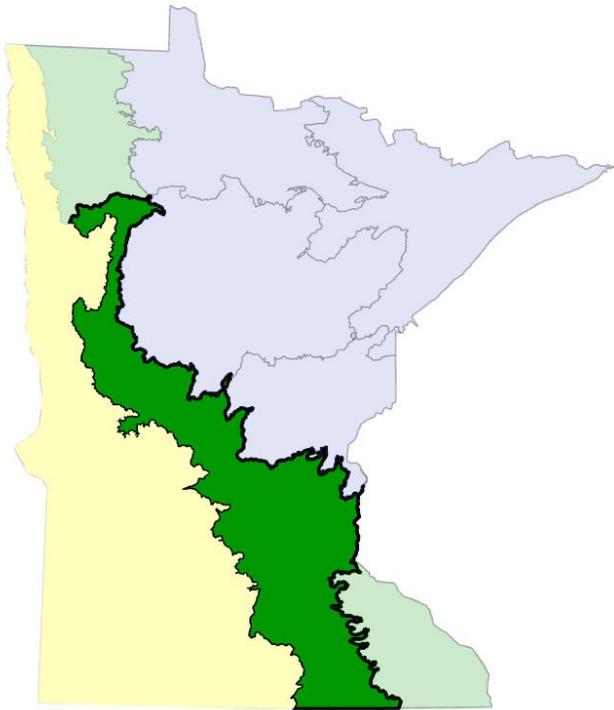


Minnesota & Northeast Iowa

Morainal

Section Forest Resource Management Plan - Section Conditions and Assessment

Prepared 2021



DRAFT

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Chapter 1. Purpose and Planning Area

Purpose of the assessment

This document provides context for the Minnesota Northeast Iowa Morainal¹ Section Forest Resource Management Plan (MIM 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 MIM 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 Minnesota Department of Natural Resources (DNR) plans and carries out management.

Introduction to the planning area

The MIM Section stretches nearly 350 miles from Northwestern Minnesota to the Iowa border. It covers approximately 9.2 million acres and contains the Twin Cities metro area. This section also contains a considerable amount of deciduous forest, woody wetlands, and open water (roughly 14.6% of the area is forested or woody wetlands). The diverse forests and lakes harbor numerous Species of Greatest Conservation Need (SGCN) including northern long eared bats, Red-shouldered Hawks, Least Weasel, and Blanding's turtles.

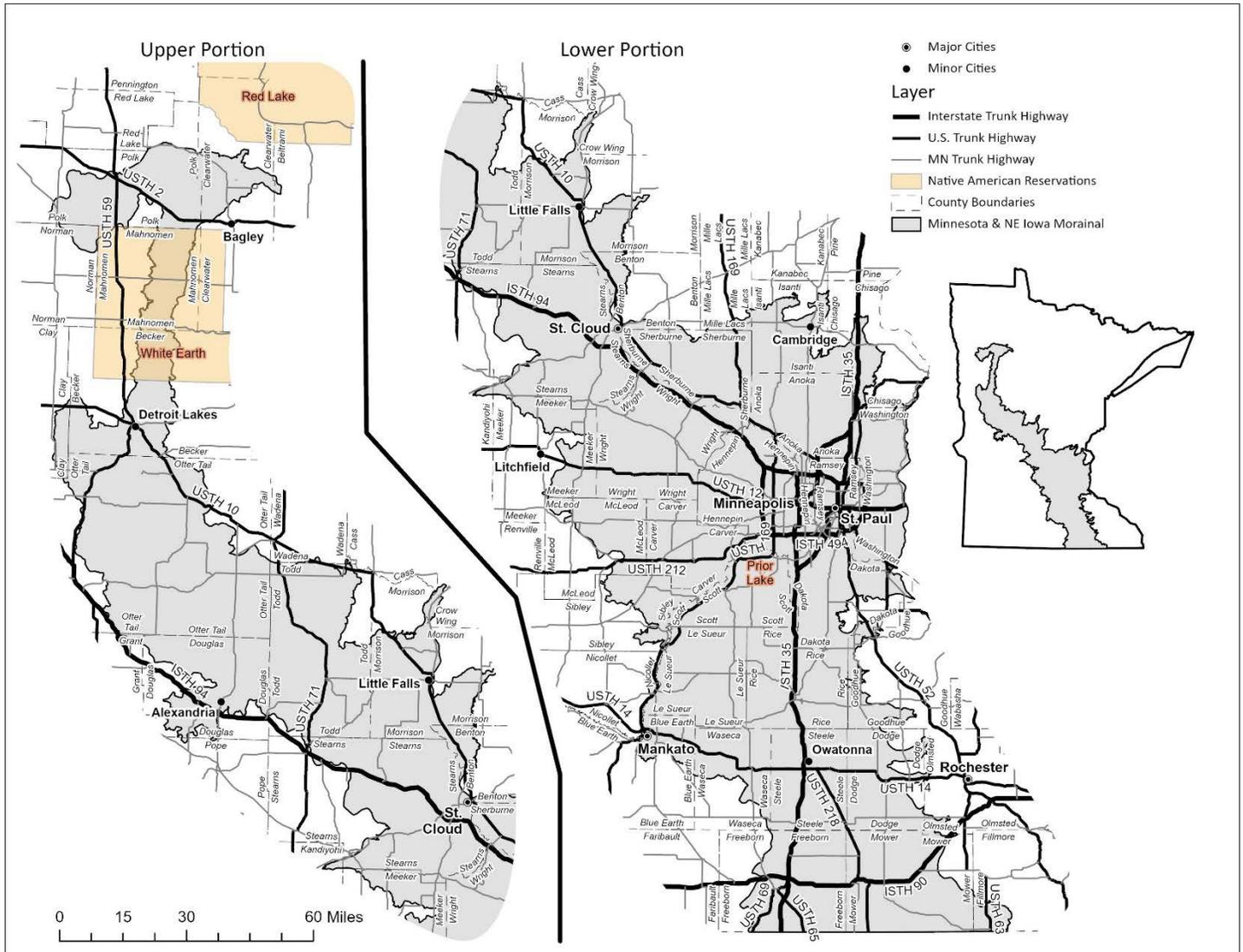
While forests only cover roughly 14 percent of the section timber production and sawmills are still present within the section. There are over 40 portable and stationary sawmills within the central and southern portions of MIM and an additional 127 mills of various sizes located within 50 miles of the Section.

Over 95% of the land is in private ownership, with approximately 4.75% of the land in public ownership (federal, county, state). State ownership accounts for approximately 222,727 acres. The MIM Section includes two tribal nations: the White Earth Reservation is in the far northwestern portion of the MIM section, and the Shakopee Mdewakanton Sioux is located within the South-central portion of the Section.

Much of the Section is rural but the section does encompass large metropolitan areas including the Twin Cities area as well as the smaller cities of Mankato, St. Cloud, and Detroit Lakes. The primary land use within this section is agriculture accounting for about 55% of the land use.

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](#).

Map 1- Location of Minnesota Northeast Iowa Morainal Section



CHAPTER 2: Landscape Context

Land Cover Classification

The Minnesota Northeast Iowa Morainal Section contains a variety of land cover classes. The most recent land cover information available, National land cover classification NLCD 2016, shows that the largest land use in MIM is agriculture with over 55% of the Section being covered by agricultural uses of hay, pasture, and cultivated crops. Forests and woody vegetation are the second largest land cover within the section covering 16.1 % of the section. This section also contains a high percentage of developed lands due the twin cities metropolitan area and other large cities. Table 1, Map 3, Map 4.

Table 1-National Land Cover Classes in the MIM Section (NLCD 2016 data)

NLCD Land Cover Class	Acres	Percent
Open Water	580,081	6.3%
Developed, Open Space	491,284	5.3%
Developed, Low Intensity	326,985	3.6%
Developed, Medium Intensity	196,982	2.1%
Developed, High Intensity	77,875	0.8%
Barren Land	18,456	0.2%
Deciduous Forest	1,103,725	12.0%
Evergreen Forest	37,875	0.4%
Mixed Forest	83,171	0.9%
Shrub/Scrub	14,589	0.2%
Herbaceous	112,016	1.2%
Hay/Pasture	968,465	10.5%
Cultivated Crops	4,176,726	45.4%
Woody Wetlands	240,778	2.6%
Emergent Herbaceous Wetlands	769,183	8.4%
Total	9,198,190	100.0%

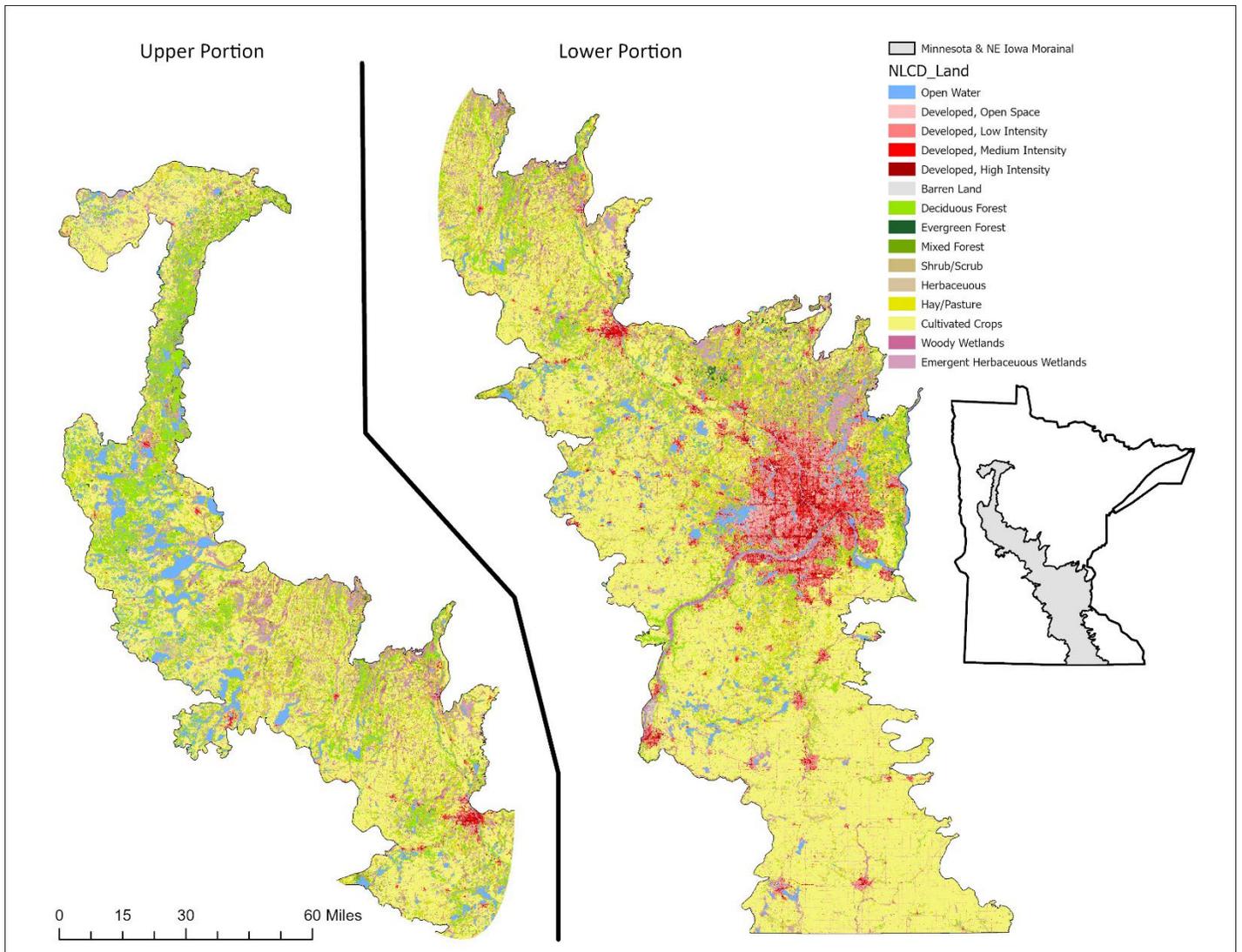
Land Ownership

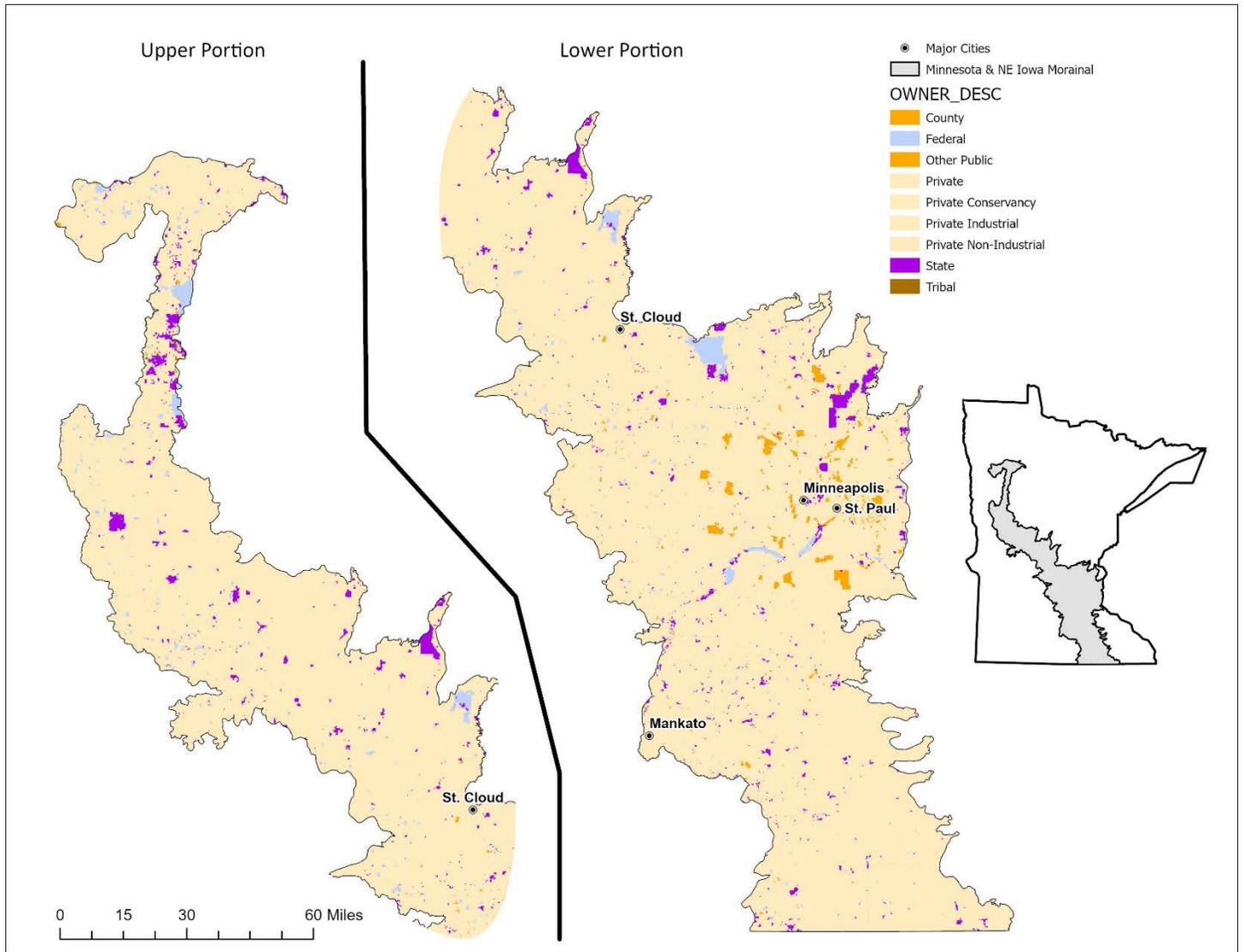
The MIM Section covers approximately 9.2 million acres. The majority of land (approximately 95%) is owned by private individuals (94.6% of private land and 0.5 % private industry). Approximately 4.75% of the land in MIM is public and administered by federal, county, or state government. With the State of Minnesota administering 2.4% of the land in the Section. Tribes and the Bureau of Indian Affairs own approximately <0.1% of the land in the MIM Section. Table 2, Map 5, Map 6

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

Administrator Class	Acres	Percent
County/Other Public	92,505	1%
Federal	121,622	1.3%
Private	8,758,263	95.2%
State	222,728	2.4%
Tribal	3,072	<0.1%
Grand Total	9,198,190	100.0%

Map 2- MIM Land Cover, 2016 National Land Cover Classification





Forest Cover Type Age Class Distributions

Estimates from USFS Forest Inventory Analysis (FIA) data show that the forest has grown older on average between the periods of 2009 and 2019. Across all ownerships, acres of older forest increased compared to acres of younger forest.

While on average the forest is getting older there is still quite a bit of young forest on all lands within the MIM section. With some cover types having more young forest than other. Table 3 shows the percentage of forest that is below and above the standard DNR even aged rotation age applied to DNR forest lands managed under the SFRMP. Figure 1 to Figure 10 show the difference in 10 year age class distributions for forest cover types from 2009 and 2019.

Table 3 - Percent of even age cover type above and below the youngest stand rotation age applied to SFRMP managed lands (2019 FIA data).

Species (lowest rotation age applied on SFRMP managed lands in even aged management)	Below rotation age	Above rotation age
Aspen (RA 40)	28%	72%
Balm of Gilead (RA 40)	84%	16%
Birch (RA 45)	21%	79%
Jack pine (RA 35)	27%	73%
Tamarack (RA 85)	79%	21%
Red pine plantation (RA 60)	85%	15%
White pine plantation (RA 60)	48%	52%
Oak (RA 60)	11%	89%

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Figure 1- Number of Acres by 10 year age class all cover types. 2009 and 2019 FIA data.

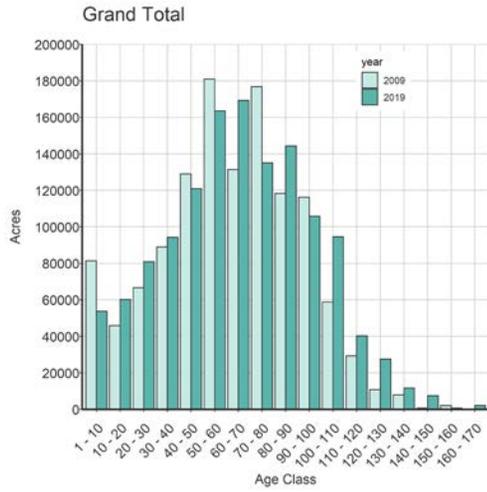


Figure 3- Number of Acres of Aspen by 10 year age class. 2009 and 2019 FIA data.

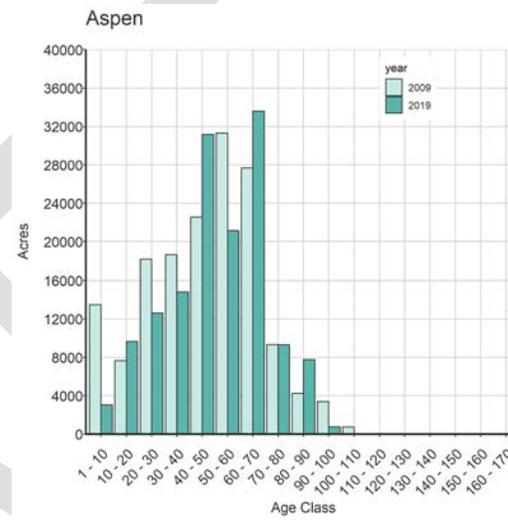


Figure 2- Number of Acres of Ash by 10 year age class. 2009 and 2019 FIA data.

