Rapid Watershed Assessment

Elm -Marsh

(MN/ND) HUC: 09020107

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.

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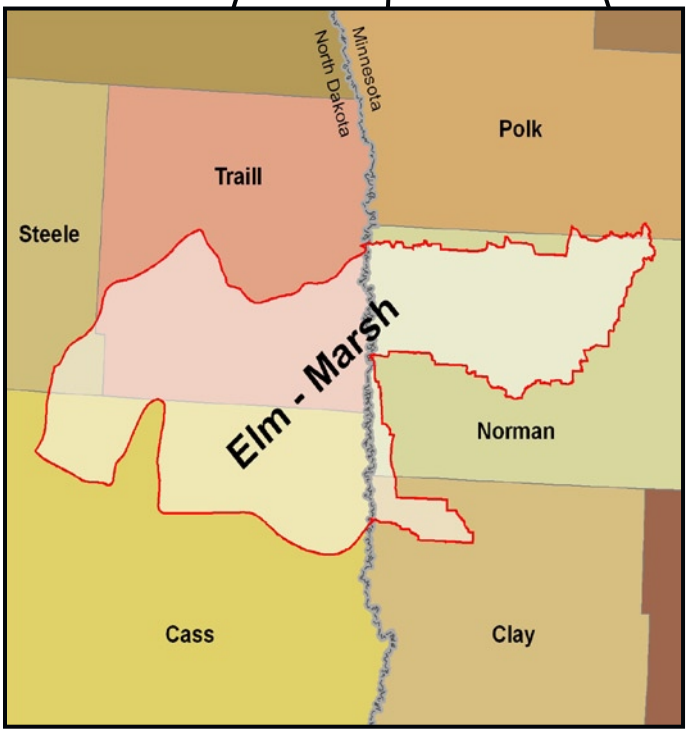
Introduction

The Elm-Marsh 8-Digit Hydrologic Unit Code (HUC) subbasin is part of the Red River Basin in northwestern Minnesota and southeastern North Dakota. The watershed encompasses the Glacial Lake Agassiz Basin, Drift Plains, Sand Deltas and Beach Ridges, and Lake Agassiz Plains portions of the Glacial Lake Agassiz Plain Ecoregion.

Formed by the confluence of the Bois de Sioux and Ottertail Rivers, the Red River flows north across the plains of glacial Lake Agassiz forming much of the border of Minnesota and North Dakota, continuing on to Manitoba and flowing into Lake Winnepeg.

The river 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

County	Acres in HUC	% HUC
Steele	17,516	2.4%
Traill	232,563	32.4%
Cass	218,696	30.4%
Polk	1,506	0.2%
Norman	224,696	31.3%
Clay	24,602	3.4%
Total acres:	**718,443**	**100%**

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Physical Description

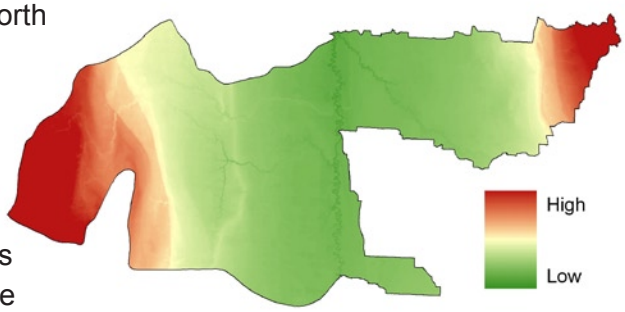
The Red River begins it's course just below Wahpeton, North Dakota at an elevation of 943 feet above mean sea level (msl). The river descends a mere 110 feet between it's origin and the northern boundary of the Elm-Marsh watershed North of Halstad, Minnesota.

Precipitation in the watershed ranges from 19 to 23 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 affect the region.

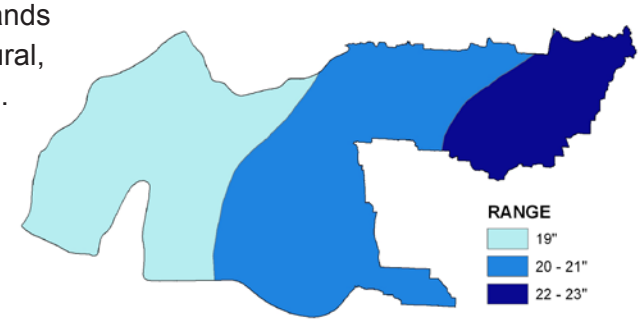
Predominate land uses / land covers are Row Crops (90.4%), Residential/Commercial Development (5.1%), and Wetlands (2.0%). Land use within the watershed is largely agricultural, accounting for nearly 91% of the overall watershed acres.

Development pressure is low to moderate in the basin, with occasional farms being parceled out for development, recreation or country homes.

