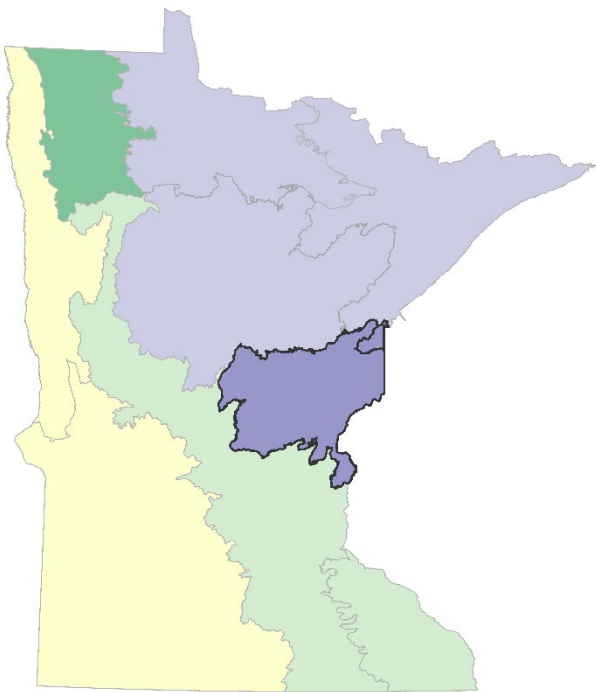


Western Superior Uplands

Section Forest Resource Management Plan

Section Conditions

Prepared 2021



Minnesota Department of Natural Resources

Divisions of Ecological and Water Resources, Fish and Wildlife, and Forestry

500 Lafayette Road

St. Paul, MN 55115

651-259-5300

FOR.Planners@state.mn.us

mndnr.gov/forestry

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Chapter 1. Purpose and Planning Area

Purpose of the assessment

This document provides context for the Western Superior Uplands¹ Section Forest Resource Management Plan (WSU SFRMP). While SFRMPs provide direction for forest resource management on state-administered land only, they are developed considering conditions across all ownerships. This assessment documents forest resource conditions and trends across all ownerships in the WSU Section, followed by conditions and trends on state-administered land. This information helps planners to develop management guidance, land managers to understand the broader context they work within, and the public to understand the environment within which the DNR plans and carries out management.

Introduction to the planning area

The WSU Section covers approximately 3.5 million acres in east-central Minnesota. Over 45% of those acres are deciduous forests or woody wetlands. Diverse, extensive forests and lakes harbor numerous Species of Greatest Conservation Need (SGCN).

The vast majority of the land is in private ownership, and over 18% is in public ownership (federal, county, and state). State ownership accounts for approximately 626,000 acres; of this, approximately 406,000 acres are administered by the Department of Natural Resources. Much of the Section is rural, and it encompasses the small cities of Carlton, Milaca, Pine City, and Sandstone, with Brainerd sitting just outside of the WSU section. Forestry, tourism, and recreation, including hunting, fishing, snowmobiling, and skiing, are important land uses across the Section. Agriculture is also a major industry and use of the land in this area.

The WSU Section does not include any major lumber mills. It does include many minor mills and has major mills near the edges of the boundary.

¹ Ecological sections are units defined in Minnesota's Ecological Classification System (ECS) by origin of glacial deposits, regional elevation, distribution of plants, and regional climate. For more information, visit [the DNR's ECS webpage](#).

DNR-administered land

Table 1 - Land Status by Primary Administrator

| Row Labels | Acquired | CONCON | School Trust | University Trust | Volstead | Grand Total |
|-------------------|----------|--------|--------------|------------------|----------|-------------|
| DNR | 639 | | | | | 639 |
| Forestry | 151,708 | 58,914 | 64,310 | 6,552 | 78 | 281,563 |
| Eco Waters | 2,200 | | | | | 2,200 |
| Parks and Trails | 52,720 | | | | | 52,720 |
| Fish and Wildlife | 63,974 | 5,029 | 241 | | | 69,243 |
| Grand Total | 270,996 | 63,943 | 64,551 | 6,552 | 78 | 406,363 |

The DNR administers approximately 406,000 acres of land in WSU. This land is acquired or owned through a variety of methods, such as School Trust Fund ownership, tax forfeit, or Consolidated Conservation (CONCON) with the county. The administration of this land is split up among the multiple divisions of the DNR.

CHAPTER 2: Landscape context

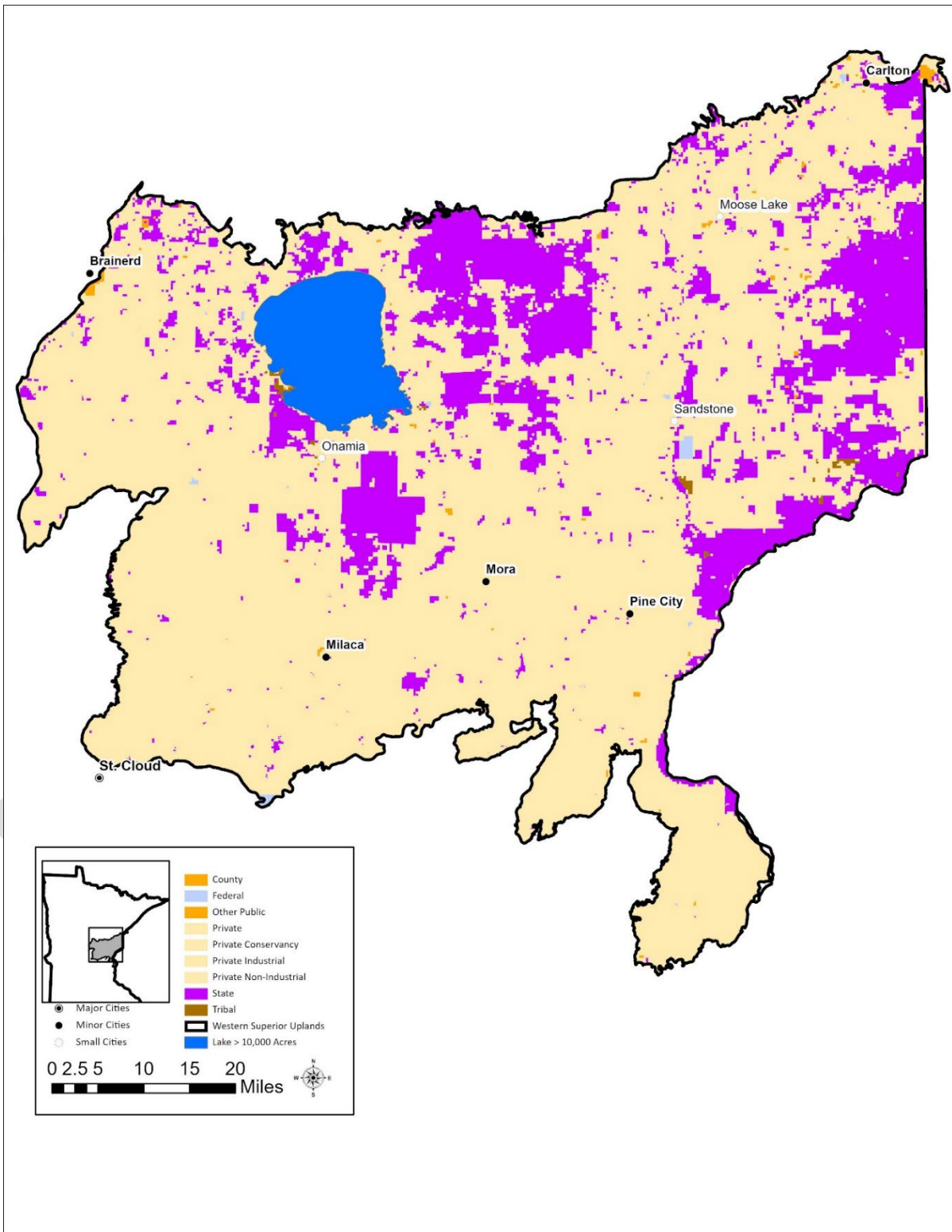
Land ownership

The WSU Section covers approximately 3.5 million acres. The majority of land (81.5%) is in private ownership. Approximately 18.3% of the land in WSU is public and administered by federal, county, or state government. The state of Minnesota administers 17.9% of the land in the section. Tribes and the Bureau of Indian Affairs own approximately 0.1% of the land in the WSU Section.

Table 2 - Land ownership/administration in the WSU Section in acres (2008 GAP Stewardship data for all ownerships)

| Administrator Class | Acres | Percent |
|----------------------------|------------------|----------------|
| State | 626,162 | 17.9% |
| Other Public | 15,155 | 0.4% |
| Private | 2,852,850 | 81.5% |
| Tribal | 5,204 | 0.1% |
| Grand Total | 3,499,370 | 100.0% |

Map 2 - WSU Subsections – Land Ownership



Land-cover classification

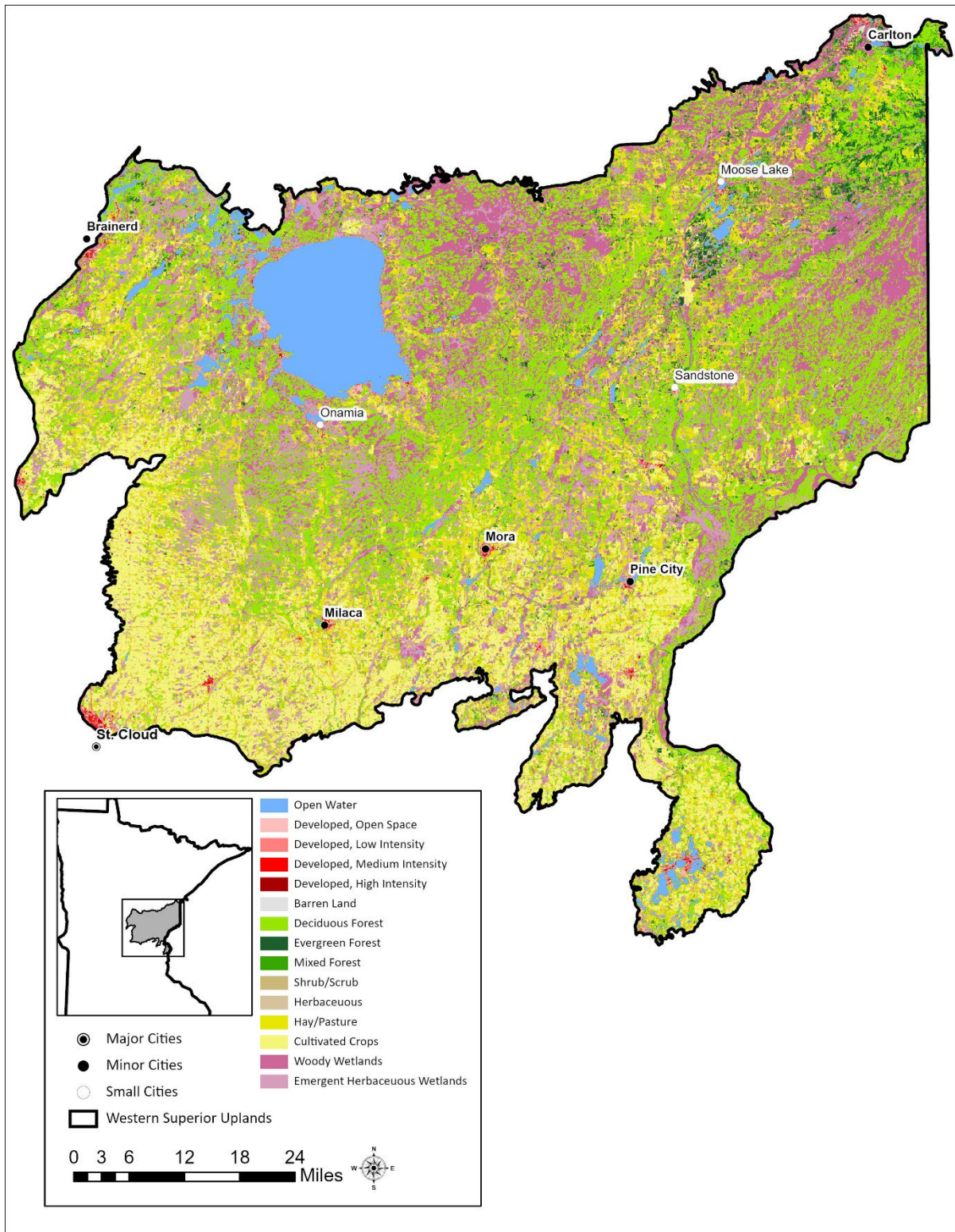
National Land Cover Classifications

The Western Superior Uplands Section contains a variety of land cover classes, with over 45% of the Section being covered by deciduous forest and woody wetlands (Table 2.1.2, Map 2). The next most prominent land cover classes are agricultural with cultivated crops or hay/pasture. Smaller amounts of other land covers are also present in the Section.

Table 3 - National Land Cover Classes in the WSU Section (NLCD 2016 data)

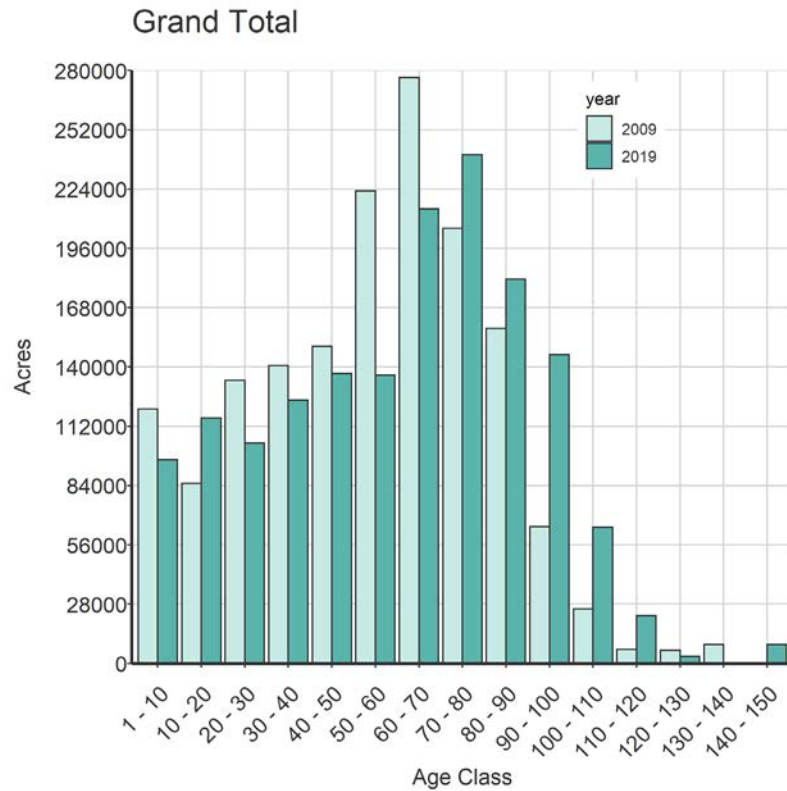
| NLCD Land Cover Class | Acres | Percent |
|------------------------------|------------------|----------------|
| Open Water | 204,883.27 | 5.9% |
| Developed, Open Space | 95,422.69 | 2.7% |
| Developed, Low Intensity | 25,541.41 | 0.7% |
| Developed, Medium Intensity | 7,832.91 | 0.2% |
| Developed, High Intensity | 2,358.92 | 0.1% |
| Barren Land | 29,948.71 | 0.1% |
| Deciduous Forest | 1,000,167.96 | 28.6% |
| Evergreen Forest | 42,529.58 | 1.2% |
| Mixed Forest | 78,149.85 | 2.2% |
| Shrub/Scrub | 16,183.33 | 0.5% |
| Herbaceous | 17,361.57 | 0.5% |
| Hay/Pasture | 504,250.51 | 14.4% |
| Cultivated Crops | 471,865.17 | 13.5% |
| Woody Wetlands | 602,612.35 | 17.2% |
| Emergent Herbaceous Wetlands | 426,512.76 | 12.2% |
| Total | 3,498,621 | 100.0% |

Map 3 - WSU Land Cover, 2016 National Land Cover Classification

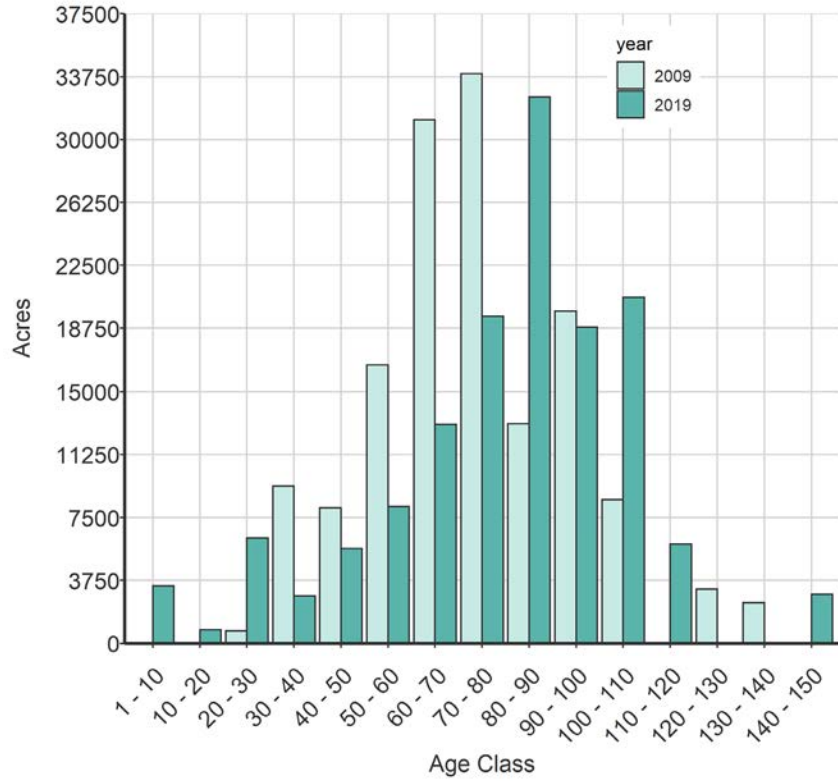


Forest cover type age class distributions

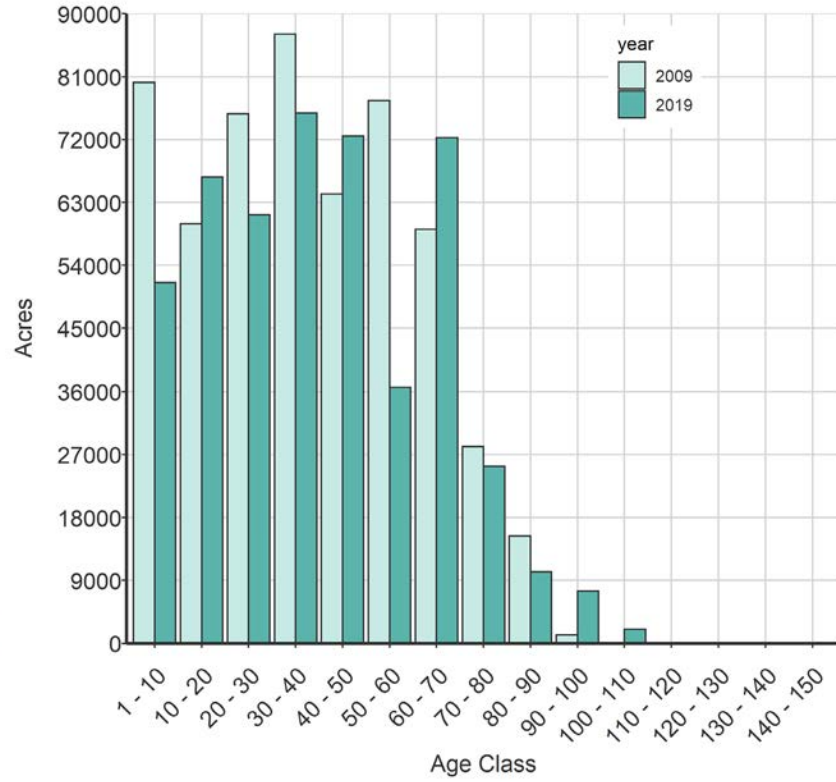
Estimates from USFS Forest Inventory Analysis data show that the forest has grown older on average over the last ten years. Across all ownerships and cover types, acres of older forest increased compared to acres of younger forest. This pattern holds for most individual cover types. Some cover types do not have sufficient data to meaningfully estimate acres within age class distributions at the Section scale for WSU. Graphs for those cover types are omitted in this section.