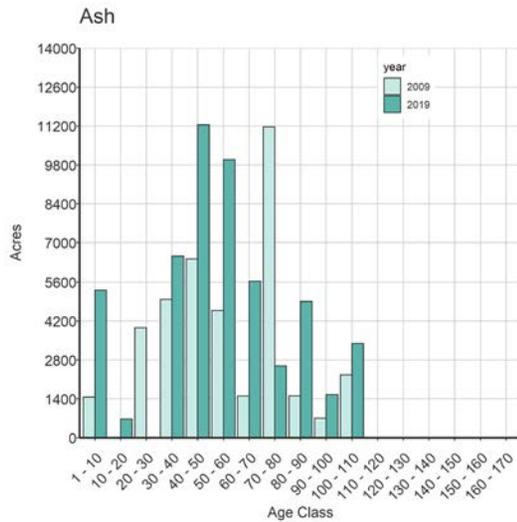


Figure 4- Number of Acres of Balsam Poplar by 10 year age class. 2009 and 2019 FIA data.

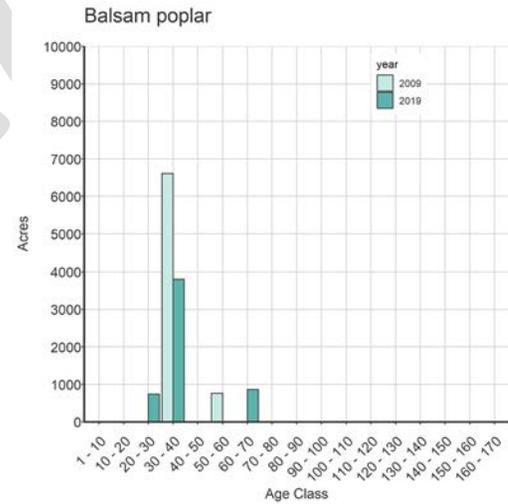


Figure 5-Number of Acres of Birch by 10 year age class. 2009 and 2019 FIA data.

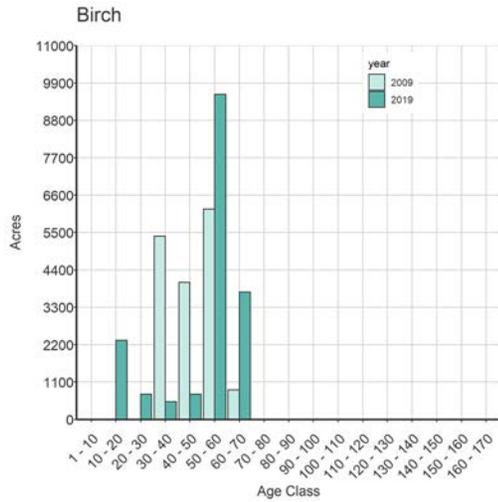


Figure 7-Number of Acres of Lowland Hardwoods by 10 year age class. 2009 and 2019 FIA data.

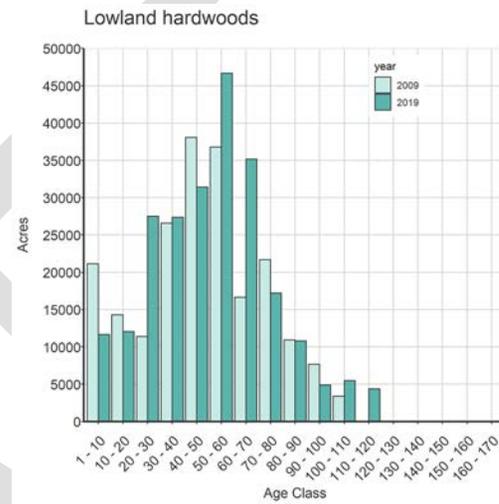


Figure 6-Number of Acres of Central Hardwoods by 10 year age class. 2009 and 2019 FIA data.

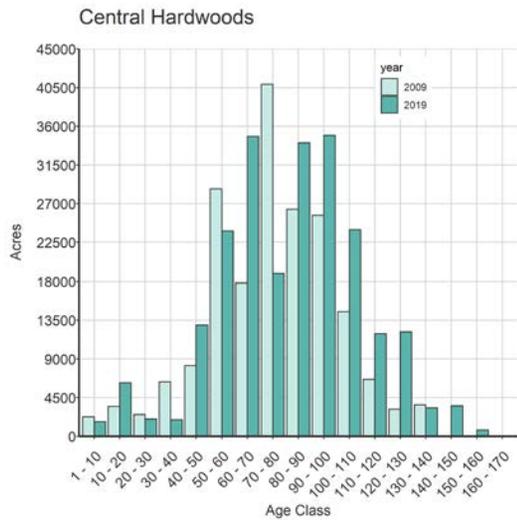


Figure 8-Number of Acres of Northern Hardwoods by 10 year age class. 2009 and 2019 FIA data.

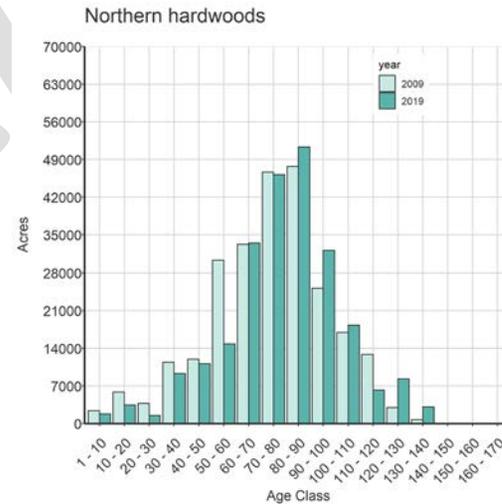


Figure 9-Number of Acres of Oak by 10 year age class. 2009 and 2019 FIA data.

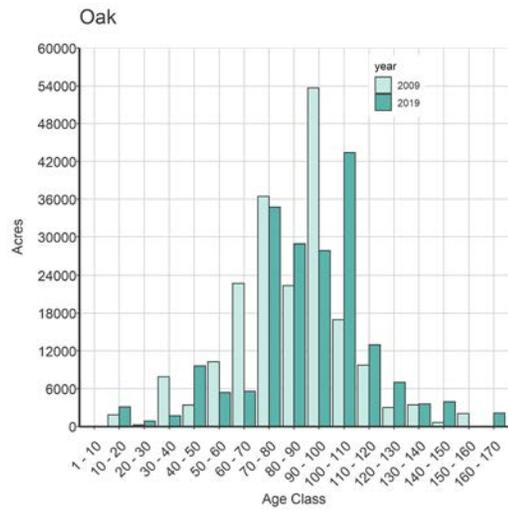
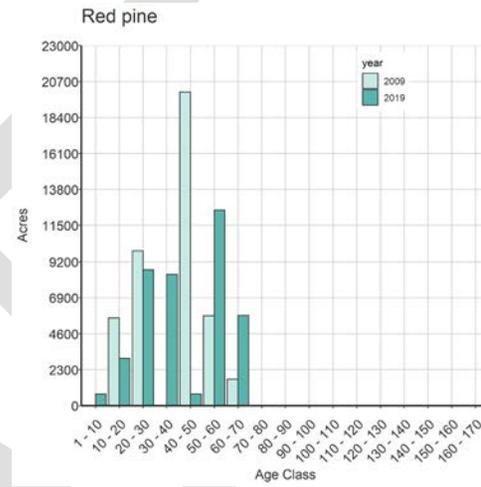


Figure 10-Number of Acres of Red Pine by 10 year age class. 2009 and 2019 FIA data.



Forest Biodiversity

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 (NPC), and functional landscapes needed to guide decision-making.

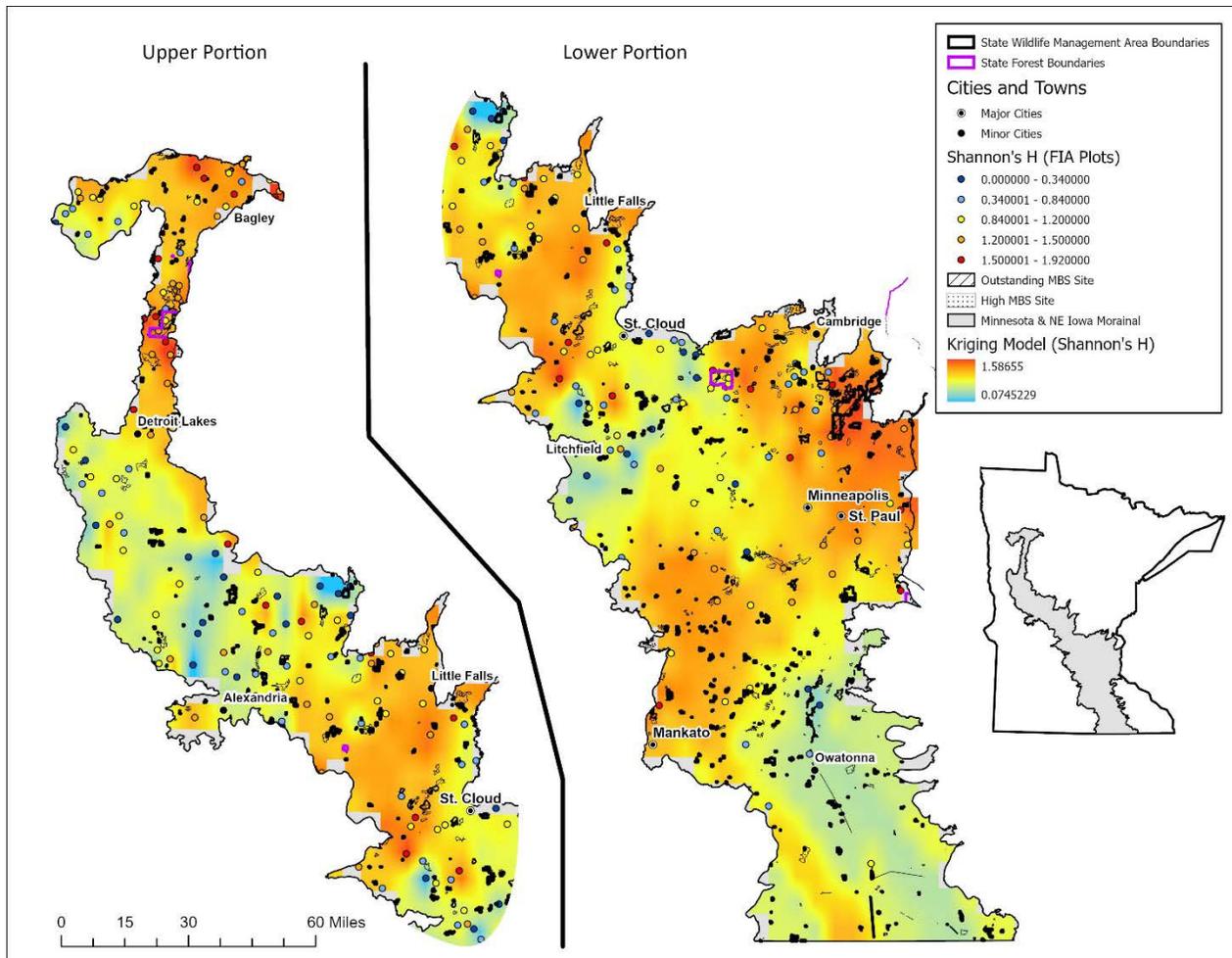
Currently within the MIM Section there is 81,000 acres identified as outstanding significance and over 142,000 acres identified as high significance. These sites contain very good to the best occurrences of the rarest species and the most functional intact landscapes.

Within Stand Forest Diversity

A Shannon's H diversity index was calculated for the FIA plots within the MIM section. The Shannons'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 7 and Map 8 show spatially through a Kriging model the estimated tree species diversity within forests in the MIM section. It shows the Shannon's H analysis of diversity along with MBS areas of outstanding and High Bio significance.

Map 4 - Estimated Forest Diversity MIM Section



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](#)).

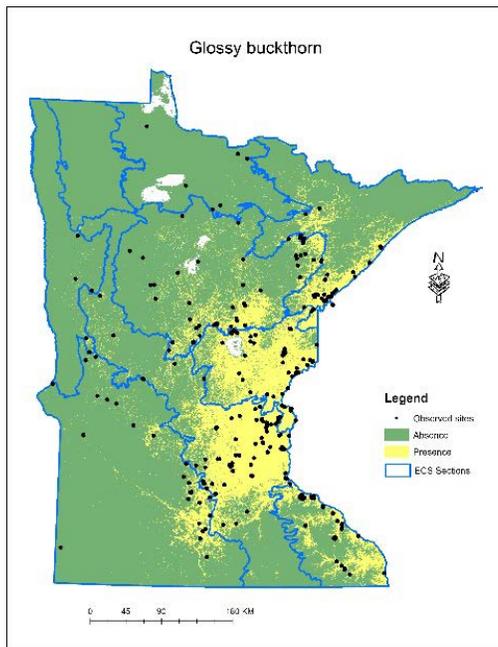
Division of Forestry (DoF) manages invasive plants when they impact reforestation, wildlife habitat, recreation, and other values. Additionally, as landowners, DNR is required by law to eradicate or prevent reproduction of certain invasive plants that are listed on the state [Noxious Weed list](#) (eradicate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

Buckthorn

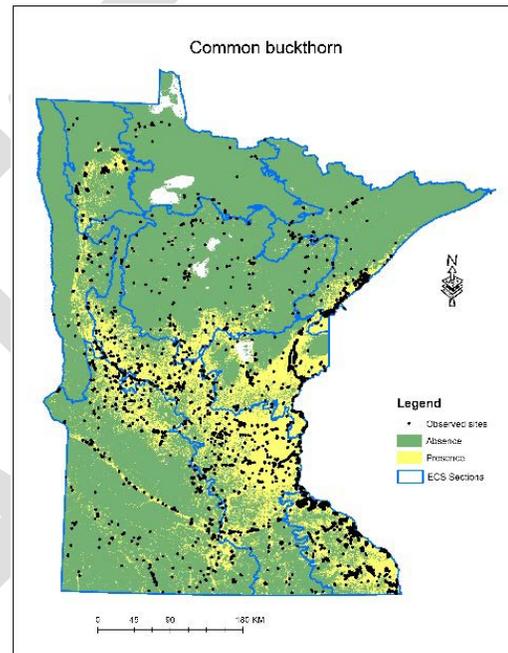
Common and glossy buckthorn are some of the most prevalent woody invasive plants in Minnesota. They grow in dense thickets, degrade habitat, and negatively impact tree regeneration. It is expensive to manage buckthorn once it is

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. Buckthorn is widespread in the central part of the MIM Section, but is found in scattered, isolated populations in the southern and northern parts of the section.

Map 5- Distribution of Glossy Buckthorn in MN



Map 6- Distribution of Common Buckthorn in MN



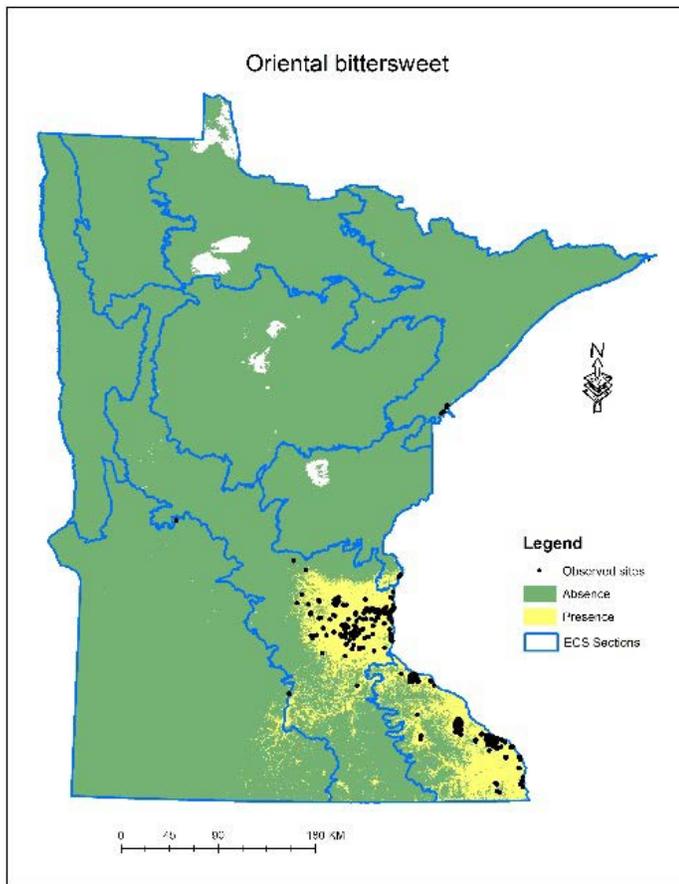
Siberian Peashrub and Honeysuckles

Siberian peashrub and non-native bush honeysuckles are two other woody shrubs that are found growing densely in isolated populations, especially in the north-central and eastern areas of the MIM 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.

Oriental Bittersweet

Some invasive plants are not widespread in the section, but could become major issues if they are allowed to spread and establish. Oriental bittersweet is currently found in isolated locations in the greater Twin Cities metro area, but has the potential to spread much more widely across Minnesota if small populations are not contained. This woody vine grows up trees and can smother them and even pull them down. It is very difficult and costly to control. Invasive barberry species are additional shrubs that are present in some locations (and have been shown to be problematic elsewhere) but are not yet widespread.

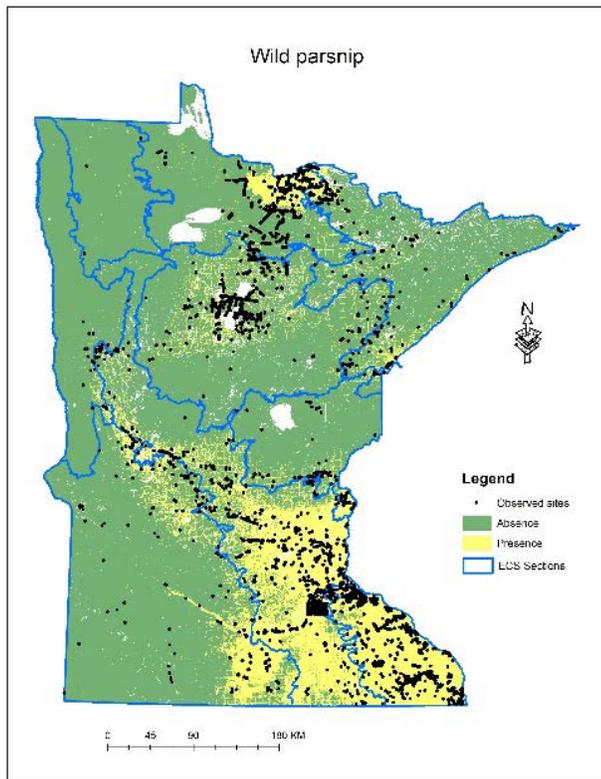
Map 7- Distribution of Oriental Bittersweet in MN



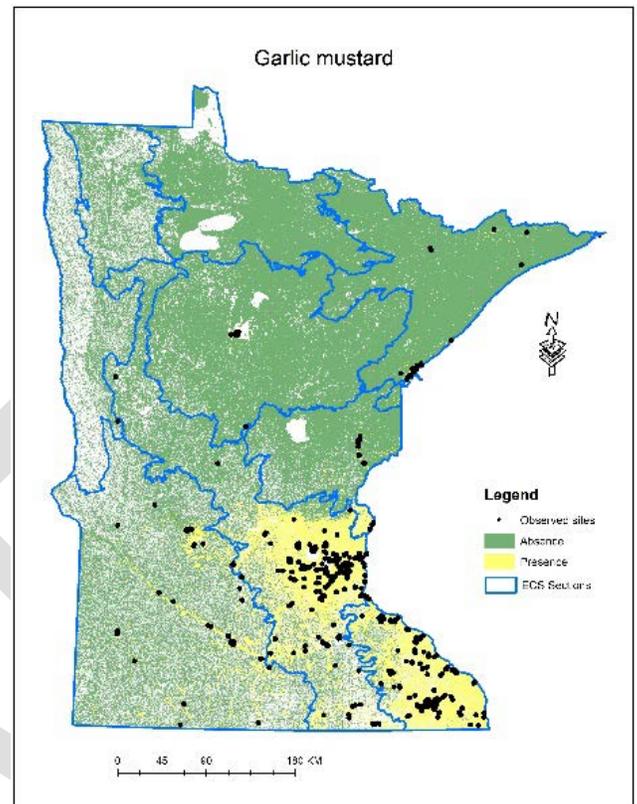
Noxious Weeds

Herbaceous invasive plants including wild parsnip, spotted knapweed, and garlic mustard are prevalent in various parts of the MIM section. DNR is required by the Noxious Weed Law to prevent reproduction and control the spread of wild parsnip and spotted knapweed, 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. Garlic mustard is an invader of shaded forest understories as well as sunny forest edges. It is only found in the southern half of the MIM section, but research in other locations has shown it can decrease growth and flowering of native wildflowers and other understory plants, with negative implications for wildlife and tourism. Current DoF practices focus on preventing the spread of garlic mustard's abundant, tiny seeds 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.

