Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 2: Land Use and Land Cover

MNDNR

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Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

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Contents

Spatial Forestland Cover Analysis (1990 Census and National Land Cover Database)

It is important to consider sampling scale when comparing modern data sets with presettlement land cover and use caution when drawing conclusions from direct comparisons. With that caveat, estimated upland forestland area decreased by 22.3 percent (4.43 to 3.44 million acres) and lowland vegetation (includes forested lowlands, shrub lowlands, and emergent herbaceous wetlands) increased by 35.2 percent (1.81 to 2.44 million acres) from presettlement to 2006. This change has been less pronounced over recent years with estimated upland forest area decreasing by only 1.2 percent from 2001 to 2006 (3.48 to 3.44 million acres) and lowland vegetation increasing by 0.7 percent (2.42 to 2.44 million acres).

Due to challenges in differentiating forested lowlands, shrub lowlands, and emergent herbaceous wetlands using remote sensing, it is difficult to assess the true extent of lowland forests in the 2001 and 2006 National Land Cover Database (NLCD) data sets.

In 1992, developed lands covered approximately 116,000 acres or 1.6 percent of the region. In 2006, developed land estimates increased by almost 68,000 acres to an area over 183,000 acres (2.5 percent) of the region. The average annual consumption of rural lands into developed lands from 1992 to 2006 was approximately 4,850 acres per year.

Agricultural land estimates in contrast have decreased from 106,000 acres (1.4 percent) in 1992 to under 15,000 acres (0.2 percent) in 2006.

Upland grasslands have also seen a substantial decrease from presettlement (9.4 percent of total) to 2006 estimates (2.5 percent of total). Despite this general declining trend, upland grassland estimates have actually increased recently from 166,443 acres in 2001 to 186,589 acres in 2006. (Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site : www.frc.state.mn.us

Figures 2.1 and 2.2 illustrate land cover patterns across the Northeast (NE) landscape as identified in the 1990 Census, and in 2006. As portrayed on the 2006 figure, the NE continues to be heavily forested. In 2006, more than 3.43 million acres of the NE Landscape were predicted to be upland forestland.

Figure 2.1. Land Use Land Cover Data from the 1990 Census

This figure is a map showing the kinds of land use and land cover that were collected as part of the 1990 census. Colors indicate the different land uses, with forested and bog-marsh-fen being the most common.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

Land Use and Land Cover data are challenging to display because of the way the data are collected and presented. There are a number of different data sets that could be used, each of which has a unique set of challenges and benefits. Some data are even derived from mathematical models rather than actually being collected in the field. The NSU SFRMP team has taken advantage of the enormous body of work undertaken recently by the Minnesota Forest Resources Council (MFRC) Landscape Planning Program. The MFRC finalized the revision of the NE Landscape Plan, which includes the entire Northern Superior Uplands (NSU) Section plus some additional lands, in 2014. The NSU makes up about 75 percent of the NE Landscape, so those data do not match exactly, but in a number of cases they serve a valuable purpose in providing an overview of the character of the landscape when specific site-level data are not available.

The maps in this section, and any charts that were borrowed from the MFRC NE Landscape Committee, carry the MFRC logo or a Data Source line acknowledging the source of the data

