

## Rapid Watershed Assessment

### Leech Lake

(MN) HUC: 07010102



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 Leech Lake 8-Digit Hydrologic Unit Code (HUC) subbasin is located in the Northern Lakes and Forest ecoregion of Minnesota. This largely forested watershed is 854,659 acres in size. Approximately forty six percent of the land in this HUC is privately owned, and the remainder is county, federal and state owned public land or held by tribal land owners.

Assessment estimates indicate 427 Farms in the watershed. Approximately fifty three percent of the operations are less than 180 acres in size, forty three percent are from 180 to 1000 acres in size, and the remaining farms are greater than 1000 acres in size. Fifty six percent of the producers are full time operators and do not rely on off-farm income.

The main resource concerns in the watershed are wind and water soil erosion, wetland management, stormwater runoff management, timberland management, and riparian development. Associated with the storm-water runoff and riparian development are increased sediment and pollutant (mercury, excess nutrients) loadings to surface waters. Declining wildlife habitat is also a concern.



### County Totals

<b>County</b>	<b>Acres in HUC</b>	<b>% HUC</b>
Beltrami	2,843	0.3%
Cass	684,639	80.1%
Hubbard	167,177	19.6%
<b>Total acres:</b>	<b>854,659</b>	<b>100%</b>

## Physical Description

Average elevation in the Leech Lake subbasin is 1,317 feet above sea level, with the highest values being in the Western and extreme Southwestern portions of the watershed, while the lowest are found across the Northern and Northeastern regions.

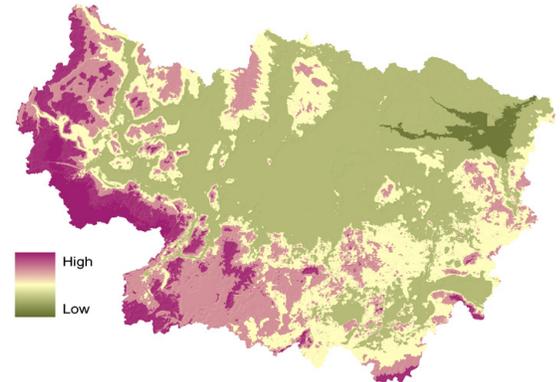
Precipitation in the watershed ranges from 25 to 27 inches annually. Evaporation estimates are between 30 to 32 inches annually (Farnworth et al., 1982, Minnesota State Climatologists Office, 1999).

Most lands within this HUC are not highly erodible, and are moderately to poorly suited to agricultural uses. Predominate land uses / land covers are Forest (44%), Wetlands (24%), Open Water (20%), and Grass Pasture/Hay (7%).

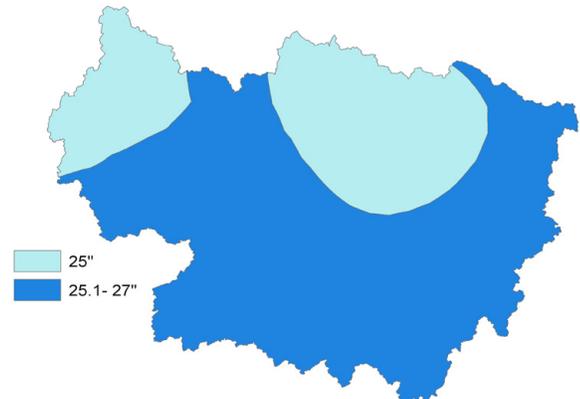
Land use within the watershed is moderately agricultural, accounting for approximately 8% of the available acres.

Development pressure is moderate to high, with farms, timberland, and considerable shoreline being parceled out for recreation, lake or country homes.

