

## Rapid Watershed Assessment

### Mustinka

**(MN) HUC: 09020102**



Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help land-owners and local leaders set priorities and determine the best actions to achieve their goals.

## Introduction

The Mustinka 8-Digit Hydrologic Unit Code (HUC) subbasin is part of the Red River Basin in northwestern Minnesota. The watershed occurs in the Glacial Lake Agassiz Plain, North Central Hardwoods, Northern Lakes and Forests, and Northern glaciated plains Level III Ecoregions.

The greater Red River basin characteristically has a poorly defined floodplain and low gradient that combine with extensive drainage, widespread conversion of tallgrass prairie to farmland, and urban/suburban development to leave the basin subject to frequent floods that affect urban and rural infrastructure and agricultural production.

The main resource concerns in the watershed are wind and water erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat. Many of the resource concerns relate directly to flooding and increased sediment and pollutant loadings to surface waters.



### County Totals

<b>County</b>	<b>Acres in HUC</b>	<b>% HUC</b>
Otter Tail	17,648	3.1%
Grant	160,193	28.5%
Traverse	225,682	40.1%
Stevens	93,582	16.6%
Big Stone	65,006	11.6%
<b>Total acres:</b>	<b>562,112</b>	<b>100%</b>

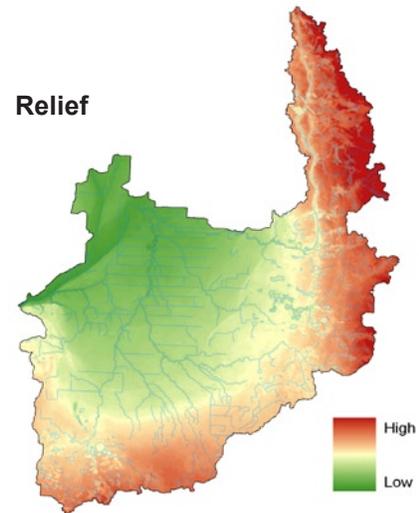
## Physical Description

The Mustinka River begins its course southwest of Fergus Falls in southwestern Otter Tail County and flows towards the south into Grant County, where it continues through Stony Brook Lake and Lightning Lake. In southern Grant County the river turns to the west, flows past Norcross into Traverse County, then turns southwest past Wheaton, flowing to the northern end of Lake Traverse. Over time the Mustinka River has been extensively channelized, straightened and dammed.

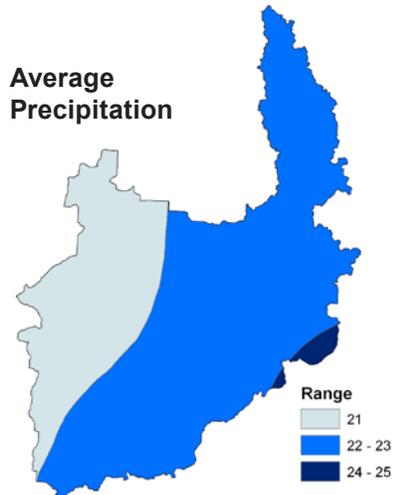
Precipitation in the watershed ranges from 21 to 25 inches annually. Above-normal amounts of precipitation in the late fall of the year or from May to October lead to high levels of soil moisture, periodically producing the snow-melt and summer floods that are known to affect the further reaches of the overall Red River Basin.

Predominate land uses / land covers are Row Crops (84%), Residential/Commercial Development (5%), Wetlands (4.5%), Open Water (3.4%), and Grass/Pasture/Hay (2%). Agricultural land use in the basin accounts for approximately 86% of the overall watershed acres.

Development pressure is moderate in most areas, with occasional farms, timberland, and lakeshore being parceled out for recreation, lake or country homes.

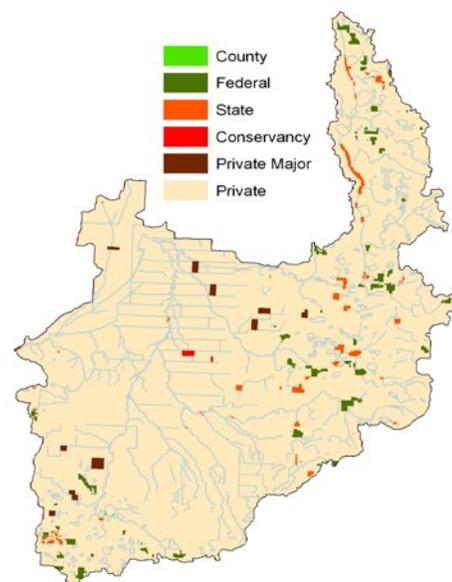


**Average  
Precipitation**



## Ownership\* <sup>1</sup>

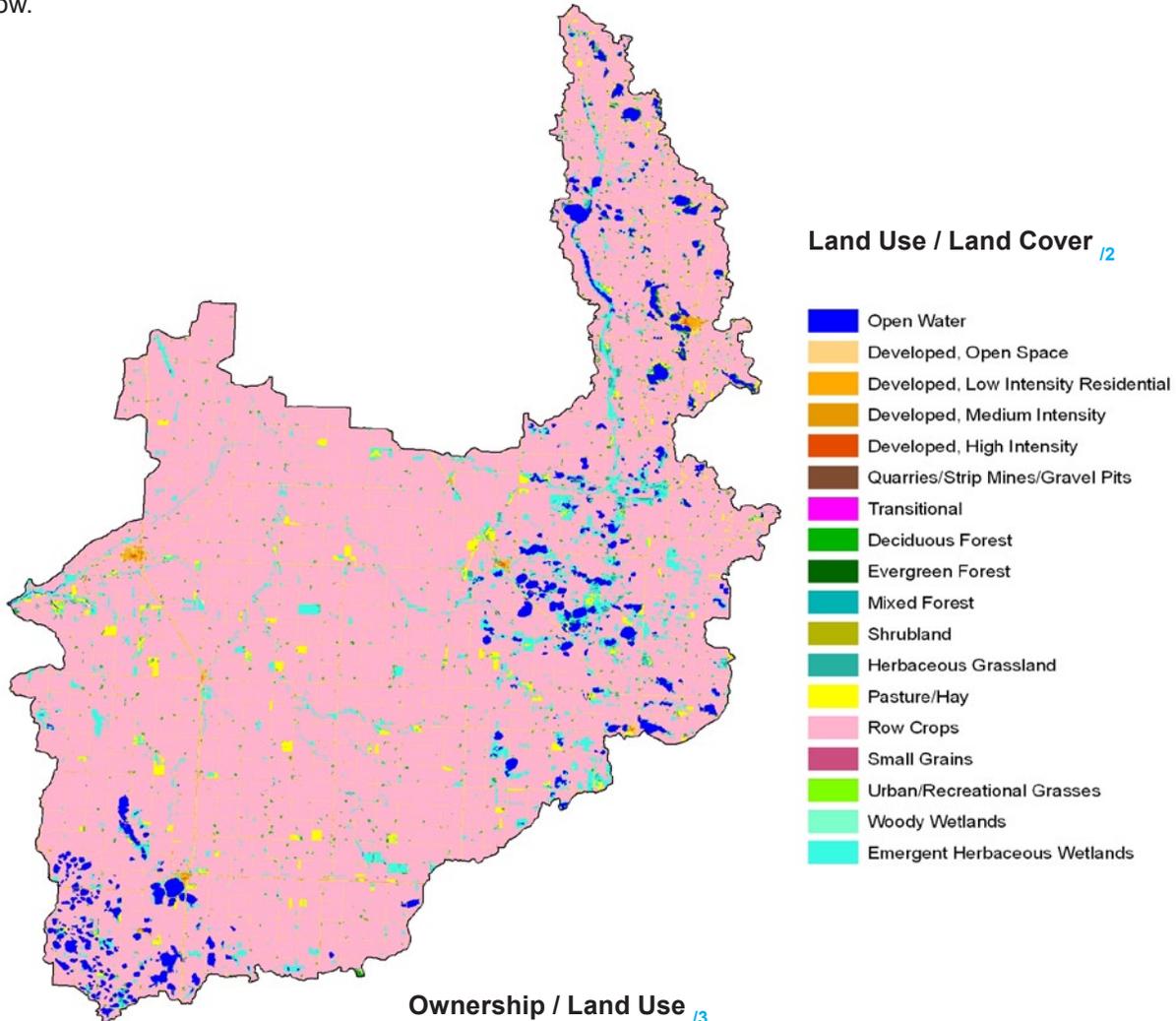
Ownership Type	Acres	% of HUC
Conservancy	380	0.1
County	44	0.0
Federal	8,145	1.4
State	4,957	0.9
Other	-	-
Tribal	-	-
Private Major	2,901	0.5
Private	545,686	97.1
<b>Total Acres:</b>	<b>562,112</b>	<b>100</b>



