Watershed Context Report:
Leech Lake River

This report provides an overview of ecological context information for the major watershed. Physical characteristics, landscape alterations, human infrastruction and population trends influence watershed health and health risk. This context will help you interpret the health challenges facing the watershed. MN DNR will provide alternate or remediated documents upon request: whaf.dnr@state.mn.us

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 entry is hyper-linked to open the WHAF map with that data displayed for further exploration.

Physical Characteristics
The first section delivers ecological context information about the "lay of the land" for your watershed compared to all of Minnesota. This includes:

- Patterns in elevation and slope
- Distribution of ecological communities
- Watershed hydrologic position
- Soil physical properties
- Groundwater sensitivity
- Precipitation and temperature

Landscape Alteration
The second section delivers information about historic and current land cover and alterations to water features. This includes:

- Historic Landscape
- Current land cover
- Crop data
- Habitats of Biodiversity Significance
- Change in water storage

Human Aspects
The third section delivers information about human population and infra-structure. This includes:

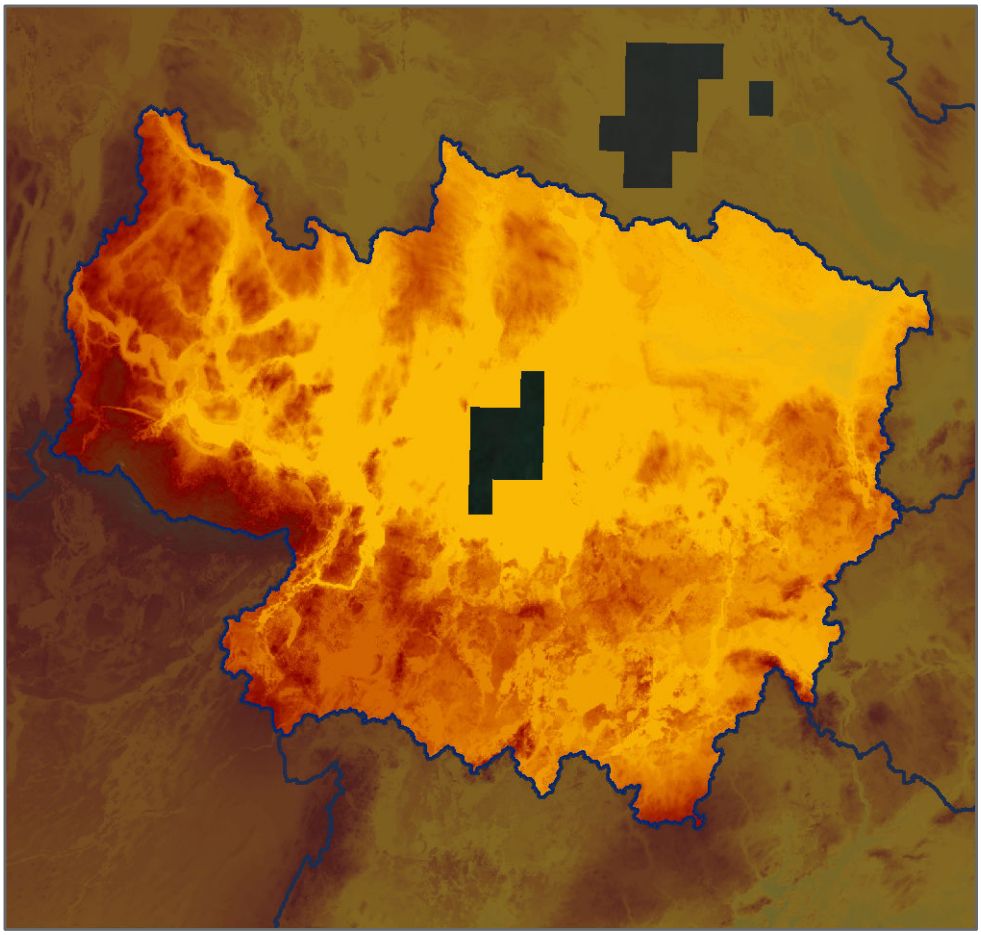
- Population density and change
- Transportation networks
- Impervious surface

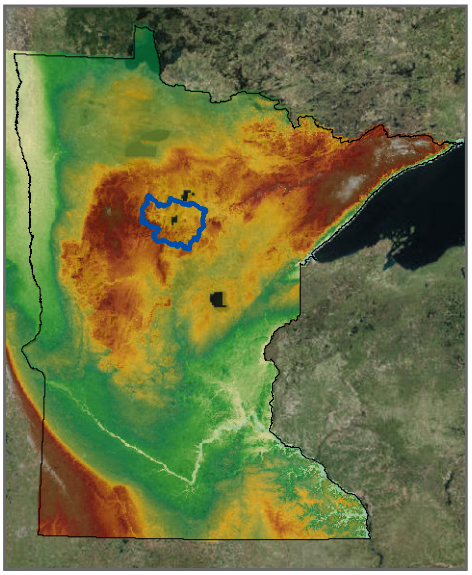
Appendix: GIS Data Sources

1. 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.





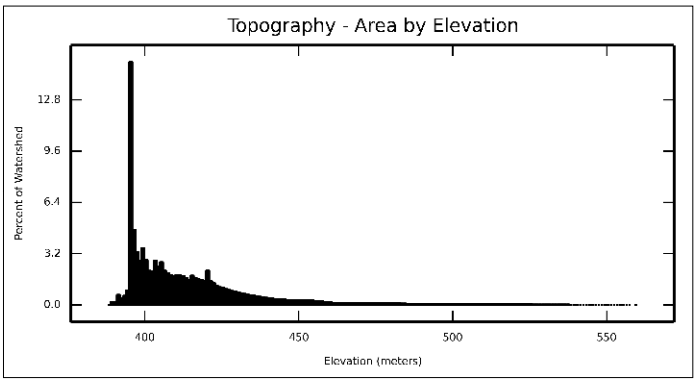


Figure 1. The distribution of watershed area over the elevation range. Each vertical bar represents the percent of watershed area for that elevation value.

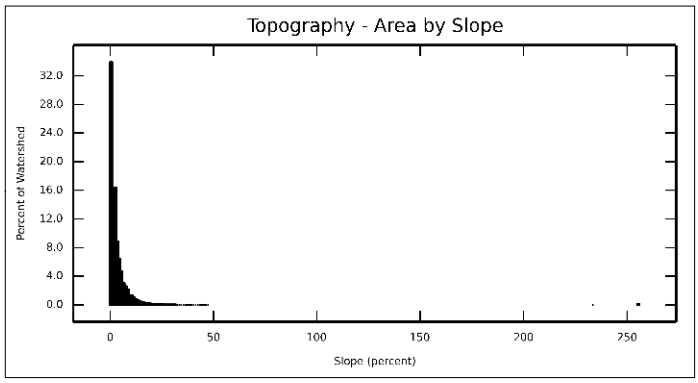


Figure 2. The distribution of watershed area over the range of hillslope. Each vertical bar represents the percent of land area for a given slope value.

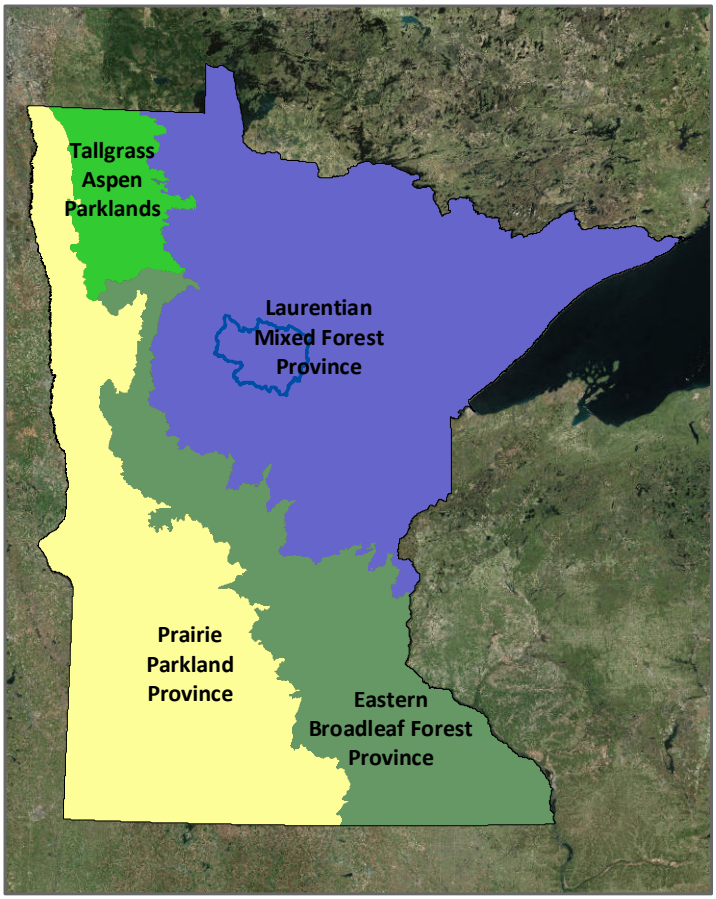
1. **Physical Characteristics** - Ecological Classification System

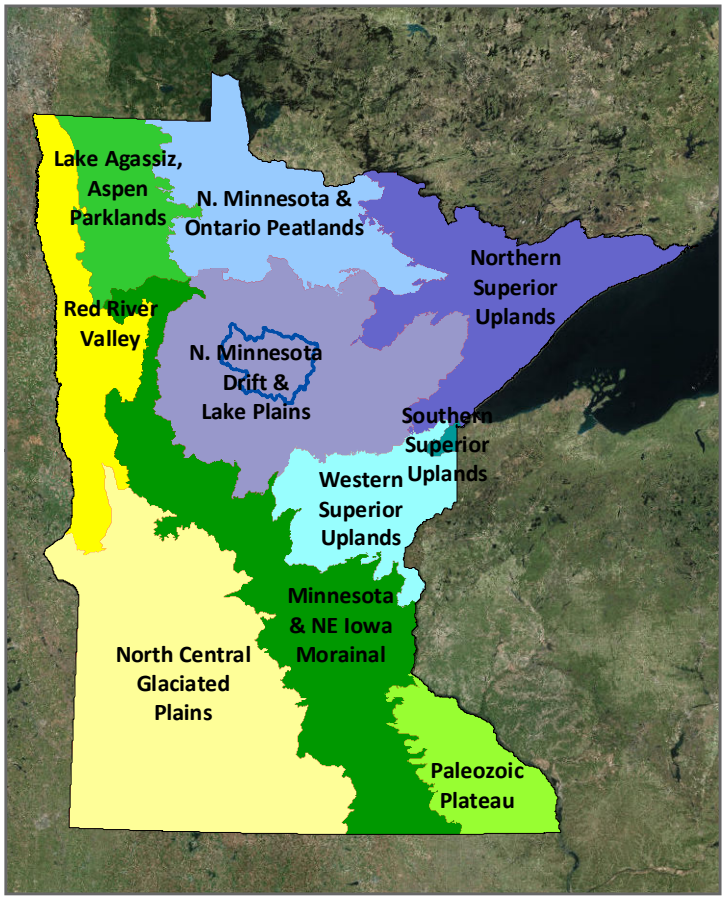
The Ecological Classification System is a system developed by the MN DNR and US Forest Service for mapping and classifying landscape ecosystems. The system provides a nested set of classification units which, from broadest to most detailed, includes: Provinces, Sections, Subsections and Land Type Associations. 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.