**Relief**

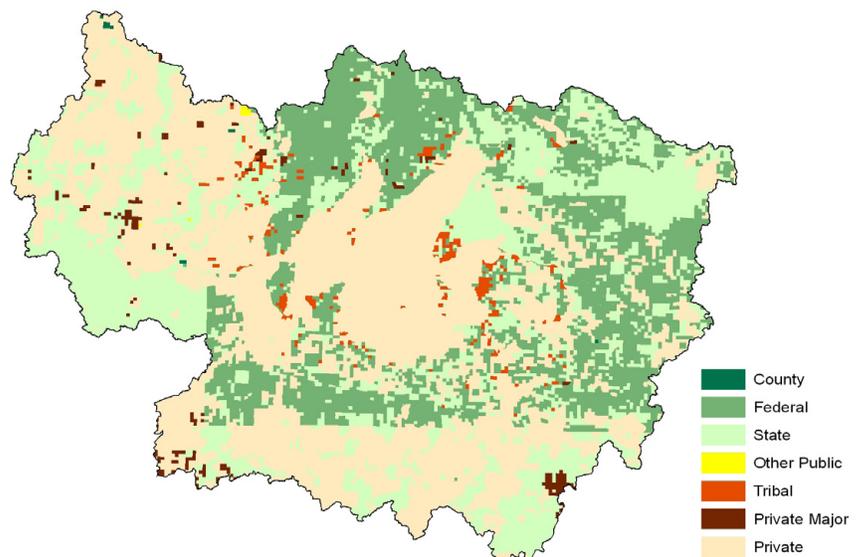


**Average Precipitation**



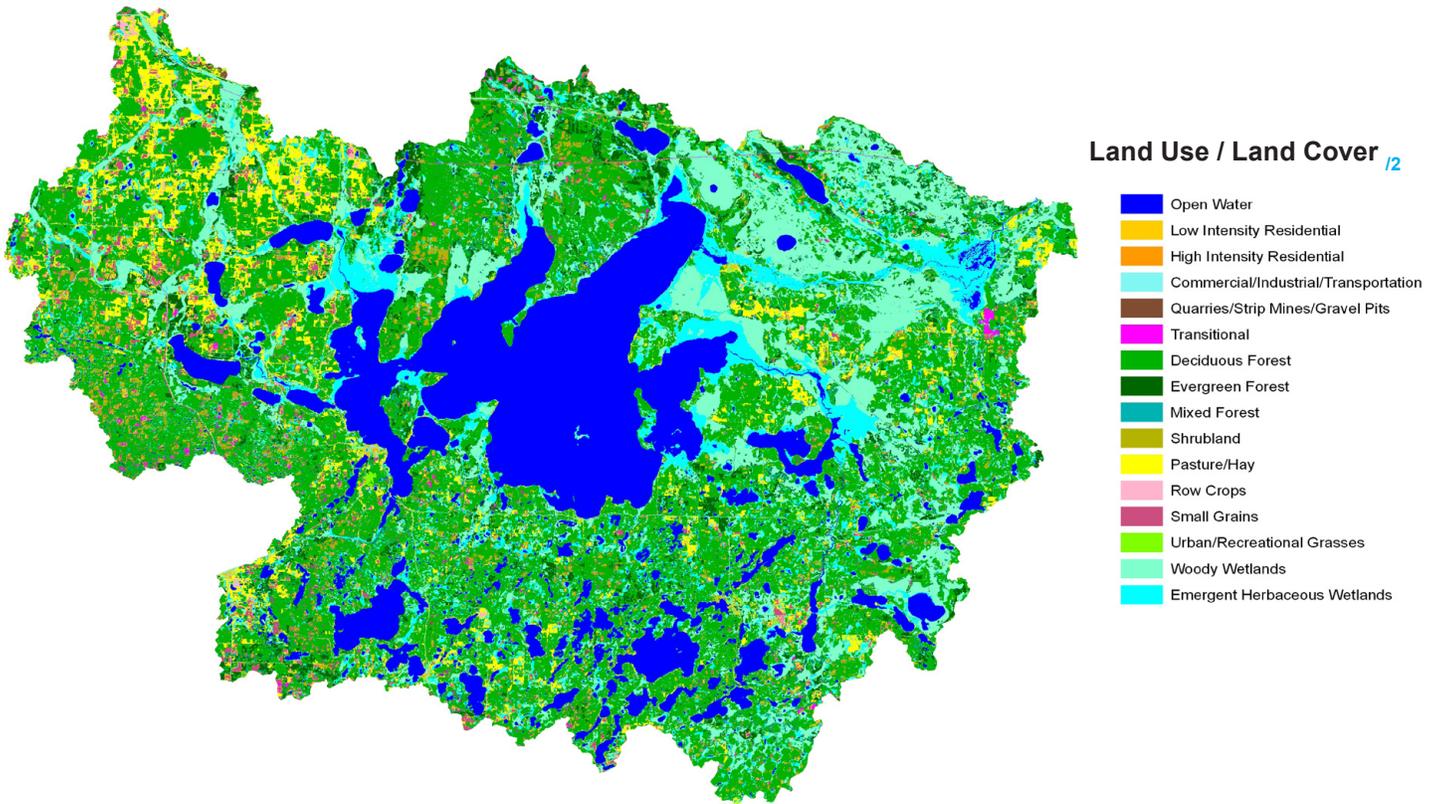
## Ownership

Ownership Type	Acres	% of HUC
Conservancy	-	-
County	452	0.1
Federal	206,113	24.1
State	234,239	27.4
Other	401	0.0
Tribal	11,727	1.4
Private Major	8,417	1.0
Private	393,310	46.0
<b>Total Acres:</b>	<b>854,659</b>	<b>100</b>



## Ownership / Land Use

The Leech Lake watershed covers an area of 854,659 acres. Approximately forty six percent of the land in the watershed is owned by private landholders (393,310 acres). The second largest ownership type is State, with approximately 204, 239 acres (27.4%), Federal with 206,113 acres (24.1%), followed by Tribal with 11,727 acres (1.4%), and Private Major with 8,417 acres (1.0%). County lands account for the smallest ownership percentage, covering 452 acres (0.1%). There are an additional 401 acres of miscellaneous “Other Public” lands, and data shows no major Conservancy land holdings in the region. Land use by ownership type is represented in the table below.



## Ownership / Land Use

<sup>1/3</sup>

Landcover/Use	Public		Private**		Tribal		Total Acres	Percent
	Acres	% Public	Acres	% Private	Acres	% Tribal		
Forest	239,390	28.2%	130,712	15.4%	6,215	0.7%	376,317	44.3%
Grass, etc	10,160	1.2%	47,006	5.5%	477	0.1%	57,642	6.8%
Orchards	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Row Crops	2,251	0.3%	6,528	0.8%	95	0.0%	8,874	1.0%
Shrub etc	23,956	2.8%	5,363	0.6%	500	0.1%	29,819	3.5%
Wetlands	151,616	17.9%	46,343	5.5%	4,092	0.5%	202,051	23.8%
Residential/Commercial	0	0.0%	3,528	0.4%	48	0.0%	3,576	0.4%
Open Water*	12,364	1.5%	157,804	18.6%	299	0.0%	170,467	20.1%
* ownership undetermined			** includes private-major					
<b>Watershed Totals:</b>	<b>439,736</b>	<b>51.81%</b>	<b>397,284</b>	<b>46.8%</b>	<b>11,727</b>	<b>1.4%</b>	<b>854,659</b>	<b>100%</b>

