County. Therefore, these plans serve as the plan for the counties as well as the Soil & Water Conservation Districts. Water management initiatives addressed include water quality monitoring, well sealing, water supply, and protection of the resource.

- Operation of County, State, and Judicial Ditch Systems: Minnesota law designates that a ditch authority can be either a county or a watershed district. Ditch authorities are responsible for inspecting, maintaining or otherwise ensuring the ditch is functioning for the purpose it was built. This includes annual inspection and maintenance planning and implementation.

- Watershed District Overall Plan: The Two Rivers Watershed District is required to update its Overall Plan once every 10 years. This plan considers water quality, flood control, drainage, and management of water natural resources. It identifies issues, goals, and initiatives for management, construction of projects, maintenance of existing projects, monitoring and data collection, and water quality and quantity programs.

- County Emergency Management Plans: Each county is required to have an updated Hazard Mitigation Plan. These plans relate to flooding and other types of emergencies, and what course of action to take during these emergencies.

- Lake Bronson Dam Emergency Action Plan: The largest structure on the Two Rivers is the Lake Bronson Dam. The purpose of the plan is to reduce the risk of human life loss and injury and minimize property damage during an unusual or emergency event at the Lake Bronson Dam. It identifies a chain of command, notification process, and what steps would be taken in such a situation.

- Various Rural Water Systems and City Water Systems: The North Kittson Rural Water System, Kittson-Marshall Rural Water System, and several City Water systems supply drinking water to all of the cities and to most residences in Kittson & Marshall Counties. There are no rural water systems in Roseau County, but the Cities of Greenbush and Badger do have public supply systems. Most rural areas are served by individual water wells. All public suppliers are responsible for wellhead protection plans and other initiatives relative to drinking water and groundwater supplies.

- Various City Stormwater and Wastewater Systems: Each city has plans for their storm sewers and sanitary sewer systems and lagoons. Lagoons are discharged usually 2 times per year into a receiving water body, which can affect flows and water quality.

State:

The following link includes a list and summary info for state plans and reports applicable to water planning.

https://bwsr.state.mn.us/sites/default/files/2019-11/state_strategies_November_2019.pdf

- Various programs and initiatives of the DNR, MPCA, BWSR, LMIC, EQB, LCCMR, Dept. of Ag, Dept. of Health, and others. Includes initiatives such as Red River Fish Management Plans, Watershed Restoration & Protection Strategies and the MN Prairie Plan.

Federal:

- Various programs and initiatives of the USFWS, NRCS, USACE, EPA, FEMA and others

Non-Government:

- The Audubon Society has identified an 'Important Bird Area' within the planning area.
- The Nature Conservancy owns large tracts of lands and is managing them to preserve, protect, and enhance natural resources like wildlife and ecosystems.
- Ducks Unlimited provides funding and land management expertise for a variety of waterfowl production initiatives.

This new plan will replace three existing plans including the Two Rivers Watershed District's Overall Plan, the Kittson County Local Water Management Plan, and the Roseau County Local Water Management Plan. The planning group has convened a Steering Team consisting of local staff, a Policy Committee consisting of a board member from each of the partners, a Citizen's and Technical Advisory Committee, and will utilize a fiscal/administrative agent to implement the plan. It will be up to the Policy Committee to decide on the future course of actions for this plan. See **Table 1.4** below which shows the roles and responsibilities of each committee. **Tables 1.5, 1.6, 1.7, 1.8** lists the agencies and personnel associated with each committee. Further details on plan administration can be found in **Section 7: Plan Administration**.

Table 1.4 Plan Administration Roles

Committee Name	Roles and Responsibilities
Policy Committee	Review the implementation funds from plan participants
	Approve the annual work plan
	Approve annual fiscal reports
	Approve annual reports submitted to BWSR
	Annually review and confirm the PWG priority issues
	Direct the ST on addressing emerging issues
	Approve plan amendments
	Approve grant applications
	Approve annual assessment
Advisory Committee	Review and provide input for the annual work plan
	Identify and advise on collaborative funding opportunities
	Recommend program adjustment to the ST
	Assist with execution of the targeted implementation schedule
Steering Team	Review the status of available implementation funds from plan participants
	Review annual fiscal reports
	Review annual reports submitted to BWSR
	Annually review and confirm 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
	Compile annual results for annual assessment

Table 1.5 Policy Committee

	Name	Organization	Title
Primary	Rick Sikorski	TRWD	Manager
Alternate	Bruce Anderson	TRWD	Manager
Primary	Joe Wilebski	Kittson SWCD	Supervisor
Alternate	Heather Peterson*	Kittson SWCD	Supervisor
Primary	Leon Olson	Kittson County	Commissioner
Alternate	Theresia Gillie	Kittson County	Commissioner
Primary	Landon Olson	Roseau SWCD	Supervisor
Alternate	John Gaukerud	Roseau SWCD	Supervisor
Primary	Daryl Wicklund	Roseau County	Commissioner
Alternate	Roger Falk	Roseau County	Commissioner

*Heather Peterson's term ended on December 31st, 2020 replaced by Andrew Muir

Table 1.6 Steering Team

Name	**Organization**	**Title**
Dan Money	TRWD	District Administrator
Jeremy Benson	Kittson SWCD	District Technician
Jamie Osowski	Kittson SWCD	District Manager
Heather Donoho	Kittson SWCD	District Outreach
Lane Nordin	Kittson County	Zoning Administrator
Janine Lovold	Roseau SWCD	District Technician
Scott Johnson	Roseau SWCD	District Manager
Matt Fischer	BWSR	Board Conservationist

Table 1.7 Technical Advisory Committee

Name	**Organization**	**Title**
Glen Kajewski	MDA	MAWQCP Area Specialist
Dan Disrud	MDH	Source Water Protection Regional Planner
Annette Drewes	DNR	Clean Water Specialist
Mathew Skoog	DNR	Fisheries
Ruthe Ann Franke*	DNR	Wildlife
Stephanie Klamm	DNR Waters	Area Hydrologist
Danielle Kvasager	MPCA	NW Watershed

Matt Fischer	BWSR	Board Conservationist
Kelly Bengston*	Kittson County	County Engineer
Brian Ketring*	Roseau County	County Engineer
Jonathan Eerkes	Nature Conservancy	Nature Conservancy
Jim Schwab	NRCS	District Conservationist
Kathy Fillmore	NRCS	District Conservationist
Danni Halvorson	IWI	Monitoring and Education Director
Scot Olson	Kittson Emergency Management	Director
Susan Grafstrom	Roseau Emergency Management	Director
Dan Money	TRWD	District Administrator
Jeremy Benson	Kittson SWCD	District Technician
Jamie Osowski	Kittson SWCD	District Manager
Lane Nordin	Kittson County	Zoning Administrator
Janine Lovold	Roseau SWCD	District Technician
Scott Johnson	Roseau SWCD	District Manager
Rachel Miller	MN DOT	Water Resources Engineer
Henry Van Offelen	BWSR	Clean Water Specialist - RRV
Anita Locken	City of Greenbush	City Well Head Protection Plan

*Ruth Ann Franke retired in 2019; replaced by Jason Wollin, Kelly Bengston retired in 2020; no replacement, Brian Ketring left in 2020; no replacement

Table 1.8 Citizens Advisory Committee

Name	Representing
Chuck Dziengel	Soybean Growers Association
Lance Hapka	Rural Citizen
Justin Dagen	Rural Citizen
Ed Walsh	Rural Citizen
Vern Langaas	Rural Citizen
Harold Moose	Rural Citizen
Murray Jacobson	Rural Citizen
Shayne Isane	Rural Citizen
Jim Rinde	City of Badger
Brenda Sather	City of Greenbush
Roger Green	Friends of Lake Bronson SP
Kris Folland	Rural Citizen
Doug Green	Rural Citizen
Justin Osowski	Rural Citizen
Shane Stewart	Joe River WD
Todd Nordine	N. Kittson Rural Water
Mark Larson	Rural Citizen

1.4.2 Plan Funding

The ability to achieve plan measurable goals is largely dependent on the amount of funding available to implement actions. However, combined funding (local, state, and federal) can vary from year to year. To address this challenge, the plan presents more than one implementation funding level, which are summarized in the targeted implementation schedule where all actions are assigned a funding level. The planning group felt this was a realistic and defensible approach. It allowed them to build out scenarios for a plan cost that communicates to decision makers (in the planning area and at the state) realistic expectations for achieving results.

As mentioned before for purposes of this plan a current base line estimate of funding was developed, Funding Level 1. Goals in this plan were set to be achieved with the expectation that Watershed Based Funding would be replacing the need for competitive funds, Funding Level 2 (Funding Level 1 + ~$500,000). Any other additional sources of funding through competitive grants would be considered Funding Level 3 (Funding Level 2 + ~$250,000). The anticipated cost and sources of funding for implementing the baseline funding level ($3,071,566 annually) is shown in **Table 1.9**.

Table 1.9 Annualized and estimated total plan cost for actions of Funding Level 1.

Implementation Program	Local		State		Federal		NGO's		All Sources	
	Annual	10-Year Total	Annual	10-Year Total	Annual	10-Year Total	Annual	10-Year Total	Annual	10-Year Total
Structural and Non-structural Management Projects and Practices Incentive Program	$16,900	$169,000	$140,873	$1,408,730	$900,000	$9,000,000	$85,000	$850,000	$1,142,773	$11,427,730
Capital Improvement Projects Program	$688,120	$6,881,200	$0	$0	$0	$0	$0	$0	$688,120	$6,881,200
Data Collection & Monitoring Program	$16,500	$165,000	$0	$0	$0	$0	$0	$0	$16,500	$165,000
Regulation and Enforcement Program	$108,082	$1,080,820	$396,051	$3,960,510	$0	$0	$0	$0	$504,133	$5,041,330
Education and Outreach Program	$3,000	$30,000	$53,252	$532,520	$0	$0	$0	$0	$56,252	$562,520
Plan Administration Program	$339,823	$3,398,230	$293,965	$2,939,650	$0	$0	$30,000	$300,000	$663,788	$6,637,880
Total	$1,172,425	$11,724,250	$884,141	$8,841,410	$900,000	$9,000,000	$115,000	$1,150,000	$3,071,566	$30,715,660

It should be noted that funding that will become available and that is discussed in detail in this plan will be through the Board of Water and Soil Resources and comes from Minnesota's Clean Water Fund. Clean Water Legacy states funds may only be spent to protect, enhance, and restore water quality in lakes, rivers, and streams and to protect groundwater from degradation. There are goals within this plan

related to drainage, flood control or other water management initiatives that do not relate directly to water quality. However, there may be water quality aspects or components of projects related to these goals that could be funded. Other sources of funding will be needed to be secured to fund the non-water quality aspects.

The information highlighted in this executive summary is discussed in detail throughout the rest of the Two Rivers Plus Comprehensive Watershed Management Plan. This plan is intended to guide each agency in their normal operations and to help plan, prioritize and fund on the ground projects that will produce measurable results.

Section 2: Land & Water Resource Narrative

2.1 Watershed Setting

The Two Rivers Plus One Watershed One Plan (TRP1W1P) area consists of two watershed districts – Joe River WD & Two Rivers WD, two Soil & Water Conservation Districts – Roseau SWCD & Kittson SWCD; and two Counties – Roseau & Kittson. The 1W1P planning area also comprises a very small portion of Marshall County, but since it is such a small portion, the Marshall SWCD and Marshall County declined to participate. The Joe River Watershed District declined to participate at the Policy Committee level because their Overall Plan was approved in 2019 at the start of the planning process. They were however a part of the advisory committees. **[Figure 2.1]**

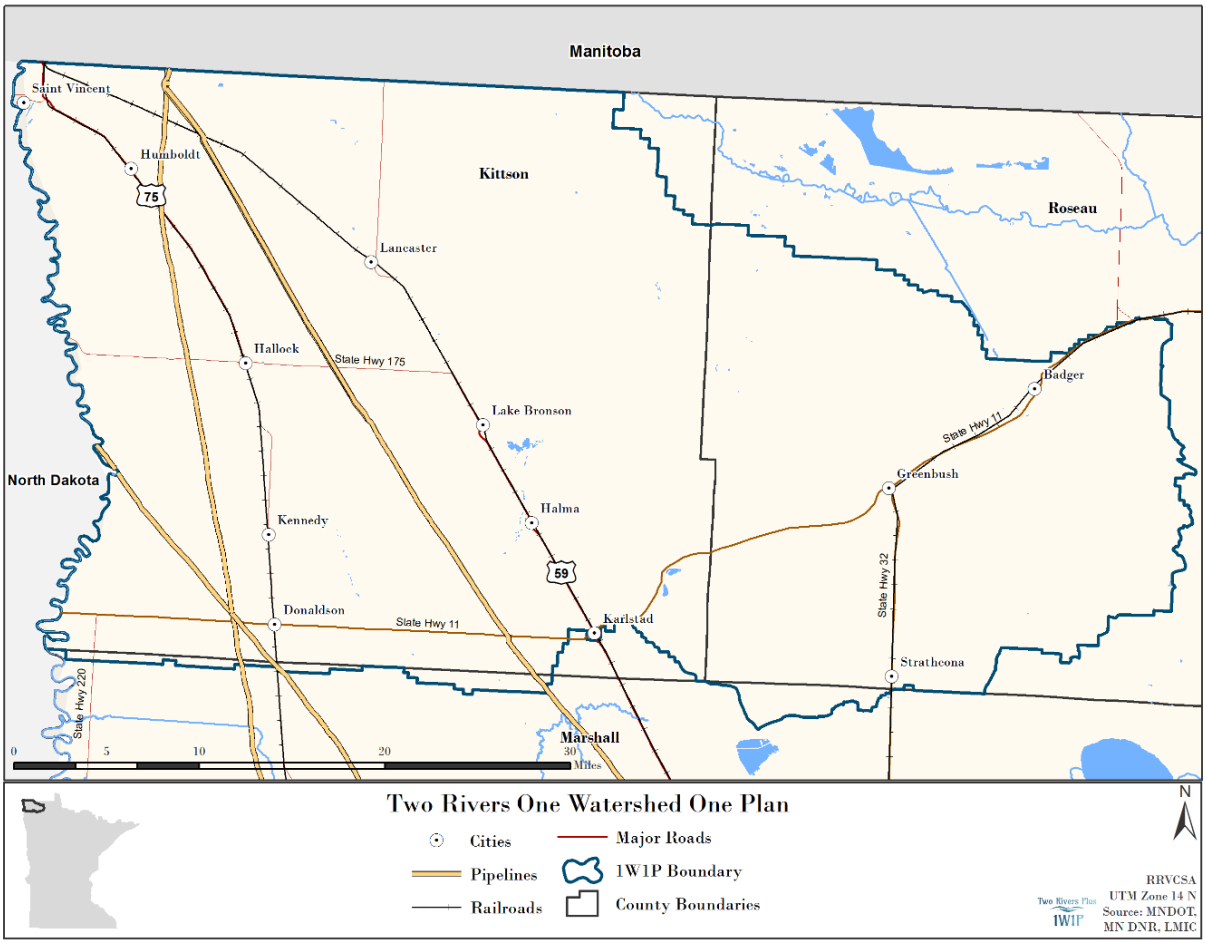


Figure 2.1 Two Rivers Plus Planning Area

2.1.1 Planning Area Description

The Planning Area is located in portions of Roseau County, Kittson County, and Marshall County, in Northwest Minnesota and follows the boundaries of the Joe River and Two Rivers Watershed Districts. In Kittson County, there are approximately 677,760 acres of land (1059 square miles). In Roseau County, there are approximately 316,800 acres of land (495 square miles). In Marshall County, there are approximately 13,760 acres of land (21.5 square miles).

The land area of the Joe River Watershed District (JRWD) is located in the extreme northwest corner of Kittson County, which is the northwestern most county in the State of Minnesota. The JRWD comprises 79,360 acres of land (124 square miles) in all or parts of the Townships of St. Vincent, Clow, Richardville, Hill, and Hampden. The JRWD is bordered to the west by the Red River of the North (also the MN - ND border), to the north by the Province of Manitoba, Canada, and to the east and south by the Two rivers Watershed District.

Beginning in the southwest corner of the JRWD, the boundary line runs 9.5 miles north following the Red River. The boundary then travels 19 miles east along the Canadian border, where it turns south - south west for 9.5 miles. The border then travels westerly about 10 miles back to the point of origin.

The Joe River flows in a northerly direction, passes through the international border into Canada, and then flows into the Red River of the North. The watershed of the Joe River is bordered in the U.S. portion entirely by the Two Rivers Watershed. There is no significant crossover of flows into or out of the Joe River Watershed.

The Two Rivers Watershed District (TRWD) encompasses an area approximately 1,451.5 square miles in portions of Roseau, Kittson, and Marshall Counties in extreme northwest Minnesota. The western boundary of the TRWD is the Red River of the North, which also serves as the North Dakota – Minnesota boundary. The TRWD begins just south of the Kittson and Marshall county line and follows the Red River to a point about ten miles from the international border with Canada. The TRWD extends sixty-two miles east from the Red River to a point located four miles west of the City of Roseau, Minnesota. From here the border extends twenty-one miles south to a point near the Roseau and Marshall county line. It then makes its way westward back to the Red River.

The TRWD is bordered to the northwest by the JRWD, to the north by the province of Manitoba, Canada, and to the northeast, east, and southeast by the Roseau River Watershed District. To the south is the Middle-Snake-Tamarac River Watershed District, which is located in Marshall County and a small portion of Kittson and Roseau County. The TRWD is about thirty-three miles wide from north to south at its widest point and sixty-five miles in length from east to west.

The Two Rivers itself is made up of three branches – the North Branch, Middle Branch, and South Branch. The South Branch arises just south of the City of Badger and flows in a southwest direction along the south side of Minnesota trunk highway #11 to the southeast corner of Pelan Township in Kittson County. At this point it crosses the highway and flows northwesterly to Lake Bronson, and from there westerly to Hallock, and then continues west to the Red River.
The Middle Branch of the Two Rivers begins as State Ditch #50 on the Roseau & Kittson County line and extends about 25 miles to the City of Hallock where it empties into and joins the South Branch. The

Middle Branch begins on the County line but does accept limited amounts of water from a series of ditches in Barto and Polonia townships located in western Roseau County. The Middle Branch flows in a general westerly direction through the central portion of Kittson County.

The North Branch of the Two Rivers arises about eight miles to the northeast of Lancaster and is fed by a series of county and state ditches that extend east into Juneberry and Soler Townships of Roseau County. The North Branch flows through the cities of Lancaster and Northcote and joins the South Branch to form the main stem at a location seven miles west of Hallock and three miles east of the Red River of the North.

An area encompassing about 360 square miles, located in the south western portion of the TRWD, is a stand-alone drainage area consisting of numerous drainage ditches and intermittent watercourses, known as coulees. These coulees join and enter the Red River approximately ten miles south of where the Two Rivers enters the Red River. This system encompasses the cities of Karlstad and Donaldson in Kittson County.

In addition, a few areas, which did not naturally drain to the Two Rivers, have been included within the boundaries of the TRWD. Among these is a fifty square mile area where Badger Creek and Skunk Creek (located north of Badger, Minnesota) were diverted from their natural course to the Roseau River via a lateral to State Ditch #95 and into the Two Rivers system. Another area of about sixty square miles and located in the upper reaches of the Joe River was diverted into the Two Rivers North Branch via Kittson County Ditch #22. This diversion included the Little Joe River and several smaller coulee systems. During extreme floods, the Roseau River will overflow and floodwaters from the Roseau River will enter the Two Rivers Watershed. These flows enter the State Ditch #72 system and Lateral 1 of State Ditch #95.

All three branches of the Two Rivers flow into the Red River of the North at a point approximately 13 miles south of the international border with Canada. **Figure 2.2** below shows this network of surface water including streams, ditches, coulees, public waters wetlands, and other watercourses.

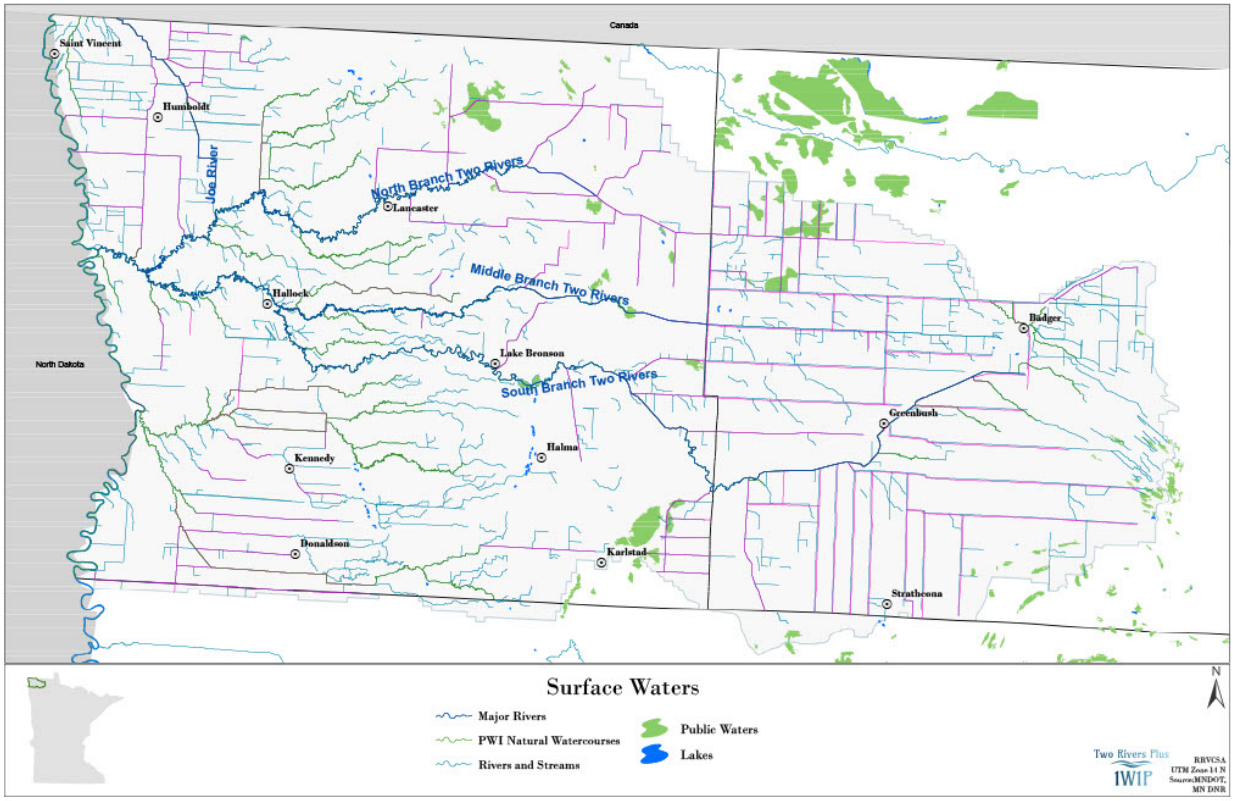


Figure 2.2 Surface Waters

Several water control structures are present within the planning area and are operated for various reasons. The MN Dept. of Natural Resources maintains and operates structures for wildlife management on the Joe River, Beaches Lake, Twistal Swamp, and Twin Lakes. A dam is maintained and operated by the DNR on the South Branch Two Rivers at Lake Bronson, forming the lake. A dam that was maintained and operated by the City of Hallock on the South Branch Two Rivers at Hallock was altered in 2020 to allow for fish passage. A private dam was constructed near Northcote on the North Branch Two Rivers in the early 1900's by railroad magnate James J. Hill. The TRWD maintains and operates flood control impoundment structures at Skull Lake in Kittson County and in Ross Township and Nereson Township, both in Roseau County. Additional information on each of these structures is available from the owners upon request.

There are no known stormwater treatment systems present within the planning area, however there are city storm sewers in most all the incorporated cities. Several cities own and operate sanitary sewage treatment ponds, and treatment ponds are also operated by the canola plant located between the cities of Hallock and Kennedy.

Water quality has been extensively studied over many years. In 1991 through the Comprehensive Local Water Planning initiative, a water quality monitoring program was started in a joint effort between the TRWD and the Kittson SWCD. 12 baseline monitoring sites were established in Kittson County on the Joe and Two Rivers, and later several sites were added in Roseau County. In the past 10 years, the MPCA has done extensive water quality monitoring and a series of reports have been written. These

include 'Condition Reports', 'Watershed Restoration and Protection Strategies', 'Stressor Identification', and 'Total Maximum Daily Loads'. Water quality details are highlighted in Section 5 when each planning zone is discussed.

Flows within the Planning Area are highly variable and dependent on precipitation. Generally, flows are very high in the spring during the snowmelt and runoff, during late spring and early summer when seasonal rains are occurring, and often in the fall again during seasonal rains. At times during the summer waterways become very dry to the point of not flowing.

2.1.1.1 Political Units Within the District

Numerous international, federal, state, and local units of government exist within the TRP1W1P. Listed below are the political units within the planning area that deal with water resources and their management. The website for each entity is listed as a reference.

International – Regional:

International Joint Commission (IJC): www.ijc.org
Red River Basin Commission: www.redriverbasincommission.org
Red River Watershed Management Board (RRWMB): www.rrwmb.org
Red River Retention Authority: www.redriverretentionauthority.net/

Federal:

U.S. Army Corps of Engineers (USACE): www.mvp.usace.army.mil
U.S. Geological Survey (USGS): http://mn.water.usgs.gov
Federal Emergency Management Agency (FEMA): www.fema.gov
U.S. Fish and Wildlife Service (USFWS): https://www.fws.gov/
Natural Resources Conservation Service (NRCS): www.mn.nrcs.usda.gov
Farm Service Agency (FSA): https://www.fsa.usda.gov/state-offices/Minnesota/index
Environmental Protection Agency (EPA): https://www.epa.gov/mn
National Weather Service: https://www.weather.gov/fgf/

State:

Board of Water & Soil Resources (BWSR): www.bwsr.state.mn.us
Department of Natural Resources (DNR): https://www.dnr.state.mn.us/waters/index.html
Pollution Control Agency (MPCA): https://www.pca.state.mn.us/hows-the-water
MN Department of Agriculture (MDA): www.mda.state.mn.us
Minnesota Geological Survey (MGS): https://www.mngs.umn.edu/
Minnesota Department of Health (MDH): www.health.state.mn.us

Local:

Information on cities can be found at the Northwest Regional Development Commission's web page and on individual county webpages:

http://visitnwminnesota.com/sample-page/county-city-information/

Kittson Co: https://www.co.kittson.mn.us/
Roseau Co: http://www.co.roseau.mn.us/
Marshall Co: http://www.co.marshall.mn.us/

Information on **soil & water conservation districts** can be found here:
https://www.maswcd.org/SWCDs_On_The_Web/swcds_on_the_web.htm
https://www.maswcd.org
Information on **watershed districts** can be found here:
www.rrwmb.org or www.mnwatershed.org

The following Counties, Cities, and special Districts are active within the TRP1W1P. Not listed but noteworthy are the township governments, of which there are 56 within the area. Information on all the following entities can be found on the above websites.

Kittson County
Kittson SWCD
Two Rivers WD
Joe River WD
City of Hallock
City of Kennedy
City of Donaldson
City of Lancaster
City of Lake Bronson
City of Halma
City of Karlstad

City of St. Vincent
City of Humboldt

Marshall County
Marshall SWCD

Roseau County
Roseau SWCD
City of Greenbush
City of Badger
City of Strathcona

The website for this One Watershed, One Plan is: https://www.tworiversplus1w1p.org/

2.2 Population

In general, population of the cities and towns within the planning area, as well as the rural areas, has declined since the 1950's and 1960's. The Eastern third of the planning area had an increase in population during the 1980's and 1990's but has since dropped back down to levels experienced in 1970.

Table 2.1: Two Rivers Plus Planning Area Demographic Information. Source: US Census Bureau

City / County	1970	1980	1990	2000	2010
Roseau County	11569	12574	15026	16338	15,629
Badger	327	320	378	470	375
Greenbush	787	817	790	784	719
Strathcona	31	47	34	29	44
Kittson County	6853	6672	5767	5285	4,552
Donaldson	69	84	55	41	42
Hallock	1477	1405	1350	1196	981
Halma	96	97	59	78	61
Karlstad	727	934	910	794	760
Kennedy	424	405	324	255	193
Lake Bronson	325	298	262	246	229
Lancaster	382	268	337	363	340
Humboldt	112	111	74	61	45
St. Vincent	177	141	116	117	64

In the western portion of the planning area, massive flooding during the 1990's took its toll on the predominantly farming related industry. Rural residents have moved away from flood prone areas and the declining farm economy has shut down many smaller family farms. Farm operations are now larger

than ever before, and the equipment used requires less farm labor. Therefore, population trends in these areas are on the downswing. **Table 2.1** shows population statistics from 1970 to 2010 for Kittson & Roseau Counties and the cities within the planning area. The U.S. Census Bureau estimates populations will continue to decline in these areas.

2.3 The Economy

2.3.1 Agriculture

The economy of the TRP1W1P, including all cities and villages, is generally driven by agriculture. According to the Minnesota Agricultural Statistics Service, Kittson (58.1% farmland), Roseau (43.3% farmland) and Marshall (72.5% farmland) Counties have consistently been in the top ten in Minnesota for crop production of wheat, barley, sunflowers, sugar beets, soybeans, dry edible beans, and canola.

Table 2.2: 2019 Top 5 Crops by County

County	Wheat	Soybeans	Corn	Canola	Sugar Beets	Oats
Roseau	2	1	3	4	N/A	5
Kittson	1	2	5	4	3	

Livestock, mainly beef cows, is also produced in the eastern portions of the planning area. Roseau County has consistently ranked in the top ten in Minnesota for beef cow production.

Table 2.3 Livestock data for Roseau County:

Livestock	2012 Data	2017 Data
All Cattle & Calves	16,701	16,046
Turkey	238,668	253,000
Sheep	1,027	375
Hogs	8,529	33

Data shows that the number of farms is declining, but number of acres in farmland is increasing. 2007-2017 farm related statistics for Marshall, Roseau & Kittson Counties as reported by the U.S. Department of Agriculture are listed in **Table 2.4**

Table 2.4: Farm Statistics
(Source: U.S. Dept. of Agriculture, National Agriculture Statistics Service)

County	Number of Farms	Total Acres in Farms	Ave. Farm Size – Acres	Total Acres in Cropland	Market Value – Crops	Market Value – Livestock	Gov. Payments
Roseau							
2007	1182	591,316	500	462,247	63,933,000	20,859,000	9,852,000
2012	977	555,833	589	445,387	136,323,000	22,087,000	9,192,000
2017	842	558,152	663	463,108	109,252,000	20,292,000	10,057,000
Kittson							
2007	677	542,062	801	439,631	100,947,000	4,407,000	9,536,000
2012	544	470,300	865	391,057	170,689,000	9,872,000	8,938,000

2017	528	479,322	908	408,591	122,742,000	5,605,000	12,450,000
Marshall							
2007	1,405	910,687	648	786,313	179,979,000	9,870,000	17,581,000
2012	1,148	820,112	714	740,407	341,981,000	7,350,000	15,614,000
2017	1,086	902,436	831	824,103	246,171,000	15,284,000	18,205,000

Land values within the planning area vary from west to east as the land changes from the flat Red River Valley to the beach ridge area to the eastern upstream areas. According to the University of Minnesota Extension website, for 2017 there were 37 ag land sales in Roseau County ranging from $400/acre to $1,900/acre and in Kittson County there were 16 sales ranging from $631/acre to $3,414/acre. According the Kittson County Assessor's office, the countywide average value per tillable acre by Township for 2019 ranged from $789 per acre in Percy Township to $3,020 per acre in St. Vincent Township.

2.3.2 Industry

Industry within the TRP1W1P is limited but has recently been expanding. Relatively new businesses include a canola refining plant located between the cities of Hallock and Kennedy, a distillery located southwest of Hallock, and a craft beer brewery in Hallock. Other industrial development companies that are in operation include a welding and manufacturing plant as well as a powder coating facility in Lancaster, a company which produces vehicle tracks located in Karlstad, and a wood burning furnace & lawn mower manufacturer located in Greenbush. A motor coach bus assembly plant, two all-terrain vehicle / snowmobile manufacturing plants, and an electronics assembly plant are located within driving distance of the planning area.

Because of the beach ridges that occur in the TRP1W1P, the mining of sand and gravel is predominant in these areas. Numerous gravel pits, both public and private, exist in Kittson, Roseau, and Marshall counties.

There are three natural gas pipeline companies (see **Figure 2.1**) with pipelines running through the area. Two power companies are located in the area, as well as two telephone companies. High speed internet is provided by two area companies. Each city has several farm related businesses, including implement and parts dealers, hardware stores, farm chemical and fertilizer companies, several elevators and seed companies, car dealerships, and supply stores.

2.3.3 Transportation

Highways:

Most of the planning area is accessible by some sort of Federal, State, County, or Township road. Two U. S. Highways, numbered 75 and 59, run north and south through Kittson County. Highway #75, otherwise known as the "King of Trails" Scenic Byway, connects Winnipeg, Manitoba, Canada to Hallock, Kennedy, and Donaldson. It continues and then crosses the entire nation connecting Minnesota to Texas. Highway #59 also connects to Winnipeg, but it travels through eastern Kittson County to Lancaster, Lake Bronson, Karlstad, and southward to Thief River Falls and other points south, also crossing the nation. State Highway #11 runs east and west through the TRW1W1P area, connecting Drayton, North Dakota, Donaldson, Karlstad, Greenbush, and Badger. It then continues east to Roseau and Warroad and ends near International Falls. A portion of MN #11 is known as the 'Waters of the

Dancing Sky' Scenic Byway. State Highway #32 runs south from Greenbush to Thief River Falls and ends near Barnesville, MN. County, Township, and private roads are too numerous to mention.

Railways:

The Burlington Northern Santa Fe Railway runs in a north and south direction across the western portion of the TRP1W1P area. Created by railroad magnate James J. Hill in the 1800's, this line connects the cities of Winnipeg, Manitoba, Canada to Hallock, Kennedy, and Donaldson, and played a major role in the early settlement of the region. The Burlington Northern Santa Fe railway also runs a line through the eastern portion of the area connecting Thief River Falls, Greenbush, Badger, and Roseau.

The Canadian Pacific Railway parallels U.S. Highway #59 through the central portion of the area connecting the cities of Lancaster, Lake Bronson, Karlstad, and Thief River Falls.

These railways principally ship grain, oil, and other cargo. There are no passenger trains within the TRP1W1P area.

Airports:

Municipal airports are operated near the cities of Hallock and Roseau. Landing strips are also located at Lake Bronson and Karlstad. Several private landing strips are also located throughout the area. Commercial air traffic and major airports are located outside the TRP1W1P area at Grand Forks, ND, Winnipeg, MB, and Thief River Falls, MN.

2.3.4 Recreation

Outdoor recreational opportunities within the area are numerous and vary with the seasons. Summer and fall activities include camping, fishing, swimming, bird watching, boating/canoeing/kayaking, hunting, golfing, tennis, tubing, biking, and others. In the winter, outdoor enthusiasts can enjoy skating, snow shoeing, trapping, cross country skiing, snowmobiling, and ice fishing. Facilities are also available for the sports of curling and bowling. Two scenic byways – The MN Highway 11 Waters of the Dancing Sky & the U.S. Highway 75 King of Trails - cross the area, as well as several stops on the Pine to Prairie birding trail.

The State of Minnesota (DNR) and the Nature Conservancy each own and manage thousands of acres within the area which are open for public use of the land (see https://www.dnr.state.mn.us/maps/compass/index.html and http://www.tnclands.tnc.org/). Among the wildlife management areas located wholly or partially within the area are the Caribou, Skull Lake, Beaches Lake, Twin Lakes, Devils' Playground, Pelan, Halma Swamp, Nereson, Roseau River, and Palmville Wildlife Management Areas. Also located within the area are Lake Bronson State Park and the Lake Bronson Aspen Parkland Scientific and Natural Area. A prairie rich fen is present in the Beaches Lake WMA near the Kittson and Roseau county line and offers an immense and unique natural area containing species classified as either rare, threatened, or special concern. In addition, the Roseau County Recreation Area is available for public use.

The Kittson County Trailblazers and similar snowmobile clubs in Roseau and Marshall Counties operate and maintain hundreds of miles of groomed snowmobile trails. Cross-country ski trails are maintained at Lake Bronson State Park. In addition, an ATV club exists in Kittson County and surrounding areas and is advocating a trail system.

Hunting opportunities are numerous in the fall. White tail deer, elk, and black bear are the main big game animals. Although a hunting season no longer exists for moose, a small population is present in the area. For the bird hunter, many species are present including ruffed and sharp-tailed grouse, Canada geese, various duck species, snow, blue, and Ross' geese, Hungarian partridge, woodcock, sandhill crane, mourning dove, and wild turkey to name a few. The Audubon Society has established an 'Important Bird Area' in Kittson County and bird watchers can spot bald eagles, great blue herons, American bittern, marbled godwit, phalarope, and many other common species too numerous to list. Other animals of note include timber wolf, beaver, mink, muskrat, fisher, bobcat and many others.

The Red River and Two Rivers support a very large and diverse fishery; however, the Joe River is limited in supporting a fish population. The South Branch Two Rivers and its only lake, Lake Bronson, support northern pike, walleye, perch, sauger, crappie, sunfish, bass, catfish, bullhead, carp, sucker, and various other species. Public water accesses are located on the Two Rivers at Lake Bronson and Hallock. Limited fishing opportunities exist on the North and Middle Branches. The Red River supports all the above and is noted for its trophy size channel catfish. Public access is available on the Red River 4.5 miles north of Minnesota Highway #175 crossing and at Pembina, ND.

Camping opportunities within the TRP1W1P area are numerous. City parks are located at Lancaster, Karlstad, Badger, Greenbush, and two in Hallock. Lake Bronson State Park is located just east of Lake Bronson on the South Branch Two Rivers. Several primitive campsites are located at area wildlife management areas and maintained by the DNR.

Nine-hole golf courses are in Lancaster, Greenbush, Karlstad, and Hallock. The City of Hallock also has a curling club and bowling alley. Tennis courts are in Hallock and Karlstad. Swimming pools are in Hallock and Greenbush. Other recreational information can be obtained by contacting each city's Chamber of Commerce.

2.4 Physical Features

2.4.1 Climate

Climate information is available from a plethora of sources, including the National Weather Service, MN DNR, State Climatology Working Group, and many other federal, state & local resources. The following information is intended to provide an understanding of local climate trends. More specific information can be obtained from the various agencies.

The climate of the TRP1W1P area can be classified as sub-humid. Weather patterns are influenced most of the year by upper level winds traveling from west to east. At the surface the wind direction is predominantly westerly. Rapid changes in weather can frequently happen in the region because of influence from the Pacific northwest and the Gulf of Mexico areas. The two areas are drastically different – cold air in the northwest vs. warm gulf air – and thus can cause drastic weather changes.

Temperatures within the Planning Area can vary drastically from winter lows below -50º F to summer highs above 100º F. Average temperatures generally range from between -8 and 10 º F in January to between 57 and 80 º F in July. Spring generally ends in mid-May and Fall generally begins in mid-September. For the period 1981-2010, the average annual high was 47.8 and the average annual low was 26.7.

Wind speeds and direction in the region can vary greatly. The following is taken from the website 'weatherspark.com' and analyzes data from the municipal airport in Hallock between 1980 and 2016:

> *This discussion is of the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.*
>
> *The average hourly wind speed at Hallock Municipal Airport experiences significant seasonal variation over the course of the year.*
>
> *The windier part of the year lasts for 8.5 months, from September 15* to *May 31, with average wind speeds of more than 10.8 miles per hour. The windiest day of the year is April 1, with an average hourly wind speed of 12.3 miles per hour.*
>
> *The calmer time of year lasts for 3.5 months, from May 31 to September 15. The calmest day of the year is July 27, with an average hourly wind speed of 9.2 miles per hour.*
>
> *The predominant average hourly wind direction at Hallock Municipal Airport varies throughout the year.*
>
> *The wind is most often from the south for 1.4 months, from May 25 to July 5; for 2.1 months, from July 15 to September 18; and for 1.0 months, from October 15* to *November 15, with a peak percentage of 36% on August 19. The wind is most often from the north for 1.4 weeks, from July 5 to July 15; for 3.9 weeks, from September 18 to October 15; and for 6.3 months, from November 15 to May 25, with a peak percentage of 32% on October 6.*

Precipitation within the watershed is also variable by month. On average, the least amount tends to fall in February, and the most tends to fall in June. Average annual rainfall for the period was 21.38 inches. **Figure 2.3** below from the Minnesota State Climatology Office shows the rainfall in the past 100 years in the watershed. Periods of dry, normal, and wet years can be seen. The period from 1990 to 2010 was wetter than normal however several drier years have occurred since 2011-2012.

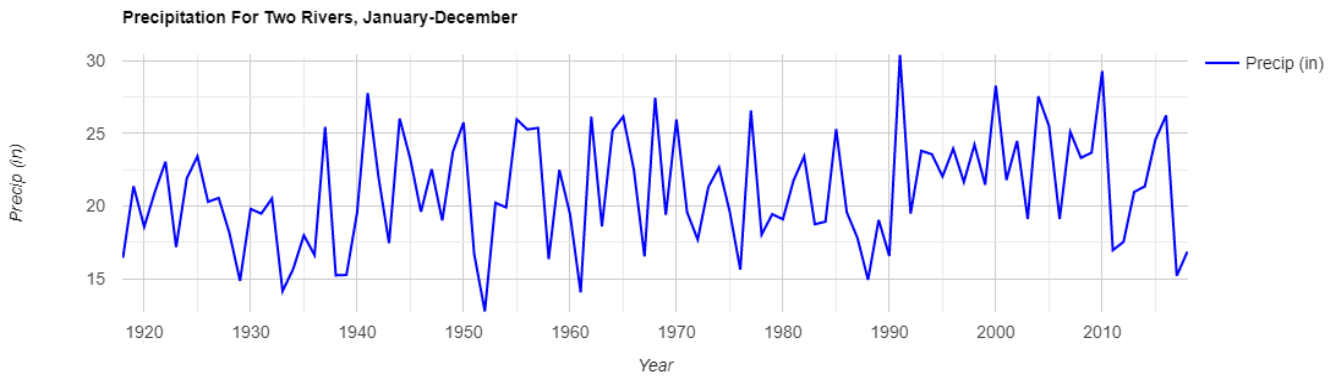


Figure2.3

The following **Table 2.5** shows spring and fall freeze data, and the freeze free period probabilities based on date from 1981-2010 at Hallock.

03/01/2013

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Summary of Annual Normals
1981-2010

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: **HALLOCK, MN US**

GHCND:USC00213455
Elev: 248 ft. Lat: 48.772° N Lon: 96.941° W

Freeze Data

Spring Freeze Dates (Month/Day)

Temp (F)	Probabilty of later date in spring (through Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	6/07	6/02	5/31	5/27	5/24	5/21	5/18	5/14	5/10
32	5/31	5/25	5/21	5/17	5/15	5/12	5/08	5/04	4/30
28	5/20	5/15	5/12	5/08	5/05	5/01	4/29	4/26	4/20
24	5/12	5/06	5/02	4/29	4/27	4/24	4/20	4/15	4/09
20	5/02	4/27	4/23	4/20	4/16	4/13	4/09	4/06	4/03
16	4/22	4/17	4/13	4/10	4/07	4/05	4/03	4/01	3/27

Fall Freeze Dates (Month/Day)

Temp (F)	Probabilty of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	9/01	9/06	9/10	9/12	9/14	9/16	9/18	9/21	9/23
32	9/11	9/15	9/18	9/20	9/22	9/24	9/26	9/29	10/02
28	9/20	9/24	9/26	9/28	10/01	10/02	10/05	10/08	10/13
24	9/27	10/01	10/03	10/06	10/08	10/11	10/14	10/18	10/24
20	10/04	10/08	10/12	10/15	10/18	10/21	10/25	10/29	11/03
16	10/12	10/17	10/21	10/25	10/28	11/01	11/03	11/07	11/12

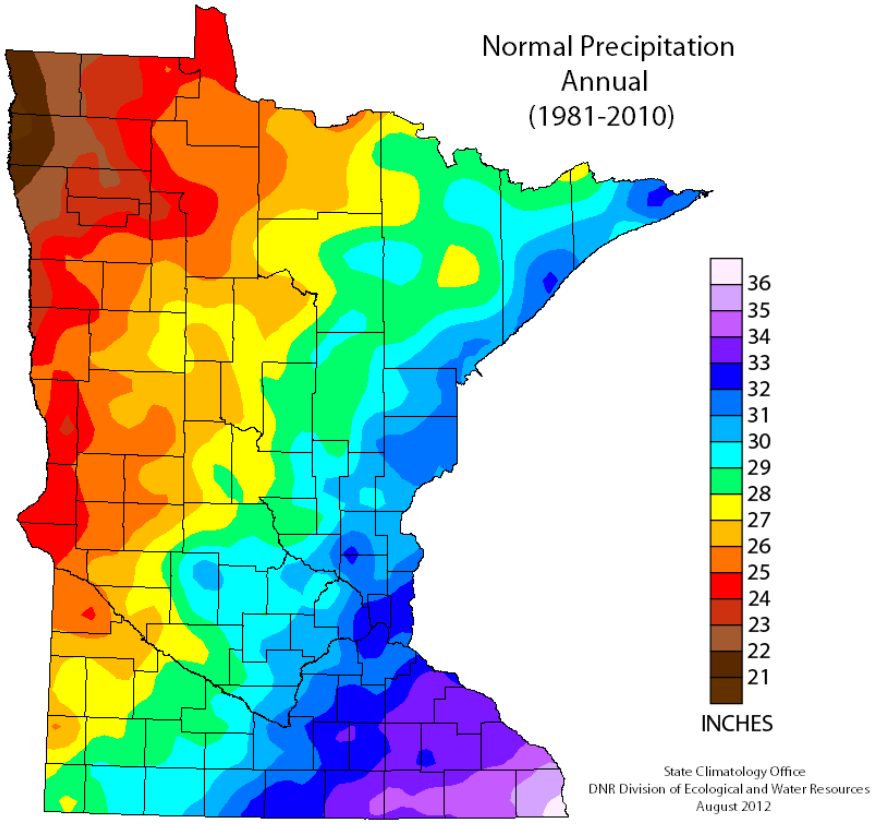
Freeze Free Period

Temp (F)	Probabilty of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	128	122	118	114	111	107	103	98	91
32	147	140	136	132	129	125	121	116	110
28	166	159	154	150	147	143	139	135	129
24	185	178	173	168	164	160	156	151	145
20	205	198	192	187	183	179	175	169	162
16	221	215	210	206	202	197	193	187	181

* Probability of observing a temperature as cold, or colder, later in the spring or earlier in the fall than the indicated date
0/00 Indicates that the probability of occurrence of threshold temperature is less than the indicated probability.
Derived from 1981-2010 serially complete daily data

Complete Documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Table 2.5 Freeze Data at Hallock, MN



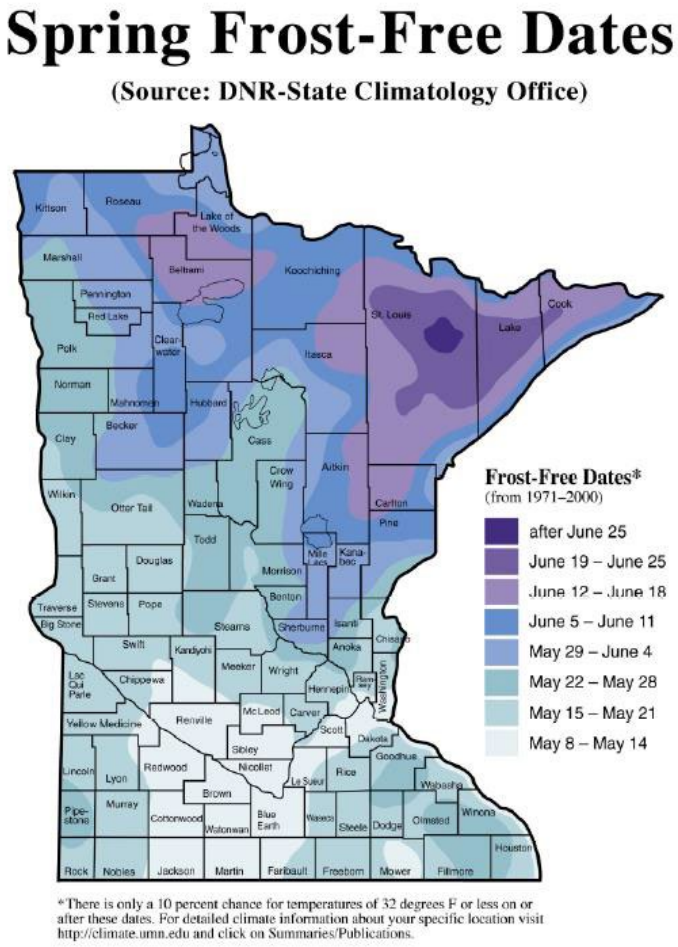
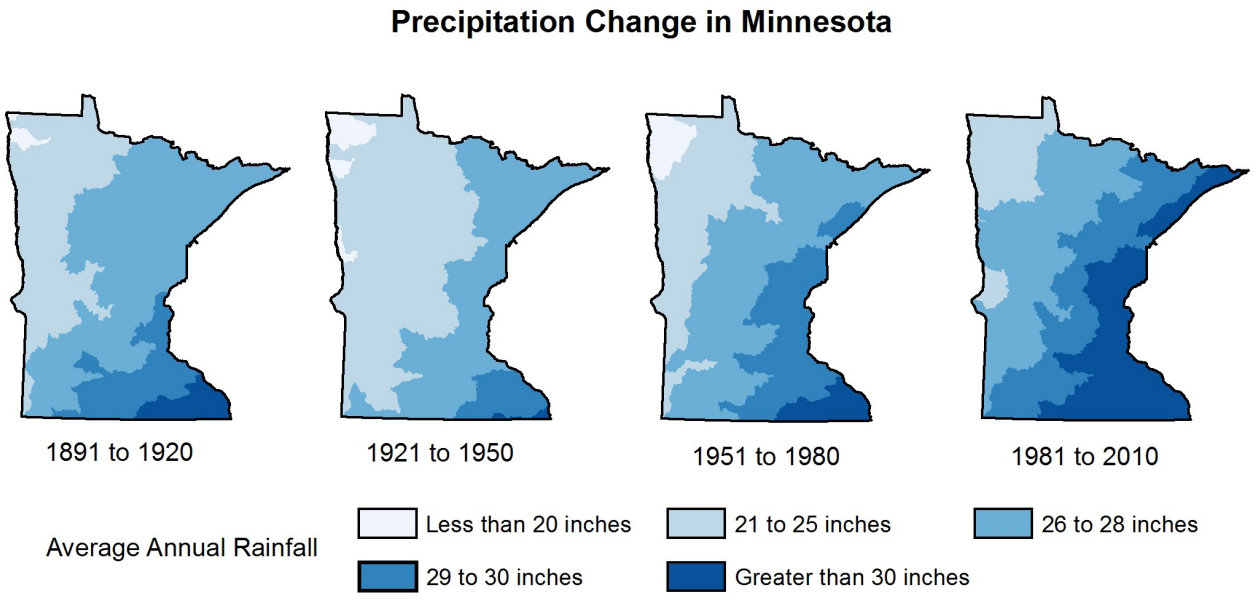


Figure 2.4 Precipitation and Frost-Free Dates

In recent years there has been much research and discussion regarding climate change as a trend of increasing temperatures and precipitation. If these changes continue, the climate is expected to continue to warm and it is anticipated that this will influence weather systems. Some models indicate severity and duration of storms and precipitation will increase as a result of warmer temperatures. While future weather and climate cannot be predicted with certainty, it is important to note that changes are expected to occur, and weather trends and cycles need to be tracked.

This information needs to be taken into consideration when designing flood control projects, drainage ditches, best management practices, erosion control structures, and other projects, programs, and conservation measures. Below is a graphical example of changing climate, focusing on precipitation. Similar information is available for temperature, occurrence of and severity of storms, and other factors.



Adapted from Fields to Streams, University of Minnesota (2015) and Gupta, S.C., A.C. Kessler, and M.K. Brown (2014). Based on data from MN DNR State Climatology Office

Figure 2.5 Credit: "Change in the Minnesota River Report" available at: www.freshwater.org

There are several in-depth publications available from sources such as the National Weather Service, MN Pollution Control Agency and Department of Natural Resources on this topic, and several tools are available to analyze data. Examples are "Adapting to Climate Change in MN", a May 2017 report from the MN Interagency Climate Adaptation Team (available on the MPCA website), and the "Watershed Health Assessment Framework", a set of on-line tools available from the MN Department of Natural Resources on their website. Since there is a large amount of information that is readily available on the subject, this plan will not go into further detail regarding the changing climate.

2.4.2 Topography

The land in the TRP1W1P area is very flat. The land in the western part, and particularly from the City of Hallock to the Red River, is flat, open land devoted entirely to the raising of small grains, sugar beets, sunflowers, soybeans, canola, and other crops. From Hallock to the east the land is not as flat and there is more tree and shrub growth. Because of steeper slopes, sandier soils, and other factors, this portion of the TRP1W1P area is more diverse with regard to land use.

In the eastern portion of the Planning Area the slope is toward the west. The slope is quite rapid and as much as twelve to fifteen feet per mile. Some portions of the Planning Area, associated with beach ridges, experience 20 to 30 feet per mile drop. In the westerly twelve to fifteen miles of the Planning Area the lands are flat, and the drop is less than one or two feet to the mile.

Although the countryside appears flat in the Planning Area, there is a considerable difference in elevation between the headwaters and the mouths of both the Two Rivers and Joe River. The following locations and their elevations show the variability and changes in elevations. There is a 420 foot drop over a distance of about 65 miles from the highest point in the east end of the Two Rivers watershed to the lowest point on the west end. [See **Figure 2.6**]

Table 2.6 Elevations across the planning area

Location	Feet above mean sea level
Near mouth of Two Rivers	790
Near Northcote	800
Near Hallock	815
Near Lancaster	900
Near Leo	1030
Kennedy	827
Karlstad	1035
Greenbush	1075
Badger	1082
Near Strathcona	1120
Poplar Grove Twp Section 20	1210

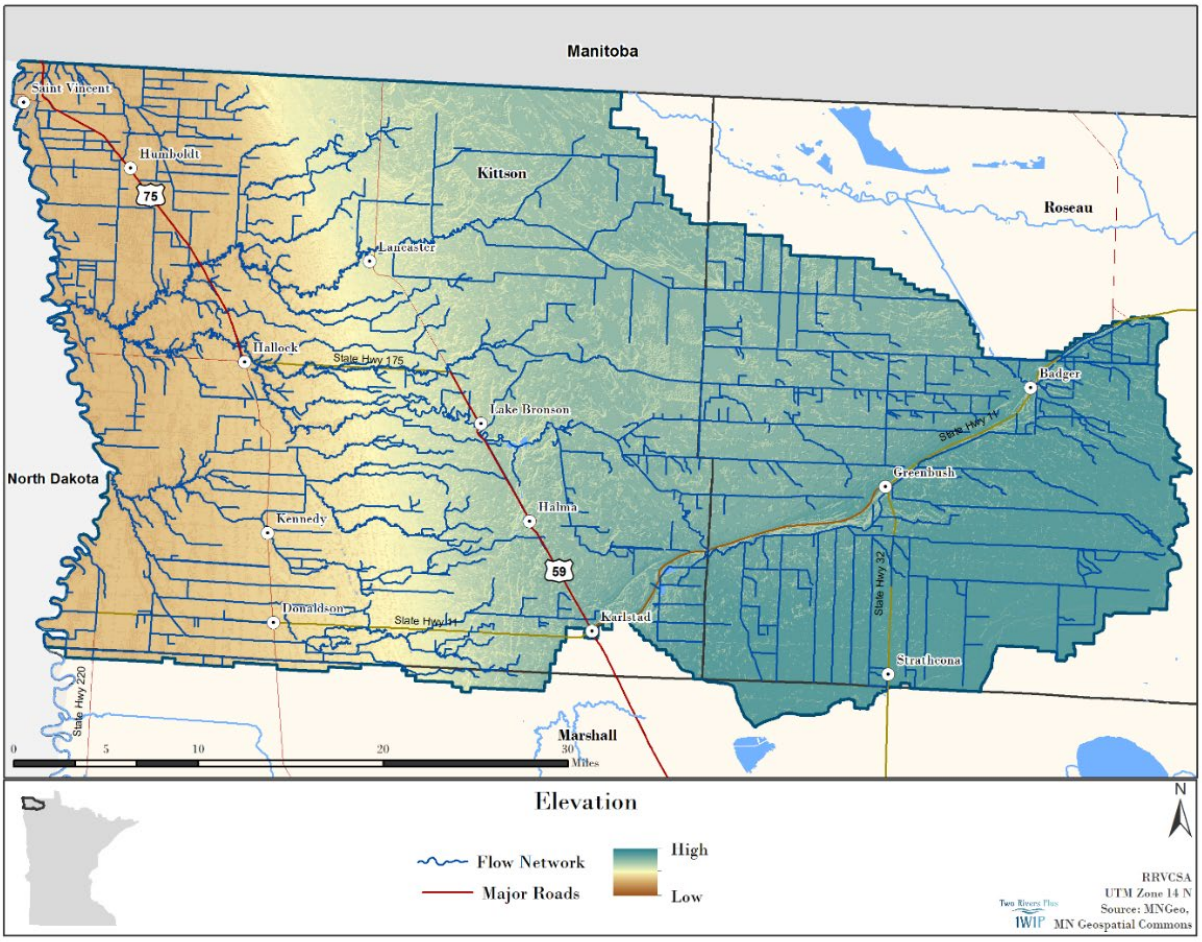


Figure 2.6. Elevation

2.4.3 Geology

The entire Planning Area lies within the limits of Glacial Lake Agassiz and this accounts for the flat topographic characteristic of the watershed. Lake clay has been deposited in the western area of the Planning Area, west of a north south line located 2 miles east of Lancaster. This is characterized by clay, gray to blue gray, plastic, dense, and contains lenses of silt and very fine sand. Small areas of lake clay occur locally in the till area. The lake clay makes up some of the richest soils suited to farming in the world.

Glacial till makes up about two-thirds of the Planning Area, beginning in the Lancaster region and covering much the Planning Area that is located in eastern Kittson County and western Roseau County. This is a heterogeneous mixture of ice deposited clay, silt, sand, and gravel. It is largely calcareous sandy clay containing scattered pebbles and cobbles. The upper 5 to 15 feet of till is commonly oxidized to a buff-tan color and is more permeable than the underlying unweathered gray till. Lenses of sand occur throughout the till. Thin, discontinuous deposits of clay, silt, sand, and peat overlie the till at numerous localities. The till ranges in thickness from 40 feet to over 200 feet.

Several beach ridges exist and were formed at various periods in time as glacial Lake Agassiz receded across the Planning Area over thousands of years. One that is especially prominent, the Campbell Beach, crosses the extreme southeastern part of Kittson County and follows the route of State Trunk Highway #11 through the cities of Karlstad, Greenbush and Badger. This beach is a high ridge, which is an obstacle to the flow of water from the southeast to the northwest. This deposit is predominantly fine to medium sand with lenses of fine to medium gravel. Deposits commonly form low beach ridges that range in height from less than 5 feet to as much as 30 feet. Widths of ridges range from a few hundred feet to about a half mile. Beach ridges are highest and widest near local sources of surficial sand. In most places beach ridges are underlain by clayey till.

A surficial channel outwash occurs in a north – south band, about 6 miles wide, located just east of Lancaster. This is a lenticularly bedded deposit of sand, gravel, and clay. Sand and gravel are most abundant in the middle of the channel near Lake Bronson. Deposits are largely silt and clay along west edge of the channel.

Two areas of buried sand and silt lenses within till occur south of the City of Greenbush. One is characterized by having higher relative amounts of sand and gravel, and the other is characterized as having large amounts of clay associated with silt deposits. Depth of these is about 60 feet.

An area of buried sand and clay within till exists north of the City of Greenbush. The deposit consists of lenses of sand, silty clay, and gravel in till. Test holes penetrated 10 feet of sand and gravel at a depth below the land surface from 45 to 55 feet. **[see Figure2.7, Geomorphology]**

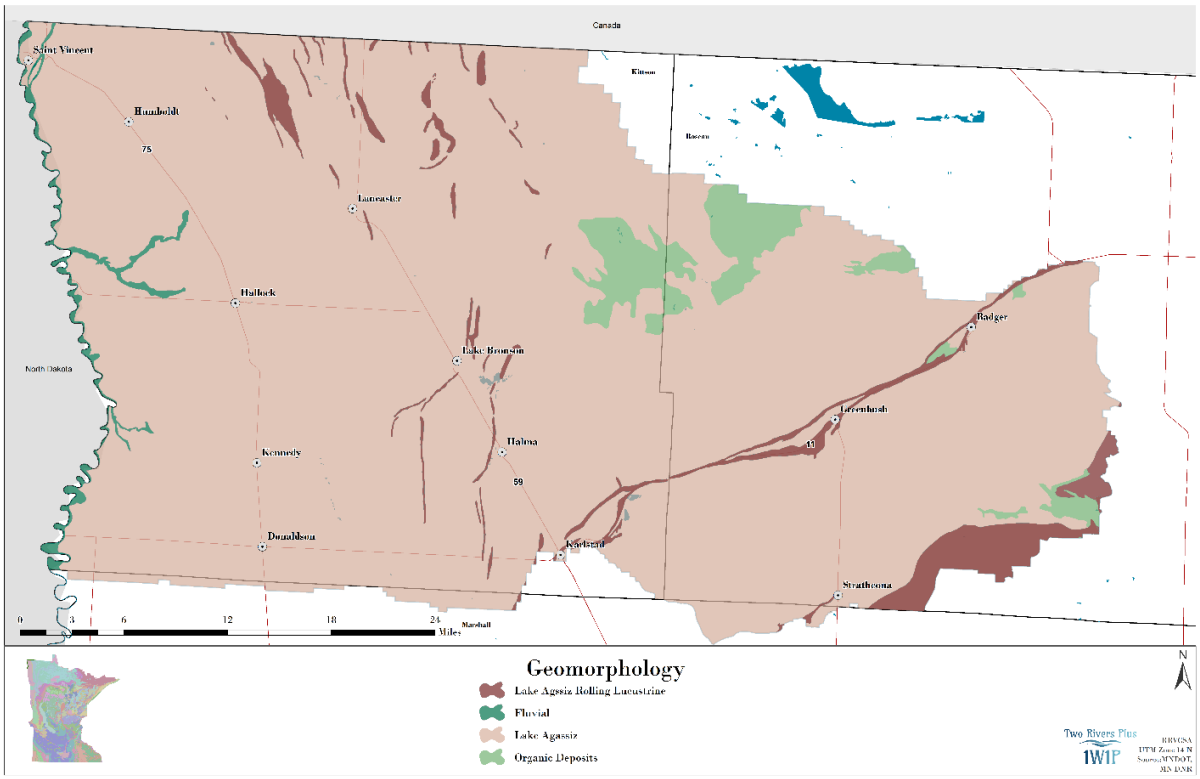


Figure 2.7. Geomorphology

Great ice sheets once moved across the Planning Area, acting like giant bulldozers. They scraped and leveled the area they touched. As the ice melted and receded northward, water accumulated in the southern part of the basin. The Planning Area was entirely covered by Lake Agassiz [See Figure 8. Lake Agassiz]. Waves and currents smoothed off the drift to nearly plane surface. The beach ridges are in the eastern half of the Planning Area. These mark the successive shorelines of the glacial Lake Agassiz; whose water occupied the basin of the Red River for several thousand years during the close of the last ice age.