Relief

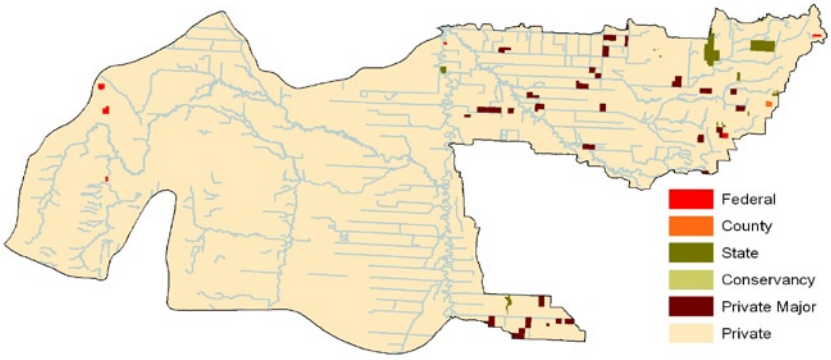


Average Precipitation



Ownership* /1

Ownership Type	Acres	% of HUC
Conservancy	235	0.0
County	160	0.0
Federal	945	0.1
State	6,049	0.8
Other Public	-	-
Tribal	-	-
Private Major	12,791	1.8
Private	698,262	97.2
Total Acres:	**718,443**	**100**

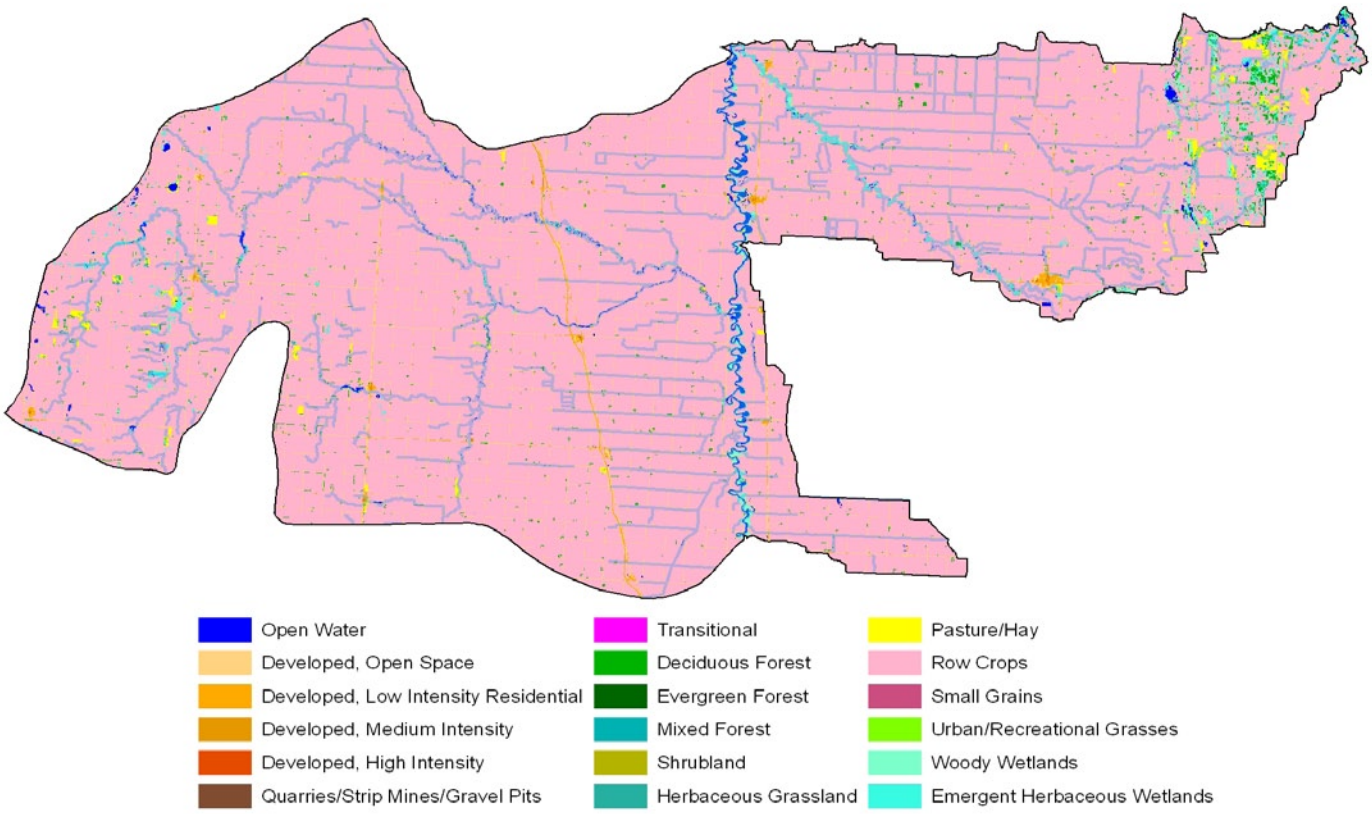


* Ownership totals derived from MN and ND GAP Stewardship data and are the best suited estimation of land stewardship available on a statewide scale at time of publication. See the bibliography section of this document for further information.

Ownership / Land Use

The Elm-Marsh watershed covers an area of 718,443 acres. Approximately ninety seven percent of the land in the watershed is owned by private landholders (698,262 acres). The second largest ownership type is Private-Major (Corporate) with approximately 12,791 acres (1.8%), followed by State with 6,049 acres (0.8%), Federal with 945 acres (0.13%), Conservancy with 235 acres (0.03%), and County with 160 acres (0.02%). Ownership data shows no major Tribal land holdings in the region. Land use by ownership type is represented in the table below.