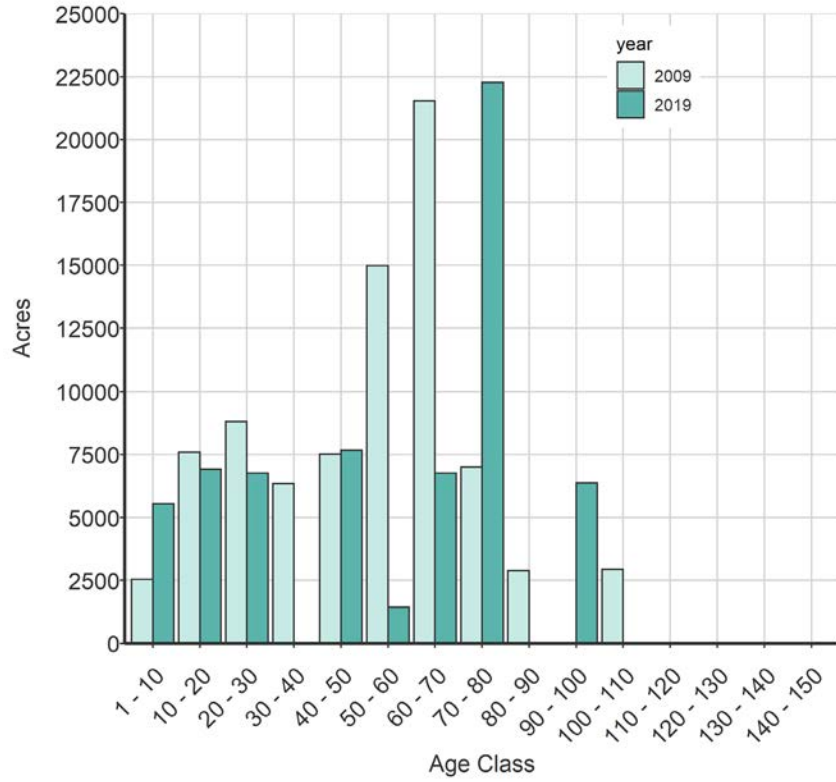
Ash



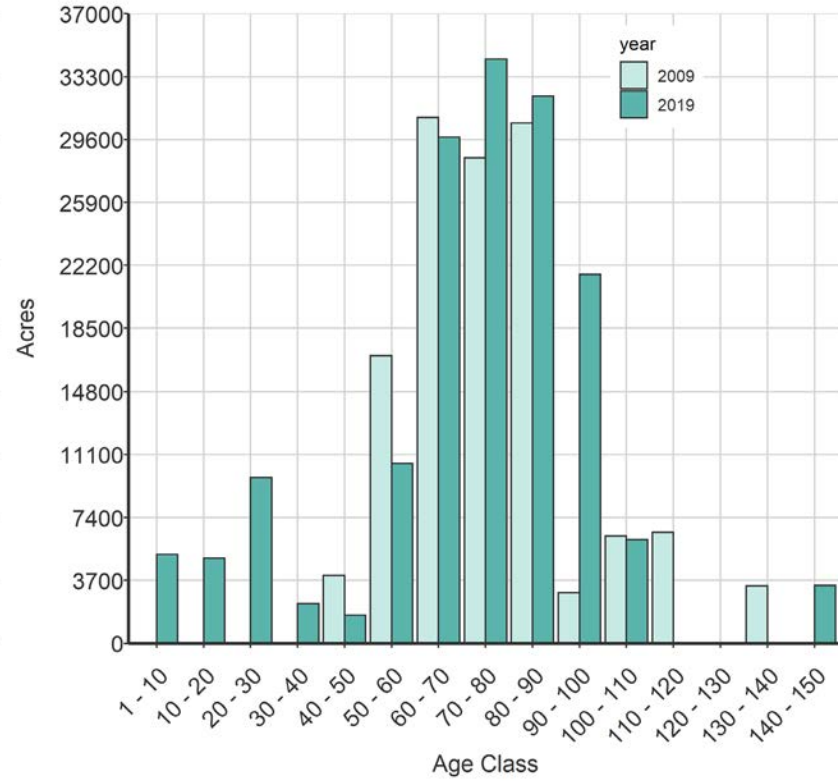
Aspen



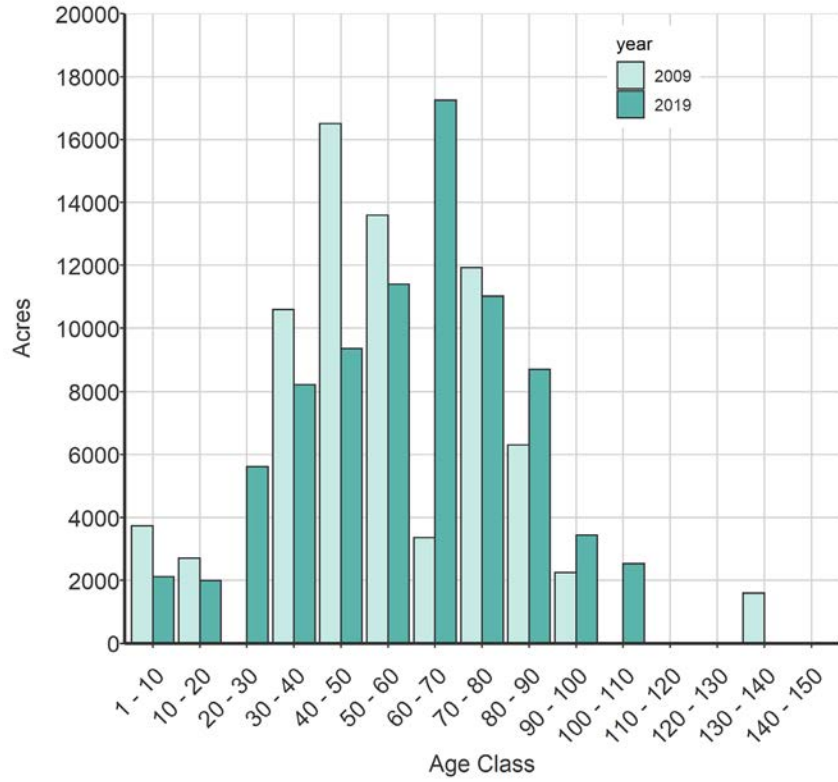
Birch



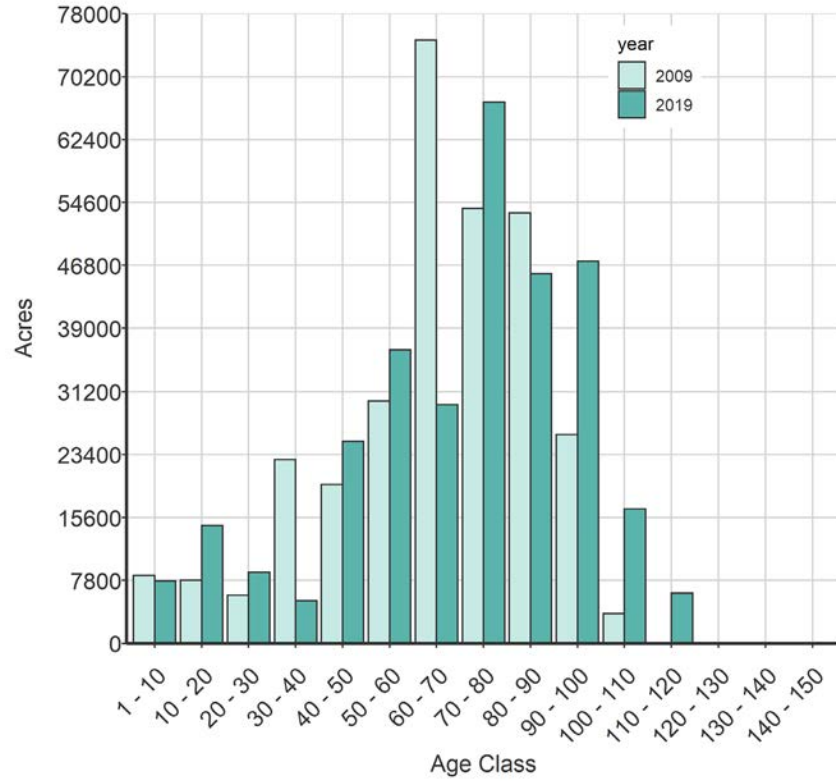
Central Hardwoods



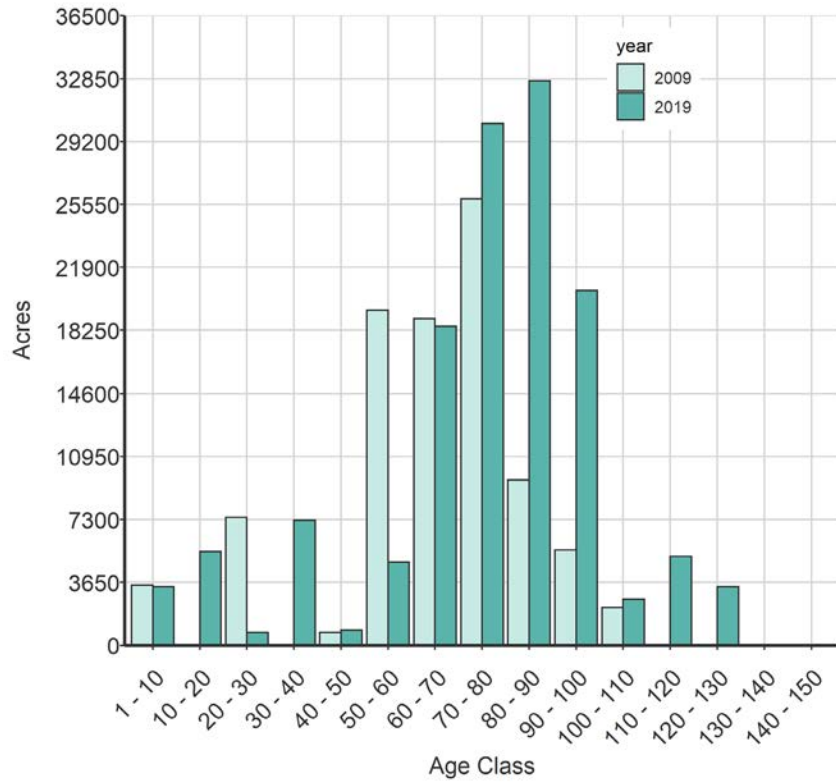
Lowland hardwoods



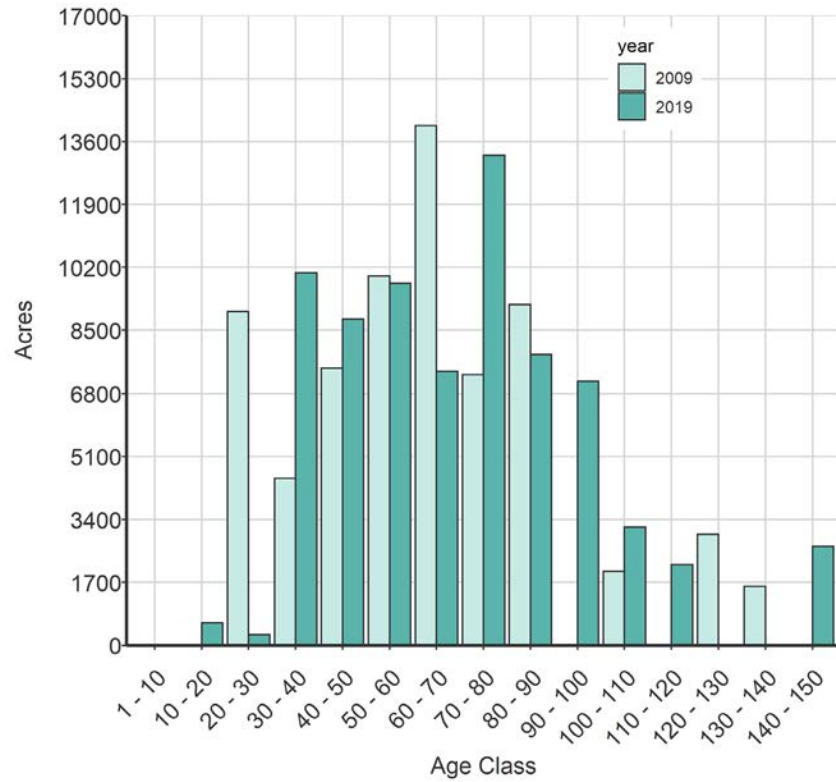
Northern hardwoods



Oak



Tamarack



Forest diversity

Minnesota Biological Survey

The Minnesota Biological Survey (MBS) systematically collects, interprets, and delivers baseline data on the distribution and ecology of rare plants, rare animals, native plant communities, and functional landscapes needed to guide decision-making.

Minnesota Biological Survey (MBS) work has been completed for some counties within the WSU section. Within the WSU Section, there are currently 164,927 acres identified as outstanding significance and over 295,562 acres identified as high significance.

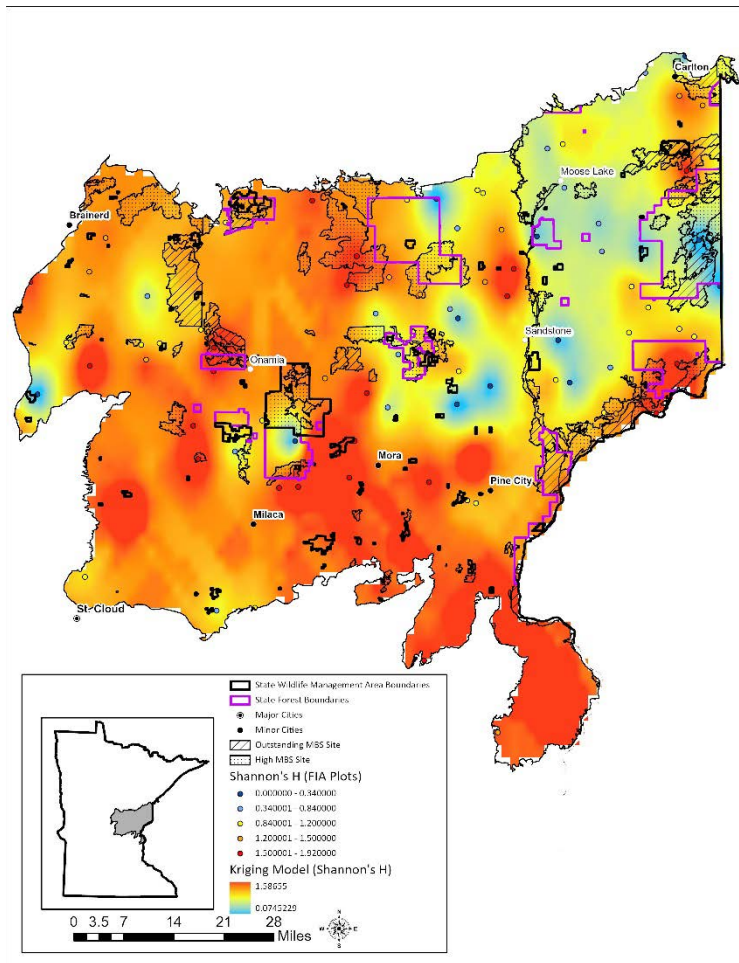
These sites contain very good to the best occurrences of the rarest species and the most functional intact landscapes.

Within Stand Forest Diversity

A Shannon's diversity index was calculated for the FIA plots within the WSU section. The Shannon's diversity index provides a numerical value to characterize tree species diversity. It shows the richness (number of species found) and relative abundance (evenness of abundance) of the tree species. Higher numbers show higher levels of diversity.

Map 4 shows spatially, through a Kriging model, the estimated tree species diversity within forests in the WSU section. It shows the Shannon's H analysis of diversity along with Minnesota biological survey (MBS) areas of outstanding and high bio significance.

Map 4 - Estimated Forest Diversity WSU Section

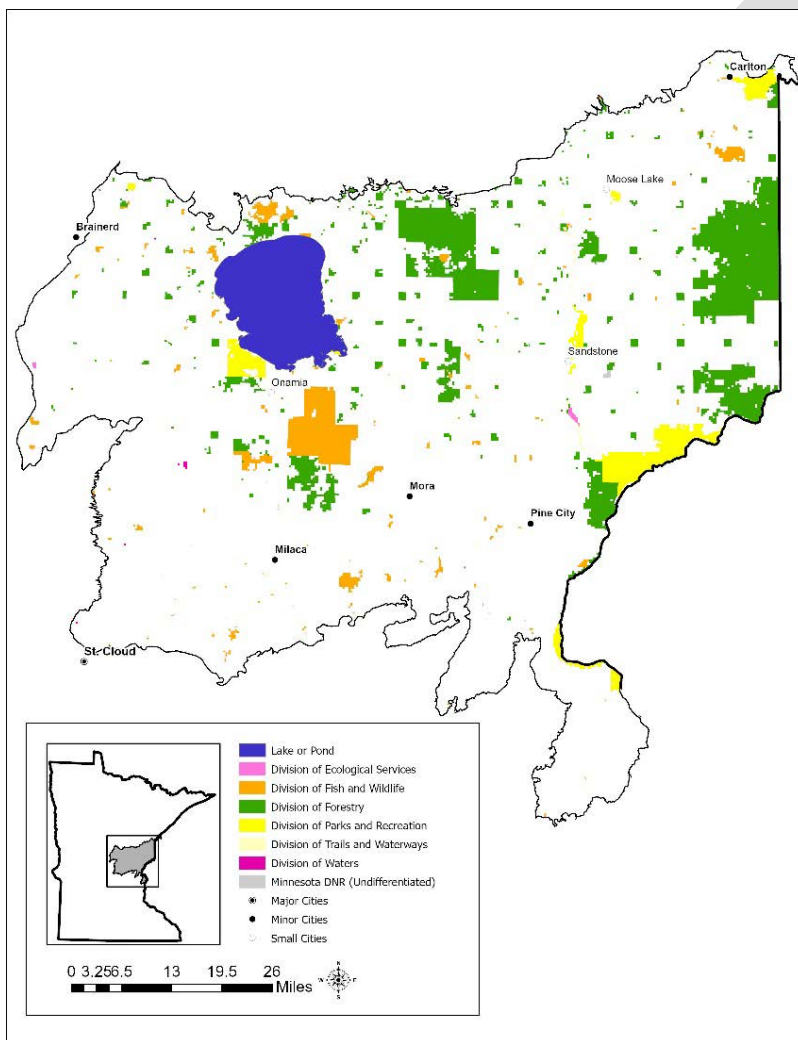


Chapter 3: DNR-administered lands

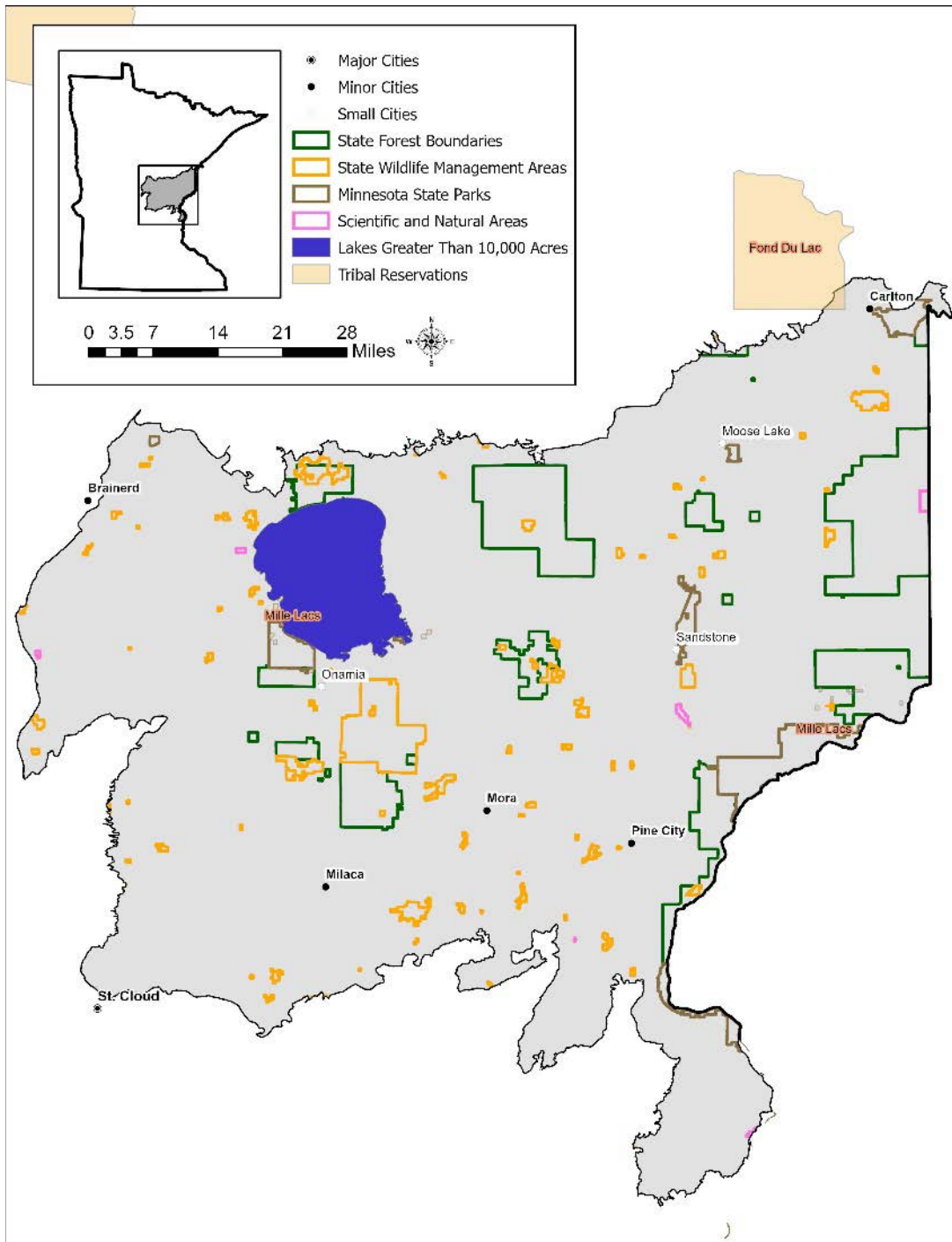
DNR major management units

There are several state forests in the WSU section. There are also four major State Parks (Jay Cooke, St. Croix, Mille Lacs Kathio, and Banning) along with some smaller parks. The major Wildlife Management Area in the section is the Mille Lacs WMA.

Map 5 – DNR administered lands by the primary administrator in the WSU Section



Map 6- Location of Recreation Units



Forest cover types

Map 7 - Western Superior Uplands Forest composition

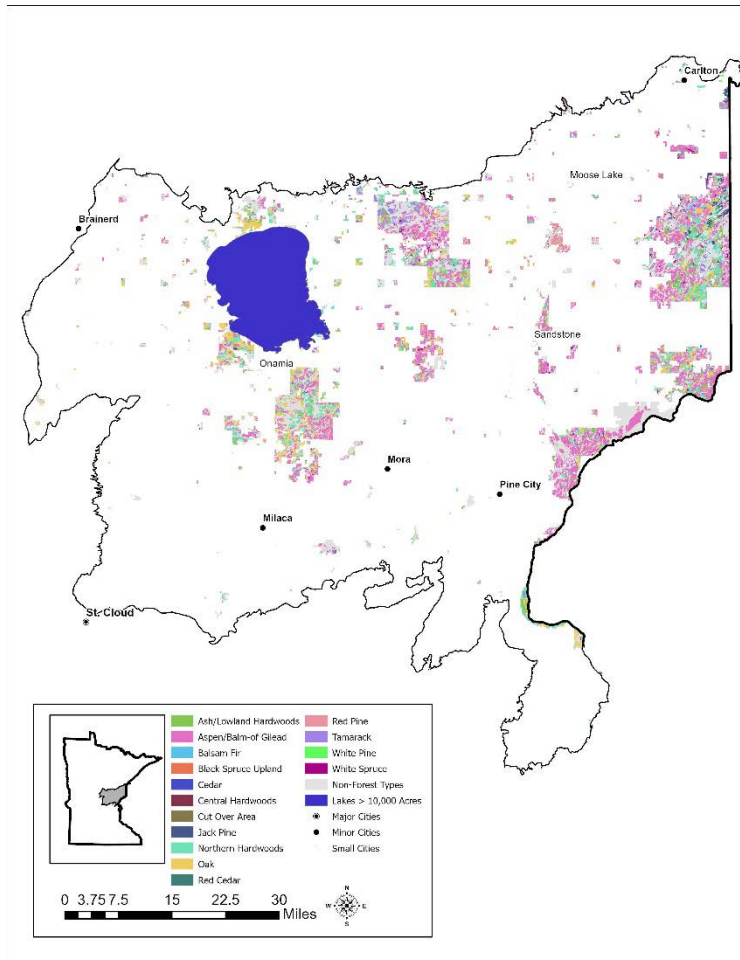


Table 4 - Change in Cover type acres 2010 to 2021 (FIM2010 and FIM2021)

| Cover type | 2010 total acres | 2021 total acres | Change |
|------------------------|------------------|------------------|--------|
| Ash/ lowland Hardwoods | 23,461 | 23,066 | -1.7% |
| Aspen | 117,143 | 120,326 | 2.5% |
| Birch | 8,532 | 6,941 | -18.6% |
| Jack Pine | 3,018 | 2,998 | -0.7% |
| Balsam Fir | 2,892 | 1,481 | -48.8% |
| Black Spruce Upland | 120 | 46 | -61.7% |
| White Spruce | 2,784 | 2,350 | -15.6% |
| Black Spruce lowland | 20,065 | 21,014 | 4.7% |
| Tamarack | 13,679 | 12,787 | -6.5% |

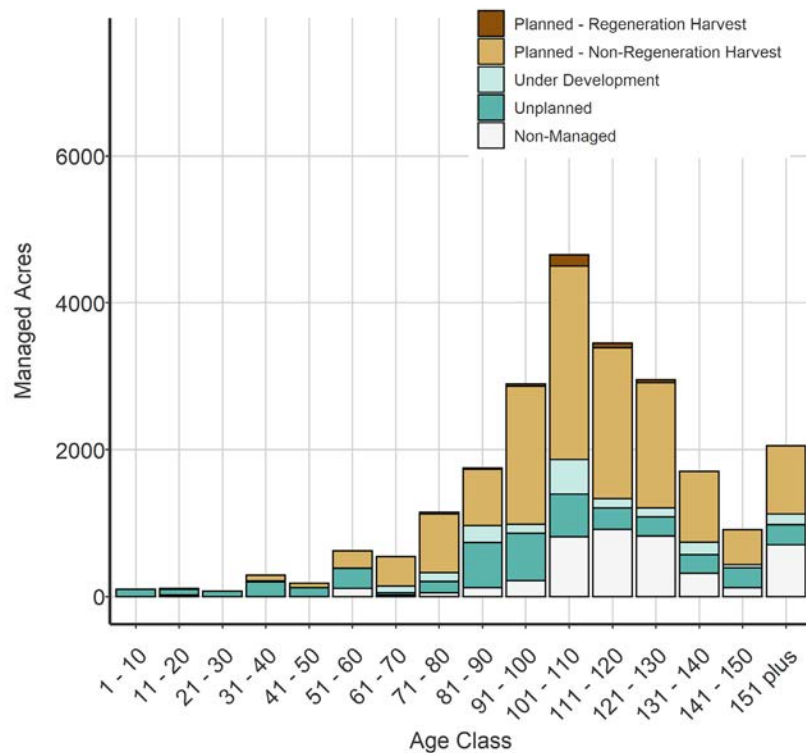
| Cover type | 2010 total acres | 2021 total acres | Change |
|--------------------|------------------|------------------|----------|
| Red Pine | 8,083 | 8,689 | 7.5% |
| White Pine | 737 | 1,000 | 35.7% |
| Northern Hardwoods | 44,090 | 43,482 | -1.4% |
| Central Hardwoods | 133 | 71 | -46.6% |
| Oak | 36,167 | 41,771 | 15.5% |
| Cedar | 417 | 505 | 21.1% |
| Other forest types | 622 | 838 | 34.5% |
| Upland Brush | 721 | 12,636 | 1,652.6% |
| Upland Grass | 4,355 | 4,860 | 11.6% |
| Other Non-Forest | 104,167 | 108,447 | 4.1% |
| Total Acres | 391,457 | 413,309 | 5.6% |

DRAFT

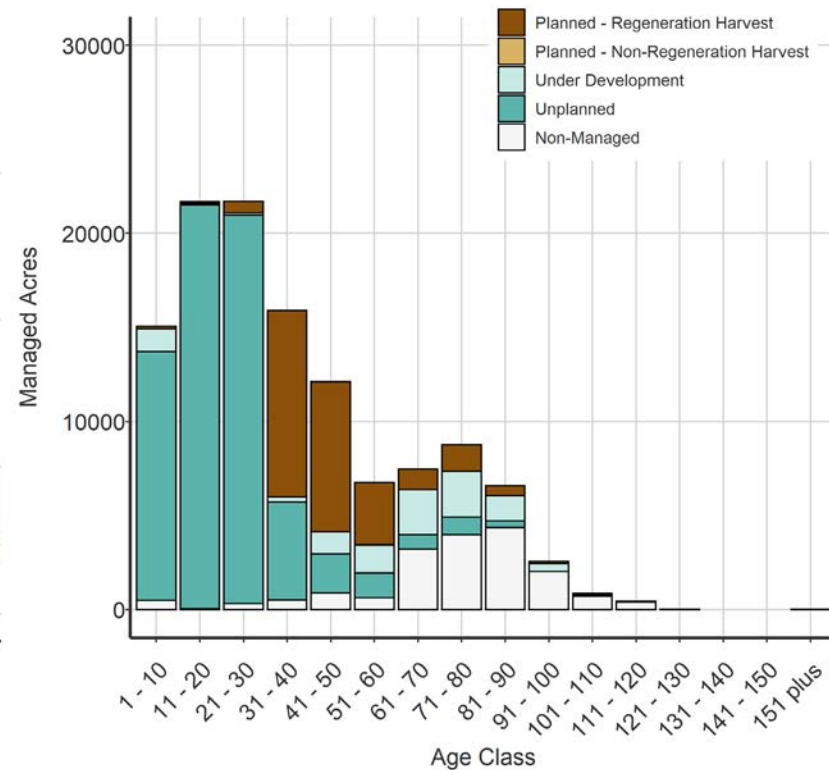
State timberland cover type age class distributions

These charts show current age class distributions for cover types in the Western Superior Uplands with acres planned on the 10-year stand exam list. Acres under development at the time of plan writing are indicated in each chart, as are stand exam acres that are planned to be visited through 2030. Acres planned on the 10-year stand exam list are further broken out by generic preliminary prescriptions of Non-regeneration Harvest (e.g., thinning) or Regeneration Harvest (e.g., primarily clearcut with reserves for even-aged managed cover types and selection harvest for uneven-aged managed cover types).

