Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 1: Background and Preliminary Issues

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This Preliminary Issues and Assessment document and color maps may be viewed as PDF files on the Northern Northern Superior Uplands Section Forest Resources Management Plan website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
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Contents

Notes: A basic set of large format color maps showing subsection characteristics is available for viewing at DNR Grand Rapids Region Forestry Office. The NSU SFRMP Assessment is available on the Minnesota DNR Web site at: www.dnr.state.mn.us/forestry/subsection/nsu/index.html

A Glossary of Terms used in forest management planning is located at http://www.dnr.state.mn.us/forestry/subsection/glossary.html

A list of commonly used acronyms is located at http://files.dnr.state.mn.us/forestry/subsection/north4/finalplan/n4chapter6.pdf

For all tables, figures, and maps: Northern Superior Uplands (NSU) ECS Section includes Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and, Toimi Uplands Subsections

Background: Brief Description of the Planning Area

This Subsection Forest Resource Management Plan (SFRMP) process considers state forest lands administered by the Department of Natural Resources (DNR), Divisions of Forestry, Parks and Trails, and Fish and Wildlife – Wildlife Section in the Northern Superior Uplands (NSU) Ecological Classification System (ECS) Section's subsection landscape units (Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands). These five units cover an area from Lake Superior in the east to Grand Rapids in the west, and from Cromwell in the south to International Falls in the north.

Figure 1.1 Location of Northern Superior Uplands Section. This is a locator map showing the location of the NSU Section in the context of the State of Minnesota and the Laurentian Mixed Forest Province. The NSU Section is shown in dark blue on the map, and is located in the far northeastern part of Minnesota.

The NSU largely coincides with the extent of the Canadian Shield in Minnesota. The NSU is characterized by glacially scoured bedrock terrain with thin and discontinuous deposits of coarse loamy till and numerous lakes. The section has high relief, reflecting the rugged topography of the underlying bedrock. The NSU receives more of its precipitation as snow than any section in the state, has the longest period of snow cover, and the shortest growing season. The upland vegetation is remarkably uniform relative to that of other sections in the Laurentian Mixed Forest (LMF) Province, consisting mostly of fire-dependent forests and woodlands. Forests with red and white pine were widespread in the past, mixed with aspen, paper birch, spruce, and balsam fir; much of the pine was cut in the late 1800s and early 1900s, leaving forests dominated mostly by aspen and paper birch. Jack pine forests are present on droughty ridges and bedrock exposures, as well as on local sandy outwash deposits. The highlands along Lake Superior have a local climate moderated by the lake that favors forests dominated by sugar maple with some white pine, yellow birch and white cedar. Peatlands and wet forests are present across the section as inclusions within broader upland forest areas; sparsely vegetated cliffs and bedrock outcrops are common in the rugged terrain along Lake Superior and in the border lakes region of the northern part of the section.

Much of this landscape remains forested; some forest types retain similar stand composition and structure to original forests. In others the once extensive white pine-red pine forests have been replaced by forests of quaking aspen and paper birch. Logging, forest management, tourism, recreation, and mining are important industries. There are extensive areas of forested public land which are managed for wood products and recreation.

For more details about land ownership, refer to Preliminary Issues and Assessment Chapter 2, .*Land Use and Land Cover*.

Section Forest Resource Management Planning

Introduction

For many years, the Minnesota Department of Natural Resources (DNR) directed timber harvesting on lands it administered through five-to 10-year forest resource management plans developed for each of its administrative forestry areas. Opportunities for public involvement were limited in the development and review of these timber management plans.

In response to growing public interest in DNR timber management planning, the original DNR Subsection Forest Resources Management Planning (SFRMP) process was designed to provide a more standardized, formal process and opportunities for increased public involvement. In addition, it was based at the subsection level of the DNR's ECS system rather than on DNR administrative-area boundaries, as was the case in the past.

The first generation of SFRMPs for the State of Minnesota was completed in 2013; the NSU and the Northern Minnesota and Ontario Peatlands section plans are the first of a second generation. Several changes have been made to the process, based on feedback from DNR staff and the stakeholders to our process. Some of the more significant changes are:

- Subsections grouped by ECS Section
- SFRMP teams now include an additional Ecological and Water Resources (EWR) member.
- SFRMP templates are being developed to further reduce plan preparation time.
- SFRMP modeling scenarios will be used to determine the final forest harvest scheduling model for each plan.
- Early stakeholder engagement process has been developed and approved; implementation is underway.
- Old forest management complex (OFMC) direction has been revised and clarified to reflect changes with respect to extended rotation forests (ERF).
- SFRMP Process Work Group (PWG) finalized a special management area (SMA) template and completed revisions of Old-Growth Amendment #5.
- Patch management direction has been revised and clarified.
- The new Adaptive Old Forest Management Approach has been incorporated into the SFRMP process.
- Watershed Analyses are being incorporated in SFRMPs as needed, and as data are available. This is a post-stand selection adjustment.
- Climate change adaptation is being incorporated in SFRMP.
- SFRMP teams are making more extensive use of new ECS data to identify additional management options.

- SFRMPs will incorporate local market information as a post-stand selection adjustment.
- Carbon sequestration: based on direction from the Commissioner's Office, DNR staff is working to incorporate carbon stock modeling in RemSoft for SFRMP (i.e., as an output of modeling scenarios).
- Incorporating pre-commercial thinning: a pool of acres for potential treatment in the event markets develop will be identified, but not included on a stand list. The focus would be on upland conifers and hardwoods (non-aspen), and perhaps brushlands. Desired prescriptions would be developed if and when markets emerge.
- Invasive species are receiving additional focus in SFRMPs.
- New opportunities are being investigated for using ECS data to identify silvicultural opportunities in adjacent stands to those being officially examined for timber harvest.