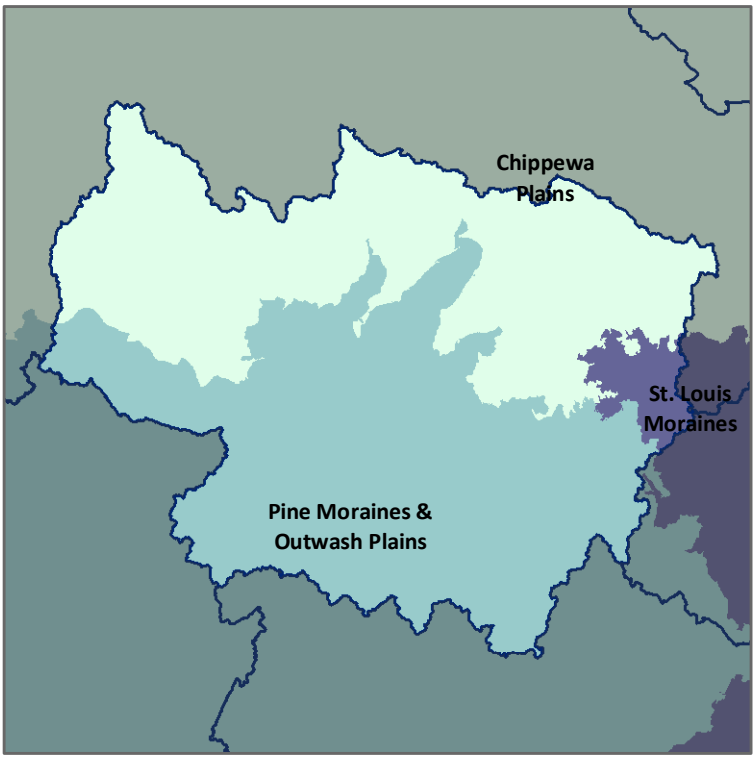
Percent Watershed Area by Province:
Laurentian Mixed Forest Province - **100.0 %**

Percent Watershed Area by Section:
N. Minnesota Drift and Lake Plains - **100.0 %**

1. **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, specially 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 and pre-European settlement vegetation.

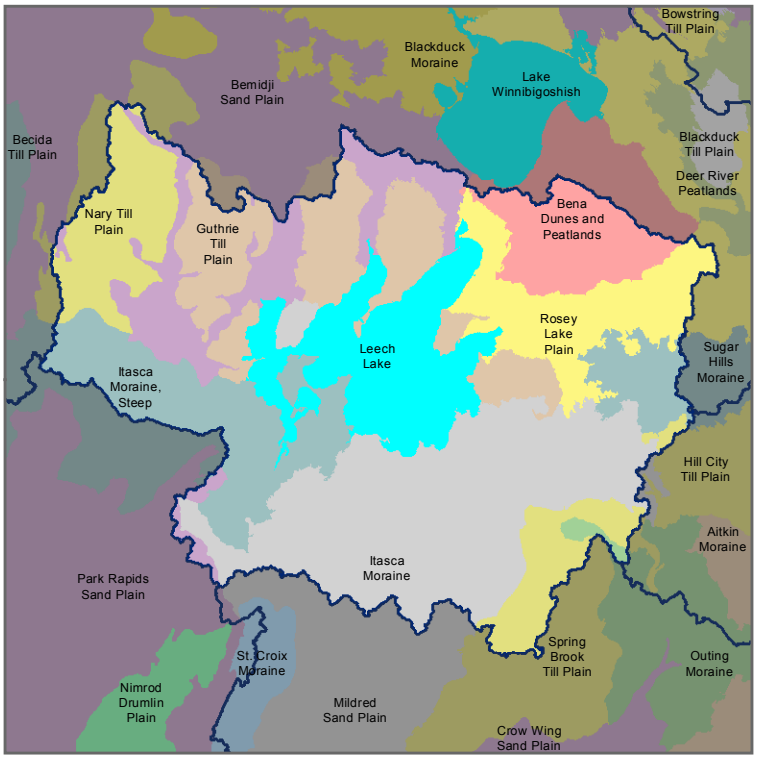


Percent Watershed Area by Subsection:

- Pine Moraines and Outwash Plains - **53.4 %**
- Chippewa Plains - **43.3 %**
- St. Louis Moraines - **3.3 %**

Percent Watershed Area by Land Type Association:

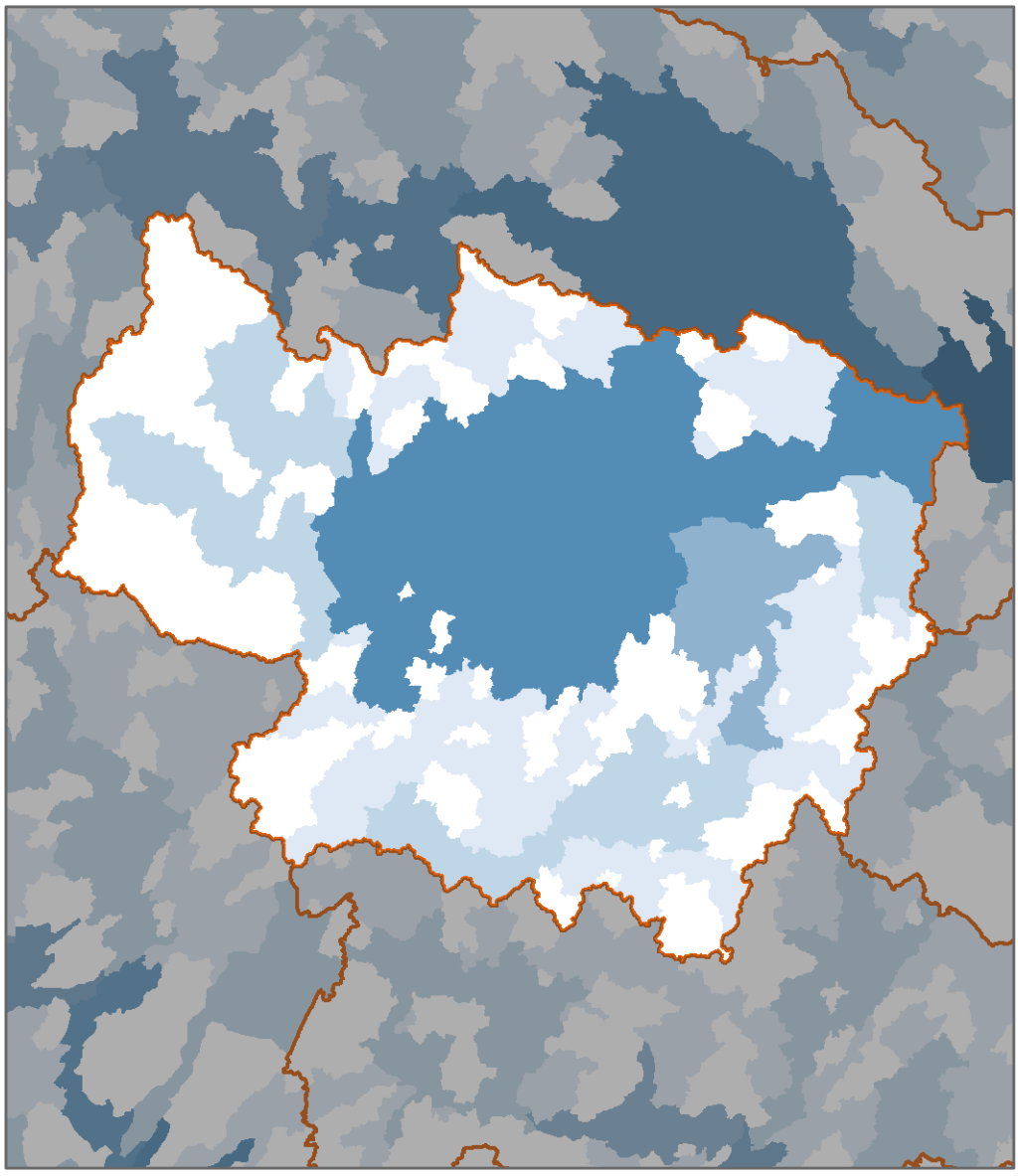
- Itasca Moraine - **24.8 %**
- Guthrie Till Plain - **12.9 %**
- Leech Lake - **12.2 %**
- Itasca Moraine, Steep - **11.2 %**
- Rosey Lake Plain - **8.8 %**
- Bemidji Sand Plain - **8.4 %**
- Nary Till Plain - **6.8 %**
- Bena Dunes and Peatlands - **6.3 %**
- Spring Brook Till Plain - **4.2 %**
- Sugar Hills Moraine - **3.1 %**
- Park Rapids Sand Plain - **0.7 %**



1. **Physical Characteristics -** Hydrologic Position

The hydrologic position maps help 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.

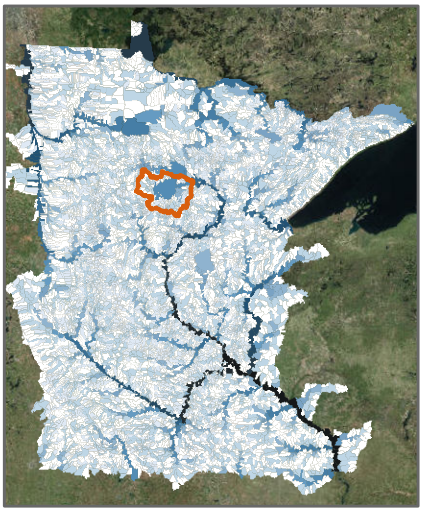
Headwater catchments are shown in white. These areas do not receive overland water flow from upstream but rather collect surface water within their boundary and send it downstream. In contrast, those catchments that encompass a major river receive flow from all catchments upstream. The mouth of major rivers accumulate all the water from the upstream river basin and have the largest water discharge amounts shown in dark blue.



Hydrologic Position:

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



1. **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.