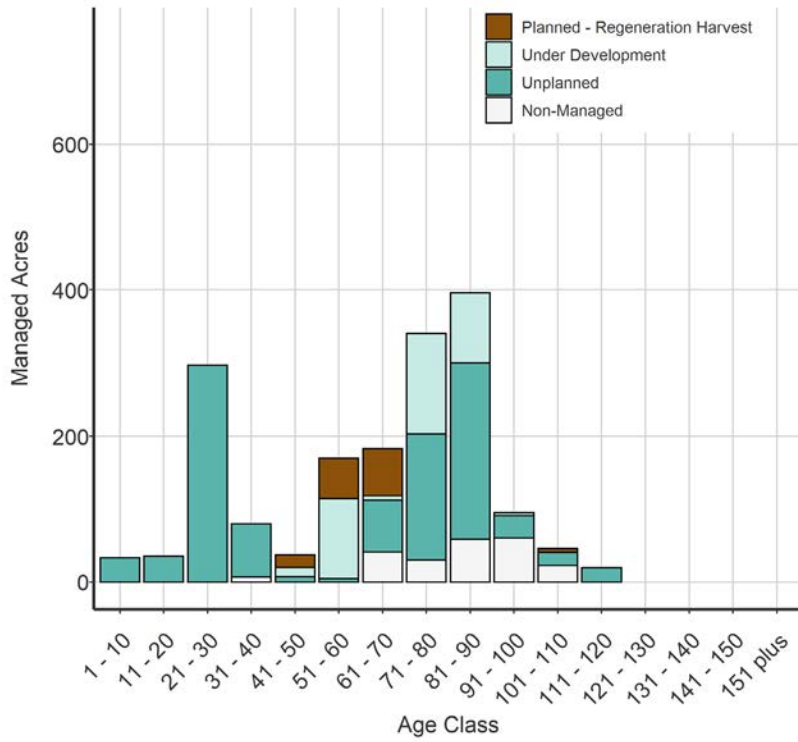
Ash/Lowland Hardwoods



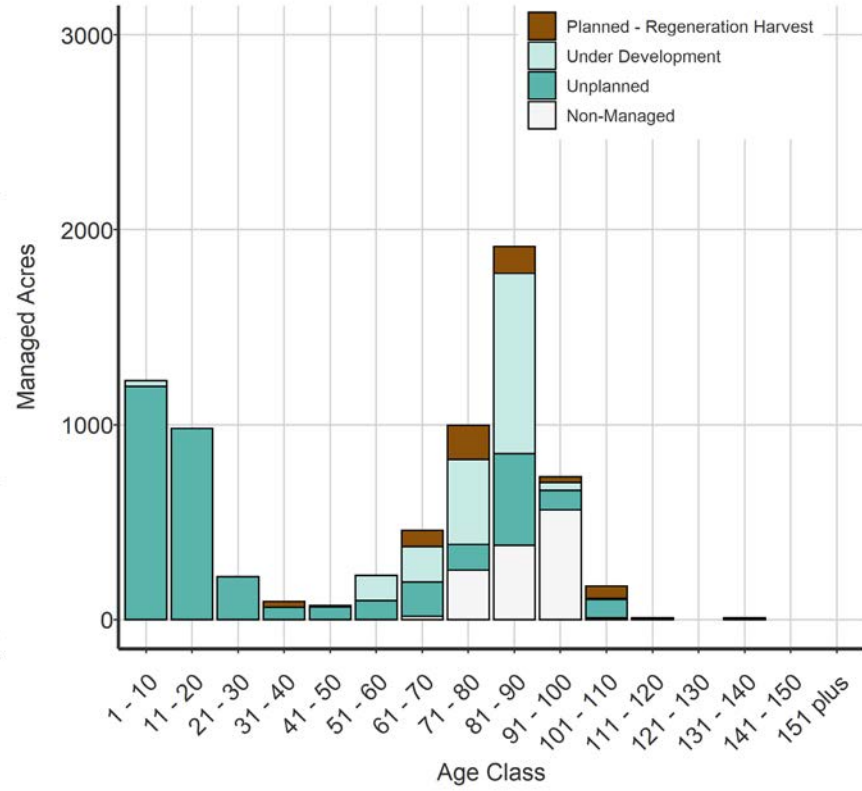
Aspen



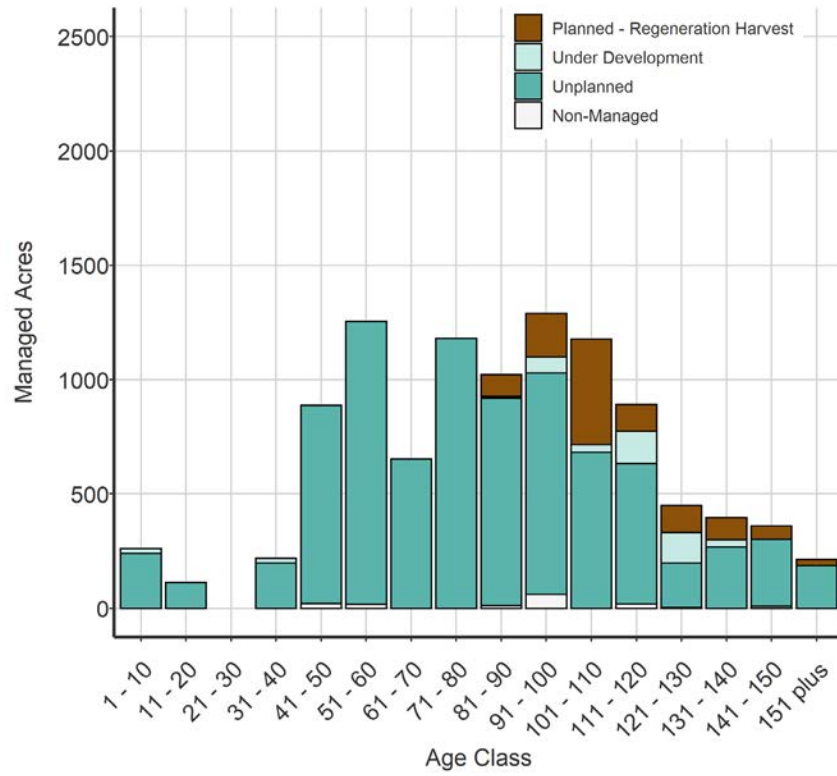
Balsam Fir



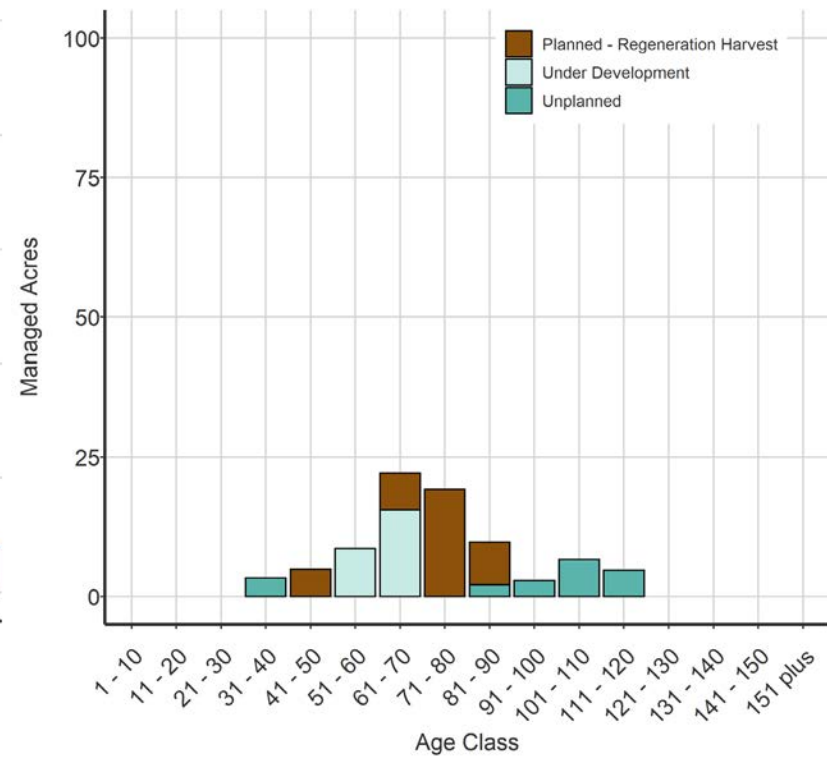
Birch



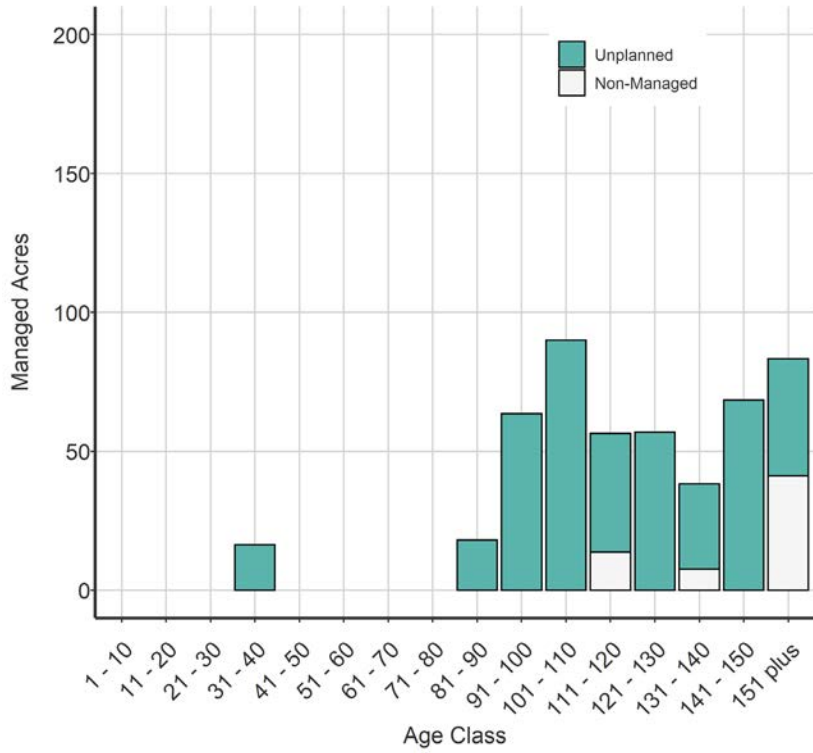
Black Spruce Lowland



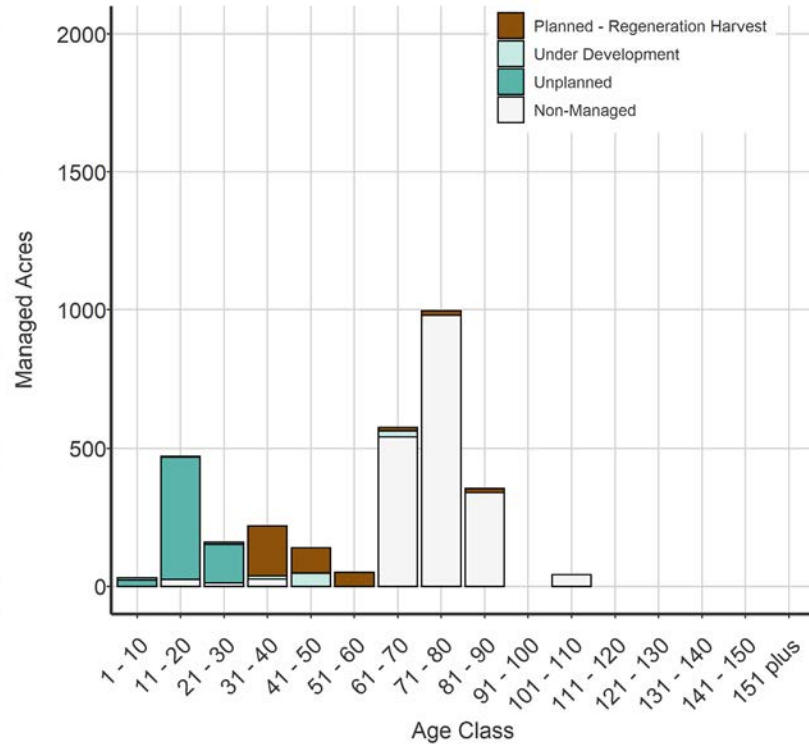
Black Spruce Upland



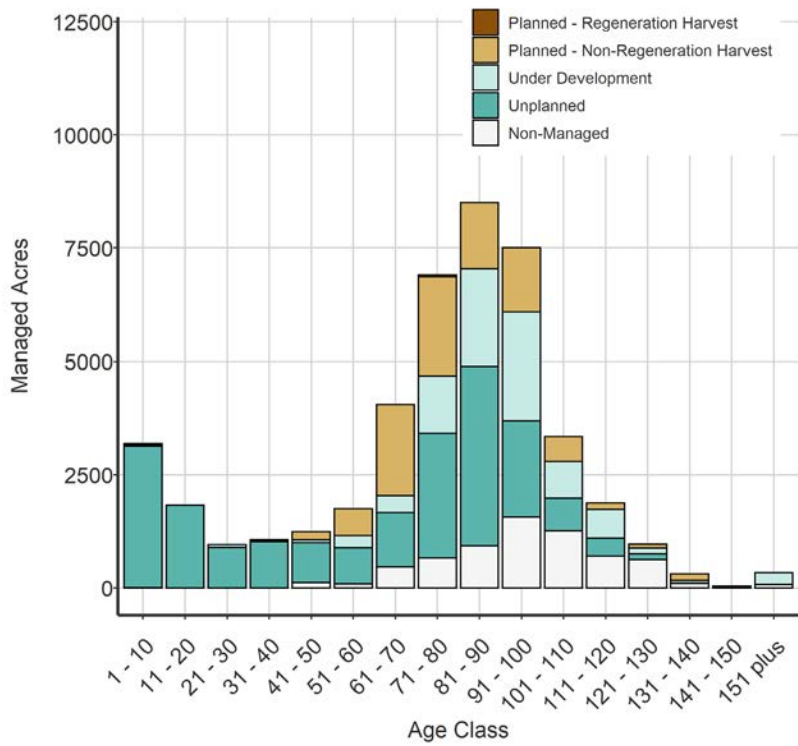
White Cedar



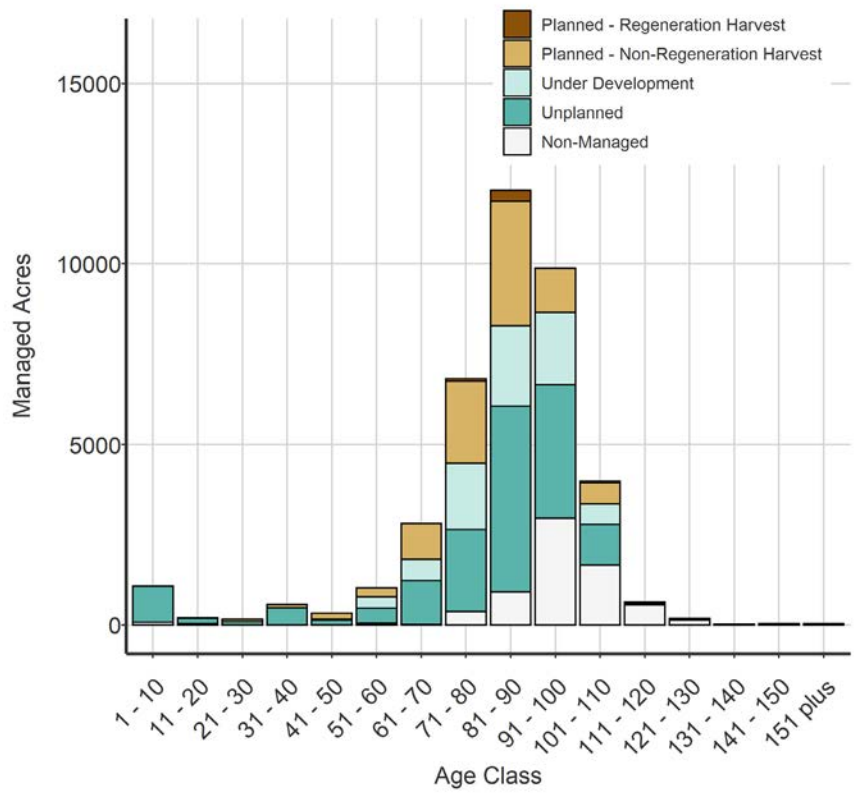
Jack Pine

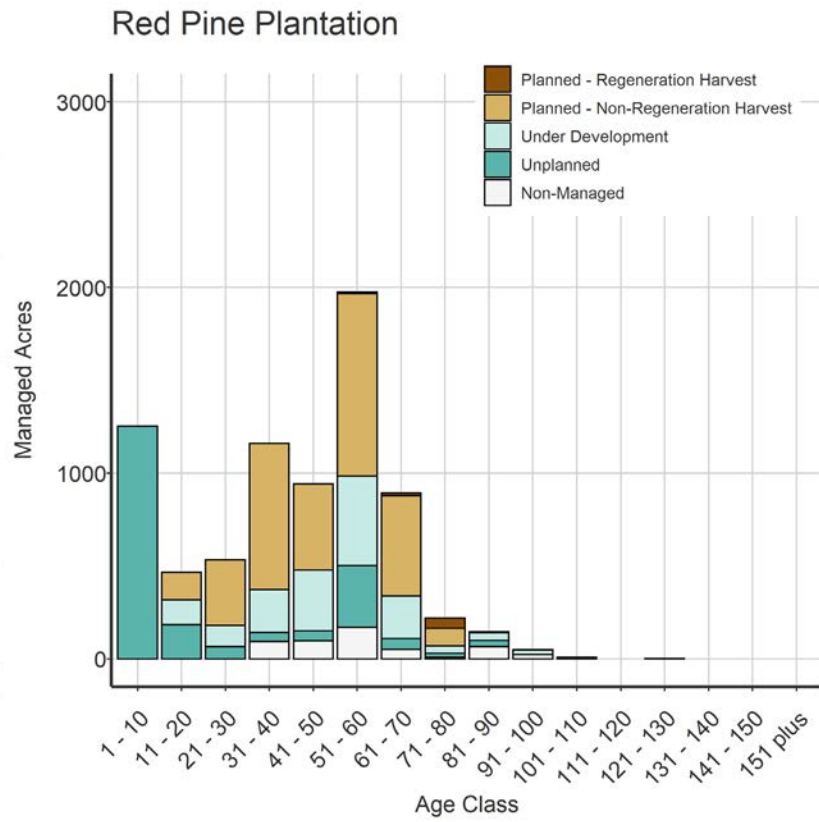
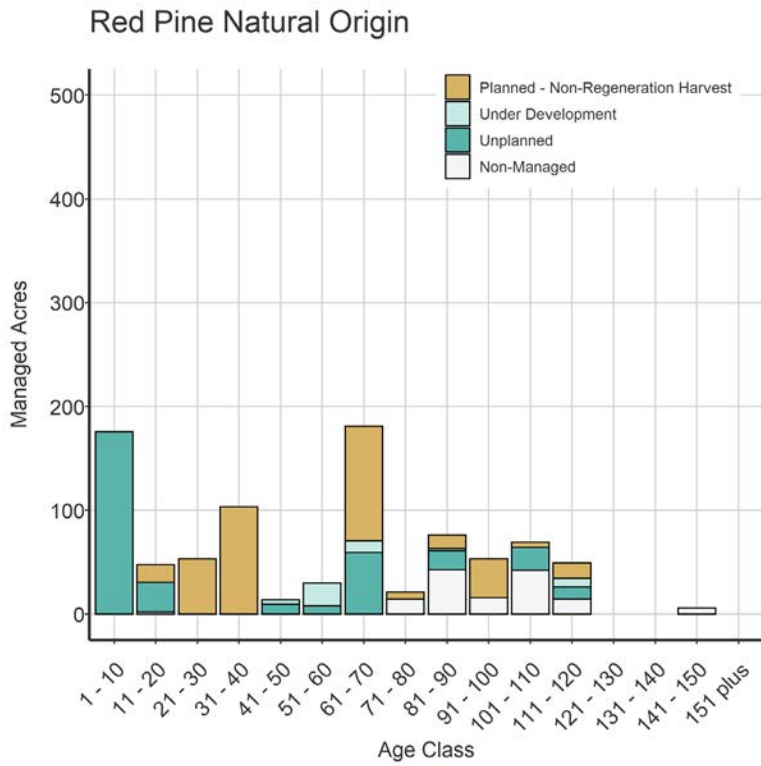


