HAY CREEK

EXISTING INFORMATION

Roseau River Watershed District

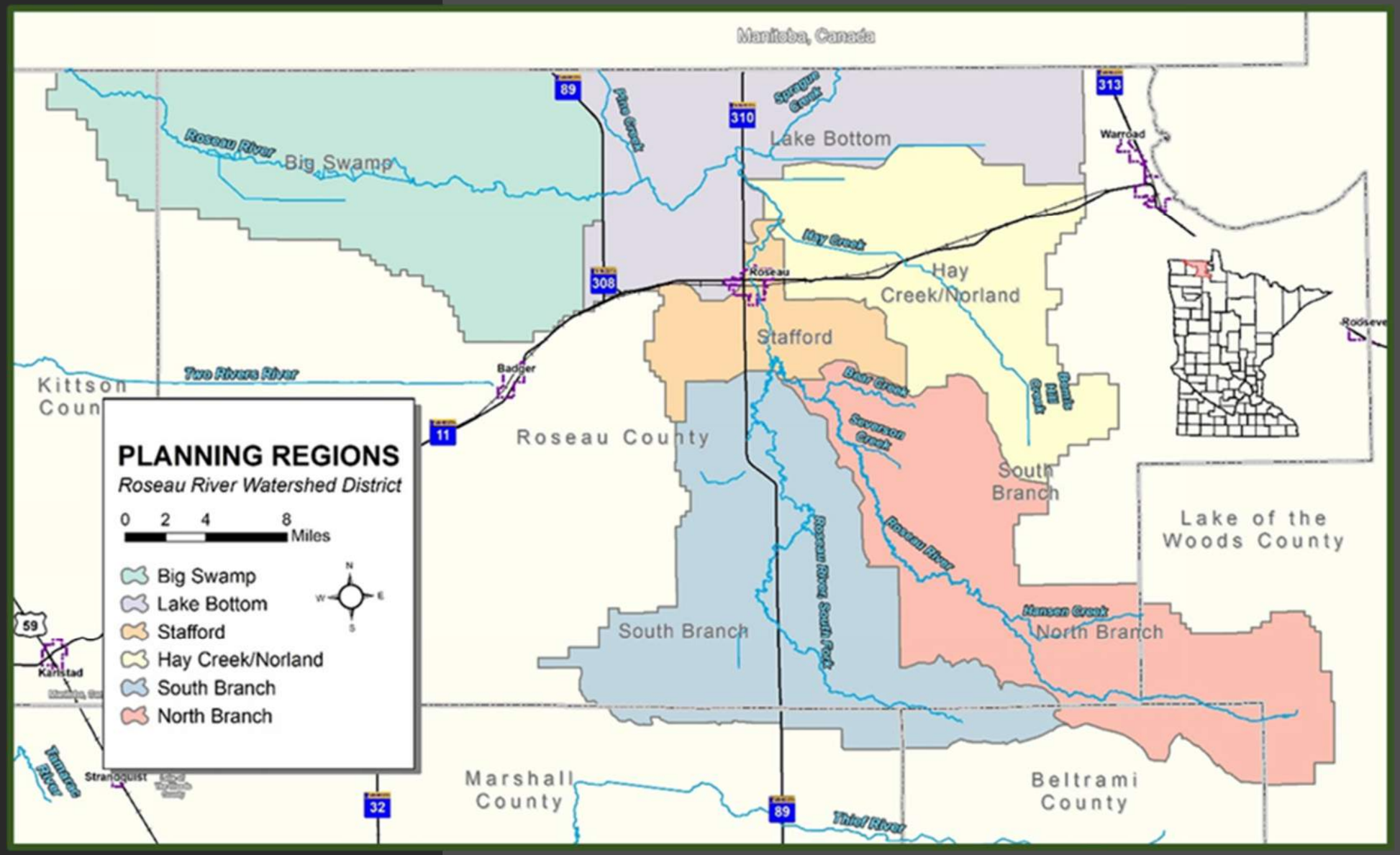
Hay Creek Landowner Open House Meeting

February 26, 2025

Erik Jones, HEI

RRWD
ROSEAU RIVER WATERSHED DISTRICT

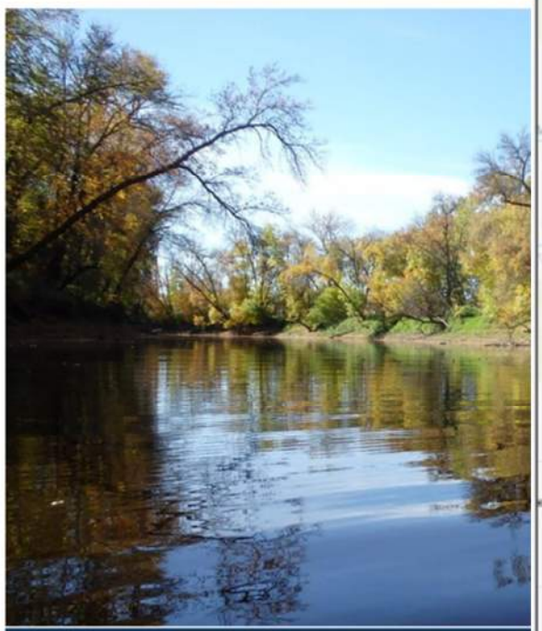
HOUSTON
engineering, inc.


Manitoba, Canada
Roseau River
Big Swamp
Lake Bottom
Hay Creek/Norland
Stafford
Roseau County
South Branch
North Branch
Lake of the Woods County
Marshall County
Beltrami County
Kittson Coun
Two Rivers River
Badger
Roseau
Warroad
Karlstad
Strandquist
Thief River
Hansen Creek
Roseau River South Fork
PLANNING REGIONS
Roseau River Watershed District
0 2 4 8 Miles
Big Swamp
Lake Bottom
Stafford
Hay Creek/Norland
South Branch
North Branch
89
310
313
308
11
59
32