**Physical Description (continued)**

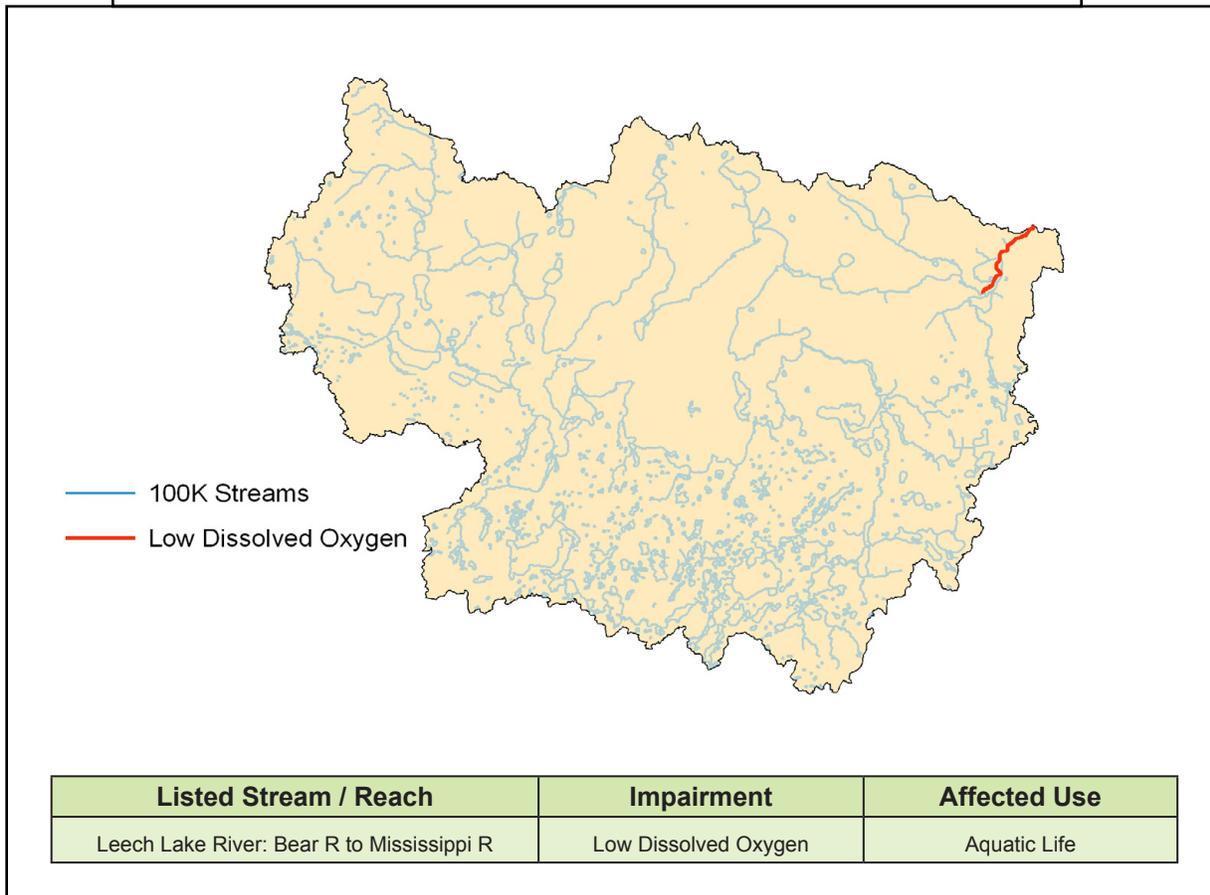
		ACRES	cu. ft/sec	
<b>Stream Flow Data</b>	USGS 05205900 LEECH LAKE AT SUGAR PT. NEAR FEDERAL DAM	<b>Total Avg.</b>	-N/A-	
		<b>May – Sept. Yield</b>	-N/A-	
<b>Stream Data<sup>14</sup></b> (*Percent of Total HUC Stream Miles)		<b>MILES</b>	<b>PERCENT</b>	
	Total Miles – Major (100K Hydro GIS Layer)	1435.4	---	
	303d/TMDL Listed Streams (DEQ)	7.2	0.05%	
<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	6,082	17.7%	
	Grain Crops	13	0.0%	
	Grass, etc	1,609	4.7%	
	Orchards	0	0.0%	
	Row Crops	258	0.7%	
	Shrub etc	156	0.5%	
	Wetlands	12,374	36.0%	
	Residential/Commercial	183	0.5%	
	Open Water*	13,723	39.9%	
	<b>Total Buffer Acres:</b>	<b>34,398</b>	100%	
<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>	0	0%	
	<b>2 – moderate limitations</b>	22,000	45.2%	
	<b>3 – severe limitations</b>	0	0%	
	<b>4 – very severe limitations</b>	26,700	54.8%	
	<b>5 – no erosion hazard, but other limitations</b>	0	0%	
	<b>6 – severe limitations; unsuitable for cultivation; limited to pasture, range, forest</b>	0	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 Croplands &amp; Pasturelands</b>	<b>48,700</b>	---
<b>Irrigated Lands<sup>17</sup></b> (1997 NRI Estimates for Non-Federal Lands Only)	<b>TYPE OF LAND</b>	<b>ACRES</b>	<b>% of Irrigated Lands</b>	<b>% of HUC</b>
	Cultivated Cropland	0	0%	0%
	Uncultivated Cropland	0	0%	0%
	Pastureland	0	0%	0%
	<b>Total Irrigated Lands</b>	<b>0</b>	<b>0%</b>	<b>0%</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.