\* Ownership totals derived from 2007 MN DNR GAP Stewardship data and are the best suited estimation of land stewardship available on a statewide scale at time of publication. See the bibliography section of this document for further information.

## Ownership / Land Use

The Mustinka watershed covers an area of 562,112 acres. Approximately ninety seven percent of the land in the watershed is owned by private landholders (545,686 acres). The second largest ownership type is Federal, with approximately 8,145 acres (1.4%), followed by State with 4,957 acres (0.9%), Private-Major with 2,901 acres (0.5%), and Conservancy with 380 acres (0.1%). County lands account for the smallest percentage, with slightly less than 50 acres (<0.1%). Land use by ownership type is represented in the table below.



Landcover/Use	Public		Private**		Tribal		Total Acres	Percent
	Acres	% Public	Acres	% Private	Acres	% Tribal		
Forest	218	0.0%	4,231	0.8%	0	0.0%	4,449	0.8%
Grass, etc	1,176	0.2%	9,878	1.8%	0	0.0%	11,055	2.0%
Orchards	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Row Crops	3,304	0.6%	469,879	83.6%	0	0.0%	473,183	84.2%
Shrub etc	20	0.0%	139	0.0%	0	0.0%	159	0.0%
Wetlands	4,709	0.8%	20,701	3.7%	0	0.0%	25,410	4.5%
Residential/Commercial	451	0.1%	28,160	5.0%	0	0.0%	28,611	5.1%
Open Water*	3,269	0.6%	15,966	2.8%	0	0.0%	19,235	3.4%
<b>Watershed Totals:</b>	<b>13,148</b>	<b>2.34%</b>	<b>548,953</b>	<b>97.7%</b>	<b>0</b>	<b>0.0%</b>	<b>562,112</b>	<b>100%</b>

\* ownership undetermined

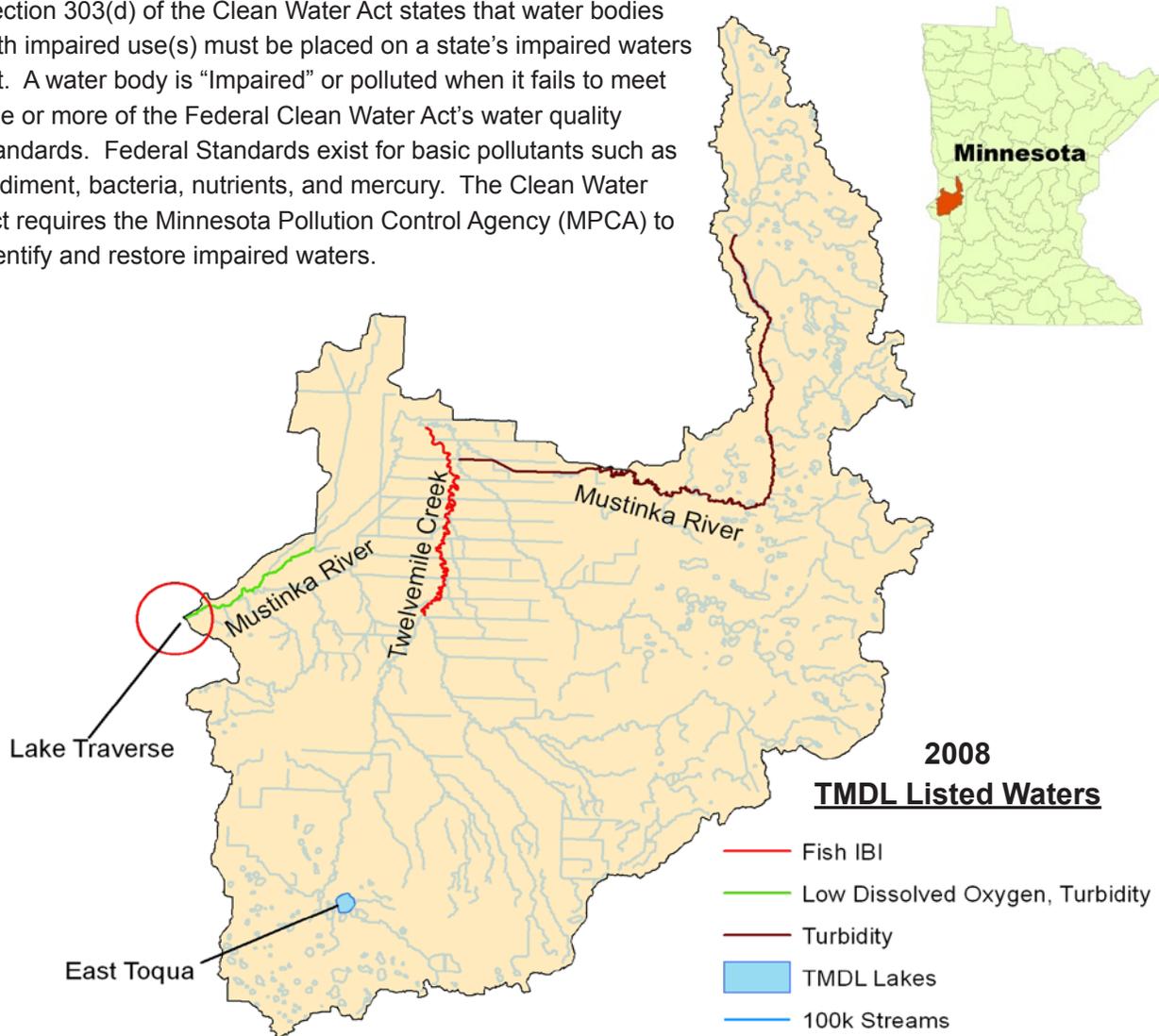
\*\* includes private-major

Physical Description (continued)