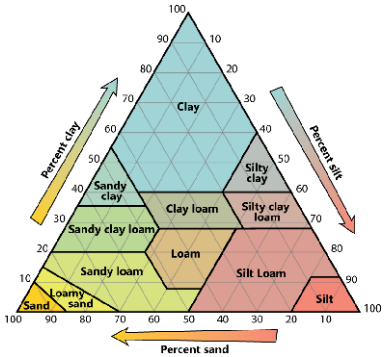
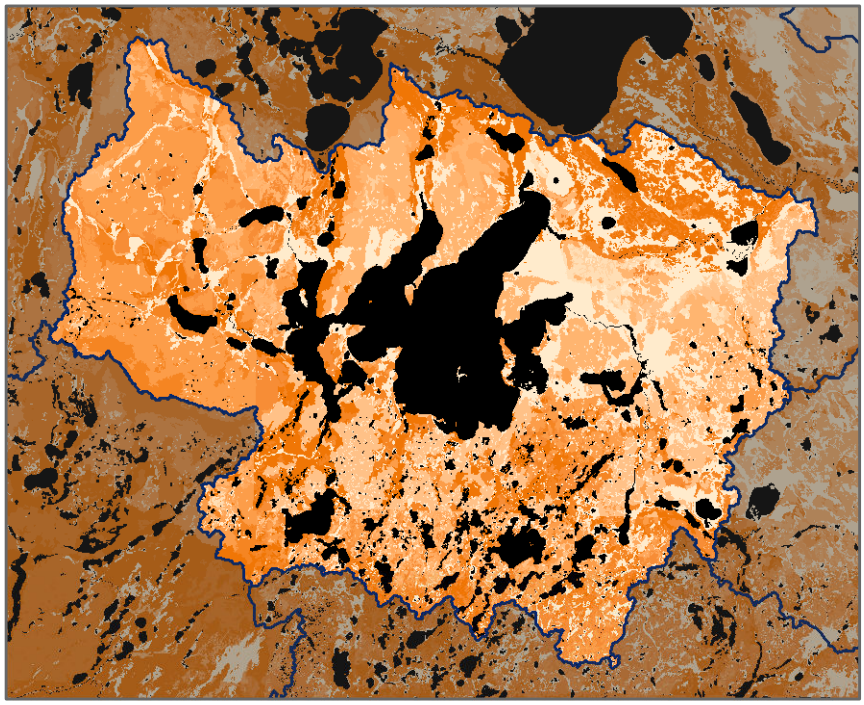
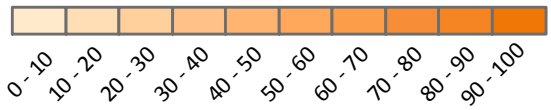
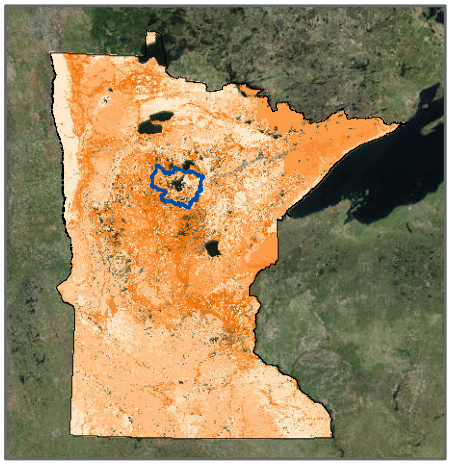


Figure 3. The soil texture triangle.
Source: Soil Science Society of America

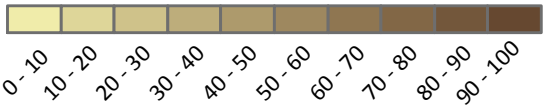


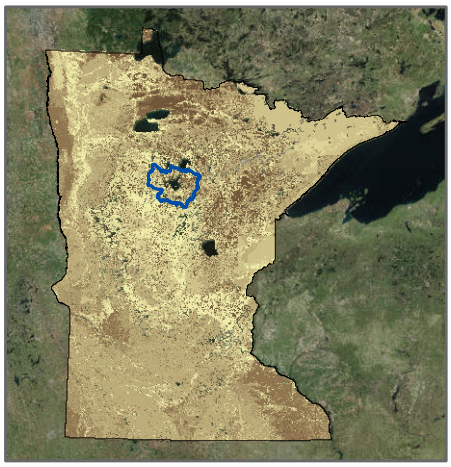
Percent Sand

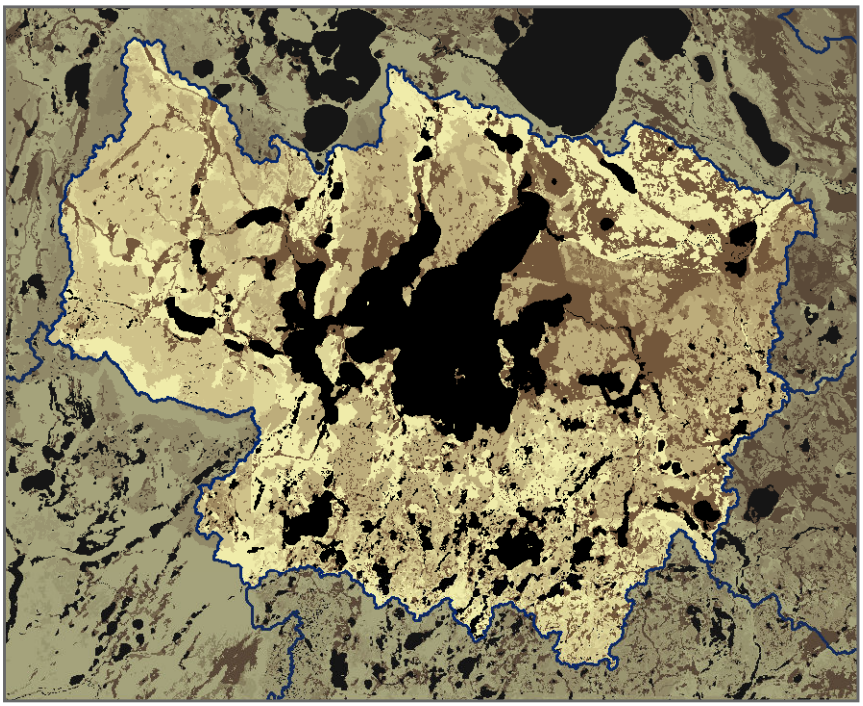




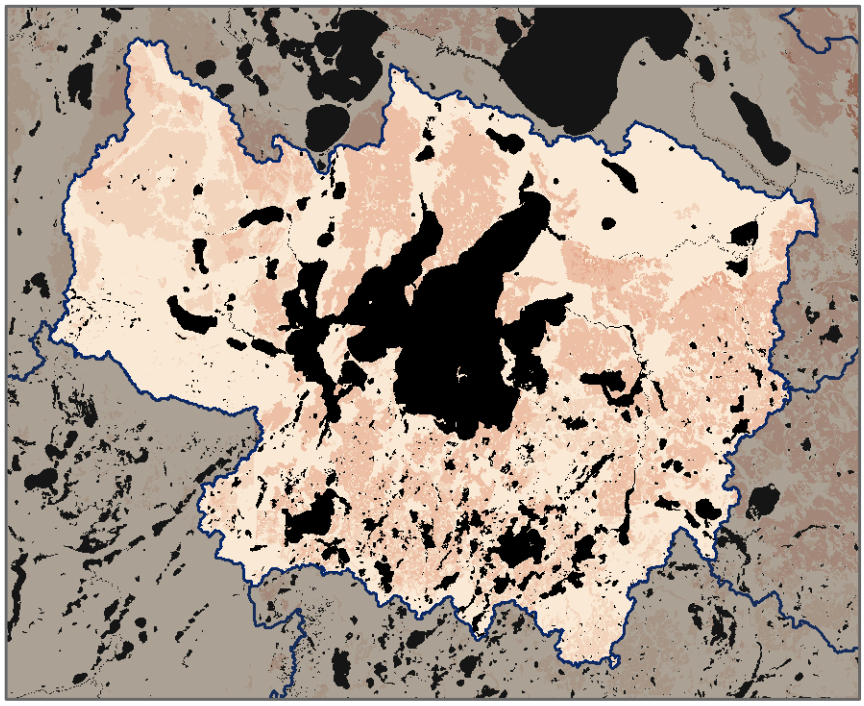
Percent Silt

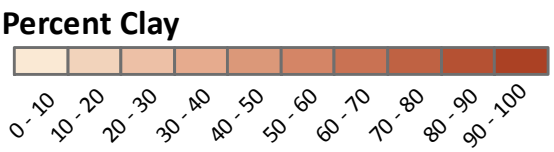


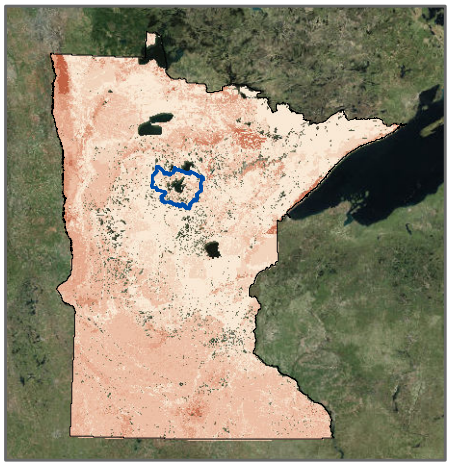




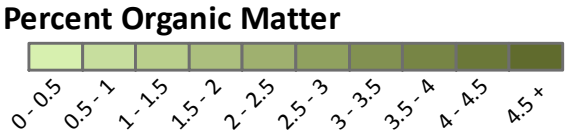
1. **Physical Characteristics -** Soils (continued)

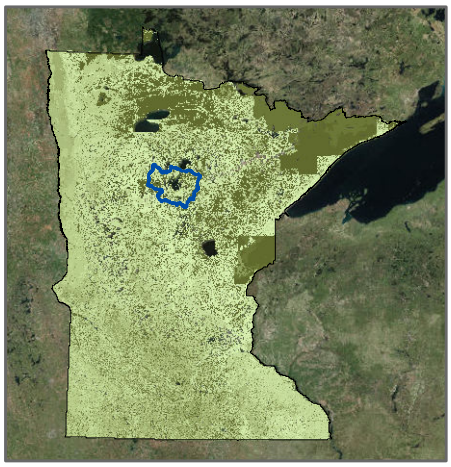


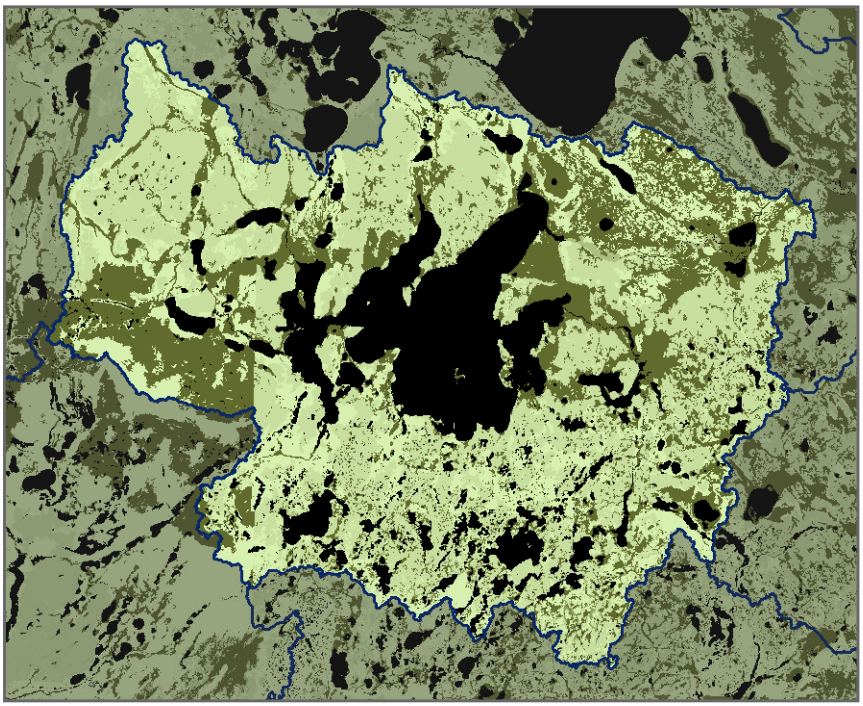




Organic matter is an important factor affecting soil physical properties such as water infiltration rate and water and nutrient holding capacity. Unlike particle size, the amount of organic matter can change; it can be either enhanced or depleted in response to land management activities.