The SFRMP process is divided into two phases. In Phase I, the planning Team will prepare a Preliminary Issues and Assessment document. This document will identify important forest resource management issues that need to be addressed in the section plan and assess the current forest resource conditions in the covered subsections. In Phase II, the planning team will prepare a draft SFRMP which includes Desired Future Composition goals (DFCs); General Direction Statements (GDSs) to further refine the DFCs; and recommended stand level management strategies to support the DFCs and GDSs. Stand selection criteria leading to a ten year stand exam list are an important plan product. Minnesota DNR will seek stakeholder input on the Draft NSU Section Forest Resource Management Plan (NSU SFRMP).

The Preliminary Issues and Assessment begins with the field organization updating its forest inventory and other management data in preparation for the "clip" of data from the Forest Inventory Module (FIM) that forms the basis of the next SFRMP. This part of the plan is mainly a collection of data that the SFRMP team will use to identify progress toward goals established in the previous plan(s); changes to the physical, political, economic, or social landscape that require adjustments to forest management; and changes to administrative areas, or special management areas that require changes to the way the data are displayed and analyzed. The team also reviews the list of issues from the previous plan and if necessary, adds language about new issues that have to be addressed during the development of the new plan.

The second part of the SFRMP process is the team's work to develop recommendations for vegetation management that will address the issues identified in the Assessment. Goals and strategies form the backbone of the Plan, along with recommendations for management of specific forest types and Native Plant Communities (NPCs). In addition to guidance, an outcome is a list of stands to be examined during the plan implementation period (ten years).

Goals for the Planning Effort

SFRMPs constitute a DNR plan for vegetation management on state forest lands administered in the subsections by the Divisions of Forestry, and Fish and Wildlife. The focus of this effort will be:

- **Identifying a desired future composition (DFC) goal** for 50 years or more. Composition could include the amount of various cover types, age-class distribution of cover types, and their geographic distribution across the subsection. The desired future composition goals for state forest lands in the subsections will be guided by assessment information, key issues, general future direction in response to issues, and strategies to implement the general future direction.
- **Identifying forest stands to be treated over the next 10-year period.** SFRMPs will identify forest stands on DNR Forestry- and Wildlife-administered lands that are proposed for treatment (e.g., harvest, thinning, regeneration, and re-inventory) over the 10-year planning period. Forest stands will be selected using criteria developed to begin moving DNR forest lands toward the long-term DFC goals. Examples of possible criteria include stand age and location, soils, site productivity, and size, number, and species of trees. Many decisions and considerations go into developing these criteria and the list of stands proposed for treatment. Examples include:
- **Assessing the adequacy of older forest on the landscape by**
  1. identifying areas needing management action during the planning period;
  2. identifying areas for various sizes of patch management,
  3. recommending management of riparian areas and visually sensitive human travel corridors,
  4. evaluating age and cover-type distributions, and
  5. identifying regeneration, thinning, and prescribed burning needs.

The DNR will select management activities (including “no action”) that best move the forest landscape toward the desired future condition (DFC) goals for state forest lands.

Consistent with state policy (Minnesota Statutes 89A), the SFRMP process will pursue the sustainable management, use, and protection of the state’s forest resources to achieve the state’s economic, environmental, and social goals.

The Planning Process

The objectives of the DNR SFRMP process are:

- to effectively inform and involve the public and stakeholders;
- to complete the process in each planning area (ECS section or subsection) within a reasonable amount of time (the target is to complete each SFRMP in 12 months);
- to conduct a process that is reasonable and feasible within current staffing levels and workloads; and
- to develop plans that are credible to most audiences and enable good forest management.

Experience, new information, new issues, changing conditions, and the desire to broaden the focus of SFRMP in the future will demand a flexible and adaptable process. The plans will need to be flexible to reflect changing conditions. The SFRMP process will provide for annual reviews by DNR planning teams for the purpose of monitoring implementation and determining whether plans need to be updated to respond to unforeseen substantial changes in forest conditions.

DNR subsection teams will include staff from the DNR divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources; and other agency personnel as needed. These subsection teams will have primary responsibility for the work and decision-making involved in crafting subsection plans.

The subsection team will invite managers of adjacent county, federal, tribal, and industrial forest lands to provide information about the condition of their forest lands and future management direction. This information will help the DNR make better decisions on the forest lands it administers. In the NSU subsections, the goals, strategies, and coordination efforts of the Minnesota Forest Resources Council (MFRC) Northeast, North Central, and Northern Landscape Committees will be considered and/or incorporated into the SFRMP.

In the first phase of the SFRMP process, the subsection team will 1) identify important forest resource management issues that will need to be addressed in the subsection plan and 2) develop an assessment of the current forest resource conditions in the subsection. The assessment document developed by the team will consider at least eight basic elements that will form the basis of the chapters in this document:

1. Introduction and preliminary issues list;
2. Land Use and Land Cover;
3. Administration and ownership;
4. Forest composition and structure;
5. Forest product harvest;
6. Ecological information;

7. Forest health;
8. Wildlife species and trends;
9. Appendices

Public Involvement

At a minimum, there will be public involvement opportunities through:

- Distribution of the Preliminary Issues and Assessment information (mailings and Web site).
- A public involvement initiative to help identify key forest management issues and solicit public opinion of preferred management direction.
- A public comment period to review the draft plan and strategic direction (i.e., general direction, forest management strategies, DFCs proposed by the DNR to address identified issues, the 10-year list of stands proposed for treatment, and any associated new access needs.
- Public review and comment on proposed plan revisions.