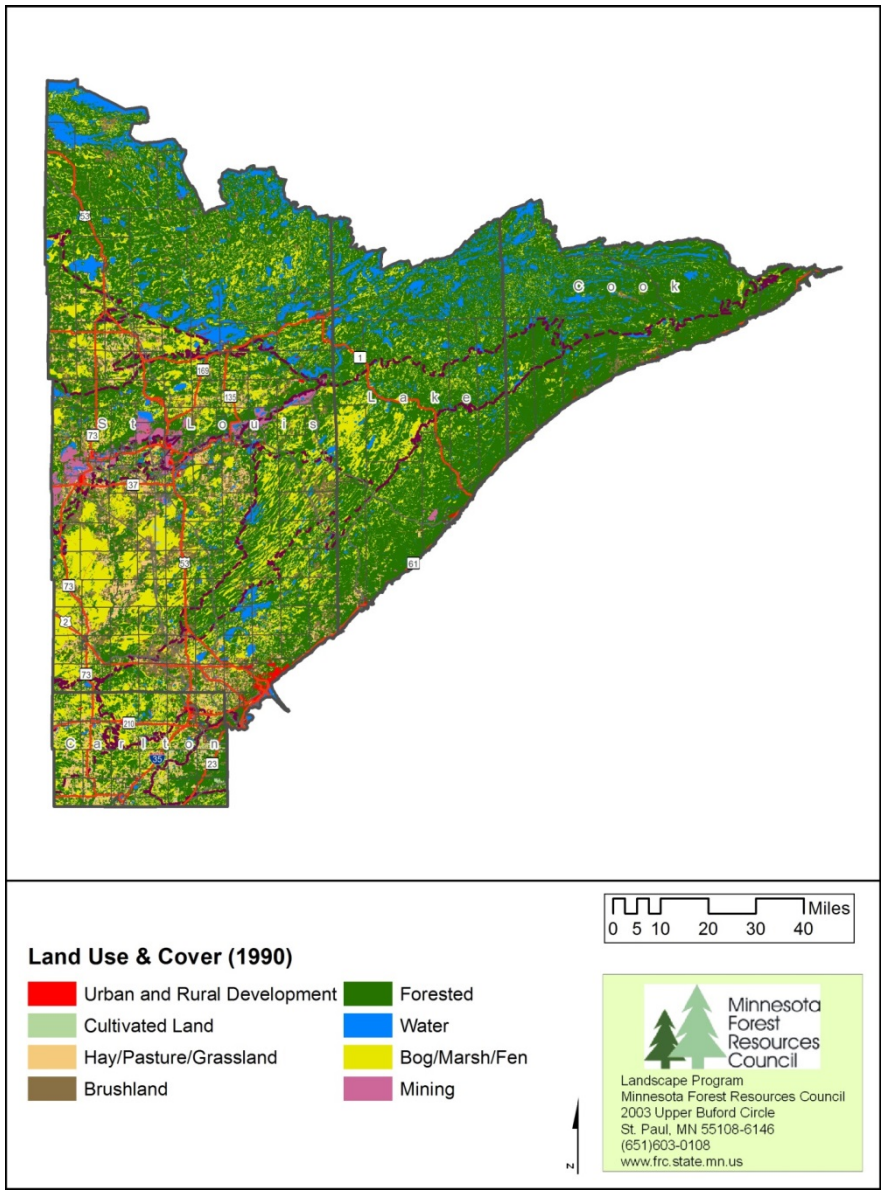


Figure 2.2. NE landscape land cover, NLCD 2006

This map displays various land cover types in the NE Landscape as different colors. Upland and lowland forest are themost common cover types.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