Map 8- Distribution of Wild Parsnip in MN



Map 9- Distribution of Garlic Mustard in MN



Many new invasives arrive in Minnesota and establish first in the southeastern part of the state, so the southern MIM is often near the frontlines of new invasions. Detection and reporting of new invasive plants, and action to rapidly respond to early-stage invasions are important to reduce the spread of new invaders further into the state, and limit potential future problems.

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.

Insect and Disease

This list includes Insects and diseases that will potentially affect forest management within the State of Minnesota and the MIM Section. This is not a list of all of the insects in diseases that affect forests, but the ones that have to potential to affect forest management over the next planning period.

Pest or Disease	Within Minn. and Iowa Morainal (MIM)
Eastern larch beetle	x
Emerald ash borer	x
Jack pine budworm	
Larch casebearer	
Spruce budworm	
Twolined chestnut borer	x
Eastern dwarf mistletoe	
Heterobasidion root disease	
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 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 more 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 10 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.

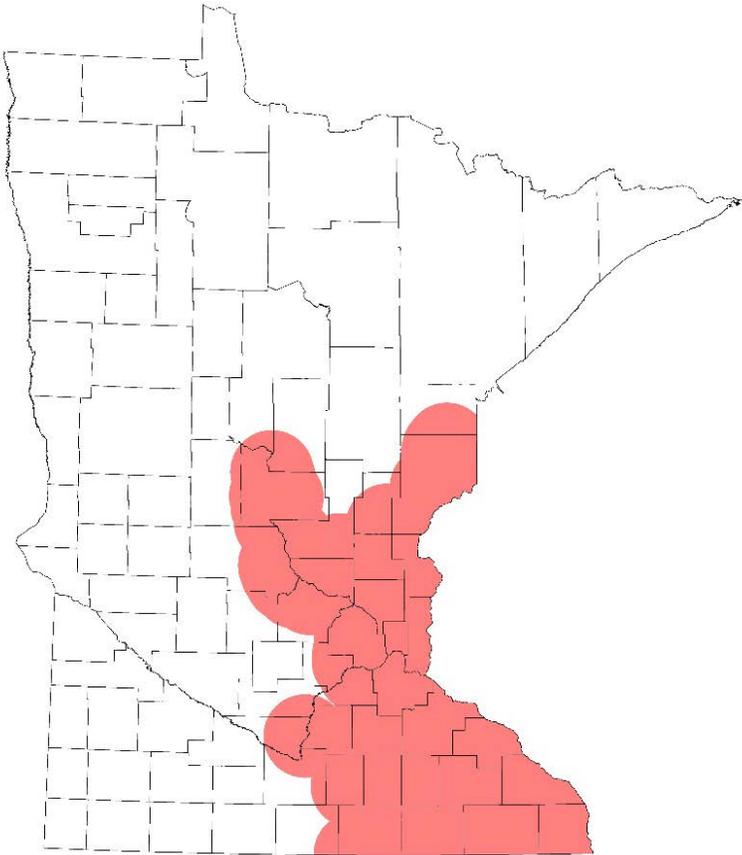
Eastern dwarf mistletoe

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 10- Oak Wilt Distribution



Chapter 3: DNR-administered lands

DNR-administered land

The DNR administers roughly 175,000 acres of land distributed across the MIM section. The majority of DNR administered lands are within small groupings across the Section, although there are a few large contiguous blocks of DNR administered lands, the two largest blocks being within the Carlos Avery Wildlife Management Area and the Maplewood State Park. The majority of DNR administered lands within MIM are administered by the Division of Fisheries and Wildlife.

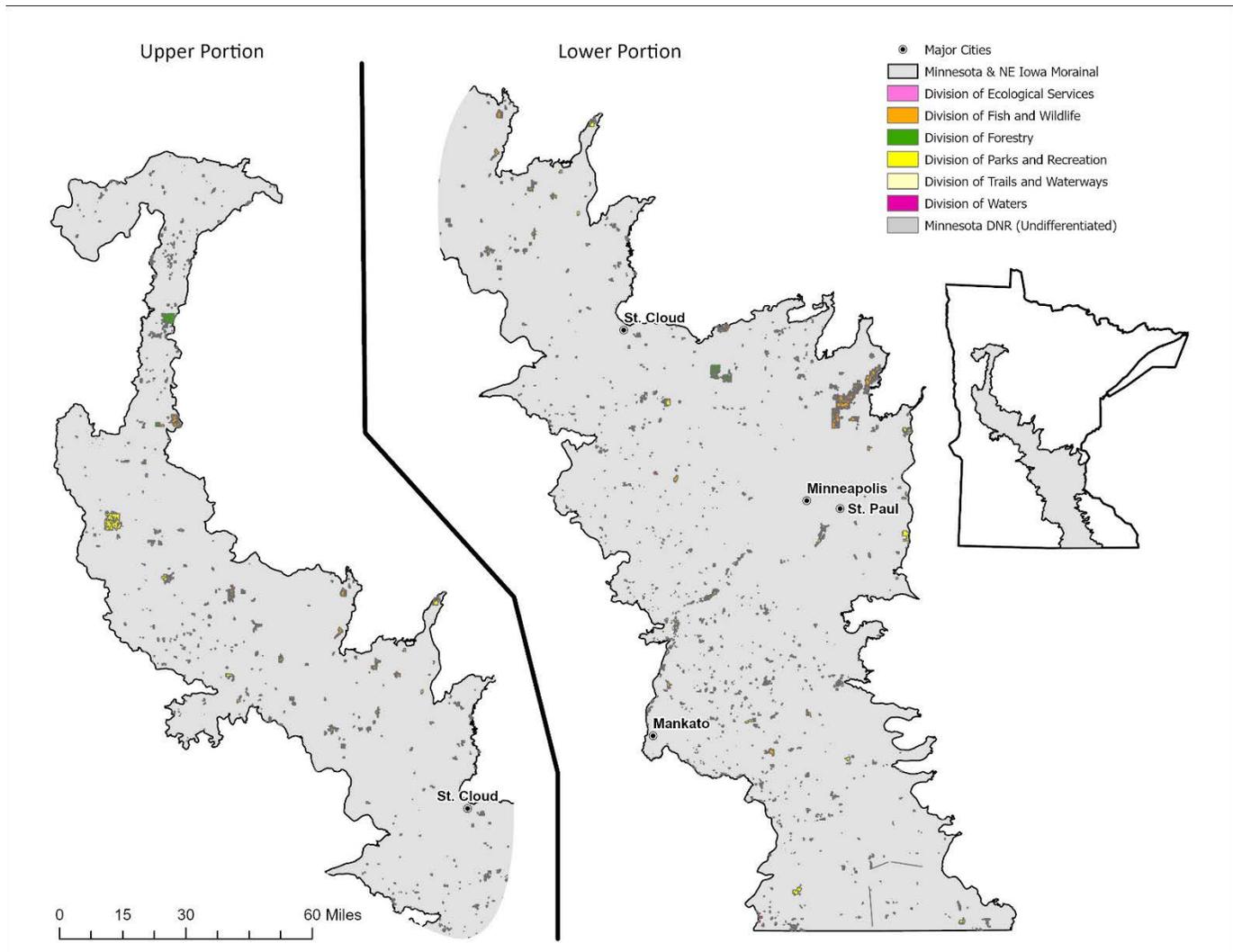
The SFRMP applies to approximately 39,000 acres of State land administered by the Divisions of Forestry and Fish and Wildlife that are in the management pool referred to as managed acres. Managed acres are timberland acres available for timber management (excluding timberlands reserved as old growth, state parks, or scientific and natural areas (SNA), inoperable stands, etc.)

The following tables and maps show the location and number of acres that are administered by the DNR from the 2008 GAP assessment.

Table 4- DNR Administration of Land Within MIM (2008 GAP)

DNR Administrator	Acres	Percent
Ecological and Water Resources	4,996	3.9%
Fisheries and Wildlife	113,753	64.7%
Forestry	22,809	13%
Parks and Trails	32,150	18.3%
other	304	.2%
Total	175,815	100%

Map 11- Location DNR administered lands within MIM



Special Management Areas

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

Table 5 - Special Management Area Types

Special Management Area Type	Number	Acres
Old Forest Management Complex (OFMC)	6	3,804
Open Landscape Management Areas (OLMA)	1	145
Ruffed Grouse Management Area (RGMA)	1	4,386
Forest Patch (PATCH)	2	2,945
High Conservation Value Forests (HCVF)	8	7377
Representative Sample Areas (RSA)	3	237

Forest Composition

Between 2010 and 2021 the total amount of lands administered by the DNR, as represented within the Forest Inventory Module (FIM), has increased by 4.2%. The two largest cover types, Oak and Northern Hardwoods, have increased during this period while the third largest, Aspen, has decreased. Table 6 shows the change in acres for forest cover types within MIM.

Table 6 - Change in Forest Cover (2010 and 2021 FIM)

Cover type	2010 acres	2021 acres	Trend
Ash/ lowland Hardwoods	4,384	4,164	-5.2%
Aspen	11,358	10,829	-4.8%
Birch	319	328	2.7%
Jack Pine	621	442	-40.4%
Balsam Fir	47	43	-9.3%
Black Spruce Upland	2	2	0%
White Spruce	308	245	-25.7%
Black Spruce lowland	11	11	0%
Tamarack	1,725	1,684	-2.4%
Red Pine	3,032	2,915	-4%
White Pine	940	1,494	37%
Northern Hardwoods	13,340	13,511	1.2%
Central Hardwoods	1,397	1,412	1%
Oak	18,245	18,944	3.6%
Cedar	2	0	-100%
Other forest types	519	598	13.2%
Upland Brush	872	938	7.5%
Upland Grass	18,331	18,661	1.8%
Other Non-Forest	75,035	80,899	7.8%
Total Acres	150,488	157,126	4.2%

State Land Cover Type Age Class Distributions

These charts show current age class distributions for cover types in the Minnesota Northeast Iowa Morainal with acres planned on the 10-year stand exam list (FIM 2017). 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). Note the y axis on all charts is variable to be able to show certain cover types that have very small acreages within the Section.

Figure 11 – Ash/ Lowland Hardwoods 10 year age class distribution

Figure 12 – Balsam Fir 10 year age class distribution

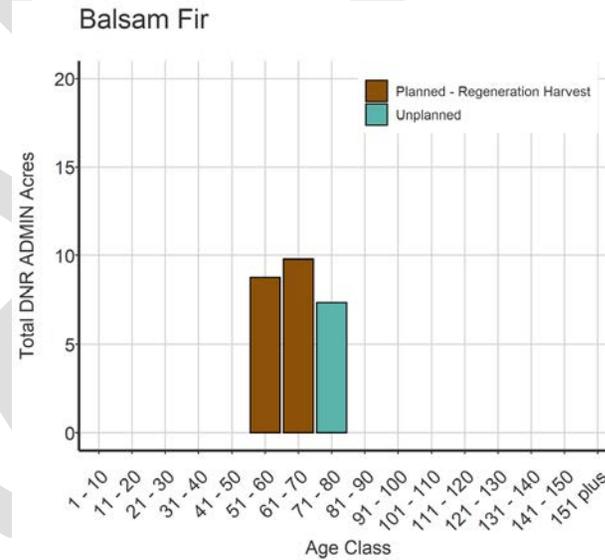
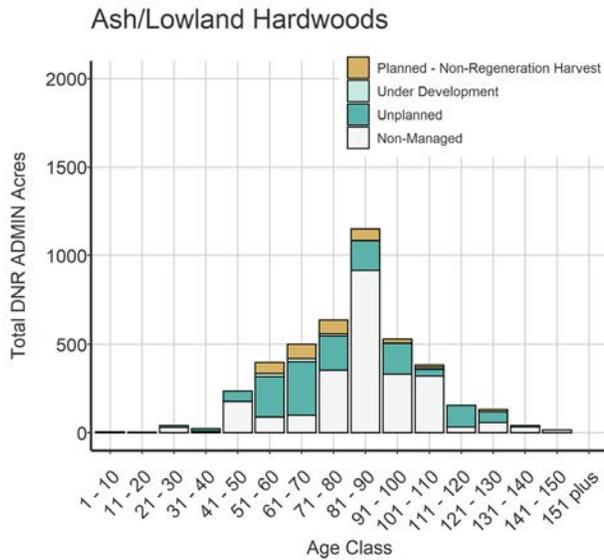