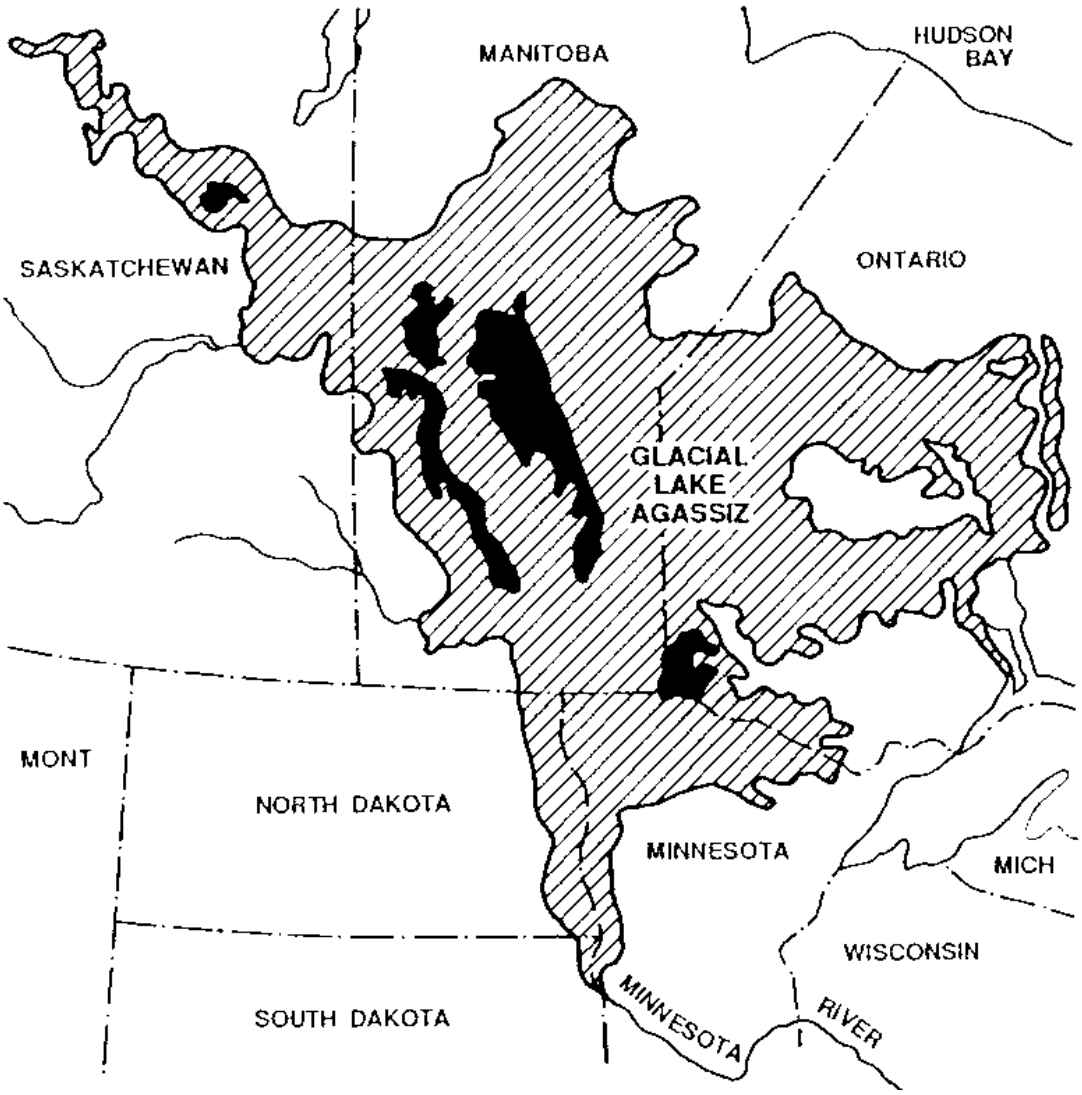


Figure 2.8. Glacial Lake Agassiz

2.4.4 Soils

Soil development was greatly influenced by the climate and living matter acting on the glacial drift. Water moves through soils in varying amounts and at varying rates. Soils in depressions are flooded with large amounts of water whereas hilltops shed water to lower slopes. As water moves through soils, it dissolves and moves the finer materials to deeper depths. This weathering moves fine size clays into the layer called subsoils and soluble minerals may be washed from the surface layer. The kind of vegetation growing on soils influenced the amount of organic matter. Timber soils formed under trees are light colored and low in organic matter. Prairie soils formed under grass are high in organic matter and are dark colored. In Kittson County, dark colored soils are relatively high in organic matter. Nearly level, wet timber silts are light colored, leached of soluble bases, and are usually slightly acid to neutral. Erosion moves soil materials from one place to another and damages growing crops, fills watercourses, and pollutes the air and water.

Soils within the Planning Area are very diverse from the eastern areas to the western areas. The soil textures are shown in **Figure 2.9**. Generally, textures are coarse – loamy in the eastern third of the Planning Area, where the till plain exists. A narrow band of loamy – skeletal soils diagonally crosses this area following the beach ridge of glacial Lake Agassiz of which Minnesota Highway 11 is built upon. The middle third of the Planning Area is also a till plain and is home to mostly sandy textured soil, with pockets of sapric soils associated with the large wetland areas. In the western third of the Planning Area, very – fine soil textures are found, associated with the flat lake plain areas of glacial Lake Agassiz.

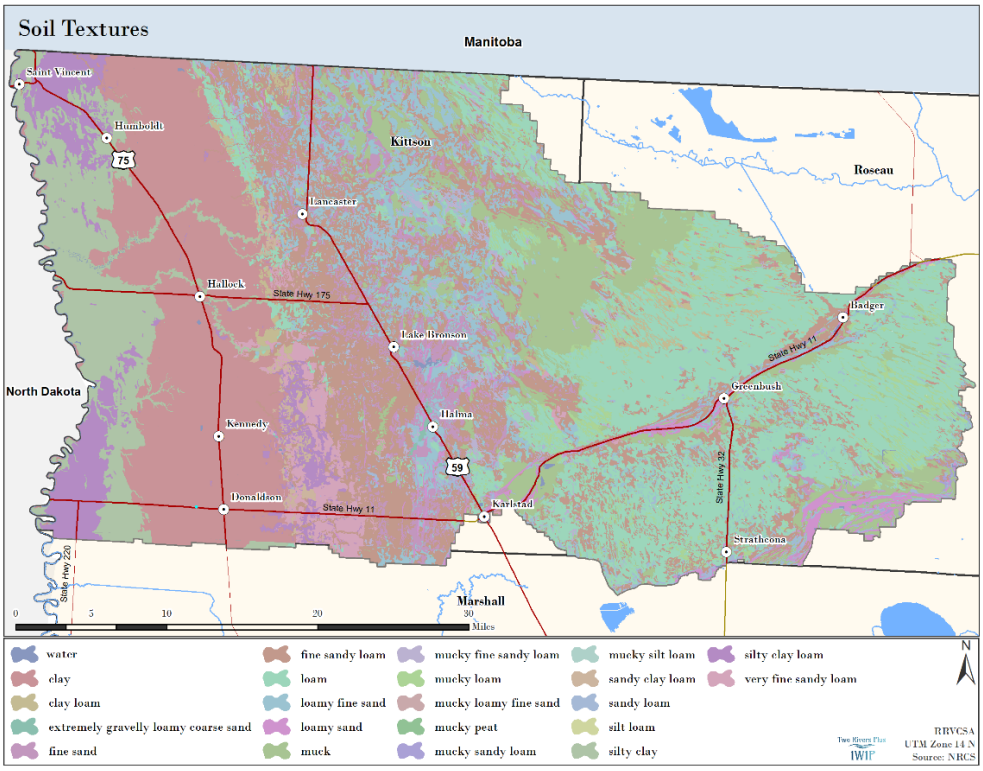


Figure 2.9. Soil Texture

Soil types within the Planning Area are very diverse. A soil survey of soils in Kittson County was published in 1979 by the Soil Conservation Service (now known as the Natural Resources Conservation Service), for Marshall County in 2000, and for Roseau County in 2002. Detailed and updated soil survey data is available on the world wide web through the NRCS 'web soil survey' at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

2.5 Land Use

Agriculture is the predominant land use within the area, comprising approximately 58% of land in Kittson County and 43% of land in Roseau County. The eastern third and western third of the area are intensively farmed, and the middle third is home to habitat blocks, conservation easements, gravel mining, and pasture and hay land. **Figure 2.10** shows the land use within the Planning Area as of 2016. Many large tracts of land in this region have been acquired by the DNR and by The Nature Conservancy for the purposes of managing for native prairie, forest, and wildlife. Much of the area that was cropland in the middle 1/3 is now either pasture/hay land or has been enrolled into a conservation program.

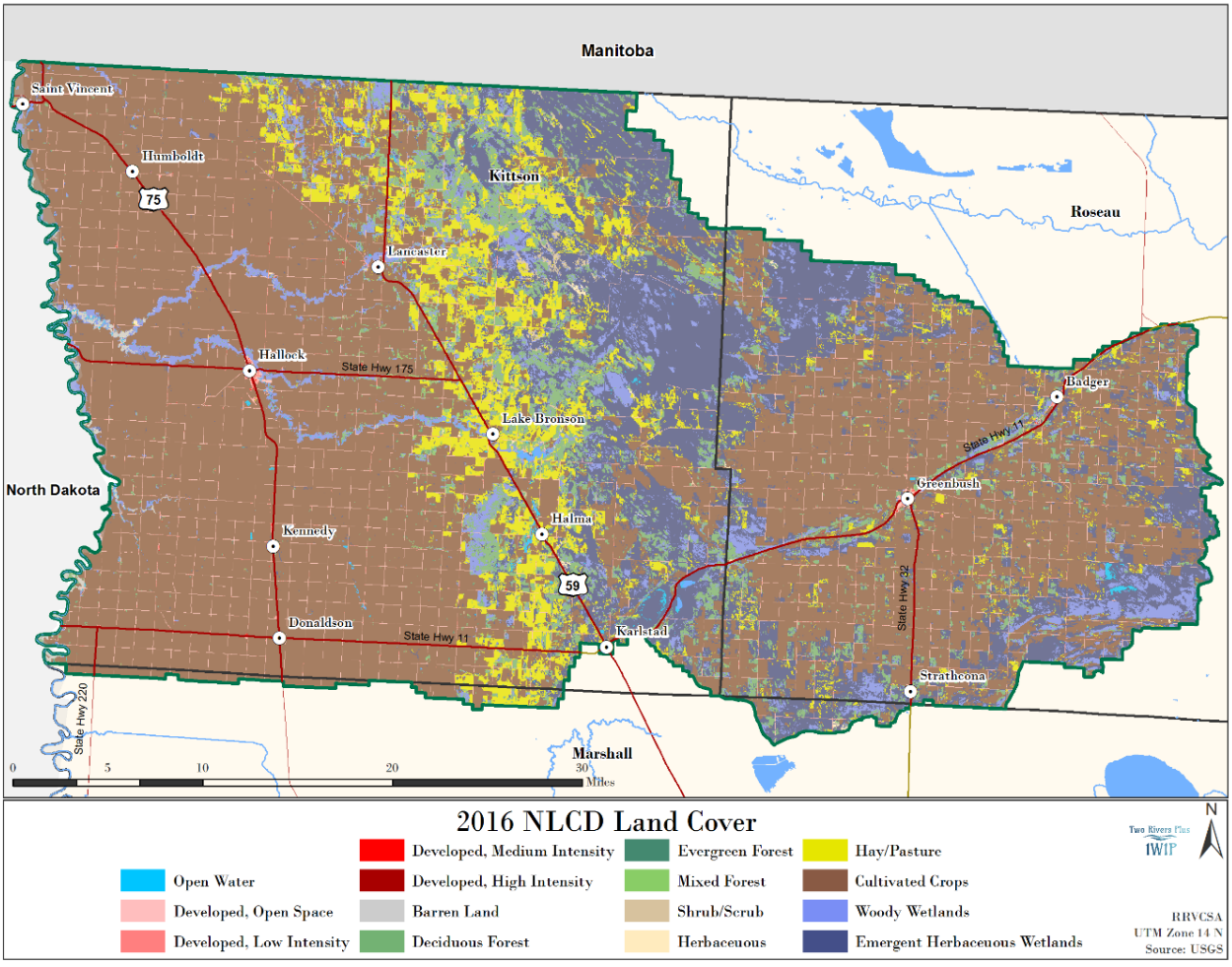


Figure 2.10. Land Use

2.5.1 Natural Resources

The TRP1W1P area is home to diverse and unique ecosystems. The combination of climate, soils, and landscape allows for multiple uses of natural resources including intensive farming and food productions, mining of gravel, and maintaining a diverse variety of birds, animals, and plants. These combinations provide for use and management of the land and habitat for flora and fauna to thrive.

The Minnesota Biological Survey was conducted in the late 1980's and provides a listing of rare, threatened, endangered, and special concern animal and plant species. This information can be found on the DNR website, at https://www.dnr.state.mn.us/mbs/index.html

Ecoregions

Figure 2.11 below shows the ecoregions within the TRP1W1P area. Intensive cropland is prevalent in the 'Glacial Lake Agassiz Basin' and in the 'Lake Agassiz Plains'. A mixture of cropland, conservation land, pastureland, prairie and aspen parkland characterizes the 'Peatlands' and the 'Beach Ridges & Sand Deltas'.

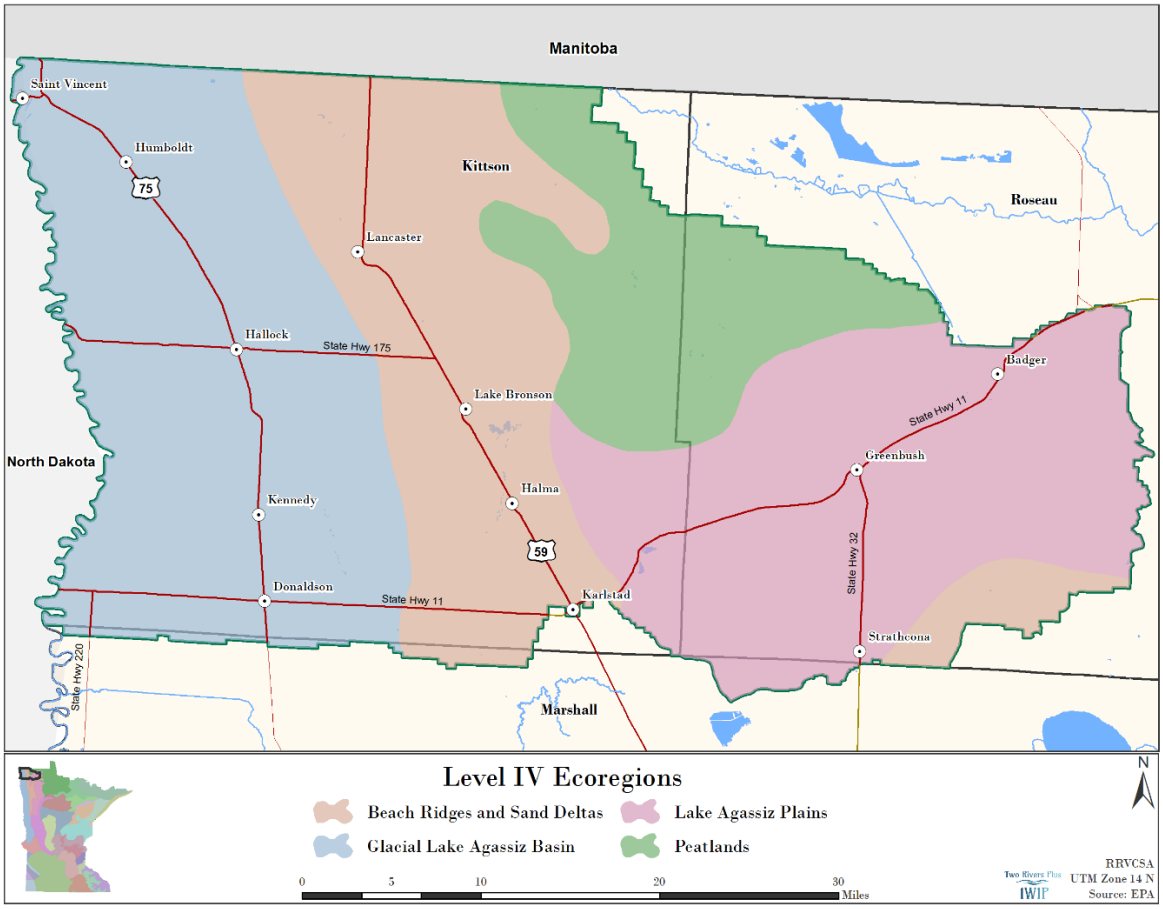
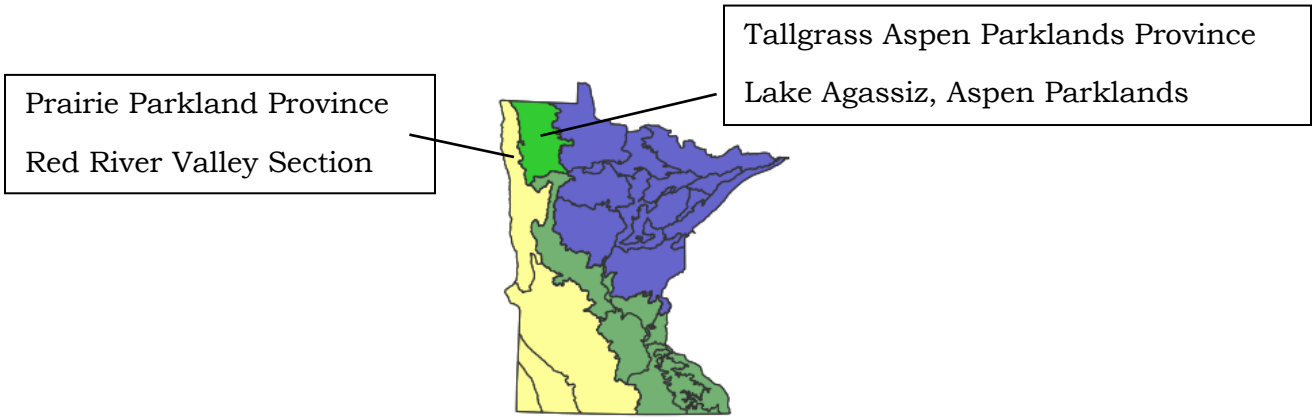


Figure 2.11 Ecoregions

Ecological Classification System

The Ecological Classification System was developed by the MNDNR and US Forestry Service. This system includes the Provinces that are further broken down into Sections and Subsections.

Aside from the ecoregions, the System identifies 4 ecological provinces in Minnesota, and of these the Tallgrass Aspen Parklands (Lake Agassiz Aspen Parkland Section) covers the eastern side of this planning area, and the Prairie Parkland (Red River Valley Prairie Section) covers the Lake Agassiz Basin on the western side.



The text below is an out-take from the publication:

MN DNR (2005). Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass aspen Parkland Provinces. Ecological Land Classification Program, MN County Biological Survey, & Natural Heritage & Nongame Research Program. MNDNR St. Paul, MN.

The Red River Valley Section (RRV) within Prairie Parkland Province is formed predominantly by a single landform, the deep-water basin of Glacial Lake Agassiz. The basin is a nearly featureless plain with poorly drained silty and clayey soils. Low, sinuous beach ridges and wave-cut scarps mark the positions of former shorelines of Glacial Lake Agassiz along the eastern margin of the basin. The section is drained by the Red River and a system of tributaries with shallow, poorly developed valleys that create the only topography in the section. The RRV is the flattest, driest, most fire-prone region of Minnesota and for that reason was historically dominated by communities of the upland prairie and wetland prairie systems, which covered more than 90% of the section. Wooded communities were present only in the deepest river valleys, on narrow patches of upland between river valleys, and along the eastern edge of the section where the flat Agassiz basin abuts rugged stagnation moraines. In these areas, communities of the fire dependent forest/woodland, mesic hardwood forest, wet forest, and floodplain forest systems were present together in small patches and accounted for less than 5% of the vegetation. Communities of the marsh and the wet meadow/carr systems were present on river bottoms and shallow depressions, especially along the eastern edge of the section.

The Lake Agassiz, Aspen Parklands Section (LAP) within the Tallgrass Aspen Parklands Province is composed of a single landform, the basin of Glacial Lake Agassiz. About 60% of the section consists of sandy deposits from the shallow portions of Glacial Lake Agassiz. About 12% of these sandy deposits are beach ridges or complexes of shoreline deposits that mark successively lower levels of the glacial lake as it drained. Loamy till deposited by glacial ice and then inundated and flattened by wave action forms about 30% of the section. Clay and silt deposited in the deeper portions of the glacial lake cover about 10% of the section. There is no clear correlation between vegetation and parent material, as transitions between landforms are gradual. Historic patterns of vegetation appear mostly related to frequency and intensity of fire, which were influenced by variation in water table and soil moisture. The historic patchiness of fire created a complex mosaic of prairies, brushlands, woodlands, and forests on uplands, and wet prairies, meadows, fens, and wet forests in lowlands. Communities of the wet meadow carr and marsh systems were common in seasonally wet depressions, occupying 14% and 7% of the section, respectively. Areas where the regional water table was at the land surface supported communities of the open rich peatland, forested rich peatland, and wet forest systems. These open and forested wetlands covered 10% of the section. Fire-dependent forest/woodland communities were present where seasonally wet depressions, peatlands, and river valleys isolated upland sites from fire, enabling survival of trees. These woodland communities covered 22% of the LAP and were variously described by early land surveyors in MN as brush, brush with scattered timber, or timber, depending on length of time since the last fire on the site. Communities of the mesic hardwood forest and floodplain forest systems were present on sites exceedingly well protected from fire and were rare in the section.

These ecological provinces and how they were formed provides the basis of natural resources and defines the plant and animals that occupy them. According to the MNDNR, two of the largest contiguous blocks of tallgrass aspen parkland in the United States exist within the TRP1W1P area. These areas contain a large prairie rich fen, brush prairie, quaking aspen, and balsam poplar groves. The Audubon Society has identified within the Planning Area the Kittson-Roseau Aspen Parkland Important Bird Area. The various habitats in existence hold water, increase infiltration and transpiration, and reduce the amount of water that runs off the land.

Fish & Wildlife

Game animals prevalent within the Planning Area include whitetail deer, black bear, elk, fox, coyote, sharp-tailed and ruffed grouse, woodcock, various duck species, Canada, snow, blue, and Ross' geese, sandhill crane, and many fur-bearing animals (such as beaver & fisher) that may be trapped or hunted.

In addition to the game species listed above, many non-game species of animals also exist within the Planning Area. These include, but are not limited to bald eagle, moose, great blue heron, magpie, bald eagle, timber wolf, garter snake, various frog species, American bittern, marbled godwit, loon, and many others.

A significant fishery and fish community exists on the Two Rivers, benefiting from the resource of the Red River. Field survey work was done by the Minnesota DNR during the summer of 2001 and identified 33 species of fish within the Two Rivers watershed, including walleye, northern pike, channel catfish, largemouth bass, black crappie, bluegill, sauger, and various other species. The MNDNR periodically

does fish and creel surveys on the Two Rivers at Lake Bronson and on the Red River of the North, and data is available on the DNR website.

Similar to the DNR work, the MPCA performed field survey work for fish and macroinvertebrates as a part of the 'Watershed Restoration and Protection Strategy' work that was done between 2015-2019 in both the Two Rivers and the Lower Red (Joe River, Unnamed Coulee, and Tamarac River) watersheds. This information is available on the MPCA website.

Renewable & Non-Renewable Resources

Several renewable and nonrenewable resources exist within the Planning Area. The most prominent nonrenewable resource is gravel. The Kittson SWCD performed a gravel pit inventory in 1999, tallying 61 gravel pits within Kittson county. There are several new pits that have been established since the survey was completed. Several additional public and private pits exist in Roseau County. These pits are found primarily along the beach ridge areas left by Lake Agassiz. The gravel is extracted by excavating large open pits and utilized for various projects, mostly relating to road construction and projects needing a sand base.

The major renewable resource produced within the Planning Area is agricultural crops. Another renewable resources that is utilized within the watershed is timber. The area designated as aspen parkland has many areas that are now or have been logged for aspen, which is used as pulpwood by various paper companies and others in the timber industry. This logging activity is market driven and was more prominent in the 1990's and early 2000's but does continue as we approach 2020. Groundwater resources are currently used for drinking water and irrigation for cropland. No major industrial uses are known. Also, of note is the growing of native prairie grass seed on farms in the Halma region.

2.6 Sub-Watershed Planning Zones

For the purposes of this plan, the TRP1W1P area has been divided into 11 major sub watershed planning zones. These are identified according to **Figure 2.12** and are listed below. This plan has attempted to describe the watershed setting, environmental factors, and water management problems associated with each. The narratives that follow will describe each area, discuss the existing conditions and related problems with regard to water quality, water quantity, water conservation, and other water management issues. The plan process will then discuss opportunities in each, summarize the problems identified by the public, review problems identified in prior planning initiatives and accomplishments of prior plans, and describe goals and objectives that have been identified for each zone.

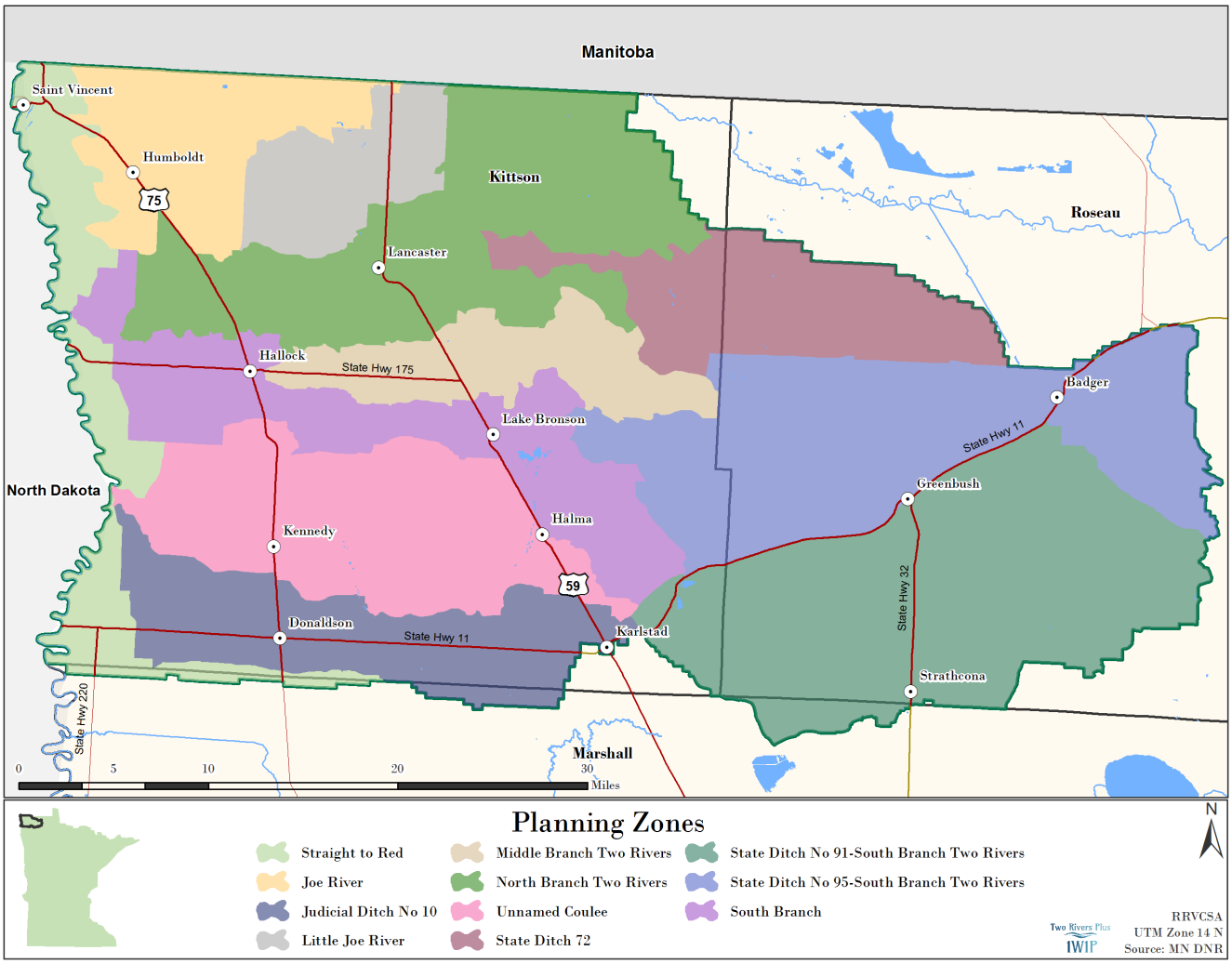


Figure 2.12 Planning Zones

Section 3: Issue Prioritization

The One Watershed One Plan process requires thoughtful consideration of issues and resource concerns identified in the watershed and priority issues and resources that will be addressed in the plan. The purpose of this section is to summarize the process that was used to reach agreement on priority resource concerns and issues that will be addressed within the next 10 years. The outcome of the priority resource concerns and issues will determine the Measurable Goals described in Section 4 to achieve the desired results.

The complication with issues is that one issue can impact multiple resource concerns and conversely, a resource concern can be impacted by multiple issues. One example is a sedimentation issue at a public drainage outlet. The resulting sedimentation may ultimately impact aquatic life in a downstream river, lake, or wetland. If the sedimentation was from field soil loss due to erosion, soil loss may cause instability issues on a landowner's field and create the potential to damage expensive equipment and lessen the soil's ability to support a healthy crop. If the public ditch cannot drain adequately due to sediment barriers blocking the outlet, a backwater effect could follow and drown planted fields. Blockage could also lead to over-saturation effects causing damage to public infrastructure; i.e. culvert washed out, roads overtopped, and further ditch bank erosion. As there may be numerous connections between resource concerns and issues, the planning group was challenged to identify and pick out which ones are the most important to target within the next 10 years without getting too complicated.

Acknowledging the complexity, the TRP1W1P planning group made the decision to focus on identifying and prioritizing the issues with the understanding that addressing priority issues through implementation actions will yield benefits for multiple resource concerns. This decision is not to discount from addressing the connections between resources and issues or to ignore resources altogether.

Resource issues that can be mapped are identified in **Section 4: Measurable Goals** where a description of measurable goals and implementation actions provide details for further prioritization.

3.1 Prioritization Process

Resource concerns and issues were initially identified through prior local water management plans, NRCS Local Work Groups, state agency reports, and responses to the 60-day notification of the intent to begin planning. All these efforts have resulted in a long list of issues. The issues that will address the resource concerns for the TRP1W1P Area were generated and prioritized with a variety of input and knowledge from the general public, Steering Team, the Advisory and Policy Committees, state agencies, and the NRCS Local Work Groups.

Public kickoff meetings were held in three strategic locations over two days within the Two Rivers Plus Planning Area: Greenbush Community Center, Kennedy Community Center, and the Lancaster School. The purpose of these meetings was to inform the public of the planning process and provide the opportunity to submit input on water planning topics and issues. Prior to the meeting the Steering Team met and formulated a list of issues to provide to the public to work from when providing comments. Under the direction of the Policy Committee, public comments that were received were crossed referenced and incorporated into the list of priority issues.

The Steering Team and Advisory Committees reviewed the issues and public input from the kickoff meetings before putting forth the list of prioritized issues to the Policy Committee. Issues were prioritized as low, medium, or high by their importance in each planning zone and based on state agency reports, local and regional plans, as well as local knowledge by the local water and resource managerial staff. The full list of issues and prioritization of them can be found in **Table 3-1**. During the 10-year lifespan of the plan, progress will be focused on addressing the high and medium priority level issues, and only the high and medium priority issues will have measurable goals specifically developed in the next step of the planning process. These measurable goals are identified and described in **Section 4: Measurable Goals.**

Low priority level issues will not be a primary focus of this 10- year plan, but they may experience benefits through actions addressing higher priority issues. These issues may also be addressed through actions taken by other state or federal entities outside of the planning group. Nevertheless, there may be situations where addressing low priority level issues may arise. This may be due to funding opportunities, new information, secondary benefits to the high and medium priorities, updates made during annual work planning, or a reassessment of issue priorities during the 5-year plan evaluation. The Steering Team will assess these opportunities to address low priority level issues and bring their recommendation to the Policy Committee for a decision.

Table 3-1 Full List of Priority Issues by Planning Zone

Resource Concern	Issue	Straight to Red	Joe River	Judicial Ditch No 10	Little Joe River	Middle Branch Two Rivers	North Branch Two Rivers	Unnamed Coulee	State Ditch 72	State Ditch 91 - South Branch Two Rivers	State Ditch 95 - South Branch Two Rivers	South Branch Two Rivers
Sufrace Water Quality	Excessive sediment loading to surface waters	High	Medium	High	Low	Medium	Medium	High	Medium	High	High	High
	Excessive nutrient loading to surface waters	High	High	Medium	Medium	Medium	Medium	Medium	Low	High	High	Medium
	Low dissolved oxygen in surface waters	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Medium
	Excessive bacteria loading to surface waters	Low	Low	Low	Low	Medium	Low	Low	Low	Medium	Medium	Medium
	Instability of all types of watercourses	Medium	Low	Medium	Medium	Low	Medium	Medium	Low	Medium	Medium	High
Hydrology/ Flood Damage	Inadequate conveyance capacity of all types of watercourses	High	Medium	Medium	High	Medium	Medium	High	High	High	High	Medium
	Flood damage to communites, public infrastructure and rural homesteads	High	Medium	High	Medium	Medium	Medium	Medium	High	High	High	Medium
	Flood damage to farmland	High	High	High	Medium	Medium	Medium	High	High	High	High	Medium
	Extreme flow fluctuations (highs too high, and lows too low)	Medium	Medium	Medium	Medium	High	High	Medium	Medium	Medium	Medium	High
Ground Water Quality	Nitrate, arsenic, and other types of groundwater contamination	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
	Unused, unsealed wells act as a contamination condult to drinking water supply	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
Ground Water Quantity	Groundwater quantity levels	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium
Natural Resources	Degraded wetland habitat	Low	Low	Low	Medium	Low	Medium	Low	Medium	Medium	Medium	Low
	Degraded aquatic habitat in watercourses	Low	Low	Low	Low	Medium	Medium	Low	Low	Medium	Medium	High
	Loss of longitudinal connectivity	Low	Medium	Low	Low	Medium	High	Low	Low	Low	Low	High
	Degraded riparian habitats	Low	Medium	Low	Medium	Medium	Medium	Low	Low	Medium	Medium	Medium
	Degraded terrestrial habitats	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Medium	Medium
	Algae blooms in Lake Bronson	Low	Low	Low	Low	Low	Low	Low	Low	High	High	High
Agricultural Productivity	Reduced soil organic matter/infiltration rates/water holding capacity	High	High	High	Medium	Medium	Medium	High	Low	Medium	Medium	High
	Excessive salinity in soils	Medium	Medium	Medium	Low	Low	Medium	Medium	Low	Low	Low	Low
	Excessive wind erosion	High	High	High	Medium	Medium	Medium	High	Low	Medium	Medium	High
	Excessive water erosion	High	Medium	High	Medium	Medium	Medium	High	Medium	High	High	High
	Inadequate feed/water supply/waste management	Low	Low	Low	High	High	High	Low	Medium	Medium	Medium	Medium
	Inadequate field drainage system outlets and/or improper management of drainage systems including tile line management	Medium	Medium	High	Medium	Medium	Medium	High	High	High	High	Medium

3.2 Resource Issues

Once comments from the public meetings, state agencies, citizen's and technical advisory committees, and others were received and compiled, the Steering Team reviewed and ranked them into priority issues. The Policy Committee officially accepted the priority issues to complete this part of this locally focused plan. The Steering Team then used the overall priority issues to develop and prioritize issues for each planning zone. These are found in **Section 5: Planning Zone Resource Issues and Actions**.

Great care and consideration was taken by the Steering Team when developing the priority issues. As noted in the Land and Water Narrative, the TRP1W1P spans a very diverse and complex landscape with many different characteristics from one end to the other. While some issues are evident across all planning zones, each one also has issues that are unique specifically to that zone. The list of issues used in this plan and how they relate to the resource concerns is explained in detail below.

3.2.1 Surface Water Quality

Excessive sediment loading to surface waters:

The Monitoring and Assessment Report and Stressor Identification Report by the MN Pollution Control Agency lists turbidity/total suspended solids (TSS) as the cause of impairments and high suspended sediment as a stressor in the Two Rivers Plus Planning Area. Rivers naturally carry sediment and are continually eroding and depositing sediment as a natural function. Wind and water erosion can deliver excessive sediment from adjacent landscapes into ditches, streams and other watercourses. These reports identify 3 streams segments with impairments caused by total suspended solids (TSS) and 5 additional stream segments that identify high suspended sediment as a minor stressor to either the fish or macroinvertebrate communities within the planning area. These goals and priority zones were established based on data from the Two Rivers and Lower Red River WRAPS and TMDL reports, HSPF models, and PTMApp and are stated out in **Section 4: Measurable Goals**.

According to the Stressor ID reports total suspended solids (TSS) is a measurement of the weight of suspended mineral (e.g., soil particles) or organic (e.g., algae) sediment per volume of water. Klimetz and Simon (2008) indicated that streams in the Red River of the North Basin had the highest median suspended sediment concentration of any region in Minnesota, with the exception of the Western Corn Belt Plains ecoregion (e.g., the Minnesota River Basin). Soil erosion from agricultural fields is believed to be the largest source of sediment to streams in the basin (Lauer et al., 2006). Modified headwater (i.e., first and second order) streams convey much of this sediment to receiving waters (EOR, 2009). The majority of the annual suspended sediment load associated with the streams in the basin is discharged between the months of March and May, when agricultural fields are particularly vulnerable to erosion (EOR, 2009). Sediment controls in the planning area have benefits to downstream communities (Winnipeg) that rely on the watershed as part of international flow as their drinking water supply. TSS levels at surface water intakes for public water suppliers impacts regulatory, operational and financial burden for maintaining safe drinking water supplies delivered to those populations.

Excessive sediment affects fish and macroinvertebrates specifically in many ways. These include abrasion of fish gills, burying eggs and larvae, reduced visibility, and increase in oxygen demand. Too much sediment will also block sunlight, preventing photosynthesis and contributing to lower oxygen levels. Finally, sediment deposition is a maintenance problem in agricultural areas when it causes blockages in ditches, coulees, and other watercourses.

Excessive nutrient loading to surface waters:

Excessive amounts of phosphorous (TP), nitrogen (TN), and other nutrients in water bodies can be problematic from a natural resource standpoint. While some phosphorus is dissolved in water, some binds to soil particles, entering waterways by attaching to sediment and is deposited as the sediment drops out of the water. It is the limiting factor in algal growth in lakes, therefore excessive phosphorous can lead to excessive algae and cyanobacteria (blue-green algae) levels. Excessive algae can lead to lower levels of oxygen which is needed by aquatic organisms. Algae also limits recreational opportunities and can be a health hazard if ingested.

Nitrogen is soluble in water and can enter waterbodies as runoff from both surface sources and subsurface sources (tile). Excessive nitrogen can also stimulate algae and plant growth which hinders flow and causes stagnation of waterways.

Low Dissolved Oxygen:

Two stream reaches in the TRP1W1P area are listed as impaired for dissolved oxygen. This plan will work to achieve acceptable levels using state water quality standards as the guideline. It is suspected that organisms will avoid areas with dissolved oxygen below 5 mg/l. The Stressor ID report indicates that low DO can be an issue in streams with slow currents, excessive temperatures, high biological oxygen demand, and/or high groundwater seepage (Hansen, 1975). The Stressor ID Report concluded that low dissolved oxygen is a stressor to aquatic life in 12 (2 of which are the ones with impairments caused by low DO) of the 13 stream reaches that were determined to have poor biological assemblages. The critical conditions for DO usually occur during the late summer, when the water temperature is high and stream flow is low. Additionally, eutrophication (i.e., increased phosphorus) can cause excessive aquatic plant and algal growth, which can ultimately result in a decline in daily minimum DO concentrations and an increase in the magnitude of daily DO concentration fluctuations. These conditions have been noted to occur within the TRP1W1P area.

Excessive E. coli loading to surface waters:

The Monitoring and Assessment report indicates that five stream reaches are impaired due to excessive *E. coli*, which is a fecal coliform bacterium. The one main source is waste from warm-blooded animals including manure runoff from livestock and from wildlife. It is unknown if any failing septic systems are contributing and what proportion of E. coli may be naturalized or from natural background sources. All city waste is treated and regulated through state permits.

High levels of *E. coli* in waterbodies is a concern for both recreation and for water consumption by livestock. All cities within the planning area receive their water from ground water sources.

Instability of all types of watercourses:

Bank erosion along streams, rivers, and ditches can be a major issue within the Two Rivers Plus planning area. Sloughing usually occurs when a large runoff event (flood) happens. It is not uncommon for hundreds of feet of a ditch or river to slough and for large amounts of sediment and eroded material to fall into the channel. This sediment is then carried downstream and deposited in the channel, in or near culverts, and in areas of slow-moving water.

Watercourses with high banks and ditches with high spoil piles commonly undergo sloughing. Dangerous situations can occur when roads adjacent to a ditch are impacted or culverts wash out. The common solution for man-made ditch systems is to excavate the sloughed material, flatten the slope when possible, and protect the bank either with vegetation, rock rip rap, or bioengineering techniques. In natural channels, several areas of riverbank sloughing have been addressed either with bioengineering or rock rip rap or a combination.

This is not only an issue with flowage but is also a social and economic issue. Instability happens in natural watercourses as well as in man-made ditches. Ditch authorities have a responsibility under ditch law to maintain the ditch to its constructed grade and cross section. There is merit also to maintaining a more natural flow pattern to protect fish and wildlife habitat. Several projects have been constructed with setback levies and meanders to allow for drainage and flood control while maintaining natural functions. When possible, projects of this nature and projects that moderate flows can be a good solution.

3.2.2 Hydrology/ Flood Damage

Inadequate conveyance capacity of all types of watercourses:

The existing network of legal (public) drainage systems, road ditches, private drainage systems, and natural systems all affect flow regime, flooding, water quality, and habitat. Each type of system is managed differently due to legal, administrative, environmental, or other reasons. The Red River Flood Damage Reduction Work Group's - *Basin Technical and Scientific Advisory Committee Paper #3*, 2014, has determined that ditches designed to carry a 10-year runoff event can balance the economic need for drainage and flood control with the need to maintain functions and values of natural systems.

The main issues that are occurring with all of these types of systems are:

- reduce the number of drainage systems with outlets that are in disrepair,
- address beaver dams on ditches and natural watercourses,
- address problems of debris in river channels,
- address blockages in drainage systems from sediment, vegetation, and other causes,
- reduce "flashiness" of the hydrograph related to ditches and natural watercourses,
- reduce damages to legal ditches and natural systems by preventing or correcting slope failures.

Flood damage to communities, public infrastructure, and rural homesteads:

Flooding on the Red River and its tributaries is an annual problem and can happen both during spring runoff and summertime rain events. The cities of Badger, Greenbush, Halma, St. Vincent, Hallock, and Kennedy have experienced flood problems in the past. Numerous farmsteads in or near the floodplain have also experienced flooding issues.

Besides annual spring floods along the Red River, overland flooding within the Planning Area is also a problem and can occur multiple times during a year. Damages to roads, culverts, and bridges is a common occurrence. Numerous roads suffer culvert washouts and gravel losses and become dangerous to the traveling public. Public ditch systems also are at risk during these high-water events.

Flood damage to farmland:

Recent flooding has been repetitive and dramatic from year to year. Not only is this a problem in springtime events because of delayed planting, but also during summer and fall. Flooding from rainfall after crops are planted can result in major crop loss from drown out, crop stress, or lead to inability to

harvest the crop. This in turn can lead to large scale economic hardship. The fall of 2019 was an example of this, illustrating the need to protect cropland as much as possible.

Several repetitive flood prone areas exist, including:

- Large scale flooding along the Red River,
- Overland flooding within the unnamed coulee & JD10 areas,
- Overflow flooding from the Roseau River,
- Overland flooding along South Branch Two Rivers, and
- Channel capacities are not large enough in many systems thus creating breakout overland flows.

The Red River Basin Commission has studied Red River flooding through their 'Long Term Flood Solutions' initiative and have developed an initiative to reduce peak flooding on the Red River by 20%. The Red River Watershed Management Board and its members, including the Two Rivers Watershed District and the Joe River Watershed District have endorsed this initiative and are working toward this common goal.

Extreme flow fluctuations (highs are too high, and the lows are too low):

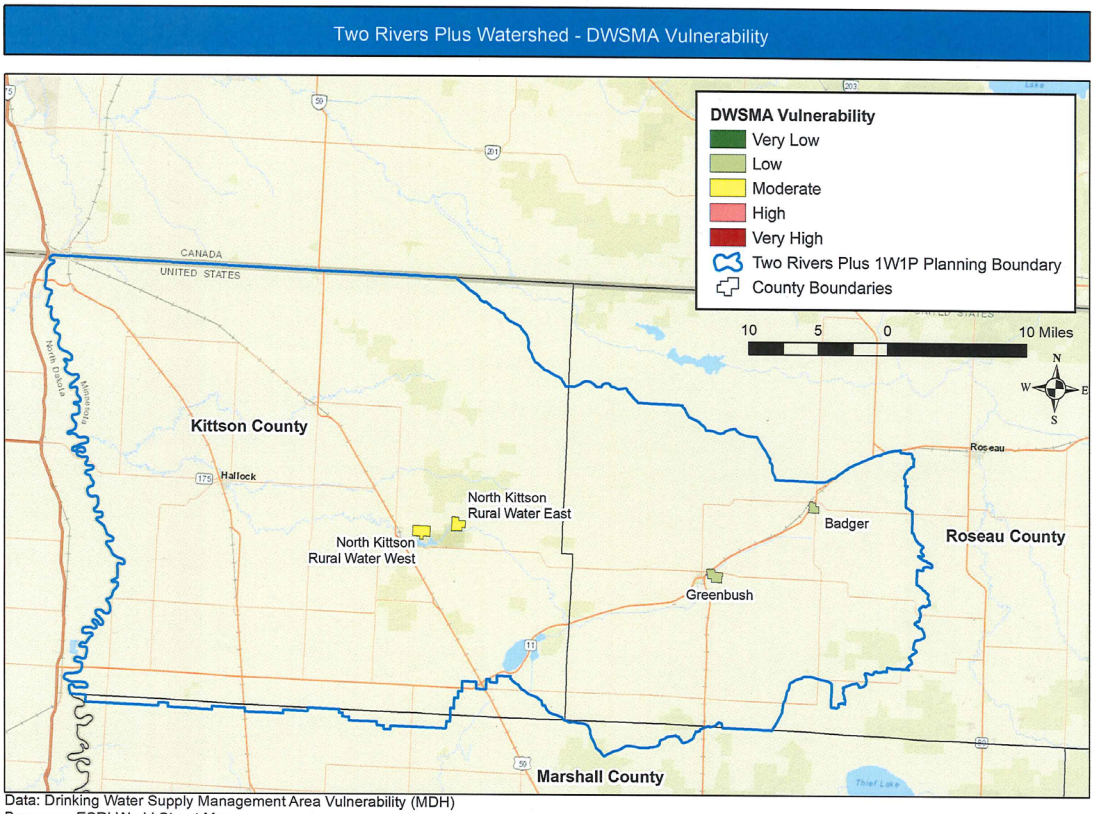
Seventeen stream reaches within the TRP1W1P have been listed as impaired for fish and macroinvertebrates, thirteen of which have had stressors identified. Both excessive high flows and the lack of flows contribute to this problem. The 2004 Overall Plan of the Two Rivers Watershed District listed a 'priority issue' to restore a more natural hydrograph and reduce the "flashiness" of stream flows. Intensive drainage activities have changed the flow regime of the Two Rivers over the years, and it is desirable to reduce the higher flows, increase the lower flows, and generally create longer periods of stable stream flows.

Doing so would address erosion problems in rivers, streams and ditches. Nutrient loading and suspended sediment would be reduced, and the dissolved oxygen problems caused by sediment oxygen demand, biological oxygen demand, chemical oxygen demand, wetland influence, and low flows would be addressed.

Drought has also been identified in the past as a problem. During common low flow periods and times with extended periods of little or no rainfall, streams and rivers in the planning area commonly go dry. This contributes to biota impairments relative to poor fish and macroinvertebrates communities. Little or no baseflow can also contribute to other water quality problems.

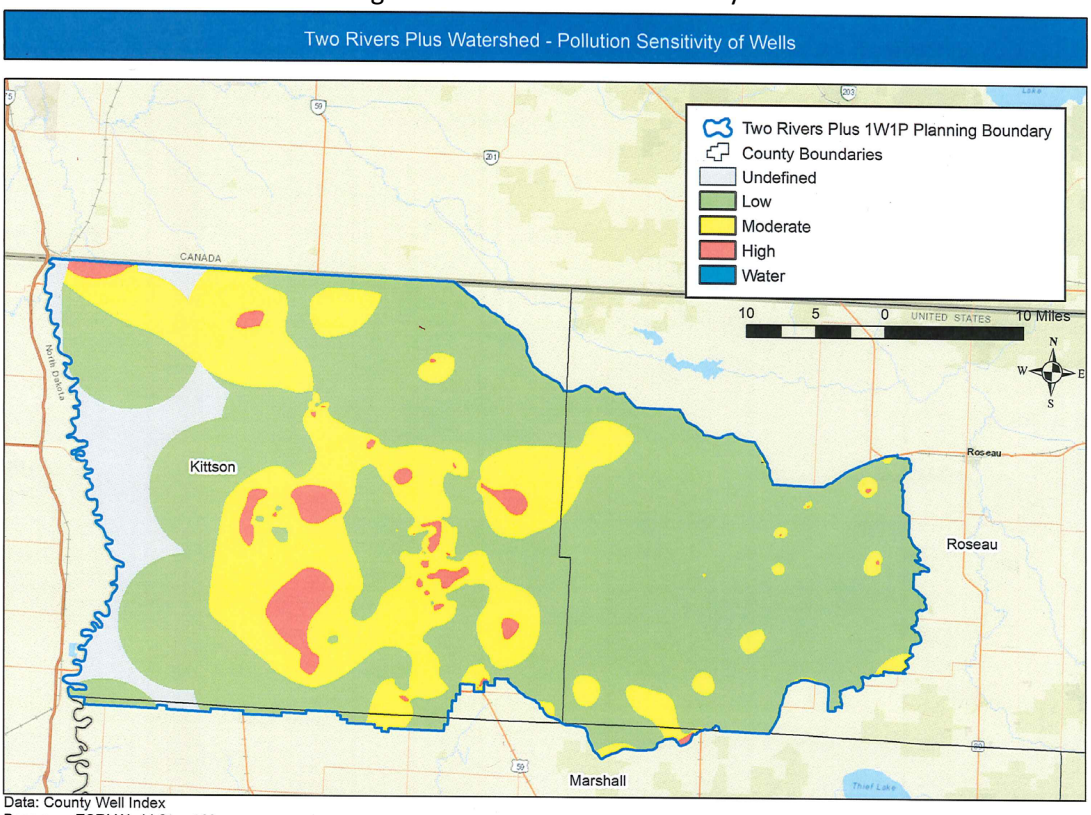
3.2.3 Groundwater Quality

Groundwater is 100% the source of drinking water within the planning area. Since the late 1970's all of the cities and farmsteads within Kittson County in the western 2/3 of the planning area receive their drinking water either from public water suppliers (City wells, North Kittson Rural Water, Kittson Marshall Rural Water) or private wells. In Roseau County in the eastern 1/3 of the planning area all cities rely on city wells, and most farmsteads rely on private wells (as opposed to rural water systems). A large aquifer exists in the Halma and Lake Bronson area (USGS, 1963), and also in the Lancaster, Greenbush, and Badger areas near glacial beach ridges.



Data: Drinking Water Supply Management Area Vulnerability (MDH)
Basemap: ESRI World Street Map

Figure 3.1: DWSMA Vulnerability

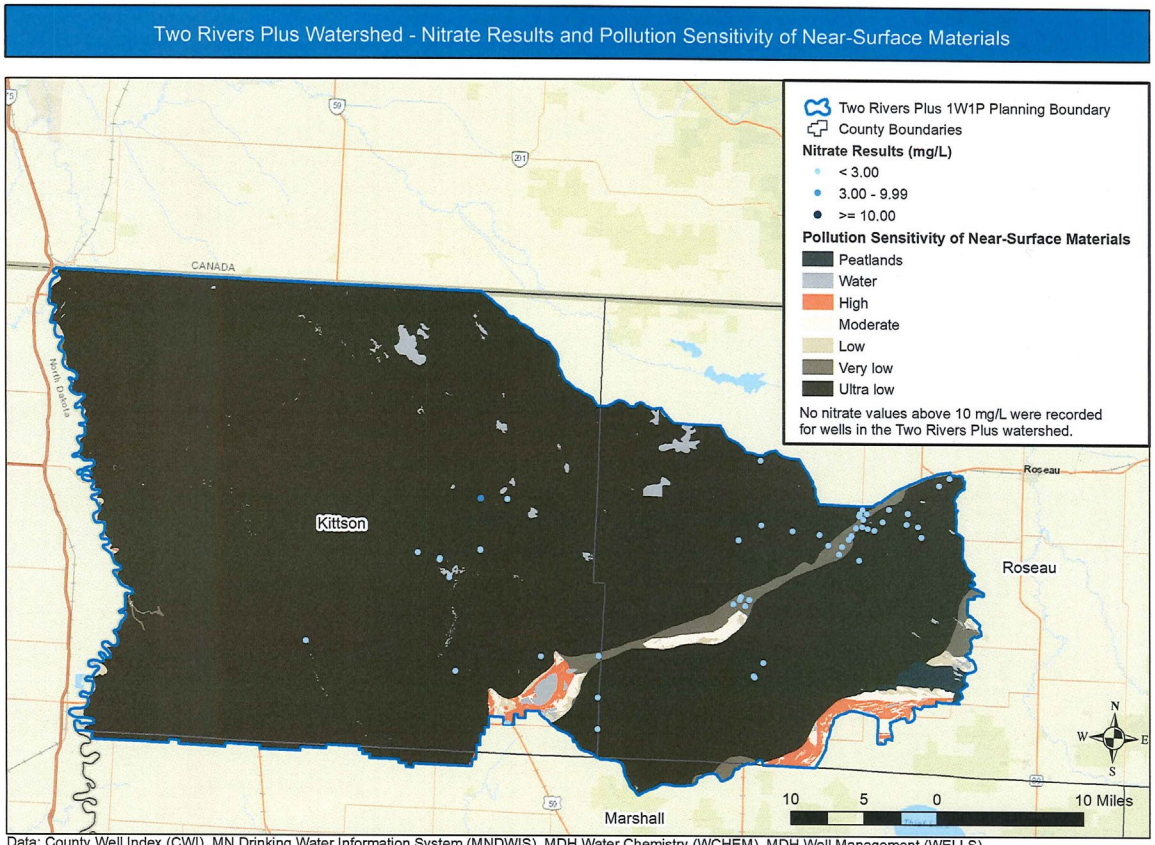


Data: County Well Index
Basemap: ESRI World Street Map

Figure 3.2 Groundwater sensitivy

Nitrate, arsenic, and other types of groundwater contamination:

Because of the reliance upon groundwater as the sole source of drinking water, potential contaminants must be identified, and measures taken to prevent them from entering the groundwater supply. The TRP1W1P area is regulated for nitrogen fertilizer by the MN Department of Agriculture and nitrogen best management practices have been developed by the University of Minnesota. Arsenic testing programs exist, and ground water users and public water suppliers periodically test for these and other contaminants. Newly constructed potable water-supply wells are tested for arsenic, total coliform bacteria, and nitrate nitrogen under Minnesota Administrative Rules, Chapter 4725.



Data: County Well Index (CWI), MN Drinking Water Information System (MNDWIS), MDH Water Chemistry (WCHEM), MDH Well Management (WELLS), DNR Pollution Sensitivity of Near-Surface Materials
Basemap: ESRI World Street Map

Figure 3.3: Nitrate sensitivity

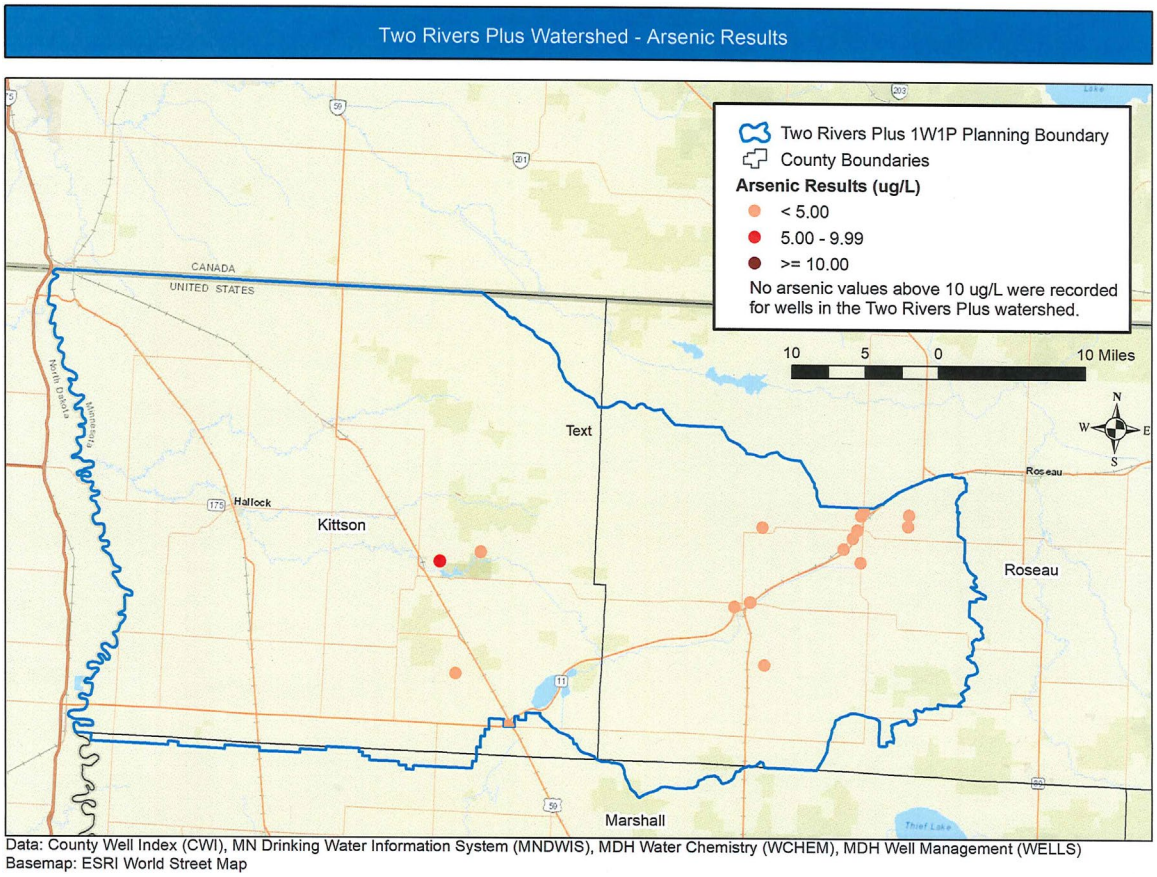


Figure 3.4: Arsenic testing results

Unused, unsealed wells act as a contamination conduit to drinking water supply wells:

The Kittson and Roseau County Comprehensive Local Water Plans each have historically addressed unused, unsealed wells. Wellhead Protection Plans developed by public water suppliers prioritize the sealing of unused wells. Well sealing programs have been utilized in the past to seal wells that are no longer in use. Both programs are run by the Kittson SWCD and Roseau SWCD.

3.2.4 Groundwater Quantity

Groundwater quantity levels:

The best knowledge of groundwater in the TRP1W1P area comes from two studies that were done by the U.S. Geological Survey in the 1960's, and from water suppliers like Cities and the North Kittson Rural Water system who operate and maintain public water supply wells. The 1963 study, "Ground-Water Exploration and Test Pumping in the Halma-Lake Bronson Area, Kittson County, Minnesota" estimated that 65 billion gallons of groundwater is contained in an underground aquifer in that area. This study and a subsequent study in 1967, titled "Water Resources of the Two Rivers Watershed, Northwestern Minnesota" provide basic information regarding geology, ground water and surface water interactions, and ground water movement and water quality.

Current information from water supply wells, observation wells, well sealing logs and other information is helpful to monitor and assess groundwater supplies and groundwater suitability. Based upon studies

that have been done and based upon the current water usage in the area, it appears there is sufficient groundwater supply available for the foreseeable future. Past efforts to establish wellhead protection areas and to seal abandoned wells should continue in order to protect the existing groundwater supplies.

3.2.5 Natural Resources

Degraded wetland habitat:

Wetlands can provide natural resources value by attenuating floodwater, recharging groundwater, providing nutrient uptake, and providing habitat for wildlife. It is estimated that 80% of the pre-settlement wetlands within the planning area have been drained or filled. While it is not feasible nor desirable to reclaim all of the lost wetlands, it has been noted in past County and Watershed District planning efforts that where plausible wetlands should be restored for flood control and habitat.

