

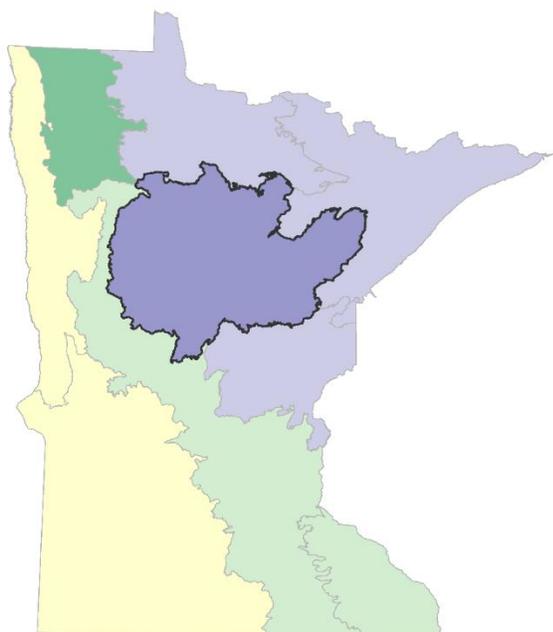
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# Northern Minnesota Drift and Lake Plains

Section Forest Resource Management Plan – Assessment and  
Current Conditions

August 2022

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## Table of Contents

Chapter 1. Purpose and Planning Area.....	5
Purpose of the assessment.....	5
Introduction to the planning area .....	5
Chapter 2: Landscape context .....	7
Land ownership .....	7
Land-cover classification .....	9
Potential native plant community.....	11
Forest cover type age class distributions .....	12
Older and younger forest .....	17
Forest diversity .....	18
Chapter 3: DNR-administered lands.....	19
DNR-administered land .....	19
DNR major management units .....	20
Forest cover types .....	21
State timberland cover type age class distributions .....	24
Older and younger, early successional forest .....	32
Old-growth forests .....	33
Acres of timber offered and sold from DNR-administered lands .....	35
Chapter 4: Resource Conditions .....	41
Natural forest disturbances and forest health .....	41
Native plant communities .....	48
Forest patch distribution .....	55
Special Management Areas .....	56
Minnesota’s List of Endangered, Threatened, and Special Concern Species .....	56
Water resources .....	65

Sites of Biodiversity Significance .....	66
Climate change .....	67
Appendix A: Glossary.....	71
Appendix B: Acronyms .....	78

# Chapter 1. Purpose and Planning Area

## Purpose of the assessment

This document provides context for the Northern Minnesota Drift and Lake Plains<sup>1</sup> Section Forest Resource Management Plan (MDLP 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 MDLP Section, followed by conditions and trends on state-administered land. This information helps planners to develop management guidance, land managers to understand the broader context they work within, and the public to understand the environment within which the DNR plans and carries out management.

## Introduction to the planning area

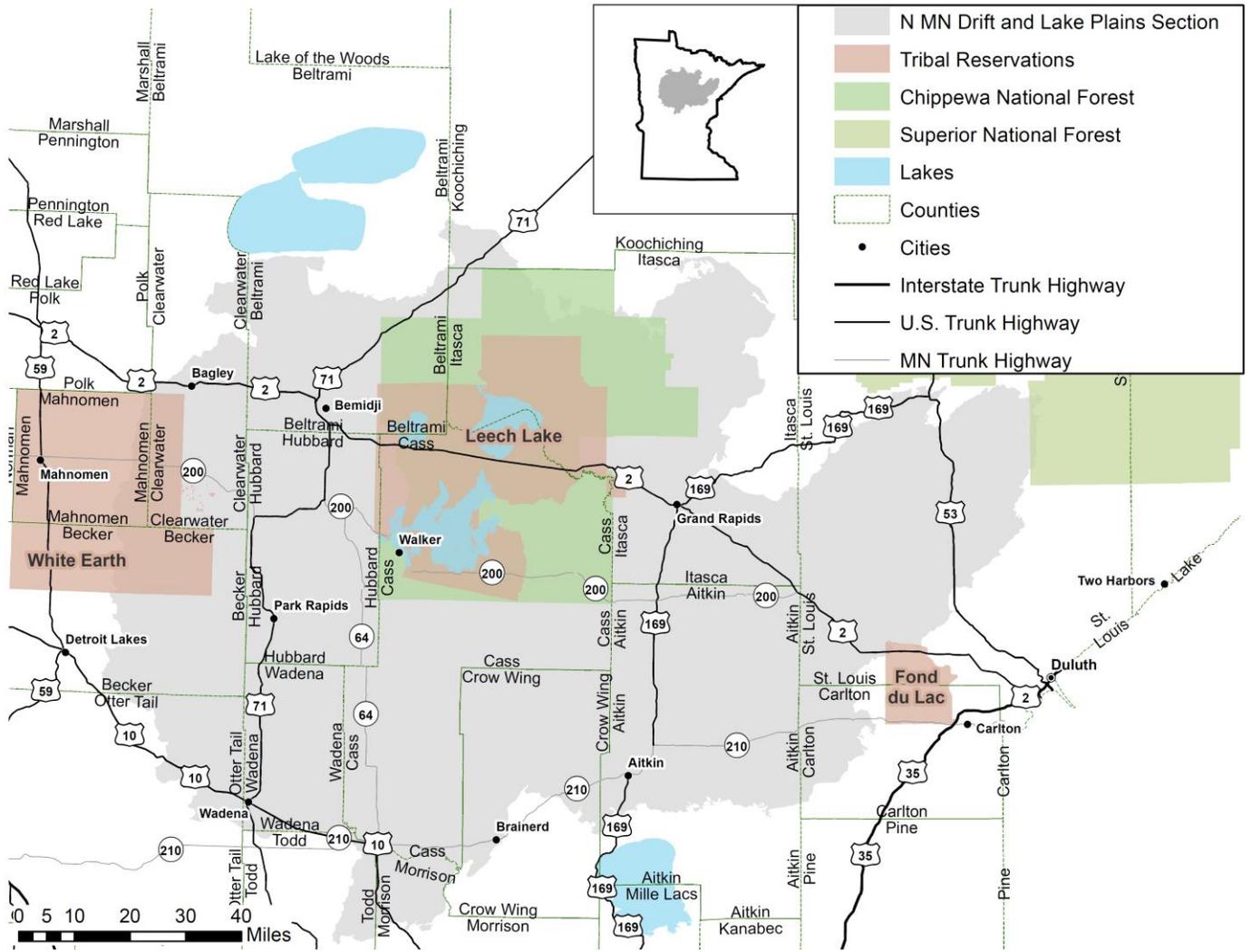
The MDLP Section (Map 1.1) covers approximately 8.4 million acres in north-central Minnesota, and over 50% of those acres are deciduous forests or woody wetlands. With over 3,500 lakes, including three of Minnesota's Large Lakes greater than 15,000 acres (Cass, Leech, and Winnibigoshish), and the iconic headwaters of the Mississippi River, the Section is rich in water resources. Diverse, extensive forests and lakes harbor numerous Species in Greatest Conservation Need, including gray wolves, bald eagles, sharp-tailed grouse, yellow rails, red-necked grebes, black-backed woodpeckers, red-shouldered hawks, northern goshawks, least darters, eastern hognose snakes, Blanding's turtles, and four-toed salamanders. The [DNR's Ecological Classification System website](#) describes the ecology of the Section and the subsections within it: the Chippewa Plains, Pine Moraines and Outwash Plains, St. Louis Moraines, and Tamarack Lowlands.

Most of the land in the MDLP Section is in private ownership, and over 40% is in public ownership (federal, county, state). State ownership accounts for approximately 1.3 million acres. The MDLP Section includes three tribal nations. The Leech Lake Reservation lies in the north-central part of the Section (overlapping much of the Chippewa National Forest), the eastern portion of the White Earth Reservation covers the western edge of the section, and the southern edge of the Red Lake Reservation touches the north-west edge of the section. Much of the section is rural and encompasses the small cities of Bemidji, Brainerd, and Grand Rapids. Forestry, tourism, and recreation, including hunting, fishing, snowmobiling, and skiing, are the most significant land uses across the section. Agriculture is important locally in the western and some areas of the eastern parts of the section.

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<sup>1</sup> 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 1.1 Location of the Northern Minnesota Drift and Lake Plains Section.



## Chapter 2: Landscape context

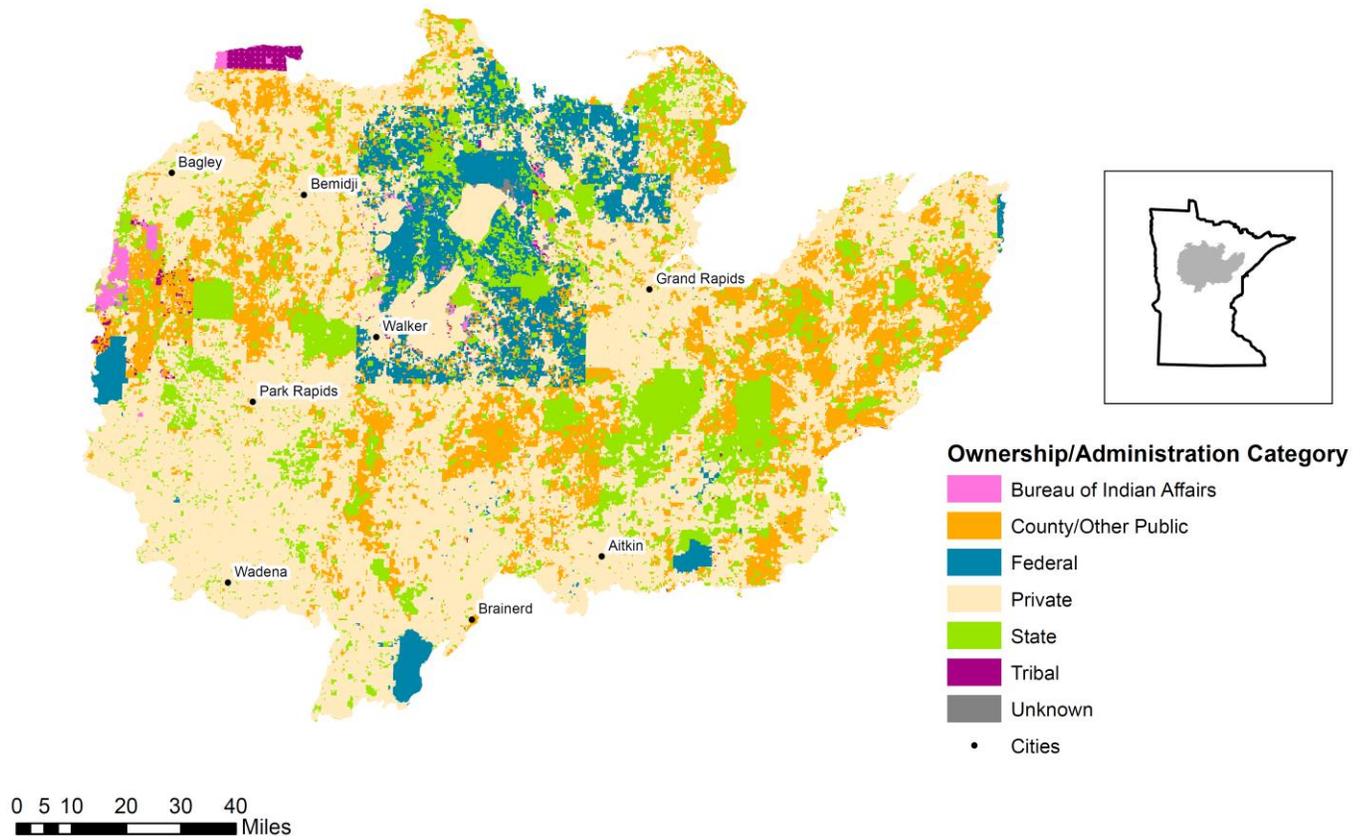
### Land ownership

The MDLP Section covers approximately 8.5 million acres. Private individuals and industry own most of the land (55% total; individuals own 91%, and industry owns 8% of the section's private land; Table 2.1, Map 2.1). Approximately 42% of the land in MDLP is public and administered by federal, county, or state government. The state of Minnesota administers 15% of the land in the section. The MDLP SFRMP applies to approximately 1.1 million acres of state land administered by the Divisions of Forestry and Fish and Wildlife that are in the management pool (productive forest cover types, excluding specific land designations and areas such as old growth stands and the Boundary Waters Canoe Area Wilderness). Tribes and the Bureau of Indian Affairs own approximately 1.3% of the land in the MDLP Section.

Table 2.1 Land ownership/administration in the MDLP Section in acres (2008 Gap Analysis Project (GAP) Stewardship data for all ownerships).

<b>Administrator Class</b>	<b>Acres</b>	<b>Percent</b>
Bureau of Indian Affairs	60,260	0.7%
County/Other Public	1,610,229	18.8%
Federal	753,277	8.8%
Private	4,742,033	55.4%
State-administered	1,325,203	15.5%
Tribal	51,616	0.6%
Unknown	14,892	0.2%
<b>Grand Total</b>	<b>8,557,509</b>	<b>100.0%</b>

Map 2.1 Land ownership or administration in the MDLP Section.



## Land-cover classification

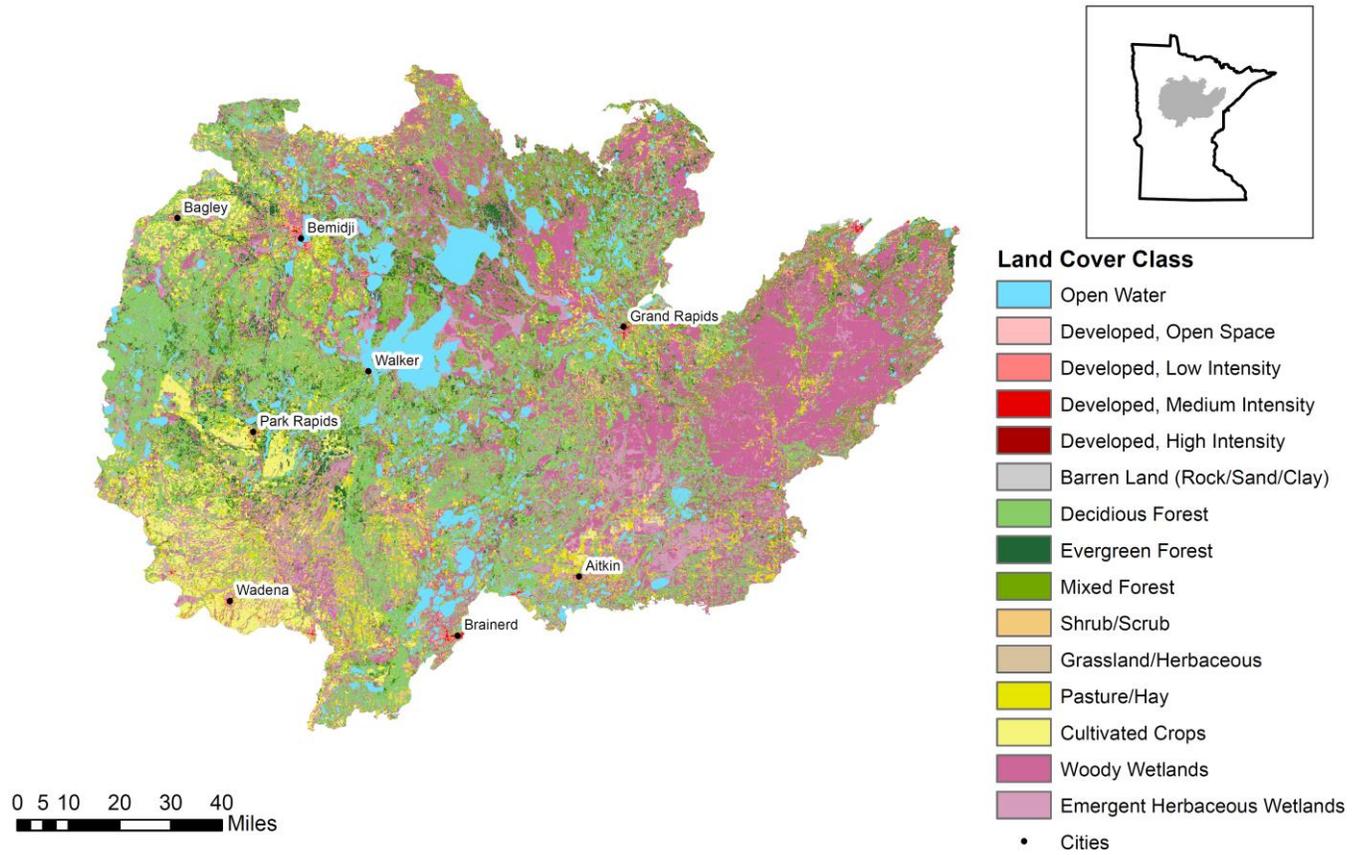
### *National Land Cover Classifications*

The MDLP Section contains a variety of land cover classes, with deciduous forest and woody wetlands covering over 50% of the section (Table 2.2, Map 2.2). The next most prominent land cover classes are emergent herbaceous wetlands, open water, and mixed forests. The section also includes small amounts of developed land, upland coniferous forest, shrub/scrub land, herbaceous land, and cultivated crops or pastures.

Table 2.2 National land cover classes in the MDLP Section (NLCD 2016 data)

<b>NLCD Land Cover Class</b>	<b>Acres</b>	<b>Percent</b>
Open Water	725,700	8.6%
Developed, Open Space	210,268	2.5%
Developed, Low Intensity	41,638	0.5%
Developed, Medium Intensity	13,650	0.2%
Developed, High Intensity	4,356	0.1%
Barren Land	11,176	0.1%
Deciduous Forest	2,188,706	26.1%
Evergreen Forest	325,776	3.9%
Mixed Forest	698,530	8.3%
Shrub/Scrub	173,003	2.1%
Herbaceous	114,881	1.4%
Hay/Pasture	460,653	5.5%
Cultivated Crops	373,104	4.4%
Woody Wetlands	2,297,919	27.4%
Emergent Herbaceous Wetlands	751,100	9.0%
<b>Total</b>	<b>8,390,457</b>	<b>100.0%</b>

Map 2.2 MDLP Land Cover, 2016 National Land Cover Classification



## Potential native plant community

The Natural Resources Research Institute modeled [potential native plant communities](#) (NPC) across northeastern Minnesota, including within the MDLP Section<sup>2</sup>. This dataset shows the most probable NPC given multiple variables, including soils, climate, pre-European settlement vegetation data, and current land cover class.

The MDLP Section's potential NPC classes are diverse, with nearly 30% of the Section predicted to be fire-dependent forest, almost 30% mesic hardwood forest, and over 30% forested or unforested wetlands (Table 2.3).

Table 2.3. Potential Native Plant Community system.

<b>Native Plant Community System</b>	<b>Acres</b>	<b>Percent</b>
Forested peatland	679,010	8%
Mesic hardwood	2,344,717	28%
Open peatland	31,538	0%
Wet meadow	598,865	7%
Water	738,887	9%
Wet forest	830,709	10%
Fire dependent	2,317,396	28%
Acid peatland	848,673	10%
Floodplain forest	0	0%

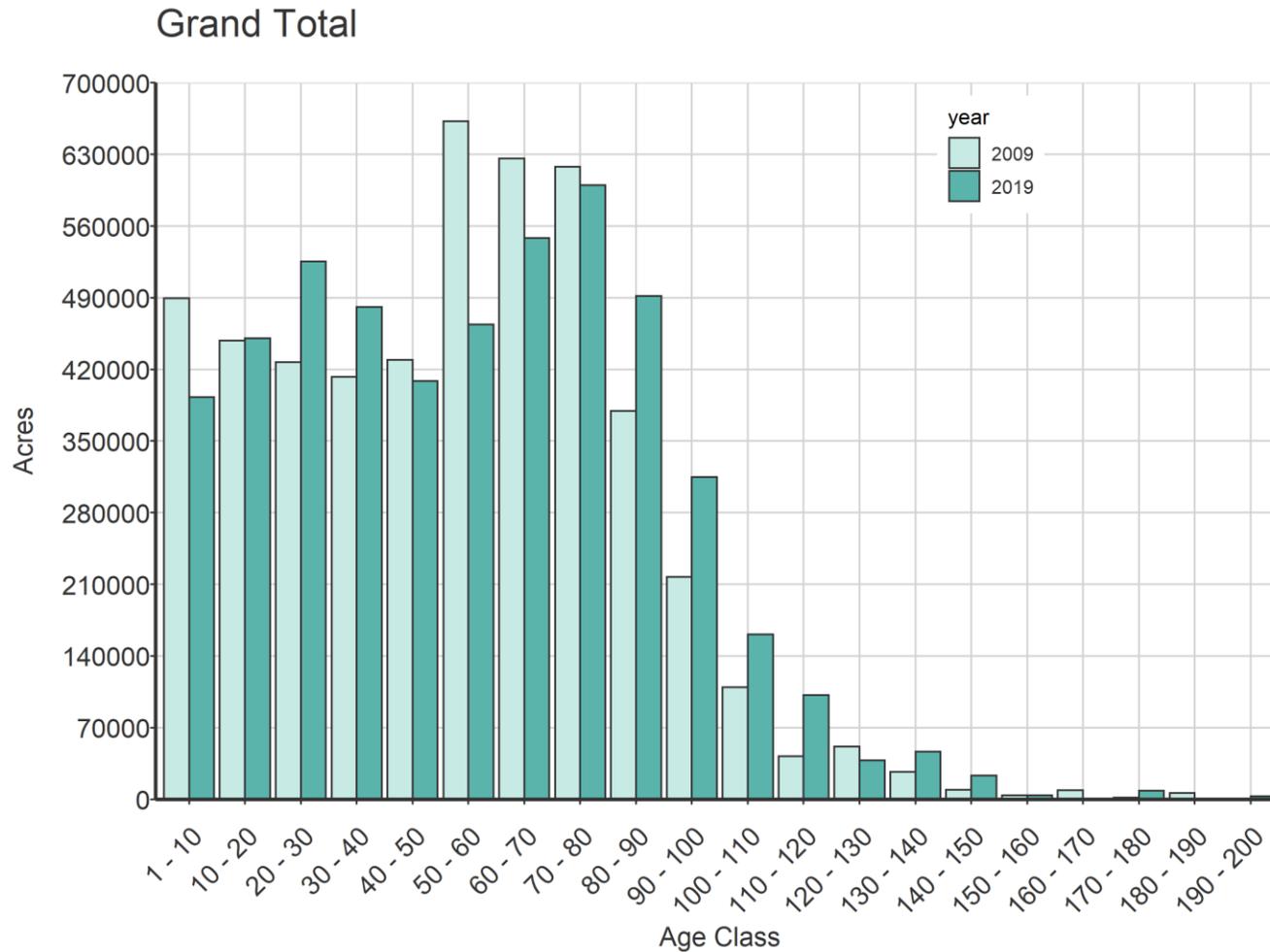
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<sup>2</sup> Brown, T., Meysembourg, P., & Host, G. E. (2013). Geospatial Modeling of Native Plant Communities of Minnesota's Laurentian Mixed Forest.

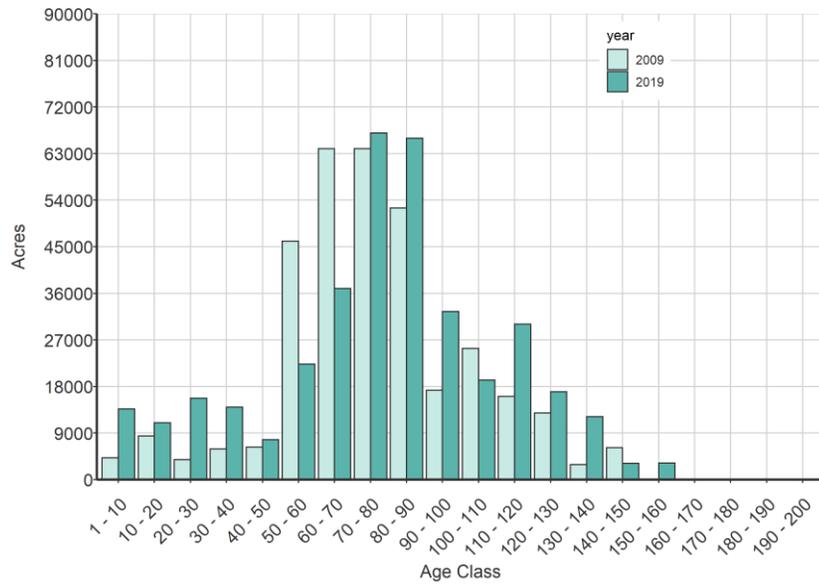
## Forest cover type age class distributions

Estimates from USFS Forest Inventory Analysis data show that the forest has grown older on average over the last ten years. Across all ownerships and cover types, older forest acres increased compared to those of younger forest. This pattern holds for most individual cover types (Fig. 2.1).

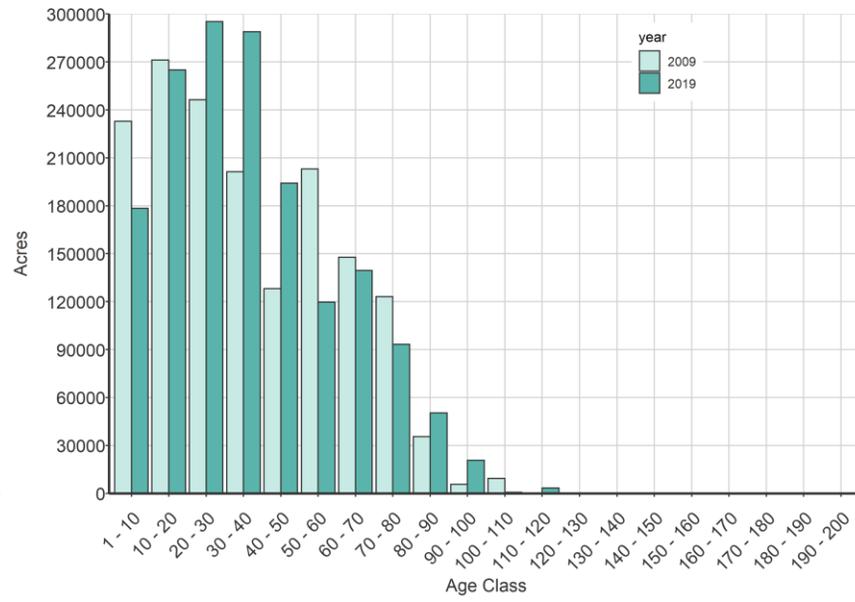
Figure 2.1. Age class distributions across ownerships based on USFS Forest Inventory Analysis (FIA) data.