For this new generation of SFRMPs, DNR intends to use electronic communication technology to improve access early in the planning process so that public involvement occurs in a more timely way to influence DNR forest management planning decisions. Stakeholders, affected Indian nations, and interested parties are being invited to attend one or more "webinars", or internet seminars, that will explain the process, solicit input through questions and surveys, and provide the data participants need to enable their meaningful input into the process. The webinars will be presented by DNR professional resource managers and will be recorded so that people can participate at times convenient to them in the event the live webinar is at a time when they cannot participate.

The first webinar will deal mainly with the changes to the SFRMP process since the first generation of plans. Some of these changes are in response to things the planning staff has learned. Others are in response to new legislation or policy regulating forest management. At the end of the webinar, participants will be asked one or two questions about how the process worked for them.

A second webinar will present alternative harvest levels, age class distributions, and climate change adaptation strategies; and will explain the models used to develop forest stand examination lists. A final webinar toward the end of 2015 will present the draft plan that the teams developed with consideration of participants' input in the earlier webinars. Additional webinars will be scheduled as needed.

SFRMP planning documents will be available on the DNR Web site www.dnr.state.mn.us/forestry/subsection/nsu/index.html and summary information will be available upon request.

Table 1.1. Public Involvement and Process Timelines for the NSU SFRMP

SFRMP Task	Notification/Participation	Comment Period	Length of Step	Proposed Dates
Preparation to Begin the Planning Process Assemble initial assessment information and data sets. Designate team and facilitator, and conduct team training.	DNR develops mailing list of public/ stakeholders. Establish web-site for subsection.	N/A	Complete prior to official start of process	12/1/2013 – 1/24/2014
Assessment and Issues Identification	Inform the public of planning efforts, schedule, and how and when they can be involved. Provide complete maps and documents on web/CD.	N/A	195 days +/- (overlaps with start of full team meetings)	12/01/2013 – 6/15/2014
Early Public Involvement Webinars	Letters will be sent to invited participants representing a balance of stakeholders. Stakeholders will be invited to participate in webinars, surveys, and review processes.	30 days +/-	This is a new process; length is still being determined.	6/15/2014 – 10/15/2015
Forest Scheduling Model Development	Stakeholders will be involved in identifying desired model scenarios; no public review of model	N/A	45 days	3/1/2015 – 4/15/2015

SFRMP Task	Notification/Participation	Comment Period	Length of Step	Proposed Dates
	at this stage.			
Strategic Direction Document (GDSs, Strategies, DFCs to address issues, and Stand Selection Criteria) Draft Stand Examination list and New Access Needs	Mail summary to mailing list. Provide complete maps and documents on web/CD. Identify SFRMP contacts for questions. Offer meetings by appointment.	45 days 45 days	~26 weeks	4/15/2015 – 7/1/2015 7/1/2015 – 8/15/2015
Finalize Plan Planners summarize public comments and DNR responses. Present revised plan to Department for Commissioner's approval. Commissioner approves final plan and posts written notice in Minnesota State Register.	Inform public of final plan. Provide summary of public comments and DNR responses. Provide final plans on web/CD and in key public libraries. Email executive summary of plan to email list.	None	~6 weeks	9/1/2015 – 10/15/2015

Issue Identification

One of the first steps in the SFRMP process is to identify issues that the plans will address. SFRMP teams will use assessment information; local knowledge; existing plans, policies, and guidelines; and public input to help identify issues relevant to the scope of the plans. Subsection teams will begin with the common set of issues developed from previous SFRMP plans. These common SFRMP issues will then be refined and supplemented based on subsection-specific conditions and considerations.

What Is an SFRMP Issue?

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

What Is Not an SFRMP Issue?

Issues that cannot be addressed in whole or substantial part by vegetation management decisions on DNR-administered lands are outside the scope of the SFRMP process. For example, SFRMP will not address recreation trails system issues or planning. However, aesthetic concerns along existing recreational trail corridors can be a consideration in determining forest stand management direction in these areas. Another example is wildlife populations; the plan will establish wildlife habitat goals but not goals for wildlife population levels.

Each issue needs to consider four pieces of information:

- What is the issue?
- Why is this an issue? (i.e., what is the specific threat, opportunity or concern?)
- What are the likely consequences of not addressing this issue?
- How can this issue be addressed by vegetation management decisions on DNR-administered lands?

Public Review

The assessment document and preliminary issues for the subsection will be made available electronically through the DNR Web site.

The following pages contain the preliminary issues identified by the subsection team. These issues were developed based on the common issues from previous SFRMP plans, general field knowledge of Department staff, and by reviewing forest resource information for the subsections. Then the SFRMP team will determine how vegetation management on DNR-administered lands can address these issues.

Preliminary Issues List

This plan will provide guidance for forest management on state lands for the next 10 years and establish goals for the next 50 to 100 years. The NSU SFRMP team reviewed the standard list of issues that affect our forests and could be mitigated or avoided by forest planning and vegetation management. In response to several new and emerging issues, several new issues have been added to the standard list.

1. How should the age classes of forest types be represented across the landscape?

    a. **Why is this an issue?** Representation of all age classes and growth stages, including old-forest types, provides a variety of wildlife habitats, timber products, and ecological values over time.
    b. **How might DNR vegetation management address this issue?** Vegetation management can provide for a balance of all forest types and age classes.
    c. **What are possible consequences of not addressing this issue?** A forest without representation of all age classes and growth stages exposes itself to increased insect and disease problems, loss of species with age-specific habitat requirements, and loss of forest-wide diversity. Such a forest would also provide a boom-and-bust scenario for forest industries that depend on an even supply of forest products.