Degraded aquatic habitat in watercourses:

Fish and wildlife habitat has been a goal in past water plans. Many watercourses have undergone extensive straightening and drainage to benefit agricultural crop production, and many other areas have been maintained in a more natural meandering fashion with riffles, runs and pools. In the planning zones with good habitat, it is desirable to protect natural channels having meanders, pools, riffles and runs, and restore this habitat where it is feasible to do so.

Loss of longitudinal connectivity:

Water control structures like culverts and dams block fish from moving up and down rivers and streams. Within the planning area, dams are located on rivers at Lake Bronson, Northcote, and Beaches Lake. Hallock dam was removed in 2020-2021. Other man made structures are present at Twin Lakes, Skull Lake, Nereson impoundment and Ross impoundment, and many locations on smaller tributaries have culverts, crossings or even beaver dams that can affect fish movement.

Degraded riparian habitats:

Riparian habitat is important with regard to water quality because it can provide a vegetative buffer between a watercourse and intensive agricultural practices. This buffer can filter sediment and nutrients from entering ditches, coulees, streams and rivers. Vegetated riparian areas can provide root systems that hold soil in place along these watercourses. The *Two Rivers Monitoring and Assessment Report (2016)* compiled by the MPCA as part of the WRAPS process indicates that establishing and repairing riparian zones and protecting existing riparian zones will help to curb suspended solids, lack of habitat, erosion, and other impairments. Past planning efforts have also recognized the need to address riparian areas.

Degraded terrestrial habitat:

The Two Rivers Plus planning area is home to vast and unique habitat blocks. According to the MN DNR, the Two Rivers Plus planning area contains the two largest contiguous blocks of tallgrass aspen parkland in the United States. Beaches Lake and Caribou Wildlife Management Areas (WMA's) protect this unique landscape of brush prairie, sedge dominated fens, quaking aspen and balsam poplar groves. Two Scientific and Natural Areas, Additional WMA's, Lake Bronson State Park and shallow lakes in this area provide habitat for rare species. The Kittson-Roseau Aspen Parkland Important Bird Area is also located here, an important area for birds due to its large acreage and diverse habitats. These large terrestrial

habitat blocks provide water storage, increase infiltration and transpiration, and reduce the amount of water that runs off the land as well as providing opportunities for outdoor recreation.

Algae blooms in Lake Bronson:

Lake Bronson was created on the South Branch Two Rivers in 1938 when the Works Progress Administration constructed the Lake Bronson Dam. Lake Bronson State Park was created and today the dam is operated by the DNR and the area surrounding the lake is part of the park. Since the 1970's, local observations have taken notice of the algae problem. The algae impacts the swimming beach at the park as well as boaters, water skiers, and swimmers. In many years when there are low flow conditions, the beach is closed and contact with the lake water is not recommended.

3.2.6 Agricultural Productivity

Reduced soil organic matter; Infiltration rates; Water holding capacity:

Agriculture drives the economy and is the most prominent land use in the TRP1W1P Planning Area, highlighting the importance of protecting and revitalizing healthy soils. Not only do healthy soils increase agricultural yields, they also can provide a host of other benefits, including reducing runoff, retaining nutrients and sediment on the landscape, promoting carbon storage, and supporting robust micro-biotic communities. Soil loss can contribute to declines in agricultural yields, excessive sediment and nutrient loading to waterways, and channel instability.

Soil Salinity:

Soil salinity is an issue for many ag producers within the TRP1W1P Planning Area resulting in annual crop losses across the watershed. Increasing rainfall patterns in the last 20 years has caused many of the salts to move toward the surface of the soil. Salts draw water away from plant roots which is stressful to crops. Salinity can lower yields and even result in a complete failure if salt is present across the entire field. Studies by NRCS have determined that the saline areas in Kittson County are located along the U.S. Highway 75 corridor. The Steering Team has prioritized the planning zones that align with this data and the land use across the watershed to work towards implementing best management practices to alleviate the effects of these saline soils.

Excessive wind erosion:

Wind erosion has been identified in past water plans as a problem for this planning area. The immediate health hazard is the suspension and movement of very small particles in the air, which have been linked to increased asthma and other lung ailments in humans. Soil particles deposited in surface water contain nitrogen and phosphorus, which cause algal blooms in lakes, rivers and bays. When algae die, they decompose and remove oxygen from the water (hypoxia) and cause fish deaths. Ditches filled with eroded topsoil restrict field drainage and can lower crop yields from higher water tables and increase soluble salts in fields. Dredging streams or ditches to ease this problem is costly and wreaks havoc on aquatic plant and animal communities.

According to the University of MN Extension, the average wind erosion rate in Minnesota is 5.2 tons of soil loss per acre per year. North Dakota is slightly lower at 4.7 tons and South Dakota is at 2.4 tons. The Red River Valley is particularly susceptible to wind erosion in areas where there is flat topography, row crops with no cover, heavy tillage, and other factors.

During the WRAPS process, a wind erosion prediction system (WEPS) model was done for the areas of the Joe River and the unnamed coulee within the 'Lower Red River' watershed. The model produced a series of maps showing the most susceptible places for wind erosion in these sub watersheds and discusses various factors of wind erosion. This and other information will be used in determining goals for wind erosion.

Excessive water erosion:

1) Concentrated Flow - water that begins flowing overland and then becomes concentrated into a creek, stream, or field ditch has the potential to be erosive, especially if the watercourse is lacking in vegetation or has a relatively steep slope. Typical areas of concentrated flow with potential to cause erosion are where agricultural field ditches outlet into road ditches or into legal ditches. Other problems areas could be in the channels of field, road or legal ditches or in channels of natural watercourses. Another typical area would be near culverts and where legal ditches outlet into natural watercourses or where natural watercourses outlet into legal ditches.

2) Sheet and Rill – Water flowing across fields during large rainfall events or during flooding has potential to cause soil erosion. Water erosion may be identified by small rills and channels on the soil surface, soil deposited at the base of slopes, sediment in streams, lakes, and reservoirs, and pedestals of soil supporting pebbles and plant material. Water erosion is most obvious on steep, convex landscapes.

Inadequate feed/water supply/waste management:

Numerous livestock grazing systems are in operation within the TRP1W1P Planning Area. For instance, information from NRCS indicates that 31 operators within the SD 95 and SD 91 planning zones are using rotational grazing systems. There are many more in Kittson County as well. This highlights the importance of protecting water sources, pasture ground, and protecting surface waters from inadequate waste management. Livestock are a key component when looking at soil health benefits. Healthy soils increase agricultural yields, reduce runoff, retain nutrients and sediment on the landscape, promote carbon storage, and support robust micro biotic communities.

Inadequate field drainage system outlets and/or improper management of drainage systems including tile line management:

Throughout the planning area, erosion can occur at outlets of field ditches, road ditches, natural systems, and private systems. Steep slopes, erosive flows, abrupt elevation changes where a tributary watercourse outlet into another watercourse, inadequate vegetation or armor, and erosion around culverts can contribute to the problem. Legal systems are generally inspected, maintained and managed through MN statute 103E, however most other systems do not necessarily have a maintenance plan or funding to do maintenance or repair.

Issues carried forth from prior planning efforts that will be addressed in this plan will include:

- Repair and maintenance of outlets,
- Address debris and other blockages, including sediment, vegetation, and beaver dams,
- Reduce flashiness of flows,
- Prevention, maintenance, and correction of slope failures, gullies, side inlet erosion, and culvert inlets and outlet.

3.3: Emerging Issues

Emerging issues are those that lack detailed information yet are sometimes prominent in the media and may affect the resources within the TRP1W1P area 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;
- Specific requests from the members of the TRP1W1P Committees; and
- A general understanding of resource management trends.

Emerging issues are expected to be periodically monitored by plan participants with respect to how they may affect plan implementation. If new emerging issues are identified during implementation, goals included in this plan may shift.

This section summarizes a framework for addressing emerging issues during this plan. These issues include scientific and technical matters influencing the priorities established by the plan, and policy and funding opportunities to aid with plan implementation.

3.3.1: Scientific and Technical Emerging Issues

Changing Climate

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. Much like temperature, Minnesota has been experiencing 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" (MN DNR; State Climatology Office, 2020). 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.

As the climate has changed over the past century, loss of ice cover occurs earlier in the spring on Minnesota lakes. Lake Osakis, near Alexandria, MN (for which the state has the longest ice-out record, 150 years), indicates that ice-out in recent years has been occurring about a week earlier compared to historical ice-out dates (Runkle, Kunkel, Frankson, Easterling, & Champion, 2017; Minnesota State Climate Summary. NOAA Technical Report NESDIS 149-MN, 4pp.). 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 seasonal management. As noted by the Soil and Water Conservation Society (SWCS, 2003. Conservation Implications of Climate change: Soil Erosion and Runoff from Cropland, Ankeny, IA), increased storm intensities result in increased soil erosion and increased runoff. Also, the 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. FEMA recently updated its Flood Insurance Rate Maps for both Kittson and Roseau Counties, showing areas within the 100 year and 500-year flood zone. State and local zoning and floodplain rules govern what structures can be constructed in these zones. Weather extremes and influences of climate change and their effect on the landscape will be recognized in this planning process and considered in the development of issues, goals and actions contained in the plan.

Aquatic and Terrestrial Invasive Species

Invasive species are not native to Minnesota and cause ecological and economic damage. Aquatic and terrestrial invasive species, and their mitigation, continue to be an emerging issue for local governments.

Fortunately, there aren't many aquatic invasive species (AIS) in the TRP1W1P area. The Red River of the North is the only watercourse associated with the TRP1W1P Area that has infestations of zebra mussels. Locally, Kittson and Roseau counties have programs and funding in place for AIS programs. Due to the lack of infestations within the planning area, this plan does not address AIS issues outside of current program administration. The Roseau County AIS Prevention Program's purpose is to identify, educate, and control or eradicate AIS through watercraft inspections, treatment measures and public education. The AIS program at Kittson County is ultimately a public education program at this time. We educate the public by performing level 1 watercraft inspections, completing surveys, and giving promo items. We aim to keep our water bodies free of all AIS. To read more about these programs visit:

- Kittson County: https://www.co.kittson.mn.us/2239/Zoning
- Roseau SWCD: www.roseauswcd.org/districtprograms

Terrestrial invasive species are not always considered when addressing watershed health, but they can cause long-term damage to vegetative cover and stream buffers, which can lead to increased streambank erosion.

This plan recognizes the importance of controlling the spread of terrestrial invasive species, the most common of which affecting the TRP1W1P Area is noxious weeds. To achieve this the local SWCDs, townships, and cities manage terrestrial invasive species with the County Ag Inspector through the Minnesota Noxious Weed Law (MN Statutes 18.75-18.91). The law defines a noxious weed as an annual, biennial, or perennial plant that the Commissioner of Agriculture designates to be injurious to public health, the environment, public roads, crops, livestock, or other property. Prohibited noxious weeds must be eradicated or controlled in accordance with the Minnesota Noxious Weed Law. The Ag Inspection Program targets terrestrial noxious and invasive species through identification, mapping, monitoring, control/eradication, and education techniques. Early detection is crucial for controlling and eradicating invasive species before they gain a foothold and can establish a seed bank.

There are several species of noxious weeds within the planning area that are on the state's noxious weed list (which is maintained by MN Department of Agriculture [MDA]). Dalmatian toadflax is currently the only species with a status of "Prohibited – Eradicate" on the list within the planning area. Species with a status of "Prohibited – Control" on the list within the planning area are Canada thistle,

common tansy, leafy spurge, purple loosestrife, spotted knapweed, and wild parsnip. Other species of concern on the noxious weed list are buckthorn, Palmer amaranth and yellow star thistle, as they are often found in conservation plantings which makes up much of the planning area. Many of these listed species threaten native plant species and can be harmful to humans and wildlife

Hazardous Spills

Hazardous spills from over the road trucking, pipelines, rail, and above and below ground storage tanks have the potential to threaten surface water and groundwater. Three major pipelines carrying petroleum products run northwest to southeast through Kittson County. These pipelines cross miles of cropland and cross many rivers, streams, and ditches. Another potential source of oil or hazardous chemical spills are by rail. Canadian shale oil is shipped from Canada and through the TRP1W1P area going southeast via Canadian Pacific Rail and BNSF. Various hazardous substances are also trucked over the road along U.S. highways 59 and 75 and MN highways 11, 32, 171, and 175. Kittson, Roseau & Marshall Counties have hazard mitigation plans approved through the MN Department of Homeland Security Emergency Management which plan for spills and the containment, cleanup, and mitigation activities.

Agricultural Irrigation using Surface and Groundwater Sources

Because 100% of the drinking water in the TRP1W1P area comes from groundwater, it is recognized as an extremely important resource. It is also a major resource for irrigation of cropland. A drought frequency investigation for the Red River Valley predicts a strong probability of an extreme drought event occurring before 2050 (Meridian Environmental Technology, Inc. 2004). A prolonged drought event could have a pronounced impact on agricultural productivity, leading to a greater reliance on groundwater as a source of irrigation. Local trends are showing an increase in tile drainage installations which manipulate the subsurface water levels. Furthermore, irrigation is beginning to be looked at to boost production, which also can manipulate subsurface water levels, potentially affecting groundwater dependent resources. With these emerging issues, concerns have arisen, and care should be taken in issuing permits in order to temper potential long-term negative impacts to ground water quality and quantity. Although it is not expected that the TRP1W1P area surface or ground waters will necessarily be impacted by irrigation during this 10-year plan, it does remain an area of emerging concern.

3.4: Barriers for Implementation

Funding for Plan Implementation

Funding is one of the primary factors in executing the targeted implementation schedule in **Section 5**. Increased funding beyond current levels will be needed to execute the actions listed within the targeted implementation schedule and achieve the measurable goals. All available Local, Regional, State, Federal, and non-government resources will need to be pooled in order to achieve the goals set out in this plan. Historically, policy is made at the Federal and State levels; data collection happens at the federal, state and local levels; and implementation / construction is done mainly at the local level. Funding sources come from all levels, but funding has been and will continue to be the limiting factor in achieving goals.

The targeted implementation schedule in this plan represents a coherent, comprehensive approach to mark progress towards measurable goals. Although local agencies have had success in acquiring competitive grants and designated state and federal funds, relying on those funding sources to achieve the measurable goals is unsustainable. Therefore, watershed-based implementation funding on a regular basis is needed. This includes funding for all planning initiatives including water quality, flood control, drainage, conservation initiatives, natural resources, and groundwater.

CONSERVATION PRACTICE DELIVERY MECHANISM

An improved means of effectively delivering conservation programs is needed to meet plan goals. The targeted implementation schedule in this plan represents a collaborated approach to mark progress towards measurable goals. However, 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, potentially in conflict with soil and water conservation policies. The challenge is to balance the need for economic profitability with necessary conservation and flood control practices that can provide sustainability of the resources. These policies will require coordination with landowners, local elected and appointed officials, private markets, legislatures, and universities with their research in developing local markets to help with promoting conservation practices. This plan recognizes the need to improve conservation delivery through implementation programs aimed to increase engagement with landowners within the plan area.

VARIOUS 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, watershed district rules (Minnesota Statute 103D), the regulation of animal feedlots (Minnesota Administrative Rules Chapter 7020), development and implementation of wellhead protection plans (Minnesota Rules Chapter 4720), shoreland and floodplain management (Minnesota Administrative Rules Chapter 6120), and soil erosion (Minnesota Statutes Chapter 103F). Local governments provide a portion of the administration and enforcement of these rules and statutes. However, the inconsistent administration and enforcement of these rules and statues between jurisdictional boundaries may result in confusion among landowners and farmers that manage property in two or more jurisdictions. Furthermore, negligent administration and enforcement in one jurisdictional boundary may negatively impact water quality and quantity of jurisdictional boundaries downstream. The planning partners within the TRP1W1P planning area recognize the importance of consistent application of Minnesota Rules and Statutes can have on water quality and quantity at the large watershed scale. This plan addresses the issue in the Section 6 Program Administration where a consistent layout of all enforcement duties is recognized.

FARM LAW LEGISLATION

National legislation changes can have huge implications on the varieties, size and profitability of crops produced in Minnesota. Changes made to federal crop insurance support and subsidies dramatically effects the varieties and productivity of crops planted. A major example of this is corn growth pushed by legislation for ethanol production. This can cause huge impacts on the amount of corn and crop rotations in the agricultural industry. Conservation funding allocation from the 2018 Farm Bill is a major

source of federal support for this plan. Since then there have been many rule changes within federal programs. Planning partners must be opportunistic and adapt to changes in federal policy in order to capitalize on farm program funding initiatives. Some of the potential future programs that may be useful and available include:

***PL566*:** Known as the 'Small Watershed Program' through NRCS. One project in the Joe River watershed and three projects in the Two Rivers watershed have been constructed using this program. This is an excellent source of federal funding and technical resources. Under this program a planning process is used to identify problems, investigate a range of alternatives, prepare environmental review and engineering plans, provide funding and construct projects that address drainage, flood control, environmental enhancements and conservation initiatives.

Regional Conservation Partnership Program: Through NRCS, this program is similar to PL566 in that it will provide funding and technical resources to plan, design, construct and implement water resources projects. Targeted EQIP funding can be made available to farmers and landowners to become certified under the MN Ag Water Quality Certification Program. Watershed District projects can also be benefitted by the RCPP program.

This plan recognizes the impact that national 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 managing for soil stewardship, conservation, and agronomics by programs that encourage the long-term resilience of farms.

3.5: Other Issues

Other emerging issues continually come up on the federal and state levels. Local plan partners can participate and provide comments on these issues through procedures related to rule making, public comment periods, attending meetings, and becoming aware of initiatives.

One recent topic that has been prominent in the planning area, regionally, state, and internationally includes '**Tiered Aquatic Life Use'** designations from the MPCA. This is a method of classifying rivers, creeks, coulees and legal ditches according to the organisms that utilize these systems and the system's impact on the environment. It has raised questions regarding legal authority and the application of TALU designations to legal drainage ditches and other watercourses. These designations may have ramifications for agricultural drainage and flood control. Actions to address these concerns are to petition for reclassification of Class 2 ditches to Class 7.

The International Joint Commission has recommended numerical **nutrient concentration objectives and nutrient load targets** for total phosphorous and total nitrogen at the international border. At this time these are guidelines, but these designations could have ramifications for farmers, landowners, and residents of the planning area.

Section 4: Measurable Goals

Section 4.1: Definitions

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

- ***Priority Issue*:** Issues categorized, through the prioritization process (**Section 3**), as High and Medium Priority Issues. Priority issues will be the focus of this comprehensive plan.
- ***Measurable Goal*[1]:** 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.
- ***Short-Term Goal(s)*[2]:** 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.
- ***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.

Section 4.2: Measurable Goal Planning Region Prioritization

Because the TRP1W1P Planning Area is large, and issues impact certain areas more than others, this plan prioritizes measurable goals at the planning zone scale. The weighting criteria for prioritization consists of data from PTMApp, the TRP1W1P Planning Area restoration and protection maps, bank stabilization results from the WRAPS and TMDL reports, and input from the Steering Team and Advisory Committees.

Prioritization of measurable goals in the planning region is a guide for where implementation actions should be employed to address priority issues and make progress towards measurable goals. Other considerations, such as funding opportunities, local government capacity, and perhaps most importantly, landowner willingness are just as vital for determining where implementation will occur. Planning region prioritization sets a framework for determining areas in the watershed to work first, relative to measurable goals, while recognizing that implementation opportunities may occur in lower priority planning regions due to capacity, timing, and opportunity. Goal progress will be measured within each planning zone to track the progress to the watershed wide goals.

Measurable goals for water quality were established based on information from the Watershed Restoration and Protection Strategy (WRAPS) related report and results from the PTMApp model. The WRAPS report was used to establish the long-term sediment and nutrient reduction goals as a

[1] In many instances, measurable goals are based on modeled or observed data that provides precise estimates. Despite the appearance of precision, these numbers are estimates based on the best scientific data available.
[2] Short-Term Goals are often defined as percent progress towards the Long-Term Goal, giving the expectation that because a X% of the Long-Term Goal is attainable in the 10-year lifespan of the plan, that the Long-Term Goal completion date can be extrapolated. While this may be true in some instances, there may not always be a linear relationship when measuring progress towards Short- and Long-Term Goals.

percentage reduction. These percentages were used to establish a measurable reduction in tons or pounds to the outlet of each planning region using PTMApp. The short-term goals were established using PTMApp in an iterative process where different implementation scenarios for each planning region were evaluated based on Level 2 funding (Section 5). Final short-term goal percentages and measurable load reduction are based on the implementation scenarios (Section 5.1). Full PTMApp scenario tables for each planning zone can be found in Appendix A.

MEASURABLE GOAL: WATER QUALITY- SEDIMENT

Background:

Local ditch authorities (Counties & Watershed Districts) have identified and documented where wind and water erosion has deposited sediment in each ditch system. Sediment from sloughing and bank erosion is also evident in river channels and can be mapped. In addition to physically viewing and mapping these areas, modelling tools like PTMApp and HSPF have been utilized to identify sources, determine the most cost-effective practices to address the problem, and help decide where to locate these practices.

The majority of the planning zones are ranked high for sediment. In the "Priority Issue" box, the rankings shown are from the PTMApp model, unless otherwise noted.

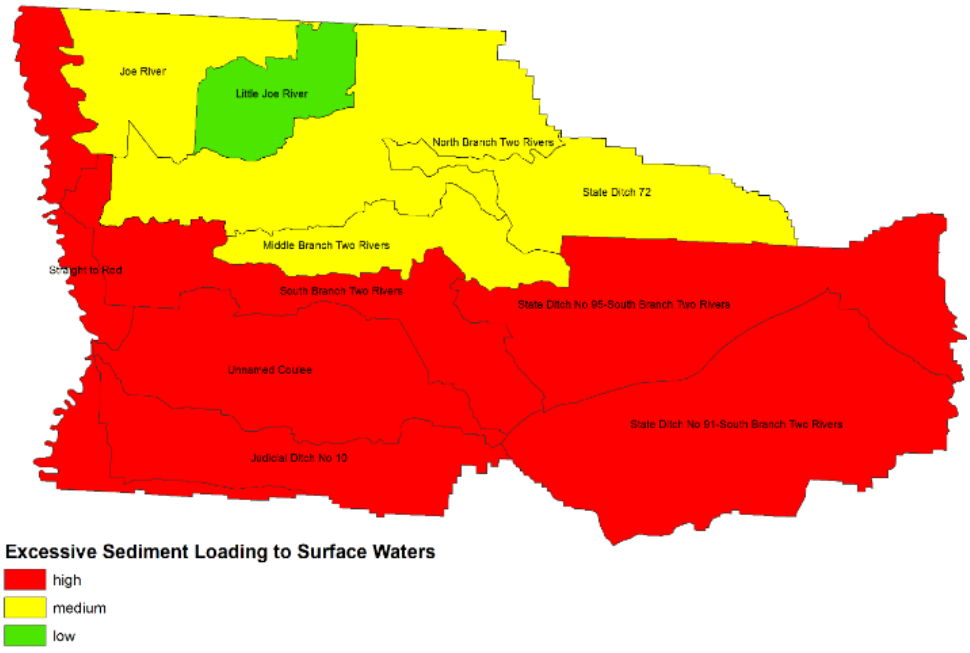


Figure 4.1 *Planning Zone Sediment Rankings*

Priority Issue:

- **Excessive Sediment Loading to Surface Waters**

Goals for Planning Zones:

High Rank:

- **Judicial Ditch #10**
  - **2.5% - 100 tons**
- **Straight to Red**
  - **2.5 % - 81 tons**
- **South Branch Two Rivers**
  - **2.5% - 99 tons**
- **Unnamed Coulee**
  - **2.5% - 113 tons**
- **State Ditch 95**
  - **2.5% - 126 tons**
- **State Ditch 91**
  - **2.5% - 167 tons**

Medium Rank:

- **Joe River**
  - **2.0% - 144 tons**
- **North Branch Two Rivers**
  - **2.0% - 43 tons**
- **Middle Branch Two Rivers**
  - **2.0% - 38 tons**
- **State Ditch #72**
  - **2.0 % - 25 tons**

Sediment Goals

SHORT TERM: Reduce sediment delivery to ditches, streams, and lakes by 2.5% in 'High' priority areas and 2% in 'Medium' priority areas.

LONG TERM: Reduce sediment delivery to ditches, streams, and lakes to meet the TMDL reduction goal of 78% maximum load for the Two Rivers portion of the planning area only.

MEASURABLE GOAL: WATER QUALITY- NUTRIENTS

Background:

Total Phosphorous and Total Nitrogen are two nutrients that are of the most concern. Algae blooms at Lake Bronson State Park are a large concern to the public. The Watershed Restoration and Protection Strategies for the Two Rivers and Lower Red River were utilized in determining priority planning zones. Also, PTMApp was essential in determining realistic percentage reduction goals. Figure 4.2 shows the ranking map for nutrients.

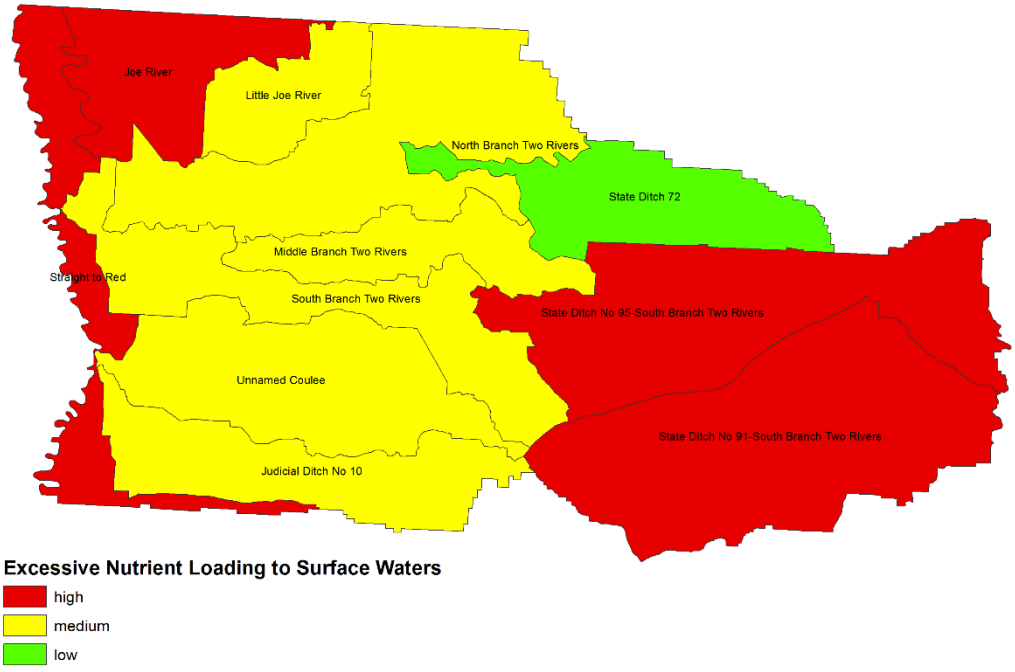


Figure 4.2 *Planning Zone Nutrient Rankings*

Nutrient Goals

SHORT TERM: Reduce nutrient delivery to ditches, streams, and lakes based on sediment reduction goal using PTMApp results. Planning zones upstream of Lake Bronson: TP 2% and TN 0.7% reductions to address nutrient loading contributing to algae blooms in Lake Bronson.

LONG TERM: Maintain minimal nutrient delivery to ditches, streams, and lakes to maintain the state standard.

Priority Issues:

- Excessive Nutrient Loading to Surface Waters
- Algae Blooms in Lake Bronson

Goals for Planning Zones:

High Rank:

- State Ditch #95
  - TP 2.0 % - 419 lbs
  - TN 0.70% - 3,334 lbs
- State Ditch #91
  - TP 1.9% - 483 lbs
  - TN 0.70%- 4,030 lbs
- Straight to Red River
  - TP 2.0%- 191 lbs
  - TN 0.90% - 1,598 lbs
- Joe River
  - TP 2.0 %- 279 lbs
  - TN 0.73%- 1,947 lbs

Medium Rank:

- Judicial Ditch #10
  - TP 2.0 %- 298 lbs
  - TN 0.88%- 2,509 lbs
- Little Joe River
  - TP 0.60 %- 46 lbs
  - TN 0.31%- 470 lbs
- North Branch Two Rivers
  - TP 2.0 %- 239 lbs
  - TN 0.60%- 1,508 lbs
- Middle Branch Two Rivers
  - TP 1.0 %- 64 lbs
  - TN 0.42%- 589 lbs
- Unnamed Coulee
  - TP 2.0%- 395 lbs
  - TN 0.60%- 2,269 lbs
- South Branch Two Rivers
  - TP 1.8 %- 247 lbs
  - TN 0.80%- 2,148 lbs

MEASURABLE GOAL: WATER QUALITY- *E. coli*

Background:

E. coli is measured as an indicator of the amount of fecal contamination in surface water. *E. coli* source assessments in the Lower Red River WRAPS report and the Two Rivers WRAPS report both indicate that livestock is a greater source of *E. coli* than humans or wildlife. However, in order to better define the sources of fecal contamination, DNA analysis of bacteria (i.e. microbial source tracking) will be used to identify the animal groups contributing fecal contamination to surface waters. A benefit of DNA analysis is that source identification will help identify the strategies needed to reduce fecal contamination to our waters from sources of concern such as humans.

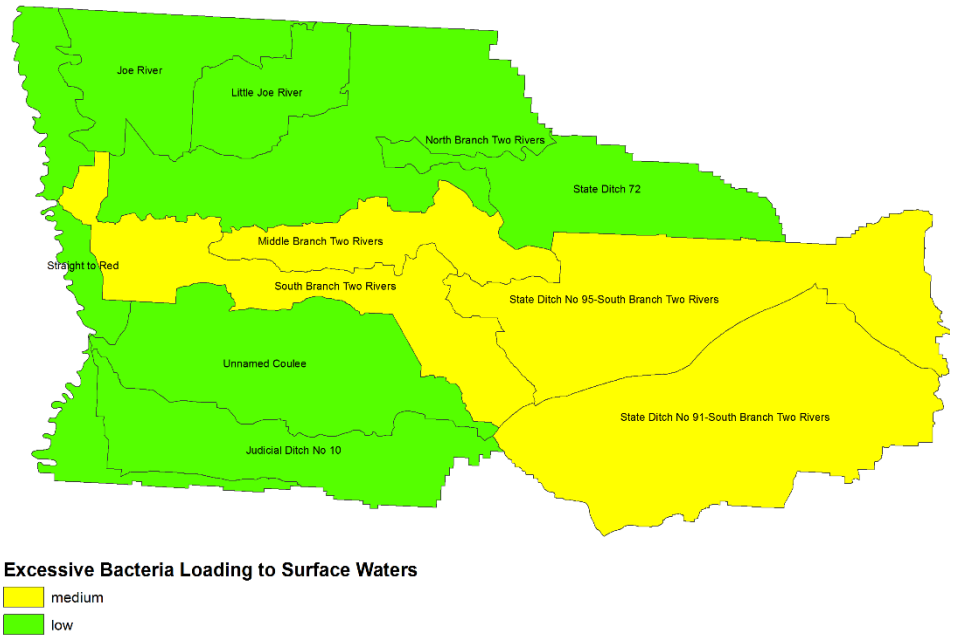


Figure 4.3 *Planning Zone Bacteria Rankings*

Priority Issue:

- **Excessive Bacteria Loading to Surface Waters**

Goals for Planning Zones:

High Rank:

- **None**

Medium Rank:

- **State Ditch #95**
- **State Ditch #91**
- **Middle Branch Two Rivers**
- **South Branch Two Rivers**

E. Coli Goals:

SHORT TERM: Progress towards the long-term goal. Perform microbial source tracking (MST) to identify the primary sources of fecal contamination using DNA analysis.

LONG TERM: Eliminate aquatic recreation use impairments caused by excessive *E. coli* on 5 reaches by decreasing *E. coli* levels to less than or equal to the state standard of 126 orgs/100ml.

MEASURABLE GOAL: WATER QUALITY- CHANNEL INSTABILITY – DEGRADED AQUATIC HABITAT

Background:

Channel instability can be inventoried either by inspection, remote sensing or by other assessment methods. Causes of instability can range from extreme high flows or flow regime instability to construction of channels that increase stream power to insufficient physical habitat / lack of vegetation. Watercourses can be split into three categories:

Legal Ditches – ditch authorities perform annual inspections and maintenance of their ditch systems and are aware of most damage locations.

Private Ditches and Road Ditches – Road authorities also perform inspections and maintenance of roadways, and some eroding areas are well known while others are not frequently inspected.

Natural Watercourses – There is no entity that regularly inspects or maintains natural watercourses. It is generally up to individual landowners to inspect, maintain or repair these with need of a permit from the MN DNR for working in public waters. However, federal and state program funds could be utilized.

Degraded aquatic habitat goes along with channel instability and includes in-channel areas where erosion, sloughing, downcutting, or aggradation is occurring. This is highlighted in the MPCA Stressor ID and DNR Geomorphology reports. Ditch Authorities and LGU's identified specific problem areas.

Figures 4.4 and 4.5 show instability and degraded aquatic habitat are a high priority in the South Branch Two Rivers.

Channel Erosion Goals:

SHORT TERM: Work to stabilize all high and medium ranked ditch bank/ stream bank sloughing issues. This should include 1) areas identified in legal ditch inspections, 2) areas along roads & private ditches, and 3) identified areas along natural watercourses.

LONG TERM: Stabilize all ditch and stream banks in planning area.

Priority Issue:

- **Instability of all types of watercourse**
- **Degraded aquatic habitat**

Goals for Planning Zones:

High Rank:

- **South Branch Two Rivers**
  - **0.5 miles Ditches**
  - **2 miles Streambanks**

Medium Rank:

- **Straight to Red River**
  - **0.5 miles Ditches**
- **Judicial Ditch #10**
  - **0.75 miles Ditches**
- **Little Joe River**
  - **2.75 miles Ditches**
- **North Branch Two Rivers**
  - **2 Outlets**
- **Unnamed Coulee**
  - **10 miles Ditches**
- **State Ditch #91**
  - **8.5 miles Ditches**
- **State Ditch #95**
  - **3 miles Ditches**

MEASURABLE GOAL: WATER QUALITY- CHANNEL INSTABILITY – DEGRADED AQUATIC HABITAT

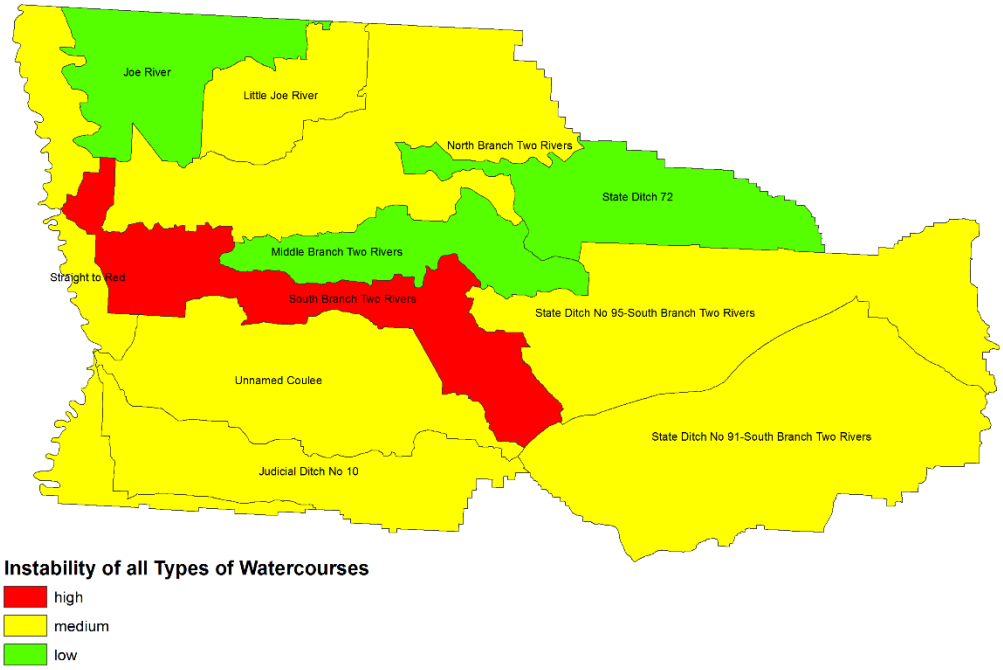


Figure 4.4 *Planning Zone Instability of watercourses Rankings.*

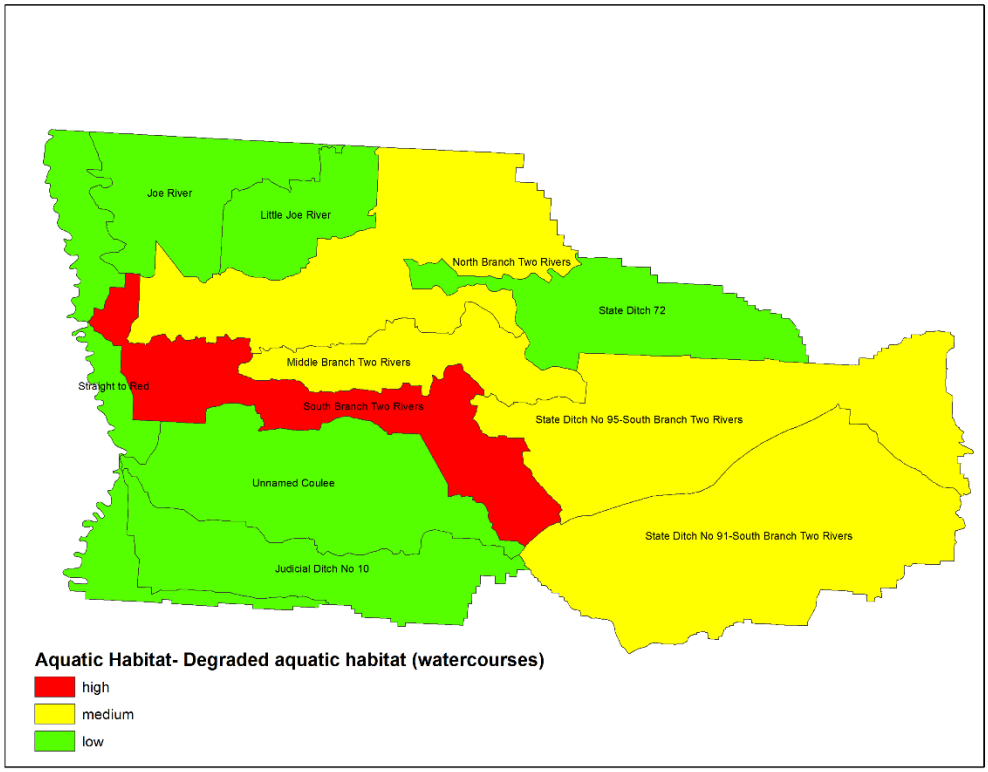


Figure 4.5 *Degraded Aquatic Habitat*

MEASURABLE GOAL: HYDROLOGY/ FLOODING: CONVEYANCE CAPACITY

Background:

The 1998 Red River Mediation Agreement identifies a need to balance drainage, flood control, and natural resources. It also identifies the need to provide conveyance capacity to ag lands for up to a 10-year runoff event. Systems can be categorized into legal ditches, road & private ditches, and natural watercourses. Past planning efforts have identified several needs, as follows:

- ❖ reduce the number of drainage systems with outlets that are in disrepair,
- ❖ address beaver dams on ditches and natural watercourses,
- ❖ address problems of debris in river channels,
- ❖ address blockages in drainage systems from sediment, vegetation, and other causes,
- ❖ reduce "flashiness" of the hydrograph related to ditches and natural watercourses,
- ❖ reduce damages to legal ditches and natural systems by preventing or correcting slope failures.

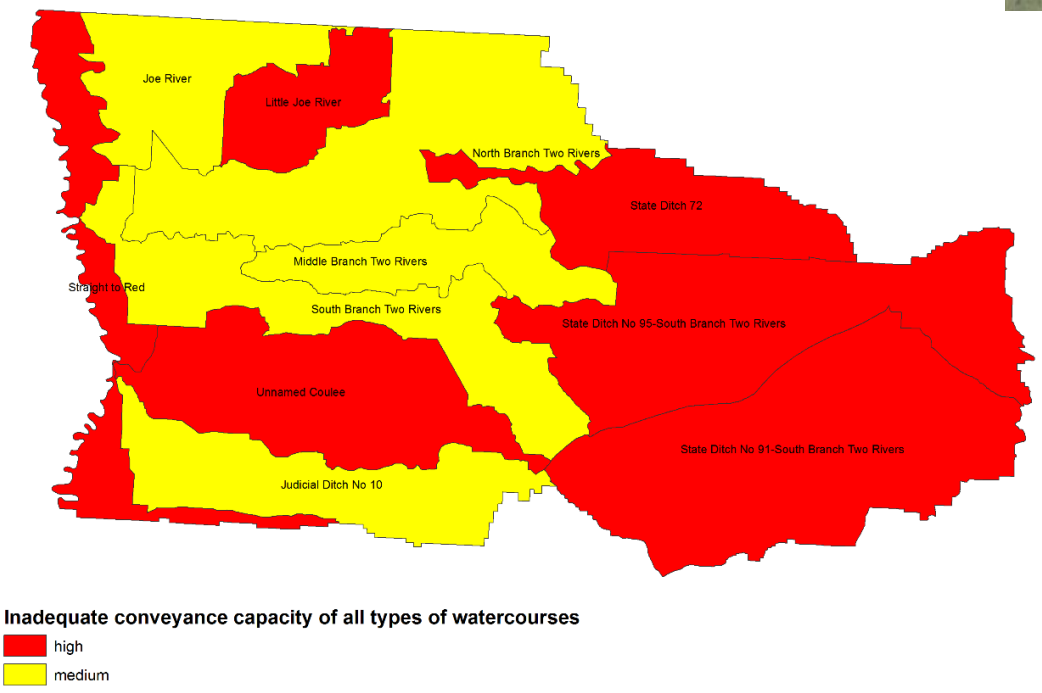


Figure 4.6 *Planning Zone Priorities for conveyance capacity*.

Watercourse Capacity Goals

SHORT TERM: 1) Provide a channel capacity for up to a 10-year runoff event on 10% of legal ditch systems in high priority areas and 5% in medium priority areas (Dependent upon drainage law proceedings & landowner support). 2) Maintain natural capacity of unaltered streams and rivers.

LONG TERM: When it is determined that the outlet is adequate, maintain, modify, construct, or improve ALL ditch systems to provide a channel capacity for up to a 10-year runoff event. Maintain existing capacity of natural, unaltered streams and rivers.

Priority Issue:

- **Inadequate conveyance capacity of all types of watercourses**

Goals for Planning Zones:

High Rank:

- ❖ **State Ditch #95**
- ❖ **State Ditch #91**
- ❖ **State Ditch #72**
- ❖ **Unnamed Coulee**
- ❖ **Little Joe River**
- ❖ **Straight to Red River**

Medium Rank:

- ❖ **South Branch Two Rivers**
- ❖ **Judicial Ditch #10**
- ❖ **North Branch Two Rivers**
- ❖ **Middle Branch Two Rivers**
- ❖ **Joe River**

MEASURABLE GOAL: HYDROLOGY/FLOODING: FLOW EXTREMES

Background:

The Red River Basin Flood Damage Reduction Work Group's 'Technical Paper #11' details all known flood damage reduction measures. These include 1) reduce flood volumes (cropland BMP's, wetlands, 2) increase conveyance capacity (ditches), 3) increase temporary storage (impoundments, culvert sizing, set-back levees, and 4) protection and avoidance (ring dikes, buyouts).

Studies done by the Red River Basin Commission and watershed districts indicate to reduce peak flows on the Red River by 20% about 45,700 acre feet of storage (impoundments) is needed in this planning area. Local watershed districts recognize that for various reasons, gated storage is the most efficient way to do this. It is a long term goal to provide 20% flow reduction. This goal is much larger because it is specific to the whole Planning Area. The proposed 'Klondike Clean Water Retention Project' is being developed by the Two Rivers Watershed District to achieve this long term goal.

A shorter term goal is to keep water on the land by reducing tillage, cropland BMP's, wetland restorations, and culvert sizing programs. These activities can help to reduce crop damage, road overtopping, sloughing, and other types of damage. Past efforts have constructed over 30 farmstead ring dikes, numerous buyouts of flood prone properties, and protection of cities. General short term storage goals for the high and medium ranking planning zones were ascertained using a spreadsheet calculator and are listed in box to the right.

Recent planning efforts have identified the need to increase base flows during low water periods. Better flow regimes will lead to improved water quality, increased dissolved oxygen levels in streams, lower algae issues, reduced number of impairments, and improved aquatic habitats. There is a desire to provide a more natural flow regime to reduce flashiness of the rivers caused by alterations to the landscape, drainage, natural hydrology, river channel morphology, and climate change. Local project work teams are discussing the flow minimums and will make recommendations as these are discussed and developed.

Hydrology/ Flood Damages Goals

SHORT TERM: Construct projects and consider land-use strategies to reduce flood volume, provide protection, increase storage, and attenuate stream flows.

- High Priority Planning Zones: 1/4 inch run off reduction
- Medium Priority Planning Zones: 1/8 in run off reduction
    - (Goals shown in acre-feet storage)

LONG TERM:

- Protect agricultural land from flooding for up to a 10-year runoff event
- Protect cities and farmsteads for up to a 100-year runoff event
- Provide 40,000-acre feet of storage within the Two Rivers Watershed District
- Provide 5,700-acre feet of storage within the Joe River Watershed District
- Maintain minimum flow 20 cubic CFS on S. Branch Two Rivers and 10 CFS on M. Branch Two Rivers during low flow periods.

Priority Issues:

- **Flood damage to Farmland**
- **Flood Damage to communities, public infrastructure and rural homesteads**
- **Degraded Riparian Habitat**
- **Extreme Low Flow**
- **Low Dissolved Oxygen**

Goals for Planning Zones:

High Rank:

- **State Ditch #95**
    - **3,075 ac-ft**
- **State Ditch #91**
    - **3,712 ac-ft**
- **State Ditch #72**
    - **1,479 ac-ft**
- **Judicial Ditch #10**
    - **1,630 ac-ft**
- **Straight to Red River**
    - **1,272 ac-ft**
- **Unnamed Coulee**
    - **2,217 ac-ft**
- **Joe River**
    - **1,288 ac-ft**

Medium Rank:

- **South Branch Two Rivers**
    - **941 ac-ft**
- **North Branch Two Rivers**
    - **1,434 ac-ft**
- **Middle Branch Two Rivers**
    - **522 ac-ft**
- **Little Joe River**
    - **421 ac-ft**

MEASURABLE GOAL: HYDROLOGY/FLOODING: FLOW EXTREMES

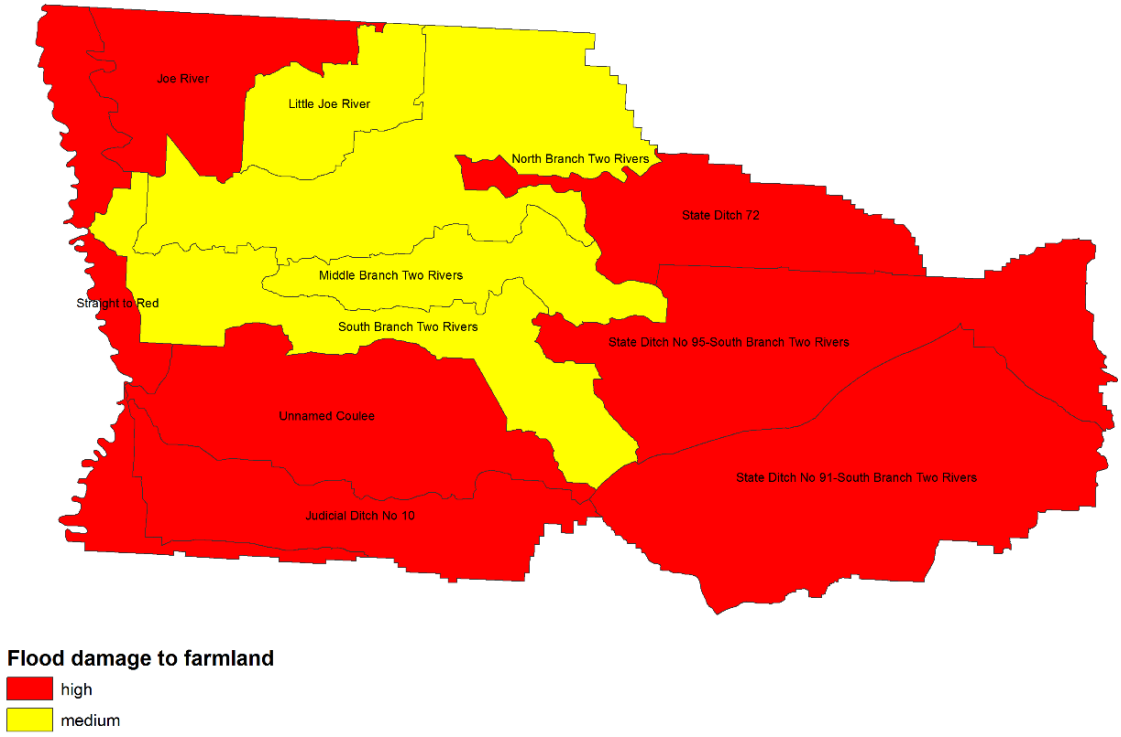


Figure 4.7 *Flood Damage to Farmland*

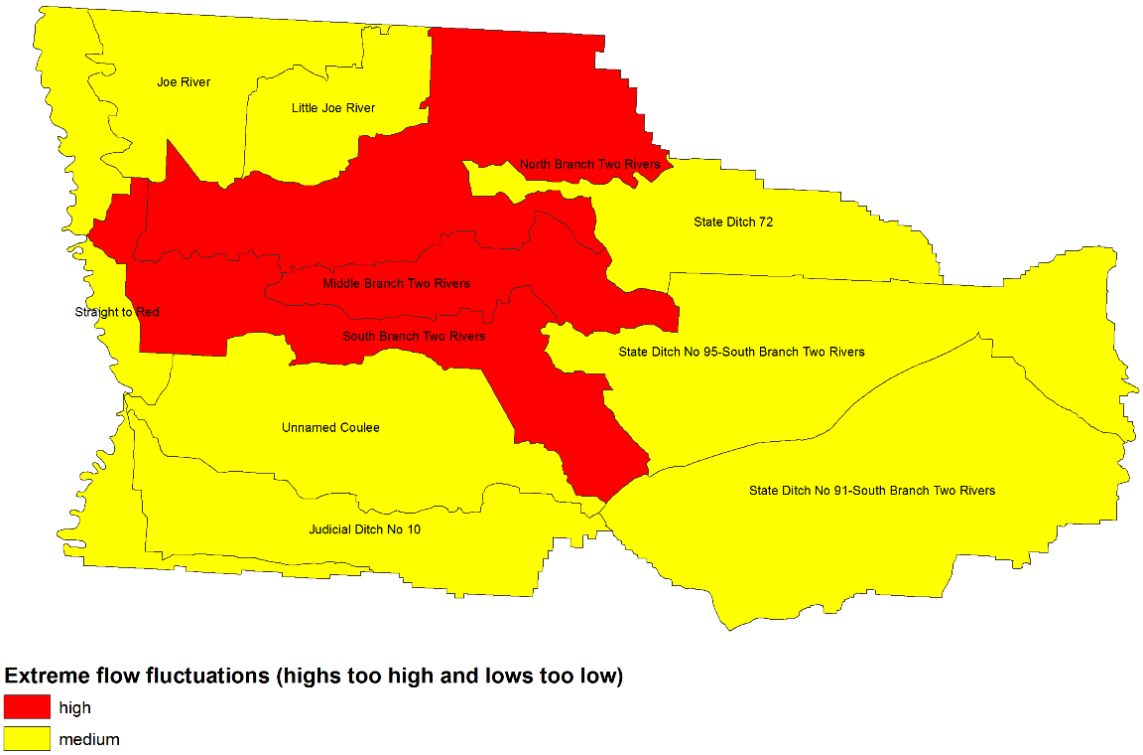


Figure 4.8 *Priority Planning Zones to address low flow fluctuations*.

MEASURABLE GOAL: GROUNDWATER- QUALITY AND QUANTITY

Background:

Sources of potential contamination need to be identified and measures taken to protect groundwater quality. Because of the need in the eastern 1/3 of the planning area to assist with assessing private wells, it will be a goal to provide outreach opportunities to educate citizens on the need to test their wells and to create awareness regarding the potential contaminants that may exist in well water.

Groundwater protection activities for both public and private wellheads should include continuation of an abandoned well sealing program, educating residents on proper well maintenance, inspecting / maintaining septic systems, and proper management of hazardous materials including household hazardous waste.

Data on past and current groundwater levels within the planning area is limited. The Kittson SWCD participates in the MN DNR's observation well program by collecting water level information on one well within Kittson County. While this is good information, many more wells are needed in order to collect needed information.

Discussion has been held in past local water plans to do a 'County Geological atlas' for the area. Until an atlas is done, it is wise to monitor groundwater levels to look for short and long term changes that may occur.

Priority Issue:

- **Groundwater Quantity**
- **Nitrate, arsenic and other types of groundwater contamination**
- **Wellhead Protection**

Goals for Planning Zones:

High Rank:

- **None**

Medium Rank:

- **South Branch Two Rivers**
- **State Ditch #95**
- **State Ditch #91**
- **Unnamed Coulee**

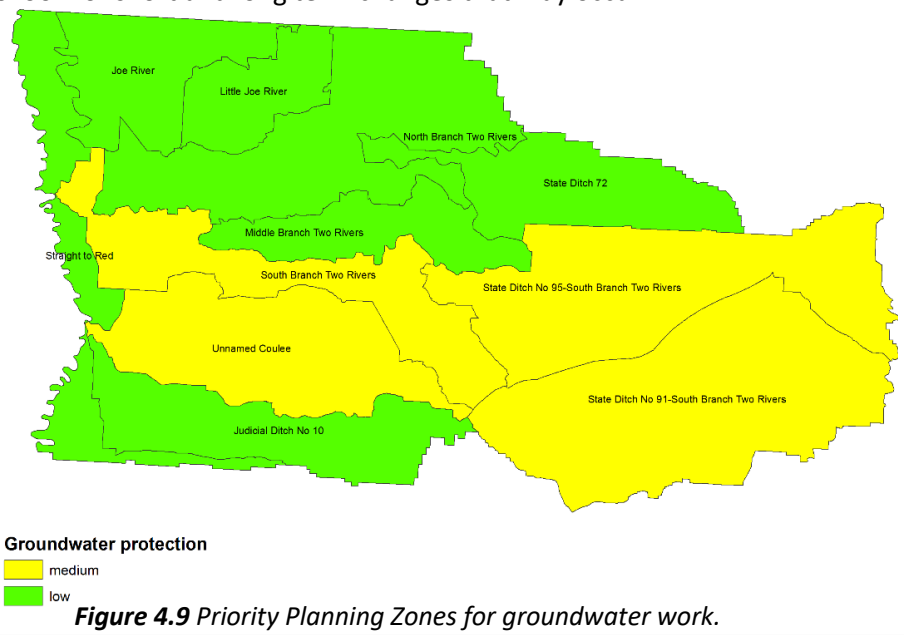


Figure 4.9 *Priority Planning Zones for groundwater work.*

Groundwater Short Term Goals:

- Expand the observation well-water level monitoring program from 1 well to 3 wells within the Planning Area.
- Develop an "Un-Used Well Inventory" educational and outreach program to ensure the protection & preservation of drinking water supplies within DWSMAS or vulnerable areas affecting private wells and to determine a number of wells to seal as future goals.
- Develop ground water quality educational and outreach program to gather adequate data to analyze trends in order to make informed decisions and future prioritizations.

Groundwater Long Term Goals:

- Support land use controls and decisions that result in groundwater protection.
- Participate with wellhead protection plan development and implementation efforts of public water suppliers.

MEASURABLE GOAL: NATURAL RESOURCES- WETLAND HABITAT

Background:

Federal and State laws are in place to regulate the loss of wetland habitat. Wetland restorations could be beneficial in areas that are marginal for crop production that undergo frequent flooding. These could provide temporary storage of floodwater, take up nitrogen and phosphorus, and help to attenuate low stream flows.

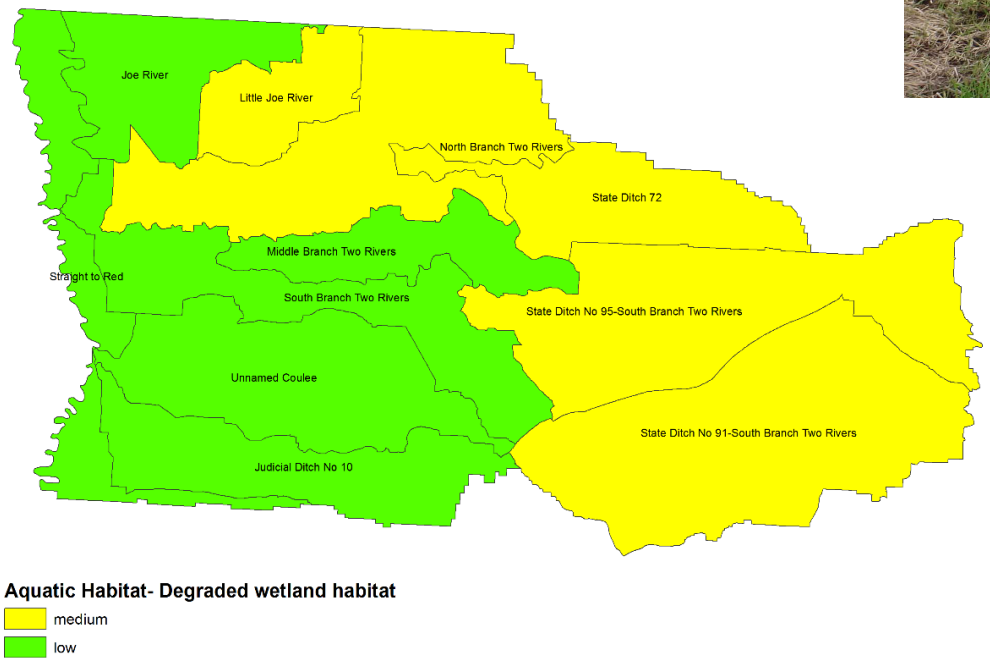


Figure 4.10 *Planning Zone Degraded Wetland Habitat Rankings*

Priority Issue:

- **Degraded Wetland Habitat**

Goals for Planning Zones:

High Rank:

- **None**

Medium Rank:

- **State Ditch #95**
- **State Ditch #91**
- **State Ditch #72**
- **North Branch Two Rivers**
- **Little Joe River**

Wetland Habitat Goals

SHORT TERM: Maintain wetland acres and improve quality for 500- acres of protected wetlands.

LONG TERM: Maintain wetland acres and improve quality on 1,000-acres of protected wetlands.

MEASURABLE GOAL: NATURAL RESOURCES- LONGITUDINAL CONNECTIVITY

Background:

Improving connectivity to allow passage of large-bodied fishes moving up from the Red River will enhance the sport fisheries value of the TRP1W1P area. The Hallock Dam has been replaced with a boulder, rock, and riffle structure to allow for fish passage. The Northcote Dam is the only man made structure to be assessed and possibly removed. Although the DNR has plans for a new dam at Lake Bronson, they will address safety issues and will not incorporate fish passage/connectivity due to very tall height and uneconomical cost. Reconnecting floodplain habitat is also beneficial for fish, because it provides access to essential spawning habitat for species such as northern pike.

Other problematic structures include beaver dams, private road crossings, grade control structures, perched culverts, and rock check dams. Where feasible, these types of structures should be altered or removed.

Priority Issue:

- Loss of longitudinal connectivity

Goals for Planning Zones:

High Rank:

- South Branch Two Rivers
- North Branch Two Rivers

Medium Rank:

- Joe River
- Middle Branch Two Rivers

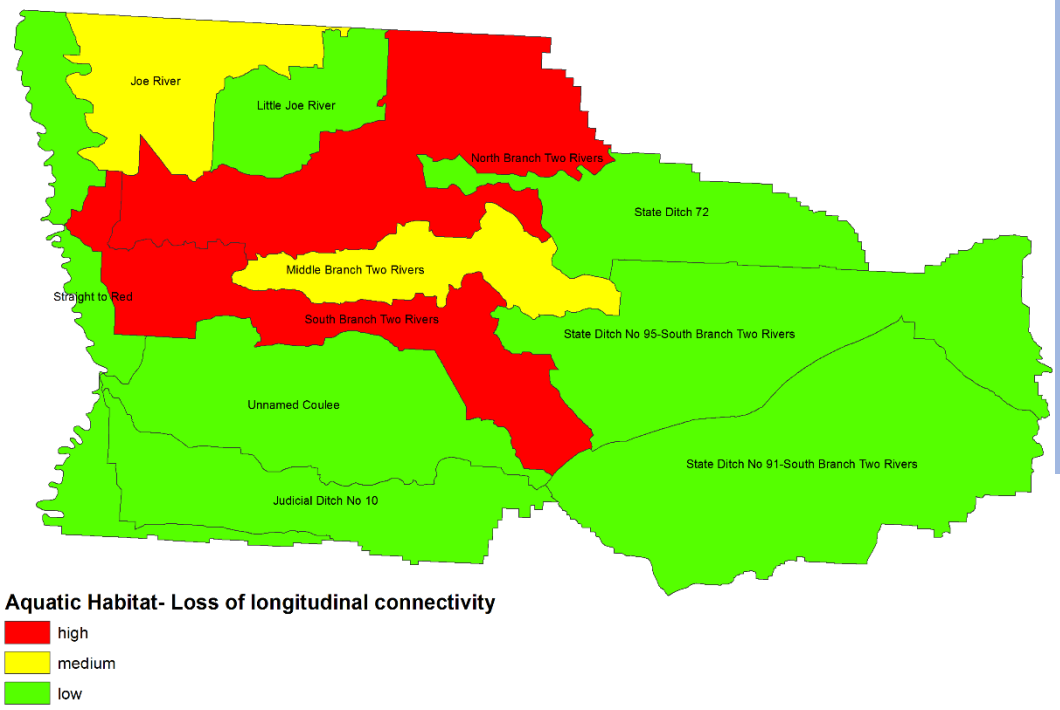


Figure 4.11 *Priority Planning Zones to address loss of longitudinal connectivity*.