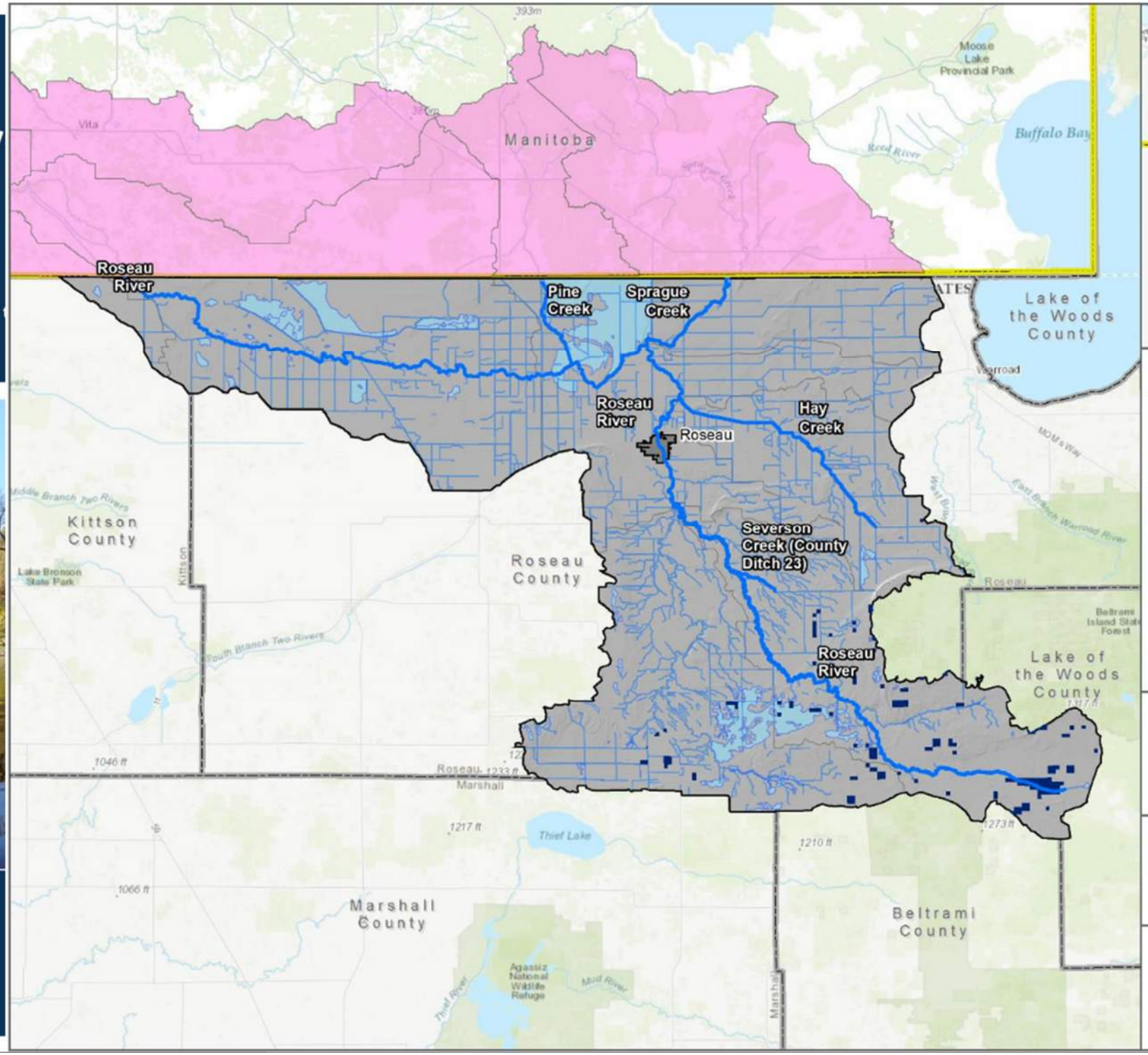
December 2020

Final Roseau Riv Total Maximum Study

A sediment and bacteria TMDL assessment for t the Hay Creek Subwatershed



MINNESOTA POLLUTION CONTROL AGENCY



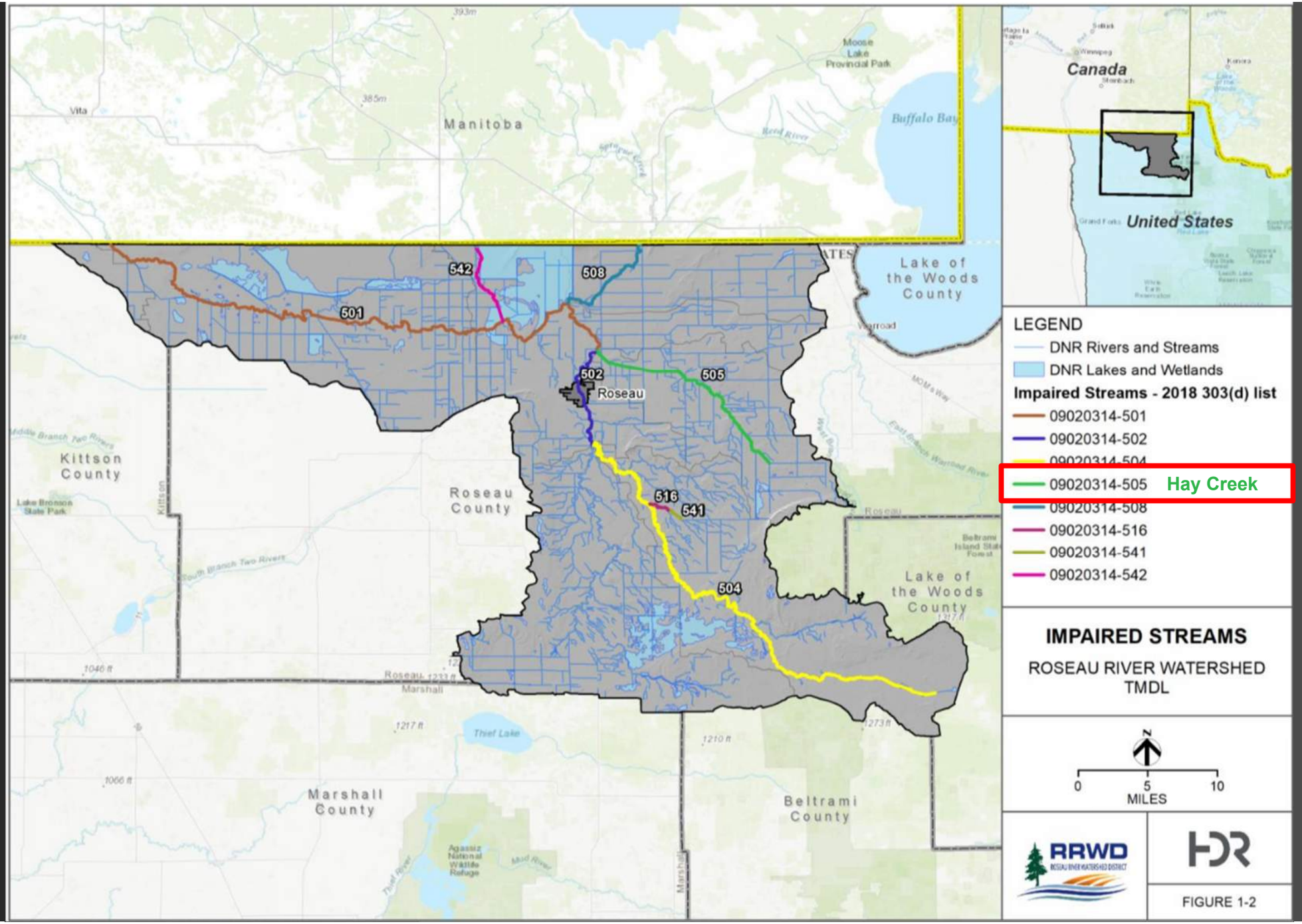
WATERSHED OVERVIEW

ROSEAU RIVER WATERSHED TMDL

RRWD

HDR

FIGURE 1-1


Manitoba
Moose Lake Provincial Park
Buffalo Bay
Vita
Canada
United States
Lake of the Woods County
Kittson County
Roseau County
Marshall County
Beltrami County
Roseau
Marshall
Lake Bronson State Park
Agassiz National Wildlife Refuge
Thief Lake
542
508
501
502
505
516
541
504
LEGEND
DNR Rivers and Streams
DNR Lakes and Wetlands
Impaired Streams - 2018 303(d) list
09020314-501
09020314-502
09020314-505 Hay Creek
09020314-508
09020314-516
09020314-541
09020314-542
IMPAIRED STREAMS
ROSEAU RIVER WATERSHED TMDL
0
5
10
MILES
RRWD
HDR
FIGURE 1-2

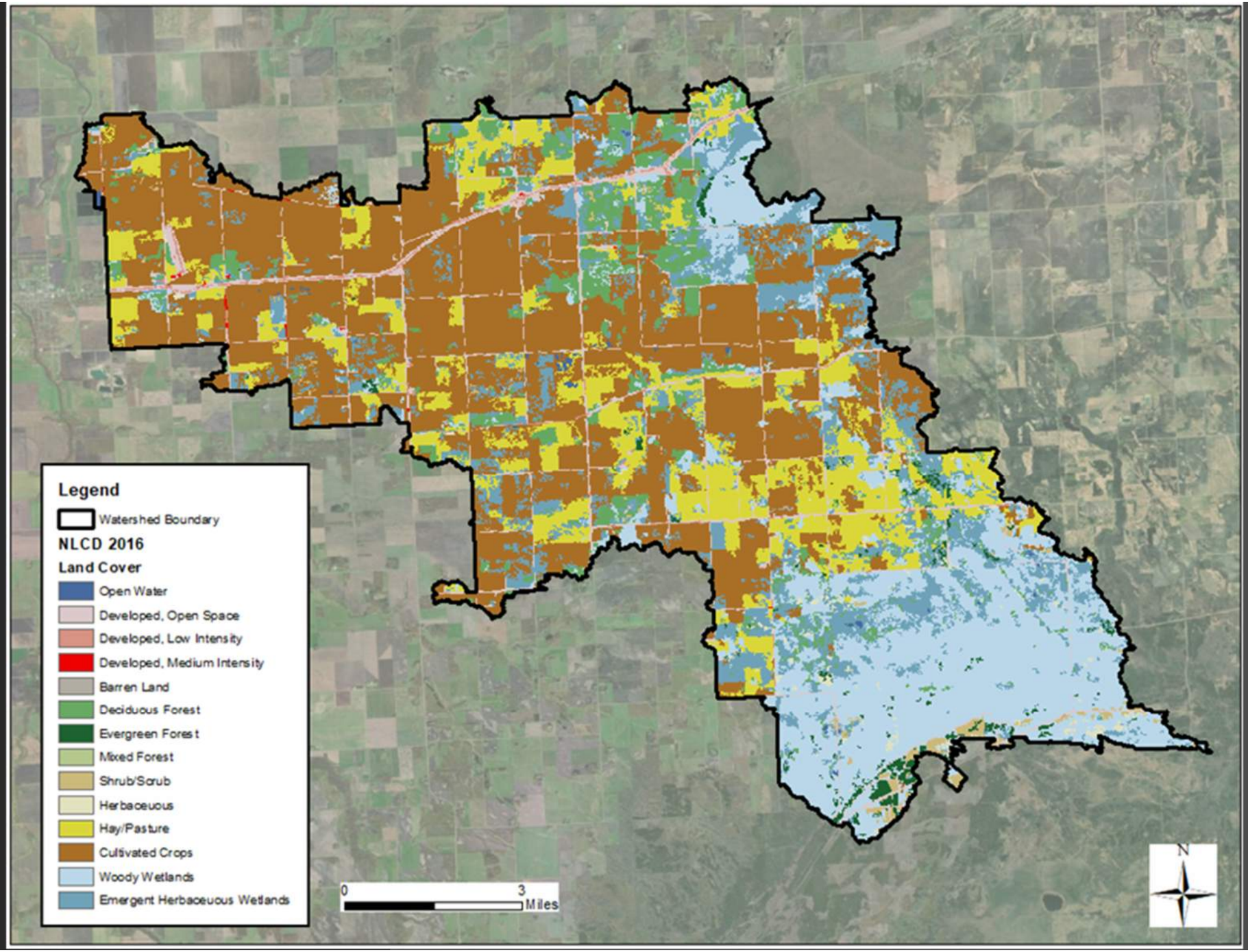
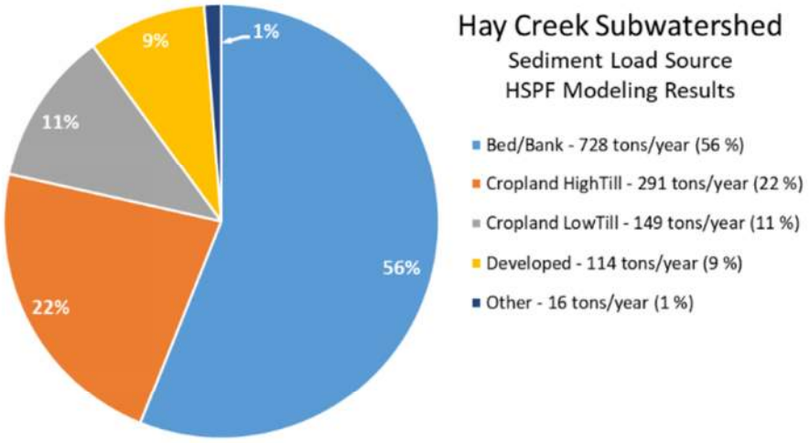

Legend
Watershed Boundary
NLCD 2016
Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceuous
Hay/Pasture
Cultivated Crops
Woody Wetlands
Emergent Herbaceuous Wetlands
0
3
Miles
N

Figure 3-11: Hay Creek Subwatershed sediment source loading summary by source type. HSPF modeling results over the analysis period (2005 to 2014).



*Other Sediment Source Loads in descending order include: Developed Effective Impervious Area (EIA), Roseau WWTP, Woody Wetlands, Pasture, Deciduous Forest, Coniferous Forest, Grassland, and Herbaceous Wetlands.

Figure 3-12: Hay Creek Subwatershed sediment source loading summary, by source location. HSPF modeling results over the analysis period (2005 to 2014).