2. What are appropriate mixes of vegetation composition, structure, spatial arrangement, growth stages, and plant community distribution on state lands across the landscape?

    a. **Why is this an issue?** These subsections have experienced decreased ecological diversity over time. Since European settlement, forest composition and structure have been simplified, e.g., mature, diverse pine stands were harvested and replaced by early sucessional and less diverse forest types such as aspen, birch, and jack pine. Certain important component tree species and forested communities have declined, such as paper birch, mixed pine, lowland conifers, and jack pine. Existing landscape patterns do not reflect natural disturbance patterns and the composition, structure, and function of native plant community complexes that developed historically over long periods of time. Current vegetation management often does not replicate the characteristics of natural disturbance events. Forest fragmentation results in a loss of ecologically intact landscapes as forests are converted to other uses, e.g., residential development.
    b. **How might DNR vegetation management address this issue?** DNR can develop vegetation management strategies that produce effects similar to natural disturbances and can begin to restore certain species and conditions that were once more prevalent.

c. **What are possible consequences of not addressing this issue?** 1) Loss of wildlife habitat and associated species; 2) increase in invasive exotics; 3) loss of biodiversity; 4) simplification of stand and landscape communities; 5) loss of ecologically intact landscapes; and 6) loss of the ability to produce a diversity of forest products, e.g., saw timber, balsam boughs and other non-timber products, and tourism. 7) being less resilient to adapt to climate change.

3. How can we address the impacts of forest management on riparian and aquatic areas?

a. **Why is this an issue?** Riparian areas are critical to fish, wildlife, and certain forest resources.
b. **How might DNR vegetation management address this issue?** The Minnesota Forest Resources Council (MFRC) site-level guidelines are the DNR's standard for vegetation management in riparian areas. At the site level, managers may want to exceed those guidelines. When planning vegetation management adjacent to aquatic and riparian areas, managers can consider specific conditions associated with each site such as soils, hydrology, desired vegetation, and consider enhancements to the MFRC guidelines.
c. **What are possible consequences of not addressing this issue?** Failure to consider vegetation management that affects riparian and aquatic areas could result in increased run-off and erosion; more conspicuous run-off events; less stable stream flows; and negative impacts to water quality, stream stability, and fish and wildlife habitat; including disruptions to temperature regimes.

4. How can DNR develop new forest management access routes that minimize damage to other forest resources?

a. **Why is this an issue?** Routes are necessary to access forest stands identified for management during the 10-year planning period. These routes provide access for a variety of forest management activities and recreation. Negative impacts include costs, land disturbance, losses to the timberland base, increased spread of invasive exotic species, potential for user-developed trails, and habitat fragmentation.
b. **How might DNR vegetation management address this issue?** Using existing access routes or closing access routes after forest management activities have been completed might meet needs while minimizing negative impacts. Clustering stands to be harvested is an example of a management strategy that could reduce the amount of new access needed.
c. **What are possible consequences of not addressing this issue?** Not planning for access needs could result in unfulfilled management goals; poorly located access routes; negative impacts on wildlife habitat; and excessive costs for development, maintenance, and road closure. Unnecessary access potentially provides a route for the spread of invasive exotic species.

5. How might we maintain or enhance biodiversity, native plant community composition, and retain within-stand structural complexity on actively managed stands where natural succession pathways are cut short?

a. **Why is this an issue?** Areas of biodiversity significance provide reference areas to help us evaluate the effects of management on biodiversity. Forest management has altered the rate and direction of natural change. Some current practices tend to reduce within-stand structural complexity and diversity of vegetation.
b. **How might DNR vegetation management address this issue?** DNR will incorporate management techniques that maintain or enhance biological diversity and structural complexity into vegetation management plans. The Minnesota Forest Resources Council, which was established by the Minnesota Sustainable Forest Resources Act, is mandated to "encourage appropriate mixes of forest cover types and age classes within landscapes to promote biological diversity and viable forest-dependent fish and wildlife habitats."
c. **What are possible consequences of not addressing this issue?** 1) Degradation of existing biodiversity and ecosystem function; 2) fewer opportunities for maintaining or restoring ecological relationships; 3) reduction of species associated with declining habitat; and 4) social and economic losses resulting from a decline in recreational activity associated with wildlife viewing and hunting 5) being less resilient to adapt to climate change.

6. How might we provide habitat for all wildlife and plant species and maintain opportunities for hunting, trapping, and nature observation?

a. **Why is this an issue?** Forest wildlife species are important to society. A wide range of factors, from timber harvest to development, influences wildlife species and populations.
b. **How might DNR vegetation management address this issue?** DNR can select vegetation management techniques that provide a variety of wildlife habitats; maintaining or increasing the diversity of habitat has the added benefit of increasing resilience in the face of climate change.
c. **What are possible consequences of not addressing this issue?** 1) Reduction of some types of wildlife habitat; 2) reductions of species associated with declining habitats; and 3) economic and social losses resulting from a decline in recreational activity associated with wildlife viewing, hunting, and aesthetics.

7. How might we address the impacts on forest ecosystems from forest insects and disease, invasive species, nuisance animals, herbivory, and natural disturbances such as fires and blowdowns?

a. **Why is this an issue?** All of the above-mentioned processes can impact the amount of forest land harvested and regenerated during the 10-year planning period. They can also influence the long-term desired future forest composition (DFFC) goals of the subsection plans.

b. **How might DNR vegetation management address this issue?** DNR can design flexibility into the plan to deal with specific stands that are affected by these processes.
c. **What are possible consequences of not addressing this issue?** 1) Reduced timber volume and recreational enjoyment of the forest; 2) long-lasting change to native plant and animal communities; and 3) increased fire danger.