Connectivity Goals

SHORT TERM: Remove 25% of barriers, including the Northcote dam.

LONG TERM: Increase connectivity by 100% in natural watercourses identified by the Two Rivers Stressor ID Report.

MEASURABLE GOAL: NATURAL RESOURCES- TERRESTRIAL HABITAT

Background:

As land that has been enrolled in the Conservation Reserve Program (CRP) begins to expire and be cultivated again, large blocks of habitat may be converted to ag production. This will potentially have the effect of increasing runoff, erosion, sediment loading, and nutrient loading.

Actions regarding these large habitat blocks have been identified in past watershed district and comprehensive local water plans. These will be carried forward into this updated plan, and include participation in efforts to enhance, establish, and protect stream corridors, riparian areas, aquatic habitats, and upland habitats. The short and long term acre goals are based on 1% and 10% of enrolled CRP acres. This plan acknowledges that there are various other agencies and programs that work to achieve this goal.

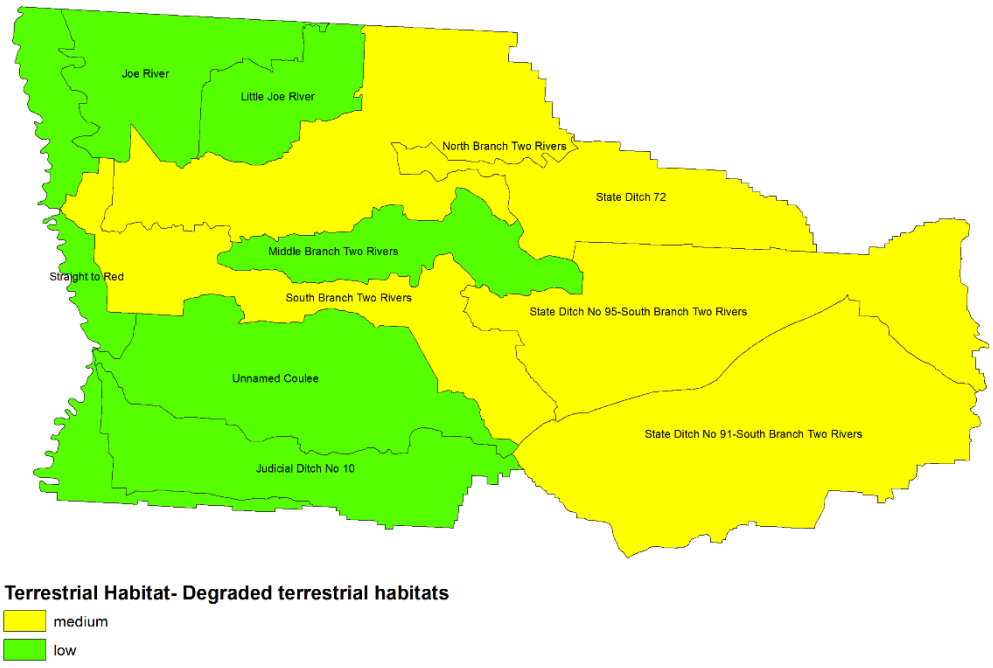


Figure 4.12 *Priority planning areas to address terrestrial habitat goals*.

Priority Issue:

- **Degraded Terrestrial Habitat**

Goals for Planning Zones:

High Rank:

- **None**

Medium Rank:

- **State Ditch #72**
  - **200 acres**
- **South Branch Two Rivers**
  - **200 acres**
- **State Ditch #95**
  - **200 acres**
- **State Ditch #91**
  - **200 acres**
- **North Branch**
  - **200 acres**

Degraded Habitat Goals:

SHORT TERM: Maintain terrestrial acres and improve quality on 1,000 acres.

LONG TERM: Enhance terrestrial acres and improve quality on 10,000 acres.

MEASURABLE GOAL: AG PRODUCTIVITY- SOIL HEALTH

Background:

Recognizing the importance of soil health, the Steering Team gave the highest rank to the Planning Zones with the most intense agricultural practices being used on the landscape that may contribute to sediment loss areas from overland erosion, and areas containing soils vulnerable to wind erosion. These zones are the target zones for management practices aimed at improving soil health. The soil health priority zones mirrored the same priority zones as wind erosion. Due to this outcome, the Soil Health Priority Zone Map represents both. The excessive water erosion map is shown separately. Both are on the next page.

Priority Issues:

- Excessive wind erosion
- Excessive water erosion
- Decreased soil organic matter, infiltration rates, and water holding capacity

Goals for Planning Zones:

High Rank: Soil Health

- South Branch Two Rivers
- Unnamed Coulee
- Judicial Ditch #10
- Straight to Red River
- Joe River

High Rank: Excessive Water Erosion

- State Ditch #95
- State Ditch #91

Medium Rank: Soil Health

- Little Joe River
- North Branch Two Rivers
- Middle Branch Two Rivers
- State Ditch #95
- State Ditch #91

Medium Rank: Excessive Water Erosion

- State Ditch #72
- Joe River
- Little Joe River
- North Branch Two Rivers
- Middle Branch Two Rivers

Ag Productivity Goals

SHORT TERM: Implement best management practices such as but not limited to buffers, field windbreaks, cover crops, reduced tillage, and livestock incorporation to certify 5,000 acres through the Minnesota Ag Water Quality Certification Program (MAWQCP) on cropland acres to increase soil organic matter, infiltration rates, and water holding capacity.

LONG TERM: Certify all cropland acres in the Minnesota Ag Water Quality Certification Program (MAWQCP).

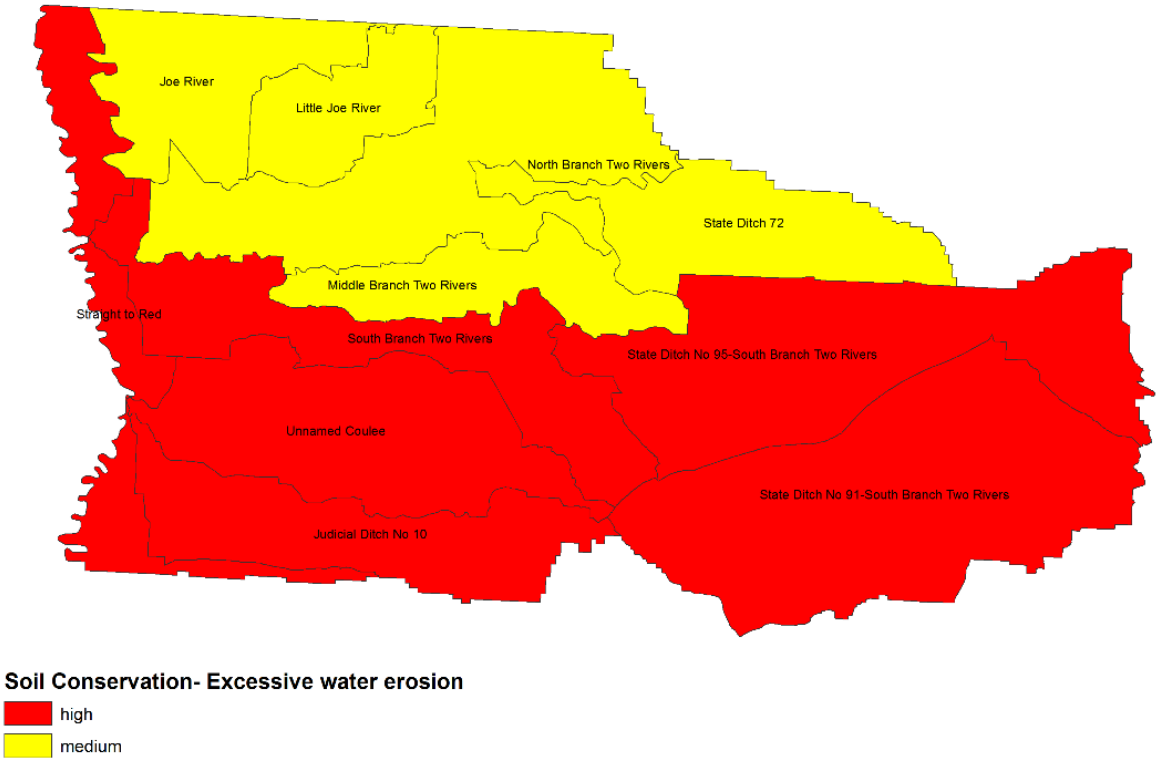


Figure 4.13 *Priority planning zones for excessive water erosion*

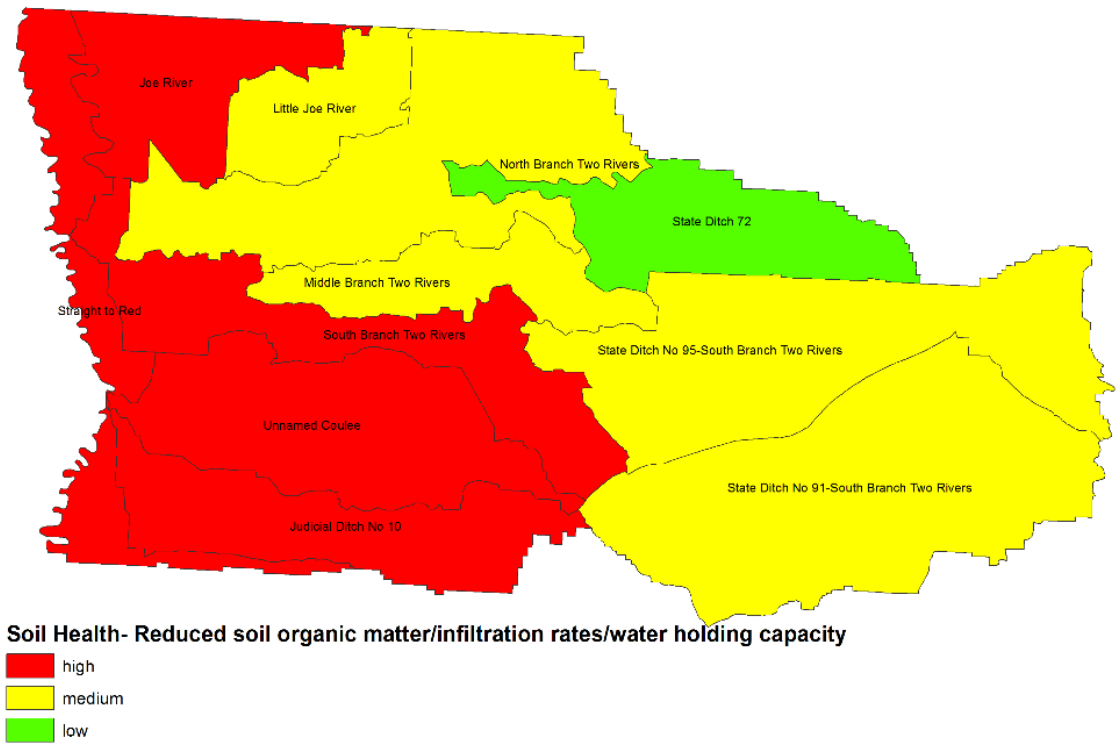


Figure 4.14 *Priority planning zones for soil health and wind erosion.*

MEASURABLE GOAL: AG PRODUCTIVITY- SOIL SALINITY

Background:

Soil salinity is an issue for many producers resulting in annual losses of crops across the western portion of the TRP 1W1P area. Even with the current trend of increasing rainfall, crops within areas of high salts may appear to be drought stricken to the casual observer. This effect is due to the salts' ability to draw water away from the roots and make it unavailable for crop plant use. The effects of salinity on crops may range from lower yields in select field areas all the way through entire field crop failure.

The Planning Group has prioritized the planning zones that align with this data and the land use across relevant areas of the watershed to work towards implementing best management practices to alleviate the effects of these saline soils.

Priority Issue:

- Excessive soil salinity

Goals for Planning Zones:

High Rank:

- None

Medium Rank:

- Unnamed Coulee
- North Branch Two Rivers
- Judicial Ditch #10
- Joe River
- Straight to Red River

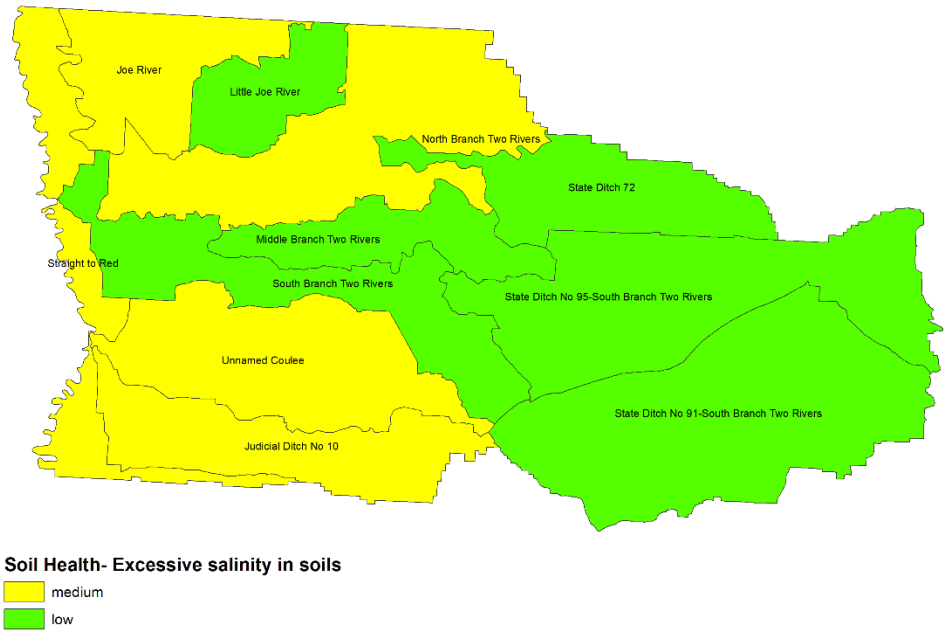


Figure 4.15 *Planning Zone Excessive Salinity Rankings*

Salinity Goals

SHORT TERM: Progress towards long term goal.

LONG TERM: Reduce soil salinity issues along the U.S. Highway 75 corridor.

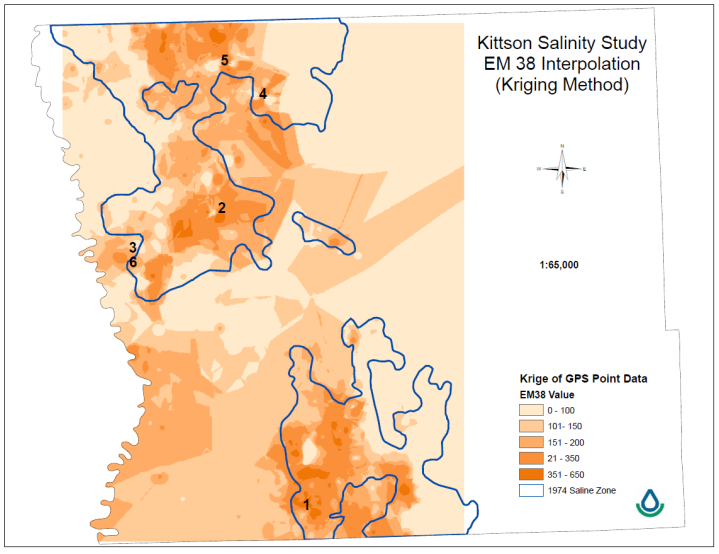
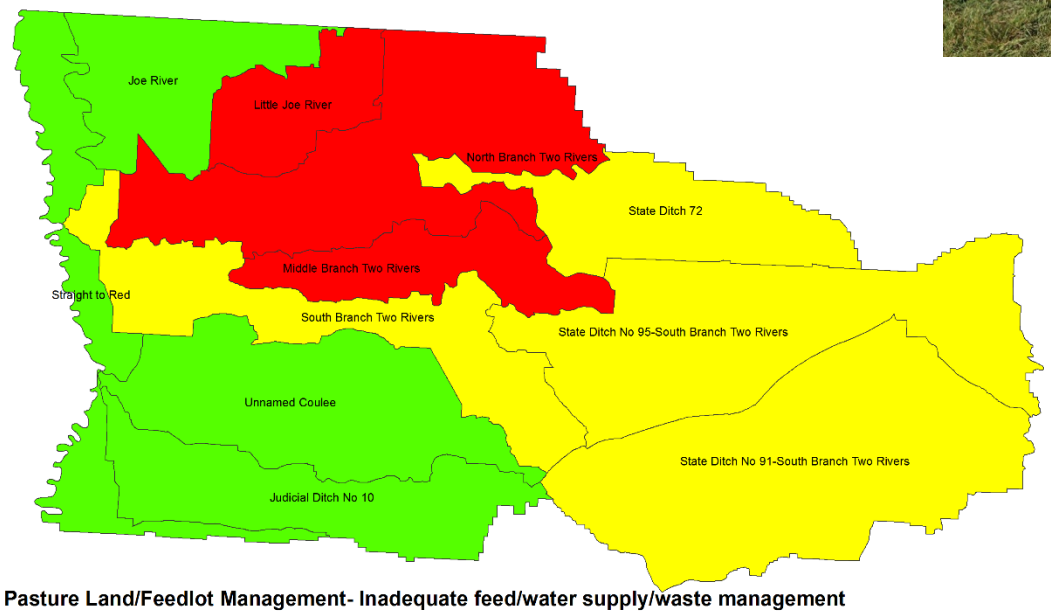


Figure 4.16 *NRCS Kittson Salinity Study*

MEASURABLE GOAL: AG PRODUCTIVITY- INADEQUATE FEED/WATER SUPPLY AND WASTE MANAGEMENT

Background:

Recognizing the importance of livestock use and wellbeing, the Planning Group gave a higher ranking to the Planning Zones with livestock use on the landscape. Hay and pastureland areas are highlighted in **Section 2: Land and Water Resource Narrative Figure 2.10 Land Use**. These areas are targeted for management practices aimed at improving and implementing rotational grazing systems.



Priority Issue:

- Inadequate feed, water supply, and waste management

Goals for Planning Zones:

High Rank:

- North Branch
- Middle Branch
- Little Joe River

Medium Rank:

- South Branch Two Rivers
- State Ditch #95
- State Ditch #91

Figure 4.17 *Planning Zone Inadequate Feed/water supply/ waste management Rankings*

Livestock water and grazing Goals

SHORT TERM: Implement 3,200 acres of rotational grazing systems to provide adequate feed and water supplies and best manure/waste management practices.

LONG TERM: Develop rotational grazing systems for ALL livestock producers in the planning area to provide adequate feed and water supplies and best manure/waste management practices.

Section 5: Implementation Schedule

A primary outcome of the 1W1P effort is to identify the most effective actions which will be implemented to make the greatest progress towards plan goals. This section contains a targeted implementation schedule to summarize information about each action, where and when it will occur, who will be responsible for implementation, how it will be measured, and an estimate of how much it will cost.

Many types of actions can be implemented to make progress towards goals. The actions highlighted in this section are targeted to occur across each Planning Zone (sub-watershed level). Each Planning Zone details its own Implementation Schedule Table of Best Management Practice (BMP) Actions showing variation due to types of priority issues and how PTMApp modeling was applied. (More information on PTM App is found in 5.1.) Each table calls out the number of practices that is planned on being implemented, the 10-year cost, the lead responsible party for each action, when the action will be done, what goal(s) the action satisfies, and the funding levels. The profiles also describe the current conditions, unique natural resources, as well as projects that have been completed within the Zone. The Steering Team realizes that the Planning Zone actions are landowner and producer dependent and have various degrees of interest or program success.

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. If more funds are available for implementation, more actions within the targeted implementation schedule can be implemented, and more progress can be made toward goals. The amount of funding for implementing this plan is uncertain, presenting a challenge for planning purposes. To address this challenge, three funding levels are provided in this plan.

- **Funding Level 1:** Actions in this scenario are based on the current funding levels of the participating LGU's($1,079,950/year). Assumes plan funding is similar in magnitude to current funding focused on water issues within the plan area.
- **Funding Level 2:** Actions in this scenario are based on the current LGU funding plus the estimated watershed-based implementation dollars or "Fund the Plan" dollars (approximately $532,000/year). Goals are set to be achieved through this funding level.
- **Funding Level 3:** Actions in this scenario are based on Funding Level 2 plus approximately $250,000/ year in competitive grants or other sources for implementation.

The targeted implementation schedule includes actions intended to be completed by local entities as well as 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. Combined total planning zone actions can be found in **Table 5-2** of the Two Rivers Plus Planning Area Actions Implementation Table.

5.1 Planning Zone Implementation Efforts

For purposes of this plan, actions that summarize projects and practices are planning zone specific. The who, what, when, where, and cost of each action dealing with projects and practices are described in an **implementation profile** for each planning zone.

A computer-based water quality model, known as "Prioritize, Target, & Measure Application" (PTMApp) was used in this plan establish sediment and phosphorous load reduction goals, evaluate implementation scenarios and develop implementation scenarios. PTMApp uses the best available data (e.g., soils, land use, precipitation, practice

costs, best management practice placement signatures, LiDAR topography) to estimate sediment and nutrient loading from upland areas of the landscape to the edge of field (catchment) and to priority resource points. The model also identifies specific locations for potential Best Management Practices (BMPs) and estimates their costs and load reduction potential.

PTMApp model results were used to build and evaluate implementation scenarios for each watershed planning zone as follows:

1. Establish the current sediment load at the outlet of each planning zone. This provided a current estimate in tons.
2. Establish initial sediment load reduction protection at 10% of existing load. This provided a reduction estimate in tons.
3. Screen PTMApp data so that only the practices in the top 50th percentile for load reduction potential are used to evaluate scenario. This step removes less effective practices and prioritizes more effective practices. PTMApp practices in the filtration, protection, source reduction, and storage practice categories were used in this plan.
4. Calculate median load reduction potential for each practice type within each watershed planning zone. This step provides the load reduction potential for each practice type that was used to build the scenario.
5. Build a series of implementation scenarios for each planning zone based on different combinations of practice types. This step uses local knowledge to determine and evaluate the number of each type of practice that could be implemented.
6. Estimate the cost of each scenario, compare scenario costs and load reduction estimates and adjust scenarios as needed to optimize sediment load reduction potential given estimated costs and local knowledge of implementation potential. This step uses local knowledge to determine and evaluate the number of each type of practice that could be implemented given available funding.
7. Finalize sediment load reduction scenario for sediment reduction.
8. Estimate associated phosphorus and nitrogen load reduction potential based on final scenario and the set of practices originally screened primarily for sediment reduction potential.

This process was followed for all planning zones except S.D. 95 and S.D. 91. In these planning zones, phosphorus load reduction was a priority over sediment loading. In this scenario, phosphorus was used as the primary water quality variable instead of sediment through step 7 and then sediment and nitrogen load reductions were estimated in step 8.

The types, numbers, cost, and locations of projects and practices shown in the targeted implementation schedule and implementation profiles reflect the PTMApp implementation approach designed for this plan. These types, numbers, cost, and locations will inevitably shift during plan implementation due to a variety of factors, including but not limited to:

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

The types, numbers, estimated costs, and locations of projects and practices shown in the following targeted implementation schedule represent a best-case-scenario for planning purposes. During implementation, alternative practices may be pursued to make progress towards plan goals. PTMApp data will be used to guide plan implementation to achieve water quality goals. Load reduction potential and cost-effectiveness will be key factors

in site specific selection of practices in priority areas within each planning region. Full PTMApp scenario tables for each planning zone can be found in **Appendix A**.

The cost effectiveness of a project will be a key factor in informing decisions about which alternative practices to fund. This information can provide a guide for evaluating if potential alternative projects and practices provide a cost-effective solution for making progress towards goals. For example, if there is an opportunity to implement a project or practice that is not part of the set of projects and practices within the targeted implementation schedule, but the dollar per unit reduction is a positive ratio, it is likely that that project or practice would provide a cost-effective option for making progress towards measurable goals. A list of possible practices and potential alternatives is shown in **Table 5-1** and is not all-inclusive.

This comprehensive plan deals with a wide variety of issues that vary in importance geographically. To simplify implementation efforts and identify where most work is needed, the Steering Team developed one composite ranking map to prioritize planning zones. The composite ranking encompassed the most pertinent factors used in the issue prioritization and goal setting process. A full list of the composite planning zones prioritization ranking criteria and methodology are shown in **Appendix B**.

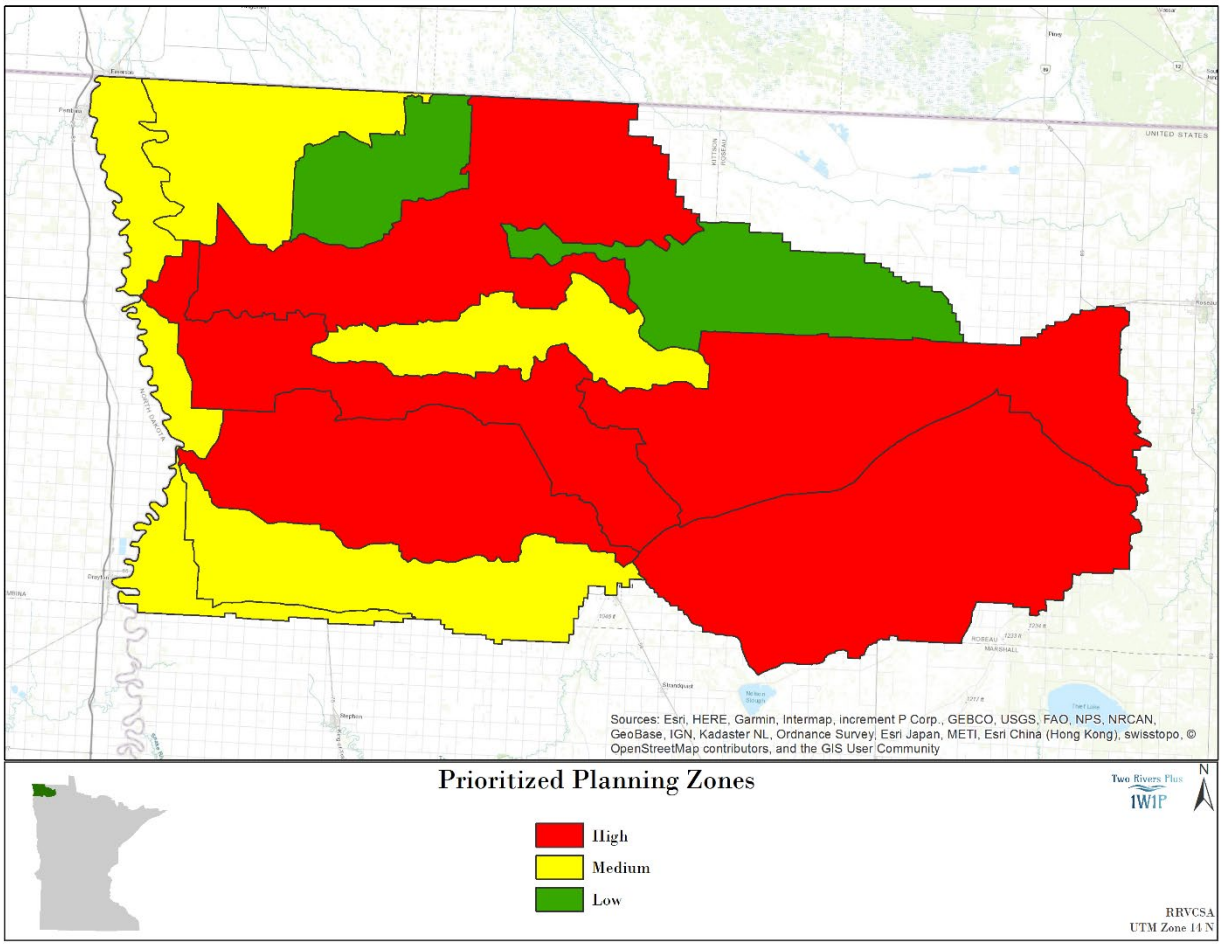


Figure 5.1: Prioritized Planning Zones

5.2 Projects and Practices Cost-Share Program

The Projects and Practices Cost-Share Program funds actions pertaining to the planning, design, and implementation of structural projects (i.e. grassed waterways, controlled drainage) and management practices (i.e. nutrient management, conservation tillage) on the landscape to make progress toward goals. Many types of actions highlighted in this section are eligible for funding under the Projects and Practices Cost Share Program.

Actions funded by the Projects and Practices Cost-Share Program are typically much smaller in size than capital improvements. These projects and practices are intended to reduce the amount of sediment and nutrients leaving the landscape and delivered downstream, thereby treating runoff near the pollutant source. This cost-share is also used to fund practices that create live storage on the landscape. Any type of assistance (financial incentive, technical assistance, and tax exemption) can be used to provide the Projects and Practices Cost-Share Program, up to the total project or practice cost unless limited by state or local polices.

The Projects and Practices Cost-Share Program is expected be funded through current base funding and the additional Clean Water Fund dollars with potentially dollars from federal, non-governmental, and private entities to pay for eligible activities. 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, private engineer standards or guidance found within NOAA Atlas 14. Projects that address water quality will be selected based on PTMApp criteria set earlier in this section.

Table 5.1 Impairments on the draft 2020 impaired waters list, grouped by Two rivers Plus Planning Zones, and distinguished as either a legal ditch or natural watercourse by local partners with proposed action.

Planning Zone	Water Body Name (Description)	Legal Ditch (LD) or Natural Waterbody (NW)	AUID or Lake ID	Affected Use: Pollutant/ Stressor	Proposed action
J.D. #10	Judicial Ditch 10 (Unnamed cr to CD 16)	LD	09020311-521	*Aquatic Life*: Benthic macroinvert. Bioassessments	Petition reclassification
				Aquatic Life: Fishes bioassessments	
	Judicial Ditch 10 (Unnamed ditch to CD 19)	LD	09020311-524	*Aquatic Life*: Benthic macroinvert. Bioassessments	Petition reclassification
				Aquatic Life: Fishes bioassessments	
Joe River	Joe River (Salt Coulee to MN/Canada Border	NW	09020311-513	*Aquatic Life*: Chloride	
				Aquatic Life: pH	
Middle Branch Two Rivers	Two River, Middle Branch (CD 23 to S Br Two R)	NW	09020312-503	*Aquatic Life*: Benthic macroinvert. Bioassessments	
				Aquatic Life: Fishes bioassessments	
				Aquatic Recreation: Escherichia coli	

North Branch Two Rivers	Two River, North Branch (Heade waters to CD 22)	NW	09020312-504	*Aquatic Life*: Dissolved oxygen	
				Aquatic Life: Fishes bioassessments	
	Two River, North Branch (CD 22 to Two R)	NW	09020312-508	*Aquatic Life*: Dissolved oxygen	
				Aquatic Life: Fishes bioassessments	
	State Ditch 84 (Headwaters to N Br Two R)	LD	09020312-514	*Aquatic Life*: Fishes bioassessments	Petition reclassification
	Judicial Ditch 31 (Unnamed cr to N BR Two R)	LD	09020312-549	*Aquatic Life*: Fishes bioassessments	Petition reclassification
State Ditch #72	State Ditch 72 (JD 31 to State Ditch 85)	LD	09020312-531	*Aquatic Life*: Benthic macroinvert. Bioassessments	Petition reclassification
				Aquatic Life: Fishes bioassessments	
State Ditch #91	County Ditch 4 (Unnamed ditch to unnamed ditch)	LD	09020312-522	*Aquatic Life*: Fishes bioassessments	Petition reclassification
State Ditch #95	Two River, South Branch (unnamed ditch to Lateral Ditch 2 SD 95)	NW	09020312-506	*Aquatic Life*: Benthic macroinvert. Bioassessments	
				Aquatic Life: Fishes bioassessments	
				Aquatic Recreation: Escherichia coli	
	Lateral Ditch 1 of State Ditch 95	LD	09020312-521	*Aquatic Life*: Benthic macroinvert. Bioassessments	Petition reclassification
				Aquatic Life: Fishes bioassessments	
	County Ditch 13 (Unnamed ditch to Badger Cr) (disconnected portion)	LD	09020312-535	*Aquatic Recreation*: Escherichia coli	Petition reclassification
	Lateral Ditch 1 of State Ditch 95 (Unnamed ditch to State Ditch 50)	LD	09020312-539	*Aquatic Life*: Benthic macroinvert. Bioassessments	Petition reclassification
				Aquatic Life: Fishes bioassessments	

South Branch Two Rivers	Two River (M Br Two R to N Br Two R)	NW	09020312-501	*Aquatic Life*: Turbidity	
				Aquatic Recreation: Escherichia coli	
	Two River, South Branch (Lk Bronson to M Br Two R)	NW	09020312-502	*Aquatic Life*: Benthic macroinvert. Bioassessments	
				Aquatic Life: Fishes bioassessments	
	Two River, South Branch (Lateral Ditch 2 to Lk Bronson)	NW	09020312-505	*Aquatic Life*: Benthic macroinvert. Bioassessments	
				Aquatic Life: Fishes bioassessments	
				Aquatic Recreation: Escherichia coli	
	Two River (N Br Two R to Red R)	NW	09020312-509	*Aquatic Life*: Turbidity	
	State Ditch 49 (Headwaters to S Br Two R)	LD	09020312-544	*Aquatic Life*: Fishes bioassessments	Petition reclassification
	Lake Bronson	NW	35-0003-00	*Aquatic Consumption*: mercury in fish tissue	
Unnamed Coulee	Unnamed creek (County Ditch 27) (240th Ave to 210th ave)	LD	09020311-565	*Aquatic Life*: Benthic macroinvert. Bioassessments	
				Aquatic Life: Fishes bioassessments	
	Unnamed creek (County Ditch 27) (210th Ave to Red R)	NW	09020311-566	*Aquatic Life*: Fishes bioassessments	
				Aquatic Life: Total suspended solids	

Table 5.2: Preliminary list of projects and practices which may be pursued for implementation of projects and practices in the targeted implementation schedule. Projects and practices are grouped by their Prioritize, Target, and Measure Application (PTMApp) treatment group and applicable Planning Zones.

PTMApp Treatment Group Project or Practice	NRCS Code/Other	Planning Zone Priority										
		Straight to Red	Joe River	J.D. 10	Little Joe	Middle Branch	North Branch	Unnamed Coulee	S.D. 72	S.D. 91	S.D. 95	South Branch
Storage												
Culvert Sizing	BTSAC BP#3	X	X	X	X	X	X	X	X	X	X	X
Drainage Water Management	554	X	X	X	X	X	X	X	X	X	X	X
Structure for Water Control	587	X	X	X	X	X	X	X	X	X	X	X
Wetland Creation	658	X	X	X	X	X	X	X	X	X	X	X
Wetland Restoration	657	X	X	X	X	X	X	X	X	X	X	X
Filtration												
Filter Strips	393	X	X	X	X	X	X	X	X	X	X	X
Grassed Waterways and Swales	412	X	X	X	X	X	X	X	X	X	X	X
Riparian Forest Buffer	391	X				X	X					X
Riparian Herbaceous Cover	322	X				X	X					X
Protection												
Critical Area Planting	342	X	X	X	X	X	X	X	X	X	X	X
Grade Stabilization Structure	410	X	X	X	X	X	X	X	X	X	X	X
Grassed Waterways and Swales	412	X	X	X	X	X	X	X	X	X	X	X
Stream Channel Stabilization	584	X	X	X	X	X	X	X	X	X	X	X
Streambank and Shoreline Protection	580	X	X			X	X	X				X
Tree/Shrub Establishment	612	X	X	X	X	X	X	X	X	X	X	X
Non-Structural Management Practices												
Conservation Cover	327	X	X	X	X	X	X	X	X	X	X	X
Conservation Crop Rotation	328	X	X	X	X	X	X	X	X	X	X	X
Conservation Tillage	329	X	X	X	X	X	X	X	X	X	X	X
Cover Crop	340	X	X	X	X	X	X	X	X	X	X	X
Forage and Biomass Planting	512	X	X	X	X	X	X	X	X	X	X	X
Nutrient Management	590	X	X	X	X	X	X	X	X	X	X	X
Prescribed Grazing	528	X	X	X	X	X	X	X	X	X	X	X
Non-PTMApp Related Practices												
Drainage	N/A	X	X	X	X	X	X	X				X
Floodwater Detention	N/A			X	X	X	X	X	X	X	X	X
Floodwater Retention	N/A			X	X	X	X	X	X	X	X	X
Ring Dikes	N/A	X	X	X			X	X	X	X		X
Agricultural Levees	N/A			X			X	X	X	X	X	X
Diversion Channels	N/A			X			X	X		X	X	X
Flood Plain Management	N/A	X	X	X			X	X				X
Field Walkover/ Comprehensive Farm Management Plan	N/A	X	X	X	X	X	X	X	X	X	X	X
Sub-Surface Sewage Treatment System	N/A	X	X	X	X	X	X	X	X	X	X	X
Well Decommissioning	351	X	X	X	X	X	X	X	X	X	X	X

Two Rivers Plus Planning Area Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	**Output (Number of Practices)**	**Total 10-Year Cost**	**Lead**	**Partner**	**2021-22**	**2023-24**	**2025-26**	**2027-28**	**2029-30**	**Sediment**	**Nitrogen**	**Phosphorus**	**Bacteria**	**Streambank/ Channel**	**Conveyance Capacity**	**Hydrology/ Flood**	**Groundwater**	**Natural Resource**	**Ag Productivity**
Storage Practices (i.e. Drainage Water Management/ Controlled Drainage; WASCOBS; Wetland Restorations; and Farm Ponds)	**7**	**$70,519**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*14*	*$147,538*																	
Funding Level 3	*25*	*$268,224*																	
Filtration Practices (i.e. Grassed Waterways, Filter Strips)	***25***	**$54,566**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*33*	*$73,713*																	
Funding Level 3	*42*	*$93,922*																	
Non-Structural Land Management Practices	***500***	**$9,500,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*709*	*$13,471,000*																	
Funding Level 3	*770*	*$14,630,000*																	
Protection	***33***	**$419,415**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*40*	*$508,436*																	
Funding Level 3	*50*	*$636,907*																	
Field Windbreak/Shelterbelt	***5 Miles Field Windbreaks***	**$10,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*10 Miles Field Windbreaks*	*$20,000*																	
Funding Level 3	*15 Miles Field Windbreaks*	*$30,000*																	
Grassland restoration and wildlife habitat management	***1,000 acres***	**$500,000**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*1,550 acres*	*$775,000*																	
Funding Level 3	*1,875 acres*	*$850,000*																	
Well Sealings	***3 Wells sealed/year***	**$30,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*5 wells sealed/year*	*$50,000*																	
Funding Level 3	*8 wells sealed/year*	*$80,000*																	
SSTS Upgrades	***10 System Upgrades***	**$100,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*12 System Upgrades*	*$120,000*																	
Funding Level 3	*15 System Upgrades*	*$150,000*																	
Livestock Exclusion/ Rotational Grazing Systems	***3,200 acres***	**$80,000**	**SWCD**	**NRCS, County, BWSR, MPCA, MDA**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					**X**
Funding Level 2	*4,000 acres*	*$100,000*																	
Funding Level 3	*4,600 acres*	*$105,000*																	
Field Walkover/CFMP	***500 MAWQCP acres/year***	**$15,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					**X**	**X**
Funding Level 2	*1,500 MAWQCP acres/year*	*$45,000*																	
Funding Level 3	*1,750 MAWQCP acres/year*	*$50,500*																	
	Total Funding Level 1 10-Year Cost	**$10,779,500**	**Total Level 1 10-Year Progress Toward Goals**							**75%**	**77%**	**78%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
	Total Funding Level 2 10-Year Cost	*$15,310,687*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
	Total Funding Level 3 10-Year Cost	*$16,894,553*	*Total Level 3 10-Year Progress Toward Goals*							*125%*	*112%*	*115%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.3: Implementation schedule and actions for all work in the Two Rivers Plus Planning Area

Straight to Red River Planning Zone

Planning Zone Description:

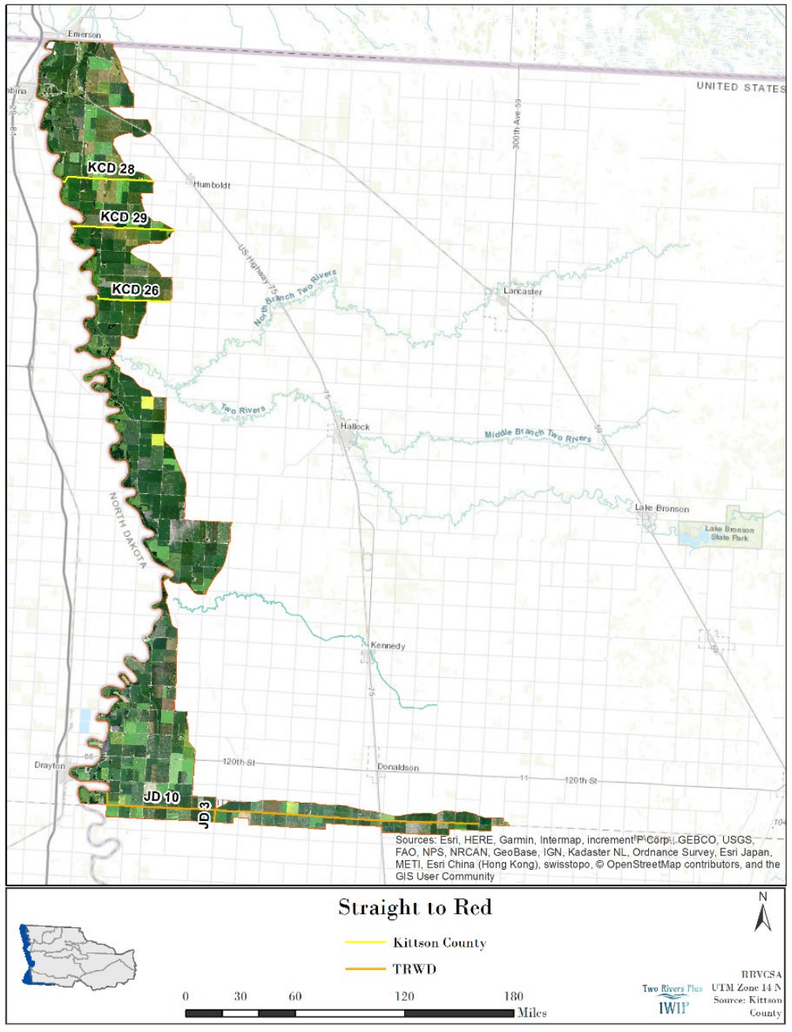
This planning zone is approximately 107 square miles in size (6.7% of Two Rivers Plus Planning Area) and comprises the area draining directly to the Red River. The zone consists of predominantly cultivated agricultural land. The riparian area along the Red River is wooded. Topography is extremely flat in this zone, at times less than 2 feet per mile. Numerous farmstead ring dike projects have been put in place to protect homesteads.

As the name indicates, the land areas drain directly to the Red River via either direct runoff or coulee drainage. Legal ditch systems include Kittson County Ditches #26, #28, & #29 and Branch B of Judicial Ditch #10. The other areas of this zone are directly drained by coulee systems, private field ditches, or road ditches. As stated above, most areas of this zone are very flat with the exception being along the edges of the coulees where the banks are well developed and there is good slope from adjacent fields into the waterways.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the Direct to Red River planning zone, and these continue to be ongoing issues.

- ✓ The duration of the flooding along the Red River can last for months and is compounded by local flooding from the east and the south (see map on page 90).
- ✓ Overland flooding from the east (from Two Rivers) and the south (from the Red River). This is the number one issue for this subwatershed and can occur during both springtime and summer events.
- ✓ Sizes of culverts within the floodplain should be unrestricted to allow the land to drain out in a timely manner after floodwaters have receded. This is to allow cropland to be seeded.
- ✓ Township, County and State road authorities have documented numerous repetitive road washouts of township, county, and state roads.
- ✓ Debris left by flooding accumulates on road shoulders, in culverts, on fields, and on ring dikes.
- ✓ Severe and repeated overland flooding causes a loss of ag and pasture land as well as a loss of crops that have been planted prior to the flood. Between 1995 and 2020, 11 Federal disaster declarations have occurred (44%).
- ✓ Frequency and duration of flooding causes a loss of residential property and also contributes to a loss of population and tax revenue.
- ✓ Sedimentation caused by flooding is a problem because it blocks watercourses and covers adjacent cropland.
- ✓ Wet conditions lead to a higher water table which causes problems with crops and cropland.
- ✓ High stream flows are too high during flooding and consequently fall too low during other times. It is desirable to have a more constant and sustained stream flow in watercourses. Numerous gullies are occurring in watercourses as a result.
- ✓ Wind erosion is causing sedimentation of ditches, coulees, and watercourses.
- ✓ Because of the loss of population due to flooding, buildings and farmsteads are left vacant, and vandalism of these buildings becomes a problem. Some of these sites may contain abandoned wells which should be sealed.



Natural Resources and Unique Water & Land Related Resources

Existing Resources: The Red River Valley (Glacial Lake Agassiz) is an extremely flat landscape composed of thick lacustrine sediments. Soils range from silty to clayey in texture. Most soils have a high-water table and are very productive. Saline soils exist in places. Most areas, except river and coulee corridors, are farmed with main crops being small grain, sugar beets, and soybeans. The native vegetation was tall grass prairie. Primary resource concerns are soil erosion and deposition by wind.

Most of the fish and wildlife habitat in this zone has been altered due to land use changes, drainage, and channel modifications. Fish habitat is somewhat limited by channelization of some waterways and a flow regime characterized by periods of high flow and inundation and lengthy periods of extremely low flows that support a less diverse community. The remaining natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. Small waterways here are likely to provide spawning and rearing habitat for a variety of species. Wildlife habitat is limited by a lack of grassland and wetland habitat and a loss of connectivity of the habitat that remains. Very little CRP land is located in this zone. A small corridor of habitat is located along the Red River. Most wetlands have been drained. Extensive flooding for long periods of time affects this zone.

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated “outstanding resource value waters” or “critical vegetated habitat” as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: In particular, rehabilitating existing degraded channels (existing coulees) and buffering them with grasses has the potential to benefit fish and wildlife in this zone. Creation of one or two large habitat blocks adjacent to the Red River Corridor would provide substantial habitat in this zone. These habitat blocks must be planted with flood tolerant vegetation to prevent the invasion of noxious weeds and undesirable plants. Land use changes, and some wetland restorations could help reduce flood damages during high flow periods. The water quality monitoring program will be utilized to assess the current condition of waters identified as being impaired and formulate strategies to address the issue.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10 year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the Direct to Red River Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive sediment loading to surface waters due to wind and water erosion,
- excessive nutrient loading to surface waters
- inadequate conveyance capacity of all watercourse,
- overland flood damages to communities, public infrastructure, rural homesteads and farmland
- reduced soil organic matter, infiltration rates and water holding capacity

Medium Priority Issues

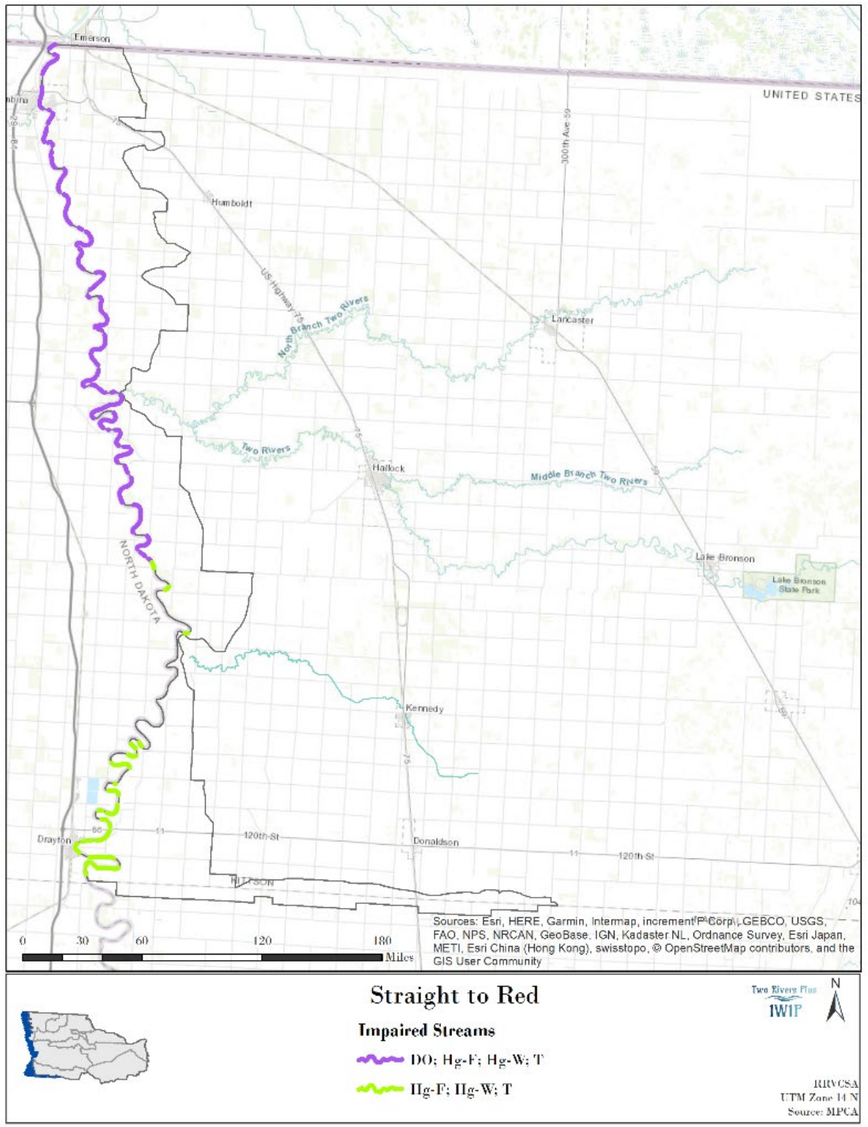
- instability of all watercourses,
- extreme flow fluctuations,
- excessive salinity in soils
- inadequate field drainage system outlet and/or improper management of tile drainage systems

Table 5.4 Straight to Red River Goal Summary

Direct to Red River Goal Summary				
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**
2.5% (81 tons/yr)	TP: 2.0% (191 lbs/yr) TN: 0.90% (1,598 lbs/yr)	0.5 miles of ditches	10-year channel capacity on 10% of legal ditches	1/4 inch (1,272 ac-ft)

What's Been Accomplished – Existing Projects & Practices

- **Ring Dikes -** Thirteen farmstead ring dikes have been constructed in this planning zone by the Two Rivers Watershed District utilizing cost share funding from the landowner, the State of MN, the Red River Watershed Management Board, and the TRWD. The Joe River Watershed District has also constructed numerous ring dikes within their jurisdiction. These dikes have been utilized during a number of major floods to protect property and infrastructure. The current demand for ring dikes is low due to the amount constructed, property buy-outs, and out-migration from the floodplain.
- **Cover Crops –** Within the past 10 years, the Kittson SWCD has worked with landowners to implement 320 acres of cover crops.

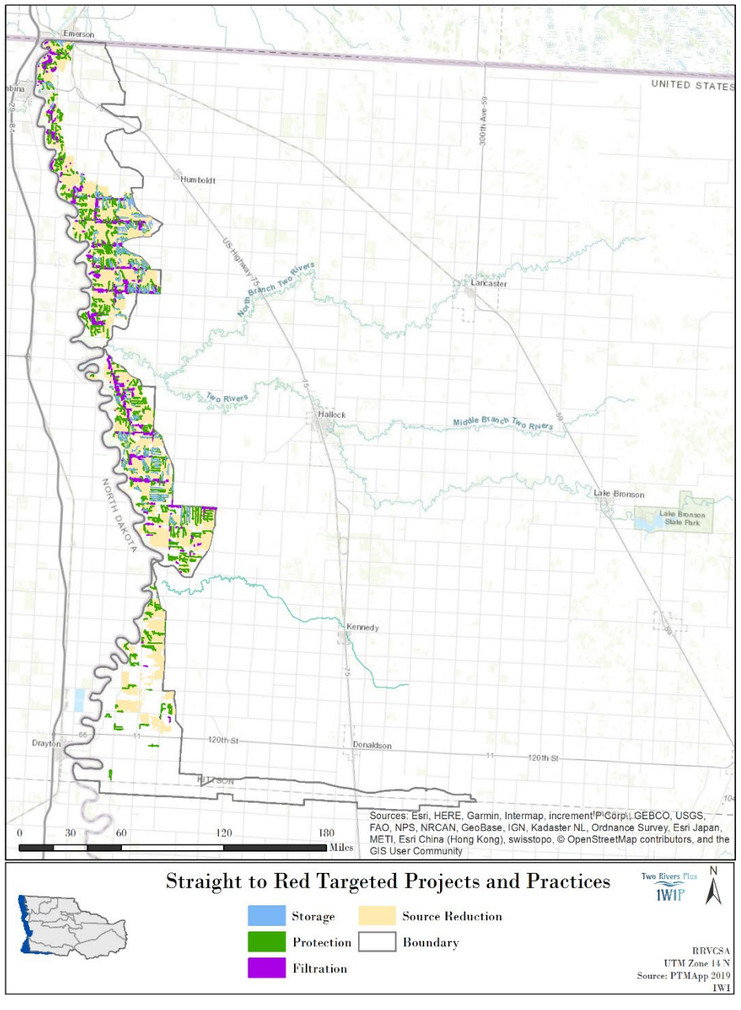


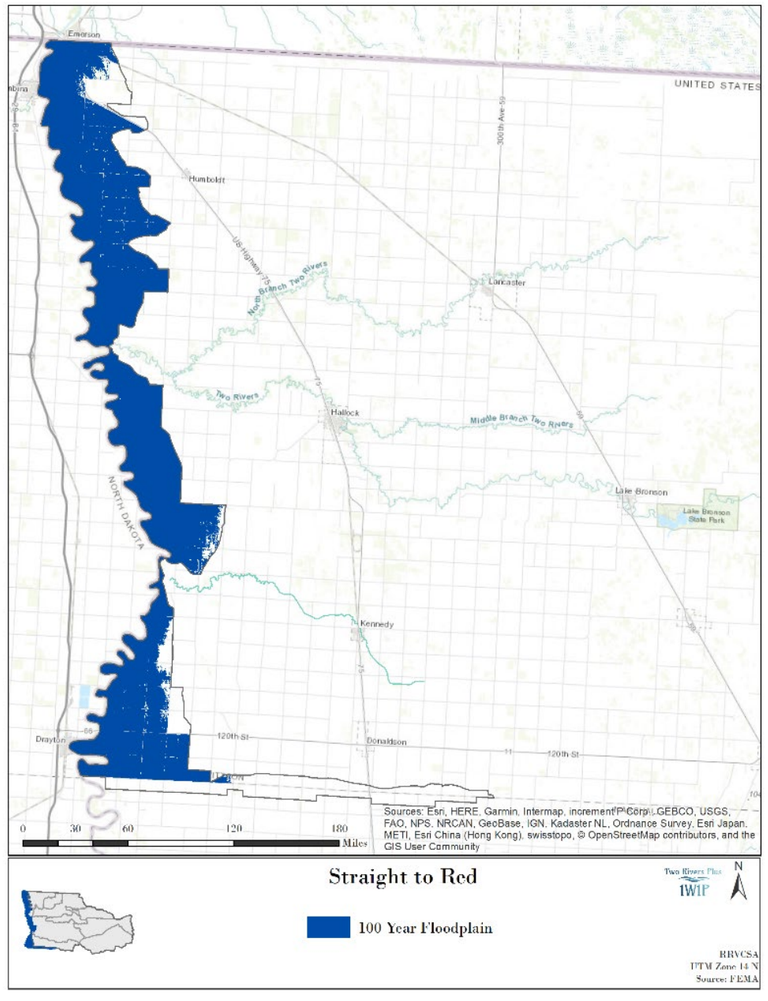
Straight to Red River Planning Zone

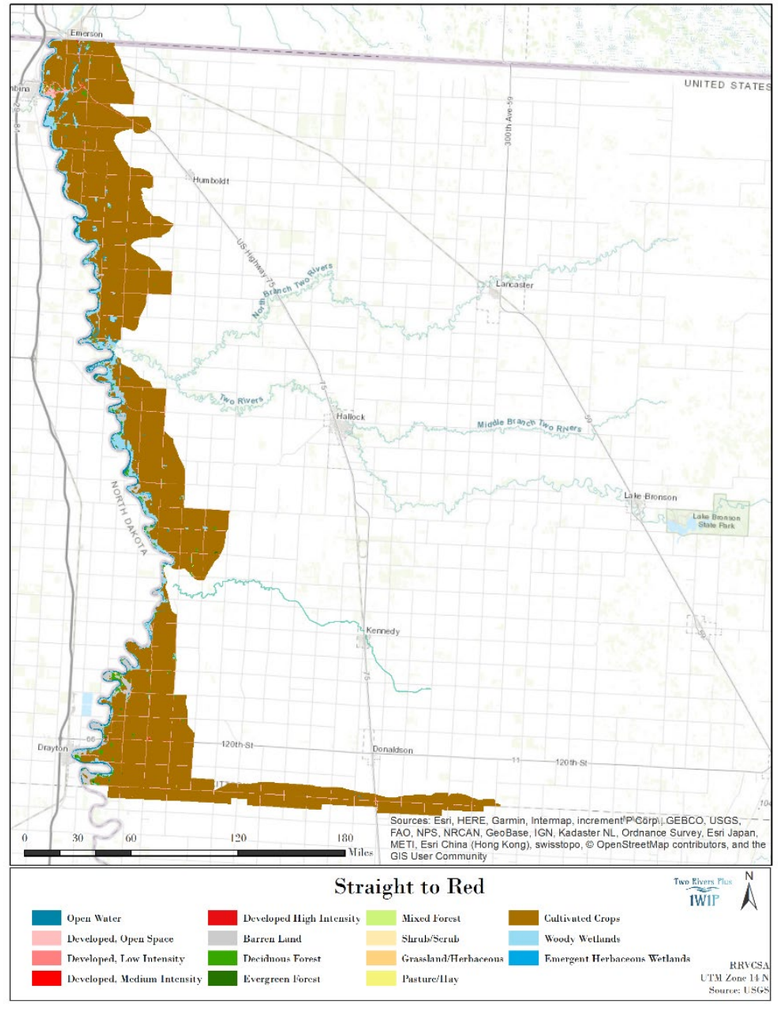
Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 3,237 tons of sediment, 9,587 pounds of Phosphorus, and 177,618 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 69 new project and practice opportunities, 1.5 miles of field windbreaks, and 50 acres of grassland/habitat have been identified within the Direct to Red River Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.







Straight to Red Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Ground water	Natural Resource	Ag Productivity
Storage Practices	**0**	**$0**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*0*	*$0*																	
Funding Level 3	*1*	*$11,726*																	
Filtration Practices	**2**	**$4,082**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$6,123*																	
Funding Level 3	*3*	*$6,123*																	
Non-Structural Land Management Practices	**45**	**$855,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*61*	*$1,159,000*																	
Funding Level 3	*70*	*$1,330,000*																	
Protection	**2**	**$23,920**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*3*	*$35,880*																	
Funding Level 3	*3*	*$35,880*																	
Field Windbreak/Shelterbelt	**1 Mile Field Windbreaks**	**$2,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1.5 Miles Field Windbreaks*	*$3,000*																	
Funding Level 3	*2 Miles Field Windbreaks*	*$4,000*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres*	*$25,000*																	
Funding Level 3	*75 acres*	*$37,500*																	
Well Sealings	**1 well sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 well sealed/year*	*$1,000*																	
Funding Level 3	*2 well sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Total Funding Level 1 10-Year Cost		**$896,002**	**Total Level 1 10-Year Progress Toward Goals**							**72%**	**74%**	**73%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$1,240,003*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$1,447,229*	*Total Level 3 10-Year Progress Toward Goals*							*114%*	*118%*	*116%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.5: Implementation schedule and action related to work in Straight to Red River Planning Zone

J.D. #10 Planning Zone

Planning Zone Description

The Judicial Ditch #10 planning zone is approximately 130 square miles in size (8.1% of Two Rivers Plus Planning Area). Although there is 250 feet of fall from the east end of the zone near the City of Karlstad to the west end near the Red River of the North, the topography is steep in the east and flattens out in the west. A distinct land use change occurs from grass, pasture, CRP and aspen parkland in the eastern 1/3 to intensive cropland in the western 2/3.

The only cities in this zone are Karlstad and Donaldson. There are no major rivers in this zone, however legal drainage ditches include KCD 7, KCD 10, KCD 16, KCD19, JD 3, and JD 10. There is a network of coulees connected to these legal drainage ditches in the upstream and middle areas of this zone, and they all have one common outlet in an unnamed coulee near the Red River. There have been several watershed district and conservation projects constructed, as detailed below.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the JD 10 planning zone, which are ongoing issues.

- ✓ High flows on the Red River create problems for the outlets to drainage systems, coulees, and rivers that tributary to it. This is most apparent in Teien, South Red River, Svea, and Skane Townships.
- ✓ Many ditch and coulee systems have inadequate capacity (grades and cross sections) to handle the water that comes to them.
- ✓ Road, culvert, and bridge washouts are a problem in the springtime. Road authorities have mapped locations that experience repetitive damages.
- ✓ Flooding during summer rainfall events causes crop damage and losses in ag fields.
- ✓ Outlets to ditch and coulee systems need to be redesigned to handle summer rainfall events, especially in the western portion of the sub watershed and where ditches outlet into coulee systems. Gully erosion is a common problem that is occurring.
- ✓ Maintenance needs to continue to be coordinated and performed on watercourses designated as DNR protected waters.
- ✓ Overland flooding leads to erosion problems, especially in the areas where there is a beach ridge.
- ✓ Inspection and routine maintenance need to be done on many ditch systems in the western 1/3 of the planning zone that are experiencing side slope damage or sedimentation of the ditch bottom.
- ✓ The common outlet for Kittson County ditches 7, 16, and 19 and Judicial Ditch #10 needs to be evaluated and a maintenance plan needs to be developed.
- ✓ Wind erosion needs to be addressed. Commonly wind erodes topsoil from ag fields and deposits it in waterways causing blockage and degraded water quality.
- ✓ Stream flows are too high during runoff events and too low during other times of the year. It is desirable to achieve a more natural flow regime by minimizing the extreme unnatural variability.

The MPCA states that Judicial Ditch #10 is impaired for fish and macroinvertebrates. However, the Planning Group has indicated that it is not necessarily important to address these impairments because the system that they are located on is a legal ditch with the specific purpose of drainage for agricultural lands. In this case, ag drainage is in conflict with natural resources habitat. It is not deemed as locally important to foster fish and macroinvertebrate habitat within this agricultural ditch system. Impairments in this planning zone are listed in Table 5.1.