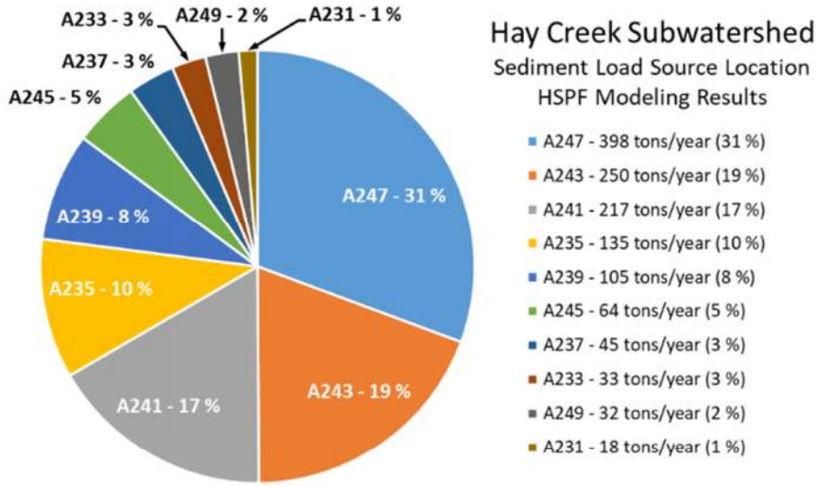


Figure 3-13: Hay Creek Subwatershed sediment source loading summary map. The figure is colored by the percent of total load each sub-basin c end of the impaired reach (Hay Creek). Darker color denotes higher contribution. HSPF modeling results over the analysis period (2005 to 2014)

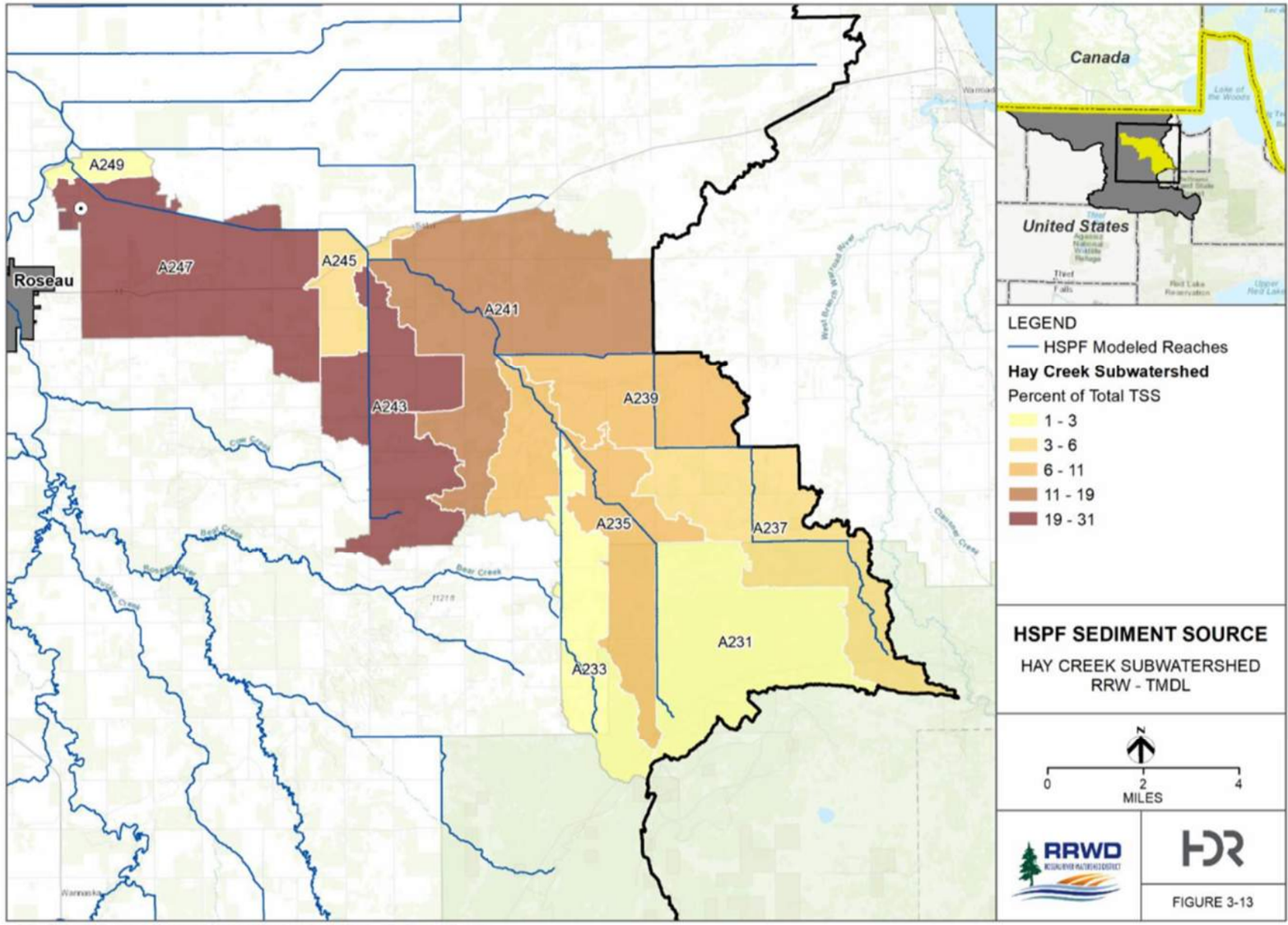
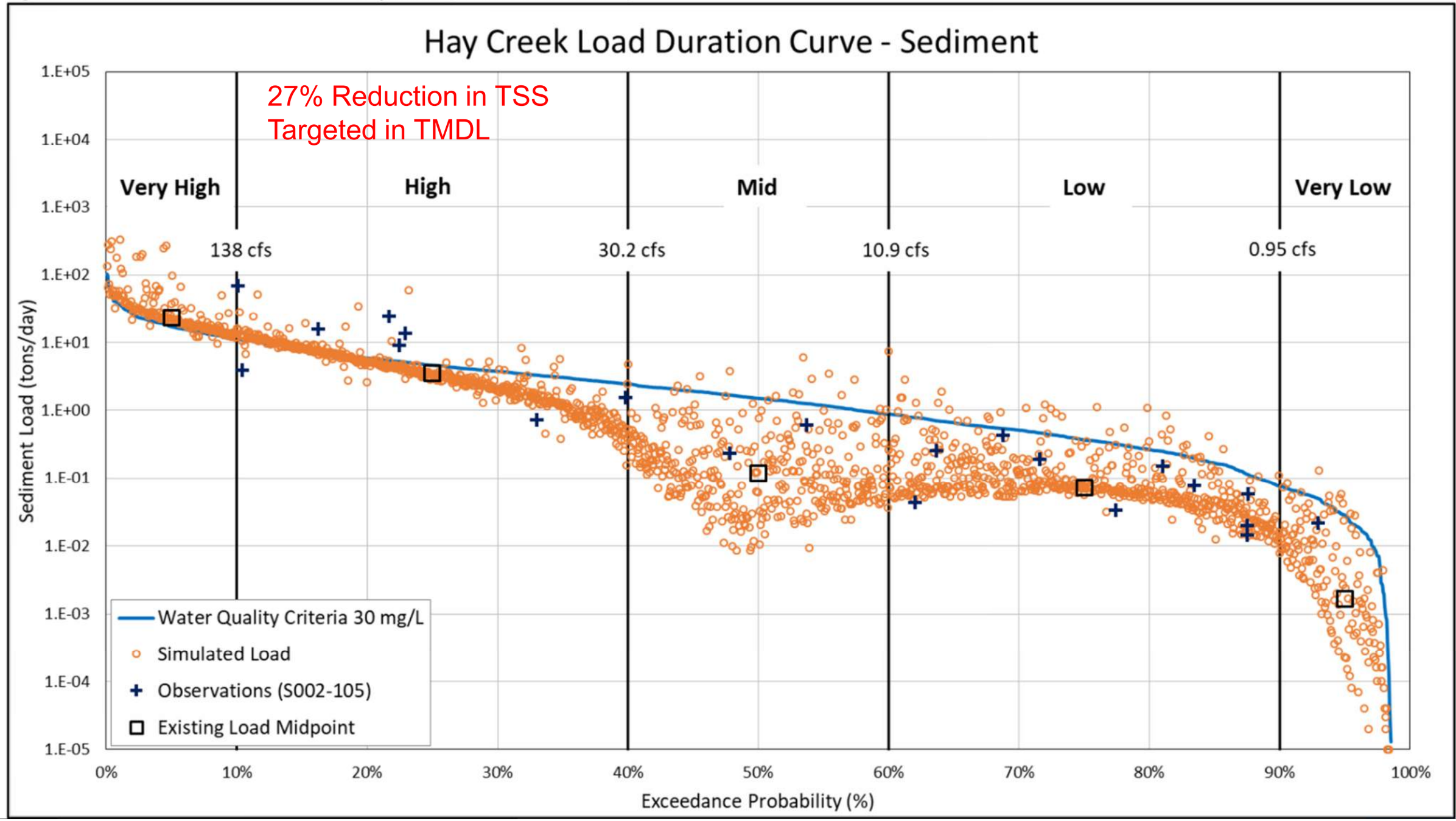
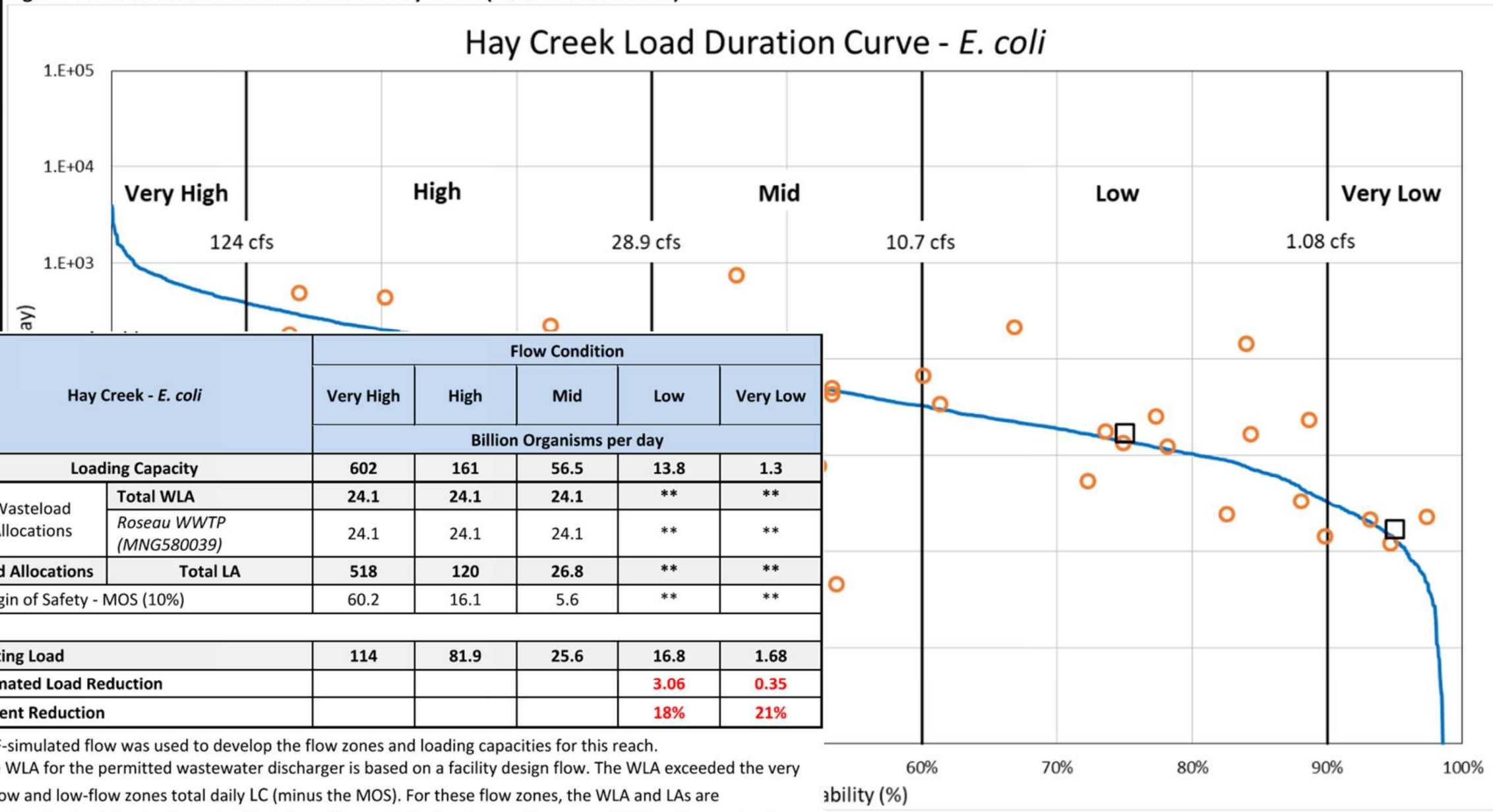