Land Use / Land Cover /2



Ownership / Land Use /3

	Public		Private**		Tribal			
Landcover/Use	**Acres**	**% Public**	**Acres**	**% Private**	**Acres**	**% Tribal**	**Total Acres**	**Percent**
Forest	636	0.1%	6,631	0.9%	0	0.0%	7,267	1.0%
Grass, etc	130	0.0%	5,916	0.8%	0	0.0%	6,047	0.8%
Orchards	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Row Crops	2,193	0.3%	647,602	90.1%	0	0.0%	649,795	90.4%
Shrub etc	0	0.0%	60	0.0%	0	0.0%	60	0.0%
Wetlands	984	0.1%	13,184	1.8%	0	0.0%	14,169	2.0%
Residential/Commercial	91	0.0%	36,822	5.1%	0	0.0%	36,914	5.1%
Open Water*	461	0.1%	3,712	0.5%	0	0.0%	4,172	0.6%
* ownership undetermined			** includes private-major					
Watershed Totals:	**4,496**	**0.63%**	**713,928**	**99.4%**	**0**	**0.0%**	**718,443**	**100%**

Physical Description (continued)

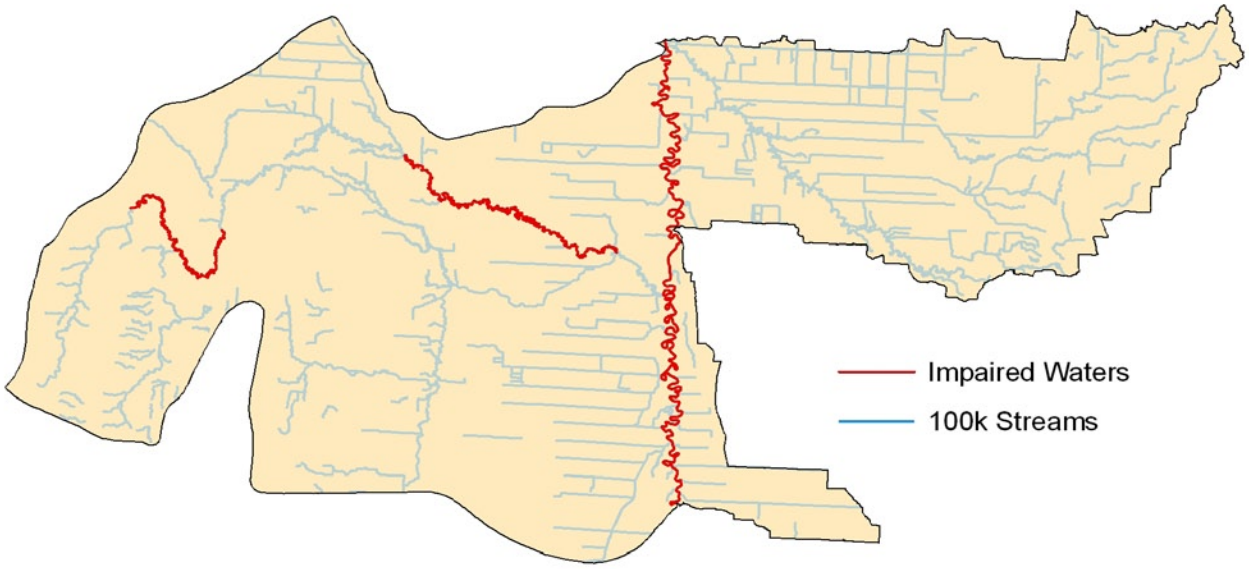
			cu. ft/sec
Stream Flow Data	USGS 05064500 RED RIVER OF THE NORTH AT HALSTAD, MN	**2008 Avg.**	2,142
		May – Sept. Avg.	3,346
Stream Data[4] *(*Percent of Total HUC Stream Miles)*		**MILES**	**PERCENT**
	Total Miles – Major (100K Hydro GIS Layer)	1,037	---
	303d/TMDL Listed Streams (DEQ)	81.8	7.8%
Riparian Land Cover/Land Use[5] *(Based on a 100-foot buffer on both sides of all streams in the 100K Hydro GIS Layer)*	**Land Use Type**	**Acres**	**Percent**
	Forest	357	1.4%
	Grain Crops	0	0.0%
	Grass, etc	386	1.6%
	Orchards	0	0.0%
	Row Crops	18,354	74.5%
	Shrub etc	1	0.0%
	Wetlands	2,025	8.2%
	Residential/Commercial	1,855	7.5%
	Open Water	1,654	6.7%
	Total Buffer Acres:	**24,632**	100%
Crop and Pastureland Land Capability Class[6] *(Croplands & Pasturelands Only) (2002 NASS Croplands extracted from Non-Irrigated Land Capabuility Class)*	**1** – slight limitations	0	0%
	2 – moderate limitations	488,668	75%
	3 – severe limitations	147,345	23%
	4 – very severe limitations	12,630	2%
	5 – no erosion hazard, but other limitations	0	0%
	6 – severe limitations; unsuitable for cultivation; limited to pasture, range, forest	0	0%
	7 – very severe limitations; unsuitable for cultivation; limited to grazing, forest, wildlife habitat	0	0%
	8 – miscellaneous areas; limited to recreation, wildlife habitat, water supply	0	0%
	Total NASS Crop & Pasture Land	**648,643**	-

	TYPE OF LAND	**ACRES**	**% of Crop Lands**	**% of HUC**
Irrigated Lands[7] *(2002 NASS Estimates)*	**Cultivated Cropland / Pastureland**	2,527	0.4%	0.3%
	Uncultivated Cropland	0	0%	0%
	Total Irrigated Lands	2,527	0.4%	0.3%

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 states to identify and restore impaired waters.