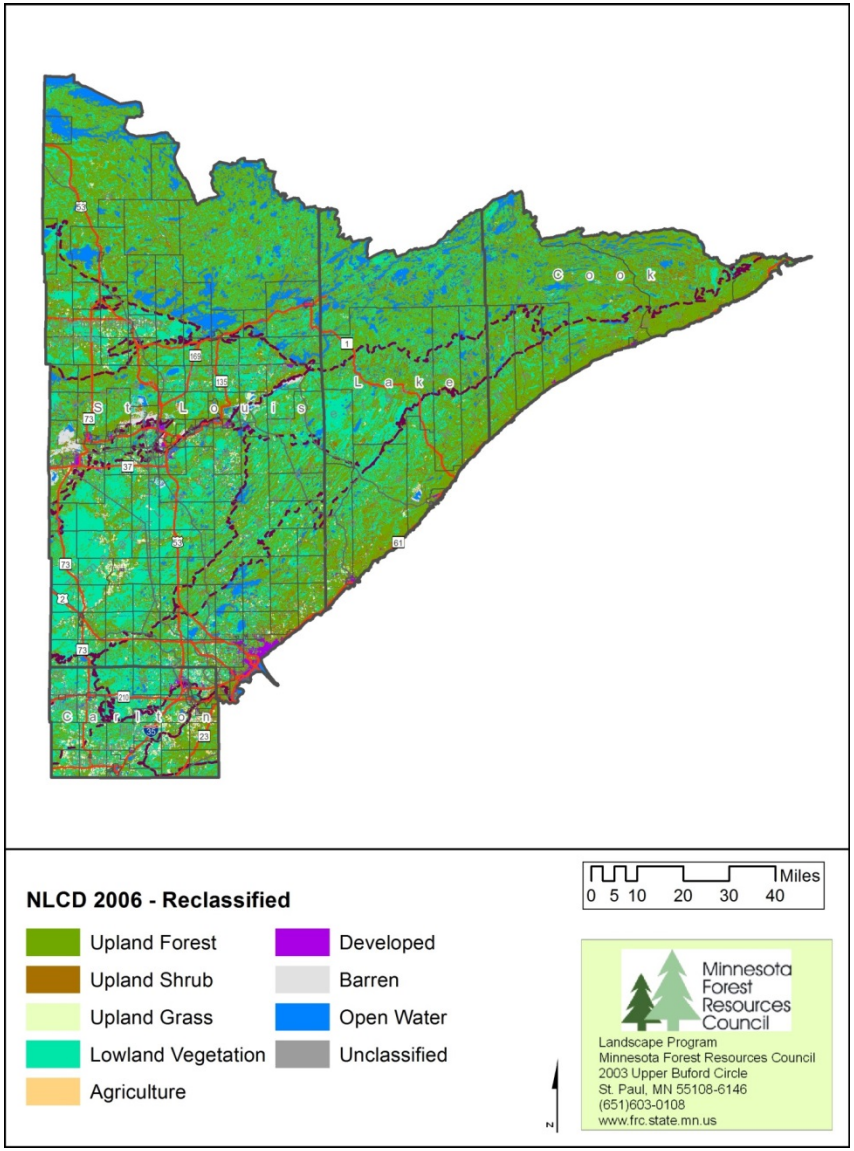


Table 2.1. Land cover in the NE Landscape over four time periods

This table compares land cover in the NE Landscape over four time periods; presettlement, 1992, 2001, and 2006. Columns show land cover type; and acreage, percent of total acres, acreage change, and percent change for presettlement, NLCD 2001, NLCD 2006, and 1992 GAP data.

Cover Type	Presettlement					GAP 1992 (compared to Presettlement)			
	Acres	% of Total	Acres Change	% Change		Acres	% of Total	Acres Change	% Change
Upland Forest	4,428,714	60.1	-	-		3,928,833	53.4	-499,881	-11.3
Upland Shrub	0	0.0	-	-		427,374	5.8	427,374	n/a
Upland Grass	688,738	9.4	-	-		292,368	4.0	-396,371	-57.6
Lowland Vegetation	1,805,454	24.5	-	-		1,878,267	25.5	72,813	4.0
Agriculture	0	0.0	-	-		106,289	1.4	106,289	n/a
Developed	0	0.0	-	-		115,799	1.6	115,799	n/a
Barren	0	0.0	-	-		37,402	0.5	37,402	n/a
Open Water	425,582	5.8	-	-		576,353	7.8	150,771	35.4
Unclassified	15,156	0.2	-	-		960	0.0	-14,196	-93.7
Totals	**7,363,644**	**100.0**	**-**	**-**		**7,363,644**	**100.0**	**-**	**-**
Cover Type	**NLCD 2001 (compared to GAP 1992)**					**NLCD 2006 (compared to NLCD 2001)**			
	Acres	**% of Total**	**Acres Change**	**% Change**		**Acres**	**% of Total**	**Acres Change**	**% Change**
Upland Forest	3,480,330	47.3	-448,503	-11.4		3,439,594	46.7	-40,736	-1.2
Upland Shrub	472,971	6.4	45,598	10.7		473,577	6.4	605	0.1
Upland Grass	166,443	2.3	-125,925	-43.1		186,589	2.5	20,146	12.1
Lowland Vegetation	2,424,108	32.9	545,841	29.1		2,440,580	33.1	16,472	0.7
Agriculture	14,534	0.2	-91,755	-86.3		14,843	0.2	309	2.1
Developed	182,030	2.5	66,231	57.2		183,665	2.5	1,635	0.9
Barren	40,963	0.6	3,561	9.5		46,510	0.6	5,548	13.5
Open Water	581,902	7.9	5,549	1.0		577,923	7.8	-3,979	-0.7
Unclassified	363	0.0	-597	-62.2		363	0.0	0	0.0
Totals	**7,363,644**	**100.0**	**-**	**-**		**7,363,644**	**100.0**	**-**	**-**

Source: Minnesota DNR GIS Data Deli, compiled by Minnesota Forest Resources Council.

