DEPARTMENT OF NATURAL RESOURCES

Watershed Context Report

Little Fork River

September, 2017

DEPARTMENT OF NATURAL RESOURCES

The Watershed Context Report is supported by the Watershed Health Assessment Framework (WHAF) team; River Ecology Unit, Division of Ecological and Water Resources.

Contact the WHAF Team:
WHAF.DNR@state.mn.us
651-345-3331 ext 228

Visit the Watershed Health Assessment Framework online at *mndnr.gov/whaf*

Funding for this project comes from the Clean Water Fund, which receives 33 percent of the sales tax revenue from the Clean Water, Land and Legacy Amendment, approved by voters in November 2008. The Clean Water Fund's purpose is to protect, enhance and restore water quality in lakes, rivers, streams and groundwater. At least 5 percent of the money is targeted for the protection of drinking water sources. The Legislature allocates funds for water quality work and drinking water protection based on recommendations from the Clean Water Council.

CLEAN WATER LAND & LEGACY AMENDMENT

This publication produced by:

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4040
888-646-6367 or 651-296-6157
mndnr.gov

Watershed Context Report:
Little Fork River

DNR Major ID: 76
HUC 8: 09030005

This report provides an overview of ecological conditions and human influences in the Little Fork River watershed. Physical characteristics, landscape alterations, human infrastructure and population trends influence watershed health and health risk. This background information is foundational for understanding the health challenges that face the watershed.

This report is designed as a companion document for exploring watershed health scores and other data with the WHAF interactive map. The appendix lists the spatial data sources for each report page. Each appendix entry is hyper-linked to open the WHAF map with that data displayed for further exploration.

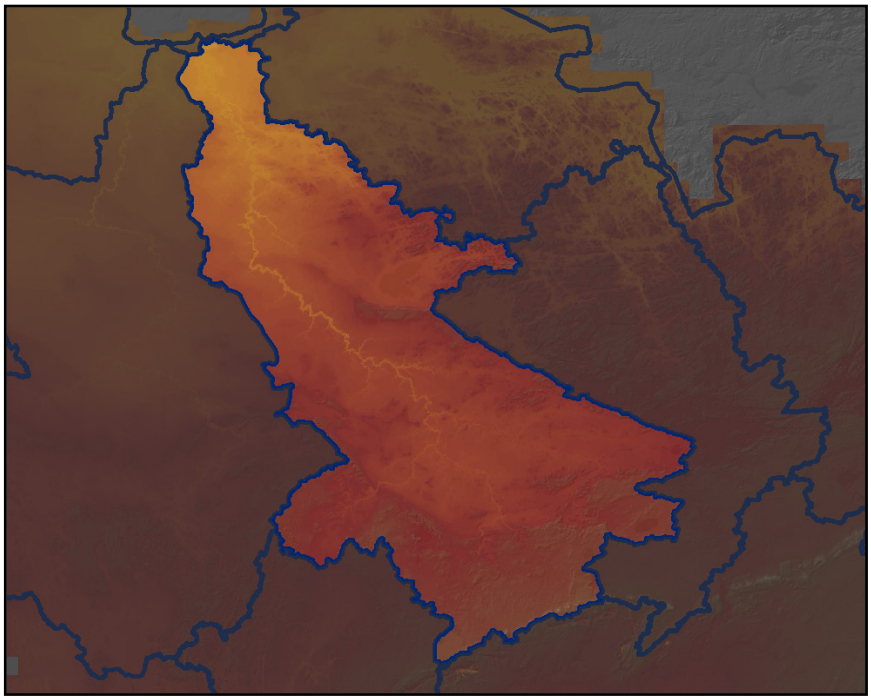
Table of Contents

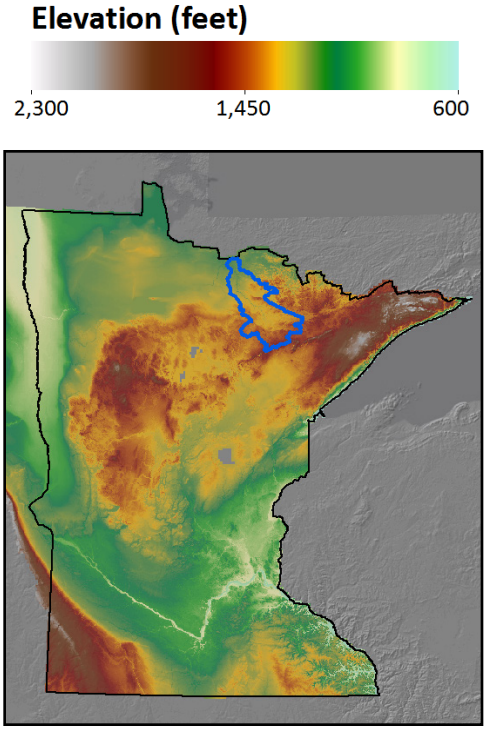
Physical Characteristics

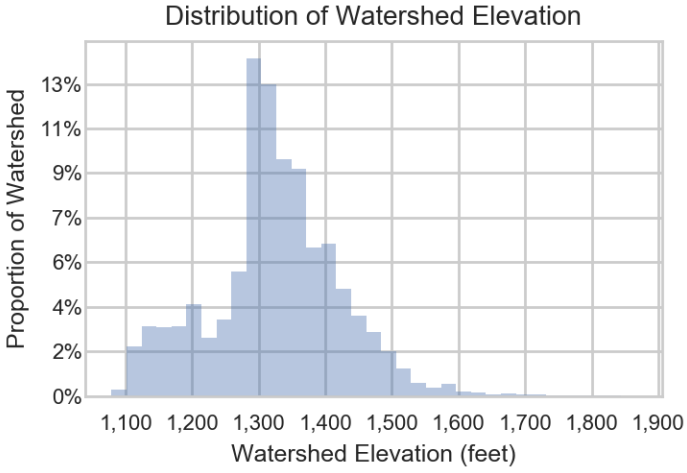
Topography

Topography is a foundational landscape condition. The elevation and slope of the land affects factors as diverse as wind, water flow, temperature and land use. Elevation change or 'relief' is the amount a geographic area varies in its height above sea level. Minnesota's landscapes range from the flat Red River Valley basin in the west, to steep slopes and bluffs near Lake Superior and along the Minnesota, Mississippi and St. Croix rivers.

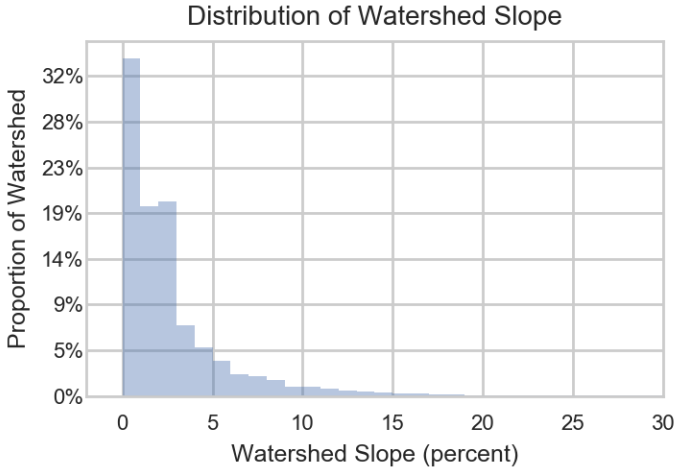
The steepness and length of slopes impacts other landscape features. Slope concentrates water flows leading to the formation of streams and rivers. Soil erosion also accelerates on long steep slopes. Historically, steep slopes have been less used for agriculture and human development. Important remnant native plant and animal communities are now often found on steep slopes.







The distribution of watershed area over the elevation range. Each vertical bar represents the percent of this watershed at that elevation value.



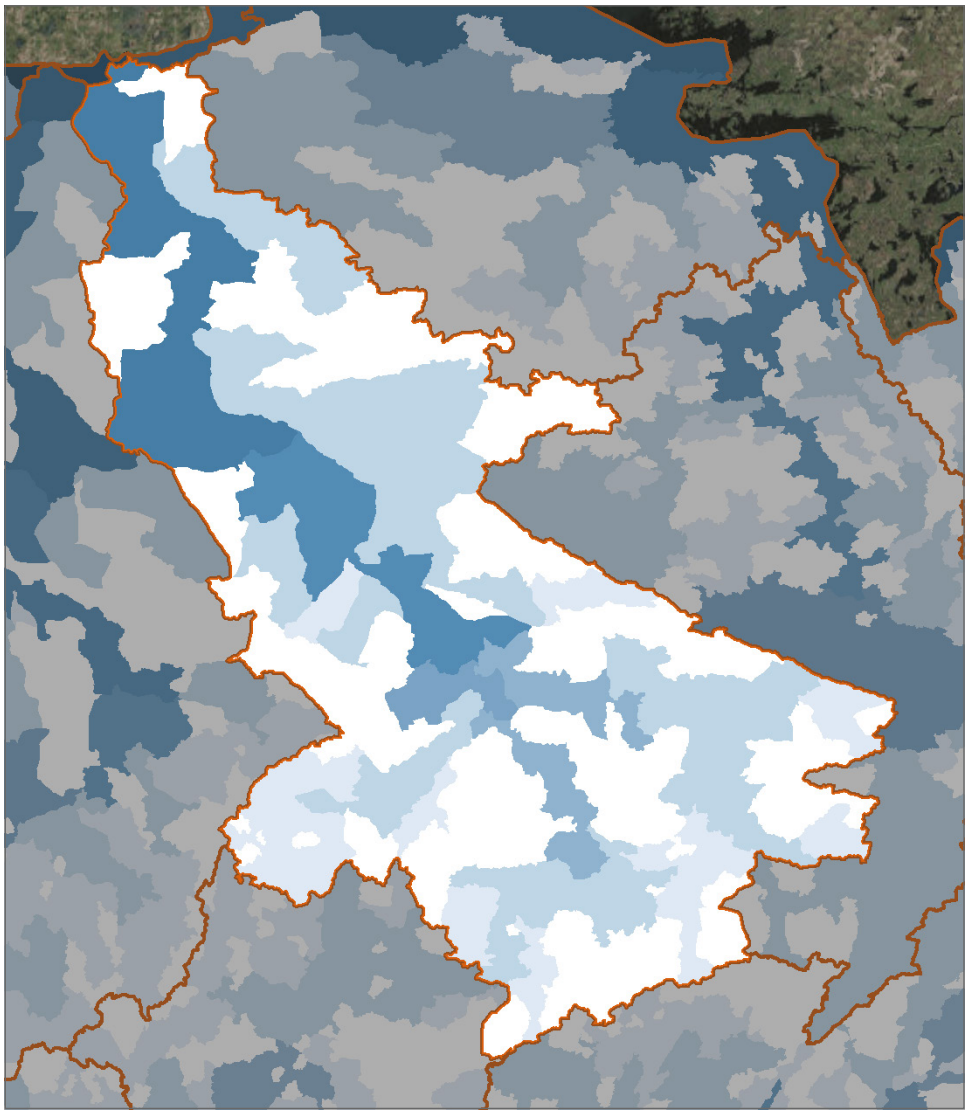
The distribution of watershed area over the range of hillslope. Each vertical bar represents the percent land area for a given slope value.