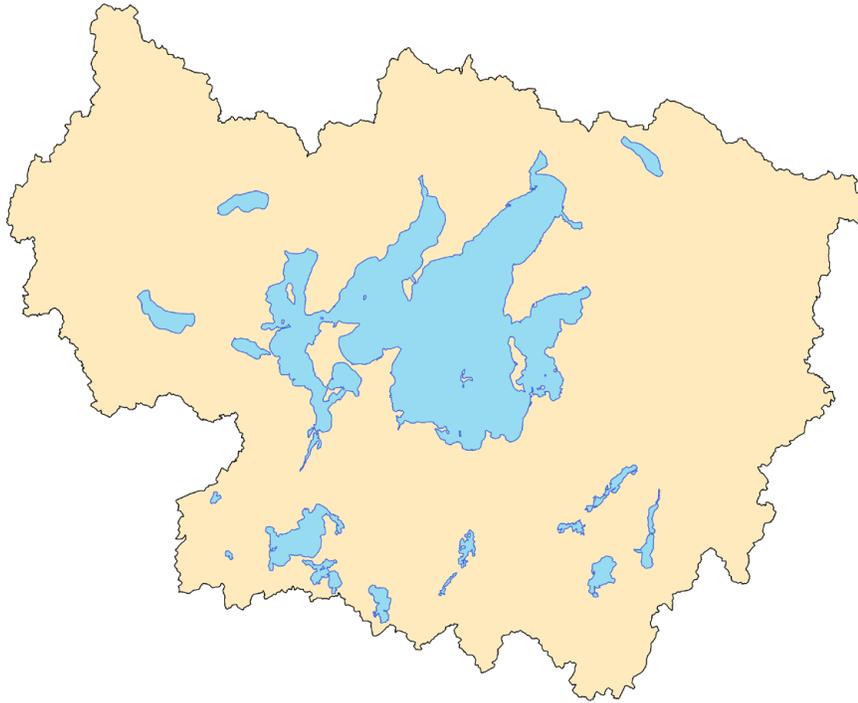
Minnesota's impaired waters list, updated every two years, identifies assessed waters that do not meet water quality standards. The primary tool for addressing impaired waters is a pollution reduction plan called a Total Maximum Daily Load, or TMDL. After impaired use(s) have been identified, the TMDL process identifies all sources of each pollutant. The plan then determines how much each source must reduce its contribution in order to meet the applicable water quality standard. The Clean Water Act requires a completed TMDL for each water quality violation identified on a state's impaired waters list. Lakes or river reaches with multiple impairments require multiple TMDLs.

**2006 Minnesota 303d Listed Streams - Leech Lake Watershed**



Assessment of Waters (continued)

**2006 Minnesota 303d Listed Lakes - Leech Lake Watershed**



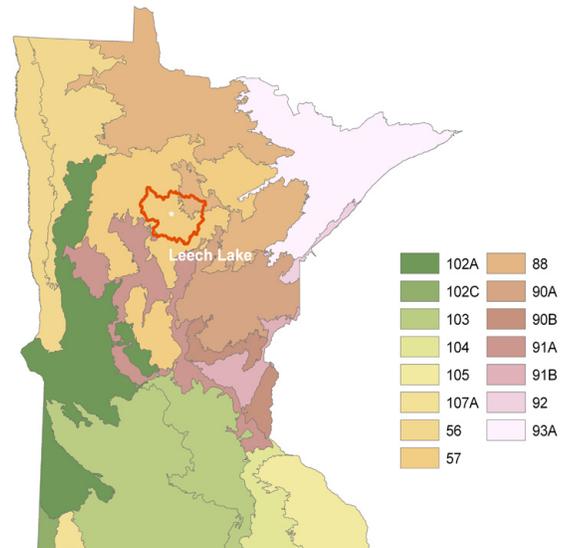
Listed Lake	Impairment	Affected Use
Inguadona	Mercury	Aquatic Consumption
Long	Mercury	Aquatic Consumption
Six Mile	Mercury	Aquatic Consumption
Little Boy	Mercury	Aquatic Consumption
Girl	Mercury	Aquatic Consumption
Leech	Mercury	Aquatic Consumption
Trillium	Mercury	Aquatic Consumption
Baby	Mercury	Aquatic Consumption
Pleasant	Mercury	Aquatic Consumption
Birch	Mercury	Aquatic Consumption
Ten Mile	Mercury	Aquatic Consumption
Steamboat	Mercury	Aquatic Consumption
Williams	Mercury	Aquatic Consumption
Shingobee	Mercury	Aquatic Consumption
Kabekona	Mercury	Aquatic Consumption

## Common Resource Areas

The Leech Lake Watershed encompasses three common resource areas, CRA 91A.1, 88.1, and 57.1. <sup>/9</sup>

**57.1 Northern Minnesota Till Moraine:** Rolling glacial moraine and associated outwash with short, choppy and complex slopes. Soils are generally loamy with some clayey and sandy soils included. Organic soils occur in depressions. Land use is cropland, pasture timber and recreation. Numerous lakes occur in this region. Main crops are small grain, soybeans and forage crops. Resource concerns include improved drainage for crop production, grazing management of forest and grassland, water and wind erosion and water quality impacts.

**88.1 Northern Minnesota Glacial Lake Basins:** Nearly level to gently sloping areas formed in lake washed till, lacustrine and organic soil material. Generally the soils are silty, clayey and loamy with small amounts of sandy and gravelly soils on beach ridges. Timber land is the main use. Scattered cropland and grazing land for beef and dairy are present. Cropland is used mostly for small grain, silage and hay. Resource concerns include management of excessive wetness, short growing season, pasture management, and water quality.



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

**91A.1 Central Minnesota Outwash:** Nearly level to gently sloping well drained sandy soils on outwash plains and stream terraces. There are also numerous poorly and very poorly drained mineral and organic soils. Irrigated crop land, pasture and hayland are the major land uses. Forestland is common in parts. Corn, soybeans, edible beans and potatoes are the primary irrigated crops. Forage crops are also extensively grown. Resource concerns are wind erosion water quality, nutrient management, improperly managed grazing.

## Geology / Soils <sup>/10</sup>

Soils within the watershed are primarily Alfisols, which generally form underneath deciduous forests underlain by silty sands and are present in woodland and mixed woodland and cropland areas, Entisols which are sandy soils commonly found in glacial outwash and alluvium and Histosols which are common yellow-brown to dark-brown organic soils found in wetlands.

In the watershed the bedrock geology consists of primarily Precambrian crystalline rocks (Sims and Morey, 1972, Stark et al., 1996). The Leech Lake River Watershed also lies within calcareous glacial deposits associated with the Des Moines Lobe and the Wadena Lobe Associations.