Northern Hardwoods

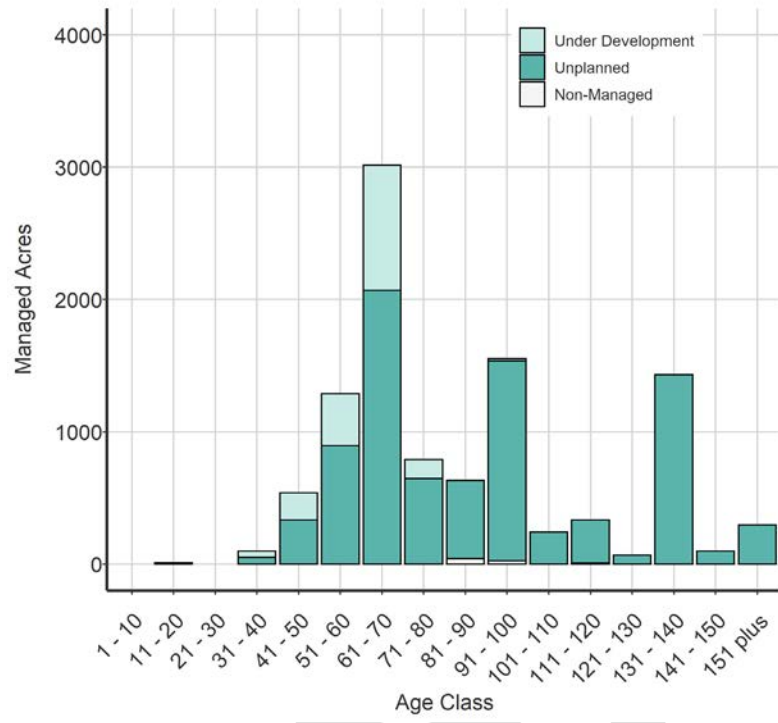


Oak

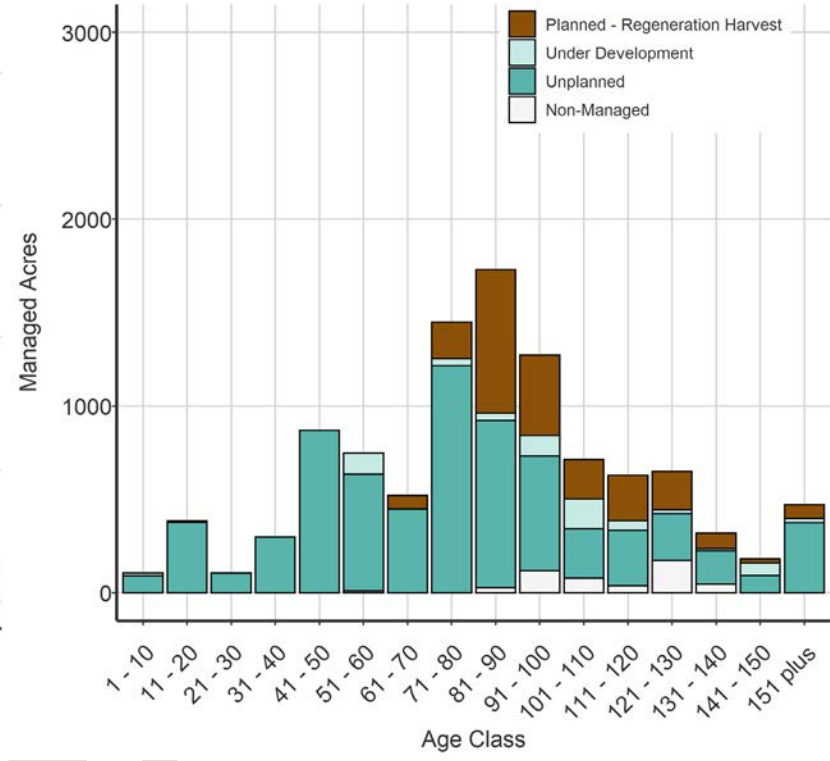




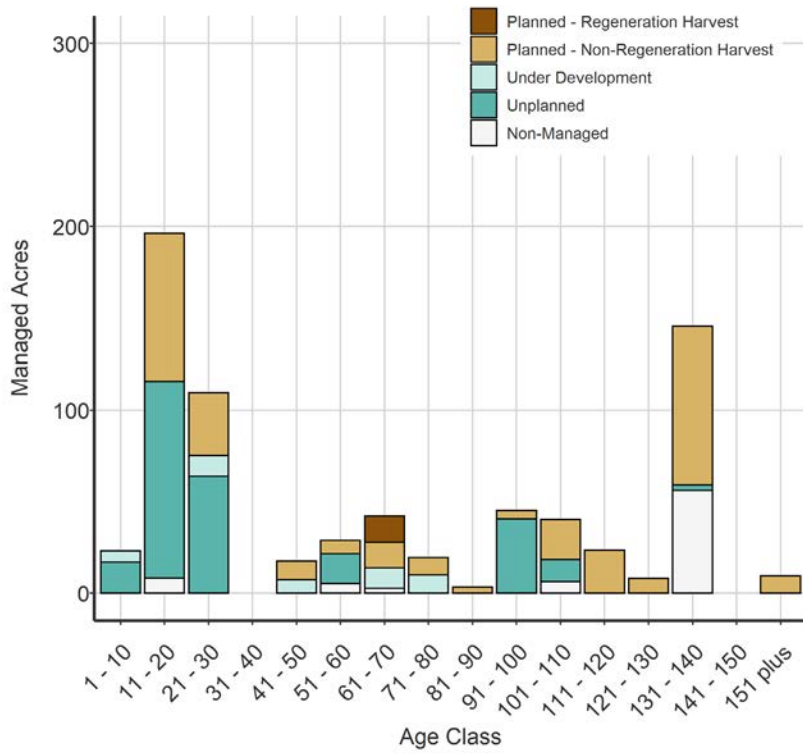
Stagnant Spruce



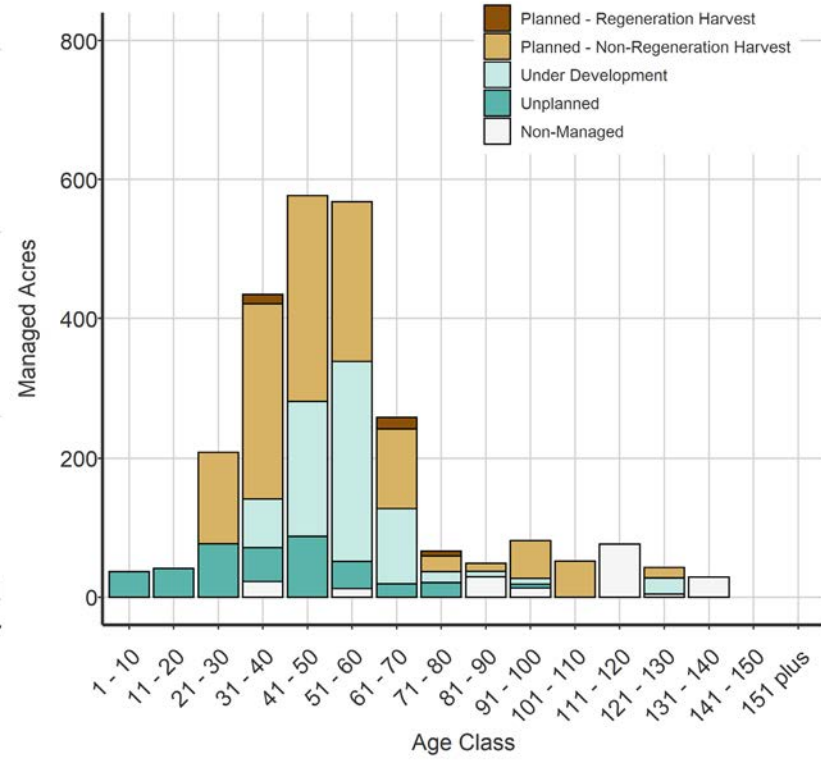
Tamarack



White Pine



White Spruce



Cover types above and below Rotation Age total and managed acres

Table 5 - Percent Forest Above and Below Rotation Age (FIM2021)

| Cover type | Percent below Rotation Age | Percent above rotation age | Percent below rotation age Managed acres | Percent above rotation age managed acres | Total stand acres | Total managed acres |
|--------------------------|----------------------------|----------------------------|--|--|-------------------|---------------------|
| Aspen/Balm-of Gilead | 66.7% | 33.3% | 75.4% | 24.6% | 120,326 | 104,034 |
| Balsam fir | 30.4% | 69.6% | 33.2% | 66.8% | 1,481 | 1,347 |
| Black spruce Upland | 17.6% | 82.2% | 17.6% | 82.2% | 46 | 46 |
| Jack pine | 29.7% | 70.2% | 80.9% | 19.2% | 2,999 | 1,028 |
| Lowland Black spruce | 71.8% | 28.2% | 72.8% | 27.2% | 49,151 | 47,251 |
| Oak | 99.9% | 0.1% | 100.0% | 0.0% | 41,771 | 34,470 |
| Red pine-Natural | 98.0% | 2.0% | 99.3% | 0.7% | 1,148 | 892 |
| Red pine-Plantation | 88.3% | 11.7% | 87.9% | 12.1% | 3,226 | 3,028 |
| Tamarack | 43.1% | 56.9% | 45.0% | 55.0% | 10,583 | 10,047 |
| White pine-Natural | 28.9% | 71.1% | 62.7% | 37.4% | 638 | 280 |
| White pine-Plantation | 84.5% | 15.2% | 87.9% | 15.9% | 176 | 169 |
| White spruce-Natural | 33.4% | 66.6% | 39.8% | 60.2% | 597 | 500 |
| White spruce Plantations | 69.3% | 30.7% | 70.9% | 29.1% | 1,753 | 1,703 |
| Birch | 50.1% | 49.9% | 53.9% | 46.1% | 6,941 | 6,433 |

- % cover types over our normal rotation age or comparison with past SFRMP benchmarks (even if the units these were developed for don't map to our Sections, the benchmarks were listed as a % of area over rotation age, so we could apply them by subsection)
- Data from October 2021
- The rotation age used for the above table is the Standard Rotation age and does not account for any site-specific differences in rotation age.

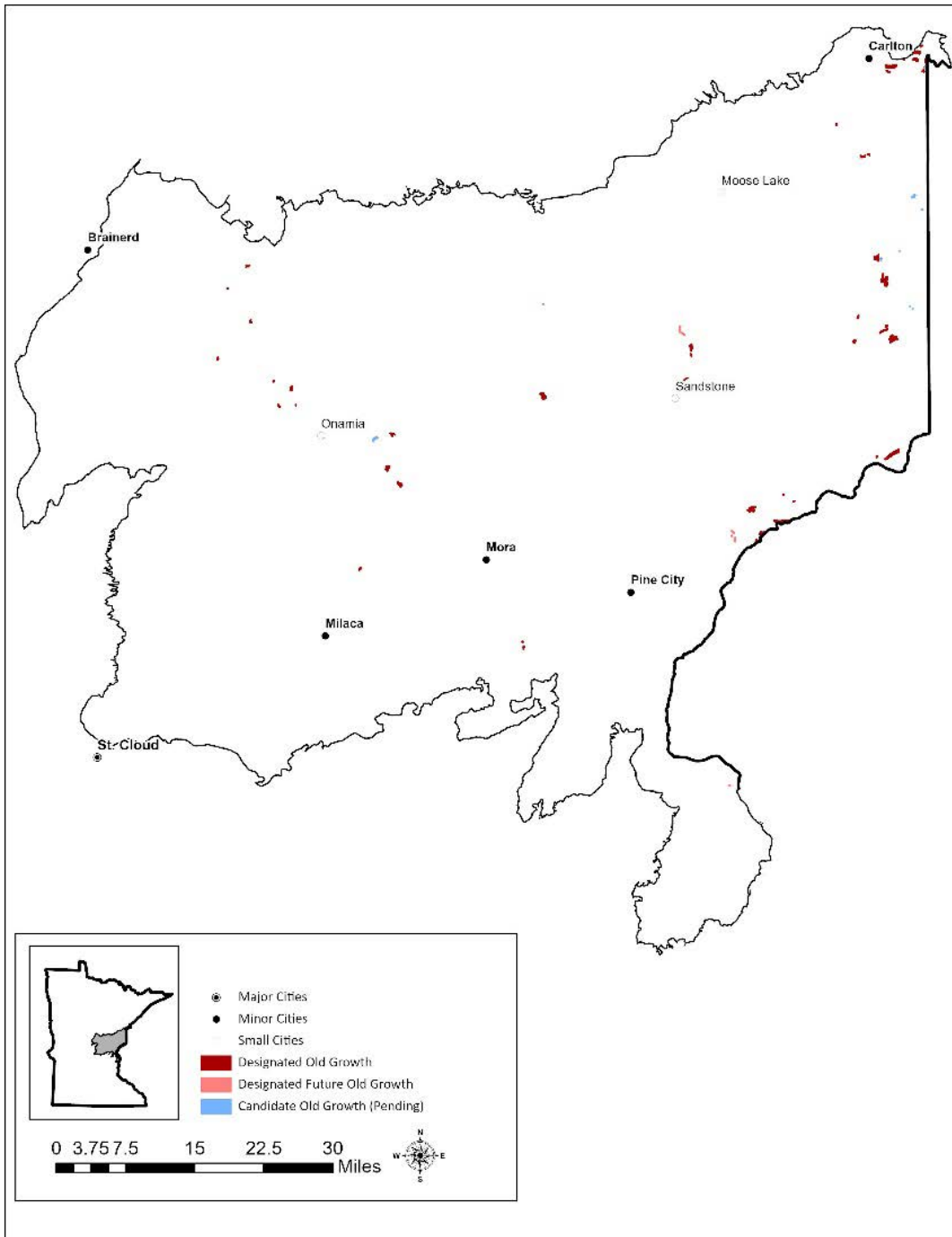
Old-growth forests

Old-growth forest represents the latter stages of succession in forested ecosystems. Remaining old-growth forests provide scientific and educational values and habitat for native plants and wildlife. Because old-growth ecosystems developed for a long time without large-scale disturbance, the study of plants, animals, soils, and ecosystem processes in old-growth stands provides important insights into the function of forest ecosystems. Such insights can inform future forest management for the maintenance of biological diversity.

Table 6 - Designated Old Growth and Future Old Growth by Forest Type

| Old Growth Cover type | Candidate Old Growth | Designated Future Old Growth | Designated Old Growth | Grand Total |
|-----------------------|----------------------|------------------------------|-----------------------|----------------|
| *Unknown | | | 214.9 | 214.9 |
| ASH | | | 587.8 | 587.8 |
| Balsam Fir | | | 10.5 | 10.5 |
| LCOG | 164 | | | 164 |
| Lowland Hardwoods | | 76.1 | 507.9 | 584 |
| Northern Hardwoods | | | 1,105.9 | 1,105.9 |
| Norway Pine | | 33.8 | 80 | 113.8 |
| Oak | | | 207.5 | 207.5 |
| Tamarack | | | 17.3 | 17.3 |
| White Pine | | 6.4 | 388.5 | 394.9 |
| White Spruce | | | 27.5 | 27.5 |
| Grand Total | 164 | 116.3 | 3,147.8 | 3,428.1 |

Table 7 - Designated and designated future old growth stands in the WSU Section.

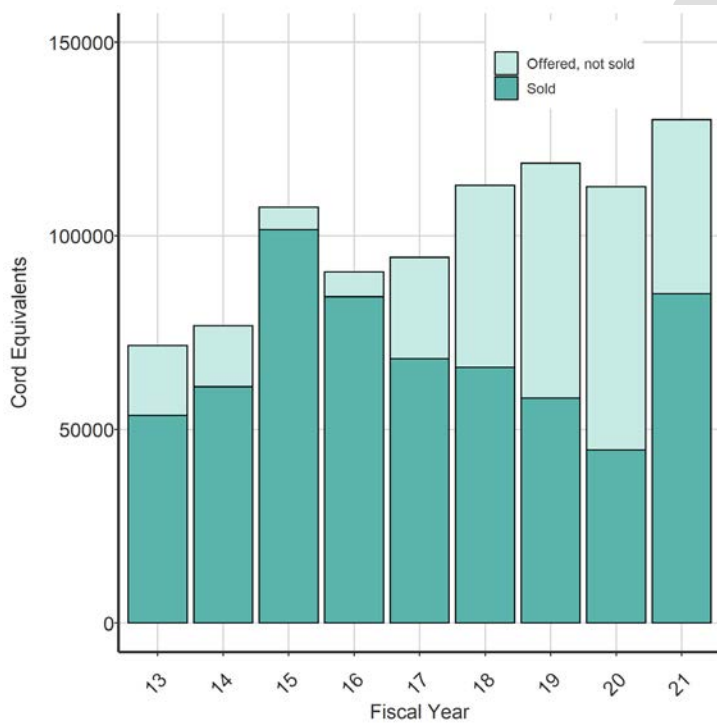


Timber sold on DNR lands in the WSU Section

On average, the DNR offered 101,723 cord equivalents and sold 69,191 cord equivalents per year in the WSU Section during fiscal years (FY) 2013-2021. More cords have been offered per year, on average, in this Section over the last four years. Except for 2019, the actual volume sold has remained steady or within the range of variation for the past nine years, but the proportion of offered volume that is sold decreased.

The proportion of volume offered that went unsold varies by species (Figures 1 to 8). Aspen and hardwoods make up the greatest proportion of the volume offered and sold in the WSU section. While the absolute volume sold has changed relatively little over time, the proportion unsold has increased as greater volume has been offered for several species groups, including aspen, hardwoods, and tamarack.

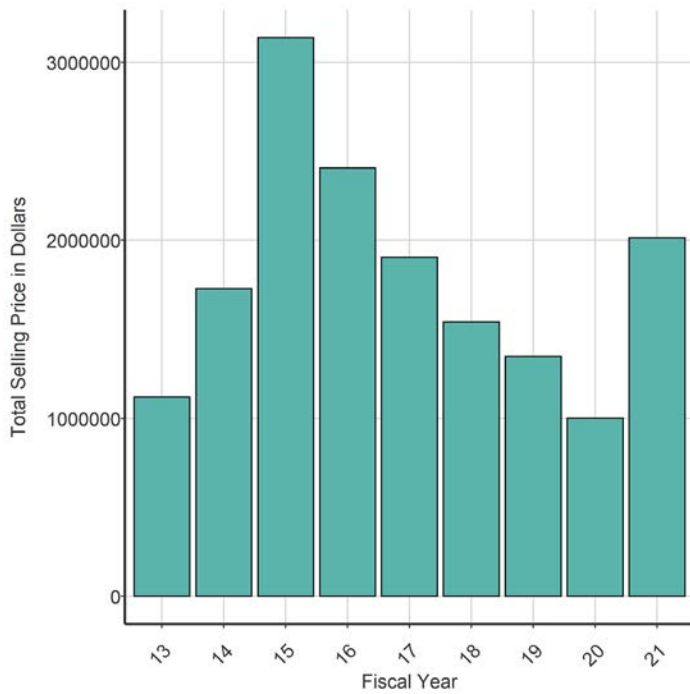
Figure 1 - Proportion of offered volume that was sold and unsold from DNR-administered lands in the WSU Section by fiscal year*



Value of timber sold from DNR lands per fiscal year in the Sections

Timber sales in the WSU Section generated \$1.8 million dollars on average per year from 2013-2020. Total sales prices per year varied from a high of 3.1 million dollars in fiscal year 2015 to a low of 1.0 million dollars in fiscal year 2020.

Figure 1 - Total selling price of cord equivalents sold in the WSU Section from DNR-administered lands by fiscal year



The proportion of offered volume that was sold and unsold by species group and fiscal year. The y-axis for each graph is set to 80,000 cords to show the relative difference in volume offered, sold, and unsold by species group over time.

Figure 2 - Aspen average volume offered and sold from DNR lands in Cord equivalents

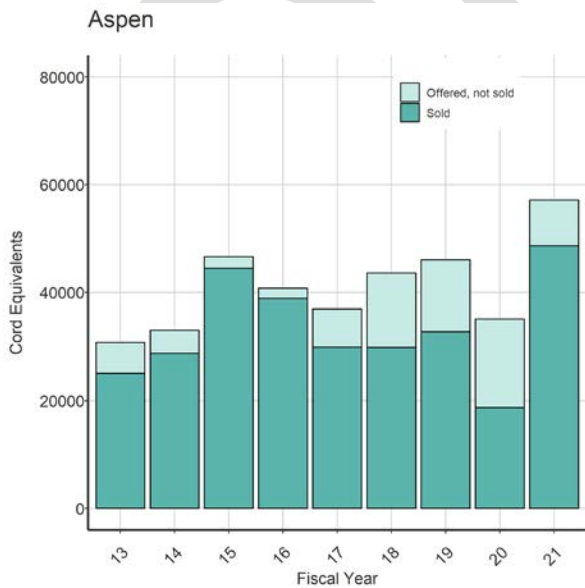


Figure 3 – Balsam fir average volume offered and sold form DNR lands in Cord equivalents

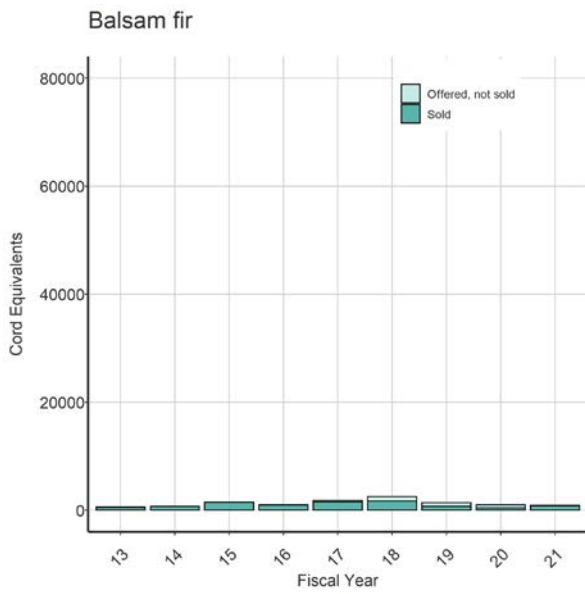


Figure 4 - Hardwoods average volume offered and sold form DNR lands in Cord equivalents

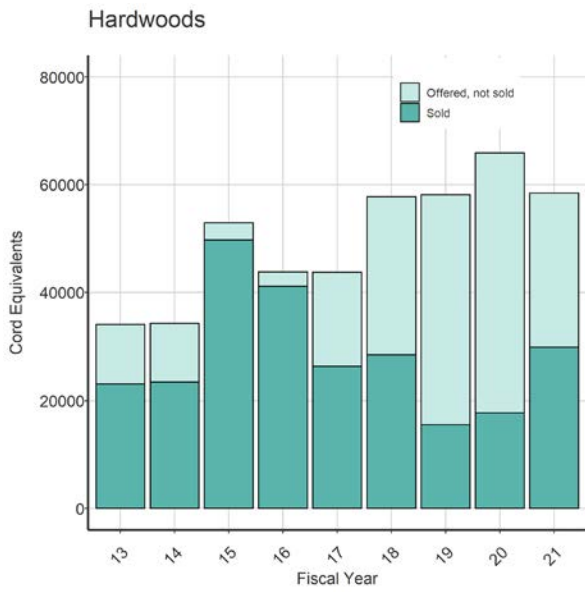


Figure 5 - Pine average volume offered and sold form DNR lands in Cord equivalents

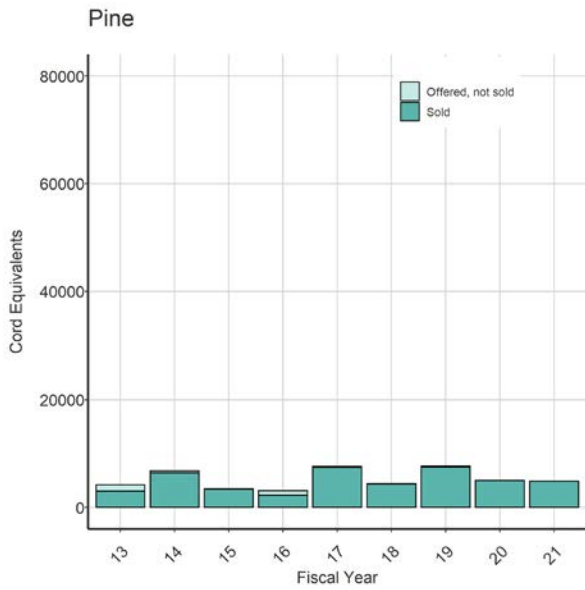


Figure 6 - Spruce average volume offered and sold form DNR lands in Cord equivalents

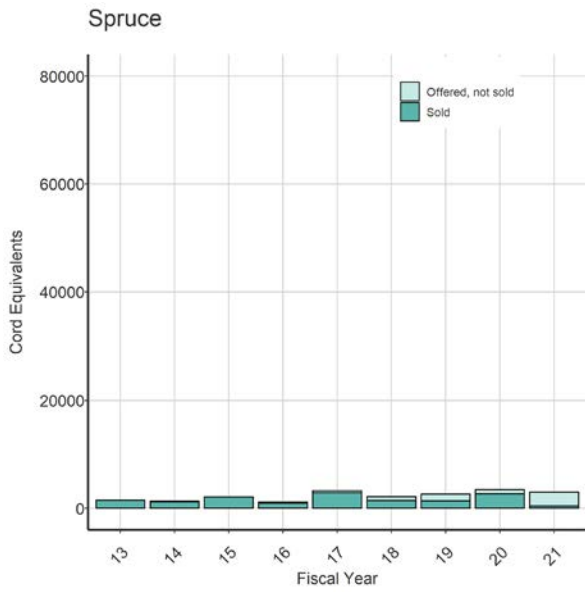
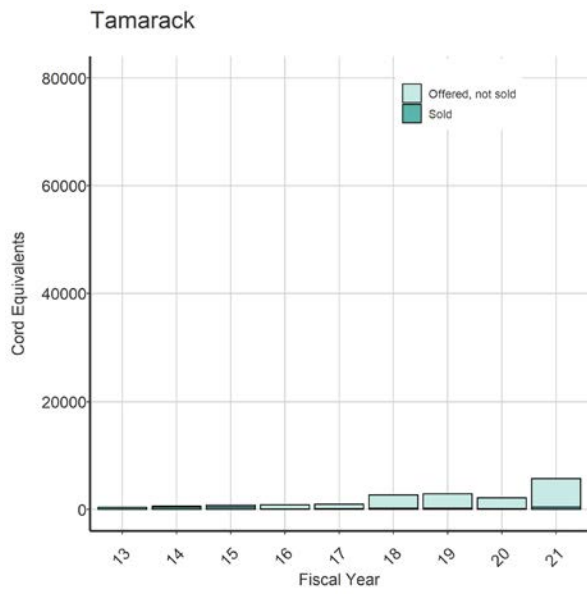


Figure 7 - Tamarack average volume offered and sold form DNR lands in Cord equivalents



DRAFT

CHAPTER 4: Resource Conditions

Ecological description of the Section

The Western Superior Uplands Planning unit comprises both the Western Superior Uplands Section and the Southern Superior Uplands Section. They are both considered in this assessment and referred to when discussing the Western Superior Uplands Section.

