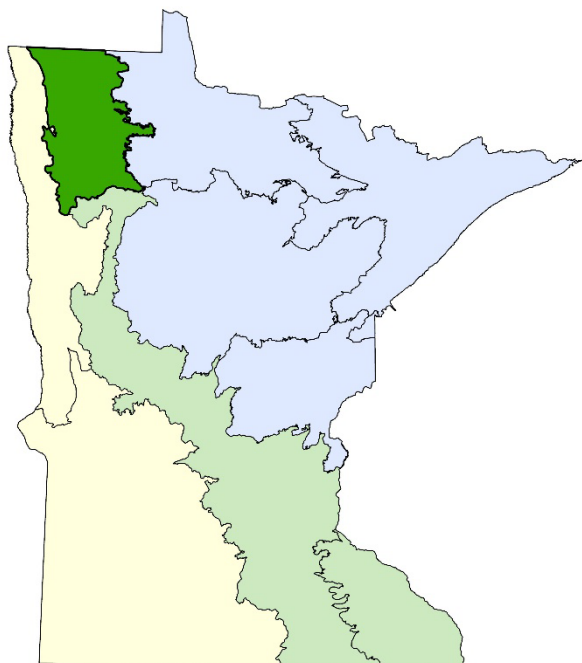

Aspen Parklands

Section Forest Resource Management Plan – Section
Assessment and Conditions

Prepared 2021



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Chapter 1. Purpose and Planning Area

Purpose of the Assessment

This document provides context for the Aspen Parkland¹ Section Forest Resource Management Plan (AP 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 AP 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

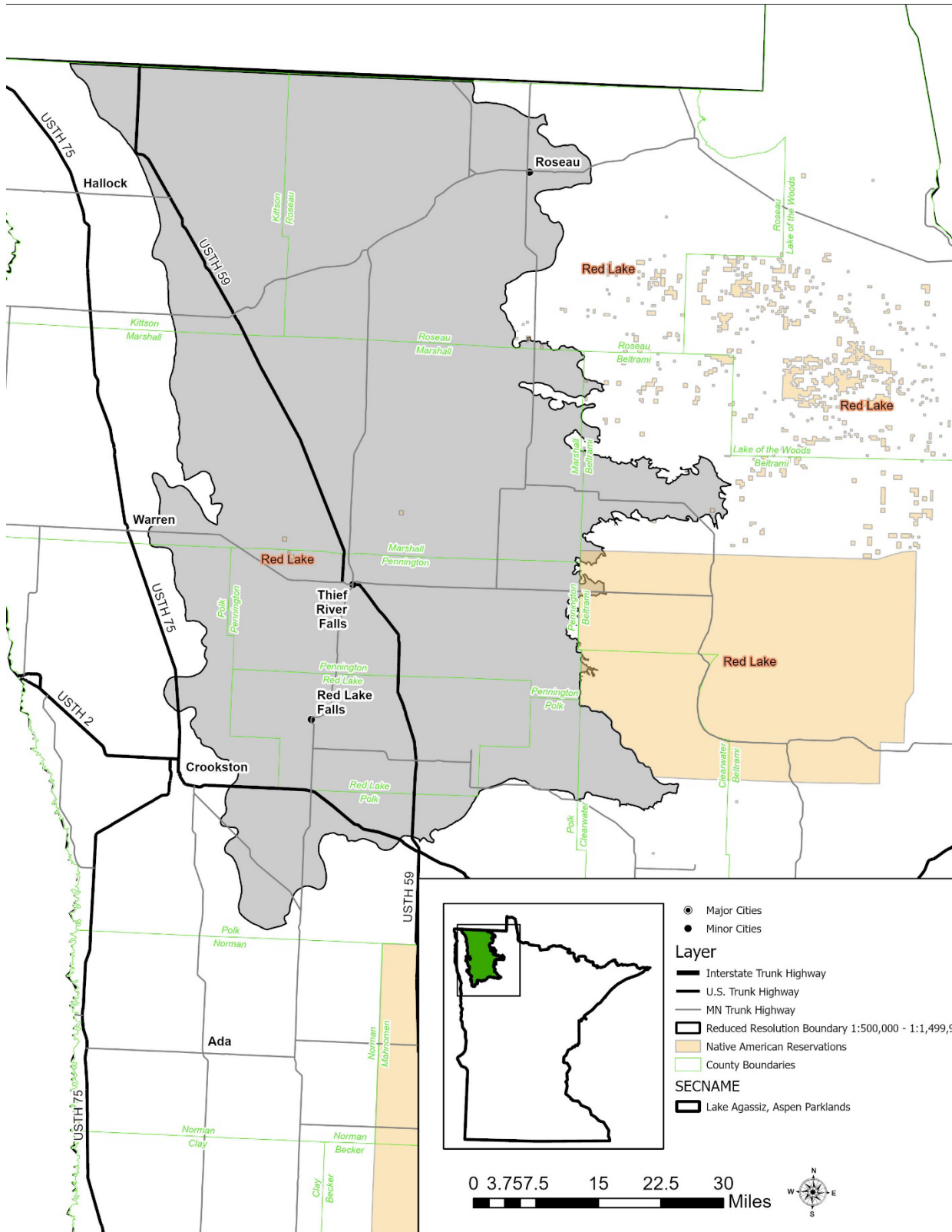
The Lake Agassiz, Aspen Parklands Section (AP), located in northwestern Minnesota, is a mix of lacustrine plain and shoreline (beach) ridges formed by Glacial Lake Agassiz, with extensive forested peatlands to the east and tallgrass prairie to the west. Low dunes, beach ridges, and wet swales mark the western edge of the AP. They provided a barrier that reduced fire frequency and intensity, resulting in increased dominance by quaking aspen, balsam poplar, and shrubs. To the east, low ridges of water-reworked till are surrounded by herbaceous wetlands. The Aspen Parklands Section in Minnesota is the southern end of the parkland landscape, which is more extensive to the north and west in the Canadian provinces of Manitoba, Saskatchewan, and Alberta.

Historical vegetation consisted of a combination of aspen savanna, tallgrass prairie, wet prairie, and dry gravel prairie (on gravelly beach ridges). Floodplain forests of silver maple, elm, cottonwood, and ash occurred along rivers and streams. Today, agriculture is the dominant land use in the southern half of the section, and extensive areas have been cleared recently for farming in the north. Still, some remnants of large contiguous patches of native plant communities, including wetlands, remain.

Almost 84% of the land is in private ownership, with approximately 16% of the land in public ownership (federal, county, state). State ownership accounts for approximately 394,000 acres. The AP Section contains a small amount (0.33%) of land owned by the Red Lake Nation.

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

Map 1 - Location of Aspen Parkland Section.



Chapter 2: Landscape Context

Land Cover Classification

The Aspen Parkland Section contains a variety of land cover classes. The most recent land cover information available, National land cover classification NLCD 2016, shows that agriculture is the largest land use in the AP. Forests and woody vegetation are the second largest land cover within the section (Table 1, Map 2).

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

NLCD Land Cover Class	Acres	Percent
Unclassified	58	0.0%
Open Water	22,871	0.8%
Developed, Open Space	70,108	2.4%
Developed, Low Intensity	17,099	0.6%
Developed, Medium Intensity	1,447	0.1%
Developed, High Intensity	340	0.0%
Barren Land	1,381	0.1%
Deciduous Forest	134,453	4.6%
Evergreen Forest	1,678	0.1%
Mixed Forest	11,516	0.4%
Shrub/Scrub	3,521	0.1%
Herbaceous	4,534	0.2%
Hay/Pasture	153,120	5.3%
Cultivated Crops	1,538,830	53.0%
Woody Wetlands	248,246	8.5%
Emergent Herbaceous Wetlands	696,978	24.0%
Grand Total	2,906,180	100.0%

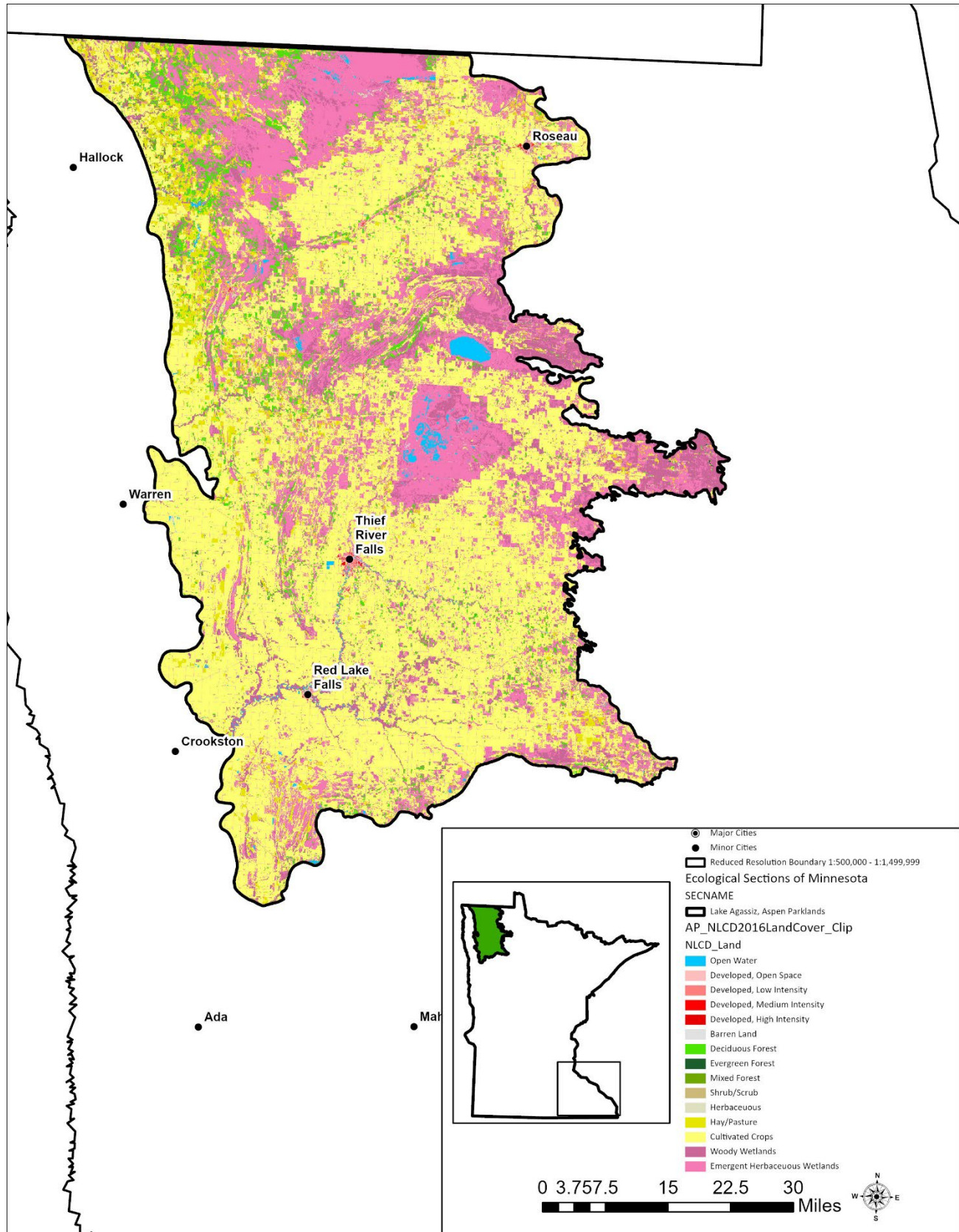
Land Ownership

The AP Section covers approximately 2.9 million acres. The majority of land (approximately 84%) is owned by private individuals. Approximately 16% of the land in the AP is public and administered by federal, county, or state government. Tribes and the Bureau of Indian Affairs own approximately 0.3% of the land in the AP Section (Table 2, Map 3).

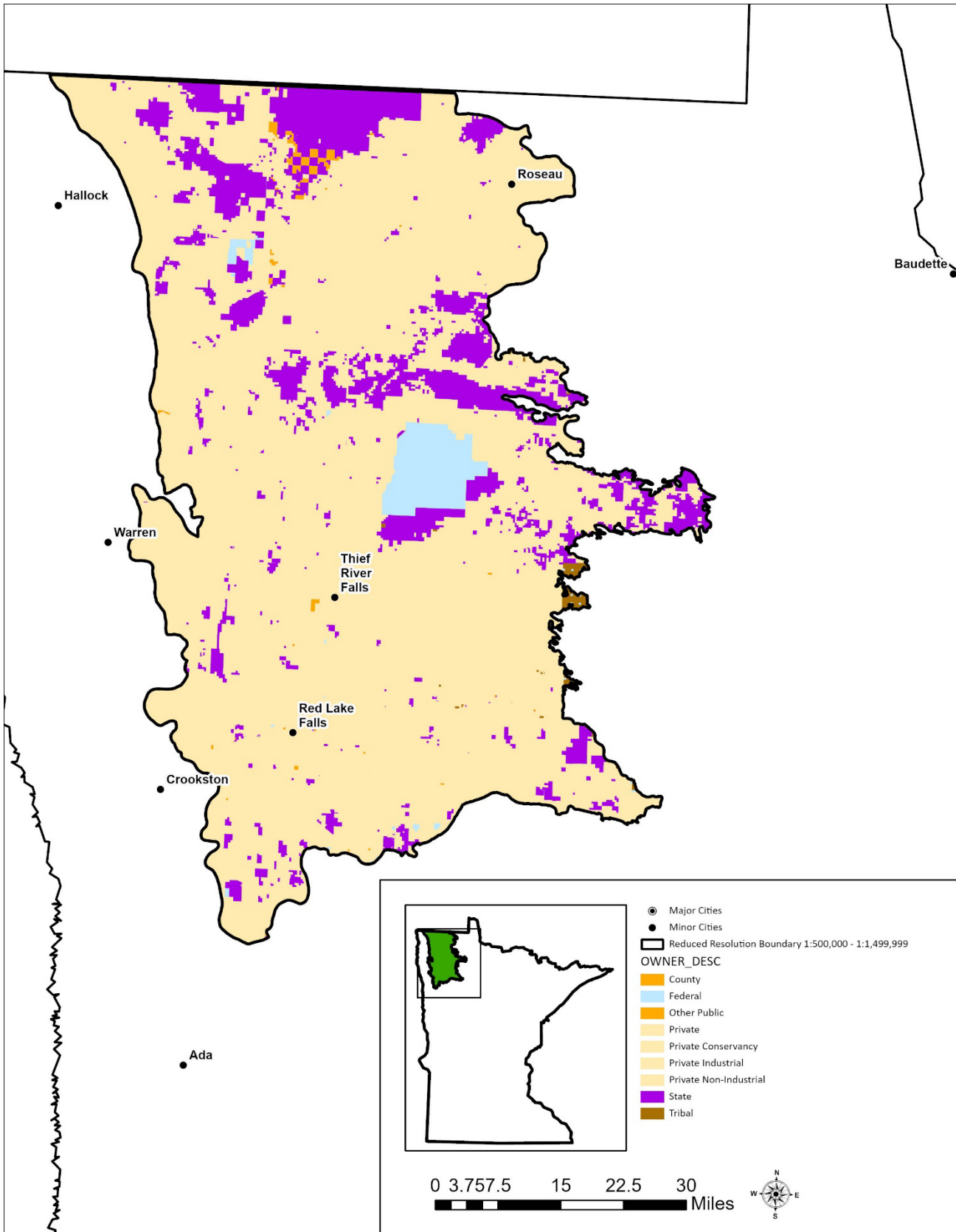
Table 2 - Land ownership/administration in the AP Section in acres (2008 GAP Stewardship data for all ownerships).

Administrator Class	Acres	Percent
County/Other Public	10,659	0.4%
Federal	68,892	2.3%
Private	2,462,773	83.6%
State	393,600	13.4%
Tribal	9,669	0.3%
Grand Total	2,945,593	100.0%

Map 2 - AP land cover (2016 National Land Cover Classification).



Map 3 - AP land ownership (GAP 2008).



Forest Cover Type Age Class Distributions

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

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

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

Species/Rotation Ages	Percent Above	Percent Below
Aspen (40)	47%	53%
Balm-of Gilead (40)	54%	46%
Birch (45)	100%	0%
Oak (60)	58%	42%
Red Pine Plantation (60)	0%	100%
Tamarack (80)	0%	100%
White Spruce Plantation (50)	0%	100%

Figure 1. Acres of all forest land by 10-year age class (2009 and 2019 FIA data).

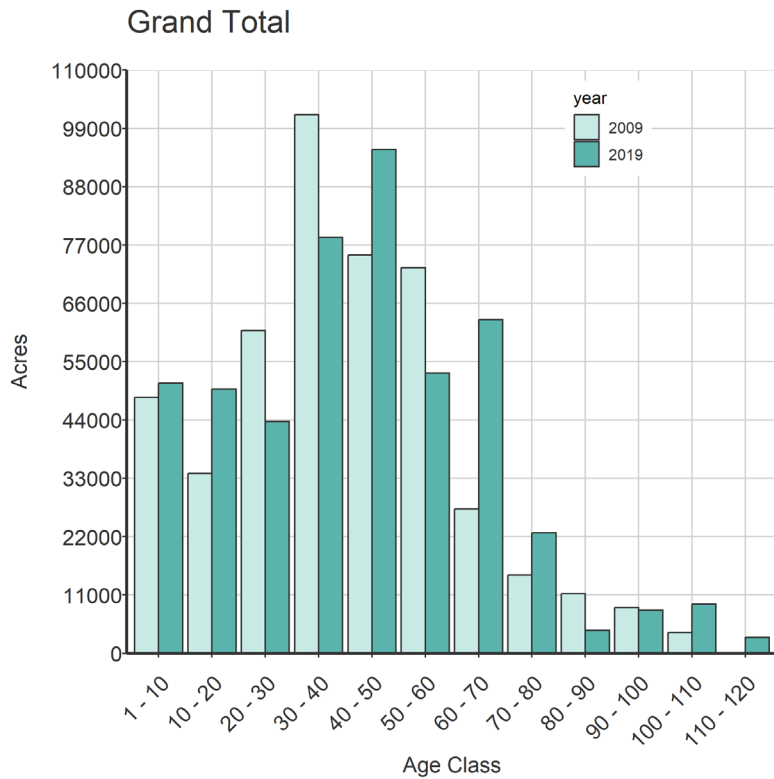


Figure 2. Acres of ash by 10-year age class (2009 and 2019 FIA data).

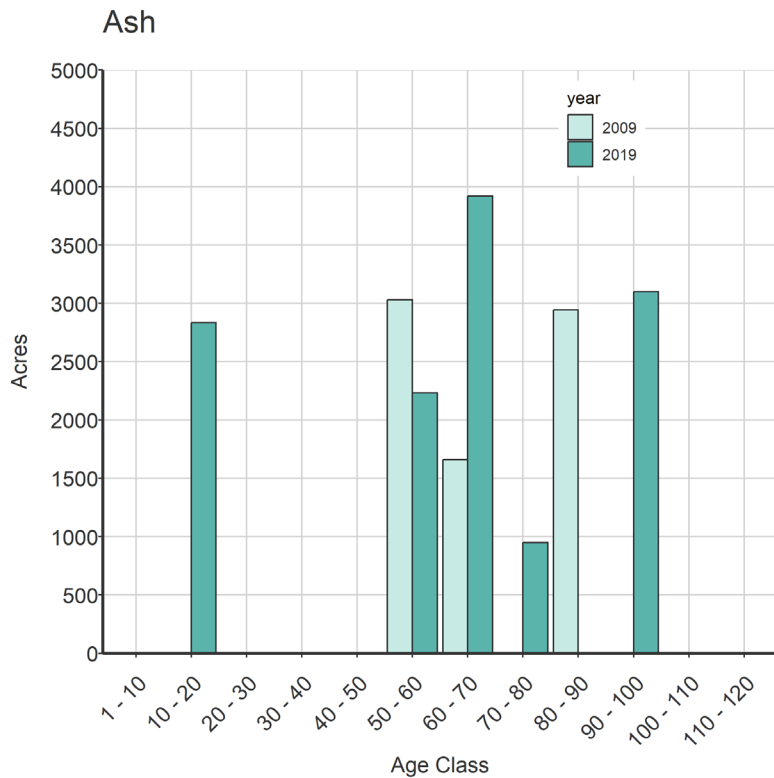


Figure 3. Acres of aspen by 10-year age class (2009 and 2019 FIA).

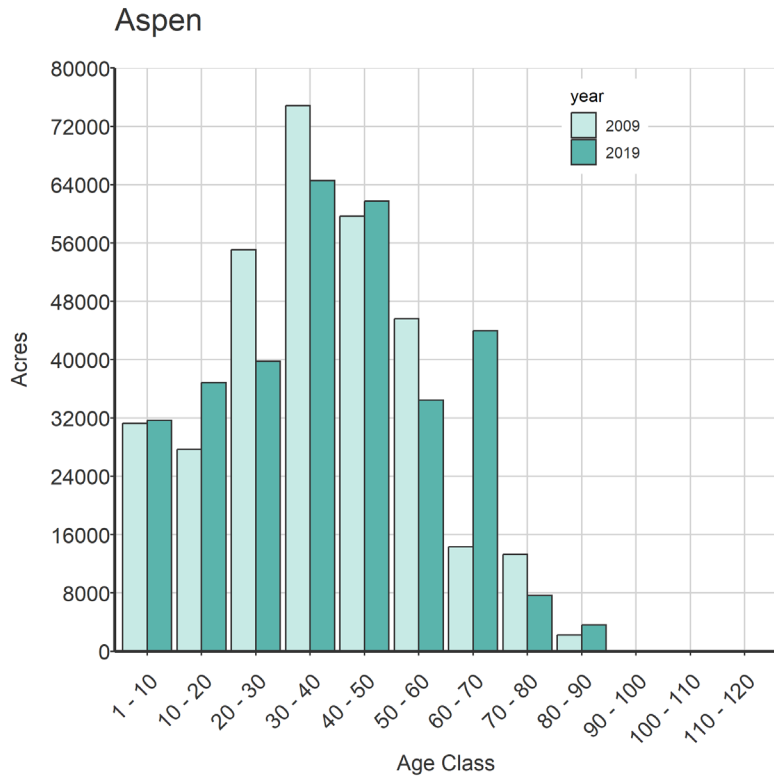


Figure 4. Acres of balsam poplar by 10-year age class (2009 and 2019 FIA).

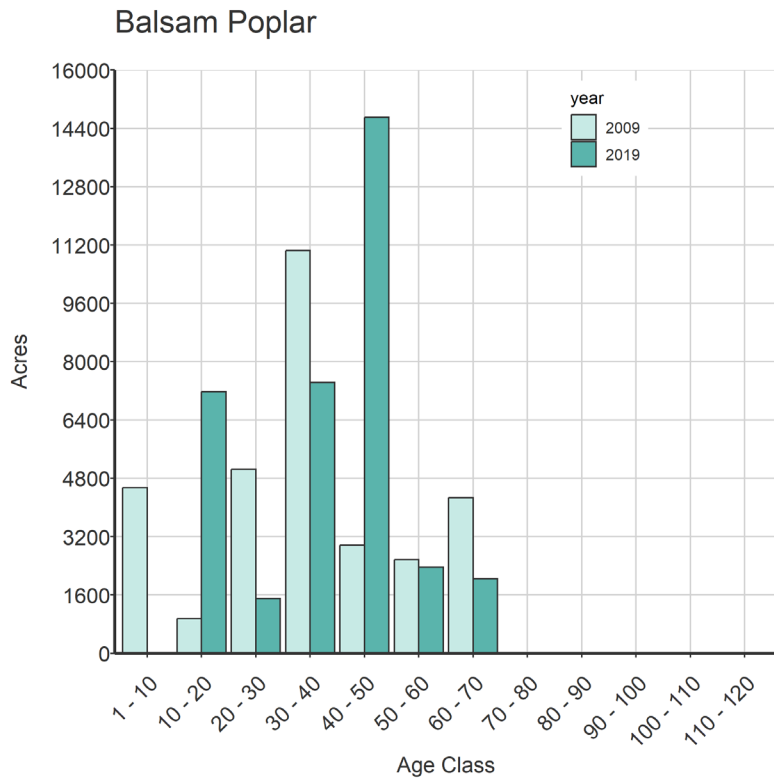


Figure 5. Acres of birch by 10-year age class (2009 and 2019 FIA).

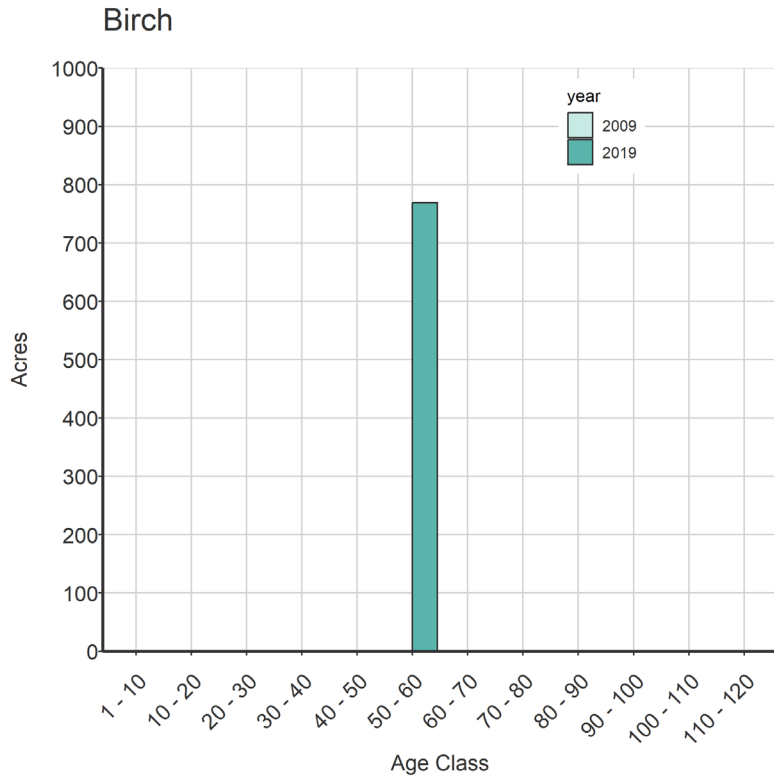


Figure 6. Acres of central hardwoods by 10-year age class (2009 and 2019 FIA).

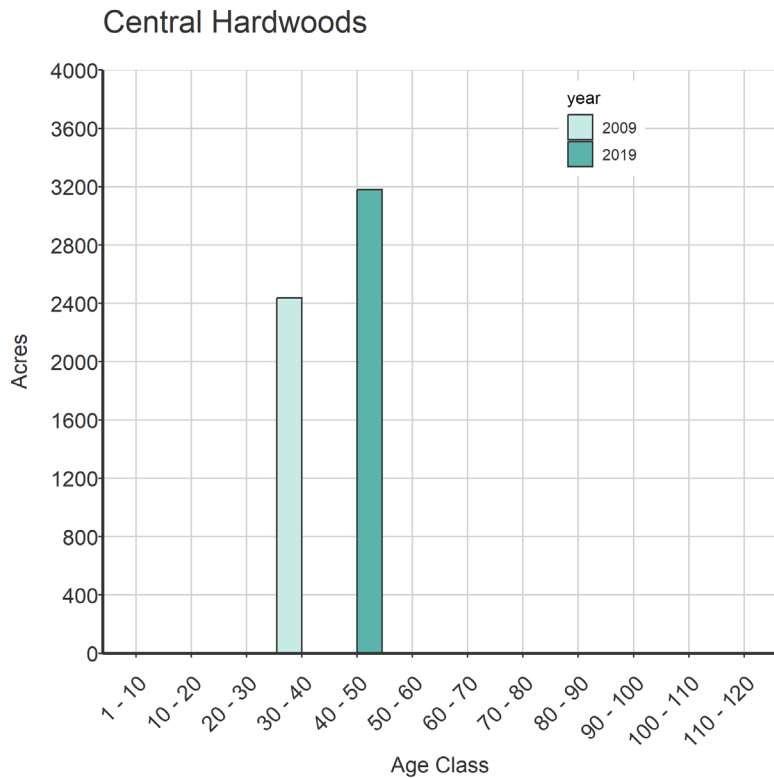


Figure 7. Acres of cottonwood by 10-year age class (2009 and 2019 FIA).

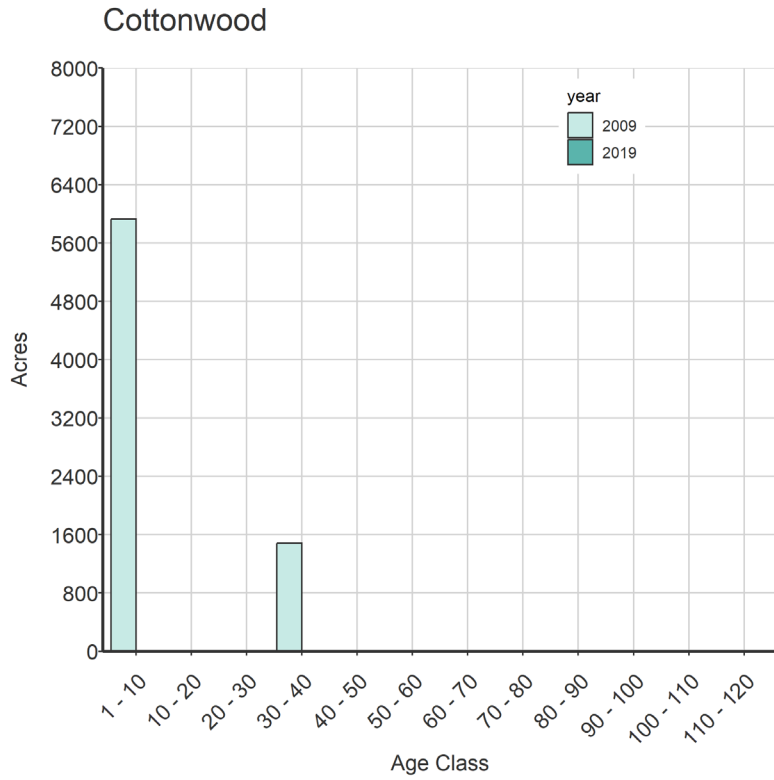


Figure 8. Acres of red pine by 10-year age class (2009 and 2019 FIA).

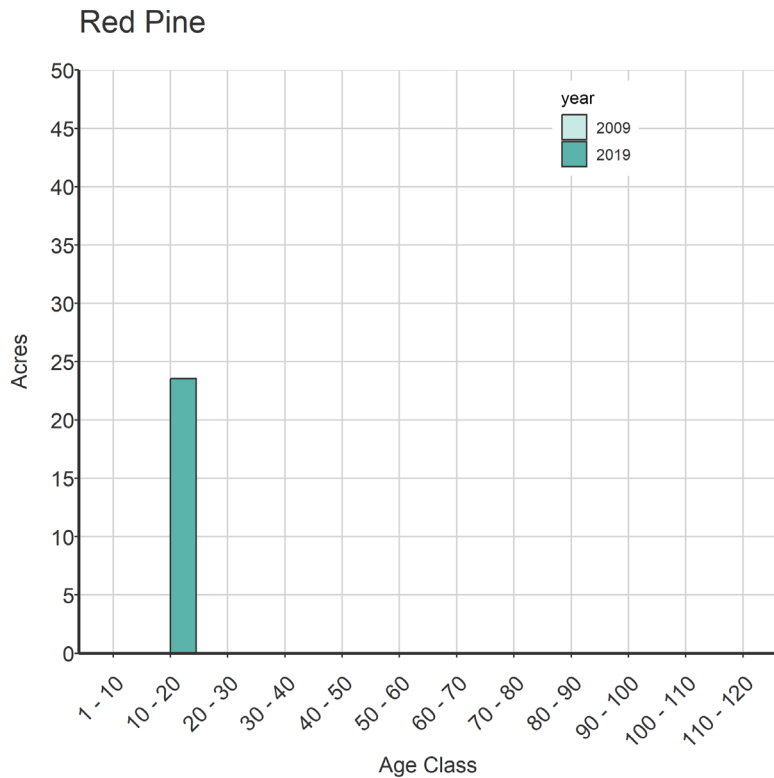


Figure 9 Acres of oak by 10-year age class (2009 and 2019 FIA).

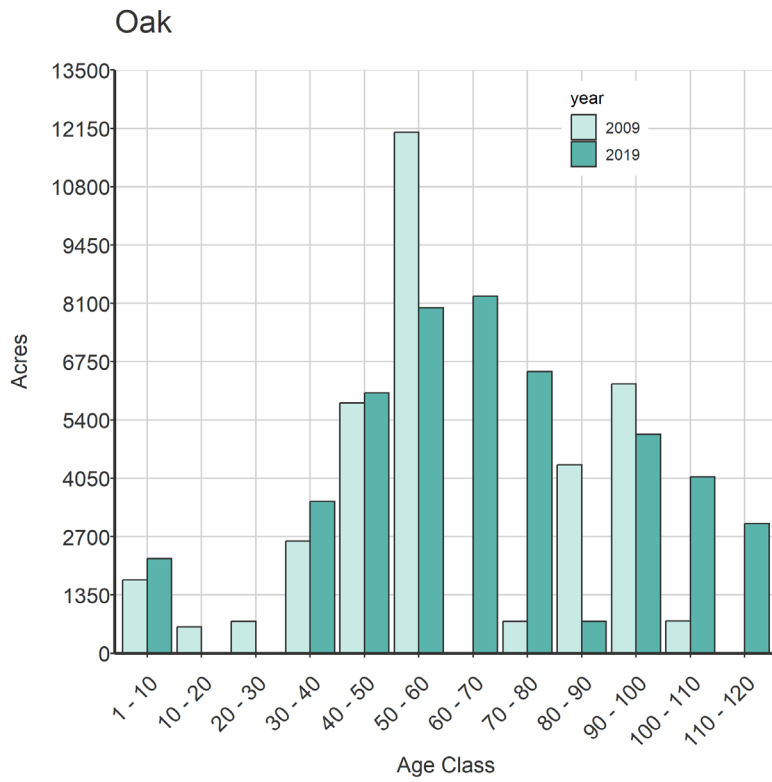


Figure 10. Acres of northern hardwoods by 10-year age class (2009 and 2019 FIA).

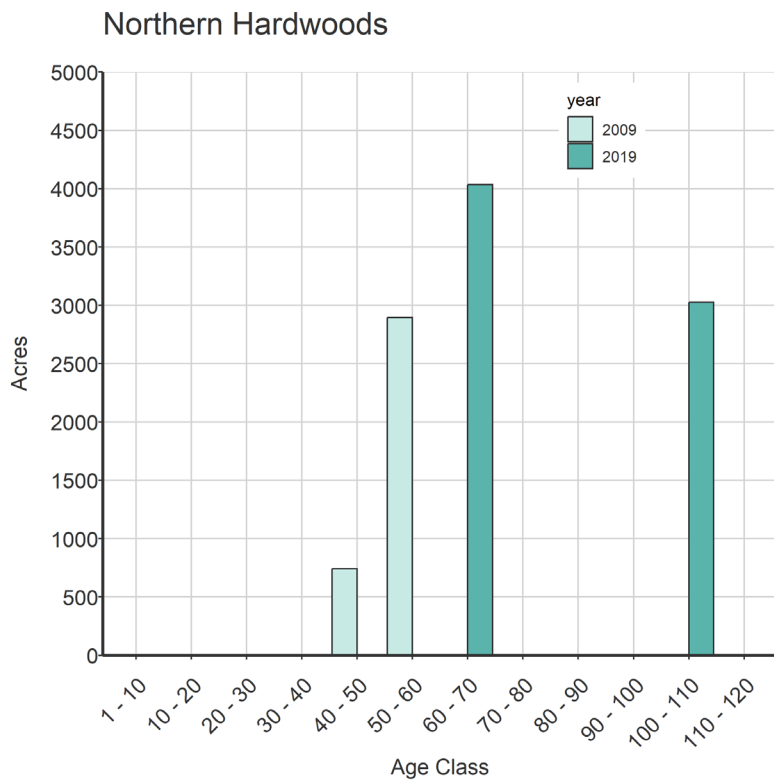


Figure 11. Acres of lowland hardwoods by 10-year age class (2009 and 2019 FIA).

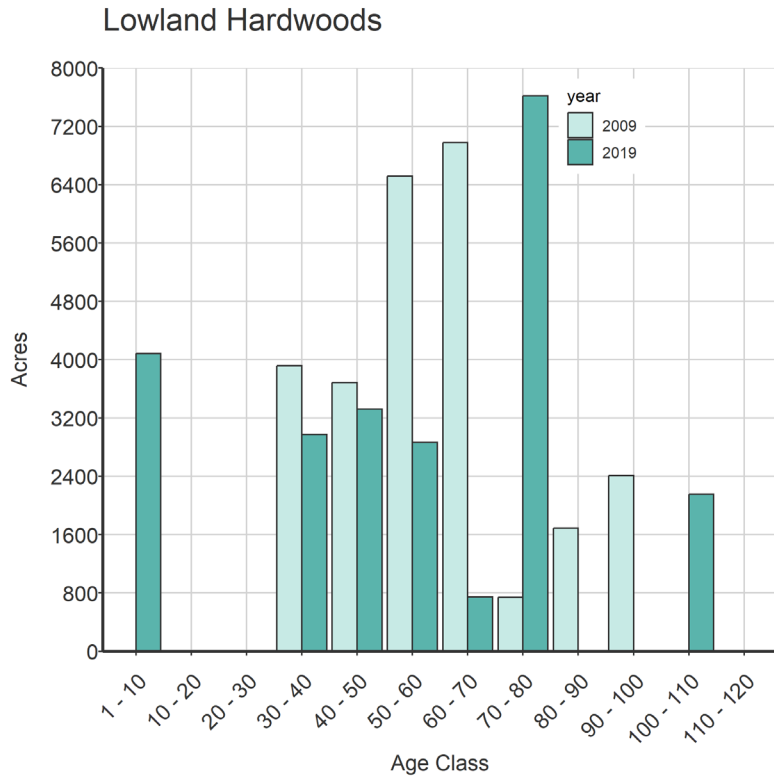
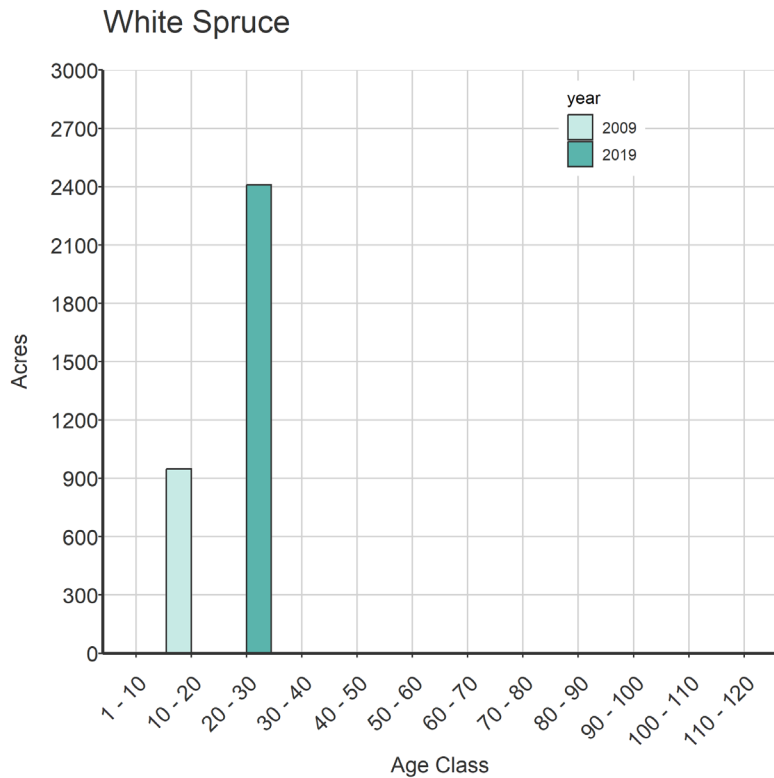


Figure 12. Acres of white spruce by 10-year age class (2009 and 2019 FIA).



Forest Biodiversity

Minnesota Biological Survey

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

Currently, within the AP Section, there are over 270,000 acres identified as MBS sites of outstanding or high biodiversity significance (Table 4). These sites contain very good to the best occurrences of the rarest species and the most functional intact landscapes.

Table 4 - Sites of biodiversity significance acres in the AP Section, summarized by ranking.

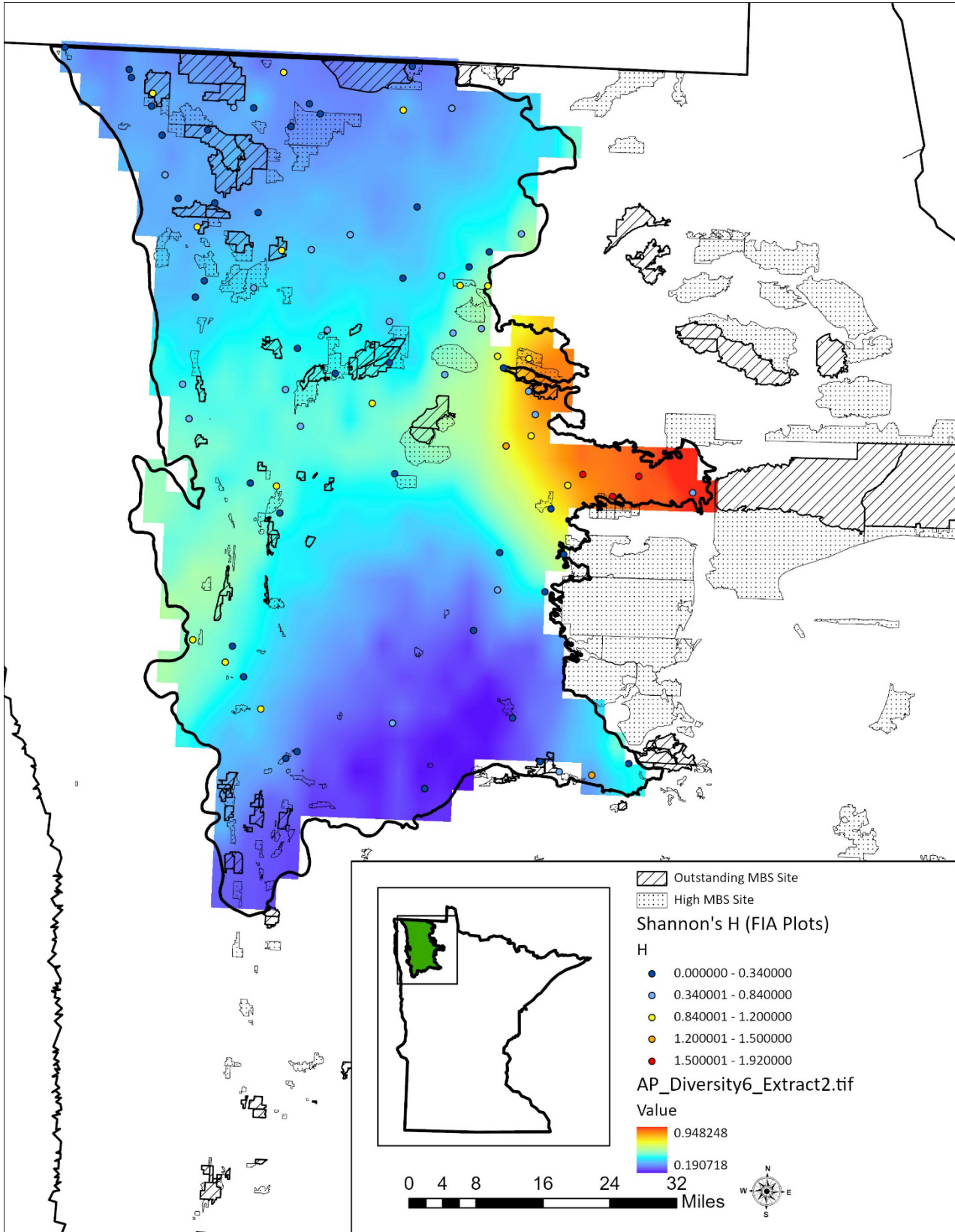
Rank	Number of Sites	Total Acres	Total State-Managed Acres
Outstanding	63	138,829	8,079
High	106	136,557	231
Moderate	348	193,526	3,467
Below	297	168,335	412

Within Stand Forest Diversity

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

Map 4 shows the estimated tree species diversity within forests in the AP Section. It shows the Shannon's H analysis of diversity along with MBS areas of outstanding and high biodiversity significance.

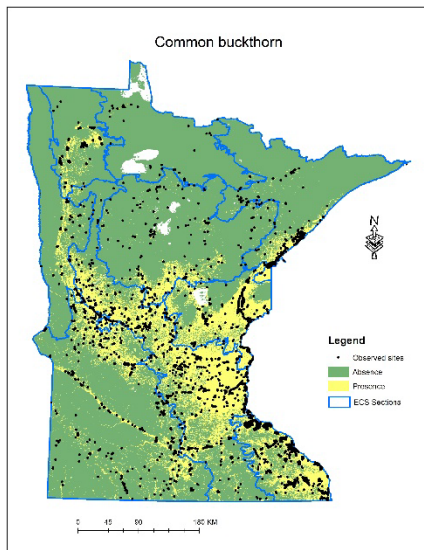
Map 4 - Estimated forest diversity and locations of MBS sites with outstanding and high biodiversity significance.



Invasive Species

Invasive species are species that are not native to Minnesota that cause economic or environmental harm or harm to human health or threaten natural resources or the use of natural resources in the state ([Minnesota Statute 84D.01](#)). Division of Forestry (DoF) manages invasive plants when they impact reforestation, wildlife habitat, recreation, and other values. Additionally, the DNR is legally required to eradicate or prevent the reproduction of certain invasive plants listed on the state [Noxious Weed list](#) (eradicate and control lists, respectively) wherever they are found on DNR property.

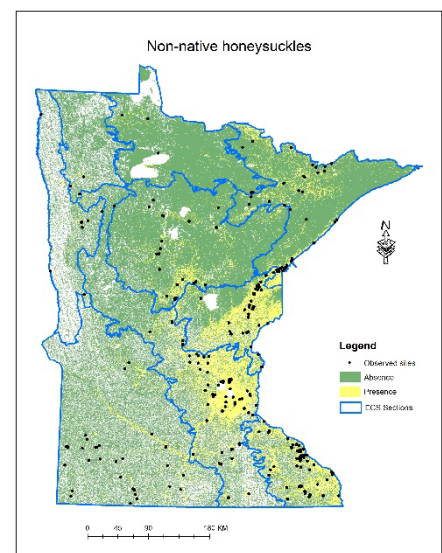
The AP Section may be the part of Minnesota with the fewest invasive plants. Therefore, it is especially important that staff, contractors, and recreationists who come into the section from elsewhere in the state arrive with clean vehicles, gear, and equipment to prevent the introduction of new invasive species. Additionally, when new populations of invasive plants are discovered in this area, it is important to work quickly to treat and control or eradicate the population to prevent it from spreading further into the section.

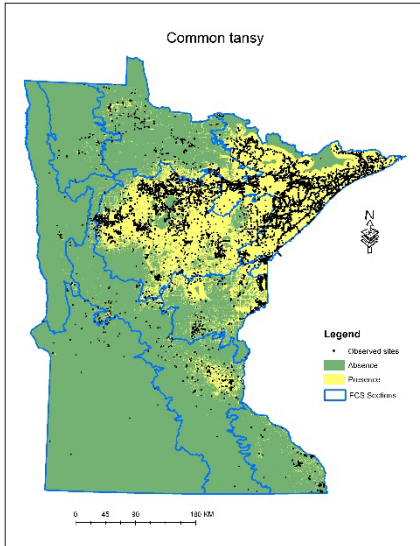


Common buckthorn is one of the most prevalent woody invasive plants in Minnesota. It grows in dense thickets, degrades habitat, and negatively impacts tree regeneration. It is expensive to manage buckthorn once it is established, so management by DoF is typically focused on stands listed for harvest in areas of dense buckthorn (because opening up the canopy can allow buckthorn to flourish and outcompete desirable tree seedlings). However, along the edges of buckthorn distribution, DoF treats scattered stems and isolated patches of buckthorn to prevent it from spreading and becoming a larger and more expensive problem. Buckthorn is not nearly as widespread in the AP as in other parts of Minnesota. Populations in this section are currently scattered and isolated, which gives land managers a great opportunity to treat small populations and prevent them from becoming large infestations. If left unmanaged, buckthorn is expected to continue to spread into and throughout this section in the coming years and change the composition of the forests.

Non-native bush honeysuckle is another woody shrub growing in dense thickets in scattered, isolated populations, especially in the southern areas of the AP Section. This species is not nearly as widespread as buckthorn, but it is a species of concern to DoF and can cause issues and require management in some locations.

Herbaceous invasive plants, including common tansy and spotted knapweed, are found in isolated populations scattered across the AP Section. DNR is required by the Noxious Weed Law to prevent

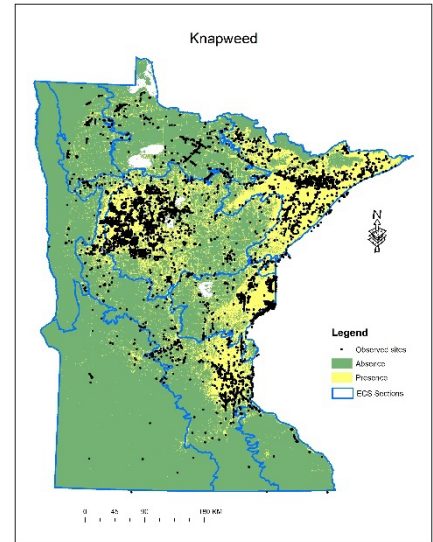




reproduction and control the spread of both species, so DoF regularly mows and sprays herbicide along forest roads where these species proliferate. Current DoF practices also focus on preventing the spread of seeds from these species to other areas of the state through permit and contract language requiring vendors to arrive with clean equipment as well as PlayCleanGo outreach campaigns to the public to encourage cleaning footwear and gear of mud, seeds, and plant parts before heading to a new recreation location.

More invasive plant populations keep being discovered, so in general, this issue appears to be getting worse. We also are aware of more populations of problematic invasive plants on DoF-administered lands than we have

available funds and personnel or contractors to manage. Invasive species do not respect property boundaries, so working with neighboring landowners (private and public) and finding ways to fund management on lands adjacent to DNR forest lands is important to successful invasive plant management across the landscape.



Insect and Disease

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

Pest or Disease	Within Aspen Parklands (AP)
Eastern Larch Beetle	X
Emerald Ash Borer	
Jack Pine Budworm	X
Larch Casebearer	
Spruce Budworm	X
Twolined Chestnut Borer	
Eastern Dwarf Mistletoe	X
Heterobasidion Root disease	
Oak Wilt	

Eastern Larch Beetle

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

Emerald Ash Borer

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

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

Jack Pine Budworm

Jack pine budworm is a native Minnesota insect that primarily feeds on jack pine, but won't hesitate to feed on white or red pine if they are present in a jack pine stand. Populations of jack pine budworm are generally found in the central to northwestern part of the state. Outbreaks in the northwest are typically cyclical, occurring roughly every 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 spruce budworm population in the Arrowhead Region. Spruce budworm typically feeds in a given zone for about eight years, which is the maximum period of time in which balsam fir can sustain defoliation before it dies. The budworm population then moves to

a different zone in northeast Minnesota. Overall, the average size of the area impacted by spruce budworm since 2000 has been about 100,000 acres.

Twolined Chestnut Borer

Twolined chestnut borer is a native beetle that feeds on the inner bark of stressed oak trees. It can cause widespread dieback and mortality of oaks after serious droughts, wind storms, or intense and repeated defoliation events. Mortality from twolined chestnut borer can occur 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.

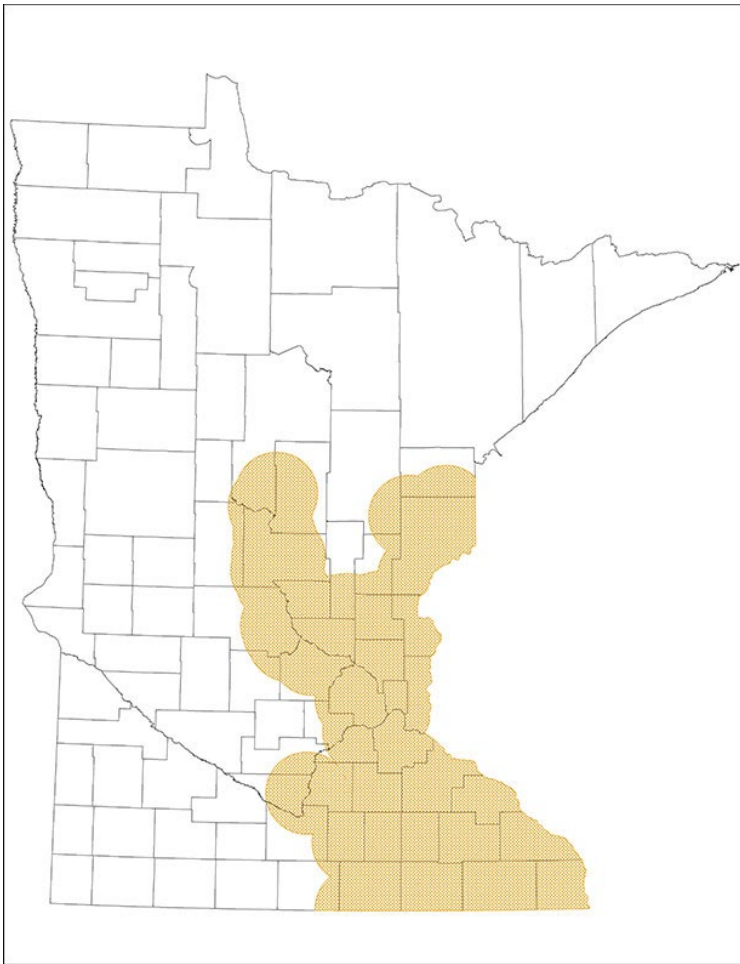
Eastern Dwarf Mistletoe

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

Oak Wilt

Oak wilt can infect and kill all species of oak, but those in the red oak group die about two months after infection. Oak wilt is widespread in the southern half of Minnesota and covers about 40% of the range of the red oak group (see map below, showing a 20-mile buffer around confirmed oak wilt disease centers). It continues to expand its range northward, and in 2021 it was discovered in Cass and Crow Wing counties for the first time. For forests dominated by oak in oak wilt's range, oak wilt infections can be prevented by not wounding oaks from early April through much of July. Find prevention and control details by consulting the DNR's [webpage on oak wilt](#) and the [oak wilt guide](#).

Map 5 - Oak wilt distribution.



Chapter 3: DNR-Administered Lands

DNR-Administered Land

The DNR administers roughly 369,000 acres of land distributed across the AP Section. The majority of the DNR lands within the AP are administered by the Division of Fisheries and Wildlife. The largest contiguous blocks of DNR-administered land are in the northern half of the section, most notably the Roseau River and Thief Lake WMAs. Lands administered by the Division of Forestry comprise ~6% of the DNR-administered land and are concentrated within the portion of the AP that intersects Beltrami County.

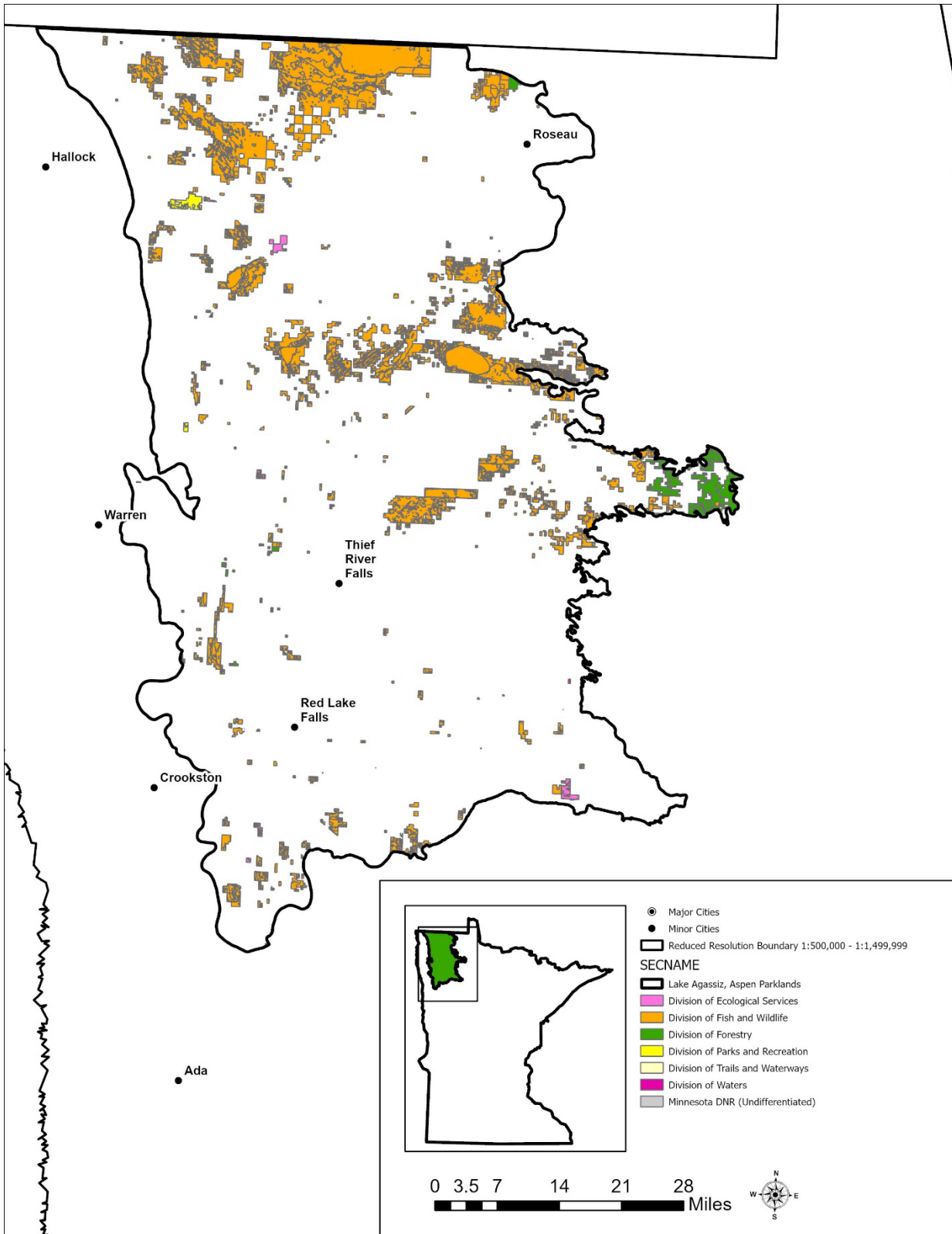
The SFRMP applies to approximately 346,385 acres of State land administered by the Divisions of Forestry and Fish and Wildlife that are in the management pool referred to as managed acres. Managed acres are timberland acres available for timber management (excluding timberlands reserved as old growth, state parks, and scientific and natural areas (SNAs), inoperable stands, etc.)

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

Table 5- DNR administration of land within the AP (2008 GAP).

DNR Administrator	Acres	Percent
Division of Ecological Services	4,369	1.2%
Division of Fish and Wildlife	338,180	91.7%
Division of Forestry	22,291	6.0%
Division of Parks and Recreation	3,093	0.8%
Division of Trails and Waterways	85	0.0%
State (Undifferentiated)	865	0.2%
Grand Total	368,883	100.0%

Map 6 - Location DNR-administered lands within the AP.



Forest Composition

Between 2010 and 2021, the total amount of land administered by the DNR, as represented within the Forest Inventory Module (FIM), decreased by 15.5%. The two largest cover types, aspen/Balm-of-Gilead and open landscapes (i.e., grass and brush) have also decreased. Table 6 shows the change in acres for forest cover types within the AP on lands administered by the DNR.

Table 6 - Change in cover types (2010 and 2021 FIM).

Cover Type	Total Acres 2010	Total Acres 2021	Percent Change
Ash/Lowland Hardwoods	3,920	3,590	-8.4%
Aspen/Balm of Gilead	108,465	93,079	-14.2%
Balsam Fir	171	116	-31.9%
Birch	94	113	20.0%
Black Spruce (lowland)	389	352	-9.3%
Black Spruce (upland)	30	23	-22.5%
Cottonwood	156	122	-21.9%
Hybrid Poplar	5	5	0.0%
Jack Pine	408	408	0.2%
Northern Hardwoods	512	451	-11.8%
Northern White Cedar	431	376	-12.7%
Norway Pine	223	228	2.1%
Oak	1,128	1,921	70.3%
Offsite Aspen	946	783	-17.2%
Offsite Oak	3,466	2,857	-17.6%
Stagnant Tamarack	143	45	-68.6%
Tamarack	5,217	3,136	-39.9%
White Pine	4	3	-19.4%
White Spruce	306	300	-1.9%
Willow	140	29	-79.5%
Forested Total	126,151	107,937	-14.4%
Agricultural	6,664	4,995	-25.0%
Duff	8	8	0.0%
Industrial Urban Development	831	978	17.6%
Marsh	49,879	24,136	-51.6%
Muskeg	1,581	188	-88.1%
Non-permanent water	540	357	-33.8%
Open Landscapes (upland and lowland grass and brush)	220,228	210,925	-4.2%
Permanent Water	19,434	10,004	-48.5%
Recreation Development	100	100	0.0%
Roads	920	821	-10.7%
Nonforested Total	300,185	252,513	-15.9%
Grand Total	426,335	360,450	-15.5%

State Land Cover Type Age Class Distributions

These charts show current age class distributions for cover types on DNR-administered lands in the Aspen Parklands 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). Note the y-axis on all charts is variable to be able to show certain cover types that have very small acreages within the section.

Figure 13 – Ash/lowland hardwoods 10-year age class distribution.

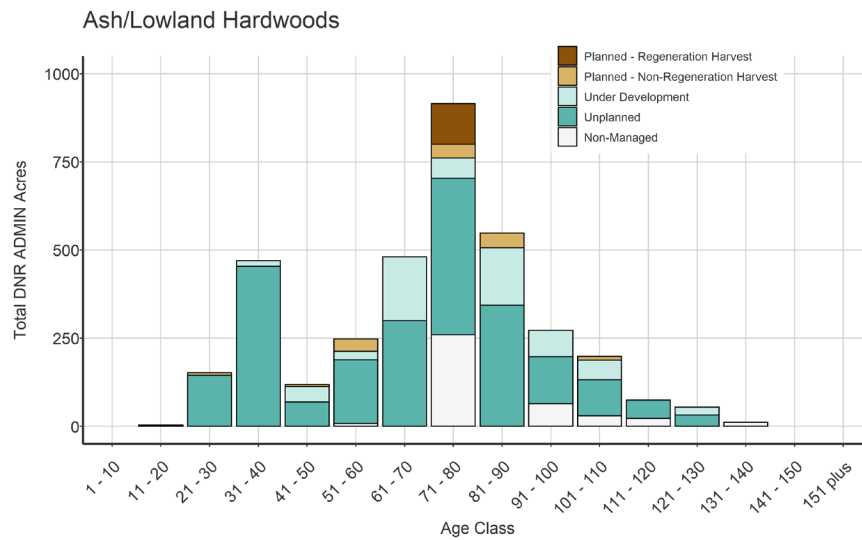


Figure 14 - Aspen 10-year age class distribution.

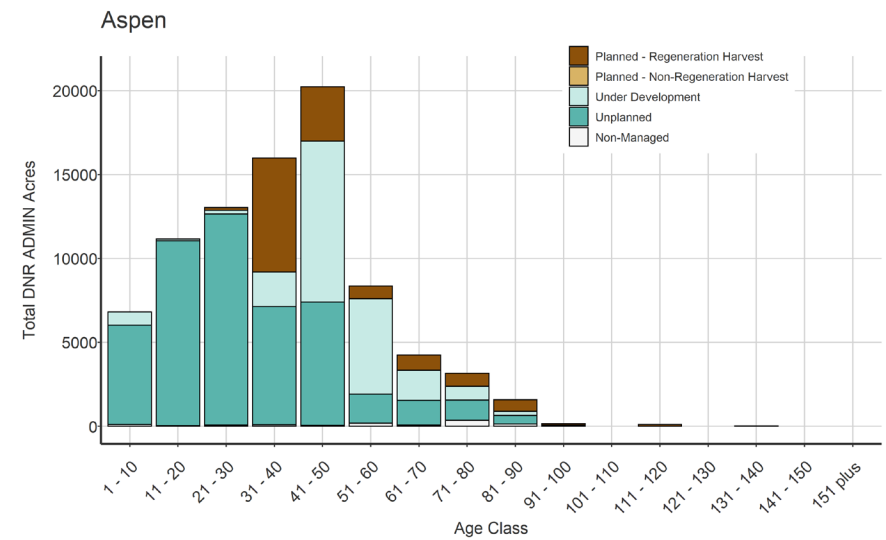


Figure 15 - Birch 10-year age class distribution.

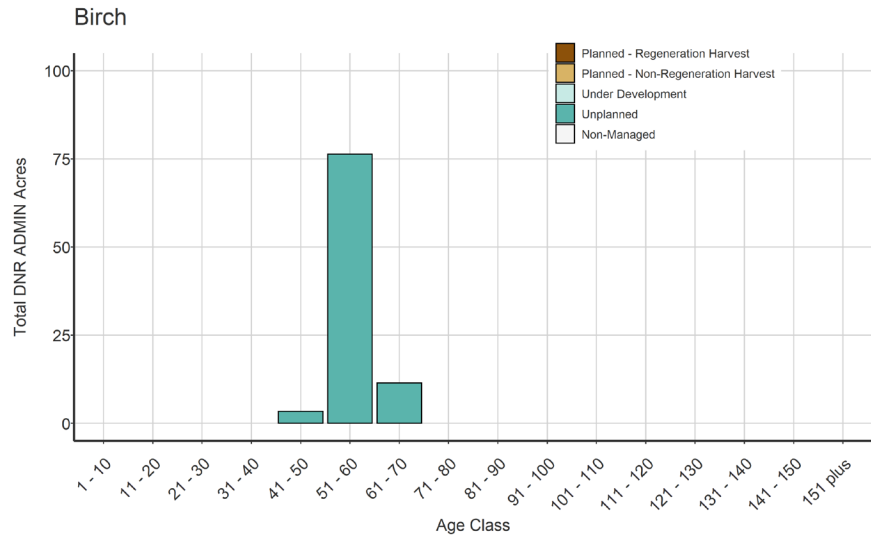


Figure 17 - Northern hardwoods 10-year age class distribution.

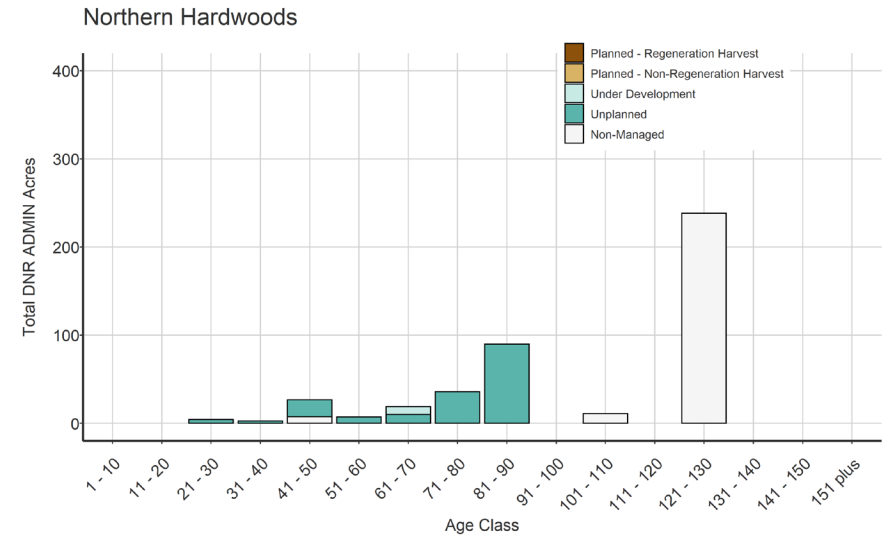


Figure 16 - Central hardwoods 10-year age class distribution.

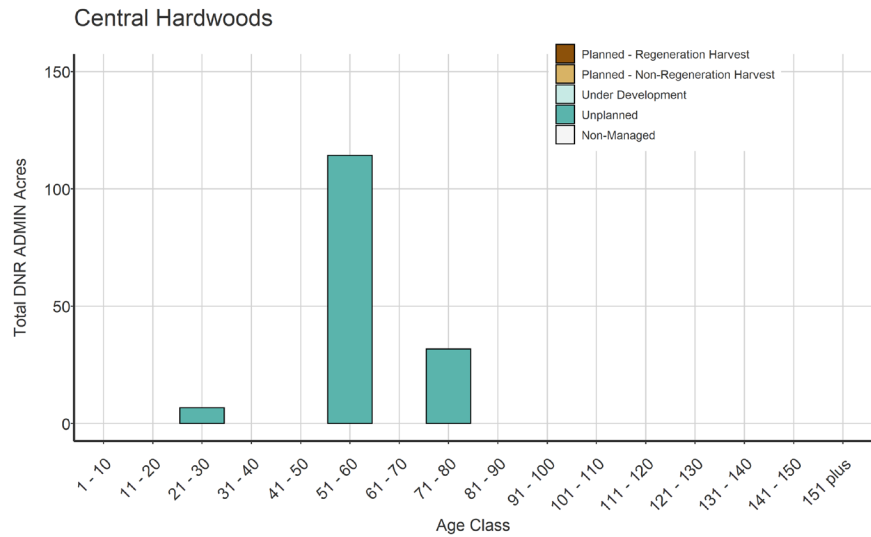


Figure 18 - Oak 10-year age class distribution.

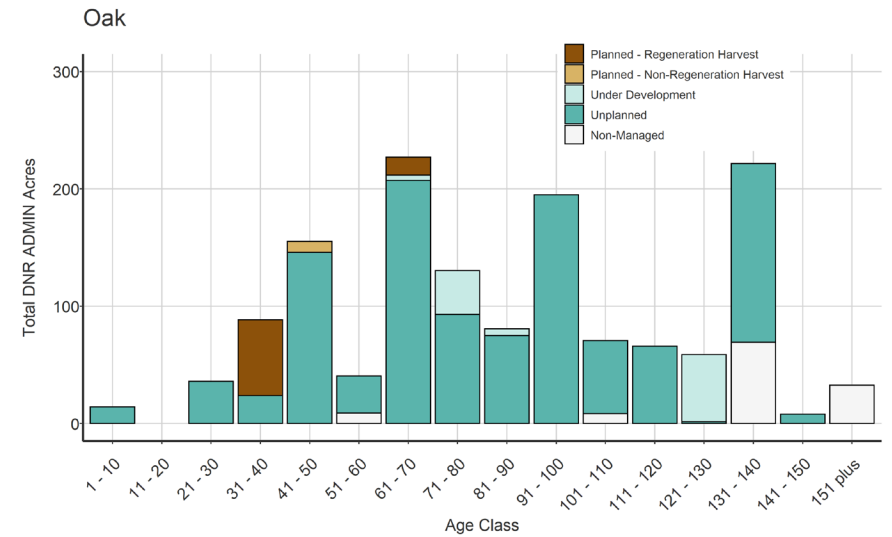


Figure 19 - White pine 10-year age class distribution.

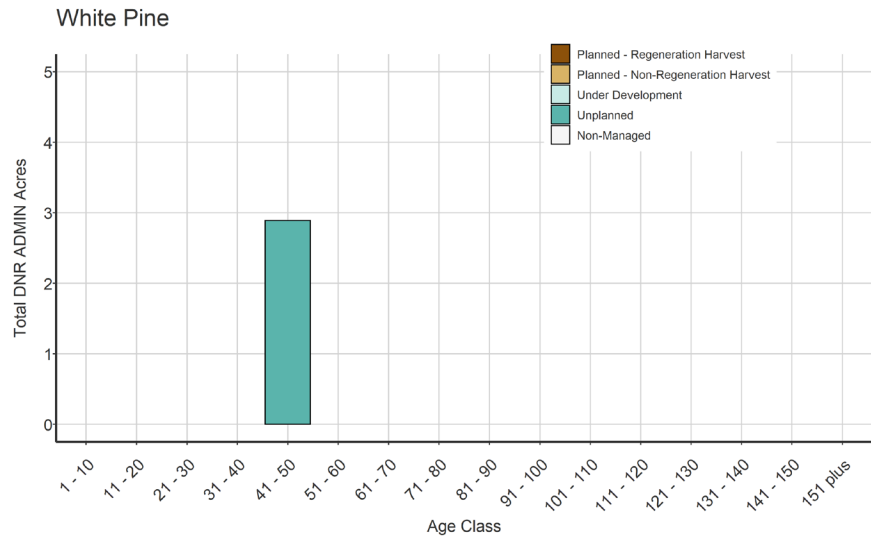


Figure 21 - Red pine plantation 10-year age class distribution.

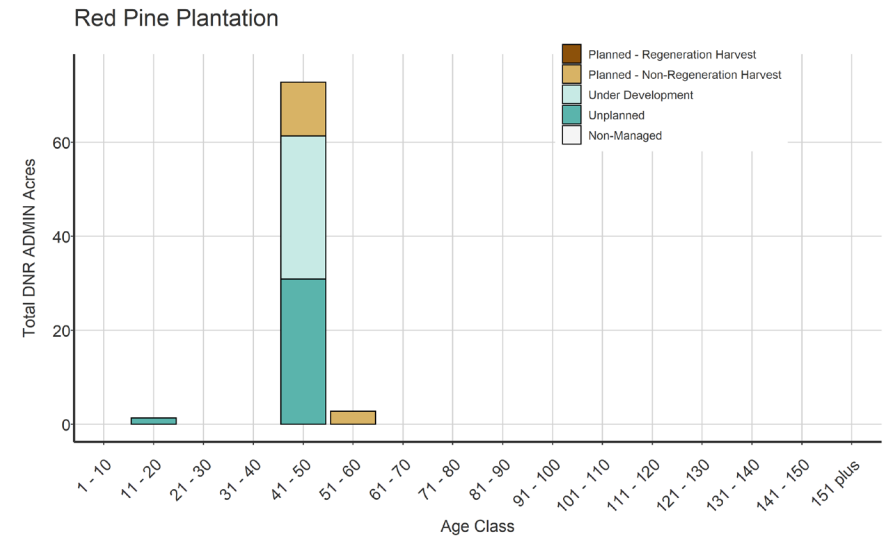


Figure 20 - Tamarack 10-year age class distribution.

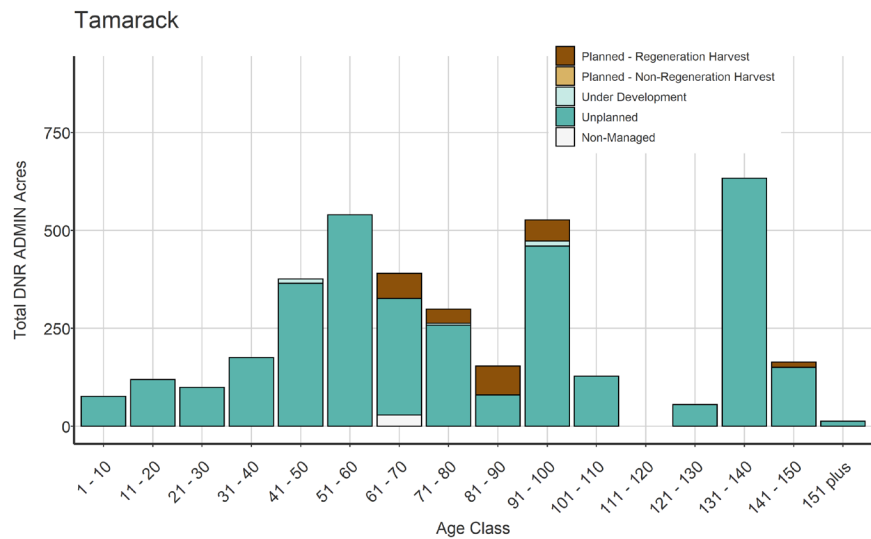
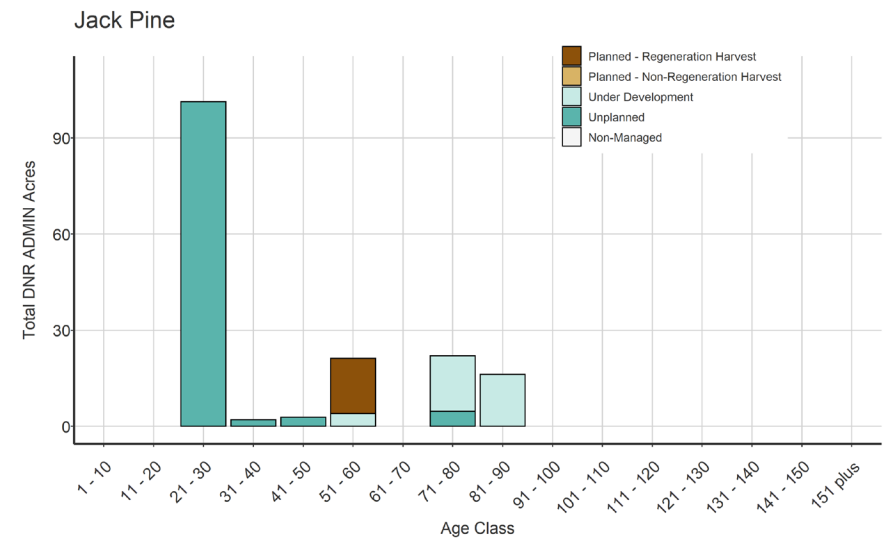


Figure 22 - Jack pine 10-year age class distribution.



Forests Above and Below Rotation Age

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

Table 7 - Percent forest above and below rotation age (2021 FIM).

Forest Type	SI	RA	% Above Rotation Age (Managed Acres)	% Below Rotation Age (Managed Acres)	% Above Rotation Age (Total Acres)	% Below Rotation Age (Total Acres)	Total Managed Acres	Total Acres
Oak	75 +	60	43.0%	57.0%	43.0%	56.8%	25	25
Balsam Fir	NA	45	46.0%	54.0%	46.9%	54.0%	115	116
Birch	NA	45	97.2%	2.8%	97.7%	2.8%	112	113
White Spruce Plantations	NA	50	18.5%	81.5%	18.5%	81.9%	268	269
Jack Pine	NA	50	14.3%	85.7%	14.3%	85.7%	408	408
Tamarack	< 40	100	49.5%	50.5%	49.5%	50.9%	1,176	1,180
Tamarack	40 +	80	37.0%	63.0%	37.0%	63.0%	1,956	1,956
Lowland Black Spruce	23-29	120	26.3%	73.7%	30.2%	88.1%	2,160	2,555
Lowland Black Spruce	40+	80	26.3%	73.7%	30.2%	88.1%	2,160	2,555
Lowland Black Spruce	30-39	100	8.4%	91.6%	10.1%	94.1%	6,735	7,016
Oak	< 75	60	69.6%	30.4%	76.8%	31.4%	1,753	1,896
Aspen/Balm-of Gilead	65 +	40	24.8%	75.2%	25.1%	75.4%	13,620	13,693
Aspen/Balm-of Gilead	< 65	50	15.1%	84.9%	16.3%	86.2%	77,480	79,386

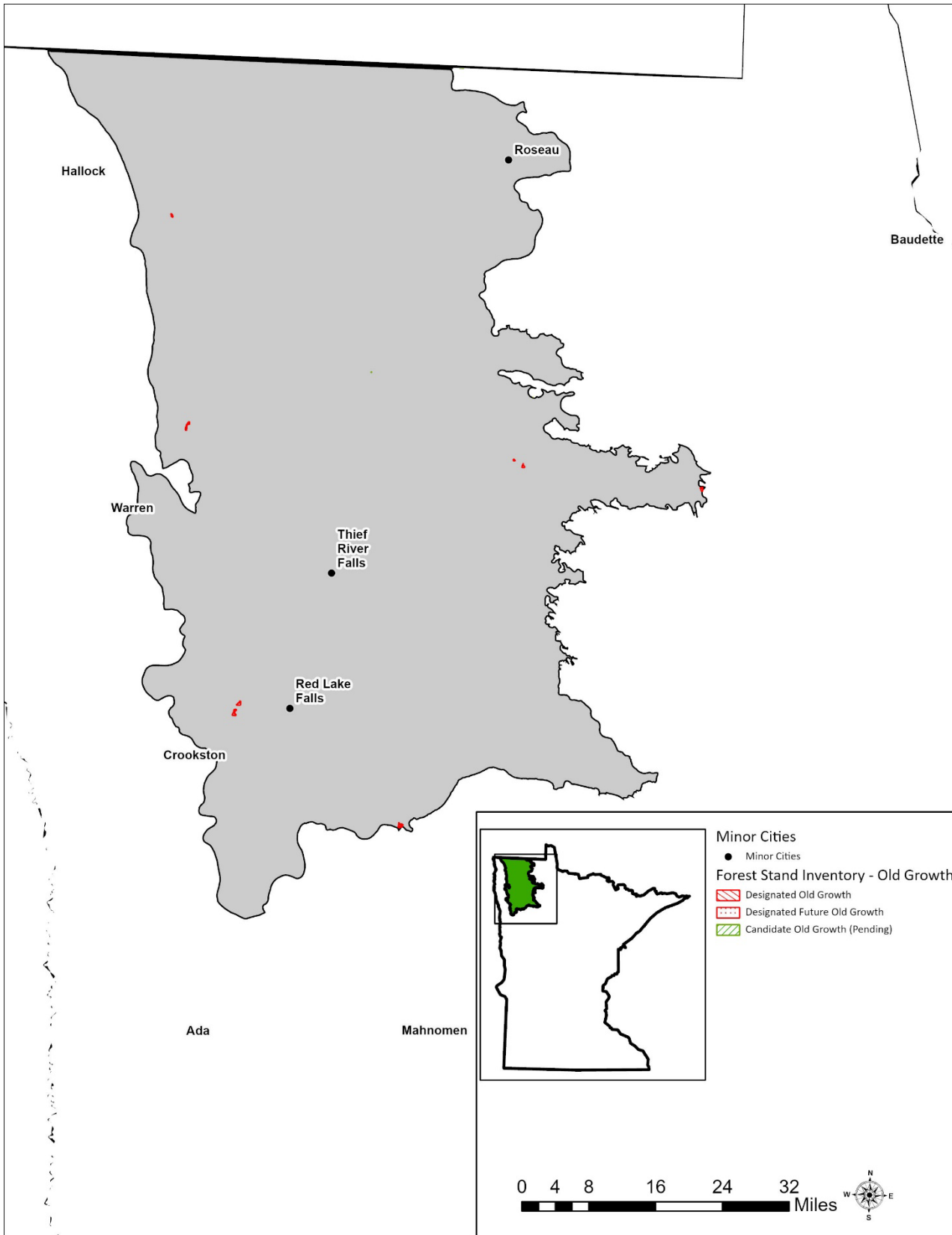
Old-Growth Forests

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

Table 8 - Designated old growth and future old growth by forest type in the AP.

Cover Type	Candidate Old Growth	Designated Old Growth	Grand Total
Ash		172.4	172.4
Lowland Hardwoods		79.7	79.7
Northern Hardwoods		117.8	117.8
Oak		176.7	176.7
Black Spruce (Lowland)	2.8		2.8
Grand Total	2.8	546.6	549.4

Map 7 - Designated old growth.



Chapter 4: Resource Conditions

Ecological Description of the Lake Agassiz, Aspen Parklands Section

The Lake Agassiz, Aspen Parklands Section (AP) is composed of a single landform, the basin of Glacial Lake Agassiz. About 60% of the section consists of sandy deposits from the shallow portions of Glacial Lake Agassiz. About 12% of these sandy deposits are beach ridges or complexes of shoreline deposits that mark successively lower levels of the glacial lake as it drained. Loamy till deposited by glacial ice and then inundated and flattened by wave action forms about 30% of the section. Clay and silt deposited in the deeper portions of the glacial lake cover about 10% of the section.

There is no clear correlation between vegetation and parent material, as transitions between landforms are gradual. Historic patterns of vegetation appear mostly related to frequency and intensity of fire, which were influenced by variation in water table and soil moisture. The historic patchiness of fire created a complex mosaic of prairies, brushland, woodlands, and forests on uplands, and wet prairies, meadows, fens, and wet forests in wetlands. Upland prairie and wetland prairie communities were most extensive, covering 40% of the section. Wet meadow and marsh communities were common in seasonally wet depressions, occupying 14% and 7% of the section, respectively. (Source: [DNR Lake Agassiz, Aspen Parklands](#))

Areas where the regional water table was at the land surface supported open rich peatland, forested rich peatland, and wet forest communities. These open and forested wetlands covered 10% of the section. Fire-dependent forest/woodland communities were present where seasonally wet depressions, peatlands, and river valleys isolated upland sites from fire, enabling survival of trees. These woodland communities covered 22% of the AP and were variously described by early land surveyors in Minnesota as brush, brush with scattered timber, or timber, depending on length of time since the last fire on the site. Mesic hardwood forest and floodplain forest communities were present on sites exceedingly well protected from fire and were rare in the section.

Subsections are units within Sections that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants, especially trees. The Aspen Parklands Subsection comprises the entirety of the AP Section in Minnesota.

Water Resources

Lakes are rare in the AP, although there are numerous meandering streams and rivers throughout the section. Flooding can be a problem due to level topography. The major river is the Roseau River, which flows through the northern quarter of the AP and into Canada.

The AP Section contains part or the entirety of 11 of Minnesota's 81 major watersheds (Table 9). The land management decisions made across this landscape can have important implications for the quality and quantity of water resources in the region. A suite of watershed health index scores has been calculated that represent many of the important ecological relationships within and between five different components (biology, connectivity, geomorphology, hydrology, and water quality). These scores are built on statewide GIS data that is compared consistently across Minnesota to provide a baseline health condition report for each of the major watersheds in the state. See the [Watershed Health Assessment Framework website](#) for more information.

Table 9 - HUC 8 watersheds within the AP.

Watershed Name	Acres	Square Miles	Mean Health Score
Clearwater River	382,327	597	50
Rapid River	1,280	2	76
Red Lake River	507,326	793	58
Red River of the North - Grand Marais Creek	63,094	99	68
Red River of the North - Sandhill River	33,420	52	63
Red River of the North - Tamarac River	212,271	332	49
Roseau River	315,026	492	50
Snake River	286,578	448	85
Thief River	513,005	802	51
Two Rivers	590,508	923	59
Upper/Lower Red Lake	1,342	2	68

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

Minnesota's Endangered Species Statute ([Minnesota Statute 84.0895 Protection of Threatened and Endangered Species](#)) requires the Minnesota DNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern (ETS). The resulting List of Endangered, Threatened, and Special Concern Species ([Minnesota Rare Species Guide](#)) is codified as [Minnesota Rules, Chapter 6134](#). The Endangered Species Statute also authorizes the DNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are codified as Minnesota Rules, Parts [6212.1800](#) to [6212.2300](#).

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

Note that the federal Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544; see the [U.S. Fish & Wildlife Service - Endangered Species Act webpage](#)) requires the U.S. Department of the Interior to identify species as endangered or threatened according to a separate set of definitions, and imposes a separate set of restrictions for those species. Within Minnesota there are currently 21 species with federal designations of endangered, threatened, or experimental population.

Table 10 - Federal listed species within Minnesota², species with asterisks* have ranges within the Aspen Parklands.

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

Minnesota Natural Heritage Information System

Records of known locations of listed species and other rare features are maintained in the Minnesota Natural Heritage Information System (NHIS). All DNR offices have this information available for review prior to forest management activities to determine if a known location of a rare species is in the vicinity of a stand. When reviewing forest stands for management activities during the planning process, this information will be available

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

when assigning stand prescriptions. If an ETS species is known to exist or found on a site, management activities are modified to protect, promote, or enhance the ETS species on the site.

Survey Methods

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

- review of existing information
- selection of targeted species and survey sites
- field survey using techniques appropriate to the species
- information management

A more detailed description of rare plant and animal survey procedures can be found in the [Minnesota Biological Survey](#) webpage.

Minnesota Listed Species

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

Information on the ETS species documented within the AP Section is presented below in Table 11. To understand the table it is useful to know what the state ranking of endangered, threatened, and special concern mean.

Rank Key for Tables 11.

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

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

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

Additional information on the conservation status ranks (S-rank, G-rank) used in Table 11 can be found online at [NatureServe Conservation Status](#).

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

Table 11 - Known occurrences of Minnesota listed species in the AP Section.

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Achillea alpina</i>	Siberian Yarrow	Vascular Plant	THR	S2	G5
<i>Acipenser fulvescens</i>	Lake Sturgeon	Vertebrate Animal	SPC	S3	G3G4
<i>Ammodramus bairdii</i>	Baird's Sparrow	Vertebrate Animal	END	S1B,SNRM	G4
<i>Ammodramus henslowii</i>	Henslow's Sparrow	Vertebrate Animal	END	S1B	G4
<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Vertebrate Animal	SPC	S3B	G5
<i>Anaxyrus cognatus</i>	Great Plains Toad	Vertebrate Animal	SPC	S3	G5
<i>Androsace septentrionalis</i>	Northern Androsace	Vascular Plant	SPC	S3	G5
<i>Antennaria parvifolia</i>	Small-leaved Pussytoes	Vascular Plant	SPC	S3	G5
<i>Anthus spragueii</i>	Sprague's Pipit	Vertebrate Animal	END	S1B,SNRM	G3G4
<i>Argynnis idalia</i>	Regal Fritillary	Invertebrate Animal	SPC	S3	G3?
<i>Aristida purpurea var. longiseta</i>	Red Three-awn	Vascular Plant	SPC	S3	G5T5?
<i>Asio flammeus</i>	Short-eared Owl	Vertebrate Animal	SPC	S3B	G5
<i>Athene cunicularia</i>	Burrowing Owl	Vertebrate Animal	END	S1B,SNRM	G4
<i>Avenula hookeri</i>	Spike Oat	Vascular Plant	SPC	S3	G5
<i>Boechera collinsii</i>	Collins' Rock Cress	Vascular Plant	THR	S1	G5
<i>Botrychium ascendens</i>	Upswept Moonwort	Vascular Plant	END	S1	G3
<i>Botrychium campestre</i>	Prairie Moonwort	Vascular Plant	SPC	S3	G3G4
<i>Botrychium gallicomontanum</i>	Frenchman's Bluff Moonwort	Vascular Plant	END	S1	G2
<i>Botrychium lineare</i>	Slender Moonwort	Vascular Plant	END	S1	G3
<i>Botrychium lunaria</i>	Common Moonwort	Vascular Plant	THR	S2	G5
<i>Botrychium minganense</i>	Mingan Moonwort	Vascular Plant	SPC	S3	G5
<i>Botrychium pallidum</i>	Pale Moonwort	Vascular Plant	SPC	S3	G3
<i>Botrychium simplex</i>	Least Moonwort	Vascular Plant	SPC	S3	G5
<i>Botrychium spathulatum</i>	Spatulate Moonwort	Vascular Plant	END	S1	G3
<i>Calamagrostis montanensis</i>	Plains Reedgrass	Vascular Plant	SPC	S3	G5
<i>Carex formosa</i>	Handsome Sedge	Vascular Plant	END	S1	G4
<i>Carex garberi</i>	Garber's Sedge	Vascular Plant	THR	S2	G5
<i>Carex hallii</i>	Hall's Sedge	Vascular Plant	SPC	S3	G4?
<i>Carex hookerana</i>	Hooker's Sedge	Vascular Plant	SPC	S3	G4?
<i>Carex obtusata</i>	Blunt Sedge	Vascular Plant	SPC	S3	G5
<i>Carex scirpoidea ssp. scirpoidea</i>	Northern Single-spike Sedge	Vascular Plant	SPC	S3	G5T5
<i>Carex sterilis</i>	Sterile Sedge	Vascular Plant	THR	S2	G4G5
<i>Carex xerantica</i>	Dry Sedge	Vascular Plant	SPC	S3	G5
<i>Charadrius melodus</i>	Piping Plover	Vertebrate Animal	END	S1B	G3
<i>Chondestes grammacus</i>	Lark Sparrow	Vertebrate Animal	SPC	S3B	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Cladium mariscoides</i>	Twig Rush	Vascular Plant	SPC	S3	G5
<i>Coturnicops noveboracensis</i>	Yellow Rail	Vertebrate Animal	SPC	S3B	G4
<i>Cygnus buccinator</i>	Trumpeter Swan	Vertebrate Animal	SPC	S3B,SNRN,S NRM	G4
<i>Cypripedium arietinum</i>	Ram's Head Orchid	Vascular Plant	THR	S2	G3
<i>Cypripedium candidum</i>	Small White Lady's-slipper	Vascular Plant	SPC	S3	G4
<i>Drosera anglica</i>	English Sundew	Vascular Plant	SPC	S3	G5
<i>Elatine triandra</i>	Three-stamened Waterwort	Vascular Plant	SPC	S3	G5
<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush	Vascular Plant	SPC	S3	G5
<i>Eleocharis rostellata</i>	Beaked Spikerush	Vascular Plant	THR	S2	G5
<i>Empidonax virescens</i>	Acadian Flycatcher	Vertebrate Animal	SPC	S3B	G5
<i>Erigeron lonchophyllus</i>	Short Ray Fleabane	Vascular Plant	THR	S2	G5
<i>Eurynia dilatata</i>	Spike	Invertebrate Animal	THR	S2	G5
<i>Gaillardia aristata</i>	Blanketflower	Vascular Plant	SPC	S3	G5
<i>Gentiana affinis</i>	Northern Gentian	Vascular Plant	SPC	S3	G5
<i>Gentianella amarella</i>	Felwort	Vascular Plant	SPC	S3	G5
<i>Helianthus nuttallii ssp. rydbergii</i>	Nuttall's Sunflower	Vascular Plant	SPC	S3	G5T5
<i>Hesperia assiniboia</i>	Assiniboia Skipper	Invertebrate Animal	END	S1	G5
<i>Hesperia dacotae</i>	Dakota Skipper	Invertebrate Animal	END	S1	G2
<i>Hudsonia tomentosa</i>	Beach Heather	Vascular Plant	THR	S2	G5
<i>Juniperus horizontalis</i>	Creeping Juniper	Vascular Plant	SPC	S3	G5
<i>Lanius ludovicianus</i>	Loggerhead Shrike	Vertebrate Animal	END	S1B	G4
<i>Lasmigona compressa</i>	Creek Heelsplitter	Invertebrate Animal	SPC	S3	G5
<i>Lasmigona costata</i>	Fluted-shell	Invertebrate Animal	THR	S2	G5
<i>Leucophaeus pipixcan</i>	Franklin's Gull	Vertebrate Animal	SPC	S3B	G5
<i>Ligumia recta</i>	Black Sandshell	Invertebrate Animal	SPC	S3	G4G5
<i>Limosa fedoa</i>	Marbled Godwit	Vertebrate Animal	SPC	S3B	G5
<i>Limosella aquatica</i>	Mudwort	Vascular Plant	SPC	S3	G5
<i>Malaxis monophyllos var. brachypoda</i>	White Adder's Mouth	Vascular Plant	SPC	S3	G5T4T5
<i>Microtus ochrogaster</i>	Prairie Vole	Vertebrate Animal	SPC	S3	G5
<i>Minuartia dawsonensis</i>	Rock Sandwort	Vascular Plant	THR	S2	G5
<i>Mustela nivalis</i>	Least Weasel	Vertebrate Animal	SPC	S3	G5
<i>Myotis lucifugus</i>	Little Brown Myotis	Vertebrate Animal	SPC	S3	G3G4
<i>Najas marina</i>	Sea Naiad	Vascular Plant	SPC	S3	G5

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Necturus maculosus</i>	Mudpuppy	Vertebrate Animal	SPC	S3	G5
<i>Oarisma garita</i>	Garita Skipperling	Invertebrate Animal	THR	S2	G5
<i>Oarisma poweshiek</i>	Poweshiek Skipperling	Invertebrate Animal	END	S1	G1
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse	Vertebrate Animal	SPC	S3	G5
<i>Orobanche fasciculata</i>	Clustered Broomrape	Vascular Plant	THR	S2	G4G5
<i>Orobanche ludoviciana</i> var. <i>ludoviciana</i>	Louisiana Broomrape	Vascular Plant	THR	S2	G5T5
<i>Packera cana</i>	Gray Ragwort	Vascular Plant	END	S1	G5
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Vertebrate Animal	SPC	S3B	G4
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Vertebrate Animal	THR	S2B	G5
<i>Pituophis catenifer</i>	Gophersnake	Vertebrate Animal	SPC	S3	G5
<i>Platanthera praeclara</i>	Western Prairie Fringed Orchid	Vascular Plant	END	S1	G3
<i>Podiceps auritus</i>	Horned Grebe	Vertebrate Animal	END	S1B	G5
<i>Progne subis</i>	Purple Martin	Vertebrate Animal	SPC	S3B	G5
<i>Ranunculus lapponicus</i>	Lapland Buttercup	Vascular Plant	SPC	S3	G5
<i>Rhynchospora capillacea</i>	Hair-like Beak Rush	Vascular Plant	THR	S2	G4G5
<i>Salicornia rubra</i>	Red Saltwort	Vascular Plant	THR	S2	G5
<i>Salix maccalliana</i>	McCalla's Willow	Vascular Plant	SPC	S3	G5
<i>Salix pseudomonticola</i>	False Mountain Willow	Vascular Plant	SPC	S3	G5
<i>Schinia lucens</i>	Leadplant Flower Moth	Invertebrate Animal	SPC	S3	G4
<i>Scleria verticillata</i>	Whorled Nutrush	Vascular Plant	THR	S2	G5
<i>Shepherdia canadensis</i>	Soapberry	Vascular Plant	SPC	S3	G5
<i>Shinnersoseris rostrata</i>	Annual Skeletonweed	Vascular Plant	THR	S2	G5?
<i>Silene drummondii</i> ssp. <i>drummondii</i>	Drummond's Campion	Vascular Plant	SPC	S3	G5T5
<i>Spilogale putorius</i>	Eastern Spotted Skunk	Vertebrate Animal	THR	S2	G4
<i>Stellaria longipes</i> ssp. <i>longipes</i>	Long-stalked Chickweed	Vascular Plant	SPC	S3	G5T5
<i>Sterna forsteri</i>	Forster's Tern	Vertebrate Animal	SPC	S3B	G5
<i>Stuckenia vaginata</i>	Sheathed Pondweed	Vascular Plant	END	S1	G5
<i>Thomomys talpoides</i>	Northern Pocket Gopher	Vertebrate Animal	THR	S2	G5
<i>Trichophorum clintonii</i>	Clinton's Bulrush	Vascular Plant	THR	S2	G4
<i>Tympanuchus cupido</i>	Greater Prairie-chicken	Vertebrate Animal	SPC	S3	G4
<i>Urocitellus richardsonii</i>	Richardson's Ground Squirrel	Vertebrate Animal	SPC	S3	G5

Additional Species Data

In addition to listed species, the AP Section contains species labeled as ‘Watchlist’ and ‘Species of Greatest Conservation Need’ (SGCNs).

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

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

Table 12 - Minnesota ‘watchlist’ species in the AP Section.

Scientific Name	Common Name	Type	State Status	S-Rank	G-Rank
<i>Antigone canadensis</i>	Sandhill Crane	Vertebrate Animal	Watchlist	S4B,SNR M	G5
<i>Bartramia longicauda</i>	Upland Sandpiper	Vertebrate Animal	Watchlist	S4B	G5
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Vertebrate Animal	Watchlist	S3B,S3N	G5
<i>Botaurus lentiginosus</i>	American Bittern	Vertebrate Animal	Watchlist	S4B	G5
<i>Chamaerhodos erecta</i>	Nuttall's Groundrose	Vascular Plant	Watchlist	S4	G5
<i>Poa arida</i>	Plains Bluegrass	Vascular Plant	Watchlist	S4	G5
<i>Puccinellia nuttalliana</i>	Alkali Grass	Vascular Plant	Watchlist	S3	G5
<i>Potentilla hippiana</i>	Woolly Cinquefoil	Vascular Plant	Watchlist	S1	G5
<i>Hesperostipa curtiseta</i>	Small Porcupine Grass	Vascular Plant	Watchlist	S3	G5
<i>Carex lurida</i>	Shallow Sedge	Vascular Plant	Watchlist	SNR	G5
<i>Carex capillaris</i>	Hair-like Sedge	Vascular Plant	Watchlist	S3	G5
<i>Strix nebulosa</i>	Great Gray Owl	Vertebrate Animal	Watchlist	SNR	G5
<i>Marpissa grata</i>	A Jumping Spider	Invertebrate Animal	Watchlist	S3	GNR
<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary	Invertebrate Animal	Watchlist	SNR	G5T5
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Vertebrate Animal	Watchlist	SNRB	G5
<i>Aechmophorus occidentalis</i>	Western Grebe	Vertebrate Animal	Watchlist	SNRB	G5
<i>Ophioglossum pusillum</i>	Adder's Tongue	Vascular Plant	Watchlist	S3	G5

Species of Greatest Conservation Need (SGCNs)

The AP Section is the transition zone between prairie and forest and provides a variety of wildlife habitats, including large complexes of wetlands, aspen and brush prairie with dry prairie on beach ridges. Well over 60 percent of this section is in agriculture, mostly in the southern half. In the northern half, extensive areas have recently been cleared for farming. Still, some remnants of large contiguous patches of native plant communities remain.

Of the 346 species that are considered SGCN in Minnesota, 41 are found in the AP Section, and at least 10 SGCN are directly associated with forest habitats (Table 13).

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

Common Name	Scientific Name	Key Habitat/ or Habitat used
Acadian Flycatcher	<i>Empidonax virescens</i>	Mesic Hardwood Forest
Eastern Spotted Skunk	<i>Spilogale putorius</i>	Savanna, Mesic Hardwood Forest
Garita Skipperling	<i>Oarisma garita</i>	Savanna
Gopher Snake	<i>Pituophis catenifer</i>	Savanna
Lark Sparrow	<i>Chondestes grammacus</i>	Savanna ,Fire Dependent Forest
Leadplant Flower Moth	<i>Schinia lucens</i>	Savanna
Least Weasel	<i>Mustela nivalis</i>	Savanna, Mesic Hardwood Forest, Fire Dependent Forest
Little Brown Myotis	<i>Myotis lucifugus</i>	Floodplain Forest, Mesic Hardwood Forest
Prairie Vole	<i>Microtus ochrogaster</i>	Savanna
Short-eared Owl	<i>Asio flammeus</i>	Forested Rich Peatland

Native Plant Communities

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

Following is a list of the native plant community classes known to occur in the AP Section (Table 14). Both the codes and their associated names are provided. Much more detailed information about each plant community in this section, including distribution maps, can be found in the Field Guide to the Native Plant Communities of Minnesota series of publications. These field guides are available through the [University of Minnesota Bookstores](#). Additional information on Minnesota’s native plant communities can be found online at [Minnesota's Native Plant Communities](#).

Table 14 - Native plant community classes, types, and subtypes documented in the AP Section with their associated conservation rank.

Native Plant Community	Community Code	State Conservation Rank	Global Conservation Rank¹	# of Observations²
Northern Poor Conifer Swamp	APn81	(S4, S5)	(G5)	9
Poor Tamarack - Black Spruce Swamp, Tamarack Subtype	APn81b2	S4	G5	24
Low Shrub Poor Fen	APn91a	S5	G4G5 or G5	33
Central Rich Dry Pine Woodland	FDc24	(S1 or S3)	(G4?)	2
Jack Pine Woodland (Sand)	FDn12a	S2	G4G5	8
Aspen - Birch Forest	FDn43b	S5	G4? or G4G5 or G5	2
Southern Dry-Mesic Oak-Aspen Forest	FDs36	(S3S4)	(GNRQ)	8
Bur Oak - Aspen Forest	FDs36a	S3S4	GNRQ	27
Northwestern Dry-Mesic Oak Woodland	FDw24	(S2, S3)	(G4?)	68
Bur Oak - (Prairie Herb) Woodland	FDw24a	S2	G4?	10
Bur Oak - (Forest Herb) Woodland	FDw24b	S3	G4?	6
Northwestern Mesic Aspen-Oak Woodland	FDw34	(S3, S4)	(G4G5, G5)	77
Aspen - (Prairie Herb) Woodland	FDw34a	S3	G4G5	59
Aspen - (Beaked Hazel) Woodland	FDw34b	S4	G5	32
Northwestern Wet-Mesic Aspen Woodland	FDw44	(S3, S4)	(G3G4)	540
Aspen - (Cordgrass) Woodland	FDw44a	S3	G3G4	72
Aspen - (Chokecherry) Woodland	FDw44b	S4	G3G4	58
Northern Terrace Forest	FFn57	(S3)	(GNR)	60
Black Ash - Silver Maple Terrace Forest	FFn57a	S3	GNR	60
Northern Floodplain Forest	FFn67	(S3)	(GNR)	5
Silver Maple - (Sensitive Fern) Floodplain Forest	FFn67a	S3	GNR	2
Northern Cedar Swamp	FPn63	(S3, S4)	(G4)	3
White Cedar Swamp (Northwestern)	FPn63c	S3	G4	14
Rich Black Spruce Swamp (Water Track)	FPn71a	S3	GNR	8
Northern Rich Alder Swamp	FPn73	(S5)	(G5)	2
Alder - (Maple - Loosestrife) Swamp	FPn73a	S5	G5	15
Northern Rich Tamarack Swamp (Water Track)	FPn81	(S4)	(GNR)	1
Rich Tamarack (Sundew - Pitcher Plant) Swamp	FPn81a	S4	GNR	10
Northern Rich Tamarack Swamp (Western Basin)	FPn82	(S4, S5)	(G4)	4
Extremely Rich Tamarack Swamp	FPn82b	S4	G4	1
Tamarack Swamp (Southern)	FPs63a	S2S3	G2G3 or G3G4	9
Northwestern Rich Conifer Swamp	FPw63	(S3)	(G4)	28
Tamarack - Black Spruce Swamp (Aspen Parkland)	FPw63a	S3	G4	65
Tamarack Seepage Swamp (Aspen Parkland)	FPw63b	S3	G4	17
Aspen - (Sugar Maple - Basswood) Forest	MHc37a	S4	G3G4	1
Northern Mesic Hardwood Forest	MHn35	(S4)	(G5)	3
Aspen - Birch - Basswood Forest	MHn35a	S4	G5	2

Native Plant Community	Community Code	State Conservation Rank	Global Conservation Rank ¹	# of Observations ²
Northern Wet-Mesic Boreal Hardwood-Conifer Forest	MHn44	(S2, S3, S3S4, S4)	(G5, GNR)	65
Aspen - Fir Forest	MHn44c	S3S4	G5	14
Basswood - Bur Oak - (Green Ash) Forest	MHs38b	S3	G3	4
Green Ash - Bur Oak - Elm Forest	MHw36a	S2	GNR	66
Northern Mixed Cattail Marsh	MRn83	(S2)	(G4?, G5)	36
Cattail - Sedge Marsh (Northern)	MRn83a	S2	G4?	20
Cattail Marsh (Northern)	MRn83b	S2	G5	12
Northern Bulrush-Spikerush Marsh	MRn93	(S2, S3)	(G3G4, G4 or G4G5)	15
Cattail - Sedge Marsh (Prairie)	MRp83a	S1	G4?	36
Cattail Marsh (Prairie)	MRp83b	S1	G5	31
Prairie Bulrush-Arrowhead Marsh	MRp93	(S1)	(G3G4, G4G5, GNR)	8
Bulrush Marsh (Prairie)	MRp93a	S1	G3G4	9
Northern Rich Fen (Water Track)	OPn91	(S2, S3, S4)	(G3G5 or GNR, GNR)	5
Shrub Rich Fen (Water Track)	OPn91a	S4	G3G5 or GNR	10
Graminoid Rich Fen (Water Track)	OPn91b	S2 or S3	GNR	2
Graminoid Rich Fen (Water Track), Flark Subtype	OPn91b2	S2	GNR	2
Northern Rich Fen (Basin)	OPn92	(S4)	(G4G5, G4G5 or GNR)	1
Graminoid Rich Fen (Basin)	OPn92a	S4	G4G5 or GNR	3
Prairie Rich Fen	OPp91	(S3)	(G3, G3G4)	340
Rich Fen (Mineral Soil)	OPp91a	S3	G3	93
Rich Fen (Peatland)	OPp91b	S3	G3G4	187
Rich Fen (Prairie Seepage)	OPp91c	S3	G3G4	10
Prairie Extremely Rich Fen	OPp93	(S1, S2)	(G2, G2G3 or G3G4)	11
Calcareous Fen (Northwestern)	OPp93a	S2	G2	50
Sand/Gravel/Cobble River Shore	RVx32	(S3, S4)	(G4G5)	1
Dry Barrens Prairie (Northern)	UPn12a	S1	G2G3	17
Dry Sand - Gravel Prairie (Northern)	UPn12b	S2	G2G3	94
Dry Sand - Gravel Brush-Prairie (Northern)	UPn12c	S1	G2G3	9
Northern Dry Savanna	UPn13	(S1, S1S2)	(G2)	10
Dry Barrens Oak Savanna (Northern)	UPn13b	S1S2	G2	10
Dry Sand - Gravel Oak Savanna (Northern)	UPn13c	S1	G2	57
Northern Mesic Prairie	UPn23	(S2)	(G2G3)	4
Mesic Brush-Prairie (Northern)	UPn23a	S2	G2G3	90
Mesic Prairie (Northern)	UPn23b	S2	G2G3	175
Northern Mesic Savanna	UPn24	(S1, S2)	(G1G2, G4G5)	1
Mesic Oak Savanna (Northern)	UPn24a	S1	G1G2	1
Aspen Openings (Northern)	UPn24b	S2	G4G5	6
Northern Wet Cedar Forest	WFn53	(S3, S4)	(GNR)	1
Lowland White Cedar Forest (Northern)	WFn53b	S3	GNR	8
Northern Wet Ash Swamp	WFn55	(S3, S4)	(G4)	59
Black Ash - Aspen - Balsam Poplar Swamp (Northeastern)	WFn55a	S4	G4	1

Native Plant Community	Community Code	State Conservation Rank	Global Conservation Rank ¹	# of Observations ²
Black Ash - Mountain Maple Swamp (Northern)	WFn55c	S4	G4	9
Northern Very Wet Ash Swamp	WFn64	(S4)	(G4)	5
Black Ash - Alder Swamp (Northern)	WFn64c	S4	G4	1
Alder - (Red Currant - Meadow-Rue) Swamp	WFn74a	S3	GNR	64
Northwestern Wet Aspen Forest	WFW54	(S4)	(G5)	172
Lowland Black Ash - Aspen - Balsam Poplar Forest	WFW54a	S4	G5	330
Northern Wet Meadow/Carr	WMn82	(S4, S5)	(G4? or G4G5, G4G5, G5)	50
Willow - Dogwood Shrub Swamp	WMn82a	S5	G5	457
Sedge Meadow	WMn82b	S4 or S5	G4? or G4G5	73
Sedge Meadow, Bluejoint Subtype	WMn82b1	S5	G4G5	7
Sedge Meadow, Lake Sedge Subtype	WMn82b4	S5	G4G5	14
Prairie Meadow/Carr	WMP73a	S3	G3? or G3G5	167
Southern Seepage Meadow/Carr	WMS83	(S2, S3)	(G3G4 or G4? or G4G5, G4?, G4? or G4G5)	4
Seepage Meadow/Carr	WMS83a	S3	G4? or G4G5	91
Seepage Meadow/Carr, Tussock Sedge Subtype	WMS83a1	S3	G4?	4
Basin Meadow/Carr	WMS92a	S2	G3G5	5
Northern Wet Prairie	WPn53	(S2, S3)	(G2G3, G3?, G3G4)	21
Wet Seepage Prairie (Northern)	WPn53a	S2	G3?	67
Wet Brush-Prairie (Northern)	WPn53b	S3	G3	289
Wet Prairie (Northern)	WPn53c	S3	G3G4	212
Wet Saline Prairie (Northern)	WPn53d	S2	G2G3	43
Southern Wet Prairie	WPs54	(S1, S2)	(G2G3, G2G3 or G3G4, G3?)	1
Wet Prairie (Southern)	WPs54b	S2	G2G3 or G3G4	3

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

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

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

The information listed in Table 14 is currently incomplete; however, as MBS surveys are completed, additional information on NPCs within the AP 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](#).

Climate Change

Forest management plans will consider the effects of climate change on forest management activities. Efforts will be made to be aware of the specific cover types that are projected to do better in what are anticipated to be future climate trends. Because forest management is implemented over relatively long terms (50 plus years) drastic forest management activities reacting to climate change will not be undertaken. Rather, efforts will be made to introduce some cover type conversions and specific strategies that are consistent with the [State of Minnesota's Climate Action Framework](#), the [Department's Conservation Agenda](#), and the Department's policy to incorporate climate adaptation and mitigation practices into DNR plans (*Operational Order 131 Climate Adaptation and Mitigation in Natural Resource Management*). See the [Department's climate change website](#) for more information on the impacts of climate change in Minnesota.

More comprehensive research on the impacts of climate change has been prepared by the Northern Institute of Applied Climate Science (NIACS). See the [NIACS website](#) for research and further information.

The U.S. Forest Service's (USFS) [Climate Change Tree Atlas](#) is a tool used to examine current distributions and modeled future climate habitat for 134 individual tree species by geographic area. Table 15 (next page) was created using data from the Atlas and shows the change in potential suitable habitat for tree species within the AP Section, weighted for both the area and abundance of habitat for various climate model scenarios projected to year 2100. The data was calculated for the AP Section based on the DISTRIB habitat model.

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

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

Additional information on individual tree species, the models used, as well as inputs and the data can be found at the [USFS Climate Change Tree Atlas website](#).

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

Table 15 - Tree Habitat Suitability shows the modeled IV for a subset of the tree species within the AP Section. Species are placed in the order of highest to lowest IV based on the average Hadley, GDFL, PCM High scenario³.

Species Name	Scientific Name	DISTRIB Weighted SUM IV (Current)	DISTRIB Weighted SUM IV (Hadley High)	DISTRIB Weighted SUM IV (PCM low)	DISTRIB Weighted SUM IV (Average Hadley, GDFL, and PCM High)	DISTRIB Weighted SUM IV (Average of the Hadley, GDFL, and PCM Low)
American elm	<i>Ulmus americana</i>	805	↓ 795	↑ 1250	↑ 1042	↓ 1224
eastern cottonwood	<i>Populus deltoides</i>	0.68	↑ 11.18	↑ 1.27	↑ 11.04	↑ 2.04
bur oak	<i>Quercus macrocarpa</i>	8.68	↑ 10.36	↑ 9.27	↑ 10.54	↑ 10.95
American elm	<i>Ulmus americana</i>	3.27	↑ 10.32	↑ 4.13	↑ 9.82	↑ 4.77
eastern redcedar	<i>Juniperus virginiana</i>	0	↑ 8.55	↑ 1.82	↑ 9.36	↑ 6.18
boxelder	<i>Acer negundo</i>	4.68	↑ 9.41	↑ 6.59	↑ 9.09	↑ 8.18
green ash	<i>Fraxinus pennsylvanica</i>	4.45	↑ 7.68	↑ 5.9	↑ 8.36	↑ 6.68
hackberry	<i>Celtis occidentalis</i>	0.5	↑ 6.82	↑ 1.27	↑ 5.32	↑ 3.41
quaking aspen	<i>Populus tremuloides</i>	52.45	↓ 4.09	↓ 14.86	↓ 4.22	↓ 12.86
red mulberry	<i>Morus rubra</i>	0	↑ 4.09	↑ 0.32	↑ 3.91	↑ 1.64
American basswood	<i>Tilia americana</i>	1.55	↑ 4.05	↑ 2.82	↑ 3.87	↑ 3.5
black willow	<i>Salix nigra</i>	0.36	↑ 3.45	↑ 1.09	↑ 3.45	↑ 1.54
silver maple	<i>Acer saccharinum</i>	0.23	↑ 3.37	↑ 0.96	↑ 3.32	↑ 1.87
black walnut	<i>Juglans nigra</i>	0	↑ 3.05	0	↑ 2.82	↑ 0.27
slippery elm	<i>Ulmus rubra</i>	0	↑ 3.32	↑ 1.41	↑ 2.73	↑ 2.32
balsam poplar	<i>Populus balsamifera</i>	14.64	↓ 2.55	↓ 1.28	↓ 2.69	↓ 2.91
northern red oak	<i>Quercus rubra</i>	0.77	↑ 2.04	↑ 2.91	↑ 2.27	↑ 3.04
red pine	<i>Pinus resinosa</i>	0.36	↑ 1.72	↑ 1	↑ 2.09	↑ 1.59
honeylocust	<i>Gleditsia triacanthos</i>	0	↑ 2.5	0	↑ 2	0
black ash	<i>Fraxinus nigra</i>	4.05	↓ 1.69	↓ 3.05	↓ 1.73	↓ 2.32
black locust	<i>Robinia pseudoacacia</i>	0	↑ 2.55	0	↑ 1.73	0
sugar maple	<i>Acer saccharum</i>	0.41	↑ 1.46	↑ 2.59	↑ 1.64	↑ 2.86
black cherry	<i>Prunus serotina</i>	0.27	↑ 1.36	↑ 1.22	↑ 1.54	↑ 1.72
eastern hophornbeam	<i>Ostrya virginiana</i>	0.36	↑ 1.68	↑ 1.22	↑ 1.5	↑ 1.54
white oak	<i>Quercus alba</i>	0	↑ 1.09	↑ 0.64	↑ 1.41	↑ 0.73

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

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

Hadley - Hadley Climate Model

PCM - Parallel Climate Model

GFCL - Geophysical Fluid Dynamics Laboratory GCM Model

GCM - General Circulation Model

³ Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. <https://www.fs.usda.gov/ccrc/tool/climate-change-tree-atlas>, Northern Research Station, USDA Forest Service, Delaware, Ohio.

Appendix A: Glossary

Access route: A temporary access or permanent road connecting the most remote parts of the forest to existing public roads. Forest roads provide access to forestlands for timber management, fish and wildlife habitat improvement, fire control, and a variety of recreational activities. Also, see Forest road.

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 10 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). A cover type age class distribution is balanced when it has an even number of acres in each age class (usually 5- to 10-year increments) up to the normal rotation age for the cover type.

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

Annual plan addition: Stands added to the stand exam list and released for public comment as needed throughout the year. Examples of reasons for APAs include insect, disease, animal, or environmental damage (e.g., storm or fire) that needs to be treated quickly; operational considerations such as harvesting a stand adjacent to a stand on the exam list, avoiding repeated entries to stands with limited or difficult access, and cooperating with adjacent landowners; and incorrect inventory, such as incorrect stand boundaries or cover type classification, for stands that should be harvested.

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

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

Aspen opening: Sparsely treed, herb- and shrub-dominated communities on medium-fine to medium textured loamy soils. Quaking aspen is the dominant tree, but bur oak is typically present, and balsam poplar may be occasional. Aspens tend to occur in clumps (usually root-connected clones), with some older trees present among the shrub- and sapling-size root suckers. [See NPC factsheet for UPn24 Northern Mesic Savanna.](#)

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

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

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

Biodiversity Significance: The relative value, in terms of size, condition, and quality, of native biological diversity for a given area of land or water. (Adapted from Guidelines for MBS Statewide Biodiversity Significance Rank): The Minnesota Biological Survey (MBS) 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 very good quality occurrences of the rarest species, high-quality examples of the rarest native plant communities, and/or important functional landscapes.

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

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

Browse: (n) Portions of woody plants, including twigs, shoots, and leaves used as food by animals such as deer and rabbits. (v) To feed on leaves, young shoots, and other vegetation.

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

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

Competition: The struggle between trees or other vegetation to obtain sunlight, nutrients, water, and growing space.

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

Conversion: Changing a stand or site from one cover type to another through management actions (active) or without management actions (passive).

Cooperative Stand Assessment (CSA): The forest stand mapping and information system used by the Minnesota Department of Natural Resources to inventory the approximately five million acres (7,800 square miles) owned and administered by the state. The spatial information and stand attributes are now maintained in the Forest Inventory Module (FIM) note: FIM is in the process of being replaced with a system containing similar data.

Cord: A pile of wood four feet high, four feet wide, and eight 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 tight the wood is stacked. In the Lake States, pulpwood cords are usually four feet x four feet x 100 feet and contain 133 cubic feet. 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 types 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 tree species is aspen would be considered an aspen cover type.

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

Cultural resource: An archaeological site, cemetery, historical structure, historical area, or traditional use area that is of cultural or scientific value.

Desired Future Condition (DFC): 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.

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

Dominant trees: Trees that are in the upper layer of the forest canopy, larger than the average trees in the stand.

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.

Ecological evaluation: A concise report containing descriptions of the significant natural features of a site, such as the flora, fauna, rare features, geology, soils, and any other factors that provide an interpretation of the site's history, present state, and biodiversity significance. Management and protection recommendations are often included in these reports. Evaluations are produced by the Minnesota Biological Survey (MBS) at the completion of MBS work in a given county or ecological classification system (ECS) subsection and are generally reserved for those sites with the highest biodiversity significance in a geographic region, regardless of ownership.

Ecological integrity: In general, ecological integrity refers to the degree to which the elements of biodiversity and the processes that link them together and sustain the entire system are complete and capable of performing desired functions. Exact definitions of integrity are relative and may differ depending on the type of ecosystem being described.

Ecological Section and Subsection: Section and subsection are levels within the DNR's Ecological Classification System (ECS). From largest to smallest in terms of geographic area, the ECS is comprised of the following levels: Province --> Section --> Subsection --> Land Type Association --> Land Type --> Land Type Phase.

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.

Enhance: To modify a vegetative community component for the purpose of favoring a certain function or value. For example, changing the structure of a degraded plant community to bring it closer to a native plant community.

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).

Even-aged prescription: Planned forest management action that promotes the stand composition of trees of primarily the same age or age class. Examples of even-aged silvicultural treatments or prescriptions include clearcut and shelterwood harvests.

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

Forest Inventory and Analysis (FIA): A statewide forest survey of timber lands jointly conducted by the 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 road: A temporary or permanent road connecting the remote parts of the forest to existing public roads. Forest roads provide access to public land for timber management, fish and wildlife habitat improvement, fire control, and a variety of recreational activities. The Division of Forestry has three classifications for roads and access routes:

System roads: These roads are the major roads in the forest that provide forest management and recreational access and may be connected to the state, county, or township public road systems. These roads are used at least on a weekly basis and often used on a daily basis. The roads should be graveled and maintained to allow travel by highway vehicles, and road bonding money can be used to fund the construction and reconstruction of these types of roads. The level and frequency of maintenance will be at the discretion of the Area Forester and as budgets allow.

Minimum maintenance roads: These roads are used for forest management access on an intermittent, as-needed basis. Recreational users may use them, but the roads are not promoted or maintained for recreation. The roads will be open to all motorized vehicles but not maintained to the level where low clearance licensed highway vehicles can travel routinely on them. The roads will be graded and graveled as needed for forest management purposes. Major damage, such as culvert washouts or other conditions that may pose a safety hazard to the public, will be repaired as reported and budgets allow.

Temporary access: If the access route does not fit into one of the first two options, the access route has to be abandoned and the site reclaimed so that evidence of a travel route is minimized. The level of effort to effectively abandon temporary accesses will vary from site to site depending on the location of the access (e.g., swamp/winter vs. upland route), remoteness, and existing recreational use pressures.

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

Fragmentation: Breaking up contiguous or homogeneous land cover through conversion to different vegetation types, age classes, or uses. Forest fragmentation occurs in landscapes with distinct contrasts between land uses, such as between woodlots and farms. Habitat fragmentation occurs when a contiguous or homogeneous forest area of a similar cover type and age is broken up into smaller dissimilar units.

Free to grow: When seedlings have grown taller than the surrounding competing vegetation.

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

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

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

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

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

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)

Herbivory: A plant-animal interaction whereby an organism eats some or all of a plant. Herbivory occurs both above and below ground. Dominant herbivores include beaver, deer, moose, hares, rabbits, small mammals, and forest tent caterpillars.

High-quality native plant community: A community that has experienced relatively little human disturbance, has few exotic species and supports the appropriate mix of native plant species for that community. A high-quality native plant community may be unique or have a limited occurrence in the subsection, have a known association with rare species, or be an exemplary representative of the native plant community diversity prior to European settlement.

Intensive management: Intensity of management refers to the degree of disturbance associated with silvicultural treatments. In this plan, references to it range from less intensive to more intensive management. Examples of more intensive management are 1) site preparation techniques such as rock-raking that disrupts the soil profile and leaves coarse woody debris in piles; 2) broadcast herbicide use that eliminates or dramatically reduces herbaceous plant and shrub diversity; 3) Conversions of mixed forest stands through clearcutting and/or site preparation that result in the establishment of a more simplified monotypic stand such as mostly pure aspen regeneration or high-density pine plantations. Examples where more intensive management may be needed include regenerating a site successfully to a desired species, controlling insect or disease problems, and managing wildlife habitat (e.g., maintenance of wildlife openings).

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

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.

Leave trees: Live trees selected to remain on a site to provide present and future benefits, such as shelter, resting sites, cavities, perches, nest sites, foraging sites, mast, and coarse woody debris.

Legacy patch: An area within a harvest unit that is excluded from harvest; this area is representative of the site and is to maintain a source area for recolonization, gene pool maintenance, and establishment of microhabitats for organisms that can persist in small patches of mature forest.

Managed acres: Acres that are available for management purposes.

Management Opportunity Areas (MOA): are groups of stands intended to use vegetation management to provide opportunities to address values such as biodiversity, rare features, diversity of native plant community growth stages, and wildlife needs that can't be addressed through site-level management within individual stands.

Mast: Nuts, seeds, catkins, flower buds, and fruits of woody plants that provide food for wildlife.

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.

Minnesota Forest Resources Council (MFRC): The Minnesota Forest Resources Council is a state council established by the Sustainable Forest Resources Act (SFRA) of 1995 to promote long-term sustainable management of Minnesota's forests.

MFRC Voluntary Site-Level Forest Management Guidelines: A set of best management practices for timber harvesting and forest management on forested lands in Minnesota.

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

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

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

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.

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

Natural spatial patterns: Refers to the size, shape, and arrangement of patches in forested landscapes as determined primarily by natural disturbance and physical factors.

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

Nongame species: In this plan, nongame species include amphibians, reptiles, and those mammal and bird species that are not hunted or trapped.

Non-native invasive species: Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Non-timber forest products: Non-timber forest products, also known as special forest products, can be categorized into five general areas: foods, herbs, medicinals, decoratives, and specialty items. Special forest products might include berries, mushrooms, boughs, bark, Christmas trees, lycopodium, rose hips and blossoms, diamond willow, birch tops, highbush cranberries, burls, conks, Labrador tea, seedlings, cones, nuts, aromatic oils, extractives.

Normal Rotation Age (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.

Older forest: A forest stand of any particular forest cover type is considered 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.

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.

Overstory: The canopy in a stand of trees.

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

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

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

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

Pulpwood: Wood cut or prepared primarily for manufacture into wood pulp or chips for subsequent manufacture into paper, fiberboard, or chipboard. Generally, trees five to 12 inches in diameter at breast height are used.

Range of Natural Variation (RNV): Refers to the expected range of conditions (ecosystem structure and composition) to be found under naturally functioning ecosystem processes (natural climatic fluctuations and disturbance cycles such as fire and windstorms). RNV provides a benchmark (range of reference conditions) to compare with current and potential future ecosystem conditions.

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 do not (yet) have an official designation, but whose distribution and abundance need to be better understood.

Refuge/refugia: Area(s) where plants and animals can persist through a disturbance event or as climate changes.

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

Release: Freeing seedlings from competition before they are free to grow.

Restore: To return a stand, site, or ecosystem to its original structure and species composition through active management actions.

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

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

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.

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

Sapling: A tree that is one to five inches in diameter at breast height.

Sawtimber: Trees that yield logs suitable in size and quality for the production of lumber.

Scientific and Natural Area (SNA): Areas established by the DNR Division of Ecological and Water Resources to preserve natural features and rare resources of exceptional scientific and educational value.

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

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

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

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

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

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

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

Site preparation: Treatment of a site (e.g., hand or mechanical clearing, prescribed burning, or herbicide application) to prepare it for planting or seeding and to enhance the success of regeneration.

Site productivity: The relative capacity of a site to sustain a production level over time. The rate at which biomass is produced per unit area. For example, cords per acre growth of timber.

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

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

Snag: A standing dead tree.

Special concern species: A plant or animal species that is extremely uncommon in Minnesota or has 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.

Species in Greatest Conservation Need (SGCN): Animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability, as defined in the state Wildlife Action Plan.

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: In the DNR's forest inventory, the average age of the main species within a stand.

Stand density: The number of trees per unit area. Density usually is evaluated in terms of basal area, number of trees, volume, or percent crown cover.

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.

Stand selection criteria: Criteria used to help identify stands to be treated.

Stocking: An indication of the number of trees in a stand as compared to the desirable number for best growth and management, such as well-stocked, overstocked, and partially stocked. A measure of the proportion of an area actually occupied by trees.

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

Sucker: A shoot arising from below ground level from a root. Aspen regenerates from suckers.

Suppressed: The condition of a tree characterized by low growth rate and low vigor due to competition from overtopping trees or shrubs.

Sustainability: Protecting and restoring the natural environment while enhancing economic opportunity and community well-being. Sustainability addresses three related elements: the environment, the economy, and the community. The goal is to maintain all three elements in a healthy state indefinitely. Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable treatment level: A treatment level (e.g., harvest acres or volume per year) that can be sustained over time at a given intensity of management without damaging the forest resource base or compromising the ability of future generations to meet their own needs. Treatment levels may need to be varied above and/or below the sustainable treatment level until the desired age class structure or stocking level is reached.

Thermal cover: Habitat component (e.g., conifer stands such as white cedar, balsam fir, and jack pine) that provides wildlife protection from the cold in the winter and heat in the summer. The vegetative cover used by animals against the weather.

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to improve growth, enhance forest health, or recover potential mortality. Row thinning is where selected rows are harvested, usually the first thinning, which provides equipment operating room for future selective thinnings. Selective thinning is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. Variable density or variable retention thinnings vary the distribution of trees that are removed or retained in the stand. Commercial thinning is thinning after the trees are of merchantable size for timber

markets. Pre-commercial thinning is done before the trees reach merchantable size, usually done in overstocked (very high stems per acre) stands to provide more growing space for crop trees that will be harvested in future years.

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

Timberland: Forestland capable of producing timber of marketable size and volume at the normal harvest age for the cover type. It does not include lands withdrawn from timber utilization by statute (e.g., Boundary Waters Canoe Area Wilderness) or administrative regulation such as designated old-growth forests and state parks. On state 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.

Timber Stand Improvement (TSI): A practice in which the quality of a residual forest stand is improved by removing less desirable trees and large shrubs to achieve the desired stocking of the best quality trees or to improve the reproduction, composition, structure, condition, and volume growth of a stand. TSI occurs after trees in the stand are free to grow and includes pruning.

Tolerant: A plant capable of becoming established and growing beneath overtopping vegetation. A tree or seedling capable of growing in shaded conditions.

Underplant: The planting of seedlings under an existing canopy or overstory.

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

Uneven-aged 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.

Variable density: Thinning or planting in a clumped or dispersed pattern so that tree spacing more closely replicates patterns after natural disturbance (e.g., use gap management, vary the residual density within a stand when thinning, or plant seedlings at various densities within a plantation).

Variable retention: A harvest system based on the retention of structural elements or biological legacies (e.g., retain tree species and diameters present at older growth stages, snags, large downed logs, etc.) from the harvested stand for integration into the new stand to achieve various ecological objectives. Aggregate retention retains these structural elements in small patches or clumps within the harvest unit. Dispersed retention retains these structural elements as individual trees scattered throughout the harvest unit.

Viable populations: The number of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations that are adequately distributed throughout their range.

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

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

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.

Windthrow: A tree pushed over by the wind. Windthrows are more common among shallow-rooted species.

Appendix B: Acronyms

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

Appendix C: METADATA

<i>Data</i>	<i>Date(s)</i>	<i>Source</i>	<i>Size of Data Area</i>	<i>Spatial Resolution</i>	<i>Summary</i>	<i>Pros (+) / Cons (-)</i>
Forest Inventory Module FIM	2010 2017 2021	Aerial photos and ground surveys	Minnesota Stand Level, Public Forest Lands	1 to 3 acres	Updated version of CSA.	+ Detailed forest stand information - Only land managed by public agencies
Forest Inventory and Analysis FIA	1977 1990	Aerial photos and ground surveys	Minnesota, Plot Level	1225 acres represented per plot	A federally funded inventory of the state's forest resources: their type, extent, growth, mortality, and removals.	+ Detailed forest stand information + Represents public and private lands - Poor spatial resolution
GAP Stewardship	2008	PLS Sections and ownership data	Minnesota	40 acres	Database containing land ownership information. Attribute fields describe ownership, administrator, and conservation management code	+ Best data available to get quickly get an idea of land ownership. - Inaccurate below 40 acre level.
National Land Cover Dataset (NLCD)	2016	Aerial photos and satellite images	Conterminous United States	30 meters	Shows land use broken down by 16 different land cover classifications.	+ Recognize and evaluate types of land use changes
Natural Heritage Information System	2021	MNDNR Section of Ecological Services, Nongame Program	Varies according to completion of CBS in state.		Displays inventory of native plant communities, rare species, and biodiversity.	+ Extensive habitat classification - Not complete statewide - Different standards statewide