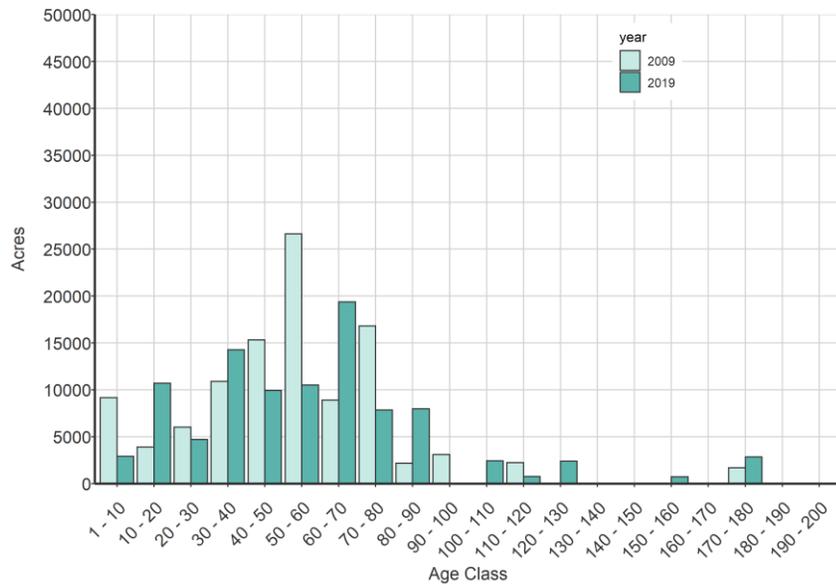
Ash



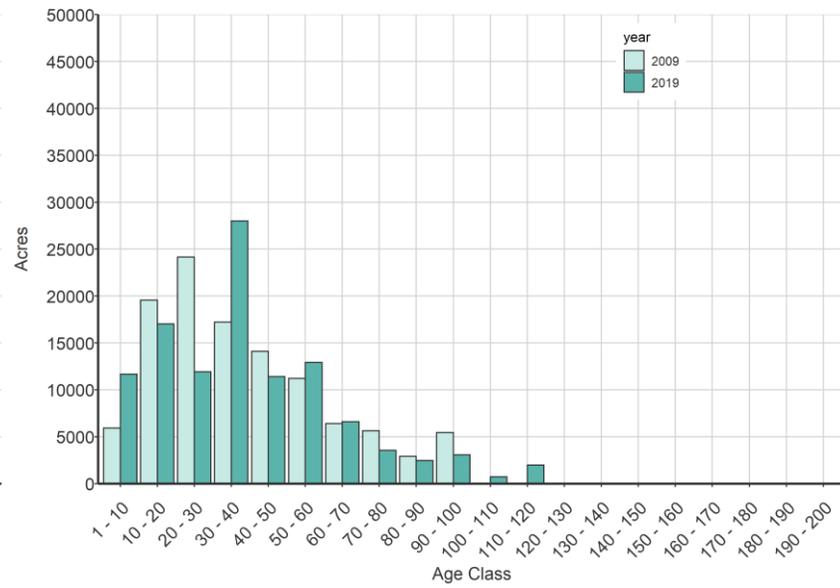
Aspen



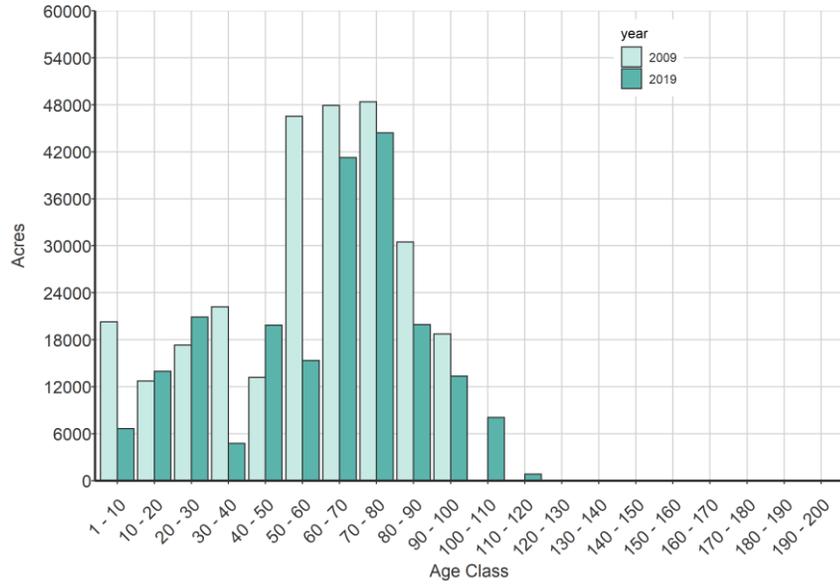
Balsam fir



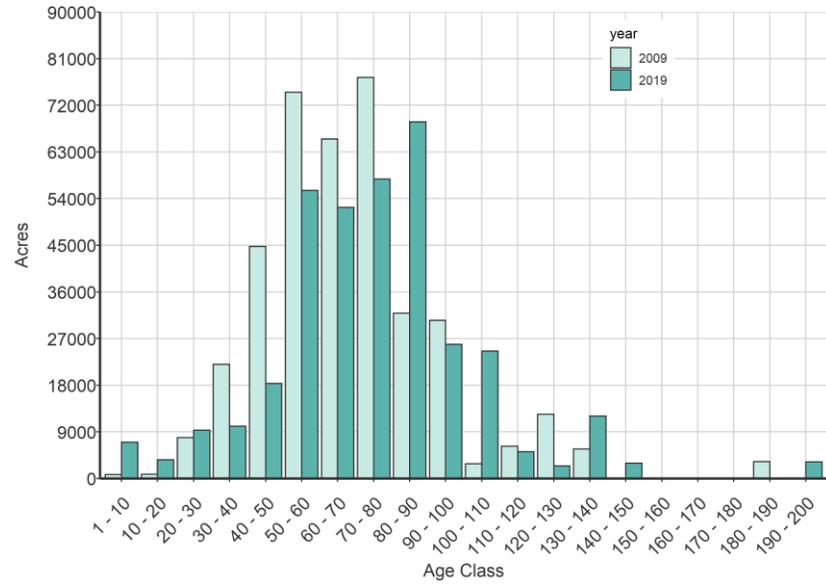
Balsam poplar



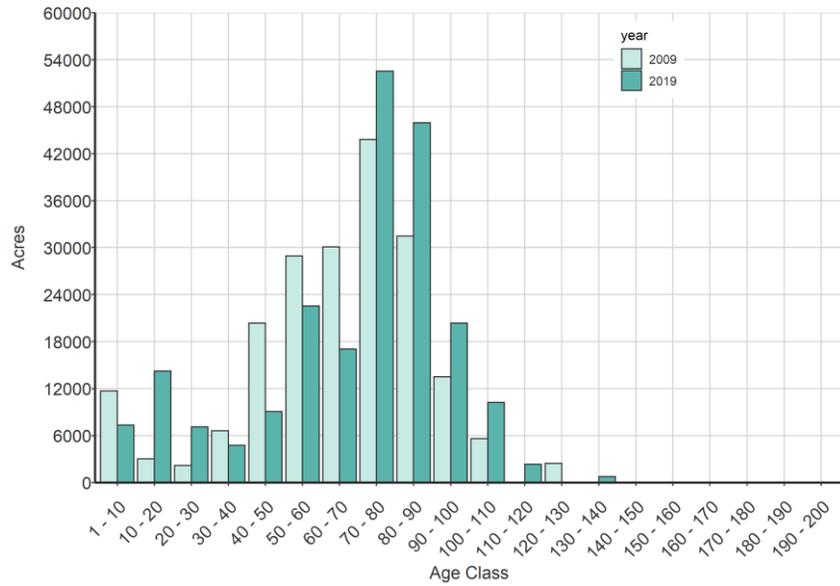
Birch



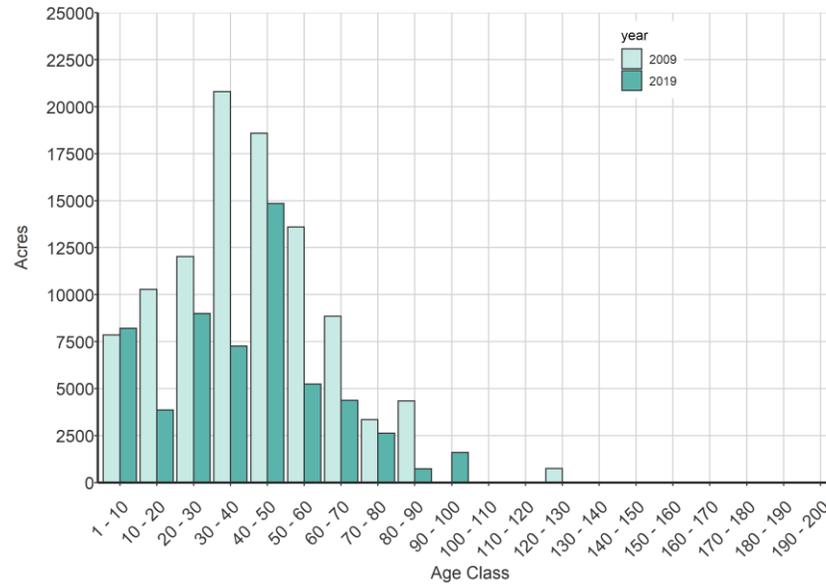
Black spruce



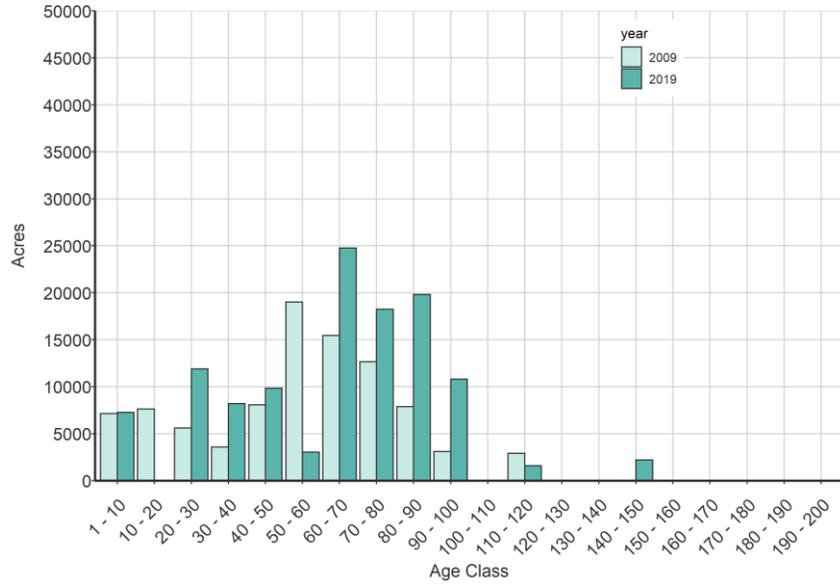
Central Hardwoods



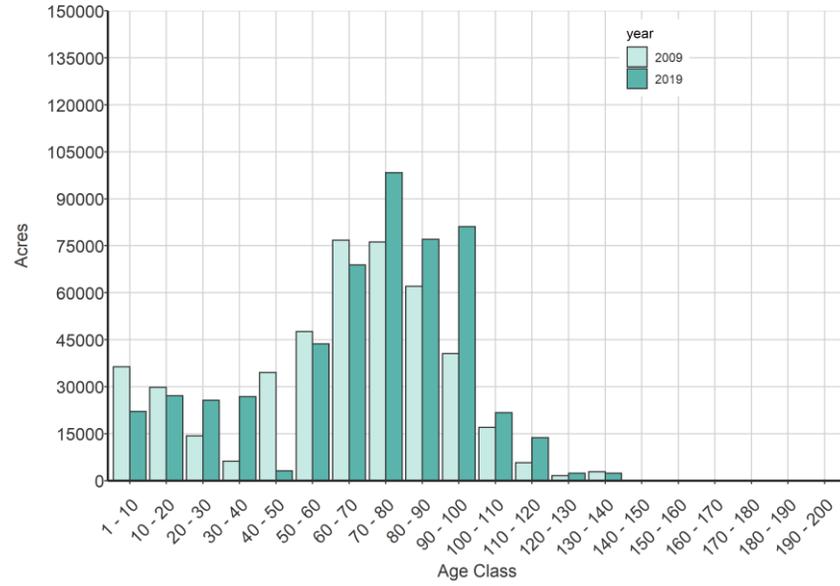
Jack pine



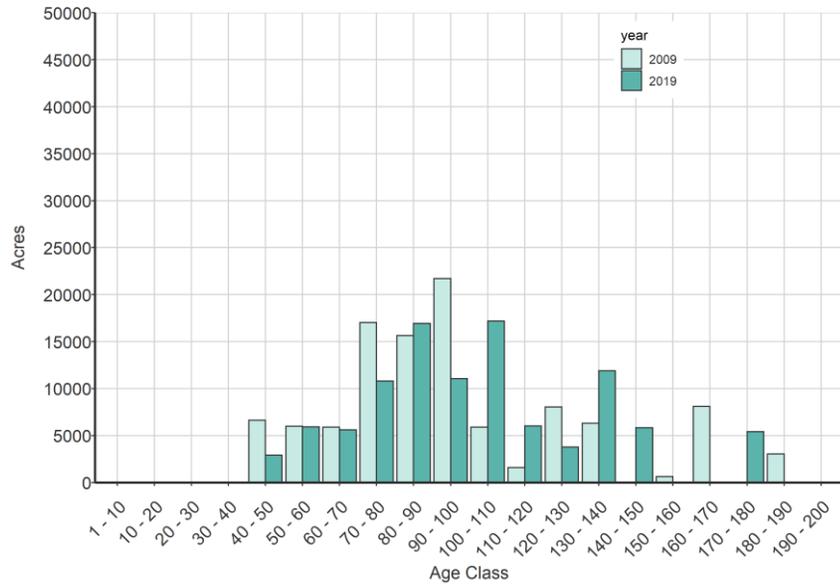
Lowland hardwoods



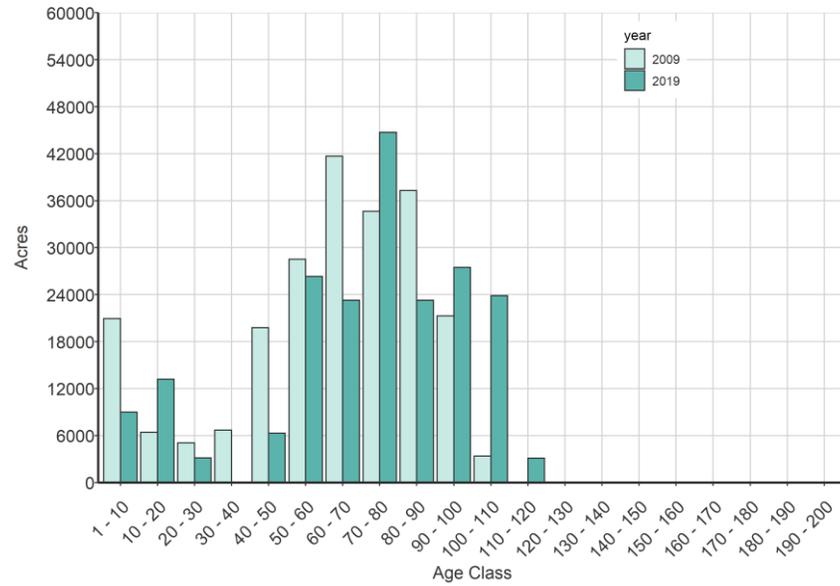
Northern hardwoods



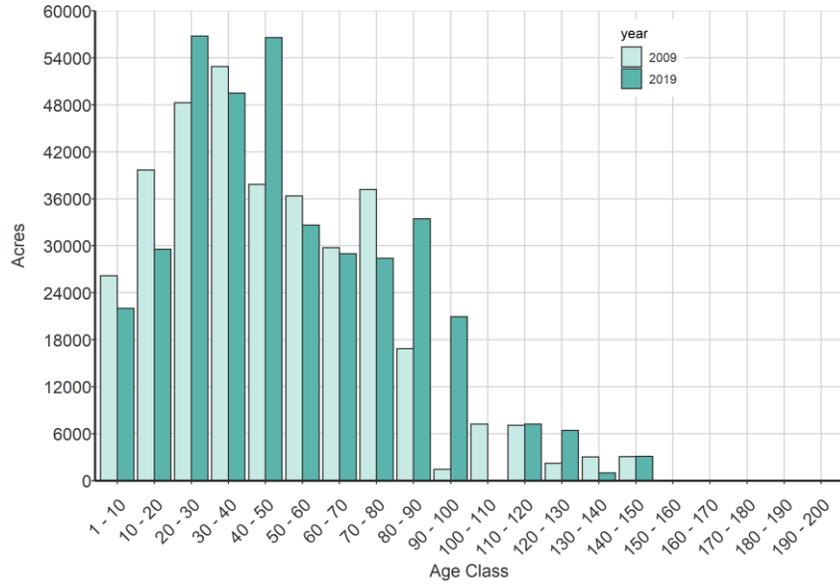
Northern white cedar



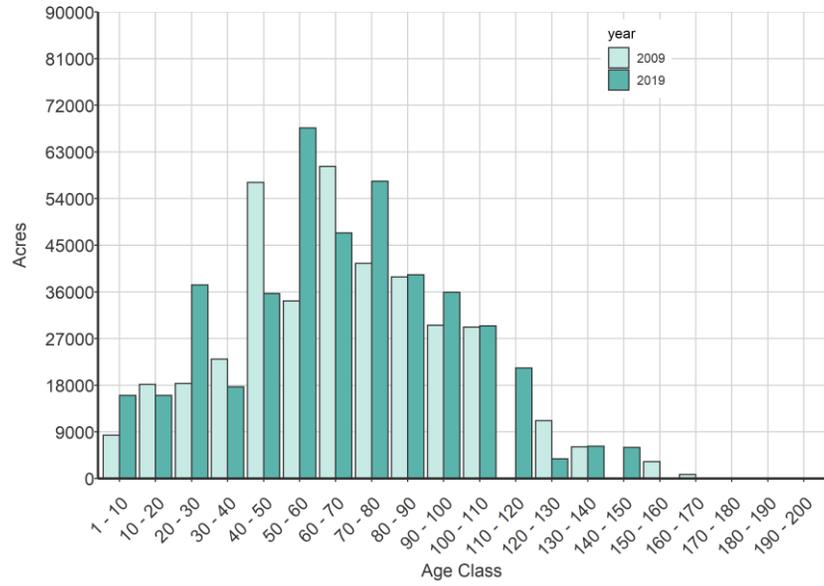
Oak



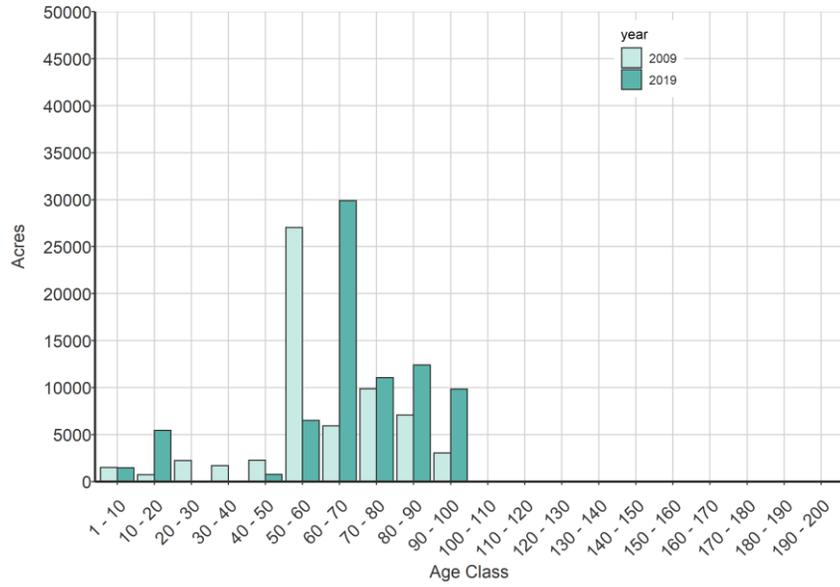
Red pine



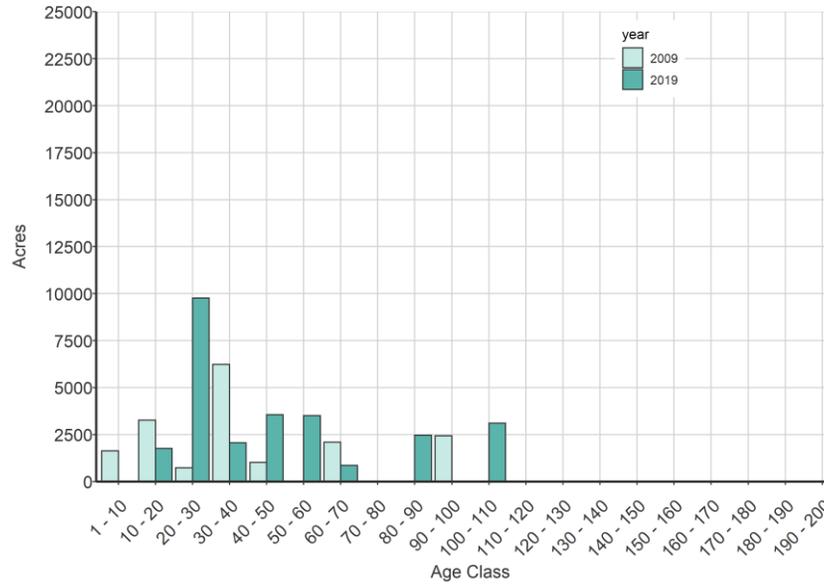
Tamarack



Eastern white pine



White spruce



## Older and younger forest

### Older forest

A significant portion of most even-age managed cover types are estimated to be over normal rotation age (Table 2.4). Estimated acres over rotation age are greater than the desired future forest condition (DFFC) from previous SFRMPs that overlap the MDLP Section for most cover types.

Table 2.4. Proportion of cover types estimated to be older than normal rotation age compared to desired future forest condition benchmarks (DFFCs) from previous SFRMPs that overlap the MDLP Section (Chippewa Plains, Pine Moraines, and Outwash Plains [CPPMOP] and North 4 SFRMPs).

Cover Type	Rotation Age	% over Rotation Age	CPPMOP DFFC	North 4 DFFC
Aspen	45	32%	14%	21%
Birch	50	68%	13%	12%
Jack Pine	45	64%	14%	12%
Black spruce	100	14%	18-19%*	11-15%***
Balsam fir	45	61%	24%	-
White spruce	50	37%	10%	12%
Tamarack	70	46%	14%	13-21%****
Red pine	65	31%	22%**	46%**
White pine	65	62%	-	-
Oak	65	66%	-	-

\*based on a normal rotation age of 65-95, depending on the site index

\*\*the CPPMOP and North 4 DFFCs for red pine are based on a normal rotation age of 100 years and were meant to apply to natural origin red pine only. Approximately 5% of all red pine acres in the MDLP are estimated to be over 100 years old.

\*\*\*based on a normal rotation age of 40-120, depending on the site index

\*\*\*\*based on a normal rotation age of 60-90, depending on the site index

### Younger forest

Early successional forests (aspen, birch, and jack pine cover types age 0-30, Table 2.4) are estimated to comprise 17% of forested acres in the MDLP Section.