Figure 13- Aspen 10 year age class distribution

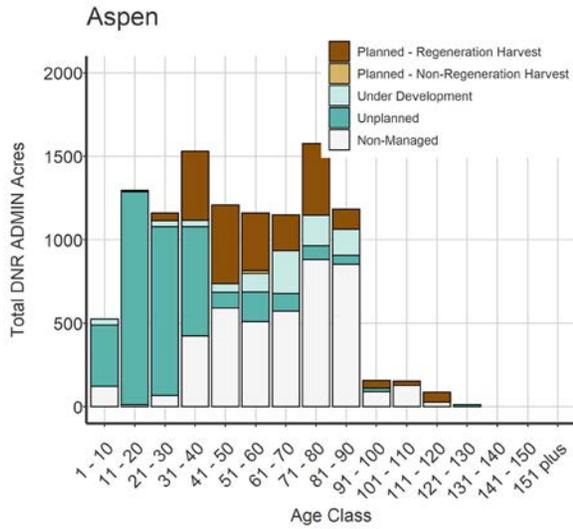


Figure 15 – Black Spruce Upland 10 year age class distribution

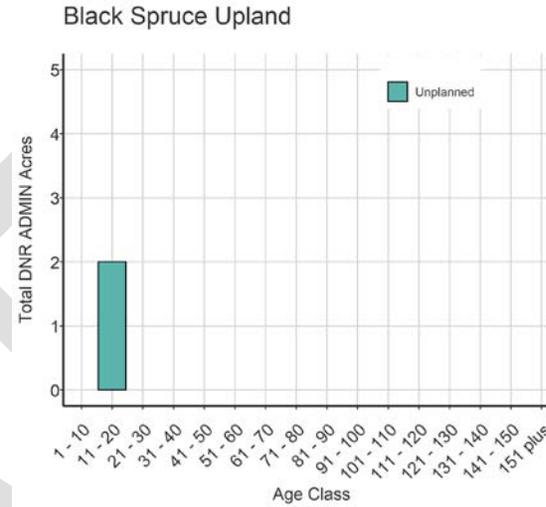


Figure 14 - Birch 10 year age class distribution

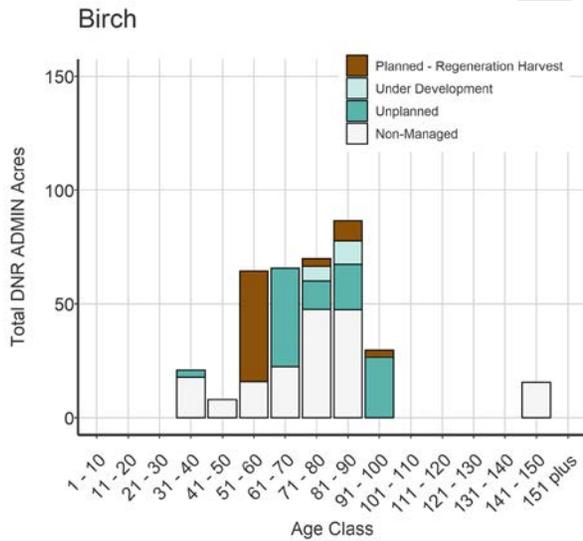


Figure 16- Jack Pine 10 year age class distribution

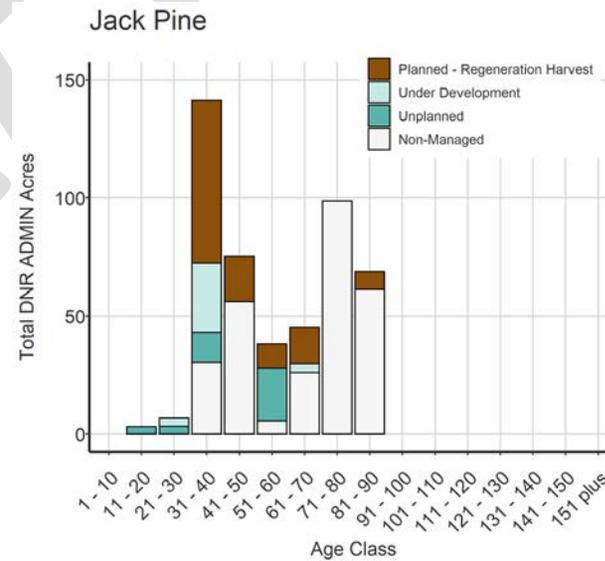


Figure 17- Northern Hardwoods 10 year age class distribution

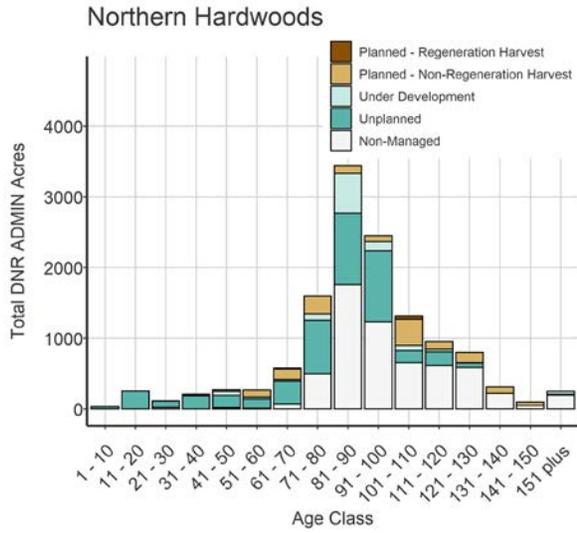


Figure 19- Red Pine Natural Origin 10 year age class distribution

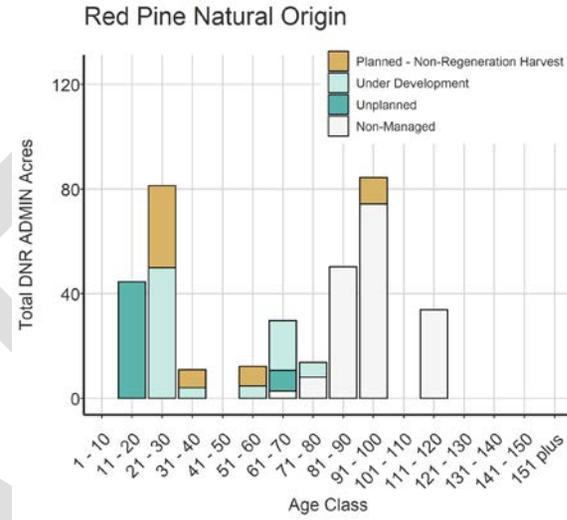


Figure 18- Oak 10 year age class distribution

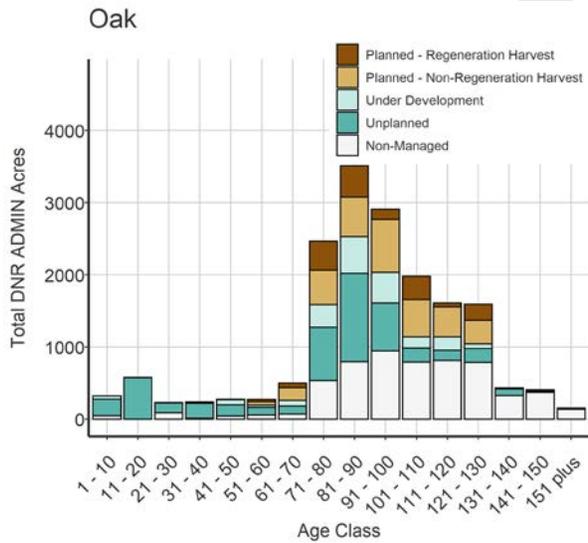


Figure 20- Red Pine Plantation 10 year age class distribution

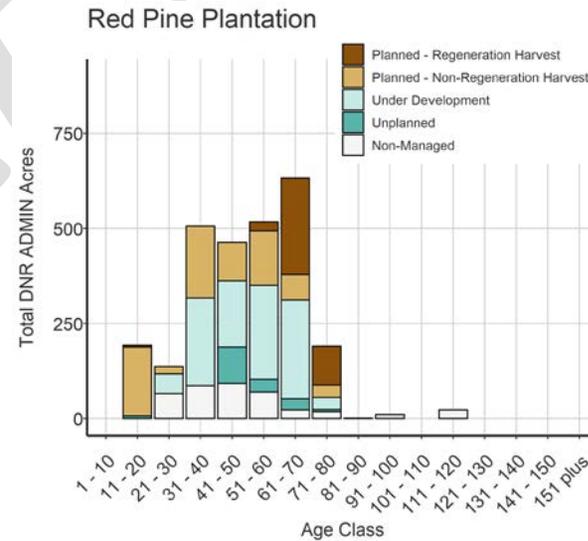


Figure 21 – White Pine 10 year age class distribution

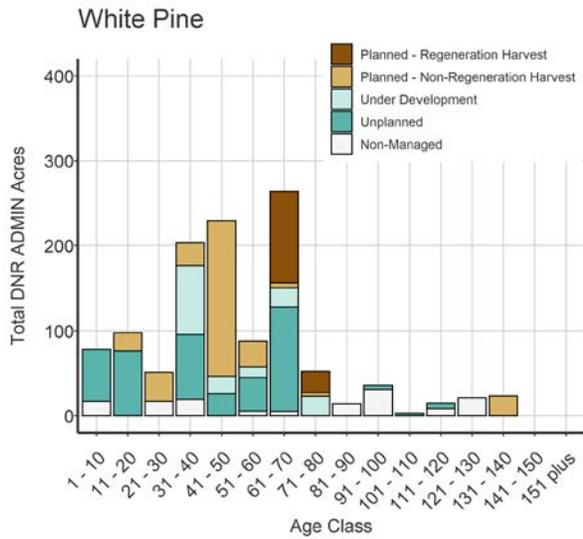


Figure 23 – Black Spruce Upland 10 year age class distribution

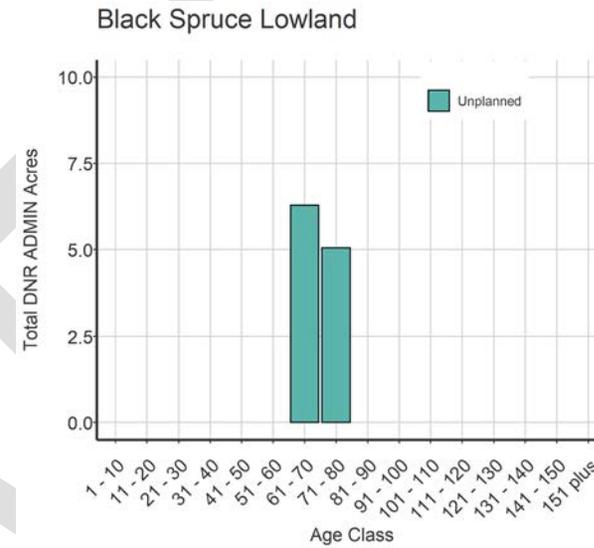


Figure 22 – White Spruce 10 year age class distribution

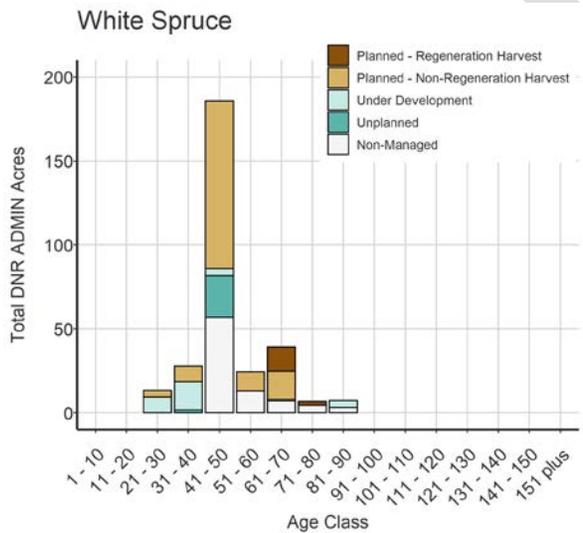


Figure 24 - Tamarack 10 year age class distribution

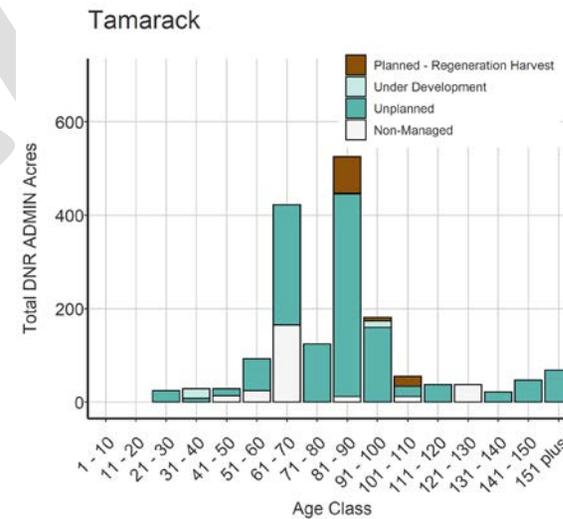
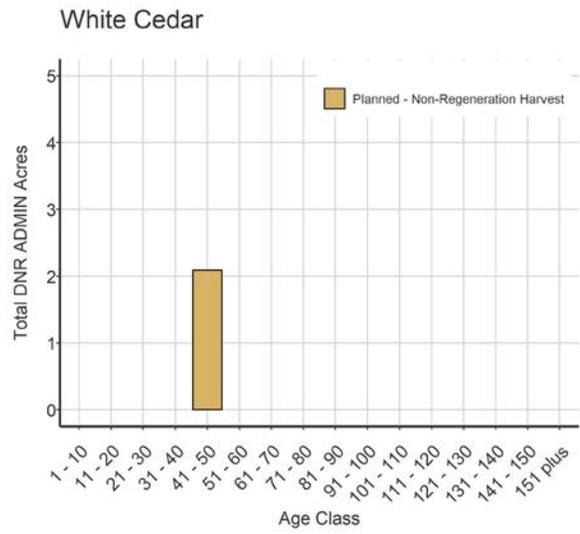


Figure 25 – White Cedar 10 year age class distribution



Forests Above and Below Rotation Age

The following table shows the percent by species group that is above and below the standard DNR even aged rotation age. Stand acres includes all DNR administered acres within this species group, managed acres are the acres within the species group managed under the SFRMP.

Table 7 - Percent Forest Above and Below Rotation Age (FIM2021)

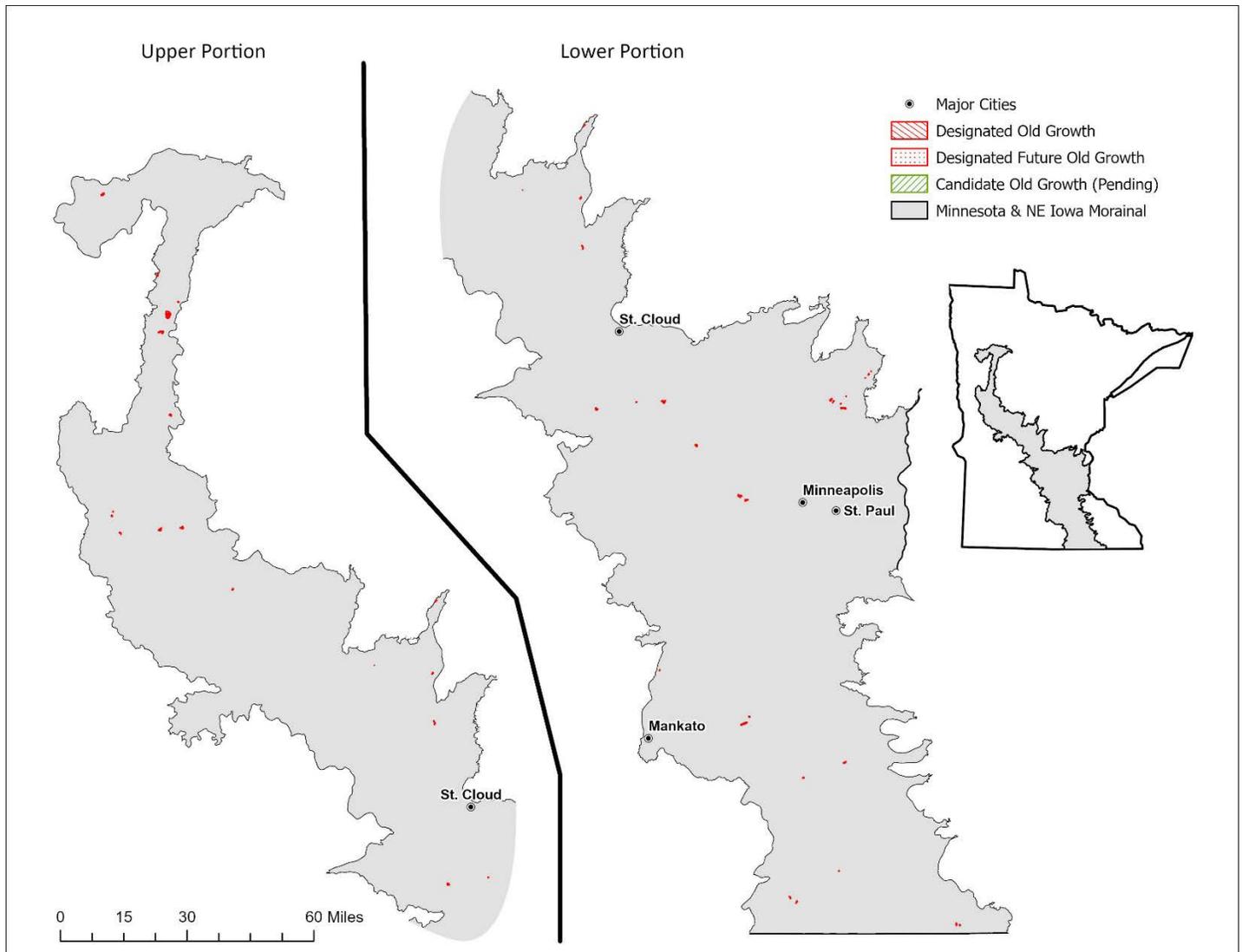
Cover type	Percent Below Rotation Age (Stand Acres)	Percent Above Rotation Age (Stand Acres)	Percent Below Rotation Age (Managed Acres)	Percent Above Rotation Age (Managed Acres)	Total Stand Acres	Total Managed Acres
Aspen / Balm of Gilead	47%	52%	63%	36%	10,829	6,747
Birch	13%	86%	3%	96%	328	211
Jack Pine	12%	87%	27%	72%	442	199
Black spruce uplands	100%	0%	100%	0%	2	2
Balsam Fir	20%	79%	20%	79%	43	43
White Spruce	67%	32%	61%	38%	245	126
Black Spruce Lowland	100%	0%	100%	0%	11	11
Tamarack	64%	35%	60%	39%	1,684	1,446
Red pine	19%	80%	19%	81%	2,915	2,365
White Pine plantation	65%	35%	66%	33%	1,010	902
Oak	12%	87%	16%	83%	17,783	11,888

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 8- Designated Old Growth and Future Old Growth by Forest Type in MIM

Row Labels	Designated	Designated Future Old Growth	Total
Aspen	54.3	0	54.3
Ash	16.8	0	16.8
Central Hardwoods	92.5	0	92.5
Lowland Hardwood	208.8	0	208.8
Northern Hardwood	2,003.4	0	2,003.4
Oak	804.5	0	804.5
Red Pine	8.4	0	8.4
White Pine	152.9	0	152.9
Grand Total	3,341.6	0	3,341.6



Acres of Timber Sold on DNR Lands

On average, the DNR offered 9,440 cord equivalents and sold 7,562 cord equivalents per year in fiscal years (FY) 2013-2021 in the MIM Section. The following figures show the amount of volume offered and sold in total as well as for specific species within MIM.

Figure 26 - MIM Section volume offered and Sold from DNR lands

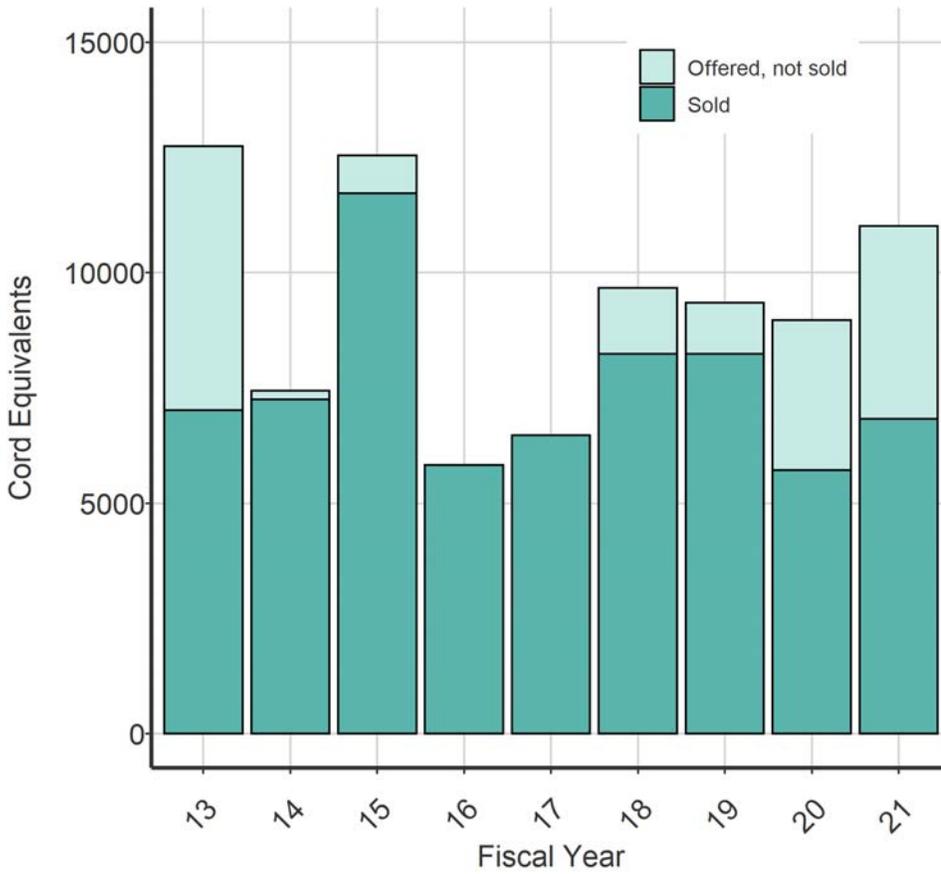


Figure 27- Aspen average volume offered and sold form DNR lands in Cord equivalents

Aspen

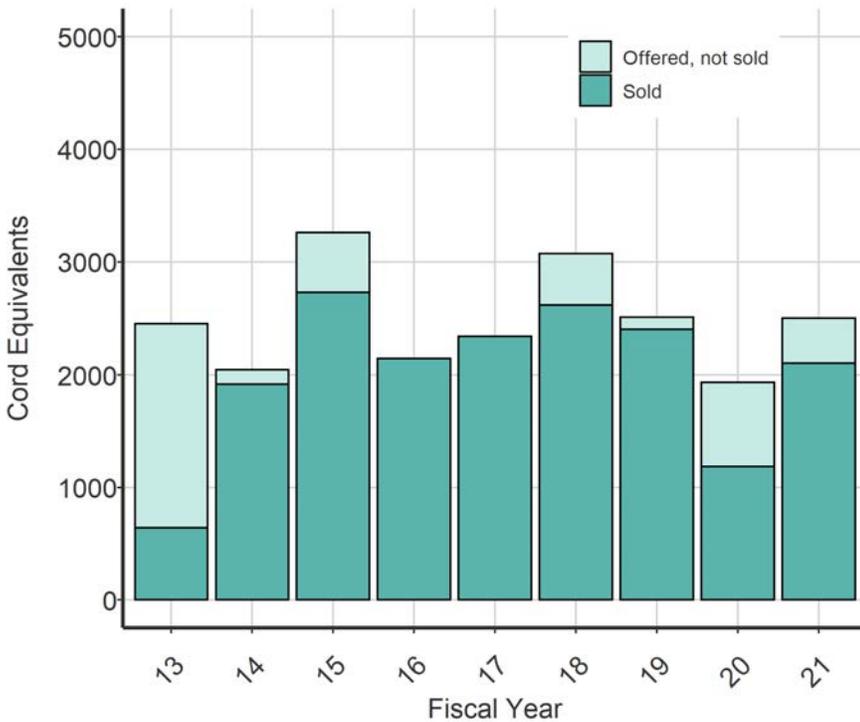


Figure 28 - Hardwoods average volume offered and sold form DNR lands in Cord equivalents

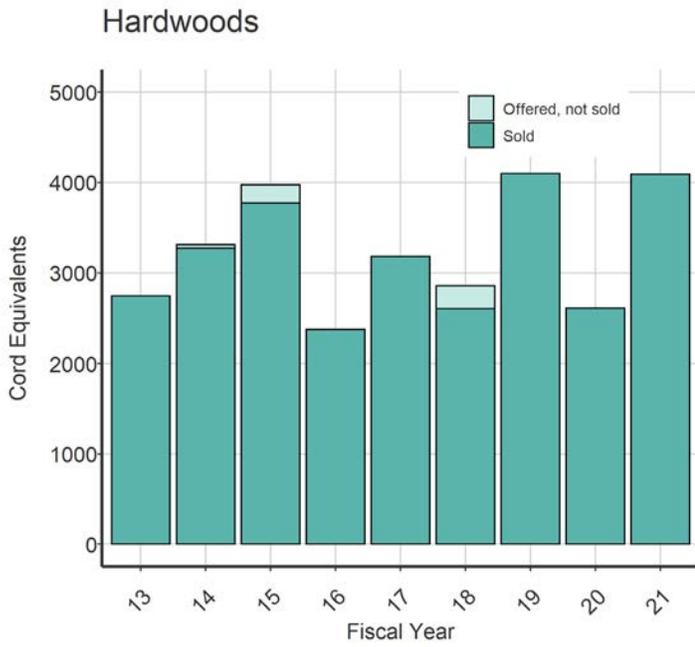


Figure 29 - Pine average volume offered and sold form DNR lands in Cord equivalents