2006 303d Listed Streams - Elm - Marsh Watershed [8]

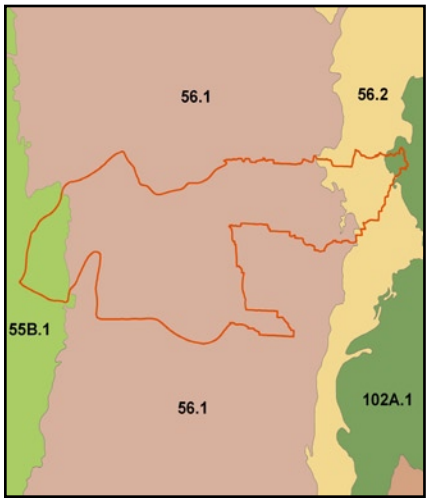


State	Listed Waterbody	Impairment	Affected Use
ND	ELM RIVER FROM DAM NW OF GALESBURG, ND DOWNSTREAM TO DAM NE OF GALESBURG	CAUSE UNKNOWN - IMPAIRED BIOTA, SEDIMENT	AQUATIC LIFE
ND	ELM RIVER FROM THE DAM NE OF GALESBURG, ND DOWNSTREAM TO ITS CONFLUENCE WITH THE SOUTH BRANCH ELM RIVER	CAUSE UNKNOWN - IMPAIRED BIOTA, SEDIMENT	AQUATIC LIFE
ND	NORTH BRANCH ELM RIVER, DOWNSTREAM TO ITS CONFLUENCE WITH THE ELM RIVER.	CAUSE UNKNOWN - IMPAIRED BIOTA, SEDIMENT	AQUATIC LIFE
ND	RED RIVER OF THE NORTH FROM ITS CONFLUENCE WITH THE ELM RIVER, DOWNSTREAM TO ITS CONFLUENCE WITH THE MARSH RIVER.	MERCURY	AQUATIC CONSUMPTION
ND	RED RIVER OF THE NORTH FROM ITS CONFLUENCE WITH THE BUFFALO RIVER DOWNSTREAM TO ITS CONFLUENCE WITH THE ELM RIVER.	MERCURY	AQUATIC CONSUMPTION
MN	RED RIVER OF THE NORTH; BUFFALO R (MN) TO ELM R (ND)	MERCURY, PCBs, FECAL COLIFORM, TURBIDITY	AQUATIC LIFE, AQUATIC CONSUMPTION
MN	RED RIVER OF THE NORTH; ELM R (ND) TO WILD RICE R	MERCURY, PCBs	AQUATIC CONSUMPTION
MN	RED RIVER OF THE NORTH; GOOSE R (ND) TO MARSH R	MERCURY, PCBs	AQUATIC CONSUMPTION
MN	RED RIVER OF THE NORTH; WILD RICE R TO GOOSE R (ND)	MERCURY, PCBs, TURBIDITY	AQUATIC LIFE, AQUATIC CONSUMPTION

Common Resource Areas

The Elm-Marsh watershed encompasses four Common Resource Areas, CRA 55B.1, 56.1, 56.2 and 102A.1. [9]

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

55B.1 Central Black Glaciated Drift Plain: The Central Black Glaciated Drift Plains are a gently rolling to undulating landscape with a thick layer of glacial till. Temporary and seasonal wetlands are numerous throughout the area. These soils are very fertile, but agricultural success is subject to annual climatic fluctuations. Most of the soils are deep, well drained and moderately well drained, sandy to clayey and have a frigid temperature regime.

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.

56.2 Glacial Lake Agassiz Basin: 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, doughtiness on sandy soils and wetness in low lying and seepy areas.

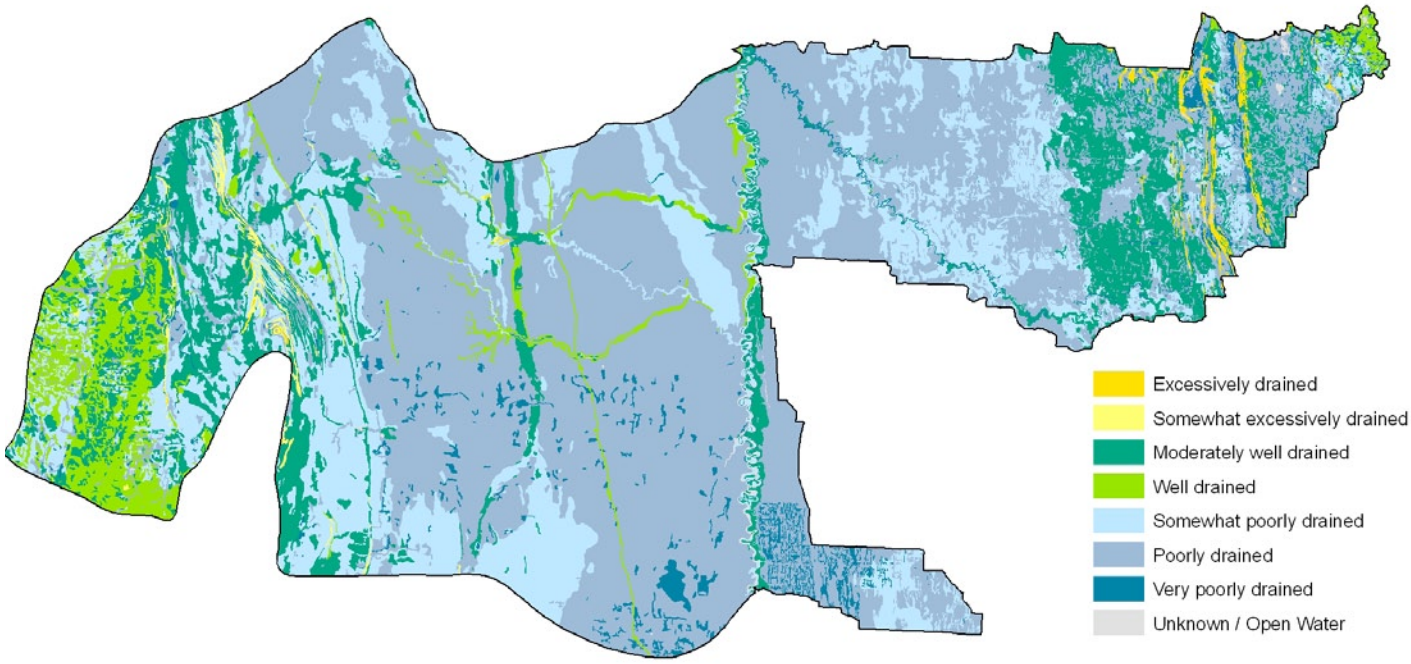
102A.1 Rolling Till Prairie: Gently sloping to steep, loamy glacial till soils with scattered sandy outwash soils and silty alluvial flood plains soils. This area is part of the Prairie Pothole region of the upper Midwest. Predominantly cropped to corn and soybeans with increasing hayland and pasture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