Visit the online Web Soil Survey at
   
<http://websoilsurvey.nrcs.usda.gov> for official and
   
 current USDA soil information as viewable maps and
   
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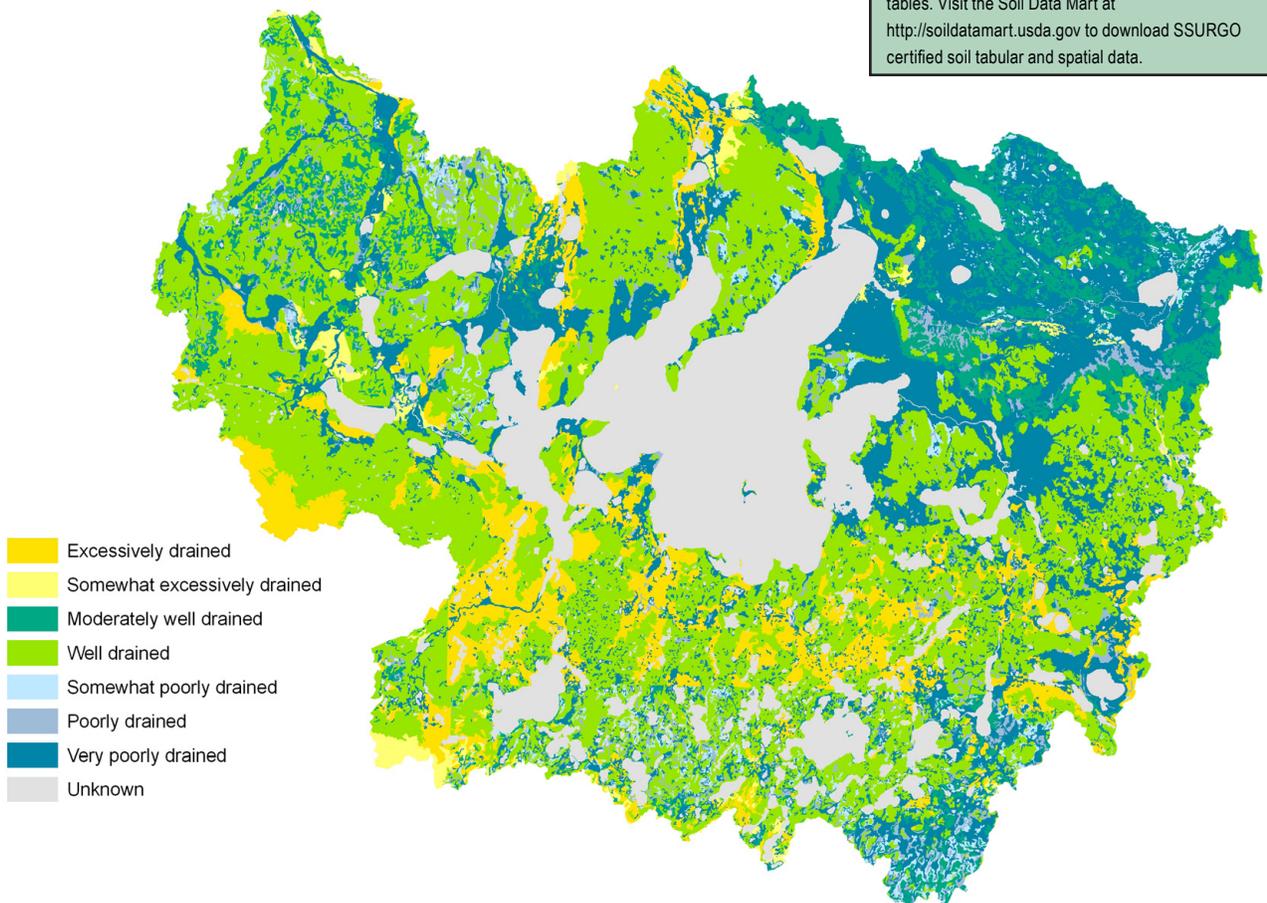
## Drainage Classification

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.”



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.



## 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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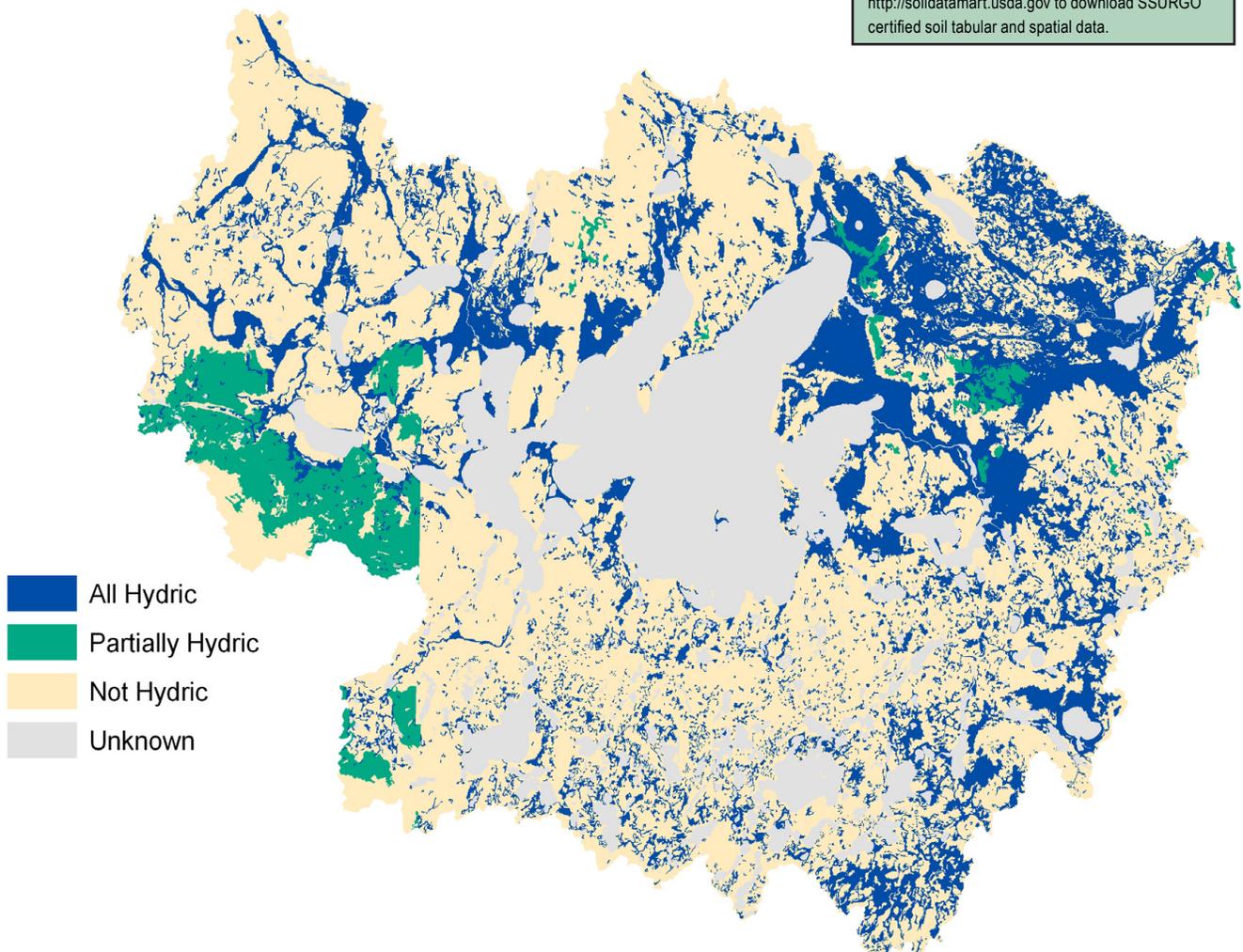
## Hydric Soils