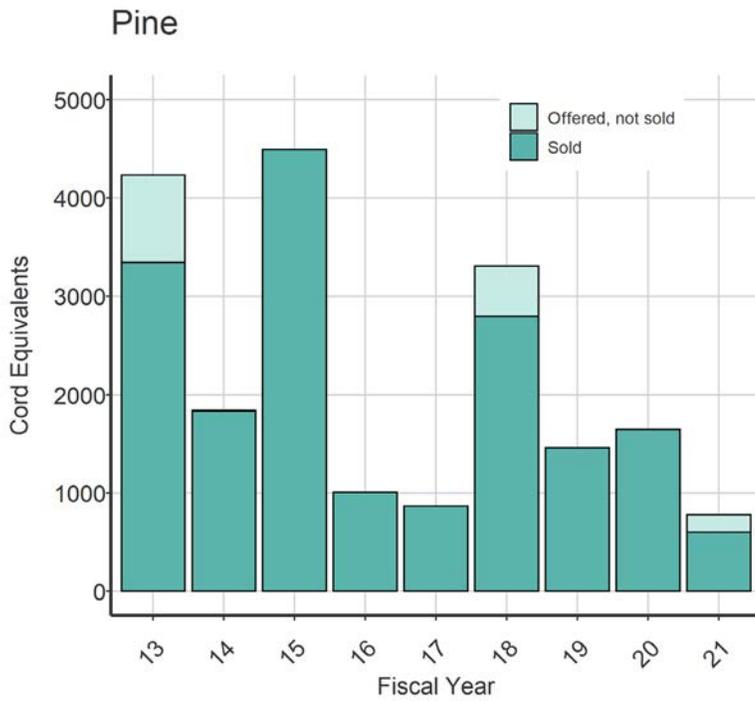


Figure 30 - Spruce average volume offered and sold from DNR lands in Cord equivalents

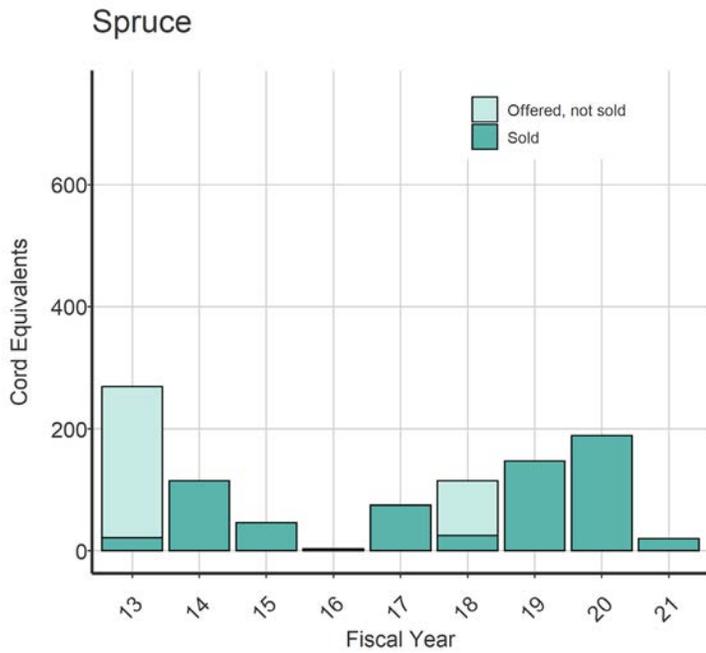
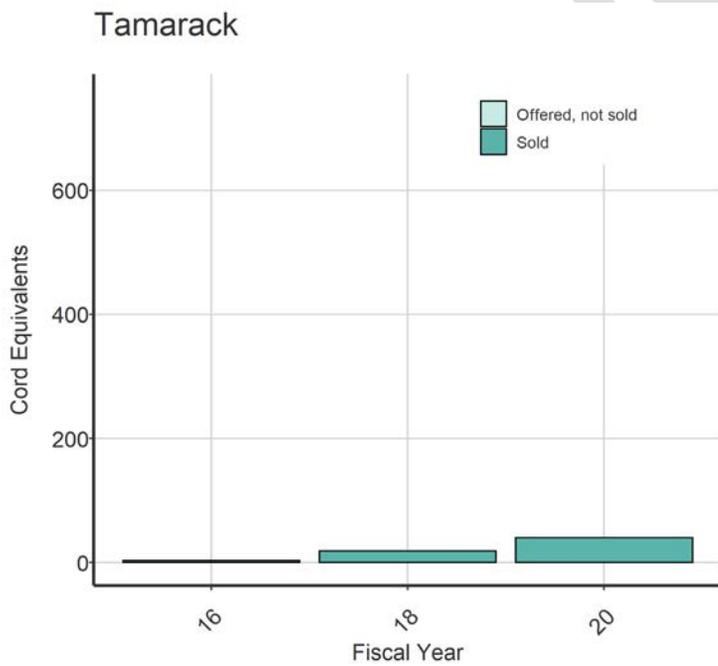


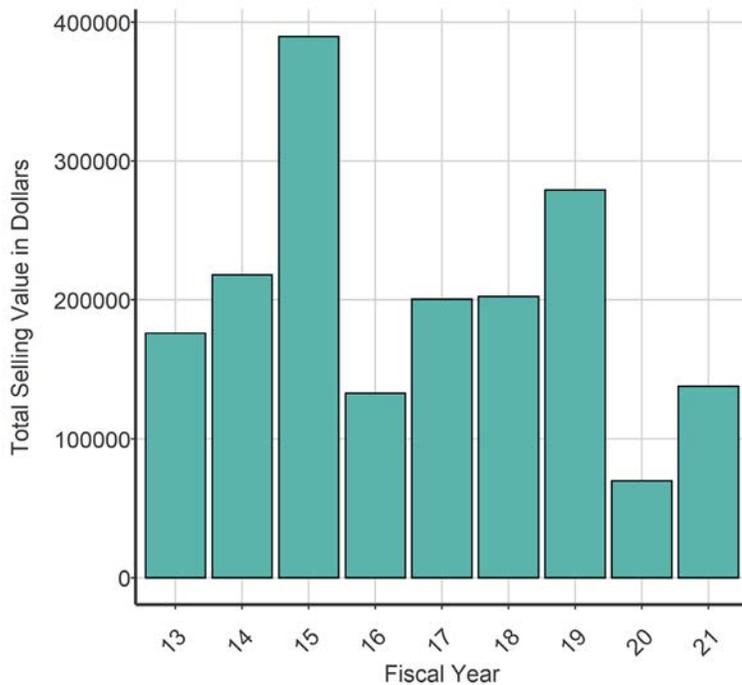
Figure 31 - Tamarack average volume offered and sold from DNR lands in Cord equivalents



Value of Timber Sold from DNR Lands

Timber sales in the MIM Section generated \$216,826.00 dollars on average per fiscal year from 2013-2021.

Figure 32 - Value of timber sold



CHAPTER 4: Resource Conditions

Ecological Description of Minnesota and Northeast Iowa Morainal Section (MIM)

The Minnesota and Northeast Iowa Morainal Section (MIM) is a long band of deciduous forest, woodland, and prairie that stretches nearly 350 miles (560km) from Polk County in northwestern Minnesota to the Iowa border. Over half of this area consists of rugged to hummocky moraines deposited along the eastern margin of the Des Moines ice lobe during the last glaciation. Another quarter of the area consists of rolling till or basal till deposited as drumlins. Small sand plains occur locally within the moraines. A rather large sand plain, the Anoka Sand Plain, is present north of the Twin Cities metropolitan area. This level plain is formed from sand deposited by meltwater from the Grantsburg sublobe, a spur of ice emanating from the east flank of the Des Moines lobe.

The pre-settlement pattern of upland vegetation in the MIM reflects substrate texture and landform topography. These features affected plants directly through their influence on moisture and nutrient availability, insolation, and local temperature, and also indirectly through their influence on the frequency and severity of fires. Sandy flat areas were dominated by prairie, savanna, and oak and aspen woodlands. This is especially true of the Anoka Sand Plain and sandy terraces along the major rivers. In these areas, droughty soils and absence of impediments to the spread of fire promoted fire-dependent prairie and woodland vegetation. A large area of prairie, savanna, and oak woodland was also present on gently undulating glacial till in the southern part of the section, adjacent to the extensive prairie lands of western Minnesota. The low-relief landscape in this part of the section afforded few impediments to the spread of fire, including fires that spread into the section from the adjacent prairie region. Woodland and forest dominated sites in the section where fire was uncommon or rare. Fine-textured drift deposited in hummocky moraines supported mesic forests dominated by sugar maple, basswood, American elm, and northern red oak. Even small reductions in fire frequency afforded by streams, lakes, or topographic breaks permitted the formation of forest on finer-textured soils, and once formed these forests were highly resistant to burning.

Floodplain and terrace forests were present historically along the valleys of the major rivers, the Mississippi, Minnesota, and St. Croix, and are still prominent today along many stretches of these rivers. Forests of silver maple occupy the active floodplains, while forests of silver maple, cottonwood, box-elder, green ash, and elm occupy terraces that flood infrequently. These valleys are also characterized by herbaceous and shrubby river shore communities along shorelines and on sand bars, and in some areas by cliff communities on steep rocky river bluffs. Closed depressions that pond water in the spring provide habitat for open wetlands such as marshes, wet meadows, shrub swamps, and wet prairies. Peatlands are uncommon in the section and usually develop following formation of sedge or moss mats over sediments in former lake basins. (Source: [DNR Minnesota Northeast Iowa Morainal](#))

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 Anoka Sand Plain (DNR Anoka Sand Plain), Big Woods (DNR Big Woods), Hardwood Hills (DNR Hardwood Hills), Oak Savanna (DNR Oak Savanna), and St. Paul Baldwin Plains (DNR St. Paul Baldwin Plains) are five subsections that comprise the MIM section.

Water resources

There are numerous lakes streams and rivers throughout the Section. These features are heavily impacted on the geology of the subsections within it. This results in a difference in the number and size of lakes within each subsection as well as the size and direction of flow of the rivers and streams. The continental divide splits the northern portion of the Section with water in the north flowing to the Hudson bay and water in the central and southern portions flowing into rivers and streams that eventually flow into the Mississippi river.

The MIM section contains part or the entirety of 29 of Minnesota’s 81 major watersheds (Table 9). The land management decisions made across this landscape can have important implications for the quality and quantity of water resources in the region. A suite of watershed health index scores have been calculated that represent many of the important ecological relationships within and between five different components (biology, connectivity, geomorphology, hydrology, and water quality). These scores are built on statewide GIS data that is compared consistently across Minnesota to provide a baseline health condition report for each of the major watersheds in the state. See the Watershed Health Assessment Framework website for more information [Watershed Health Assessment Framework](#).

Table 9 - HUC 8 Watersheds within MIM

Watershed name	Acres	Square miles	Mean Health Score ¹
Blue Earth	513	0.8	57
Buffalo	115853	181	68
Cannon	741264	1158.2	62
Chippewa	99327	155.1	63
Clearwater	309214	483.1	68
Clearwater-Elk	546224	853.4	60
Crow	479114	748.6	61
Crow Wing	59302	92.6	83
Eastern Wild Rice	151485	236.6	71
Elk-Nokasippi	253869	396.6	80
Elm-Marsh	3738	5.8	58
Le Sueur	198361	309.9	58
Long Prairie	459140	717.4	73
Lower Minnesota	789229	1233.1	45
Lower St. Croix	295708	462	68

Watershed name	Acres	Square miles	Mean Health Score ¹
Middle Minnesota	95963	149.9	57
Otter Tail	760340	1188	72
Platte-Spunk	399579	624.3	70
Pomme De Terre	126579	197.7	63
Red Lake	2581	4	64
Redeye	239459	374	77
Root	108906	170.1	77
Rum	316582	494.6	75
Rush-Vermillion	173157	270.5	57
Sandhill-Wilson	131332	205.2	60
Sauk	413236	645.6	63
South Fork Crow	299497	467.9	55
Twin Cities	644166	1006.5	49
Upper Cedar	454021	709.4	57
Zumbro	287128	448.6	64

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 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 Minnesota there are currently 21 species with federal designations of endangered, threatened, or experimental population.

Table 10 - Federal Listed Species within Minnesota²

Scientific Name	Common Name	Federal Status
<i>Bombus affinis</i>	Rusty patched bumble bee	Endangered
<i>Calidris canutus rufa</i>	Red knot	Threatened
<i>Canis lupus</i>	Gray wolf	Threatened
<i>Charadrius melodus</i>	Piping Plover	Endangered
<i>Cumberlandia monodonta</i>	Spectaclecase (mussel)	Endangered
<i>Epioblasma triquetra</i>	Snuffbox mussel	Endangered
<i>Erythronium propullans</i>	Minnesota dwarf trout lily	Endangered
<i>Grus americana</i>	Whooping crane	Experimental Population, Non-Essential
<i>Hesperia dacotae</i>	Dakota Skipper	Threatened
<i>Lampsilis higginsii</i>	Higgins eye (pearlymussel)	Endangered
<i>Lespedeza leptostachya</i>	Prairie bush-clover	Threatened
<i>Lycaeides melissa samuelis</i>	Karner blue butterfly	Endangered
<i>Lynx canadensis</i>	Canada Lynx	Threatened
<i>Myotis septentrionalis</i>	Northern Long-Eared Bat	Threatened
<i>Notropis topeka (=tristis)</i>	Topeka shiner	Endangered
<i>Platanthera leucophaea</i>	Eastern prairie fringed orchid	Threatened
<i>Platanthera praeclara</i>	Western prairie fringed Orchid	Threatened
<i>Plethobasus cyphus</i>	Sheepnose Mussel	Endangered
<i>Quadrula fragosa</i>	Winged Mapleleaf	Endangered
<i>Rhodiola integrifolia ssp. leedyi</i>	Leedy's roseroot	Threatened
<i>Sistrurus catenatus</i>	Eastern Massasauga (=rattlesnake)	Threatened

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:

² 2022 April 14, U.S. Fish & Wildlife Midwest Region Endangered Species Minnesota. Retrieved from Environmental Conservation Online System (ECOS) <https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=MN&stateName=Minnesota&statusCategory=Listed>

- 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 in the MBS page of the MN DNR website at [Minnesota Biological Survey](#).

Minnesota Listed Species

The rare feature products prepared for the MIM 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 MIM section is presented below in Table 11. To understand the table it is useful to know what the state ranking of endangered, threatened, and special concern mean.

Rank Key for Tables 11.

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 Table 11 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 for. Permission to use these data does not imply endorsement or approval by the DNR of any interpretations or products derived from the data.

Table 11 - Minnesota Listed Species in the MIM section

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Hydroptila quinola</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Parapsyche apicalis</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5
<i>Limnephilus rossi</i>	A Caddisfly	Invertebrate Animal	THR	S2	G4G5
<i>Ironoquia punctatissima</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5
<i>Limnephilus secludens</i>	A Caddisfly	Invertebrate Animal	END	S1	G5
<i>Oecetis ditissa</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5
<i>Protophila erotica</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Anabolia ozburni</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Agapetus tomus</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Oxyethira ecornuta</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5
<i>Oxyethira itascae</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G3
<i>Phidippus pius</i>	A Jumping Spider	Invertebrate Animal	SPC	S3	GNR
<i>Habronattus texanus</i>	A Jumping Spider	Invertebrate Animal	SPC	S3	GNR
<i>Marpissa formosa</i>	A jumping spider	Invertebrate Animal	SPC	S3	GNR
<i>Pelegrina arizonensis</i>	A Jumping Spider	Invertebrate Animal	SPC	S3	GNR
<i>Paradamoetas fontanus</i>	A Jumping Spider	Invertebrate Animal	SPC	S3	GNR
<i>Habronattus viridipes</i>	A Jumping Spider	Invertebrate Animal	SPC	S3	GNR
<i>Tutelina formicaria</i>	A Jumping Spider	Invertebrate Animal	THR	S2	GNR
<i>Ochrotrichia spinosa</i>	A Purse Casemaker Caddisfly	Invertebrate Animal	END	S1	G5
<i>Empidonax virescens</i>	Acadian Flycatcher	Vertebrate Animal	SPC	S3B	G5
<i>Anguilla rostrata</i>	American Eel	Vertebrate Animal	SPC	S3	G4
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Vertebrate Animal	SPC	S3B	G4
<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>Ictiobus niger</i>	Black Buffalo	Vertebrate Animal	THR	S2	G5
<i>Moxostoma duquesnei</i>	Black Redhorse	Vertebrate Animal	SPC	S3	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<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>Cycleptus elongatus</i>	Blue Sucker	Vertebrate Animal	SPC	S3	G3G4
<i>Athene cunicularia</i>	Burrowing Owl	Vertebrate Animal	END	S1B SNR M	G4
<i>Ellipsaria lineolata</i>	Butterfly	Invertebrate Animal	THR	S2	G4G5
<i>Setophaga cerulea</i>	Cerulean Warbler	Vertebrate Animal	SPC	S3B	G4
<i>Calcarius ornatus</i>	Chestnut-collared Longspur	Vertebrate Animal	END	S1B	G5
<i>Gallinula galeata</i>	Common Gallinule	Vertebrate Animal	SPC	S3B	G5
<i>Sterna hirundo</i>	Common Tern	Vertebrate Animal	THR	S2B	G5
<i>Lasmigona compressa</i>	Creek Heelsplitter	Invertebrate Animal	SPC	S3	G5
<i>Crystallaria asprella</i>	Crystal Darter	Vertebrate Animal	END	S1	G3
<i>Spilogale putorius</i>	Eastern Spotted Skunk	Vertebrate Animal	THR	S2	G4
<i>Reginaia eburnus</i>	Ebonysell	Invertebrate Animal	END	S1	G4G5
<i>Elliptio crassidens</i>	Elephant-ear	Invertebrate Animal	END	S1	G5
<i>Alasmidonta marginata</i>	Elktoe	Invertebrate Animal	THR	S2	G4
<i>Venustaconcha ellipsiformis</i>	Ellipse	Invertebrate Animal	THR	S2	G4
<i>Truncilla donaciformis</i>	Fawnsfoot	Invertebrate Animal	THR	S2	G5
<i>Lasmigona costata</i>	Fluted-shell	Invertebrate Animal	THR	S2	G5
<i>Sterna forsteri</i>	Forster's Tern	Vertebrate Animal	SPC	S3B	G5
<i>Leucophaeus pipixcan</i>	Franklin's Gull	Vertebrate Animal	SPC	S3B	G5
<i>Cicindela lepida</i>	Ghost Tiger Beetle	Invertebrate Animal	THR	S2	G3G4
<i>Percina evides</i>	Gilt Darter	Vertebrate Animal	SPC	S3	G4
<i>Pituophis catenifer</i>	Gophersnake	Vertebrate Animal	SPC	S3	G5
<i>Anaxyrus cognatus</i>	Great Plains Toad	Vertebrate Animal	SPC	S3	G5
<i>Tympanuchus cupido</i>	Greater Prairie-chicken	Vertebrate Animal	SPC	S3	G4
<i>Ammodramus henslowii</i>	Henslow's Sparrow	Vertebrate Animal	END	S1B	G4