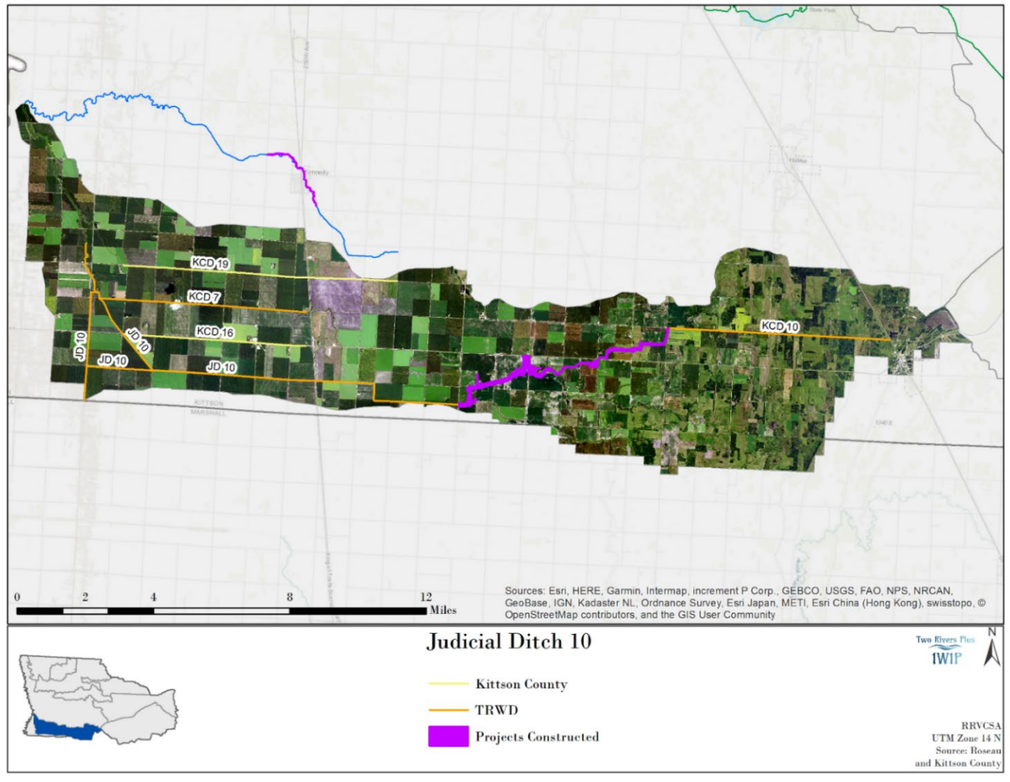
Natural Resources and Unique Water & Land Related Resources

Existing Resources: The Red River Valley (Glacial Lake Agassiz) is an extremely flat landscape composed of thick lacustrine sediments. Soils range from silty to clayey in texture. Most soils have a high water table and are very productive. Saline soils exist in places. Most areas are farmed with main crops being small grain, sugar beets, and soybeans. The native vegetation was tall grass prairie. Primary resource concerns are soil erosion and deposition by wind.

Most of the fish and wildlife habitat in this subwatershed has been altered due to land use changes, drainage, and channel modifications. Fish habitat is somewhat limited by channelization of some waterways and a flow regime characterized by periods of high flow and inundation and lengthy periods of extremely low flows that support a less diverse community. Wildlife habitat is limited by a lack of grassland and wetland habitat and limited connectivity of the habitat that remains. CRP land is almost exclusively limited to the eastern portions of this subwatershed. A few remnant grassland habitat blocks are present in this sub-watershed and most wetlands have been drained (MCEA report).

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated “outstanding resource value waters” or “critical vegetated habitat” as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: In particular, rehabilitating existing degraded channels (existing coulees) and buffer them with grasses has the potential to benefit fish and wildlife in this subwatershed. Creation of one or two large grassland habitat blocks adjacent to a buffered waterway would provide substantial habitat in this subwatershed. Land use changes, wetland restorations, and impoundments sited near the upper reaches of waterways in this watershed could help reduce runoff during high flow periods and augment base flows during low flow periods.



Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the J.D. #10 Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive sediment loading to surface waters due to wind and water erosion,
- inadequate conveyance capacity of all watercourse,
- overland flood damages to communities,
- public infrastructure, rural homesteads and farmland
- inadequate field drainage system outlets and/or improper management of tile drainage

Medium Priority Issues

- excessive nutrient loading to surface waters,
- instability of all watercourses,
- inadequate conveyance capacity of watercourse,
- extreme flow fluctuations,
- excessive salinity in soils

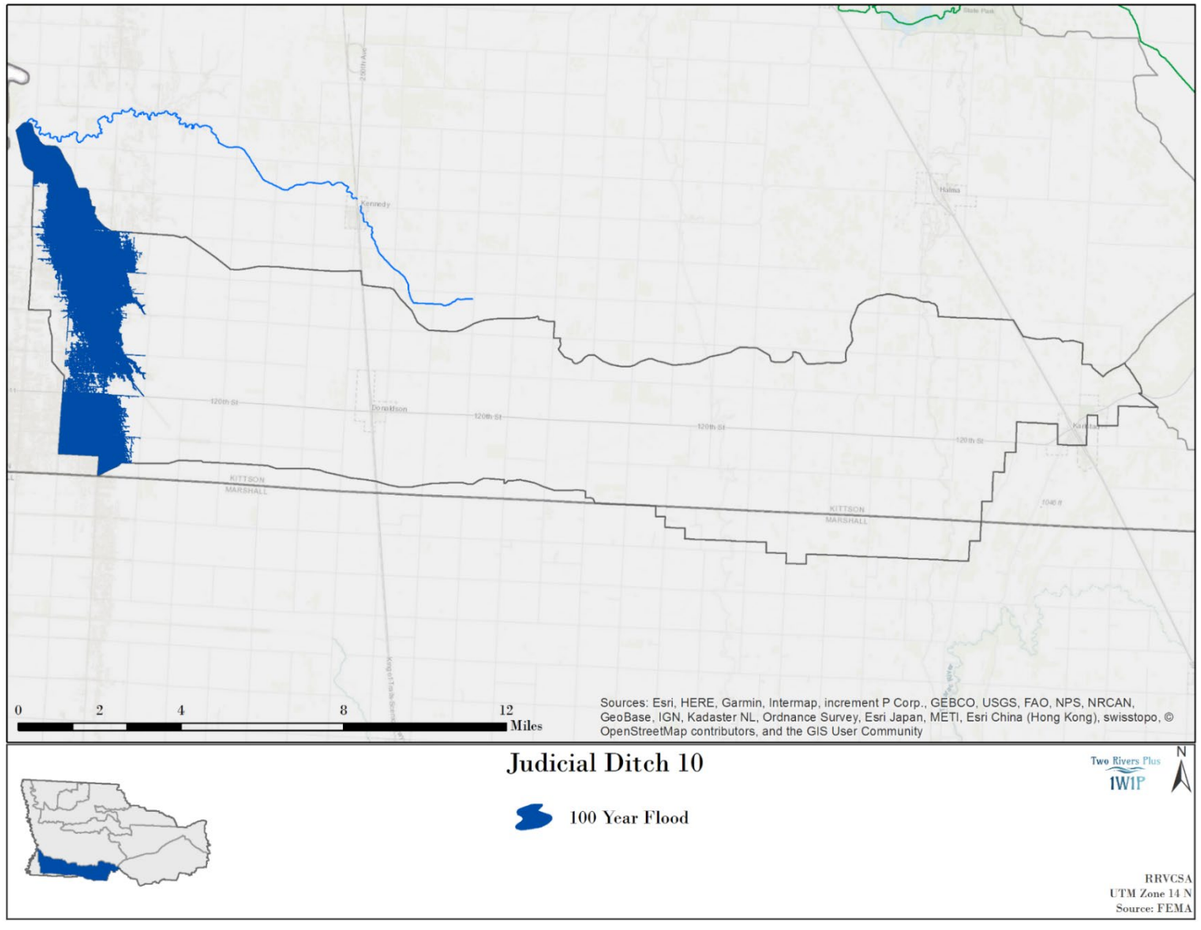
Table 5.6 J.D. 10 Goal Summary

Judicial Ditch #10 Goal Summary				
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**
2.5% (100 tons/yr)	TP: 2.0% (298 lbs/yr) TN: 0.88% (2509 lbs/yr)	0.75 miles of ditches	10-year channel capacity on 5% of legal ditches	1/4 inch (1,630 ac-ft)

What's Been Accomplished

- **Kittson County Ditch #10 –** The ditch had a history of sloughing and eroding problems. The TRWD installed five grade stabilization structures in the 1990's to reduce erosion and prevent future problems. These have been effective in stabilizing this ditch.
- **Springbrook #10 -** Landowners petitioned to the TRWD for a flood control, erosion control, and drainage capacity project along an unnamed watercourse. The Natural Resources Conservation Service's 'PL-566' program was utilized and in 2013 construction was completed consisting of set back levees, 26 side water inlets, several grade stabilizations structures, and channel work. The project also utilized the RIM program and established a 300' wide grass corridor alongside the watercourse for a length of 8 miles.
- **Judicial Ditch #10 –** The floods of the early 2000's caused severe erosion along the south bank of the ditch. In 2008 a FEMA grant was obtained and the TRWD repaired 8 miles of ditch by re-sloping, moving the ditch spoil bank back 65' away from the ditch, and stabilizing the eroded ditch.

Ring Dikes - One farmstead ring dike has been constructed in this planning zone by the TRWD utilizing cost share funding from the landowner, the State of MN, the Red River Watershed Management Board, and the TRWD. These dikes have been utilized during a number of major floods to protect property and infrastructure.

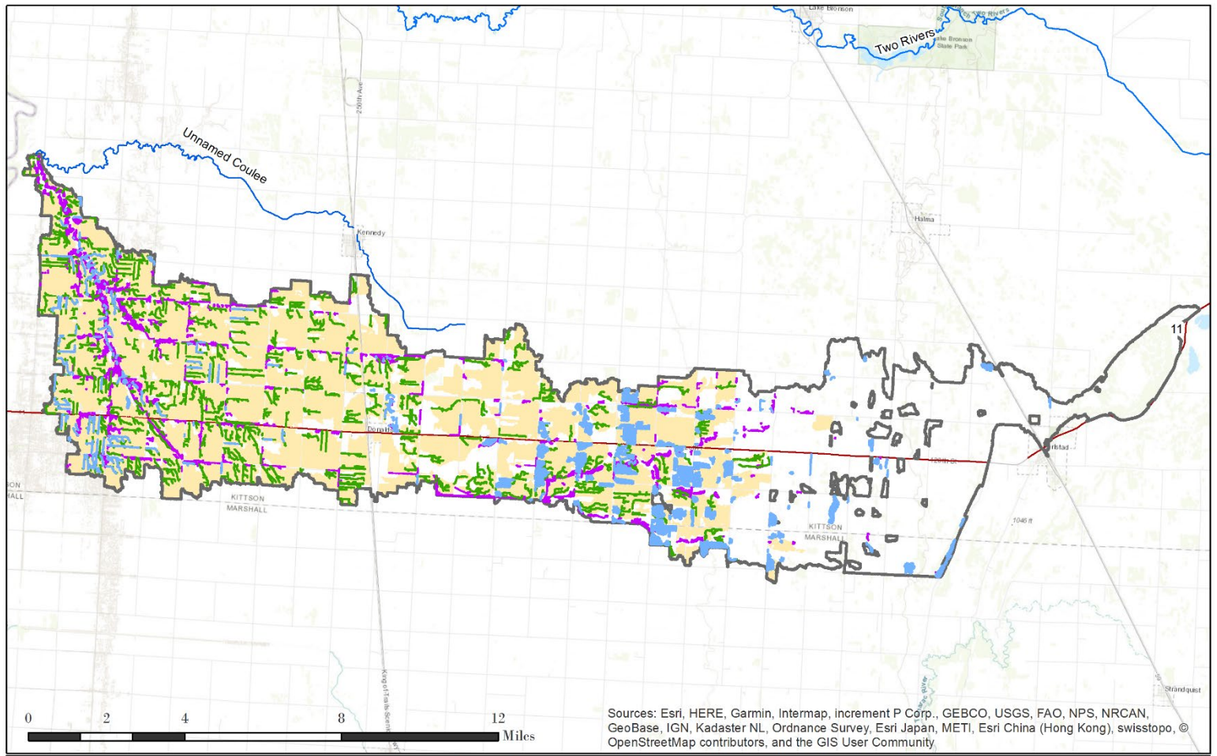


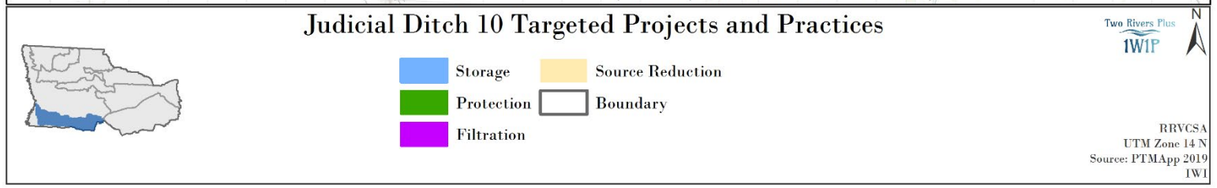
JD 10 Planning Zone

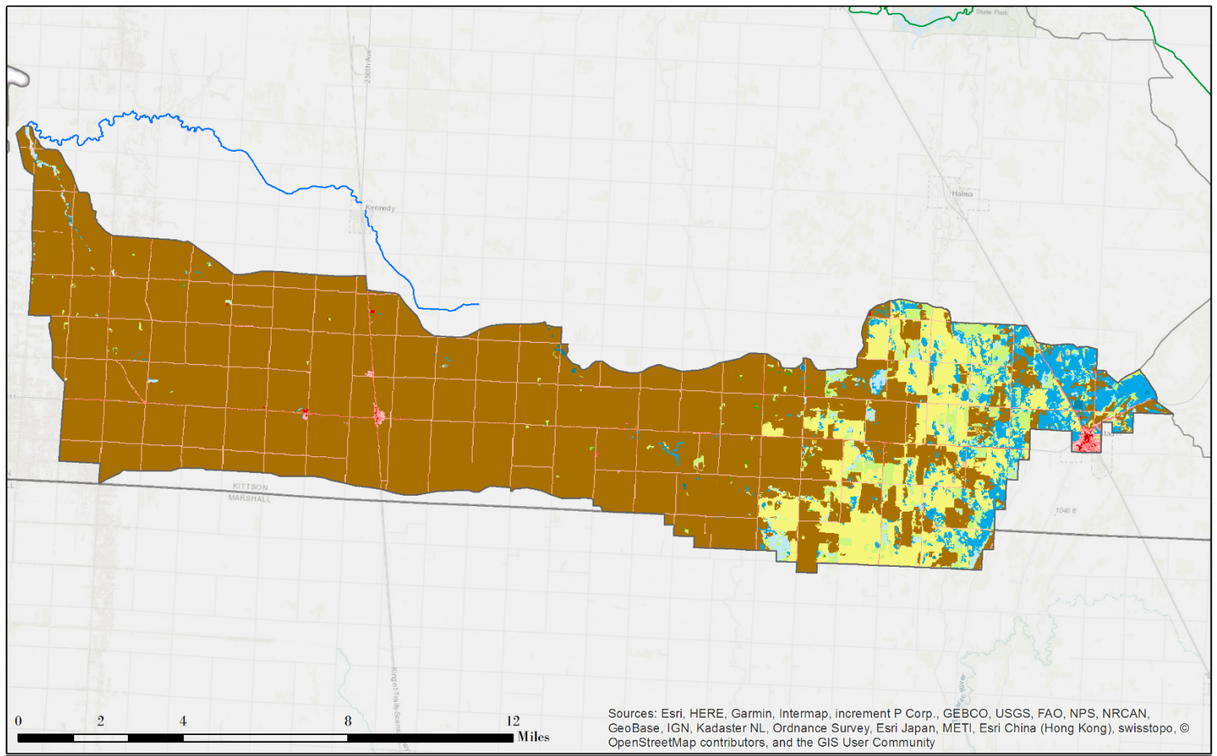
Feasible Projects and Practices - PTMApp

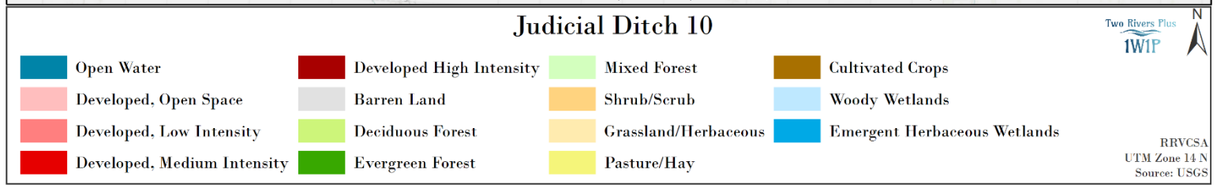
Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to the Planning Zone outlet to be 3,986 tons of sediment, 14,943 pounds of Phosphorus, and 285,169 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 79 new project and practice opportunities, 1.5 miles of field windbreaks, and 50 acres of grassland/habitat have been identified within the Direct to Red River Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning region goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.









J.D. 10 Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**0**	**$0**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$12,584*																	
Funding Level 3	*2*	*$24,168*																	
Filtration Practices	**2**	**$4,622**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$6,933*																	
Funding Level 3	*4*	*$9,244*																	
Non-Structural Land Management Practices	**50**	**$950,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*69*	*$1,311,000*																	
Funding Level 3	*75*	*$1,425,000*																	
Protection	**4**	**$55,608**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$55,608*																	
Funding Level 3	*5*	*$69,510*																	
Field Windbreak/Shelterbelt	**1 Mile Field Windbreaks**	**$2,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1.5 Miles Field Windbreaks*	*$3,000*																	
Funding Level 3	*2 Miles Field Windbreaks*	*$4,000*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres*	*$25,000*																	
Funding Level 3	*75 acres*	*$37,500*																	
Well Sealings	**0 Wells sealed/year**	**$0**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 wells sealed/year*	*$1,000*																	
Funding Level 3	*1 wells sealed/year*	*$1,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Total Funding Level 1 10-Year Cost		**$1,022,230**	**Total Level 1 10-Year Progress Toward Goals**							**73%**	**74%**	**73%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$1,425,125*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$1,590,422*	*Total Level 3 10-Year Progress Toward Goals*							*110%*	*111%*	*111%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.7: Implementation schedule and action related to work in J.D. #10 Planning Zone

Joe River Planning Zone

Planning Zone Description:

This planning zone is approximately 93 square miles in size (5.8% of Planning Area) and comprises the area drained by the Joe River. The zone consists of predominantly agricultural land with pasture-hay-grassland in the upper ¼ of the area, and cultivated land in the remaining ¾ of the area. The riparian corridor along the Joe River is predominantly grassland. Topography is relatively steep across the upper ¼ of the planning zone and relatively flat across ¾ of the zone. The cities present in this planning zone are Humboldt and St. Vincent.

The legal ditch systems in this zone are KCD 12, KCD 20, KCD 28, KCD 30. Significant landscape features include a series of glacial ridges in the upper end of the zone.

The Joe River PL566 project, completed in 1971, included channel improvements for the purposes of flood prevention and improvement of water management off the land. The channels were designed to contain a 10-year frequency storm.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the Joe River planning zone, and these continue to be ongoing issues.

- ✓ Some areas have capacity problems for drainage system outlets. High flows on the Red River create problems at the outlets to drainage systems, coulees, and rivers that are tributary to it.
- ✓ Large summer rain events cause crop damage and loss where ditches are poorly maintained. This is a minor problem if the drainage systems are functioning.
- ✓ Spring flooding is viewed as a high problem in the western 2/3 of the planning zone. This is because of the high frequency of events over the past 10 years and also because of the damage to public roads, culverts, bridges, and other infrastructure. These floods also cause delayed planting of crops and large amounts of debris to be scattered across cropland. Summer flooding also occurs but is less severe.
- ✓ Overland flooding is viewed as a moderate problem. This is associated with areas in Canada, areas near the ridge in the north and east and along coulees and other waterways where breakouts occur.
- ✓ Damages related to farmsteads and residential areas in St. Vincent are a high problem in the western 2/3 of the planning zone. This is mainly due to the Red River flooding and backup on the Joe River and coulees because of this flooding.
- ✓ Areas of erosion contribute to sedimentation throughout the planning zone, specifically where field ditches enter into a main drainage ditch. This leads to reduced capacity of drainage systems and increased vegetation such as cattail, which is an undesirable situation with regard to ag drainage.
- ✓ Beaver dams are an annual maintenance problem along the ditches, coulees, and other natural watercourses within the District. These beaver dams cause drainage problems and potential crop loss to the agricultural areas of the District.
- ✓ The Joe River begins in the USA and outlets into the Red River in the Province of Manitoba, Canada. This leads to many management hurdles to cross. A different water management entity exists in Canada with a different way to manage the resources. Communication between the two Countries is important.

Two impairments caused by chloride and pH currently exist in the Joe River. However, as they may be due to natural background, MPCA has indicated that they will recommend to EPA that the impairments be reclassified as such, so these impairments will not be addressed by this plan. Impairments can be

Natural Resources and Unique Water & Land Related Resources

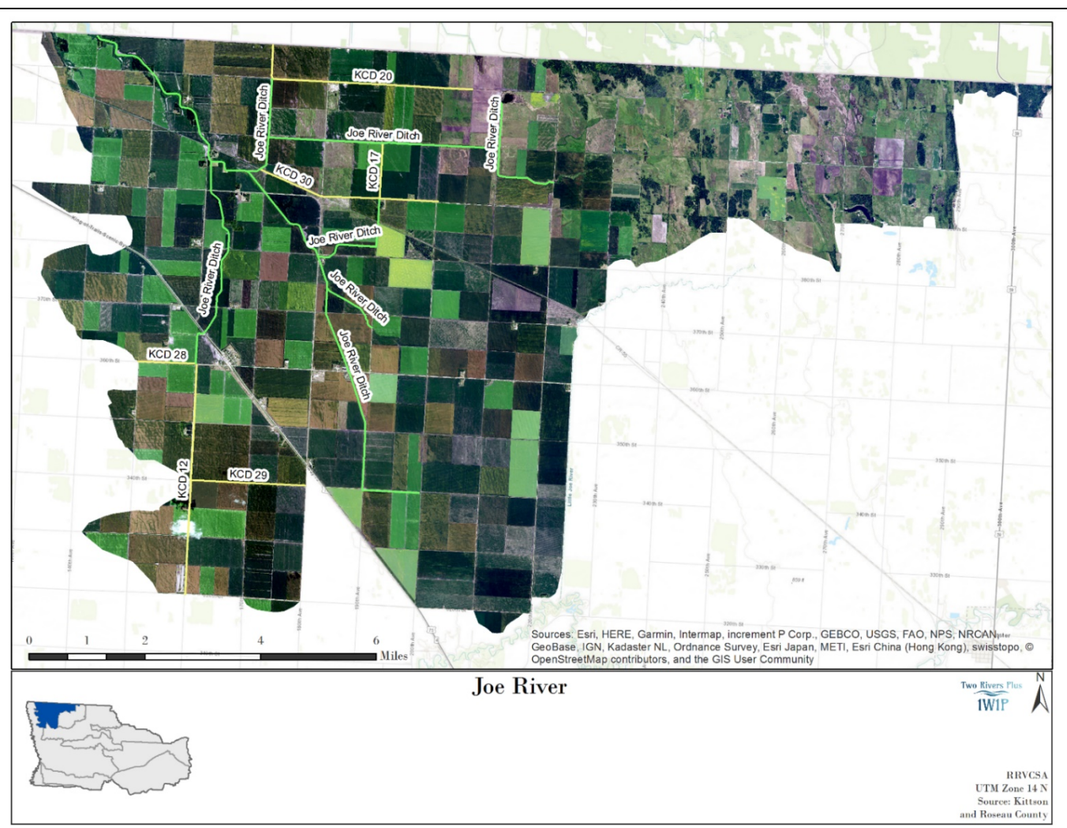
Existing Resources: The Red River Valley (Glacial Lake Agassiz) is an extremely flat landscape composed of thick lacustrine sediments. Soils range from silty to clayey in texture. Most soils have a high-water table and are very productive. Saline soils exist in places. Most areas are farmed with main crops being small grain, sugar beets, and soybeans. The native vegetation was tall grass prairie. Primary resource concerns are soil erosion and deposition by wind.

Land use changes have altered the quality and quantity of natural resources in this sub watershed. Agricultural lands are common in the western and southern portions of this planning zone while some large blocks of grassland and woodland habitats are common in the northern and eastern portions of this planning zone. A beach ridge runs through this planning zone and some gravel pits are present. An overall lack of large habitat blocks and a lack of connectivity between existing grasslands, wetlands, brushlands, and woodlands limit the function of the terrestrial habitats in this planning zone.

The waterways in this planning zone flow into Joe River project which flows into Canada. Many natural waterways have been converted to ditches. Fish habitat is somewhat limited by channelization of some waterways and a flow regime characterized by periods of high flow and inundation and lengthy periods of extremely low flows that support a less diverse community.

In addition to these general habitat features, the MN County Biological Survey has documented natural heritage elements in this planning zone. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed.

*Resource Improvement Opportunities: A*ctions should be taken to protect existing upland habitats (grassland, wetland, brushlands, woodlands), create some large habitat blocks in the western portion of the watershed, create some multipurpose impoundments in the eastern portion, protect existing stable waterways, and stabilize existing unstable waterways.



Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the Joe River Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive nutrient loading to surface waters
- flood damage to farmland
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind erosion

Medium Priority Issues

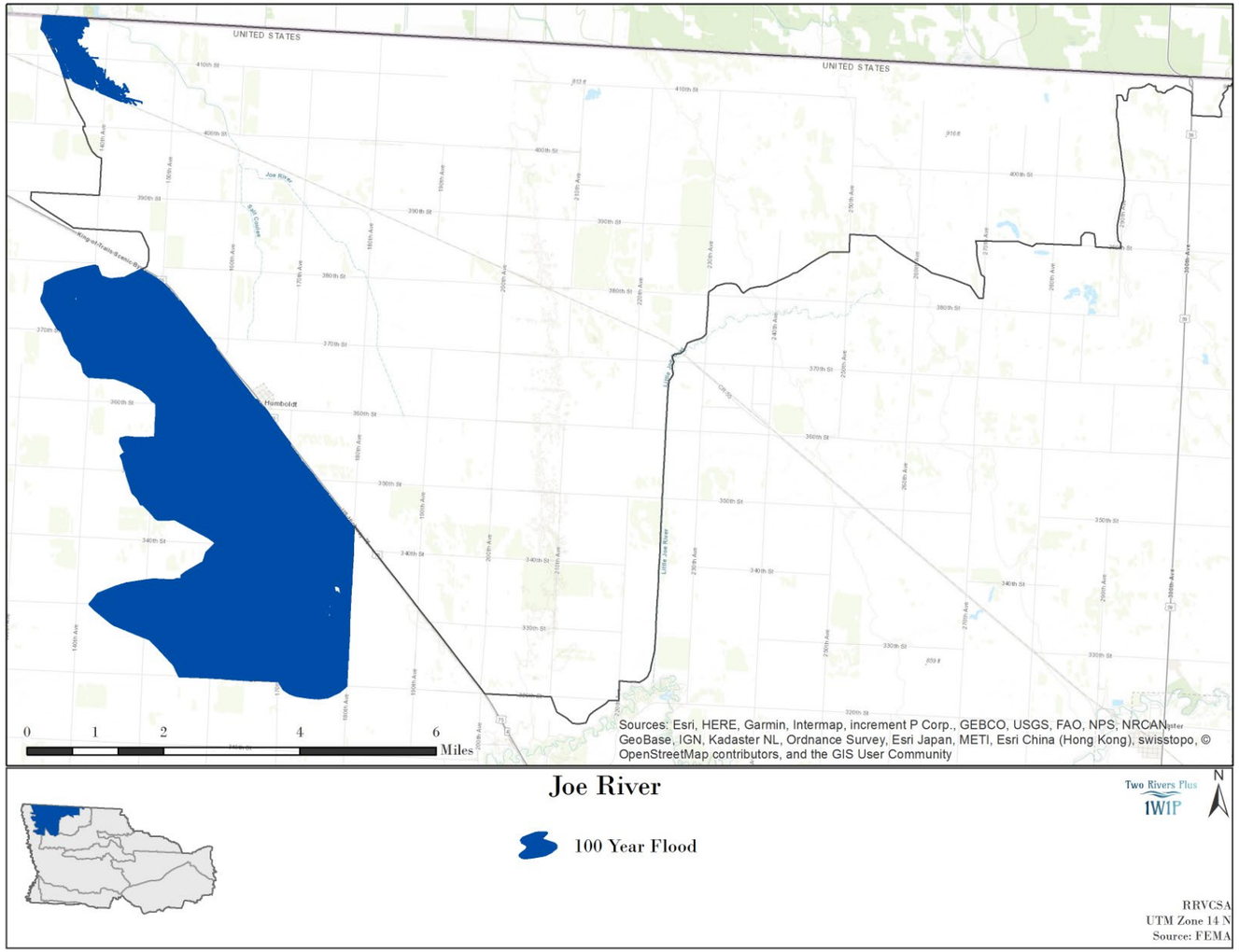
- excessive sediment loading to surface waters
- inadequate conveyance capacity of watercourses
- inadequate feed/water supply/waste management
- instability of all types of watercourses
- flood damage to public and private property and homesteads
- extreme flow fluctuations
- degraded riparian habitats
- loss of longitudinal connectivity
- excessive salinity in soils,
- excessive water erosion,
- inadequate field drainage system outlets / tile drainage management

Table 5.8 Joe River Goal Summary

Joe River Goal Summary			
Sediment	**Nutrients**	**Conveyance Capacity**	**Runoff Reduction**
2.0 % (144 tons/yr)	TP: 2.0 % (279 lbs/yr) TN: 0.73% (1,947lbs/yr)	10-year channel capacity on 5% of legal ditches	1/4 inch (1,288 ac-ft)

What's Been Accomplished – Existing Projects & Practices

- In 1963 the Joe River WD partnered with the Natural Resources Conservation Service (formerly Soil Conservation Service) and the Kittson Soil & Water Conservation District to prepare a work plan for flood control under the Federal Public Law 566 Program. Installation of the structures and channel work relative to this plan took place between 1968 and 1971.
- The JRWD has worked with numerous landowners to construct farmstead ring dikes.
- The Kittson SWCD has implemented the following projects and practices.
  - 560 acres of cover crops
  - 3.1 acres of buffers under clean water funding

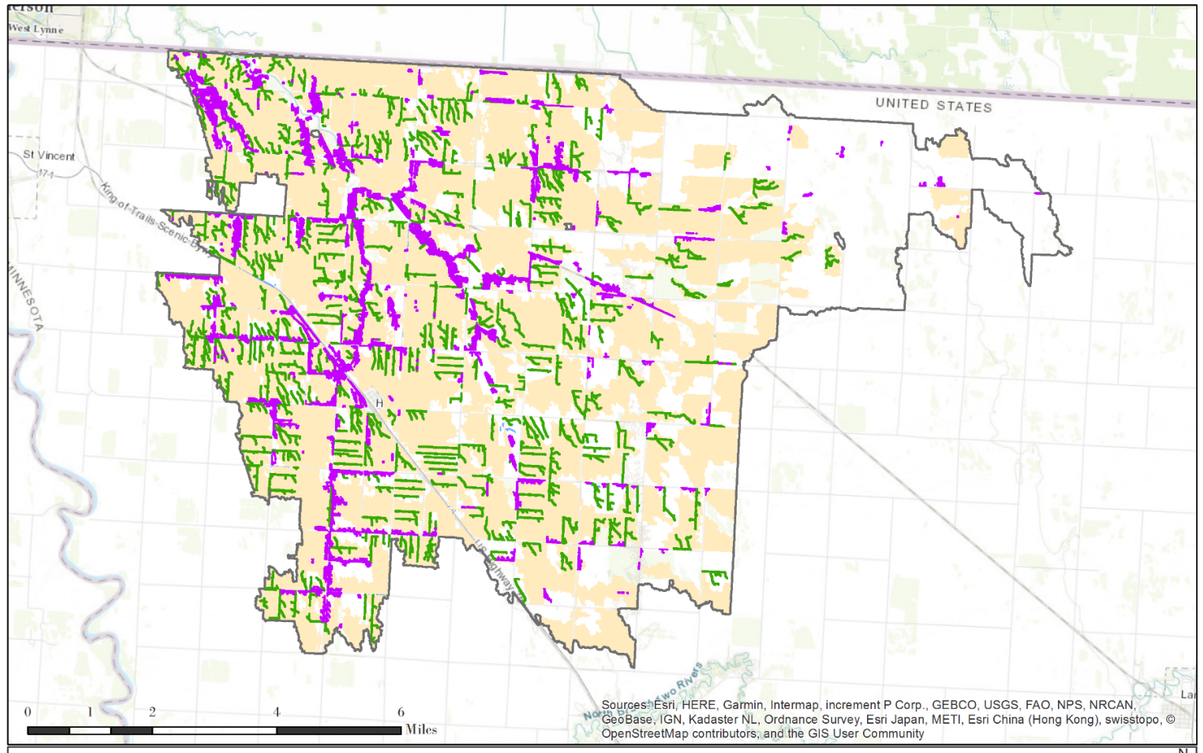


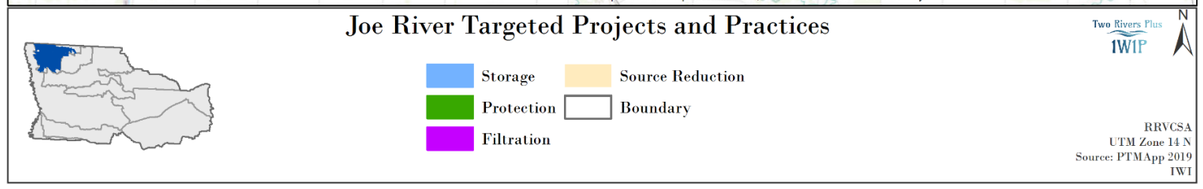
Joe River Planning Zone

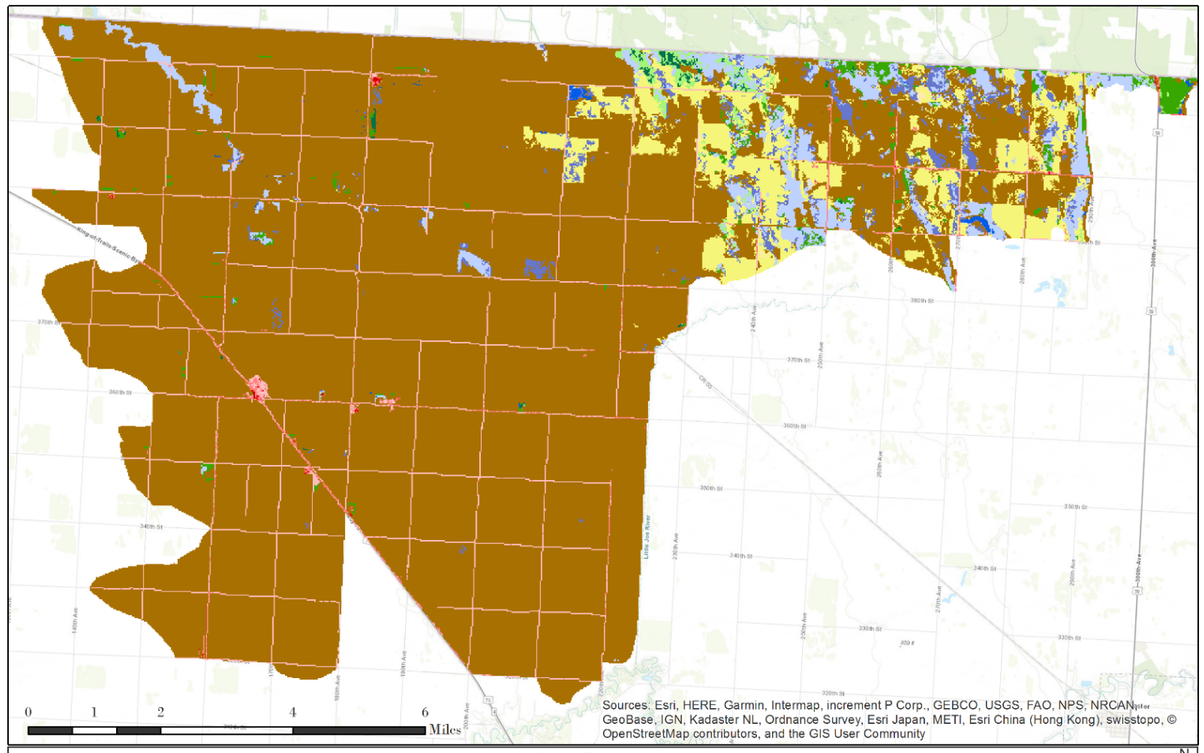
Feasible Projects and Practices - PTMApp

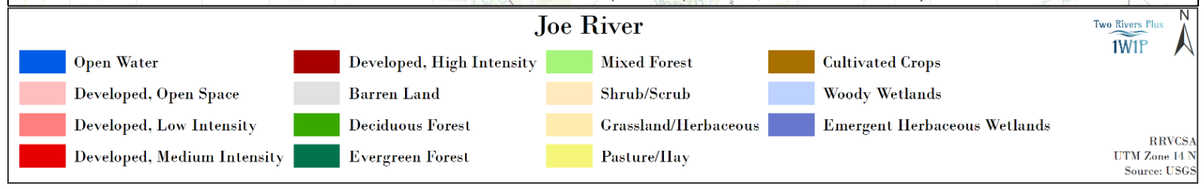
Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp estimates delivery to the Planning Zone outlet to be 7,207 tons of sediment, 13,970 pounds of Phosphorus, and 266,757 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 55 new projects opportunities, 1½ miles of field windbreaks, and 50 acres/yr habitat have been identified within the Joe River Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.









Joe River Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$12,101**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$12,101*																	
Funding Level 3	*2*	*$24,202*																	
Filtration Practices	**2**	**$6,224**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$9,336*																	
Funding Level 3	*4*	*$12,448*																	
Non-Structural Land Management Practices	**40**	**$760,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*44*	*$836,000*																	
Funding Level 3	*50*	*$950,000*																	
Protection	**3**	**$38,952**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$51,936*																	
Funding Level 3	*5*	*$64,920*																	
Field Windbreak/Shelterbelt	**1 Mile Field Windbreaks**	**$2,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1.5 Miles Field Windbreaks*	*$3,000*																	
Funding Level 3	*2 Miles Field Windbreaks*	*$4,000*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres*	*$25,000*																	
Funding Level 3	*75 acres*	*$37,500*																	
Well Sealings	**1 Well sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*2 wells sealed/year*	*$2,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Total Funding Level 1 10-Year Cost		**$830,277**	**Total Level 1 10-Year Progress Toward Goals**							**90%**	**89%**	**91%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$949,373*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$1,115,070*	*Total Level 3 10-Year Progress Toward Goals*							*116%*	*117%*	*116%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.9: Implementation schedule and action related to work in Joe River Planning Zone

Little Joe River Planning Zone

Planning Zone Description:
This planning zone is approximately 64 square miles in size (4% of the Planning Area) and comprises the area drained by the Little Joe River and 3 other unnamed coulees. These systems originally flowed west to outlet into the Joe River but were diverted by the construction of Kittson County Ditch #22, which cut off the four systems and brought the water directly south into the North Branch Two Rivers. These coulee systems are characterized by ridges in the upstream areas with steeper slopes. The downstream ends of the waterways flatten out to generally less than 5 feet of drop in one mile. The zone consists of predominantly agricultural land with pasture-hay-grassland in the upper 1/3, and cultivated land in the remaining 2/3 of the area. There are no cities within this zone.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area is a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from excessively drained on ridges to very poorly drained basins. Many areas have been partially drained. The main crops are small grain, soybeans and hay. Native vegetation was mixed tall and short grass prairie with scattered woodland and brush. Primary resource concerns are wind erosion, dryness on sandy soils and wetness in low lying and seepy areas.

Land use changes have altered the quality and quantity of natural resources in this sub watershed. Agricultural lands are common in the western and southern portions of this subwatershed while some large blocks of grassland and woodland habitats are common in the northern and eastern portions of this subwatershed. A beach ridge runs through this subwatershed and some gravel pits are present. Some wetland areas remain but most areas have been drained. An overall lack of large habitat blocks and a lack of connectivity between existing grasslands, wetlands, brushlands, and woodlands limit the function of the terrestrial habitats in this subwatershed.

The waterways in this subwatershed flow into Kittson county Ditch 22 which in turn flows into the North Branch of Two Rivers. Many natural waterways have been converted to ditches. The remaining natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. Small waterways here are likely to provide spawning and rearing habitat for a variety of species. Flashy flows, susceptibility to extended low flow or no flow periods, unstable channels, and a lack of riparian habitat limit the function of these aquatic resources.

Gravel mining and logging of aspen are the main activities relative to renewable and nonrenewable resources in this subwatershed. There is potential to do reclamation activities in old gravel pits not in use anymore.

In addition to these general habitat features, natural heritage elements have been documented in this subwatershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated “outstanding resource value waters” or “critical vegetated habitat” as defined in state statutes have been found in this sub-watershed.

*Resource Improvement Opportunities: A*ctions should be taken to protect existing upland habitats (grassland, wetland, brushlands, woodlands), create some large habitat blocks in the western portion of the watershed, create some multipurpose impoundments in the eastern portion, protect existing stable waterways, and stabilize existing unstable waterways.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the Little Joe River planning zone, and these continue to be ongoing issues.

- ✓ Water that once drained to Canada in the northeast area of this zone now flows west and then south into the Kittson County Ditch #22 system. This was identified as due to culvert restrictions and beaver dams.
- ✓ Water that overflows from the State Ditch #84 (Skull Lake) system add to the problems on the Little Joe River. This was perceived to be of great importance when runoff exceeds 5”.
- ✓ A dike and / or road that was built in Canada is restricting the natural flow to the northwest from this subwatershed.
- ✓ Overland flooding, especially in the area of CD 22 causes water quality problems in gravel pits.
- ✓ Losses to agricultural land due to flooding and excessive rainfall, including crop losses, damaged hay land, and damaged pastureland (including damage to fences).
- ✓ Road authorities have inventoried damage to infrastructure, including township and county roads, and associated culverts and bridges.
- ✓ Beaver dams cause backup of water and related flooding on the Little Joe River and other intermittent waterways.
- ✓ Inconsistent culverts sizes for subwatersheds. Generally, culverts in upstream areas should be of a smaller size and proportionately increased as water travels downstream, according to drainage area. Culverts need to be inventoried, analyzed and changed appropriately.
- ✓ Ineffective ditch systems. Legal, private, and road ditches should be analyzed and maintained to handle excessive flows.
- ✓ Interaction between surface and ground water could affect levels in gravel pit lakes. Surface drainage may be causing lower than ordinary levels in these pit lakes. This was an issue relating to drought.

What’s Been Accomplished – Existing Projects & Practices

- Th Kittson SWCD has implemented the following projects and practices.
  - Three abandoned wells have been sealed
  - 279 acres of cover crops
  - 34.1 acres of buffers under clean water funding

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the Little Joe River Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

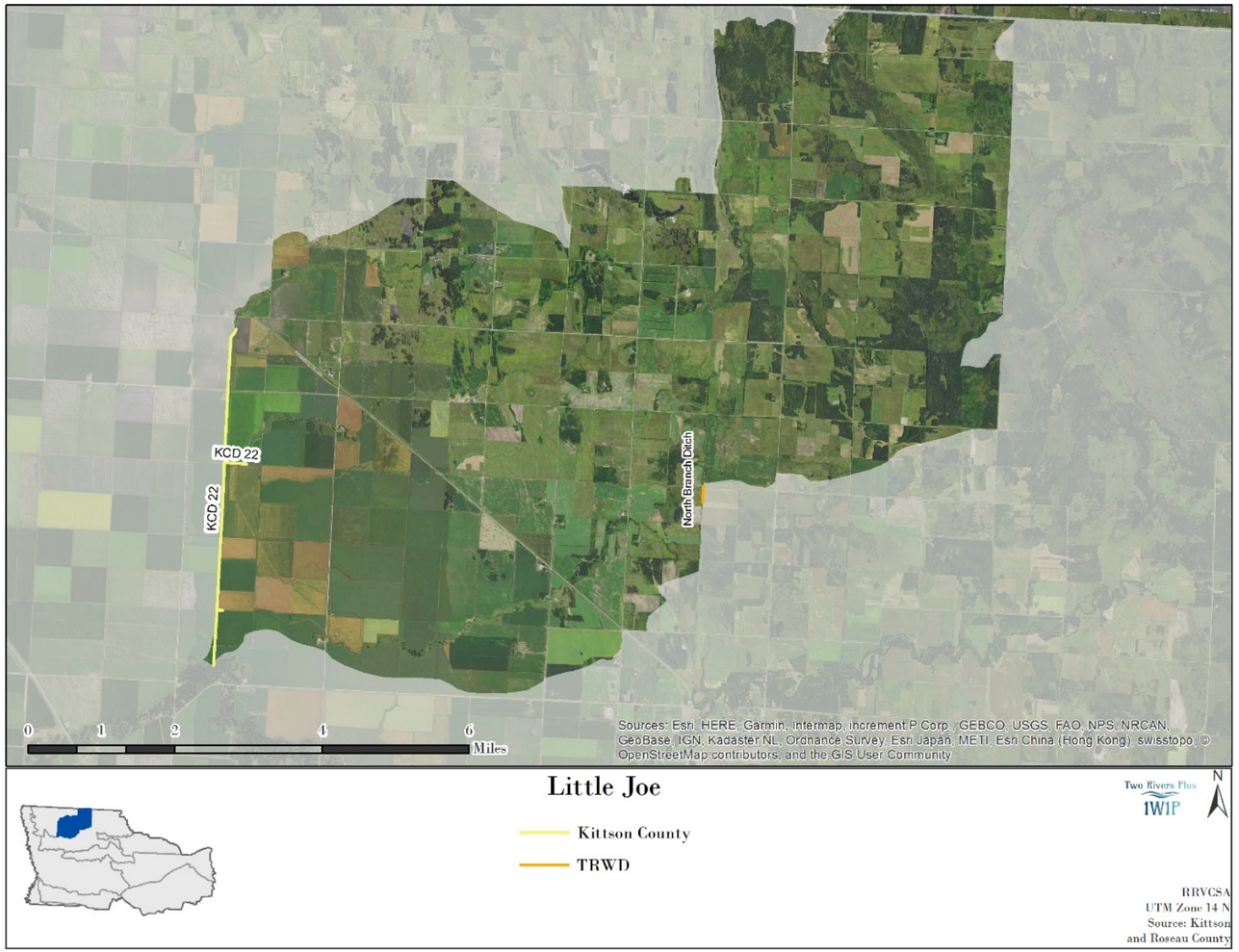
- inadequate conveyance capacity of watercourses
- inadequate feed/water supply/waste management

Medium Priority Issues

- excessive nutrient loading to surface waters
- instability of all types of watercourses
- flood damage to public and private property, homesteads, and farmland
- extreme flow fluctuations
- degraded wetland and riparian habitats
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive salinity in soils,
- excessive wind and water erosion,
- inadequate field drainage system outlets / tile drainage management

Table 5.10 Little Joe River Goal Summary

Little Joe River Goal Summary				
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**
1 % (28 tons/yr)	TP: 0.60 % (46 lbs/yr) TN: 0.31% (470 lbs/yr)	2.75 miles of ditches	10-year channel capacity on 10% of legal ditches	1/8 inch (421 ac-ft)

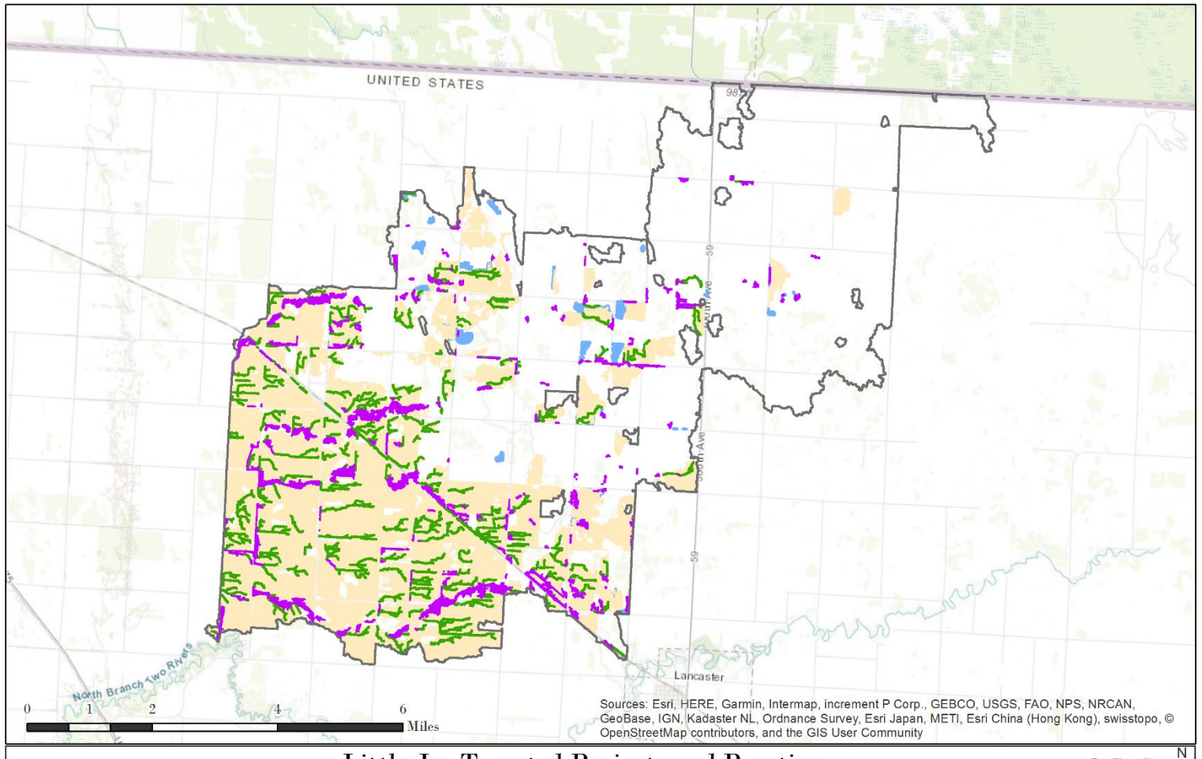


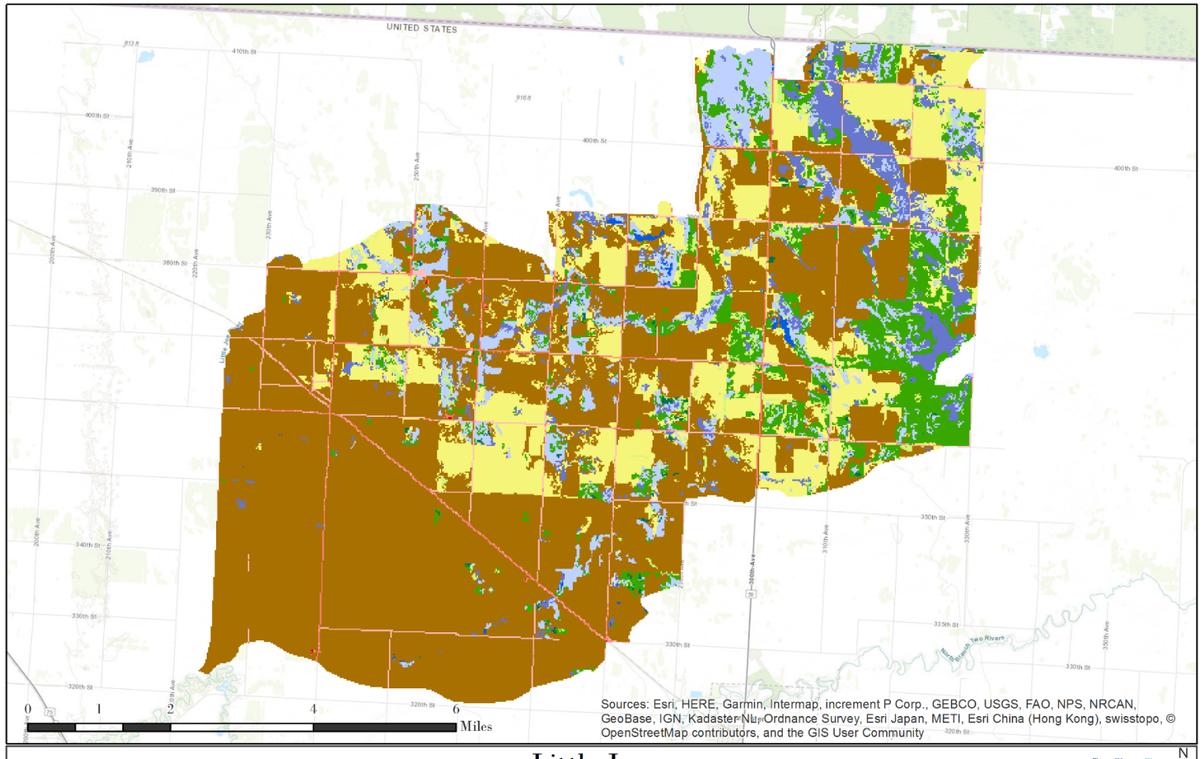
Little Joe River Planning Zone

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to the Planning Zone outlet to be 2,811 tons of sediment, 7,704 pounds of Phosphorus, and 151,918 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 21 new projects opportunities, ½ miles of field windbreaks, 50 acres/yr. habitat, and 760 acres grazing systems have been identified within the Little Joe River Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.





Little Joe River Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$8,693**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$8,693*																	
Funding Level 3	*2*	*$17,386*																	
Filtration Practices	**2**	**$4,642**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$6,963*																	
Funding Level 3	*3*	*$6,963*																	
Non-Structural Land Management Practices	**10**	**$190,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*13*	*$247,000*																	
Funding Level 3	*20*	*$380,000*																	
Protection	**2**	**$27,560**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*2*	*$27,560*																	
Funding Level 3	*3*	*$41,340*																	
Field Windbreak/Shelterbelt	**1/3 Mile Field Windbreaks**	**$666**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/2 Mile Field Windbreaks*	*$1,000*																	
Funding Level 3	*3/4 Miles Field Windbreaks*	*$1,500*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres*	*$25,000*																	
Funding Level 3	*75 acres*	*$37,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 wells sealed/year*	*$1,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**640 acres**	**$16,000**	**SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*760 acres*	*$19,000*																	
Funding Level 3	*880 acres*	*$22,000*																	
Total Funding Level 1 10-Year Cost		**$258,561**	**Total Level 1 10-Year Progress Toward Goals**							**81%**	**82%**	**85%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$346,216*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$528,689*	*Total Level 3 10-Year Progress Toward Goals*							*157%*	*160%*	*160%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.11: Implementation schedule and action related to work in Little Joe River Planning Zone

Middle Branch Two Rivers Planning Zone

Planning Zone Description:

This Planning Zone is approximately 71 square miles in size (4.4% of Two Rivers Plus Planning Area) and extends from the Roseau / Kittson County line, passes north of the City of Lake Bronson, and ends where the Middle Branch joins the South Branch Two Rivers at the City of Hallock. The landscape is characterized by pasture/grass/wetlands/CRP/forest in the east transitioning to cultivated land in the west. The river corridor along the Middle Branch is mostly wooded. Topography is steep in the east and flat in the west.

Legal ditch systems include State Ditch #50, Kittson County Ditch #15, and Kittson County Ditch #23. Another major watercourse is the Middle Branch Project, constructed by the TRWD. The other areas of this zone are directly drained by coulee systems, private field ditches, or road ditches. Significant landscape features include expansive tracts of DNR managed wildlife management areas in the eastern portions containing wetland – upland complexes. This includes Beaches Lake, constructed on State Ditch #50 in the 1960's to provide waterfowl habitat.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area is a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from excessively drained on ridges to very poorly drained basins. Many areas have been partially drained. The main crops are small grain, soybeans and hay. Native vegetation was mixed tall and short grass prairie with scattered woodland and brush. Primary resource concerns are wind erosion, dryness on sandy soils and wetness in low lying and seepy areas.

The western half of this planning zone is dominated by agricultural lands. The eastern half of this zone is dominated by large blocks of natural habitats (e.g. Beaches WMA). These natural habitats include rich fens, lowland shrub lands, and aspen woodlands. CRP lands are also present in this watershed with their greatest density in the area just west of Hwy 59. Some wetland areas remain but most areas have been drained. A lack of large habitat blocks in the western portion of the zone limits the function of the terrestrial habitats. Overflow from the Roseau watershed also limits the active management of vegetation on state wildlife lands in this zone (during and after very extreme runoff events).

The Middle Branch of the Two Rivers is the primary waterway and almost all natural tributaries have been converted to ditches. The remaining natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. Small waterways here are likely to provide spawning and rearing habitat for a variety of other species. Flashy flows, susceptibility to extended low flow or no flow periods, unstable channels, beaver dams, and a lack of riparian habitat limit the function of these aquatic resources.

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated areas" as defined in state statutes have been found in this sub-watershed.

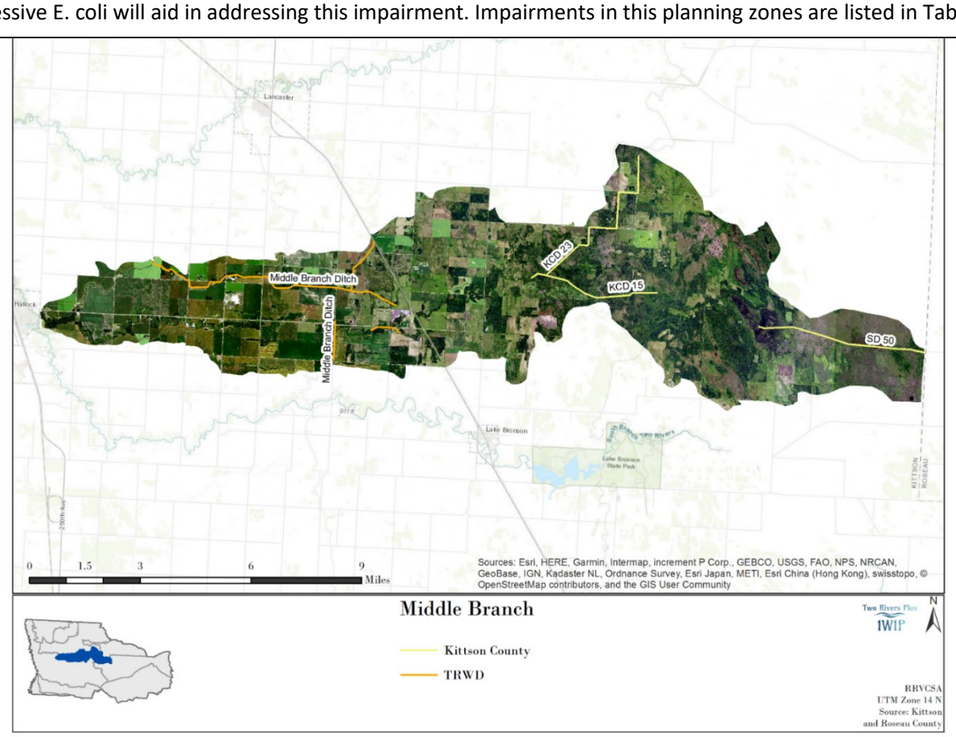
Resource Improvement Opportunities: There is a high potential to significantly improve fish and wildlife habitat in this subwatershed. In particular, actions should be taken to protect existing upland habitats (grassland, wetland, brushlands, woodlands), create some large habitat blocks in the western portion of the watershed, create some multipurpose impoundments in the eastern portion, protect existing stable waterways, and stabilize existing unstable waterways. Water storage projects like the proposed Klondike Clean Water Retention Project located in upstream watersheds and in the Roseau River watershed should continue to be explored.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the Middle Branch planning zone, and these continue to be ongoing issues.

- ✓ Beaver dams blocking drainage systems (KCD 15, KCD 23, SD 50), coulees, and other waterways is the biggest issue within the Planning Zone.
- ✓ Flooding is an issue at the confluence of Kittson County Ditch #15 and Kittson County Ditch #23. This affects crop land, hay land, and pasture.
- ✓ Other flooding problems are associated with the river breaking out of its channel west of US Highway 59 and affecting adjacent lands posing isolated problems to crops, infrastructure, and residences. The Roseau River overflows also contribute to this flooding during large flood events. The Middle Branch west of highway 59 has a significant impact on and contributes to flooding in Hallock. This may be a timing issue that should be looked at.
- ✓ Debris in the river channel is restricting the flow. The river is narrow in spots, allowing for log jams and beaver to block the channel.
- ✓ Stream flows are too "flashy'. The high flows are too high and the low flows are too low. Stream flows should be more constant.

The MPCA lists impairments for fish, macroinvertebrates, and E. Coli on the middle branch Two Rivers. The Planning Group has indicated that it is not necessarily important to address the biologic impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. DNA analysis to identify the sources of fecal contamination as indicated by excessive E. coli will aid in addressing this impairment. Impairments in this planning zones are listed in Table 5.1.



Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the Middle Branch Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

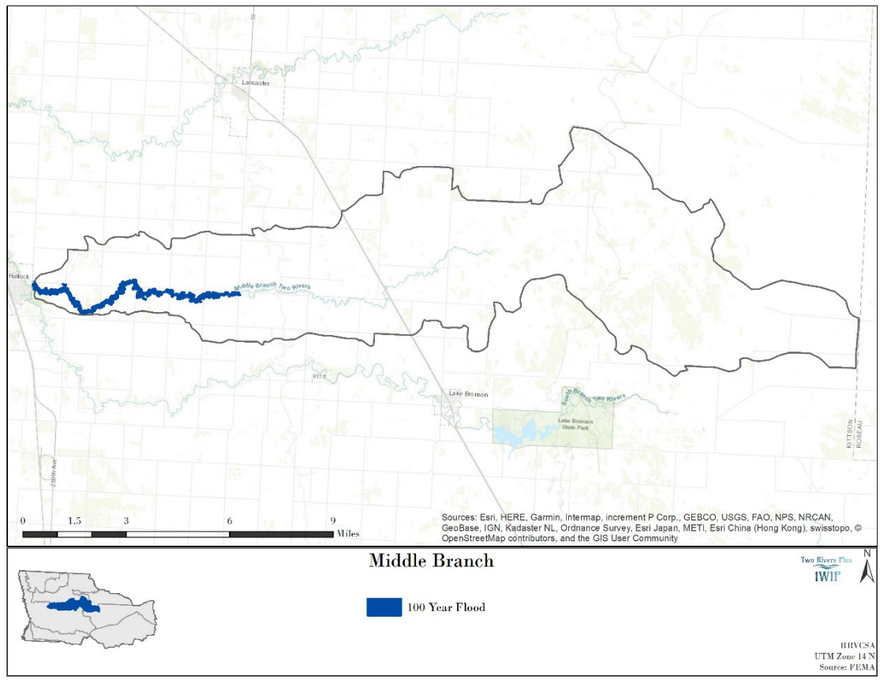
- extreme flow fluctuations
- inadequate feed/water supply/waste management

Medium Priority Issues

- excessive sediment loading to surface waters
- excessive nutrient loading to surface waters,
- excessive bacteria loading to surface waters,
- inadequate conveyance capacity of watercourses
- flood damage to public and private property, homesteads, and farmland
- degraded aquatic and riparian habitats
- loss of longitudinal connectivity
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind and water erosion,
- inadequate field drainage system outlets / tile drainage management

What's Been Accomplished – Existing Projects & Practices

- One ring dike has been constructed by the Two Rivers Watershed District to protect farmsteads from flooding.
- The 'Middle Branch' project was constructed in the 1960's by the Two Rivers Watershed District and encompasses 10.6 miles of channel improvements for flood protection and agricultural water management to carry 10 year event flood flows.
- Over the past 10 years, the following practices have been implemented by the Kittson SWCD
  - Two wells have been sealed
  - 80 acres of cover crops



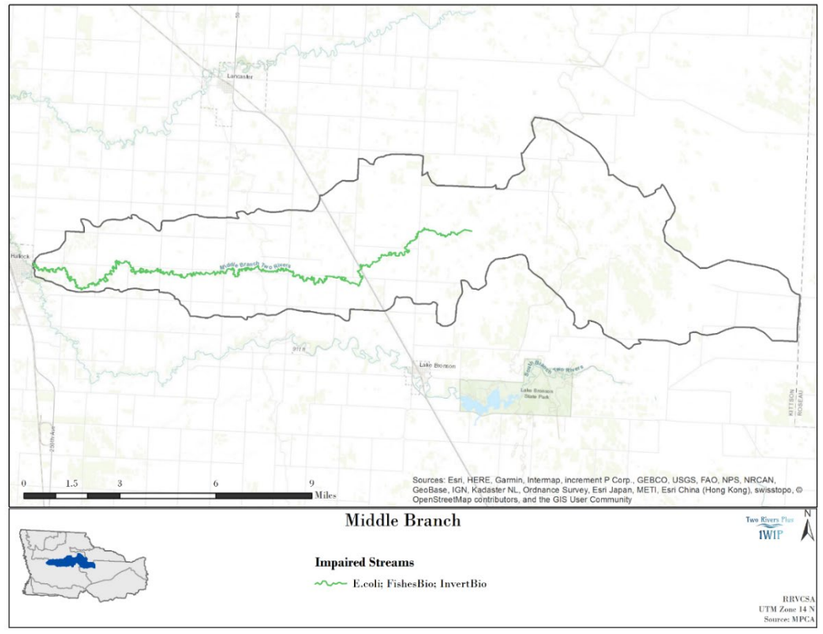


Table 5.12 Middle Branch Goal Summary

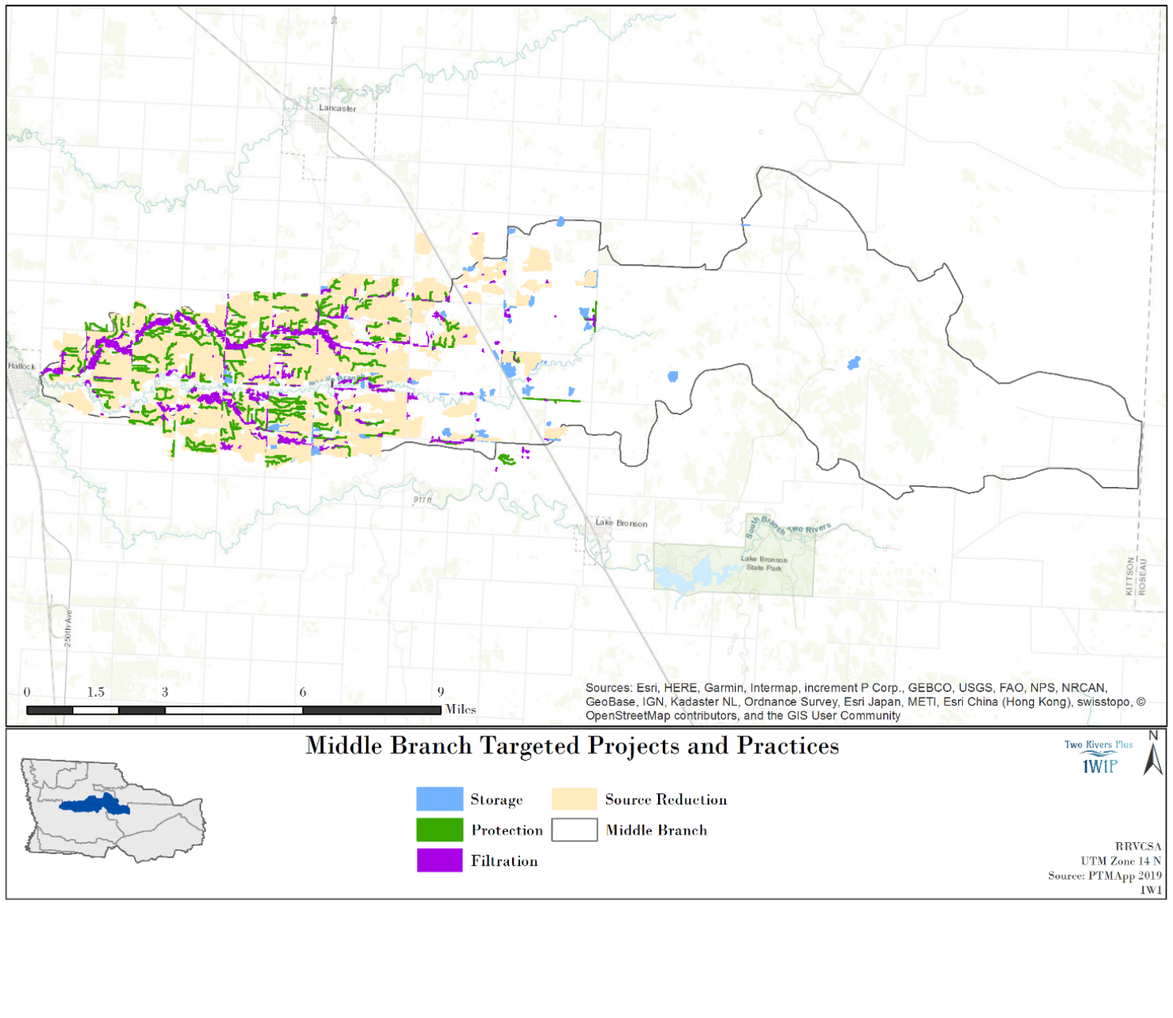
Middle Branch Goal Summary			
Sediment	**Nutrients**	**Conveyance Capacity**	**Runoff Reduction**
2.0 % (38 tons/yr)	TP: 1.0 % (64 lbs/yr) TN: 0.42% (589 lbs/yr)	10-year channel capacity on 10% of legal ditches	1/8 inch (522 ac-ft)

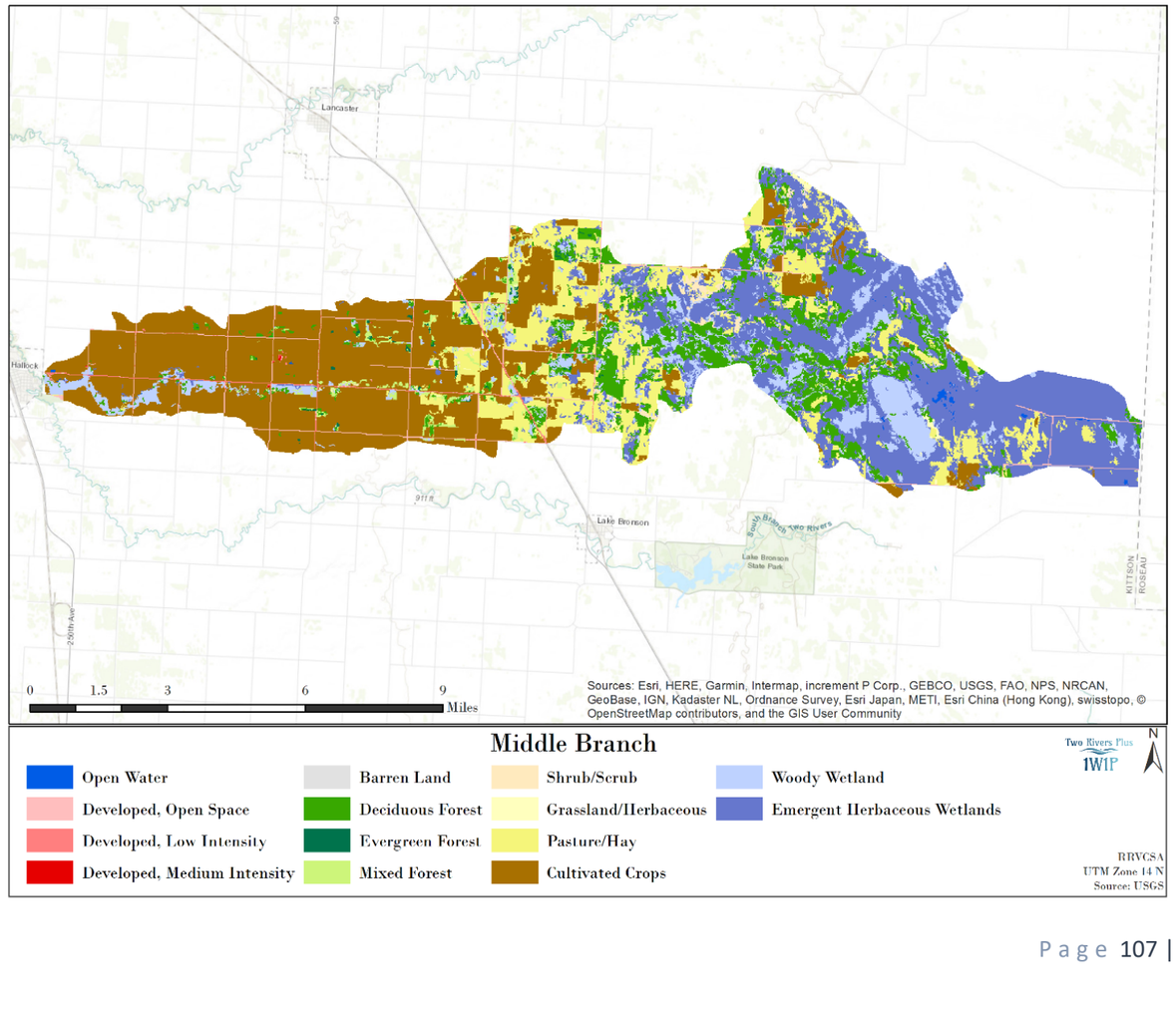
Middle Branch Two Rivers Planning Zone

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 1,883 tons of sediment, 6,427 pounds of Phosphorus, and 140,470 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 32 new projects opportunities, ½ miles of field windbreaks, 50 acres/yr habitat, and 760 acres grazing systems have been identified within the Middle Branch Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.





Middle Branch Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**0**	**$0**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$6,434*																	
Funding Level 3	*2*	*$12,868*																	
Filtration Practices	**2**	**$5,866**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$8,799*																	
Funding Level 3	*4*	*$11,732*																	
Non-Structural Land Management Practices	**15**	**$285,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*20*	*$380,000*																	
Funding Level 3	*25*	*$475,000*																	
Protection	**3**	**$36,951**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$49,268*																	
Funding Level 3	*5*	*$61,585*																	
Field Windbreak/Shelterbelt	**1/3 Mile Field Windbreaks**	**$666**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/2 Mile Field Windbreaks*	*$1,000*																	
Funding Level 3	*3/4 Mile Field Windbreaks*	*$1,500*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres/year*	*$25,000*																	
Funding Level 3	*75 acres/year*	*$37,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*2 wells sealed/year*	*$2,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*2 System Upgrades*	*$20,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**640 acres**	**$16,000**	**SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*760 acres*	*$19,000*																	
Funding Level 3	*880 acres*	*$22,000*																	
Total Funding Level 1 10-Year Cost		**$355,483**	**Total Level 1 10-Year Progress Toward Goals**							**75%**	**77%**	**75%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$511,501*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$644,185*	*Total Level 3 10-Year Progress Toward Goals*							*126%*	*131%*	*125%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.13: Implementation schedule and action related to work in Middle Branch Planning Zone

North Branch Two Rivers Planning Zone

Planning Zone Description:
This planning zone is approximately 219 square miles in size (13.7% of Two Rivers Plus Planning Area) and consists of several wildlife management areas in the upstream, northeasterly areas interspersed with pasture, hayland, and ag. Cultivated land is dominant in the middle and westerly areas of the zone, except that the corridor along the North Branch Two Rivers is wooded. Topography is moderate across the planning zone. Lancaster is the only city in this zone, as well as the unincorporated area of Northcote.

Legal ditch systems include State Ditch #84, Kittson County Ditch 11, Kittson County Ditch #13, Kittson County Ditch #14, Kittson County Ditch #18, Judicial Ditch #31, and Judicial Ditch #32. Another major watercourse is the North Branch Project, constructed by the TRWD. The other areas of this zone are directly drained by coulee systems, private field ditches, or road ditches. Significant landscape features include expansive tracts of DNR managed wildlife management areas in the eastern portions containing wetland – upland complexes. This includes Skull Lake, constructed on State Ditch #84 in the 1960's to provide flood control and waterfowl habitat.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the North Branch planning zone, and these continue to be ongoing issues.

- ✓ During large flood events, overflows from the Roseau River watershed add to the flooding on the North Branch.
- ✓ Inconsistent culvert sizes for subwatersheds. Generally, culverts in upstream areas should be of a smaller size and proportionately increased as water travels downstream, according to drainage area. Culverts need to be inventoried, analyzed and changed appropriately.
- ✓ Road washouts lead to annual maintenance costs and present dangerous situations to the traveling public. Road authorities have documented these areas.
- ✓ Loss of agriculture and pasture land from continued flooding is an annual problem.
- ✓ Residential losses throughout the planning zone occur from flooding during the spring and summer events.
- ✓ Sedimentation of field ditches and road ditches caused by flooding. This occurs mainly on the western side of the watershed and in some isolated areas on the eastern side.
- ✓ Ice jams and log jams on the main channel of the North Branch Two Rivers cause water to back up and raise water levels locally during runoff events. These ice and log jams can also cause damage to bridges, culverts, and other public structures.
- ✓ Slope failures can occur on legal ditch systems due to large amounts of runoff and erosive water velocities.
- ✓ Sedimentation due to wind erosion causes blockages to waterways.
- ✓ High flows are perceived to be too high and low flows are too low. There needs to be more controlled runoff .

The MPCA lists impairments for fish and dissolved oxygen on the North Branch Two Rivers and for fish on SD 84 and JD 31. The Planning Group has indicated that it is not necessarily important to address impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. Impairments in this planning zone are listed in Table 5.1.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area transitions from extremely flat landscape composed of thick lacustrine sediments to a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from silty/clayey in texture to excessively drained on ridges to very poorly drained basins. Areas in the western 2/3 of the zone are farmed with main crops being small grain, sugar beets, soybeans, and hay. The native vegetation was mixed tall and short grass prairie with scattered woodland and brush.

The western end of this zone is dominated by agricultural lands. Quality natural habitats are found in the rather narrow river corridor along the North Branch. A lack of large habitat blocks limits the potential of the terrestrial habitats. In the eastern end of the zone, land use changes have altered the quantity and quality of some of these habitats but those that remain can support diverse fish, wildlife, and related natural resources. Some of the most diverse and unique habitats in the entire Two Rivers watershed are found in this planning zone. These habitats on public and private lands include large contiguous tracts of native prairie/brush prairie, large contiguous wet prairies (i.e. sedge meadows, etc), and the dry prairies and sand dunes found in Skull Lake and Caribou WMA's.

The North Branch is the primary waterway in this planning zone. Some of the best remaining stream and aquatic habitat in the entire Two Rivers Watershed is also found in this sub watershed. This reach of the North Branch Two Rivers is a relatively stable sinuous channel with an intact riparian area that supports a small but diverse fish population. Most natural tributaries in this planning zone remain intact although some have been converted to ditches. These natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. Small waterways here are likely to provide spawning and rearing habitat for a variety of species.

Diversity and abundance of fish populations are limited by extended periods of low flow and downstream structures that may inhibit fish passage to this reach. Flashy flows, susceptibility to extended low flow or no flow periods, unstable channels, beaver dams, and a lack of riparian habitat limit the function of these aquatic resources.

In addition to these general fish and wildlife features, Natural Heritage elements have been documented in this planning zone. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed.

*Resource Improvement Opportunities: A*ctions should be taken to protect existing upland habitats (grassland, wetland, brushlands, woodlands), create some large habitat blocks in the western portion of the watershed, create some multipurpose impoundments in the eastern portion, protect existing stable waterways, and stabilize existing unstable waterways.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the North Branch Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- extreme flow fluctuations
- loss of longitudinal connectivity
- inadequate feed/water supply/waste management

Medium Priority Issues

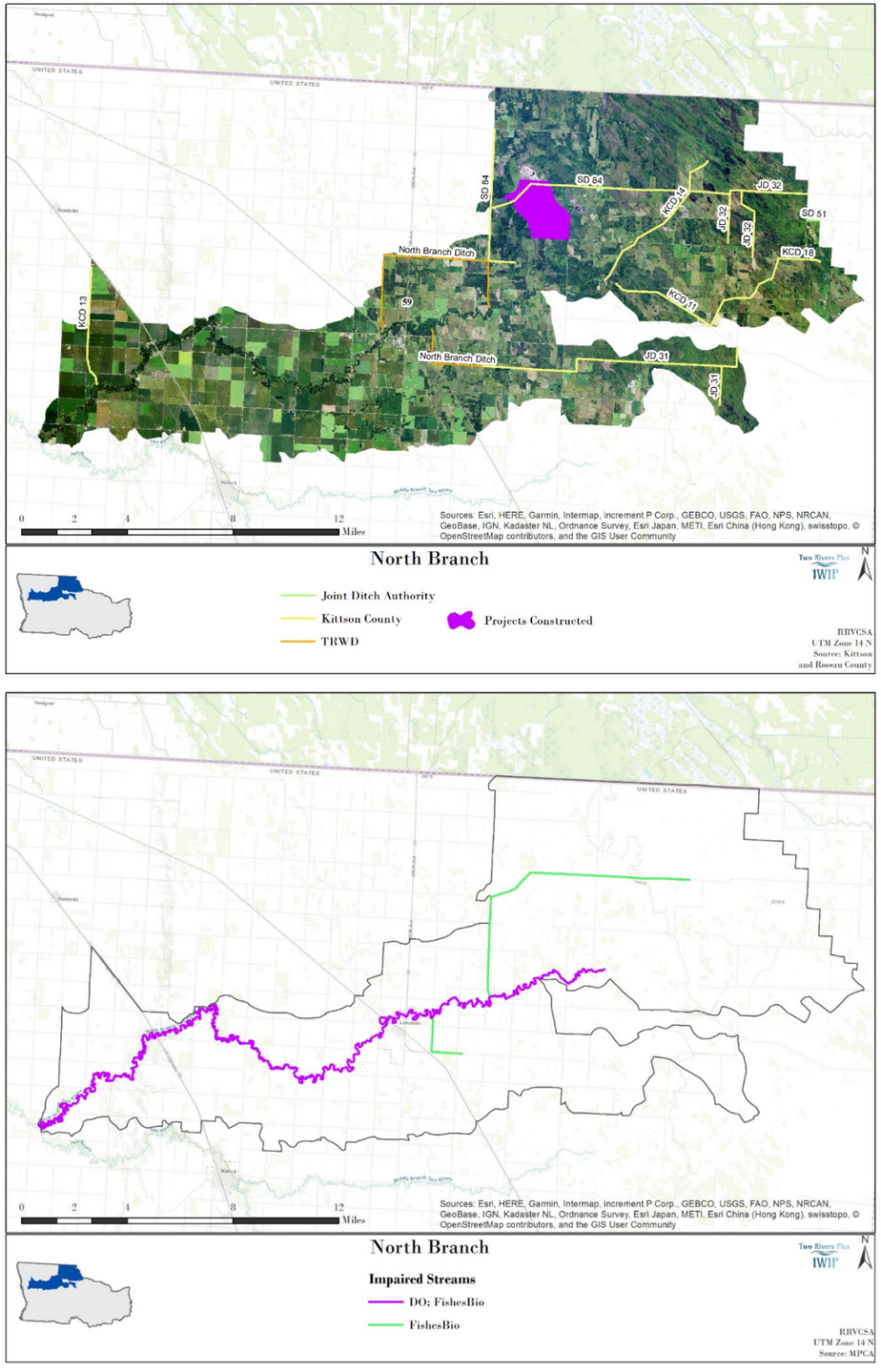
- excessive sediment loading to surface waters
- excessive nutrient loading to surface waters,
- low dissolved oxygen in surface waters,
- instability and inadequate conveyance capacity of watercourses
- flood damage to public and private property, homesteads, and farmland
- degraded aquatic, wetland, riparian, and terrestrial habitats
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive salinity in soils,
- excessive wind and water erosion,
- inadequate field drainage system outlets / tile drainage management

Table 5.14 North Branch Goal Summary

North Branch Goal Summary					
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**	**Terrestrial Habitat**
2.0% (43 tons/yr)	TP: 2 % (239 lbs/yr) TN: 0.60% (1,508lbs/yr)	2 outlets	10-year channel capacity on 5% of legal ditches	1/8 inch (1,434 ac-ft)	200 acres

What's Been Accomplished – Existing Projects & Practices

- Three ring dikes have been constructed by the Two Rivers Watershed District to protect farmsteads from flooding.
- The 'North Branch' project was constructed in the 1960's by the Two Rivers Watershed District and encompasses roughly 12 miles of channel improvements for flood protection and agricultural water management to carry 10-year event flood flows. This project also included the Skull Lake impoundment.
- The Kittson SWCD has implemented the following projects and practices.
  - Four abandoned wells have been sealed
  - 1,133 acres of cover crops
  - 36 acres of buffers under clean water funding
  - 150 linear feet of grade stabilization

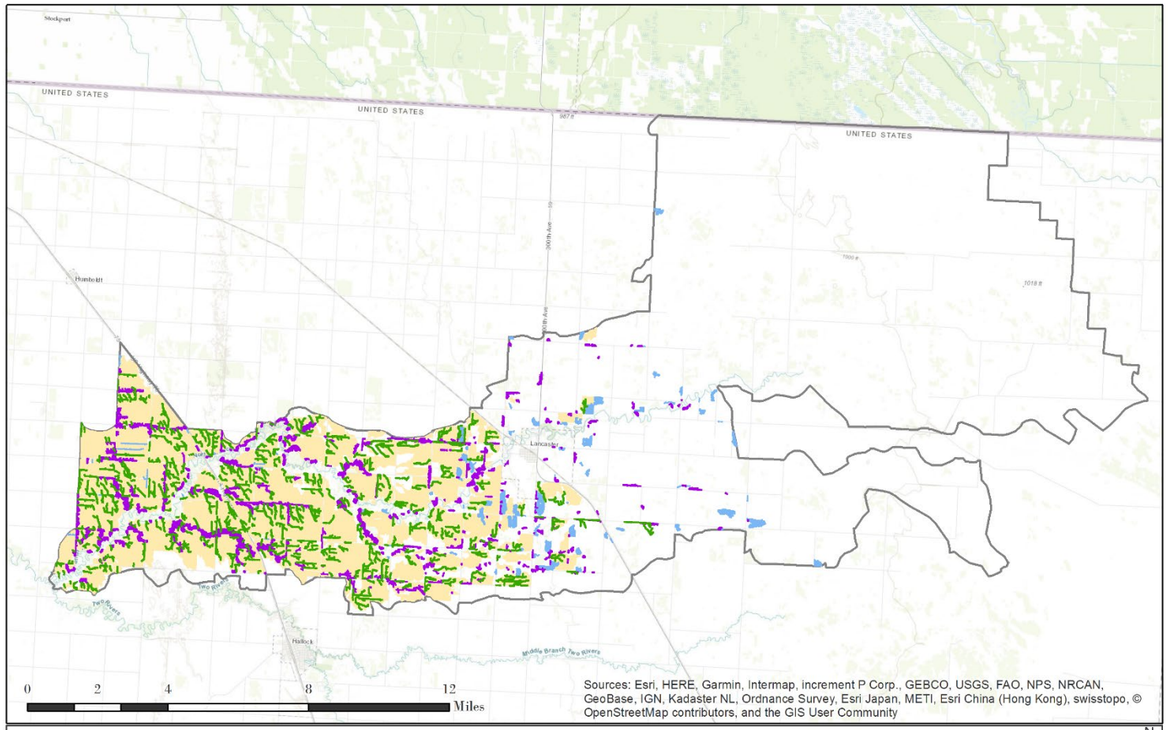


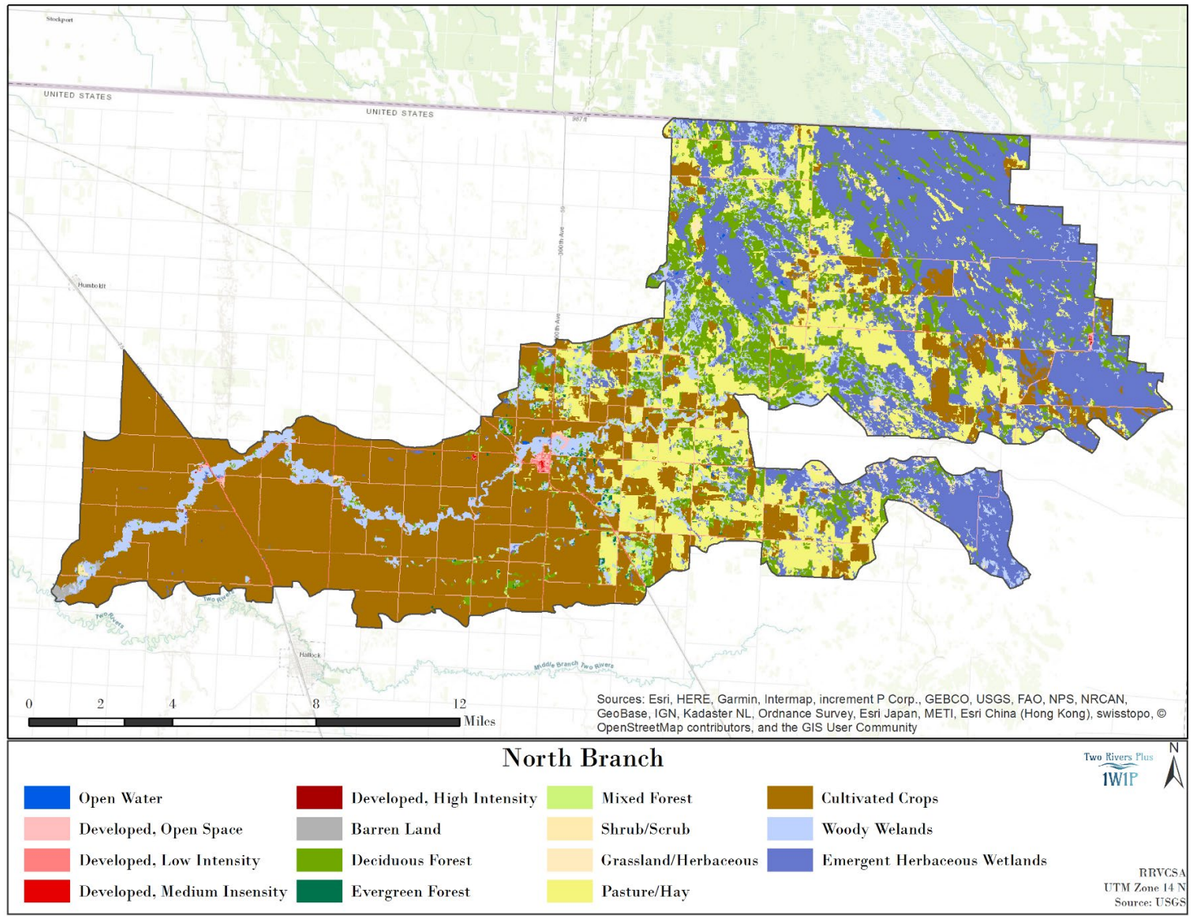
North Branch Two Rivers Planning Zone

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 2,168 tons of sediment, 11,961 pounds of Phosphorus, and 251,361 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 75 new project opportunities, ½ miles of field windbreaks, 250 acres/yr habitat, and 760 acres grazing systems have been identified within the North Branch Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.





North Branch Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$10,562**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*2*	*$21,124*																	
Funding Level 3	*3*	*$31,686*																	
Filtration Practices	**3**	**$7,386**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$7,386*																	
Funding Level 3	*4*	*$9,848*																	
Non-Structural Land Management Practices	**45**	**$855,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*64*	*$1,216,000*																	
Funding Level 3	*70*	*$1,330,000*																	
Protection	**4**	**$46,588**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$46,588*																	
Funding Level 3	*5*	*$58,235*																	
Field Windbreak/Shelterbelt	**1/3 Mile Field Windbreaks**	**$666**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/2 Mile Field Windbreaks*	*$1,000*																	
Funding Level 3	*3/4 Mile Field Windbreaks*	*$1,500*																	
Grassland restoration and wildlife habitat management	**200 acres**	**$100,000**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*250 acres*	*$125,000*																	
Funding Level 3	*275 acres*	*$137,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 wells sealed/year*	*$1,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**640 acres**	**$16,000**	**SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*760 acres*	*$19,000*																	
Funding Level 3	*880 acres*	*$22,000*																	
Total Funding Level 1 10-Year Cost		**$1,047,202**	**Total Level 1 10-Year Progress Toward Goals**							**71%**	**71%**	**73%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$1,447,098*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$1,612,769*	*Total Level 3 10-Year Progress Toward Goals*							*110%*	*111%*	*113%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.15: Implementation schedule and action related to work in North Branch Planning Zone

State Ditch #72 Planning Zone

Planning Zone Description

This area is approximately 110 square miles in size (6.9% of the Planning Area) and mainly comprises the drainage area of State Ditch #72. The landscape is characterized by cultivated and pasture land interspersed with wetlands and grassland. The 'Big Swamp', 'Beaches Area Fen' and 'Juneberry Ridge' are major landscape features located in this planning zone. Topography is relatively gradual from east to west as the elevation changes about 20' in the upper ½ and about 35' in the lower ½ of the planning zone. There are no cities in this planning zone.

There are no major rivers in this zone, however SD 72 forms the headwaters of the North Branch Two Rivers. Other ditch systems include State Ditch #85 and State Ditch #85 Improvement. The Soler #4 project of the TRWD is located upstream of SD 72.

Due to repetitive flooding and natural resources concerns, the TRWD has extensively studied this area. Crossover flooding from the Roseau River affects the area, and the Klondike Clean Water Retention Project is in the planning stages.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area is a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from excessively drained on ridges to very poorly drained basins. Many areas have been partially drained. The main crops are small grain, soybeans and hay. Native vegetation was mixed tall and short grass prairie with scattered woodland and brush. Primary resource concerns are wind erosion, dryness on sandy soils and wetness in low lying and seepy areas.

Land use changes have altered the quantity and quality of some of these habitats but those that remain can support diverse fish, wildlife, and related natural resources.

Some of the most diverse and unique habitats in the entire Two Rivers watershed are found in this subwatershed. These habitats on public and private lands include large contiguous tracts of native prairie/brush prairie, and large contiguous wet prairies (i.e. sedge meadows, etc.). These terrestrial habitats provide seasonal and year-round support to elk, moose, deer, sandhill crane, marbled godwit, Wilson's Phalaropes, a variety of rails and bitterns, sharp-tailed and ruffed grouse, and many other species. Recreational opportunities include hunting, trapping, bird watching, hiking and others.

Harvesting of aspen and farming are the major activities involving renewable resources within this subwatershed. Farming practices range from traditional harvesting of small grains to cattle – pasture – haying operations. Also, unique to this subwatershed is the harvesting of native grass seed.

In addition to these general fish and wildlife features, Natural Heritage elements have been documented in this subwatershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: The potential to significantly improve fish and wildlife habitat in this subwatershed is good. The TRWD and the MN DNR recently prepared the "Beaches Lake Area Fen Management Plan". When practical and feasible, this plan should be consulted and utilized when contemplating and designing projects in the area of this fen. Opportunities exist to address downstream water quality impairments by reducing sediment, nitrogen, and phosphorous loading to surface waters. It is desirable achieve a more natural flow regime rather than the current "flashy" flows.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the SD 72 planning zone, and these continue to be ongoing issues.

- ✓ The main issue is the potential for the Roseau River to overflow and enter into the planning zone from the north. This occurs mainly during high flows in the springtime and excessive summer rains, most recently in the fall of 2019 and the summer of 2020.
- ✓ Crop losses, damage to hay land, and pasture damage especially in the upper and middle areas of this zone.
- ✓ Previous planning efforts identified "Grunig" ditches by private landowners in the upstream areas has added to the flooding problem. Specific reference was made to ditches previously installed on land that has now been purchased by The Nature Conservancy. The planning group will work with TNC on this issue.
- ✓ Drought concerns and flashy stream flows were both identified however viewed as low in severity.

The MPCA lists impairments for fish and macroinvertebrates on SD 72. The Planning Group has indicated that it is not necessarily important to address impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. Impairments in this planning zone are listed in Table 5.1.

S.D. #72 Planning Zone

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the S.D. #72 Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- inadequate conveyance capacity of all watercourse,
- overland flood damages to communities, public infrastructure, rural homesteads and farmland
- inadequate field drainage system outlets and/or improper management of tile drainage

Medium Priority Issues

- excessive sediment loading to surface waters,
- extreme flow fluctuations
- degraded wetland habitats
- excessive water erosion
- inadequate feed/water supply/waste management

Table 5.16 State Ditch #72 Goal Summary

State Ditch #72 Goal Summary				
Sediment	**Nutrients**	**Conveyance Capacity**	**Runoff Reduction**	**Terrestrial Habitat**
2.0 % (10 tons/yr.)	TP: 1.6 % (56 lbs./yr.) TN: 0.33% (488 lbs./yr.)	10-year channel capacity on 10% of legal ditches	1/4 inch (1,479 ac-ft)	200 acres

What's Been Accomplished – Existing Projects & Practices

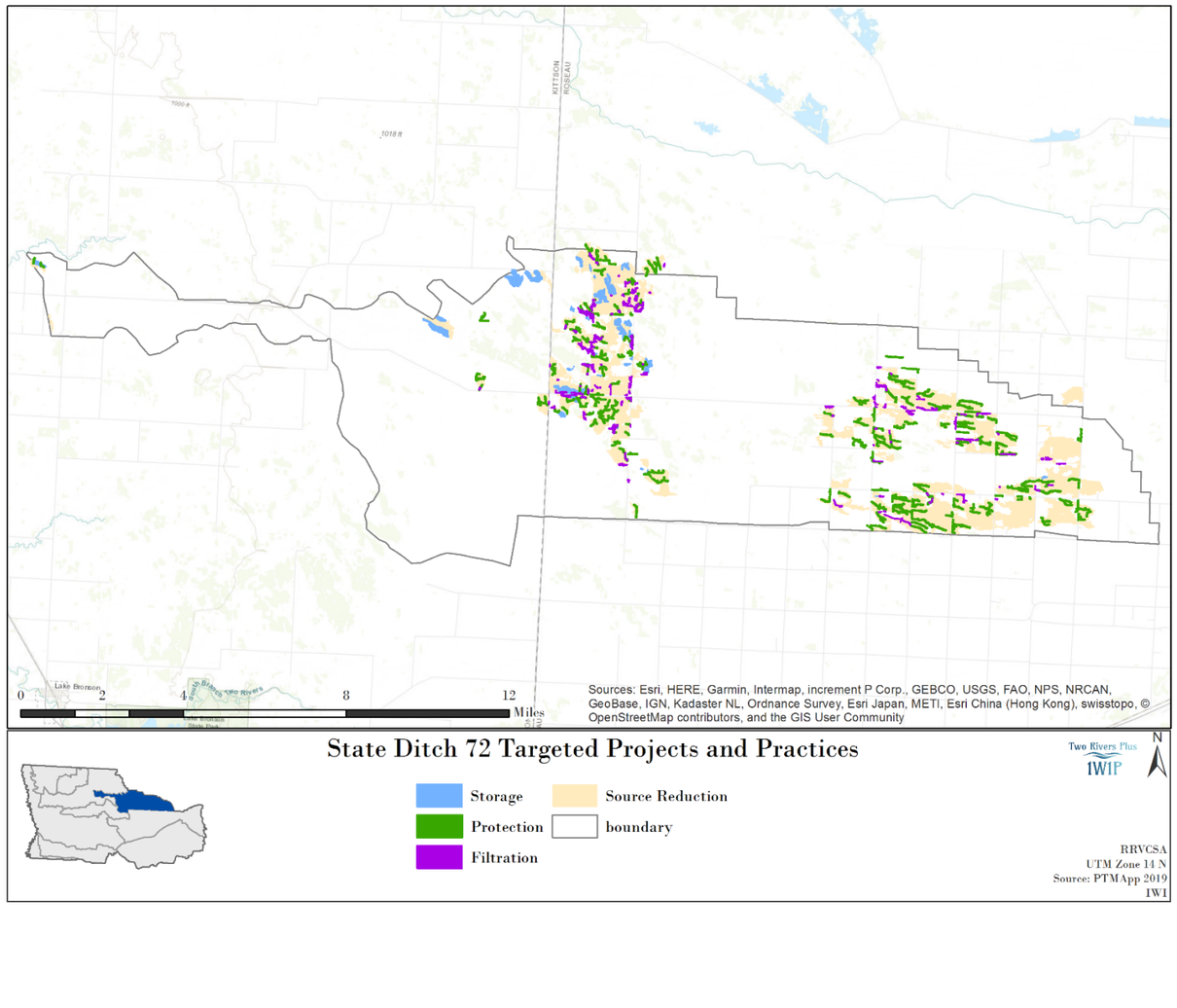
- The **Soler #4 project** was constructed by the TRWD in the early 1980's. It is a 5-mile-long water conveyance and flood control project that provides carrying capacity for up to a 10 year event.
- One abandoned well has been sealed through Roseau SWCD cost share program.
- Oiland Free Lutheran Church - Transient Public Water Supply which protects groundwater through a wellhead protection plan.

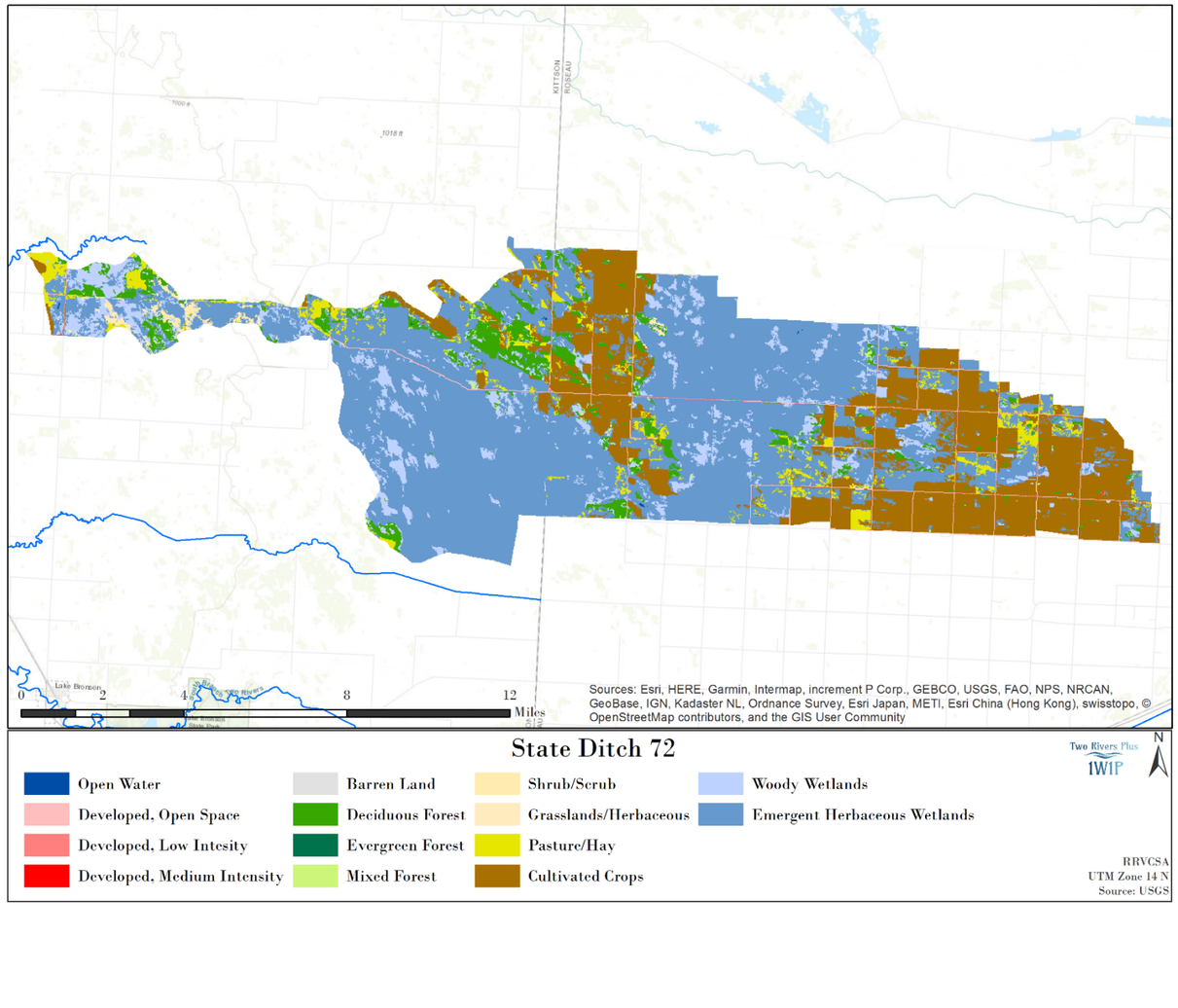
Roseau River overflowing Roseau County Road #7, fall 2019

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to the Planning Zone outlet to be 514 tons of sediment, 3,491 pounds of Phosphorus, and 147,884 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 28 new project opportunities, 1/3 miles of field windbreaks, 250 acres/yr habitat, and 430 acres grazing systems have been identified within the S.D. #72 Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.





State Ditch 72 Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$9,660**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*2*	*$19,320*																	
Funding Level 3	*3*	*$28,980*																	
Filtration Practices	**2**	**$2,872**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$4,308*																	
Funding Level 3	*4*	*$5,744*																	
Non-Structural Land Management Practices	**15**	**$285,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*18*	*$342,000*																	
Funding Level 3	*20*	*$380,000*																	
Protection	**2**	**$24,142**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*3*	*$36,213*																	
Funding Level 3	*4*	*$48,284*																	
Field Windbreak	**0 Miles Field Windbreaks**	**$0**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/3Mile Field Windbreaks*	*$666*																	
Funding Level 3	*1/2 Mile Field Windbreaks*	*$1,000*																	
Grassland restoration and wildlife habitat management	**200 acres/year**	**$100,000**	**NRCS/SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*250 acres/year*	*$125,000*																	
Funding Level 3	*275 acres/year*	*$137,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 wells sealed/year*	*$1,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**County/SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**320 acres**	**$8,000**	**NRCS/SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*430 acres*	*$10,750*																	
Funding Level 3	*500 acres*	*$12,500*																	
Total Funding Level 1 10-Year Cost		**$440,674**	**Total Level 1 10-Year Progress Toward Goals**							**80%**	**81%**	**80%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$549,257*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$636,008*	*Total Level 3 10-Year Progress Toward Goals*							*113%*	*116%*	*111%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.17: Implementation schedule and action related to work in S.D. #72 Planning Zone

State Ditch #91 Planning Zone

Planning Zone Description

This area is approximately 232 square miles in size (14.5% of Planning Area) and comprises the drainage area of State Ditches #90 and #91. The landscape is characterized by mostly cultivated and pastureland, although the southeastern and the western portions harbor extensive wetland areas. The 'Twin Lakes', 'Twistal Swamp' and 'Nereson WMA' are major landscape features located in this planning zone. For lands east of Greenbush, the topography is relatively gradual from east to west. Topography is steeper from south to north for lands southwest of Greenbush.

The Cities of Strathcona and Greenbush are located in this planning zone. The South Branch Two Rivers was straightened by the construction of SD 91 in the early 1900's, leaving only a small stretch of natural river near Pelan on the Kittson and Roseau County line. Legal drainage ditches are extensive and include RCD #4, SD #90, and Laterals 1-14 of SD #91. Ditches are located on virtually every mile line with little other watercourses. All have one common outlet in the main channel of SD #91, which becomes the South Branch Two Rivers. One watershed district impoundment project has been constructed, as detailed on the next page.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area is a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from excessively drained on ridges to very poorly drained basins. Many areas have been partially drained. The main crops are small grain, soybeans and hay. Native vegetation was mixed tall and short grass prairie with scattered woodland and brush. Primary resource concerns are wind erosion, dryness on sandy soils and wetness in low lying and seepy areas.

Land use changes have altered the quality and quantity of natural resources in this sub watershed. Agricultural lands are common in this planning zone. The southeast portion of the watershed is a large diverse habitat block and additional habitat is located along the southern border of this planning zone. Habitats in these lands include woodlands, rich fens, lowland shrub lands, and mesic prairies. CRP lands are also present throughout this planning zone. Some wetland areas remain but most areas have been drained. A grassland and forestland corridor exists along State Hwy 11. Fire suppression in some areas has degraded some habitats. A lack of connectivity between existing grasslands, wetlands, brushlands, and woodlands limit the function of the terrestrial habitats in this sub watershed.

The waterways in this planning zone flow into Ditch 91 which is the South Branch of the Two Rivers. Almost all-natural waterways have been converted to ditches. The remaining natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. Small waterways here are likely to provide spawning and rearing habitat for northern pike and a limited variety of other species. Flashy flows, susceptibility to extended low flow or no flow periods, unstable channels, and a lack of riparian habitat limit the function of these aquatic resources.

While few gravel pits are active in this planning zone, gravel mining has been the main activity associated with nonrenewable resources. Harvesting of aspen on both private and state managed lands is the major activity regarding renewable resources, as well as farming.

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: The potential to significantly improve fish and wildlife habitat in this planning zone is good but projects need to be balanced with the agricultural economy. In particular, actions should be taken to protect existing upland habitats (grassland, wetland, brushlands, forests), create and connect some large habitat blocks, protect existing stable waterways, and stabilize existing unstable waterways. Land use changes, wetland restorations, and impoundments could be sited near the upper reaches of waterways in this watershed to reduce runoff during high flow periods and augment base flows during low flow periods. The water quality monitoring program will be utilized to assess the current condition of waters identified as being impaired and formulate strategies to address the issue.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the SD 91 planning zone, and these continue to be ongoing issues.

- ✓ Water backing up at the outlet of State Ditch #91 because of inefficient channel capacity is a recurring issue in this planning zone. The problem occurs during a spring snowmelt or summer rainfall runoff event, and the effect is that water backs up and waffles through Dewey and Hereim Townships.
- ✓ Crop loss from flooding is a very large problem, occurring on a large scale in both 2019 and 2020.
- ✓ Road and culvert washouts are documented by road authorities and are ongoing issues. This is viewed as a high problem that has happened annually across the entire planning zone.
- ✓ Overland flooding, field erosion and sedimentation, and blockage of existing drainage systems are recurring issues. Overland flooding prevails from the southeastern portion of the watershed, field erosion is most severe in the northwest, and blockage of drainage systems occurs over the entire planning zone.
- ✓ Other issues were reduced flows, which allow for vegetative growth in drainage channels and high-water table, which results in housing problems and crop loss. Reduced flows occur planning zone wide, and the high water table occurs mainly in the western portion of the planning zone.
- ✓ Drought can be a problem for pastures, crop losses and shallow wells. These are severe problems when drought is occurring and are widespread throughout the planning zone.
- ✓ Natural resource issues listed for this planning zone include erosion and sedimentation issues detailed above and their effects on downstream Kittson CD #10, high levels of suspended solids affecting water quality, flooding of nesting habitats in springtime, a flashy hydrograph, loss of upland habitats, beaver control issues, high water effects on wildlife affecting wild game numbers and access to hunting lands, and log jams affecting boating and canoeing.
- ✓ Seepage from Twin Lakes into Twistal Swamp and seepage from the ridge area after heavy precipitation. This was identified as a problem particularly during summer rain events. Twistal Swamp impacts cropland in the immediate area and adds water to the downstream systems.
- ✓ Beaver dams on ditch systems and other waterways. This is a problem on the SD #90 system in particular and the dams also affect cropland in the Twistal Swamp and Twin Lakes areas.
- ✓ Overland flooding and seepage affecting residential homes north of the Karlstad golf course is a moderate problem. A number of homes are located in low areas north and east of the City of Karlstad. These need to be looked at to avoid flood damages to these residences.
- ✓ Bad odors in well water could be addressed with testing of private wells.

The MPCA lists impairments for fish and macroinvertebrates on Roseau CD 4. The Planning Group has indicated that it is not necessarily important to address impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. Impairments in this planning zone are listed in Table 5.1.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the S.D. #91 Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive sediment loading to surface waters,
- excessive nutrient loading to surface waters,
- inadequate conveyance capacity of all watercourse,
- overland flood damages to communities, public infrastructure, rural homesteads and farmland
- inadequate field drainage system outlets and/or improper management of tile drainage
- algae blooms in Lake Bronson
- excessive water erosion

Medium Priority Issues

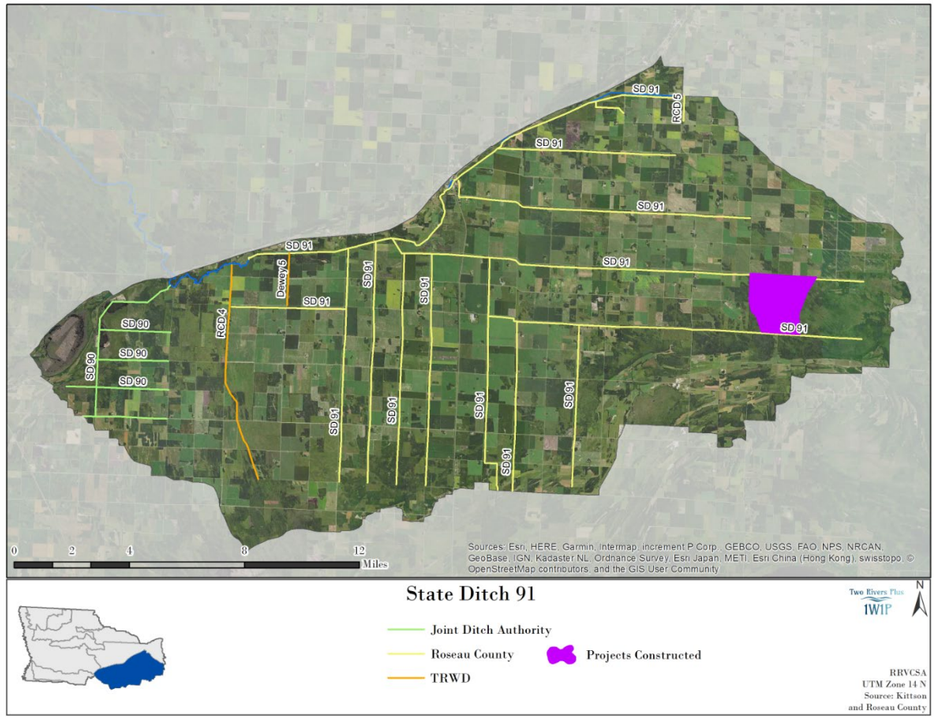
- excessive bacteria loading to surface waters,
- instability of all watercourses,
- extreme flow fluctuations
- groundwater quality
- degraded wetland, aquatic, terrestrial, and riparian habitats
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind erosion
- inadequate feed/water supply/waste management

Table 5.18 S.D. 91 Goal Summary

State Ditch #91 Goal Summary					
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**	**Terrestrial Habitat**
2.5 % (167 tons/yr)	TP: 1.9 % (483 lbs/yr) TN: 0.70% (4,030 lbs/yr)	8.5 miles of ditches	10-year channel capacity on 10% of legal ditches	1/4 inch (3,712 ac-ft)	200 acres

What's Been Accomplished – Existing Projects & Practices

- **Nereson Impoundment and Sub-impoundment –** The impoundment is located in section 28 of Nereson Township in the eastern end of the District. The impoundment consists of a main dike and outlet structure, which was completed in the early 1980's. This was a cooperative effort between Roseau County, the Minnesota DNR, the Red River Watershed Management Board, and the Two Rivers Watershed District. Between 1987-2003, a second, sub-impoundment was designed and constructed to add to the flood control and wildlife benefits of the original impoundment. Together, the main impoundment and the sub-impoundment cam control the runoff from approximately 17 square miles along laterals 4 and 5 of SD #91.
- **Twin Lakes & Twistal Swamp - WMA Outlet Structures -** In the late 1960's the MNDNR constructed a control structure for wildlife enhancement on North & South Twin Lakes. At that time dikes were constructed at Twistal Swamp, also for wildlife.
- The Roseau SWCD and Kittson SWCD have implemented the **following projects** and practices.
  - Eleven abandoned wells have been sealed
  - 122.8 acres of buffers under clean water funding
  - 44,490 linear feet of field windbreaks
- **Groundwater Protection** – wellhead protection plan for Greenbush, Non Transient Public Water Supply designation for Central Boiler, Transient Public Water Suppliers are Faith Lutheran Church, Rivers Edge Bait & Convenience, Paradise Mall/Post Office, and Gustaf Adolf Lutheran Church.

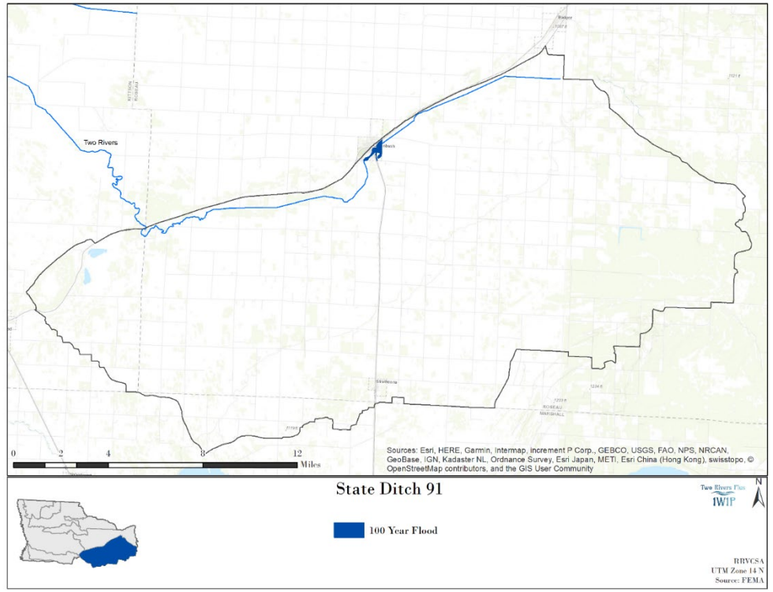


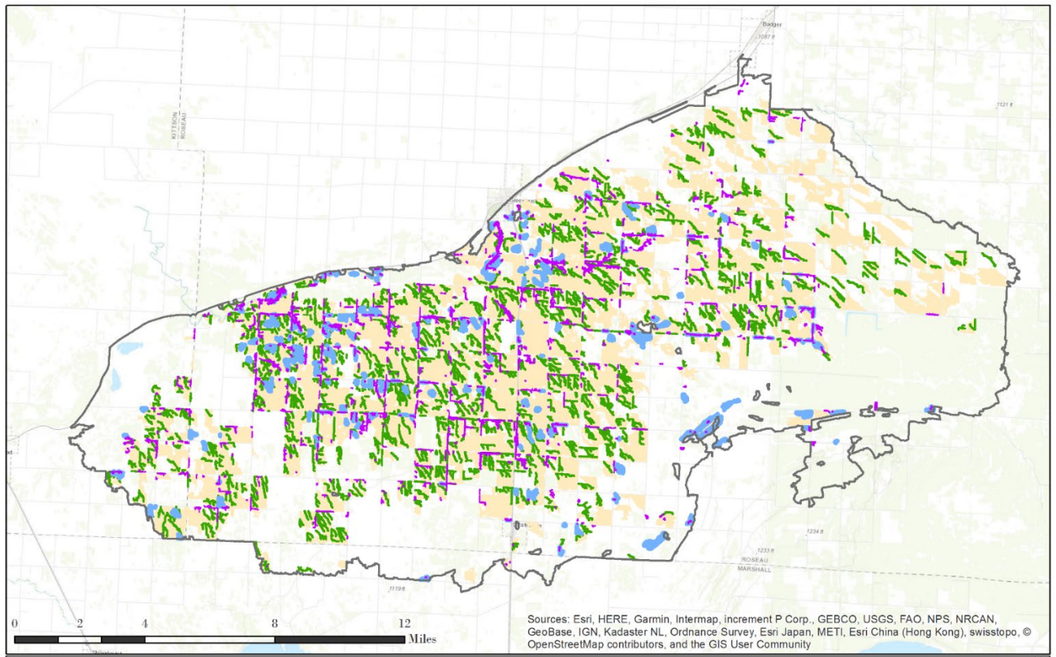
S.D. #91 Planning Zone

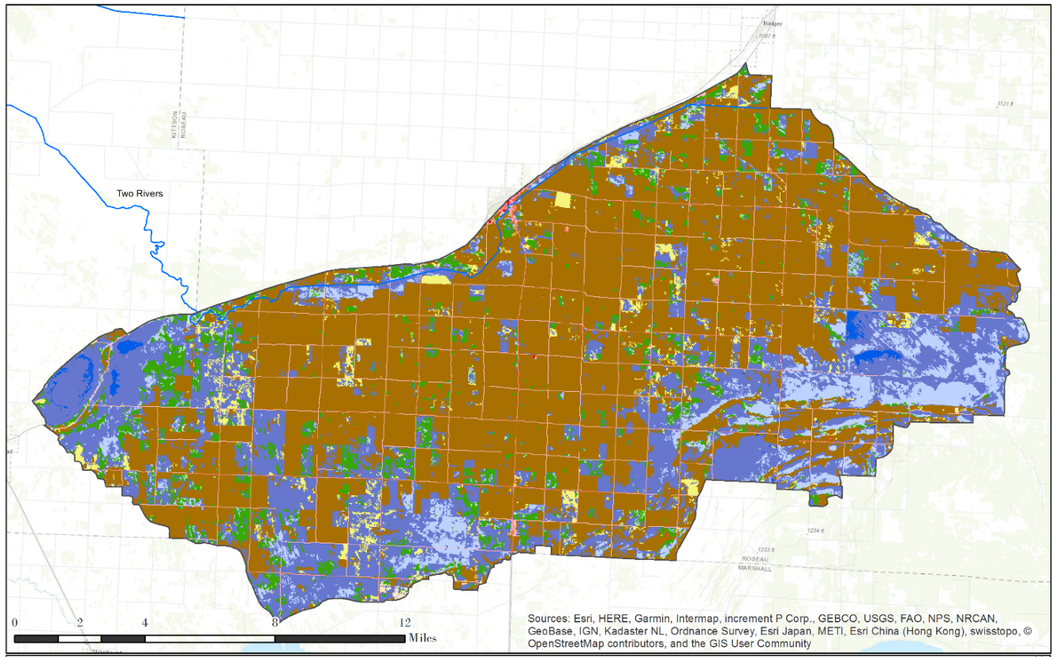
Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 6,667 tons of sediment, 24,425 pounds of Phosphorus, and 575,822 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 142 new projects, ½ mile of windbreaks, 430 acres of grazing systems and 250 acres/yr of habitat have been identified within the S.D. #91 Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.







State Ditch 91 South Branch Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$7,667**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*2*	*$15,334*																	
Funding Level 3	*3*	*$23,001*																	
Filtration Practices	**3**	**$4,395**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$4,395*																	
Funding Level 3	*4*	*$5,860*																	
Non-Structural Land Management Practices	**90**	**$1,710,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*130*	*$2,470,000*																	
Funding Level 3	*135*	*$2,565,000*																	
Protection	**2**	**$26,316**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*3*	*$40,974*																	
Funding Level 3	*4*	*$54,632*																	
Field Windbreak	**1/3 Mile Field Windbreaks**	**$666**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/2 Mile Field Windbreaks*	*$1,000*																	
Funding Level 3	*3/4 mile Field Windbreaks*	*$1,500*																	
Grassland restoration and wildlife habitat management	**200 acres/year**	**$100,000**	**NRCS/SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*250 acres/year*	*$125,000*																	
Funding Level 3	*275 acres/year*	*$137,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*2 wells sealed/year*	*$2,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**County/SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*2 System Upgrades*	*$20,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**320 acres**	**$8,000**	**NRCS/SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*430 acres*	*$10,750*																	
Funding Level 3	*500 acres*	*$12,500*																	
Total Funding Level 1 10-Year Cost		**$1,868,044**	**Total Level 1 10-Year Progress Toward Goals**							**68%**	**69%**	**70%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$2,689,453*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$2,821,993*	*Total Level 3 10-Year Progress Toward Goals*							*103%*	*105%*	*105%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.19 Implementation schedule and actions related to work in S.D. 91 Planning Zone

State Ditch #95 Planning Zone

Planning Zone Description

This area is approximately 160 square miles in size (10% of Two Rivers Plus planning area) and mainly comprises the drainage area of State Ditch #95. The landscape is characterized by cultivated land and pasture interspersed with wetlands and grassland. The slope is variable - in the upper 1/3 there is about 60 feet of fall, in the middle 1/3 about 40' of fall, and in the lower 1/3 about 5' of fall. MN highway 11 runs along the southern border of this planning zone, where the cities of Greenbush and Badger are located.