8. What are sustainable levels of harvest for timber and nontimber forest products?

a. **Why is this an issue?** Some cover types have pronounced age-class imbalances. Demand for nontimber forest products, e.g., balsam boughs and decorative trees, has been increasing; markets for some forest products have changed or declined.
b. **How might DNR vegetation management address this issue?** The DNR can develop a 10-year harvest plan for state lands in these subsections that promotes a balance of all age classes for all cover types. It could implement regulations to protect some nontimber species, and conduct training about sustainable harvest of nontimber forest products.
c. **What are possible consequences of not addressing this issue?** 1) Possible unsustainable harvest of these resources; 2) adverse impact to wildlife habitat and native plant communities; 3)reduced ability to accomplish forest management goals without markets, and 4) unintended overharvest of rare nontimber species.

9. How might the quantity and quality of timber products on state lands be increased?

a. **Why is this an issue?** The demand for timber from state land remains strong and Minnesota's forest industry requires a sustainable and predictable supply of wood.
b. **How might DNR vegetation management address this issue?** Vegetation management planning can identify forest stands for treatments that will increase timber productivity (e.g., harvesting at desired rotation ages, thinning, control of competing vegetation, and reforestation to desired species and stocking levels).
c. **What are possible consequences of not addressing this issue?** A less-predictable or unsustainable supply of timber would be available for logging and the forest products industry, likely resulting in higher procurement, chemical, and waste management costs. Alternatively, wood and wood product imports might increase from countries that have fewer environmental controls, effectively exporting U.S. environmental issues.

10. How can we implement forest management activities and minimize impacts on visual quality?

a. **Why is this an issue?** Scenic beauty is the primary reason people choose to live or use their recreation and vacation time in or near forested areas.

b. **How might DNR vegetation management address this issue?** DNR managers will continue to follow Best Management Practices (BMPs) for visual quality and identify areas that may need additional mitigation strategies**.**
c. **What are possible consequences of not addressing this issue?** Not addressing this issue may result in a negative experience for the public living, vacationing, and recreating in our forests.

11. How will land managers achieve desired results and continue to uphold various state and federal statutes?

a. **Why is this an issue?** Divisions within the DNR must follow legal mandates, while fulfilling both department and division missions. For example, State Trust Fund lands must generate income for various trust accounts under state law, and timber sales are currently the primary tool for this process. Wildlife habitat management and preservation, not timber sales, is the mandate for acquired Wildlife Management Area (WMA) lands.
b. **How might DNR vegetation management address this issue?** Vegetation management will take administrative land status and relevant statutes into consideration during the planning process.
c. **What are possible consequences of not addressing this issue?** Failure to follow these mandates and legislative intent may be a violation of federal or state law.

12. How will cultural resources be protected during forest management activities on state-administered lands?

a. **Why is this an issue?** Cultural resource sites possess spiritual, traditional, scientific, and educational values. Some types of sites are protected by federal and state statutes.
b. **How might DNR vegetation management address this issue?** DNR managers will continue to have all vegetation management projects reviewed for known cultural resources. They will survey unidentified sites and if cultural resources are found, modify the project to protect the resource. If cultural resources are discovered during a project, the project will be modified to protect the resource. Coordinate with other governments to determine location-specific concerns.
c. **What are possible consequences of not addressing this issue?** Loss or damage to cultural resources.

13. How can we ensure that rare plants and animals, their habitats, and other rare features are protected in these subsections?

a. **Why is this an issue?** Protecting rare features (endangered, threatened, and special concern species) is a key component of ensuring species, community, and forest-level biodiversity in these subsections.
b. **How might DNR vegetation management address this issue?** The Minnesota Biological Survey (MBS) has been completed in some counties and is in progress in other counties. DNR managers will check the Rare Features Database for the location of

known rare features. The needs of rare features will be addressed in the management plan. The State Wildlife Action Plan (SWAP) will be used as a guide for the protection of rare species and their habitats.

c. **What are possible consequences of not addressing this issue?** 1) Loss of rare species at the local and state level; 2) rare species declines leading to status changes; 3) rare habitat loss or degradation; and 4) loss of biodiversity at the species, community, and/or landscape level.

14. How can we ensure that forest management actions help maintain or enhance healthy watersheds?

a. **Why is this an issue?** Forested lands act as a water filter and are a key component in the hydrologic cycle for sustaining high quality water and hydrology. Forest management operations can have a direct impact on surface water quantity and quality.
b. **How might DNR vegetation management address this issue?** Forest management impacts can be planned to result in practices and promote a forest condition that maintains or enhances watershed conditions.
c. **What are possible consequences of not addressing this issue?** 1) Missed opportunities to improve the health of watersheds; 2) loss of the ability of streams in impaired watersheds to maintain cold-water attributes in a possibly changing climate; and 3) further degradation of watershed health.

15. How can we ensure that forest management actions consider the effects of climate change on forest resources and the environment?

a. **Why is this an issue?** Forest ecosystems in northern Minnesota will be affected directly and indirectly by global climate change. These forest ecosystems are predicted to undergo many changes as a result of a changing climate; forest management practices can have an important influence on the way that forests respond to climate change. Climate change will likely result in altered forest composition or lead to areas of deforestation, which could reduce the forest's capacity to sequester and store carbon. Site-level carbon debt of forest management may exceed site-level forest carbon sequestration for increasingly longer periods of time.
b. **How might DNR vegetation management address this issue?** DNR can incorporate climate change adaptation strategies into forest management decisions. The three main climate change adaptation strategies are: 1) Resistance - improve the forest's defenses against change (i.e., protect forests from severe fire and wind disturbance), 2) Resilience - improve the forest's ability to accommodate some degree of change (i.e., maintain and enhance species and structural diversity), and 3) Response – actively facilitate forest change (i.e., promote landscape connectivity to enhance species migration). DNR can incorporate carbon debt minimization strategies into forest management decisions.

c. **What are the possible consequences of not addressing this issue?** Forest ecosystems would be less resilient to climate change. Forest managers would miss opportunities to help forest ecosystems more smoothly adjust to climate change. Forest impacts due to climate change may be more drastic over time. Forest ecosystems will have reduced abilities to mitigate climate change. Forest carbon stocks may be reduced. Forest carbon sequestration may be reduced. Forest land managers will miss opportunities to reduce management's carbon debt; if as a result carbon stocks are reduced, climate change could be more pronounced.