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Lampsilis higginsii</i>	Higgins Eye	Invertebrate Animal	END	S1	G1G2
<i>Setophaga citrina</i>	Hooded Warbler	Vertebrate Animal	SPC	S3B	G5
<i>Podiceps auritus</i>	Horned Grebe	Vertebrate Animal	END	S1B	G5
<i>Atrytone arogos iowa</i>	Iowa Skipper	Invertebrate Animal	SPC	S3	G2G3T2 T3
<i>Plebejus melissa samuelis</i>	Karner Blue	Invertebrate Animal	END	S1	G1G2
<i>Acipenser fulvescens</i>	Lake Sturgeon	Vertebrate Animal	SPC	S3	G3G4
<i>Chondestes grammacus</i>	Lark Sparrow	Vertebrate Animal	SPC	S3B	G5
<i>Schinia lucens</i>	Leadplant Flower Moth	Invertebrate Animal	SPC	S3	G4
<i>Etheostoma microperca</i>	Least Darter	Vertebrate Animal	SPC	S3	G5
<i>Mustela nivalis</i>	Least Weasel	Vertebrate Animal	SPC	S3	G5
<i>Hesperia leonardus leonardus</i>	Leonard's Skipper	Invertebrate Animal	SPC	S3	G4T4
<i>Myotis lucifugus</i>	Little Brown Myotis	Vertebrate Animal	SPC	S3	G3
<i>Lanius ludovicianus</i>	Loggerhead Shrike	Vertebrate Animal	END	S1B	G4
<i>Parkesia motacilla</i>	Louisiana Waterthrush	Vertebrate Animal	SPC	S3B	G5
<i>Limosa fedoa</i>	Marbled Godwit	Vertebrate Animal	SPC	S3B	G5
<i>Theliderma metanevra</i>	Monkeyface	Invertebrate Animal	THR	S2	G4
<i>Actinonaias ligamentina</i>	Mucket	Invertebrate Animal	THR	S2	G5
<i>Necturus maculosus</i>	Mudpuppy	Vertebrate Animal	SPC	S3	G5
<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Vertebrate Animal	SPC	S3B	G5
<i>Coluber constrictor</i>	North American Racer	Vertebrate Animal	SPC	S3	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>Lepomis peltastes</i>	Northern Sunfish	Vertebrate Animal	SPC	S3	G5
<i>Notropis nubilus</i>	Ozark Minnow	Vertebrate Animal	SPC	S3	G5
<i>Polyodon spathula</i>	Paddlefish	Vertebrate Animal	THR	S2	G4

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Hybopsis amnis</i>	Pallid Shiner	Vertebrate Animal	END	S1	G4
<i>Hesperia leonardus pawnee</i>	Pawnee Skipper	Invertebrate Animal	SPC	S3	G4T4
<i>Falco peregrinus</i>	Peregrine Falcon	Vertebrate Animal	SPC	S3B	G4
<i>Aphredoderus sayanus</i>	Pirate Perch	Vertebrate Animal	SPC	S3	G5
<i>Tritogonia verrucosa</i>	Pistolgrip	Invertebrate Animal	END	S1	G4G5
<i>Heterodon nasicus</i>	Plains Hog-nosed Snake	Vertebrate Animal	SPC	S3	G5
<i>Perognathus flavescens</i>	Plains Pocket Mouse	Vertebrate Animal	SPC	S3	G5
<i>Oarisma poweshiek</i>	Poweshiek Skipperling	Invertebrate Animal	END	S1	G1
<i>Microtus ochrogaster</i>	Prairie Vole	Vertebrate Animal	SPC	S3	G5
<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>Lythrurus umbratilis</i>	Redfin Shiner	Vertebrate Animal	SPC	S3	G5
<i>Buteo lineatus</i>	Red-shouldered Hawk	Vertebrate Animal	SPC	S3B,SNRN	G5
<i>Clinostomus elongatus</i>	Redside Dace	Vertebrate Animal	SPC	S3	G3G4
<i>Aflexia rubranura</i>	Red-tailed Prairie Leafhopper	Invertebrate Animal	SPC	S3	G2
<i>Argynnis idalia</i>	Regal Fritillary	Invertebrate Animal	SPC	S3	G3?
<i>Arcidens confragosus</i>	Rock Pocketbook	Invertebrate Animal	END	S1	G4
<i>Pleurobema sintoxia</i>	Round Pigtoe	Invertebrate Animal	SPC	S3	G4G5
<i>Simpsonaias ambigua</i>	Salamander Mussel	Invertebrate Animal	END	S1	G3
<i>Cicindela macra macra</i>	Sandy Stream Tiger Beetle	Invertebrate Animal	SPC	S3	G5T5
<i>Cicindela limbata nympha</i>	Sandy Tiger Beetle	Invertebrate Animal	END	S1	G5T4
<i>Plethobasus cyphus</i>	Sheepnose	Invertebrate Animal	END	S1	G3
<i>Asio flammeus</i>	Short-eared Owl	Vertebrate Animal	SPC	S3B	G5
<i>Alosa chrysochloris</i>	Skipjack Herring	Vertebrate Animal	END	S1	G5
<i>Noturus exilis</i>	Slender Madtom	Vertebrate Animal	END	S1	G5
<i>Apalone mutica</i>	Smooth Softshell	Vertebrate Animal	SPC	S3	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Epioblasma triquetra</i>	Snuffbox	Invertebrate Animal	END	S1	G3
<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>Ophiogomphus susbehcha</i>	St. Croix Snaketail	Invertebrate Animal	THR	S2	G2
<i>Phenacobius mirabilis</i>	Suckermouth Minnow	Vertebrate Animal	SPC	S3	G5
<i>Crotalus horridus</i>	Timber Rattlesnake	Vertebrate Animal	THR	S2	G4
<i>Perimyotis subflavus</i>	Tricolored Bat	Vertebrate Animal	SPC	S3	G2G3
<i>Cygnus buccinator</i>	Trumpeter Swan	Vertebrate Animal	SPC	S3B,SNRN,SNR M	G4
<i>Hesperia uncas</i>	Uncas Skipper	Invertebrate Animal	END	S1	G4G5
<i>Quadrula nodulata</i>	Wartyback	Invertebrate Animal	THR	S2	G4
<i>Megaloniaias nervosa</i>	Washboard	Invertebrate Animal	END	S1	G5
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	Vertebrate Animal	SPC	S3	G5
<i>Catocala whitneyi</i>	Whitney's Underwing	Invertebrate Animal	SPC	S3	G2G3
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Vertebrate Animal	THR	S2B	G5
<i>Quadrula fragosa</i>	Winged Mapleleaf	Invertebrate Animal	END	S1	G1
<i>Glyptemys insculpta</i>	Wood Turtle	Vertebrate Animal	THR	S2	G3
<i>Coturnicops noveboracensis</i>	Yellow Rail	Vertebrate Animal	SPC	S3B	G4
<i>Lampsilis teres</i>	Yellow Sandshell	Invertebrate Animal	END	S1	G5
<i>Cypripedium candidum</i>	Small White Lady's-slipper	Vascular Plant	SPC	S3	G4
<i>Gymnocladus dioica</i>	Kentucky Coffee Tree	Vascular Plant	SPC	S3	G5
<i>Eryngium yuccifolium</i>	Rattlesnake Master	Vascular Plant	SPC	S3	G5
<i>Najas gracillima</i>	Slender Naiad	Vascular Plant	SPC	S3	G5?
<i>Valeriana edulis</i> var. <i>ciliata</i>	Edible Valerian	Vascular Plant	THR	S2	G5T3
<i>Arnoglossum plantagineum</i>	Tuberous Indian-plantain	Vascular Plant	THR	S2	G4G5
<i>Desmanthus illinoensis</i>	Prairie Mimosa	Vascular Plant	SPC	S3	G5
<i>Rhynchospora capillacea</i>	Hair-like Beak Rush	Vascular Plant	THR	S2	G4G5
<i>Panax quinquefolius</i>	American Ginseng	Vascular Plant	SPC	S3	G3G4
<i>Thaspium barbinode</i>	Hairy-jointed Meadow-parsnip	Vascular Plant	SPC	S3	G5
<i>Trillium nivale</i>	Snow Trillium	Vascular Plant	SPC	S3	G4
<i>Cladium mariscoides</i>	Twig Rush	Vascular Plant	SPC	S3	G5
<i>Sagittaria calycina</i> var. <i>calycina</i>	Hooded Arrowhead	Vascular Plant	THR	S2	G5T5?

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Carex sterilis</i>	Sterile Sedge	Vascular Plant	THR	S2	G4G5
<i>Buellia nigra</i>	A Species of Lichen	Fungus	SPC	S3	G1G2
<i>Juglans cinerea</i>	Butternut	Vascular Plant	END	S1	G3
<i>Berula erecta</i>	Stream Parsnip	Vascular Plant	THR	S2	G4G5
<i>Taenidia integerrima</i>	Yellow Pimpernel	Vascular Plant	SPC	S3	G5
<i>Eleocharis rostellata</i>	Beaked Spikerush	Vascular Plant	THR	S2	G5
<i>Scleria verticillata</i>	Whorled Nutrush	Vascular Plant	THR	S2	G5
<i>Asclepias sullivantii</i>	Sullivant's Milkweed	Vascular Plant	THR	S2	G5
<i>Crataegus calpodendron</i>	Late Hawthorn	Vascular Plant	SPC	S3	G5
<i>Jaffueliobryum wrightii</i>	Wright's Blunt Leaved True Moss	Nonvascular Plant	SPC	S3	G4G5
<i>Arnoglossum reniforme</i>	Great Indian Plantain	Vascular Plant	THR	S2	G4
<i>Phlox maculata</i>	Wild Sweetwilliam	Vascular Plant	SPC	S3	G5
<i>Baptisia bracteata</i> var. <i>glabrescens</i>	Plains Wild Indigo	Vascular Plant	SPC	S3	G4G5T4T5
<i>Platanthera praeclara</i>	Western Prairie Fringed Orchid	Vascular Plant	END	S1	G3
<i>Psathyrella rhodospora</i>	A Species of Fungus	Fungus	END	S1	G1?
<i>Baptisia lactea</i> var. <i>lactea</i>	White Wild Indigo	Vascular Plant	SPC	S3	G5T4T5
<i>Carex annectens</i>	Yellow-fruit Sedge	Vascular Plant	SPC	S3	G5
<i>Dicentra canadensis</i>	Squirrel Corn	Vascular Plant	SPC	S3	G5
<i>Carex grayi</i>	Gray's Sedge	Vascular Plant	SPC	S3	G4G5
<i>Crocantemum canadense</i>	Canada Frostweed	Vascular Plant	SPC	S3	G5
<i>Sanicula trifoliata</i>	Beaked Snakeroot	Vascular Plant	SPC	S3	G4
<i>Arisaema dracontium</i>	Green Dragon	Vascular Plant	SPC	S3	G5
<i>Allium cernuum</i>	Nodding Wild Onion	Vascular Plant	SPC	S3	G5
<i>Desmodium cuspidatum</i> var. <i>longifolium</i>	Big Tick Trefoil	Vascular Plant	THR	S2	G5T5?
<i>Erythronium propullans</i>	Dwarf Trout Lily	Vascular Plant	END	S1	G1
<i>Parthenium integrifolium</i>	Wild Quinine	Vascular Plant	END	S1	G5
<i>Carex conjuncta</i>	Jointed Sedge	Vascular Plant	THR	S2	G4G5
<i>Carex davisii</i>	Davis' Sedge	Vascular Plant	THR	S2	G4
<i>Hasteola suaveolens</i>	Sweet-smelling Indian plantain	Vascular Plant	END	S1	G4
<i>Platanthera flava</i> var. <i>herbiola</i>	Tuberclad Rein Orchid	Vascular Plant	THR	S2	G4?T4Q
<i>Psathyrella cystidiosa</i>	A Species of Fungus	Fungus	END	S1	GNR
<i>Phemeranthus rugospermus</i>	Rough-seeded Fameflower	Vascular Plant	THR	S2	G3G4
<i>Napaea dioica</i>	Glade Mallow	Vascular Plant	THR	S2	G4
<i>Lespedeza leptostachya</i>	Prairie Bush Clover	Vascular Plant	THR	S2	G3
<i>Carex jamesii</i>	James' Sedge	Vascular Plant	THR	S2	G5
<i>Rudbeckia triloba</i> var. <i>triloba</i>	Three-leaved Coneflower	Vascular Plant	THR	S2	G5T4T5
<i>Boechera laevigata</i>	Smooth Rock Cress	Vascular Plant	SPC	S3	G5T5
<i>Dodecatheon meadia</i>	Prairie Shooting Star	Vascular Plant	END	S1	G5
<i>Orobanche uniflora</i>	One-flowered Broomrape	Vascular Plant	THR	S2	G5
<i>Asclepias hirtella</i>	Prairie Milkweed	Vascular Plant	THR	S2	G5
<i>Scutellaria ovata</i> var. <i>versicolor</i>	Ovate-leaved Skullcap	Vascular Plant	THR	S2	G5T5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Carex muskingumensis</i>	Muskingum Sedge	Vascular Plant	SPC	S3	G4
<i>Rubus stipulatus</i>	A Bristle-berry	Vascular Plant	END	S1	G4
<i>Hydrastis canadensis</i>	Goldenseal	Vascular Plant	END	S1	G3G4
<i>Atrichum crispum</i>	Wave-leaved Crane?s-bill Moss	Nonvascular Plant	SPC	S3	G5
<i>Trichophorum clintonii</i>	Clinton's Bulrush	Vascular Plant	THR	S2	G4
<i>Silene nivea</i>	Snowy Champion	Vascular Plant	THR	S2	G4?
<i>Carex laevivaginata</i>	Smooth-sheathed Sedge	Vascular Plant	THR	S2	G5
<i>Nuttallanthus canadensis</i>	Old Field Toadflax	Vascular Plant	SPC	S3	G5
<i>Crotalaria sagittalis</i>	Rattlebox	Vascular Plant	SPC	S3	G5
<i>Fimbristylis autumnalis</i>	Autumn Fimbry	Vascular Plant	SPC	S3	G5
<i>Hydrocotyle americana</i>	American Water-pennywort	Vascular Plant	SPC	S3	G5
<i>Carex typhina</i>	Cattail Sedge	Vascular Plant	SPC	S3	G5
<i>Juniperus horizontalis</i>	Creeping Juniper	Vascular Plant	SPC	S3	G5
<i>Cirsium pumilum</i> var. <i>hillii</i>	Hill's Thistle	Vascular Plant	SPC	S3	G3
<i>Ruellia humilis</i>	Wild Petunia	Vascular Plant	SPC	S3	G5
<i>Dryopteris goldiana</i>	Goldie's Fern	Vascular Plant	SPC	S3	G4G5
<i>Opuntia macrorhiza</i>	Devil's Tongue	Vascular Plant	SPC	S3	G5
<i>Usnea mutabilis</i>	Bloody Beard Lichen	Fungus	THR	S2	G5
<i>Usnea rubicunda</i>	Red Beard Lichen	Fungus	SPC	S3	G4G5
<i>Oenothera rhombipetala</i>	Rhombic Evening Primrose	Vascular Plant	SPC	S3	G4G5
<i>Botrychium oneidense</i>	Blunt-lobed Grapefern	Vascular Plant	THR	S2	G4
<i>Besseyia bullii</i>	Kitten-tails	Vascular Plant	THR	S2	G3
<i>Poa paludigena</i>	Bog Bluegrass	Vascular Plant	THR	S2	G3G4
<i>Orobanche fasciculata</i>	Clustered Broomrape	Vascular Plant	THR	S2	G4G5
<i>Polanisia jamesii</i>	James' Polanisia	Vascular Plant	END	S1	G5
<i>Asclepias amplexicaulis</i>	Clasping Milkweed	Vascular Plant	THR	S2	G5
<i>Desmodium nudiflorum</i>	Stemless Tick Trefoil	Vascular Plant	THR	S2	G5
<i>Floerkea proserpinacoides</i>	False Mermaid	Vascular Plant	THR	S2	G5
<i>Aureolaria pedicularia</i>	Fernleaf False Foxglove	Vascular Plant	THR	S2	G5
<i>Lechea tenuifolia</i> var. <i>tenuifolia</i>	Narrow-leaved Pinweed	Vascular Plant	END	S1	G5TNR
<i>Botrychium rugulosum</i>	St. Lawrence Grapefern	Vascular Plant	SPC	S3	G3
<i>Paronychia fastigiata</i> var. <i>fastigiata</i>	Forked Chickweed	Vascular Plant	END	S1	G5T5
<i>Lysurus cruciatus</i>	Lizard's Claw	Fungus	SPC	S3	GNR
<i>Aristida tuberculosa</i>	Seaside Three-awn	Vascular Plant	THR	S2	G5
<i>Minuartia dawsonensis</i>	Rock Sandwort	Vascular Plant	THR	S2	G5
<i>Alisma gramineum</i>	Narrow-leaved Water Plantain	Vascular Plant	SPC	S3	G5
<i>Cirriphyllum piliferum</i>	Hair-pointed Feather Moss	Nonvascular Plant	THR	S2	G5
<i>Scleria triglomerata</i>	Tall Nutrush	Vascular Plant	END	S1	G5
<i>Antennaria parvifolia</i>	Small-leaved Pussytoes	Vascular Plant	SPC	S3	G5
<i>Botrychium simplex</i>	Least Moonwort	Vascular Plant	SPC	S3	G5
<i>Decodon verticillatus</i> var. <i>laevigatus</i>	Water-willow	Vascular Plant	SPC	S3	G5TNR
<i>Rubus multiflorus</i>	Kinnickinnick Dewberry	Vascular Plant	SPC	S3	G5