Figure 4-1: TSS Load Duration Curve for Hay Creek (AUIC 09020314-505)




ROSEAU RIVER
HAY CREEK

Figure 4-2: *E. coli* Load Duration Curve for Hay Creek (AUID 09020314-505)



Hay Creek - *E. coli*		Flow Condition				
		Very High	High	Mid	Low	Very Low
		Billion Organisms per day				
Loading Capacity		**602**	**161**	**56.5**	**13.8**	**1.3**
Wasteload Allocations	**Total WLA**	**24.1**	**24.1**	**24.1**	**	**
	Roseau WWTP (MNG580039)	24.1	24.1	24.1	**	**
Load Allocations	**Total LA**	**518**	**120**	**26.8**	**	**
Margin of Safety - MOS (10%)		60.2	16.1	5.6	**	**
Existing Load		**114**	**81.9**	**25.6**	**16.8**	**1.68**
Estimated Load Reduction					**3.06**	**0.35**
Percent Reduction					**18%**	**21%**

*HSPF-simulated flow was used to develop the flow zones and loading capacities for this reach.

**The WLA for the permitted wastewater discharger is based on a facility design flow. The WLA exceeded the very low-flow and low-flow zones total daily LC (minus the MOS). For these flow zones, the WLA and LAs are determined by the following formula: Allocation = (flow contribution from a given source) X (*E. coli* concentration limit or standard).

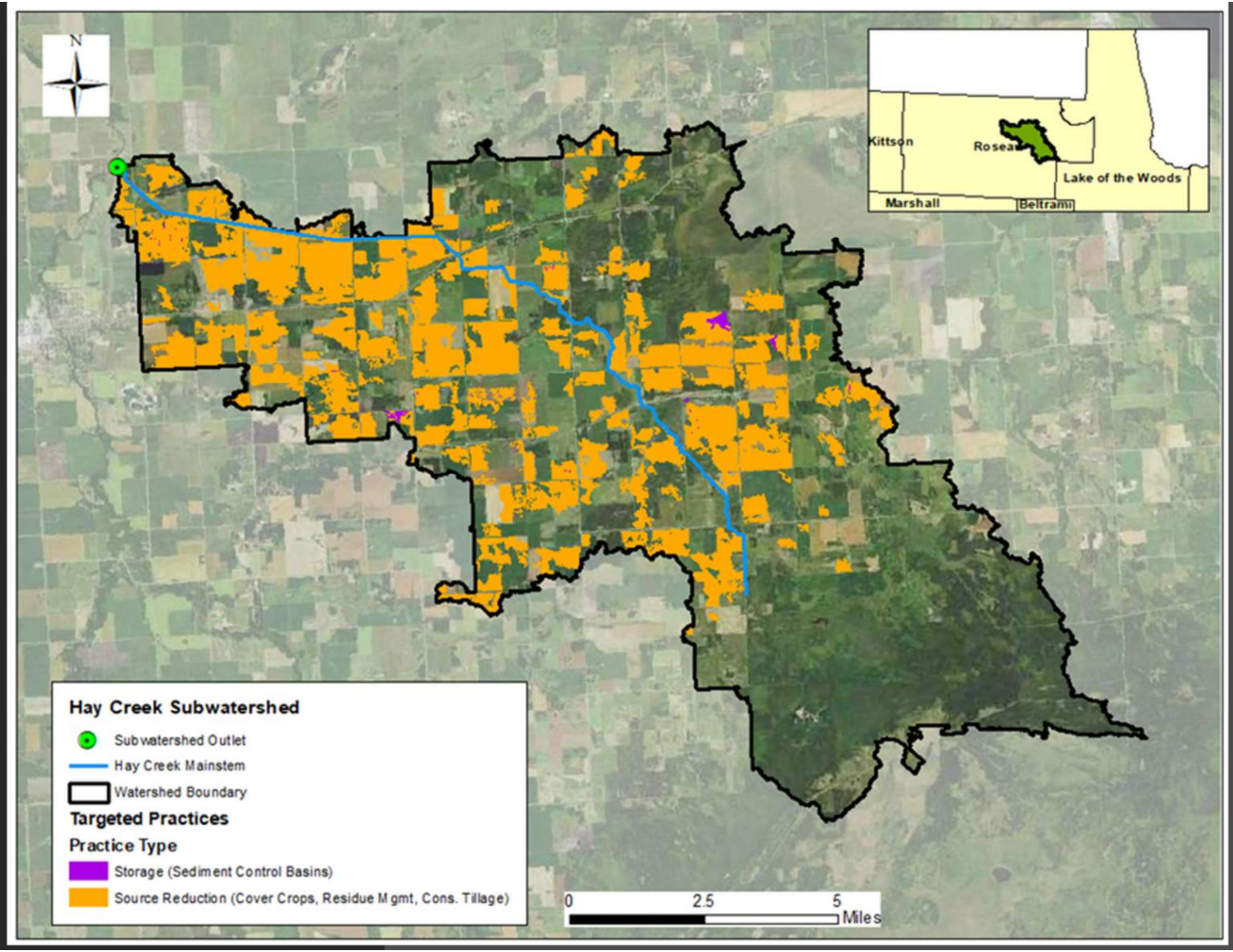
WHAT ARE SOME OPTIONS TO IMPROVE CONDITIONS?

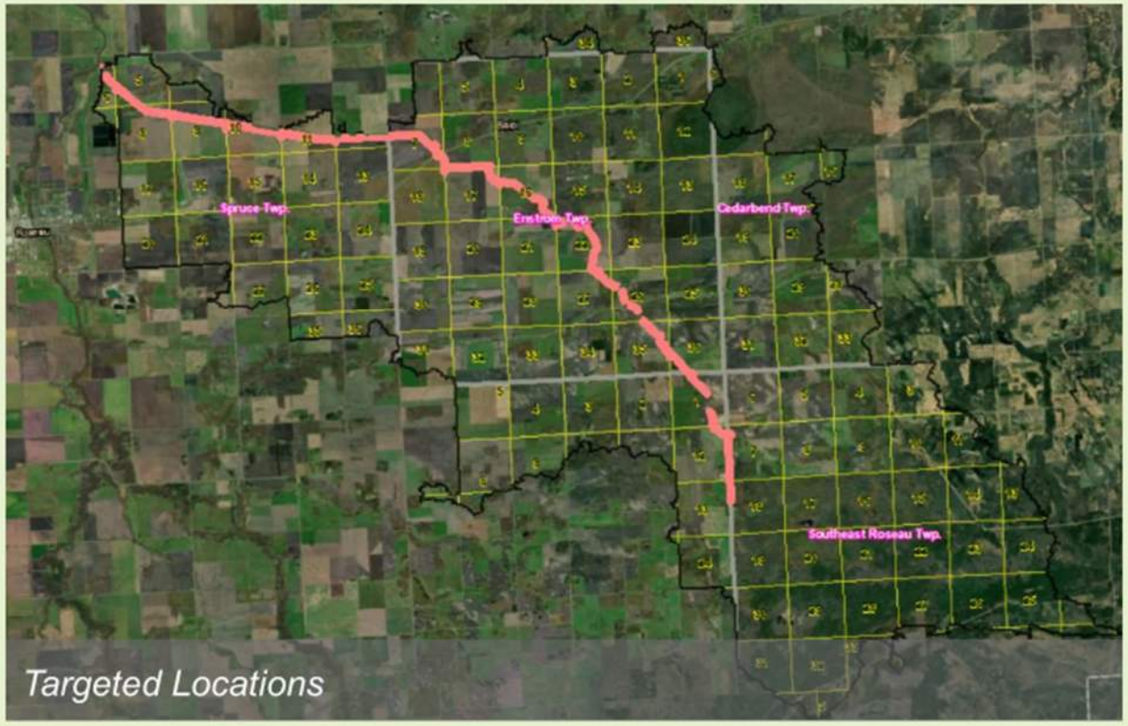
HOUSTON engineering, inc.

HAY CREEK SUBWATERSHED TARGETED IMPLEMENTATION PROFILE

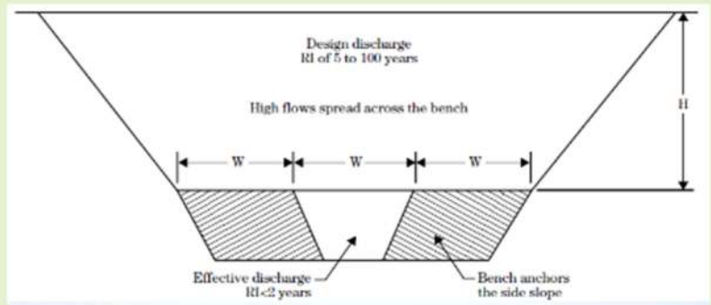
CLEAN WATER LAND & LEGACY AMENDMENT

RRWD ROSEAU RIVER WATERSHED DISTRICT


N
Kittson
Roseau
Lake of the Woods
Marshall
Beltrami
Hay Creek Subwatershed
Subwatershed Outlet
Hay Creek Mainstem
Watershed Boundary
Targeted Practices
Practice Type
Storage (Sediment Control Basins)
Source Reduction (Cover Crops, Residue Mgmt, Cons. Tillage)
0
2.5
5
Miles



Targeted Locations




Two-Stage Ditch

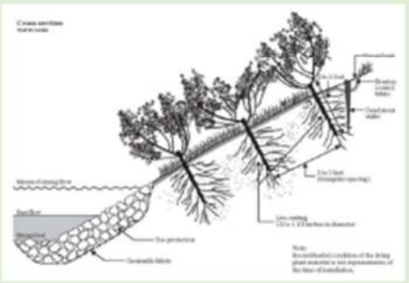
General Criteria

Max Sheer Stress (lbs./feet^2)	Max Slope	Max Substrate	Zone[1]	Vegetation Density	Cost[2]	Strength[3]	Advantages	Disadvantages
2-4	N/A	Boulder	T, B, C	76-100%	$$$	M	Brings creek to a more natural flow	Loss of farming land