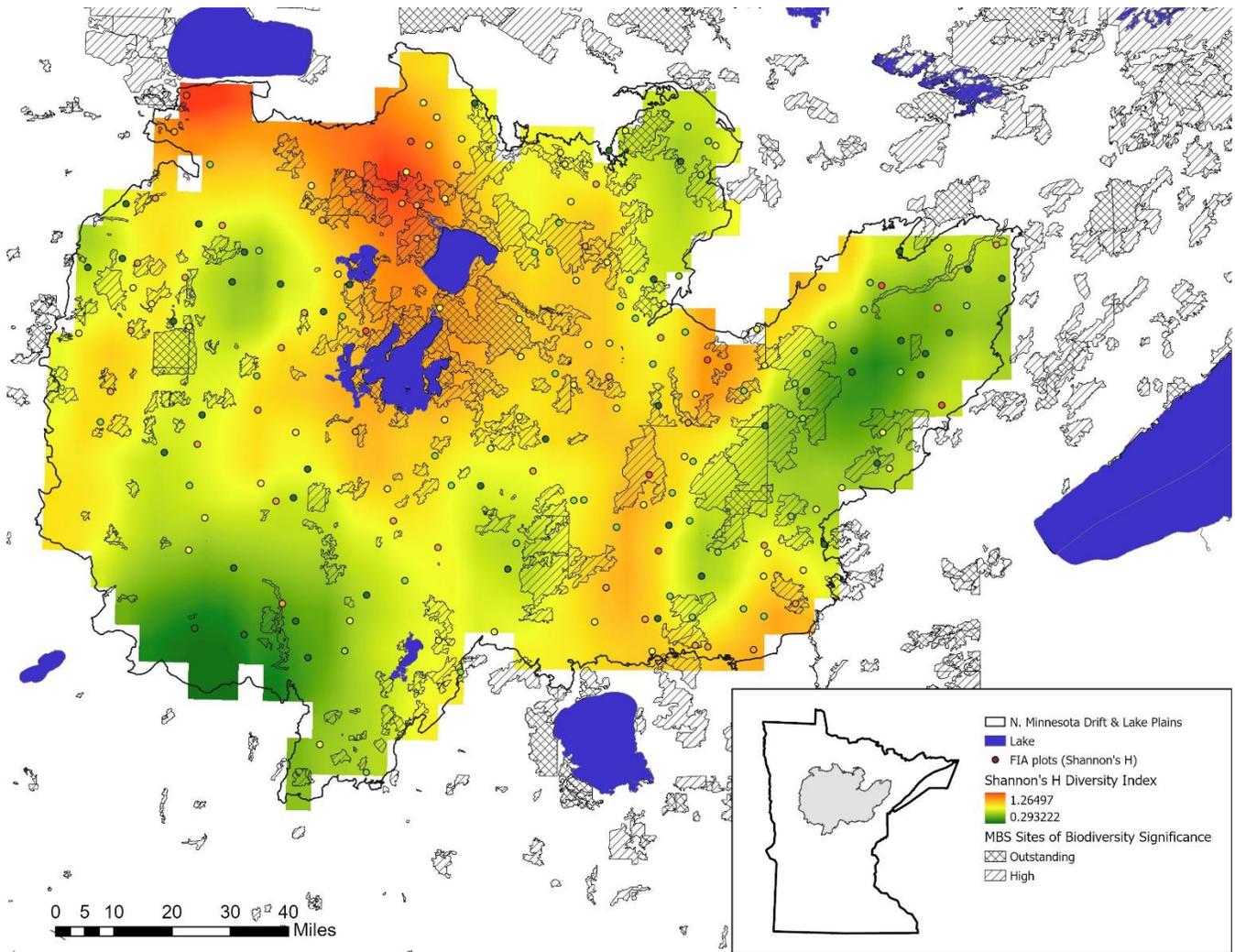
Table 2.4. Percent of early successional cover type acres estimated to be 0-30 years old (2019 FIA data).

Cover Type	% of cover type age 0-30
Aspen	45%
Birch	20%
Jack Pine	36%

## Forest diversity

Tree species diversity varies across the MDLP Section, with pockets of relatively high estimated tree species diversity in the Leech Lake Reservation, Chippewa National Forest, and south of Red Lake (Map 2.3).

Map 2.3. Shannon's H diversity estimated from 2019 FIA plot data interpolated using kriging across the MDLP Section.



## Chapter 3: DNR-administered lands

### DNR-administered land

The DNR administers nearly 1.2 million acres in the MDLP Section that are included in the state's Forest Inventory Module (FIM) dataset. A majority of those acres are school trust lands (63%). The DNR Division of Forestry administers most of the DNR-administered land in the Section (Table 3.1). The DNR also administers over 40,000 acres in Camp Ripley and over 4,000 acres in state parks, including Itasca State Park, but these acres are not in the management pool.

Table 3.1. Summary of DNR-administered land (acres) by DNR land administrator and school trust status.

State Land Administrator	Non-trust	Trust	Total
Camp Ripley	40,808		40,808
DNR	59		59
EWR	1,914		1,914
Fish and Wildlife	71,272	3,370	74,642
Forestry	314,701	740,420	1,055,121
Lands and Minerals	17		17
Mean Water	4,109		4,109
Parks and Trails	4,126	468	4,594



## Forest cover types

Aspen comprises the most significant proportion of cover type acres on DNR-administered land, making up over 30% of forested acres (Map 3.2, Table 3.2). The next most abundant forested cover types include lowland conifers, red pine, northern hardwoods, and lowland hardwoods. Of these cover types, aspen, red pine, and northern hardwoods have increased in acres. Acres have decreased for lowland hardwoods and some lowland conifers.

Map 3.2. Northern Minnesota Drift and Lake Plains forest composition on DNR-administered land.

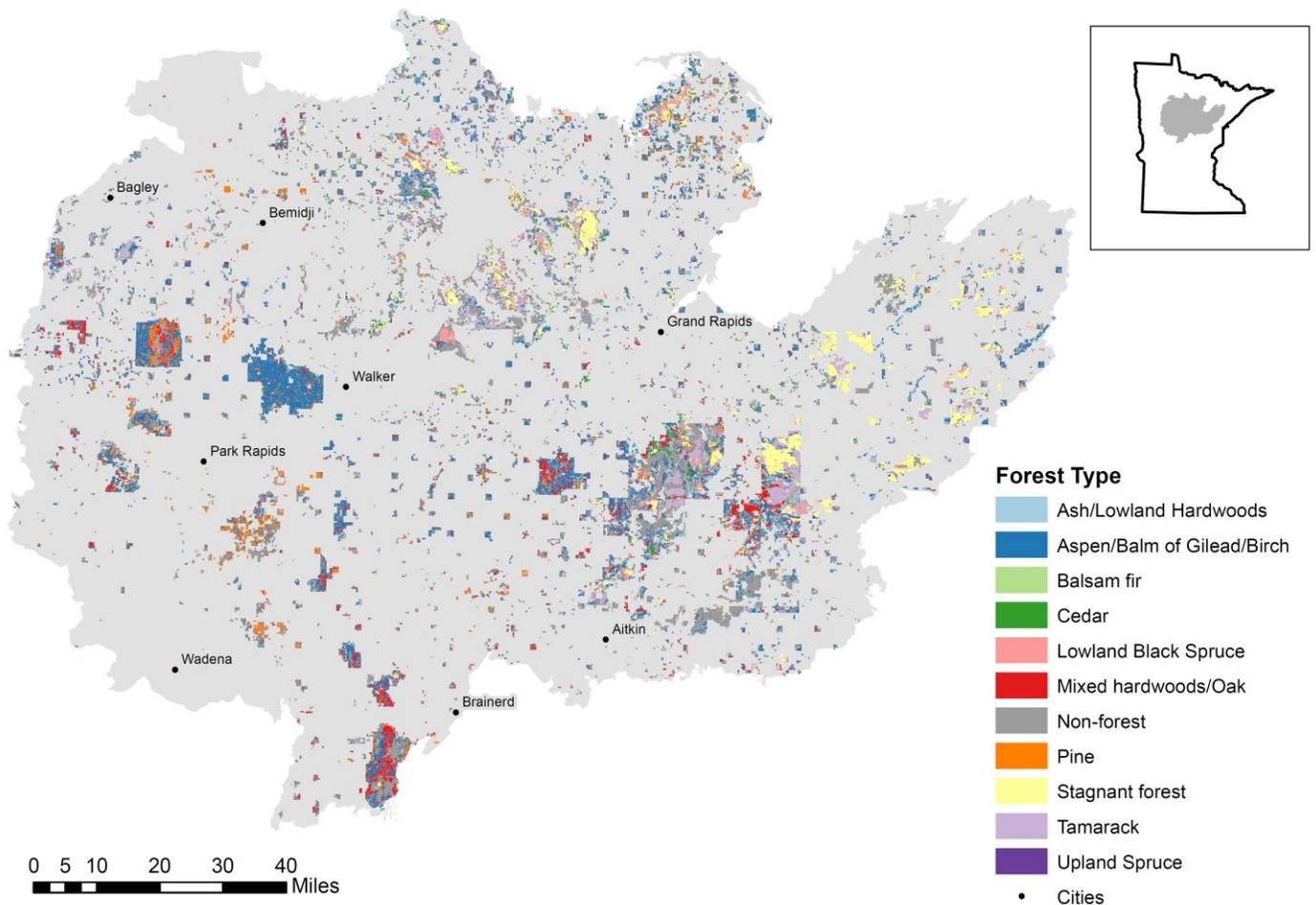


Table 3.2. Trends in total cover type acres in FIM from 2010 to 2021.

Cover Type	Acres 2010	Acres 2021	Trend
Ash	37,058	40,450	9%
Willow	20	20	0%
Lowland Hardwoods	8,479	4,184	-51%
Aspen	332,436	335,307	1%
Birch	15,414	11,963	-22%
Balm of Gilead	4,088	3,112	-24%
Northern Hardwoods	47,366	50,855	7%
Walnut	7		-100%
Oak	34,197	37,894	11%
Central Hardwoods	6		-100%
White Pine	5,019	5,392	7%
Norway Pine	54,426	58,340	7%
Jack Pine	19,113	17,649	-8%
Scotch Pine	13	10	-20%
White Spruce	10,155	9,682	-5%
Balsam Fir	11,735	6,604	-44%
Norway Spruce	18	33	78%
Black Spruce-Lowland	70,825	60,276	-15%
Tamarack	98,663	99,237	1%
White Cedar	26,567	28,019	5%
Black Spruce-Upland	306	329	7%
Stagnant Spruce	66,017	70,426	7%
Stagnant Tamarack	30,101	29,493	-2%
Stagnant Cedar	18,332	19,090	4%
Offsite Aspen	169	499	195%
Offsite Oak	1,057	1,249	18%
Red Cedar	6	6	0%
Lowland Grass	53,842	57,563	7%
Upland Grass	13,195	13,702	4%
Lowland Brush	129,467	132,879	3%
Upland Brush	1,745	1,422	-19%
Total	1,089,841	1,095,684	1%

Before the MDLP SFRMP, two Subsection Forest Resource Management Plans covered the MDLP Section (the Chippewa Plains, Pine Moraines, and Outwash Plains SFRMP and North 4 SFRMP, which included the Tamarack Lowlands and St. Louis Moraines subsection in the MDLP Section). The cover type conversion goals for those plans were referenced and considered, among other information, such as climate change projections, when cover type change goals for the current MDLP SFRMP were developed (Figure 3.1). Both plans called for decreasing aspen and increasing jack pine, red pine, and white pine. The North 4 plan also recommended increasing northern hardwoods, upland black spruce, and upland cedar. Additionally, the Chippewa Plains, Pine Moraines, and Outwash Plains SFRMP recommended reducing some ash, lowland hardwoods, balsam fir, and oak and increasing tamarack and white cedar.

Changes in the DNR forest inventory over the last 10 years show that some cover types have been trending in the direction of the SFRMP goals while others have not (Table 3.2). The aspen, balm of Gilead, and birch group has increased slightly due to a one percent increase in aspen with decreases in birch and balm of Gilead. The SFRMP goal for jack pine has been to increase the cover type acres, but they decreased over the last 10 years by 8%. Cover types that have trended in the direction of SFRMP cover type goals include ash and tamarack (-9%), balsam fir (-44%), northern hardwoods (+7%), red pine (+7%), white cedar (+5%), white pine (+7%), and upland black spruce (+7%). Note that these changes are influenced by several factors, including inventory corrections, changes to the land base DNR administers, and management.

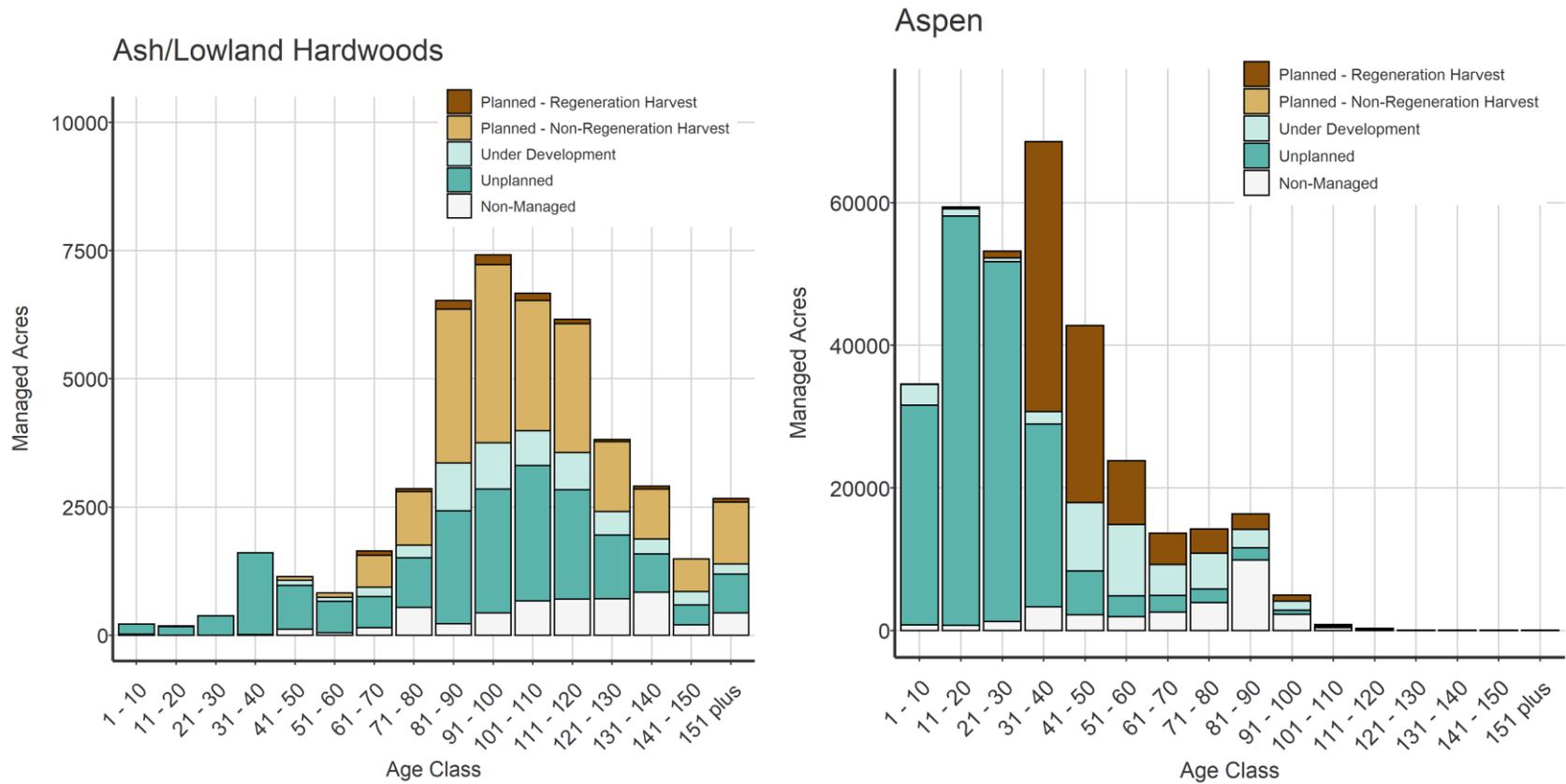
Figure 3.1. Summarized general cover type change goals from the portions of the Chippewa Plains, Pine Moraines, and Outwash Plains (CP) and North 4 (N4) SFRMPs that overlap the MDLP Section. Overall trends for each cover type are shown by arrows at the bottom of the figure. Dark gray arrows indicate the general trend goal from the Chippewa Plains, Pine Moraines, and Outwash Plains SFRMP, and light gray arrows indicate general trend goals from the North 4 SFRMP. Note: BAM refers to Balm-of-Gilead.

		Convert to												
	Cover type	Aspen/BAM /Birch	Ash/lowland hardwoods	Balsam fir	Jack pine	Northern hardwoods	Red pine	Tamarack	White cedar	White pine	White spruce	Upland Black Spruce	Upland cedar	
Convert From	Aspen/BAM/Birch				CP, N4	N4	CP, N4		CP	CP, N4	CP, N4	N4	N4	
	Ash/lowland hardwoods							CP	CP					
	Balsam fir							CP			CP			
	Jack pine													
	Northern hardwoods				CP		CP			CP	CP			
	Oak				CP, N4									
	Red pine				CP									
	Tamarack													
	White cedar													
	White spruce				CP									
	Overall Trend	↓ ↓	↓	↓	↑ ↑	↑	↑ ↑ ↑	↑	↑	↑ ↑	↓ ↑	↑	↑	

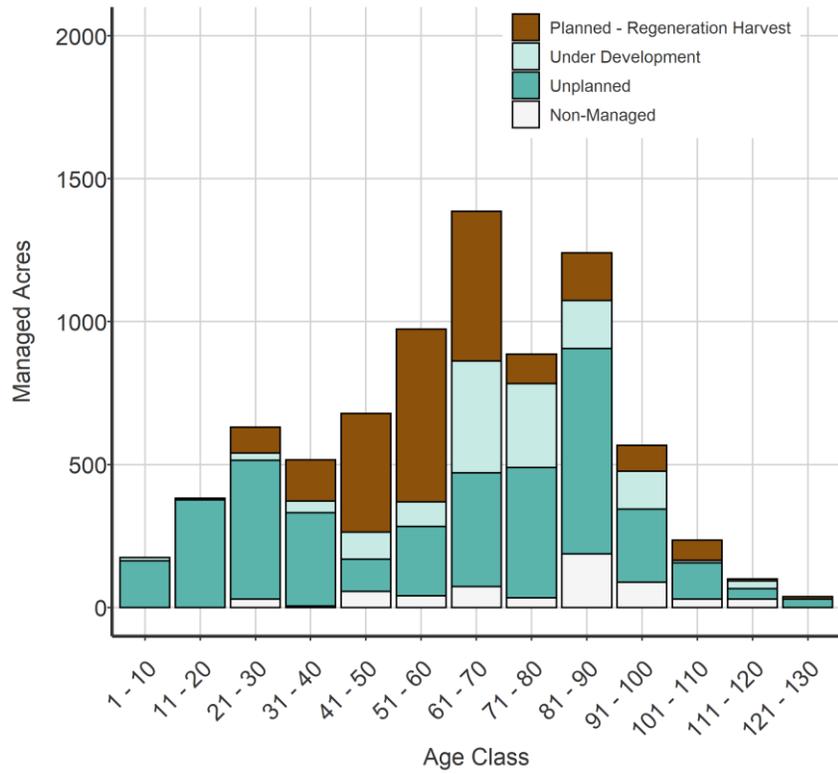
## State timberland cover type age class distributions

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

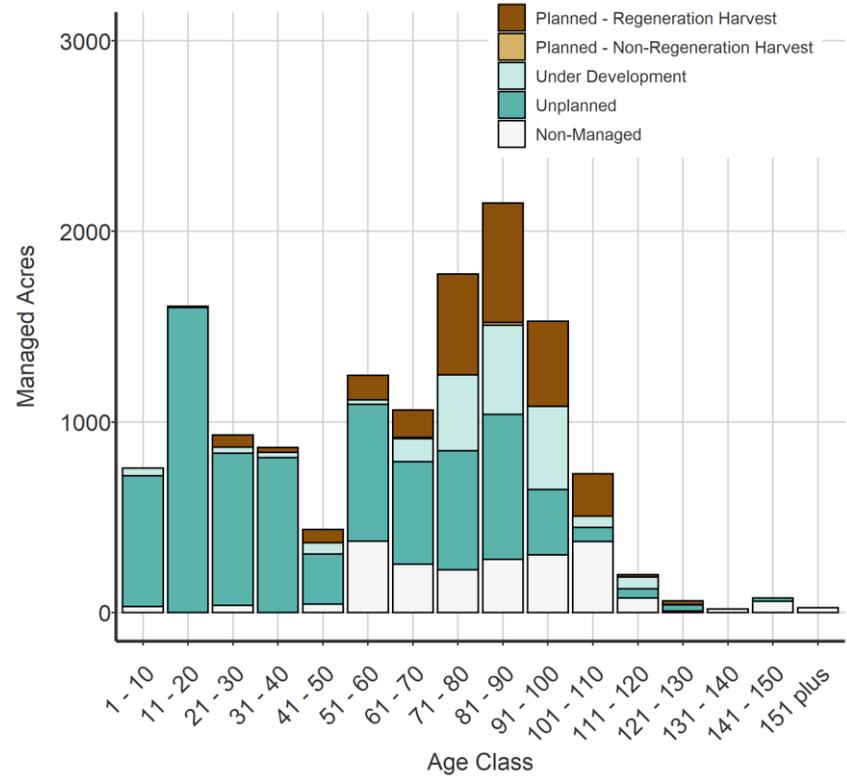
Figure 3.2. Age class distributions (2019) for cover types on state-administered lands in the MDLP Section from FIM data.