Physical Characteristics

Hydrologic Position

The hydrologic position map helps to illustrate where each watershed catchment resides on the landscape in relationship to neighboring catchments. This relationship is based on the location of the mouth or 'pour point' of each catchment and the area that is upstream of that point. The amount of land area upstream influences the amount of water that leaves or 'discharges' from the mouth of each catchment.

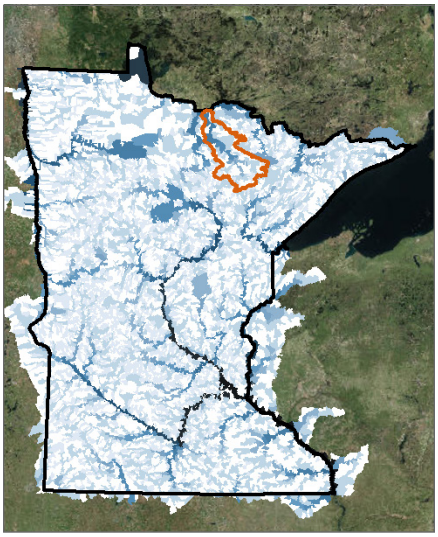
Headwater catchments are shown in white. These areas do not receive overland water flow from upstream but rather collect surface water within their boundary and send it downstream. In contrast, those catchments that encompass a major river receive flow from all catchments upstream. The mouth of major rivers accumulate all the water from the upstream river basin and have the largest water discharge amounts shown in dark blue. The discharge amounts in cubic feet per second (cfs) are estimates based on modeling, not actual measurements of stream flow.



Hydrologic Position

Modeled Stream Discharge (cfs)

- Headwater catchment
- 0 - 50
- 50 - 100
- 100 - 170
- 170 - 260
- 260 - 370
- 370 - 520
- 520 - 770
- 770 - 1,200
- 1,200 - 1,900
- 1,900 - 2,800
- 2,800 - 4,000
- 4,000 - 5,700
- 5,700 - 9,000
- 9,000 - 22,000
- Major Watershed Boundary



Physical Characteristics

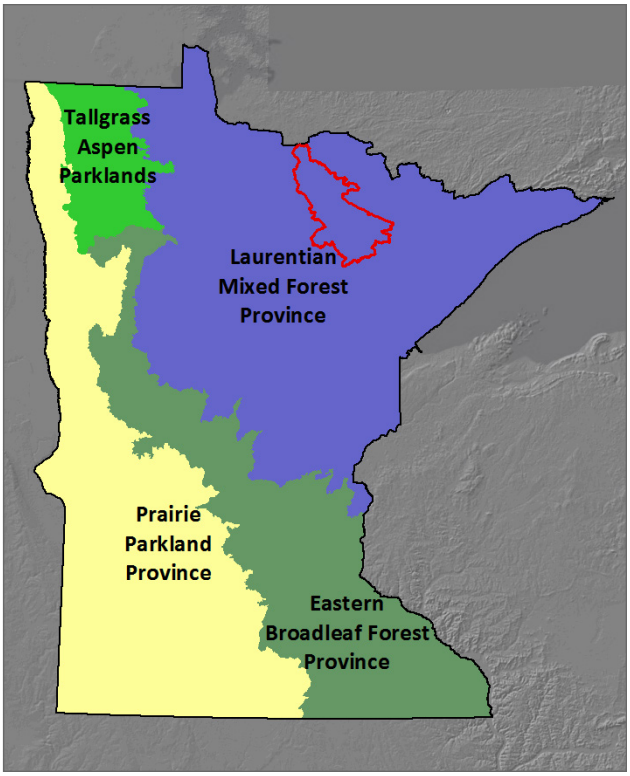
Ecological Classification System

The Ecological Classification System is a system developed by the MN DNR and US Forest Service for mapping and classifying landscape ecosystems. The system provides a nested set of classification units which, from broadest to most detailed, includes: Provinces, Sections, Subsections and Land Type Associations. Each scale maps progressively more uniform ecological features, including climate, geology, topography, soils, hydrology and vegetation. These patterns represent different correlated landscape features and can help guide appropriate resource management approaches across different spatial scales.

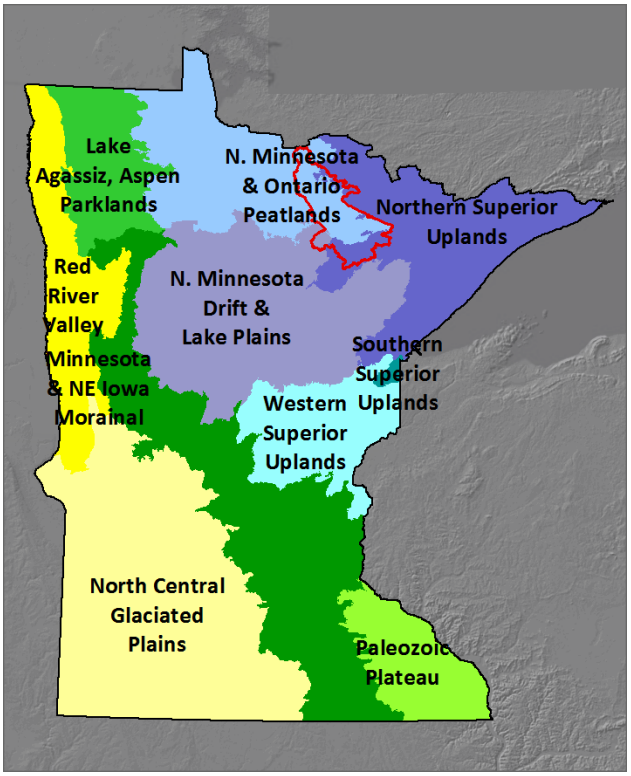
For additional information on Minnesota's Ecological Classification System go to – *www.mndnr.gov/ecs*

Provinces are units of land defined using major climate zones, native vegetation, and biomes such as prairies, deciduous forests, or boreal forests.

Sections are units within Provinces that are defined by origin of glacial deposits, regional elevation, distribution of plants, and regional climate.



Map of the Ecological Classification System Provinces in Minnesota



Map of the Ecological Classification System Sections in Minnesota

Percent Watershed Area by Province:

Laurentian Mixed Forest Province: 100.0%

Percent Watershed Area by Section:

N. Minnesota & Ontario Peatlands: 65.5%

Northern Superior Uplands: 29.3%

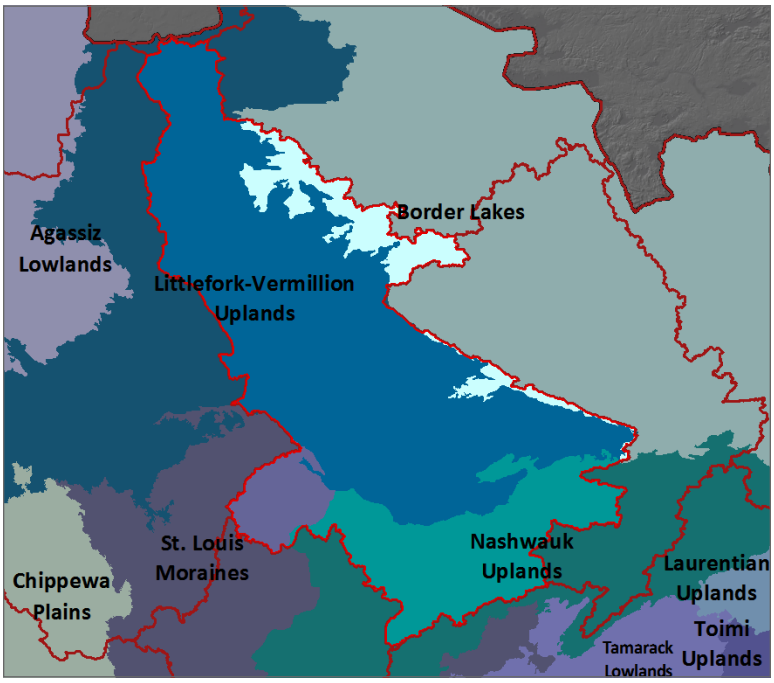
N. Minnesota Drift & Lake Plains: 5.2%

Physical Characteristics

Ecological Classification System (continued)

Subsections are units within Sections that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants, especially trees.

Land Type Associations are units within Subsections that are defined using glacial landforms, bedrock types, topographic roughness, lake and stream distributions, wetland patterns, depth to ground water table, soil parent material and pre-European settlement vegetation. *www.mndnr.gov/ecs*



Percent Watershed Area by Subsection:

Littlefork-Vermillion Uplands: 65.5%

Nashwauk Uplands: 20.5%

Border Lakes: 8.7%

St. Louis Moraines: 5.2%

Percent Watershed Area by Land Type Association:

Rauch Till Plain: 17.0%

Nashwauk Moraine: 12.3%

Koochiching Peatlands: 10.5%

Little-Big Fork Till Plain: 9.4%

Cook Till Plain: 8.1%

Ash Lake Till Plain: 5.2%

Haney Till Plain: 4.9%

Effie Till Plain: 4.6%

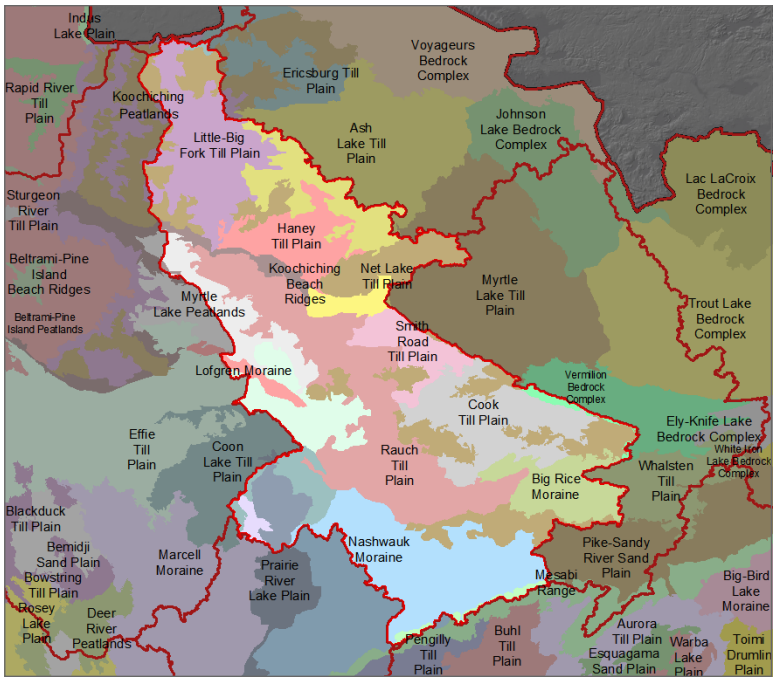
Big Rice Moraine: 4.4%

Myrtle Lake Peatlands: 3.9%

Smith Road Till Plain: 3.3%

Myrtle Lake Till Plain: 3.0%

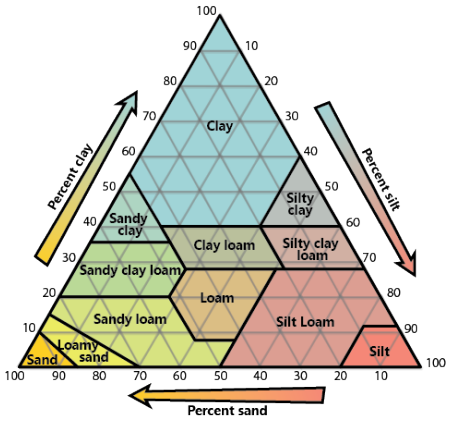
Pike-Sandy River Sand Plain: 2.7%

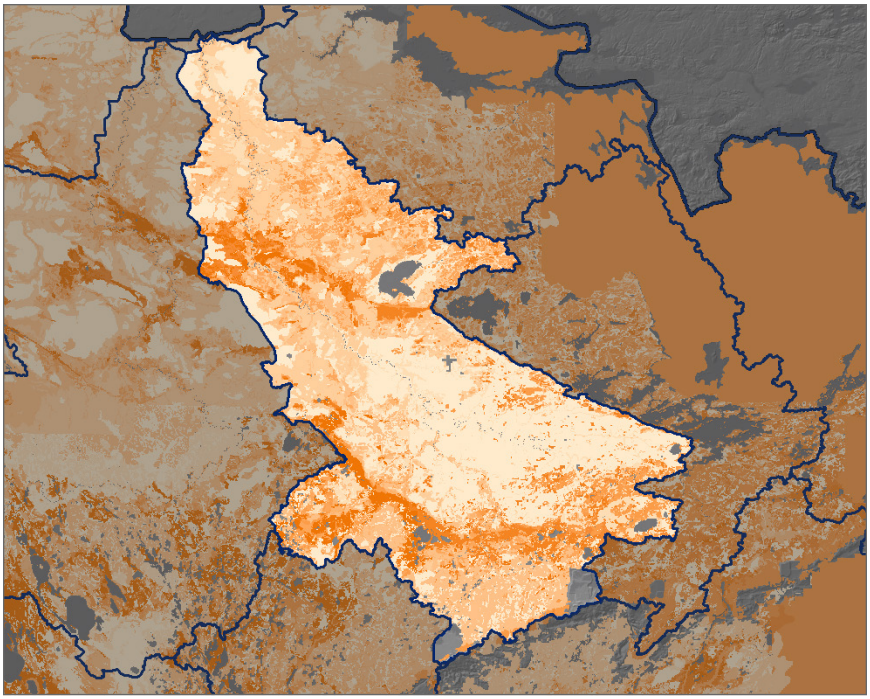


Physical Characteristics

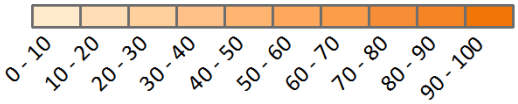
Soils

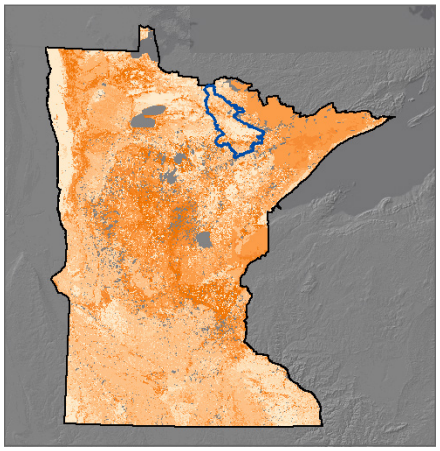
Soil texture results from the relative amount of sand, silt and clay present in the soil. These particle types vary in size from clay particles (< .002 mm), to silt (.002 - .05mm) to sand particles (> .05mm). The combination and relative amount of each particle type influences many soil properties. This chart shows the relationship between some common soil texture classes and the relative amount of each particle type. Soil texture in turn influences soil erodibility, permeability and suitability for various uses.



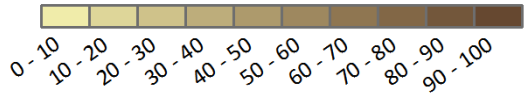


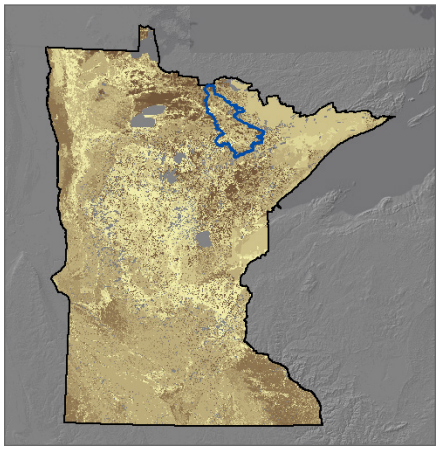
Percent Sand

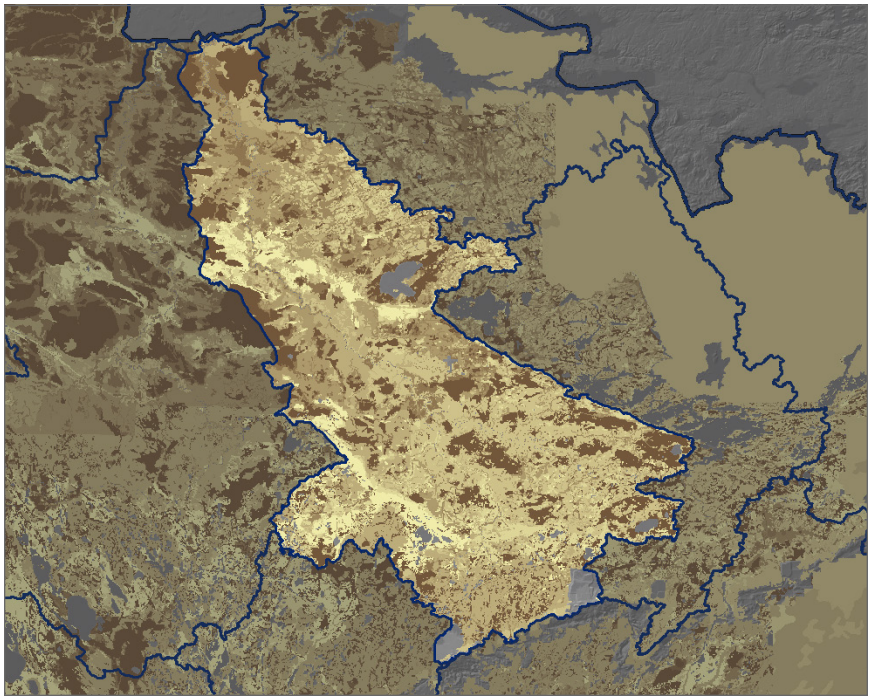




Percent Silt

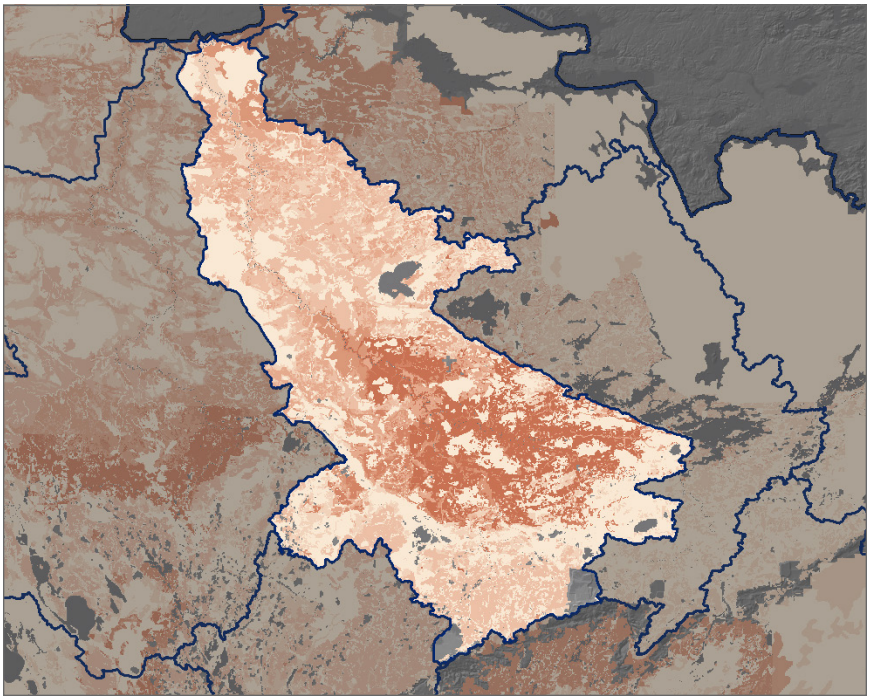


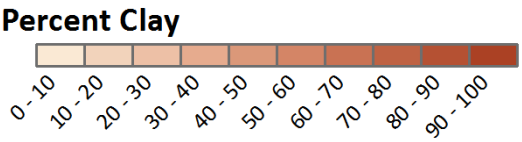


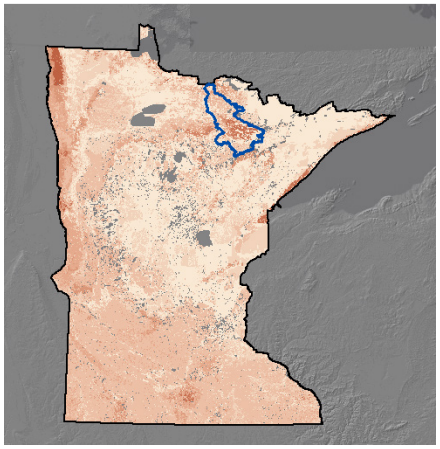


Physical Characteristics

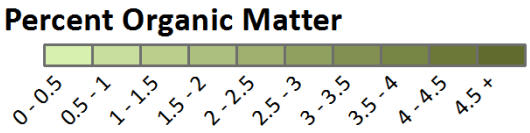
Soils (continued)