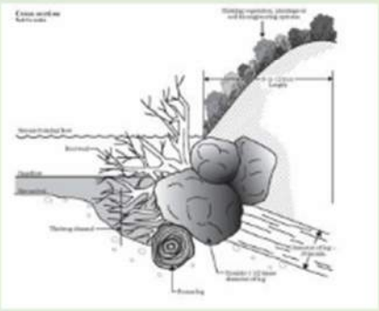
Targeted Locations

Practices

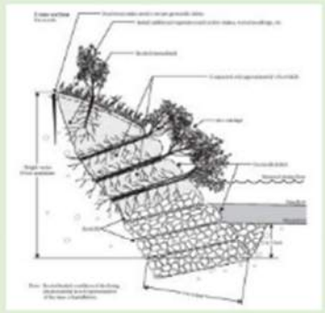
Minimal Impact Design/Maintenance



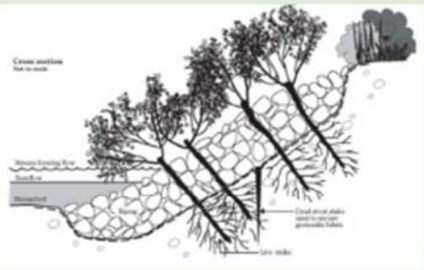
Natural Restoration and Protection



"Soft" Protection – Soft Armor



"Hard" Protection-Hard Armor



General Criteria

Practice	Max Shear Stress (lbs/ft^2)	Max Slope	Max Substrate	Zone[1]	Veg Density	Cost[2]	Strength[3]	Advantages
Vegetative Restoration	4	2:1	Gravel	U	76-100%	$	L	Inexpensive and easy to install
Tree/Boulder Revetment	3.9	N/A	Boulder	T, B	10-25%	$$	M	Reduces velocity along bank
Soft Armor Walls	3.8	1:1	Bedrock	T, B	76-100%	$$$	M	Permanent armor solution w/o rocks
Riprap with Live Stakes	2.5 - 10.1	2:1	Bedrock	T, B	26-50%	$$	H	Structural flexibility

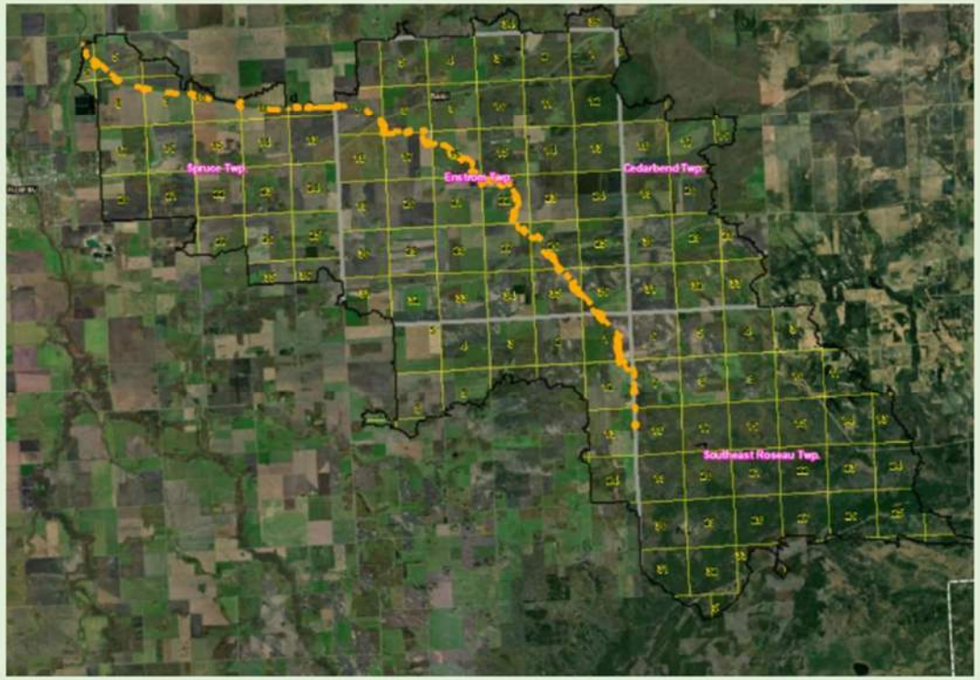
1 - T = Toe/Splash Zone, B= Bank, C = Channel, and U = Upland Area.

2 - Cost is relative cost for the conceptual designs; $ is lowest cost option(s) to $$$ is the highest cost option(s).

3 - Strength is the relative strength of the practice to resist erosive flows (L= relatively low resistance, M = medium resistance, and H = high resistance).

Protect Overland Flow

Targeted Locations



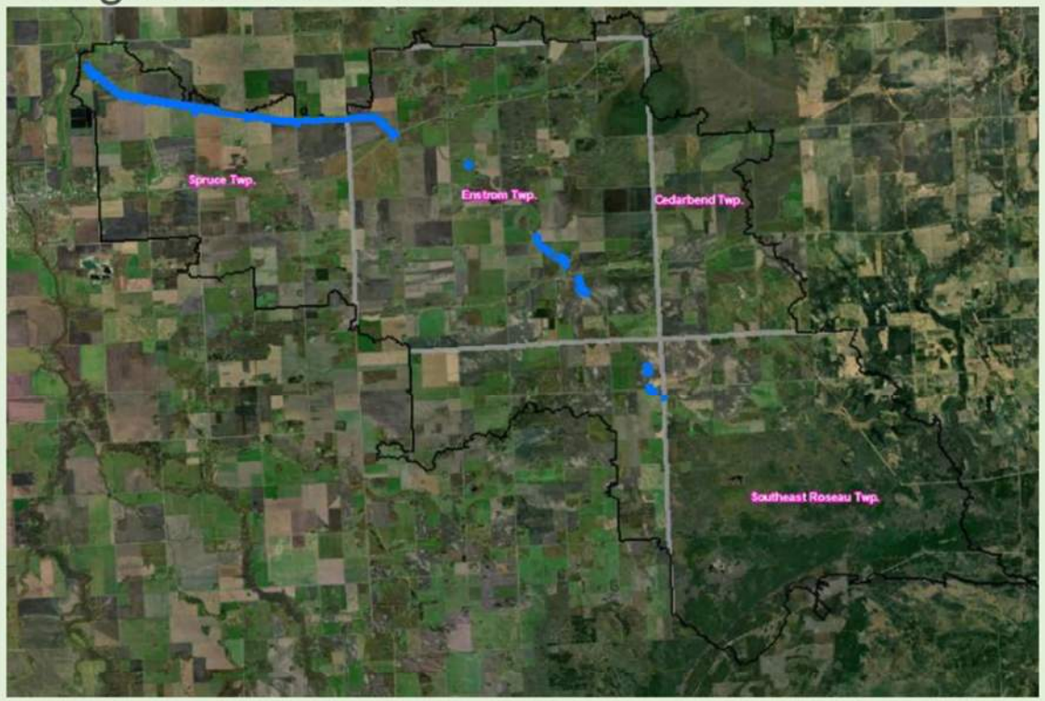
Types of Upstream Practices

Structural

- Grade Control Structure
- Side Water Inlets
- Cattle Exclusion Fencing
- Riparian Corridor Establishment