16. How will we ensure that Permanent School Trust Fund policy is implemented on state lands without compromising sound natural resource management?

a. **Why is this an issue?** Trust Fund lands comprise approximately 80 percent of state lands in the NSU. By statute, Trust lands are to be managed for long-term revenue maximization using sound resource management principles. Strategies for revenue maximization on these lands will have a higher profile in SFRMP than they have in the past, as well as influencing on-the-ground decision making.
b. **How might DNR vegetation management address this issue?** Strategies for income maximization include using normal (economic) rotation ages for stand selection, and grouping these selections when possible to increase timber sale marketability and reduce road construction/costs. Management activities will remain consistent with direction set forth by SFI/FSC Forest Certification, Minnesota Forest Resource Council Voluntary Site-Level Guidelines, and statutes such as Shipstead-Newton-Nolan and Endangered Species protections.
c. **What are the possible consequences of not addressing this issue?** The Commissioner of Natural Resources has been entrusted by the Minnesota Legislature to manage Permanent School Trust Fund lands according guidelines set forth in state statute, that is, long-term income maximization using sound resource management principles. A consequence of failing to manage School Trust lands according to statute could result in DNR losing management authority over those lands.

17. The DNR reviewed its 1994 Extended Rotation Forest (ERF) policy in 2012 and agreed to new direction for monitoring and managing older forests on DNR timberlands. How is the DNR going to ensure that adequate amounts of old forest remain on the landscape?

a. **Why is this an issue?** Older forest provides important habitat for a variety of native plants and animals. Older forest also provides timber products, ecological values, and aesthetic appeal.
b. **How might DNR vegetation management address this issue?** The DNR has adopted an "Old Forest Adaptive Management" approach. As part of this approach, the DNR will monitor the amount of older forest on all ownerships. DNR may adjust management of DNR older forest in response to changing conditions across all ownerships. DNR will revisit the amount of

planned acres of older forest on DNR lands if acreage of older forest for a cover type on all ownerships is predicted to fall below the desired conditions outlined in the original SFRMP (generally 10-15% of the landscape). Other management objectives that will benefit old forest on DNR lands include application of riparian management guidelines, old forest management complexes, large old patches, and management objectives applied in designated High Conservation Value Forests (HCVF).

c. **What are possible consequences of not addressing this issue?** Loss of old forest habitat for some native plants and animals, a decline in species dependent on old forest habitat, loss of forest-wide diversity, and reduced climate change resiliency.

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 2: Land Use and Land Cover

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

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Contents

Spatial Forestland Cover Analysis (1990 Census and National Land Cover Database)

It is important to consider sampling scale when comparing modern data sets with presettlement land cover and use caution when drawing conclusions from direct comparisons. With that caveat, estimated upland forestland area decreased by 22.3 percent (4.43 to 3.44 million acres) and lowland vegetation (includes forested lowlands, shrub lowlands, and emergent herbaceous wetlands) increased by 35.2 percent (1.81 to 2.44 million acres) from presettlement to 2006. This change has been less pronounced over recent years with estimated upland forest area decreasing by only 1.2 percent from 2001 to 2006 (3.48 to 3.44 million acres) and lowland vegetation increasing by 0.7 percent (2.42 to 2.44 million acres).

Due to challenges in differentiating forested lowlands, shrub lowlands, and emergent herbaceous wetlands using remote sensing, it is difficult to assess the true extent of lowland forests in the 2001 and 2006 National Land Cover Database (NLCD) data sets.

In 1992, developed lands covered approximately 116,000 acres or 1.6 percent of the region. In 2006, developed land estimates increased by almost 68,000 acres to an area over 183,000 acres (2.5 percent) of the region. The average annual consumption of rural lands into developed lands from 1992 to 2006 was approximately 4,850 acres per year.

Agricultural land estimates in contrast have decreased from 106,000 acres (1.4 percent) in 1992 to under 15,000 acres (0.2 percent) in 2006.

Upland grasslands have also seen a substantial decrease from presettlement (9.4 percent of total) to 2006 estimates (2.5 percent of total). Despite this general declining trend, upland grassland estimates have actually increased recently from 166,443 acres in 2001 to 186,589 acres in 2006. (Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site : www.frc.state.mn.us

Figures 2.1 and 2.2 illustrate land cover patterns across the Northeast (NE) landscape as identified in the 1990 Census, and in 2006. As portrayed on the 2006 figure, the NE continues to be heavily forested. In 2006, more than 3.43 million acres of the NE Landscape were predicted to be upland forestland.

Figure 2.1. Land Use Land Cover Data from the 1990 Census

This figure is a map showing the kinds of land use and land cover that were collected as part of the 1990 census. Colors indicate the different land uses, with forested and bog-marsh-fen being the most common.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

Land Use and Land Cover data are challenging to display because of the way the data are collected and presented. There are a number of different data sets that could be used, each of which has a unique set of challenges and benefits. Some data are even derived from mathematical models rather than actually being collected in the field. The NSU SFRMP team has taken advantage of the enormous body of work undertaken recently by the Minnesota Forest Resources Council (MFRC) Landscape Planning Program. The MFRC finalized the revision of the NE Landscape Plan, which includes the entire Northern Superior Uplands (NSU) Section plus some additional lands, in 2014. The NSU makes up about 75 percent of the NE Landscape, so those data do not match exactly, but in a number of cases they serve a valuable purpose in providing an overview of the character of the landscape when specific site-level data are not available.