Visit the online Web Soil Survey at http://websoilsurvey.nrcs.usda.gov for official and current USDA soil information as viewable maps and tables. Visit the Soil Data Mart at http://soildatamart.usda.gov to download SSURGO certified soil tabular and spatial data.

Drainage Classification

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."



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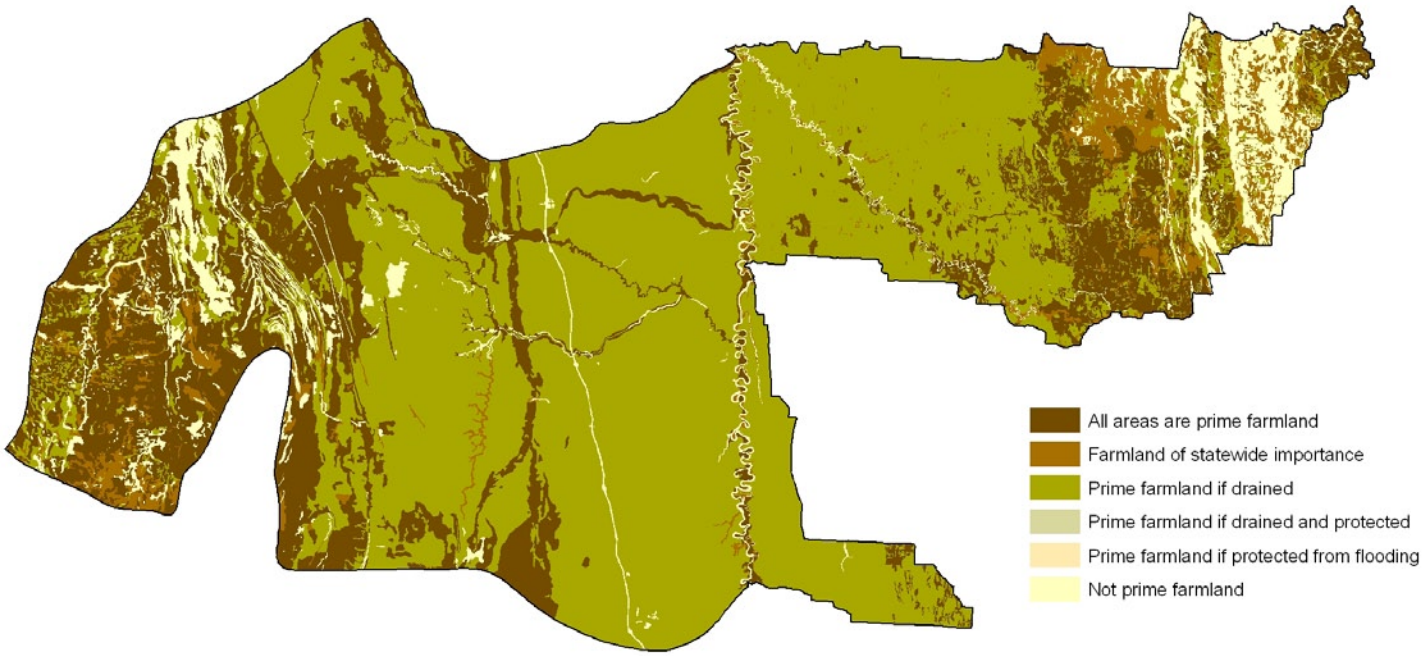
Farmland Classification

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.