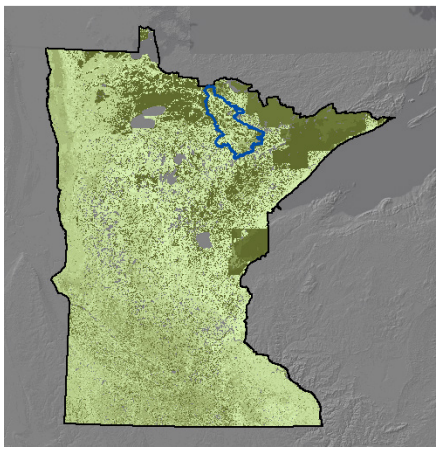


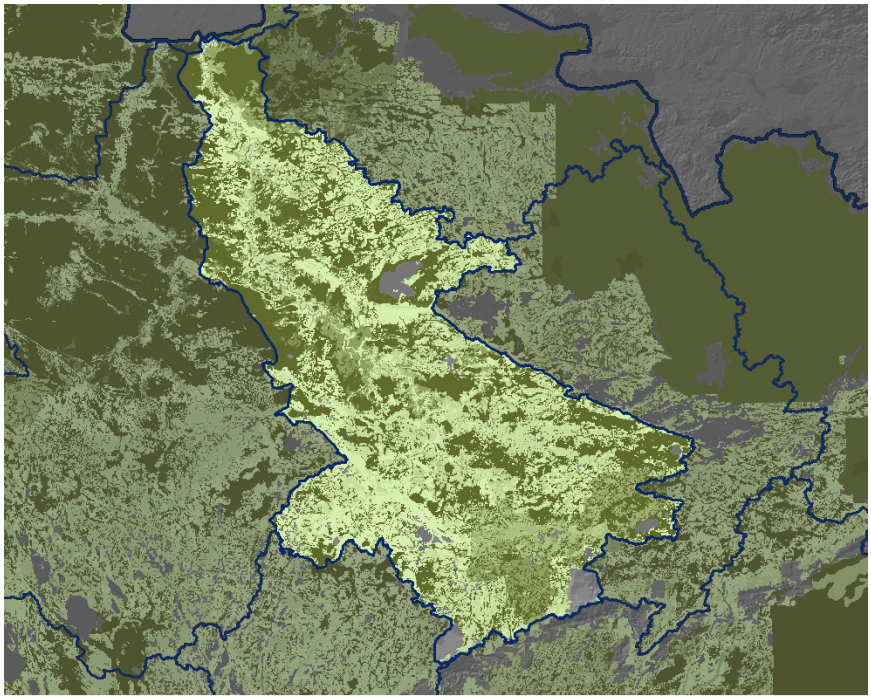




Organic matter is an important factor affecting soil physical properties such as water infiltration rate and water and nutrient holding capacity. Unlike particle size, the amount of organic matter can change; it can be either enhanced or depleted in response to land management activities.



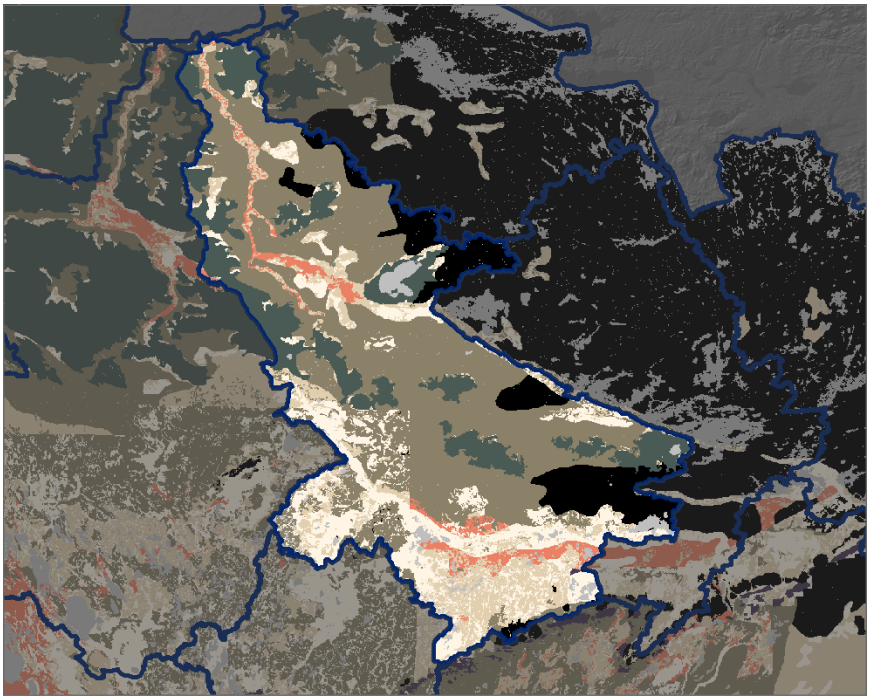


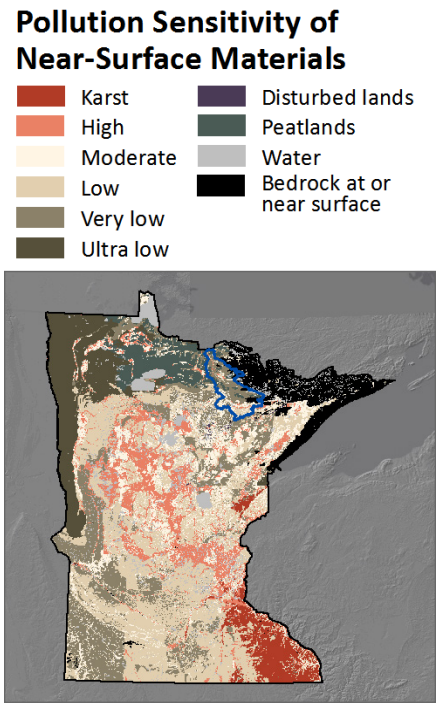


Physical Characteristics

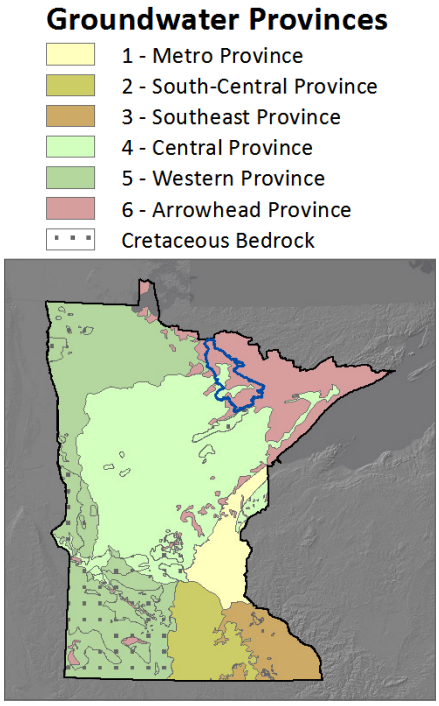
Groundwater

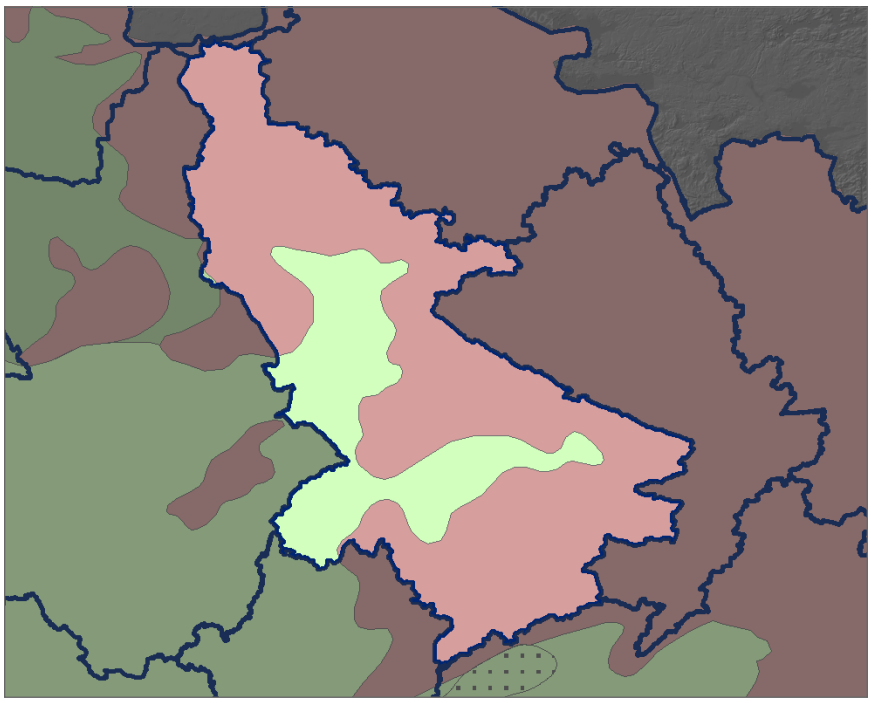
The Pollution Sensitivity of Near-Surface Materials delineates different rates at which contaminants may travel through the top 10 feet of the soil profile. The different rates across the state show the range in risk level for contamination to infiltrate toward groundwater resources. In some areas, the surface is so hard that it limits infiltration of water, but increases the risk that contaminants may run over the surface directly into lakes and streams.