The maps in this section, and any charts that were borrowed from the MFRC NE Landscape Committee, carry the MFRC logo or a Data Source line acknowledging the source of the data

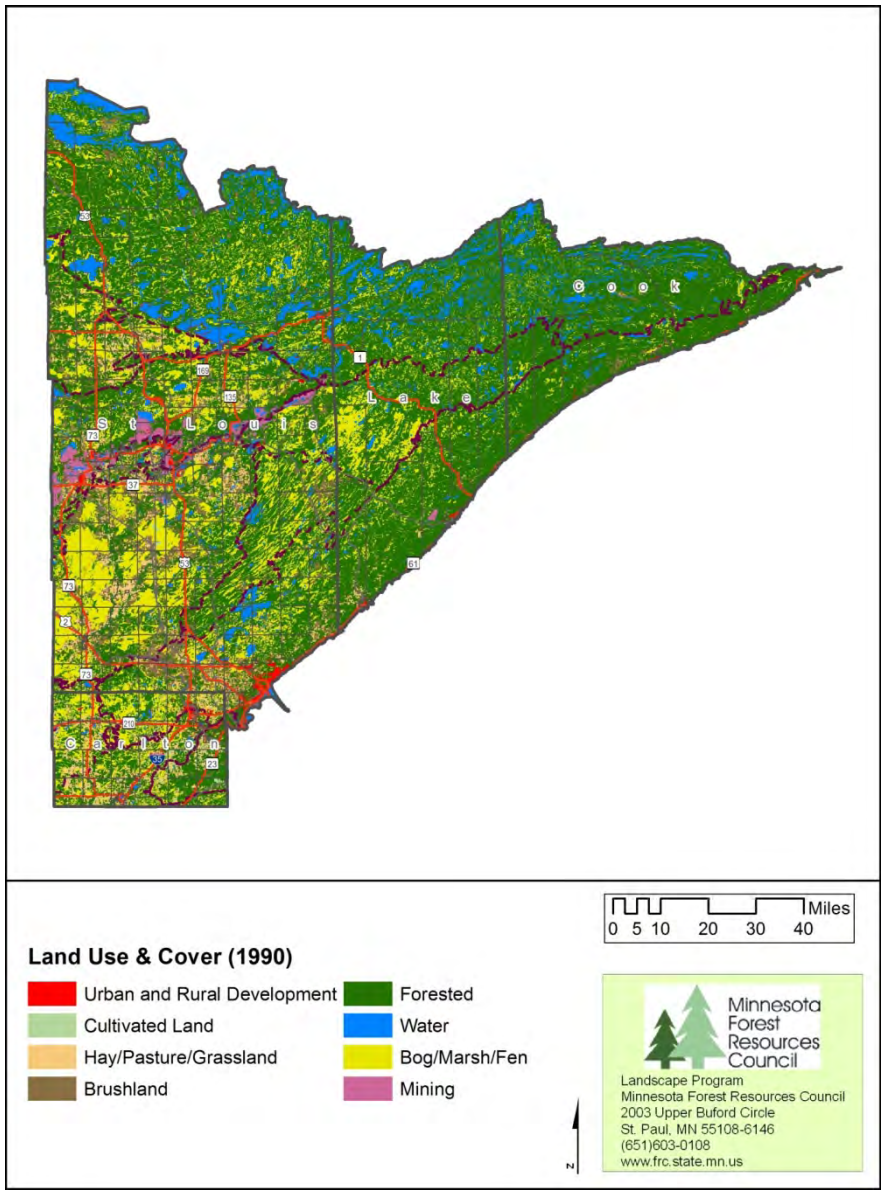


Figure 2.2. NE landscape land cover, NLCD 2006

This map displays various land cover types in the NE Landscape as different colors. Upland and lowland forest are themost common cover types.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