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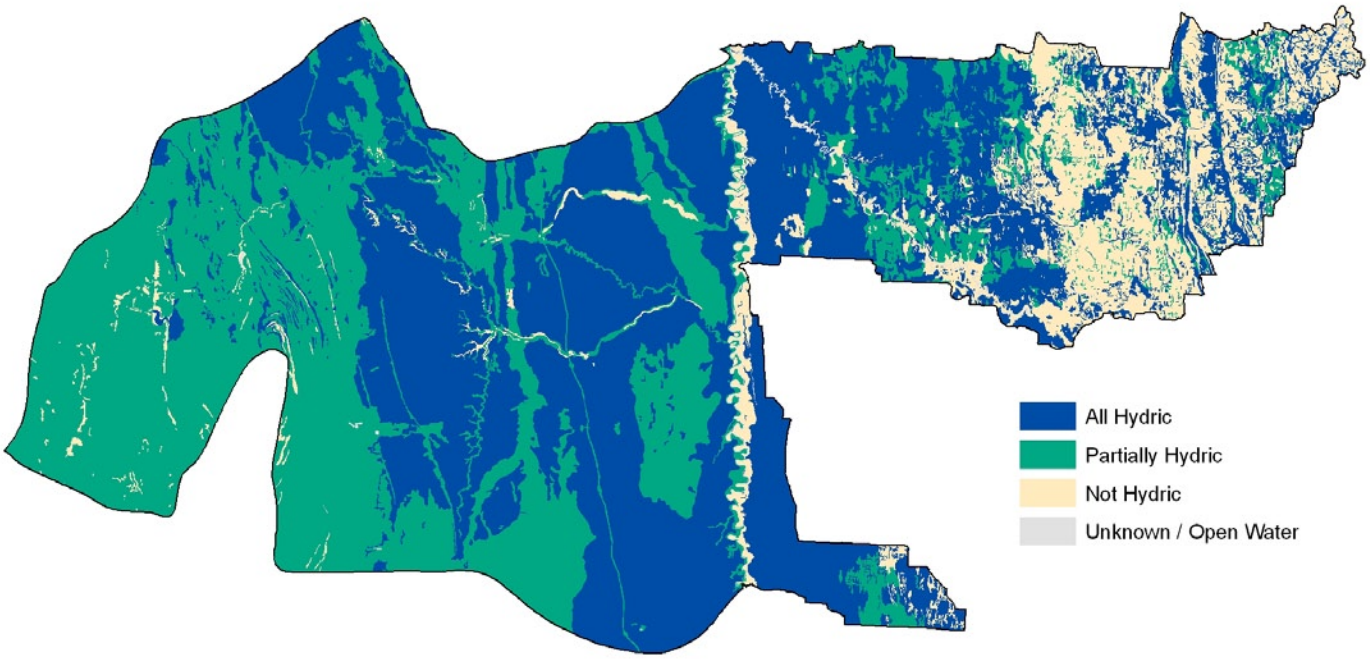
Hydric Soils

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 nonhydric 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.



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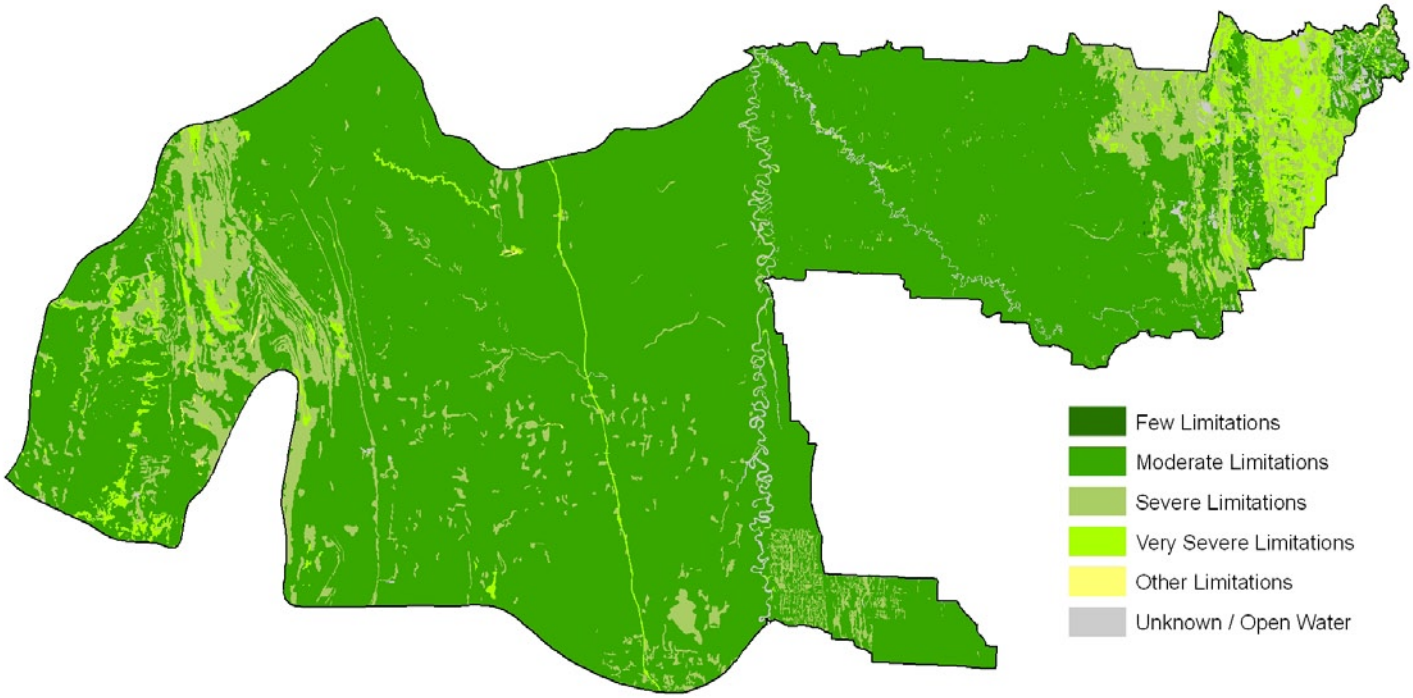
Land Capability Classification

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 designedto-show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.