		ACRES	cu. ft/sec	
<b>Stream Flow Data</b>	USGS Streamflow not available for HUC 09020102	<b>2008 Avg.</b>	--	
		<b>May – Sept. Avg.</b>	--	
		ACRES/MILES	PERCENT	
<b>Stream Data<sup>14</sup></b> (*Percent of Total HUC Stream Miles)	Total Miles – Major (100K Hydro GIS Layer)	1,085.1	---	
	303d/TMDL Listed Streams (DEQ)	66.1	6.1%	
<b>Riparian Land Cover/Land Use<sup>15</sup></b> (Based on a 100-foot buffer on both sides of all streams in the 100K Hydro GIS Layer)	<b>Land Use Type</b>	<b>Acres</b>	<b>Percent</b>	
	Forest	407	1.6%	
	Grain Crops	0	0.0%	
	Grass, etc	716	2.7%	
	Orchards	0	0.0%	
	Row Crops	14,737	56.4%	
	Shrub etc	37	0.1%	
	Wetlands	4,116	15.7%	
	Residential/Commercial	1,700	6.5%	
	Open Water*	4,436	17.0%	
<b>Total Buffer Acres:</b>		<b>26,150</b>	<b>100%</b>	
<b>Crop and Pastureland Land Capability Class<sup>16</sup></b> (Croplands & Pasturelands Only) (1997 NRI Estimates for Non-Federal Lands Only)	<b>1 – slight limitations</b>	26,900	6%	
	<b>2 – moderate limitations</b>	385,200	81%	
	<b>3 – severe limitations</b>	45,400	10%	
	<b>4 – very severe limitations</b>	15,000	3%	
	<b>5 – no erosion hazard, but other limitations</b>	0	0%	
	<b>6 – severe limitations; unsuitable for cultivation; limited to pasture, range, forest</b>	1,900	0%	
	<b>7 – very severe limitations; unsuitable for cultivation; limited to grazing, forest, wildlife habitat</b>	0	0%	
	<b>8 – miscellaneous areas; limited to recreation, wildlife habitat, water supply</b>	0	0%	
	<b>Total NRI Crop &amp; Pasture Lands</b>	<b>474,400</b>	<b>-</b>	
	<b>TYPE OF LAND</b>	<b>ACRES</b>	<b>% of Crop Lands</b>	<b>% of HUC</b>
<b>Irrigated Lands<sup>17</sup></b> (2002 NASS Estimates)	Cultivated Cropland / Pastureland	6,391	1.3%	0.9%
	Uncultivated Cropland	0	0%	0%
	<b>Total Irrigated Lands</b>	<b>6,391</b>	<b>1.3%</b>	<b>0.9%</b>

## Assessment of Waters

Section 303(d) of the Clean Water Act states that water bodies with impaired use(s) must be placed on a state's impaired waters list. A water body is "Impaired" or polluted when it fails to meet one or more of the Federal Clean Water Act's water quality standards. Federal Standards exist for basic pollutants such as sediment, bacteria, nutrients, and mercury. The Clean Water Act requires the Minnesota Pollution Control Agency (MPCA) to identify and restore impaired waters.



Listed Stream	Impairment	Affected Use
Twelvemile Creek: West Branch Twelvemile Creek to Mustinka River	Fish IBI	Aquatic Life
Mustinka River: Unnamed creek to Lake Traverse	Low Dissolved Oxygen	Aquatic Life
Mustinka River: Lightning Lake to Grant/Traverse County line	Turbidity	Aquatic Life
Mustinka River: Grant/Traverse County line to Fivemile Creek	Turbidity	Aquatic Life
East Toqua	Excess nutrients	Aquatic Consumption
Lake Traverse	Mercury	Aquatic Consumption

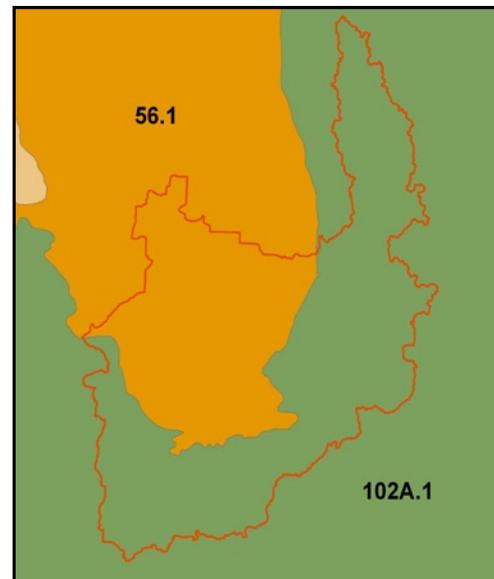
## Common Resource Areas

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The Mustinka watershed encompasses two Common Resource Areas, CRAs 56.1 and 102A.1. <sup>19</sup>

A Common Resource Area (CRA) map delineation is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area (General Manual Title 450 Subpart C 401.21)

Common Resource Areas are created by subdividing MLRAs by resource concerns, soil groups, hydrologic units, resource use, topography, other landscape features, and human considerations affecting use and treatment needs.



Only the major CRA units are described.  
For further information, go to:  
<http://soils.usda.gov/survey/geography/cra.html>