Reduce Runoff

Targeted Locations



Types of Upstream Practices

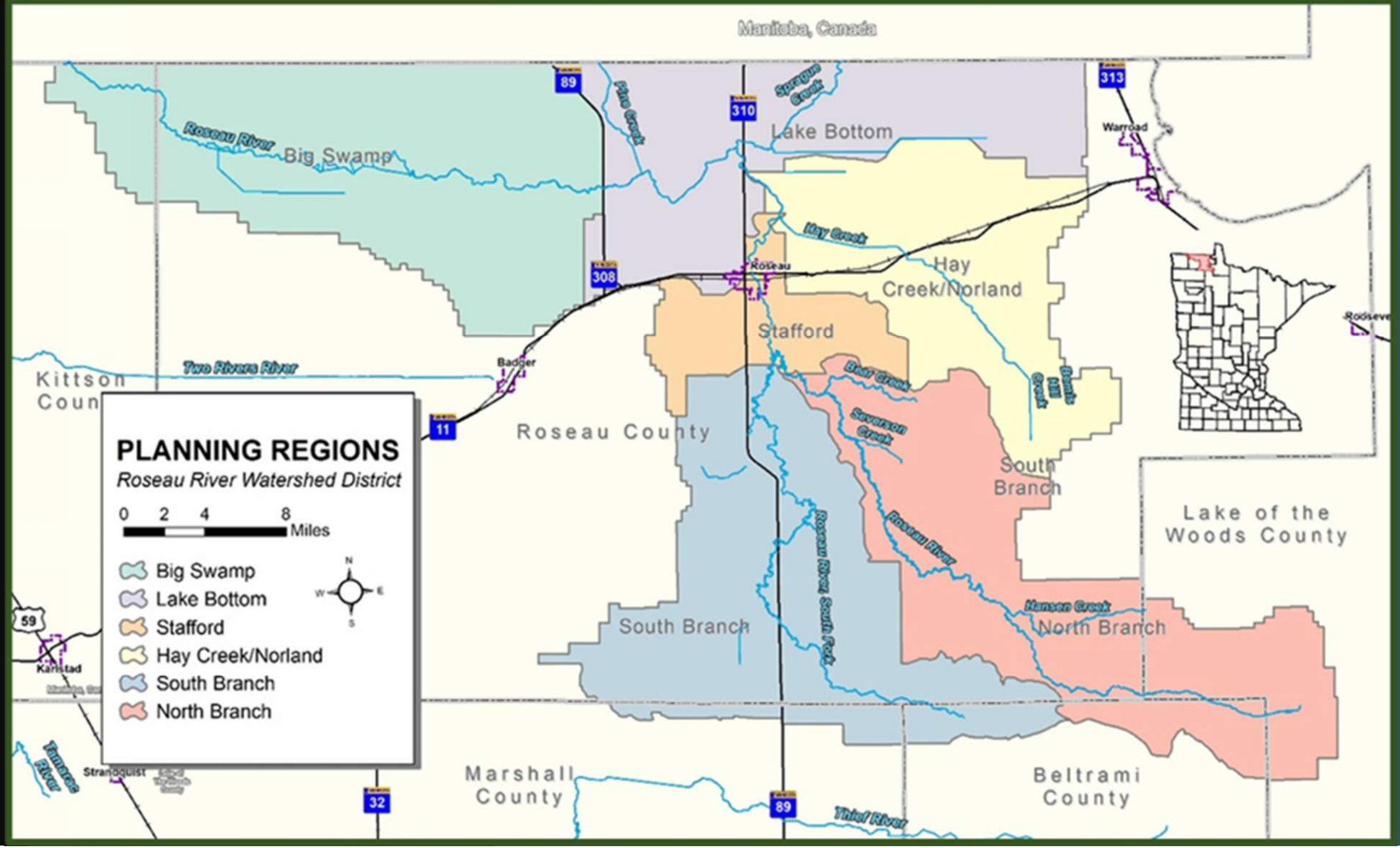
Field Management

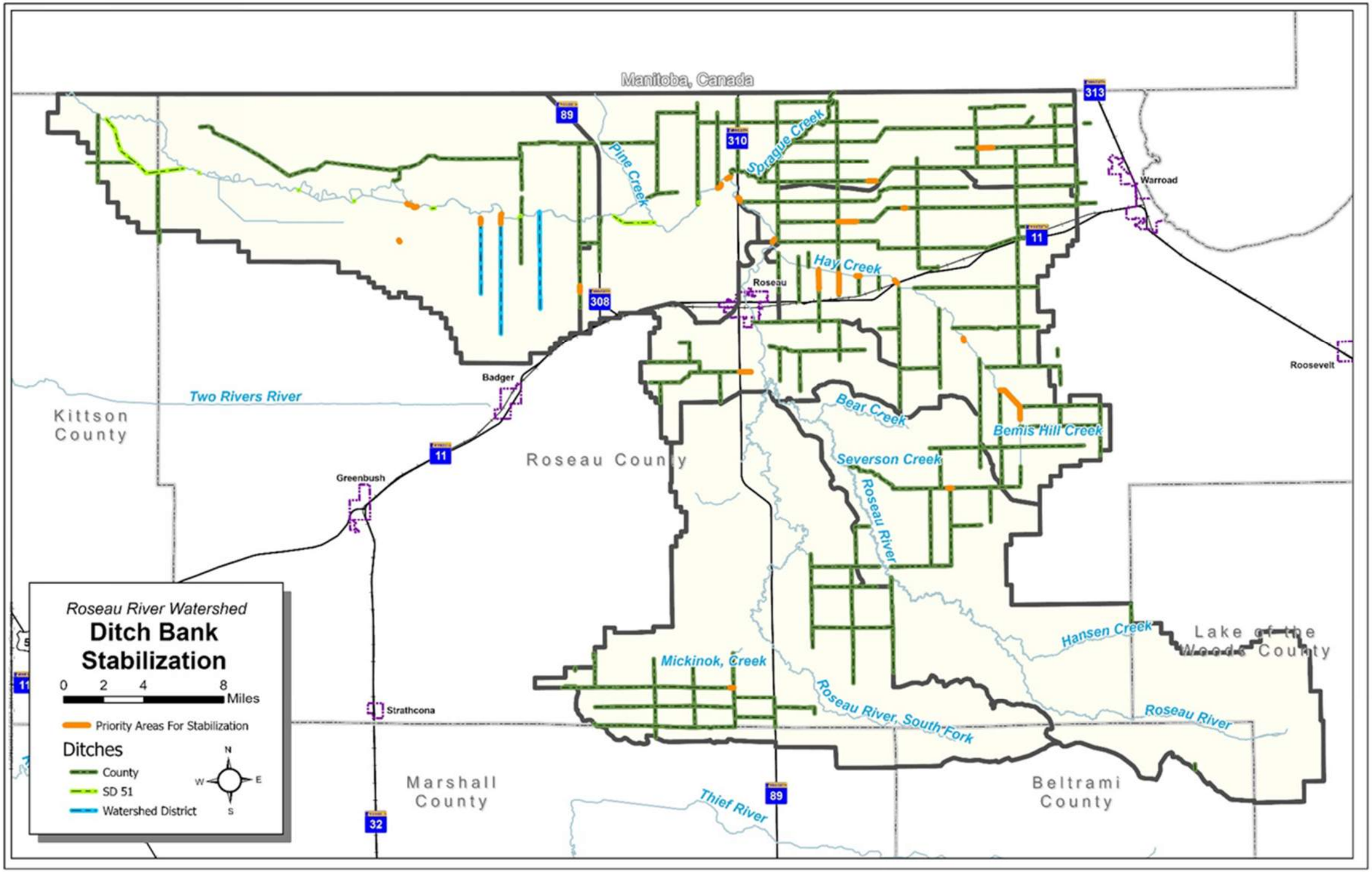
- Cover Crops
- Conservation Tillage
- Residue Management

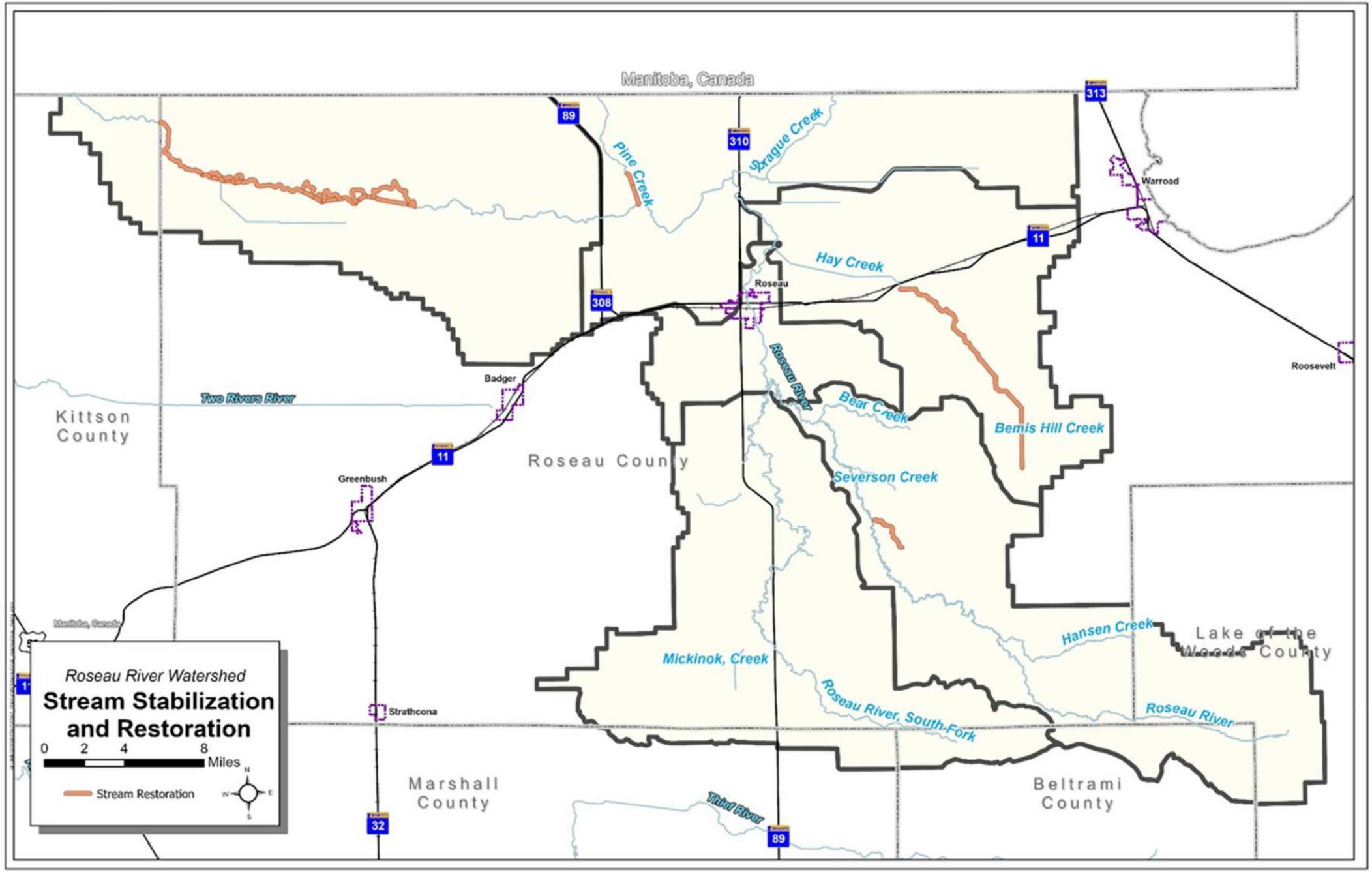
Structural

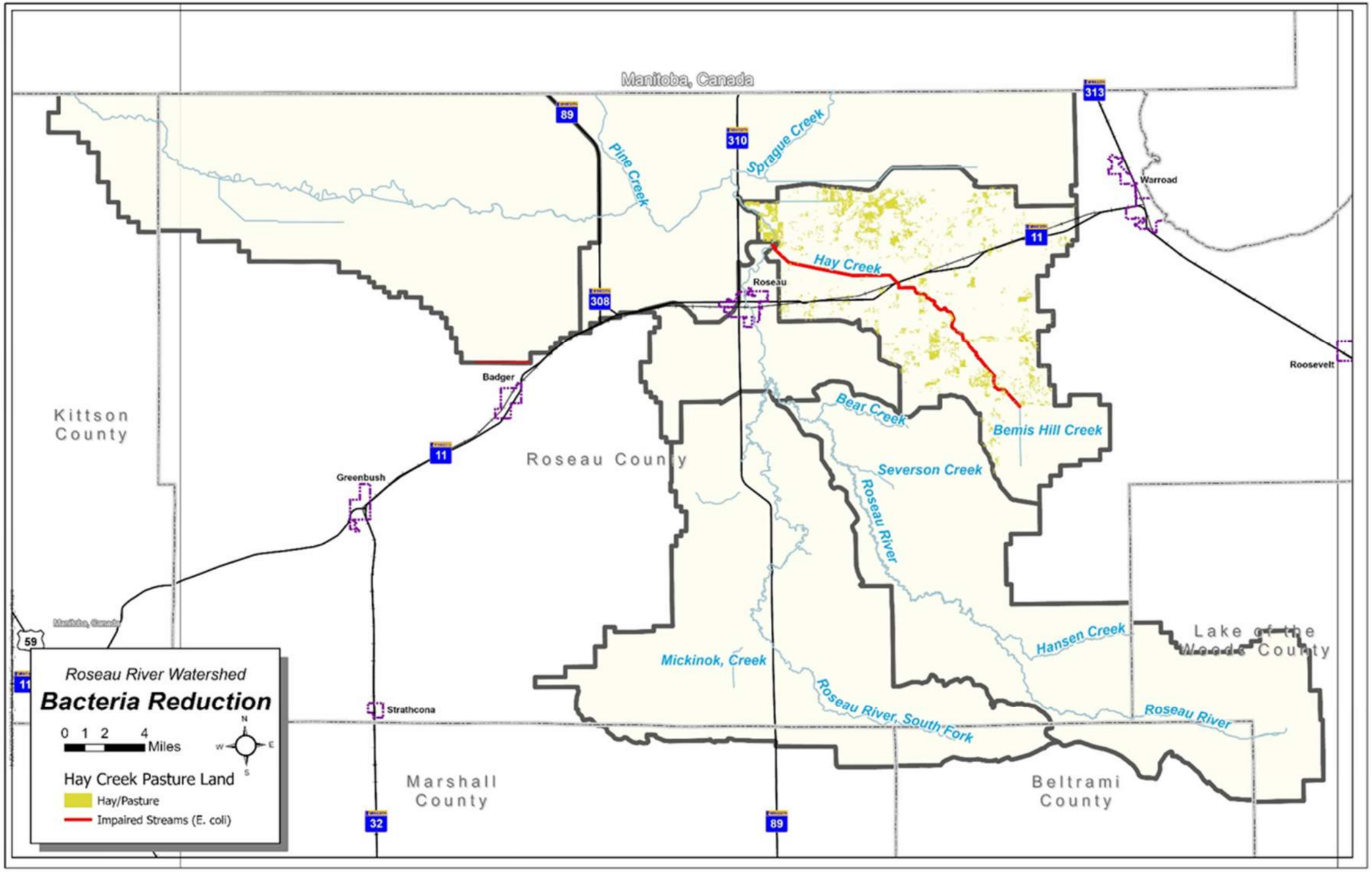
- WASCOBs
- Drainage Water Management
- Culvert resizing
- Impoundments
- Retention ponds

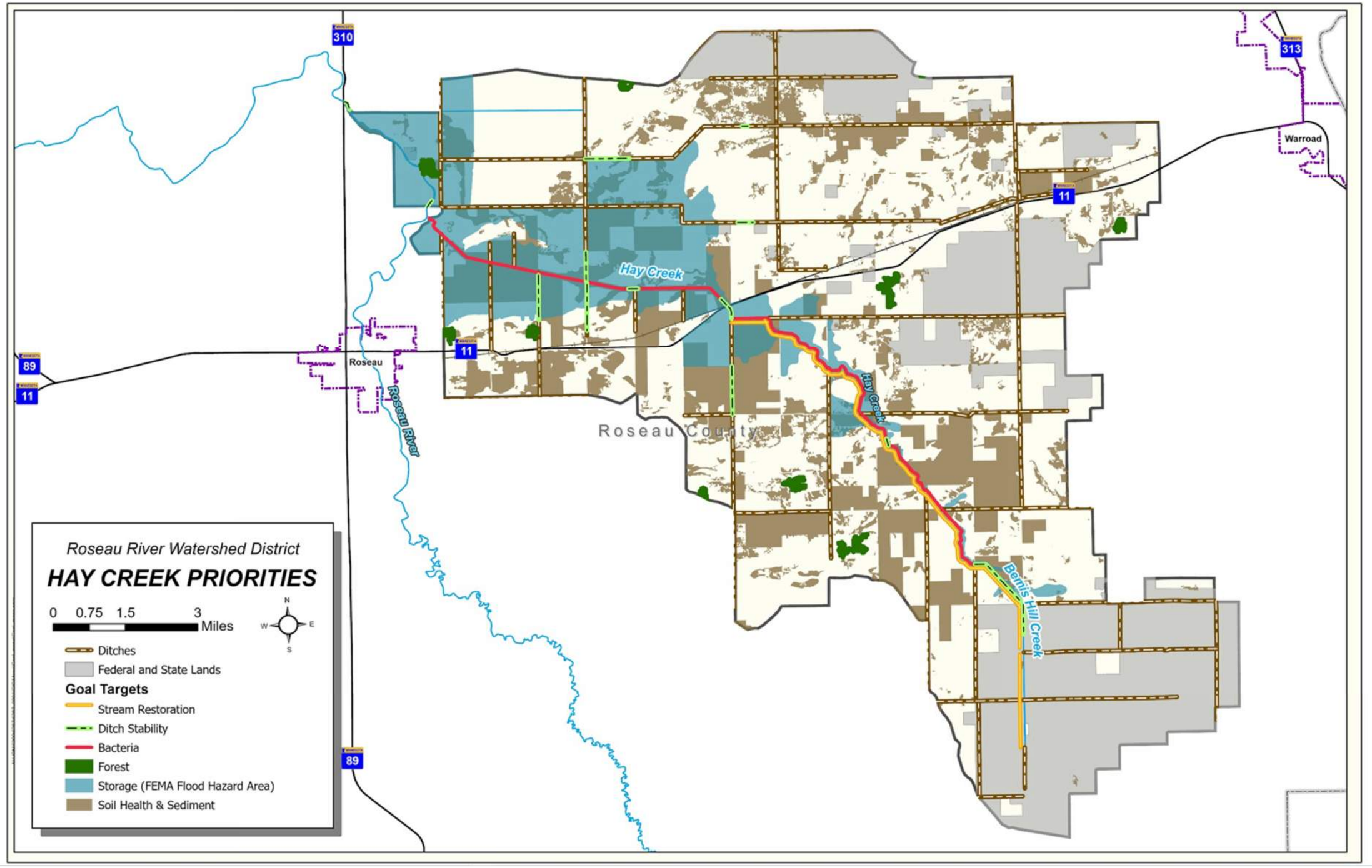

Roseau River
Comprehensive
Watershed
Management Plan
CLEAN
WATER
LAND &
LEGACY
AMENDMENT


Manitoba, Canada
PLANNING REGIONS
Roseau River Watershed District
0 2 4 8
Miles
Big Swamp
Lake Bottom
Stafford
Hay Creek/Norland
South Branch
North Branch
Roseau River
Big Swamp
Lake Bottom
Hay Creek/Norland
Stafford
South Branch
North Branch
Roseau County
Kittson County
Lake of the Woods County
Marshall County
Beltrami County
Two Rivers River
Pine Creek
Sprague Creek
Hay Creek
Bear Creek
Severson Creek
Bemis Hill Creek
Roseau River South Fork
Hansen Creek
Tamarac River
Thief River
Roseau
Badger
Warroad
Karlstad
Stranquist
89
310
313
308
11
59
32


Manitoba, Canada
89
310
313
11
308
Pine Creek
Sprague Creek
Hay Creek
Warroad
Roseau
Roosevelt
Badger
Two Rivers River
Kittson County
Roseau County
Bear Creek
Bemis Hill Creek
Severson Creek
Roseau River
Greenbush
Hansen Creek
Lake of the Woods County
Mickinok, Creek
Roseau River, South Fork
Roseau River
Strathcona
Marshall County
Thief River
Beltrami County
32
Roseau River Watershed
Ditch Bank Stabilization
0 2 4 8 Miles
Priority Areas For Stabilization
Ditches
County
SD 51
Watershed District
N
W
E
S


Manitoba, Canada
89
310
313
Pine Creek
Sprague Creek
Warroad
11
Hay Creek
Roseau
308
Roseau River
Roosevelt
Badger
Two Rivers River
Bear Creek
Bemis Hill Creek
Kittson County
11
Roseau County
Greenbush
Severson Creek
Hansen Creek
Lake of the Woods County
Mickinok, Creek
Roseau River, South Fork
Roseau River
Strathcona
Marshall County
Beltrami County
Tamarac River
32
89
Roseau River Watershed
Stream Stabilization and Restoration
0 2 4 8
Miles
Stream Restoration
N
W
E
S


Manitoba, Canada
89
310
313
Pine Creek
Sprague Creek
Warroad
11
Hay Creek
Roseau
308
Roosevelt
Badger
Kittson County
Bear Creek
Bemis Hill Creek
11
Roseau County
Severson Creek
Greenbush
Roseau River
59
Hansen Creek
Lake of the Woods County
Mickinok, Creek
Roseau River, South Fork
Roseau River
Strathcona
Marshall County
Beltrami County
32
89
Roseau River Watershed
Bacteria Reduction
0 1 2 4
Miles
N
W
E
S
Hay Creek Pasture Land
Hay/Pasture
Impaired Streams (E. coli)


310
313
Warroad
11
Hay Creek
89
11
Roseau
Roseau River
Roseau County
Hay Creek
Bemis Hill Creek
89
Roseau River Watershed District
HAY CREEK PRIORITIES
0 0.75 1.5 3 Miles
N
W
E
S
Ditches
Federal and State Lands
Goal Targets
Stream Restoration
Ditch Stability
Bacteria
Forest
Storage (FEMA Flood Hazard Area)
Soil Health & Sediment

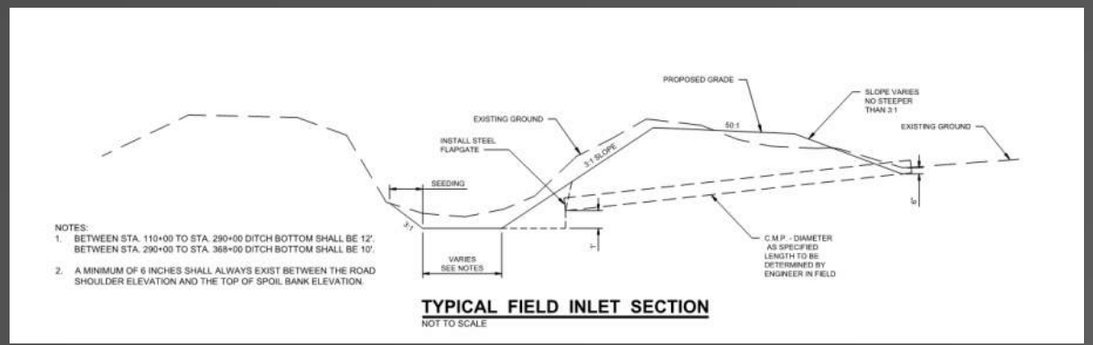
Hay Creek Planning Region Implementation Table