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Performance Results System and Other Data

Watershed Name: Elm-Marsh				Watershed Number: 9020107						
PRS Performance Measures	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL (MN)
Total Conservation Systems Planned (acres)	0	3,353	0	2,173	3,716	N/A	1,995	6,763	16,074	34,074
Total Conservation Systems Applied (acres)	0	1,228	0	902	902	N/A	3,089	6,824	10,091	23,036
Conservation Practices										
Total Waste Management (313) (numbers)	0	0	0	0	0	0	0	0	0	0
Riparian Forest Buffers (391) (acres)	0	0	0	40	163	0	61	4	0	268
Erosion Control Total Soil Saved (tons/year)	0	0	0	28,633	8,816	N/A	N/A	N/A	N/A	37,449
Total Nutrient Management (590) (Acres)	0	0	0	576	256	0	571	571	1,646	3,620
Pest Management Systems Applied (595A) (Acres)	0	0	0	57	0	0	0	0	0	57
Prescribed Grazing 528a (acres)	0	0	0	45	0	43	0	0	0	88
Tree & Shrub Establishment (612) (acres)	0	0	0	129	0	11	1	0	0	141
Residue Management (329A-C) (acres)	0	0	121	61	176	1,132	1,132	3,117	629	6,368
Total Wildlife Habitat (644 - 645) (acres)	0	3,910	27	1,784	1,027	251	1,784	1,965	2,445	13,193
Total Wetlands Created, Restored, or Enhanced (acres)	0	42	0	95	11	109	45	203	131	636
Acres enrolled in Farmbill Programs										
Conservation Reserve Program	0	1,228	41,044	803	1,984	N/A	1,618	2,953	1,941	51,571
Wetlands Reserve Program	0	0	0	0	0	N/A	0	0	0	0
Environmental Quality Incentives Program	0	0	0	0	0	N/A	1,081	2,487	7,450	11,018
Wildlife Habitat Incentive Program	0	0	0	0	0	N/A	0	0	0	0
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 Minnesota portion of the subbasin.

Scientific Name	Common Name	Type
Carex hallii	Hall's Sedge	Botanical
Carex obtusata	Blunt Sedge	Botanical
Carex scirpoidea	Northern Singlespike Sedge	Botanical
Carex sterilis	Sterile Sedge	Botanical
Cypripedium candidum	Small White Lady's-slipper	Botanical
Eleocharis quinqueflora	Few-flowered Spike-rush	Botanical
Gentiana affinis	Northern Gentian	Botanical
Heterodon nasicus	Western Hognose Snake	Zoological
Juniperus horizontalis	Creeping Juniper	Botanical
Ligumia recta	Black Sandshell	Zoological
Orobanche ludoviciana	Louisiana Broomrape	Botanical
Oryzopsis hymenoides	Indian Ricegrass	Botanical
Perognathus flavescens	Plains Pocket Mouse	Zoological
Platanthera praeclara	Western Prairie Fringed Orchid	Botanical
Rhynchospora capillacea	Hair-like Beak-rush	Botanical
Shinnersoseris rostrata	Annual Skeletonweed	Botanical
Triplasis purpurea	Purple Sand-grass	Botanical
Tympanuchus cupido	Greater Prairie-chicken	Zoological

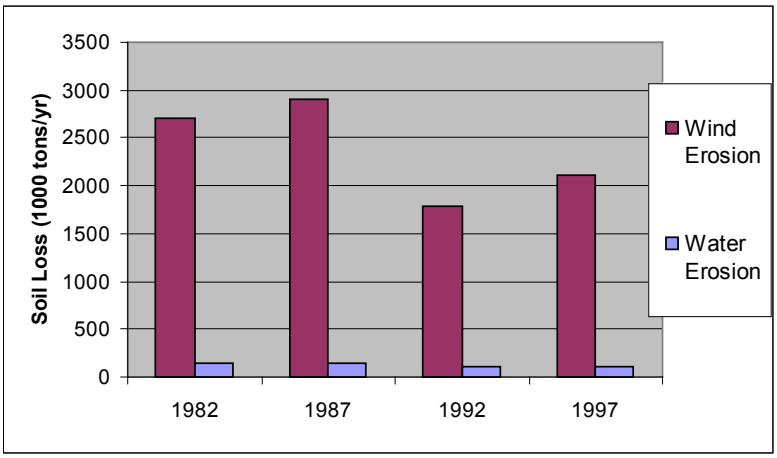
RESOURCE CONCERNS

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

- **Soil Quality; Excessive Erosion:** Erosion and deposition are concerns in the basin. Retention of water on the landscape, cover crops, buffers, conservation tillage and considering agricultural impacts significantly improve flooding and erosion.
- **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 in the Red River Valley.
- **Flood Damge Reduction.** Local districts recognize that annual flood damage is a major concern. Concerns over flooding in the basin include tiling practices, drainage management, stormwater conveyence, protection of city and private sewer systems, property damage, excessive erosion and sedimentation.
- **Surface and Ground Water Quality; Nutrients, Priority Pollutants.** Reduction of priority pollutants and sediments in surface waters is a priority issue throughout the watershed. Excessive amounts of sediments, nutrients, and bacteria degrade the water quality causing a fish community with depressed populations and limited diversity. Increased levels of phosphorus and chlorophyll-a are reaching area lakes as impervious surface increases and natural buffers disappear.
- **Nutrient Management:** Installation of waste control systems on high priority feedlots, identification and replacement of failing or non-compliant individual septic systems.
- **Wildlife Habitat.** Given the fragmentation caused by development, and agricultural land use there are few to no natural corridors of natural habitat for wildlife. Districts recognize the need for the protection and enhancement of Prairie and Wetland areas throughout the watershed.
- **Wetland Management.** Due to documented issues within riparian and agricultural areas, priority should be given to preserving the wetlands within 1000 feet of a lake or 300 feet of a river. Restoration of wetlands, dam repair and placing flood-prone lands in CRP/RIM all serve to lessen the impact of flooding and sedimentation, and improve drainage.