The six ground water provinces of the state are based on bedrock and glacial geology. Within each province, ground-water sources and the availability of ground water for drinking water, industrial, and agricultural uses are similar. For additional information - *www.mndnr.gov/groundwater/provinces/index.html*

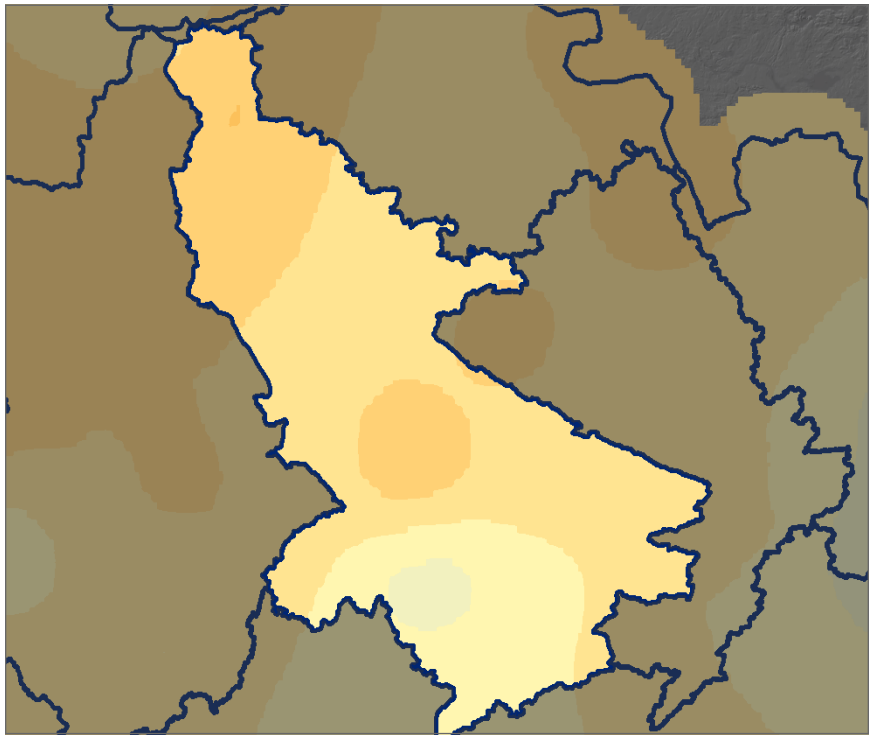




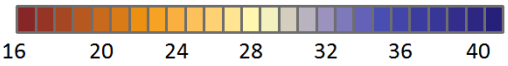
Physical Characteristics

Climate

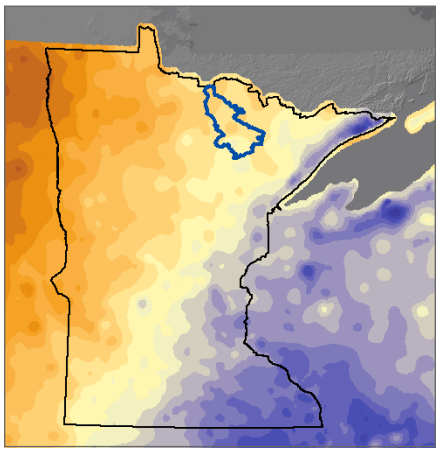
Minnesota's landscape is located at the intersection of three distinct ecological biomes. Precipitation and temperature play an important role in defining the boundaries of these biomes. These two climate trends show different statewide patterns which create a range of temperature and precipitation combinations.



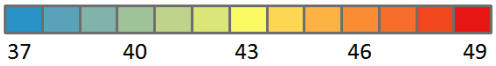
Normal Annual Precipitation (Inches, 1981 - 2010)



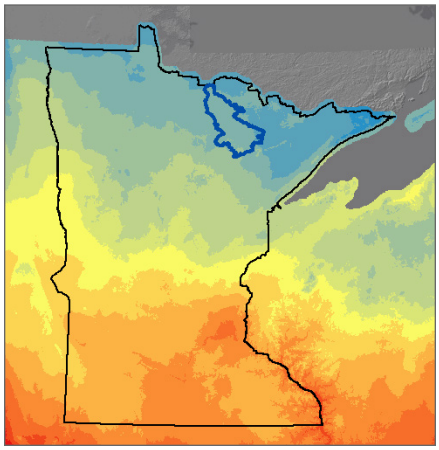
Watershed-wide 30-year average:
27.8 in. (liquid equivalent)

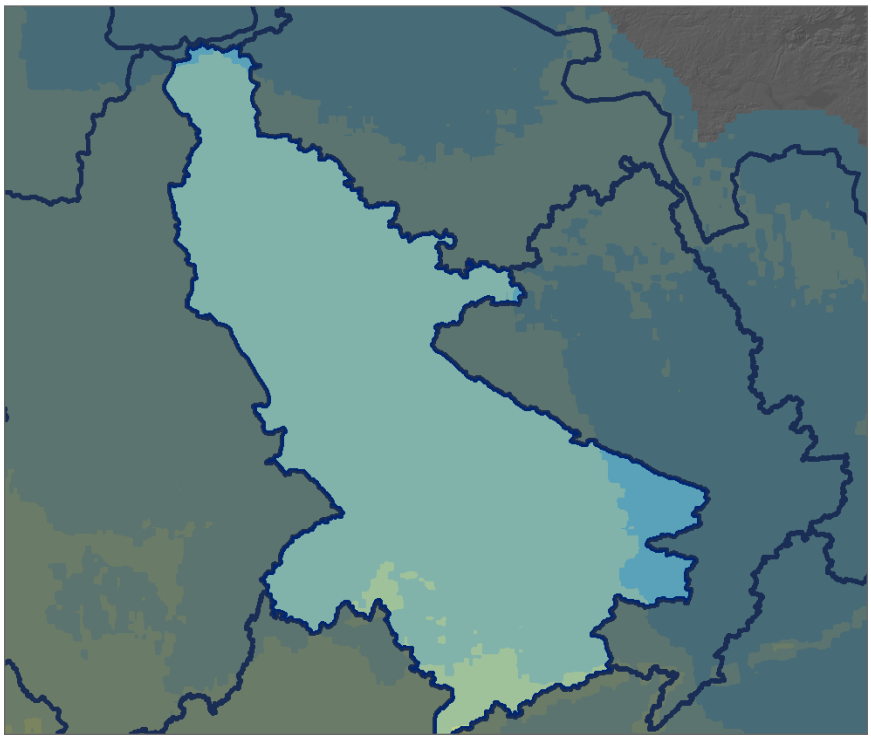


Normal Annual Temperature (Farenheit, 1981 - 2010)



Watershed-wide 30-year average:
38.5 degrees Fahrenheit

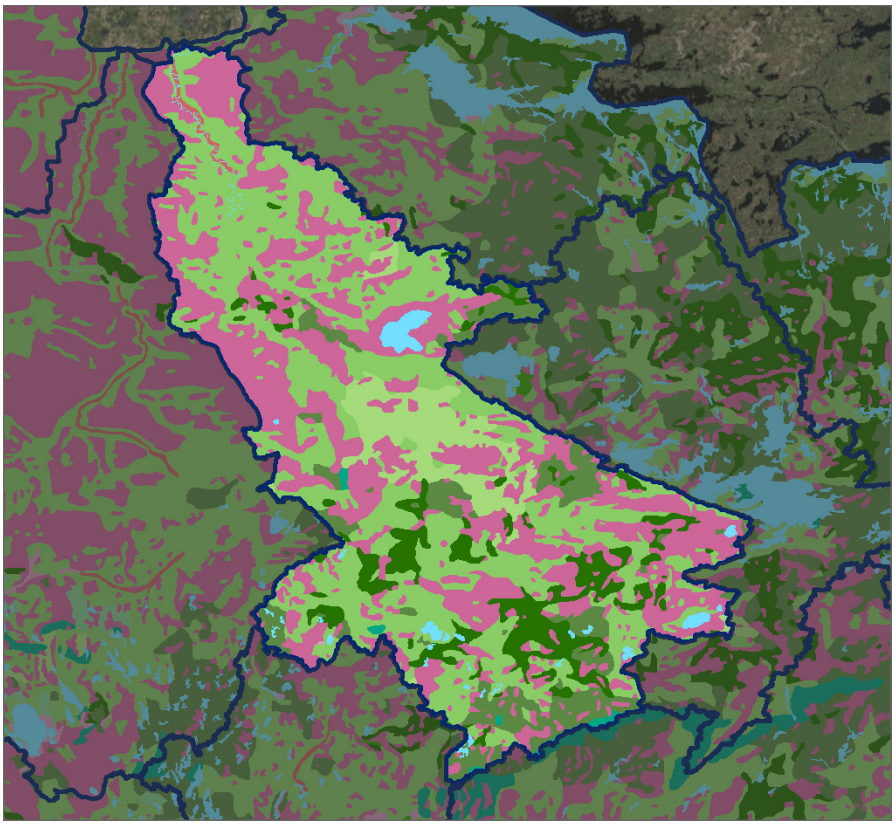




Landscape Alteration

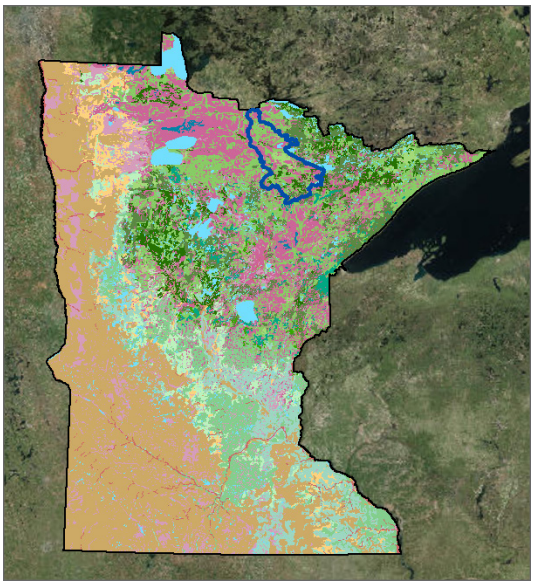
Historic Land Cover

Marschner's Early-European Settlement Vegetation Map is interpreted from Public Land Survey notes from the 1890's. This map gives an insight in to the distribution of vegetation before non-Native Americans began to significantly impact the land cover patterns of Minnesota.



Percent of Watershed by Marschner Land Class:

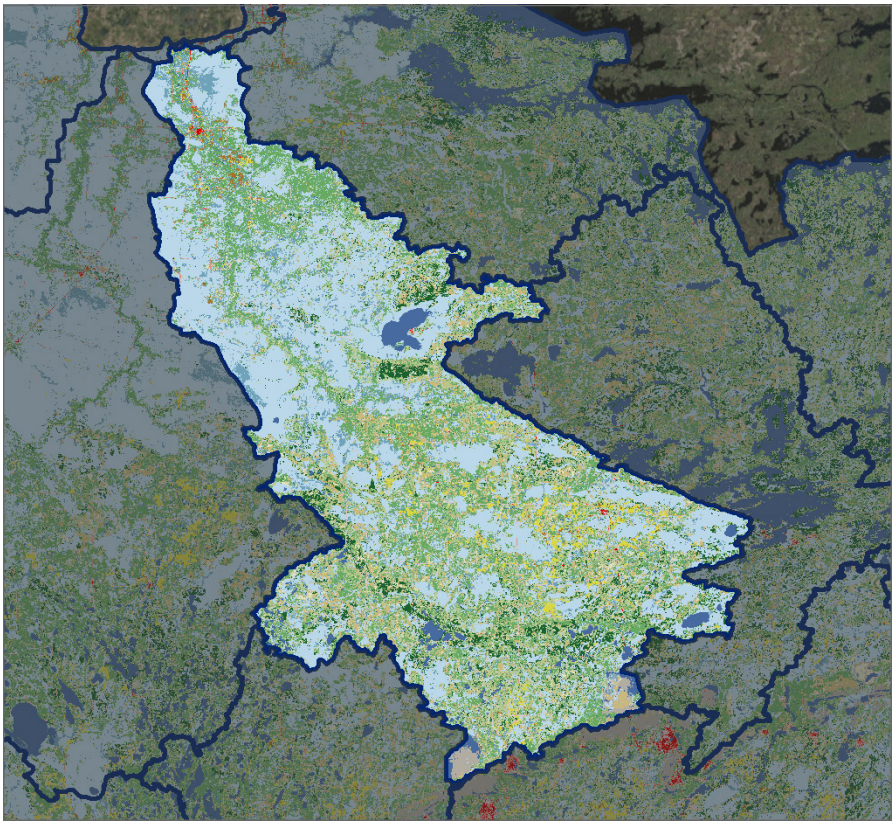
Aspen-Birch (trending to Conifers): 38.1%
Conifer Bogs and Swamps: 35.8%
Mixed White Pine and Red Pine: 8.8%
Jack Pine Barrens and Openings: 8.6%
Aspen-Birch (trending to hardwoods): 6.2%
Lakes (open water): 1.6%
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc): 0.5%
River Bottom Forest: 0.3%
Undefined: 0.0%
Wet Prairie: 0.0%