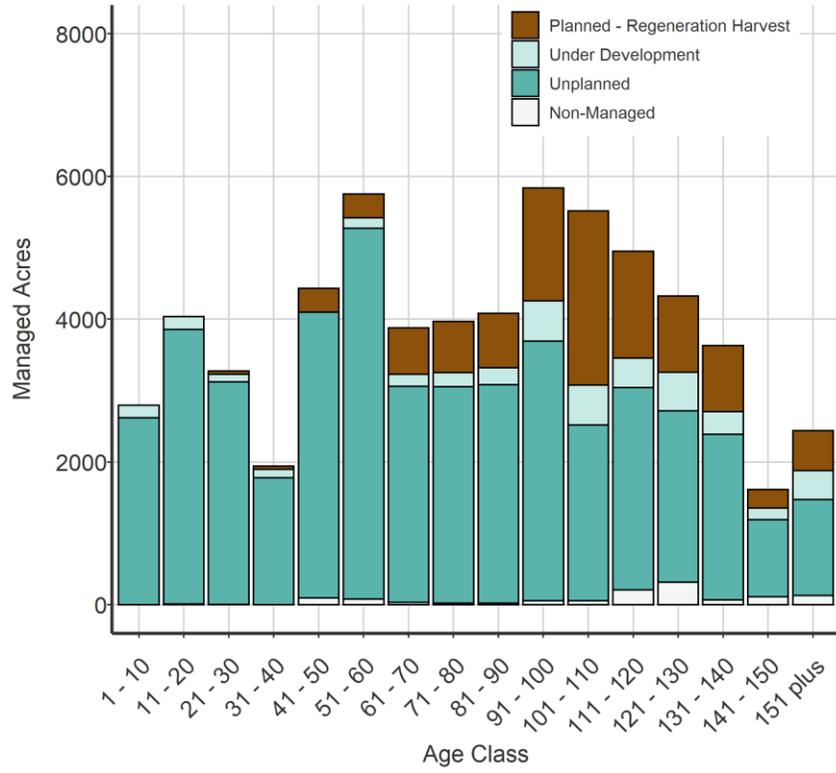
### Balsam Fir



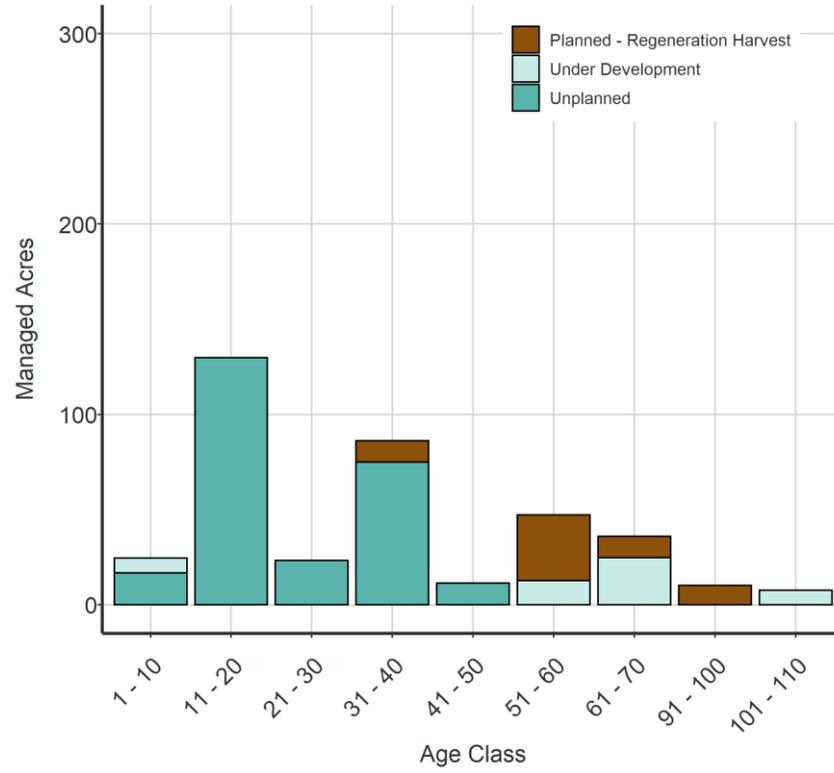
### Birch



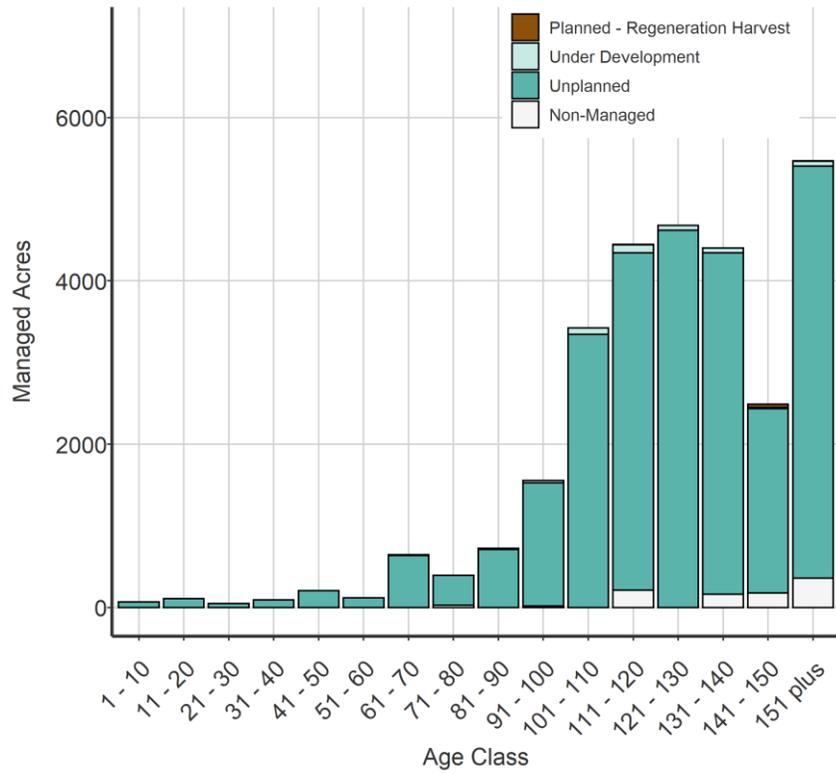
### Black Spruce Lowland



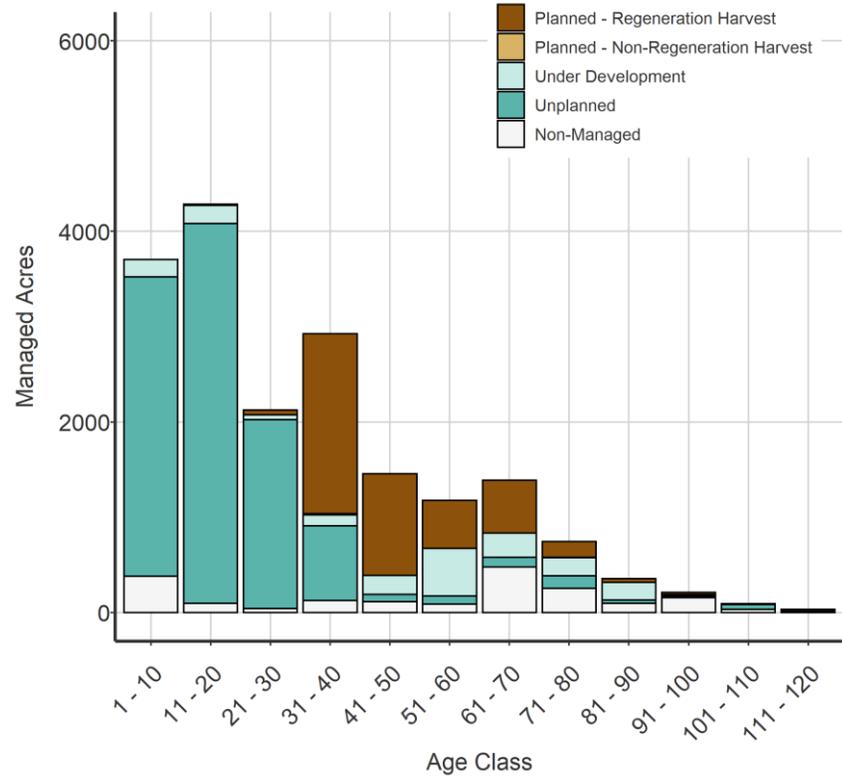
### Black Spruce Upland



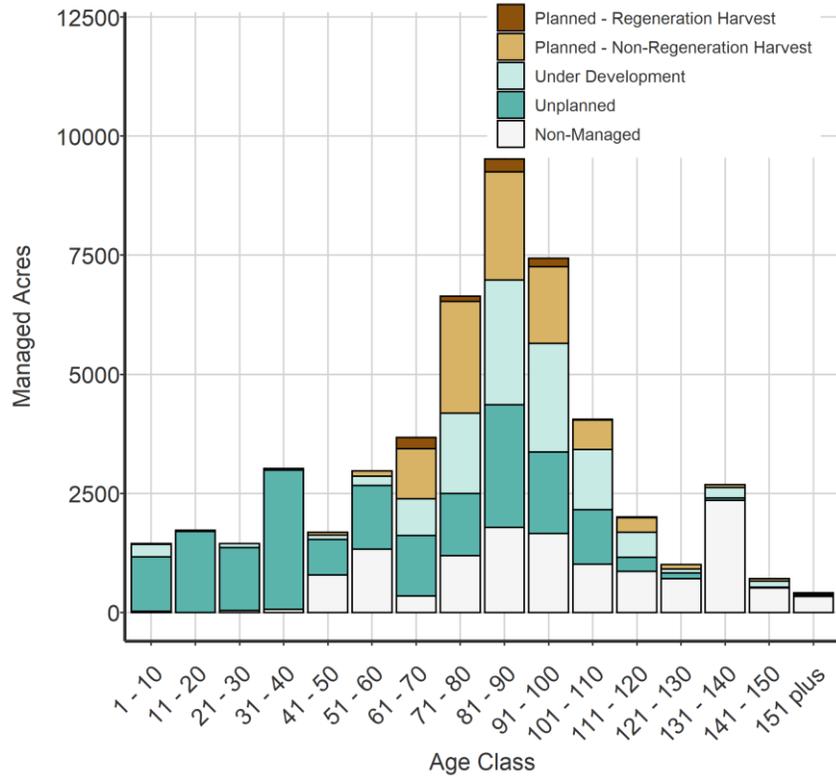
### White Cedar



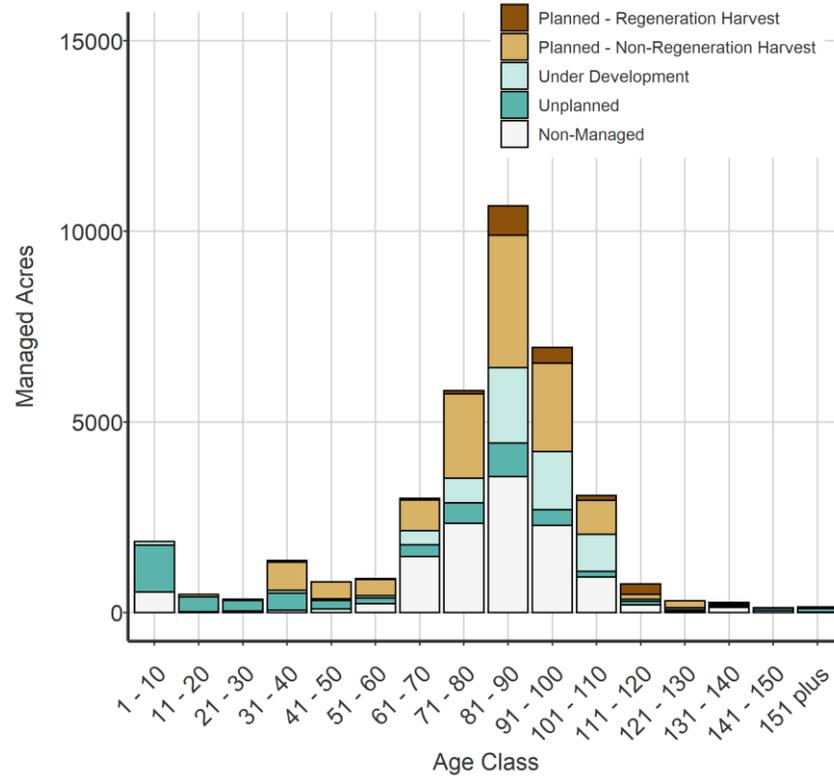
### Jack Pine



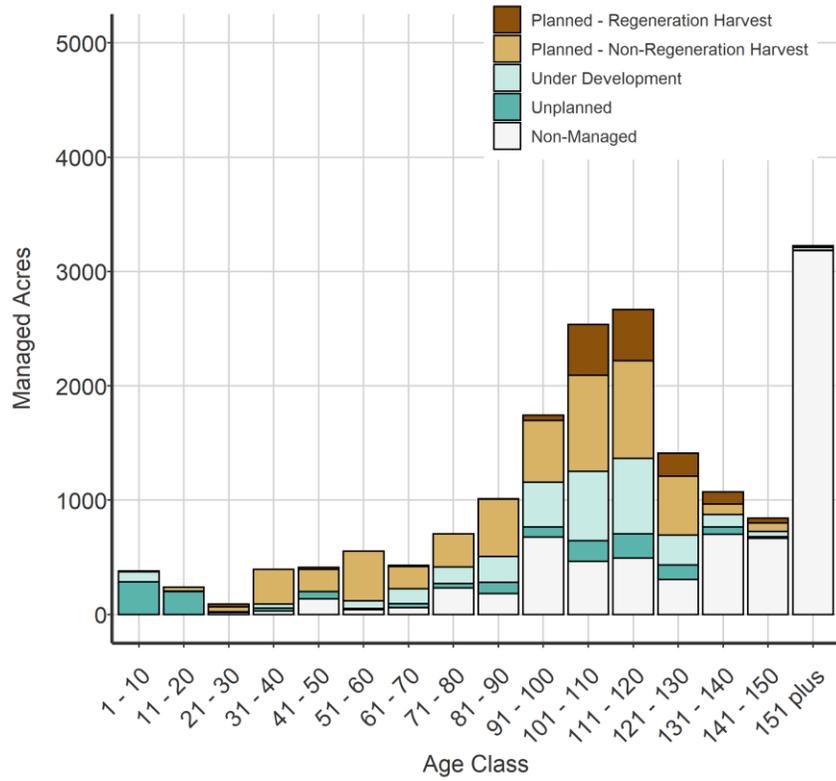
### Northern Hardwoods



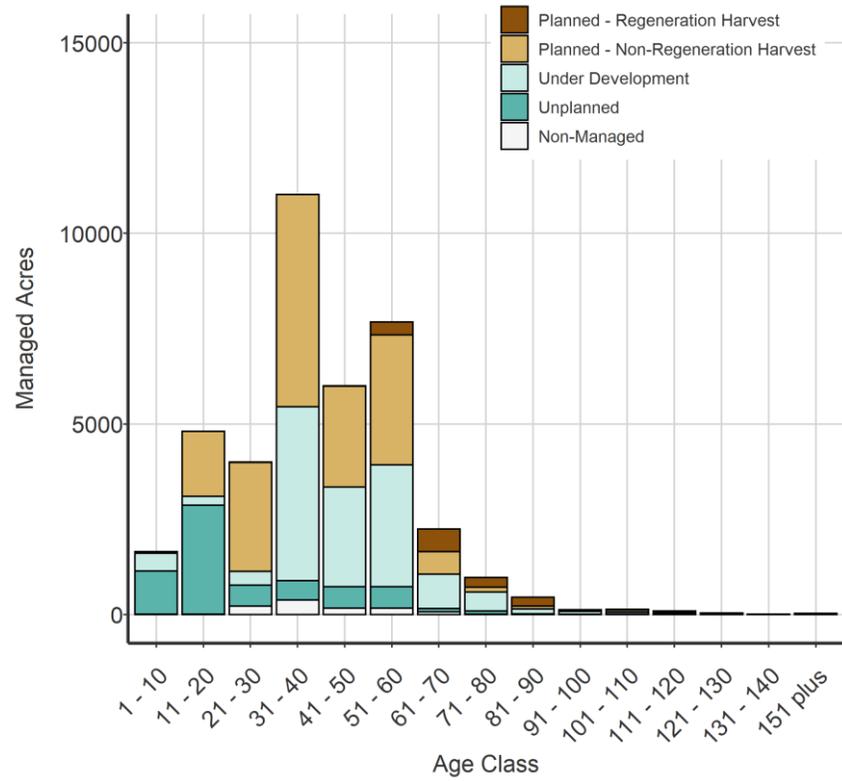
### Oak



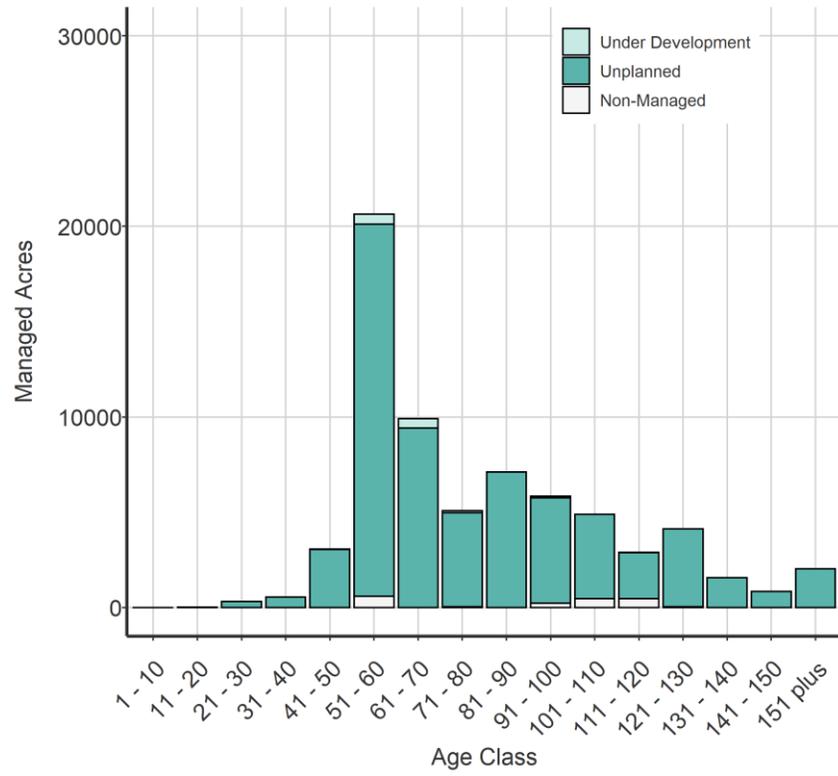
### Red Pine Natural Origin



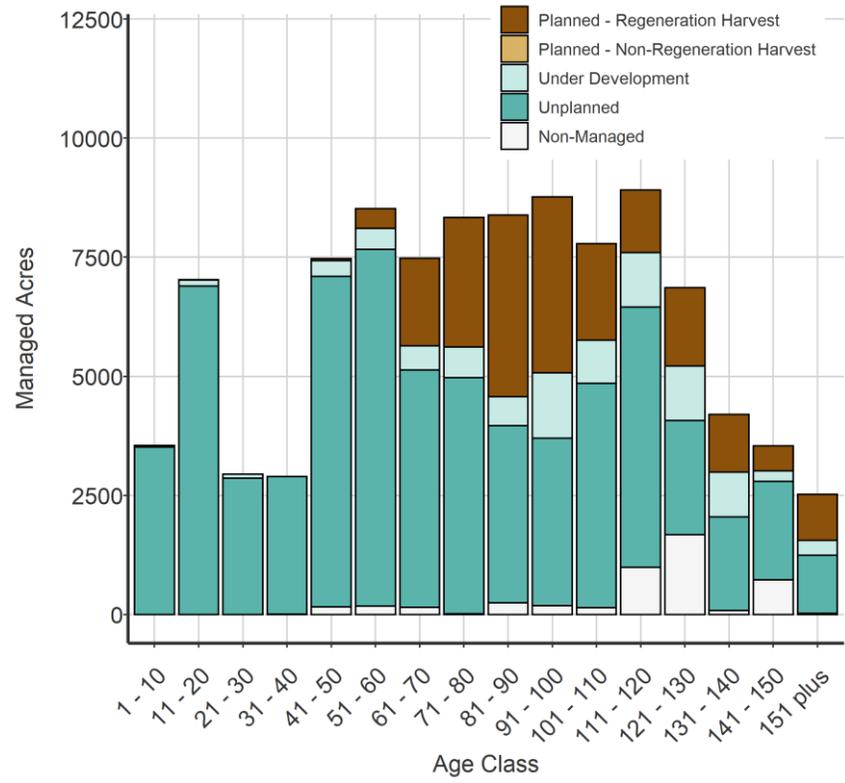
### Red Pine Plantation



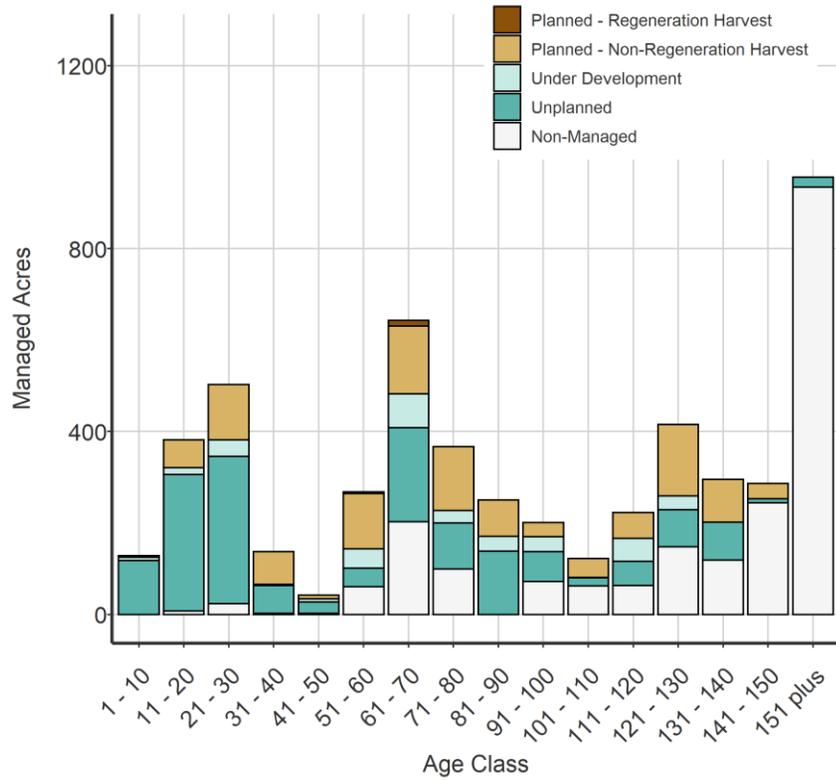
### Stagnant Spruce



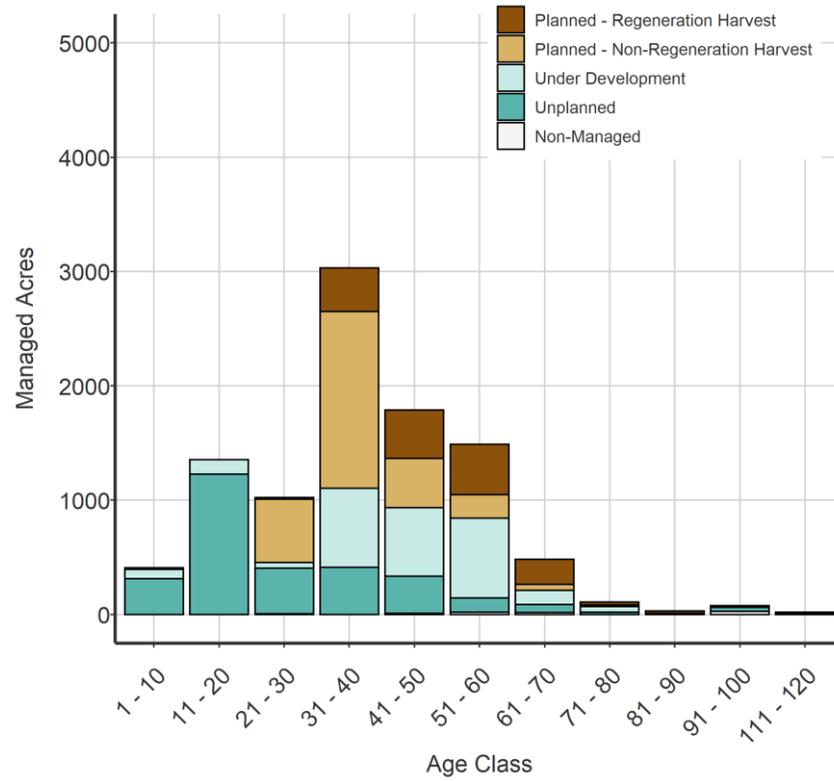
### Tamarack



### White Pine



### White Spruce



## Older and younger, early successional forest

As of 2021, FIM data show that for most even-age managed cover types, most acres are below rotation age (Table 3.3). A significant proportion of most cover types are also above normal rotation age, and for most cover types, the proportion is greater than the all-ownership desired future forest condition benchmarks from previous SFRMPs that overlap the MDLP Section (see Table 3.3). The proportion of acres over rotation age across all ownerships, which DNR lands contribute to, is also greater than the original DFFC benchmarks.

Table 3.3. The proportion of managed and total acres above and below rotation age for even-age managed cover types on DNR-administered land (from FIM data with stand ages adjusted to 2021).

Cover Type	Site Index	RA	Above Rotation Age		Below Rotation Age		Above Rotation Age		Below Rotation Age	
			Managed Acres	Total Acres	Managed Acres	Total Acres	% Managed Acres	% Total Acres	% Managed Acres	% Total Acres
Aspen/Balm-of Gilead	< 65	50	16,554	22,772	71,061	76,458	19%	23%	81%	77%
Aspen/Balm-of Gilead	65 +	40	47,289	64,604	167,671	174,313	22%	27%	78%	73%
Balsam fir	NA	45	4,071	4,617	1,962	2,045	67%	69%	33%	31%
Birch	NA	45	5,553	7,546	4,281	4,471	56%	63%	44%	37%
Black spruce Upland	NA	45	49	58	265	271	15%	18%	85%	82%
Jack pine	NA	45	2,417	3,530	13,348	14,201	15%	20%	85%	80%
Lowland Black spruce	23-29	120	24,173	25,415	66,296	69,207	27%	27%	73%	73%
Lowland Black spruce	40+	80	24,173	25,415	66,296	69,207	27%	27%	73%	73%
Lowland Black spruce	30-39	100	40,791	46,894	72,587	76,124	36%	38%	64%	62%
Oak	75 +	50	208	230	359	377	37%	38%	63%	62%
Oak	< 75	50	19,448	31,706	4,651	5,560	81%	85%	19%	15%
Red pine-Natural	NA	100	5,497	11,366	5,382	6,816	51%	63%	49%	37%
Red pine-Planted	< 55	70	186	202	3,821	4,433	5%	4%	95%	96%
Red pine-Planted	65 +	60	186	202	3,821	4,433	5%	4%	95%	96%
Red pine-Planted	55-64	65	955	1,023	16,516	16,931	5%	6%	95%	94%
Tamarack	< 40	75	29,064	32,954	24,076	24,679	55%	57%	45%	43%
Tamarack	40 +	65	23,278	24,178	16,943	17,413	58%	58%	42%	42%
White pine-Planted	< 55	70	91	92	167	185	35%	33%	65%	67%
White pine-Planted	65 +	60	91	92	167	185	35%	33%	65%	67%
White pine-Planted	55-64	65	184	191	585	611	24%	24%	76%	76%
White Spruce-Planted	NA	50	1,650	1,717	7,063	7,134	19%	19%	81%	81%

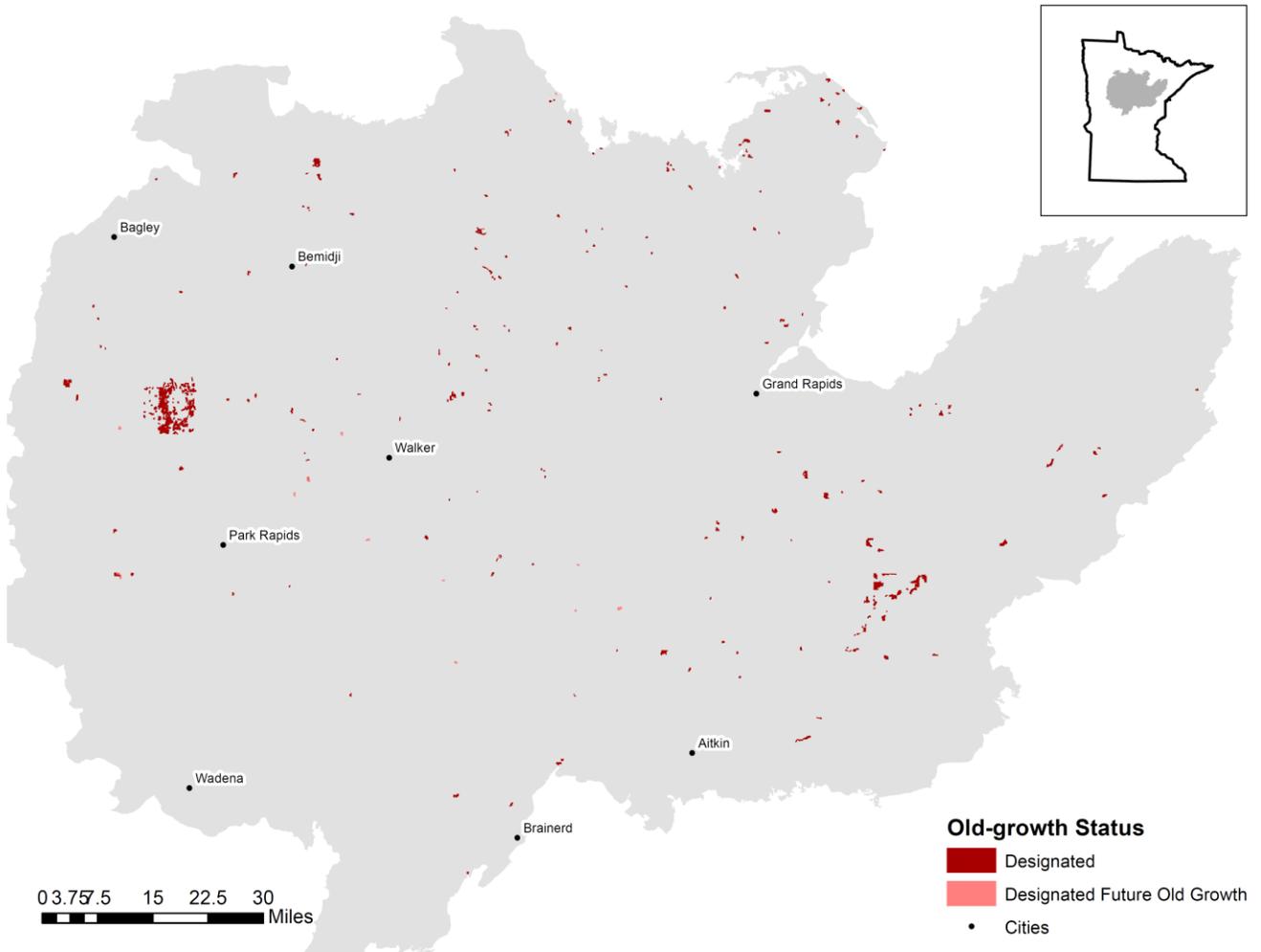
## Old-growth forests

Old-growth forest represents the later 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, studying 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. In the MDLP Section, most old growth acres are in ash, lowland hardwoods, northern hardwoods, red pine, and white pine types (Table 3.4, Map 3.3).