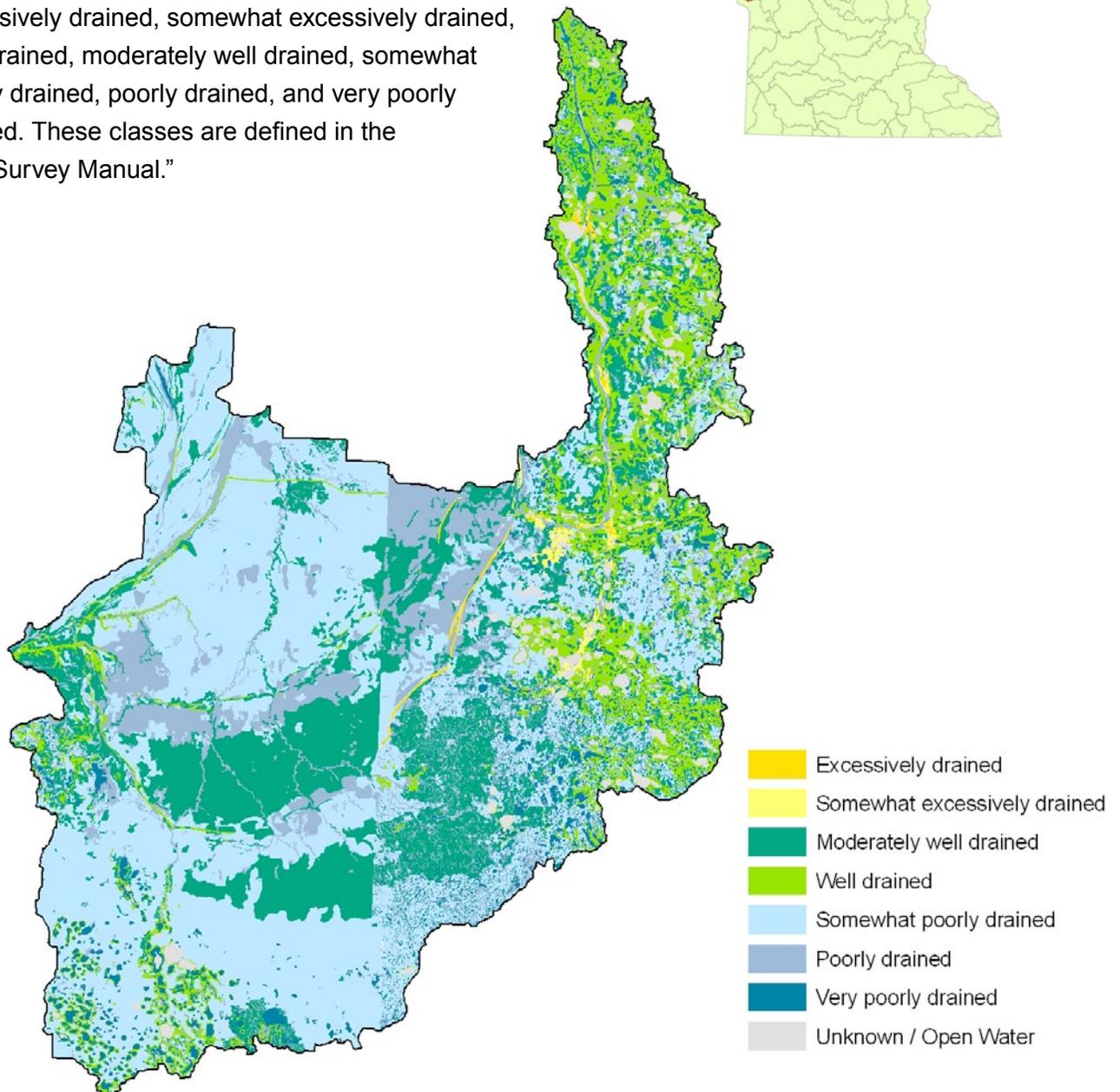
**56.1 Red River Valley:** The Red River Valley (Glacial Lake Agassiz) is an extremely flat landscape composed of thick lacustrine sediments. Soils range from silty to clayey in texture. Most soils have a high water table and are very productive. Saline soils exist in places. Most areas are farmed with 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.

**102A.1 Rolling Till Prairie:** Gently sloping to steep, loamy glacial till soils with scattered sandy outwash soils and silty alluvial flood plains soils. This area is part of the Prairie Pothole region of the upper Midwest. Predominantly cropped to corn and soybeans with increasing hayland and pasture and small grains in the western part. Resource concerns are water and wind erosion, nutrient management and water quality.

## Drainage Classification<sup>10</sup>

Drainage class (natural) refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil.

Seven classes of natural soil drainage are recognized – excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”



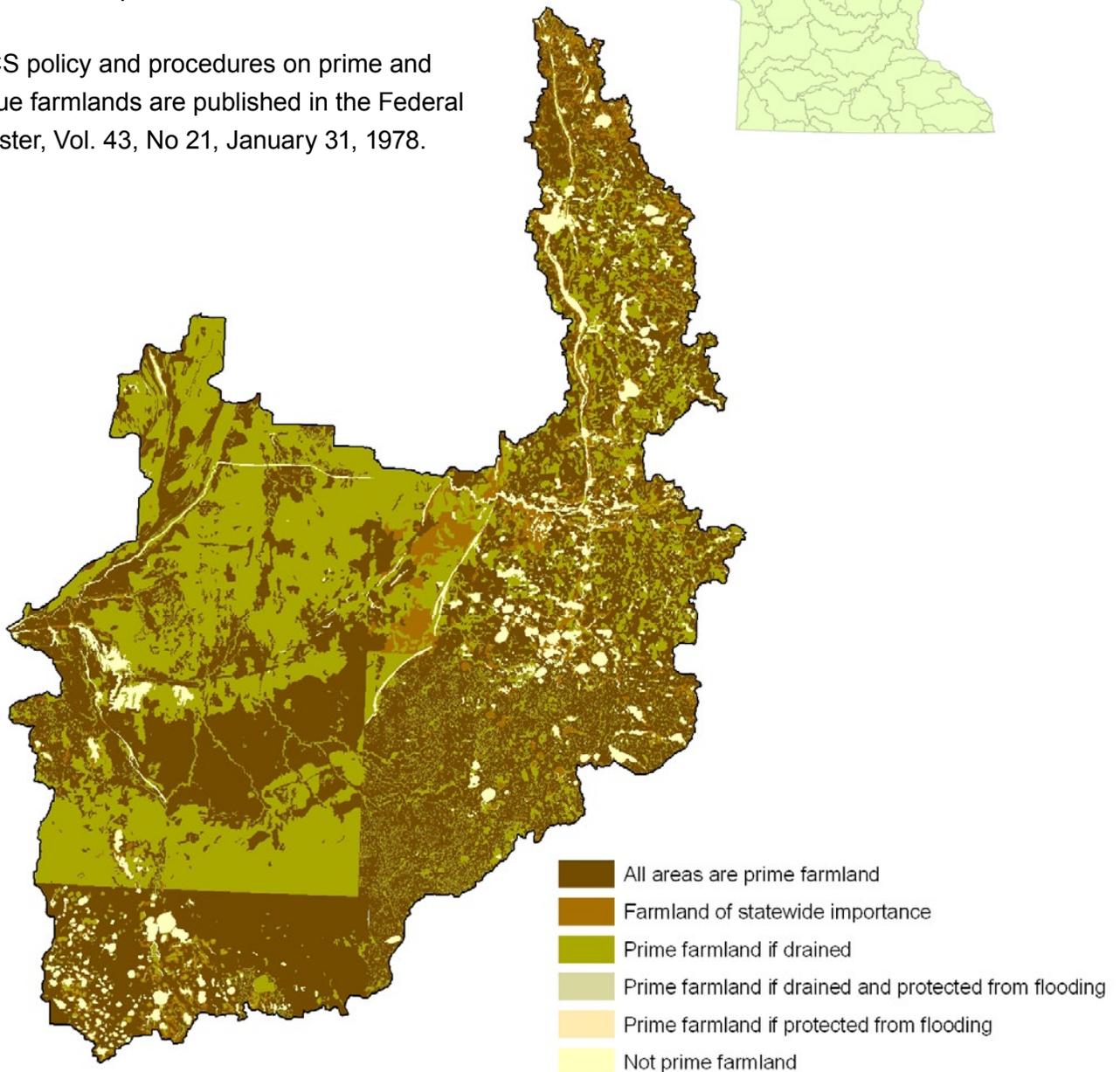
*Note: Historical Hydric Soil Determination Standards, scale, and methodology can vary on a county-to-county basis, leading to irregularities in thematic maps representing drainage class determinations.*

## Farmland Classification <sup>/10</sup>

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland.