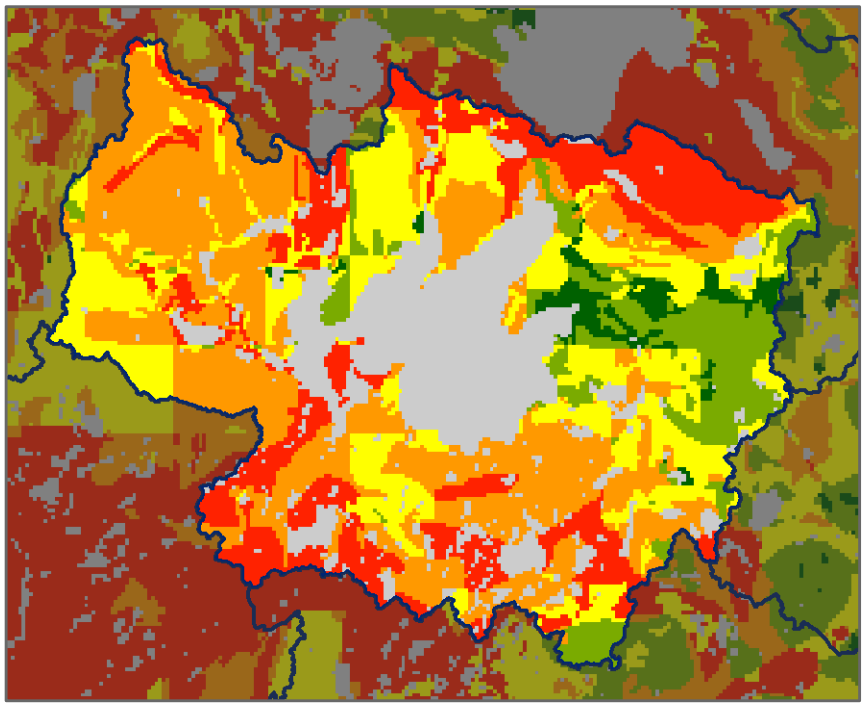






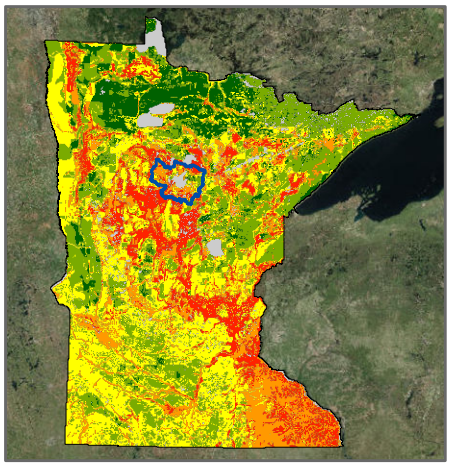
1. **Physical Characteristics -** Groundwater

The Groundwater Contamination Susceptibility layer uses four parameters (aquifer materials, recharge potential, soil materials, and vadose zone materials) to delineate areas of relative susceptibility to ground water contamination. The range of relative susceptibility across the state reflects the rate at which contamination would likely reach groundwater resources.



Groundwater Contamination Susceptibility

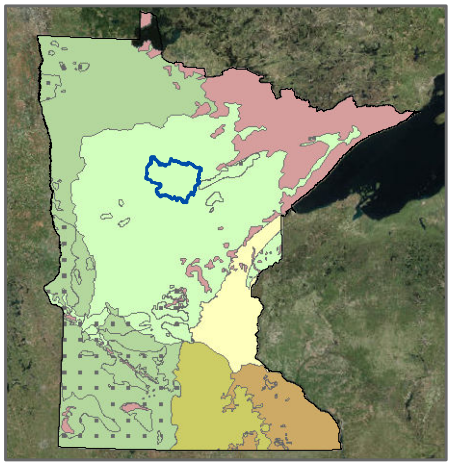
- Insufficient Data to Rank
- Lowest Susceptibility
- Low Susceptibility
- Medium Susceptibility
- High Susceptibility
- Highest Susceptibility

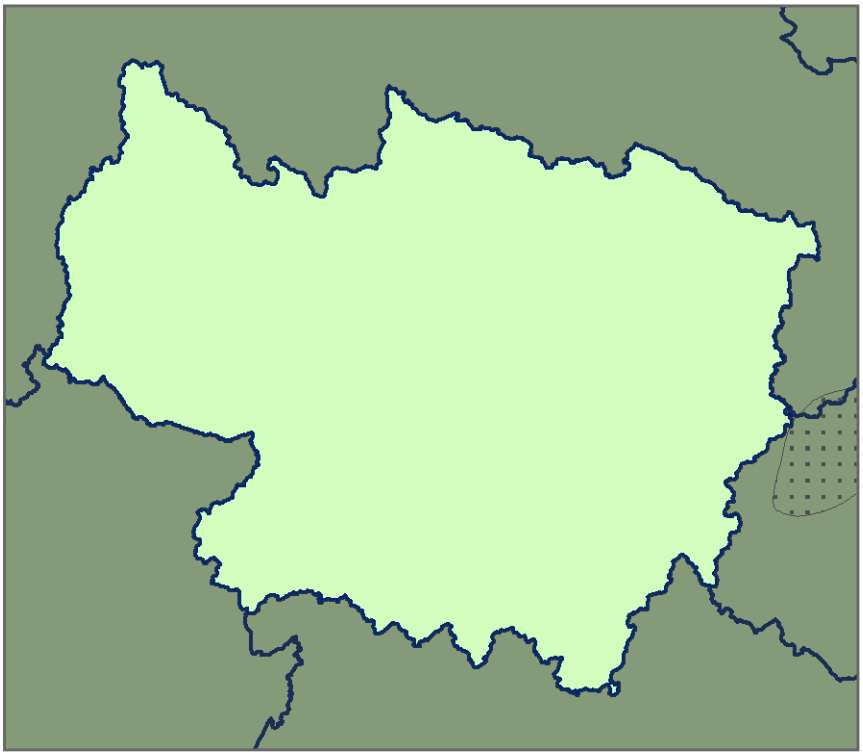


The six ground water provinces of the state are based on bedrock and glacial geology. Within each province, ground-water sources and the availability of ground water for drinking water, industrial, and agricultural uses are similar.
For additional information - **www.mndnr.gov/groundwater/provinces/index.html**

Groundwater Provinces

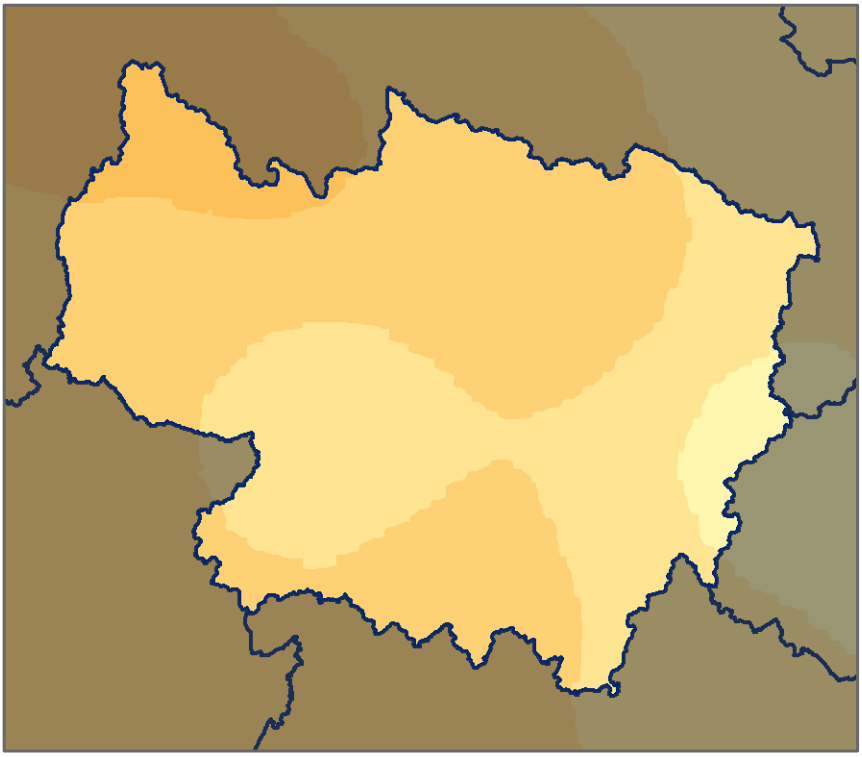
- 1 - Metro Province
- 2 - South-Central Province
- 3 - Southeast Province
- 4 - Central Province
- 5 - Western Province
- 6 - Arrowhead Province
- Cretaceous Bedrock



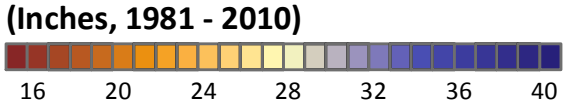


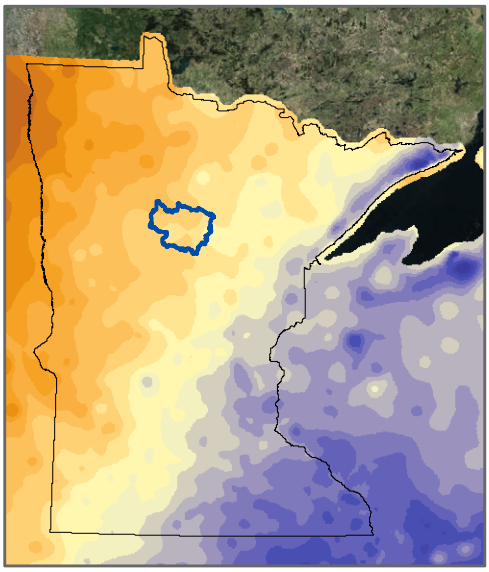
1. **Climate -** 30 Year Average Precipitation and Temperature

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.

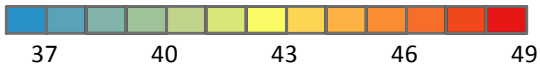


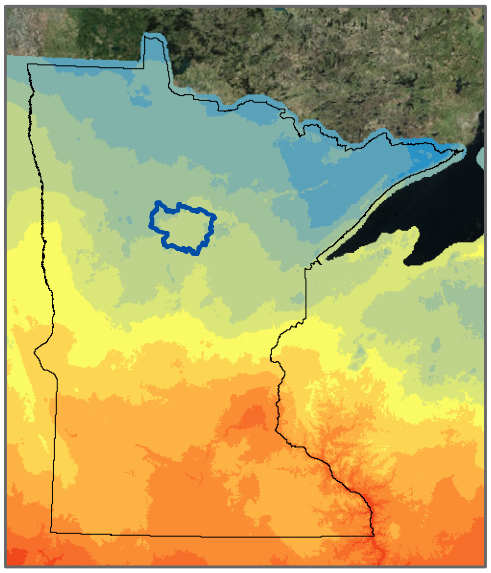
Normal Annual Precipitation (Inches, 1981 - 2010)

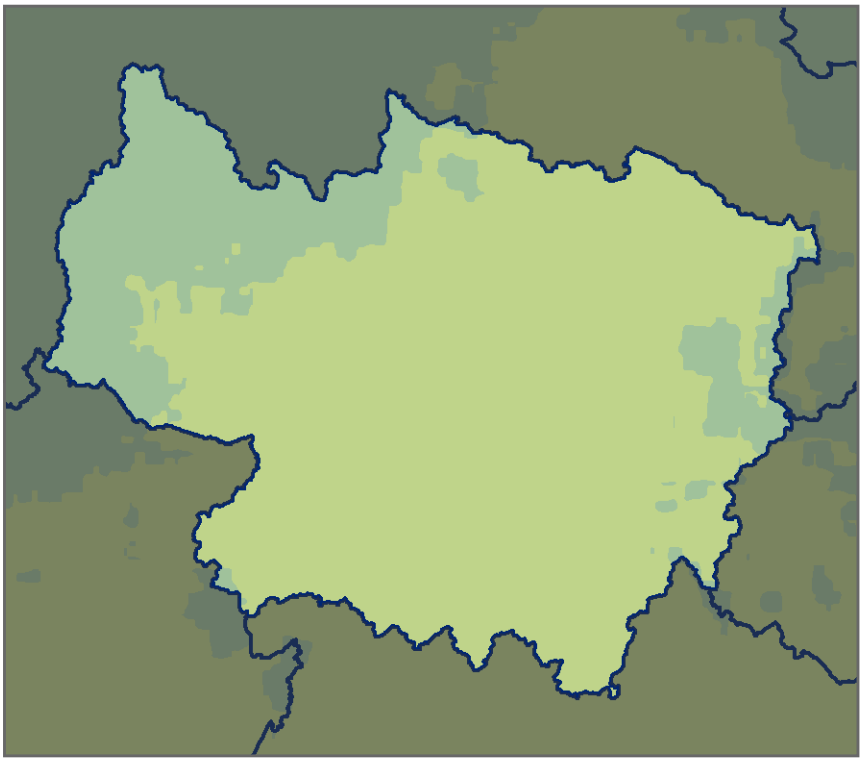




Normal Annual Temperature (Farenheit, 1981 - 2010)

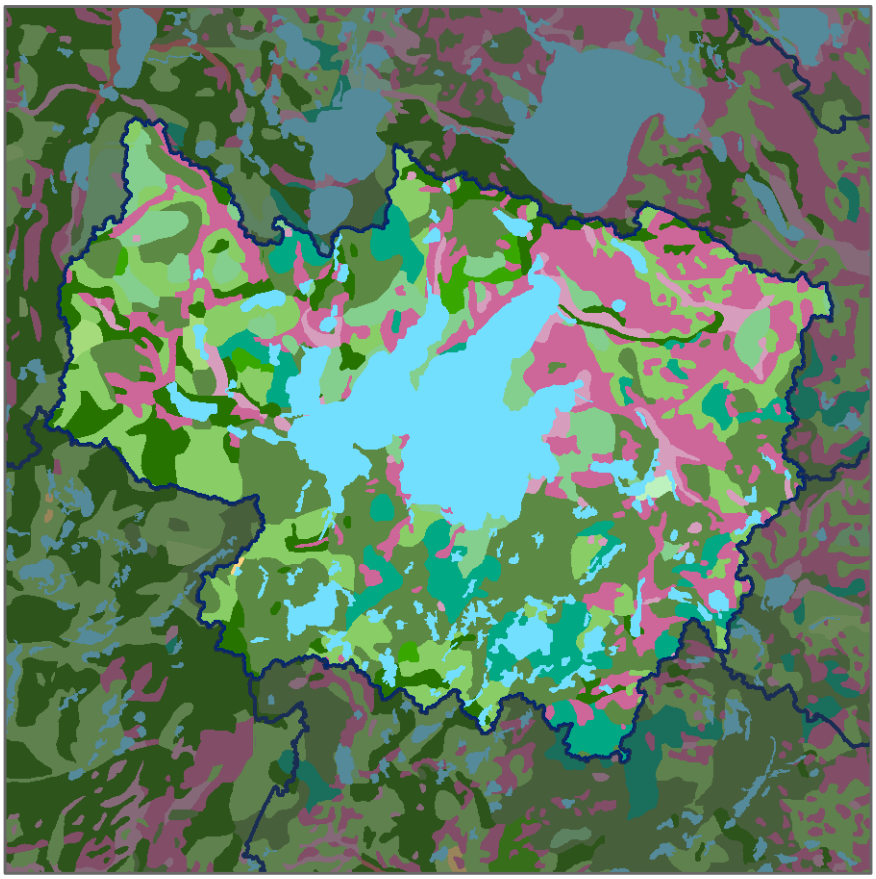






2. **Land Cover Alteration -** Historic Landscape

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

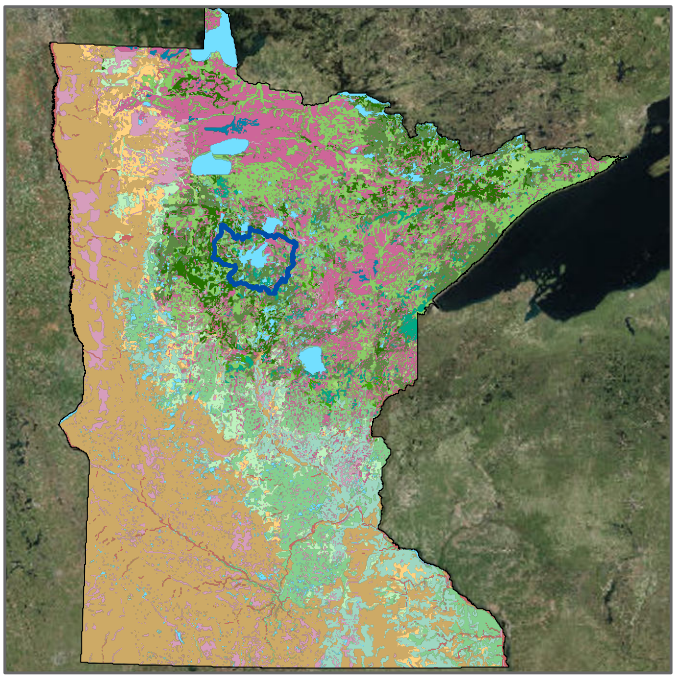


Marschner's Pre-European Settlement Land Cover

- Prairie
- Brush Prairie
- Wet Prairie
- Aspen-Oak Land
- Aspen-Birch (trending to hardwoods)
- Oak Openings and Barrens
- Big Woods - Hardwoods
- River Bottom Forest
- Mixed Hardwood and Pine
- White Pine
- Mixed White Pine and Red Pine
- Jack Pine Barrens and Openings
- Pine Flats
- Aspen-Birch (trending to Conifers)
- Conifer Bogs and Swamps
- Open Muskeg
- Lakes (open water)
- Undefined

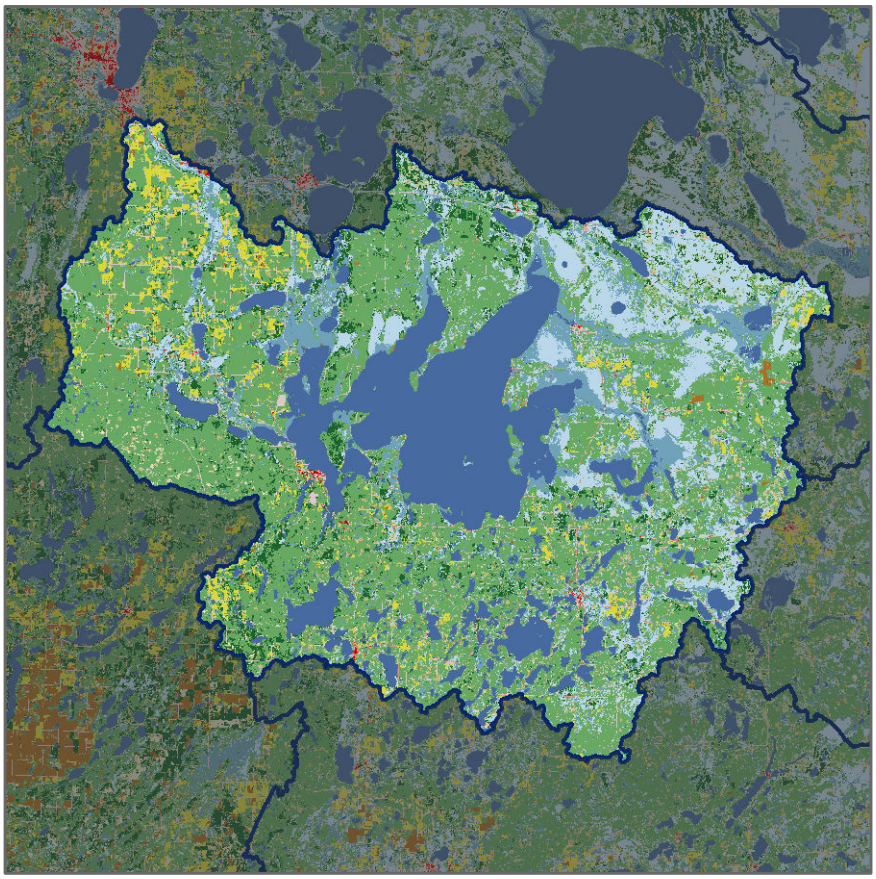
Percent Watershed by Marschner Land Class:

Mixed White Pine and Red Pine - **22.8 %**
Lakes (open water) - **18.5 %**
Conifer Bogs and Swamps - **17.4 %**
Aspen-Birch (trending to Conifers) - **15.1 %**
Mixed Hardwood and Pine - **7.6 %**
Jack Pine Barrens and Openings - **7.0 %**
Big Woods - Hardwoods - **6.9 %**
Wet Prairie - **3.1 %**
White Pine - **1.0 %**
Aspen-Birch (trending to hardwoods) - **0.5 %**
Aspen-Oak Land - **0.2 %**



2. **Land Cover Alteration -** 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 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.



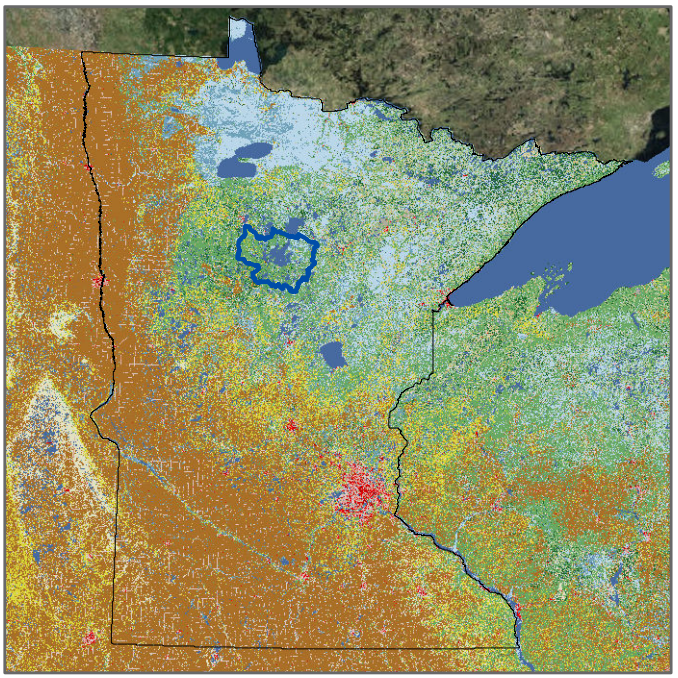
National Land Cover Database

Land Cover Class

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Med Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forst
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetland

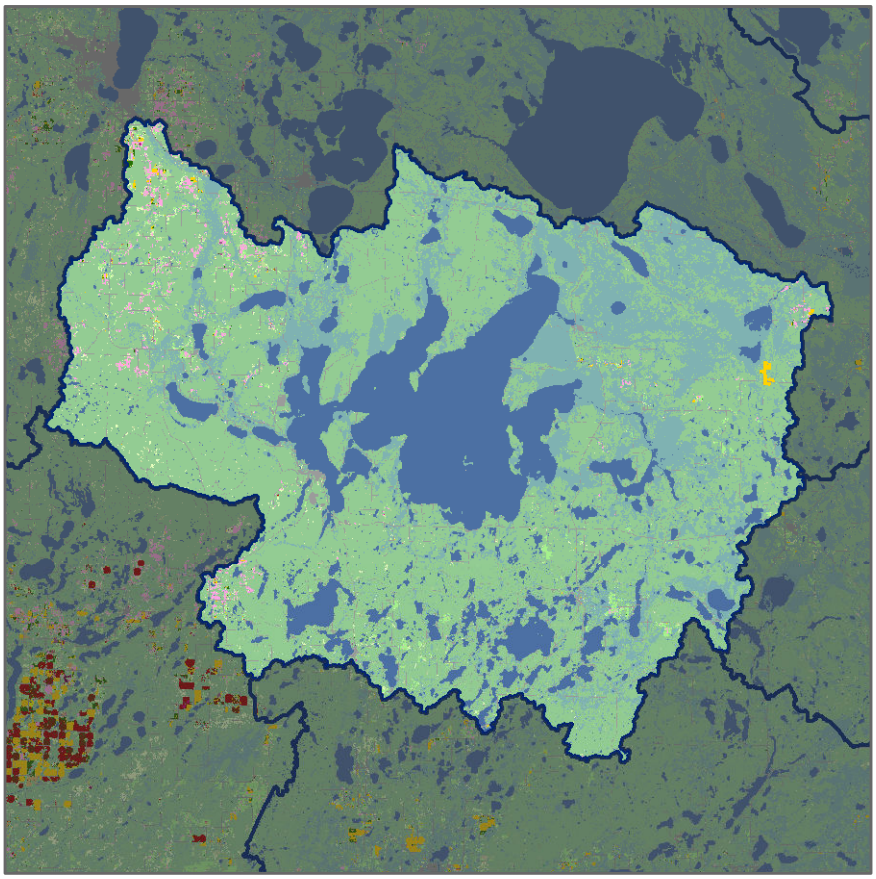
Percent of Watershed by Land Class Group:

- Forest - **50.0 %**
- Wetlands - **20.8 %**
- Open Water - **19.4 %**
- Crop and Pasture - **4.0 %**
- Herbaceous and Shrub - **2.9 %**
- Developed - **2.9 %**
- Barren - **0.0 %**



2. **Landscape Alteration -** Crop Data Layer

The USDA Crop Data Layer 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 2015 data).



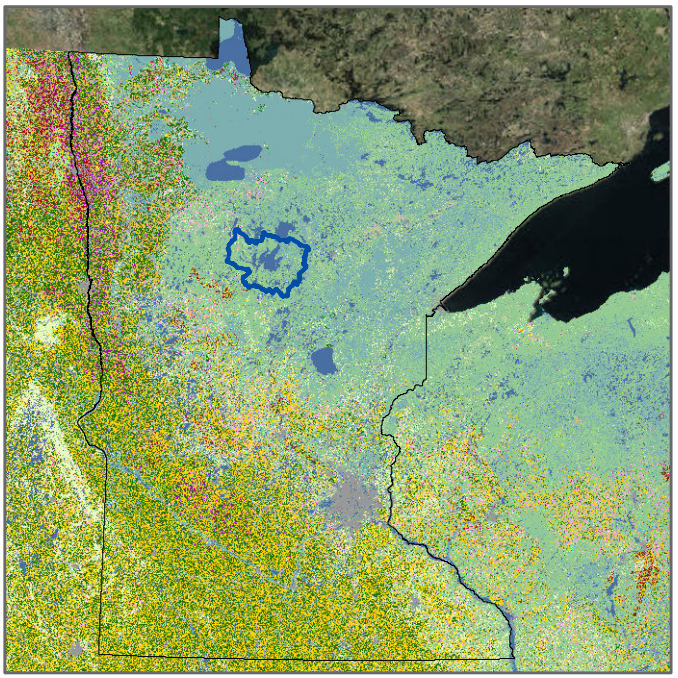
Crop Data Layer- USDA

Crop Class (abbrev. list)

- Alfalfa
- Barley
- Corn
- Dry Beans
- Durum Wheat
- Oats
- Peas
- Potatoes
- Rice
- Rye
- Sorghum
- Soybeans
- Spring Wheat
- Sugarbeets
- Winter Wheat

Percent of Watershed Land Area by Crop Group:

- Hay and Forage - **2.0 %**
- Corn - **0.1 %**
- Soy and Dry Beans - **0.1 %**
- Wheat - **0.1 %**
- Sugarbeets - **0.0 %**
- Potatoes - **0.0 %**
- Grains and Seeds - **0.0 %**

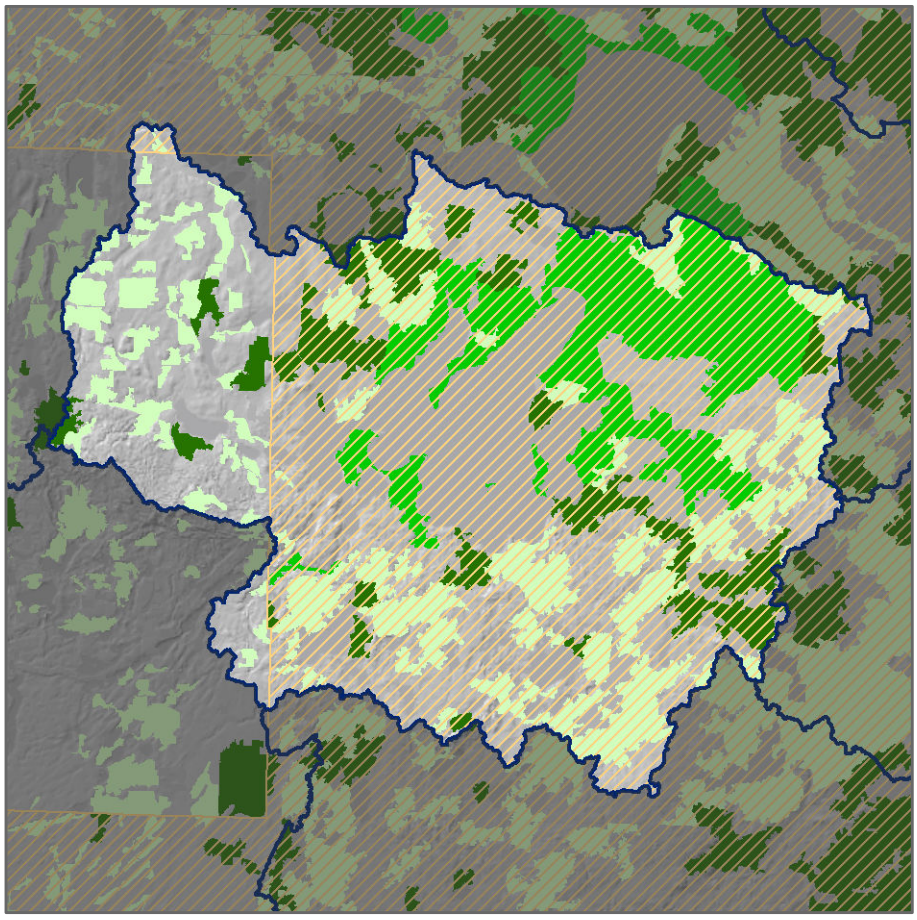


2. **Landscape Alteration -** Habitats of Biodiversity Significance

Minnesota Biological Survey 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.

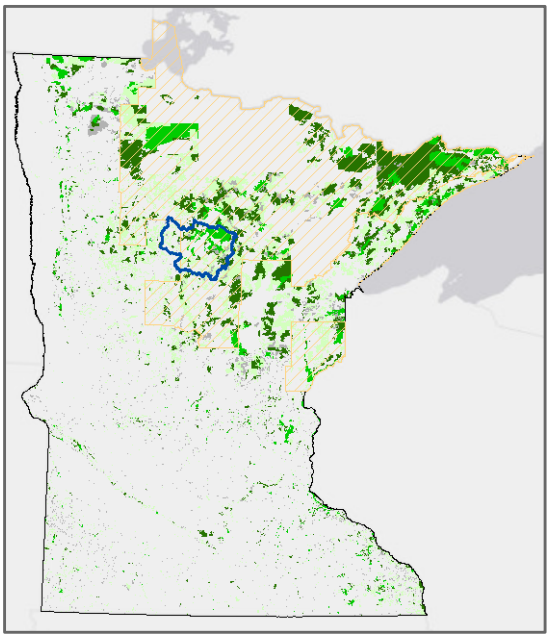


Sites of Biodiversity Significance

MBS - Sites of Biodiversity Significance

- Outstanding
- High
- Moderate
- Below

Areas with Preliminary or Incomplete Data



Area of Sites of Biological Significance by Rank
square miles (% of Major watershed):

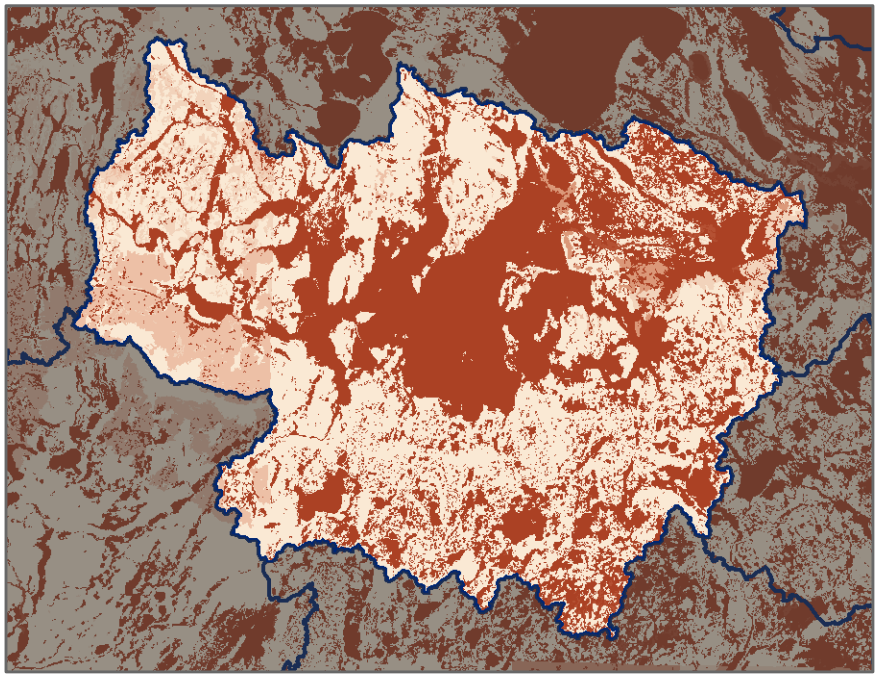
Outstanding - **202.1 (15.1%)**
High - **114.0 (8.5%)**
Moderate - **259.7 (19.4%)**
Below - **55.5 (4.1%)**

2. **Landscape Alteration -** Change in Water Storage

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 rainfall 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)

Percent Hydric

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

Hydric soils -

Area in sq mi (% of major watershed)

634.49 (47.33 %)

National Wetland Inventory

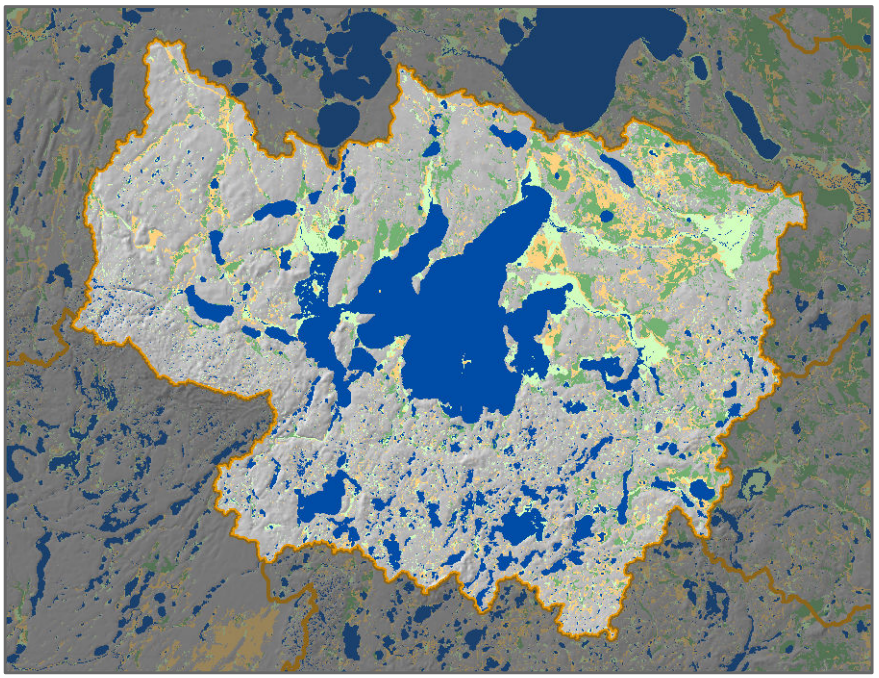
Cowardin Wetland Classification

- 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)

National Wetland Inventory -

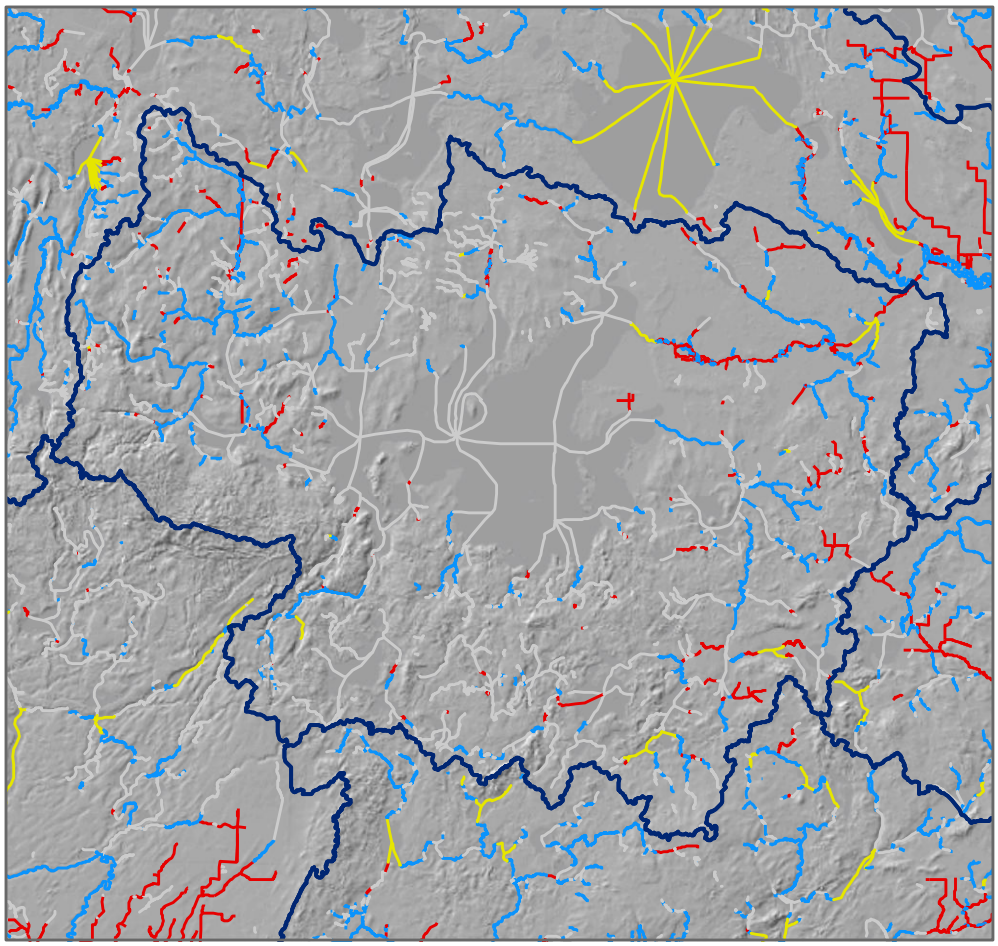
Area in sq mi (% of major watershed)

554.8 (41.39 %)



2. **Landscape Alteration -** Change in Water Storage (continued)

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

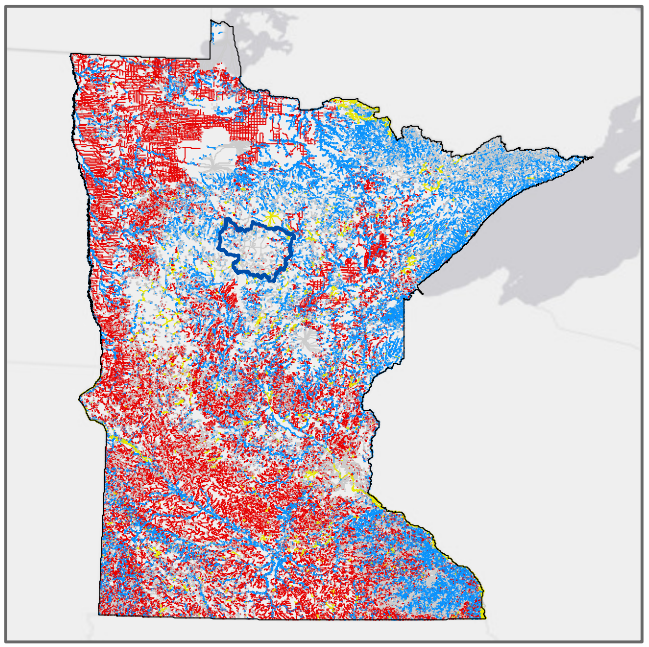
Altered Watercourse Length by Type Within Watershed (miles):

Natural - **276.27 (28.4%)**

Altered - **102.58 (10.6%)**

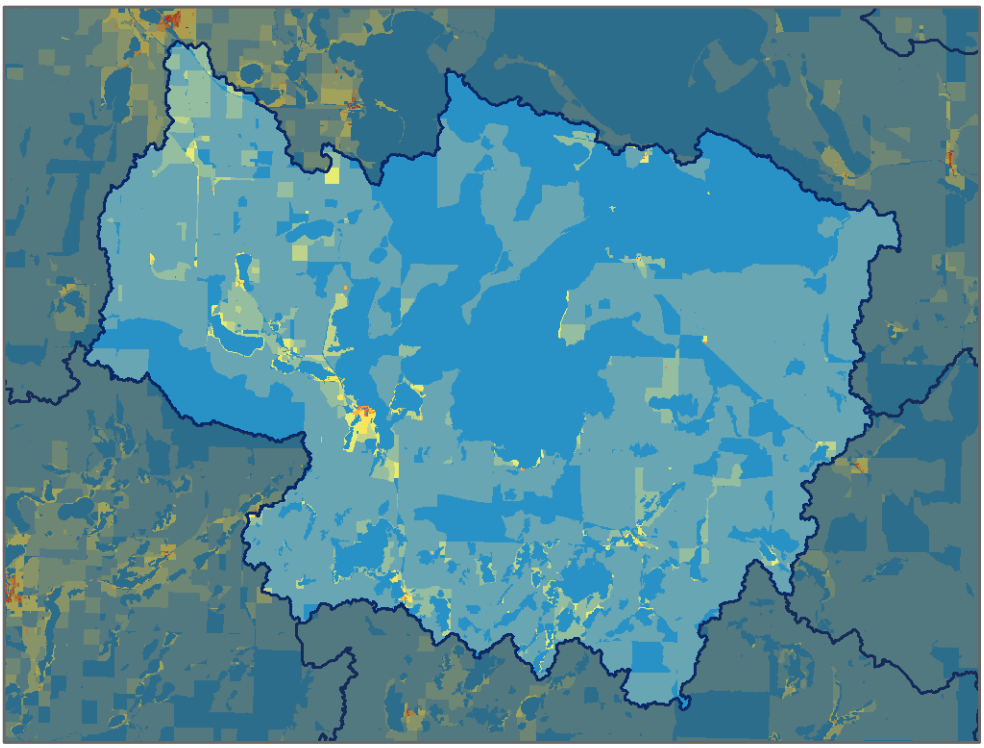
Impounded - **17.05 (1.8%)**

No Definable Channel - **575.24 (59.2%)**



3. **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:

Population Density
(people per square mile): **9.81**
Total Population: **13,157**

This map represents change in population between the 2000 and 2010. The population values were aggregated to the catchment watershed boundary in order to compare the 2000 and 2010 census data sets. Loss of population is shown in shades of blue with population gains in shades of red.