Table 3.4. Designated old growth and future and total acres designated by forest type (2021 DNR Old Growth data).

Row Labels	Designated	Designated Future Old Growth	Total
Aspen	10		10
Ash	1,766		1,766
Cedar	690		690
Lowland Hardwood	1,198		1,198
Northern Hardwood	5,043		5,043
Oak	291		291
Red Pine	5,190	309	5,499
Tamarack	6		6
White Pine	1,614	177	1,790
White Spruce	28		28
<b>Grand Total</b>	<b>15,836</b>	<b>486</b>	<b>16,321</b>

Map 3.3. Designated and designated future old growth forests in the MDLP Section (2021 DNR Old Growth data).



## Acres of timber offered and sold from DNR-administered lands

On average, the DNR offered 298,000 cord equivalents and sold 265,000 cord equivalents per year in fiscal years (FY) 2013-2021 (89% sell rate) from the MDLP Section (Fig. 3.3). Volume sold during this period generated an average of 7.8 million dollars annually (Fig. 3.4). Aspen makes up nearly 50% of the cords offered and sold in the section (Fig. 3.5). Other hardwoods and pine are the next most significant species. Sell rates were relatively high overall and across most species groups. Ash/lowland hardwoods and tamarack have the highest proportion of unsold volume.

Figure 3.3. The proportion of volume (cord equivalents) offered and sold from DNR-administered lands in the MDLP Section by fiscal year.

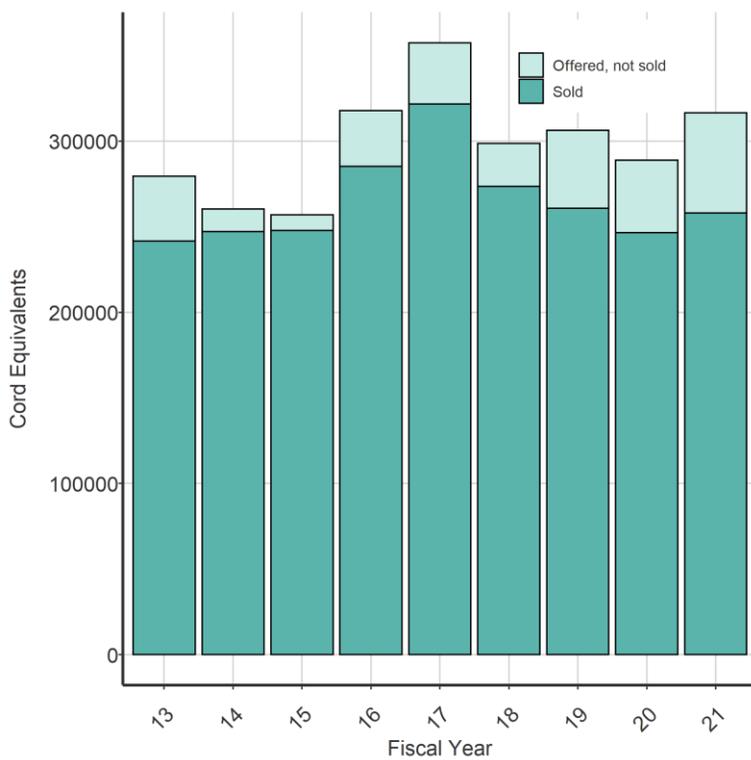


Figure 3.4. Total selling price for volume sold from DNR-administered lands by fiscal year.

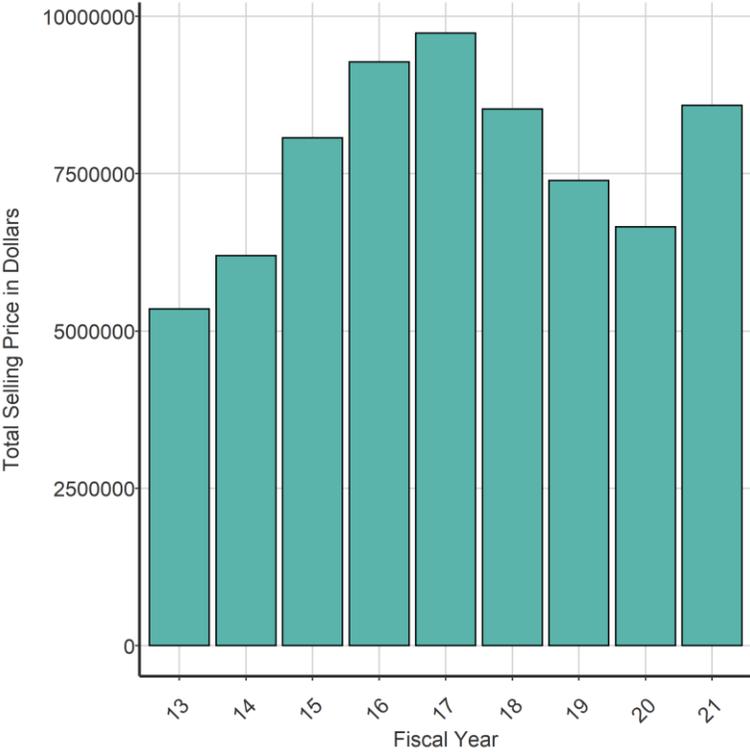
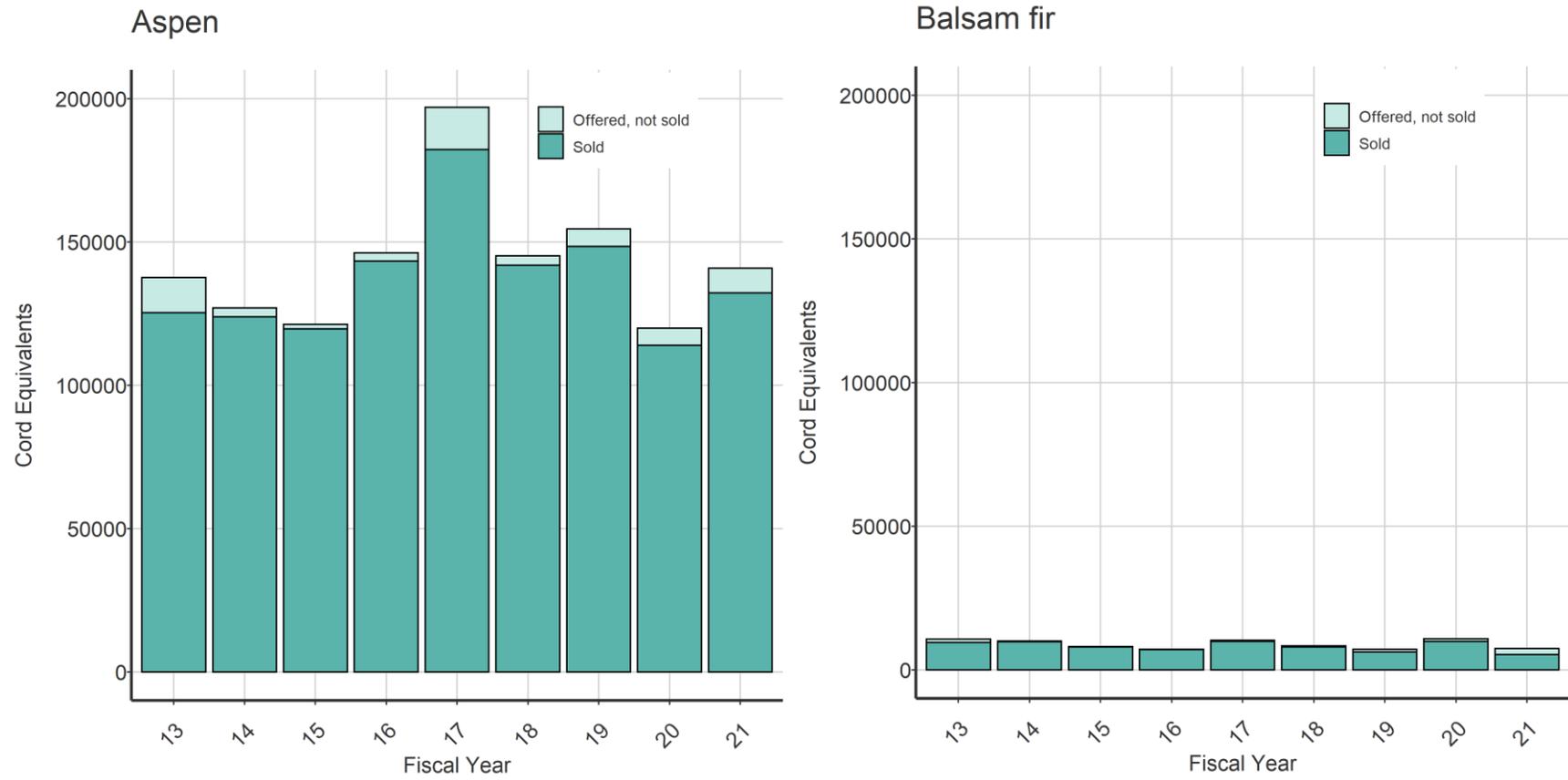
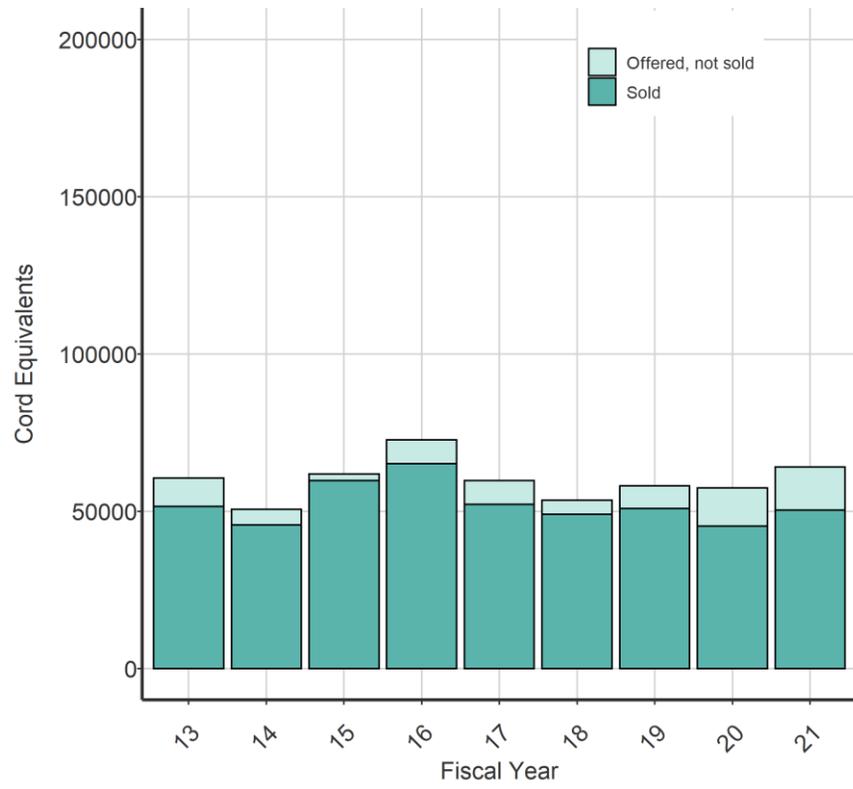


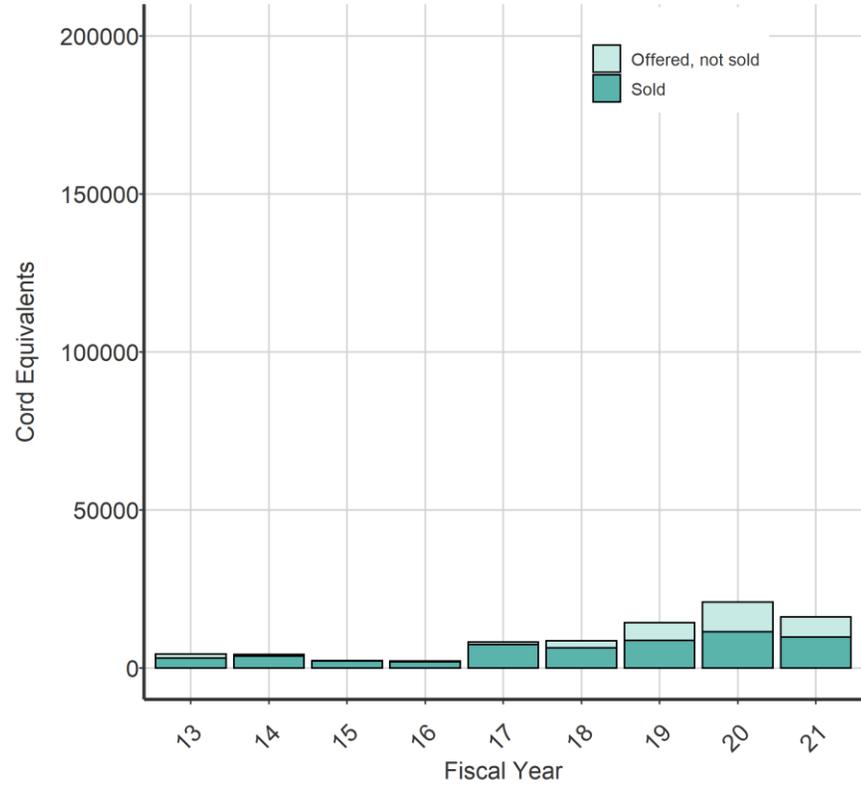
Figure 3.5. The average volume offered and sold from DNR lands in cord equivalents by species group from 2016-2020.



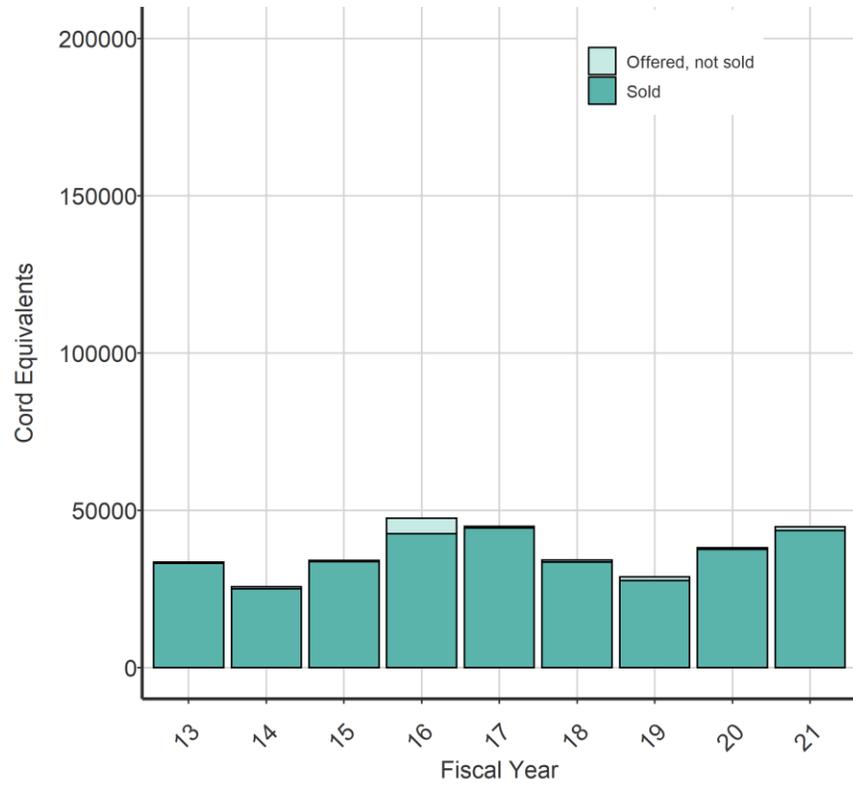
### Hardwoods



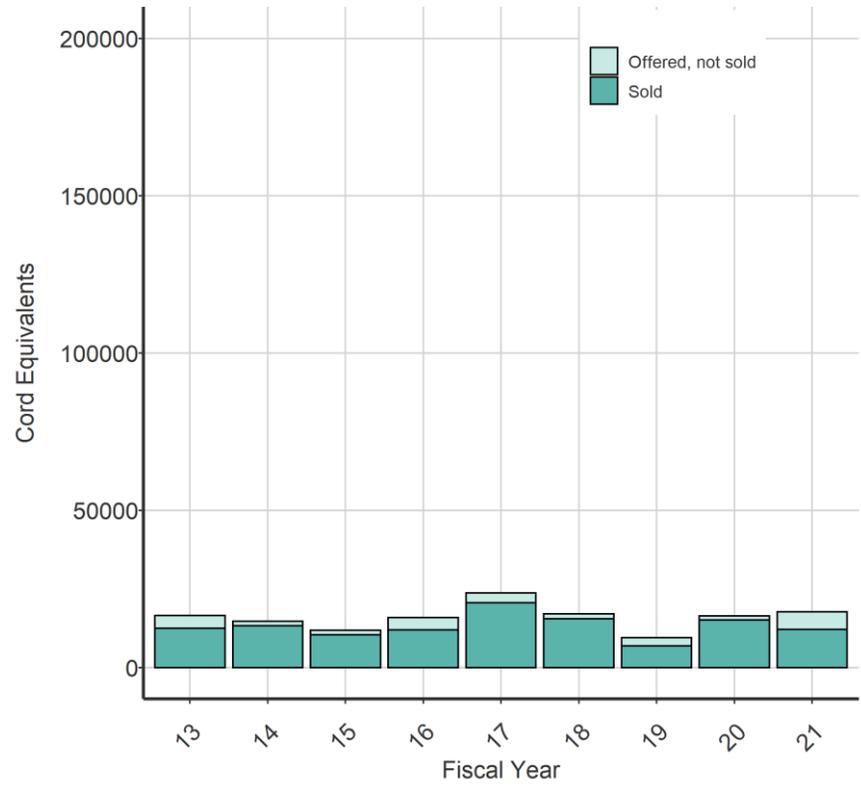
### Ash and Lowland Hardwoods



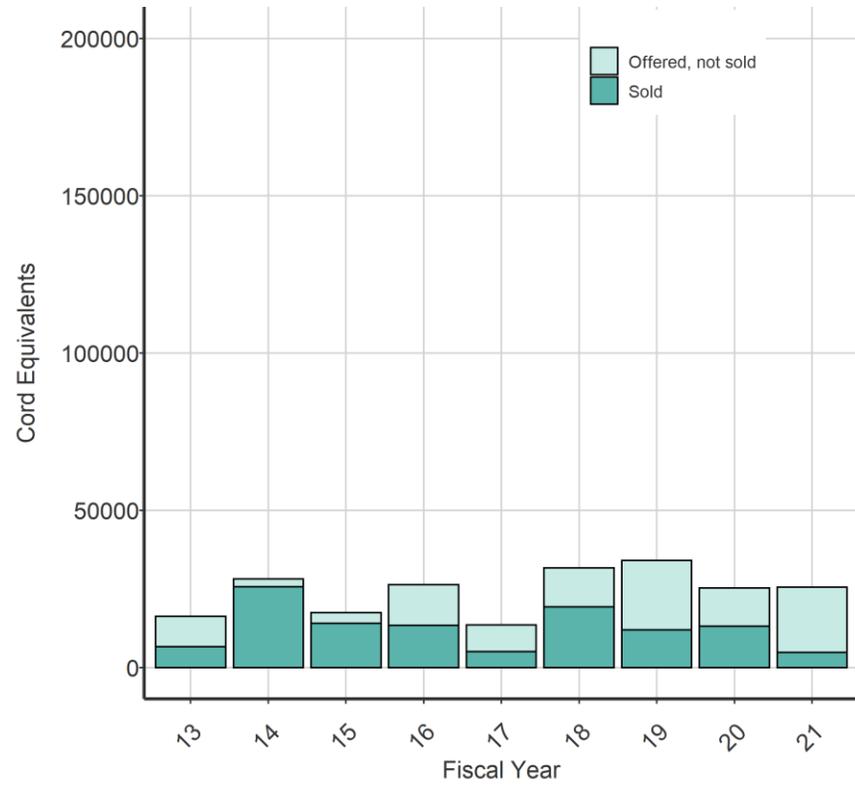
### Pine



### Spruce



# Tamarack



## Chapter 4: Resource Conditions

### Natural forest disturbances and forest health

#### *Insects and Disease*

Table 4.1. Major pests or diseases that affect forests in the MDLP section or may in the future (Heterobasidion root disease).

<b>Pest or disease</b>	<b>MN Drift and Lake Plains (MDLP)</b>
Eastern larch beetle	x
Emerald ash borer	x
Jack pine budworm	x
Larch casebearer	x
Spruce budworm	x
Twolined chestnut borer	x
Eastern dwarf mistletoe	x
Heterobasidion root disease	
Oak wilt	x

### *Eastern larch beetle*

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

### *Emerald ash borer*

Emerald ash borer attacks white, green, and black ash. It was discovered in North America in 2002. By 2009, it had made its way to Minnesota.

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 mainly in southeast Minnesota, but the population in the Duluth area may work its way into large black ash swamps.

The water table in black ash stands will rise after EAB has killed most black ash trees, making tree regeneration of any species challenging. Forest managers are encouraged to plant a diversity of tree species and to harvest black ash to remove it from the landscape to help slow the emerald ash borer's spread.

### *Jack pine budworm*

Jack pine budworm is a native Minnesota insect that primarily feeds on jack pine but also feeds on white or red pine if present in a jack pine stand. Populations of jack pine budworm are generally found in the central to northwestern part of the state. Outbreaks in the northwest are typically cyclical, occurring roughly every ten years. The next large outbreak is expected between 2023 and 2025.

### *Larch casebearer*

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

### *Spruce budworm*

Spruce budworm is a native caterpillar that prefers to feed on balsam fir but readily feeds on white spruce. This needle-feeding caterpillar has been recorded defoliating many acres of forests in various areas in the Arrowhead Region every year since at least 1954. Since then, there has been a consistent population of spruce budworm in the Arrowhead Region. Spruce budworm typically feeds in a given zone for about eight years, which is the maximum period 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 severe droughts, wind storms, or intense and repeated defoliation events. Mortality from twolined chestnut borer can occur one to three years after infestation. Symptoms can resemble 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.

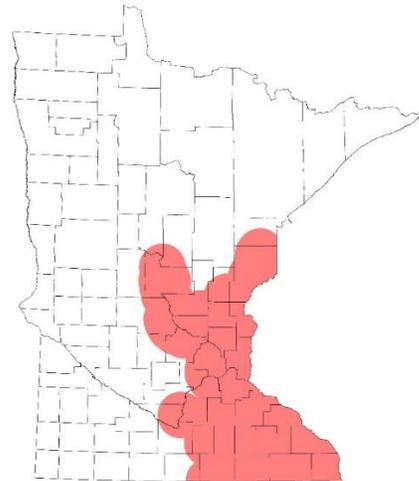
### *Eastern dwarf mistletoe*

Eastern dwarf mistletoe is Minnesota's most significant tree health problem in black spruce. It is a parasitic plant that causes abnormal growths called witches'-brooms, dense areas of host branches, and foliage that feed the parasite and rob the host plant of nutrients. 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 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 (Fig. 4.1). It continues to expand its range northward and, in 2021, was discovered in Crow Wing County for the first time.

Figure 4.1. Oak wilt distribution in Minnesota.