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<i>Aphanorrhagma serratum</i>	Lidded Earth Moss	Nonvascular Plant	SPC	S3	G4G5
<i>Asplenium platyneuron</i>	Ebony Spleenwort	Vascular Plant	SPC	S3	G5
<i>Suillus weaverae</i>	A Species of Fungus	Fungus	END	S1	G1?
<i>Potamogeton bicupulatus</i>	Snailseed Pondweed	Vascular Plant	END	S1	G4
<i>Orobanche ludoviciana</i> var. <i>ludoviciana</i>	Louisiana Broomrape	Vascular Plant	THR	S2	G5T5
<i>Gaylussacia baccata</i>	Black Huckleberry	Vascular Plant	THR	S2	G5
<i>Polygala cruciata</i>	Cross-leaved Milkwort	Vascular Plant	END	S1	G5
<i>Juncus articulatus</i>	Jointed Rush	Vascular Plant	END	S1	G5
<i>Rubus semisetosus</i>	Swamp Blackberry	Vascular Plant	THR	S2	G5
<i>Platanthera clavellata</i>	Small Green Wood Orchid	Vascular Plant	SPC	S3	G5
<i>Quercus bicolor</i>	Swamp White Oak	Vascular Plant	SPC	S3	G5
<i>Hudsonia tomentosa</i>	Beach Heather	Vascular Plant	THR	S2	G5
<i>Najas guadalupensis</i> ssp. <i>olivacea</i>	Olive-colored Southern Naiad	Vascular Plant	SPC	S3	G5T4?
<i>Viola lanceolata</i> var. <i>lanceolata</i>	Lance-leaf Violet	Vascular Plant	THR	S2	G5T5
<i>Aristida longespica</i> var. <i>geniculata</i>	Slimspike Three-awn	Vascular Plant	END	S1	G5T5?
<i>Triplasis purpurea</i> var. <i>purpurea</i>	Purple Sandgrass	Vascular Plant	SPC	S3	G4G5TN R
<i>Carex formosa</i>	Handsome Sedge	Vascular Plant	END	S1	G4
<i>Laccaria trullisata</i>	Sand-loving Laccaria	Fungus	SPC	S3	GNR
<i>Xyris torta</i>	Twisted Yellow-eyed Grass	Vascular Plant	END	S1	G5
<i>Rotala ramosior</i>	Toothcup	Vascular Plant	THR	S2	G5
<i>Potamogeton diversifolius</i>	Diverse-leaved Pondweed	Vascular Plant	END	S1	G5
<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush	Vascular Plant	SPC	S3	G5
<i>Bacopa rotundifolia</i>	Waterhyssop	Vascular Plant	THR	S2	G5
<i>Juncus marginatus</i>	Marginated Rush	Vascular Plant	END	S1	G5
<i>Rubus fulleri</i>	a bristle-berry	Vascular Plant	THR	S2	G4?Q
<i>Sagittaria brevirostra</i>	Short-beaked Arrowhead	Vascular Plant	END	S1	G5
<i>Rubus missouricus</i>	Missouri Bristle-berry	Vascular Plant	END	S1	G5?Q
<i>Iodanthus pinnatifidus</i>	Purple Rocket	Vascular Plant	END	S1	G5
<i>Utricularia geminiscapa</i>	Hidden-fruit Bladderwort	Vascular Plant	THR	S2	G4G5
<i>Bidens discoidea</i>	Discoid Beggarticks	Vascular Plant	SPC	S3	G5
<i>Rorippa sessiliflora</i>	Sessile-flowered Yellow Cress	Vascular Plant	SPC	S3	G5
<i>Carex plantaginea</i>	Plantain-leaved Sedge	Vascular Plant	END	S1	G5
<i>Agalinis auriculata</i>	Eared False Foxglove	Vascular Plant	END	S1	G3
<i>Huperzia porophila</i>	Rock Fir Moss	Vascular Plant	THR	S2	G4
<i>Eleocharis wolfii</i>	Wolf's Spikerush	Vascular Plant	END	S1	G3G5
<i>Rubus vermontanus</i>	Vermont Bristle-berry	Vascular Plant	SPC	S3	G5
<i>Cypripedium arietinum</i>	Ram's Head Orchid	Vascular Plant	THR	S2	G3
<i>Ruppia cirrhosa</i>	Spiral Ditchgrass	Vascular Plant	SPC	S3	G5
<i>Botrychium campestre</i>	Prairie Moonwort	Vascular Plant	SPC	S3	G3G4
<i>Najas marina</i>	Sea Naiad	Vascular Plant	SPC	S3	G5
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's Mouth	Vascular Plant	SPC	S3	G5T4T5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
Chamaesyce missurica	Missouri Spurge	Vascular Plant	SPC	S3	G5
Cardamine pratensis	Cuckoo Flower	Vascular Plant	THR	S2	G5
Botrychium mormo	Goblin Fern	Vascular Plant	THR	S2	G2Q
Aristida purpurea var. longiseta	Red Three-awn	Vascular Plant	SPC	S3	G5T5?
Carex obtusata	Blunt Sedge	Vascular Plant	SPC	S3	G5
Silene drummondii ssp. drummondii	Drummond's Campion	Vascular Plant	SPC	S3	G5T5
Lactarius fuliginellus	A Species of Fungus	Fungus	SPC	S3	GNR
Shinnersoseris rostrata	Annual Skeletonweed	Vascular Plant	THR	S2	G5?
Bartonia virginica	Yellow Bartonia	Vascular Plant	END	S1	G5
Stellaria longipes ssp. longipes	Long-stalked Chickweed	Vascular Plant	SPC	S3	G5T5
Torreyochloa pallida	Torrey's Mannagrass	Vascular Plant	SPC	S3	G5
Botrychium pallidum	Pale Moonwort	Vascular Plant	SPC	S3	G3
Gaillardia aristata	Blanketflower	Vascular Plant	SPC	S3	G5
Avenula hookeri	Spike Oat	Vascular Plant	SPC	S3	G5
Stuckenia vaginata	Sheathed Pondweed	Vascular Plant	END	S1	G5
Carex scirpoidea ssp. scirpoidea	Northern Single-spike Sedge	Vascular Plant	SPC	S3	G5T5
Achnatherum hymenoides	Indian Ricegrass	Vascular Plant	END	S1	G5
Drosera anglica	English Sundew	Vascular Plant	SPC	S3	G5
Packera cana	Gray Ragwort	Vascular Plant	END	S1	G5
Salix maccalliana	McCalla's Willow	Vascular Plant	SPC	S3	G5

Additional Species Data

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

'**Watchlist**' species (previously referred to 'NON's) are defined as a 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.

Table 12 - Minnesota 'Watchlist' species in the MIM Section

Scientific Name	Common Name	Type
Opsopoeodus emiliae	Pugnose Minnow	Vertebrate Animal
Bartramia longicauda	Upland Sandpiper	Vertebrate Animal
Pantherophis ramspotti	Western Foxsnake	Vertebrate Animal
Scaphirhynchus platyrhynchus	Shovelnose Sturgeon	Vertebrate Animal
Haliaeetus leucocephalus	Bald Eagle	Vertebrate Animal
Antigone canadensis	Sandhill Crane	Vertebrate Animal
Obovaria olivaria	Hickorynut	Invertebrate Animal

Scientific Name	Common Name	Type
Lampropeltis triangulum	Milksnake	Vertebrate Animal
Bombus affinis	Rusty-patched Bumble Bee	Invertebrate Animal
Lethenteron appendix	American Brook Lamprey	Vertebrate Animal
Lithobates catesbeianus	Bullfrog	Vertebrate Animal
Euphyes bimacula	Two-spotted Skipper	Invertebrate Animal
Lithobates palustris	Pickerel Frog	Vertebrate Animal
Heterodon platirhinos	Eastern Hog-nosed Snake	Vertebrate Animal
Lycaena epixanthe michiganensis	Bog Copper	Invertebrate Animal
Marpissa grata	A Jumping Spider	Invertebrate Animal
Botaurus lentiginosus	American Bittern	Vertebrate Animal
Nicrophorus americanus	American Burying Beetle	Invertebrate Animal
Leptodea leptodon	Scaleshell	Invertebrate Animal
Aechmophorus occidentalis	Western Grebe	Vertebrate Animal
Phalacrocorax auritus	Double-crested Cormorant	Vertebrate Animal
Potentilla paradoxa	Nicollet's Cinquefoil	Vascular Plant
Oxypolis rigidior	Cowbane	Vascular Plant
Cornus drummondii	Rough-leaved Dogwood	Vascular Plant
Cystopteris laurentiana	Laurentian Bladder Fern	Vascular Plant
Geum laciniatum	Rough avens	Vascular Plant
Lycopus virginicus	Virginia Water Horehound	Vascular Plant
Penstemon digitalis	Beard-tongue	Vascular Plant
Hieracium longipilum	Long-bearded Hawkweed	Vascular Plant
Wolffia brasiliensis	Pointed Watermeal	Vascular Plant
Triodanis leptocarpa	Venus' Looking-glass	Vascular Plant
Oenothera laciniata	Slashed Evening Primrose	Vascular Plant
Juncus antheratus	Greater Poverty Rush	Vascular Plant
Lychnothamnus barbatus	A Species of Macroalgae	Alga (Plant)
Gaura biennis	Biennial Gaura	Vascular Plant
Ceratophyllum echinatum	Spiny Hornwort	Vascular Plant
Rubus wheeleri	Wheeler's Blackberry	Vascular Plant
Ophioglossum pusillum	Adder's Tongue	Vascular Plant
Chamaerhodos erecta	Nuttall's Groundrose	Vascular Plant
Carex capillaris	Hair-like Sedge	Vascular Plant

Species of Greatest Conservation Need (SGCNs)

The MIM 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 include 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, 134 are found in the MIM Section; At least 19 SGCN are directly associated with forest habitats (Table 13).

Table 13 - Species of Greatest Conservation Need found within the MIM Section that are associated with Forests.

Common Name	Scientific Name	Key Habitat/ or Habitat used
Blanchard's Cricket Frog	<i>Acris blanchardi</i>	Upland Forest & Wetland / Floodplain Forests
Northern Goshawk	<i>Accipiter gentilis</i>	Upland Coniferous & Deciduous Forest
Red-shouldered Hawk	<i>Buteo lineatus</i>	Upland Forest & Wetland / Floodplain Forests
Lark Sparrow	<i>Chondestes grammacus</i>	Upland Coniferous & Deciduous Forest
Acadian Flycatcher	<i>Empidonax virescens</i>	Upland Coniferous & Deciduous Forest
Peregrine Falcan	<i>Falco peregrinus</i>	Upland Coniferous & Deciduous Forest
Louisiana Waterthrush	<i>Parkesia motacilla</i>	Wetland forests & floodplain forests
Cerulean Warbler	<i>Setophaga cerulea</i>	Upland Forest & Wetland / Floodplain Forests
Hooded Warbler	<i>Setophaga citrina</i>	Upland Coniferous & Deciduous Forest
Blanding Turtle	<i>Emydoidea blandingii</i>	Wetland forests & floodplain forests
Gophersnake	<i>Pituophis catenifer</i>	Upland Coniferous & Deciduous Forest
North American Racer	<i>Coluber constrictor</i>	Upland Coniferous & Deciduous Forest
Wood Turtle	<i>Glyptemys insculpta</i>	Upland Forest & Wetland / Floodplain Forests
Big Brown Bat	<i>Eptesicus fuscus</i>	Upland Forest & Wetland / Floodplain Forests
Least Weasel	<i>Mustela nivalis</i>	Upland Coniferous & Deciduous Forest
Little Brown Myotis	<i>Myotis lucifugus</i>	Upland Forest & Wetland / Floodplain Forests
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Upland Forest & Wetland / Floodplain Forests
Tricolored Bat	<i>Perimyotis subflavus</i>	Upland Coniferous & Deciduous Forest
Eastern Spotted Skunk	<i>Spilogale putorius</i>	Upland Coniferous & Deciduous Forest

Native plant communities

A native plant community 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 known to occur in the MIM Section (Table 14). 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](#).

Table 14 - Native Plant Community Classes, Types and Subtypes Documented in the MIM Section, by ecological subsection, with their Associated Conservation Rank

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Northern Poor Conifer Swamp	APn81			x			(S4, S5 (G5))	5
Poor Tamarack - Black Spruce Swamp	APn81b	x	x	x			S4 G5	8
Poor Tamarack - Black Spruce Swamp, Black Spruce Subtype	APn81b1	x				x	S4 G5	2
Tamarack Subtype	APn81b2	x		x			S4 G5	5
Northern Poor Fen	APn91	x		x			(S3, S4, S5) (G3G4, G4G5 or G5, GNR)	10
Low Shrub Poor Fen	APn91a	x		x		x	S5 G4G5 or G5	144
Graminoid Poor Fen (Basin)	APn91b	x	x	x			S3 G3G4	12
Southern Dry Cliff	CTs12					x	(S1, S2, S4) (G4G5, GNR)	1
Southern Wet Cliff	CTs53					x	(S1, S2) (G4G5)	2
Wet Sandstone Cliff (Southern)	CTs53a		x			x	S1 G4G5	2
Central Dry Pine Woodland	FDc23			x			(S1 (G2) S2)	11
Jack Pine - (Yarrow) Woodland, Bur Oak - Aspen Subtype	FDc23a2	x		x			S1S2 G2	2
Central Rich Dry Pine Woodland	FDc24			x			(S1 or S3) (G4?)	26
Jack Pine - (Bush Honeysuckle) Woodland	FDc24a	x					S1 or S3 G4?	8
Central Dry Oak-Aspen (Pine) Woodland	FDc25	x					(S2) (G4?, G4G5)	45
Oak - Aspen Woodland	FDc25b	x				x	S2 G4?	82
Central Dry-Mesic Pine-Hardwood Forest	FDc34		x	x			(S2, S3) (G3 or G4, G4?)	4
Red Pine - White Pine Forest	FDc34a			x			S2 G3 or G4	7
Oak - Aspen Forest	FDc34b			x		x	S3 G4?	13
White Pine - Oak Woodland (Sand)	FDs27b				x		S1 G3	1
Black Oak - White Oak Woodland (Sand)	FDs27c				x		S2 G4?	1

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Southern Dry-Mesic Oak-Aspen Forest	FDs36			x	x		(S3S4)	31
Bur Oak - Aspen Forest	FDs36a			x			S3S4(GNR)	137
Southern Dry-Mesic Oak (Maple) Woodland	FDs37	x	x	x	x	x	(S3, S4) (G3G4, G4?)	390
Oak - (Red Maple) Woodland	FDs37a	x		x		x	S4 G3G4	255
Pin Oak - Bur Oak Woodland	FDs37b	x	x	x	x	x	S3 G4?	356
Oak - Shagbark Hickory Woodland	FDs38a				x		S3(GNR)	10
Northwestern Dry-Mesic Oak Woodland	FDw24			x			(S2, S3) (G4?)	43
Northwestern Wet-Mesic Aspen Woodland	FDw44	x		x			(S3, S4) (G3G4)	16
Northern Terrace Forest	FFn57	x		x			(S3) (GNR)	10
Black Ash - Silver Maple Terrace Forest	FFn57a	x		x			S3(GNR)	10
Northern Floodplain Forest	FFn67	x					(S3) (GNR)	1
Silver Maple - (Sensitive Fern) Floodplain Forest	FFn67a	x					S3(GNR)	13
Southern Terrace Forest	FFs59	x	x		x	x	(S1, S2, S3) (G2G3, G4?)	111
Silver Maple - Green Ash - Cottonwood Terrace Forest	FFs59a	x	x	x	xx		S3 G4?	114
Elm - Ash - Basswood Terrace Forest	FFs59c	x	x	x	x	x	S2 G4?	64
Southern Floodplain Forest	FFs68	x	x		x	x	(S3)(G3G4)	24
Silver Maple - (Virginia Creeper) Floodplain Forest	FFs68a	x	x			x	S3 G3G4	267
Northern Rich Alder Swamp	FPn73			x			(S5) (G5)	9
Alder - (Maple - Loosestrife) Swamp	FPn73a	x	x	x		xx	S5 G5	272
Northern Rich Tamarack Swamp (Western Basin)	FPn82			x			(S4, S5) (G4)	40
Rich Tamarack - (Alder) Swamp	FPn82a			x			S5 G4	5
Extremely Rich Tamarack Swamp	FPn82b			x			S4 G4	10

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Southern Rich Conifer Swamp	FPs63			x			(S2S3) (G2G3 or G3G4)	4
Tamarack Swamp (Southern)	FPs63a	x	x	x		x	S2S3 G2G3 or G3G4	405
Tamarack Seepage Swamp (Aspen Parkland)	FPw63b			x			S3 G4	5
Central Dry-Mesic Oak-Aspen Forest	MHc26	x		x			(S4) (G4G5, GNR)	78
Oak - Aspen - Red Maple Forest	MHc26a	x		x			S4(GNR)	25
Red Oak - Sugar Maple - Basswood - (Large-Flowered Trillium) Forest	MHc26b	x		x			S4 G4G5	18
Central Mesic Hardwood Forest (Eastern)	MHc36	xx		x			(S4) (G3G4)	111
Red Oak - Basswood Forest (Noncalcareous Till)	MHc36a	x	x	x		x	S4 G3G4	126
Red Oak - Basswood Forest (Calcareous Till)	MHc36b			x		x	S4 G3G4	52
Central Mesic Hardwood Forest (Western)	MHc37		x	x			(S4) (G3G4)	143
Aspen - (Sugar Maple - Basswood) Forest	MHc37a		x	x		x	S4 G3G4	127
Sugar Maple - Basswood - (Aspen) Forest	MHc37b		x	x		x	S4 G3G4	337
White Pine - Sugar Maple - Basswood Forest (Cold Slope)	MHc38a					x	S1 G2?	1
Central Wet-Mesic Hardwood Forest	MHc47	x		x	x		(S3) (G3G4)	3
Basswood - Black Ash Forest	MHc47a	x		x			S3 G3G4	22
Northern Mesic Hardwood Forest	MHn35			x			(S4) (G5)	64
Aspen - Birch - Basswood Forest	MHn35a			x			S4 G5	25
Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest	MHn35b			x			S4 G5	16
Northern Wet-Mesic Boreal Hardwood-Conifer Forest	MHn44			x			(S2, S3, S3S4, S4) (G5, GNR)	20
Aspen - Birch - Fir Forest	MHn44d			x			S3 (GNR)	35

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Northern Wet-Mesic Hardwood Forest	MHn46			x			(S4) (GNR)	16
Aspen - Ash Forest	MHn46a			x			S4(GNR)	1
Northern Rich Mesic Hardwood Forest	MHn47			x			(S3) (G3?)	1
Southern Dry-Mesic Oak Forest	MHs37	x			x		(S3, S4) (G4?)	39
Red Oak - White Oak Forest	MHs37a	x			x		S3 G4?	37
Red Oak - White Oak -(Sugar Maple) Forest	MHs37b	x		x	x		S4 G4?	70
Southern Mesic Oak-Basswood Forest	MHs38		x	x	x		(S3) (G2G3 or GNR, G3, G4?)	145
White Pine - Oak - Sugar Maple Forest MHs38a	MHs38a	x					S3 G2G3 or GNR	6
Basswood - Bur Oak - (Green Ash) Forest	MHs38b	x	x	x	x		S3 G3	202
Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	MHs38c	x	x	x	x		S3 G4?	318
Southern Mesic Maple-Basswood Forest	MHs39		x	x	x		(S2, S3) (G3G4)	106
Sugar Maple - Basswood - (Bitternut Hickory) Forest	MHs39a	x	x		x		S2 (G3G4)	188
Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	MHs39b		x	x			S3 G3G4	8
Sugar Maple Forest (Big Woods)	MHs39c	x	x	x	x		S2 G3G4	137
Southern Wet-Mesic Hardwood Forest	MHs49		x		x		(S2, S3) (G3G4)	33
Elm - Basswood - Black Ash - (Hackberry) Forest	MHs49a	x	x	x	x		S3 G3G4	118
Southern Bedrock Outcrop	ROs12	x					(S2, S3) (G3?, GNR)	5
Crystalline Bedrock Outcrop (Prairie), Minnesota River Subtype	ROs12a1		x				S2 G3?	3
Crystalline Bedrock Outcrop (Transition)	ROs12b	x		x			S2 G3?	88