The Western Superior Uplands Section (WSU) is a large region of non-calcareous till deposited by glacial ice that advanced southward from the Lake Superior Basin. Most of this till is deposited in level to undulating ground moraines or in drumlins. These landforms are coarse-textured near the southwestern edge of the WSU but become increasingly clayey to the northeast because of later, less extensive advances of glacial ice that incorporated clayey sediments from Glacial Lake Duluth with the glacial till. The areas of coarser drift are occupied by forests dominated by northern red oak, while areas of clayey till have forests of sugar maple, aspen, and birch. Sandy terraces along the St. Croix River and small sand plains in other parts of the Section have fire-dependent woodlands or forests of jack pine, bur oak, northern pin oak, and aspen. Fire-dependent pine, oak, and aspen forests are also present occasionally with mesic hardwood forests on coarse till and drumlins. Peatlands and other wetland communities are present mostly as inclusions within the broad areas of hardwood forest. (Source: [DNR Western Superior Upland Section](#))

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. The two subsections that comprise the WSU Section are the Glacial Lake Superior Plain ([DNR Glacial Lake Superior Plain](#)) and Mille Lacs Uplands Subsection ([DNR Mille Lacs Uplands](#)). These subsection-specific websites provide additional ecological information, which is applied during much of the land management planning within the subsections.

Insects and diseases of WSU, MDLP, and MIM

| Pest or disease | West. Sup. Uplands (WSU) |
|-----------------------------|--------------------------|
| Eastern larch beetle | x |
| Emerald ash borer | x |
| Jack pine budworm | x |
| Larch casebearer | x |
| Spruce budworm | x |
| Two-lined chestnut borer | x |
| Eastern dwarf mistletoe | x |
| Heterobasidion root disease | Potential |
| Oak wilt | x |

Eastern larch beetle

Eastern larch beetle is native to Minnesota and usually attacks weakened tamarack. Since 2001, beetle populations have been at record levels and have caused mortality of healthy tamaracks larger than four inches in diameter. There has been an upward trend of damaged acres since the beginning of the outbreak. Since then, about 666,000 acres, or almost 50 percent of tamarack in the state, have been impacted to some degree by the eastern larch beetle. This trend is likely to continue – climate change has lengthened the growing season, which has, in turn, increased reproductive success and allowed the beetle population to increase more quickly than in the past.

Emerald ash borer

Emerald ash borer was discovered in North America in 2002. By 2009 it had made its way to Minnesota. Emerald ash borer attacks white, green, and black ash and is predicted to infest and kill nearly all ash in a matter of time.

Whether due to efforts at removing infested trees, reducing firewood movement, or cold temperatures in the north, emerald ash borer has spread more slowly in Minnesota than in many other infested states. It is spreading mostly in southeast Minnesota, but the population in the Duluth area could easily work its way into large black ash swamps. The water table in black ash stands will rise after EAB has killed the majority of black ash trees, making tree regeneration of any species extremely challenging. Forest managers are encouraged to plant a diversity of tree species and to harvest black ash to remove it from the landscape and perhaps help to slow the spread of emerald ash borer.

Jack pine budworm

Jack pine budworm is a native Minnesota insect that primarily feeds on jack pine but won't hesitate to feed on white or red pine if they are present in a jack pine stand. Populations of jack pine budworm are generally found in the central to northwestern part of the state. Outbreaks in the northwest are typically cyclical, occurring roughly every ten years. The next large outbreak is expected between 2023 and 2025.

Larch casebearer

Larch casebearer is a non-native moth whose caterpillar feeds on tamarack needles and can cause defoliation when populations are high. Mortality from defoliation has not been recorded in the state, but it is a possibility. Research has shown that defoliation by larch casebearer is associated with increased mortality from eastern larch beetle.

Spruce budworm

Spruce budworm is a native caterpillar that prefers to feed on balsam fir but readily feeds on white spruce. This needle-feeding caterpillar has been recorded defoliating many acres of forests in various areas in the Arrowhead Region every year since at least 1954. Since then, there has been a consistent population of spruce budworm in the Arrowhead Region. Spruce budworm typically feeds in a given zone for about eight years, which is the maximum period of time in which balsam fir can sustain defoliation before it dies. The budworm population then moves to a different zone in northeast Minnesota. Overall, the average size of the area impacted by spruce budworm since 2000 has been about 100,000 acres.

Twolined chestnut borer

Twolined chestnut borer is a native beetle that feeds on the inner bark of stressed oak trees. It can cause widespread dieback and mortality of oaks after serious droughts, wind storms, or intense and repeated defoliation events. Mortality from twolined chestnut borer can occur from one to three years after infestation. Symptoms can resemble those of oak wilt; a distinctive difference is that dead leaves will stay on oak trees suffering from twolined chestnut borer, but oak leaves will rapidly fall off an oak infected with oak wilt. This is especially true with red oak.

Heterobasidion root disease

Heterobasidion root disease was found on one occasion in Minnesota, in a red pine plantation in Winona County, where it was subsequently eradicated. It is found widely in Wisconsin, so forest managers need to be aware of the potential of Heterobasidion root disease to be discovered again in Minnesota, where it could have devastating consequences if left untreated.

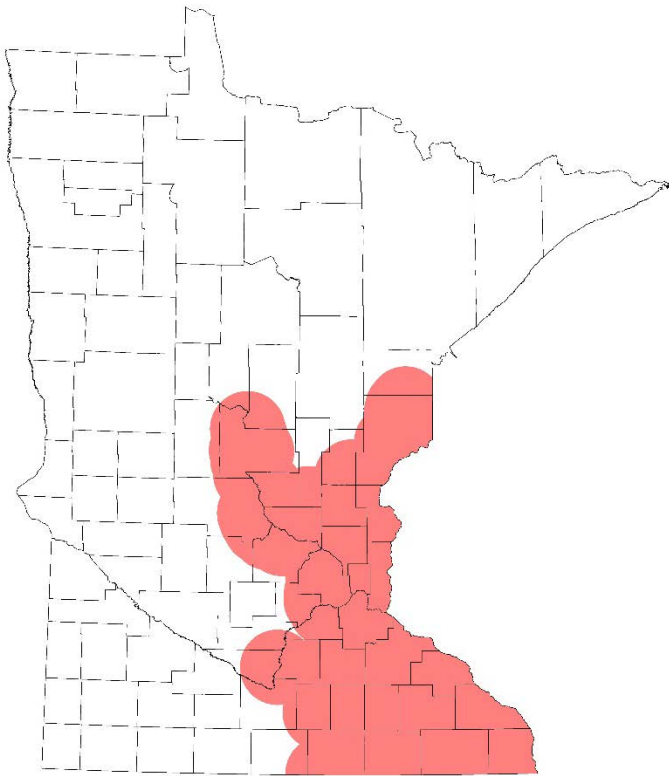
Eastern dwarf mistletoe

The most significant tree health problem on black spruce in Minnesota is eastern dwarf mistletoe. Eastern dwarf mistletoe is a parasitic plant that causes abnormal growths called witches'-brooms, dense areas of host branch, and foliage proliferation that feed the parasite and rob the host plant of nutrients. Eastern dwarf mistletoe is distributed throughout Minnesota. It frequently kills its black spruce host. Mortality centers caused by eastern dwarf mistletoe in black spruce stands develop where all or most black spruce die, and throughout the course of a stand's lifetime, these mortality centers can become as large as 20 acres. Besides mortality, eastern dwarf mistletoe reduces growth, timber quality, seed production, and seedling or sapling survival.

Oak wilt

Oak wilt can infect and kill all species of oak, but those in the red oak group die about two months after infection. Oak wilt is widespread in the southern half of Minnesota and covers about one-third of the area where most Minnesota oaks grow (see map below). It continues to expand its range northward, and in 2021 was discovered in Crow Wing County for the first time.

Map 8 - Oak Wilt Distribution



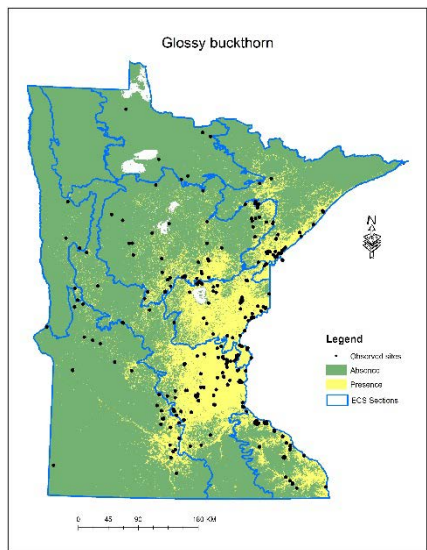
Invasive Species

Invasive species are species that are not native to Minnesota that cause economic or environmental harm or harm to human health or threaten natural resources or the use of natural resources in the state (Minnesota Statutes [84D.01](#)). Division of Forestry (DoF) manages invasive plants when they impact

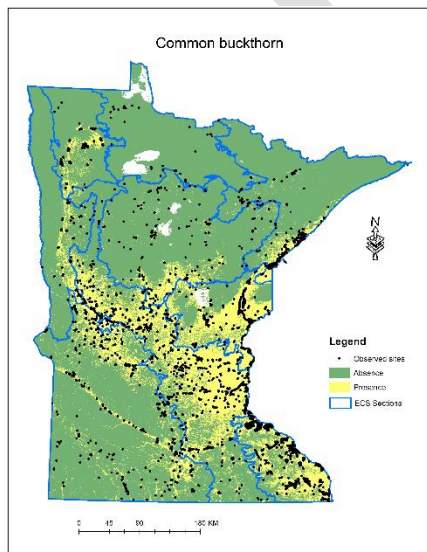
reforestation, wildlife habitat, recreation, and other values. Additionally, as landowners, DNR is required by law to eradicate or prevent the reproduction of certain invasive plants that are listed on the state [Noxious Weed list](#) (eradicate and control lists, respectively) wherever they are found on DNR property.

Common and Glossy Buckthorn

Map 9 - Distribution of Glossy Buckthorn in MN



Map 10 - Distribution of Common Buckthorn in MN

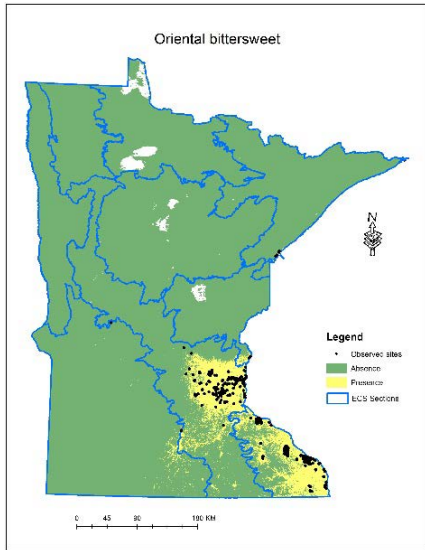


Common and glossy buckthorn are some of the most prevalent woody invasive plants in Minnesota. They grow in dense thickets, degrade habitat, and negatively impact tree regeneration. It is expensive to manage buckthorn once it is established, so management by DoF is typically focused on stands listed for

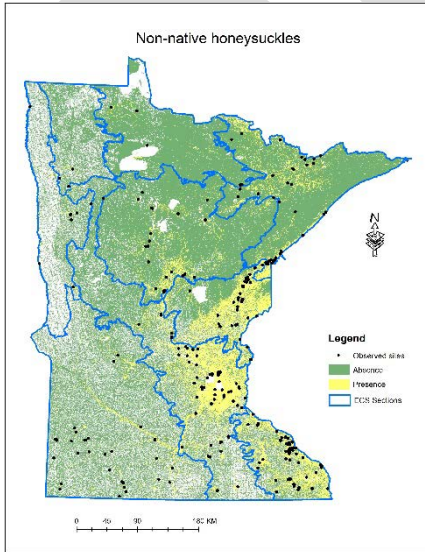
harvest in areas of dense buckthorn (because opening up the canopy can allow buckthorn to flourish and outcompete desirable tree seedlings). However, along the edges of buckthorn distribution, DoF treats scattered stems and isolated patches of buckthorn to prevent it from spreading and becoming a larger, more expensive problem locally. While buckthorn is widespread across much of the WSU section, there are still areas where it is found in scattered, isolated populations.

Woody Shrubs

Map 11 - Distribution of Oriental Bittersweet in MN

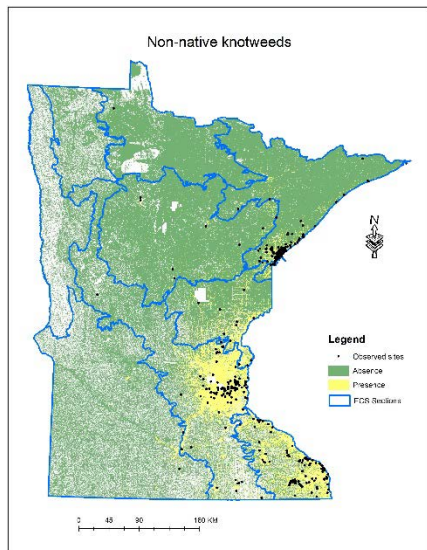


Map 12 - Distribution of Non-Native Honeysuckles in MN



Siberian peashrub, non-native bush honeysuckle, and invasive barberries are other woody shrubs that are found growing densely in scattered, isolated populations, especially in the eastern areas of the WSU section. These species are not nearly as widespread as the buckthorns, but they are species of concern to DoF and can cause issues and require management in some locations.

Map 13 - Distribution of Non-native Knotweeds in MN



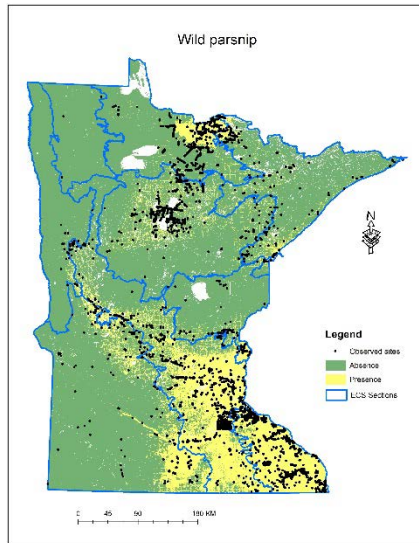
Potential Issues

Some invasive plants are not widespread in the section but could become a major issue if they are allowed to spread and establish. Oriental bittersweet is not currently present in the WSU but has the potential to spread much more widely across Minnesota if populations in southeastern Minnesota are not contained. This woody vine grows up trees and can smother them and even pull them down. It is very costly to control.

Non-native knotweeds (giant, Japanese, and Bohemian knotweeds) are also of concern in the WSU section. This bamboo-like plant forms dense stands and is very difficult and expensive to control. Multiple years of herbicide treatments are required, as the plant can resprout from even small pieces of cut stem. There are many known populations surrounding Duluth (just outside the WSU), as well as smaller cities and towns in the section. Knotweeds were planted in people's yards as ornamental plants and have since spread into nearby natural areas.

Noxious Weeds

Map 14 - Distribution of Wild Parsnip in MN



Herbaceous invasive plants, including wild parsnip, spotted knapweed, and common tansy, are prevalent in various parts of the WSU section. Wild parsnip is present in scattered locations along the southern edge of the WSU, while spotted knapweed populations are concentrated more in the eastern area of the section. Common tansy can be found across the WSU section, although it is most common in the northern part of the section. DNR is required by the Noxious Weed Law to prevent reproduction and control the spread of all three of these species, so DoF regularly mows and sprays herbicide along forest roads where these species proliferate. Wild parsnip is also a health hazard (its sap burns people's skin when exposed to sunlight), so management of this species is especially important along trails and recreation areas. Current DoF practices also focus on preventing the spread of seeds from these species to other areas of the state through permit and contract language requiring vendors to arrive with clean equipment as well as PlayCleanGo outreach campaigns to the public to encourage cleaning footwear and gear of mud, seeds, and plant parts before heading to a new recreation location.

More invasive plant populations keep being discovered, so in general, this issue appears to be getting worse. We also are aware of more populations of problematic invasive plants on DoF-administered lands than we have available funds and personnel or contractors to manage. Invasive species do not respect property boundaries, so working with neighboring landowners (private and public) and finding ways to fund management on lands adjacent to DNR forest lands is important to successful invasive plant management across the landscape.

Native plant communities

A native plant community (NPC) is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes. Examples of natural disturbances include wildfires, severe droughts, windstorms, and floods.

Following is a list of the native plant community classes, types, and subtypes known to occur in the WSU Section (Table 6.9.1). Both the codes and their associated names are provided. Much more detailed information about each plant community in this section, including distribution maps, can be found in the Field Guide to the Native Plant Communities of Minnesota series of publications. These field guides are available through the Minnesota Bookstore at [Minnesota Bookstore](#). Additional information on Minnesota's native plant communities can be found online at [Minnesota's Native Plant Communities](#).

Map 15 - Native Plant Community Classes, Types, and Subtypes Documented in the WSU Section with their Associated Conservation Rank

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|--|----------------|-----------------------------|--------------------|---|--------------------------------|
| Northern Spruce Bog | APn80 | | X | (S4) (G4G5, G5, G4G5 or G5) | 33 |
| Black Spruce Bog | APn80a | | X | S4, G4G5 or G5 | 15 |
| Black Spruce Bog, Treed Subtype | APn80a1 | x | X | S4, G5 | 3 |
| Black Spruce Bog, Semi-Treed Subtype | APn80a2 | | X | S4, G4G5 | 9 |
| Northern Poor Conifer Swamp | APn81 | | X | (S4, S5) (G5) | 380 |
| Poor Black Spruce Swamp | APn81a | | X | S5, G5 | 196 |
| Poor Tamarack - Black Spruce Swamp | APn81b | | X | S4, G5 | 89 |
| Poor Tamarack - Black Spruce Swamp, Black Spruce Subtype | APn81b1 | | X | S4, G5 | 3 |
| Poor Tamarack - Black Spruce Swamp, Tamarack Subtype | APn81b2 | | X | S4, G5 | 62 |
| Northern Open Bog | APn90 | | x | "(S2, S4, S4S5), (G2? or G4G5, G2?, G4G5, G5) | 40 |

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|--|-----------------------|------------------------------------|---------------------------|--|---------------------------------------|
| Low Shrub Bog | APn90a | | X | S4 S5, G5 | 4 |
| Graminoid Bog | APn90b | | X | S2 or S4G2? or G4G5 | 1 |
| Northern Poor Fen | APn91 | | X | (S3, S4, S5), (G3G4, G4G5 or G5, GNR) | 295 |
| Low Shrub Poor Fen | APn91a | | x | S5, G4G5 or G5 | 252 |
| Graminoid Poor Fen (Basin) | APn91b | | x | S3, G3G4 | 42 |
| Graminoid Poor Fen (Water Track) | APn91c | | x | S3 or S4, GNR | 2 |
| Central Dry Pine Woodland | FDc23 | | X | (S1S2), (G2) | 3 |
| Central Dry Oak-Aspen (Pine) Woodland | FDc25 | | X | (S2), (G4?, G4G5) | 139 |
| Jack Pine - Oak Woodland | FDc25a | | X | S2, G4G5 | 116 |
| Oak - Aspen Woodland | FDc25b | | X | S2, G4? | 253 |
| Central Dry-Mesic Pine-Hardwood Forest | FDc34 | | X | (S2, S3), (G3 or G4, G4?) | 91 |
| Red Pine - White Pine Forest | FDc34a | | X | S2, G3 or G4 | 3 |
| Oak - Aspen Forest | FDc34b | | X | S3, G4? | 2 |
| Northern Dry-Bedrock Pine (Oak) Woodland | FDn22 | | X | (S2, S3), (G4?, GNR) | 4 |
| Red Pine - White Pine Woodland (Eastcentral Bedrock) | FDn22d | x | X | S2, G4? | 74 |
| Red Pine - White Pine Woodland | FDn33a | | x | S3, G4? | 7 |
| Red Pine - White Pine Woodland, Balsam Fir Subtype | FDn33a1 | x | | S3, G4? | 1 |
| Red Pine - White Pine Woodland, Mountain Maple Subtype | FDn33a2 | | X | S3, G4? | 1 |
| Aspen - Birch Woodland | FDn33b | x | | S5, GNR | 2 |
| Northern Mesic Mixed Forest | FDn43 | x | X | (S2, S3, S5), (G3G4, G4? or G5, G4, G4G5 or G5, G4? or G4G5 or G5) | 48 |

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|--|-----------------------|------------------------------------|---------------------------|--|---------------------------------------|
| White Pine - Red Pine Forest | FDn43a | | x | S2, G3G4 | 3 |
| Aspen - Birch Forest | FDn43b | x | x | S5, G4? or G4G5 or G5 | 36 |
| Aspen - Birch Forest, Balsam Fir Subtype | FDn43b1 | | x | S5, G4G5 or G5 | 6 |
| Aspen - Birch Forest, Hardwood Subtype | FDn43b2 | | x | S5, G4? or G5 | 2 |
| Upland White Cedar Forest | FDn43c | x | | S3, G4 | 2 |
| Southern Dry-Mesic Oak (Maple) Woodland | FDs37 | | x | (S3, S4), (G3G4, G4?) | 10 |
| Oak - (Red Maple) Woodland | FDs37a | | x | S4, G3G4 | 14 |
| Pin Oak - Bur Oak Woodland | FDs37b | | x | S3, G4? | 4 |
| Northern Terrace Forest | FFn57 | | x | (S3), (GNR) | 15 |
| Black Ash - Silver Maple Terrace Forest | FFn57a | x | x | S3, GNR | 111 |
| Northern Floodplain Forest | FFn67 | | x | (S3), (GNR) | 13 |
| Silver Maple - (Sensitive Fern) Floodplain Forest | FFn67a | | x | S3, GNR | 43 |
| Silver Maple - Green Ash - Cottonwood Terrace Forest | FFs59a | | x | S3, G4? | 23 |
| Silver Maple - (Virginia Creeper) Floodplain Forest | FFs68a | | x | S3, G3G4 | 8 |
| Northern Rich Spruce Swamp (Basin) | FPn62 | | x | (S3), (G5) | 2 |
| Northern Cedar Swamp | FPn63 | | x | (S3, S4), (G4) | 1 |
| White Cedar Swamp (Northeastern) | FPn63a | x | | S4, G4 | 3 |
| Northern Rich Tamarack Swamp (Eastern Basin) | FPn72 | | x | (S3), (G4) | 231 |
| Rich Tamarack Swamp (Eastcentral) | FPn72a | | x | S3, G4 | 247 |
| Northern Rich Alder Swamp | FPn73 | X | x | (S5), (G5) | 339 |
| Alder - (Maple - Loosestrife) Swamp | FPn73a | x | x | S5, G5 | 371 |