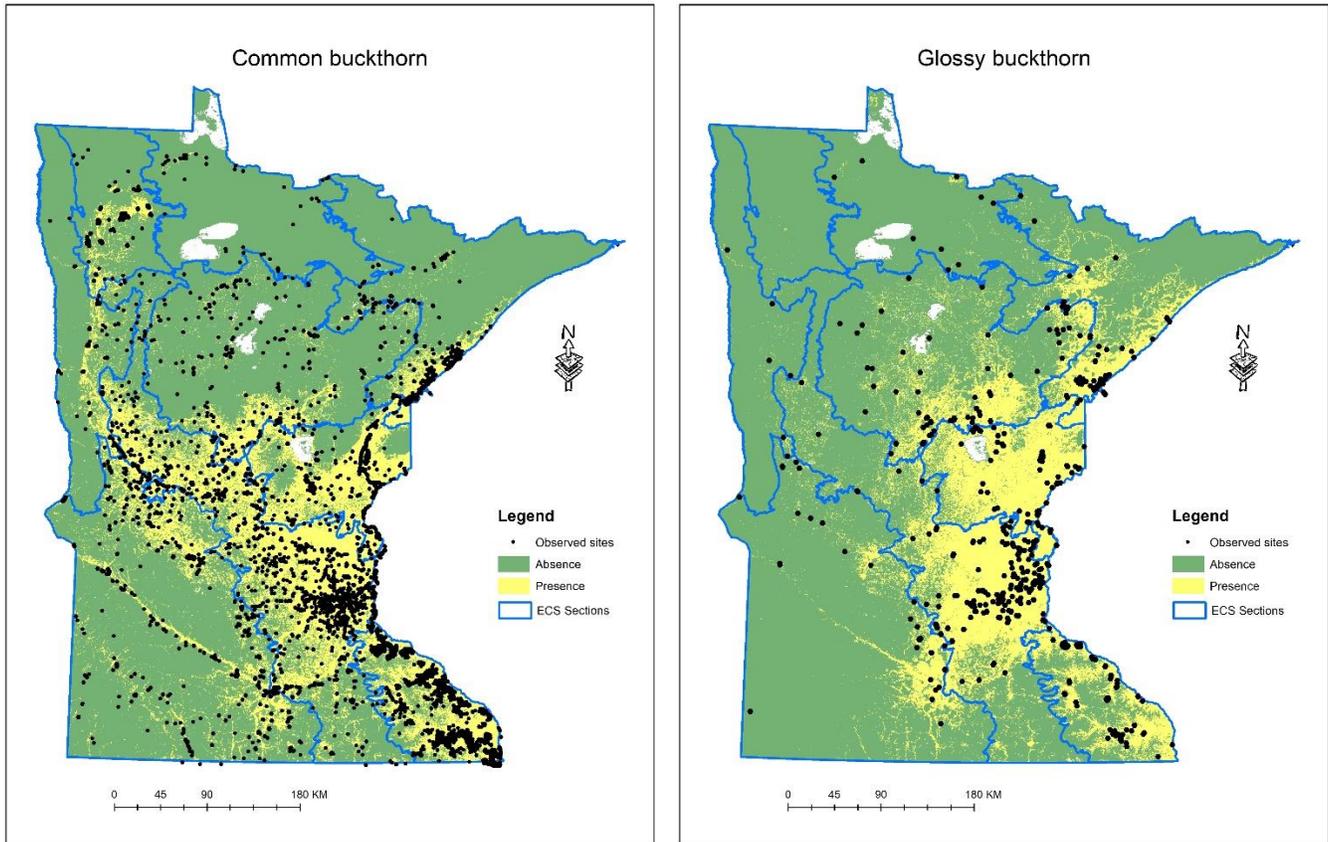


### *Invasive Species*

Invasive species are not native to Minnesota and cause economic or environmental harm, harm human health, or threaten natural resources or the use of natural resources in the state (Minnesota Statutes [84D.01](#)). The DNR

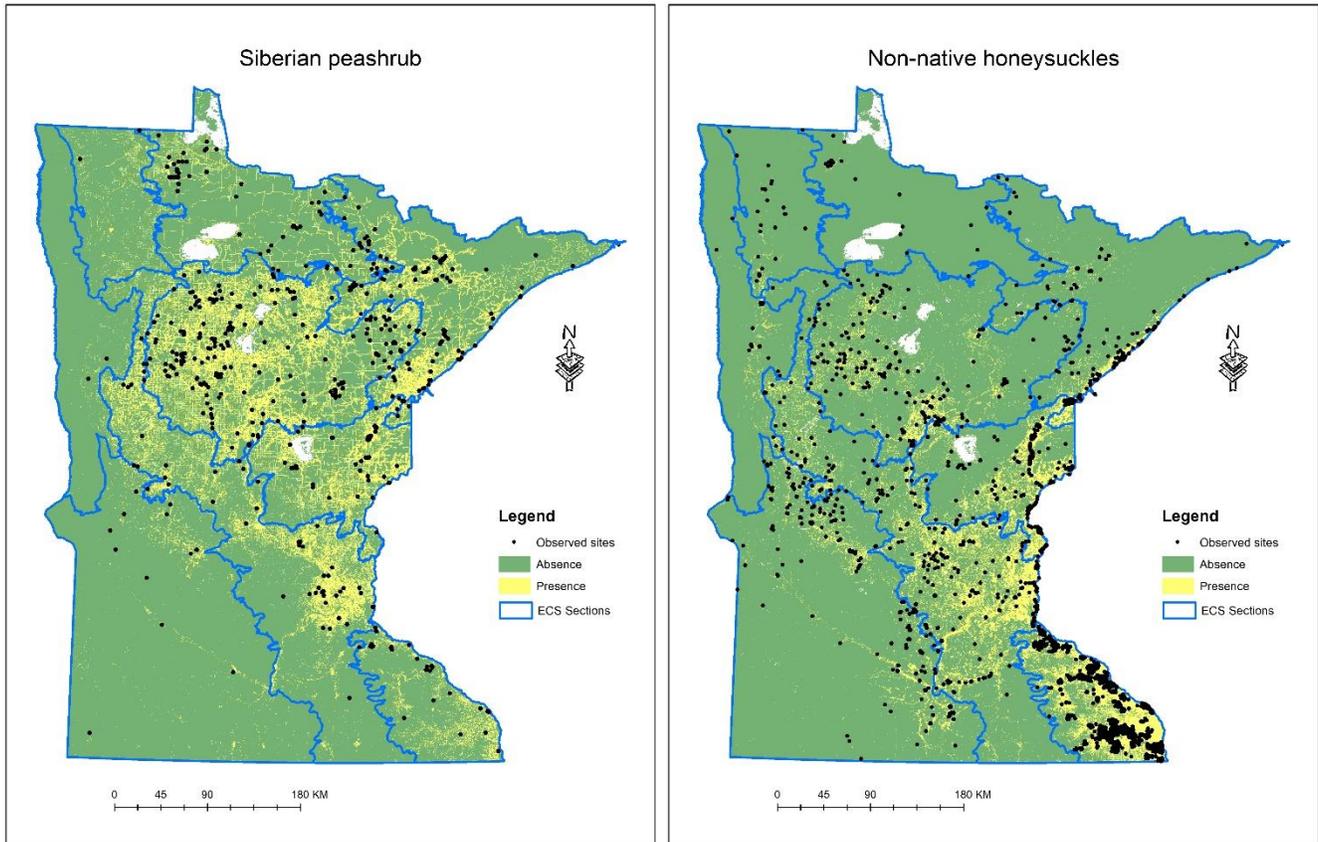
Division of Forestry manages invasive plants when they impact reforestation, wildlife habitat, recreation, and other values. Additionally, state law requires the DNR to eradicate or prevent the reproduction of certain invasive plants on the state [Noxious Weed list](#) (eradicate and control lists, respectively) wherever they are found on DNR-administered land.

Figure 4.2. Common buckthorn and glossy buckthorn distribution across Minnesota.



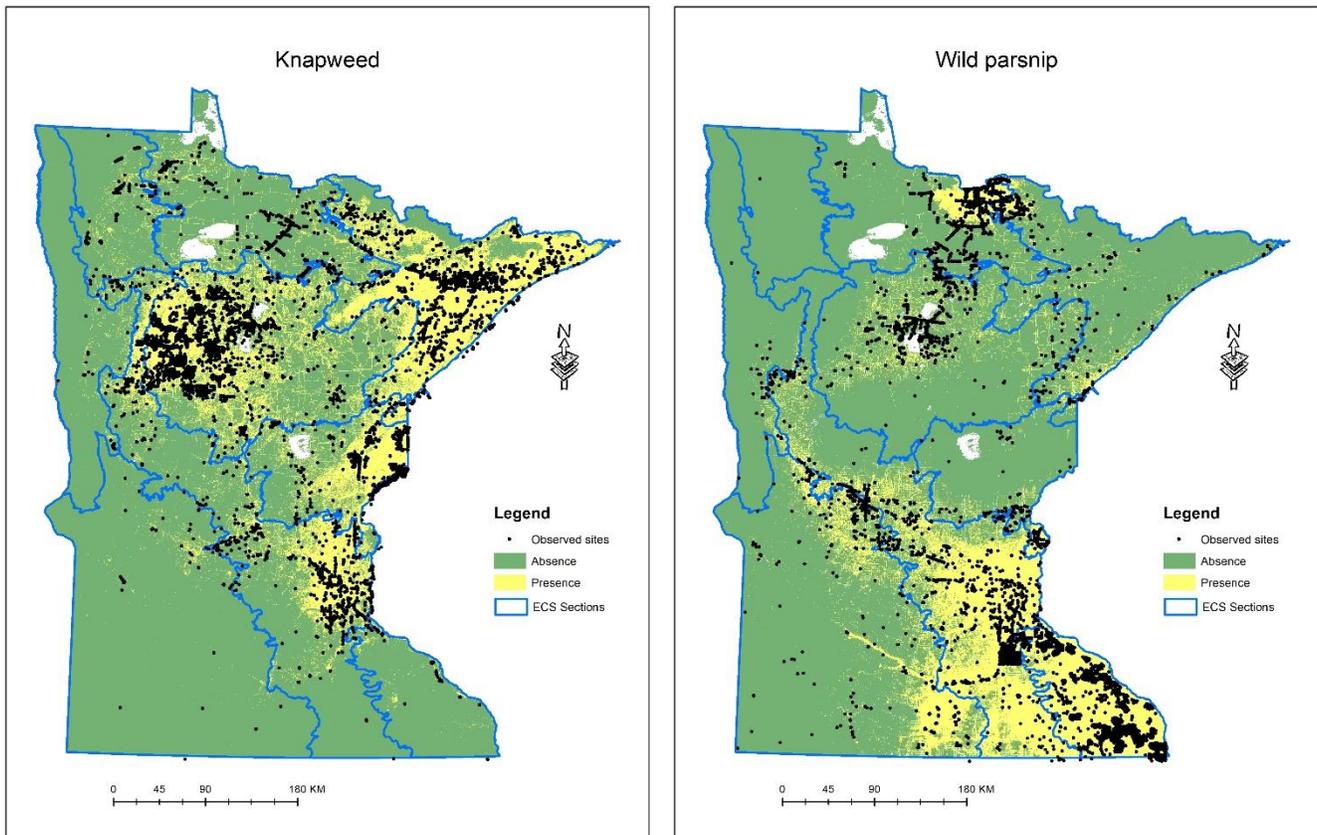
Common and glossy buckthorn are two of Minnesota's most prevalent woody invasive plants (Fig. 4.2). They grow in dense thickets, degrade habitat, and negatively impact tree regeneration. It is expensive to manage buckthorn once established, so Division of Forestry buckthorn management typically focuses on stands planned for harvest in areas of dense buckthorn. At the edge of buckthorn's distribution in Minnesota, the Division of Forestry also treats scattered stems and isolated patches of buckthorn to prevent it from spreading and becoming a more significant, more expensive problem locally. Buckthorn is not nearly as widespread in the MDLP as it is in other parts of Minnesota. Populations in this section are currently scattered and isolated, allowing land managers to treat small populations and prevent them from becoming large infestations. If left unmanaged, buckthorn will continue spreading in the section, altering forest composition.

Figure 4.3. Siberian peashrub and non-native honeysuckle distribution across Minnesota.



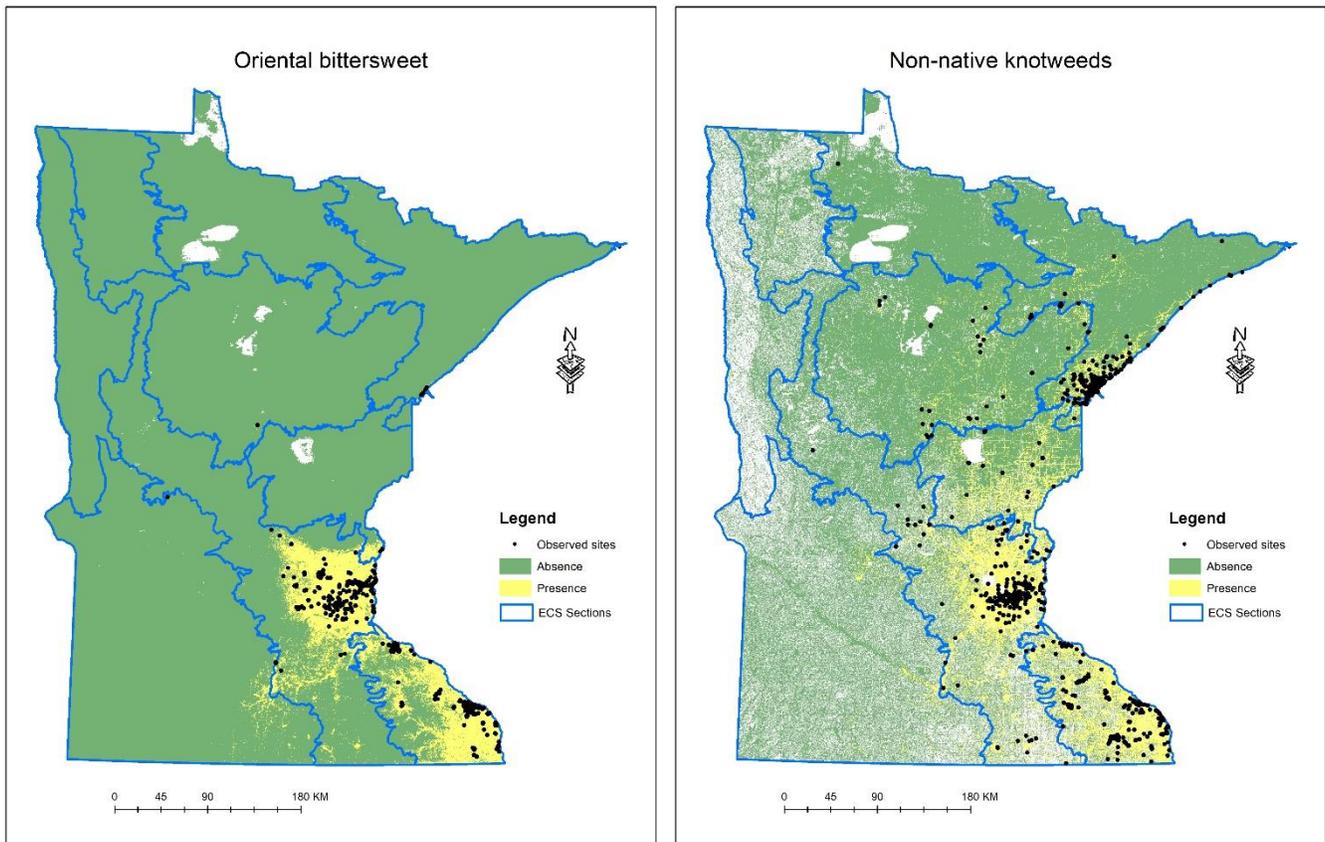
Siberian peashrub and non-native bush honeysuckle are two other woody shrubs that grow densely in isolated populations. Siberian peashrub is widespread across the MDLP, while non-native honeysuckle is more common along the southern edge of the section (Fig. 4.3). These species are generally not as great of a threat to forests as the buckthorns, but they are species of concern that require management in some locations.

Figure 4.4. Knapweed and wild parsnip distribution across Minnesota.



Herbaceous invasive plants, including common tansy, wild parsnip, and spotted knapweed, are prevalent in various parts of the MDLP Section (Fig. 4.4). Common tansy is widespread throughout the MDLP Section and is most common in the northeastern portion of Minnesota. Wild parsnip is present in scattered locations across the northern and central areas of the MDLP, while spotted knapweed populations are concentrated more in the western part of the section. The Noxious Weed Law requires the DNR to prevent reproduction and control the spread of all three species. The Division of Forestry regularly mows and sprays herbicide along forest roads where these species proliferate. Wild parsnip is also a health hazard (its sap burns skin when exposed to sunlight), so management of this species is essential along trails and recreation areas.

Figure 4.5. Oriental bittersweet and non-native knotweed distribution across Minnesota.



Some invasive plants are not widespread in the Section but could become a significant issue if they spread and become established. Oriental bittersweet is not currently present in the MDLP but can spread much more widely across Minnesota if small populations elsewhere are not contained (Fig. 4.5). This woody vine grows up trees and can smother them and even pull them down. It is very costly to control.

Non-native knotweeds (giant, Japanese, and Bohemian knotweeds) are also concerns in the MDLP section (Fig. 4.5). Knotweeds were planted in yards as ornamental plants and have since spread into nearby natural areas. This bamboo-like plant forms dense stands and is very difficult and expensive to control. Multiple years of herbicide treatments are required, as the plant can resprout from even small cut stem pieces. Many known populations are in Duluth (just outside the MDLP) and smaller cities and towns in the section.

Invasive plant populations continue to be discovered. There are more populations of problematic invasive plants on DNR-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 vital to successful invasive plant management across the landscape. The Division of Forestry includes language in permits and contracts requiring vendors to arrive with clean equipment to prevent the seeds of these species from spreading. Additionally, the PlayCleanGo outreach campaigns to the public encourage cleaning footwear and gear of mud, seeds, and plant parts before heading to a new recreation location.

## Native plant communities

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

Following is a list of the native plant community classes, types, and subtypes in the MDLP Section (Table 4.2). 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 4.2. Native Plant Community Classes, Types, and Subtypes Documented in the MDLP Section with their Associated Conservation Rank. An “X” indicates the NPC has been documented in one of the MDLP subsections (subsection abbreviations: CP = Chippewa Plains, STL = St. Louis Moraines, TL = Tamarack Lowlands, PMOP = Pine Moraines and Outwash Plains)

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
APn80 - Northern Spruce Bog	APn80	X	X	X	X	(G4G5, G5, G4G5 or G5)(S4)	361
APn80a - Black Spruce Bog	APn80a	X	X	X	X	G4G5 or G5S4	29
APn80a1 - Black Spruce Bog, Treed Subtype	APn80a1	X	X	X		G5S4	64
APn80a2 - Black Spruce Bog, Semi-Treed Subtype	APn80a2		X	X		G4G5S4	76
APn81 - Northern Poor Conifer Swamp	APn81	X	X	X	x	(G5)(S4, S5)	1200
APn81a - Poor Black Spruce Swamp	APn81a	X	X	X	X	G5S5	260
APn81b - Poor Tamarack - Black Spruce Swamp	APn81b	X	X	X	X	G5S4	260
APn81b1 - Poor Tamarack - Black Spruce Swamp, Black Spruce Subtype	APn81b1	X	X	X	X	G5S4	26
APn81b2 - Poor Tamarack - Black Spruce Swamp, Tamarack Subtype	APn81b2	X	X	X	X	G5S4	87
APn90 - Northern Open Bog	APn90	X	X	X	X	(G2? or G4G5, G2?, G4G5, G5)(S2, S4, S4S5)(S2, S4, S4S5)(S2, S4, S4S5)	141

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
APn90a - Low Shrub Bog	APn90a	X	X	X	X	G5S4S5	56
APn90b2 - Graminoid Bog, Schlenke Subtype	APn90b2			X		G2?S2	4
APn91 - Northern Poor Fen	APn91	X	X	X	X	(G3G4, G4G5 or G5, GNR)(S3, S4, S5)	990
APn91a - Low Shrub Poor Fen	APn91a	X	X	X	X	G4G5 or G5S5	629
APn91b - Graminoid Poor Fen (Basin)	APn91b	X	X	X	X	G3G4S3	193
APn91c - Graminoid Poor Fen (Water Track)	APn91c	X	X			GNR S3 or S4	2
APn91c1 - Graminoid Poor Fen (Water Track), Featureless Water Track Subtype	APn91c1	X				GNR S4	2
CTn11 - Northern Dry Cliff	CTn11	X				(GNR)(S1, S2, S3, S4)	1
FDc12 - Central Poor Dry Pine Woodland	FDc12	X			X	(G3G4 or G4G5)(S2)	18
FDc12a - Jack Pine - (Bearberry) Woodland	FDc12a	X				G3G4 or G4G5S2	6
FDc23 - Central Dry Pine Woodland	FDc23	X			X	(G2)(S1S2)	204
FDc23a - Jack Pine - (Yarrow) Woodland	FDc23a	X			X	G2S1S2	45
FDc24 - Central Rich Dry Pine Woodland	FDc24	X		X	X	(G4?)(S1 or S3)	806
FDc24a - Jack Pine - (Bush Honeysuckle) Woodland	FDc24a	X			X	G4?S1 or S3	280
FDc24a1 - Jack Pine - (Bush Honeysuckle) Woodland, Bracken Subtype	FDc24a1	X			X	G4?S1	19
FDc24a2 - Jack Pine - (Bush Honeysuckle) Woodland, Bur Oak - Carrion-Flower Subtype	FDc24a2	X			X	G4?S3	5
FDc34 - Central Dry-Mesic Pine-Hardwood Forest	FDc34	X	X	X	X	(G3 or G4, G4?)(S2, S3)	1000
FDc34a - Red Pine - White Pine Forest	FDc34a	X	X		X	G3 or G4S2	784
FDc34b - Oak - Aspen Forest	FDc34b	X	X		X	G4?S3	298
FDn12 - Northern Dry-Sand Pine Woodland	FDn12	X	X	X		(G4G5)(S2)	44
FDn12a - Jack Pine Woodland (Sand)	FDn12a	X				G4G5S2	35
FDn12b - Red Pine Woodland (Sand)	FDn12b	X	X			G4G5S2	3
FDn32 - Northern Poor Dry-Mesic Mixed Woodland	FDn32		X	X		(G2, G3, G4G5, G4G5 or G5, G5, GNR)(S1, S2, S3)	37
FDn32c2 - Black Spruce - Jack Pine Woodland, Black Spruce - Feathermoss Subtype	FDn32c2			X		G5S3	1

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
FDn33 - Northern Dry-Mesic Mixed Woodland	FDn33	X	X	X	X	(G4?, G5, GNR)(S2, S3, S5)	650
FDn33a - Red Pine - White Pine Woodland	FDn33a	X	X		X	G4?S3	255
FDn33a1 - Red Pine - White Pine Woodland, Balsam Fir Subtype	FDn33a1	X	X		X	G4?S3	106
FDn33a2 - Red Pine - White Pine Woodland, Mountain Maple Subtype	FDn33a2	X	X	X	X	G4?S3	29
FDn33b - Aspen - Birch Woodland	FDn33b	X	X			GNR5	28
FDn43 - Northern Mesic Mixed Forest	FDn43	X	X	X		(G3G4, G4? or G5, G4, G4G5 or G5, G4? or G4G5 or G5)(S2, S3, S5)	298
FDn43b - Aspen - Birch Forest	FDn43b			X		G4? or G4G5 or G5S5	1
FDn43b1 - Aspen - Birch Forest, Balsam Fir Subtype	FDn43b1	X	X	X		G4G5 or G5S5	2
FDn43c - Upland White Cedar Forest	FDn43c	X		X		G4S3	2
FDs36a - Bur Oak - Aspen Forest	FDs36a	X				GNRQS3S4	2
FDs37b - Pin Oak - Bur Oak Woodland	FDs37b				X	G4?S3	21
FFn57 - Northern Terrace Forest	FFn57		X	X	X	(GNR)(S3)	82
FFn57a - Black Ash - Silver Maple Terrace Forest	FFn57a	X	X	X	X	GNR53	55
FFn67 - Northern Floodplain Forest	FFn67		X	X	X	(GNR)(S3)	2
FFn67a - Silver Maple - (Sensitive Fern) Floodplain Forest	FFn67a			X	X	GNR53	1
FPn62 - Northern Rich Spruce Swamp (Basin)	FPn62		X	X		(G5)(S3)	29
FPn62a - Rich Black Spruce Swamp (Basin)	FPn62a		X	X		G5S3	2
FPn63 - Northern Cedar Swamp	FPn63	X	X		X	(G4)(S3, S4)	433
FPn63a - White Cedar Swamp (Northeastern)	FPn63a	X				G4S4	1
FPn63b - White Cedar Swamp (Northcentral)	FPn63b	X	X	X	X	G4S3	286
FPn63c - White Cedar Swamp (Northwestern)	FPn63c	X				G4S3	1
FPn71 - Northern Rich Spruce Swamp (Water Track)	FPn71	X			X	(GNR)(S3)	5
FPn72 - Northern Rich Tamarack Swamp (Eastern Basin)	FPn72	X	X	X	X	(G4)(S3)	31

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
FPn72a - Rich Tamarack Swamp (Eastcentral)	FPn72a	X	X		X	G4S3	33
FPn73 - Northern Rich Alder Swamp	FPn73	X	X	X	X	(G5)(S5)	1569
FPn73a - Alder - (Maple - Loosestrife) Swamp	FPn73a	X	X	X	X	G5S5	1206
FPn81 - Northern Rich Tamarack Swamp (Water Track)	FPn81		X	X	X	(Gnr)(S4)	7
FPn82 - Northern Rich Tamarack Swamp (Western Basin)	FPn82	X	X	X	X	(G4)(S4, S5)	1657
FPn82a - Rich Tamarack - (Alder) Swamp	FPn82a	X	X		X	G4S5	203
FPn82b - Extremely Rich Tamarack Swamp	FPn82b	X	X	X	X	G4S4	293
FPs63 - Southern Rich Conifer Swamp	FPs63	X			X	(G2G3 or G3G4)(S2S3)	30
FPs63a - Tamarack Swamp (Southern)	FPs63a	X			X	G2G3 or G3G4S2S3	103
LKi32 - Inland Lake Sand/Gravel/Cobble Shore	LKi32	X			X	(G4G5)(S1, S2)	12
LKi32a - Sand Beach (Inland Lake)	LKi32a	X			X	G4G5S1	8
LKi54a - Clay/Mud Shore (Inland Lake)	LKi54a				X	GNRS4	4
MHc26 - Central Dry-Mesic Oak-Aspen Forest	MHc26	X	X	X	X	(G4G5, Gnr)(S4)	1216
MHc26a - Oak - Aspen - Red Maple Forest	MHc26a	X	X	X	X	GNRS4	670
MHc26b - Red Oak - Sugar Maple - Basswood - (Large-Flowered Trillium) Forest	MHc26b	X		X	X	G4G5S4	497
MHc36 - Central Mesic Hardwood Forest (Eastern)	MHc36	X	X	X	X	(G3G4)(S4)	72
MHc36a - Red Oak - Basswood Forest (Noncalcareous Till)	MHc36a	X	X		X	G3G4S4	8
MHc36b - Red Oak - Basswood Forest (Calcareous Till)	MHc36b	X			X	G3G4S4	10
MHc37 - Central Mesic Hardwood Forest (Western)	MHc37	X			X	(G3G4)(S4)	78
MHc37a - Aspen - (Sugar Maple - Basswood) Forest	MHc37a	X			X	G3G4S4	124
MHc37b - Sugar Maple - Basswood - (Aspen) Forest	MHc37b	X			X	G3G4S4	151
MHc47 - Central Wet-Mesic Hardwood Forest	MHc47		X	X	X	(G3G4)(S3)	4
MHc47a - Basswood - Black Ash Forest	MHc47a	X			X	G3G4S3	62
MHn35 - Northern Mesic Hardwood Forest	MHn35	X	X	X	X	(G5)(S4)	2286
MHn35a - Aspen - Birch - Basswood Forest	MHn35a	X	X	X	X	G5S4	643