There are no major rivers in this zone, however Badger Creek and Skunk Creek are upstream of the City of Badger, tributary to SD 95. In turn, SD 95 is tributary to the South Branch Two Rivers upstream of Lake Bronson. Due to repetitive flooding and natural resources concerns, the TRWD has extensively studied this area. The Ross Impoundment was built in 2008, and the Klondike Clean Water Retention Project is in the planning stages.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the SD 95 planning zone, and these continue to be ongoing issues.

- ✓ Insufficient capacity of the main stem and laterals to the State Ditch #95 system. This contributes to out of bank flows and overland flooding, causing damage to ag land and infrastructure.
- ✓ Crossover of drainage systems from the north into the SD #95 system. This deals with the water that overflows from the Roseau River and enters the Two Rivers via the State Ditch #72 and its laterals.
- ✓ Crop loss from overland flooding during the growing season occurs over the entire subwatershed and is most prevalent along SD 95 between Badger and the Roseau-Kittson Co. line. Lateral 1 of SD #95 is subject to outflow to the south during runoff events, and Lateral 3 needs to be extended.
- ✓ Road & culvert washouts happen annually and are documented by road authorities. Impacts on the Juneberry road (County Road #7) are a major concern.
- ✓ Cattail & sediment blockage of existing drainage systems and field erosion are subwatershed wide problems that happen frequently.
- ✓ Stream flows were identified with the high flows too high, and the low flows too low. This results in an unnatural situation. It was noted that it would be better to develop a more sustained water flow in the channels throughout the year. A related problem is a high-water table resulting in housing & crop loss problems. These problems are happening across the entire subwatershed.
- ✓ Drought was viewed as a problem that is a concern when it happens. Problems arise with pasture and crop loss and also the capacity of shallow wells becomes limited.
- ✓ Natural resources and wildlife issues that were identified included erosion problems where fields enter main ditches, ditch bank erosion and sloughing, high level of suspended solids during runoff, flooding of nesting habitats, high population and disbursement of beavers, and loss of upland habitat due to flooding and excessive rains.
- ✓ Ditch bank erosion is a problem during high flows as ditch and stream banks erode, slough into the channel, and willows and other vegetation begin to grow. It was identified that a maintenance plan needs to be implemented in these areas, side slopes should be leveled, and culvert sizes should be reviewed.

The MPCA lists impairments for fish, macroinvertebrates and *E. coli* on SD 95, Lat1 SD 95, and RCD 13. The Planning Group has indicated that it is not necessarily important to address the fish and macroinvertebrate impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. DNA analysis to identify the sources of fecal contamination as indicated by excessive *E. coli* will aid in addressing these impairments. Impairments in this planning zone are listed in Table 5.1.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area is a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from excessively drained on ridges to very poorly drained basins. Many areas have been partially drained. The main crops are small grain, soybeans and hay. Native vegetation was mixed tall and short grass prairie with scattered woodland and brush. Primary resource concerns are wind erosion, dryness on sandy soils and wetness in low lying and seepy areas.

This small sub watershed is dominated by natural resource features common for a beach ridge area because the Campbell beach ridge runs along the southern border of this sub-watershed. Land use changes and gravel mining have altered the quality and quantity of natural resources in this sub watershed. A few large habitat blocks or conservation lands are present in this sub-watershed (4 WMA's and 2 SNA's). Habutats in these lands include rich fens, lowland shrub lands, and mesic prairies. Several wetland complexes have been drained (MCEA report). Some CRP lands are quite common with their greatest density in the northern and eastern portions of this sub watershed. Fire suppression in some areas has degraded some habitats. A grassland and forestland corridor exist along State Hwy 11. Lack of large habitat blocks and a lack of connectivity between existing grasslands, wetlands, brushlands, and woodlands limit the function of the terrestrial resources in this subwatershed.

Land use changes have altered the quality and quantity of natural resources in this sub watershed. The waterways in this subwatershed flow into Ditch 95 which becomes the South Branch Two Rivers. Agricultural lands dominate this subwatershed particularly in the western and southern portions. Almost all-natural waterways have been converted to ditches. These ditches and the remaining natural waterways provide some fish and aquatic habitat but most of these are probably limited to seasonal use. These small waterways are likely to provide spawning and rearing habitat for a variety of fish species. Fish habitat is somewhat limited by channelization of waterways and a flow regime characterized by periods of high flow and inundation and lengthy periods of extremely low flows that support a less diverse community.

Gravel along the beach ridge is the major nonrenewable resource available for consumption in this subwatershed, however actively mined pits are few. Renewable resources within the subwatershed include the harvesting of aspen, mostly on private lands and on wildlife management areas.

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: The potential to significantly improve fish and wildlife habitat in this subwatershed is good. In particular, actions should be taken to protect existing upland habitats (grassland, wetland, brushlands, woodlands), create some large habitat blocks, protect existing stable waterways, and stabilize existing unstable waterways. Reclamation of gravel pits should be considered whenever possible. Stream rehabilitation of ditch 95 between Pelan and Lake Bronson would connect this reach to natural habitats found upstream and downstream. Opportunities exist to address downstream water quality impairments by reducing sediment, nitrogen, and phosphorous loading to surface waters.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the S.D. #95 Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

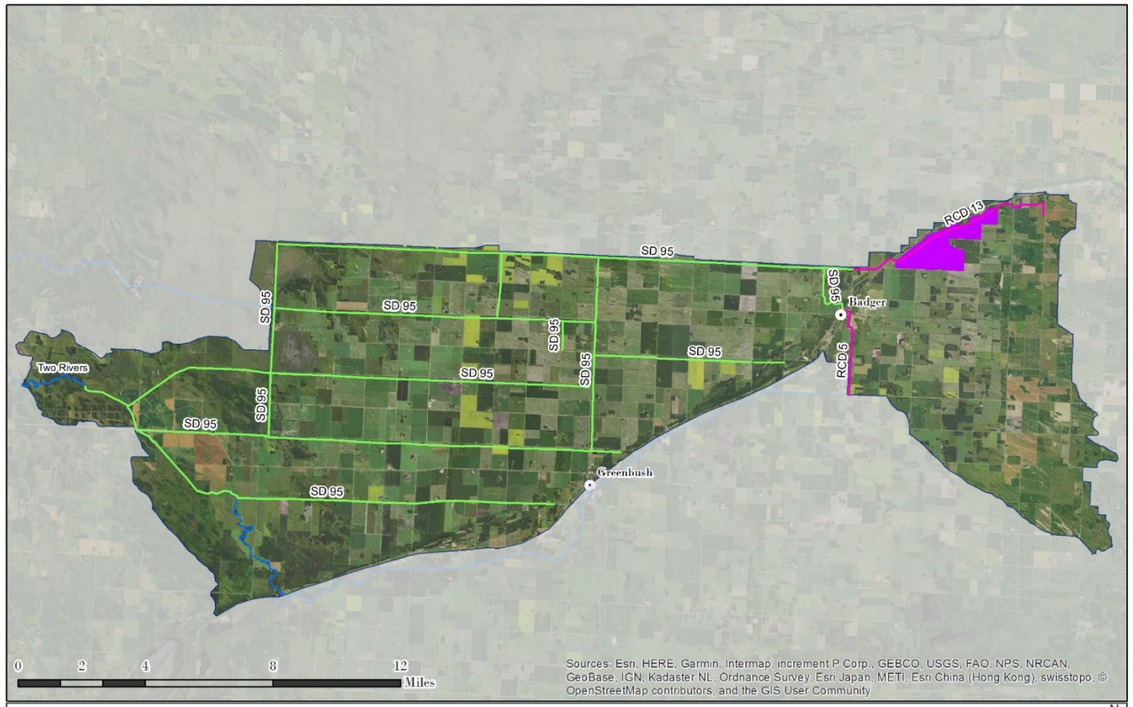
- excessive sediment loading to surface waters,
- excessive nutrient loading to surface waters,
- inadequate conveyance capacity of all watercourse,
- overland flood damages to communities, public infrastructure, rural homesteads and farmland
- inadequate field drainage system outlets and/or improper management of tile drainage
- algae blooms in Lake Bronson
- Excessive water erosion

Medium Priority Issues

- excessive bacteria loading to surface waters,
- instability of all watercourses,
- extreme flow fluctuations
- groundwater quality and quantity
- degraded wetland, aquatic, terrestrial, and riparian habitats
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind erosion
- inadequate feed/water supply/waste management

Table 5.20 S.D. 95 Goal Summary

State Ditch #95 Goal Summary					
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**	**Terrestrial Habitat**
2.5 % (126 tons/yr)	TP: 2 % (419 lbs/yr) TN: 0.70% (3,334 lbs/yr)	3 miles of ditches	10-year channel capacity on 10% of legal ditches	1/4 inch (3,075 ac-ft)	200 acres



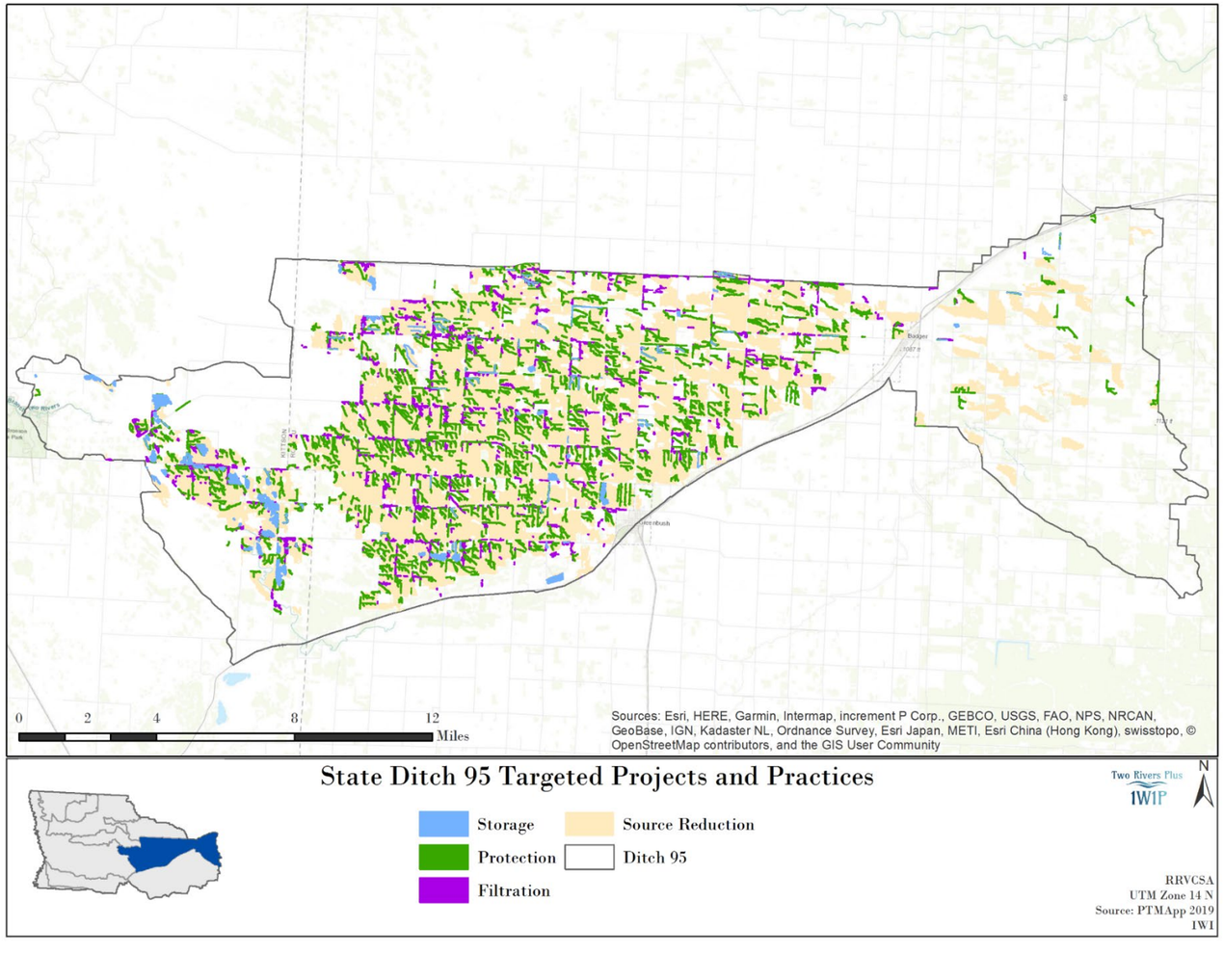
What's Been Accomplished – Existing Projects & Practices

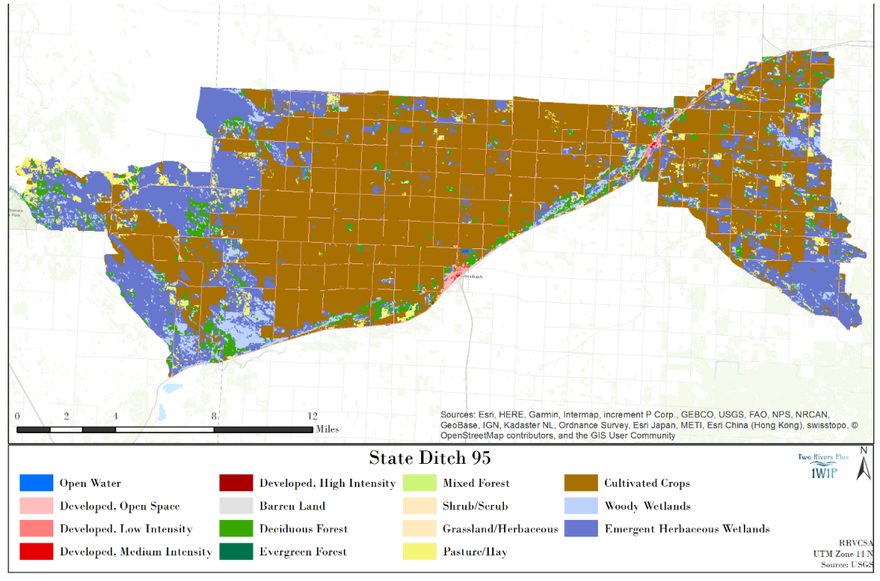
- **Ross Impoundment –** The impoundment is located 2 miles east of Badger MN, south of MN Highway 11, in the eastern end of the District. The impoundment consists of a main dike and outlet structure that can store a combination of gated and un-gated floodwater up to 3,600-acre feet. The impoundment can control the runoff from approximately 18.5 square miles. Over 300 acres was converted from farmland to wetland/upland habitat, and over 1,000 acres is farmed when not being used for flood control.
- The Roseau and Kittson SWCD's have implemented the **following projects** and practices.
  - 12 abandoned wells have been sealed
  - 98 acres of ditch buffers under clean water funding
  - 4,950 linear feet of field windbreaks
  - 3 side water inlets
  - 1 grade stabilization project
- **Groundwater Protection Plans** – The City of Badger is a 'Community Public Water Supplier', and the Badger Motel is a 'Transient Public Water Supplier'.

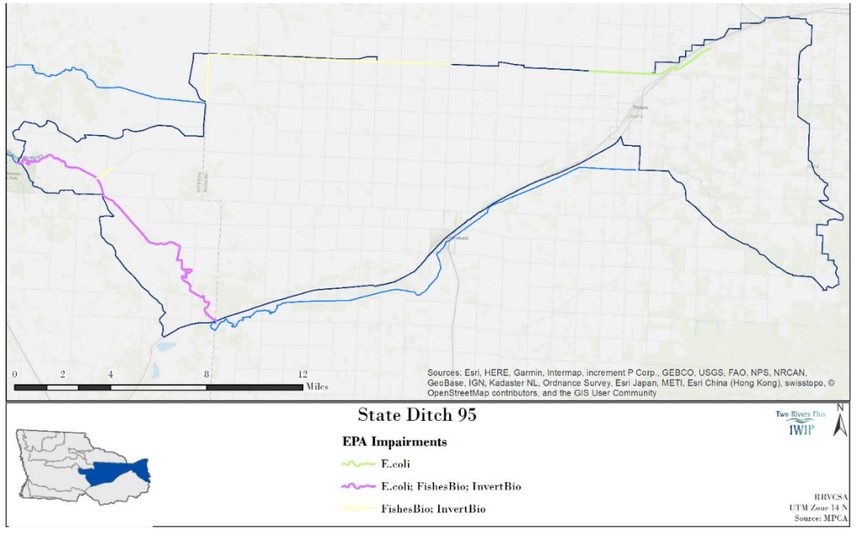
S.D. #95 Planning Zone

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates deliver to the Planning Zone outlet to be 5,051 tons of sediment, 20,980 pounds of Phosphorus, and 476,364 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 143 new project opportunities, ½ miles of field windbreaks, 250 acres/yr habitat, and 430 acres grazing systems have been identified within the S.D. #95 Planning Zone. Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.







State Ditch 95 South Branch Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$10,689**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*2*	*$21,378*																	
Funding Level 3	*3*	*$32,067*																	
Filtration Practices	**3**	**$4,491**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$4,491*																	
Funding Level 3	*4*	*$5,988*																	
Non-Structural Land Management Practices	**75**	**$1,425,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*125*	*$2,375,000*																	
Funding Level 3	*130*	*$2,470,000*																	
Protection	**4**	**$48,324**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$48,324*																	
Funding Level 3	*5*	*$60,405*																	
Field Windbreak/Shelterbelt	**1/3 Mile Field Windbreaks**	**$666**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1/2 Mile Field Windbreaks*	*$1,000*																	
Funding Level 3	*3/4 Mile Field Windbreaks*	*$1,500*																	
Grassland restoration and wildlife habitat management	**200 acres/year**	**$100,000**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*250 acres/year*	*$125,000*																	
Funding Level 3	*275 acres/year*	*$137,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*2 wells sealed/year*	*$2,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*2 System Upgrades*	*$20,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**320 acres**	**$8,000**	**SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*430 acres*	*$10,750*																	
Funding Level 3	*500 acres*	*$12,500*																	
Total Funding Level 1 10-Year Cost		**$1,608,170**	**Total Level 1 10-Year Progress Toward Goals**							**61%**	**70%**	**56%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$2,607,943*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*97%*	*92%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$2,741,960*	*Total Level 3 10-Year Progress Toward Goals*							*105%*	*103%*	*96%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.21: Implementation schedule and action related to work in S.D. #95 Planning Zone

South Branch Rivers Planning Zone

Planning Zone Description

This area is approximately 135 square miles in size (8.4% of Planning Area) and comprises the drainage area of State Ditch 49, the South Branch Two Rivers from Lake Bronson to Hallock, and the South Branch Two Rivers from Hallock to the Red River. The landscape is characterized by pasture, hay, grassland-wetland east of US Hwy 59 and intensive cropland west of US Hwy 59. The entire reach of the riparian corridor along the river is mostly wooded. Major landscape features include Lake Bronson State Park, featuring the 318-acre lake, managed by MN DNR. Topography is steep in upper reaches of the planning zone, and relatively flat in the downstream reaches. The area includes the cities of Halma, Lake Bronson, and Hallock.

The South Branch of the Two Rivers is the major watercourse in this planning zone. Legal ditches include State Ditch #48, State Ditch #49, Kittson County Ditch #12, Kittson County Ditch #21, Kittson County Ditch #21 Diversion 1 Improvement, and Kittson County Ditch #25. Major flooding occurs in the western end of the planning zone, associated with large Red River floods. Several farmstead ring dikes have been constructed to address the flooding problems.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the South Branch planning zone, and these continue to be ongoing issues.

- ✓ Crop land and pasture damage from flooding occurs west and northwest of the State Ditch #49 system, exacerbated by beaver dams affecting pastures and farmsteads along State Ditch #48 & SD #49.
- ✓ Lake Bronson dam, constructed in 1938, is at risk for failure. The MN Legislature appropriated funding to replace the dam in 2020 and project plans are being developed. The DNR has developed an Emergency Action Plan to notify agencies and the public regarding potential dam failures.
- ✓ Damage to roads, infrastructure, and homes in Norway, Deerwood, and Jupiter Townships and the City of Halma is due in part to water that overflows from this subwatershed.
- ✓ Lake Bronson, a eutrophic lake, experiences summertime algae blooms and large concentrations of phosphorous.
- ✓ Sedimentation is occurring in the upper reaches Lake Bronson, possibly due to the influence of the dam.
- ✓ The campgrounds and trail system at Lake Bronson State Park are at risk of periodic flooding.
- ✓ Out of bank flow during spring events caused by restricted flows from ice, debris and beaver dams affects areas near bridges, the Two River Golf Course, Gilbert Olson Park, and three to four homes upstream of Hallock.
- ✓ Residential and infrastructure damages is a potentially high risk in the Cities of Lake Bronson and Hallock, should Lake Bronson dam fail.
- ✓ Flood damage to campgrounds, dikes, Hallock dam, and Hallock dam spillway is a maintenance problem.
- ✓ Loss of life to livestock has been a problem along the river in past years between Lake Bronson and Hallock during spring runoff and summer rainfall events due to flooding and poor communication regarding operation of the dam.
- ✓ High flows are too high and low flows are too low, resulting in an unnatural hydrograph.
- ✓ Low flows during drought cause a water supply problem resulting in economic impact to the golf course.
- ✓ Excessive duration of flooding along the Red River compounded by local overland flooding from the eastern areas of the planning region contribute to road washouts, loss of cropland and pasture, and sedimentation to watercourses. This causes undue financial hardship to landowners.
- ✓ Slope failure on legal & private ditches in western 1/3 of planning zone cause banks to fail and large amounts of sediment to enter the system.
- ✓ Sedimentation due to wind erosion fills natural watercourses and ditches and adds to water pollution during runoff events.

The MPCA lists impairments for fish, macroinvertebrates, E. Coli, turbidity, and mercury on the South Branch Two Rivers and also on SD 49 for fish. The Planning Group has indicated that it is not necessarily important to address fish and macroinvertebrate impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. Impairments for this planning zone are listed in Table 5.1.

Natural Resources and Unique Water & Land Related Resources

Existing Resources: This area transitions from extremely flat landscape composed of thick lacustrine sediments to a complex of sandy beach material, stratified interbeach material, lacustrine silts and lake washed glacial till. Soils range from silty/clayey in texture to excessively drained on ridges to very poorly drained basins. Most areas are farmed with main crops being small grain, sugar beets, soybeans, and hay. The native vegetation was mixed tall and short grass prairie with scattered woodland and brush.

Noteworthy is the fact that the North Kittson Rural Water system has located all of its wells in this planning zone. These wells are the water supply for much of Kittson County, including the cities of Lake Bronson, Lancaster, Humboldt, and Hallock. It is of utmost importance to protect these wells and the integrity of the surficial channel outwash aquifer that they draw from.

Much historical value is associated with Lake Bronson State Park, the dam, and other structures, as they were constructed under the WPA in the 1930's.

Land use changes have altered the quality and quantity of natural resources in this subwatershed. Agricultural lands are common in this subwatershed. Large habitat blocks and conservation lands are only found along the eastern edge of this sub-watershed. CRP lands are also common in the eastern portion of this subwatershed. Quality natural habitats are found primarily in the rather narrow river corridor along the Two Rivers main stem. An overall lack of quality habitat limits the function of the terrestrial habitats in this sub watershed.

The South Branch is the primary waterway in this subwatershed. Very few natural waterways have been converted to ditches. These natural waterways and the ditches provide some fish and aquatic habitat but most of these are probably limited to seasonal use. These small waterways are likely to provide spawning and rearing habitat for a variety of species. The South Branch here has some high-quality fish habitats, but the channel has reaches that are quite unstable. Lake Bronson (an artificial lake created by damming the Two Rivers) provides a largemouth bass, panfish, northern pike, and walleye fishery. Flashy flows extended low flow or no flow periods, unstable channels, the dams at Hallock and Lake Bronson, beaver dams, high turbidity and a lack of riparian habitat limit the function of these aquatic resources. The dam in Hallock limited the diversity and abundance of fish in this subwatershed and has been replaced with a rock-riffle structure (2020).

In addition to these general habitat features, Natural Heritage elements have been documented in this sub watershed. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). All though there are no known state designated "outstanding resource value waters" or "critical vegetated habitat" as defined in state statutes have been found in this sub-watershed, Lake Bronson State Park is an area with Outstanding Biological Diversity, including 263 acres of federally listed critical butterfly habitat within the park boundaries. The park plays a large role in the Minnesota Prairie Conservation Plan, with seven of the park's thirteen native plant communities listed as globally significant.

Resource Improvement Opportunities: The potential to improve fish and wildlife habitat in this subwatershed is good. In particular, actions should be taken to protect existing habitats along waterways (grassland, wetland, brushlands, woodlands), protect the existing river corridor, create some large habitat blocks along this corridor, protect existing stable waterways, and stabilize existing unstable waterways. Land use changes, wetland restorations, and impoundments could be sited near waterways in this watershed and in upstream watersheds to reduce runoff during high flow periods and augment base flows during low flow periods.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the South Branch Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive sediment loading to surface waters due to wind and water erosion,
- instability of all watercourses,
- extreme flow fluctuations
- degraded aquatic habitats
- loss of longitudinal connectivity
- algae blooms in Lake Bronson
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind and water erosion

Medium Priority Issues

- excessive nutrient and bacteria loading to surface waters,
- low dissolved oxygen
- inadequate conveyance capacity of watercourses
- flood damage to public and private property and farmland
- ground water quality and quantity
- degraded riparian and terrestrial habitats
- inadequate field drainage system outlets / tile drainage management
- inadequate feed/water supply/waste management

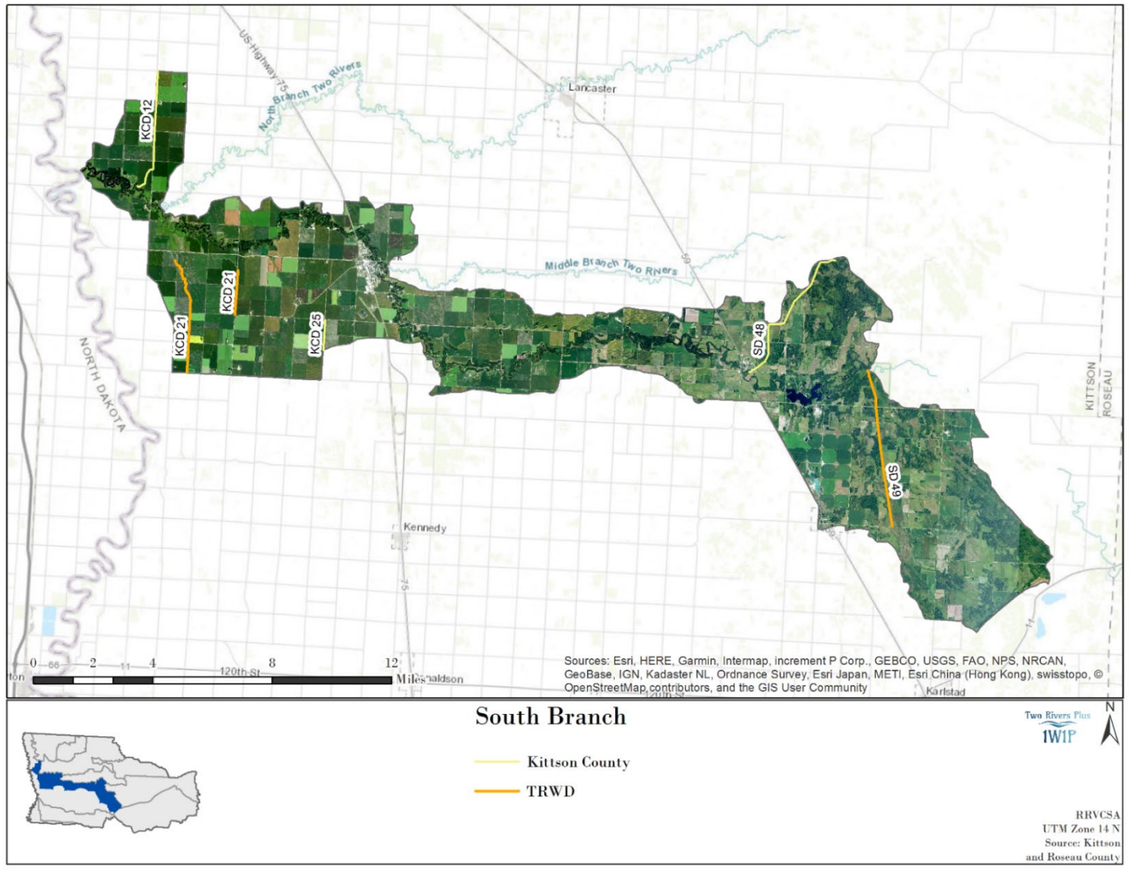


Table 5.22 South Branch Goal Summary

South Branch Goal Summary					
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**	**Terrestrial Habitat**
2.5 % (99 tons/yr)	TP: 1.8 % (247 lbs/yr) TN: 0.80% (2,148 lbs/yr)	0.5 miles of ditches and 2 miles of Streambank	10-year channel capacity on 5% of legal ditches	1/8 inch (941 ac-ft)	200 acres

What's Been Accomplished – Existing Projects & Practices

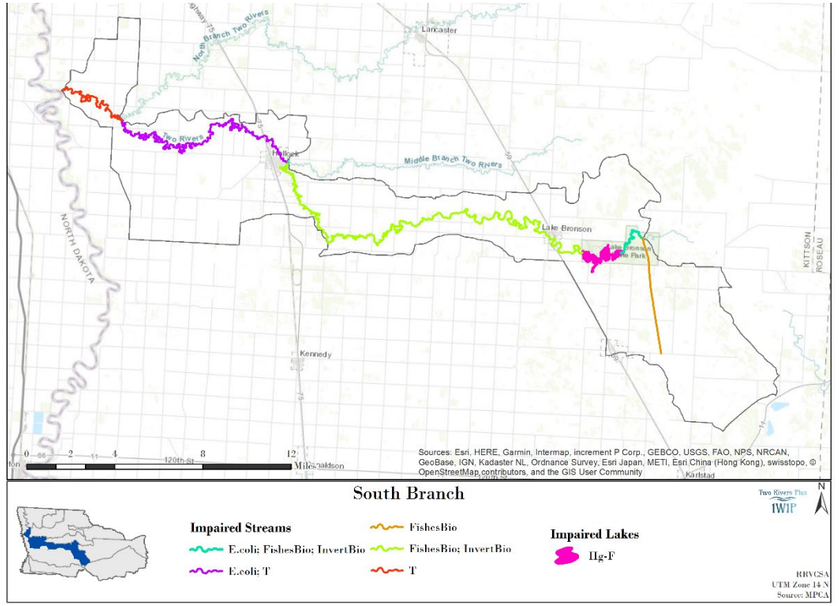
- Seven ring dikes have been constructed by the Two Rivers Watershed District to protect farmsteads from flooding.
- The City of Hallock has constructed dikes to protect homes and infrastructure from flooding.
- Groundwater Protection - North Kittson Rural Water constructed and maintains several water supply wells. Transient water suppliers are Lake Bronson State Park, Galilee Lutheran Bible Camp, and Bronson City (formerly Lakeside Bait & Deli).
- Over the past 10 years, the following practices have been implemented by the Kittson SWCD
  - Nine wells have been sealed
  - Two side water inlet structures
  - 610 linear feet of streambank stabilization
  - 2000 feet of field windbreaks
  - 217 acres of cover crops

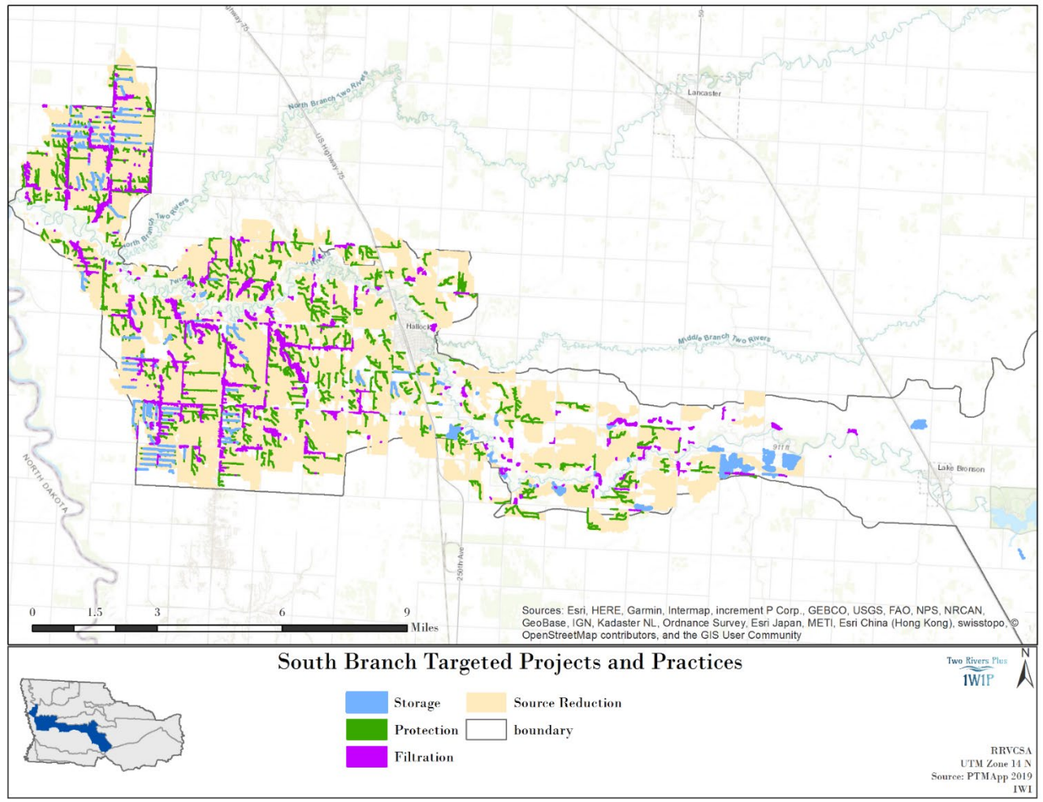
South Branch Two Rivers Planning Zone

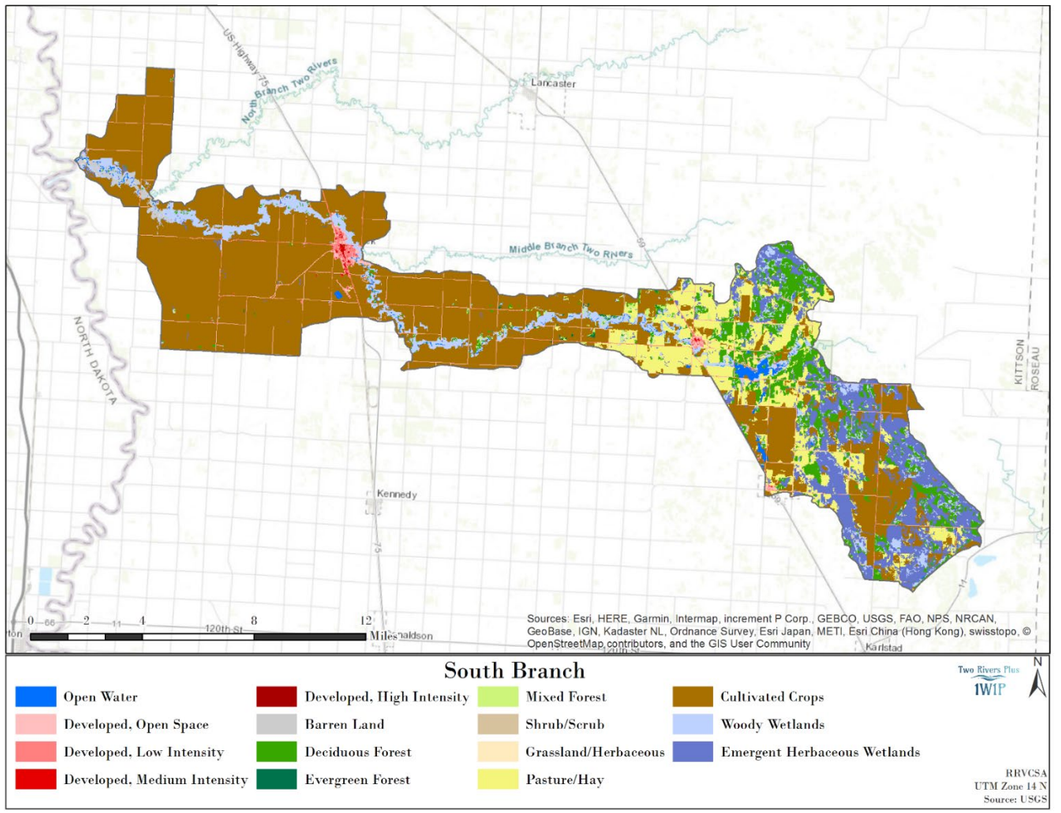
Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 3,976 tons of sediment, 13,763 pounds of Phosporus, and 268,609 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 78 new project opportunities, 1½ miles of field windbreaks, 250 acres/yr habitat, and 430 acres grazing systems have been identified within the South Branch Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.







South Branch Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**1**	**$11,147**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$11,147*																	
Funding Level 3	*2*	*$22,294*																	
Filtration Practices	**2**	**$4,384**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$6,576*																	
Funding Level 3	*4*	*$8,768*																	
Non-Structural Land Management Practices	**50**	**$950,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*65*	*$1,235,000*																	
Funding Level 3	*70*	*$1,330,000*																	
Protection	**4**	**$47,844**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*5*	*$59,805*																	
Funding Level 3	*6*	*$71,766*																	
Field Windbreak/Shelterbelt	**1 Mile Field Windbreaks**	**$2,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1.5 Miles Field Windbreaks*	*$3,000*																	
Funding Level 3	*2 Miles Field Windbreaks*	*$4,000*																	
Grassland restoration and wildlife habitat management	**200 acres/year**	**$100,000**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*250 acres/year*	*$125,000*																	
Funding Level 3	*275 acres/year*	*$137,500*																	
Well Sealings	**1 Wells sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*2 wells sealed/year*	*$2,000*																	
Funding Level 3	*2 wells sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*2 System Upgrades*	*$20,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Livestock Exclusion/ Rotational Grazing Systems	**320 acres**	**$8,000**	**SWCD**	**County, BWSR, MPCA, MDA**		**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**					**X**
Funding Level 2	*430 acres*	*$10,750*																	
Funding Level 3	*500 acres*	*$12,500*																	
	Total Level 1 10-Year Cost	**$1,134,375**		**Total Level 1 10-Year Progress Toward Goals**						**77%**	**77%**	**78%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
	Total Level 2 10-Year Cost	*$1,473,278*		*Total Level 2 10-Year Progress Toward Goals*						*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
	Total Level 3 10-Year Cost	*$1,608,828*		*Total Level 3 10-Year Progress Toward Goals*						*109%*	*111%*	*110%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.23: Implementation schedule and action related to work in South Branch Planning Zone

Unnamed Coulee Planning Zone

Planning Zone Description:

This Planning Zone is approximately 170 square miles in size (10.6% of Planning Area) and is characterized by pasture/grass/crp/forest in the east transitioning to cultivated land in the west. Numerous gravel pits have been excavated in this zone, and other major landscape features include the Halma Swamp, located west of the City of Halma. Topography is steep in the east and flat in the west. Cities in this zone are Halma and Kennedy.

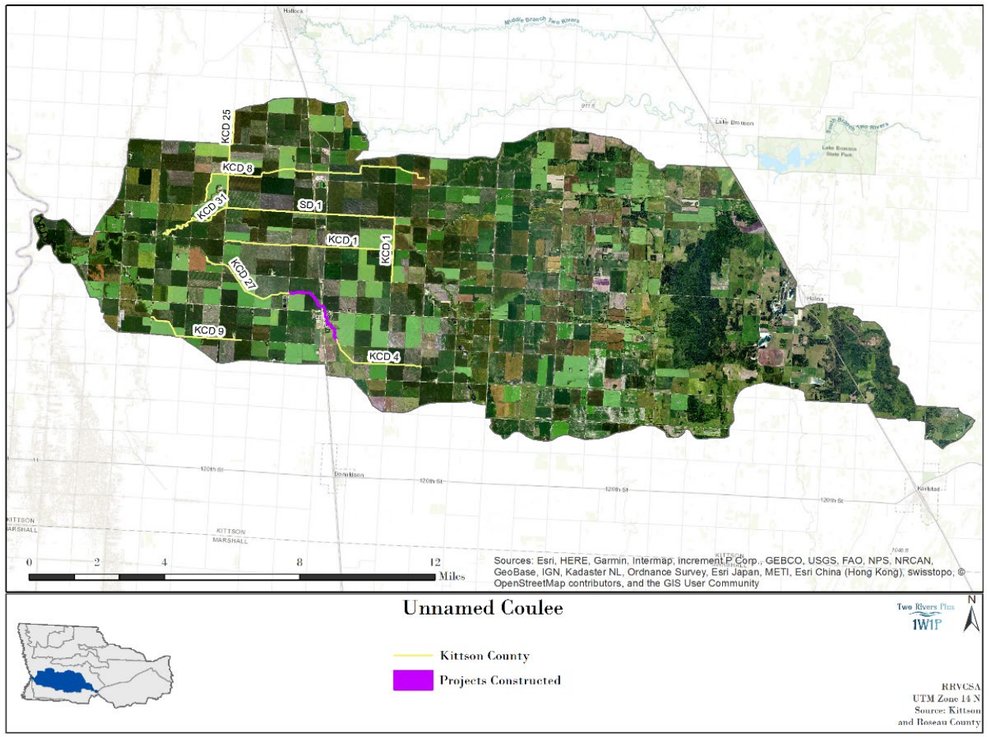
There are no rivers in this zone, and other watercourses include a network of coulees connected to the legal drainage ditches. The legal ditch systems are KCD 1, KCD 4, KCD 8, KCD 9, KCD 25, KCD 27, KCD 31, SD 1.

Existing Conditions, Related Potential Problems, and Solution Alternatives

Previous planning efforts have closely studied the area and have looked at the social and economic issues as they relate to Water Quantity, Water Quality, Erosion & Sedimentation, Fish & Wildlife, Water Based Recreation, & Unique Water or Land Related Resources. These past plans have identified the following issues for the Unnamed Coulee planning zone, and these continue to be ongoing issues.

- ✓ High flows on the Red River create problems for the outlets to drainage systems, coulees, and rivers that outlet into it. This is most apparent in Teien, South Red River, Svea, and Skane Townships.
- ✓ The ditch and coulee systems that occur within the planning zone are inadequately designed and cannot carry the high flows, resulting in overland flooding.
- ✓ In locations where ditch systems outlet into a coulee, a redesign of the system is needed to provide sufficient capacity to handle runoff from summer rainfall events.
- ✓ Overland flooding that crosses between subwatersheds is affecting infrastructure and individual farmsteads.
- ✓ As a result of spring runoff from snow melt, roads, culverts, bridges, and other infrastructure are damaged annually. Road authorities have mapped locations that experience repetitive damages.
- ✓ Waterways designated on the DNR Protected Waters map need to be maintained. Trees, brush, and other vegetation are becoming prevalent within coulee systems and needs to be removed in order for the systems to carry water.
- ✓ All legal and some private ditch systems are incurring damage to their side slopes. Maintenance needs to be done to keep the ditches properly functioning.
- ✓ Because of spring flooding, it is becoming an annual problem that spring planting of crops is delayed.
- ✓ In the ridge areas in the upstream parts of the sub-watershed, overland flooding and resultant erosion is a problem.
- ✓ Water levels in gravel pits are a problem for the owners & operators of these pits. Gravel pit dewatering is a potential problem for downstream landowners.
- ✓ High stream flows seem to be too high and low flows seem to be too low. It is desirable to achieve a more natural flow regime by minimizing the extreme unnatural variability.
- ✓ Wind erosion needs to be addressed. Some areas blow during the winter and spring resulting in siltation of the waterways and loss of topsoil.

The MPCA states that Kittson County Ditch #27 is impaired for fish, macroinvertebrates and total suspended solids. The Planning Group has indicated that it is not necessarily important to address fish and macroinvertebrate impairments if they are on a legal ditch with the specific purpose of drainage for agricultural lands. In the case that the impairments are on a natural watercourse then it is deemed important to address these concerns. Impairments for this planning zone are listed in Table 5.1.



Natural Resources and Unique Water & Land Related Resources

Existing Resources: The Red River Valley (Glacial Lake Agassiz) is an extremely flat landscape composed of thick lacustrine sediments. Soils range from silty to clayey in texture. Most soils have a high water table and are very productive. Saline soils exist in places. Most areas are farmed with main crops being small grain, sugar beets, and soybeans. The native vegetation was tall grass prairie. Primary resource concerns are soil erosion and deposition by wind.

Most of the fish and wildlife habitat in this planning zone has been altered due to land use changes, drainage, and channel modifications. Fish habitat is somewhat limited by channelization of some waterways and a flow regime characterized by periods of high flow and inundation and lengthy periods of extremely low flows that support a less diverse community. Wildlife habitat is limited by a lack of grassland and wetland habitat and limited connectivity of the habitat that remains. CRP land is almost exclusively limited to the eastern portions of this planning zone. A few remnant grassland habitat blocks are present in this sub-watershed and most wetlands have been drained (MCEA report).

In addition to these general habitat features, Natural Heritage elements have been documented in this planning zone. These heritage elements, found on public and private land, include rare and endangered birds, mammals, insects, and unique habitats (DNR heritage database). No known state designated “outstanding resource value waters” or “critical vegetated habitat” as defined in state statutes have been found in this sub-watershed.

Resource Improvement Opportunities: The potential to significantly improve fish and wildlife habitat in this sub-watershed is high. In particular, rehabilitating existing degraded channels (existing coulees) and buffer them with grasses has the potential to benefit fish and wildlife in this planning zone. Creation of one or two large grassland habitat blocks adjacent to a buffered waterway would provide substantial habitat in this planning zone. Land use changes, wetland restorations, and impoundments sited near the upper reaches of waterways in this watershed, where practical and feasible, could help reduce runoff during high flow periods and augment base flows during low flow periods. Opportunities exist in this planning zone to reclaim abandoned or unused gravel pits.

Planning Zone Goals

Short – term goals are defined as goals that can be accomplished within the 10-year planning period. Actions are identified as items that can be done to accomplish the goals. The high and medium priority issues were assigned short-term goals for the Unnamed Coulee River Planning Zone. The Planning Group will collectively implement projects and practices to make progress towards achieving these goals.

Priority Resources

Using input from public meetings, past planning efforts, SWCD & Watershed District Board members, County Commissioners, Citizen's Advisory Committees, and Technical Advisory Committees, the following high and medium issues were identified for this Planning Zone.

High Priority Issues

- excessive sediment loading to surface waters
- inadequate conveyance capacity of watercourses
- flood damage to farmland
- reduced soil organic matter/infiltration rates/water holding capacity
- excessive wind and water erosion
- inadequate field drainage system outlets / tile drainage management

Medium Priority Issues

- excessive nutrient loading to surface waters
- instability of all types of watercourses
- flood damage to communities, public infrastructure, and homesteads
- extreme flow fluctuations
- groundwater quality and quantity
- excessive salinity in soils

What's Been Accomplished – Existing Projects & Practices

- The Two Rivers Watershed District constructed the Kennedy #6 project at the request of the City of Kennedy. The purpose of the project is for flood control and water conveyance through the city. The channel project connects Kittson County Ditch #4 with Kittson County Ditch #27.
- The Kittson SWCD has implemented the following projects and practices.
  - Five abandoned wells have been sealed
  - Four side water inlets
  - 480 acres of cover crops
  - 6,600 linear feet of grade stabilization
  - 5,000 linear feet of field windbreaks

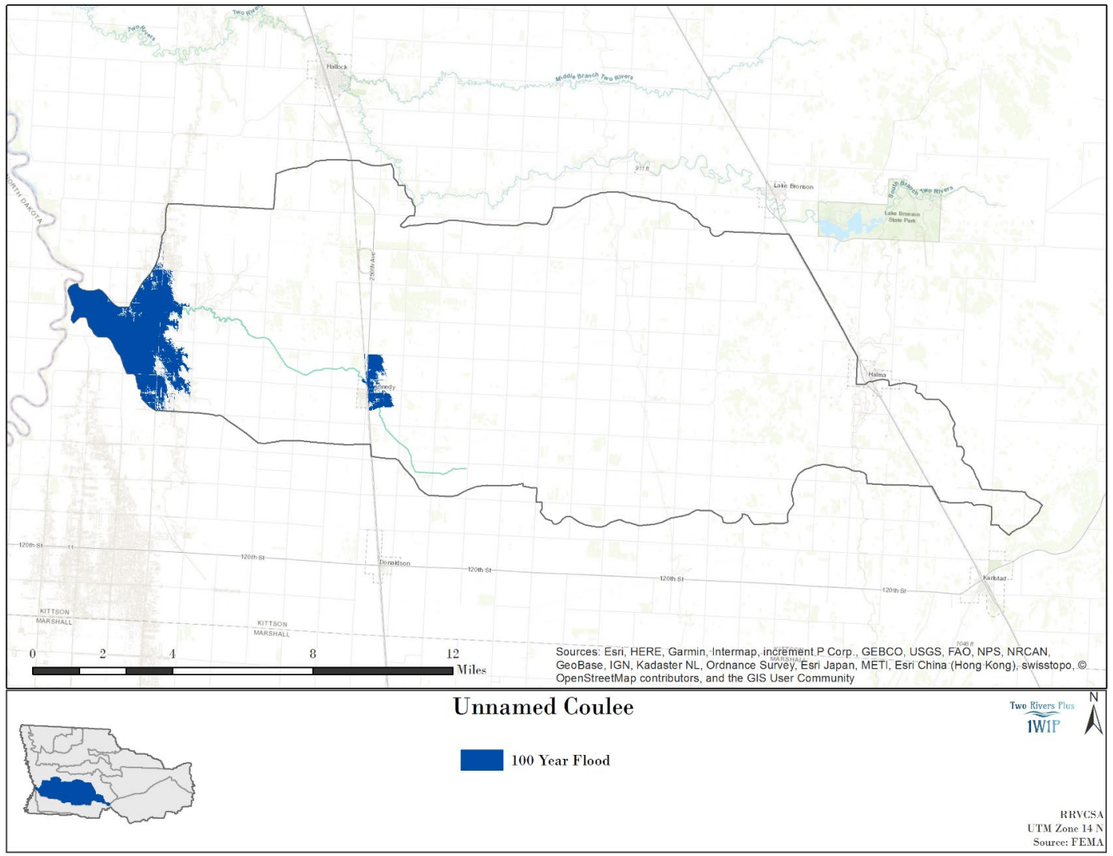


Table 5.24 Unnamed Coulee Goal Summary

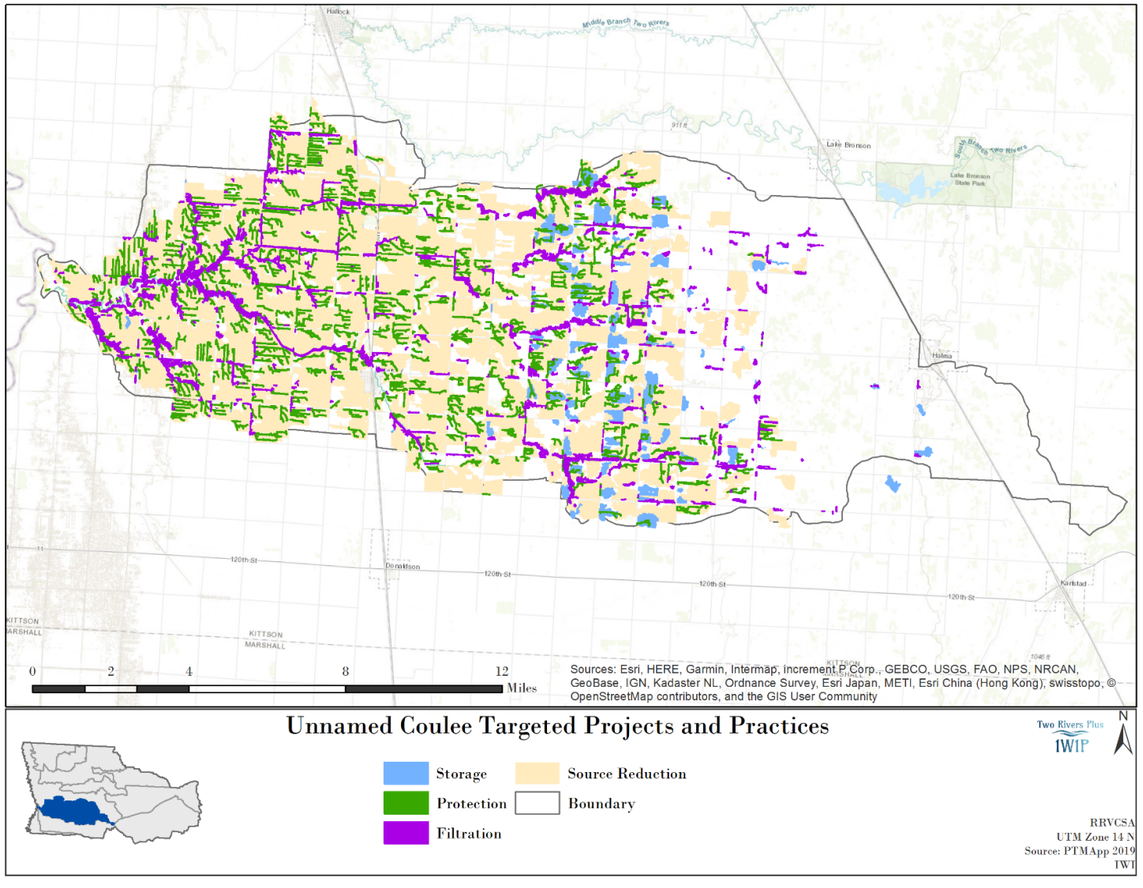
Unnamed Coulee Goal Summary				
Sediment	**Nutrients**	**Channel Instability**	**Conveyance Capacity**	**Runoff Reduction**
2.5 % (113 tons/yr)	TP: 2.0 % (395 lbs/yr) TN: 0.60% (2,269lbs/yr)	10 miles of ditches	10-year channel capacity on 10% of legal ditches	1/4 inch (2,217 ac-ft)

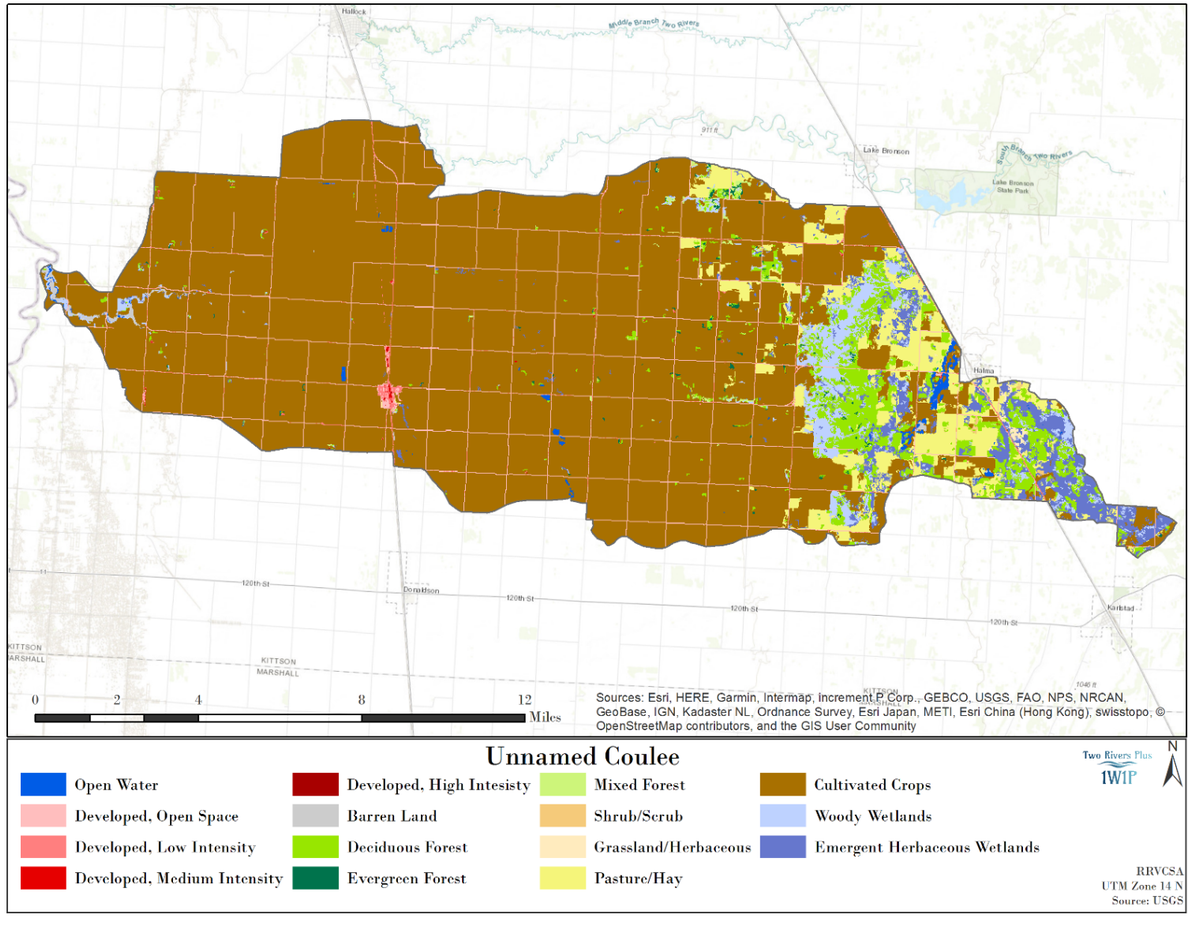
Unnamed Coulee Planning Zone

Feasible Projects and Practices - PTMApp

Focusing on the water quality elements of sediment, nitrogen, and phosphorous, PTMApp model results help to achieve the implementation of projects and practices. PTMApp model estimates delivery to Planning Zone outlet to be 4,516 tons of sediment, 19,777 pounds of Phosphorus, and 378,239 pounds of Nitrogen. Using PTMApp data, to prioritize and target implementation efforts, the Steering Team defined the best, most cost-effective projects to target as shown below. Based on implementation trends and workload 55 new project opportunities, 1½ miles of field windbreaks, and 50 acres/yr habitat have been identified within the Unnamed Coulee Planning Zone.

Implementation of these targeted projects and practices would make considerable progress towards multiple planning zone goals, as shown below and expanded upon in the targeted implementation schedule. It should be noted- these are not the only actions that will make progress towards plan goals. The targeted implementation schedules summarize these and additional actions the Steering Team will pursue during implementation.





Unnamed Coulee Planning Zone Actions			Responsibility		Timeline					Short-Term Measurable Goals									
Actions by BMP Type	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
Storage Practices	**0**	**$0**	**SWCD**	**WD, NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*1*	*$19,423*																	
Funding Level 3	*2*	*$38,846*																	
Filtration Practices	**2**	**$5,602**	**SWCD**	**WD, NRCS, BWSR**		**X**		**X**		**X**	**X**	**X**		**X**	**X**	**X**		**X**	**X**
Funding Level 2	*3*	*$8,403*																	
Funding Level 3	*4*	*$11,204*																	
Non-Structural Land Management Practices	**65**	**$1,235,000**	**SWCD**	**NRCS, BWSR**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**
Funding Level 2	*100*	*$1,900,000*																	
Funding Level 3	*105*	*$1,995,000*																	
Protection	**3**	**$42,210**	**County/WD**	**SWCD, BWSR, DNR**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2	*4*	*$56,280*																	
Funding Level 3	*5*	*$70,350*																	
Field Windbreak/Shelterbelt	**1 Mile Field Windbreaks**	**$2,000**	**SWCD**	**NRCS, BWSR**	**X**		**X**		**X**	**X**	**X**	**X**			**X**			**X**	**X**
Funding Level 2	*1.5 Mile Field Windbreaks*	*$3,000*																	
Funding Level 3	*2 Mile Field Windbreaks*	*$4,000*																	
Grassland restoration and wildlife habitat management	**Maintain acres**	**$0**	**SWCD**	**NRCS, BWSR, TNC DNR**	**X**	**X**	**X**	**X**	**X**	**X**						**X**	**X**	**X**	
Funding Level 2	*50 acres/year*	*$25,000*																	
Funding Level 3	*75 acres/year*	*$37,500*																	
Well Sealings	**1 Well sealed/year**	**$1,000**	**SWCD**	**MDH, BWSR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 2	*1 well sealed/year*	*$1,000*																	
Funding Level 3	*2 well sealed/year*	*$2,000*																	
SSTS Upgrades	**1 System Upgrades**	**$10,000**	**SWCD**	**County, MPCA, BWSR**	**X**	**X**	**X**	**X**	**X**				**X**						
Funding Level 2	*1 System Upgrades*	*$10,000*																	
Funding Level 3	*2 System Upgrades*	*$20,000*																	
Total Funding Level 1 10-Year Cost		**$1,295,812**	**Total Level 1 10-Year Progress Toward Goals**							**65%**	**63%**	**91%**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Funding Level 2 10-Year Cost		*$2,023,106*	*Total Level 2 10-Year Progress Toward Goals*							*100%*	*100%*	*100%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Total Funding Level 3 10-Year Cost		*$2,178,900*	*Total Level 3 10-Year Progress Toward Goals*							*106%*	*103%*	*106%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5.25: Implementation schedule and action related to work in Unnamed Coulee Planning Zone

Section 6: Watershed Wide Actions

In Section 5, projects and actions were split into planning zone profiles. There are other actions and programs that occur on a watershed wide scale that can also assist in achieving goals. These programs are the focus of this plan section.

- Capital Improvements
- Education & Outreach
- Data Collection, Monitoring and Analysis
- Regulation & Enforcement

Watershed wide implementation programs are the funding mechanism to implement actions and help make progress toward achieving plan measurable goals. Previously, watershed wide implementation programs were used by plan participants across the Two Rivers Plus Area but lacked unity. This plan establishes common implementation programs within the plan area and describes them conceptually. Specific details for execution may be needed before these watershed wide programs can be used.

6.1 Capital Improvements

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 Two Rivers Plus Planning Group. To be considered a capital improvement for purposes of this plan, a project must be operated and maintained by a Local Government Unit after completion.

Existing capital improvements are shown for each planning zone with a brief summary in **Table 6-1**. Additional discussions are needed among plan participants to develop the specific process for implementing capital improvements. Specifically, members of the Policy Committee or the Steering Team'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 improvements may use the Project Work Team process highlighted in the Flood Damage Reduction Work Group mediation agreement.