Farmland classification identifies the location and extent of the most suitable land for producing food, feed, fiber, forage, and oilseed crops.

NRCS policy and procedures on prime and unique farmlands are published in the Federal Register, Vol. 43, No 21, January 31, 1978.

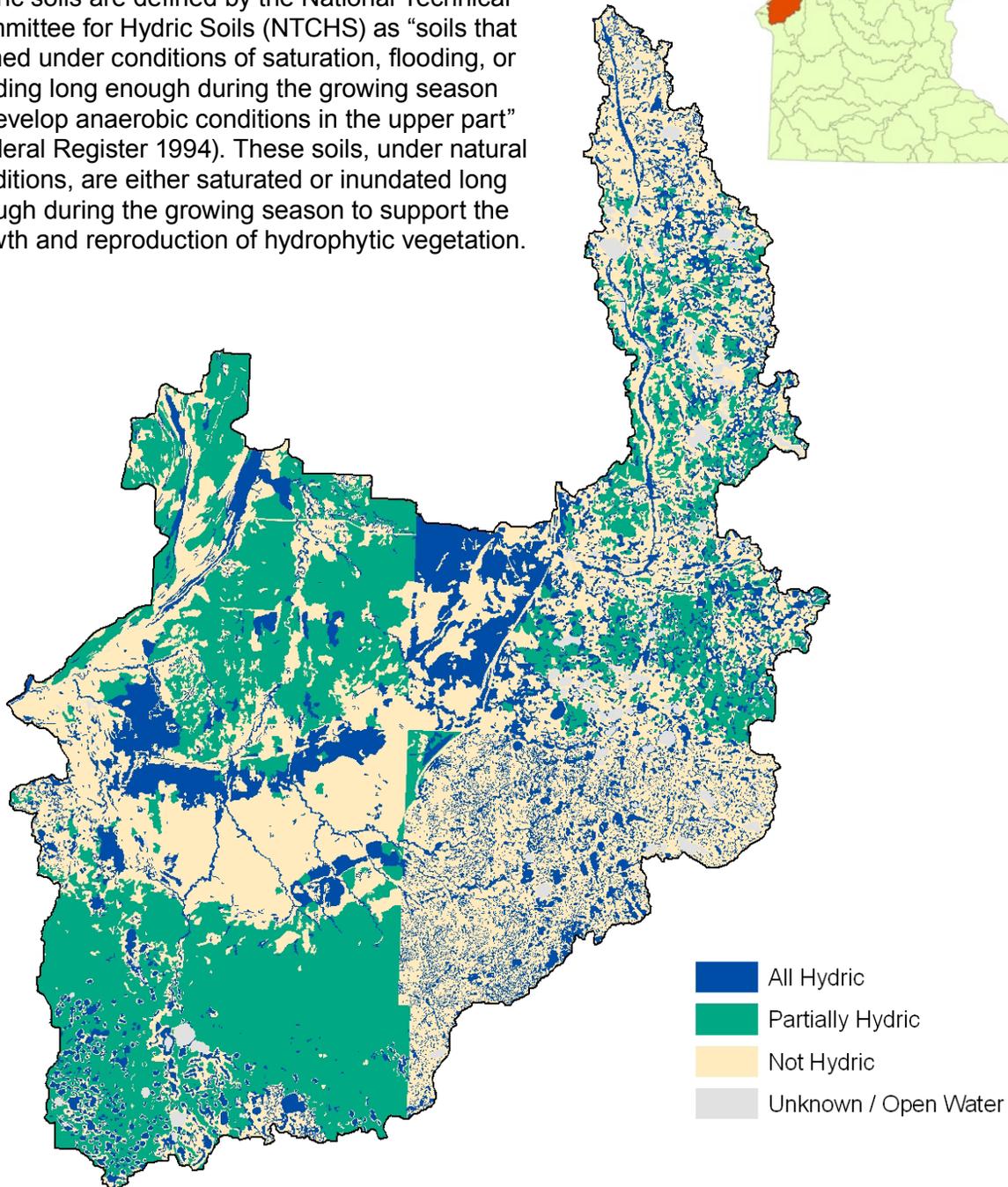


*Note: Historical Hydric Soil Determination Standards, scale, and methodology can vary on a county-to-county basis, leading to irregularities in thematic maps representing farmland classification determinations.*

## Hydric Soils 7/10

This rating provides an indication of the proportion of the map unit that meets criteria for hydric soils. Map units that are dominantly made up of hydric soils may have small areas, or inclusions of non-hydric soils in the higher positions on the landform. Map units of dominantly non-hydric soils may therefore have inclusions of hydric soils in the lower positions on the landform.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as “soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (Federal Register 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