NRI Soil Loss Estimates[13]

- Sheet and rill erosion rates on crop and pasture land decreased by approximately 20,700 tons (15%) between 1982 and 1997.
- NRI estimates indicate wind erosion on crop and pasture land decreased by approximately 589,500 tons (22%) between 1982 and 1997.



Socioeconomic and Agricultural Data (Relevant)

Population estimates indicate that approximately 7,278 people reside in the basin. Median household income is $39,774 yearly, roughly 86% of the national average. Figures show an unemployment rate of 3.6%, and approximately 9% of the residents in the watershed live below the national poverty level.

There are an estimated 674 farms in the watershed. Of the 645 operators in the basin, seventy three percent are full time producers not reliant on off-farm income. Approximately thirty four percent of the operations are less than 180 acres in size, forty three percent are from 180 to 1000 acres in size, and thirty two percent of the farms are greater than 1000 acres. Average Farm size in the basin is 113 acres.

(MN) HUC# 9020107		Total Acres:	718,443
Population Data*	Watershed Population	7,278	
	Unemployment Rate	3.6%	
	Median Household Income	39,774	
	% below poverty level	9%	
	Median Value of Home	66,667	
Farm Data	# of Farms	674	
	# of Operators	645	**Percent**
	# of Full Time Operators	473	73%
	# of Part Time Operators	172	27%
	Total Cropland Acres	**648,643**	90.3%
Farm Size	1 to 49 Acres	88	13%
	50 to 179 Acres	142	21%
	180 to 499 Acres	134	20%
	500 to 999 Acres	88	13%
	1,000 Acres or more	215	32%
	Average Farm Size	**190**	
Livestock & Poultry	Cattle - Beef	2,598	11%
	Cattle - Dairy	891	4%
	Chicken	117	0%
	Swine	4,205	18%
	Turkey	2,909	12%
	Other	13,126	55%
	Animal Count Total:	**23,846**	
	Total MN Permitted AFOs:	**27**	
Chemicals MN (Acres Applied)	Insecticides	12,245	
	Herbicides	110,927	
	Wormicides	818	
	Fruiticides	1,173	
	Total MN Acres Treated	**125,163**	
	% MN Chemical Totals	**0.9%**	

* 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

- **Flood Damage Reduction Planning**
  Red River Basin Commission
- **Waffle Flood Mitigation Project**
  Energy & Environmental Research Center, UND
- **Wild Rice Flood Damage Reduction Project**
  Wild Rice Watershed District
- **Ada Flood Protection Project**
  US Army COE, City of Ada
- **Rural Ring Dike Program**
  Wild Rice Watershed District, MN DNR
- **PL 566: Norman-Polk, Spring Creek**
  Minnesota NRCS
- **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

- **Cass County Soil Conservation District**
  4660 Amber Valley Parkway Fargo, ND 58104
  Phone (701) 282-2157
- **Clay County SWCD**
  1615 30th Ave S, Moorhead, MN 56560
  Phone (218) 287-2255
- **Minnesota NRCS - USDA**
  375 Jackson Street, Suite 600 St Paul, MN 55101
  On the Web: www.mn.nrcs.usda.gov
- **North Dakota NRCS - USDA**
  220 E Rosser Avenue # 270 Bismarck, ND 58501
  Phone (701) 530-2000
- **Norman SWCD**
  100 Main Ave E PO Box 60, Twin Valley, MN 56584
  Phone (218) 584-5169
- **Polk SWCD West**
  528 Strander Ave, Crookston, MN 56716
  Phone (218) 281-6070
- **Red River Basin Commission**
  119th 5th St. P.O. Box 66 Moorhead, MN 56561
  www.redriverbasincommission.org
- **Red River RC&D**
  516 cooper Ave, Suite 101 Grafton, ND 58237
  Phone (701) 352-0127
- **Steele County Soil Conservation District**
  101 Industrial Drive Finley, ND 58230-0336
  Phone: (701) 524-2840
- **Traill County Soil Conservation District**
  804 West Caledonia Hillsboro, ND 58045
  Phone: (701) 436-4311
- **West Central Minnesota Joint Powers Board**
  809 SE 8th St, Detroit Lakes, MN 56501
  Phone (218) 847-9392
- **Wild Rice Watershed District**
  11 5th Avenue Ada, MN 56510
  Phone: (218) 784-5501

Footnotes / Bibliography

1. Ownership Layer – Source: MN Stewardship Data: Minnesota Department of Natural Resources, Section of Wildife, 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 varable 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. ND: Gap Stewardship, North Dakota Stewardship and Conservation Status, USGS, Northern Prairie Wildlife Research Center, October 2003.

2. National Land Cover Dataset (NLCD) - Originator: U.S. Geological Survey (USGS); Publication date 20010631; Title: National 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. The Hydro 100k layer was compared to EPA'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), 2006. Data obtained from Minnesota Pollution Control Agency (MPCA), and 2006 North Dakota Waters listed with the United States Environmental Protection Agency.

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Footnotes / Bibliography (continued)

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 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 (7/30/04). CREP Acres: http://www.bwsr.state.mn.us/easements/crep/easementsummary.html (7/31/03). WRP Acres: NRCS (8/16/04). 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, 2008 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. Additional information on included projects and planning can be obtained from the listed party.

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