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|---|-----------------------|------------------------------------|---------------------------|--|---------------------------------------|
| Northern Rich Tamarack Swamp (Western Basin) | FPn82 | | x | (S4, S5), (G4) | 63 |
| Rich Tamarack - (Alder) Swamp | FPn82a | | x | S5, G4 | 1 |
| Extremely Rich Tamarack Swamp | FPn82b | | x | S4, G4 | 8 |
| Southern Rich Conifer Swamp | FPs63 | | x | (S2S3), (G2G3 or G3G4) | 2 |
| Tamarack Swamp (Southern) | FPs63a | | x | S2S3, G2G3 or G3G4 | 37 |
| Central Dry-Mesic Oak-Aspen Forest | MHc26 | | x | (S4), (G4G5, GNR) | 965 |
| Oak - Aspen - Red Maple Forest | MHc26a | | x | S4, GNR | 63 |
| Red Oak - Sugar Maple - Basswood - (Large-Flowered Trillium) Forest | MHc26b | | x | S4, G4G5 | 84 |
| Central Mesic Hardwood Forest (Eastern) | MHc36 | | x | (S4), (G3G4) | 717 |
| Red Oak - Basswood Forest (Noncalcareous Till) | MHc36a | | x | S4, G3G4 | 827 |
| Red Oak - Basswood Forest (Calcareous Till) | MHc36b | | x | S4, G3G4 | 36 |
| Aspen - (Sugar Maple - Basswood) Forest | MHc37a | | x | S4, G3G4 | 3 |
| Sugar Maple - Basswood - (Aspen) Forest | MHc37b | | x | S4, G3G4 | 1 |
| Central Wet-Mesic Hardwood Forest | MHc47 | | x | (S3), (G3G4) | 146 |
| Basswood - Black Ash Forest | MHc47a | | x | S3, G3G4 | 563 |
| Northern Mesic Hardwood Forest | MHn35 | x | x | (S4), (G5) | 512 |
| Aspen - Birch - Basswood Forest | MHn35a | x | x | S4, G5 | 170 |
| Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest | MHn35b | x | x | S4, G5 | 152 |

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|---|-----------------------|------------------------------------|---------------------------|--|---------------------------------------|
| Northern Wet-Mesic Boreal Hardwood-Conifer Forest | MHn44 | x | x | (S2, S3, S3S4, S4), (G5, GNR) | 290 |
| Aspen - Birch - Red Maple Forest | MHn44a | x | x | S4, G5 | 146 |
| White Pine - White Spruce - Paper Birch Forest | MHn44b | x | x | S2, GNR | 97 |
| Aspen - Fir Forest | MHn44c | X | | S3, S4G5 | 68 |
| Northern Wet-Mesic Hardwood Forest | MHn46 | X | x | (S4), (GNR) | 295 |
| Aspen - Ash Forest | MHn46a | X | x | S4, GNR | 260 |
| Black Ash - Basswood Forest | MHn46b | x | x | S4, GNR | 285 |
| Northern Rich Mesic Hardwood Forest | MHn47 | | x | (S3), (G3?) | 80 |
| Sugar Maple - Basswood - (Bluebead Lily) Forest | MHn47a | x | x | S3, G3? | 57 |
| Sugar Maple - Basswood - (Horsetail) Forest | MHn47b | | x | S3, G3? | 3 |
| Southern Dry-Mesic Oak Forest | MHs37 | | x | (S3, S4), (G4?) | 1 |
| Red Oak - White Oak - (Sugar Maple) Forest | MHs37b | | x | S4, G4? | 7 |
| Southern Mesic Oak-Basswood Forest | MHs38 | | x | (S3), (G2G3 or GNR, G3, G4?) | 1 |
| White Pine - Oak - Sugar Maple Forest | MHs38a | | x | S3, G2G3 or GNR | 4 |
| Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest | MHs38c | | x | S3, G4? | 20 |
| Sugar Maple Forest (Big Woods) | MHs39c | | x | S2, G3G4 | 2 |
| Southern Wet-Mesic Hardwood Forest | MHs49 | | x | (S2, S3), (G3G4) | 1 |
| Dry Sand - Gravel Prairie (Southern) | UPs13b | | x | S2, G2G3 or G3 | 2 |
| Dry Barrens Oak Savanna (Southern), Jack Pine Subtype | UPs14a1 | | x | S1, G3 | 6 |

| Native Plant Community Name | Community Code | Glacial Lake Superior Plain | Mille Lacs Uplands | Conservation Status Rank ¹ | # of Observations ₂ |
|---|-----------------------|------------------------------------|---------------------------|--|---------------------------------------|
| Dry Barrens Oak Savanna (Southern), Oak Subtype | UPs14a2 | | x | S1S2, G2 or G3 | 4 |
| Dry Sand - Gravel Oak Savanna (Southern) | UPs14b | | x | S1S2, G3 | 8 |
| Mesic Prairie (Southern) | UPs23a | | x | S2, G1G2 or G2G3 | 1 |
| Mesic Oak Savanna (Southern) | UPs24a | | x | S1, G1 or G1G2 | 2 |
| Northern Wet Cedar Forest | WFn53 | | x | (S3, S4), (GNR) | 17 |
| Lowland White Cedar Forest (North Shore) | WFn53a | x | | S4, GNR | 2 |
| Lowland White Cedar Forest (Northern) | WFn53b | | x | S3, GNR | 9 |
| Northern Wet Ash Swamp | WFn55 | x | x | (S3, S4), (G4) | 603 |
| Black Ash - Aspen - Balsam Poplar Swamp (Northeastern) | WFn55a | x | x | S4, G4 | 14 |
| Black Ash - Yellow Birch - Red Maple - Basswood Swamp (Eastcentral) | WFn55b | | x | S3, G4 | 405 |
| Black Ash - Mountain Maple Swamp (Northern) | WFn55c | | x | S4, G4 | 18 |
| Northern Very Wet Ash Swamp | WFn64 | x | x | (S4), (G4) | 359 |
| Black Ash - Conifer Swamp (Northeastern) | WFn64a | x | x | S4, G4 | 99 |
| Black Ash - Yellow Birch - Red Maple - Alder Swamp (Eastcentral) | WFn64b | | x | S4, G4 | 142 |
| Black Ash - Alder Swamp (Northern) | WFn64c | | x | S4, G4 | 12 |
| Northern Wet Alder Swamp | WFn74 | | x | (S3), (GNR) | 92 |
| Alder - (Red Currant - Meadow-Rue) Swamp | WFn74a | x | x | S3, GNR | 71 |
| Southern Wet Ash Swamp | WFn57 | | x | (S1, S1S2), (GNR) | 3 |
| Black Ash - (Red Maple) Seepage Swamp | WFn57a | | x | GNR | 55 |

¹ Conservation status ranks are assigned to NPC types and subtypes as follows:

| Native Plant Community Heritage Conservation Status Ranks (state rank: S, global rank: G) | |
|---|--|
| S1 / G1 | Critically imperiled |
| S2 / G2 | Imperiled |
| S3 / G3 | Vulnerable to extirpation |
| S4 / G4 | Apparently secure, uncommon but not rare |
| S5 / G5 | Secure, common, widespread, and abundant |

² Number of occurrences based on data collected by MN DNR and collaborators. These occurrence numbers do not reflect a community's actual abundance within this section but offer a measure of how often they have been documented during field surveys by the time of this printing. NPC classes without documented occurrences have been included when corresponding types/subtypes have been observed.

The information listed in Table 6.7.1 is currently incomplete; however, as MBS surveys are completed, additional information on NPCs within the WSU section will become available and be incorporated into management plans. For a complete list of Minnesota's native plant communities and more information on conservation status ranks, refer to [Minnesota's native plant communities - status and rankings](#).

Special Management Areas

Special management areas (SMA) are locations where alternative management is done to meet DNR policy or DNR landscape scale habitat objectives. The following table shows the number of acres within WSU that are within special management areas.

Table 8 - Special Management Area Types

| Type | Number | Acres |
|---|--------|----------|
| Representative Sample Areas (RSA) | 1 | 41.2 |
| High Conservation Valued Forests (HCVF) | 11 | 40,588.6 |
| Old Forest Management Complex (OFMC) | 5 | 3,591.6 |
| Forest Patch (PATCH) | 11 | 11,061.9 |
| Ruffed Grouse Management Area (RGMA) | 3 | 11,598.5 |

Minnesota's List of Endangered, Threatened, and Special Concern Species Purpose, Scope, and Relationships to Federal Laws

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895, [Revisor of statutes 84.0895 Protection of Threatened and Endangered Species](#)) requires the Minnesota DNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern (ETS). The resulting List of Endangered, Threatened, and Special Concern Species ([Minnesota Rare Species Guide](#)) is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also

authorizes the DNR to adopt rules that regulate the treatment of species designated as endangered and threatened. These regulations are codified as Minnesota Rules, Parts 6212.1800 to 6212.2300 ([Revisor of statutes 6212.1800 General Restrictions for permits to possess threatened and endangered species](#), [Revisor of statutes 6212.2300 Emergency Taking](#)).

Minnesota's Endangered Species Statute and the associated rules impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as endangered or threatened. A person may not take, import, transport, or sell any portion of an endangered or threatened species. However, these acts 1) may be allowed by a permit issued by the DNR, 2) exempt plants on certain agricultural lands and plants destroyed in consequence of certain agricultural practices, and 3) exempt the accidental, unknowing destruction of designated plants. Minnesota's Endangered Species Statute or the associated rules do not protect species of special concern. Persons are advised to read the full text of the statute and rules in order to understand all regulations pertaining to species that are designated as endangered, threatened, or species of special concern.

Note that the federal Endangered Species Act of 1973, as amended (16 USC 1531 _ 1544; see [U.S. Fish & Wildlife Service - Endangered Species](#)), requires the U.S. Department of the Interior to identify species as endangered or threatened according to a separate set of definitions, and imposes a separate set of restrictions for those species. Within the WSU section, there are currently six species with federal designations (northern long eared bat- threatened, rusty patched bumble bee- endangered, higgins eye pearly mussel- endangered, snuffbox mussel- endangered, spectaclecase mussel- endangered, winged maple leaf mussel- endangered.)

Minnesota Natural Heritage Information System

Records of known locations of listed species and other rare features are maintained in the Minnesota Natural Heritage Information System (NHIS). All DNR offices have this information available for review prior to forest management activities to determine if a known location of a rare species is in the vicinity of a stand. When reviewing forest stands for management activities during the planning process, this information will be available when assigning stand prescriptions. If an ETS species is known to exist or found on a site, management activities are modified to protect, promote, or enhance the ETS species on the site.

Survey Methods

Much of the information about rare features in the Minnesota Natural Heritage Information System is the result of rare features survey work done since the 1970s. While survey processes and protocols for plants, animals, and other features are necessarily different in some ways, methods common to both include:

- Review of existing information;
- Selection of targeted species and survey sites;
- Field survey using techniques appropriate to the species; and,

- Information management.

A more detailed description of rare plant and animal survey procedures can be found on the MBS page of the MN DNR website at [Minnesota Biological Survey](#).

Minnesota Listed Species

The rare feature products prepared for the WSU section plan include information on species of plants and animals listed as endangered, threatened, and special concern. *Minnesota's List of Endangered, Threatened, and Special Concern Species* was created in 1984 and was last revised in 2013. The list, created under Minnesota's Endangered and Threatened Species Statute, draws attention to species that are at greatest risk of extinction within the state and applies special regulations to species listed as endangered or threatened. By alerting resource managers and the public to species in jeopardy, activities can be reviewed and prioritized to help preserve the diversity and abundance of Minnesota's flora and fauna.

Information on the ETS species documented within the WSU section is presented below in Tables 6.10.1 and 6.10.2. State rankings of endangered, threatened, and special concern have the following definitions.

Rank Key for Tables 6.6.1 and 6.6.2.

END – Endangered. A species is considered **endangered** if the species is threatened with extinction throughout all or a significant portion of its range within Minnesota.

THR – Threatened. A species is considered **threatened** if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range within Minnesota.

SPC – Special Concern. A species is considered a **species of special concern** if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range not listed as threatened may be included in this category, along with those species that were once threatened or endangered but now have increasing or protected, stable populations.

Additional information on the conservation status ranks (S-rank, G-rank) used in Tables 6.3 and 6.4 can be found online at [NatureServe Conservation Status](#).

The following information on Minnesota's ETS species is legally protected. Copyright (2014) State of Minnesota, Department of Natural Resources. Rare features data included here were current as of September 2013. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present. In addition, there may be inaccuracies in the data, of which the DNR is not aware and shall not be held

responsible. Permission to use these data does not imply endorsement or approval by the DNR of any interpretations or products derived from the data.

Table 9 - Minnesota Listed Species in the WSU section

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|--|-----------------------------|---------------------|---------------------|---------------|----------------|
| Rubus stipulatus | A Bristle-berry | Vascular Plant | END | S1 | G4 |
| Rubus fulleri | a bristle-berry | Vascular Plant | THR | S2 | G4?Q |
| Limnephilus secludens | A Caddisfly | Invertebrate Animal | END | S1 | G5 |
| Hydroptila waskesia | A Caddisfly | Invertebrate Animal | END | S1 | G4G5 |
| Agapetus tomus | A Caddisfly | Invertebrate Animal | SPC | S3 | G5 |
| Hydroptila metoeca | A Caddisfly | Invertebrate Animal | SPC | S3 | G4G5 |
| Protophila erotica | A Caddisfly | Invertebrate Animal | SPC | S3 | G5 |
| Pelegrina arizonensis | A Jumping Spider | Invertebrate Animal | SPC | S3 | GNR |
| Habronattus viridipes | A Jumping Spider | Invertebrate Animal | SPC | S3 | GNR |
| Paradamoetas fontanus | A Jumping Spider | Invertebrate Animal | SPC | S3 | GNR |
| Boletus subcaerulescens | A Porcini Mushroom | Fungus | SPC | S3 | GNR |
| Ochrotrichia spinosa | A Purse Casemaker Caddisfly | Invertebrate Animal | END | S1 | G5 |
| Trichocolea tomentella | A Species of Liverwort | Nonvascular Plant | THR | S2 | G5 |
| Empidonax virescens | Acadian Flycatcher | Vertebrate Animal | SPC | S3B | G5 |
| Anguilla rostrata | American Eel | Vertebrate Animal | SPC | S3 | G4 |
| Panax quinquefolius | American Ginseng | Vascular Plant | SPC | S3 | G3G4 |
| Littorella americana | American Shore Plantain | Vascular Plant | SPC | S3 | G5 |
| Hydrocotyle americana | American Water-pennywort | Vascular Plant | SPC | S3 | G5 |
| Huperzia appalachiana | Appalachian Fir Moss | Vascular Plant | SPC | S3 | G5 |
| Fimbristylis autumnalis | Autumn Fimbry | Vascular Plant | SPC | S3 | G5 |
| Waldsteinia fragarioides var. fragarioides | Barren Strawberry | Vascular Plant | SPC | S3 | G5T5 |
| Hudsonia tomentosa | Beach Heather | Vascular Plant | THR | S2 | G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|---|--------------------------|---------------------|--------------|--------|---------|
| <i>Vireo bellii</i> | Bell's Vireo | Vertebrate Animal | SPC | S3B | G5 |
| <i>Eptesicus fuscus</i> | Big Brown Bat | Vertebrate Animal | SPC | S3 | G5 |
| <i>Gaylussacia baccata</i> | Black Huckleberry | Vascular Plant | THR | S2 | G5 |
| <i>Ligumia recta</i> | Black Sandshell | Invertebrate Animal | SPC | S3 | G4G5 |
| <i>Acris blanchardi</i> | Blanchard's Cricket Frog | Vertebrate Animal | END | S1 | G5 |
| <i>Emydoidea blandingii</i> | Blanding's Turtle | Vertebrate Animal | THR | S2 | G4 |
| <i>Usnea mutabilis</i> | Bloody Beard Lichen | Fungus | THR | S2 | G5 |
| <i>Cycleptus elongatus</i> | Blue Sucker | Vertebrate Animal | SPC | S3 | G3G4 |
| <i>Carex obtusata</i> | Blunt Sedge | Vascular Plant | SPC | S3 | G5 |
| <i>Botrychium oneidense</i> | Blunt-lobed Grapefern | Vascular Plant | THR | S2 | G4 |
| <i>Poa paludigena</i> | Bog Bluegrass | Vascular Plant | THR | S2 | G3G4 |
| <i>Ellipsaria lineolata</i> | Butterfly | Invertebrate Animal | THR | S2 | G4G5 |
| <i>Juglans cinerea</i> | Butternut | Vascular Plant | END | S1 | G3 |
| <i>Crocanthemum canadense</i> | Canada Frostweed | Vascular Plant | SPC | S3 | G5 |
| <i>Macrosteles clavatus</i> | Caped Leafhopper | Invertebrate Animal | SPC | S3 | GNR |
| <i>Persicaria careyi</i> | Carey's Smartweed | Vascular Plant | SPC | S3 | G4 |
| <i>Carex typhina</i> | Cattail Sedge | Vascular Plant | SPC | S3 | G5 |
| <i>Setophaga cerulea</i> | Cerulean Warbler | Vertebrate Animal | SPC | S3B | G4 |
| <i>Plestiodon fasciatus</i> | Common Five-lined Skink | Vertebrate Animal | SPC | S3 | G5 |
| <i>Sterna hirundo</i> | Common Tern | Vertebrate Animal | THR | S2B | G5 |
| <i>Lasmigona compressa</i> | Creek Heelsplitter | Invertebrate Animal | SPC | S3 | G5 |
| <i>Bidens discoidea</i> | Discoïd Beggarticks | Vascular Plant | SPC | S3 | G5 |
| <i>Silene drummondii</i> ssp. <i>drummondii</i> | Drummond's Campion | Vascular Plant | SPC | S3 | G5T5 |
| <i>Tsuga canadensis</i> | Eastern Hemlock | Vascular Plant | END | S1 | G4G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|---|--------------------------|---------------------|--------------|--------|---------|
| <i>Alasmidonta marginata</i> | Elktoe | Invertebrate Animal | THR | S2 | G4 |
| <i>Floerkea proserpinacoides</i> | False Mermaid | Vascular Plant | THR | S2 | G5 |
| <i>Salix pseudomonticola</i> | False Mountain Willow | Vascular Plant | SPC | S3 | G5 |
| <i>Lasmigona costata</i> | Fluted-shell | Invertebrate Animal | THR | S2 | G5 |
| <i>Somatochlora forcipata</i> | Forcinate Emerald | Invertebrate Animal | SPC | S3 | G5 |
| <i>Hemidactylium scutatum</i> | Four-toed Salamander | Vertebrate Animal | SPC | S3 | G5 |
| <i>Percina evides</i> | Gilt Darter | Vertebrate Animal | SPC | S3 | G4 |
| <i>Botrychium mormo</i> | Goblin Fern | Vascular Plant | THR | S2 | G2Q |
| <i>Pituophis catenifer</i> | Gophersnake | Vertebrate Animal | SPC | S3 | G5 |
| <i>Carex grayi</i> | Gray's Sedge | Vascular Plant | SPC | S3 | G4G5 |
| <i>Tympanuchus cupido</i> | Greater Prairie-chicken | Vertebrate Animal | SPC | S3 | G4 |
| <i>Ammodramus henslowii</i> | Henslow's Sparrow | Vertebrate Animal | END | S1B | G4 |
| <i>Utricularia geminiscapa</i> | Hidden-fruit Bladderwort | Vascular Plant | THR | S2 | G4G5 |
| <i>Lampsilis higginsii</i> | Higgins Eye | Invertebrate Animal | END | S1 | G1G2 |
| <i>Cirsium pumilum var. hillii</i> | Hill's Thistle | Vascular Plant | SPC | S3 | G3 |
| <i>Carex media</i> | Intermediate Sedge | Vascular Plant | SPC | S3 | G5T5 |
| <i>Chrysosplenium iowense</i> | Iowa Golden Saxifrage | Vascular Plant | END | S1 | G4 |
| <i>Besseyia bullii</i> | Kitten-tails | Vascular Plant | THR | S2 | G3 |
| <i>Acipenser fulvescens</i> | Lake Sturgeon | Vertebrate Animal | SPC | S3 | G3G4 |
| <i>Viola lanceolata var. lanceolata</i> | Lance-leaf Violet | Vascular Plant | THR | S2 | G5T5 |
| <i>Chondestes grammacus</i> | Lark Sparrow | Vertebrate Animal | SPC | S3B | G5 |
| <i>Crataegus calpodendron</i> | Late Hawthorn | Vascular Plant | SPC | S3 | G5 |
| <i>Etheostoma microperca</i> | Least Darter | Vertebrate Animal | SPC | S3 | G5 |
| <i>Botrychium simplex</i> | Least Moonwort | Vascular Plant | SPC | S3 | G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|--|-------------------------------|---------------------|--------------|-----------|---------|
| <i>Myotis lucifugus</i> | Little Brown Myotis | Vertebrate Animal | SPC | S3 | G3 |
| <i>Atrichum tenellum</i> | Little Saw Moss | Nonvascular Plant | SPC | S3 | G4G5 |
| <i>Lanius ludovicianus</i> | Loggerhead Shrike | Vertebrate Animal | END | S1B | G4 |
| <i>Parkesia motacilla</i> | Louisiana Waterthrush | Vertebrate Animal | SPC | S3B | G5 |
| <i>Schistostega pennata</i> | Luminous Moss | Nonvascular Plant | END | S1 | G4 |
| <i>Botrychium minganense</i> | Mingan Moonwort | Vascular Plant | SPC | S3 | G5 |
| <i>Theliderma metanevra</i> | Monkeyface | Invertebrate Animal | THR | S2 | G4 |
| <i>Xyris montana</i> | Montane Yellow-eyed Grass | Vascular Plant | SPC | S3 | G5 |
| <i>Actinonaias ligamentina</i> | Mucket | Invertebrate Animal | THR | S2 | G5 |
| <i>Necturus maculosus</i> | Mudpuppy | Vertebrate Animal | SPC | S3 | G5 |
| <i>Calamagrostis lacustris</i> | Narrow Reedgrass | Vascular Plant | SPC | S3 | G3Q |
| <i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i> | Narrow Triangle Moonwort | Vascular Plant | THR | S2 | G5T4 |
| <i>Alisma gramineum</i> | Narrow-leaved Water Plantain | Vascular Plant | SPC | S3 | G5 |
| <i>Carex ormostachya</i> | Necklace Sedge | Vascular Plant | SPC | S3 | G4G5 |
| <i>Ammodramus nelsoni</i> | Nelson's Sparrow | Vertebrate Animal | SPC | S3B | G5 |
| <i>Cicindela patruela patruela</i> | Northern Barrens Tiger Beetle | Invertebrate Animal | SPC | S3 | G3T3 |
| <i>Ichthyomyzon fossor</i> | Northern Brook Lamprey | Vertebrate Animal | SPC | S3 | G4 |
| <i>Accipiter gentilis</i> | Northern Goshawk | Vertebrate Animal | SPC | S3B, SNRN | G5 |
| <i>Myotis septentrionalis</i> | Northern Long-eared Bat | Vertebrate Animal | SPC | S3 | G1G2 |
| <i>Boyeria grafiana</i> | Ocellated Darner | Invertebrate Animal | SPC | S3 | G5 |
| <i>Nuttallanthus canadensis</i> | Old Field Toadflax | Vascular Plant | SPC | S3 | G5 |
| <i>Eleocharis flavescens</i> var. <i>olivacea</i> | Olivaceous Spikerush | Vascular Plant | THR | S2 | G5 |
| <i>Najas guadalupensis</i> ssp. <i>olivacea</i> | Olive-colored Southern Naiad | Vascular Plant | SPC | S3 | G5T4? |
| <i>Orobanche uniflora</i> | One-flowered Broomrape | Vascular Plant | THR | S2 | G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|---|---------------------------------|---------------------|--------------|-----------|---------|
| <i>Woodsia oregana</i> ssp. <i>cathcartiana</i> | Oregon Woodsia | Vascular Plant | SPC | S3 | G5T5 |
| <i>Botrychium pallidum</i> | Pale Moonwort | Vascular Plant | SPC | S3 | G3 |
| <i>Hybopsis amnis</i> | Pallid Shiner | Vertebrate Animal | END | S1 | G4 |
| <i>Falco peregrinus</i> | Peregrine Falcon | Vertebrate Animal | SPC | S3B | G4 |
| <i>Tritogonia verrucosa</i> | Pistolgrip | Invertebrate Animal | END | S1 | G4G5 |
| <i>Heterodon nasicus</i> | Plains Hog-nosed Snake | Vertebrate Animal | SPC | S3 | G5 |
| <i>Parmelia stippea</i> | Powder-edged ruffle lichen | Fungus | THR | S2 | G4G5 |
| <i>Rubus quaesitus</i> | Prince Edward Island Blackberry | Vascular Plant | SPC | S3 | GUQ |
| <i>Notropis anogenus</i> | Pugnose Shiner | Vertebrate Animal | THR | S2 | G3 |
| <i>Progne subis</i> | Purple Martin | Vertebrate Animal | SPC | S3B | G5 |
| <i>Cyclonaias tuberculata</i> | Purple Wartyback | Invertebrate Animal | END | S1 | G5 |
| <i>Utricularia purpurea</i> | Purple-flowered Bladderwort | Vascular Plant | END | S1 | G5 |
| <i>Ophiogomphus howei</i> | Pygmy Snaketail | Invertebrate Animal | SPC | S3 | G3 |
| <i>Cypripedium arietinum</i> | Ram's Head Orchid | Vascular Plant | THR | S2 | G3 |
| <i>Usnea rubicunda</i> | Red Beard Lichen | Fungus | SPC | S3 | G4G5 |
| <i>Buteo lineatus</i> | Red-shouldered Hawk | Vertebrate Animal | SPC | S3B, SNRN | G5 |
| <i>Oenothera rhombipetala</i> | Rhombic Evening Primrose | Vascular Plant | SPC | S3 | G4G5 |
| <i>Eleocharis robbinsii</i> | Robbins' Spikerush | Vascular Plant | THR | S2 | G4G5 |
| <i>Pleurobema sintoxia</i> | Round Pigtoe | Invertebrate Animal | SPC | S3 | G4G5 |
| <i>Simpsonaias ambigua</i> | Salamander Mussel | Invertebrate Animal | END | S1 | G3 |
| <i>Aristida tuberculosa</i> | Seaside Three-awn | Vascular Plant | THR | S2 | G5 |
| <i>Asio flammeus</i> | Short-eared Owl | Vertebrate Animal | SPC | S3B | G5 |
| <i>Najas gracillima</i> | Slender Naiad | Vascular Plant | SPC | S3 | G5? |
| <i>Platanthera clavellata</i> | Small Green Wood Orchid | Vascular Plant | SPC | S3 | G5 |
| <i>Pyrola minor</i> | Small Shinleaf | Vascular Plant | SPC | S3 | G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|---|--------------------------|---------------------|--------------|-----------------|---------|
| <i>Antennaria parvifolia</i> | Small-leaved Pussytoes | Vascular Plant | SPC | S3 | G5 |
| <i>Potamogeton bicupulatus</i> | Snailseed Pondweed | Vascular Plant | END | S1 | G4 |
| <i>Epioblasma triquetra</i> | Snuffbox | Invertebrate Animal | END | S1 | G3 |
| <i>Shepherdia canadensis</i> | Soapberry | Vascular Plant | SPC | S3 | G5 |
| <i>Ichthyomyzon gagei</i> | Southern Brook Lamprey | Vertebrate Animal | SPC | S3 | G5 |
| <i>Cumberlandia monodonta</i> | Spectaclecase | Invertebrate Animal | END | S1 | G3 |
| <i>Eurynia dilatata</i> | Spike | Invertebrate Animal | THR | S2 | G5 |
| <i>Potamogeton pulcher</i> | Spotted Pondweed | Vascular Plant | END | S1 | G5 |
| <i>Ambystoma maculatum</i> | Spotted Salamander | Vertebrate Animal | SPC | S3 | G5 |
| <i>Ophiogomphus susbehcha</i> | St. Croix Snaketail | Invertebrate Animal | THR | S2 | G2 |
| <i>Botrychium rugulosum</i> | St. Lawrence Grapefern | Vascular Plant | SPC | S3 | G3 |
| <i>Desmodium nudiflorum</i> | Stemless Tick Trefoil | Vascular Plant | THR | S2 | G5 |
| <i>Berula erecta</i> | Stream Parsnip | Vascular Plant | THR | S2 | G4G5 |
| <i>Aeshna subarctica</i> | Subarctic Darner | Invertebrate Animal | SPC | S3 | G5 |
| <i>Rubus semisetosus</i> | Swamp Blackberry | Vascular Plant | THR | S2 | G5 |
| <i>Elatine triandra</i> | Three-stamened Waterwort | Vascular Plant | SPC | S3 | G5 |
| <i>Rotala ramosior</i> | Toothcup | Vascular Plant | THR | S2 | G5 |
| <i>Torreyochloa pallida</i> | Torrey's Mannagrass | Vascular Plant | SPC | S3 | G5 |
| <i>Perimyotis subflavus</i> | Tricolored Bat | Vertebrate Animal | SPC | S3 | G2G3 |
| <i>Cygnus buccinator</i> | Trumpeter Swan | Vertebrate Animal | SPC | S3B, SNRN, SNRM | G4 |
| <i>Platanthera flava</i> var. <i>herbiola</i> | Tuberclad Rein Orchid | Vascular Plant | THR | S2 | G4?T4Q |
| <i>Cladium mariscoides</i> | Twig Rush | Vascular Plant | SPC | S3 | G5 |
| <i>Elodea bifoliata</i> | Two Leaf Waterweed | Vascular Plant | END | S1 | G4G5 |
| <i>Rubus vermontanus</i> | Vermont Bristle-berry | Vascular Plant | SPC | S3 | G5 |