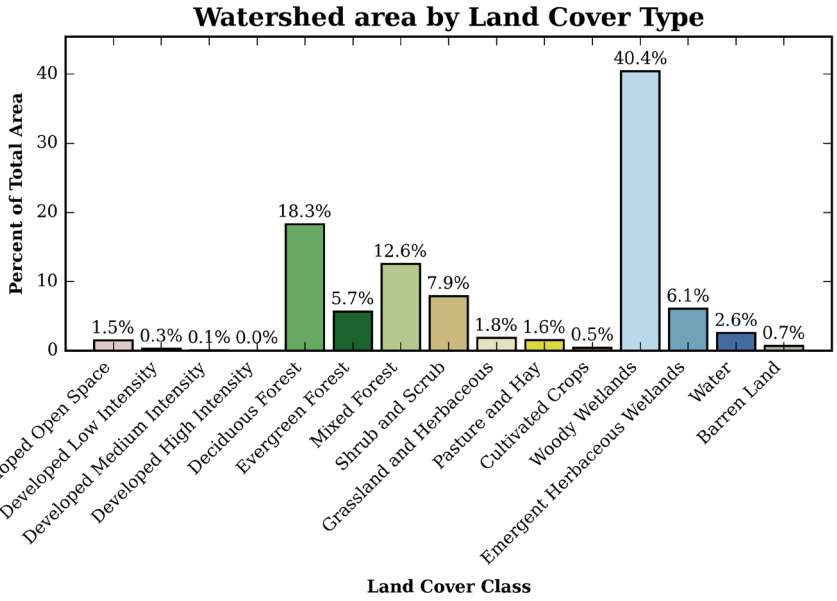


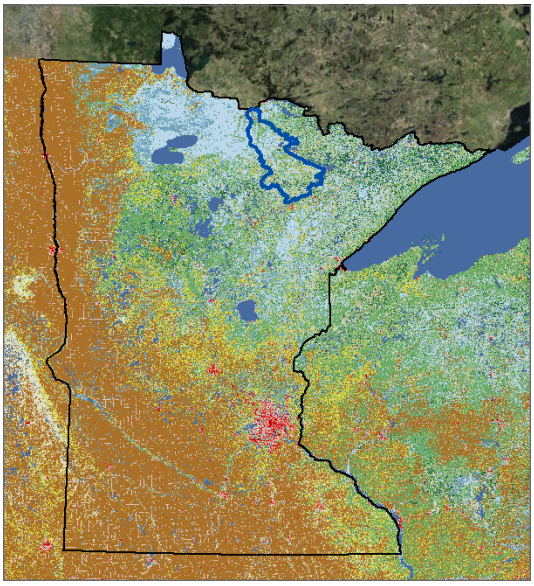
Landscape Alteration

Current Land Cover - NLCD

Land cover data provides information on current and past land use patterns primarily derived from satellite and aerial imagery. The National Land Cover Database (NLCD) is a nation-wide data set classifying all lands into one of 16 categories. Every five years, an update of land cover is completed giving land cover trends over time. The most recent layer currently available is based primarily on Landsat Satellite data collected in 2011.



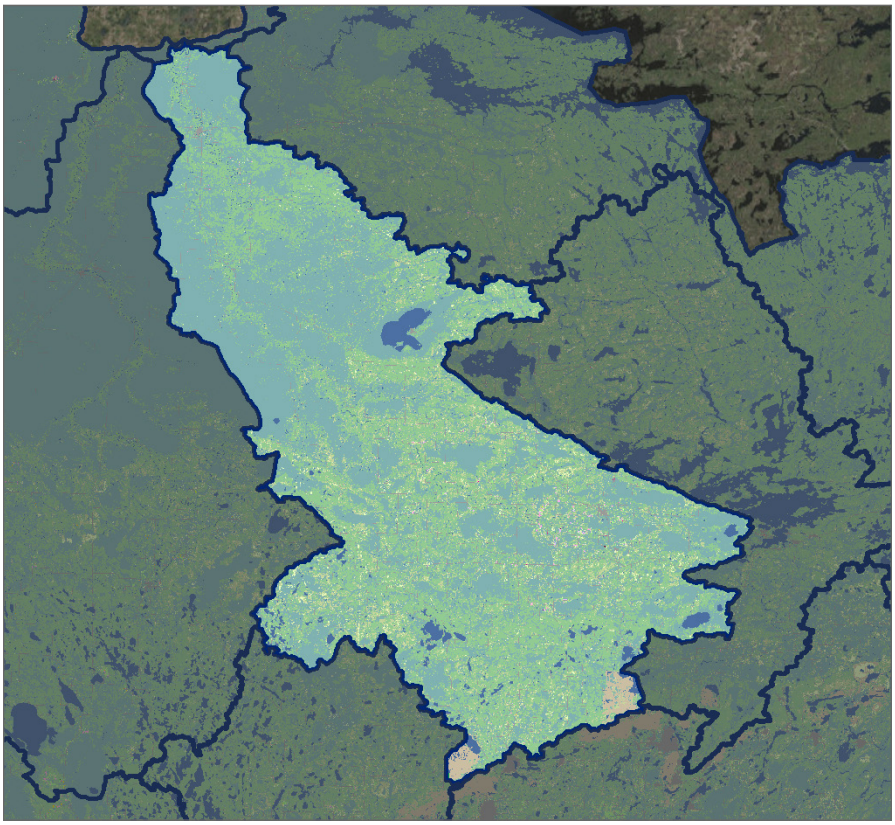


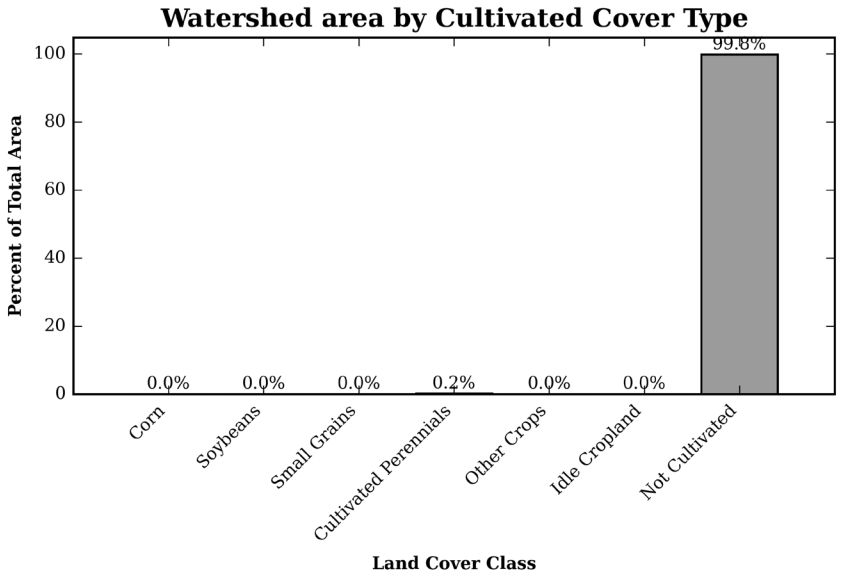


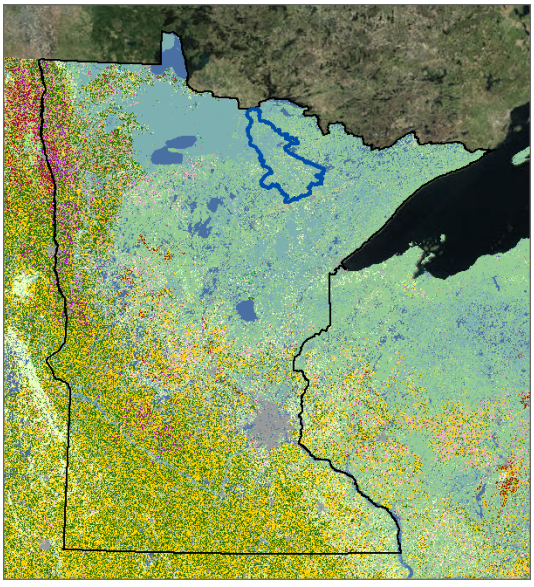
Landscape Alteration

Current Land Cover - CDL

The USDA Crop Data Layer (CDL) gives detail about the location and amount of various types of agricultural cultivation. The national data contains a very wide range of crops, but only some of these are present in Minnesota and different regions of Minnesota have different typical crop rotations. The Crop Data Layer data is summarized to show the percent of land area in each major watershed used to produce each of the major crop types found in Minnesota (based on 2016 data).