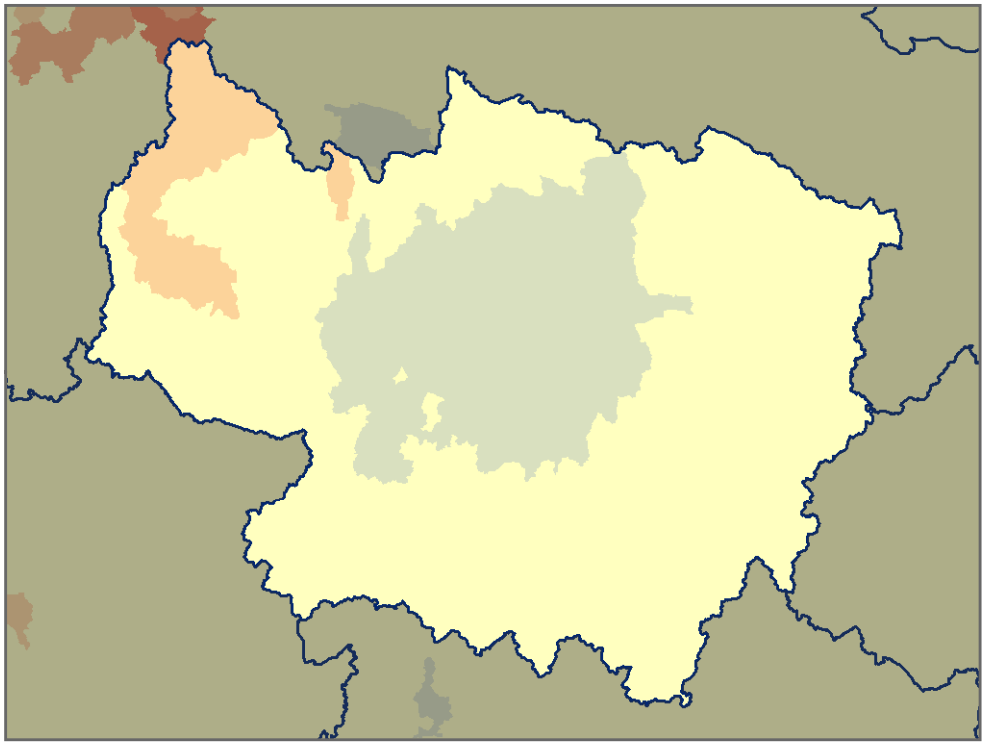
Population Change

Decennial census 2000 to 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

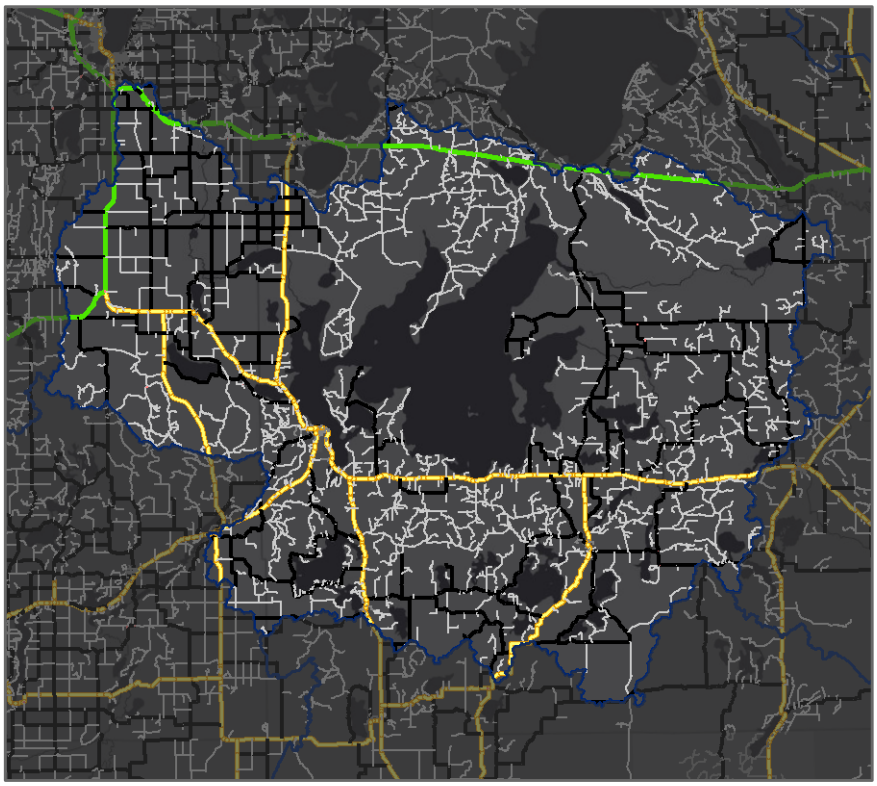
Major Watershed Net Pop. Change:

2000 to 2010: **374**



3. **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 the spread of 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

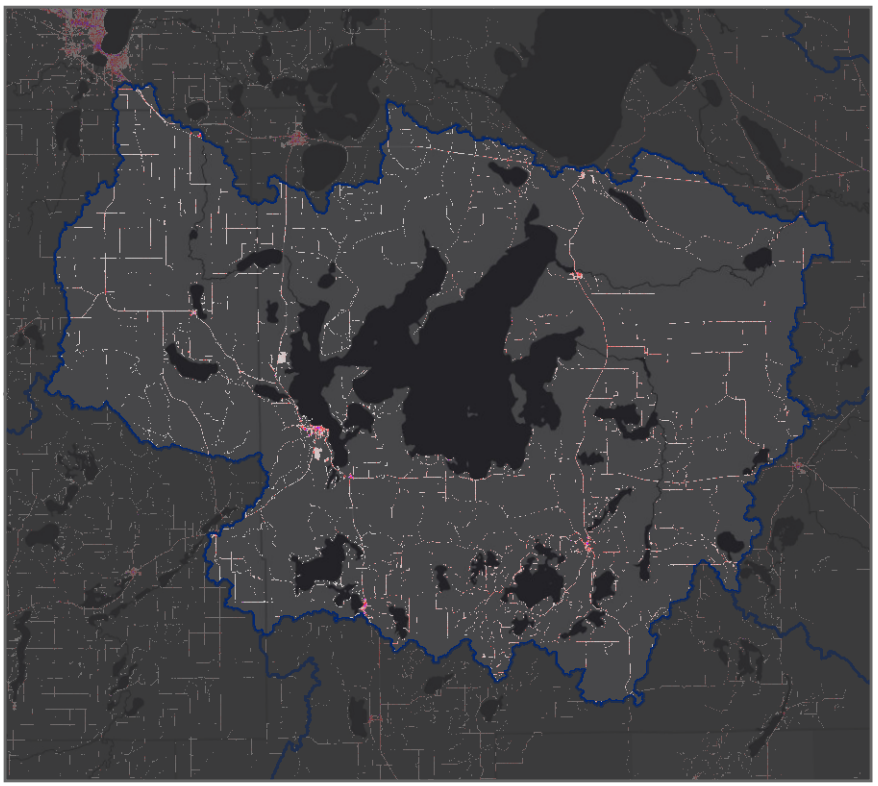
Road Length by Type within Major Watershed (miles):

Interstate: **0 (0%)**
U.S. Trunk Hwy: **40.19 (2.3%)**
MN Trunk Hwy: **114.27 (6.4%)**
County Hwy: **442.38 (24.9%)**
Municipal Rd: **38.48 (2.2%)**
Township/Other: **1138.5 (64.1%)**
Ramp: **1.26 (0.1%)**

Percent Imperviousness

1 20 40 60 80 100

Major Watershed Imperviousness:
(percent of watershed covered by impervious surfaces)
0.373 %



GIS Data Sources

References to data sources are grouped by the document page they appear in. For most pages the GIS data is also available in the WHAF web application. Click on the *link to web map* button  to launch the application with the associated data layers pre-loaded.

Page:	Link:	Data Sources:
Page 1 - Topography		Minnesota LiDAR Derived Digital Elevation Model (DEM). Various sources, data made available by Minnesota Geospatial Information Office. Available online at https://gisdata.mn.gov/. 2006-2012.
Page 2 - Ecological Classification		Ecological Provinces of Minnesota. Minnesota Department of Natural Resources. 1999. Ecological Sections of Minnesota. Minnesota Department of Natural Resources. Available online at https://gisdata.mn.gov/. 1999.
Page 3 - Ecological Class. (cont.)		Ecological Subsections of Minnesota. Minnesota Department of Natural Resources. 1999. Land Type Associations of Minnesota. Minnesota Department of Natural Resources. Available online at https://gisdata.mn.gov/. 1999.
Page 4 - Hydrologic Position		An Index of Water Use Intensity for Minnesota. Minnesota Department of Natural Resources, Department of Ecological and Water Resources. 2014.
Page 5 - Soils		Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database & the U.S. General Soil Map (STATSGO2) for Minnesota. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. 2015 official release.
Page 6 - Soils (cont.)		Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database & the U.S. General Soil Map (STATSGO2) for Minnesota. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. 2015 official release.
Page 7 - Groundwater		Groundwater Provinces. Minnesota Department of Natural Resources – County Geologic Atlas Program. Available online at www.mndnr.gov/groundwater/provinces/index.html. 2001. Groundwater Contamination Susceptibility. MN Department of Natural Resources. Available online at www.mndnr.gov/waters/groundwater_section/mapping/gwcontam_susceptibility.html. 1989.
Page 8 - Climate		Normal Annual Precipitation Average, Minnesota, 1981-2010. MN Department of Natural Resources, State Climatology Office. Available online at https://gisdata.mn.gov/. 2010. 30-yr Normal Mean Temperature, Annual: 1981-2010. PRISM Climate Group, Oregon State University. Available online at http://prism.oregonstate.edu. 2012.
Page 9 - Historic Land Cover		Presettlement Vegetation (1895). Minnesota Department of Natural Resources. Available online at https://gisdata.mn.gov/. 1994.
Page 10 - NLCD Land Cover		National Land Cover Database (NLCD), Land Cover 2011. Multi-Resolution Land Characteristics Consortium. Available online at http://www.mrlc.gov/index.php. 2014. Homer, C.G., Dewitz, J.A., Yang, L., Jin, S., Danielson, P., Xian, G., Coulston, J., Herold, N.D., Wickham, J.D., and Megown, K., 2015, Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354
Page 11 - CDL (Crop) Land Cover		USDA National Agricultural Statistics Service Cropland Data Layer. 2015. Published crop-specific data layer [Online]. Available at https://nassgeodata.gmu.edu/CropScape/ (accessed 3/15/2016; verified 3/2/2016). USDA-NASS, Washington, DC

GIS Data Sources - Continued

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Page:	Link:	Data Sources:
Page 12 - MBS Biodiv. Significance		MBS Sites of Biodiversity Significance. Minnesota Department of Natural Resources, Minnesota Biological Survey. Available online at https://gisdata.mn.gov/. 2016.
Page 13 - Change in Water Storage, Wetlands		Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database & the U.S. General Soil Map (STATSGO2) for Minnesota. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. 2015 official release. National Wetland Inventory, Minnesota, 1980-1986. Minnesota Department of Natural Resources – Division of Waters. Available online at https://gisdata.mn.gov/. 1994. National Wetland Inventory Update for Minnesota. Minnesota Department of Natural Resources; Ducks Unlimited; St. Mary's University of Minnesota. Available online at https://gisdata.mn.gov/. 2015.
Page 14 - Change in Water Storage, Streams		Statewide Altered Watercourse Project. Minnesota Geospatial Information Office for the Minnesota Pollution Control Agency. Available online at https://gisdata.mn.gov/. 2014.
Page 15 - Population		Census 2010. U.S. Department of Commerce, U.S. Census Bureau. Generated by Ben Gosack using American FactFinder. Available online at http://factfinder2.census.gov. 2015. TIGER 2010 Census. U.S. Department of Commerce, U.S. Census Bureau. Available online at https://gdg.sc.egov.usda.gov/. 2015.
Page 16 - Transportation		Roads, Minnesota, 2012. Minnesota Department of Transportation (MnDOT). Available online at https://gisdata.mn.gov/. 2012. National Land Cover Database (NLCD), Percent Developed Imperviousness 2011. Multi-Resolution Land Characteristics Consortium. Available online at http://www.mrlc.gov/index.php. 2014. Xian, G., Homer, C., Dewitz, J., Fry, J., Hossain, N., and Wickham, J., 2011. The change of impervious surface area between 2001 and 2006 in the conterminous United States. Photogrammetric Engineering and Remote Sensing, Vol. 77(8): 758-762.
Reference Data and Basemaps		MN DNR Watershed Suite. Minnesota Department of Natural Resources. Available online at https://gisdata.mn.gov/. 2014. ESRI Basemap Service Layers: World Imagery - Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community World Street Map - Sources: Esri, DeLorme, HERE, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (HongKong), Esri (Thailand), MapmyIndia, TomTom Light Gray Canvas Maps - Sources: Esri, DeLorme, HERE, MapmyIndia World Dark Gray Base - Sources: Esri, HERE, DeLorme, MapmyIndia, INCREMENT P, © OpenStreetMap contributors, and the GIS user community