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Sedimentary Bedrock Outcrop (Southeast), Sandstone Subtype	ROs12c1		x				S2 GNR	2
Dry Sand - Gravel Prairie (Northern)	UPn12b			x			S2 G2G3	45
Dry Hill Prairie (Northern) UPn12d	UPn12d			x			S1 G3?	17
Northern Dry Savanna	UPn13			x			(S1, S1S2) (G2)	1
Dry Barrens Oak Savanna (Northern)	UPn13b			x			S1S2 G2	1
Dry Sand - Gravel Oak Savanna (Northern) UPn13c	UPn13c			x			S1 G2	3
Dry Hill Oak Savanna (Northern)	UPn13d			x			S1 G2	1
Mesic Prairie (Northern)	UPn23b			x			S2 G2G3	9
Southern Dry Prairie	UPs13	x	x	x		x	(S1S2, S2, S3) (G2G3 or G3?, G2G3 or G3, G3G4)	72
Dry Barrens Prairie (Southern)	UPs13a	x	x		x	x	S1S2 G2G3 or G3	26
Dry Sand - Gravel Prairie (Southern)	UPs13b	x	x	x	x	x	S2 G2G3 or G3	403
Dry Bedrock Bluff Prairie (Southern)	UPs13c		x		x	x	S3 G3G4	103
Dry Hill Prairie (Southern)	UPs13d		x	x	x		S2 G2G3 or G3?	64
Southern Dry Savanna	UPs14	x				x	(S1, S1S2) (G2 or G3, G3)	18
Dry Barrens Oak Savanna (Southern)	UPs14a	x		x			S1 or S1S2 G2 or G3	7
Dry Barrens Oak Savanna (Southern), Oak Subtype	UPs14a2	x	x		x		S1S2 G2 or G3	94
Dry Sand - Gravel Oak Savanna (Southern)	UPs14b	x	x	x	x	x	S1S2 G3	66
Dry Hill Oak Savanna (Southern)	UPs14c		x		x	x	S1 G3	9
Southern Mesic Prairie	UPs23		x		x		(S2) (G1G2 or G2G3)	7
Mesic Prairie (Southern)	UPs23a	x	x	x	x	x	S2 G1G2 or G2G3	206
Southern Mesic Savanna	UPs24	x		x			(S1) (G1 or G1G2)	12
Mesic Oak Savanna (Southern)	UPs24a				x		S1 G1 or G1G2	2
Northern Wet Cedar Forest	WFn53			x			(S3, S4) (GNR)	1

Native Plant Community Name	Community Code	Anoka Sand Plain	Big Woods	Hardwood Hills	Oak Savanna	St. Paul Baldwin Plains	Conservation Status Rank ¹	# of Observations ²
Lowland White Cedar Forest (Northern)	WFn53b	x		x			S3(GNR)	11
Northern Wet Ash Swamp	WFn55	x		x	x		(S3, S4) (G4)	32
Black Ash - Aspen - Balsam Poplar Swamp (Northeastern)	WFn55a	x			x		S4 G4	2
Black Ash - Yellow Birch - Red Maple - Basswood Swamp (Eastcentral)	WFn55b	x		x		x	S3 G4	244
Black Ash - Mountain Maple Swamp (Northern)	WFn55c			x			S4 G4	2
Northern Very Wet Ash Swamp	WFn64	x		x			(S4) (G4)	22
Black Ash - Conifer Swamp (Northeastern)	WFn64a			x			S4 G4	13
Black Ash - Yellow Birch - Red Maple - Alder Swamp (Eastcentral)	WFn64b	x				x	S4 G4	61
Black Ash - Alder Swamp (Northern)	WFn64c			x			S4 G4	24
Northern Wet Alder Swamp	WFn74	x		x			(S3)	8
Alder - (Red Currant - Meadow-Rue) Swamp	WFn74a			x			S3 (GNR)	2
Southern Wet Aspen Forest	WFs55	x		x			(S4) (GNR)	10
Lowland Aspen Forest	WFs55a	x	x	x			S4(GNR)	132
Southern Wet Ash Swamp	WFs57			x	x	x	(S1, S1S2) (GNR)	14
Black Ash - (Red Maple) Seepage Swamp	WFs57a	x	x	x	x	x	S1S2(GNR)	56
Northwestern Wet Aspen Forest	WFW54			x			(S4) (G5)	4

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

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 14 is currently incomplete; however, as MBS surveys are completed, additional information on NPCs within the MIM 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](#)

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

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Forest Patchiness

Areas of forest patchiness on DNR administered lands was calculated for the MIM Section. A patch within the table below contains stands of similar cover type and age within 50 meters of each other. Forest patchiness was determined using age grouping based on standard DNR even age Management regimes within the MIM section.

Patch Type	Cover types	Young	Intermediate	Old
Aspen	Aspen and balm of Gilead	1-30	31-49	50+
Upland Hardwoods	Upland hardwoods and Oak	1-30	31-59	60+
Lowland Hardwoods	Ash and lowland hardwoods	1-30	31-79	80+
Pine	Norway pine and White pine	1-30	31-114	115+
Lowland Conifers	Lowland Black spruce and Tamarack	1-30	31-119	120+

Patch type	>640 acres		251–640 acres		101-250 acres		41-100 acres		<= 40 acres	
	Count	Total acres	Count	Total acres	Count	Total acres	Count	Total acres	Count	Total acres
Young Aspen 1-30 years	0	0	2	635	7	488	51	1329	101	790
Intermediate Aspen 31-49 years	0	0	2	350	9	623	32	882	109	784
Old Aspen 50 + years	1	788	2	514	10	840	72	2056	178	1416
Young Upland Hardwoods 1-30 years	0	0	1	255	4	343	24	785	38	258
Intermediate Upland Hardwoods 31-59 years	0	0	0	0	3	200	20	647	82	652

Patch type	>640 acres		251–640 acres		101-250 acres		41-100 acres		<= 40 acres	
	Count	Total acres	Count	Total acres	Count	Total acres	Count	Total acres	Count	Total acres
Old Upland Hardwoods 60 + years	8	6888	28	6584	86	6806	154	4557	285	2440
Young Lowland Hardwoods 1-30 years	0	0	0	0	0	0	1	25	7	32
Intermediate Lowland Hardwoods 31-79 years	0	0	1	205	0	0	35	951	70	549
Old Lowland Hardwoods 80 + years	0	0	0	0	8	817	31	881	50	403
Young Pine 1-30 years	0	0	0	0	0	0	0	0	0	0
Intermediate Pine 31-114 years	0	1485	2	432	5	393	18	528	58	425
Old Pine 115 + years	0	0	0	0	0	0	0	0	0	0
Young Lowland conifers 1-30 years	0	0	0	0	0	0	1	24	0	0
Intermediate Lowland conifers 31-119 years	0	0	1	386	6	609	4	135	38	349
Old Lowland conifers 120 + years	0	0	0	0	1	68	2	79	3	26

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Climate change

Forest management plans will consider the effects of climate change on forest management activities. Efforts will be made to be aware of the specific cover types that are projected to do better in what are anticipated to be future climate trends. Because forest management is implemented over relatively long terms (50 plus years) drastic forest management activities reacting to climate change will not be undertaken. Rather efforts will be made to introduce some cover type conversions and specific Strategies that are consistent with the Department's recommendations concerning how to react to climate change as the SFRMP is prepared and implemented. Climate change impacts are identified in the Department's Strategic Conservation Agenda. See for more information:

[DNRs Strategic Direction - Climate change mitigation and adaptation](#)

More comprehensive research on impacts of climate change has been prepared by the Northern Institute of Applied Climate Science. See research and further information on NIACS at:

[Northern Institute of Applied Climate Science](#)

[The climate change atlas](#) is a tool used to examine current distributions and modeled future climate habitat for 134 individual tree species by geographic area. The following table was created using data from the climate change atlas and shows the change in potential suitable habitat for tree species within the MIM Section, weighted for both the area and abundance of habitat for various climate model scenarios projected to year 2100. The data was calculated for the MIM 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 a species.

Table 15 - Tree Habitat Suitability shows the modeled IV for a subset of the tree species within the MIM Section. Species are placed in the order of highest to lowest IV based on the average Hadley, GDFL, PCM High Scenario.

Table 15 - Tree Habitat Suitability Minnesota & NE Iowa Morainal³

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)
bur oak	Quercus macrocarpa	1764	↑ 1882	↑ 1929	↑ 2009	↑ 2100
green ash	Fraxinus pennsylvanica	1030	↓ 1014	↓ 854	↑ 1108	↑ 1057
eastern redcedar	Juniperus virginiana	181	↑ 805	↑ 673	↑ 901	↑ 1004
silver maple	Acer saccharinum	526	↑ 738	↑ 958	↑ 836	↑ 1007
eastern cottonwood	Populus deltoides	185	↑ 733	↑ 417	↑ 819	↑ 653
American basswood	Tilia americana	1110	↓ 733	↓ 1008	↓ 800	↓ 1023
black walnut	Juglans nigra	151	↑ 514	↑ 769	↑ 623	↑ 820
northern red oak	Quercus rubra	1119	↓ 381	↓ 1059	↓ 482	↓ 954
white oak	Quercus alba	478	↓ 336	↑ 758	↓ 360	↑ 718
sugar maple	Acer saccharum	664	↓ 248	↓ 592	↓ 315	↓ 480
red maple	Acer rubrum	296	↓ 277	↑ 333	↓ 273	↓ 291
quaking aspen	Populus tremuloides	1516	↓ 249	↓ 586	↓ 260	↓ 485
white ash	Fraxinus americana	156	↑ 222	↑ 369	↑ 253	↑ 327
black ash	Fraxinus nigra	366	↓ 179	↓ 240	↓ 190	↓ 233
eastern white pine	Pinus strobus	99	↑ 134	↑ 162	↑ 165	↑ 145
jack pine	Pinus banksiana	236	↓ 139	↓ 179	↓ 146	↓ 188
balsam poplar	Populus balsamifera	139	↑ 147	↓ 23	↑ 140	↓ 60
red pine	Pinus resinosa	181	↓ 135	↓ 167	↓ 130	↓ 159
tamarack (native)	Larix laricina	197	↓ 106	↓ 96	↓ 107	↓ 107
northern pin oak	Quercus ellipsoidalis	148	↓ 85	↑ 218	↓ 90	↑ 212
swamp white oak*	Quercus bicolor	0	↑ 45	↑ 14	↑ 48	↑ 30
paper birch	Betula papyrifera	381	↓ 40	↓ 143	↓ 41	↓ 114
bigtooth aspen	Populus grandidentata	159	↓ 11	↓ 79	↓ 21	↓ 58
white spruce	Picea glauca	18	↓ 11	↓ 3	↓ 13	↓ 7
northern white cedar	Thuja occidentalis	17	↓ 1	↓ 10	↓ 9	↓ 4
balsam fir	Abies balsamea	59	↓ 0	↓ 0	↓ 0	↓ 0
black spruce	Picea mariana	37	↓ 0	↓ 0	↓ 0	↓ 0

*- species not represented in the FIA that will have new potential 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

Current IV Model- DISTRIB species habitat model for conditions in 2000

Hadley- Hadley Climate Model

PCM- Parallel Climate Model

GFCL- Geophysical Fluid Dynamics Laboratory GCM Model

GCM-General Circulation Model

³ 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

Acres: 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 10 years, into which the age range of trees or forest stands is divided for classification or use.

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.

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.

Basal area: The cross-sectional area of a tree taken at the base of the tree (i.e., measured at 4.5 feet above the ground). Basal area is often used to measure and describe the density of trees within a geographic area using an estimate of the sum of the basal area of all trees cross-sectional expressed per unit of land area (e.g., basal area per acre).

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 (MBS Sites) to natural resource professional, state and local government officials, and the public. MBS 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 MBS 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 harvest method used to regenerate shade-intolerant species, such as aspen and jack pine.

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.

Connectivity: An element of spatial patterning where patches of vegetation such as, forest types, native plant communities or wildlife habitats are connected to allow the flow of organisms and processes between them.

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

Cord: A pile of wood 4 feet high, 4 feet wide, and 8 feet long, measuring 128 cubic feet, including bark and air space. Actual volume of solid wood may vary from 60 to 100 cubic feet, depending on size of individual pieces and how tight the wood is stacked. In the lake states, pulpwood cords are usually four feet x four feet x 100 feet and contain 133 cubic feet. Pulpwood volume of standing trees is estimated in cords. For example, a 10-inch DBH tree, which is 70 feet tall, is about 0.20 cords; or five trees of this size would equal one cord of wood.

Cord Equivalent: Forest product units of measure converted to cords.

Corridor: A defined tract of land connecting two or more areas of similar habitat type through which wildlife species can travel.

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.

Cubic foot: A wood volume measurement containing 1,728 cubic inches, such as a piece of wood measuring one foot on a side. A cubic foot of wood contains approximately six to 10 usable board feet of wood. A cord of wood equals 128 cubic feet.

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. (See Appendix A.)

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 10 years).

Extirpated: The species is no longer found in this portion of its historical range.

Forest inventory and analysis (FIA): A statewide forest survey of timber lands jointly conducted by the DNR and the U.S. Department of Agriculture—Forest Service that periodically, through a system of permanent plots, assesses the current status of, and monitors recent trends in, forest area, volume, growth, and removals.

Forest Inventory Module (FIM): The FIM provides a database and application through which field foresters can maintain an integrated and centralized inventory of the forests on publicly owned lands managed by the Division of Forestry and other divisions. In the field, foresters collect raw plot and tree data. Those data are summarized in stand level data that are linked to a spatial representation of stand boundaries. Part of the DNR's **FOR**estry **I**nformation **S**ysTem (FORIST).

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 road: A temporary or permanent road connecting the remote parts of the forest to existing public roads. Forest roads provide access to public land for timber management, fish and wildlife habitat improvement, fire control, and a variety of recreational activities. The Division of Forestry has three classifications for roads and access routes:

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 on adjoining areas.

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 Analysis (GAP): Data produced to provide ownership and land cover information for the USGS [Gap Analysis Project](#).

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

Habitat: An area in which a specific plant or animal normally lives, grows and reproduces; the area that provides a plant or animal with adequate food, water, shelter and living space.

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).

Intermediate cut: The removal of immature trees from the forest sometime between establishment and major harvest with the primary objective of improving the quality of the remaining forest stand.

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 description 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 available for timber management purposes.

Marketable timber: Merchantable timber that is accessible now.

Mesic: Moderately moist.

MBS Sites: Areas of land identified by Minnesota Biological Survey (MBS) 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.

Mortality: Death or destruction of forest trees as a result of competition, disease, insect damage, drought, wind, fire, or other factors.

Multi-aged stand: A stand with two or more age classes.

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., wild fires, wind storms, normal flood cycles).

Natural Area: An area of land, with significant native biodiversity, where a primary goal is to protect, enhance or restore ecological processes and Native Plant Community composition and structure. An MBS Site of Outstanding or High biodiversity significance is often recommended for nomination as a natural area. For these Sites, an MBS *Ecological Evaluation* is written to characterize the ecological significance of the Site as a whole and to serve as a guide for conservation action by the various landowners. Sites (or portions of Sites) that are recommended as natural areas may be identified by the landowner or land management agency for conservation activities such as designation as a (city, county, state, private) park, non-motorized recreation area, scientific and natural area, reserve, special vegetation management (e.g. natural disturbance based forest management for maintenance of mature growth stage), etc. (*Draft definition 3/24/2004*)

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 from 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.

Standard DNR rotation age: For even-aged managed cover types, the rotation age for non-Wildlife administered and non-SMA lands.

Old-growth forests: Forests defined by age, structural characteristics, and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances, 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 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.

Open or Brushland Landscape Management Area - Forests or patches of trees in these areas that are managed to benefit species with open landscape habitat requirements.

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.

Prescribed burn: To deliberately burn wildlands (e.g., forests, prairie, or savanna) in either their natural or modified state and under specified conditions within a predetermined area to meet management objectives for the site. A fire ignited under known conditions of fuel, weather, and topography to achieve specific objectives.

Prescription: A planned treatment (clear-cut, selective harvest, thin, reforest, reserve, etc.) designed to change 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.

Pulpwood: Wood cut or prepared primarily for manufacture into wood pulp or chips, for subsequent manufacture into paper, fiber board, or chip board. Generally, trees 5- to-12 inches diameters at breast height are used.

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.

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.

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).

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; or 2) To create or maintain an under-represented ecological condition; or 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.

Reserved forestland: Forestland withdrawn from timber utilization through statute, administrative regulation, or designation.

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.

Ruffed Grouse Management Areas (RGMAs) - Ruffed grouse management areas are managed to supply all of the habitat needs of ruffed grouse, as well as other species with similar habitat requirements such as woodcock.

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 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 disease.

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

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.

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.

Special concern species: A plant or animal species that is extremely uncommon in Minnesota, or has a unique or highly specific habitat requirements, 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.

Special management zone (SMZ): a buffer immediately surrounding designated old-growth forest stands. It is intended to minimize edge effects and windthrow damage to old-growth stands. Minimum width is 330- feet from the edge of the old-growth stand. Timber harvest is allowed in the SMZ, but there are limitations on how much can be clearcut at any given time.

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 10 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.

Stand examination list: DNR forest stands to be considered for treatment (e.g., harvest, thinning, regeneration, prescribed burning, reinventory, etc.) over the planning period based on established criteria (e.g., rotation age, site index, basal area, desired future cover-type composition, etc.). These stands will be assigned preliminary prescriptions and most will receive the prescribed treatment. However, based on field appraisal visit, prescriptions may change for some stands because of new information on the stand or its condition.

State forest road: Any permanent road constructed, maintained, or administered by the DNR for the purposes of accessing or traversing state forest lands.

Strategic planning: A process to plan for desired future states. Includes aspects of a plan or planning process that provide statements and guides for future direction. The geographic, programmatic, and policy focus can range from very broad and general to more specific in providing tiers/levels of direction. Strategic planning is usually long term (i.e., at least five years, often longer). It usually includes an assessment of current trends and conditions (e.g., social, natural resource, etc.), opportunities, and threats; identification of key issues; and the resulting development of goals (e.g., desired future conditions), strategies, and objectives. Vision and mission statements may also be included.

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: Province → Section → Subsection → Land Type Association → Land Type → Land 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.

Section forest resource management plan (SFRMP): A DNR plan for vegetation management on forest lands administered by DNR Divisions of Forestry and Fish and Wildlife that uses ECS Sections as the basic unit of delineation. Initial focus will be to identify forest stands and road access needs for the duration of the 10-year plan. There is potential to be more comprehensive in the future.

Succession: The natural replacement, over time, of one plant community with another.

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 a 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 forest 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, and cedar, offsite aspen, or nonforest land.

Timber productivity: The quantity and quality of timber produced on a site. The rate at which timber volume is produced per unit area over a period of time (e.g., cords per acre per year). The relative capacity of a site to sustain a level of timber production over time.

Understory: The shorter vegetation (shrubs, seedlings, saplings, small trees) within a forest stand that forms a layer between the overstory and the herbaceous plants of the forest floor.

Uneven-aged stand: A stand of trees of a variety of ages and sizes growing together on a uniform site. A stand of trees with three or more distinct age classes.

Uneven-aged management: Forest management that results in forest stands comprised of intermingling trees or small groups that have three or more distinct age classes. Best suited for shade tolerant species.

Volume: The amount of wood in a tree or stand according to some unit of measurement (board feet, cubic feet, cords), or some standard of use (pulpwood, sawtimber, etc.).

Well-stocked: The situation in which a forest stand contains trees spaced widely enough to prevent competition yet closely enough to utilize the entire site.

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
DBH	Diameter at Breast Height
DNR	Department of Natural Resources
ECS	Ecological Classification System
ETS	Endangered, Threatened, or Special Concern
FIA	Forest Inventory and Analysis
FIM	Forest Inventory Module
FORIST	Forest Information System
FY	Fiscal Year
G1G2	Globally Critically Imperiled (G1) and Globally Imperiled (G2) Native Plant Communities
GAP	Gap Analysis Program
HCVF	High Conservation Value Forest
MBS	Minnesota Biological Survey
NHIS	Natural Heritage Information System
NPC	Native Plant Community
MIM	Minnesota & Northeast Iowa Morainal
OFMC	Old Forest Management Complex
SFRMP	Subsection Forest Resource Management Plan
SGCN	Species in Greatest Conservation Need
SI	Site Index
SMA	Special Management Area
SMZ	Special Management Zone
SNA	Scientific and Natural Area
WMA	Wildlife Management Area

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	2010 2017 2021	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
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)	2016	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
Natural Heritage Information System	2021	MNDNR Section of Ecological Services, Nongame Program	Varies according to completion of CBS in state.		Displays inventory of native plant communities, rare species, and biodiversity.	+ Extensive habitat classification - Not complete statewide - Different standards statewide