New capital improvement projects completed through this plan will be operated and maintained by the LGU of the project for the lifespan of the project.

Table 6-1 Existing Capital Improvements

Existing Capital Improvements			Operation, Inspection, Maintenance	Focus Area										
Capital Improvements	Description	Established	Lead	Direct to Red	Joe River	J.D. 10	Little Joe River	Middle Branch	North Branch	Unnamed Coulee	S.D. 72	S.D. 91	S.D. 95	South Branch
Middle Branch Project #1	*9.0 mile channel improvement*	1968; PL566	TWRD					x						
North Branch Project #2	*11.8 mile channel improvement*	1969; PL566	TRWD						X					
Soler Project #4	*5 mile extension of State Ditch 72*	1979; Project Petition	TRWD								X			
Dewey Project #5	*1.8 mile lateral to State Ditch #91*	1980 Project Petition	TRWD									X		
Nereson Impoundment Project	*3,600 Acrefoot Flood Control Impoundment*	1981; Board Initiated	TRWD									X		
Nereson Modification Project	*3,600 Acrefoot Flood Control Impoundment*	2005; Board Initiated	TRWD									X		
Dewey 5 Improvement Proejct	*Improvement of Dewey #5 Ditch System*	2002; Project Petition	TRWD									X		
Horseshoe Lake Project	*Drawdown Structure*	2006; Kittson Co. DNR, TRWD	TRWD						X					
Kennedy Project #6	*2.6 mile ditch connect KCD4 & KCD27*	2009; Project Petition	TRWD							X				
Ross Project #7	*3,600 Acrefoot Flood Control Impoundment*	2007; Board Initiated	TRWD										X	
Springbrook Proejct #10	*Setback dikes and SWI's along 8.65 mile waterway*	2013; Project Petition	TRWD			X								
Polonia Clean Water Retention Project #12	*1,100 Acrefoo Flood Control and Wetland restoration*	2018; NRCS, TRWD	TRWD										X	

Any issues that require repairs that are above and beyond regular operation and maintenance related to these existing capital improvements falls under the definition stated previously to be considered for purposes of this plan.

6.1.1 Future Capital Improvements

MN Statute 103D – Watershed Law:

This statute allows a watershed district to undertake projects for various water management purposes, including ditch and watercourse work, water control works, and water use and conservation. Projects can be instituted by petition or by board action. There are currently no new capital improvement projects being contemplated at this time under this statute. The watershed districts within the planning area will undertake projects as the need arises.

MN Statute 103E – Drainage Law:

Under this statute several types of activities can be done regarding drainage ditches. This includes new construction, improvement of an existing ditch, improvement to an outlet of a ditch, new laterals to an existing ditch and impounding, rerouting, and diverting water associated with a drainage ditch. Generally, a project petition from affected landowners is required to initiate a project. Currently there are no active petitions regarding drainage ditches. However, if a petition is received the appropriate ditch authority will proceed with the project according to law.

Red River Basin Flood Damage Reduction Work Group & Mediation Process:

The Mediation Process will continue over the course of the next 10 years. This is a process that was set up as a result of an Environmental Impact Statement (EIS) that was done by the U.S. Army Corps of Engineers and the Minnesota DNR in the early 1990's, which was intended to assess the cumulative impact of flood control

impoundments built by Watershed Districts within the Red River Basin. Disagreement over the outcome of the EIS led to a judge's decision that the USACE, DNR, and RRWMB enter into mediation to settle their differences.

A committee consisting of all possible "stakeholders" in the Red River Basin was put together, known as the Red River Basin Flood Damage Reduction Work Group. This work group was made up of representatives of various federal, local, and state agencies as well as environmental advocate organizations. A Mediation Agreement was written which is to be used to guide a possible flood control impoundment project through the permitting process. Each project will now address the problem, the proposed solution, and any possible alternatives. Each project will also now be assessed as to its flood control benefits, wildlife benefits, ecological benefits, etc. The District will strive to implement - both in conjunction with other agencies and on its own - natural resource enhancement alternatives as well as flood damage reduction alternatives in any project that is under consideration. This will be accomplished through the project work team process.

Each Watershed District on the Minnesota side of the Red River has now formed its own "project work team" which addresses flood control projects and reports back to the overall Work Team. The Two Rivers Watershed District assembled its Local Mediation Project Work Team and holds meetings throughout each year regarding flood control impoundments and other projects. This work team is made up of representatives of the Minnesota DNR, Board of Water & Soil Resources, Minnesota Pollution Control Agency, Kittson & Roseau County Commissioner and staff, Kittson & Roseau County SWCD's, local citizens, U.S. Fish &Wildlife Service, Audubon Society, Two Rivers Watershed District, and The Nature Conservancy. Other interested parties are welcome to sit in on meetings and listen to discussion.

There is one active project work team currently. This team is working toward design and implementation of the Klondike Clean Water Retention Project. Other project work groups will be convened as necessary by the Board of Managers of the TRWD.

	Two Rivers Plus Planning Area: Capital Improvement/ Operations and Maintenance			Responsibility		Timeline					Short-Term Measurable Goals									
	Actions	Output (Number of Practices)	Total 10-Year Cost	Lead	Partner	2021-22	2023-24	2025-26	2027-28	2029-30	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/ Channel	Conveyance Capacity	Hydrology/ Flood	Groundwater	Natural Resource	Ag Productivity
1	**Maintain public drainage infrastructure to provide adequate drainage while minimizing upstream and downstream flood damages and impacts on water quality**	**Total Number of miles of ditch**	**$3,300,000**	**Drainage Authorities**	**NRCS, BWSR**	X	X	X	X	X	X	X	X		X	X	X		X	X
2	**Stabilize legal ditches by re-sloping the ditch banks; the project will also include side water inlet structures where needed.**	***See Section 4 Measurable Goal Page 66 26 Total Number of Miles***	**$0**	**Drainage Authorities**	**FEMA,NRCS, BWSR**	X	X	X	X	X	X				X	X	X		X	X
	Funding Level 3		**$1,950,000**																	
3	**Klondike Clean Water Retention Project #11**	***See Section 6.1.2***	**$0**	**TRWD**	**NRCS, BWSR, DNR, MPCA, Enbridge, RRWMB, LSOHC**	X	X	X	X	X	X	X	X		X	X	X		X	X
	Funding Level 3		**$25,000,000**																	
4	**Provide a channel capacity for up to a 10-year runoff event on 10% of legal ditch systems in high priority areas 5% in medium priority areas**	***60 Miles***	**$0**	**WD; Drainage Authorities**	**SWCD, BWSR, DNR, RRWMB**	X	X	X	X	X					X	X	X			X
	Funding level 3 by petition		*$6,000,000*																	
5	**Remove Northcote dam to increase connectivity**	***1***	**$0**	**DNR**	**NRCS, BWSR**	X	X	X	X	X						X			X	
	Funding Level 3	*1*	*$50,000*																	
6	**Implement a series of runoff reduction BMPs to reduce average annual runoff in high and medium priority zones**	***See Section 4 Measurable Goal Page 68 15,000 Total acre-feet***	**$0**	**SWCD**	**WD, NRCS, BWSR, TNC DNR**	X	X	X	X	X	X	X	X		X	X	X		X	X
	Funding level 3		*$30,000,000*																	

Table 6-2: Capital Improvement/ Operations and Maintenance

1. This action refers to maintenance activities undertaken by a drainage authority and authorized under MN Statute 103E.705. This ditch maintenance does not normally constitute a capital project, but because of One Watershed One Plan requirements of the Board of Water and Soil Resources this maintenance activity is listed here in the capital improvements section. Funding for maintenance and repair under this statute is set by an annual levy determined by the Drainage Authority and certified to the County Auditors. Maintenance activity, if any, is determined after an annual inspection is performed and / or survey data is compiled and reviewed by the drainage inspector and the drainage authority.
2. If after the annual inspection it is determined that a portion of a legal ditch is unstable due to bank sloughing, water erosion, sediment deposition due to wind, sedimentation, erosion from open inlets and tributaries or other forces, re-sloping may be done in accordance with MN Statute 103E.715. This also would not necessarily constitute a capital improvement project, however due to Board of Water and Soil Resources plan requirements, it is listed here.
3. This capital improvement project was initiated in 2017 and is an on-going project.
4. This provision would be done only if a watershed district received a petition for an improvement to an existing system, a new system, a lateral to an existing system, or an improvement of an outlet in accordance with MN Statutes 103E.212, 103E.215, 103E.221 or 103E.225. In most cases this could be a capital improvement project and portions of the project would be eligible for clean water funds. These types of projects would only be undertaken if and when a required petition and bond are filed. Because of the required bond and petition, the number of miles listed, and funds needed are only an estimate.
5. This item most likely will not be undertaken by any of the plan partners, however it is listed here because the partnership will support the project because it would address the plan goal of improving connectivity.
6. More information is needed to determine if this item would be cost effective and socially / economically feasible. It is assumed existing cost share programs could be utilized, but a very large number of projects would be needed to achieve the acre feet of storage needed.

6.1.2 On-going Capital Improvements

Klondike Clean Water Retention Project #11:

During the wet years of the 1990's, a group of landowners came to the TRWD asking for help with severe and repeated flooding problems. The TRWD Board of Managers convened the 'Big Swamp Project Work Team' to study the problem and come up with solutions. From 2008 to 2012, the BSPWT met to identify the problem, discuss potential solutions, and come up with a range of alternatives.

From 2012-2015 the TRWD investigated the range of alternatives, and ultimately decided to move forward with a large-scale impoundment. The impoundment was based upon the BSPWT recommendations and intended to accomplish significant flood damage reduction as well as achieving natural resource enhancements. The District purchased 12 square miles of land with the assistance of the Red River Watershed Management Board and initiated the project.

Proceeding under MN Statute 103D, the TRWD appointed HDR Engineering to conduct the necessary survey work, soil borings, and other data collection needed to prepare an Engineer's Report. In addition, the TRWD was awarded cost share funding through the Natural Resources Conservation Service to prepare a Plan & Environmental Assessment for the proposed project.

The Engineer's Report was completed in accordance with MN Statute 103D, and a public hearing was held on November 1, 2017. The Board of Managers officially accepted the Engineer's Report and ordered the preparation of detailed plans and specifications. Work is proceeding with the NRCS Plan / EA. The District is proceeding with project design, permitting, funding, and other project aspects.

The project is expected to be constructed over time in 3 phases (Phase 1: $13,000,000, Phase 2: $5,000,000, Phase 3: $7,000,000) and when complete will be able to store up to 40,000 acre feet of floodwater, provide an adequate outlet for Lateral 1 of State Ditch 95, store a portion of the overflows that enter the TRWD from the Roseau River, address flooding on the Red River, will help to protect and enhance a high quality prairie rich fen complex, will provide fish habitat and flow augmentation on 65 river miles, and will significantly reduce sediment, nitrogen, and phosphorous to benefit water quality in the Middle and South branches of the Two Rivers.

6.1.3 Drainage

As highlighted throughout this plan, parts of the Two Rivers Plus Plan Area have extensive public drainage system. Goals associated with drainage include bank stabilization, and 10-year event conveyance capacity. These goals are highlighted in Section 4 Measurable Goals. In order to achieve these goals local ditch authorities may develop 5-year ditch maintenance and inspection plans. Any issues related to these capital improvement drainage systems falls under the definition stated above to be considered for purposes of this plan. The cost associated with capital improvements within these drainage systems lays heavily on the systems tax levy balance. Each ditch system has different tax levy rates. The table and map below show all legal drainage systems, 2021 tax levy rates and the ditch

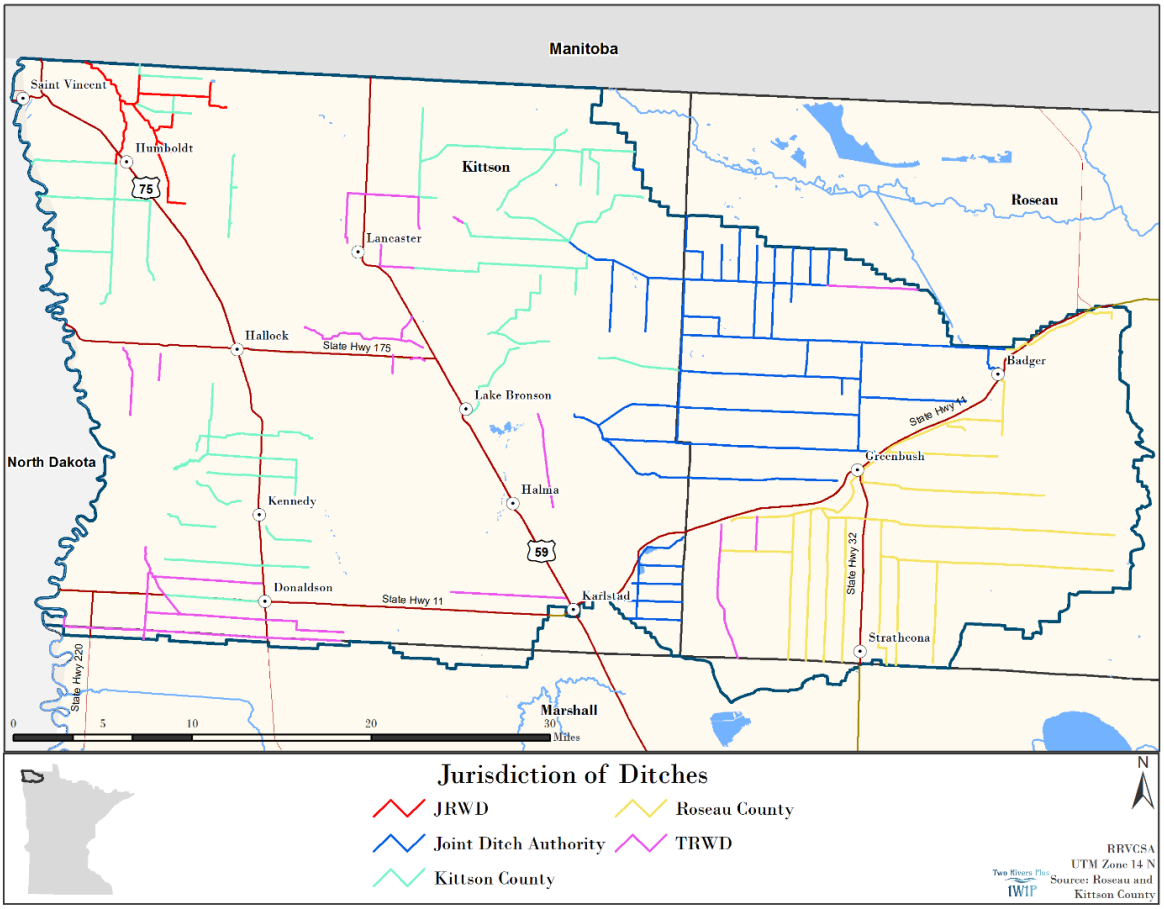
authorities. Each ditch authority manages the ditch fund and is responsible for the inspection, operation and maintenance of the ditch as described in statute.

Table 6-2: Two Rivers Plus Legal Ditch Systems.

Legal Ditch Systems	Sub watershed Location	Ditch Authority	2021 Certified Levy
Kittson County Ditch #1	Unnamed Coulee	Kittson County	$0
Kittson County Ditch #4	Unnamed Coulee	Kittson County	$5,500
Kittson County Ditch #7	J.D. 10	TRWD	$5,000
Kittson County Ditch #8	Unnamed Coulee	Kittson County	$8,000
Kittson County Ditch #9	Unnamed Coulee	Kittson County	$8,000
Kittson County Ditch #10	J.D. 10	TRWD	$14,000
Kittson County Ditch #12	Joe River; South Branch	Kittson County	$5,000
Kittson County Ditch #13	North Branch	Kittson County	$7,500
Kittson County Ditch #14	North Branch	Kittson County	$2,000
Kittson County Ditch #15	Middle Branch	Kittson County	$0
Kittson County Ditch #16	J.D. 10	Kittson County	$0
Kittson County Ditch #17	Joe River	Kittson County	$0
Kittson County Ditch #18	North Branch	Kittson County	$0
Kittson County Ditch #19	J.D. 10	Kittson County	$17,500
Kittson County Ditch #20	Joe River	Kittson County	$3,500
Kittson County Ditch #21	South Branch	TRWD	$55,000
Kittson County Ditch #21 Lateral 1	South Branch	TRWD	$25,000
Kittson County Ditch #22	Little Joe River	Kittson County	$2,500
Kittson County Ditch #23	Middle Branch	Kittson County	$5,000
Kittson County Ditch #25	Unnamed Coulee	Kittson County	$2,500
Kittson County Ditch #26	Direct to Red	Kittson County	$0
Kittson County Ditch #27	Unnamed Coulee	Kittson County	$4,500
Kittson County Ditch #28	Joe River; Direct to Red	Kittson County	$3,000
Kittson County Ditch #29	Joe River; Direct to Red	Kittson County	$0
Kittson County Ditch #30	Joe River	Kittson County	$1,000
Judicial Ditch #3	J.D. 10; Direct to Red	TRWD	$0
Judicial Ditch #10	J.D. 10	TRWD	$6,500
Judicial Ditch #31	North Branch	Kittson County	$11,500
Judicial Ditch #32	North Branch	Kittson County	$0
Judicial Ditch #33	S.D. 72	Joint Ditch Authority	$0
Roseau County Ditch #4	S.D. 91	TRWD	$5,000
Roseau County Ditch #5	S.D. 95	Roseau County	$2,555*
Roseau County Ditch #13	S.D. 95	Roseau County	$3,996*
State Ditch #1	Unnamed Coulee	Kittson County	$6,000
State Ditch #48	South Branch	Kittson County	$1,000
State Ditch #49	South Branch	TRWD	$0
State Ditch #50	Middle Branch	Kittson County	$0
State Ditch #72	S.D. 72	Joint Ditch Authority	$31,711*
State Ditch #84	North Branch	Kittson County	$20,000
State Ditch #85	S.D. 72	Kittson County	$0
State Ditch #85 Improvement	S.D. 72	TRWD	$0
State Ditch # 90	S.D. 95	Joint Ditch Authority	$20,853**
State Ditch #91	S.D. 91	Roseau County	$21,259*

State Ditch #95	S.D. 95	Joint Ditch Authority	$0

*2020 Roseau Co. Levy
**2020 Roseau County Levy plus 2021 Kittson County Levy



All drainage authorities are also partnering agencies for the Two Rivers Plus 1W1P. Working within the auspices of the drainage law, drainage authorities will be encouraged to coordinate drainage activities when possible with implementation of the targeted implementation schedule in order to make progress towards measurable goals. This includes maintenance of watercourses, providing ditch capacity to carry a 10-year runoff event, managing sediment delivery, providing storage, attenuating flows, and improving aquatic habitat where prudent and feasible. Implementation funds are available to MN Statute 103E drainage authorities to adopt drainage actions in the targeted implementation schedule (**Section 5**) specific to measurable goals. Potential projects could include side water inlets and grassed buffers to provide sediment reduction and storage within the planning area.

6.1.4 Long Term Protection

Wetland and grassland loss and modification is an ongoing concern in the Two Rivers Plus Planning Area. As such, this plan includes a measurable goal focused on restoring and protecting wetland and upland areas (Section 5). Long term protection is defined as perennial cover for more than 10 years and is one strategy for making progress towards the

watershed wide goal of maintaining or improving 1,000 acres of terrestrial acres while maintaining no net loss of wetland acres. This may include grassland restorations, wildlife habitat improvements, private easements or public protection areas.

Implementation of maintenance plans on currently protected areas is a major concern in the Two Rivers Plus Planning Area. All permanent protection lands should have a maintenance plan that will be followed by the respective lead agency or owner.

6.2 Data Collection, Monitoring, and Analysis

The Data Collection, Monitoring, and Analysis Implementation Program funds actions which close information and data gaps and continue the development and assembly of existing data and information. A large portion of these data and information are water quality monitoring data.

The Data Collection, Monitoring, and Analysis Implementation Program is dedicated to enhancing and maintaining the existing monitoring network in the Two Rivers Plus 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. Surface and groundwater quality monitoring and analysis throughout the Two Rivers Plus includes efforts (not all-inclusively) from the TRWD, International Water Institute (IWI), SWCDs, MPCA, DNR, MDA, and MDH.

Monitoring program efforts currently supporting the tracking of surface water quality and groundwater supply quantity and quality trends in the Two Rivers Plus include:

- TRWD – snow survey, flood statements, water quality monitoring, stream flow monitoring, culvert inventory and GPS surveying.
- Counties – AIS boat inspections.
- SWCD's – DNR Observation Well, Rain Gauge Monitoring Program,
- MDH oversee water quality monitoring for all public water supply systems.
- MDA- assesses nitrate-nitrogen concentrations in private wells at the township scale.
- MPCA –responsible for working alongside MDH and MDA to establish ambient groundwater quality monitoring network throughout MN. Follow surface water monitoring processes highlighted through WRAPs. Performs fish and macroinvertebrate surveys. Regulates wastewater treatment and disposal, stormwater management, feedlots, mining and non-ag pesticides near water.
- DNR – Conducts MN County Biological Survey, vegetation surveys, wildlife surveys, and ecosystem mapping. Also conducts water quality monitoring, fish surveys and geomorphology studies.
- USGS – Flow and water quality monitoring
- Cities and Townships – install water supply systems and are required to comply with the rules and regulations, including monitoring of drinking water supplies and effluent discharges from sewage treatment ponds, set by the state agencies and county governments for groundwater protection and uses in compliance with the Safe Drinking Water Act. Local cities and townships are also responsible for developing wellhead monitoring and protection plans in accordance with the MDH rules.

Local entities continue to pursue funding to assess and monitor water quality in the Two Rivers Plus Planning Area to fill identified data gaps, compare results, 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 determine level of impairment and achieve measurable goals will be completed by local and partnering entities. Additional monitoring and data collection actions are highlighted in **Table 6-3**.

PTMApp was the primary model used for planning purposes of this plan. During implementation, the Data Collection, Monitoring, and Analysis Implementation Program will build on the data and information processes already established by plan participants. Using other analysis methods and models such as SAM, HSPF, and WRAPs will allow the Steering Team to compare results across different sources. 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 Collection, Monitoring, and Analysis 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.

Table 6-3: Data Collection and Monitoring Plan

Two Rivers Plus Data Collection & Monitoring Implementation				Responsibility		Timeline					Short-Term Goals and Multiple Benefits									
DCM Actions	**Output**	**Unit Cost**	**Total 10-Year Cost**	**Lead**	**Partner**	**2020-21**	**2022-23**	**2024-25**	**2026-27**	**2028-29**	**Sediment**	**Nitrogen**	**Phosphorus**	**Bacteria**	**Streambank/Channel**	**Conveyance Capacity**	**Hydrology/Flood**	**Groundwater**	**Natural resource**	**Ag Productivity**
Continue surface water monitoring	**Annual Program Implementation**	**$150/site 10 sites 6 times/year**	**$90,000**	**SWCD/WD**	**MPCA**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**						
Funding Level 3	20 Sites/ Year	$18,000/ Year	$180,000																	
Conduct/continue a groundwater monitoring program	**1 Well**	**$300/ Year**	**$3,000**	**SWCD**	**DNR**	**X**	**X**	**X**	**X**	**X**								**X**		
Funding Level 3	3 Wells	$900/ Year	$9,000																	
Conduct well testing clinics for private drinking water	**Annual Program Implementation**	**$5,000/year**	**$50,000**	**SWCD**	**MDH**	**X**	**X**	**X**	**X**	**X**		**X**		**X**				**X**		
Validate unverified wells to complete Phase 1 development of a Groundwater Geologic Atlas (RC=586, KC=314)	**300 wells verified**	**$1,000/ Year**	**$10,000**	**SWCD**	**County, MGS, DNR**			**X**		**X**								**X**		
Funding Level 2	600 well verified	$2,000/ Year	$20,000																	
Funding Level 3	900 wells verified	$3,000/ Year	$30,000																	
Conduct *E. coli* DNA analysis of impaired reaches within Planning Zones SD 95, SD 91 and Middle Branch to determine the source. (bovine, human, or wildlife) Funding Level 2	**3 Impaired Stretches**	**$20,000/year using FL lab**	**$20,000**	**SWCD**	**MPCA**	**X**		**X**		**X**				**X**						
Continue aquatic invasive species monitoring.	**Annual Program Implementation**	**$40,000/year**	**$400,000**	**SWCD/County**	**MDA**	**X**	**X**	**X**	**X**	**X**									**X**	
Funding Level 3	Increase monitoring and outreach workshops	$50,000/year	$500,000																	
Conduct Flow Monitoring (automated collection)	**Annual Program Implementation**	**$30,000/year**	**$300,000**	**TRWD**	**DNR, USGS**	**X**	**X**	**X**	**X**	**X**	**X**					**X**	**X**		**X**	
Funding Level 3	Add 8 automated sites	$40,000/year	$400,000																	
Conduct ditch capacity analysis	**10% of all high priority area ditches have 10-year capacity**	**$0**	**$0**	**TRWD**	**RRWMB SWCD**		**X**		**X**		**X**					**X**	**X**		**X**	
Funding Level 2		$75,000/year	$750,000																	
Update culvert inventory	**Culvert inventory database with all culverts in planning area**	**$0**	**$0**	**TRWD**	**RRWMBSWCD**	**X**		**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**		**X**	
Funding Level 2		$30,000/year	$300,000																	

6.3 Education and Outreach

The Education and Outreach Implementation Program funds the implementation of actions that use education and outreach to make progress toward a measurable goal. The Education and Outreach Implementation Program is operated through the Two Rivers Plus 1W1P sharing of services. Expectations are that a common set of education and outreach materials will be developed for use across the watershed but delivered by the staff within each jurisdiction. 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.

Communicating with the general public is intended to create positive and impactful education and outreach experiences to create cohesion. Examples of existing outreach activities include, tours of established projects, Soil Café Chats, social media, newsletters, Crop Expo's, local 4-H clubs, crop improvement days, county fairs, and the Minnesota Envirothon.

Agricultural landowners and producers represent an important group of people in the community. Landowners and producers can serve communities to increase adoption of voluntary land management practices, potentially accruing environmental, human, and at times, economic benefit. There are numerous state and local programs within the Two Rivers Plus Planning Area that serve to engage landowners and producers. Examples include assistance to implement non-structural land management practices (cover crops, conservation tillage) and field walkovers.

The Two Rivers Plus 1W1P utilizes existing federal and state conservation programs for setting aside land, including the Wetland Reserve Program, Conservation Reserve Program, and Continuous Conservation Reserve Program. The Minnesota Ag Water Quality Certification Program (MAWQCP) is also available in the plan area and is designed to accelerate the adoption of on-farm conservation practices to protect lakes and rivers. Combined, these programs offer a suite of land management and education opportunities that steward the land and build trust and understanding among communities. These programs are a part of the Field Walkover goal highlighted in previous sections.

Several activities are eligible as part the Education and Outreach Implementation Program. Eligible activities include production of educational materials, demonstration projects, and workshops tailored to landowners and agricultural producers about compensation and incentive programs to promote structural and management practices. 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.

Table 6-4: Outreach Actions

Two Rive Plus Outreach Implementation				Responsibility		Timeline					Short-Term Goals and Multiple Benefits									
Outreach Actions	**Output**	**Unit Cost**	**Total 10-Year Cost**	**Lead**	**Partner**	**2020-21**	**2022-23**	**2024-25**	**2026-27**	**2028-29**	**Sediment**	**Nitrogen**	**Phosphorus**	**Bacteria**	**Streambank/Channel**	**Conveyance Capacity**	**Hydrology/Flood**	**Groundwater**	**Natural resource**	**Ag Productivity**
Funding Level 1 Actions																				
Develop a coordinated education and outreach plan among TR+ 1W1P leads to promote consistent strategies, materials, and messaging.	1 program	$10,000	$10,000	ST	AC	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Outreach and materials regarding flooding and flood control measures	1	$500/year	$5,000	TRWD	RRWMB	•	•	•	•	•					•	•	•		•	•
Outreach and materials regarding tile drainage	1	$500/year	$5,000	TRWD	RRWMB	•	•	•	•	•					•	•	•		•	•
Continue general education and outreach activities by jurisdictional area.	Annual implementation	$15,500/year	$155,000	SWCD/WD	Various	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Set-up and participate in existing environmental education programs for youth such as the Envirothon, county fairs, conservation days, ag-in-the-classroom, conservation camps for kids, prairie wetlands center programs, 4-H, River Watch	Annual program implementation	$10,000/year	$100,000	SWCD	U of M Extension, TRWD	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Host soil health forums featuring local soil health advocates for educational purposes.	1 forum/ year	$2,500 /year	$25,000	SWCD	BWSR, NRCS	•	•	•	•	•	•	•	•				•		•	•
Promote and show-case soil health demonstration sites using conservation farming practices (tillage management, cover crops, etc.)	1 field day/ year	$2,000/year	$20,000	SWCD	BWSR, NRCS	•	•	•	•	•	•	•	•							•
Educate and encourage landowners to conduct proper septic system maintenance at a minimum of every three years.	8 outreach contacts / year	$1,000/year	$10,000	SWCD	County, MPCA	•	•	•	•	•				•				•		
Utilize social media to engage the public on watershed issues.	Annual implementation	$200/year	$2,000	SWCD	WD, County	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Develop workshops to tour successful structural conservation projects throughout the watershed.	1 field day/ year	$500/year	$5,000	SWCD	BWSR, NRCS	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Funding Level 2 Actions																				
Conduct outreach to the general public and local elected officials on stormwater bmp's to address environmental contaminants, including salt, fertilizers, pesticides, household waste, prescription drugs, and legacy contaminants (e.g. mercury and PCBs).	1 workshop/ 2 years	$1,000/workshop	$5,000	SWCD	County, MPCA	•	•	•	•	•		•	•	•				•		
Host drainage water management workshops for landowners and producers.	2 Workshops	$1,100/Workshop	$2,200	SWCD	BWSR, NRCS	•	•	•	•	•	•	•	•		•	•	•			•
Increase landowner awareness on the benefits of buffering non-public waters / waterways.	5 outreach contacts / year	$1,000/year	$10,000	SWCD	BWSR	•	•	•	•	•	•	•	•	•	•		•		•	•
Develop and implement a river and lake outreach program to better understand issues and inform the public on management measures to protect or improve river and lake water quality.	1 program	$2,000	$2,000	SWCD	COLA, DNR, Extension, TRWD	•	•	•	•	•	•	•	•		•		•		•	

6.4 Regulations and Enforcement

A few of the issues in this planning area can be addressed through the administration of statutory responsibilities and local ordinances. These actions are funded by the Regulatory and Enforcement Implementation Program. **Table 6-5** shows the relationship between statutory obligations, ordinances and permits administrated by the Two Rivers Plus counties and watershed districts. This list in not all inclusive. **Table 6-6** shows regulation and enforcement implementation schedule along with how they address the goals highlighted in this plan.

6.4.1 Statutory responsibilities

The state statutes administered by the counties and the watershed district 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. The responsibility for implementing these programs will remain with the respective counties or appointed LGUs.

Feedlots

Feedlot rules, regulations, and programs were established under MN Rules 7020 and are administered through the MPCA. While Kittson County is a delegated feedlot county, Roseau County is not, which means the MPCA implements the feedlot rules in Roseau County. Counties administering the feedlot program provide regulatory oversight, technical assistance programs and maintain a feedlot inventory. Kittson SWCD has been delegated this authority by Kittson County.

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. MN Rules Chapter 6120 establishes the authority for counties and cities to regulate activities within defined floodplain boundaries. Kittson County and Roseau County have established floodplain management ordinances.

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. Furthermore, Kittson County has a Kittson County Hazard Mitigation Plan that addresses Hazard Management. Roseau County has an All Hazard Multi-Jurisdictional Mitigation Plan.

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 2014, Section 103B.101), 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 counties (SWCDs) and the TRWD will be relied upon for implementation and assessing compliance of the buffer legislation. The JRWD has no jurisdictional ditch systems. The 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.

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. Established under MN Rules Chapter 6120, Kittson County and Roseau County have developed shoreland management ordinances/rules.

Solid Waste Management

The counties participating in the Two Rivers Plus 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 pickup for household garbage and publicly owned and operated recycling center;
- Mixed municipal solid waste transfer stations;
- Demolition landfill;
- Household hazardous waste special collection events;
- Yard waste composting sites; and
- Regional hazardous waste management facility.

Subsurface Sewage Treatment Systems (SSTS)

The counties participating in the 1W1P administer Minnesota Rules Chapter 7080 through 7083 for SSTSs. The programs provide technical assistance, education, plan review, and inspections to protect water quality, prevent and control water borne diseases, and prevent or eliminate nuisance conditions. The Kittson SWCD and Roseau County Environmental Office are responsible for fulfilling this obligation.

Wellhead Protection

The MDH administers the state wellhead protection rule, Minnesota Rules, Chapter 4720.5100 – 4720.5590, that sets standards for wellhead protection planning. Kittson County and municipalities within the Two Rivers Plus Planning Area have completed 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 (WCA) 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. MN Rules Chapter 8420 establishes this authority. In Kittson County, the WCA LGU is the Kittson SWCD; in Roseau County the WCA LGU is the Roseau SWCD.

6.4.2 Local Ordinances

Local ordinances are used by the LGUs in the Two Rivers Planning Area to address issues specific to their LGU. Table 6-6 shows which LGUs have ordinances related to managing water and resources. The responsibility for implementing these ordinances will remain with the respective LGUs.

Countywide Zoning

Within the plan area, Kittson County has countywide zoning and Roseau County does not. In Kittson County, zoning ordinances are administered by the Zoning Office. In Roseau County, Soler, Moose, Ross, Jadis, Stafford, Stokes, Skagen, Barto, Polina, Dewey, Hereim, Barnett, Nereson, Grimstad, Palmville, Poplar Grove, Huss, Deer and Lind Townships all administer zoning ordinances that pertain to land use.

6.4.3 Watershed District Rules

There are two watershed districts within the Two Rivers Plus Planning Area: Two Rivers Watershed District and the Joe River Watershed District. The districts have a system of rules and regulations for the management of water within their watershed district boundary area. The implementation of existing rules and regulations within the district, as well as the development of new ones, will continue through the district. Existing rules and regulations within the district, as they relate to statutory responsibilities and local county ordinances, are shown in Table 6-6. The TRWD and Joe River WD have rule making authority per MS 103D.341 and permitting authority per 103D.345. TRWD current rules were adopted October 7, 1980 and amended on June 5, 1997, June 3, 2015, and November 7, 2017. Joe River WD rules were adopted September 21, 1988 and amendments could periodically change per life of this plan. For more information regarding the rules of the TRWD and Joe River WD Rules please go to the following websites: Two Rivers Watershed District www.tworiverswd.com, Joe River Watershed District https://www.rrwmb.org/Joe_River_Watershed.html

Tile Drainage

TRWD has rules pertaining to tile drainage and has asked landowners to submit permit applications on tiled fields within the jurisdictional boundaries of the district. Kittson County and MN DOT do not allow any tile drainage equipment in the right of way (ROW). Erosion control measures are required at all the tile outlets.

In many cases, local regulations and ordinances have been adopted to conform to the standards and requirements of the state statutes. The responsibility for implementing these programs will remain with the respective counties or appointed LGUs.

Table 6.5 Two Rivers Plus Ordinances Rules and Permits

Ordinance, Rule, or Permits	Kittson	Roseau	Two Rivers WD	Other Agencies
Buffer Ordinance	Kittson SWCD; MS §103F; Kittson County Buffer Ordinance	MS §103F; Roseau County, Ordinance No. 40	MS §103F; Rules of the Two Rivers Watershed	
Culvert Sizing	N/A	Roseau County Highway Department - Culvert Policy; MS §103E	Rules of Two Rivers Watershed	Rules of Joe River Watershed
Construction of street, road or highway	N/A	Roseau County Highway Department MN Constitution Art. 14; MS §160, 162, 163; MN Rules 8820	Rules of Two Rivers Watershed	Road Authorities MN Constitution Art. 14; MS §160, 161, 162, 163, 164,169, 174; MN Rules 8810, 8820; Rules of the JRWD
Construction of bridge, dike, or culvert	N/A	Roseau County Highway Department MS §103E	Rules of Two Rivers Watershed; MS §103E	Road Authorities MS §103E; Rules of the JRWD
Drainage over 20 acres	N/A	N/A	Rules of Two Rivers Watershed	Rules of Joe River Watershed
Feedlot Program	MN Rules 7020	No Delegation	N/A	MPCA; MN Rules 7020; MS§ 116
Floodplain Ordinance	Kittson County Zoning Office; Kittson County Floodplain Ordinance	Roseau County Environmental Office; MN Rules 6120; Floodplain Ordinance #29	N/A	MS §103F
Public Waters	N/A	N/A	N/A	MN DNR; MS§ 103G
Shoreland Ordinance	Kittson SWCD; MN Rules 6120; Kittson County Shoreland Ordinance	Roseau County Environmental Office; MN Rules 6120; Roseau County Ordinance No. 4	N/A	MN DNR; MS §103F
Solid Waste Ordinance	Kittson County Environmental Office; Kittson County Solid Waste Ordinance	Roseau County Environmental Office; Roseau County Ordinances No. 2 (1972) and 31 (2015)	N/A	N/A
Septic Ordinance	Kittson SWCD; MN Rules 7080; Kittson County Ordinance	Roseau County Environmental Office; MN Rules 7080; Roseau County Ordinance No. 24	Rules of Two Rivers Watershed	N/A
Tile Drainage	N/A	MS §103E	Rules of Two Rivers Watershed	MS §103E; Rules of Joe River Watershed
Transfer of Water	N/A	N/A	Rules of Two Rivers Watershed	Rules of Joe River Watershed
Wetlands	Kittson SWCD; WCA; MN Rules 8420	Roseau SWCD; WCA; MN Rules 8420	Rules of Two Rivers Watershed; Types 3, 4, 5 or 8 wetlands	MN DNR, MS §103G; CWA §404, CWA §401; USCOE - SPGPs, RGPs
Tower and Wind	Kittson County Zoning Office; Tower and Wind Energy Safety Ordinance	N/A	N/A	N/A
Zoning Ordinances	Kittson County Zoning Office; Kittson County Ordinance	N/A,	N/A	Various Cities and Townships

Table 6-6 Regulations and Enforcement Implementation Schedule

Two Rivers Plus Regulations and Enforcements				Responsibility		Timeline					Short-Term Goals and Multiple Benefits									
Regulation and Enforcement Actions	Output	Unit Cost	Total 10-Year Cost	Lead	Partner	2020-21	2022-23	2024-25	2026-27	2028-29	Sediment	Nitrogen	Phosphorus	Bacteria	Streambank/Channel	Conveyance Capacity	Hydrology/Flood	Groundwater	Natural resource	Ag Productivity
Ensure compliance with the state buffer law	N/A; Existing Budget			SWCD, TRWD, County	BWSR	X	X	X	X	X	X	X	X		X					
Administer Watershed District Rules and Permits	N/A; Existing Budget			TRWD, JRWD		X	X	X	X	X	X	X	X		X	X	X		X	X
Administer adopted land use and zoning ordinances to manage contamination sources	N/A; Existing Budget			County	MDH, MPCA, BWSR	X	X	X	X	X	X	X	X	X				X		X
Meet all statutory requirements of the state of Minnesota shoreland rules	N/A; Existing Budget			SWCD, County	DNR	X	X	X	X	X					X				X	
Use floodplain management ordinance and land use and zoning approvals to minimize likelihood of future flood damages	N/A; Existing Budget			County	SWCD	X	X	X	X	X							X		X	X
Implement the state feedlot program rules	N/A; Existing Budget			SWCD/County	MPCA	X	X	X	X	X	X	X	X	X					X	X
Implement and enforce applicable county ordinances and the Wetland Conservation Act (WCA) to retain wetland quantity, function and value	N/A; Existing Budget			County, SWCD	DNR, BWSR	X	X	X	X	X		X	X			X	X		X	
Implement Minn. R. Ch. 7080 and local ordinances related to septic systems	N/A; Existing Budget			County, SWCD	BWSR	X	X	X	X	X				X				X	X	

Section 7: Plan Funding and Administration

This plan sets an ambitious implementation schedule. The success of implementing the plan to achieve the goals laid out will depend on staffing needs, local funding, reliable watershed-based funding implementation dollars, and collaboratively sought state, federal, and private grant dollars.

7.1 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. Actions are assigned implementation programs within the targeted implementation schedule. The sources of Funding Level 1 are estimates to be used to fund the implementation programs are shown in Table 7-1.

Table 7-1 Funding Sources

Implementation Program	Local		State		Federal		NGO's		All Sources	
	Annual	10 Year Total	Annual	10-Year Total	Annual	10-Year Total	Annual	10-Year Total	Annual	10-Year Total
Structural and Non-structural Management Incentive Program	$16,900	$169,000	$140,873	$1,408,730	$900,000	$9,000,000	$85,000	$850,000	$1,142,773	$11,427,730
Capital Improvement Projects Program	$688,120	$6,881,200	$0	$0	$0	$0	$0	$0	$688,120	$6,881,200
Data Collection & Monitoring Program	$16,500	$165,000	$0	$0	$0	$0	$0	$0	$16,500	$165,000
Regulation and Enforcement Program	$108,082	$1,080,820	$396,051	$3,960,510	$0	$0	$0	$0	$504,133	$5,041,330
Education and Outreach Program	$3,000	$30,000	$53,252	$532,520	$0	$0	$0	$0	$56,252	$562,520
Administration	$339,823	$3,398,230	$293,965	$2,939,650	$0	$0	$30,000	$300,000	$663,788	$6,637,880
Total	$1,172,425	$11,724,250	$884,141	$8,841,410	$900,000	$9,000,000	$115,000	$1,150,000	$3,071,566	$30,715,660

7.1.1 Local Funding

The amount of local funding needed to implement Base Funding Level 1 is an estimated $1,172,425 annually and $11,724,250 for the ten-year plan life cycle. Local revenue is defined as money derived from either the local property tax base, fees for service (Ex. Tree planting, survey work, seeding service) or in-kind services of any personnel funded from the local tax base. Local funding excludes general operating funds obtained from BWSR 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.

7.1.2 State Funding

The amount of state funding needed to implement Base Funding Level 1 is $884,141 annually and $8,841,410 for the ten-year plan life cycle. State funding includes all funds derived from the State tax base for state cost-share and regulatory purposes. State funding includes general operating funds obtained from BWSR, and grants. It excludes local funding and partnership agreements with the federal government or other conservation organizations.

The Two Rivers Plus Planning Work Group may apply individually or take a collaborative approach when applying for competitive or non-competitive grants. The assumption is that future base support for implementation will be provided to Two Rivers Plus 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.

7.1.3 Federal Funding

The amount of federal funding needed to implement Base Funding Level 1 is $900,000 annually and $9,000,000 for the ten-year plan life cycle. 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 NRCS-USDA also has a standalone program called the Regional Conservation Partnership Program (RCPP) which may provide funding for practices to improve agriculture, watershed, and natural resource issues. 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 effectively engaged 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.

7.1.4 Other Funding Sources

Non-governmental organizations and private entities also contribute resources to the planning area. This “other” 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.

Several non-governmental funding sources may provide technical assistance and fiscal resources to implement the Two Rivers Plus 1W1P targeted implementation schedule. For example, locally active Minnesota Deer Hunter Associations and The Nature Conservancy (TNC) are potential funding sources that differ from the other categories. Other non-governmental agencies that could provide services to help achieve our goal may consist of Minnesota Center for Environmental Advocacy (MCEA), Red River Basin Commission (RRBC), and International Water Institute (IWI). 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 projects and practices

because they are interested in soil health and agricultural sustainability. 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.

7.2 Plan Administation

7.2.1 Decision Making and Staffing

Expectations are that the roles of each committee will shift and change focus during implementation. The Two Rivers Plus 1W1P fiscal agent and plan coordination/administrative duties will be assigned through a PC decision as outlined in a formal agreement. Responsibilities for annual work planning and serving as the central fiscal agent will be revisited by the Steering Team on an annual basis and approved by the PC. The purposed of this is to evaluate progress in order maintain consistency in these duties. Table 7-2 shows the probable roles and functions related to plan implementation.

Table 7-2 Plan Administration Roles

Committee Name	Roles and Responsibilities
Policy Committee	Review the implementation funds from plan participants
	Approve the annual work plan
	Approve annual fiscal reports
	Approve annual reports submitted to BWSR
	Annually review and confirm the ST priority issues
	Direct the ST on addressing emerging issues
	Approve plan amendments
	Approve grant applications
	Approve annual assessment
Advisory Committee	Review and provide input for the annual work plan
	Identify and advise on collaborative funding opportunities
	Recommend program adjustment to the ST
	Assist with execution of the targeted implementation schedule
Steering Team	Review the status of available implementation funds from plan participants
	Review annual fiscal reports
	Review annual reports submitted to BWSR
	Annually review and confirm 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
	Compile annual results for annual assessment

7.2.1.1 Policy Committee Organization

The Two Rivers Plus Policy Committee is a coalition of counties, SWCDs, and a WD within the Two Rives Plus Planning Area of north-western Minnesota. The Two Rivers Plus Planning Group previously entered into a formal agreement through a MOA for planning the 1W1P for the Two Rivers Plus and will develop an agreement to implement the actions and projects highlighted in this plan. The parties are in the current stages of drafting an agreement for purposes of implementing this plan.

7.2.2 Assessment and Evaluation

7.2.2.1 Annual Evaluation

Each year the Steering Team and other members of the TAC/CAC meet annually for the Local Working Group meetings. Here new issues may be brought forward for ranking in the NRCS EQIP program. This Local Working Group meeting will also allow the Steering Team to re-cap the year of projects to track where implementation efforts are taking place. During this annual meeting feedback on new issues and projects completed from other LGU's and Non-LGU's will be compiled for a report to the PC. The Steering Team may develop a tracking database to enter projects as they get implemented to streamline the tracking process.

Besides taking part in the Local Working Group meetings, the Steering Team will provide each of the participating LGU's with an annual update on the progress of the plan's implementation in accordance with BWSR's Level 1 Performance Review and Assistance Program (PRAP) standards. During this annual review process, feedback will be solicited from the participating boards, the PC, and the AC. This feedback will be presented to the PC to set the coming year's priorities for achieving the plan's goals, to decide on the direction for grant submittals, and to support generation of the local work plan based on local evaluation of previous years' work. Besides annually updating the PC, the Steering Team participants will utilize the Technical and Citizens Advisory Committees on a case by case basis if needed, otherwise there will be a meeting held at least every 2 years to reevaluate achievements towards the goals of this plan.

Through these processes the participating LGU's will be able to evaluate the partnership efforts from each LGU and Non-LGU's. This will allow the Steering Team to assess the relationships built and adjust if needed to continue working together to achieve the goals highlighted in this plan. In addition, all the feedback and discussions had through these processes will be documented and if determined necessary incorporated into the plan through the amendment process.

7.2.2.2 Five Year Evaluation

This plan has a ten-year life cycle beginning in 2021. 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 2026-27 a five-year evaluation will be undertaken to determine if the current course of actions is sufficient to reach the goals of the plan, or if a change in the course of actions is necessary.

7.2.2.3 Reporting

The LGUs have several annual reporting requirements. A number of these reporting requirements will remain a responsibility of the LGUs. However, reporting related to grants and programs developed collaboratively and administered under this plan will be reported by the Steering Team. As part of the workplan development and in addition to annual reports, the Steering Team may also decide to develop an annual State of the Watershed Report. This report would 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 would be developed through the annual evaluation process.

7.2.3 Plan Amendment Process

This plan extends through 2030. Revision of the plan may be needed through an amendment

prior to the plan update if significant changes emerge in the priorities, goals, policies, administrative procedures, or plan implementation programs. Revisions may also be needed if issues emerge that are not addressed in the plan.

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, SWCD or WD to the PC, but only the PC can initiate the amendment process. All recommended plan amendments must be submitted to the PC along with a statement of the problem, need, and rationale for the amendment. Any costs associated with making amendments to the plan would be covered under Plan Administration and carried out by the Plan Coordinator. Final decisions on all amendments would go back to the respective LGU's for approvals. However, the existing authorities of each LGU within the Two Rivers Plus are still maintained. As such, if watershed management districts are needed to be developed for major projects, only approval by the local WD board is needed to be amended to the plan, with notification to the PC.

Preparers of this plan recognize it may need to be periodically amended to remain useful as a long-term planning tool. The structure and intent of this plan is to provide flexibility to respond to short-term emerging issues and opportunities. The PC 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, if technical information results in a policy that conflicts or provides benefit with to the plan, its implementation schedule, or programs, a plan amendment may be required.

7.3 Collaboration

7.3.1 Collaboration with Other Units of Government

The TR Plus ST will continue coordination and cooperation with other governmental units at all levels. This cooperation and coordination are both local and regional or state. Regional or state coordination between the TR Plus ST and agencies such as BWSR, US Army Corps of Engineers (USACE), MNDNR, MDA, MDH, and the MPCA are mandated through legislative and permit requirements. Local cooperation between the TR Plus ST and comparable units of government such as municipalities, township boards, county boards, SWCD boards, the TRWD board, joint powers boards, and other water management authorities are a practical necessity to facilitate watershed wide activities. Additional federal agencies that the ST currently collaborates with include the USDA – Farm Service Agency (FSA), the USDA – Natural Resources Conservation Service (NRCS), and the United States Fish and Wildlife Service (USFWS).

The TR Plus ST will exercise intergovernmental coordination and cooperation as needed to perform its required functions. The ST will continue to foster an environment that enhances coordination and cooperation throughout the implementation of this plan. The TR Plus ST will act as the lead for the implementation of this plan's identified priority issues.

7.3.2 Collaboration with Others

Plan partners expect to continue and build on existing collaborations with others, including non-governmental organizations, while implementing this plan. These organization have various functions, many of which address issues and work towards achieving goals outlined in this plan. Examples of functions these groups may provide include education and facilitation services, volunteering and promotion of stewardship related to Lake Bronson and its surrounding resources and assisting with land stewardship within the watershed itself.

Potential non-governmental collaboration partners range from educational groups like the University of Minnesota (UMN) Extension, to private organizations such as 4-H, Friends of Lake Bronson State Park, Minnesota State Cattleman's Association, The Nature Conservancy, and the Scouts, to specialized local groups such as the North Red River Chapter of the Minnesota Deer Hunters Association.

7.3.3 Work Planning

This plan envisions collaborative implementation. Biennial work planning is envisioned to align the priority issues addressed, the availability of funds, and the roles and responsibilities for implementation. A biennial work plan will be developed by the ST based on the targeted implementation schedule and any adjustments as needed by plan assessment. The ST may solicit input from the Advisory Committees during this process. The work plan will then be presented to the PC, who will provide guidance information from their respective LGU to be considered into the work plan. In the end, each participating LGU Board will need to approve of the proposed workplan or as laid out in the collaborative agreement. The intent of these work plans will be to maintain collaborative progress toward completing actions within the targeted implementation schedule and achieving measurable goals.

7.3.4 Shared Services

Watershed-wide program actions as well as multiple jurisdictional Planning Zone actions will be operated through a combination of independent work and shared services. Details about which actions are independent and are shared services will be outlined in the biennial work plan.

One example for shared services is that a common set of education and outreach materials will be developed for use across the watershed, but the program is delivered by the staff within each county. Another example of shared services will be projects completed by multiple local agencies in various phases, utilizing their staff with specialized abilities or job approval authority. 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.

Appendix A

PTMApp scenario tables for each planning zone

South Branch Planning Zone				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	273	1.67	$11,147	1	1.67	1.97	58.51	$11,147
Filtration	841	0.32	$2,192	3	0.95	0.99	30.00	$6,576
Biofiltration	89	0.21	$61,114		0.00	0.00	0.00	$0
Infiltration	342	0.05	$108,820		0.00	0.00	0.00	$0
Protection	918	0.75	$11,961	5	3.77	6.00	118.50	$59,805
Source Reduction	1416	1.42	$29,836	65	92.43	240.50	1937.00	$1,235,000
Total	3879	-	-	74	98.82	249.46	2144.01	$1,312,528

Straight to Red				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	312	1.24	$11,726	0	0.00	0.00	0.00	$0
Filtration	840	0.28	$2,041	3	0.84	0.96	27.51	$6,123
Biofiltration	10	0.10	$42,589		0.00	0.00	0.00	$0
Infiltration	6	0.31	$73,342		0.00	0.00	0.00	$0
Protection	870	0.67	$11,960	3	2.01	3.33	62.46	$35,880
Source Reduction	1184	1.26	$28,043	61	76.86	187.27	1498.16	$1,159,000
Total	3222	-	-	67	19.71	191.56	1588.13	$1,201,003

S.D. 91				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	468	0.43	$15,505	2	0.86	1.97	57.00	$15,334
Filtration	1537	0.37	$18,019	3	1.11	0.99	38.00	$4,395
Biofiltration	227	0.89	$7,491		0.00	0.00	0.00	$0
Infiltration	306	0.88	$7,576		0.00	0.00	0.00	$0
Protection	1825	0.55	$12,122	3	1.65	4.00	77.00	$40,974
Source Reduction	2833	1.24	$5,377	130	161.20	481.00	3861.00	$2,470,000
Total	7196	-	-	138	164.82	488.00	4033.00	$2,530,703

Little Joe River				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	97	0.46	$11,147	1	0.46	1.00	48.00	$8,693
Filtration	477	0.56	$2,192	3	1.69	2.00	46.00	$6,963
Biofiltration	102	1.14	$61,114		0.00	0.00	0.00	$0
Infiltration	216	0.53	$108,820		0.00	0.00	0.00	$0
Protection	401	0.78	$11,961	2	1.57	3.00	58.00	$27,560
Source Reduction	744	1.96	$29,836	13	25.53	42.00	340.00	$247,000
Total	2037	-	-	19	29.26	48.00	492.00	$290,216

S.D.95				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	299	0.72	$10,689	2	1.44	2.58	77.00	$21,378
Filtration	1582	0.28	$1,497	3	0.84	1.17	33.27	$4,491
Biofiltration	101	1.16	$54,768		0.00	0.00	0.00	$0
Infiltration	200	0.98	$135,964		0.00	0.00	0.00	$0
Protection	1789	0.47	$12,081	4	1.80	4.16	76.92	$48,324
Source Reduction	2657	0.98	$28,792	125	122.50	378.75	3042.50	$2,375,000
Total	6628	-	-	134	126.66	386.66	3229.69	$2,449,193

J.D. 10				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	723	0.28	$12,584	1	0.28	1.00	30.00	$12,584
Filtration	991	0.33	$2,311	3	0.99	0.00	0.00	$6,933
Biofiltration	103	0.44	$61,415		0.00	0.00	0.00	$0
Infiltration	469	0.10	$99,827		0.00	0.00	0.00	$0
Protection	914	0.59	$13,902	4	2.36	6.00	112.00	$55,608
Source Reduction	1538	1.40	$33,766	69	96.60	296.00	2373.00	$1,311,000
Total	3200	-	-	74	100.23	303.00	2514.00	$1,386,125

S.D. 72				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	156	0.09	$9,660	2	0.18	1.00	25.00	$19,320
Filtration	227	0.17	$1,436	3	0.51	0.00	0.00	$4,308
Biofiltration	11	0.51	$36,436		0.00	0.00	0.00	$0
Infiltration	86	0.35	$81,139		0.00	0.00	0.00	$0
Protection	279	0.18	$12,071	3	0.54	3.00	51.00	$36,213
Source Reduction	442	0.50	$30,054	18	9.00	52.00	413.00	$342,000
Total	1201	-	-	26	10.23	56.00	489.00	$401,841

Joe River				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	375	2.66	$12,101	1	2.66	3.00	80.00	$12,101
Filtration	755	0.65	$3,112	3	1.95	0.00	0.00	$9,336
Biofiltration	18	0.57	$49,611		0.00	0.00	0.00	$0
Infiltration	63	0.63	$109,683		0.00	0.00	0.00	$0
Protection	831	1.45	$12,984	4	5.80	6.00	112.00	$51,936
Source Reduction	1265	3.05	$34,280	44	134.20	218.00	1743.00	$836,000
Total	3307	-	-	52	144.61	226.00	1935.00	$909,373

Middle Branch				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	393	0.08	$6,434	1	0.08	1.00	1.00	$6,434
Filtration	468	0.53	$2,933	3	1.59	0.00	0.00	$8,799
Biofiltration	85	1.02	$58,163		0.00	0.00	0.00	$0
Infiltration	327	0.24	$70,043		0.00	0.00	0.00	$0
Protection	372	0.75	$12,317	4	3.00	5.00	98.00	$49,268
Source Reduction	666	1.66	$26,285	20	33.20	61.00	489.00	$380,000
Total	2311	-	-	28	37.87	67.00	588.00	$444,501

North Branch				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	308	0.11	$10,562	2	0.22	1.50	41.48	$21,124
Filtration	939	0.12	$2,462	3	0.36	0.84	24.24	$7,386
Biofiltration	167	0.11	$59,815		0.00	0.00	0.00	$0
Infiltration	410	0.04	$86,877		0.00	0.00	0.00	$0
Protection	877	0.31	$11,647	4	1.24	3.96	75.56	$46,588
Source Reduction	1534	0.65	$27,584	64	41.60	174.08	1392.00	$1,216,000
Total	4235	-	-	73	43.42	180.38	1533.28	$1,291,098

Unnamed Coulee				Funding Level 2 Scenario				
Practice Category	Count of Potential Practices Identified	Median Sediment Load Reduction of Top 50% of Practices (tons)	Average Cost of Top 50% of Practices	Number of Practices	Estimated Sediment Load Reduction (tons)	Estimated Phosphorus Load Reduction (lbs)	Estimated Nitrogen Load Reduction (lbs)	Estimated Scenario Cost
Storage	454	0.44	$19,423	1	0.44	1.30	39.11	$19,423
Filtration	1387	0.24	$2,801	3	0.72	1.05	29.67	$8,403
Biofiltration	201	0.41	$60,945		0.00	0.00	0.00	$0
Infiltration	464	0.20	$116,152		0.00	0.00	0.00	$0
Protection	1335	0.49	$14,070	4	1.96	5.20	103.88	$56,280
Source Reduction	2246	1.10	$31,819	100	110.00	379.00	3037.00	$1,900,000
Total	6087	-	-	108	113.12	386.55	3209.66	$1,984,106

Appendix B

Prioritization Ranking of Issues and Planning Zones

	Planning Zones										
	Straight to Red	Joe River	Judicial Ditch No 10	Little Joe River	Middle Branch Two Rivers	North Branch Two Rivers	Unnamed Coulee	State Ditch 72	State Ditch 91 - South Branch Two Rivers	State Ditch 95 - South Branch Two Rivers	South Branch Two Rivers
High Total	8	4	7	2	2	3	7	4	8	8	9
Medium Total	4	9	5	11	13	16	8	6	13	13	13
Low Total	11	10	11	10	8	4	8	14	3	3	2
Overall Total	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**24**	**24**	**24**	**24**
High + Medium Total	**12**	**13**	**12**	**13**	**15**	**19**	**15**	**10**	**21**	**21**	**22**
Planning Region Rank	**9**	**7**	**9**	**7**	**5**	**4**	**5**	**11**	**2**	**2**	**1**
Weighted High + Medium Total (Highs = 2x Medium)	**20**	**17**	**19**	**15**	**17**	**22**	**22**	**14**	**29**	**29**	**31**
Planning Region Rank	**6**	**8**	**7**	**10**	**8**	**4**	**4**	**11**	**2**	**2**	**1**
	7	3	8	6	5	2	4	11	10	9	1
Steering Committee members with organizational area within the planning zone	TRWD Kittson Co. Kittson SWCD	Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD	TRWD Roseau Co. Roseau SWCD Kittson Co. Kittson SWCD	TRWD Roseau Co. Roseau SWCD Kittson Co. Kittson SWCD	TRWD Roseau Co. Roseau SWCD Kittson Co. Kittson SWCD	TRWD Kittson Co. Kittson SWCD

	Surface Water Quality					Hydrology/ Flood Damage				Ground Water Quality		Ground Water Quantity	Natural Resources						Ag Productivity					
	Excessive sediment loading to surface waters	Excessive nutrient loading to surface waters	Excessive bacteria loading to surface waters	Low dissolved oxygen in surface waters	Instability of all types of watercourses	Inadequate conveyance capacity of all types of watercourses	Flood damage to communites, public infrastructure and rural homesteads	Flood damage to farmland	Extreme flow fluctuations (highs too high and lows too low)	Nitrate, Arsenic, and other types of groundwater contamination	Unused, unsealed wells act as a contamination conduit to drinking water supply	Groundwater quantity levels	Degraded wetland habitat	Degraded aquatic habitat in watercourses	Loss of longitudinal connectivity	Degraded riparian habitats	Degraded terrestrial habitats	Algae blooms in Lake Bronson	Reduced soil organic matter/ infiltration rates /water holding capacity	Excessive salinity in soils	Inadequate feed/water supply/waste management	Inadequate field drainage system outlets and/or improper management of drainage systems including tile line management	Excessive wind erosion	Excessive water erosion
High Total	6	4	0	0	1	6	5	7	3	0	0	0	0	1	2	0	0	3	5	0	3	5	5	6
Medium Total	4	6	4	2	7	5	6	4	8	4	4	4	5	4	2	7	5	0	5	5	4	6	5	5
Low Total	1	1	7	9	3	0	0	0	0	7	7	7	6	6	7	4	6	1	1	6	4	0	1	0
Overall Total	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**4**	**11**	**11**	**11**	**11**	**11**	**11**
High + Medium Total	**10**	**10**	**4**	**2**	**8**	**11**	**11**	**11**	**11**	**4**	**4**	**4**	**5**	**5**	**4**	**7**	**5**	**3**	**10**	**5**	**7**	**11**	**10**	**11**
Issue Rank	**7**	**7**	**18**	**24**	**11**	**1**	**1**	**1**	**1**	**18**	**18**	**18**	**14**	**14**	**18**	**12**	**14**	**23**	**7**	**14**	**12**	**1**	**7**	**1**
Weighted High + Medium Total (Highs = 2x	**16**	**14**	**4**	**2**	**9**	**17**	**16**	**18**	**14**	**4**	**4**	**4**	**5**	**6**	**6**	**7**	**5**	**6**	**15**	**5**	**10**	**16**	**15**	**17**
Issue Rank based on Weighted High	**4**	**9**	**20**	**24**	**12**	**2**	**4**	**1**	**9**	**20**	**20**	**20**	**17**	**14**	**14**	**13**	**17**	**14**	**7**	**17**	**11**	**4**	**7**	**2**

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