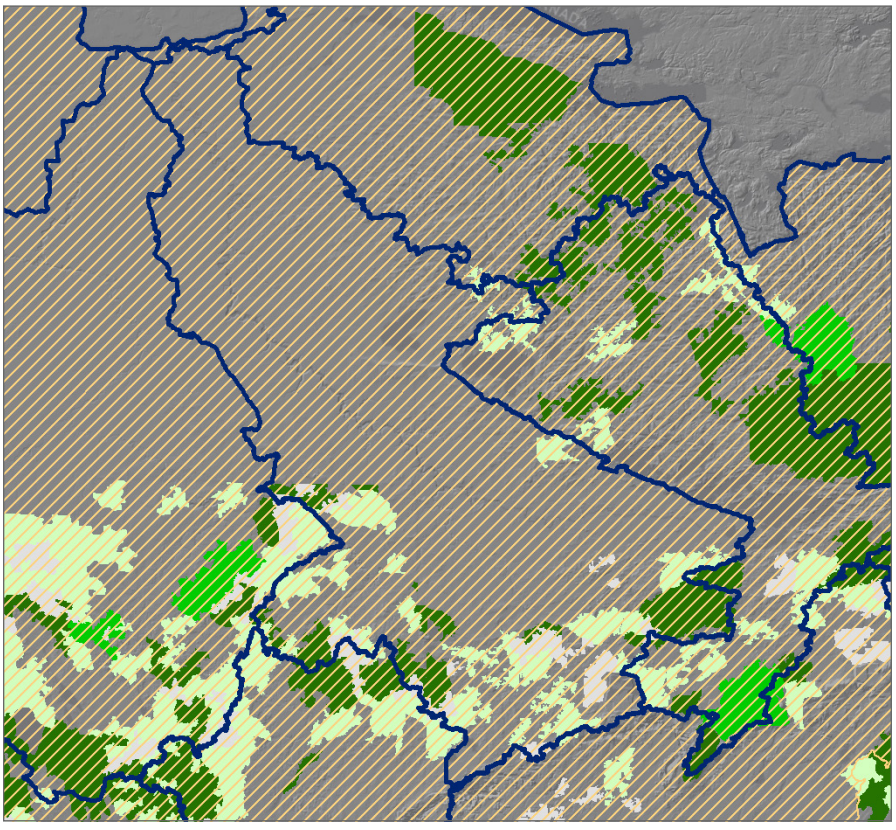
Landscape Alteration

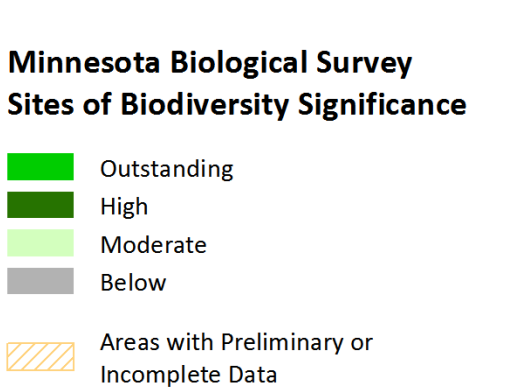
Habitats of Biodiversity Significance

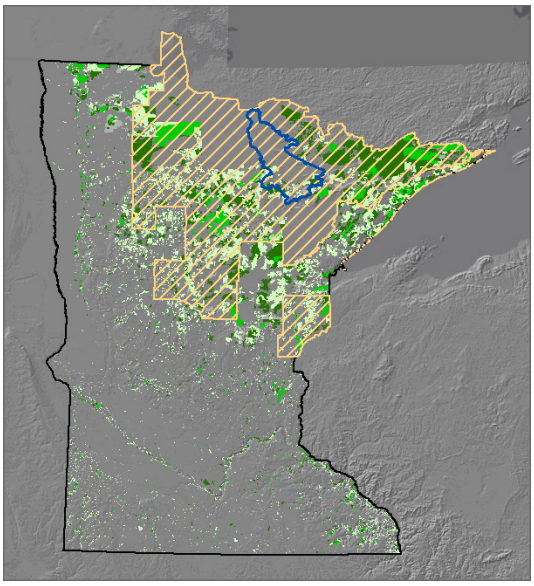
Minnesota Biological Survey (MBS) ecologists rank the biodiversity of habitat sites based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context. In many areas of Minnesota, remaining sites occur primarily along steep slopes and near water features, while most of the upland has been converted to human use. For more information visit - *www.mndnr.gov/eco/mcbs/biodiversity_guidelines.html*

There are four biodiversity significance ranks, outstanding, high, moderate, and below:

- Outstanding sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact or functional landscapes.
- High sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- Moderate sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- Below sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.







Area of Sites of Biological Significance Rank

Outstanding: 0.0 sq. mi. (0.0%)

High: 90.9 sq. mi. (4.9%)

Moderate: 152.9 sq. mi. (8.2%)

Below: 50.3 sq. mi. (2.7%)

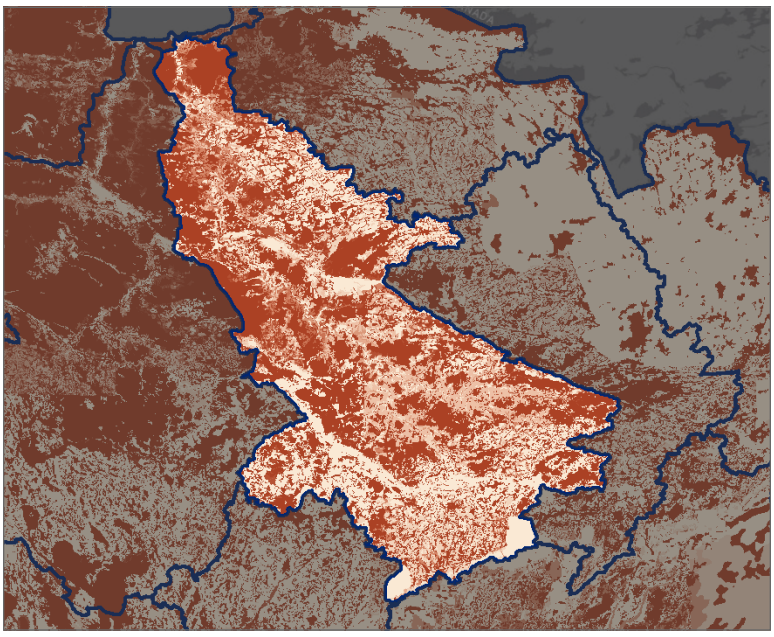
Landscape Alteration

Change in Water Storage - Wetlands

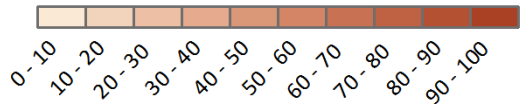
In much of Minnesota, the historic landscape had many more seasonal and perennial wetlands. Land has been drained using ditches and tile lines, streams have been straightened to accommodate agriculture, communities and roads. The scale of this change has accelerated the rate at which rain fall moves through the system, creating rapid fluctuations in Minnesota's stream and lake levels.

Hydric soils form when the soil is saturated for a long enough period of time during the growing season to create an anaerobic condition. This is a lasting change that allows soil scientists to use the extent of hydric soils today to approximate where there were saturated soils historically.

Comparing the extent of hydric soils to the extent of current wetlands provides an estimate for the amount of wetland loss that has taken place within the watershed.



Hydric Soils (SSURGO/STATSGO)



Watershed Hydric Area:

Area: 1,038.9 sq. mi.

Percent of major watershed: 55.4%

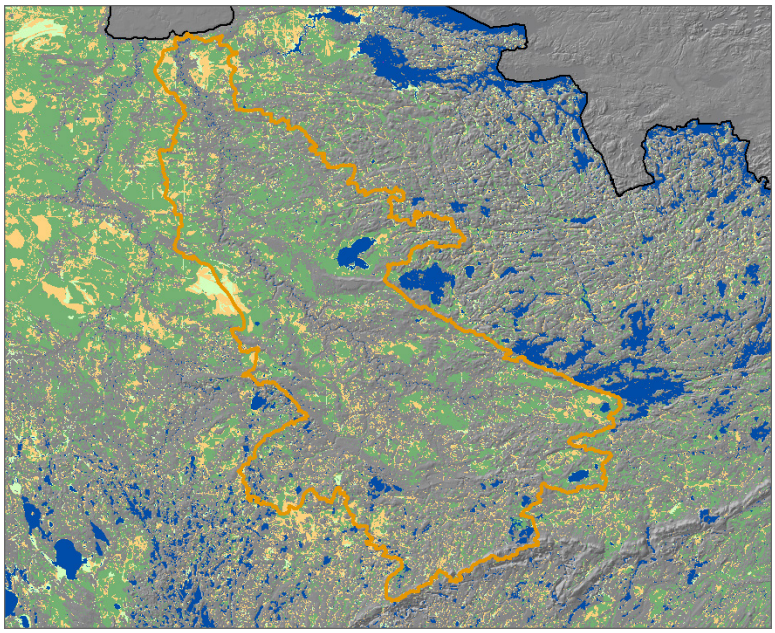
National Wetland Inventory
Cowardin Wetland Classification

- Aquatic Bed
- Emergent Vegetation
- Forested
- Moss/Lichen
- Open Water (Flooded Areas)
- Rock Bottom
- Rocky Shore
- Streambed (Intermittent)
- Scrub-Scrub Forest
- Unconsol. Bottom (Basins & Channels)
- Unconsol. Shore (Banks & Sandbars)

Watershed Wetland Area:

Area: 766.5 sq. mi.

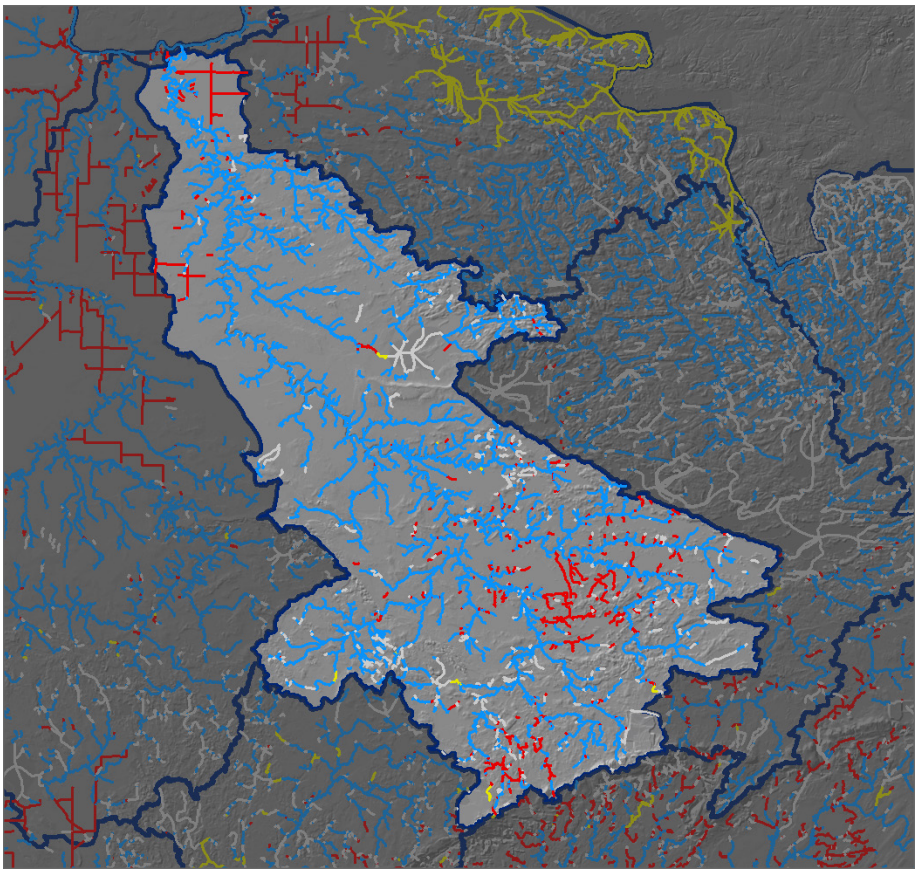
Percent of major watershed: 40.9%



Landscape Alteration

Change in Water Storage - Streams

In addition to loss of storage in wetlands, more than 50% of Minnesota's streams have been altered by ditching or impoundments. This alteration has also accelerated the rate at which water leaves the landscape, compounding the impact from lost wetland storage.