| Scientific Name | Common Name | Type | State Status | S-Rank | G- Rank |
|---------------------------------------|---------------------|---------------------|--------------|--------|---------|
| Quadrula nodulata | Wartyback | Invertebrate Animal | THR | S2 | G4 |
| Decodon verticillatus var. laevigatus | Water-willow | Vascular Plant | SPC | S3 | G5TNR |
| Decodon verticillatus | Water-willow | Vascular Plant | SLL-SPC | S3 | G5 |
| Malaxis monophyllos var. brachypoda | White Adder's Mouth | Vascular Plant | SPC | S3 | G5T4T5 |
| Lysimachia quadrifolia | Whorled Loosestrife | Vascular Plant | SPC | S3 | G5 |
| Allium schoenoprasum | Wild Chives | Vascular Plant | END | S1 | G5 |
| Phalaropus tricolor | Wilson's Phalarope | Vertebrate Animal | THR | S2B | G5 |
| Quadrula fragosa | Winged Mapleleaf | Invertebrate Animal | END | S1 | G1 |
| Hamamelis virginiana | Witch-hazel | Vascular Plant | THR | S2 | G5 |
| Glyptemys insculpta | Wood Turtle | Vertebrate Animal | THR | S2 | G3 |
| Coturnicops noveboracensis | Yellow Rail | Vertebrate Animal | SPC | S3B | G4 |

Additional Species Data

In addition to listed species, the WSU section contains species labeled as 'Watchlist' and 'Species of Greatest Conservation Need' (SGCNs).

'**Watchlist**' species (previously referred to 'NON's) are defined as plant or animal species with no legal status but for which data are being compiled in the Natural Heritage Information System because the species falls into one of the following categories:

- The species is being considered for addition to the state list.
- The species was removed from the state list, but records for the species are still entered and maintained as a precautionary measure.
- The species has been recently discovered in the state.
- The species is presumed extirpated from the state.

Watch List

Table 10 - Minnesota 'Watchlist' species in the WSU Section

| Scientific Name | Common Name | Type |
|--|--------------------------|---------------------|
| <i>Ceraclea brevis</i> | A Caddisfly | Invertebrate Animal |
| <i>Hydroptila novicola</i> | A Caddisfly | Invertebrate Animal |
| <i>Marpissa grata</i> | A Jumping Spider | Invertebrate Animal |
| <i>Ascocoryne turficola</i> | A Species of Fungus | Fungus |
| <i>Chaenothecopsis ochroleuca</i> | A Species of Lichen | Fungus |
| <i>Chaenothecopsis exilis</i> | A Species of Lichen | Fungus |
| <i>Leproloma membranaceum</i> | A Species of Lichen | Fungus |
| <i>Sphinctrina leucopoda</i> | A Species of Lichen | Fungus |
| <i>Diphyscium foliosum</i> | A Species of Moss | Nonvascular Plant |
| <i>Botaurus lentiginosus</i> | American Bittern | Vertebrate Animal |
| <i>Haliaeetus leucocephalus</i> | Bald Eagle | Vertebrate Animal |
| <i>Penstemon digitalis</i> | Beard-tongue | Vascular Plant |
| <i>Lycaena epixanthe michiganensis</i> | Bog Copper | Invertebrate Animal |
| <i>Rhynchospora capitellata</i> | Brownish Beak Sedge | Vascular Plant |
| <i>Lithobates catesbeianus</i> | Bullfrog | Vertebrate Animal |
| <i>Sparganium glomeratum</i> | Clustered Bur-reed | Vascular Plant |
| <i>Oxypolis rigidior</i> | Cowbane | Vascular Plant |
| <i>Heterodon platirhinos</i> | Eastern Hog-nosed Snake | Vertebrate Animal |
| <i>Scirpus georgianus</i> | Georgia Bulrush | Vascular Plant |
| <i>Obovaria olivaria</i> | Hickorynut | Invertebrate Animal |
| <i>Cyperus houghtonii</i> | Houghton's Cyperus | Vascular Plant |
| <i>Hieracium longipilum</i> | Long-bearded Hawkweed | Vascular Plant |
| <i>Lampropeltis triangulum</i> | Milksnake | Vertebrate Animal |
| <i>Wolffia brasiliensis</i> | Pointed Watermeal | Vascular Plant |
| <i>Geum laciniatum</i> | Rough avens | Vascular Plant |
| <i>Bombus affinis</i> | Rusty-patched Bumble Bee | Invertebrate Animal |
| <i>Antigone canadensis</i> | Sandhill Crane | Vertebrate Animal |
| <i>Lobaria quercizans</i> | Smooth Lungwort | Fungus |
| <i>Ceratophyllum echinatum</i> | Spiny Hornwort | Vascular Plant |
| <i>Bartramia longicauda</i> | Upland Sandpiper | Vertebrate Animal |

| Scientific Name | Common Name | Type |
|-------------------------------|--------------------------|-------------------|
| <i>Lycopus virginicus</i> | Virginia Water Horehound | Vascular Plant |
| <i>Pantherophis ramspotti</i> | Western Foxsnake | Vertebrate Animal |

Species of Greatest Conservation Need (SGCNs)

The WSU Section provides a variety of wildlife habitats ranging from prairie to open brush and forest, comprising primarily aspen, Northern hardwoods, and oak. The Section also includes smaller amounts of conifers, including red pine, white pine, and spruce. Other non-forest habitat includes rivers, lakes, rock outcrops, shoreline, wet meadow, and upland fields. Row crop agriculture is a significant portion of the land use within this Section.

Of the 346 species that are considered SGCN in Minnesota, 153 are found in the WSU Section (Table 1); At least 18 SGCN are directly associated with forest habitats (Table 1).

Table 11 - Species of Greatest Conservation Need found within the WSU Section that are associated with Forests.

| Common name | Scientific name | Key Habitat/ or Habitat used |
|--------------------------|--|--|
| <u>amphibian</u> | | |
| Blanchard's Cricket Frog | <i>Acris blanchardi</i> | Floodplain Forests |
| Four-toed Salamander | <i>Hemidactylum scutatum</i> | Upland Coniferous & Deciduous Forest |
| Spotted Salamander | <i>Ambystoma maculatum</i> | Upland Coniferous & Deciduous Forest |
| <u>bird</u> | | |
| Cerulean Warbler | <i>Setophaga cerulea</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |
| Lark Sparrow | <i>Chondestes grammacus</i> | Upland Coniferous & Deciduous Forest/ Savanna |
| Louisiana Waterthrush | <i>Parkesia motacilla</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |
| Northern Goshawk | <i>Accipiter gentilis</i> | Upland Coniferous & Deciduous Forest |
| Red-shouldered Hawk | <i>Buteo lineatus</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |
| Acadian Flycatcher | <i>Empidonax virescens</i> | Upland Coniferous & Deciduous Forest |
| <u>mammal</u> | | |
| Little Brown Myotis | <i>Myotis lucifugus</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |
| Big Brown Bat | <i>Eptesicus fuscus</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |

| Common name | Scientific name | Key Habitat/ or Habitat used |
|-------------------------|---|---|
| Northern Long-eared Bat | <i>Myotis septentrionalis</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests |
| Tricolored Bat | <i>Perimyotis subflavus</i> | Upland Coniferous & Deciduous Forest |
| <u>reptile</u> | | |
| Gophersnake | <i>Pituophis catenifer</i> | Savanna |
| Common Five-lined Skink | <i>Plestiodon fasciatus</i> | Savanna |
| Blanding's Turtle | <i>Emydoidea blandingii</i> | Floodplain Forests/ savanna |
| Plains Hog-nosed Snake | <i>Heterodon nasicus</i> | Savanna |
| Wood Turtle | <i>Glyptemys insculpta</i> | Upland Coniferous & Deciduous Forest/ Floodplain Forests/ Savanna |

Water resources

There are numerous lakes, streams, and rivers throughout the Section. The HUC8 watersheds, which are in WSU in whole or in part, are listed below with the amount of land in WSU.

Table 12 - HUC 8 Watersheds within

| Watershed Name | Acres | Square Miles |
|--------------------|------------------|--------------|
| Beartrap-Nemadji | 176,738 | 276 |
| Clearwater-Elk | 171,160 | 267 |
| Elk-Nokasippi | 319,052 | 499 |
| Kettle | 557,455 | 871 |
| Lower St. Croix | 286,714 | 448 |
| Platte-Spunk | 256,532 | 401 |
| Rum | 697,218 | 1,089 |
| Snake | 643,545 | 1,006 |
| St. Louis | 42,504 | 66 |
| Upper St. Croix | 347,718 | 543 |
| Grand Total | 3,498,636 | 5,467 |

Climate change

The following table shows the change in potential suitable habitat for tree species within the WSU Section, weighted for both the area and abundance of habitat for various climate model scenarios projected to the year 2100. The data is from the USFS climate change tree atlas and was calculated for the WSU Section based on the DISTRIB habitat Model.

A numerical representation of each species' potential suitable habitat is given as an importance value (IV), weighted by its geographic distribution across the Section, and was calculated for high and low emission scenarios in three different GCM climate models (Hadley, PCM, and GFDL). The higher the number, the more likely potential suitable habitat will be available for species.

The current modeled IV for each species is the DISTRIB modeled suitable habitat in 2000.

Additional information on individual tree species, the models used, as well as inputs and the data, can be found at the USFS Tree atlas website.

Species are placed in the order of highest to lowest IV based on the average Hadley, GFDL, PCM High Scenario.

Table 13 - Tree Habitat Suitability Western Superior Uplands²

| Species Name | Scientific Name | DISTRIB Weighted SUM IV (Current) | DISTRIB Weighted SUM IV (Hadley High) | DISTRIB Weighted SUM IV (PCM low) | DISTRIB Weighted SUM IV (Average Hadley, GDFL, and PCM High) | DISTRIB Weighted SUM IV (Average of the Hadley, GDFL, and PCM Low) |
|--------------------|------------------------|-----------------------------------|---------------------------------------|-----------------------------------|--|--|
| eastern redcedar | Juniperus virginiana | 4 | ↑ 366 | ↑ 104 | ↑ 409 | ↑ 289 |
| bur oak | Quercus macrocarpa | 272 | ↑ 418 | ↓ 259 | ↑ 398 | ↑ 336 |
| American basswood | Tilia americana | 224 | ↑ 252 | ↑ 230 | ↑ 258 | ↑ 303 |
| white oak | Quercus alba | 69 | ↑ 209 | ↑ 245 | ↑ 233 | ↑ 268 |
| northern red oak | Quercus rubra | 343 | ↓ 180 | ↑ 392 | ↓ 208 | ↑ 393 |
| silver maple | Acer saccharinum | 40 | ↑ 208 | ↑ 108 | ↑ 202 | ↑ 178 |
| quaking aspen | Populus tremuloides | 1151 | ↓ 206 | ↓ 533 | ↓ 202 | ↓ 450 |
| green ash | Fraxinus pennsylvanica | 144 | ↑ 188 | ↓ 115 | ↑ 198 | ↑ 148 |
| sugar maple | Acer saccharum | 302 | ↓ 163 | ↑ 340 | ↓ 178 | ↑ 340 |
| black ash | Fraxinus nigra | 355 | ↓ 156 | ↓ 196 | ↓ 157 | ↓ 174 |
| red pine | Pinus resinosa | 138 | ↓ 122 | ↑ 160 | ↓ 128 | ↑ 171 |
| white ash | Fraxinus americana | 31 | ↑ 105 | ↑ 55 | ↑ 109 | ↑ 64 |
| northern pin oak | Quercus ellipsoidalis | 76 | ↑ 79 | ↑ 93 | ↑ 79 | ↑ 117 |
| tamarack (native) | Larix laricina | 175 | ↓ 71 | ↓ 82 | ↓ 71 | ↓ 78 |
| eastern white pine | Pinus strobus | 79 | ↓ 67 | ↑ 111 | ↓ 61 | ↑ 134 |
| balsam poplar | Populus balsamifera | 69 | ↑ 74 | ↓ 3 | ↓ 55 | ↓ 6 |

² Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. <https://www.nrs.fs.fed.us/atlas/tree>, Northern Research Station, USDA Forest Service, Delaware, Ohio.

| Species Name | Scientific Name | DISTRIB Weighted SUM IV (Current) | DISTRIB Weighted SUM IV (Hadley High) | DISTRIB Weighted SUM IV (PCM low) | DISTRIB Weighted SUM IV (Average Hadley, GDFL, and PCM High) | DISTRIB Weighted SUM IV (Average of the Hadley, GDFL, and PCM Low) |
|-----------------------------|-----------------------|---|--|--|--|---|
| paper birch | Betula papyrifera | 370 | ↓ 50 | ↓ 206 | ↓ 48 | ↓ 153 |
| bigtooth aspen | Populus grandidentata | 119 | ↓ 26 | ↓ 107 | ↓ 34 | ↓ 84 |
| white spruce | Picea glauca | 41 | ↓ 30 | ↓ 23 | ↓ 26 | ↓ 25 |
| northern white-cedar | Thuja occidentalis | 84 | ↓ 12 | ↓ 32 | ↓ 12 | ↓ 18 |
| balsam fir | Abies balsamea | 188 | ↓ 13 | ↓ 26 | ↓ 11 | ↓ 17 |
| black spruce | Picea mariana | 145 | ↓ 11 | ↓ 15 | ↓ 11 | ↓ 12 |
| eastern hemlock | Tsuga canadensis | 8 | ↓ 3 | ↑ 19 | ↓ 3 | ↑ 9 |

*- species not represented in the FIA that will have new habitat within the section

Importance value (IV) - Measure of abundance that accounts for both the tree basal area and number of stems, ranging from 0-100. Higher numbers are more abundant

Hadley- Hadley Climate Model

PCM- Parallel Climate Model

GFCL- Geophysical Fluid Dynamics Laboratory GCM Model

GCM-General Circulation Model

Citation:

Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. <https://www.nrs.fs.fed.us/atlas/tree>, Northern Research Station, USDA Forest Service, Delaware, Ohio.

APPENDIX A: Glossary

Acre: An area of land containing 43,560 square feet, roughly the size of a football field, or a square that is 208 feet on a side. A “forty” of land contains 40 acres, and a “section” of land contains 640 acres.

Age class: An interval, commonly ten years, into which the age range of trees or forest stands is divided for classification or use.

Age-class distribution: The proportionate amount of various age classes of a forest or forest cover-type within a defined geographic area (e.g., ecological classification system subsection).

All-aged: An uneven-aged stand that represents all ages or age classes, from seedlings to mature trees.

Annual stand examination list: List of stands to be considered for treatment in a particular year that was selected from the 10-year stand examination list. Treatment may include harvest, thinning, regeneration, prescribed burning, re-inventory, etc.

Annual work plan: The annual work responsibilities at the area (i.e., Division of Forestry administrative boundary) documented for the fiscal year.

Artificial regeneration: Renewal of a forest stand by planting seedlings or sowing seeds.

Assessment: A compilation of information about the trends and conditions related to natural and socio-economic resources and factors. The initial round of Subsection Forest Resource Management Plans (SFRMP) will focus primarily on trends and conditions of forest resources. Standard core assessment information sources and products have been defined.

Biodiversity (biological diversity): The variety and abundance of species, their genetic composition, and the communities and landscapes in which they occur, including the ecological structures, functions, and processes occurring at all of these levels.

Biodiversity Significance: The relative value, in terms of size, condition, and quality, of native biological diversity for a given area of land or water. *(Adapted from: Guidelines for MCBS Statewide Biodiversity Significance Rank):* The Minnesota County Biological Survey uses a statewide ranking system to evaluate and communicate the biodiversity significance of surveyed areas (MCBS Sites) to natural resource professionals, state and local government officials, and the public. MCBS Sites are ranked according to several factors, including the quality and types of *Element Occurrences*, the size and quality of native plant communities, and the size and condition of the landscape within the Site. Areas are ranked as *Outstanding, High, Moderate, or Below the Minimum Threshold* for statewide biodiversity significance. *(Draft definition 3/24/2004)*

Outstanding Sites: Those containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes present in the state.

High Sites: Those containing the best of the rest, such as sites with very good quality occurrences of the rarest species, high quality examples of the rarest native plant communities, and/or important functional landscapes.

Moderate Sites: Those containing significant occurrences of rare species and/or moderately disturbed native plant communities and landscapes that have a strong potential for recovery.

Sites Below the Minimum Threshold: Those lacking significant populations of rare species and/or natural features that meet MCBS minimum standards for size and condition. These include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, and open space areas.

Clearcut: The removal of all or most trees during harvest to permit the re-establishment of an even-aged forest. A harvesting method used to regenerate shade-intolerant species, such as aspen and jack pine.

Coarse woody debris: Stumps and fallen tree trunks or limbs of more than 6-inch diameter at the large end.

Coarse filter: Management of lands from a local to landscape scale that addresses the needs of all or most species, communities, environments, and ecological processes. In using a coarse filter approach (Hunter, 1990), it assumes that a broad range of habitats encompassing the needs of most species needs will be met, and their populations will remain viable on the landscape.

Cohort: a group of trees developing after a single disturbance, commonly consisting of trees of similar age.

Common forest inventory: Also known as CCSA (Common Cooperative Stand Assessment). Forest inventory stand data compiled by the Minnesota Interagency Information Cooperative from public agencies, including the Minnesota DNR, Superior and Chippewa National Forests, and county land departments (2001). The common format contains the common attributes found in the state, federal, and county forest inventories.

Competition: The struggle between trees to obtain sunlight, nutrients, water, and growing space. Every part of the tree, from the roots to the crown, competes for space and food.

Conversion: A change through forest management from one tree species to another within a forest stand or site.

Cooperative stand assessment (CSA): The forest stand mapping and information system used by the DNR to inventory the approximately five million acres (7,800 square miles) owned and administered by the state. The spatial information and stand attributes are now maintained in the Forest Inventory Module (FIM).