Note: Some changes in areas of cover types from one dataset to another may be due to changes in scale and/or classification methodologies used in creation of each dataset. However, the NLCD 2001 and 2006 datasets are directly comparable.

The Extent of Forest Land in Recent Decades

The NE landscape is heavily forested. In 2012 estimates, forestland encompassed nearly 5.8 million (85.3 percent) of the NE Landscape's 6.8 million acres of land. This is an increase from estimates of forestland for 1977, 1990, and 2003 which ranged from 80.8 percent to 83.0 percent of the total land area. Comparing 1977 conditions with 2012 conditions suggests that forestland area increased 4.5 percent (5.5 to 5.8 million acres) during the 35 year period.

Table 2.2. Estimated extent of forestland in the NE Landscape, 1977-2012

This table from the MFRC Northeast Landscape Plan (2014) shows the change in extent of forestland over time, by comparing forested to non-forested acres in the years 1977, 1990, 2003, and 2012. Percentages remained in the range of 81-85 percent forested land cover during that period.

Land Cover	1977 acres	1990 acres	2003 acres	2012 acres
Forestland[A]	5,483,205	5,630,435	5,484,718	5,787,419
Non-forestland[B]	1,302,516	1,155,286	1,301,003	998,302
Percent	80.8%	83.0%	80.8%	85.3%

Source: Forest Inventory and Analysis estimate compiled by Minnesota Forest Resources Council.

[A] FIA defines forestland as: Land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and not currently developed for a non-forest use. The minimum area for classification as forest land is one acre. Roadside, stream-side, and shelterbelt strips of timber must be at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams and other bodies of water, or natural clearings in forested areas are classified as forest, if less than 120 feet in width or one acre in size. Grazed woodlands, reverting fields, and pastures that are not actively maintained are included if the above qualifications are satisfied. Forest land includes three sub-categories: timberland, reserved forestland, and other forestland.

[B] All terrestrial acres not designated as forestland.

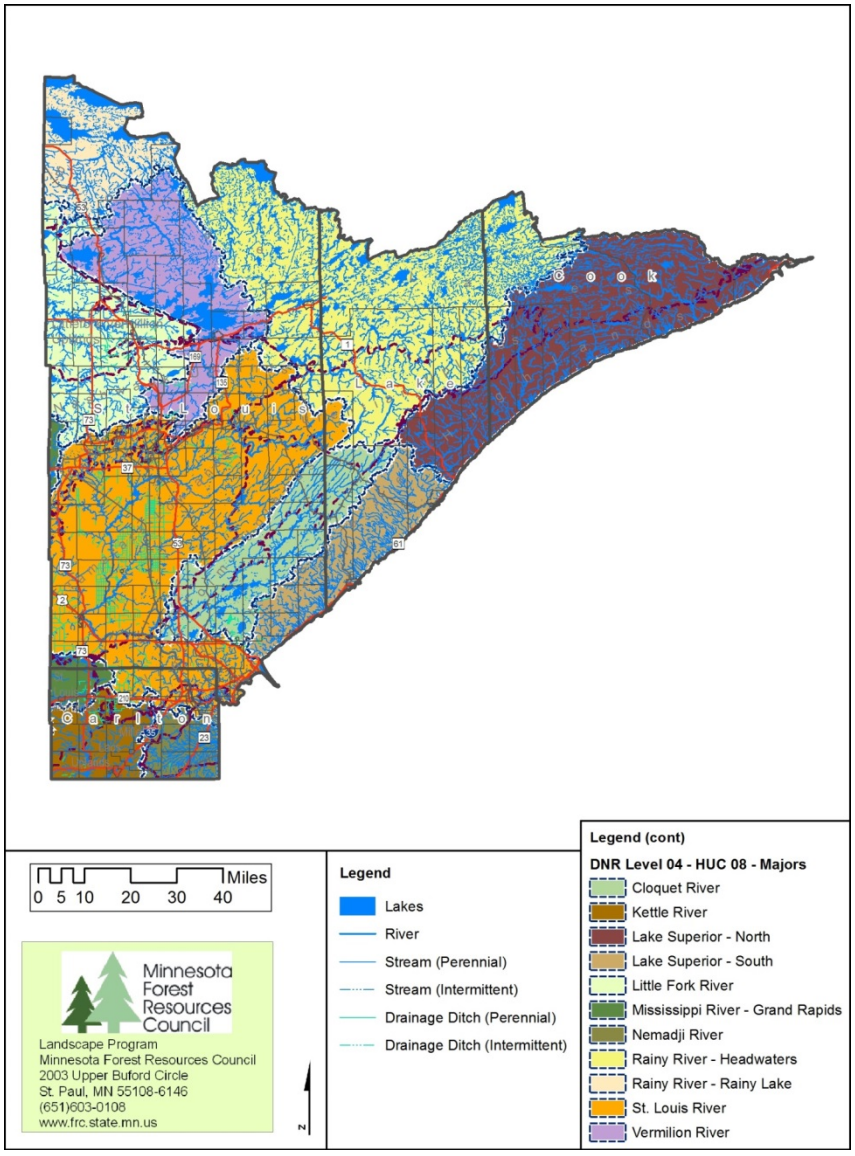
Note: Area estimates are based on FIA samples and affected by stratification of the sample into categories and by non-sampled rates leading to some artificial variability in area estimates from survey to survey.