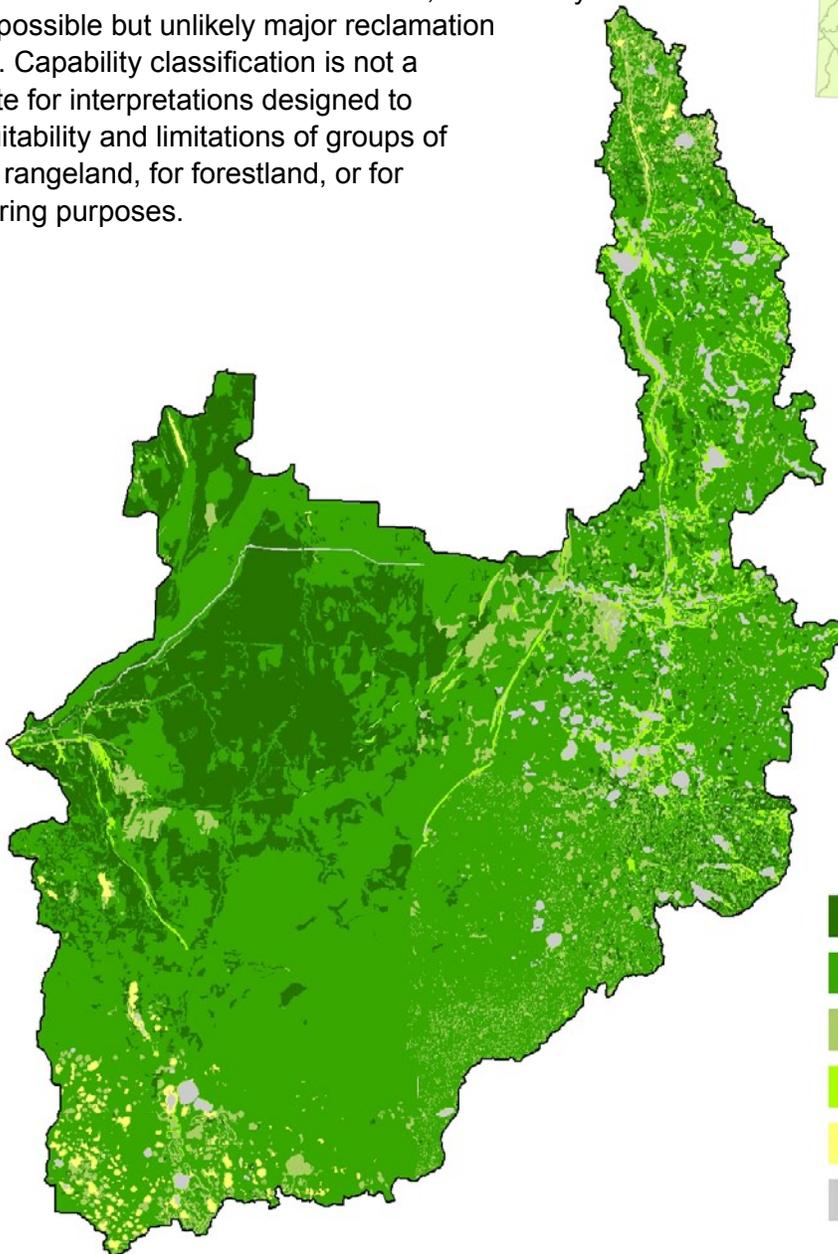


*Note: Historical Hydric Soil Determination Standards, scale, and methodology can vary on a county-to-county basis, leading to irregularities in thematic maps representing hydric soil determinations.*

## Land Capability Classification <sup>710</sup>

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management.

The criteria used in grouping the soils does not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.



**Performance Results System and Other Data**

Watershed Name: Mustinka				Watershed Number: 9020102						
PRS Performance Measures	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
Total Conservation Systems Planned (acres)	1,400	5,108	0	8,083	4,833	N/A	5,975	9,702	19,091	54,192
Total Conservation Systems Applied (acres)	800	4,097	0	9,648	9,648	N/A	4,117	9,738	10,605	48,653
<b>Conservation Practices</b>										
Total Waste Management (313) (numbers)	0	1	0	0	0	0	0	0	0	1
Riparian Forest Buffers (391) (acres)	0	86	70	33	132	9	113	21	17	481
Erosion Control Total Soil Saved (tons/year)	0	24,311	44,696	36,764	27,194	N/A	N/A	N/A	N/A	132,965
Total Nutrient Management (590) (Acres)	500	1,630	1,090	1,185	611	2,290	1,583	1,583	1,615	12,087
Pest Management Systems Applied (595A) (Acres)	944	1,470	1,090	830	304	160	175	773	1,175	6,921
Prescribed Grazing 528a (acres)	0	240	398	233	0	0	0	0	0	871
Tree & Shrub Establishment (612) (acres)	0	318	118	113	27	123	0	0	0	699
Residue Management (329A-C) (acres)	0	10,030	30,666	0	0	1,568	1,568	4,610	259	48,701
Total Wildlife Habitat (644 - 645) (acres)	0	2,496	3,014	2,543	2,190	135	2,543	1,012	1,071	15,004
Total Wetlands Created, Restored, or Enhanced (acres)	30	375	143	361	137	544	161	651	319	2,721
<b>Acres enrolled in Farmbill Programs</b>										
Conservation Reserve Program	800	3,390	1,939	8,416	3,563	N/A	894	1,567	1,213	21,782
Wetlands Reserve Program	0	0	0	0	0	N/A	167	1,876	534	2,577
Environmental Quality Incentives Program	0	42	1,110	968	680	N/A	3,055	4,308	6,593	16,756
Wildlife Habitat Incentive Program	0	172	271	0	0	N/A	0	3	0	446
Farmland Protection Program	0	0	0	0	0	N/A	0	0	0	0

## THREATENED AND ENDANGERED SPECIES OF THE BASIN /14

NRCS assists in the conservation of threatened and endangered species and avoids or prevents activities detrimental to such species. NRCS' concern for these species includes the species listed by the Secretary of the Interior (as published in the Federal Register) and species designated by state agencies.



The following is a list of threatened, endangered, candidate species and species of special concern that occur in the subbasin.

Scientific Name	Common Name	Type
<i>Ammodramus henslowii</i>	Henslow's Sparrow	Zoological
<i>Aristida purpurea</i> var. <i>longiseta</i>	Red Three-awn	Botanical
<i>Asclepias sullivantii</i>	Sullivant's Milkweed	Botanical
<i>Astragalus flexuosus</i>	Slender Milk-vetch	Botanical
<i>Astragalus missouriensis</i>	Missouri Milk-vetch	Botanical
<i>Calcarius ornatus</i>	Chestnut-collared Longspur	Zoological
<i>Cypripedium candidum</i>	Small White Lady's-slipper	Botanical
<i>Desmanthus illinoensis</i>	Prairie Mimosa	Botanical
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Zoological
<i>Limosa fedoa</i>	Marbled Godwit	Zoological
<i>Machaeranthera pinnatifida</i>	Cutleaf Ironplant	Botanical
<i>Rhynchospora capillacea</i>	Hair-like Beak-rush	Botanical
<i>Ruppia maritima</i>	Widgeon-grass	Botanical
<i>Solidago mollis</i>	Soft Goldenrod	Botanical
<i>Speotyto cunicularia</i>	Burrowing Owl	Zoological
<i>Speyeria idalia</i>	Regal Fritillary	Zoological
<i>Sterna forsteri</i>	Forster's Tern	Zoological
<i>Tympanuchus cupido</i>	Greater Prairie-chicken	Zoological

## RESOURCE CONCERNS

County Soil and Water Conservation Districts in the watershed have identified the following concerns as top priorities for conservation and cost sharing efforts:

- Soil Quality; Excessive Erosion.** Erosion due to runoff and drainage systems, and agricultural practices is a problem in the watershed. The severity depends on the land cover, storm duration, and volume of water. Erosion is often worse in the spring due to the lack of vegetative cover on fields. Area districts promote residue management, cover crops, buffers and shoreline restoration to reduce erosion rates.