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
MHn35b - Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest	MHn35b	X	X	X	X	G5S4	263
MHn44 - Northern Wet-Mesic Boreal Hardwood-Conifer Forest	MHn44	X	X	X	X	(G5, GNR)(S2, S3, S3S4, S4)	3546
MHn44a - Aspen - Birch - Red Maple Forest	MHn44a	X	X	X	X	G5S4	192
MHn44b - White Pine - White Spruce - Paper Birch Forest	MHn44b	X	X			GNR5	31
MHn44c - Aspen - Fir Forest	MHn44c	X		X	X	G5S3S4	117
MHn44d - Aspen - Birch - Fir Forest	MHn44d	X	X		X	GNR5	187
MHn45 - Northern Mesic Hardwood (Cedar) Forest	MHn45			X		(G2Q, G3?, G4?)(S2, S3, S4)	1
MHn46 - Northern Wet-Mesic Hardwood Forest	MHn46	X	X	X	X	(GNR)(S4)	1159
MHn46a - Aspen - Ash Forest	MHn46a	X	X	X	X	GNR5	32
MHn46b - Black Ash - Basswood Forest	MHn46b	X	X	X		GNR5	128
MHn47 - Northern Rich Mesic Hardwood Forest	MHn47	X	X	X	X	(G3?)(S3)	393
MHn47a - Sugar Maple - Basswood - (Bluebead Lily) Forest	MHn47a	X	X			G3?S3	18
MHn47b - Sugar Maple - Basswood - (Horsetail) Forest	MHn47b	X	X		X	G3?S3	93
MHs39 - Southern Mesic Maple-Basswood Forest	MHs39	X				(G3G4)(S2, S3)	1
MHs39c - Sugar Maple Forest (Big Woods)	MHs39c	X			X	G3G4S2	32
MRn83 - Northern Mixed Cattail Marsh	MRn83	X	X	X	X	(G4?, G5)(S2)	221
MRn83a - Cattail - Sedge Marsh (Northern)	MRn83a	X	X		X	G4?S2	17
MRn83b - Cattail Marsh (Northern)	MRn83b	X			X	G5S2	18
MRn93 - Northern Bulrush-Spikerush Marsh	MRn93	X	X		X	(G3G4, G4 or G4G5)(S2, S3)	9
MRn93a - Bulrush Marsh (Northern)	MRn93a	X			X	G3G4S3	12
MRn93b - Spikerush - Bur Reed Marsh (Northern)	MRn93b	X			X	G4 or G4G5S2	663
OPn81 - Northern Shrub Shore Fen	OPn81	X	X	X	X	(G4G5, GNR)(S5)	720
OPn81a - Bog birch - Alder Shore Fen	OPn81a	X	X	X	X	GNR5	263
OPn81b - Leatherleaf - Sweet Gale Shore Fen	OPn81b	X		X	X	G4G5S5	9
OPn91 - Northern Rich Fen (Water Track)	OPn91	X	X	X	X	(G3G5 or GNR, GNR)(S2, S3, S4)	12
OPn91a - Shrub Rich Fen (Water Track)	OPn91a		X		X	G3G5 or GNR5	4

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
OPn91b - Graminoid Rich Fen (Water Track)	OPn91b		X			GNRS2 or S3	2
OPn91b1 - Graminoid Rich Fen (Water Track), Featureless Water Track Subtype	OPn91b1	X		X	X	GNRS3	3
OPn92 - Northern Rich Fen (Basin)	OPn92	X	X	X	X	(G4G5, G4G5 or GNR)(S4)	1138
OPn92a - Graminoid Rich Fen (Basin)	OPn92a	X	X	X	X	G4G5 or GNRS4	255
OPn92b - Graminoid - Sphagnum Rich Fen (Basin)	OPn92b	X	X	X	X	G4G5S4	178
OPn93 - Northern Extremely Rich Fen	OPn93		X			(G2Q)(S2)	1
OPn93a - Spring Fen	OPn93a		X		X	G2QS2	2
OPp91 - Prairie Rich Fen	OPp91				X	(G3, G3G4)(S3)	1
OPp91b - Rich Fen (Peatland)	OPp91b				X	G3G4S3	1
RVx32 - Sand/Gravel/Cobble River Shore	RVx32	X				(G4G5)(S3, S4)	1
RVx54b - Clay/Mud Shore (River)	RVx54b	X				GNRS3	1
UPn23 - Northern Mesic Prairie	UPn23	X				(G2G3)(S2)	1
UPs13 - Southern Dry Prairie	UPs13				X	(G2G3 or G3?, G2G3 or G3, G3G4)(S1S2, S2, S3)	1
UPs13b - Dry Sand - Gravel Prairie (Southern)	UPs13b				X	G2G3 or G3S2	2
WFn53 - Northern Wet Cedar Forest	WFn53	X	X	X	X	(GNR)(S3, S4)	47
WFn53a - Lowland White Cedar Forest (North Shore)	WFn53a	X				GNRS4	1
WFn53b - Lowland White Cedar Forest (Northern)	WFn53b	X	X	X	X	GNRS3	151
WFn55 - Northern Wet Ash Swamp	WFn55	X	X	X	X	(G4)(S3, S4)	1699
WFn55a - Black Ash - Aspen - Balsam Poplar Swamp (Northeastern)	WFn55a	X	X	X	X	G4S4	490
WFn55b - Black Ash - Yellow Birch - Red Maple - Basswood Swamp (Eastcentral)	WFn55b	X	X	X	X	G4S3	82
WFn55c - Black Ash - Mountain Maple Swamp (Northern)	WFn55c	X	X		X	G4S4	125
WFn64 - Northern Very Wet Ash Swamp	WFn64	X	X	X	X	(G4)(S4)	1115
WFn64a - Black Ash - Conifer Swamp (Northeastern)	WFn64a	X	X	X	X	G4S4	57
WFn64b - Black Ash - Yellow Birch - Red Maple - Alder Swamp (Eastcentral)	WFn64b	X	X	X		G4S4	14
WFn64c - Black Ash - Alder Swamp (Northern)	WFn64c	X			X	G4S4	48
WFn74 - Northern Wet Alder Swamp	WFn74	X		X	X	(GNR)(S3)	37

Native Plant Community Name	Community Code	CP	STL	TL	PMOP	Conservation Status Rank <sup>1</sup>	# of Observations <sup>2</sup>
WFn74a - Alder - (Red Currant - Meadow-Rue) Swamp	WFn74a	X	X	X	X	GNR53	296
WFs55 - Southern Wet Aspen Forest	WFs55				X	(GNR)(S4)	2
WFs55a - Lowland Aspen Forest	WFs55a				X	GNR54	19
WFs57 - Southern Wet Ash Swamp	WFs57	X			X	(GNR)(S1, S1S2)	7
WFs57a - Black Ash - (Red Maple) Seepage Swamp	WFs57a	X				GNR51S2	15
WMn82 - Northern Wet Meadow/Carr	WMn82	X	X	X	X	(G4? or G4G5, G4G5, G5)(S4, S5)	2391
WMn82a - Willow - Dogwood Shrub Swamp	WMn82a	X	X	X	X	G5S5	1800
WMn82b - Sedge Meadow	WMn82b	X	X	x	X	G4? or G4G5S4 or S5	3805
WMn82b1 - Sedge Meadow, Bluejoint Subtype	WMn82b1	X	X			G4G5S5	5
WMn82b2 - Sedge Meadow, Tussock Sedge Subtype	WMn82b2	X			X	G4? or G4G5S4	13
WMn82b3 - Sedge Meadow, Beaked Sedge Subtype	WMn82b3				X	G4G5S4	2
WMn82b4 - Sedge Meadow, Lake Sedge Subtype	WMn82b4		X		X	G4G5S5	15
WMs83a1 - Seepage Meadow/Carr, Tussock Sedge Subtype	WMs83a1				X	G4?S3	3

<sup>1</sup> Conservation status ranks are assigned to NPC types and subtypes as follows:

Rank code	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

<sup>2</sup> 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 4.2 is based on MBS surveys completed at the time this document was developed. As surveys are completed, additional information on NPCs within the MDLP 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](#).

## Forest patch distribution

Here, forest patches are considered relatively homogeneous areas, with similar ages and forest cover types across the patch. State-administered lands include various patch types based on age, cover type, and size (Table 4.3).

Table 4.3. Distribution of patch types and sizes in the MDLP Section.

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
Aspen 1-30 years	11	29,914	50	18,632	212	32,134	584	36,061	3156	45,891
Aspen 31-59 years	8	12,294	34	11,945	193	27,795	502	30,456	2858	43,204
Aspen 60 + years	6	12,752	6	1,976	49	6,882	178	11,080	2034	23,712
Upland Hardwoods 1-30 years	2	1,876	9	3,122	33	32,134	97	5,968	156	3,566
Upland Hardwoods 31-119 years	20	47,984	39	14,432	100	14,625	259	15,577	533	12,258
Upland Hardwoods 80 + years	39	114,246	54	21,291	137	20,545	307	19,104	603	14,452
Lowland Hardwoods 1-30 years	0	0	0	0	2	337	1	91	120	1,371
Lowland Hardwoods 31-79 years	0	0	0	0	12	1,762	67	3,857	748	9,718
Lowland Hardwoods 90 + years	2	1,676	6	2,042	32	4,647	141	8,464	992	13,701
Pine 1-30 years	0	0	2	585	15	2,121	54	3,156	621	7,631
Pine 31-119 years	0	0	8	2,684	61	9,026	194	11,461	1331	17,201
Pine 120 + years	3	3,363	1	578	4	665	17	1,053	231	2,659
Lowland conifers 1-30 years	0	0	8	3,490	32	4,588	120	7,249	673	9,188
Lowland conifers 31-89 years	10	9,768	28	10,326	105	16,191	253	14,842	1445	19,038
Lowland conifers 90 + years	14	21,710	31	12,366	121	18,870	294	18,113	1772	24,648
Stagnant Conifers 1-30 years	0	0	0	0	3	463	4	272	21	231
Stagnant Conifers 31-119 years	21	46,922	38	15,091	69	10,393	123	7,482	483	7,587
Stagnant Conifers 120 + years	3	3,621	13	4,668	47	7,123	103	6,320	388	6,319

## Special Management Areas

Special management areas (SMAs) are locations where the DNR focuses management on policy requirements or DNR landscape-scale habitat objectives (Table 4.4). Management opportunity areas (MOAs) are one type of SMA developed as part of the forest resource management plan process and are included in SFRMPs. Management opportunity areas include deer management areas, owl MOAs, white pine management areas, old forest management complexes, open landscape management areas, ruffed grouse management areas, and patch MOAs. Alternative management is also applied, according to DNR policy, to locations where particular features are located, such as bald eagle nests and endangered and threatened species.

Table 4.4. Number and acres of special management areas in the MDLP Section.

Special Management Area Type	Number	Acres
Deer Management Area (DMA)	8	14,265
Landscape (LAND)	3	9,148
Owl Management Area (OWMA)	2	18,958
White Pine Management Area (WPMA)	2	9,981
Old Forest Management Complex (OFMC)	30	13,198
Open Landscape Management Areas (OLMA)	7	47,607
Ruffed Grouse Management Area (RGMA)	16	14,654
Forest Patch (PATCH)	32	47,663
High Conservation Value Forests (HCVF)	258	80,026
Representative Sample Areas (RSA)	5	355

## Minnesota’s List of Endangered, Threatened, and Special Concern Species

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 designate endangered, threatened, and special concern species (ETS) based on their statutory definitions. The resulting list of ETS species ([Minnesota Rare Species Guide](#)) is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also authorizes the DNR to adopt rules regulating the treatment of endangered and threatened species. 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 its associated rules impose various 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. Reading the full text of the statute and rules is advisable 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.

Table 4.5. Species federally listed as endangered or threatened within the MDLP Section<sup>3</sup>

Scientific Name	Common Name	Federal Status
<i>Lynx canadensis</i>	Canada Lynx	threatened
<i>Myotis septentrionalis</i>	northern long-eared bat	threatened
<i>Charadrius melodus</i>	Piping Plover	endangered
<i>Calidris canutus rufa</i>	Rufa Red Knot	threatened
<i>Oarisma poweshiek</i>	Poweshiek skipperling	endangered
<i>Bombus affinis</i>	Rusty patched bumble bee	endangered

### *Minnesota Natural Heritage Information System*

Records of known locations of listed species and other rare features are maintained in the Minnesota Natural Heritage Information System (NHIS). All DNR offices have this information available for review before forest management activities to determine if a known location of a rare species is in the vicinity of a stand. If an endangered or threatened species is known to exist or found on a site, management activities are modified to protect, promote, or enhance the 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 differ, methods common to both include:

- Review of existing information

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<sup>3</sup> 2021 July 21, U.S. Fish & Wildlife Midwest Region Endangered Species Minnesota. Retrieved from <https://www.fws.gov/midwest/endangered/lists/minnesot-spp.html>

- Selection of targeted species and survey sites
- Field survey using techniques appropriate to the species
- Information management

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

### *Minnesota Listed Species*

*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, designates species 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 MDLP section is presented below in Table 4.6.

#### Rank Key for Table 4.6.

**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 4.6. Minnesota Listed Species in the MDLP section

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Setophaga cerulea</i>	Cerulean Warbler	Vertebrate Animal	SPC	S3B	G4
<i>Buteo lineatus</i>	Red-shouldered Hawk	Vertebrate Animal	SPC	S3B, SNRN	G5
<i>Najas guadalupensis</i> ssp. <i>olivacea</i>	Olive-colored Southern Naiad	Vascular Plant	SPC	S3	G5T4?
<i>Coturnicops noveboracensis</i>	Yellow Rail	Vertebrate Animal	SPC	S3B	G4
<i>Fimbristylis autumnalis</i>	Autumn Fimbry	Vascular Plant	SPC	S3	G5
<i>Najas gracillima</i>	Slender Naiad	Vascular Plant	SPC	S3	G5?
<i>Microtus ochrogaster</i>	Prairie Vole	Vertebrate Animal	SPC	S3	G5
<i>Juglans cinerea</i>	Butternut	Vascular Plant	END	S1	G3
<i>Cicindela patruela patruela</i>	Northern Barrens Tiger Beetle	Invertebrate Animal	SPC	S3	G3T3
<i>Emydoidea blandingii</i>	Blanding's Turtle	Vertebrate Animal	THR	S2	G4
<i>Hudsonia tomentosa</i>	Beach Heather	Vascular Plant	THR	S2	G5
<i>Chondestes grammacus</i>	Lark Sparrow	Vertebrate Animal	SPC	S3B	G5
<i>Setophaga citrina</i>	Hooded Warbler	Vertebrate Animal	SPC	S3B	G5
<i>Ligumia recta</i>	Black Sandshell	Invertebrate Animal	SPC	S3	G4G5
<i>Lasmigona compressa</i>	Creek Heelsplitter	Invertebrate Animal	SPC	S3	G5
<i>Etheostoma microperca</i>	Least Darter	Vertebrate Animal	SPC	S3	G5
<i>Silene drummondii</i> ssp. <i>drummondii</i>	Drummond's Campion	Vascular Plant	SPC	S3	G5T5
<i>Poa paludigena</i>	Bog Bluegrass	Vascular Plant	THR	S2	G3G4
<i>Rubus fulleri</i>	a bristle-berry	Vascular Plant	THR	S2	G4?Q
<i>Myotis lucifugus</i>	Little Brown Myotis	Vertebrate Animal	SPC	S3	G3G4
<i>Myotis septentrionalis</i>	Northern Long-eared Bat	Vertebrate Animal	SPC	S3	G2G3
<i>Eleocharis flavescens</i> var. <i>olivacea</i>	Olivaceous Spikerush	Vascular Plant	THR	S2	G5
<i>Progne subis</i>	Purple Martin	Vertebrate Animal	SPC	S3B	G5
<i>Eptesicus fuscus</i>	Big Brown Bat	Vertebrate Animal	SPC	S3	G5
<i>Hesperia leonardus leonardus</i>	Leonard's Skipper	Invertebrate Animal	SPC	S3	G4T4
<i>Alisma gramineum</i>	Narrow-leaved Water Plantain	Vascular Plant	SPC	S3	G5
<i>Platanthera clavellata</i>	Small Green Wood Orchid	Vascular Plant	SPC	S3	G5
<i>Carex garberi</i>	Garber's Sedge	Vascular Plant	THR	S2	G5
<i>Tsuga canadensis</i>	Eastern Hemlock	Vascular Plant	END	S1	G4G5
<i>Cygnus buccinator</i>	Trumpeter Swan	Vertebrate Animal	SPC	S3B, SNRN, SNRM	G4
<i>Torreyochloa pallida</i>	Torrey's Mannagrass	Vascular Plant	SPC	S3	G5
<i>Eleocharis nitida</i>	Neat Spikerush	Vascular Plant	SPC	S3	G4
<i>Xyris montana</i>	Montane Yellow-eyed Grass	Vascular Plant	SPC	S3	G5
<i>Utricularia resupinata</i>	Lavender Bladderwort	Vascular Plant	THR	S2	G4
<i>Accipiter gentilis</i>	Northern Goshawk	Vertebrate Animal	SPC	S3B, SNRN	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Bidens discoidea</i>	Discoïd Beggarticks	Vascular Plant	SPC	S3	G5
<i>Carex exilis</i>	Coastal Sedge	Vascular Plant	SPC	S3	G5
<i>Limnephilus secludens</i>	A Caddisfly	Invertebrate Animal	END	S1	G5
<i>Hemidactylium scutatum</i>	Four-toed Salamander	Vertebrate Animal	SPC	S3	G5
<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort	Vascular Plant	THR	S2	G5T4
<i>Botrychium simplex</i>	Least Moonwort	Vascular Plant	SPC	S3	G5
<i>Holocentropus milaca</i>	A Caddisfly	Invertebrate Animal	END	S1	G1
<i>Botrychium mormo</i>	Goblin Fern	Vascular Plant	THR	S2	G2Q
<i>Botrychium pallidum</i>	Pale Moonwort	Vascular Plant	SPC	S3	G3
<i>Botrychium oneidense</i>	Blunt-lobed Grapefern	Vascular Plant	THR	S2	G4
<i>Carex pallescens</i>	Pale Sedge	Vascular Plant	END	S1	G5
<i>Juncus stygius</i> var. <i>americanus</i>	Bog Rush	Vascular Plant	SPC	S3	G5T5
<i>Rubus vermontanus</i>	Vermont Bristle-berry	Vascular Plant	SPC	S3	G5
<i>Ranunculus lapponicus</i>	Lapland Buttercup	Vascular Plant	SPC	S3	G5
<i>Eleocharis robbinsii</i>	Robbins' Spikerush	Vascular Plant	THR	S2	G4G5
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's Mouth	Vascular Plant	SPC	S3	G5T4T5
<i>Rubus semisetosus</i>	Swamp Blackberry	Vascular Plant	THR	S2	G5
<i>Cardamine pratensis</i>	Cuckoo Flower	Vascular Plant	THR	S2	G5
<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Vertebrate Animal	SPC	S3B	G5
<i>Ammodramus henslowii</i>	Henslow's Sparrow	Vertebrate Animal	END	S1B	G4
<i>Asio flammeus</i>	Short-eared Owl	Vertebrate Animal	SPC	S3B	G5
<i>Notropis anogenus</i>	Pugnose Shiner	Vertebrate Animal	THR	S2	G3
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Vertebrate Animal	THR	S2B	G5
<i>Stuckenia vaginata</i>	Sheathed Pondweed	Vascular Plant	END	S1	G5
<i>Littorella americana</i>	American Shore Plantain	Vascular Plant	SPC	S3	G5
<i>Elatine triandra</i>	Three-stamened Waterwort	Vascular Plant	SPC	S3	G5
<i>Carex ormostachya</i>	Necklace Sedge	Vascular Plant	SPC	S3	G4G5
<i>Botrychium campestre</i>	Prairie Moonwort	Vascular Plant	SPC	S3	G3G4
<i>Panax quinquefolius</i>	American Ginseng	Vascular Plant	SPC	S3	G3G4
<i>Potamogeton oakesianus</i>	Oakes' Pondweed	Vascular Plant	END	S1	G5
<i>Acipenser fulvescens</i>	Lake Sturgeon	Vertebrate Animal	SPC	S3	G3G4
<i>Cypripedium arietinum</i>	Ram's Head Orchid	Vascular Plant	THR	S2	G3
<i>Lepomis peltastes</i>	Northern Sunfish	Vertebrate Animal	SPC	S3	G5
<i>Crocantemum canadense</i>	Canada Frostweed	Vascular Plant	SPC	S3	G5
<i>Caltha natans</i>	Floating Marsh Marigold	Vascular Plant	END	S1	G5
<i>Trichocolea tomentella</i>	A Species of Liverwort	Nonvascular Plant	THR	S2	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Utricularia purpurea</i>	Purple-flowered Bladderwort	Vascular Plant	END	S1	G5
<i>Falco peregrinus</i>	Peregrine Falcon	Vertebrate Animal	SPC	S3B	G4
<i>Malaxis paludosa</i>	Bog Adder's Mouth	Vascular Plant	END	S1	G3G4
<i>Polemonium occidentale</i> ssp. <i>lacustre</i>	Western Jacob's-ladder	Vascular Plant	END	S1	G5?T2Q
<i>Botrychium rugulosum</i>	St. Lawrence Grapefern	Vascular Plant	SPC	S3	G3
<i>Potamogeton bicupulatus</i>	Snailseed Pondweed	Vascular Plant	END	S1	G4
<i>Waldsteinia fragarioides</i> var. <i>fragarioides</i>	Barren Strawberry	Vascular Plant	SPC	S3	G5T5
<i>Juncus articulatus</i>	Jointed Rush	Vascular Plant	END	S1	G5
<i>Utricularia geminiscapa</i>	Hidden-fruit Bladderwort	Vascular Plant	THR	S2	G4G5
<i>Ruppia cirrhosa</i>	Spiral Ditchgrass	Vascular Plant	SPC	S3	G5
<i>Aeshna subarctica</i>	Subarctic Darner	Invertebrate Animal	SPC	S3	G5
<i>Potamogeton pulcher</i>	Spotted Pondweed	Vascular Plant	END	S1	G5
<i>Ophiogomphus howei</i>	Pygmy Snaketail	Invertebrate Animal	SPC	S3	G3
<i>Usnea rubicunda</i>	Red Beard Lichen	Fungus	SPC	S3	G4G5
<i>Heterodermia obscurata</i>	Orange-tinted Fringe Lichen	Fungus	SPC	S3	G5?
<i>Pseudocyphellaria holarctica</i>	Yellow specklebelly lichen	Fungus	END	S1	GNR
<i>Marpissa formosa</i>	A jumping spider	Invertebrate Animal	SPC	S3	GNR
<i>Botrychium lunaria</i>	Common Moonwort	Vascular Plant	THR	S2	G5
<i>Ahtiana aurescens</i>	Eastern candlewax lichen	Fungus	SPC	S3	G3G5
<i>Tympanuchus cupido</i>	Greater Prairie-chicken	Vertebrate Animal	SPC	S3	G4
<i>Botrychium minganense</i>	Mingan Moonwort	Vascular Plant	SPC	S3	G5
<i>Dryopteris goldiana</i>	Goldie's Fern	Vascular Plant	SPC	S3	G4G5
<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush	Vascular Plant	SPC	S3	G5
<i>Cladium mariscoides</i>	Twig Rush	Vascular Plant	SPC	S3	G5
<i>Botrychium spathulatum</i>	Spatulate Moonwort	Vascular Plant	END	S1	G3
<i>Laccaria trullisata</i>	Sand-loving Laccaria	Fungus	SPC	S3	GNR
<i>Sterna hirundo</i>	Common Tern	Vertebrate Animal	THR	S2B	G5
<i>Adlumia fungosa</i>	Allegheny Vine	Vascular Plant	SPC	S3	G4
<i>Suillus weaverae</i>	A Species of Fungus	Fungus	END	S1	G1?
<i>Gymnocarpium robertianum</i>	Northern Oak Fern	Vascular Plant	SPC	S3	G5
<i>Botrychium ascendens</i>	Upswept Moonwort	Vascular Plant	END	S1	G3
<i>Botrychium lineare</i>	Slender Moonwort	Vascular Plant	END	S1	G3
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Vertebrate Animal	SPC	S3B	G4
<i>Decodon verticillatus</i> var. <i>laevigatus</i>	Water-willow	Vascular Plant	SPC	S3	G5TNR
<i>Oxyethira itascae</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G3
<i>Oxyethira ecornuta</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Trichophorum clintonii</i>	Clinton's Bulrush	Vascular Plant	THR	S2	G4
<i>Necturus maculosus</i>	Mudpuppy	Vertebrate Animal	SPC	S3	G5
<i>Catocala whitneyi</i>	Whitney's Underwing	Invertebrate Animal	SPC	S3	G2G3
<i>Bryoria fuscescens</i>	Pale-footed Horsehair Lichen	Fungus	SPC	S3	G5
<i>Poa wolfii</i>	Wolf's Bluegrass	Vascular Plant	SPC	S3	G4
<i>Cirsium pumilum</i> var. <i>hillii</i>	Hill's Thistle	Vascular Plant	SPC	S3	G3
<i>Ochrolechia androgyna</i>	Powdery Saucer Lichen	Fungus	SPC	S3	G4G5
<i>Anabolia ozburni</i>	A Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Carex obtusata</i>	Blunt Sedge	Vascular Plant	SPC	S3	G5
<i>Goera stylata</i>	A Caddisfly	Invertebrate Animal	THR	S2	G5
<i>Eurynia dilatata</i>	Spike	Invertebrate Animal	THR	S2	G5
<i>Oarisma poweshiek</i>	Poweshiek Skipperling	Invertebrate Animal	END	S1	G1
<i>Chilostigma itascaae</i>	Headwaters Chilostigman Caddisfly	Invertebrate Animal	THR	S2	G2
<i>Carex hookerana</i>	Hooker's Sedge	Vascular Plant	SPC	S3	G4?
<i>Melanohalea subolivacea</i>	Brown-eyed Camouflage Lichen	Fungus	SPC	S3	G5
<i>Triaenodes flavescens</i>	A Triaenode Caddisfly	Invertebrate Animal	SPC	S3	G5
<i>Spilogale putorius</i>	Eastern Spotted Skunk	Vertebrate Animal	THR	S2	G4
<i>Limnephilus janus</i>	A Caddisfly	Invertebrate Animal	END	S1	G5
<i>Sterna forsteri</i>	Forster's Tern	Vertebrate Animal	SPC	S3B	G5
<i>Lasmigona costata</i>	Fluted-shell	Invertebrate Animal	THR	S2	G5
<i>Podiceps auritus</i>	Horned Grebe	Vertebrate Animal	END	S1B	G5
<i>Orobanche uniflora</i>	One-flowered Broomrape	Vascular Plant	THR	S2	G5
<i>Sticta fuliginosa</i>	Peppered moon lichen	Fungus	SPC	S3	G3G5
<i>Rubus stipulatus</i>	A Bristle-berry	Vascular Plant	END	S1	G4
<i>Spiranthes casei</i> var. <i>casei</i>	Case's Ladies' Tresses	Vascular Plant	THR	S2	G4T4
<i>Lepomis gulosus</i>	Warmouth	Vertebrate Animal	SPC	S3	G5
<i>Synaptomys borealis</i>	Northern Bog Lemming	Vertebrate Animal	SPC	S3	G5
<i>Subularia aquatica</i> ssp. <i>americana</i>	Awlwort	Vascular Plant	THR	S2	G5T5
<i>Somatochlora forcipata</i>	Forcipate Emerald	Invertebrate Animal	SPC	S3	G5
<i>Nymphaea leibergii</i>	Small White Waterlily	Vascular Plant	THR	S2	G5
<i>Platanthera flava</i> var. <i>herbiola</i>	Tubercled Rein Orchid	Vascular Plant	THR	S2	G4?T4Q
<i>Phacelia franklinii</i>	Franklin's Phacelia	Vascular Plant	THR	S2	G5
<i>Aegolius funereus</i>	Boreal Owl	Vertebrate Animal	SPC	S3B, SNRN	G5
<i>Glyptemys insculpta</i>	Wood Turtle	Vertebrate Animal	THR	S2	G3
<i>Thelia hirtella</i>	Nipple Moss	Nonvascular Plant	SPC	S3	G5
<i>Ophiogomphus anomalus</i>	Extra-striped Snaketail	Invertebrate Animal	SPC	S3	G4

### Additional Species Data

In addition to listed species, the MDLP section contains species labeled as ‘Watchlist’ and ‘Species in Greatest Conservation Need’ (SGCNs).

‘**Watchlist**’ species are defined as plant or animal species with no legal status but for which data are being compiled in the Natural Heritage Information System because the species fall 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 4.7. Minnesota ‘Watchlist’ species in the MDLP Section.

Scientific Name	Common Name	Type
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake	Vertebrate Animal
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Vertebrate Animal
<i>Antigone canadensis</i>	Sandhill Crane	Vertebrate Animal
<i>Bartramia longicauda</i>	Upland Sandpiper	Vertebrate Animal
<i>Botaurus lentiginosus</i>	American Bittern	Vertebrate Animal
<i>Sparganium glomeratum</i>	Clustered Bur-reed	Vascular Plant
<i>Ceratophyllum echinatum</i>	Spiny Hornwort	Vascular Plant
<i>Strix nebulosa</i>	Great Gray Owl	Vertebrate Animal
<i>Setophaga caerulescens</i>	Black-throated Blue Warbler	Vertebrate Animal
<i>Lobaria quercizans</i>	Smooth Lungwort	Fungus
<i>Bombus affinis</i>	Rusty-patched Bumble Bee	Invertebrate Animal
<i>Lycaena epixanthe michiganensis</i>	Bog Copper	Invertebrate Animal
<i>Marpissa grata</i>	A Jumping Spider	Invertebrate Animal
<i>Polygonum hydropiperoides</i>	Mild Water Pepper	Vascular Plant
<i>Tomentypnum falcifolium</i>	Curved-leaved Golden Moss	Nonvascular Plant
<i>Hydroptila novicola</i>	A Caddisfly	Invertebrate Animal
<i>Geum laciniatum</i>	Rough avens	Vascular Plant
<i>Potamogeton x hagstroemii</i>	Hagstrom's Pondweed	Vascular Plant
<i>Physconia subpallida</i>	Pale-bellied Frost Lichen	Fungus
<i>Usnea angulata</i>	Beard Lichen	Fungus
<i>Bryoria implexa</i>	Boreal Horsehair Lichen	Fungus
<i>Lycopus virginicus</i>	Virginia Water Horehound	Vascular Plant
<i>Potamogeton x haynesii</i>	Haynes' Pondweed	Vascular Plant
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Vertebrate Animal
<i>Ophioglossum pusillum</i>	Adder's Tongue	Vascular Plant
<i>Ceraclea vertreesi</i>	Vertrees's Ceraclean Caddisfly	Invertebrate Animal
<i>Leucophysalis grandiflora</i>	Dwarf Ground Cherry	Vascular Plant
<i>Rubus wheeleri</i>	Wheeler's Blackberry	Vascular Plant

Scientific Name	Common Name	Type
<i>Carex capillaris</i>	Hair-like Sedge	Vascular Plant
<i>Cyperus houghtonii</i>	Houghton's Cyperus	Vascular Plant
<i>Botrychium crenulatum</i>	Dainty Moonwort	Vascular Plant
<i>Botrychium michiganense</i>	Michigan Moonwort	Vascular Plant
<i>Poa sylvestris</i>	Woodland Bluegrass	Vascular Plant

### *Species in Greatest Conservation Need (SGCNs)*

Of the 346 species that are considered SGCN in Minnesota, 62 are in the MDLP Section. At least 21 SGCNs are directly associated with forest habitats (Table 4.8).

Table 4.8. Species in Greatest Conservation Need found within the MDLP Section that are associated with forests.

Common Name	Scientific Name	Key Habitat/ or Habitat used
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Fire Dependent Forest Mesic hardwood forest Savanna Floodplain forest Wet forest
Big Brown Bat	<i>Eptesicus fuscus</i>	Fire Dependent Forest Mesic hardwood forest Floodplain forest
Blanding's Turtle	<i>Emydoidea blandingii</i>	Savanna Floodplain forest Wet forest Forested rich peatland
Boreal Owl	<i>Aegolius funereus</i>	Fire Dependent Forest Mesic hardwood forest Forested rich peatland
Cerulean Warbler	<i>Setophaga cerulea</i>	Fire Dependent Forest Mesic hardwood forest Floodplain forest
Eastern Spotted Skunk	<i>Spilogale putorius</i>	Mesic hardwood forest Savanna
Extra-striped Snaketail	<i>Ophiogomphus anomalus</i>	Fire Dependent Forest Mesic hardwood forest
Forcipate Emerald	<i>Somatochlora forcipata</i>	Forested rich peatland
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Fire Dependent Forest Mesic hardwood forest
Headwaters Chilostigman Caddisfly	<i>Chilostigma itascae</i>	Forested rich peatland
Hooded Warbler	<i>Setophaga citrina</i>	Mesic hardwood forest

Common Name	Scientific Name	Key Habitat/ or Habitat used
Lark Sparrow	<i>Chondestes grammacus</i>	Fire Dependent Forest Savanna
Leonard's Skipper	<i>Hesperia leonardus</i>	Savanna
Little Brown Myotis	<i>Myotis lucifugus</i>	Mesic hardwood forest Floodplain forest
Northern Barrens Tiger Beetle	<i>Cicindela patruela patruela</i>	Savanna
Northern Bog Lemming	<i>Synaptomys borealis</i>	Forested rich peatland Forest acid peatland
Northern Goshawk	<i>Accipiter gentilis</i>	Fire Dependent Forest Mesic hardwood forest
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Fire Dependent Forest Mesic hardwood forest Floodplain forest
Prairie Vole	<i>Microtus ochrogaster</i>	Savanna
Red-shouldered Hawk	<i>Buteo lineatus</i>	Fire Dependent Forest Mesic hardwood forest Floodplain forest Wet forest
Wood Turtle	<i>Glyptemys insculpta</i>	Fire Dependent Forest Mesic hardwood forest Savanna Wet forest

## Water resources

The MDLP Section is rich in water resources, harboring over 3,500 lakes, including three of Minnesota's large lakes greater than 15,000 acres (Cass, Lake, and Winnibigoshish). The Section also includes many rivers, including the iconic headwaters of the Mississippi River.

Table 4.9. Watersheds within the MDLP Section (by hydrologic unit code 8 watersheds). Watershed health scores are calculated from 0 to 100, with higher numbers indicating better watershed health.

Watershed name	Acres	Square miles	Mean Health Score
Big Fork	127,522	775.6	75
Buffalo	22,746	4.6	54
Clearwater	1,210,012	199.25	63
Cloquet	22,743	35.5	71
Crow Wing	1,210,010	1890.6	67
Eastern Wild Rice	196,517	307	58
Elk-Nokasippi	503,700	787	66
Kettle	86,152	134.6	67
Leech Lake	85,411	1341.2	72
Little Fork	62,484	97.63	73
Long Prairie	84,847	132.5	61
Mississippi Headwaters	1,229,438	1920.9	70

Watershed name	Acres	Square miles	Mean Health Score
Otter Tail	250,602	391.5	59
Pine	501,180	783	69
Prairie- Willow	1,111,488	1736.7	70
Red Lakes	255,392	399	71
Redeye	332,650	519.7	65
St. Louis	1,062,214	1659.7	67

## Sites of Biodiversity Significance

The Minnesota Biological Survey uses a statewide ranking system to evaluate and communicate the biodiversity significance of surveyed areas (MBS Sites) to natural resource professionals, 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.

- **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 high-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.

Table 4.10. Sites of biodiversity significance acres in the MDLP Section summarized by ranking as of 2021.

Rank	Number of Sites	Total Acres	DNR-administered stand acres	DNR-administered managed acres
Sites of Biodiversity Significance				
Outstanding	27	276,250	99,000	63,882
High	251	1,252,448	237,193	228,344
Moderate	910	2,161,315	261,041	253,427
Below	124	224,630	12,445	10,990
<b>Grand Total</b>	<b>1312</b>	<b>3,914,643</b>	<b>609,680</b>	<b>556,645</b>
Preliminary Sites of Biodiversity Significance				
Outstanding	15	199,731	62,695	58,165
High	118	698,385	134,386	132,153
<b>Grand Total</b>	<b>133</b>	<b>898,116</b>	<b>197,082</b>	<b>190,318</b>

## Climate change

The model for the DNR's sustainable timber harvest analysis and 10-year stand exam list accounted for converting 1% of the managed aspen acres statewide in this planning period to make forest communities more resilient to climate change. The SFRMPs provide specific direction on which species to target for those conversions in each Section. Projected effects of climate change on tree species ranges are a critical component of developing that guidance.

The amount of habitat for many tree species in the MDLP Section is projected to shift due to climate change, and some species not currently found in the Section will likely gain new habitat. Presently, quaking aspen is the most abundant species in the Section. However, the US Forest Service (USFS) Tree Atlas<sup>4</sup> projects that quaking aspen habitat and abundance will decrease significantly under all climate change scenarios in the next 80 years (approximately 40-80%; Table 4.11). Other species, including black ash, jack pine, birch, tamarack, balsam poplar, white cedar, white spruce, black spruce, and balsam fir, are also projected to lose habitat across all climate change model scenarios. The model projects habitat gains for many other species and, for others, ambiguous outcomes depending on emissions scenarios. Some species not present or with currently very low abundance in the section are projected to gain habitat in the next 80 years, including eastern red cedar, slippery elm, shagbark hickory, hackberry, and black ash. Habitat for these species may achieve levels similar to species that are currently common in the section. For example, the projected range in weighted importance values (that express modeled abundance and habitat) for hackberry is similar to the current importance values for common species like bigtooth aspen and jack pine.

While these projections help us consider the potential effects of climate change, it is important to remember that they are based on the correlation between current species distributions and environmental variables. These correlations may not account for the broader environmental niche species can potentially occupy. In other words, if novel conditions resulting from climate change are within the set of conditions a species can occupy but currently doesn't, the species may be able to tolerate those novel conditions in ways correlative models can't predict. These projections also assume that the models accurately characterize the species' current distributions and climate change scenarios.<sup>4</sup> Additional variables, for example, competition, may also change over time as species move. For example, a species may gain new habitat based on environmental variables, but it is uncertain whether it will be competitive in a novel plant community.

The [Northern Institute of Applied Climate Science webpage](#) has additional information on tree species projections from the Tree Atlas data in the MDLP Section.

Table 4.11. Current and projected modeled weighted importance values (indicating abundance and amount of habitat) for tree species in the MDLP Section under various climate change scenarios<sup>4</sup>. Importance values are

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<sup>4</sup> 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.fs.usda.gov/nrs/atlas/tree/>, Northern Research Station, USDA Forest Service, Delaware, Ohio.

adapted from US Forest Service Tree Atlas (version 4) output for the MDLP Section. The Current Modeled column shows importance values for the year 2000. The columns to the right show projected importance values for the year 2100 from individual models (PCM - Parallel Climate Model – low emissions scenario, Hadley High emissions scenario) and model averages for low and high emissions scenarios from three general circulation models (GCMs; Hadley, PCM, and Geophysical Fluid Dynamics Laboratory - GFDL). Differences in modeled importance values relative to the current modeled importance values indicate projected increases or decreases in tree species abundance and habitat in 2100. Tree species are ordered from highest to lowest projected importance value averaged over the average low and high emissions scenarios.

Species Name	Scientific Name	Current Modeled	PCM - Low	Hadley - High	Average - Low	Average - High
quaking aspen	<i>Populus tremuloides</i>	1915	↓ 1104	↓ 408	↓ 907	↓ 415
American elm	<i>Ulmus americana</i>	189	↑ 225	↑ 721	↑ 285	↑ 757
bur oak	<i>Quercus macrocarpa</i>	351	↑ 362	↑ 586	↑ 477	↑ 565
Eastern redcedar*	<i>Juniperus virginiana</i>	0	↑ 109	↑ 582	↑ 360	↑ 626
red maple	<i>Acer rubrum</i>	265	↑ 446	↑ 406	↑ 411	↑ 429
northern red oak	<i>Quercus rubra</i>	282	↑ 588	↓ 217	↑ 560	↓ 276
sugar maple	<i>Acer saccharum</i>	226	↑ 403	↓ 215	↑ 418	↑ 254
green ash	<i>Fraxinus pennsylvanica</i>	168	↑ 207	↑ 359	↑ 250	↑ 378
boxelder	<i>Acer negundo</i>	68	↑ 171	↑ 404	↑ 262	↑ 354
American basswood	<i>Tilia americana</i>	249	↑ 274	↑ 272	↑ 330	↑ 286
black ash	<i>Fraxinus nigra</i>	458	↓ 358	↓ 238	↓ 323	↓ 275
eastern cottonwood	<i>Populus deltoides</i>	17	↑ 68	↑ 332	↑ 113	↑ 384
jack pine	<i>Pinus banksiana</i>	325	↓ 293	↓ 224	↓ 259	↓ 223
red pine	<i>Pinus resinosa</i>	207	↑ 228	↓ 160	↑ 244	↓ 191
slippery elm*	<i>Ulmus rubra</i>	1	↑ 118	↑ 245	↑ 182	↑ 243
hackberry*	<i>Celtis occidentalis</i>	0	↑ 33	↑ 315	↑ 136	↑ 285
white oak	<i>Quercus alba</i>	5	↑ 172	↑ 237	↑ 190	↑ 210
paper birch	<i>Betula papyrifera</i>	587	↓ 383	↓ 114	↓ 286	↓ 109
black cherry	<i>Prunus serotina</i>	35	↑ 158	↑ 170	↑ 225	↑ 167

Species Name	Scientific Name	Current Modeled	PCM - Low	Hadley - High	Average - Low	Average - High
red mulberry*	<i>Morus rubra</i>	0	↑ 9	↑ 304	↑ 75	↑ 281
eastern white pine	<i>Pinus strobus</i>	81	↑ 118	↑ 104	↑ 245	↑ 107
tamarack	<i>Larix laricina</i>	369	↓ 214	↓ 142	↓ 180	↓ 155
black oak	<i>Quercus velutina</i>	2	↑ 127	↑ 235	↑ 142	↑ 180
Eastern hophornbeam	<i>Ostrya virginiana</i>	93	↑ 121	↑ 153	↑ 145	↑ 148
black willow	<i>Salix nigra</i>	8	↑ 67	↑ 167	↑ 104	↑ 157
silver maple	<i>Acer saccharinum</i>	2	↑ 54	↑ 169	↑ 102	↑ 157
black walnut*	<i>Juglans nigra</i>	0	↑ 17	↑ 215	↑ 69	↑ 185
balsam poplar	<i>Populus balsamifera</i>	300	↓ 59	↓ 130	↓ 94	↓ 117
bigtooth aspen	<i>Populus grandidentata</i>	133	↑ 139	↓ 56	133	↓ 68
honeylocust*	<i>Gleditsia triacanthos</i>	0	0	↑ 202	↑ 15	↑ 165
white ash*	<i>Fraxinus americana</i>	0	↑ 34	↑ 107	↑ 36	↑ 103
shagbark hickory*	<i>Carya ovata</i>	0	↑ 22	↑ 82	↑ 50	↑ 86
northern pin oak	<i>Quercus ellipsoidalis</i>	10	↑ 42	↑ 73	↑ 61	↑ 67
chokecherry	<i>Prunus virginiana</i>	71	↓ 66	↓ 52	↓ 66	↓ 31
Northern white-cedar	<i>Thuja occidentalis</i>	191	↓ 84	↓ 15	↓ 43	↓ 44
white spruce	<i>Picea glauca</i>	95	↓ 26	↓ 42	↓ 42	↓ 42
wild plum	<i>Prunus americana</i>	0	0	↑ 69	0	↑ 68
bitternut hickory	<i>Carya cordiformis</i>	0	↑ 21	↑ 65	↑ 31	↑ 32
yellow birch	<i>Betula alleghaniensis</i>	29	↑ 37	↓ 7	↑ 32	↓ 15
peachleaf willow	<i>Salix amygdaloides</i>	0	0	↑ 42	↑ 9	↑ 34
black spruce	<i>Picea mariana</i>	430	↓ 46	↓ 17	↓ 22	↓ 18
balsam fir	<i>Abies balsamea</i>	532	↓ 58	↓ 1	↓ 15	↓ 1

Species Name	Scientific Name	Current Modeled	PCM - Low	Hadley - High	Average - Low	Average - High
swamp white oak	<i>Quercus bicolor</i>	0	0	↑ 14	0	↑ 14
mountain maple	<i>Acer spicatum</i>	54	↓ 0	↓ 0	↓ 0	↓ 0

\*Species not represented in current MDLP FIA data that are projected to gain habitat within the Section.

## Appendix A: Glossary

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

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

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

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

**Assessment:** A compilation of information about the trends and conditions related to natural and socio-economic resources and factors.

**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 Biological Survey uses a statewide ranking system to evaluate and communicate the biodiversity significance of surveyed areas (MBS Sites) to natural resource professionals, 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.

- **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 high-quality occurrences of the rarest species, high-quality examples of the rarest native plant communities, and/or important functional landscapes.
- **Moderate Sites:** Those containing significant occurrences of rare species and/or moderately disturbed native plant communities and landscapes that have a strong potential for recovery.
- **Sites Below the Minimum Threshold:** Those lacking significant populations of rare species and/or natural features that meet MCBS minimum standards for size and condition. These include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, and open space areas.

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

**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. The actual volume of solid wood may vary from 60 to 100 cubic feet, depending on the size of individual pieces and how tightly 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. The 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.

**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.

**Desired future forest composition (DFFC) goals:** Broad vision of landscape vegetation conditions in the long-term future.

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

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

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

**Element Occurrence (EO):** An area of land and/or water where a rare feature (plant, animal, natural community, geologic feature, animal aggregation) is or was present. An Element Occurrence Rank provides a succinct assessment of the estimated viability or probability of persistence (based on condition, size, and landscape context) of occurrences of a given Element. An Element Occurrence Record is the locational and supporting data associated with a particular Element Occurrence. Element Occurrence Records for the State of Minnesota are managed as part of the rare features database by the Natural Heritage and Nongame Research Program.

(Adapted from Biotics EO Standards: Chapter 2)

**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).

**Forest Inventory and Analysis (FIA):** A statewide forest survey of timber lands jointly conducted by the Minnesota Department of Natural Resources 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 DNR 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.

**Forest land:** Consists of all lands included in the forest inventory that have forested cover types, from aspen and pine cover types to stagnant conifers.

**Forest management:** The practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Note: Forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values. From: *The Dictionary of Forestry*. 1998. The Society of American Foresters. J.A. Helms, ed.

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

**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.

**Habitat:** “The resources and conditions present in an area that produce occupancy – including survival and reproduction – by a given organism. Habitat is organism-specific; it relates the presence of a species, population, or individual (animal or plant) to an area’s physical and biological characteristics. Habitat implies more than vegetation or vegetation structure; it is the sum of the specific resources that are needed by organisms.” (Hall et al., 1997)

**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).

**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 Ecological Classification System (ECS), and Minnesota Forest Resources Council (MFRC) regional landscapes. The issue being addressed usually defines the type and size of the landscape to be used.

**Managed acres:** Acres that are available for management purposes.

**Management pool:** The total acres available for timber management purposes.

**Marketable timber:** Merchantable timber that is accessible now.

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

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

**Mesic:** Moderately moist.

**Minnesota Biological Survey (MBS) Sites of Biodiversity Significance:** 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 MBS 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.

**Native Plant Community (NPC):** 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 hydrology, landforms, soils, and natural disturbance regimes (e.g., wildfires, wind storms, and normal flood cycles).

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

**Normal Rotation Age (NRA):** For even-aged managed cover types, normal rotation age is based on the age of trees at which their average annual growth for some metric (height, basal area, diameter) is maximized. Normal rotation age also considers other available data related to forest productivity, wood quality, and local knowledge.

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

**Older forest:** A forest stand of any particular forest cover type is considered an older forest whenever its age exceeds the normal rotation age established for that cover type.

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

**Old forest management complex (OFMC):** Represents an area of land made up of several to many stands that are managed for older forest characteristics in the vicinity of designated old-growth stands.

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

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

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

**Rare plants:** 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 animal:** All animal species that are listed as Federally endangered or threatened, as well as all birds, small mammals, reptiles, amphibians, mussels, and butterflies that are listed as State 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. For example, some Species in Greatest Conservation Need (SGCN) have no legal status, but SGCN includes both listed and non-listed species.

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

**Representative Sample Areas (RSAs):** Ecologically viable representative samples designated to serve one or more of three purposes: 1) To establish and/or maintain an ecological reference condition, 2) To create or maintain an under-represented ecological condition, or 3) To serve as a set of protected areas or refugia for species, communities and community types.

**Rotation age:** The age at which a forest stand (primarily even aged) receives its final harvest. This is an administrative decision based on economics, site condition, growth rates, and other facts.

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

**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.

**Snag:** A standing dead tree.

**Special concern species:** A plant or animal species that is extremely uncommon in Minnesota or has 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 Area (SMA):** An area that receives alternative modeling during stand selection and different treatment during management to account for values other than timber on the landscape. Different types of special management areas are determined by statute (e.g., endangered and threatened species), by policy (e.g., old growth special management zones), or during the SFRMP process (management opportunity areas).

**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. The 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 vegetation similar in age, species composition, and structure and growing on a site of similar quality to be a distinguishable 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, re-inventory, 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 are assigned preliminary prescriptions, and most will receive the prescribed treatment. However, based on field appraisal visits, prescriptions may change for some stands because of new information on the stand or its condition.

**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.

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

**Timberland:** Forestland capable of producing timber of marketable size and volume at the normal harvest age for the cover type. It does not include lands withdrawn from timber utilization by statute (e.g., Boundary Waters Canoe Area Wilderness) or administrative regulation such as designated old growth forests and state parks. On state forestlands, this includes stands that can produce at least three cords per acre of merchantable timber at the normal rotation 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 non-forestland.

**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.

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

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

**Wildlife Management Area (WMA):** Areas established by the Department of Natural Resources, Section of Wildlife, to manage, preserve and restore natural communities, perpetuate wildlife populations, and provide recreational and educational opportunities.

## Appendix B: Acronyms

Acronym	Description
CPPMOP	Chippewa Plains, Pine Moraines, and Outwash Plains (Subsection)
DFFC	Desired future forest condition
DMA	Deer management area
DNR	Department of Natural Resources
EAB	Emerald ash borer
ECS	Ecological classification system
ETS	Endangered, threatened, and special concern species
EWR	Ecological and Water Resources Division
FIA	Forest Inventory Analysis
FIM	Forest Inventory Module
GAP	Gap Analysis Project
GCM	General circulation model
GFDL	Geophysical Fluid Dynamics Laboratory
HCVF	High conservation value forest
LAND	Landscape
MBS	Minnesota Biological Survey
MDLP	(Northern) Minnesota Drift and Lake Plains
MOA	Management opportunity area
NHIS	Natural Heritage Information System
NLCD	National Land Cover Database
NPC	Native plant community
OFMC	Old forest management complex
OLMA	Open landscape management area
OWMA	Owl management area
PCM	Parallel climate model
RGMA	Ruffed grouse management area
RSA	Representative sample area
SFRMP	Section Forest Resource Management Plan
SGCN	Species in Greatest Conservation Need
SMA	Special management area
USFS	United States Forest Service
WPMA	White pine management area