Water quality in lakes and streams

Figure 2.3. Major watersheds in the NE Landscape

This map from the MFRC NE landscape team shows the HUC 08 watersheds in the planning area.

Data Source:Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us



The NE Landscape is an area of rich water resources. Water in this region flows north through the Rainy River to Hudson's Bay, east through the Great Lakes to the Atlantic Ocean, and south through the Mississippi River to the Gulf of Mexico. These are three of the most important water basins in North America and forestry practices within them can directly affect stream and lake health.

The Minnesota DNR developed the Watershed Health Assessment Framework (WHAF) http://www.dnr.state.mn.us/whaf/index.html to provide a comprehensive overview of the ecological health of Minnesota's watersheds. By applying a consistent statewide approach, the WHAF expands understanding of processes and interactions that create healthy and unhealthy responses in Minnesota's watersheds. Health scores are used to provide a baseline for exploring patterns and relationships in emerging health trends. The Saint Louis River watershed scored lower than the other watersheds in the region (see Figure 2.4 below, which displays watershed health scores in the NE Landscape).

Figure 2.4. Watershed health scores in the NE Landscape

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council). This map shows the scores from 1-100 of the major watersheds in this landscape. Scores in this area are between 51 and 70, 0 – 10 being the lowest score possible.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

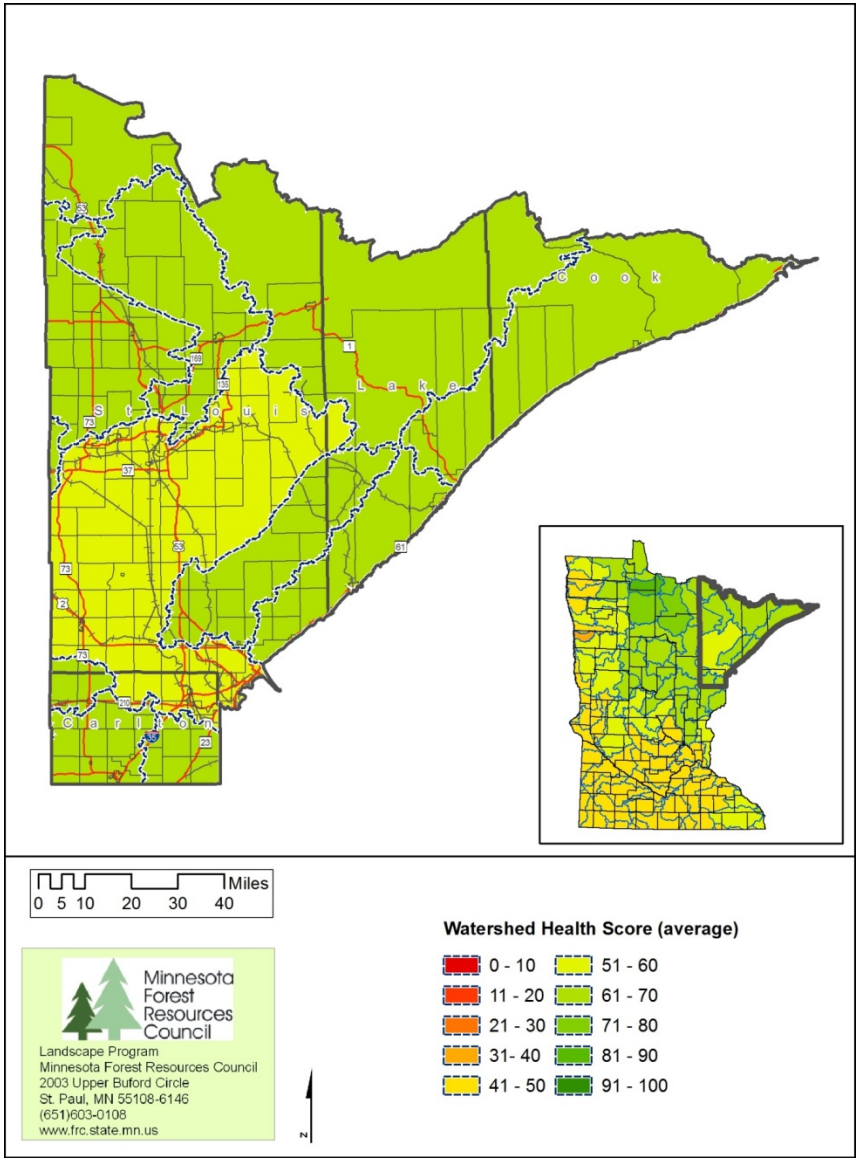
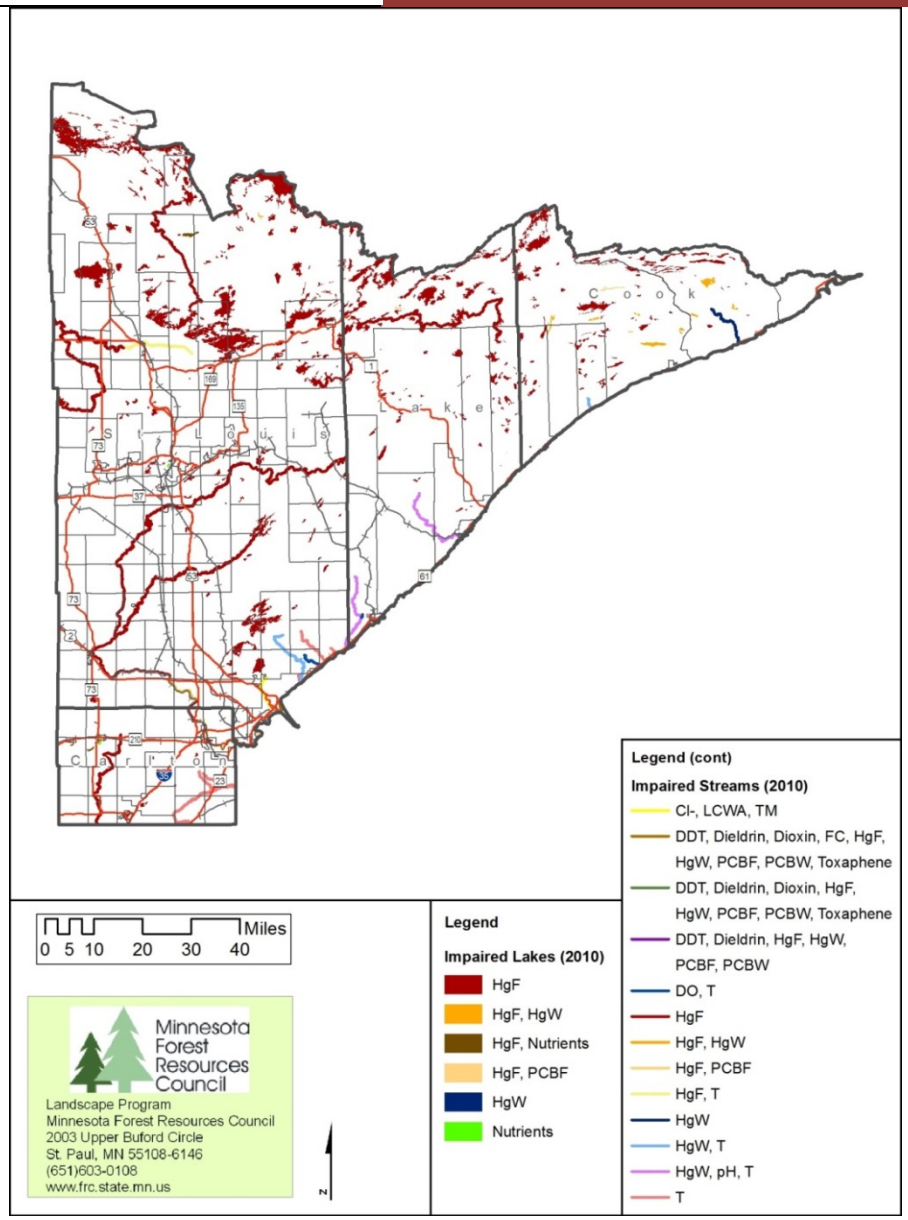