- Soil Quality; Excessive Wind Erosion.** Soil loss from high and constant wind is considerable. Though there has been recent progress in this area, reduction of Wind erosion remains a pressing concern for most basins in the Red River Valley. In addition to maintaining soil productivity and minimizing crop damage from blowing soil, control of wind erosion and the resulting sediment, has the added benefit of minimizing the clogging of drainage and road ditches.

- Water Quantity Management: Flood Damage Reduction.** Local districts recognize that annual flood damage is a main concern. The watershed experiences flooding, with spring flooding being almost an annual occurrence. Damages associated with this type of flood are to public infrastructure, personal property, cropland and public resources (fisheries, wildlife, soils and water quality).

- Surface and Ground Water Quality; Nutrients, Priority Pollutants.** Reduction of priority pollutants and sediments in surface waters is a priority issue throughout the watershed. Major Runoff events, extensive drainage and agricultural activities contribute significant sediment and nutrients to area waters, relating directly to TMDL waters in the basin.

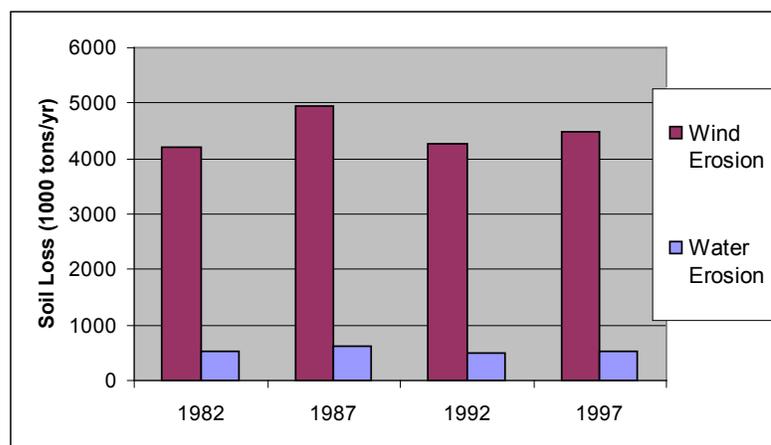
- Wildlife Habitat.** The landscape presents opportunities to increase the quantity and quality of habitats that will support diverse and abundant fish and wildlife populations. Measures such as wetland restoration and protection, preservation and restoration of grasslands, construction of fish passages, and the establishment of large contiguous habitat will sustain diverse wildlife populations in the basin.

- Wetland Management.** Much of the basin has been drained for agricultural production, and many of the original wetlands have been lost. Preservation and enhancement of existing wetlands, restoration of drained wetlands can serve to improve water quality, water quantity and wildlife habitat.

### NRI Soil Loss Estimates<sup>13</sup>

- Sheet and rill erosion estimates for crop and pasture remained relatively steady between 1982 and 1997, averaging 547,000 tons.

- Despite periodic fluctuations, NRI estimates indicate wind erosion on crop and pasture land increased by approximately 292,400 tons (7%) between 1982 and 1997.



## Socioeconomic and Agricultural Data (Relevant)

Population estimates for the subbasin indicate that approximately 8,102 people reside in the area. Median household income throughout the district is near \$35,500 yearly, roughly 77% of the national average. Figures show an unemployment rate of 4.3% for the basin, and approximately 11% of the residents in the watershed live below the national poverty level.



Estimates indicate there are 800 farms in the watershed. Of the 793 operators in the basin, seventy percent are full time producers not reliant on off-farm income. Approximately fifty one percent of the operations are less than 180 acres in size, thirty eight percent are from 180 to 1000 acres in size, and the remaining farms are greater than 1000 acres. Average farm size in the basin is 160 acres.

<b>(MN) HUC# 9020102</b>		<b>Total Acres:</b>	<b>562,112</b>
<b>Population Data *</b>	Watershed Population	8,102	
	Unemployment Rate	4.3%	
	Median Household Income	35,472	
	% below poverty level	11%	
	Median Value of Home	60,600	
<b>Farm Data</b>	# of Farms	800	
	# of Operators	793	<b>Percent</b>
	# of Full Time Operators	554	70%
	# of Part Time Operators	239	30%
	<b>Total Cropland Acres</b>	<b>450,321</b>	<b>80.1%</b>
<b>Farm Size</b>	1 to 49 Acres	149	19%
	50 to 179 Acres	252	32%
	180 to 499 Acres	205	26%
	500 to 999 Acres	95	12%
	1,000 Acres or more	97	12%
	<b>Average Farm Size</b>	<b>160</b>	
<b>Livestock &amp; Poultry</b>	Cattle - Beef	2,378	2%
	Cattle - Dairy	1,518	1%
	Chicken	2,566	2%
	Swine	54,936	37%
	Turkey	11,265	8%
	Other	75,508	51%
	<b>Animal Count Total:</b>	<b>148,170</b>	
	<b>Total Permitted AFOs:</b>	<b>139</b>	
<b>Chemicals (Acres Applied)</b>	Insecticides	17,619	
	Herbicides	300,775	
	Wormicides	823	
	Fruiticides	9,054	
	<b>Total Acres Treated</b>	<b>328,272</b>	
	<b>% State Chemical Totals</b>	<b>2.3%</b>	

\* Adjusted by percent of HUC in the county or by percent of block group area in the HUC, depending on the level of data available

## Watershed Projects, Plans and Monitoring

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- **Flood Damage Reduction Planning**  
Red River Basin Commission
- **Stream Gauging Program**  
Bois de Sioux WS District
- **Red River Valley Water Supply Project**  
Garrison Diverson Conservancy District, DKAO
- **Redpath Project**  
Bois de Sioux WS District, County SWCDs, NRCS
- **Mustinka River Rehabilitation Project**  
Minnesota Center for Environmental Advocacy
- **Mustinka River TMDL Study - Turbidity**  
Bois de Sioux WS District, MPCA
- **Red River Basin Riparian Project**  
Red River RC&D
- **Red River Water Management Consortium**  
USDA, UND EERC, Red River Basin Citizens
- **Red River Basin Water Quality Work Plan**  
Minnesota Pollution Control Agency
- **Red River Valley Water Supply Project**  
Red River International Joint Commission
- **Red River Basin Water Quality Monitoring Project**  
Red River Basin Commission
- **USGS Sediment to Streams Study - Red River Basin**  
USGS, Minnesota Pollution Control Agency

\* Have a watershed project you'd like to see included? Submit suggestions online @ <http://www.mn.nrcs.usda.gov/technical/rwa/>