Cover-type: Expressed as the tree species having the greatest presence (i.e., in terms of volume for older stands or number of trees for younger stands) in a forest stand. A stand where the major species is aspen would be called an aspen cover type.

Cover type distribution: The location and/or proportionate representation of cover types in a forest or a given geographic area.

Critical habitat: habitat or habitat elements that must be present and properly functioning to assure the continued existence of the species in question.

Disturbance: Any event, either natural or human induced, that alters the structure, composition, or functions of an ecosystem. Examples include forest fires, insect infestation, windstorms, and timber harvesting.

Disturbance regime: Natural or human-caused pattern of periodic disturbances, such as fire, wind, insect infestations, or timber harvest.

Early successional forest: The forest community that develops immediately following the removal or destruction of vegetation in an area. Plant succession is the progression of plants from bare ground (e.g., after a forest fire or timber harvest) to mature forest consisting primarily of long-lived species such as sugar maple and white pine. Succession consists of a gradual change of plant and animal communities over time. Early succession forests commonly depend on and develop first following disturbance events (e.g., fire, windstorms, or timber harvest). Examples of *early successional forest* tree species are aspen, paper birch, and jack pine. Each stage of succession provides different benefits for a variety of species.

Ecological classification system (ECS): A method to identify, describe, and map units of land with different capabilities to support natural resources. This is done by integrating climatic, geologic, hydrologic, topographic, soil, and vegetation data.

Endangered species: A plant or animal species that is threatened with extinction throughout all or a significant portion of its range in Minnesota.

Even-aged: A forest stand composed of trees of primarily the same age or age class. A stand is considered even-aged if the difference in age between the youngest and oldest trees does not exceed 20 percent of the rotation age (e.g., for a stand with a rotation age of 50 years, the difference in age between the youngest and oldest trees should be ten years).

Forest land: Consists of all lands included in the forest inventory, from aspen and pine cover types to stagnant conifers, muskeg, lowland brush, and lakes.

Forest management: the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Note: forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.

From: The Dictionary of Forestry. 1998. The Society of American Foresters. J.A. Helms, ed.

Forest stand: A group of trees occupying a given area and sufficiently uniform in species composition, age, structure, site quality, and condition so as to be distinguishable from the forest in adjoining areas.

Fragmentation: Breaking up of large and contiguous ecosystems into patches separated from each other by different ecosystem types. Breaking up a contiguous or homogeneous natural habitat through conversion to different vegetation types, age classes, or uses. *Forest fragmentation* occurs in landscapes with distinct contrasts between land uses, such as between woodlots and farms. *Habitat fragmentation* occurs where a contiguous or homogeneous forest area of a similar cover type and age is broken up into smaller dissimilar units. For example, a conifer-dominated forest (or a portion of it) is fragmented by clearcutting if it is converted to another type, such as an aspen-dominated forest.

Globally Imperiled Communities (G1G2): Refers to areas identified by *NatureServe* as highest ranking globally imperiled native plant communities. Through forest certification, the Department is required to identify and appropriately manage these identified communities.

Game Species: In this plan, *game* species include those terrestrial species that are hunted and trapped.

Gap: the space occurring in forest stands due to individual tree or groups of trees mortality or blowdown. *Gap management* uses timber harvest methods to emulate this type of forest spatial pattern.

Geographic information system (GIS): Computer software used to manipulate, analyze, and visually display inventory and other data and prepare maps of the same data.

Group selection: A process of harvesting patches of selected trees to create openings in the forest canopy and to encourage the reproduction of uneven-aged stands.

Growth stage: Growth stages of native plant communities as presented in the *Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province* are periods of stand maturation where the mixture of trees in the canopy is stable. Growth stages are separated by periods of transition where tree mortality is high and different among the species, usually involving the death of early successional species and replacement by shade-tolerant species or longer-lived species.

High Conservation Value Forests: HCVFs are defined as *areas of outstanding biological or cultural significance*. Through Certification, the Department is required to manage for a broad set of objectives and forest resources, including the management and protection of rare species, communities, features, and values across the landscape. This commitment requires certificate holders to identify High Conservation Value Forests (HCVFs) and manage such areas to “maintain or enhance” identified High Conservation Values (HCVs).

Issue: A natural resource-related concern or conflict that is directly affected by, or directly affects, decisions about the management of vegetation on lands administered by the DNR divisions of Forestry and Fish and Wildlife. Relevant issues will likely be defined by current, anticipated, or desired resource conditions and trends, threats to resources, and vegetation management opportunities. The key factor in determining the importance of issues for SFRMP is whether vegetation management issues can address the issue in whole or substantial part on DNR-administered lands.

Landform: Any physical, recognizable form or feature of the earth's surface, having a characteristic shape and produced by natural causes. Examples of major landforms are plains, plateaus, and mountains. Examples of minor landforms are hills, valleys, slopes, eskers, and dunes. Together, landforms make up the surface configuration of the Earth. The "landform" concept involves both empirical descriptions of a terrain (land-surface form) class and interpretation of genetic factors ("natural causes"). (An Ecological Land Classification Framework for the United States, 1984, p. 40).

Landscape: A general term referring to geographic areas that are usually based on some sort of natural feature or combination of natural features. They can range in scale from very large to very small. Examples include watersheds (from large to small), the many levels of the ECS, and Minnesota Forest Resources Council (MFRC) regional landscapes. The issue being addressed usually defines the type and size of landscape to be used.

Managed acres: Timberland acres that are available for timber management purposes.

Management pool: In this plan, the acres are available for timber management purposes.

Mature tree: A tree that has reached the desired size or age for its intended use. Size or age will vary considerably depending on the species and the intended use.

Mean annual increment (MAI): Average annual growth of a stand up to a particular age. It is calculated by dividing yield at that age by the age itself (e.g., the mean annual increment for a stand at age 50 with 25 cords per acre total volume: $25 \div 50 \text{ years} = 0.5 \text{ cords per year}$).

Merchantable timber: Trees or stands having the size, quality, and condition suitable for marketing under a given economic condition, even if not immediately accessible for logging.

Mesic: Moderately moist.

MCBS Sites: Areas of land identified by Minnesota County Biological Survey (MCBS) staff, ranging from tens to thousands of acres in size, selected for survey because they are likely to contain relatively undisturbed native plant communities, large populations, and/or concentrations of rare species, and/or critical animal habitat. The site provides a geographic framework for recording and storing data and compiling descriptive summaries.

Minnesota TAXA: Minnesota Taxonomy Database maintained by the DNR Division of Ecological Services.

Mixed forest or stand: A forest or stand composed of two or more prominent species.

Mixed forest conditions: In this plan refers to vegetative composition and structure that is moving toward the mix and relative proportion (e.g., dominated by, common, occasional, or scattered) of species found in the native plant community for that site. Tree species mix and proportion depend not only on the targeted growth stage (based on the rotation age for the desired cover type) but also on species found in older growth stages.

Multiple use: Using and managing a forested area to provide more than one benefit simultaneously. Common uses may include wildlife, timber, recreation, and water.

Native plant community: A group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plants form recognizable units, such as an oak forest, prairie, or marsh, that tend to reoccur over space and time. Native plant communities are classified and described by physiognomy, hydrology, landforms, soils, and natural disturbance regimes (e.g., wildfires, wind storms, and normal flood cycles).

Natural disturbances: Disruption of existing conditions by natural events such as wildfires, windstorms, drought, flooding, insects, and disease. Natural disturbances may range in scale from one tree to thousands of acres.

Natural regeneration: The growth of new trees in one of the following ways: (a) from seeds naturally dropped from trees or carried by wind or animals, (b) from seeds stored on the forest floor, or (c) from stumps that sprout or roots that sucker.

Non-forest land: Land that has never supported forests and land formerly forested where used for timber management is precluded by development for other uses such as crops, improved pasture, residential areas, city parks, improved roads, and power line clearings.

Nontimber forest products: Foods, herbs, medicinals, decoratives, and specialty items, also known as special forest products. Special forest products might include berries, mushrooms, boughs, bark, Christmas trees, lycopodium, rose hips and blossoms, diamond willow, birch tops, highbush cranberries, burls, conks, Labrador tea, seedlings, cones, nuts, aromatic oils, extractives.

Normal rotation age: For even-aged managed cover types, the rotation age is set by the SFRMP Team for non-ERF timberland acres. It is based on the culmination of the mean annual increment (CMAI) and other available data related to forest productivity that also considers wood quality and local knowledge.

Old-growth forests: Forests defined by age, structural characteristics, and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances and contain old trees (generally over 120 years old), large snags, and downed trees. Additional details on the management of old-growth forests on DNR-administered lands are contained in Old-Growth Guidelines (1994).

Old forest: A forest stand of any particular forest cover type is considered old forest whenever its age exceeds the normal rotation age established by the landscape Team for that cover type. In this plan, it does not include designated old growth, state park lands, etc.

Old forest conditions: forest that has the age and structural conditions typically found in mature to very old forests, such as large diameter trees, large snags, downed logs, mixed species composition, and greater structural diversity. These older forest conditions typically develop at stand ages greater than the normal rotation ages identified for even-aged managed forest cover types.

Old forest management complex: Represents an area of land, made up of several too many stands that are managed for old-growth, special management zone (SMZ), and extended rotation forest (ERF) in the vicinity of designated old growth stands.

Overmature: A tree or even-aged stand that has reached an age where it is declining in vigor and health and reaching the end of its natural life span resulting in a reduced commercial value because of size, age, decay, and other factors.

Overstocked: The situation in which trees are so closely spaced that they are competing for resources, resulting in less than full-growth potential for individual trees.

Overstory: The canopy in a stand of trees.

Partial cut: A cutting or harvest of trees where only some of the trees in a stand are removed.

Patch: An area of forest that is relatively homogenous in structure, primarily in height and stand density, and differs from the surrounding forest. It may be one stand or a group of stands.

Plantation: A stand composed primarily of trees established by planting or artificial seeding.

Prescription: A planned treatment (clear-cut, selective harvest, thin, reforest, reserve, etc.) designed to change the current stand structure to one that meets management goals. A written statement that specifies the practices to be implemented in a forest stand to meet management objectives. These specifications reflect the desired future condition at the site and landscape level and incorporate knowledge of the special attributes of the site.

Rare plants. Rare plants tracked are all species that are listed as Federally endangered, threatened, or as candidates for Federal listing; all species that are State listed as endangered, threatened, or special concern. Several rare species are also tracked, which currently have no legal status but need further monitoring to determine their status.

Rare animals. All animal species that are listed as Federally endangered or threatened (except the gray wolf) are tracked, as well as all birds, small mammals, reptiles, amphibians, mussels, and butterflies that are listed as State endangered, threatened, or special concern.

Animal aggregations. Certain types of animal aggregations, such as nesting colonies of waterbirds (herons, egrets, grebes, gulls, and terns), bat hibernacula, prairie chicken booming grounds, and winter bald eagle roosts are tracked regardless of the legal status of the species that comprise them. The tendency to aggregate makes these species vulnerable because a single catastrophic event could result in the loss of many individuals.

Rare species: A plant or animal species designated as **endangered, threatened,** or of **special concern** by the state of Minnesota (this includes all species designated as endangered or threatened at the federal level) or an uncommon species that does not (yet) have an official designation, but whose distribution and abundance need to be better understood.

Refuge/refugia: Area(s) where plants and animals can persist through a wind and/or fire event.

Regeneration: The act of renewing tree cover by establishing young trees naturally (e.g., stump sprouts, root suckers, natural seeding) or artificially (e.g., tree planting, seeding).

Release: Freeing a tree, or group of trees, from competition that is overtopping or closely surrounding them.

Research natural areas (RNAs): Areas within national forests that the U.S. Forest Service has designated to be permanently protected and maintained in a natural condition (e.g., unique ecosystems or ecological features, rare or sensitive species of plants and animals and their habitat, and high-quality examples of widespread ecosystems).

Representative Sample Areas (RSAs): Ecologically viable representative samples designated to serve one or more of three purposes:

- 1) To establish and/or maintain an ecological reference condition
- 2) To create or maintain an under-represented ecological condition
- 3) To serve as a set of protected areas or refugia for species, communities, and community types not captured in other Criteria of this Standard.

Riparian area: The area of land and water forming a transition from aquatic to terrestrial ecosystems along streams, lakes, and open water wetlands.

Riparian management zone (RMZ): That portion of the riparian area where site conditions and landowner objectives are used to determine management activities that address riparian resource needs. It is the area where riparian guidelines apply.

Rotation age: The period of years between when a forest stand (i.e., primarily even-aged) is established (i.e., regeneration) and when it receives its final harvest. This time period is an administrative decision based on economics, site condition, growth rates, and other factors.

Salvage cut: A harvest made to remove trees killed or damaged by fire, wind, insects, disease, or other injurious agents. The purpose of salvage cuts is to use available wood fiber before further deterioration occurs to recover the value that otherwise would be lost.

Sanitation cut: A cutting made to remove trees killed or injured by fire, insects, disease, or other injurious agents (and sometimes trees susceptible to such injuries) for the purpose of preventing the spread of insects or diseases.

Sapling: A tree that is 1 inch to 5 inches in diameter at breast height.

Scientific and natural areas (SNAs): Areas established by the DNR, Division of Ecological Services, to preserve natural features and rare resources of exceptional scientific and educational value.

Seedbed: The soil or forest floor on which seed falls.

Seed tree: Any tree which bears seed; specifically, a tree left standing to provide the seed for natural regeneration.

Selective harvest: Removal of single scattered trees or small groups of trees at relatively short intervals. The continuous establishment of reproduction is encouraged, and an all-aged stand is maintained. A management option used for shade-tolerant species.

Shade tolerance: Relative ability of a tree species to reproduce and grow under shade. The capacity to withstand low light intensities caused by shading from surrounding vegetation. Tolerant species tolerate shade, while intolerant species require full sunlight.

Shelterwood harvest: A harvest cutting in which trees on the harvest area are removed in a series of two or more cuttings to allow the establishment and early growth of new seedlings under partial shade and protection of older trees. Produces an even-aged forest.

Silviculture: The art and science of establishing, growing, and tending stands of trees. The theory and practice of controlling the establishment, composition, growth, and quality of forest stands to achieve certain desired conditions or management objectives.

Site index (SI): A species-specific measure of actual or potential forest productivity or site quality, expressed in terms of the average height of dominant trees at specific key ages, usually 50 years in the eastern U.S.

Size class: A category of trees based on diameter class. The DNR's forest inventory has size classes such as Size Class 1 = 0 - 0.9 inch diameter; 2 = 1 - 2.9 inches diameter; 3 = 3 - 4.9 inches; 4 = 5 - 8.9 inches; 5 = 9 - 14.9 inches, etc. Also, size class may be referred to as seedling, sapling, pole timber, and saw timber.

Slash: The non-utilized and generally unmarketable accumulation of woody material in the forest, such as limbs, tops, cull logs, and stumps that remain in the forest as residue after timber harvesting.

Snag: A standing dead tree.

Special concern species: A plant or animal species that is extremely uncommon in Minnesota or has a unique or highly specific habitat requirement and deserves careful monitoring. Species on the periphery of their ranges may be included in this category, as well as species that were once threatened or endangered but now have increasing or stable and protected populations.

Stand: A contiguous group of trees similar in age, species composition, and structure and growing on a site of similar quality to be a distinguishable forest unit. A forest is comprised of many stands. A **pure stand** is composed of essentially a single species, such as a red pine plantation. A **mixed stand** is composed of a mixture of species, such as a northern hardwood stand consisting of maple, birch, basswood, and oak. An **even-aged stand** is one in which all of the trees present are essentially the same age, usually within ten years of age for aspen and jack pine stands. An **uneven-aged stand** is one in

which a variety of ages and sizes of trees are growing together on a uniform site, such as a northern hardwood stand with three or more age classes.

Stand age: The average age of the main species within a stand.

Stumpage price: The value that a timber appraiser assigns to standing trees or the price a logger or other purchaser is willing to pay for timber as it is in the forest.

Subsection: A subsection is one level within the ECS. From largest to smallest in terms of geographic area, the ECS is comprised of the following levels from largest to smallest: Province, Section, Subsection, Land Type Association, Land Type, and Type Phase. Subsections areas are generally one to four million acres in Minnesota, with the average being 2.25 million acres. Seventeen subsections are scheduled for the SFRMP process.

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to improve growth, enhance forest health, or recover potential mortality. **Row thinning** is where selected rows are harvested, usually, the first thinning, which provides equipment operating room for future selective thinnings. **Selective thinning** is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. **Commercial thinning** is thinning after the trees are of merchantable size for timber markets. **Pre-commercial thinning** is done before the trees reach merchantable size, usually done in overstocked (very high stems per acre) stands to provide more growing space for crop trees that will be harvested in future years.

Threatened species: A plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range in Minnesota.

Timberland: Forestland capable of producing timber of marketable size and volume at the normal harvest age for the cover type. It does not include lands withdrawn from timber utilization by statute (e.g., Boundary Waters Canoe Area Wilderness) or administrative regulation such as designated old growth forests and state parks. On state forest lands, this includes stands that can produce at least three cords per acre of merchantable timber at the normal harvest age for that cover type. It does not include very low productivity sites such as those classified as stagnant spruce, tamarack, cedar, offsite aspen, or nonforest land.

Vegetation growth stage: The vegetative condition of an ecosystem resulting from natural succession and natural disturbance, expressed as vegetative composition, structure, and years since disturbance. The vegetation growth stage describes both the successional changes (i.e., the change in the presence of different tree species over time) and developmental changes (i.e., the change in stand structure over time due to the regeneration, growth, and mortality of trees). Vegetation growth stages express themselves along the successional pathways for a particular ecosystem depending on the type and level of natural disturbance that has occurred. Forest trees and other vegetation composition, habitat features, and wildlife species use change with the various growth stages.

Vegetation management plan: In the process of developing the 10-year stand examination list, many decisions and considerations go beyond identifying what timber will be cut (i.e., broader than timber

management). This includes the designation of old growth, extended rotation forests, riparian areas, desired future forest composition, visually sensitive travel corridors, etc., all of which are intended to address wildlife habitat, biodiversity, and aesthetic and other concerns. Prescriptions assigned to stands reflect decisions based on these multiple considerations and are broader than decisions relative to final harvest (e.g., ERF designation, uneven-aged management, thinning, regeneration, underplanting, prescribed burning, etc.).

Wildlife management area (WMA): Areas established by the DNR, Division of Fish and Wildlife, to manage, preserve and restore natural communities, perpetuate wildlife populations, and provide recreational and educational opportunities.

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Appendix B: Acronyms

| Acronym | Definition |
|---------------|--|
| <u>CSA</u> | <u>Cooperative Stand Assessment</u> |
| <u>DBH</u> | <u>Diameter at Breast Height</u> |
| <u>DFC</u> | <u>Desired Future Condition</u> |
| <u>DFFC</u> | <u>Desired Future Forest Composition</u> |
| <u>DMT</u> | <u>Division Management Team</u> |
| <u>DNR</u> | <u>Department of Natural Resources</u> |
| <u>ECS</u> | <u>Ecological Classification System</u> |
| <u>EILC</u> | <u>Ecologically Important Lowland Conifers</u> |
| <u>ELCP</u> | <u>Ecological Land Classification Program</u> |
| <u>ETS</u> | <u>Endangered, Threatened, or Special Concern</u> |
| <u>FIA</u> | <u>Forest Inventory and Analysis</u> |
| <u>FRIT</u> | <u>Forest Resource Issues Team</u> |
| <u>FTC</u> | <u>Forest Tent Caterpillar</u> |
| <u>FY</u> | <u>Fiscal Year</u> |
| <u>G1</u> | <u>Globally Critically Imperiled (G1) Native Plant Communities</u> |
| <u>G2</u> | <u>Globally Imperiled (G2) Native Plant Communities</u> |
| <u>GAP</u> | <u>Gap Analysis Program</u> |
| <u>GIS</u> | <u>Geographic Information System</u> |
| <u>HCVF</u> | <u>High Conservation Value Forest</u> |
| <u>HWDs</u> | <u>Hardwoods</u> |
| <u>MACLC</u> | <u>Minnesota Association of County Land Commissioners</u> |
| <u>MCBS</u> | <u>Minnesota County Biological Survey</u> |
| <u>MFRP</u> | <u>Minnesota Forest Resources Plan</u> |
| <u>MnTAXA</u> | <u>Minnesota Taxonomy Database</u> |
| <u>NHIS</u> | <u>Natural Heritage Information System</u> |
| <u>NHNRP</u> | <u>Natural Heritage & Nongame Research Program</u> |
| <u>NPC</u> | <u>Native Plant Community</u> |
| <u>NRCS</u> | <u>Natural Resource Conservation Service</u> |
| <u>OFMC</u> | <u>Old Forest Management Complex</u> |
| <u>RMT</u> | <u>Regional Management Team</u> |
| <u>RMZ</u> | <u>Riparian Management Zone</u> |
| <u>RNAs</u> | <u>Research Natural Areas</u> |
| <u>SGCN</u> | <u>Species in Greatest Conservation Need</u> |
| <u>SI</u> | <u>Site Index</u> |
| <u>SMA</u> | <u>Special Management Area</u> |
| <u>SMZ</u> | <u>Special Management Zone</u> |
| <u>SNA</u> | <u>Scientific and Natural Area</u> |
| <u>SPP</u> | <u>Species</u> |
| <u>WMA</u> | <u>Wildlife Management Area</u> |

APPENDIX C: METADATA

| <i>Data</i> | <i>Date(s)</i> | <i>Source</i> | <i>Size of Data Area</i> | <i>Spatial Resolution</i> | <i>Summary</i> | <i>Pros (+) / Cons (-)</i> |
|--|----------------|--|---|---------------------------------|--|---|
| Forest Inventory Module FIM | January 2013 | Aerial photos and ground surveys | Minnesota Stand Level, Public Forest Lands | 1 to 3 acres | Updated version of CSA. | + Detailed forest stand information - Only land managed by public agencies |
| Cooperative Stand Assessment CSA | 1998 | Aerial photos and ground surveys | Minnesota, Stand Level, Public Forest Lands | 1 to 3 acres | Public agencies responsible for forest management use this data as their main inventory source. | + Detailed forest stand information - Only land managed by public agencies for forest management |
| Forest Inventory and Analysis FIA | 1977 1990 | Aerial photos and ground surveys | Minnesota, Plot Level | 1225 acres represented per plot | A federally funded inventory of the state's forest resources: their type, extent, growth, mortality, and removals. | + Detailed forest stand information + Represents public and private lands - Poor spatial resolution |
| GAP Stewardship | 2008 | PLS Sections and ownership data | Minnesota | 40 acres | Database containing land ownership information. Attribute fields describe ownership, administrator, and conservation management code | + Best data available to get quickly get an idea of land ownership. -Inaccurate below 40 acre level. |
| National Land Cover Dataset (NLCD) | 2006 | Aerial photos and satellite images | Conterminous United States | 30 meters | Shows land use broken down by 16 different land cover classifications. | +Recognize and evaluate types of land use changes |
| Minnesota Wildlife Resource Assessment Project MNWRAP | 2000 | MNDNR Section of Wildlife | Minnesota State Level | | Lists wildlife species present in Minnesota and state status (e.g., endangered, threatened, or special concern) | + Statewide - Needs to be field checked -Further development |

| <i>Data</i> | <i>Date(s)</i> | <i>Source</i> | <i>Size of Data Area</i> | <i>Spatial Resolution</i> | <i>Summary</i> | <i>Pros (+) / Cons (-)</i> |
|--|------------------|---|---|---------------------------|--|---|
| National Wetlands Inventory NWI | 1994 | Aerial photos | Minnesota | | Linear wetland features (including selected streams, ditches, and narrow wetland bodies) | +High spatial resolution |
| Natural Heritage Information System | 2000 | MNDNR Section of Ecological Services, Nongame Program | Varies according to completion of CBS in the state. | | Displays inventory of native plant communities, rare species, and biodiversity. | + Extensive habitat classification - Not complete statewide - Different standards statewide |
| Silvicultural Practices | 2013 prepared | | Minnesota | none | harvesting practices in the Blufflands/Rochester Plateau subsections. | + Shows volume and value trends for 2007 - 2012 - No spatial breakdown - Does not account for practices on non-industrial private forest (NIPF) |