Figure 2.5. Impaired waters in the NE Landscape, 2010

Impaired lakes and streams in the NE landscape are shown on this map, coded by color for the substance causing the impairment.

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council).

In 2008, the Minnesota Pollution Control Agency (MPCA) adopted a watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands that complements its work on impaired waters. This watershed approach was recommended by Minnesota's Clean Water Council and directed by the Minnesota Legislature. This approach centers on intensive monitoring of each of Minnesota's 81 major watersheds on a continuous 10-year cycle. A primary product of this effort is the development and application of a Watershed Restoration and Protection Strategy (WRAPS) that contains strategies and actions designed to achieve and maintain water quality standards and goals. Partnerships with state agencies (including DNR) and various local units of government are critically necessary to the development and implementation of the WRAPS. More information about WRAPS can be found at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html

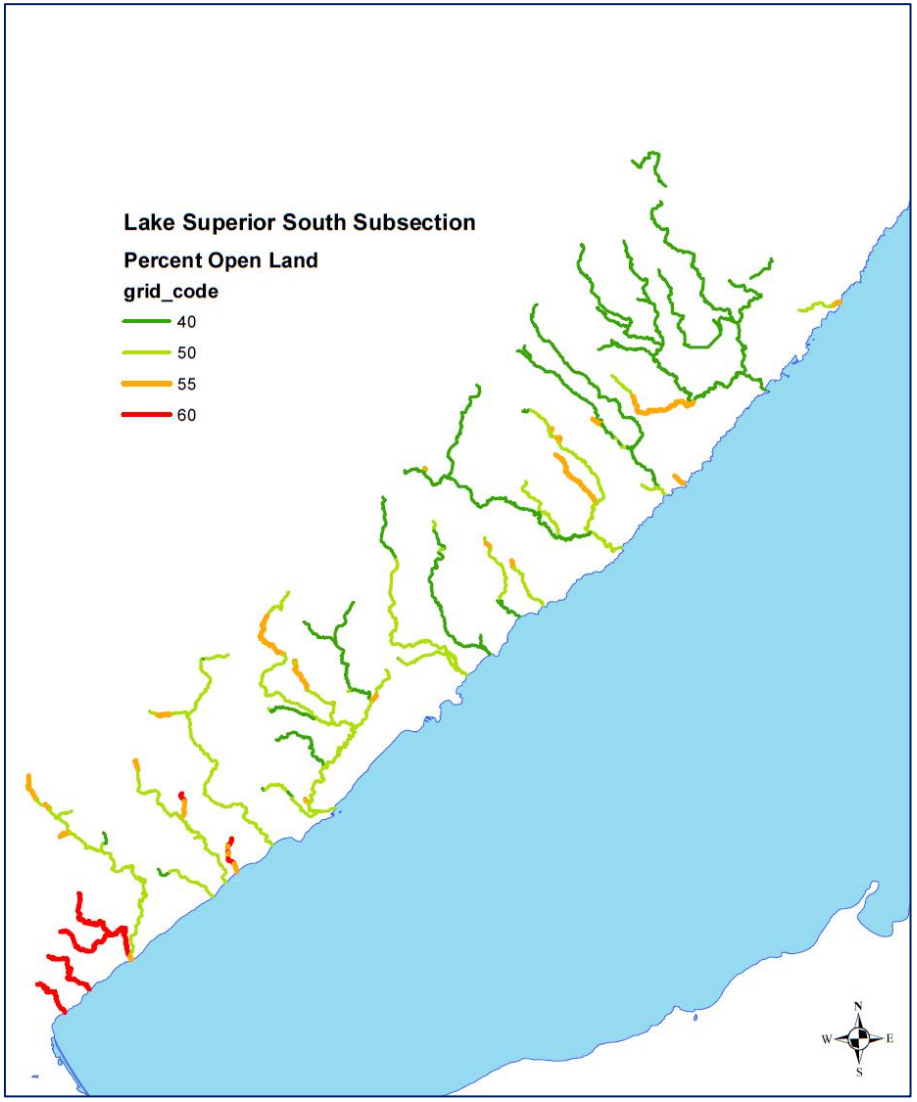


Forest cover and water quality

Figure 2.6. Percent open land and young forest in southern Lake Superior watersheds

This map color codes the watersheds to show the percentage of open land, from 40-60 percent.

Source: Minnesota DNR-Fisheries and the EPA's Mid-Continent Ecology Division



Forestlands are an important storm filter and are a key component in sustaining high quality water and hydrology. Forests buffer pounding rains and hold soil in place, allowing moisture to seep into the ground water and reducing erosion and unwanted runoff. Beyond just having forested cover, the age distribution of forests within a watershed can have an impact on water quality through effects on peak flows, loss of base flow, sedimentation and erosion, turbidity, nutrient levels, and water temperatures. These effects in turn can impact the health and distribution of aquatic organisms within the watershed.