Programs	Action	Targeting Approach (Figure 5.2)	10-year Outcomes	Progress towards Goal	Goals Addressed: Ditch Bank Stabilization	Agronomic Protection	Increase Storage	Sediment Reduction	Soil Health Enhancement	Stream Restoration	Groundwater Protection	Phosphorus Reduction	Bacteria Reduction	Land protection	Responsibility (Bold = Lead)	Timeline: 2024-2025	2026-2027	2028-2029	2030-2031	2032-2033	Total 10-Year Estimated Cost
Projects and Practices	**Structural Practices** *Grade Stabilization* *Grassed waterways* *Filter strips/riparian buffers*	PTMApp Data	Treat at least 3,673 acres	483 tons/year sediment 522 lbs/year phosphorus 10,255 lbs/year nitrogen		●	○	●	○	○	○	●	○		**Roseau SWCD, NRCS**, RRWD, BWSR, MDA	●	●	●	●	●	$1,045,000
	Non-structural Practices *Cover crops* *Reduced tillage/no till* *Prescribed grazing* *Perennial Cover* *Forage/biomass planting*	PTMApp Data	Treat at least 1,997 acres	800 tons/year sediment 380 lbs/year phosphorus 7,320 lbs/year nitrogen	○	●	○	●	●	○	○	●	○		**Roseau SWCD, NRCS**, RRWD, BWSR, MDA	●	●	●	●	●	$299,550
	Forest Management and Protection *Forest Stewardship Plans* *Sustainable Forest Incentive Act* *Conservation Easements*	Privately owned forest >20 acres	60 acres	60 acres managed and one forest stewardship plan			○	○			○	○		●	**Roseau SWCD,** DNR, BWSR	●	●	●	●	●	$650
	Bacteria Management Practices *Cattle fencing and watering* *Crossing stabilization*	*E.coli* impairments	1 site	One comprehensive bacteria management project that reduces bacteria.				○				○	●		**Roseau SWCD, NRCS**, MPCA, MDA	●	●	●	●	●	$100,000
	Ditch Stabilization	Local partners	3 miles stabilized	3 miles stabilized	●		○	●				●			**RRWD, County**		●	●	●	●	$300,000
																				Total Projects and Practices	**$1,745,200**
Capital Projects	**Stream Restoration**	Local partners	3 miles restored	3 miles restored	●	○	○	●		●		●		○	**RRWD, DNR,** Roseau SWCD, BWSR, NRCS		●	●	●	●	Costs not available

● *Direct progress towards goals*

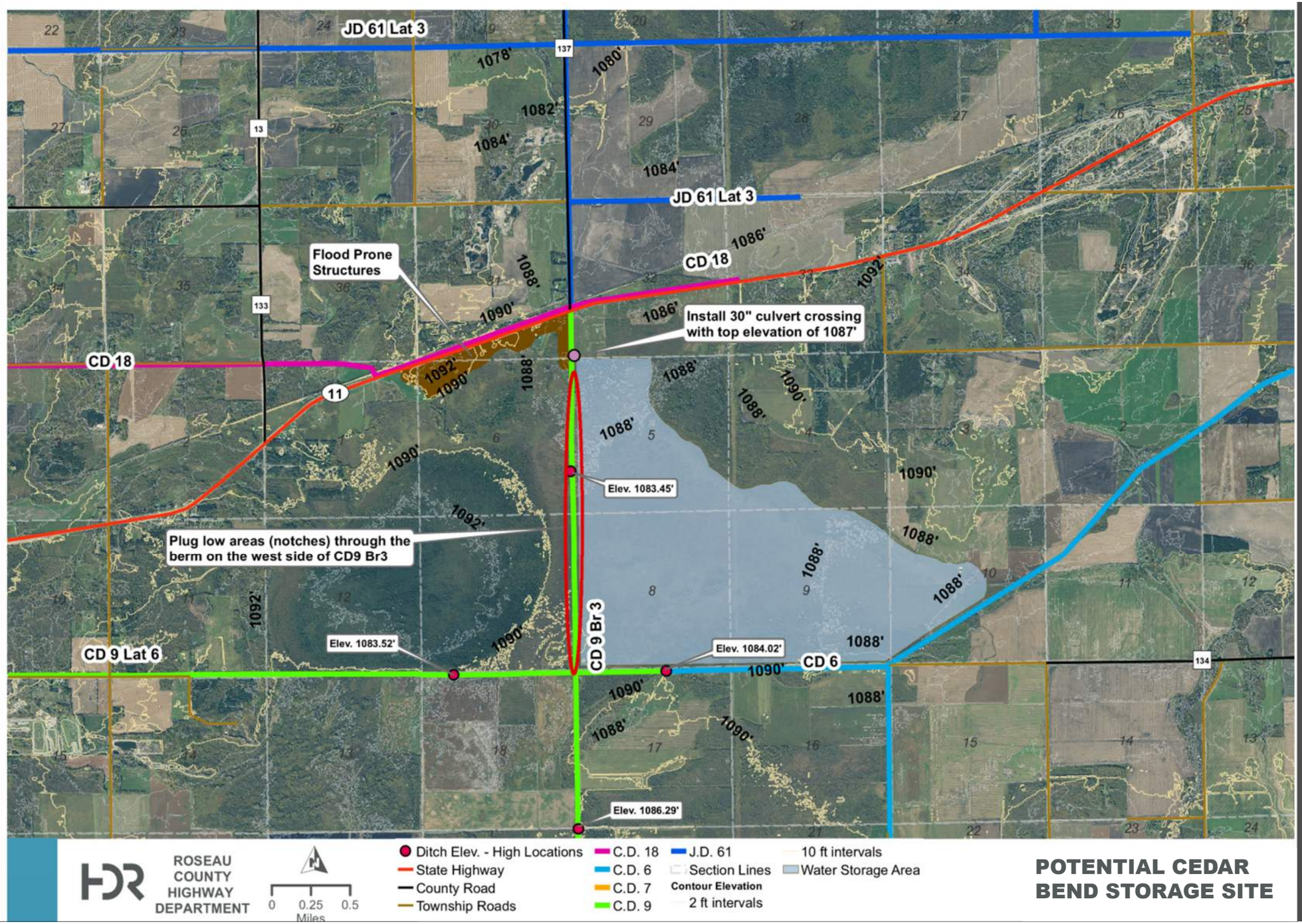
○ *Indirect progress towards goals*

Sediment Best Management Practices

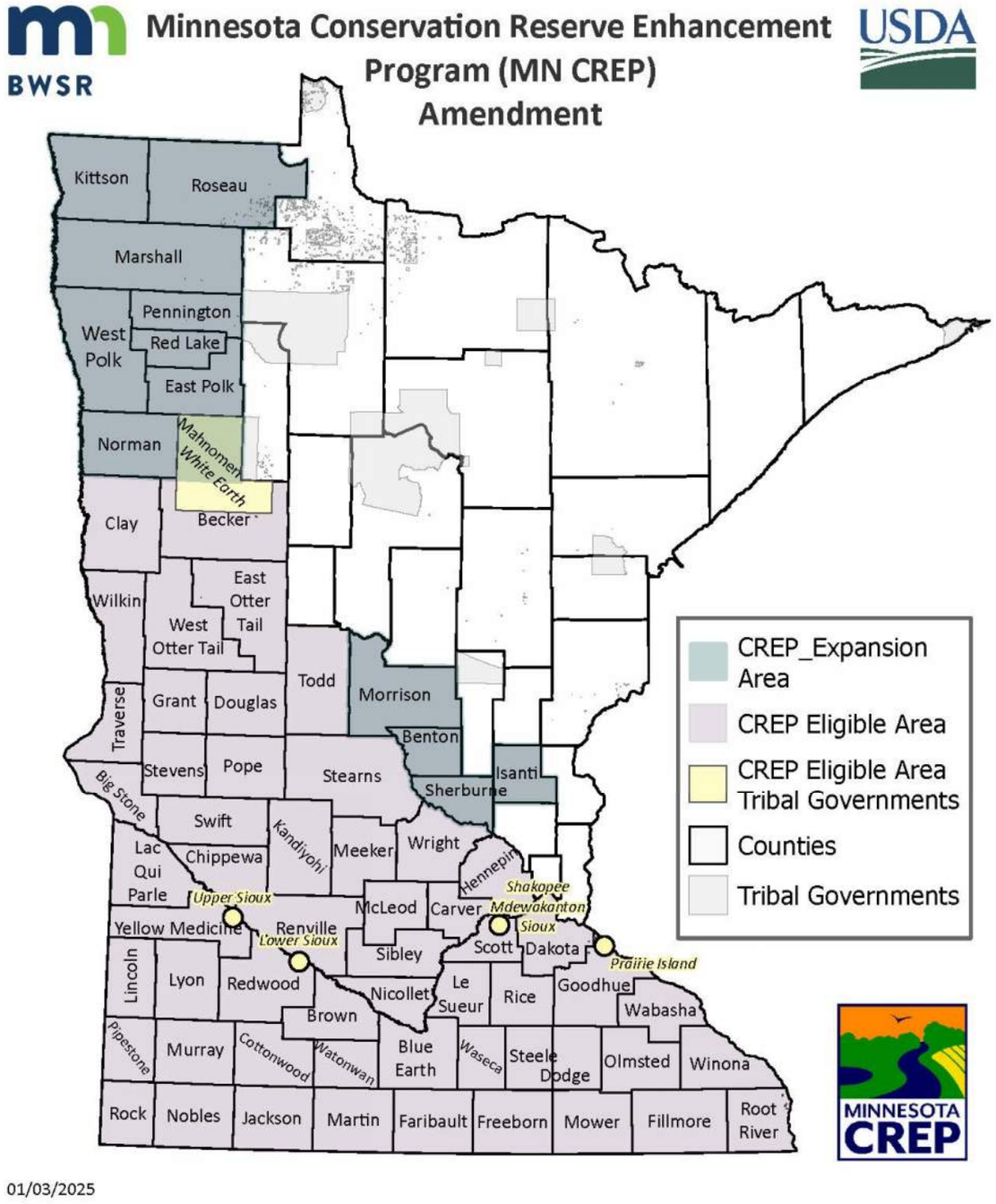


Sediment Best Management Practices

- Installation of sediment BMPs (field riprap structures)


JD 61 Lat 3
1078'
1080'
1082'
1084'
1086'
1088'
1090'
1092'
CD 18
Flood Prone Structures
Install 30" culvert crossing with top elevation of 1087'
Elev. 1083.45'
Plug low areas (notches) through the berm on the west side of CD9 Br3
CD 9 Br 3
CD 9 Lat 6
Elev. 1083.52'
Elev. 1084.02'
CD 6
Elev. 1086.29'
11
13
133
134
137
ROSEAU COUNTY HIGHWAY DEPARTMENT
0 0.25 0.5
Miles
Ditch Elev. - High Locations
State Highway
County Road
Township Roads
C.D. 18
C.D. 6
C.D. 7
C.D. 9
J.D. 61
Section Lines
Contour Elevation
2 ft intervals
10 ft intervals
Water Storage Area
POTENTIAL CEDAR BEND STORAGE SITE

- Potential Funding for Landowner Projects include:
  - Conservation Reserve Enhancement Program (CREP)
  - Environmental Quality Incentive Program (EQIP)
  - Watershed Based Implementation Fund (WBIF)
  - Section 319 Funding



Questions?