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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*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.*

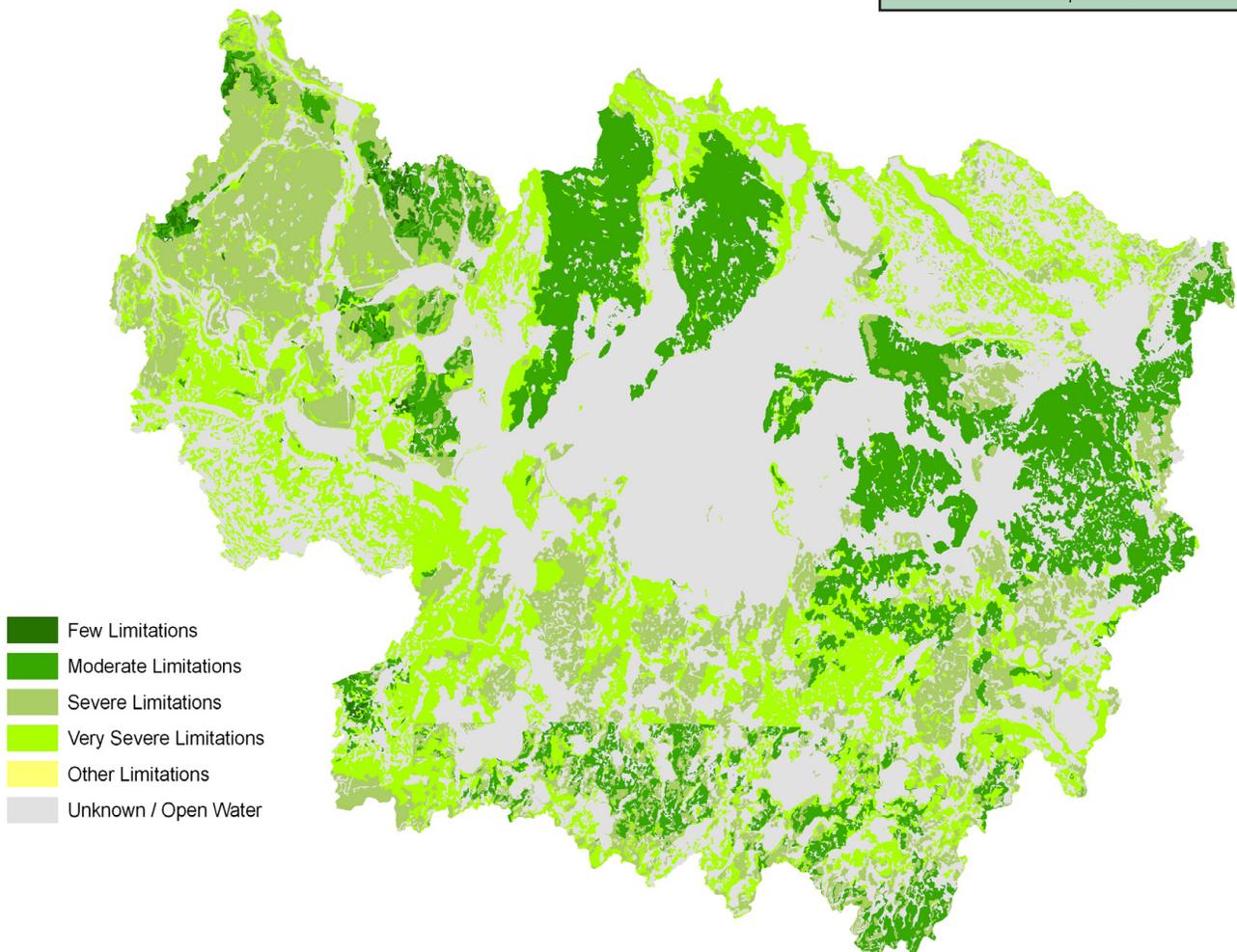
## Land Capability Classification

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.



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**Performance Results System Data**

Watershed Name: Leech Lake				Watershed Number: 7010102						
PRS Performance Measures	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
Total Conservation Systems Planned (acres)	0	1,367	0	48	77	N/A	1,111	452	6	3,061
Total Conservation Systems Applied (acres)	0	460	0	351	351	N/A	138	688	320	2,308
<b>Conservation Practices</b>										
Total Waste Management (313) (numbers)	0	0	0	0	0	0	0	0	0	0
Riparian Forest Buffers (391) (acres)	0	0	0	0	0	6	0	0	0	6
Erosion Control Total Soil Saved (tons/year)	0	99	514	451	264	N/A	N/A	N/A	N/A	1,328
Total Nutrient Management (590) (Acres)	0	0	0	0	0	0	0	0	0	0
Pest Management Systems Applied (595A) (Acres)	0	220	250	250	0	0	0	0	0	720
Prescribed Grazing 528a (acres)	0	0	0	0	92	0	0	0	0	92
Tree & Shrub Establishment (612) (acres)	0	110	0	101	33	72	7	71	217	611
Residue Management (329A-C) (acres)	0	0	0	0	0	0	0	0	0	0
Total Wildlife Habitat (644 - 645) (acres)	0	294	0	117	267	279	117	138	0	1,212
Total Wetlands Created, Restored, or Enhanced (acres)	0	0	0	0	0	0	0	21	0	21
<b>Acres enrolled in Farmbill Programs</b>										
Conservation Reserve Program	0	0	0	31	33	N/A	0	0	0	64
Wetlands Reserve Program	0	0	0	0	0	N/A	0	0	0	0
Environmental Quality Incentives Program	0	460	250	250	0	N/A	138	356	320	1,774
Wildlife Habitat Incentive Program	0	0	0	0	0	N/A	0	120	0	120
Farmland Protection Program	0	0	0	0	0	N/A	0	0	0	0

## Socioeconomic and Agricultural Data (Relevant)

Estimations for the Leech Lake subbasin indicate a current population of just under 16,900 people. Median household income throughout the district is approximately \$34,350 yearly, roughly 74% of the national average. Unemployment in the subbasin is estimated at six percent, and sixty one percent of the population over the age of 18 is active in the workforce. Approximately 14% of the residents in the watershed are living below the national poverty level.



Assessment estimates show 427 Farms in the watershed. Approximately fifty four percent of the operations are less than 180 acres in size, forty three percent are from 180 to 1000 acres in size, and the remaining farms are greater than 1000 acres in size. Of the 411 operators in the watershed, 56% are full-time producers not reliant on off farm income.

<b>(MN) HUC# 7010102</b>		<b>Total Acres:</b>	<b>854,659</b>
<b>Population Data*</b>	Watershed Population	16,899	
	Unemployment Rate	6%	
	Median Household Income	34,348	
	% below poverty level	14%	
	Median Value of Home	94,333	
<b>Farms</b>	# of Farms	427	
	# of Operators	411	<b>Percent</b>
	# of Full Time Operators	231	56%
	# of Part Time Operators	180	44%
	<b>Total Crop/Pasturelands:</b>	<b>48,700</b>	5.7%
<b>Farm Size</b>	1 to 49 Acres	58	14%
	50 to 179 Acres	170	40%
	180 to 499 Acres	145	34%
	500 to 999 Acres	38	9%
	1,000 Acres or more	16	4%
<b>Livestock &amp; Poultry</b>	Cattle - Beef	4,878	11%
	Cattle - Dairy	2,189	5%
	Chicken	32	0%
	Swine	2,958	7%
	Turkey	33,700	76%
	Other	392	1%
	<b>Animal Count Total:</b>	<b>44,148</b>	
	<b>Total Permitted AFOs:</b>	<b>37</b>	
<b>Chemicals (Acres Applied)</b>	Insecticides	2,817	
	Herbicides	6,958	
	Wormicides	0	
	Fruiticides	0	
	<b>Total Acres Treated</b>	<b>9,775</b>	
	<b>% State Chemical Totals</b>	<b>0.07%</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

## RESOURCE CONCERNS

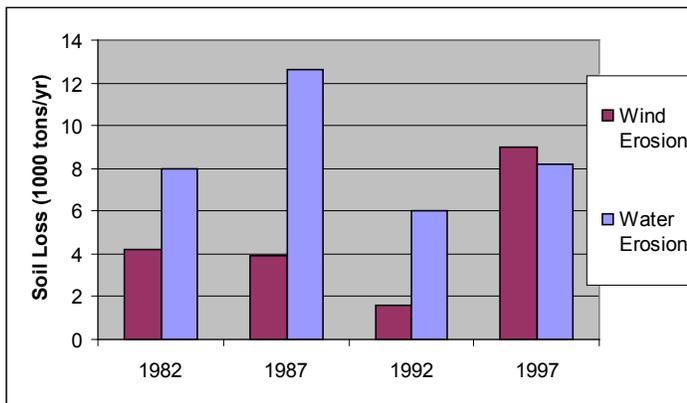
County Soil and Water Conservation Districts in the watershed have identified the following resource concerns as top priorities for conservation and cost sharing efforts:

- **Soil Quality, Excessive Sheet and Rill Erosion.** Sedimentation caused by the clearing and grading of shoreland property is neither desirable nor necessary. Erosion issues relate directly to lake pollution/eutrophication and shoreland development, and compound effects of erosion from agricultural lands.
- **Woodland Management.** Management opportunities include planting trees or shrubs, restoring prairies, timber stand improvement, timber sales, enhancing wildlife habitat, prescribed burning, and many other practices or projects.
- **Surface 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. Mercury levels are affecting the health of Aquatic communities, and affecting the consumption of fish in many area lakes.
- **Stormwater Management.** Local districts recognize that runoff volume will likely increase as development of the watershed continues. Districts seek to require that peak runoff rates be kept below the capacity of downstream conveyance facilities through the use of retention facilities.
- **Wetland Management, Surface Water Management, Gully Control.** Drained wetlands, crop production in flood prone areas, and aging dams all diminish surface water quality and productivity. Restoration of wetlands, dam repair and placing flood-prone lands in CRP/RIM all serve to lessen the impact of flooding and improve drainage.



### NRI Soil Loss Estimates

- NRI estimates for Sheet and rill erosion by water on cropland and pastureland increased by approximately 200 tons (2.5%) of soil from 1982 to 1997.
- NRI estimates indicate wind erosion rates increased by 4,800 tons (114.3%) between 1982 and 1997. [13](#)



## THREATENED AND ENDANGERED SPECIES OF THE BASIN <sup>14</sup>

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, and candidate species as well as species of special concern that occur in the subbasin.



Scientific Name	Common Name	Type
<i>Ammodramus nelsoni</i>	Nelson's Sharp-tailed Sparrow	Zoological
<i>Botrychium lanceolatum</i>	Triangle Moonwort	Botanical
<i>Botrychium minganense</i>	Mingan Moonwort	Botanical
<i>Botrychium mormo</i>	Goblin Fern	Botanical
<i>Botrychium oneidense</i>	Blunt-lobed Grapefern	Botanical
<i>Botrychium pallidum</i>	Pale Moonwort	Botanical
<i>Botrychium rugulosum</i>	St. Lawrence Grapefern	Botanical
<i>Botrychium simplex</i>	Least Moonwort	Botanical
<i>Buteo lineatus</i>	Red-shouldered Hawk	Zoological
<i>Coturnicops noveboracensis</i>	Yellow Rail	Zoological
<i>Cypripedium arietinum</i>	Ram's-head Lady's-slipper	Botanical
<i>Dryopteris goldiana</i>	Goldie's Fern	Botanical
<i>Eleocharis olivacea</i>	Olivaceous Spike-rush	Botanical
<i>Emydoidea blandingii</i>	Blanding's Turtle	Zoological
<i>Etheostoma microperca</i>	Least Darter	Zoological
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Zoological
<i>Lasmigona compressa</i>	Creek Heelsplitter	Zoological
<i>Ligumia recta</i>	Black Sandshell	Zoological
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's-mouth	Botanical
<i>Najas gracillima</i>	Thread-like Naiad	Botanical
<i>Notropis anogenus</i>	Pugnose Shiner	Zoological
<i>Orobanche uniflora</i>	One-flowered Broomrape	Botanical
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Zoological
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Zoological
<i>Polycentropus milaca</i>	A Caddisfly	Zoological
<i>Potamogeton vaseyi</i>	Vasey's Pondweed	Botanical
<i>Sparganium glomeratum</i>	Clustered Bur-reed	Botanical
<i>Spilogale putorius</i>	Eastern Spotted Skunk	Zoological
<i>Sterna hirundo</i>	Common Tern	Zoological
<i>Utricularia purpurea</i>	Purple-flowered Bladderwort	Botanical
<i>Waldsteinia fragarioides</i>	Barren Strawberry	Botanical

## Watershed Projects, Plans and Monitoring

- **Biological & Toxicological Assessment**  
Minnesota Pollution Control Agency
- **Tri-County Leech Lake Watershed Project**  
MN DNR, Cass, Beltrami, and Hubbard Counties
- **Mississippi River Env. Management Program**  
US Army Corps of Engineers
- **Mississippi River Watch**  
Mississippi Headwaters Board
- **Mississippi River Defense Network**  
Legislative Commission on Minnesota Resources
- **Citizen Stream Monitoring Program**  
Minnesota Pollution Control Agency
- **Upper Mississippi River Initiative**  
National Audobon Society
- **Upper Mississippi River Basin Planning**  
Minnesota Pollution Control Agency
- **Upper Mississippi Source Water Protection Project**  
Minnesota Department of Health
- **Upper Mississippi River WS Forest Partnership**  
USDA Forest Service
- **Upper Mississippi River Watershed Fund**  
USDA Forest Service / National Fish & Wildlife Federation
- **South Leech Lake Resource Management Project**  
USDA Forest Service / Walker Ranger Dist. Chippewa Natl Forest

\* 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

- **Beltrami County SWCD**  
3217 Bemidji Ave North Suite #3, Bemidji, MN 56601  
Phone (218) 755-4339
- **Cass County SWCD**  
303 Minnesota Avenue W Walker, MN 56484-3000  
Phone (218) 547-7399
- **Clearwater County SWCD**  
312 Main Ave N Ste 3, Bagley, MN 56621  
Phone (218) 694-6845
- **Hubbard County SWCD**  
212 1/2 - 2nd St W, Park Rapids, MN 56470  
Phone (218) 732-0121
- **Friends of the Mississippi River**  
360 N Robert St Saint Paul, MN 55101  
Phone (651) 222-2193
- **Mississippi Headwaters Board**  
Cass Co. Courthouse Box 3000 Walker, MN 56484  
Phone (218) 547-7263
- **North Central Minnesota Joint Powers Board**  
3217 Bemidji Ave N Suite 3 Bemidji, MN 56601  
Phone (218) 755-4339
- **National Fish and Wildlife Foundation**  
1 Federal Drive Minneapolis MN 55111  
Phone 612-713-5185
- **South Central Comprehensive Water Plan Joint Powers Board**  
P.O. Box 248, New Ulm, MN 56073 Phone 507-233-6642
- **USDA Forest Service North East Area**  
1992 Folwell Ave. St. Paul MN 55108  
Phone 651-649-5239

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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: 19990631; 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. U.S. Geological Survey National Hydrography Dataset (NHD) 1:100,000-scale Digital Line Graph (DLG) medium resolution hydrography data, integrated with reach-related information from the U.S. Environmental Protection Agency Reach File Version 3.0 (RF3). 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. 1997 NRI 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. [NRI-97] For more information: <http://www.nrcs.usda.gov/technical/NRI/>
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). 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 present, 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) (7/30/04). CREP Acres: <http://www.bwsr.state.mn.us/easements/crep/easementssummary.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. Data were also taken from MPCA AFO/CAFO counts provided by county for 2005.

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/>. Where listed, 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 listed individual projects can be obtained from the noted parties.