Altered Watercourse (MPCA)

AW Type

- Natural
- Altered
- Impounded
- No definable channel

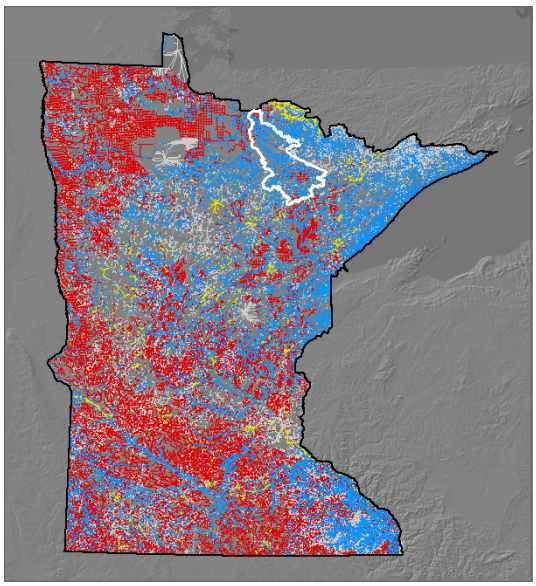
Watercourses within Watershed:
Class: length in miles (% of all watercourses)

Natural: 1,464.0 mi. (79.3%)

Altered: 203.5 mi. (11.0%)

Impounded: 7.1 mi. (0.4%)

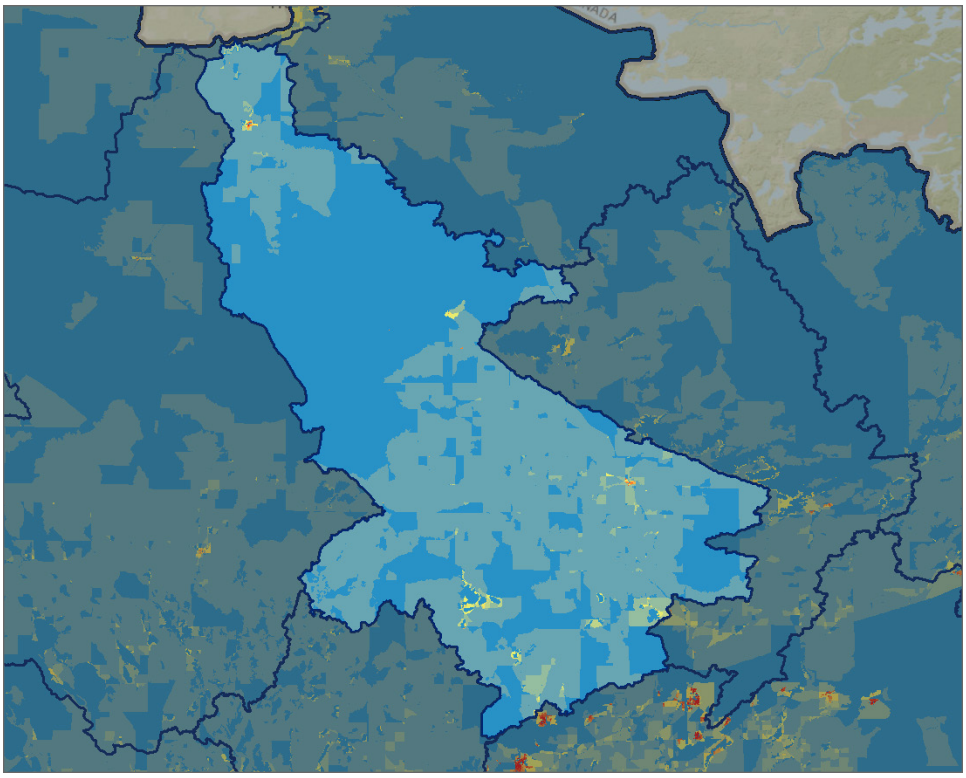
No Definable Channel: 170.4 mi. (9.2%)



Human Aspects

Population

The distribution of human populations on the landscape is the primary driver of land use patterns over time. As population distributions change over time, the types of land use pressure and impacts change.



Population Density (2010)

People per square mile

- 0
- .001 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 250
- 250 - 500
- 500 - 1000
- 1000 - 2000
- > 2000

Major Watershed Population:

People per sq. mi.: 3.91

Total Population: 7,319

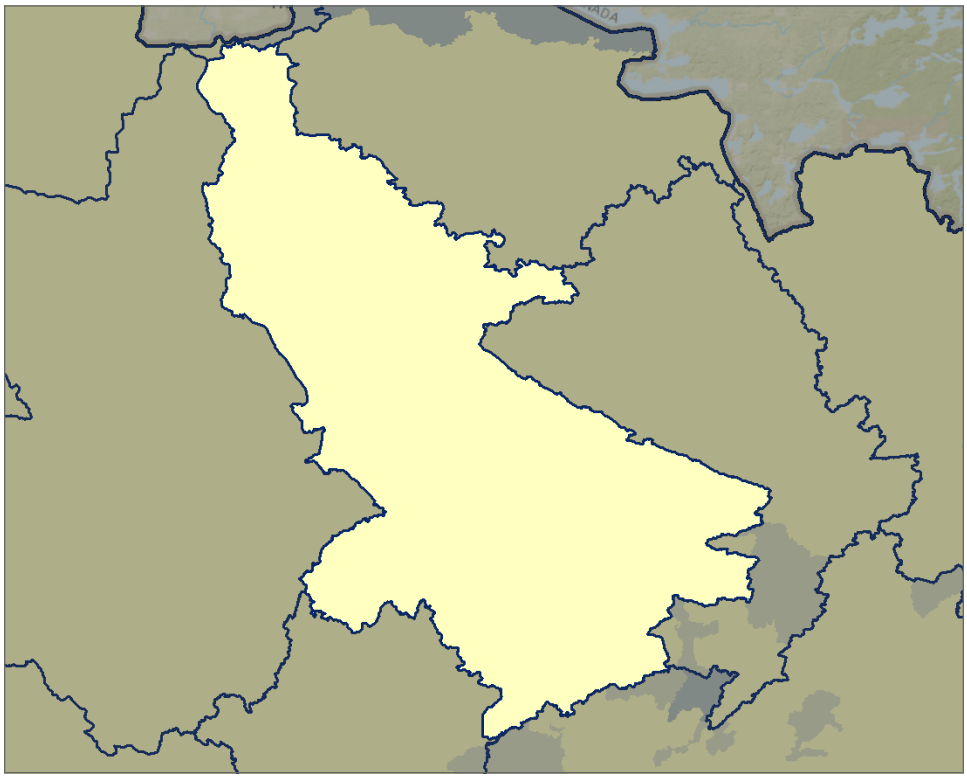
Population Change

Between 2000 and 2010

- -2665 to -2500
- -2499 to -1000
- -999 to -600
- -599 to -300
- -299 to -100
- -99 to 99
- 100 to 299
- 300 to 599
- 600 to 999
- 1000 to 2499
- 2500 to 14362

Major Watershed Population Change:

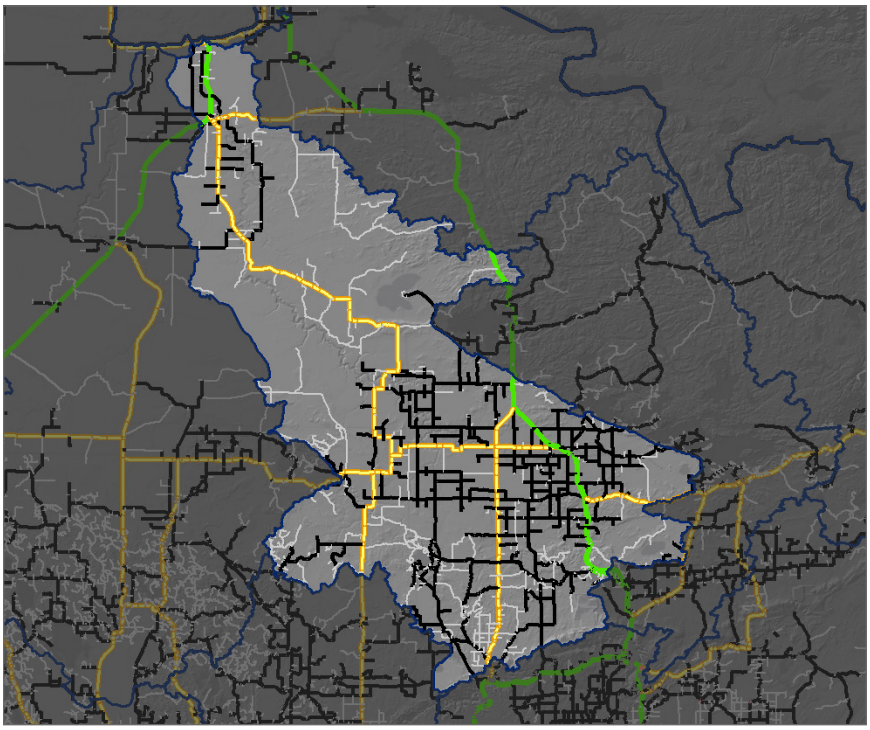
2000 to 2010: -188



Human Aspects

Transportation Networks

Roads, railroads, and other infrastructure impacts the way water moves across the landscape by channelizing water along roadways and creating storm water systems for communities. These built features also change the connections between terrestrial habitats by disrupting travel corridors and bisecting habitat patches. Often these human networks are also the conduits for spreading other threats such as invasive species across the landscape and between water bodies.



Road Network (MnDOT)

- Interstate Trunk Highway
- U.S. Trunk Highway
- MN Trunk Highway
- County Highway
- Municipal Road
- Township or Other Road
- Ramp

Road Length by Type within Major Watershed:

Interstate: 0.0 mi. (0%)
U.S. Highway: 49.0 mi. (4%)
MN Highway: 147.8 mi. (11%)
County Highway: 625.3 mi. (46%)
Municipal Road: 12.9 mi. (1%)
Township/other: 539.4 mi. (39%)
Ramp: 0.2 mi. (0%)

Percent Imperviousness

1 20 40 60 80 100

Percent of Major Watershed Covered by Impervious Surfaces:

0.26%