Changes in vegetation cover from forestland to farmland or young forest can cause snow to melt faster and allow rainfall to reach streams faster. These changes may not have an impact on peak flows during large flood events, but they do impact smaller peak flow events as well as annual peak flows. These impacts begin to appear as the percentage of open land or young forest within a watershed rises above 60 percent (Verry, 2000; *Land Fragmentation and Impacts to Streams and Fish in the Central and Upper Midwest*; Society of American Foresters).

Minnesota DNR Fisheries and Ecological and Water Resources divisions; and the EPA's Mid-Continent Ecology Division in Duluth have initiated work to identify points within watersheds in the southern portion of the Lake Superior basin that may be at risk due to impacts related to the amount of open

land/young forest within the watershed. Some of the results of this work are shown here in figure 2.6. This work will inform forest management decisions within potentially impacted watersheds and possible outcomes of this use may include reforestation efforts in locations where such work can reduce the percentage of open land/young forest below the impact threshold, and coordination of timber sale activity across land ownerships to avoid increasing the amount of young forests at points within watersheds known to be at or above the impact threshold.

Figure 2.7. Designated Trout Streams inLake Superior watersheds

This map shows designated trout streams in the NE landscape area of Minnesota, as well as protected tributaries to those streams.

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council)

Following appropriate management practices in these riparian areas as outlined in the MFRC Voluntary Site-Level Forest Management Guidelines will contribute to keeping northeast Minnesota's lakes, rivers, wetlands and fisheries healthy. These healthy forests maintain high quality aquatic systems such as cold water trout streams through shading and water temperature maintenance, erosion and nutrient loading reduction, and providing course woody debris and structural cover. The NE Landscape contains 2,153 miles of designated trout streams and an additional 1,270 protected tributaries to designated trout streams

MFRC Voluntary Site-Level Forest Management Guidelines are available at:

www.frc.state.mn.us/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf