DEPARTMENT OF NATURAL RESOURCES

Sustainable Timber Harvest

Development of the DNR 10-year Stand Exam List

March 2020

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Box 1. Acronyms and abbreviations used in this report

Acronym or Abbreviation	Definition
ConCon	Consolidated conservation land
DNR	Department of Natural Resources
FAW	Division of Fish and Wildlife
FIM	Forest Inventory Module data
FOR	Division of Forestry
FY	Fiscal year
HCVF	High conservation value forest
LCOG	Lowland conifer old growth
LUP	Land utilization project
MB&G	Mason, Bruce, & Girard
MOA	Management opportunity area
NPC	Native plant community
OFMC	Old forest management complex
RGMA	Ruffed grouse management area
SFRMP	Section forest resource management plan/planning
Section	Referring to ecological sections used as SFRMP planning boundaries
SMZ	Special management zone (related to old growth)
STH	Sustainable timber harvest

Foreword

The Minnesota Department of Natural Resource's 10-year stand exam list is a work plan that identifies which state-managed forest stands will be visited and evaluated for potential timber management over a 10-year period. Stand exam lists are developed considering many forest resource values. They are important because they allow the DNR to plan our forest management work efficiently and effectively, and they communicate the kinds of timber management work we plan to do, and where we plan to do it, to the public and stakeholders.

The intent of this report is to describe how the DNR developed its 10-year, statewide stand exam list, covering fiscal years 2021 – 2030. The stand exam list was developed to align with decisions associated with the recent Sustainable Timber Harvest Analysis, including DNR's new 10-year sustainable timber target to offer 870,000 cords for sale annually over fiscal years 2019 – 2028, plus an additional 30,000 cords of ash and tamarack annually over fiscal years 2019 - 2023. This document also summarizes the 10-year stand exam list as it relates to Sustainable Timber Harvest decision elements.

Additional resources provide context for understanding the Sustainable Timber Harvest decisions and the processes that lead to those decisions. These are located on the DNR's Sustainable Timber Harvest webpage and include:

- Minnesota DNR Sustainable Timber Harvest Analysis Phase 2 Final Report – this report includes details on modeling conducted by the external contractor, Mason, Bruce & Girard, which helped inform the Sustainable Timber Harvest decision.
- Sustainable Timber Harvest Determination: Companion Document to Mason, Bruce & Girard Sustainable Timber Harvest Analysis – this document explains the DNR's Sustainable Timber Harvest decision and the process that lead to the decision.
- Sustainable Timber Harvest Analysis Frequently Asked Questions

Executive Summary

In 2018, the Minnesota Department of Natural Resources (DNR) decided on a new Sustainable Timber Harvest (STH) target after over a year of analysis conducted by an external contractor and an internal interdisciplinary team. The decision process included input from staff across the DNR Divisions of Ecological and Water Resources, Fish and Wildlife, and Forestry; a stakeholder advisory group; and the public. To align its forest resource planning with STH decisions, the DNR decided to create 10-year stand exam lists for each forested ecological section or planning unit, resulting in a 10-year statewide stand exam list. The 10-year stand exam list is a list of forest stands that will be examined and considered for some type of timber harvest over the next 10 years. On average, approximately 60% of stand acres on stand exam lists are offered for sale.

A harvest scheduling model was developed to aid staff in selecting stands for the 10-year stand exam list. The model incorporated assumptions about timber management that varied by land administrator, land status, ecological section, and areas that receive alternative management for various reasons. Assumptions for alternative management to address statutory obligations and DNR-approved best management practices were incorporated for all acres. Staff across divisions contributed to developing these model assumptions to incorporate a broad range of forest management values.

DNR staff from the three divisions were asked to review model results, coordinate on adjusting which stands will be visited in the coming years, and identify a year for a field visit. The resulting stand exam list was run back through the model to check that it meets STH decision elements. This final model run showed that the stand exam list does meet all decision elements.

As the 10-year stand exam list is implemented, management actions for individual stands or groups of stands will be coordinated on an annual basis. Public comments on annual stand exam lists will also be solicited each year. Specific actions for any given stand will be determined after a site visit. The results of management decisions will be monitored throughout the STH decision timeframe, and adjustments to implementation will be made as needed.

Background

The Minnesota Department of Natural Resources (DNR) administers 5.6 million acres of land, 70% of which are forested. Commercial timber harvesting occurs on 2.75 million of these acres that are in state forests, wildlife management areas, and on school and university trust lands[1]. The DNR works to "pursue the sustainable management, use, and protection of the state's forest resources to achieve the state's economic, environmental, and social goals," (Minnesota Statute 89A). In addition, the DNR is responsible for adhering to mandates associated with different land statuses (e.g., acquired lands, school trust lands, university trust lands, leased federal lands, wildlife management areas, etc.).

Periodically, the DNR analyzes the sustainability of our timber harvest level. This analysis is complex and seeks to balance interrelated objectives that address wildlife habitat, biodiversity, recreation, climate change, and water quality, as well as ongoing commercial timber harvest, in a way that does not limit the options of future generations. In 2016, Governor Mark Dayton directed the DNR to assess the sustainability of harvesting one million cords per year from DNR-administered forest lands. The DNR was directed to identify an alternative harvest level if one million cords per year was determined to be unsustainable.

In 2018, the Department determined that a harvest level of 870,000 cords of timber offered per year for fiscal years 2019-2028 is sustainable. An additional 30,000 cords of ash and tamarack was added for the first five years to address ongoing forest health issues for these species. The decision was made following a multi-faceted analysis that weighed input from many sources. An external contractor, Mason, Bruce & Girard (MB&G), modeled several forest management scenarios to measure the effects of emphasizing various public values, including timber productivity, wildlife habitat, biodiversity, water quality, forest health, invasive species, and economic impact, on sustainable harvest levels over a planning horizon of 100 years. Modeling also accounted for statutory obligations and different management objectives associated with the various types of lands the DNR administers.

The sustainable timber harvest (STH) analysis project included input from DNR staff from the Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources, a stakeholder advisory group representing diverse interests, and the public. Department leadership used the model results along with other information to come to an interdisciplinary decision that involved extensive discussion with all three divisions. Detailed information on the sustainable harvest level determination is available in the Sustainable Timber Harvest Determination report[2], and information on the model that informed the decision is available in the MB&G Phase 2 Final Report[3]. Both are available on the DNR website.

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[1] School trust lands are different from, and do not include, university trust lands.

[2] Sustainable Timber Harvest Determination: companion document to Mason, Bruce & Girard Sustainable Timber Harvest Analysis, March 1, 2018

[3] Sustainable Timber Harvest Analysis: Phase 2 Final Report, January 31, 2018

After the STH decisions were made, the DNR needed to determine how to implement all aspects of the decision. To align forest management planning with the STH decisions, DNR leadership decided to change how the DNR's forest management plan is developed. The forest management plan has two main components:

- stand exam lists - lists of forest stands to be visited and evaluated for potential harvest
- Section Forest Resource Management Plans (SFRMPs) – narrative plans with management considerations for DNR staff implementing the stand exam list in each forested ecological section

In the past, 10-year stand exam lists were developed during the same planning process as narrative SFRMPs, and each section's list covered different years. After the STH decisions were made, DNR leadership decided to produce stand exam lists for all forested ecological sections at the same time, covering fiscal years 2021 – 2030[4], resulting in a statewide 10-year stand exam list. Now the DNR has a stand exam list that:

- aligns with STH decisions
- was built from an analysis of current forest conditions considering multiple objectives
- capitalizes on the investment, learning, and outcomes of the STH analysis
- allows us to monitor implementation of STH decisions at the statewide level
- provides DNR's stakeholders and the public more clarity on how DNR manages the lands it administers

Each year, annual stand exam lists are generated from the 10-year stand exam list. Staff from the Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources review and coordinate on annual stand exam lists, and the DNR makes them available for public comment. Stands on annual stand exam lists are then visited and evaluated for potential harvest.

The purpose of this report is to communicate the DNR's STH decision elements, and the process and results of 10-year stand exam list development to meet those decision elements.

Sustainable Timber Harvest Decision Elements

The following is a summary of the STH decision elements. Some of these decisions were made after the STH analysis, and others were made during subsequent model building to create the 10-year stand exam list.

Annual Volume Offered

After careful consideration of the forest values identified by public and stakeholder input, the DNR determined that a one-million-cord annual harvest level was not sustainable, and set a target of 870,000 cords offered for

[4] Prior to the first year of the 10-year stand exam list (fiscal year 2021), the DNR implemented the Sustainable Timber Harvest Decision by adding acres to existing stand exam lists for fiscal years 2019 – 2020 to ensure they met volume targets. An additional two years of stand exams are planned after the Sustainable Timber Harvest decision period (fiscal years 2029 and 2030) so the DNR has sufficient time to plan for the next 10 years, without having to manually develop stand exam lists in the interim.

sale annually over fiscal years 2019-2028 from DNR-administered forest lands. The DNR also decided to offer 30,000 additional cords of ash and tamarack annually over the first five years of the decision period to address pest outbreaks in these forest cover types.

Annual Volume Offered by Tree Species

Under the STH decision, the total annual volume offered target is further broken down to target ranges of cords offered for sale by tree species or species groups (Table 1).

Table 1. DNR annual volume offered targets (cords) by tree species for fiscal years 2019-2028.

Tree species (or species group)	FY2012-FY2016 Average Cords Offered Per Year	FY2019-FY2028 Target Volume (Cords) Offered Range Per Year
Ash / Lowland Hardwoods	10,418	25,000 – 40,000
Aspen / Balm of Gilead	395,803	360,000 – 400,000*
Balsam Fir	30,643	30,000 – 40,000
Mixed Hardwoods / Oak	103,927	110,000 – 120,000
Birch	30,538	30,000
Spruce	106,736	105,000 – 115,000
Pine	104,429	110,000 – 120,000
White Cedar	1,848	2,000
Tamarack	52,373	30,000 – 40,000
Other	734	-
Totals	**837,449**	**870,000****

*This range represents a goal of offering volume at the high end of the range early in the planning period, and decreasing aspen volume offered in a stepwise fashion to the lower end of the range over 10 years.

**Total annual volume offered target for FY 2019 – FY 2023 is 870,000 plus 30,000 cords of additional ash and tamarack.

Older Aspen

During the STH analysis, model scenarios harvested most aspen over age 60, which is older than the standard harvest age for the aspen cover type (average 45 years). To maintain older aspen for habitat and biodiversity, the DNR decided to maintain at least 2.5% of the aspen cover type 60 years old or older on DNR-administered forest lands. This level of older aspen was determined after considering the amount of older aspen across all ownerships using data sources such as the USDA Forest Service's Forest Inventory & Analysis Program. Throughout this planning period, at least 8% of the aspen cover type will be older than the standard harvest age

for aspen. In the long-term, maintaining at least 2.5% of aspen age 60 or older will result in at least 7.5% of the aspen cover type being older than standard harvest age on DNR-administered forest lands.

Fish and Wildlife Modeled Management and Contribution to Volume Target

The DNR decided to model non-school trust lands administered by the Division of Fish and Wildlife differently from DNR standard management practices. This decision reflects statutory obligations to manage primarily for habitat objectives on Fish and Wildlife-administered lands. Fish and Wildlife-administered lands (i.e., wildlife management areas and Lake County aquatic management areas) were generally modeled with harvest at slightly older forest stand ages, and with greater amounts of trees reserved from harvest within stands, compared to DNR standard management practices. Local wildlife managers were consulted during the development of these management assumptions for the model, and they reflect differences in species management by ecological section. This is a departure from past stand exam list development through SFRMP, which modeled all DNR-administered lands in the management pool using the same management assumptions. See Appendix A for management assumptions used in the model for standard DNR management practices and management on Fish and Wildlife-administered lands.

During modeling, the DNR assessed the effects of modeled management on the distribution of older forest components and harvest across all DNR-administered forest lands. As a result of that assessment, the DNR determined that Division of Fish and Wildlife-administered lands should be modeled to contribute 12% of the statewide volume offered target to maintain a relatively even distribution of older forest components and harvest across all DNR-administered lands, and to meet statutory obligations. This is a decrease from the average percent volume offered by the Division of Fish and Wildlife in recent history (Division of Fish and Wildlife-administered lands contributed 14% of total volume offered on average from fiscal years 2001 – 2019 [range 12% to 16%]).

Evenness

The DNR ran the model to produce an even amount of volume within ecological sections and tree species over time. This decision was made to prevent major variations that could affect habitat availability as well as wood supply.

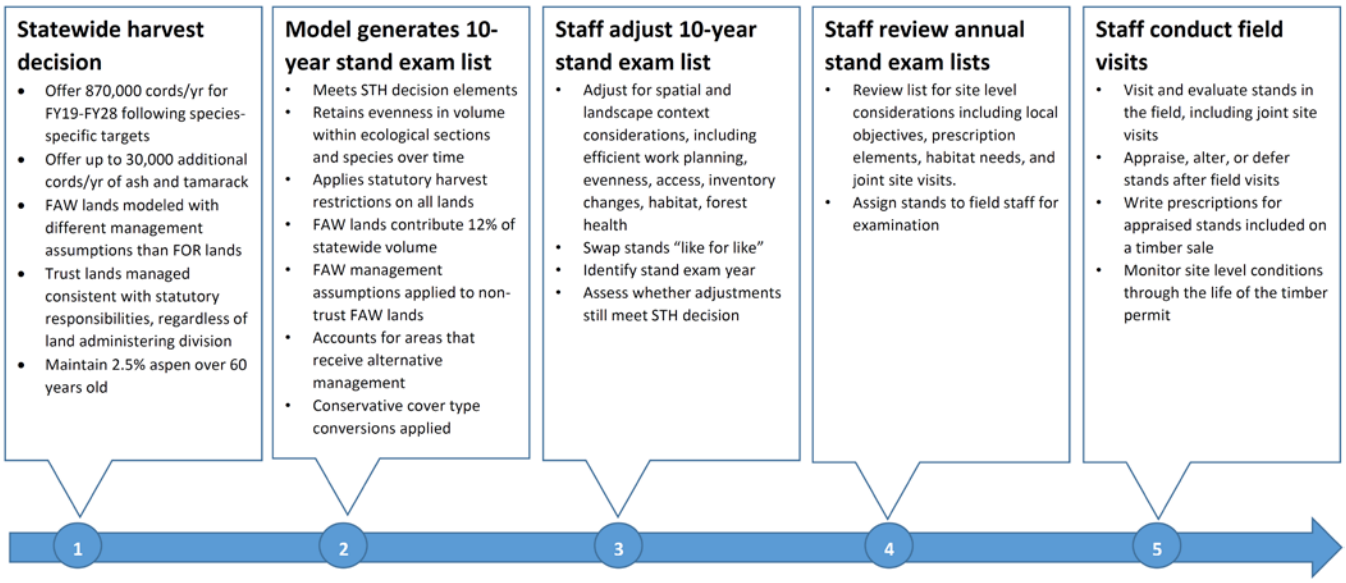
Other Lands Modeled with Alternative Management Assumptions

The DNR decided to consolidate all areas that receive alternative management compared to standard DNR management practices, and model different management on them depending on the reason for alternative management, land status, cover type, and section. Again, this was a departure from modeling for past stand exam lists in which all lands were modeled with the same management. Reasons for alternative management range from statutory obligations (accounting for endangered and threatened species) to DNR policy (old growth special management zones) to landscape habitat objectives (see Appendix B for a full list included in the model).

Developing a 10-year Stand Exam List Based on STH Decisions

The model used to build the 10-year stand exam list incorporated all STH decision elements. An initial 10-year stand exam list was developed using a harvest scheduling (or estate planning) model. DNR staff from the Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources reviewed and adjusted the model output to build the final 10-year stand exam list. Foresters led this effort for Division of Forestry administrative areas and wildlife managers led this effort for Red Lake and Mille Lacs Wildlife Management Areas. Staff adjusted the model output to address landscape goals, local habitat goals, operational considerations (e.g., adjacency, access, and land features), and field knowledge of site-level conditions. The adjusted stand list was run back through the model to ensure STH decision elements were met. The following sections describe the data and model used to develop the 10-year stand exam list and report results from the adjusted list. Figure 1 provides an overview of the process.

Figure 1. Overview of 10-year and annual stand exam list development and implementation. Abbreviations: FAW = Division of Fish and Wildlife, FY = fiscal year, STH = sustainable timber harvest.



Planning Sufficiently to Meet STH Targets and Multiple Management Objectives

Through this process, the DNR selected enough acres for stand exams so that we can meet STH targets and address management objectives related to species diversity, water quality, habitat, recreation, and other values, as we implement the 10-year stand exam list. Modeling incorporates many simplified assumptions that may not match the realities of implementation. Assumptions used in the model may not match actual conditions or results of management. For example, planned stands may not be offered for sale, or may produce less volume than expected, for a variety of reasons including stands not being ready to harvest upon examination, required inventory correction, operational issues, forest health issues, site-specific habitat management objectives, or endangered or threatened species occurrence (Fig. 2). Because of these factors, the DNR plans to visit and evaluate more acres than the model and data suggest are necessary to meet the STH goals.

Figure 2. Average annual acres visited, offered for sale, and sold. The DNR typically visits all acres on the stand exam list each year. For a variety of reasons, some examined acres are not offered for sale. Examples of reasons include a stand not being ready to harvest; required inventory corrections; operational issues such as steep slopes or wet, unfrozen ground; site-specific habitat management objectives; or endangered or threatened species occurrence. Most acres that are offered are sold.

Data Description

The dataset used to develop the 10-year stand exam list is an extension of the STH analysis dataset[5]. Forest Inventory Module (FIM) data used to develop the stand exam list were exported in April 2017, and updated in July 2018, and again in January 2019, to reflect changes in FIM data due to management actions. Only a subset of stands in FIM is available for timber management, STH modeling, and 10-year stand exam list development. Areas available for potential timber harvest include acres that are forested with a cover type that has a defined yield table (a table with an estimated volume of wood per unit area for a cover type by age). Managed acres are those administered by the DNR Divisions of Forestry and Fish and Wildlife (excluding Division of Fish and Wildlife

[5] For more information about how the DNR developed the modeling dataset, please refer to the Sustainable Timber Harvest Analysis: Phase 2 Final Report, January 31, 2018 report.

Section of Fisheries lands, except in Lake County), excluding certain land designations (e.g., old growth stands[6]) and areas (e.g., Boundary Waters Canoe Area Wilderness; see Appendix C for a full list of land designations and areas not included in managed acres). Forested managed acres exclude stagnant and offsite forest cover types that are not productive for timber (i.e., cover types with species that grow slowly or poorly on the site where they are located). Forest cover types with defined yield tables exclude walnut, willow, cottonwood, red cedar, Scotch pine, Norway spruce, hybrid poplar, and European larch. Of the 5.6 million acres DNR administers that have inventory data, approximately 49%, or 2.75 million acres, are available for the model to select while developing the 10-year stand exam list (Table 2 & 3, Appendix C).

In addition, Division of Ecological and Water Resources and Fish and Wildlife staff submitted areas that may receive alternative management to address landscape or habitat goals. Examples include old forest management complexes around some old growth stands, ruffed grouse management areas, and interior forest habitat patches, among others (see Appendix B). Alternative management was applied to these geographies in the model. This effort resulted in the first statewide compilation of such areas on DNR-administered lands.

Table 2. Summary of DNR-administered lands in acres (rounded to nearest 10 acres). Management acres are administered by the DNR Divisions of Forestry or Fish and Wildlife, excluding certain land designations and areas (See Appendix C). Forest lands with cover types that have defined yield tables define the subset of FIM data used for modeling when developing the 10-year stand exam list.

DNR-administered lands	Acres
Total DNR-administered land with FIM data	5,444,470
Management acres	4,807,260
Non-forest and unknown	-1,397,770
Stagnant and offsite forest	-655,730
Forest lands remaining	2,753,750
Modeled forest lands (those with defined yield tables)	2,749,400

[6] The DNR is in the process of designating lowland conifer old growth (LCOG) stands. Candidate stands were not available for the model to select. Candidate LCOG stands that are not designated will be released into the management pool.

Table 3. Acres of forested managed acres for cover types with defined yield tables by DNR land administrator and status (ConCon = consolidated conservation, U trust = university trust, LUP = land utilization program).

DNR Land Administrator	Division of Forestry					Division of Fish and Wildlife					Both Divisions
Cover Type	**Acquired**	**ConCon**	**School Trust**	**U Trust**	**Volstead**	**Acquired**	**ConCon**	**School Trust**	**Volstead**	**LUP**	**Total**
Ash / Lowland Hardwoods	21,958	27,349	73,865	633	168	11,871	7,530	1,003	13	1,057	145,447
Aspen / Balm of Gilead	181,097	195,244	479,990	8,933	1,258	68,852	84,754	20,994	117	20,852	1,062,091
Balsam Fir	4,660	5,873	29,268	71	144	748	2,168	91	0	1,902	44,925
Mixed Hardwoods / Oak	76,014	21,889	65,748	2,486	118	44,437	1,660	640	0	56	213,048
Birch	9,979	3,716	30,722	778	141	2,794	1,049	61	0	465	49,705
Spruce	22,788	72,547	350,197	709	3,978	1,787	26,368	300	0	6,528	485,202
Pine	46,256	39,092	114,052	1,925	50	2,968	3,181	23	0	10,368	217,915
White Cedar	5,098	26,756	112,615	259	924	896	8,366	83	0	4,574	159,571
Tamarack	8,381	105,550	180,872	178	5,293	3,950	58,293	1,414	50	7,801	371,782
Totals	**376,187**	**498,017**	**1,437,305**	**15,972**	**12,074**	**138,092**	**193,363**	**24,610**	**179**	**53,604**	**2,749,403**

Modeled Management Assumptions

For the model to estimate volume resulting from harvest, DNR leadership of the Divisions of Ecological and Water Resources, Fish and Wildlife, and Forestry, with input from project team members and field staff, decided how to model management on DNR-administered land. Model assumptions about how DNR manages forest cover types are necessarily simplified, and represent average management activity in the average stand. Model assumptions about management activities include standard types of management by cover type (Table 4), amount of trees within stands reserved from harvest, and ages at which cover types are managed. These assumptions vary by DNR land administrator and ecological section. For example, some areas were modeled with harvest occurring at older forest stand ages and with greater amounts of trees within stands reserved from harvest to address landscape and habitat goals. See Appendices I and II for details.

Division of Fish and Wildlife-administered lands were modeled with different management assumptions from DNR standard practices. Non-school trust lands administered by Fish and Wildlife were generally modeled with harvest at older forest stand ages, and with greater reserve amounts, compared to standard DNR management to give wildlife managers more flexibility to retain older forest elements for wildlife habitat (Appendix A).

Because the DNR has a fiduciary duty to administer school trust lands as a trustee, distinct from the Department's role of administering other lands as a steward, the Office of School Trust Lands was consulted on how to model management for those lands. As a result, all school trust lands were modeled with DNR standard management assumptions based on cover type, age, and reserve amounts within harvested stands that correspond to Minnesota Forest Resources Council voluntary site-level guidelines.

Table 4. Standard management categories by cover type used in the model. Even aged management means entire stands, minus reserves, are harvested to maintain trees of the same age within stands over time. Uneven aged management retains trees of different ages in a stand through partial harvests over time. Thinning removes some trees from stands before harvest to improve the growth of the remaining trees.

Cover Type	Thin	Even Aged	Uneven Aged	Cover Type	Thin	Even Aged	Uneven Aged
Ash/Lowland hardwoods			✓	Jack pine		✓	
Aspen/Balm of Gilead		✓		Norway (red) pine	✓	✓	
Birch		✓		Tamarack		✓	
Northern & Central hardwoods			✓	White cedar			✓
Oak	✓	✓		White spruce natural			✓
Balsam fir		✓		White spruce plantation	✓	✓	
Black spruce-lowland and upland		✓		White pine			✓

Modeling

Forest inventory (FIM) data, combined with other relevant data as described above, were applied to a harvest-scheduling model, using linear programming within Remsoft's Woodstock software, to estimate harvest volume in cords given a series of model parameters. The model calculates volume estimates using yield tables and growth rates that are specific to ecological section, forest cover type, and, in some cases, productivity classes (how well trees grow on a site) within cover types.

The mathematical objective of the model was to maximize harvest revenue, given the management constraints described below. Experience from the DNR's past modeling efforts, as well as MB&G's planning experience, informed the decision. An alternative objective of maximizing timber volume causes the model to cycle harvest between holding and liquidating timber over time, which would not meet STH goals of ensuring long-term habitat needs with a balanced, consistent supply of timber. The maximize revenue objective ensures more realistic harvesting behavior within the model.

The following model parameters were determined by DNR leadership and used in the final model to address STH decisions, and stakeholder and staff priorities:

- Provide evenness in volume offered within SFRMP sections over time. The model allowed variation in volume up to 10% within each planning section and up to 15% for each species over the first three 5-year cut periods. This also ensures a steady, predictable supply of young and older forest habitat into the future.
- Model school trust lands using standard DNR management practices for the age at which stands are harvested and the amount of trees reserved from harvest within stands (Appendix A).
- Incorporate different model assumptions for non-school trust Division of Fish and Wildlife-administered land that increase harvest age for most species and allow for a higher percentage of reserves after harvest (Appendix A).
- Harvest 12% of overall volume from Division of Fish and Wildlife administered lands statewide (a decrease from the historical average of 14%).
- Incorporate revised management assumptions within some areas on non-school trust lands to meet DNR habitat or landscape management objectives, or to benefit specific forest resources (Appendix A and B).
- Retain a minimum of 2.5% of the aspen cover type on DNR-administered forest lands age 60 or older statewide.
- Adhere to statutory obligations on all DNR-administered lands, including those for endangered and threatened species and bald eagle nests (Appendix B).
- Assume a reduced area available for harvest on all DNR-administered lands to apply at least minimum Minnesota Forest Resources Council site-level guidelines for riparian management zones and 5% leave trees.

The final Woodstock model solution was passed to the Spatial Allocator model, which uses the Woodstock strategic model to identify candidate stands. The Spatial Allocator model output was then reviewed and adjusted by field staff to build the 10-year stand exam list (adjustment described below).

More detail on all aspects of modeling is available in the *Sustainable Timber Harvest Implementation Modeling Report*. Contact DNR forest biometrician Scott Hillard, Ph.D., for more information (scott.hillard@state.mn.us).

Adjusting Model Output to Create the 10-year Stand Exam List

Field staff from the Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources reviewed and adjusted the model-selected stands to build the 10-year stand exam list. They assigned a stand exam year to each stand and adjusted selected stands considering spatial arrangement, landscape context, and field knowledge of site-level conditions to address various objectives, including the volume offered target. Examples of considerations addressed while making adjustments include harvest block size, access, and other forest resource objectives, including those listed in Appendix B.

To ensure confidence that adjustments to selected stands still meet STH targets, geographic units spanning the state (Forestry Administrative Areas and major Wildlife Management Areas) were given acreage amounts to plan for each cover type by ecological section derived from the model-generated stand exam list. These acre amounts exceeded the acres the model estimates would be necessary to meet volume targets for some species, to allow flexibility to address operational and other needs when the stand exam list is implemented (see "Implementing Stand Level Management and Operational Flexibility" section below). Adjustments were made by adding or dropping stands from the list, or exchanging model-selected stands with stands not selected by the model. This process is called "stand swapping." To ensure stand swapping did not affect the ability to meet STH decision elements, stands were exchanged for "like" stands that:

- had the same cover type, administration, and school trust land status
- were of similar age and size
- were in the same ecological section

An interdisciplinary team managed the stand list adjustment process. Adjusted lists were quality checked for errors and compiled into one statewide list, then re-run through the Woodstock model to verify that the adjusted list still met STH decision elements.

10-year Stand Exam List Results and Conformance to STH Decision Elements

Acre Summary Results

Total acres on the adjusted stand exam list are close to the acre targets given to staff (99%, Table 5). Because the amount of acres staff were asked to plan exceeds the amount of acres the model estimates are necessary to meet volume targets, and staff planned nearly all of those acres, the DNR is confident it can achieve volume targets, and maintain flexibility to address operational and other issues during implementation (see "Planning Sufficiently to Meet Targets" section above and "Implementing Stand Level Management and Operational Flexibility" section below).

Additional summaries for stand exam list results by planning section, DNR administrator, areas with alternative management, and cover type are available in Appendix D.

Table 5. Summary of acres on the stand exam list after staff adjustment compared to the amount of acres staff were asked to plan for each cover type. The amount of acres staff were asked to plan exceeds the number of acres the model estimates are necessary to achieve the volume target to accommodate operational flexibility, and because model assumptions and inventory data may not always accurately reflect the realities of on-the-ground conditions and management activities.

Species	Modeled Acres	Planned Acres (after adjustment)	% Modeled Acres Planned
Ash / Lowland Hardwoods	62,336	60,095	96%
Aspen / Balm of Gilead	289,438	285,873	99%
Balsam fir	24,288	20,849	86%
Mixed hardwoods / Oak	83,057	78,308	94%
Birch	10,936	11,149	102%
Spruce	111,375	112,428	101%
Pine	103,223	103,597	100%
White cedar	197	625	317%
Tamarack	74,913	76,563	102%
Other	0	1,159	-
Total	**759,763**	**750,646***	**99%**

Note: There may be slight variations in the reported total planned acres throughout this report due to rounding.

STH Decision Elements Results

The adjusted 10-year stand exam list was run through the Woodstock model, and outputs were used to verify that the stand exam list meets decision elements for the remainder of the STH decision period (fiscal years 2021-2028). Additional model result summaries are found in Appendix E.

Annual Volume Offered – Total and by Species

The 10-year stand exam list is projected to meet the STH statewide total and species volume targets (Table 6). Excess volume (above 870,000 cords plus 30,000 cords ash and tamarack) estimated for some forest cover types is intentionally planned. By planning more acres than DNR expects to treat with harvest prescriptions, the DNR is confident it can meet all STH plan targets even when a percentage of planned acres do not result in timber sales for various reasons. Planning more acres than are needed ensures we can meet those targets despite inventory that may not match conditions on the ground and modeled management assumptions that may not match actual management activities or yields. The DNR will closely monitor volume offered throughout each year at multiple scales to ensure that the annual volume offered is as close to planned targets as possible. Once targets are met, any additional planned acres can be carried over to the next year to be included in the pool of stands being assessed for sale.

Table 6. Modeled average annual volume based on adjusted 10-year stand exam list for fiscal years 2021 – 2028 compared to STH volume offered target ranges. Mixed hardwoods contain the oak, maple, and basswood estimated species volume. Pine is composed of white, red, and jack pine. For some species, more volume is planned than the target volume offered range to account for operational realities (e.g., forest health issues, terrain, incorrect inventory, etc.) and model assumptions that may not always accurately reflect on-the-ground conditions, including simplified assumptions about how much volume a stand will produce and how management is conducted.

Tree species or species group	STH Decision - FY2019-FY2028 Target Volume Offered Range (cords per year)	Modeled Stand Exam List Volume (average cords per year FY2021-FY2028)
Ash / Lowland Hardwoods	25,000 – 40,000	40,000
Aspen / Balm of Gilead	360,000 – 400,000	397,000
Balsam Fir	30,000 – 40,000	41,000
Mixed Hardwoods / Oak	110,000 – 120,000	118,000
Birch	30,000	36,000
Spruce	105,000 – 115,000	116,000
Pine	110,000 – 120,000	129,000
White Cedar	2,000	100
Tamarack	30,000 – 40,000	94,000
Total	**870,000**	**971,000**

Note: modeled average annual volume includes the additional 30,000 cords of ash and tamarack that will be offered annually during the first five fiscal years of the stand exam list.

Older Aspen

Throughout the 10-year stand exam list period, at least 3% of the aspen cover type acres on DNR-administered forest lands are projected to be over 60 years old, which meets and exceeds the STH target for maintaining a minimum of 2.5% of the aspen cover type 60 years old or older on DNR-administered forest lands. This assumes that cover type data in the forest inventory are accurate for these acres.

Fish and Wildlife Contribution to Volume Target

Fish and Wildlife-administered lands are estimated to contribute 11% of the volume total on the 10-year stand exam list, very close to the 12% modeled contribution.

Evenness Results

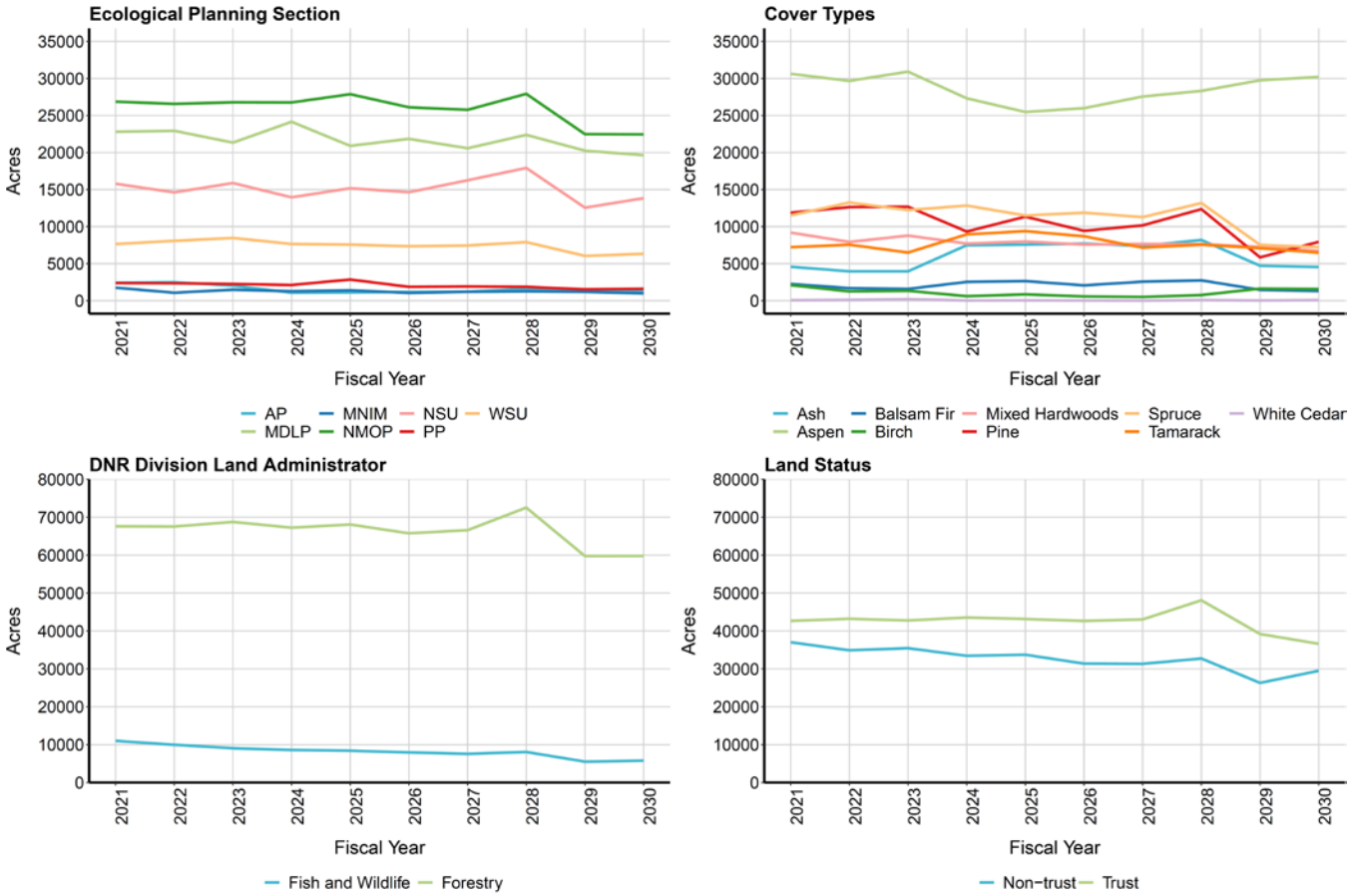
The model used to build the 10-year stand exam list included parameters to provide an even amount of volume offered within species and planning sections over time. DNR leadership also evaluated the evenness of planned

acres by trust status (school trust compared to non-school trust lands) and land administrator on the 10-year stand exam list. After adjustments, acre summaries show that evenness in planned acres was maintained, with some variation over years (Fig. 3).

In addition to maintaining evenness over time, DNR leadership evaluated the model with respect to the proportion of volume available to be offered from school trust and non-school trust lands. From modeled results based on the 10-year stand exam list, school trust lands, which represent 53% of DNR-administered acres available for model selection, are projected to contribute 55% of statewide volume.

Ultimately, the DNR will achieve evenness through volume offered targets. The results presented here show that sufficient acres are planned on the 10-year stand exam list to accomplish annual targets, provide room for operational flexibility, and account for model assumptions that may not match on-the-ground reality.

Figure 3. Evenness of acres on the 10-year statewide stand exam list by four metrics.



Translating model inputs and results to on-the-ground management

The Forest Management Planning Process and Section Forest Resource Management Plans

In the past, 10-year stand exam lists were created at the same time as narrative forest resource management plans (SFRMPs) for each forested ecological section in Minnesota. Section plans were on separate 10-year cycles, so stand exam lists covered different 10-year periods in different ecological sections. Now, DNR has 10-year stand exam lists for all sections covering the same 10-year period. Having a complete 10-year stand exam list statewide means the role of narrative SFRMPs and the process for developing them have changed. These plans will be developed by interdisciplinary planning teams for each section, and will now focus on:

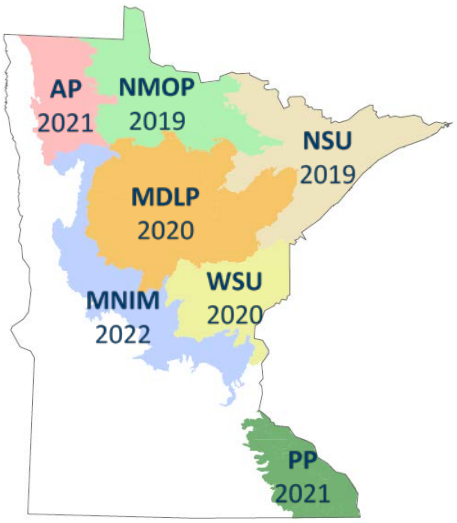
- communicating some aspects of STH for the public and DNR staff, and providing future direction on finer-level forest management detail than is addressed at the broad scale of STH (e.g., cover type change goals, within-stand diversity, habitat and native plant community (NPC) elements, etc.).
- guiding managers on what to consider when making site-level decisions for stands on annual stand exam lists that are derived from the 10-year stand exam list
- vetting management opportunity areas (MOAs) included in stand exam list modeling and developing guidance for them

The DNR restarted the process to develop SFRMPs in early 2019, after a pause since 2016 to complete the STH analysis. Going forward, all plans will be revised to align with STH decisions, starting with the Northern Minnesota and Ontario Peatlands and Northern Superior Uplands plans (Fig. 4). It is important to complete each plan in a timely manner so that staff can focus on making management decisions and monitoring effectiveness. Until new SFRMPs are completed, staff should still follow pre-STH SFRMP guidance and objectives, insofar as they align with current policy. As each narrative plan is developed, it will be made available for public comment.

More information on SFRMP, including individual section plans and related products, is available on the MN DNR Forest Management Planning webpage.

Figure 4. Estimated start years for SFRMP plan revisions by section (planning unit).

Ecological Section Abbreviation	Ecological Section Name
AP	Aspen Parklands
MDLP	Minnesota Drift & Lake Plains
MNIM	Minnesota & Northeast Iowa Moraines
NMOP	Northern Minnesota & Ontario Peatlands
NSU	Northern Superior Uplands
PP	Paleozoic Plateau
WSU	Western Superior Uplands



Implementing Stand Level Management and Operational Flexibility

When implementing the 10-year stand exam list through the annual stand exam process, it is important to remember that model assumptions, including standard types of management by cover type, amount of forest stands reserved from harvest, and age at which cover types are managed, are simplified assumptions for average management on the average stand in the average year. These simplified assumptions are necessary for the model, which cannot work with the nuance of site-level variation. In reality, sites may differ in their objectives and characteristics.

Objectives for the 10-year stand exam list were developed at the ecological section, cover type, and land administrator levels. As long as those plan objectives are met, there is some flexibility to vary management of stands. Field professionals have long had, and will continue to have, flexibility in designing appropriate prescriptions for stands based on site conditions and considerations.

Examples of site-level conditions and considerations staff use to assess how much flexibility to employ when designing prescriptions include:

- land status and administering division
- conditions on the ground and stand attributes (species, size, quality, understory, NPC, etc.)
- values present within stands and their importance (endangered, threatened, or special concern species; game species; sugarbush; berries; boughs; nesting habitat; etc.)
- objectives for the site

Types of flexibility foresters can use to address site-level considerations include:

- developing stand harvest prescriptions to meet site-level considerations, while still contributing to desired cover type age-class goals
- varying the amount of reserve trees from the modeled amount, as long as the average stand treatments across the planning unit meet targets
- changing the planned stand exam year to a different year within the 10-year plan period, as long as planned management goals will still be met
- deferring some stands that are not necessary to achieve the volume offered target outside of the 10-year planning period

Overall, management decisions must incorporate flexibility in a way that adheres to the intent of STH decision elements and allows the DNR to meet STH targets, recognizing that all objectives cannot be achieved everywhere at all times.

Next Steps

Opportunity for Future Coordination and Review

Each year, annual stand exam lists will be pulled from the 10-year list by the stand exam years assigned during adjustment of the model candidate stands. Local Ecological and Water Resources and Fish and Wildlife Division staff will have the opportunity to review annual stand exam lists with Forestry Area staff using the *Interdisciplinary Forest Management Coordination Framework*. Stand swapping or dropping should have occurred primarily during adjustment of the 10-year list, and coordination on annual stand exam lists is expected to revolve primarily around stand-level issues, such as harvest prescriptions. Although rare, some stand adjustments may also occur during annual review.

Annual stand exam lists will be made available for public review and comment. The public is notified through GovDelivery communications each year when the annual stand exam list is available for review. At that time, the DNR encourages interested parties to submit comments on planned stand exams. As part of this notice, a summary of planned acres, with preliminary prescriptions by cover type, is made available. Similarly, the DNR releases summary information and holds a comment period for annual plan additions[1]. More detailed inventory data for individual planned stands, along with preliminary prescriptions, is available through the ForestView stand exam list map interface (see link on the DNR Annual Stand Exam Lists webpage). Outside of the comment period, stands on the current annual stand exam list can be viewed through ForestView, and local Forestry Area offices can be contacted for more information. In addition to annual stand exam lists, the 10-year statewide list is available through the Minnesota Geospatial Commons website. These data provide valuable opportunities for coordination with other agencies, tribal governments, and private landowners. For more information on annual stand exam lists, or to sign up for email updates, visit the DNR Annual Stand Exam Lists webpage.

Monitoring

The DNR will monitor implementation of the STH decision in a variety of ways and will adjust implementation as needed. This report shows that current planning at the 10-year stand exam level is consistent with STH decisions. Future monitoring efforts will examine whether STH decisions are being met through actual implementation. The DNR will track volume offered and amount of visited acres annually. Monitoring results for implementation of STH decision elements will be made available to the public at the midpoint and end of the

[1] Annual plan additions (APAs) are stands not originally planned that are added to the stand exam list in a given year. They are 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 now.

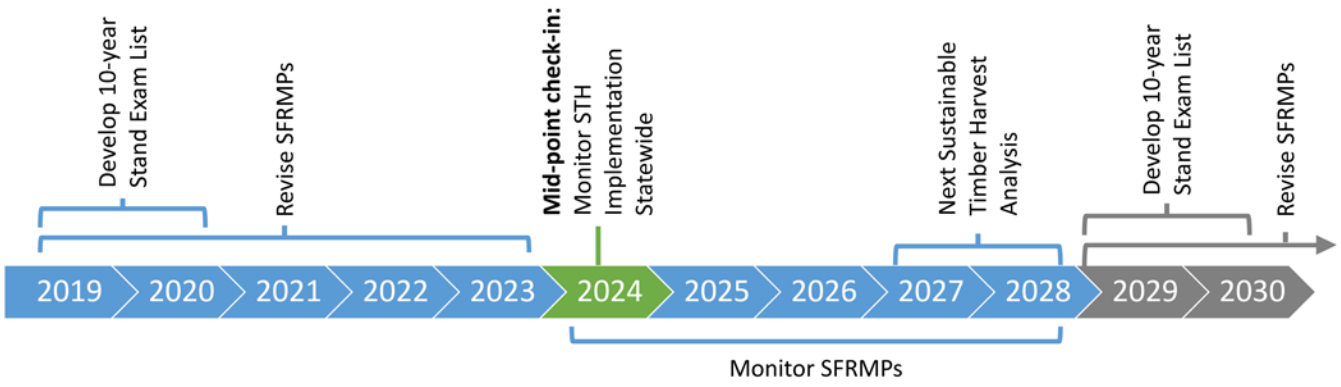
STH decision period (FY 2024 and FY 2028). Available data will be used to assess progress toward plan goals and whether there is a need to adjust the plan. Monitoring metrics include, but are not limited to:

- volume offered and sold by species, per year
- percent of aspen 60 years old and older
- volume-offered contribution by the Divisions of Forestry and Fish and Wildlife
- proportion of planned acres visited, appraised, deferred, or in need of inventory update, including reasons for deferrals (e.g., to address ecological or habitat objectives)
- evenness in volume offered by administrator, land status, and species
- actual compared to modeled management, including type of management by cover type, amount of forest stands reserved from harvest, and age at which cover types are managed by land administrator, land status, and within some areas that receive alternative management

Future Sustainable Timber Harvest Analysis

Before the end of the STH decision period (fiscal year 2019-2028), the DNR intends to reassess its sustainable timber harvest level (Fig. 5). The additional two years (fiscal years 2029 and 2030) planned on the current 10-year stand exam list will allow the DNR to plan the next 10-year period without having to manually create lists that are not guided by model results in the interim.

Figure 5. Approximate timeline of 10-year stand exam list and SFRMP planning processes over fiscal years (STH decision period, fiscal years 2019 – 2028, in blue).



Appendix A. Modeled Management

The tables below show the different even-aged management rotation ages (RA) and reserve amounts, and uneven-aged management model assumptions, by cover type and ecological sections for standard DNR management practices, Division of Fish and Wildlife-administered land, and various areas that receive alternative management. These assumptions about management are referred to throughout this appendix as modeled management regimes. Note that even-aged management rotation ages were modeled 5 years younger than the rotation ages in the tables for stands that receive standard DNR management practices and stands that include an Old Growth Special Management Zone buffer, but otherwise do not receive alternative management. This was done so the model could identify an expanded pool of stands for staff to work with during stand exam list adjustment. Although some of these stands may be selected by the model for examination before the rotation age for their cover type, it can take years from the time a stand is visited to when it is harvested, and it is assumed that these stands will be harvested at or close to their rotation age.

Table A.1 Ecological section abbreviations in management regime tables.

Ecological Section	Abbreviation
Aspen Parklands	AP
Minnesota & Northeast Iowa Moraines	MNIM
Minnesota Drift & Lake Plains	MDLP
Northern Minnesota & Ontario Peatlands	NMOP
Northern Superior Uplands	NSU
Paleozoic Plateau	PP
Western Superior Uplands	WSU

DNR Standard Even Age Reserves and Rotation Ages by Cover Type and Section

Abbreviations: SI = site index; UE = managed uneven-aged (reserve amounts do not apply)
Note: School trust lands within Wildlife Management Areas follow these standard rotation ages and reserves.

		Rotation Age (Years) by Section						
Cover Type	**Reserve %**	**AP**	**PP**	**MNIM**	**MDLP**	**NMOP**	**NSU**	**WSU**
Ash/Lowland Hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Aspen/Balm-of-Gilead - SI 65+	5	40	40	40	40	40	40	40
Aspen/Balm-of-Gilead - SI < 65	5	50	50	50	50	50	50	50
Birch	5	45	60	45	50	50	55	50
Jack Pine	5	50	60	35	45	50	60	40
Black Spruce Upland	5	50	60	35	45	50	60	40
Balsam Fir	5	50	45	45	45	45	50	60
White Spruce Planted	5	50	50	50	50	50	50	50
White Spruce Natural	-- 5 - PP, WSU, MNIM	UE	60	50	UE	UE	UE	50
Black Spruce Lowland - SI 40+	5	80	80	80	80	80	80	80
Black Spruce Lowland - SI 30-39	5	100	100	100	100	100	100	100
Black Spruce Lowland - SI 23-29	5	120	120	120	120	120	120	120
Tamarack - SI 40+	5	80	85	85	65	70	75	60
Tamarack - SI < 40	5	100	85	85	75	95	100	100
Red Pine Plantation - SI 65+	5	60	60	60	60	60	60	60
Red Pine Plantation - SI 55-64	5	65	65	65	65	65	65	65
Red Pine Plantation - SI < 55	5	70	70	70	70	70	70	70
Red Pine Natural	5	120	115	115	100	100	115	120
White Pine Plantation - SI 65+	5	60	60	60	60	60	60	60
White Pine Plantation - SI 55 - 60	5	65	65	65	65	65	65	65
White Pine Plantation - SI < 50	5	70	70	70	70	70	70	70
White Pine Natural	-- 5 - WSU	UE	UE	UE	UE	UE	UE	120
Northern Hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Central Hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Oak - SI 75+	5	60	80	60	80	60	85	120
Oak - SI < 75	5	60	80	60	50	60	85	150
Cedar	--	UE	UE	UE	UE	UE	UE	UE

Fish and Wildlife Even Age Reserves and Rotation Ages by Cover Type and Section

Abbreviations: SI = site index; UE = managed uneven-aged (reserve amounts do not apply)

		Rotation Age (Years) by Section						
Cover Type	**Reserve %**	**AP**	**PP**	**MNIM**	**MDLP**	**NMOP**	**NSU**	**WSU**
Ash/Lowland Hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Aspen/Balm-of-Gilead	10	45	45	45	60	60	60	60
Birch	15	45	45	45	60	60	60	60
Jack Pine	15	45	45	45	45	55	55	45
Black Spruce Upland	15	45	45	45	45	55	55	45
Balsam Fir	15	45	45	45	50	50	50	50
White Spruce Planted	5	45	45	45	45	45	45	45
White Spruce Natural	--	UE	UE	UE	UE	UE	UE	UE
Black Spruce Lowland - SI 40+	10	80	80	80	80	100	90	110
Black Spruce Lowland - SI 30-39	10	100	100	100	100	100	120	110
Black Spruce Lowland - SI 23-29	10	120	120	120	120	120	120	120
Tamarack - SI 40+	5	85	85	85	65	90	90	80
Tamarack - SI <40	5	85	85	85	75	90	110	110
Red Pine Plantation - SI 65+	5 10 - MDLP	55	55	50	50	55	55	55
Red Pine Plantation - SI 55-64	5 10 - MDLP	60	60	50	50	60	60	60
Red Pine Plantation - SI < 55	5	65	65	50	50	65	65	65
Red Pine Natural	66	115	110	110	110	110	110	115
White Pine Plantation	-- 20 - MDLP	UE	UE	UE	45	UE	UE	UE
White Pine Natural	--	UE	UE	UE	UE	UE	UE	UE
Northern Hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Central hardwoods	--	UE	UE	UE	UE	UE	UE	UE
Oak	15	55	90	90	90	90	90	90
Cedar	--	UE	UE	UE	UE	UE	UE	UE

Old Growth Special Management Zone (OG SMZ) Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	40	10	40	10	40	10	40	10	40	10	40	10	40	10
Aspen/BG	<65	50	10	50	10	50	10	50	10	50	10	50	10	50	10
Birch	all	45	10	60	10	45	10	50	10	50	10	55	10	50	10
Jack Pine	all	50	5	60	5	35	5	45	5	50	5	60	5	40	5
Black Spruce Upland	all	50	5	60	5	35	5	45	5	50	5	60	5	40	5
Balsam Fir	all	50	10	45	10	45	10	45	10	45	10	50	10	60	10
White Spruce Planted	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	80	5	80	5	80	5	80	5	80	5	80	5	80	5
Black Spruce Lowland	30-39	100	5	100	5	100	5	100	5	100	5	100	5	100	5
Black Spruce Lowland	23-29	120	5	120	5	120	5	120	5	120	5	120	5	120	5
Tamarack	40+	80	5	85	5	85	5	65	5	70	5	75	5	60	5
Tamarack	<40	100	5	85	5	85	10	75	5	95	5	100	5	100	5
Red Pine Plantation	65+	60	5	60	5	60	5	60	5	60	5	60	5	60	5
Red Pine Plantation	55-64	65	5	65	5	65	5	65	5	65	5	65	5	65	5
Red Pine Plantation	<55	70	5	70	5	70	5	70	5	70	5	70	5	70	5
Red Pine Natural	all	120	10	115	10	115	10	100	10	100	10	115	10	120	10
White Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Old Forest Management Complex (OFMC) Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	50	10	50	10	50	10	55	10	55	10	55	10	55	10
Aspen/BG	<65	55	10	55	10	55	10	60	10	60	10	60	10	60	10
Birch	all	50	10	50	10	50	10	65	10	65	10	65	10	65	10
Jack Pine	all	50	5	50	5	50	5	50	5	60	5	60	5	50	5
Black Spruce Upland	all	50	5	50	5	50	5	50	5	60	5	60	5	50	5
Balsam Fir	all	50	5	50	5	50	5	55	15	55	15	55	15	55	15
White Spruce Planted	all	50	5	50	5	50	5	50	5	50	5	50	5	50	5
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	80	10	80	10	80	10	80	10	80	10	80	10	80	10
Black Spruce Lowland	30-39	100	10	100	10	100	10	100	10	100	10	100	10	100	10
Black Spruce Lowland	23-29	120	10	120	10	120	10	120	10	120	10	120	10	120	10
Tamarack	40+	80	5	85	5	85	5	65	5	70	5	75	5	60	5
Tamarack	<40	100	5	85	5	85	5	75	5	95	5	100	5	100	5
Red Pine Plantation	65+	60	5	60	5	60	5	60	5	60	5	60	5	60	5
Red Pine Plantation	55 -64	65	5	65	5	65	5	65	5	65	5	65	5	65	5
Red Pine Plantation	<55	70	5	70	5	70	5	70	5	70	5	70	5	70	5
Red Pine Natural	all	120	10	115	10	115	10	100	10	115	10	120	10	120	10
White Pine Plantation	all	60	15	60	15	60	15	60	-	60	-	60	-	60	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	20	-	20	-	20	-	20	-	20	-	20	-	20
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Old Forest Patch MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	45	10	-	-	-	-	50	10	50	10	50	10	50	10
Aspen/BG	<65	50	10	-	-	-	-	55	10	55	10	55	10	55	10
Birch	all	45	10	-	-	-	-	60	10	60	10	60	10	60	10
Jack Pine	all	45	5	-	-	-	-	45	5	55	5	55	5	45	5
Black Spruce Upland	all	45	5	-	-	-	-	45	5	55	5	55	5	45	5
Balsam Fir	all	45	5	-	-	-	-	50	15	50	15	50	15	50	15
White Spruce Planted	-	50	5	-	-	-	-	50	5	50	5	50	5	50	5
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	80	10	-	-	-	-	80	10	80	10	80	10	80	10
Black Spruce Lowland	30-39	100	10	-	-	-	-	100	10	100	10	100	10	100	10
Black Spruce Lowland	23-29	120	10	-	-	-	-	120	10	120	10	120	10	120	10
Tamarack	40+	80	5	-	-	-	-	65	5	70	5	75	5	60	5
Tamarack	<40	100	5	-	-	-	-	75	5	95	5	100	5	100	5
Red Pine Plantation	65+	60	5	-	-	-	-	60	5	60	5	60	5	60	5
Red Pine Plantation	55 -64	65	5	-	-	-	-	65	5	65	5	65	5	65	5
Red Pine Plantation	<55	70	5	-	-	-	-	70	5	70	5	70	5	70	5
Red Pine Natural	all	120	10	-	-	-	-	100	10	115	10	120	10	120	10
White Pine Plantation	all	65	-	-	-	-	-	65	-	65	-	65	-	65	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	80	20	-	-	-	-	80	20	80	20	80	20	80	20
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

HCVF and G1/G2* NPC Low Harvest Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	45	10	45	10	45	10	50	10	50	10	50	10	50	10
Aspen/BG	<65	50	-	50	-	50	-	55	-	55	-	55	-	55	-
Birch	all	45	10	45	10	45	10	60	10	60	10	60	10	60	10
Jack Pine	all	45	5	45	5	45	5	45	5	55	5	55	5	45	5
Black Spruce Upland	all	45	5	45	5	45	5	45	5	55	5	55	5	45	5
Balsam Fir	all	45	5	45	5	45	5	50	15	50	15	50	15	50	15
White Spruce Planted	all	45	5	45	5	45	5	45	5	45	5	45	5	45	5
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	80	10	80	10	80	10	80	10	80	10	80	10	80	10
Black Spruce Lowland	30-39	100	10	100	10	100	10	100	10	100	10	100	10	100	10
Black Spruce Lowland	23-29	120	10	120	10	120	10	120	10	120	10	120	10	120	10
Tamarack	40+	75	5	80	5	80	5	60	5	65	5	70	5	55	5
Tamarack	<40	95	5	80	5	80	5	70	5	90	5	95	5	95	5
Red Pine Plantation	65+	60	5	60	5	60	5	60	5	60	5	60	5	60	5
Red Pine Plantation	55-64	65	5	65	5	65	5	65	5	65	5	65	5	65	5
Red Pine Plantation	<55	70	5	70	5	70	5	70	5	70	5	70	5	70	5
Red Pine Natural	all	115	10	110	10	110	10	95	10	110	10	115	10	115	10
White Pine Plantation	all	60	10	60	10	60	10	60	10	60	10	60	10	60	10
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	75+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	20	-	20	-	20	-	20	-	20	-	20	-	20
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

*G1/G2 are NatureServe global conservation status ranks indicating a native plant community is critically imperiled or imperiled.

Brushland/Open Landscape Management Area MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-		-		-	-	-	-	-	-	-	-
Aspen/BG	all	45	10	-		-		45	10	45	10	45	10	45	10
Birch	all	50	10	-		-		50	10	50	10	50	10	50	10
Jack Pine	all	-	-	-		-		-	-	-	-	-	-	-	-
Black Spruce Upland	all	-	-	-		-		-	-	-	-	-	-	-	-
Balsam Fir	all	-	-	-		-		-	-	-	-	-	-	-	-
White Spruce Planted	all	-	-	-		-		-	-	-	-	-	-	-	-
White Spruce Natural	all	-	-	-		-		-	-	-	-	-	-	-	-
Black Spruce Lowland	all	-	-	-		-		-	-	-	-	-	-	-	-
Tamarack	all	-	-	-		-		-	-	-	-	-	-	-	-
Red Pine Plantation	all	-	-	-		-		-	-	-	-	-	-	-	-
Red Pine Natural	all	115	5	-		-		95	5	95	5	110	5	115	5
White Pine Plantation	all	-	-	-		-		-	-	-	-	-	-	-	-
White Pine Natural	all	-	-	-		-		-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-		-		-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-		-		-	-	-	-	-	-	-	-
Oak	all	90	20	-		-		90	20	90	20	90	20	90	20
Cedar	all	-	-	-		-		-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Ruffed Grouse Management Area (RGMA) MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	all	45	10	-	-	45	10	45	10	45	10	45	10	45	10
Birch	all	50	10	-	-	50	10	50	10	50	10	50	10	50	10
Jack Pine	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Upland	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balsam Fir	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Spruce Planted	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tamarack	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	90	20	-	-	90	20	90	20	90	20	90	20	90	20
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

HCVF and G1/G2 NPC Medium Harvest Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	40	5	40	10	50	5	-	-	40	10	40	10
Aspen/BG	<65	-	-	50	5	50	10	50	5	-	-	50	10	50	10
Birch	all	-	-	-	5	45	5	50	5	-	-	50	10	50	10
Jack Pine	all	-	-	-	5	40	5	45	5	-	-	45	5	40	10
Black Spruce Upland	all	-	-	-	5	40	5	45	5	-	-	45	5	40	10
Balsam Fir	all	-	-	-	5	45	5	45	10	-	-	45	5	55	10
White Spruce Planted	all	-	-	50	5	50	5	-	5	-	-	50	5	50	5
White Spruce Natural	all	-	-	50	-	50	-	-	-	-	-	-	-	50	-
Black Spruce Lowland	40+	-	-	80	5	80	5	80	5	-	-	80	5	80	5
Black Spruce Lowland	30-39	-	-	100	5	100	5	100	5	-	-	100	5	100	5
Black Spruce Lowland	23-29	-	-	120	5	120	5	120	5	-	-	120	5	120	5
Tamarack	40+	-	-	85	5	85	5	65	5	-	-	70	5	60	5
Tamarack	<40	-	-	85	5	85	5	75	5	-	-	95	5	100	5
Red Pine Plantation	65 +	-	-	60	5	60	5	60	5	-	-	60	5	60	5
Red Pine Plantation	55 -64	-	-	65	5	65	5	65	5	-	-	65	5	65	5
Red Pine Plantation	<55	-	-	70	5	70	5	70	5	-	-	70	5	70	5
Red Pine Natural	all	-	-	110	5	110	5	110	5	-	-	110	5	115	5
White Pine Plantation	65+	-	-	60	5	60	5	60	5	-	-	60	5	60	5
White Pine Plantation	55-60	-	-	65	5	65	5	65	5	-	-	65	5	65	5
White Pine Plantation	< 50	-	-	70	5	70	5	70	5	-	-	70	5	70	5
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. Hardwoods	75+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	80	10	80	10	60	10	-	-	80	10	80	10
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Upland/Lowland Habitat MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	-	-	40	10	50	5	-	-	40	10	-	-
Aspen/BG	<65	-	-	-	-	50	10	50	5	-	-	50	10	-	-
Birch	all	-	-	-	-	45	5	50	5	-	-	50	10	-	-
Jack Pine	all	-	-	-	-	40	5	45	5	-	-	45	5	-	-
Black Spruce Upland	all	-	-	-	-	40	5	45	5	-	-	45	5	-	-
Balsam Fir	all	-	-	-	-	45	5	45	5	-	-	45	10	-	-
White Spruce Planted	all	-	-	-	-	50	5	50	5	-	-	50	10	-	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	-	-	-	-	80	5	80	5	-	-	80	5	-	-
Black Spruce Lowland	30-39	-	-	-	-	100	5	100	5	-	-	100	5	-	-
Black Spruce Lowland	23-29	-	-	-	-	120	5	120	5	-	-	120	5	-	-
Tamarack	40+	-	-	-	-	-	5	65	5	-	-	-	5	-	-
Tamarack	<40	-	-	-	-	-	5	75	5	-	-	-	5	-	-
Red Pine Plantation	65+	-	-	-	-	60	5	60	5	-	-	55	5	-	-
Red Pine Plantation	55 -64	-	-	-	-	65	5	65	5	-	-	60	5	-	-
Red Pine Plantation	<55	-	-	-	-	70	5	70	5	-	-	65	5	-	-
Red Pine Natural	all	-	-	-	-	110	5	110	5	-	-	110	5	-	-
White Pine Plantation	65+	-	-	-	-	60	5	60	5	-	-	60	5	-	-
White Pine Plantation	55-60	-	-	-	-	65	5	65	5	-	-	65	5	-	-
White Pine Plantation	< 50	-	-	-	-	70	5	70	5	-	-	70	5	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	-	-	80	10	60	10	-	-	80	10	-	-
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Forest Interior Habitat MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	-	-	40	10	50	5	-	-	40	10	40	10
Aspen/BG	<65	-	-	-	-	50	10	50	5	-	-	50	10	50	10
Birch	all	-	-	-	-	45	10	50	10	-	-	50	10	50	10
Jack Pine	all	-	-	-	-	40	5	45	5	-	-	45	5	40	10
Black Spruce Upland	all	-	-	-	-	40	5	45	5	-	-	45	5	40	10
Balsam Fir	all	-	-	-	-	45	5	45	10	-	-	45	5	55	10
White Spruce Planted	all	-	-	-	-	50	5	50	5	-	-	50	5	50	5
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	-	-	-	-	80	5	80	5	-	-	80	5	80	5
Black Spruce Lowland	30-39	-	-	-	-	100	5	100	5	-	-	100	5	100	5
Black Spruce Lowland	23-29	-	-	-	-	120	5	120	5	-	-	120	5	120	5
Tamarack	40+	-	-	-	-	85	5	65	5	-	-	70	5	60	5
Tamarack	<40	-	-	-	-	85	5	75	5	-	-	95	5	100	5
Red Pine Plantation	65 +	-	-	-	-	60	5	60	5	-	-	60	5	60	5
Red Pine Plantation	55 -64	-	-	-	-	65	5	65	5	-	-	65	5	65	5
Red Pine Plantation	<55	-	-	-	-	70	5	70	5	-	-	70	5	70	5
Red Pine Natural	all	-	-	-	-	110	5	110	5	-	-	100	5	115	5
White Pine Plantation	65+	-	-	-	-	60	5	60	5	-	-	60	5	60	5
White Pine Plantation	55-60	-	-	-	-	65	5	65	5	-	-	65	5	65	5
White Pine Plantation	< 50	-	-	-	-	70	5	70	5	-	-	70	5	70	5
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	-	-	80	10	60	10	-	-	80	10	80	10
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Deer Winter Area MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	-	-	-	-	40	10	40	10	40	10	40	10
Aspen/BG	<65	-	-	-	-	-	-	50	10	50	10	50	10	50	10
Birch	all	-	-	-	-	-	-	60	10	60	10	60	10	60	10
Jack Pine	all	-	-	-	-	-	-	45	5	55	5	55	5	45	5
Black Spruce Upland	all	-	-	-	-	-	-	45	5	55	5	55	5	45	5
Balsam Fir	all	-	-	-	-	-	-	50	15	50	15	50	15	50	15
White Spruce Planted	all	-	-	-	-	-	-	50	-	50	-	50	-	50	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	-	-	-	-	-	-	80	5	80	5	80	5	80	5
Black Spruce Lowland	30 - 39	-	-	-	-	-	-	100	5	100	5	100	5	100	5
Black Spruce Lowland	23 - 29	-	-	-	-	-	-	120	5	120	5	120	5	120	5
Tamarack	All	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Plantation	65 +	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Plantation	55 -64	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Plantation	<55	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Natural	all	-	-	-	-	-	-	110	10	110	10	110	10	110	10
White Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	-	-	-	-	80	15	80	15	80	15	80	15
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Moose Large Block MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	-	-	-	-	-	-	40	10	40	10	-	-
Aspen/BG	<65	-	-	-	-	-	-	-	-	50	10	50	10	-	-
Birch	all	-	-	-	-	-	-	-	-	60	10	60	10	-	-
Jack Pine	all	-	-	-	-	-	-	-	-	55	5	55	5	-	-
Black Spruce Upland	all	-	-	-	-	-	-	-	-	55	5	55	5	-	-
Balsam Fir	all	-	-	-	-	-	-	-	-	50	15	50	15	-	-
White Spruce Planted	all	-	-	-	-	-	-	-	-	50	-	50	-	-	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	-	-	-	-	-	-	-	-	80	5	80	5	-	-
Black Spruce Lowland	30-39	-	-	-	-	-	-	-	-	100	5	100	5	-	-
Black Spruce Lowland	23-29	-	-	-	-	-	-	-	-	120	5	120	5	-	-
Tamarack	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pine Natural	All	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Plantation	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oak	all	-	-	-	-	-	-	-	-	80	15	80	15	-	-
Cedar	All	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Owl MOA Even Age Rotation Ages and Reserves

		AP		PP		MNIAM		MDLP		NMOP		NSU		WSU	
Cover Type	**Site Index**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**	**RA**	**Reserves**
Ash/LH	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspen/BG	65+	-	-	-	-	-	-	40	10	40	10	-	-	-	-
Aspen/BG	<65	-	-	-	-	-	-	50	10	50	10	-	-	-	-
Birch	all	-	-	-	-	-	-	60	10	60	10	-	-	-	-
Jack Pine	all	-	-	-	-	-	-	45	5	55	5	-	-	-	-
Black Spruce Upland	all	-	-	-	-	-	-	45	5	55	5	-	-	-	-
Balsam Fir	all	-	-	-	-	-	-	50	15	45	15	-	-	-	-
White Spruce Planted	all	-	-	-	-	-	-	50	5	50	5	-	-	-	-
White Spruce Natural	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Spruce Lowland	40+	-	-	-	-	-	-	80	5	80	5	-	-	-	-
Black Spruce Lowland	30-39	-	-	-	-	-	-	100	5	100	5	-	-	-	-
Black Spruce Lowland	23-29	-	-	-	-	-	-	120	5	120	5	-	-	-	-
Tamarack	40+	-	-	-	-	-	-	60	5	65	5	-	-	-	-
Tamarack	<40	-	-	-	-	-	-	70	5	90	5	-	-	-	-
Red Pine Plantation	65 +	-	-	-	-	-	-	60	-	60	5	-	-	-	-
Red Pine Plantation	55 -64	-	-	-	-	-	-	65	-	65	5	-	-	-	-
Red Pine Plantation	<55	-	-	-	-	-	-	70	-	70	5	-	-	-	-
Red Pine Natural	all	-	-	-	-	-	-	-	-	-	5	-	-	-	-
White Pine Plantation	all	-	-	-	-	-	-	-	-	-	5	-	-	-	-
White Pine Natural	all	-	-	-	-	-	-	-	-	-	5	-	-	-	-
N. Hardwoods	all	-	-	-	-	-	-	-	-	-	20	-	-	-	-
C. hardwoods	all	-	-	-	-	-	-	-	-	-	5	-	-	-	-
Oak	all	-	-	-	-	-	-	80	15	80	15	-	-	-	-
Cedar	all	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Dashes indicate that typical division management regimes apply for even age managed cover types, or that the cover type is managed uneven aged.

Uneven Age Management Regimes

The model used to develop the 10-year stand exam list selected stands for uneven aged management based on criteria including cover type, site index, stand age, stand basal area, and the time since last treatment. In some cases, management regimes or even whether a cover type is modeled as uneven aged depends on ecological section.

The following tables show uneven aged management regimes included in the model used to develop the 10-year stand exam list. The “lock” numbers in each table represent the number of years that must pass after a treatment before a stand is eligible for a subsequent treatment. The treatment BA columns refer to the basal area at which a stand is eligible for treatment in the model. Parameters that do not apply to a given cover type or section are denoted “NA”.

DNR Standard Uneven Age Regimes

Note: School trust lands were modeled with these standard regimes regardless of land administrator or management opportunity area type.

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	All	All	>= 70	NA	20
Central Hardwoods	All except PP	All	>= 30	NA	20
Northern Hardwoods	All	> 40	>= 40	NA	20
Oak	PP	<= 55	>= 80	NA	20
Oak	PP	>= 60	>= 50	NA	20
White Pine	All	All	>= 45	NA	20
White Spruce	All	All	>= 80	NA	20

Fish & Wildlife Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	NSU	>= 55	NA	>= 90	20
Ash/Lowland Hardwoods	WSU	>= 55	NA	>= 140	25
Central Hardwoods	WSU	All	>= 60	NA	30
Northern Hardwoods	NSU	All	NA	>=90	30
Northern Hardwoods	WSU	All	>= 60	NA	30
Oak	NSU	All	>= 100	NA	20
Oak	WSU	All	>= 75	NA	25
Red Pine	MNIM	>= 65	>= 40	NA	25
White Pine	WSU	>= 65	>= 80	NA	30
White Pine Plantation	MNIM	All	>= 25	NA	10
White Pine Plantation	WSU	>= 65	>= 35	NA	25
White Spruce	MNIM	All	>= 70	NA	20
White Spruce	NMOP	All	>= 70	NA	20
White Spruce	WSU	All	>= 50	NA	25
White Spruce Plantation	NMOP	All	>= 25	NA	10

Old Growth Special Management Zone (OG SMZ) Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	All	All	>= 60	NA	20
Central Hardwoods	EBF*	All	>= 75	NA	20
Central Hardwoods	LMF*	All	>= 60	NA	20
NH	EBF*	All	>= 75	NA	20
NH	LMF*	All	>= 60	NA	20
Oak	EBF*	All	>= 75	NA	20
Oak	LMF*	All	>= 60	NA	20
White Pine	All	All	>= 60	NA	25
White Pine Plantation	All	All	>= 30	NA	15
White Spruce	All	All	>= 55	NA	20
White Spruce Plantation	All	All	>= 55	NA	20

*EBF = Eastern Broadleaf Forest, including sections: AP, MNIM, MDLP, PP

LMF = Laurentian Mixed Forest, including sections: NMOP, NSU, WSU

Old Forest Management Complex (OFMC), HCVF, and G1/G2* NPC Low Harvest Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	All	All	>= 40	NA	20
Central Hardwoods	EBF*	All	>= 75	NA	20
Central Hardwoods	LMF*	All	>= 60	NA	20
Northern Hardwoods	EBF*	All	>= 75	NA	20
Northern Hardwoods	LMF*	All	>= 60	NA	20
Oak	EBF*	All	>= 75	NA	20
Oak	LMF*	All	>= 60	NA	20
White Pine	All	All	>= 60	NA	20
White Pine Plantation	LMF*	All	>= 35	NA	20
White Spruce	All	All	>= 55	NA	20
White Spruce Plantation	LMF*	All	>= 55	NA	20

*EBF = Eastern Broadleaf Forest, including sections: AP, MNIM, MDLP, PP

LMF = Laurentian Mixed Forest, including sections: NMOP, NSU, WSU

Ruffed Grouse Management Area (RGMA) MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
White Pine	All except PP	All	>= 45	NA	20
White Spruce	All except PP	All	>= 80	NA	20

HCVF and G1/G2 NPC Medium Harvest Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	All	>= 45	NA	>= 90	20
Central Hardwoods	All	All	>= 30	>=110	20
Northern Hardwoods	All	>= 40	NA	>= 110	20
Oak	All	>= 60	>= 50	NA	20
Oak	All	<= 55	>= 80	NA	20
White Pine	All	All	>= 45	NA	20
White Pine Plantation	All	All	>= 30	NA	20
White Spruce	All	All	>= 35	NA	20
White Spruce Plantation	All	All	>= 80	NA	20

Upland/Lowland Habitat MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	NSU	All	>= 70	NA	20
Central Hardwoods	MDLP	All	>= 40	NA	20
Central Hardwoods	NSU	All	>= 30	NA	20
NH	MDLP	All	>= 40	NA	20
NH	NSU	All	>= 30	>= 90	20
Oak	MDLP	All	>= 40	NA	20
Oak	NSU	<= 55	>= 80	NA	20
Oak	NSU	>= 60	>= 50	NA	20
White Pine	NSU	All	>= 45	NA	20
White Pine Plantation	NSU	All	>= 30	NA	30
White Spruce	NSU	All	>= 80	NA	20

Forest Interior Habitat MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	MNIM	All	>= 70	NA	20
Ash/Lowland Hardwoods	NSU	All	>= 70	NA	20
Ash/Lowland Hardwoods	WSU	All	>= 40	NA	20
Central Hardwoods	MDLP	All	>= 40	NA	20
Central Hardwoods	MNIM	All	>= 40	NA	20
Central Hardwoods	NSU	All	>= 30	NA	20
Central Hardwoods	WSU	All	>= 60	NA	20
Northern Hardwoods	MDLP	All	>= 40	NA	20
Northern Hardwoods	MNIM	All	>= 40	NA	20
Northern Hardwoods	NSU	All	>= 30	NA	20
Northern Hardwoods	WSU	All	>= 60	NA	20
Oak	MDLP	All	>= 40	NA	20
Oak	MNIM	All	>= 40	NA	20
Oak	WSU	All	>= 60	NA	20
White Pine	MNIM	All	>= 45	NA	25
White Pine	NSU	All	>= 45	NA	25
White Pine	WSU	All	>= 60	NA	25
White Pine Plantation	NSU	All	>= 30	NA	20
White Pine Plantation	WSU	All	>= 30	NA	20
White Spruce	NSU	All	>= 80	NA	20
White Spruce	WSU	All	>= 55	NA	20
White Spruce Plantation	NSU	All	>= 80	NA	20
White Spruce Plantation	WSU	All	>= 55	NA	20

Older Forest Patch MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Northern Hardwoods	All	All	>= 30	>= 110	20
Oak	All	<= 55	>= 80	NA	20
White Pine Plantation	All	All	>= 30	NA	20
Central Hardwoods	All	<= 55	>= 30	>= 110	20

Deer Winter Area MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	NMOP	>= 55	NA	>= 110	30
Ash/Lowland Hardwoods	NSU	>= 55	NA	>= 110	30
Northern Hardwoods	NMOP	All	NA	>= 130	25
Northern Hardwoods	NSU	All	NA	>= 130	25
White Pine	NMOP	All	NA	>= 130	30
White Pine	NSU	All	NA	>= 130	30
White Spruce	NMOP	All	>= 75	>= 100	25
White Spruce	NSU	All	>= 75	>= 100	25
White Spruce Plantation	NMOP	All	>= 35	NA	15
White Spruce Plantation	NSU	All	>= 35	NA	15

Moose Large Block MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
Ash/Lowland Hardwoods	NSU	>= 45	NA	>= 90	20
Northern Hardwoods	NSU	All	NA	>= 30	20
White Pine	NSU	All	>= 100	NA	30
White Spruce	NSU	All	>= 70	NA	30

Owl MOA Uneven Age Regimes

Cover Type	Section	Site Index	Treatment Age	Treatment BA	Lock (years)
White Spruce	All	All	>= 80	NA	20
White Spruce	MDLP	All	>=52	NA	20
White Spruce	NSU	All	>=50	NA	20
White Spruce Plantation	MDLP	All	>=53	NA	20
White Spruce Plantation	NSU	All	>=51	NA	20

Thinning Regimes

DNR Standard Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Central Hardwoods	All	>=60	Unthinned	30	70
Central Hardwoods	All	>=60	Thin1	45	70
Central Hardwoods	All	>=60	Thin2	60	70
Northern Hardwoods	All	<=35	Unthinned	30	70
Northern Hardwoods	All	<=35	Thin1	45	70
Northern Hardwoods	All	<=35	Thin2	60	70
Oak	All except PP	All	Unthinned	40	80
Oak	All except PP	All	Thin1	55	80
Oak	All except PP	All	Thin2	70	80
Red Pine	All	All	Unthinned	25	90
Red Pine	All	All	Thin1	35	90
Red Pine	All	All	Thin2	45	90
Red Pine	All	All	Thin3	55	90
Red Pine	All	All	Thin4	65	90
Red Pine	All	All	Thin5	75	90
Red Pine Plantation	All	All	Unthinned	25	90
Red Pine Plantation	All	All	Thin1	35	90
Red Pine Plantation	All	All	Thin2	45	90
Red Pine Plantation	All	All	Thin3	55	90
Red Pine Plantation	All	All	Thin4	65	90
Red Pine Plantation	All	All	Thin5	75	90
White Pine Plantation	All	All	Unthinned	25	90
White Pine Plantation	All	All	Thin1	35	90
White Pine Plantation	All	All	Thin2	45	90
White Pine Plantation	All	All	Thin3	55	90
White Pine Plantation	All	All	Thin4	65	90
White Pine Plantation	All	All	Thin5	75	90
White Spruce Plantation	All	All	Unthinned	30	60

Fish and Wildlife Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age	Basal Area Min.
Central Hardwoods	MDLP	All	Unthinned	80	100	---
Central Hardwoods	MDLP	All	Thin1	105	125	---
Central Hardwoods	MDLP	All	Thin2	130	150	---
Central Hardwoods	MDLP	All	Thin3	155	175	---
Central Hardwoods	MDLP	All	Thin4	180	200	---
Central Hardwoods	MNIAM	All	Unthinned	50	65	---
Central Hardwoods	MNIAM	All	Thin1	70	70	---
Northern Hardwoods	MDLP	All	Unthinned	80	100	---
Northern Hardwoods	MDLP	All	Thin1	105	125	---
Northern Hardwoods	MDLP	All	Thin2	130	150	---
Northern Hardwoods	MDLP	All	Thin3	155	175	---
Northern Hardwoods	MDLP	All	Thin4	180	200	---
Northern Hardwoods	MNIAM	All	Unthinned	50	65	---
Northern Hardwoods	MNIAM	All	Thin1	70	85	---
Oak	MDLP	All	Unthinned	80	100	---
Oak	MDLP	All	Thin1	105	125	---
Oak	MDLP	All	Thin2	130	150	---
Oak	MDLP	All	Thin3	155	175	---
Oak	MDLP	All	Thin4	180	200	---
Oak	MNIAM	All	Unthinned	70	85	---
Oak	MNIAM	All	Thin1	90	105	---
Red Pine Plantation	NSU	All	---	---	---	130
Red Pine Plantation	PP	All	Unthinned	30	40	---
Red Pine Plantation	PP	All	Thin1	45	55	---
Red Pine Plantation	WSU	>=65	Unthinned	30	45	---
Red Pine Plantation	WSU	>=65	Thin1	50	65	---
White Pine Natural	NSU	All	---	---	---	140
White Pine Plantation	NSU	>=65	Unthinned	35	50	---
White Pine Plantation	NSU	>=65	Thin1	55	70	---
White Pine Plantation	PP	All	Unthinned	30	45	---
White Pine Plantation	PP	All	Thin1	50	65	---
White Spruce	NSU	All	Unthinned	70	90	---
White Spruce	NSU	All	Thin1	95	115	---
White Spruce Plantation	NSU	All	Unthinned	35	45	---
White Spruce Plantation	NSU	All	Thin1	50	60	---
White Spruce Plantation	PP	All	Unthinned	35	50	---
White Spruce Plantation	PP	All	Thin1	55	70	---
White Spruce Plantation	WSU	All	Unthinned	35	45	---
White Spruce Plantation	WSU	All	Thin1	50	60	---

Ruffed Grouse Management Area (RGMA) MOA Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Oak	All except PP	All	Unthinned	50	65
Oak	All except PP	All	Thin1	70	85
White Spruce	All except PP	All	Unthinned	25	35
White Spruce	All except PP	All	Thin1	40	50
White Spruce	All except PP	All	Thin2	55	65
White Spruce Plantation	All except PP	All	Unthinned	50	65
White Spruce Plantation	All except PP	All	Thin1	70	85

HCVF and G1/G2 NPC Medium Harvest Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Red Pine	All	All	Unthinned	40	150
Red Pine	All	All	Thin1	55	150
Red Pine	All	All	Thin2	70	150
Red Pine	All	All	Thin3	85	150
Red Pine	All	All	Thin4	100	150
Red Pine	All	All	Thin5	115	150

Upland/Lowland Habitat MOA Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Red Pine	MDLP	All	Unthinned	25	100
Red Pine	MDLP	All	Thin1	35	100
Red Pine	MDLP	All	Thin2	45	100
Red Pine	MDLP	All	Thin3	55	100
Red Pine	NSU	All	Unthinned	25	100
Red Pine	NSU	All	Thin1	35	100
Red Pine	NSU	All	Thin2	45	100
Red Pine	NSU	All	Thin3	55	100
Red Pine Plantation	MDLP	All	Unthinned	25	100
Red Pine Plantation	MDLP	All	Thin1	35	100
Red Pine Plantation	MDLP	All	Thin2	45	100
Red Pine Plantation	MDLP	All	Thin3	55	100
Red Pine Plantation	NSU	<=50	Unthinned	25	70
Red Pine Plantation	NSU	<=50	Thin1	35	70
Red Pine Plantation	NSU	<=50	Thin2	45	70
Red Pine Plantation	NSU	55-60	Unthinned	25	65
Red Pine Plantation	NSU	55-60	Thin1	35	65
Red Pine Plantation	NSU	55-60	Thin2	45	65
Red Pine Plantation	NSU	>=65	Unthinned	25	60
Red Pine Plantation	NSU	>=65	Thin1	35	60
Red Pine Plantation	NSU	>=65	Thin2	45	60

Forest Interior Habitat MOA Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Red Pine	MDLP	All	Unthinned	25	100
Red Pine	MDLP	All	Thin1	35	100
Red Pine	MDLP	All	Thin2	45	100
Red Pine	MDLP	All	Thin3	55	100
Red Pine Plantation	MDLP	All	Unthinned	25	100
Red Pine Plantation	MDLP	All	Thin1	35	100
Red Pine Plantation	MDLP	All	Thin2	45	100
Red Pine Plantation	MDLP	All	Thin3	55	100

Older Forest Patch MOA Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Central Hardwoods	All	>=60	Unthinned	30	40
Central Hardwoods	All	>=60	Thin1	45	55
Central Hardwoods	All	>=60	Thin2	60	70
Oak	All	>=60	Unthinned	30	40
Oak	All	>=60	Thin1	45	55
Oak	All	>=60	Thin2	60	70
Red Pine	All	All	Unthinned	40	150
Red Pine	All	All	Thin1	55	150
Red Pine	All	All	Thin2	70	150
Red Pine	All	All	Thin3	85	150
Red Pine	All	All	Thin4	100	150
Red Pine	All	All	Thin5	115	150
White Pine	All	All	Unthinned	40	150
White Pine	All	All	Thin1	55	150
White Pine	All	All	Thin2	70	150
White Pine	All	All	Thin3	85	150
White Pine	All	All	Thin4	100	150
White Pine	All	All	Thin5	115	150
White Spruce	All	All	Unthinned	25	80
White Spruce	All	All	Thin1	40	80
White Spruce	All	All	Thin2	55	80
White Spruce Plantation	All	All	Unthinned	30	60

Deer Winter Area MOA Thinning Regimes

Cover Type	Section	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
Oak	NMOP	All	Unthinned	100	115
Oak	NMOP	All	Thin1	120	135
Oak	NSU	All	Unthinned	100	115
Oak	NSU	All	Thin1	120	135
White Pine Plantation	NMOP	All	Unthinned	35	50
White Pine Plantation	NMOP	All	Thin1	55	70
White Pine Plantation	NSU	All	Unthinned	35	50
White Pine Plantation	NSU	All	Thin1	55	70

Moose Large Block MOA Uneven Age Regimes

Cover Type	Planning Area	Site Index	Thin Number	Min.Thin Age	Max. Thin Age
White Pine Plantation	NSU	All	Unthinned	35	50
White Pine Plantation	NSU	All	Thin1	55	70
White Spruce Plantation	NSU	All	Unthinned	30	35
White Spruce Plantation	NSU	All	Thin1	40	45
White Spruce Plantation	NSU	All	Thin2	50	55

Appendix B. Areas with Alternative Management

In some cases, alternative management is required to meet state or federal statutes, DNR policy, or DNR landscape-scale habitat objectives. Areas that require or that may receive alternative management were tagged in the inventory data used for modeling to build the 10-year stand exam list.

Alternative management was modeled either through yield reductions, reductions to the area available for management, or alternative rotation ages and reserve amounts. These alternative model assumptions were applied to stands depending on their land status and the reason for alternative management (e.g., statute vs. meeting objectives not required by statute).

School trust lands were modeled with alternative rotation ages, reserve amounts, or reductions in assumed yield or area available for harvest to address statutory requirements for endangered and threatened species and federal policy for bald eagle nests. Other reasons for alternative management listed below were not applied to school trust lands, but they were applied to all other land statuses, regardless of land administering DNR Division.

Alternative management assumptions related to endangered and threatened species and bald eagle nests were applied in the model wherever they occurred. Other reasons for alternative management were ranked in a hierarchy. Higher-ranked reasons for alternative management were generally more restrictive than lower-ranked reasons, requiring lower harvest to benefit or protect the forest resources present. If more than one reason applied to a stand, the modeled management assumptions for the highest-ranking reason were applied.

Reasons for Modeling Alternative Management

Endangered and Threatened Species

Known endangered and threatened species occurrences are documented in the state's Natural Heritage Information System. In cases where stands overlap with endangered or threatened species, modeling assumed reduced harvest. For endangered or threatened species that cannot tolerate any disturbance, the model assumed no harvest in stands with known occurrences of these species. However, these stands were available for selection on the 10-year stand exam list so that staff can visit and evaluate current conditions on the ground, in combination with information on past species occurrence records, before making management decisions.

Bald Eagle Nests

The DNR follows federal regulations for buffering or seasonal avoidance of bald eagle nests. Modeling assumed reduced area available for harvest around the buffer zone of stands within 660 feet of a bald eagle nest.

Special Concern Species

Special concern species are not listed as endangered or threatened, but are either extremely uncommon in Minnesota or have unique or highly specific habitat requirements. Their occurrences are documented in the

state's Natural Heritage Information System. Modeling accounted for some special concern species by assuming reduced harvest in stands where they occur on non-school trust lands.

Old Growth Special Management Zones (SMZs)

Old growth SMZs buffer designated old growth stands with the intent of minimizing ecological edge effects and windthrow damage to old growth stands. The DNR policy for old growth SMZs provides guidance to lower harvest or stagger clearcuts around the old growth perimeter. SMZs were modeled on non-school trust lands with standard DNR rotation ages, but higher reserve amounts.

Old growth management complex (OFMC)

OFMCs are groups of stands that extend beyond the SMZ of designated old growth stands. Not all old growth stands are within OFMCs, but where they exist, they are intended to reduce edge effects, increase forest connectivity, and provide continuous old forest characteristics for wildlife habitat. In general, stands within OFMCs that are not school trust lands were modeled assuming an older age at harvest and retaining slightly more reserves than standard DNR management practices. Entire stands designated as old growth SMZ, whether part of an OFMC or not, also received the same management assumptions in the model as stands within OFMCs.

High Conservation Value Forest (HCVF)

HCVFs are forests that contain significant concentrations of biodiversity values, including rare species, plant communities, and ecosystems. Depending on the high conservation values present, HCVFs may benefit from higher or lower levels of disturbance. Based on the level of disturbance values HCVFs can tolerate or need, HCVF sites were categorized as needing high, medium, or low amounts of harvest. Stands within low harvest HCVFs were modeled with an older age at which stands are harvested, and greater reserve amount, than medium harvest HCVFs. High harvest HCVFs were not modeled with alternative management. Alternative model assumptions for low and medium harvest HCVF management was only modeled on non-school trust lands.

G1 and G2 Native Plant Communities (NPCs)

G1 and G2 NPCs are critically imperiled and imperiled plant communities on a global scale. DNR policy requires management that maintains or enhances the ecological integrity of G1 and G2 NPCs, which can vary from high to low levels of disturbance depending on the NPC. Based on the level of disturbance specific G1 and G2 NPCs can tolerate or need, G1 and G2 NPC occurrences were categorized as needing high, medium, or low amounts of harvest. Stands that intersect low harvest G1 or G2 NPCs were modeled with an older age at which stands are harvested, and a greater reserve amount, than medium harvest G1/G2 NPCs. High harvest G1/G2 NPCs did not receive alternative management. Alternative model assumptions for low and medium harvest G1/G2 NPC management were only modeled on non-school trust lands.

Older Forest Patches

Older forest patches reduce habitat fragmentation across the landscape for species dependent on large, continuous areas of older forest. They also help represent natural variability in patch size across the landscape.

Older forest patches were modeled on non-school trust lands assuming an older age at harvest and/or reserving a greater proportion of the stand from harvest.

Forest Interior Habitat MOA

Forest Interior MOAs provide large blocks of mature and older forest for forest interior species. The boundaries of these blocks of habitat are intended to shift over time through the timing of harvest entries and stand swapping during 10-year stand exam list development. Modeled management assumed an older age at which stands are harvested within some forest cover types to maintain patch characteristics. Forest Interior MOA management assumptions were only modeled on non-school trust lands.

Upland-Lowland Habitat MOA

Upland-lowland MOAs provide habitat for species that require mature upland forest adjacent to mature lowland forest. Within the boundaries of the MOA, blocks of habitat are expected to rotate over time through stand swapping and timing of harvest entries. In some cases, modeled management assumed an older age at which stands are harvested, and/or a greater proportion of stands reserved from harvest, depending on the cover type. These alternative model management assumptions were only modeled on non-school trust lands.

Moose Management Area MOA

Moose management Area MOAs provide large blocks of habitat for moose and species with similar habitats. They were modeled on non-school trust lands with alternative management assumptions for some forest cover types in the Northern Minnesota & Ontario Peatlands and Northern Superior Uplands sections, including harvesting stands at older ages and/or reserving greater amounts of stands at harvest.

Deer Management Area

Deer management areas provide habitat elements for deer on the landscape, such as winter cover. They were modeled on non-school trust lands with alternative management assumptions including extending the age at which stands are harvested and reserving greater amounts of harvested stands for some forest cover types in some sections.

Northern Forest Owl MOA

Owl MOAs are designed to consistently provide all habitat needs for forest interior owl species, using timber harvest to rotate areas that provide various habitat elements over time. They are modeled on non-school trust lands with management assumptions that extend the age at which stands are harvested and reserve greater amounts of harvested stands for some forest cover types.

Ruffed Grouse Management Areas (RGMAs)

Ruffed grouse management areas are managed to supply all of the habitat needs of ruffed grouse, as well as other species with similar habitat requirements such as woodcock. These species need several age classes of certain forest cover types, especially aspen, within a relatively small area. RGMAs were modeled with

management assumptions that extend the age at which stands are harvested and reserve greater amounts of harvested stands for aspen, birch, and oak cover types on non-school trust lands.

Open or Brushland Landscape Management Area

Forests or patches of trees in these areas are managed to benefit species with open landscape habitat requirements. Modeled management assumptions are similar to those for RGMAs and were only applied on non-school trust lands.

Table B.1. Summary of productive managed forest acres that at least one of the reasons for alternative management listed in this section apply to. Notes**:** school trust acres were only modeled with alternative management assumptions or yield reductions for endangered and threatened species and bald eagle nests. Some acres reported here may be modeled with rotation ages or reserve amounts that are the same as DNR standard management practices, depending on the cover type, ecological section, and reason for alternative management (Appendix A). Further, some MOA acres may not receive alternative management if they are not adopted for implementation during the SFRMP process.

Land Status	Managed Acres	Productive Managed Acres	Productive Managed Acres With a Reason for Alternative Management	% Productive Managed Acres With a Reason for Alternative Management
Acquired	904,200	518,502	200,644	38.7%
ConCon	1,423,757	691,431	125,369	18.1%
LUP	84,202	53,604	6,724	12.5%
School Trust	2,343,274	1,461,976	388,694	26.6%
U Trust	22,250	15,988	7,403	46.3%
Volstead	29,572	12,254	1,973	16.1%
Total	**4,807,256**	**2,753,754**	**730,808**	**26.5%**

Table B.2 Reasons for alternative management that were applied on all lands, including school trust lands. These were applied regardless of whether there was another overlapping ranked reason for alternative management (see Table B.3). Note: when a stand included both a bald eagle nest and a riparian management zone, the model assumed reduced harvest area based on the factor that required the largest reduction in the assumed harvest area, but not both.

Reason for Alternative Management	Designation Source	Applied To	Modeled Management	Criteria for applying modeled management
Endangered and threatened species occurrence	State and federal statute	All lands	Reduced available harvest area or yield reduction	Stand intersects polygon of endangered or threatened species occurrence
Bald eagle nests	Federal policy	All lands	Reduced available harvest area	Stand within 660 feet of bald eagle nest

Table B.3 Reasons for alternative management that were applied based on rank when more than one reason applied to a stand (listed here from highest to lowest rank in the model). Note: all management opportunity areas (MOAs) included in modeling are preliminary, and are vetted and adopted during the SFRMP process. Non-STLs = non-school trust lands.

Reason for Alternative Management	Designation Source	Applied To	Modeled Management	Criteria for applying modeled management
High conservation value forest – low harvest G1G2 status native plant community- low harvest Old forest management complexes (OFMC)	DNR policy SFRMP (OFMC)	Non-STLs	Specified regimes	>50% of stand within OFMC (including whole stands designated as old growth special management zones), low harvest HCVF, or G1G2 NPC
Old growth special management zones	DNR policy	Non-STLs	Yield reduction and specified regimes	30% of stand within 330-foot buffer around an old growth stand
Forest interior habitat MOA	SFRMP	Non-STLs	Specified regimes	>30% of stand within MOA
Deer management area MOA	SFRMP	Non-STLs	Specified regimes	Stand intersects MOA polygon
High conservation value forest – medium harvest G1/G2 status native plant community – med	DNR policy	Non-STLs	Specified regimes	>30% of stand is within medium harvest HCVF polygon
Special concern species occurrence	State statute	Non-STLs	Yield reduction	Stand intersects polygon of special concern species that benefits from lower impact timber harvest
Moose management area MOA	SFRMP	Non-STLs	Specified regimes	Stand intersects MOA polygon
Older large forest patch MOA	SFRMP	Non-STLs	Specified regimes	>30% of stand within patch
Upland/lowland habitat MOA	SFRMP	Non-STLs	Specified regimes	>30% of stand within MOA
Ruffed grouse management area MOA	SFRMP	Non-STLs	Specified regimes	Stand intersects RGMA polygon
Northern forest owl MOA	SFRMP	Non-STLs	Specified regimes	Stand intersects MOA polygon
Open landscape management area MOA	SFRMP	Non-STLs	Standard or Specified regimes	Stand intersects MOA polygon

Table B.4 Summary of productive forest acres that overlap with a reason for potential alternative management by land status. Notes: school trust acres were only modeled with alternative management assumptions or yield reductions for endangered and threatened species and bald eagle nests. Some acres reported here may be modeled with rotation ages or reserve amounts that are the same as DNR standard management practices, depending on the cover type, ecological section, and reason for alternative management (Appendix A). Further, some MOA acres may not receive alternative management if they are not adopted for implementation during the SFRMP process.