## Conservation Districts, Organizations & Partners

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- **Big Stone SWCD**  
342 NW 2nd St, Ortonville, MN 56278  
Phone (320) 839-6149
- **Bois de Sioux Watershed District**  
704 S Highway 75 Wheaton, MN 56296  
Phone (320) 563-4185
- **Grant SWCD**  
712 Industrial Park Blvd, Elbow Lake, MN 56531  
Phone (218) 685-5395
- **Minnesota NRCS - USDA**  
375 Jackson Street, Suite 600 St Paul, MN 55101  
On the Web: [www.mn.nrcs.usda.gov](http://www.mn.nrcs.usda.gov)
- **MPCA Detroit Lakes Office**  
714 Lake Ave., Suite 220 Detroit Lakes, MN 56501  
Phone (218) 847-1519
- **Ottertail SWCD, West**  
506 Western Ave N, Fergus Falls, MN 56537  
Phone (218) 739-1308
- **Red River Basin Commission**  
119th 5th St. P.O. Box 66 Moorhead, MN 56561  
[www.reddriverbasincommission.org](http://www.reddriverbasincommission.org)
- **Red River Basin Riparian Project**  
516 Cooper Ave Grafton, ND 58237  
Phone (701) 352-3550
- **Traverse SWCD**  
1700 Third Ave S Rm 205, Wheaton, MN 56296  
Phone (320) 563-8218
- **Stevens SWCD**  
12 Hwy 28 E Ste 2, Morris, MN 56267-9505  
(320) 589-4886

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## Footnotes / Bibliography

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1. Ownership Layer – Source: MN Stewardship Data: Minnesota Department of Natural Resources, Section of Wildlife, BRW, Inc, 2007. This is the complete GAP Stewardship database containing land ownership information for the entire state of Minnesota. Date of source material is variable and ranges from 1976 to 2007, although a date range of 1983 to 1985 predominates. Land interest is expressed only when some organization owns or administers more than 50% of a forty except where DNR could create sub-forty accuracy polygons.
2. National Land Cover Dataset (NLCD) - Originator: U.S. Geological Survey (USGS); Publication date: 20010631; Title: Minnesota Land Cover Data Set, Edition: 1; Geospatial data presentation form: Raster digital data; Publisher: U.S. Geological Survey, Sioux Falls, SD, USA.
3. Ownership layer classes grouped to calculate Public ownership vs. Private and Tribal ownership by Minnesota NRCS Rapid Watershed Assessment Staff. Land cover / Land use data was then extracted from the National Landcover Dataset Classification System and related to ownership class polygons.
4. USGS 1:100,000 Hydrography Layer .This data set represents all features coded as ‘rivers’ on the USGS 1:100,000-scale DLG Hydrography data set. This current version was converted to ARC/INFO by the Land Management Information Center and edge-matched across map sheet boundaries. Minnesota DNR made further modifications to the files, verified lake feature identifiers, and created a state layer from the separate 100k data. The Hydro 100k layer was compared to MPCA’s 303(d) data to derive percentage of listed waters.
5. Land Cover / Land Use / Hydro 100k Buffer. Using the 100k Hydrology dataset, All streams within HUC were spatially buffered to a distance of 100 ft. National Landcover Dataset attributes were extracted for the spatial buffer to demonstrate the vegetation and landuse in vulnerable areas adjacent to waterways.
6. Land Capability Class. ESTIMATES FROM THE 1997 NRI DATABASE (REVISED DECEMBER 2000) REPLACE ALL PREVIOUS REPORTS AND ESTIMATES. Comparisons made using data published for the 1982, 1987, or 1992 NRI may produce erroneous results. This is because of changes in statistical estimation protocols and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected. All definitions are available in the glossary. In addition, this December 2000 revision of the 1997 NRI data updates information released in December 1999 and corrects a computer error discovered in March 2000. For more information: <http://www.nrcs.usda.gov/technical/NRI/>
7. 2002 NASS Irrigated Land Estimates. Irrigated land: Land that shows evidence of being irrigated during the year of the inventory or during two or more years out of the last four years. Water is supplied to crops by ditches, pipes, or other conduits. Water spreading is not considered irrigation; it is recorded as a conservation practice. For more information: <http://www.agcensus.usda.gov/>
8. 303(d) Stream data. Minnesota’s Final Impaired Waters (per Section 303(d) Clean Water Act), 2008. Data obtained from Minnesota Pollution Control Agency (MPCA). The Minnesota Pollution Control Agency (MPCA) helps protect state water by monitoring quality, setting standards and controlling inputs through the development of TMDL plans. <http://www.pca.state.mn.us/water/tmdl/index.html#maps>.

## Footnotes / Bibliography (continued)

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9. National Coordinated Common Resource Area (CRA) Geographic Database. A Common Resource Area (CRA) map delineation is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area

10. Soil Survey Geographic Database (SSURGO) Tabular and spatial data obtained from NRCS Soil Data Mart at <http://soildatamart.nrcs.gov>. Publication dates vary by county. Component and layer tables were linked to the spatial data via SDV 5.1 and ARCGIS 9.1 to derive the soil classifications presented in these examples. Highly Erodible Land Classification Data obtained from USDA/NRCS EFOTG Section II, County Soil Data. HEL classifications, where provided, were appended to SSURGO spatial data via an ARCEdit session. Addendum and publication dates vary by county.

11. Lands removed from production through farm bill programs. County enrollment derived from the following: CRP Acres: [www.fsa.usda.gov/crpstorpt/07Approved/r1sumyr/mn.htm](http://www.fsa.usda.gov/crpstorpt/07Approved/r1sumyr/mn.htm) (7/30/07). CREP Acres: <http://www.bwsr.state.mn.us/easements/crep/easementssummary.html> (7/31/07). WRP Acres: NRCS (8/16/08). Data were obtained by county and adjusted by percent of HUC in the county.

12. Socioeconomic and Agricultural Census Data were taken from the U.S. Population Census, 2000 and 2002 Agricultural Census and adjusted by percent of HUC in the county or by percent of zip code area in the HUC, depending on the level of data available. Unemployment statistics obtained from the Bureau of Labor Statistics - Labor Force Data by County, 2006 Annual Averages <http://www.bls.gov> Data were also taken from MPCA AFO/CAFO counts provided by county for 2007.

13. 1997 NRI Estimates for sheet and rill erosion (WEQ & USLE). The NRI estimates sheet and rill erosion together using the Universal Soil Loss Equation (USLE). The Revised Universal Soil Loss Equation (RUSLE) was not used in the 1997 NRI. RUSLE was not available for previous inventories, therefore the use of USLE was continued to preserve the trending capacity of the NRI database. Wind erosion is estimated using the Wind Erosion Equation (WEQ). For further information visit <http://www.mn.nrcs.usda.gov/technical/nri/findings/erosion.htm>

14. Federally listed endangered and threatened species counts obtained from NRCS Field Office Technical Guide, Section II, Threatened and Endangered List. <http://www.nrcs.usda.gov/Technical/efotg/>. Essential fish habitat as established by Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94-265, as amended through October 11, 1996 <http://www.nmfs.noaa.gov/sfa/magact/>

15. Watershed Projects, Plans, Monitoring. Natural Resources Conservation Service, Watershed Projects Planned and Authorized, <http://www.nrcs.usda.gov/programs/watershed/Purpose>.