Reason for Alternative Management	Acquired	ConCon	LUP	School Trust	U Trust	Volstead	Total	% of Total Productive Acres
Endangered and threatened species occurrence	5,966	2,327	85	3,912		18	**12,308**	**0.4%**
Bald eagle nests	8,991	2,432	19	23,020	364	10	**34,835**	**1.3%**
Old forest management complexes (OFMC) High conservation value forest – low harvest G1G2 status native plant community- low harvest	42,848	41,188	3,008	76,753	1,217	249	**165,263**	**6.0%**
Old growth special management zones	1,171	312	55	2,814	191		**4,543**	**0.2%**
Forest interior habitat MOA	39,044			12,035	1,352		**52,431**	**1.9%**
Deer yard MOA	11,963	9,434		76,417	69	440	**98,322**	**3.6%**
High conservation value forest – medium harvest G1/G2 status native plant community – med harvest	11,650	2,272		6,922	135		**20,979**	**0.8%**
Special concern species occurrence	34,324	7,618	2,518	20,424	315	0	**65,200**	**2.4%**
Moose management area MOA	2,536			40,307	3,138		**45,982**	**1.7%**
Older large forest patch MOA	13,109	11,852		44,156	119	212	**69,448**	**2.5%**
Upland/lowland habitat MOA	6,557			4,460			**11,018**	**0.4%**
Ruffed grouse management area MOA	17,554	21,896	1,039	21,784	502		**62,774**	**2.3%**
Northern forest owl MOA	2,902	13,134		17,410		871	**34,318**	**1.2%**
Open landscape management area MOA	2,029	12,905		38,281		173	**53,387**	**1.9%**
Total	**200,644**	**125,369**	**6,724**	**388,694**	**7,403**	**1,973**	**730,808**	**26.6%**

Appendix C. Acre Summary for DNR Administered Lands

Total DNR Administration = 5.6 million acres
Source: DNR webpage/2017 from the numbers

Total DNR Administration with inventory data (in Forest Inventory Module) = 5.4 million acres
Source: DNR FIM April 2017

- **Total managed acres = 4.8 million acres**
  Land administered by the DNR Divisions of Forestry and Fish and Wildlife, excludes: state parks, Camp Ripley, the Boundary Waters Canoe Area Wilderness, scientific and natural areas, meandered waters, Metro Greenways, old growth stands, stands in the Prairie Parkland planning unit, inoperable stands (flagged in FIM as TMBR_STAT=3), representative sample areas, and Fisheries-administered lands (except in Lake County)
  - **Total forested cover types assigned managed acres = 2.75 million acres**
    Excludes non-forest (lowland brush, marsh, lowland grass, muskeg, upland grass, water, flooded, others) and forested stagnant and offsite cover types (stagnant spruce, tamarack, cedar, and offsite aspen and oak). Non-forest cover types assigned managed acres = 1.4 million acres, stagnant and offsite forest cover types assigned managed acres = 0.7 million acres.
    FIM Forest cover type query: "MN_CTYPE" <> 0 AND "MN_CTYPE" < 75 OR "MN_CTYPE" = 81
    FIM Non-forest FIM query: "MN_CTYPE" = 0 OR "MN_CTYPE" > 81
    FIM Stagnant and offsite cover types FIM query: "MN_CTYPE" >= 75 AND "MN_CTYPE" <= 79
    - **Total forested cover types with defined yield tables assigned managed acres = 2.75 million acres**
      Excludes cover types without defined yield tables: walnut, willow, cottonwood, red cedar, Scotch pine, Norway spruce, hybrid poplar, and European larch.

Appendix D. 10-year Stand Exam List Acre Summaries

Of the 5.6 million acres DNR administers that have inventory data, approximately 49%, or 2.75 million acres, are available for the model to select while developing the 10-year stand exam list (managed acres with forested cover types that have defined yield tables; see Appendix C). The tables and figures in this section summarize the 10-year stand exam list, which was built from this subset of DNR-administered land.

For most sections, average annual acres on the stand exam list increase compared to recent historical averages. Aspen parklands is the only exception, with fewer acres planned than in recent years to maintain evenness in volume offered within that section over time (Table D.2). It is important to remember that for sections where planned acres increase, a portion of that increase is due to intentionally planning more acres than DNR expects to treat with harvest prescriptions, so the DNR is confident it can meet the volume offered target even when a percentage of planned acres do not result in timber sales for various reasons. Planning more acres than are needed ensures we can meet those targets despite inventory or modeled management assumptions that may not match on-the-ground realities.

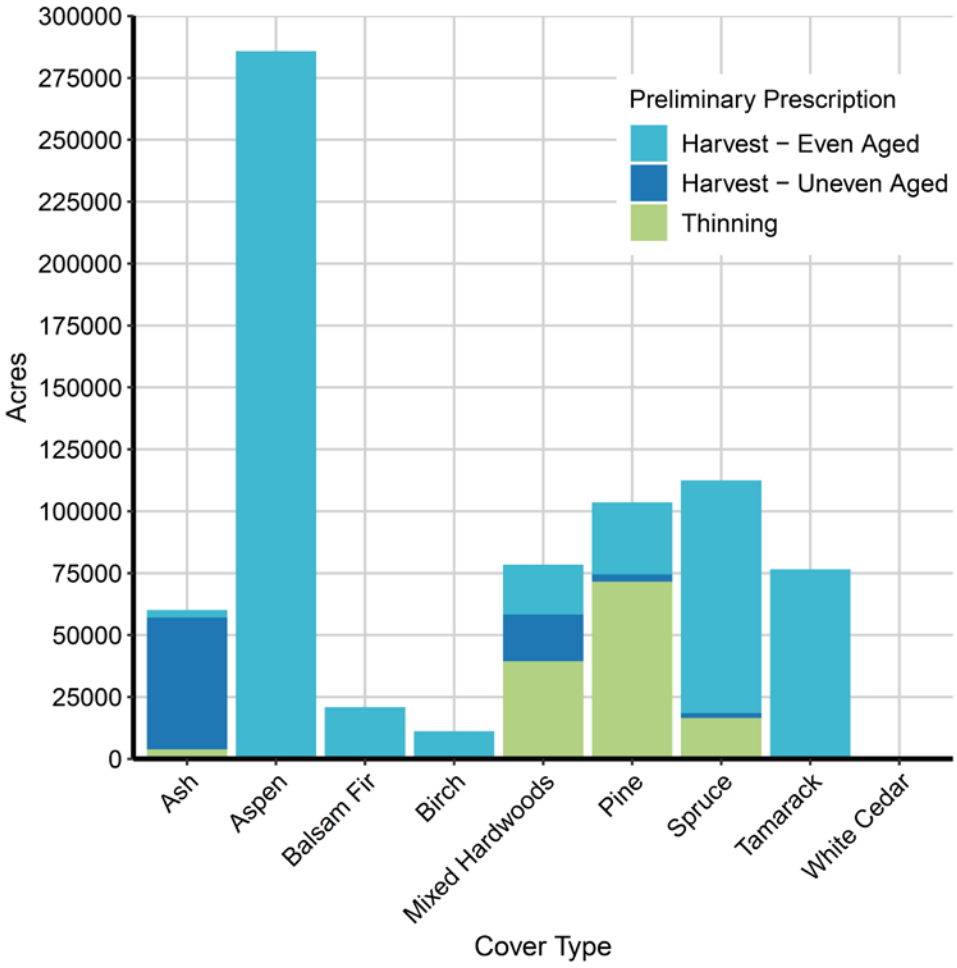
Table D.1 Acres planned fiscal years 2021-2030 by cover type and ecological section. Ecological sections: AP = Aspen Parklands, PP = Paleozoic Plateau, MDLP = Minnesota Drift and Lake Plains, MNIM = Minnesota & Northeast Iowa Moraines, NMOP = Northern Minnesota & Ontario Peatlands, NSU = Northern Superior Uplands, WSU = Western Superior Uplands.

Cover type	AP	PP	MDLP	MNIM	NMOP	NSU	WSU	Total
Ash / Lowland Hardwoods	373	1,835	19,166	352	16,720	7,570	14,078	**60,095**
Aspen / Balm of Gilead	14,899	264	86,524	2,199	88,787	67,724	25,411	**285,809**
Balsam Fir	38	0	2,384	19	10,101	8,116	192	**20,849**
Birch	0	91	2,532	64	1,944	5,955	563	**11,149**
Mixed Hardwoods / Oak	90	15,363	26,364	7,039	1,016	5,349	23,191	**78,412**
Pine	62	2,564	41,807	2,622	22,070	28,856	5,617	**103,598**
Spruce	131	105	16,717	177	67,682	24,752	2,866	**112,429**
Tamarack	253	7	20,923	121	50,527	2,200	2,531	**76,563**
White Cedar	0	26	46	2	489	61	0	**625**
Other	1	484	338	48	218	15	16	**1120**
Total	**15,846**	**20,740**	**216,803**	**12,642**	**259,553**	**150,599**	**74,465**	**750,648**

Table D.2. Planned acres by section over the STH decision period (FY 2019 – 2028) compared to recent years. Note a percentage of the total increase in planned acres is intentionally planned to ensure the DNR can meet STH decision elements despite stand exams that don't result in timber sales for various reasons and on-the-ground conditions that may not match model assumptions.

Section	Average Annual Stand Exam Acres FY 09-18	Average Annual Stand Exam Acres FY 19-28	Percent Change
Aspen Parklands	3,286	1,640	-50%
Paleozoic Plateau	1,690	2,195	+30%
Minnesota Drift & Lake Plains	16,472	22,073	+34%
Minnesota & Northeast Iowa Moraines	1,000	1,309	+31%
Northern Minnesota & Ontario Peatlands	18,355	26,817	+46%
Northern Superior Uplands	9,756	15,525	+59%
Western Superior Uplands	6,785	7,760	+14%
Total	**57,344**	**77,318**	**+35%**

Figure D.1. Total acres on the fiscal year 2021-2030 stand exam list by preliminary prescription for cover type groups. Note, too few acres are planned for white cedar to show on this figure.



Approximately 26.5% of productive forest acres are within areas that receive alternative management. A similar proportion of acres (27.4%) in these areas were selected for the 10-year stand exam list (Table D.3).

Table D.3. Reasons for alternative management, planned acres on the 10-year stand exam list, and percent of stand list acres for each reason. Note that all MOAs included in modeling will be vetted during SFRMP, and may or may not be adopted for management. Planned acres may or may not receive alternative management (Appendix A & B) depending on land status, cover type, ecological section, and MOA vetting results.

Reason for Alternative Management	Planned Acres	% Planned Acres
Endangered and threatened species occurrence	2,009	0.3%
Bald eagle nests	10,532	1.4%
High conservation value forest – low harvest G1G2 status native plant community- low harvest Old forest management complexes (OFMC)	47,686	6.4%
Old growth special management zones	1,311	0.2%
Forest interior habitat MOA	17,696	2.4%
Deer yard MOA	24,580	3.3%
High conservation value forest – medium harvest G1/G2 status native plant community – med harvest	5,675	0.8%
Special concern species occurrence	20,842	2.8%
Moose management area MOA	13,975	1.9%
Older large forest patch MOA	20,011	2.7%
Upland/lowland habitat MOA	3,442	0.5%
Ruffed grouse management area MOA	17,179	2.3%
Northern forest owl MOA	8,829	1.2%
Open landscape management area MOA	12,261	1.6%
Areas that do not receive alternative management	544,620	72.6%
Total	**750,648**	**100.0%**

Appendix E. 10-year Stand Exam List Modeled Volume Summaries

Table E.1 Modeled average annual volume estimated from the statewide 10-year stand exam list by cover type and ecological section. Estimated volume for annual stand exam lists may vary around these averages, and more volume is estimated per year on average than needed to meet the volume offered target. It is important to remember that estimated volume over the annual target is due to intentionally planning more acres than DNR expects to treat with harvest prescriptions, so the DNR is confident it can meet the volume offered target even when a percentage of planned acres do not result in timber sales for various reasons. Planning more acres than are needed ensures we can meet those targets despite inventory or modeled management assumptions that may not match on-the-ground realities.

Cover Type	AP	PP	MDLP	MNIM	NMOP	NSU	WSU	Total
Ash / Lowland Hardwoods	833	2,338	12,154	769	13,524	3,605	7,439	**40,662**
Aspen / Balm of Gilead	27,500	2,791	120,914	4,254	124,936	81,314	38,652	**400,361**
Balsam Fir	1,442	136	8,927	134	14,262	14,942	936	**40,780**
Mixed Hardwoods / Oak	1,947	21,789	40,859	8,515	12,461	8,334	28,402	**122,307**
Birch	1,006	282	9,989	495	7,077	12,172	4,037	**35,058**
Spruce	385	141	14,865	452	73,000	24,700	2,056	**115,599**
Pine	572	985	46,000	4,301	35,597	32,320	6,507	**126,283**
White Cedar	0	0	62	0	4	70	0	**135**
Tamarack	379	114	23,924	174	62,879	3,738	3,024	**94,233**
Total	**34,064**	**28,576**	**277,694**	**19,094**	**343,740**	**181,196**	**91,055**	**975,420**

Ecological sections: AP = Aspen Parklands, PP = Paleozoic Plateau, MDLP = Minnesota Drift and Lake Plains, MNIM = Minnesota & Northeast Iowa Moraines, NMOP = Northern Minnesota & Ontario Peatlands, NSU = Northern Superior Uplands, WSU = Western Superior Uplands.

Table E.2 Modeled average annual volume estimated from the statewide 10-year stand exam list by cover type, ecological section, and land administrator. The estimated volume for annual stand exam lists may vary around these averages. FOR = Division of Forestry, FAW = Fish and Wildlife.

Ecological Section	AP		PP		MDLP		MNIM		NMOP		NSU		WSU	
Cover Type	**FOR**	**FAW**	**FOR**	**FAW**	**FOR**	**FAW**	**FOR**	**FAW**	**FOR**	**FAW**	**FOR**	**FAW**	**FOR**	**FAW**
Ash / Lowland Hardwoods	17	816	1,432	906	11,676	478	340	429	12,469	1,056	3,534	72	6,356	1,083
Aspen / Balm of Gilead	613	26,887	2,022	769	116,201	4,713	1,578	2,676	112,610	12,326	79,668	1,646	32,872	5,780
Balsam Fir	43	1,399	97	39	8,567	360	78	56	12,339	1,923	14,628	315	818	118
Mixed Hardwoods / Oak	62	1,885	14,353	7,436	38,924	1,935	3,613	4,902	11,301	1,159	8,209	125	24,037	4,365
Birch	25	981	245	37	9,519	470	168	326	5,992	1,086	11,756	416	3,482	555
Spruce	8	376	129	11	14,662	203	378	75	65,809	7,190	24,603	97	2,007	49
Pine	12	561	789	195	45,081	919	3,864	437	31,679	3,918	32,264	56	6,304	203
White Cedar	0	0	0	0	61	0	0	0	4	0	70	0	0	0
Tamarack	4	375	91	24	23,474	450	79	95	47,032	15,847	3,726	12	2,845	179
Total	**785**	**33,279**	**19,159**	**9,418**	**268,166**	**9,528**	**10,098**	**8,996**	**299,236**	**44,505**	**178,457**	**2,739**	**78,722**	**12,333**

Ecological sections: AP = Aspen Parklands, PP = Paleozoic Plateau, MDLP = Minnesota Drift and Lake Plains, MNIM = Minnesota & Northeast Iowa Moraines, NMOP = Northern Minnesota & Ontario Peatlands, NSU = Northern Superior Uplands, WSU = Western Superior Uplands.