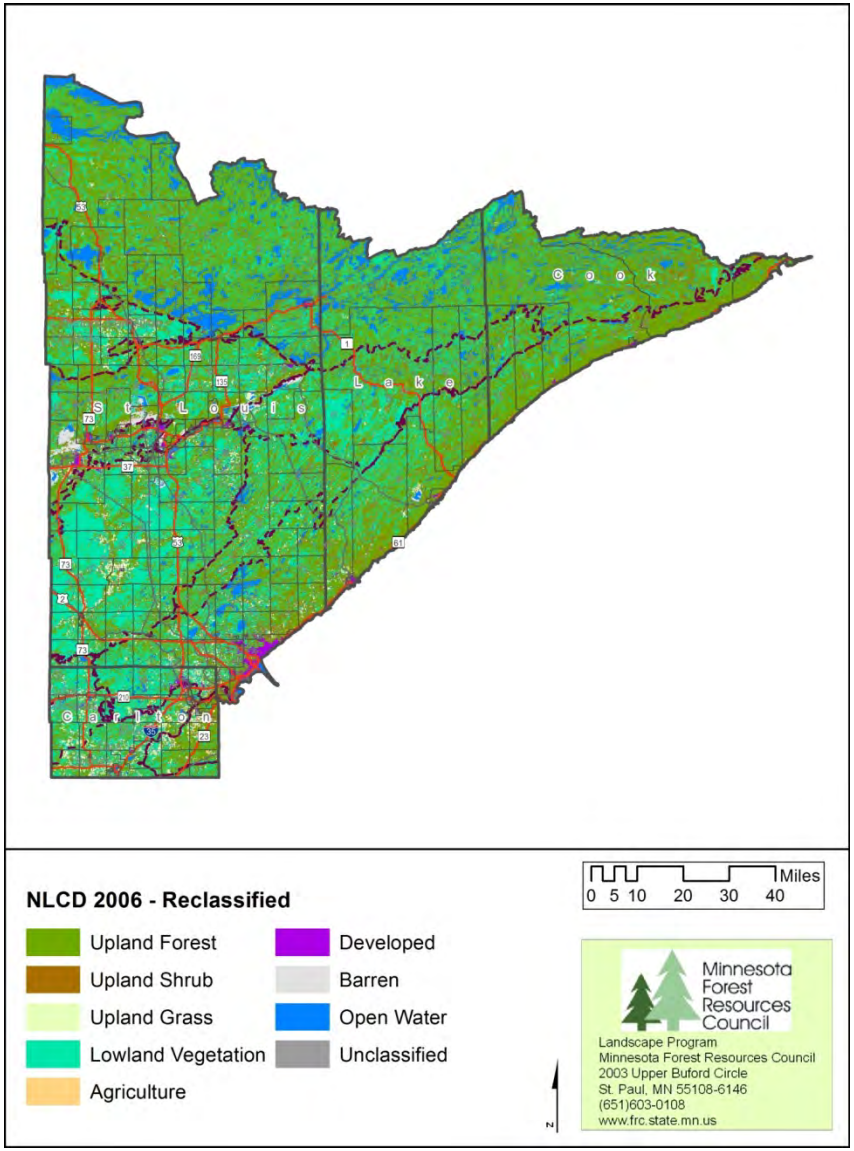


Table 2.1. Land cover in the NE Landscape over four time periods

This table compares land cover in the NE Landscape over four time periods; presettlement, 1992, 2001, and 2006. Columns show land cover type; and acreage, percent of total acres, acreage change, and percent change for presettlement, NLCD 2001, NLCD 2006, and 1992 GAP data.

Cover Type	Presettlement					GAP 1992 (compared to Presettlement)			
	Acres	% of Total	Acres Change	% Change		Acres	% of Total	Acres Change	% Change
Upland Forest	4,428,714	60.1	-	-		3,928,833	53.4	-499,881	-11.3
Upland Shrub	0	0.0	-	-		427,374	5.8	427,374	n/a
Upland Grass	688,738	9.4	-	-		292,368	4.0	-396,371	-57.6
Lowland Vegetation	1,805,454	24.5	-	-		1,878,267	25.5	72,813	4.0
Agriculture	0	0.0	-	-		106,289	1.4	106,289	n/a
Developed	0	0.0	-	-		115,799	1.6	115,799	n/a
Barren	0	0.0	-	-		37,402	0.5	37,402	n/a
Open Water	425,582	5.8	-	-		576,353	7.8	150,771	35.4
Unclassified	15,156	0.2	-	-		960	0.0	-14,196	-93.7
Totals	**7,363,644**	**100.0**	**-**	**-**		**7,363,644**	**100.0**	**-**	**-**
Cover Type	**NLCD 2001 (compared to GAP 1992)**					**NLCD 2006 (compared to NLCD 2001)**			
	Acres	**% of Total**	**Acres Change**	**% Change**		**Acres**	**% of Total**	**Acres Change**	**% Change**
Upland Forest	3,480,330	47.3	-448,503	-11.4		3,439,594	46.7	-40,736	-1.2
Upland Shrub	472,971	6.4	45,598	10.7		473,577	6.4	605	0.1
Upland Grass	166,443	2.3	-125,925	-43.1		186,589	2.5	20,146	12.1
Lowland Vegetation	2,424,108	32.9	545,841	29.1		2,440,580	33.1	16,472	0.7
Agriculture	14,534	0.2	-91,755	-86.3		14,843	0.2	309	2.1
Developed	182,030	2.5	66,231	57.2		183,665	2.5	1,635	0.9
Barren	40,963	0.6	3,561	9.5		46,510	0.6	5,548	13.5
Open Water	581,902	7.9	5,549	1.0		577,923	7.8	-3,979	-0.7
Unclassified	363	0.0	-597	-62.2		363	0.0	0	0.0
Totals	**7,363,644**	**100.0**	**-**	**-**		**7,363,644**	**100.0**	**-**	**-**

Source: Minnesota DNR GIS Data Deli, compiled by Minnesota Forest Resources Council.

Note: Some changes in areas of cover types from one dataset to another may be due to changes in scale and/or classification methodologies used in creation of each dataset. However, the NLCD 2001 and 2006 datasets are directly comparable.

The Extent of Forest Land in Recent Decades

The NE landscape is heavily forested. In 2012 estimates, forestland encompassed nearly 5.8 million (85.3 percent) of the NE Landscape's 6.8 million acres of land. This is an increase from estimates of forestland for 1977, 1990, and 2003 which ranged from 80.8 percent to 83.0 percent of the total land area. Comparing 1977 conditions with 2012 conditions suggests that forestland area increased 4.5 percent (5.5 to 5.8 million acres) during the 35 year period.

Table 2.2. Estimated extent of forestland in the NE Landscape, 1977-2012

This table from the MFRC Northeast Landscape Plan (2014) shows the change in extent of forestland over time, by comparing forested to non-forested acres in the years 1977, 1990, 2003, and 2012. Percentages remained in the range of 81-85 percent forested land cover during that period.

Land Cover	1977 acres	1990 acres	2003 acres	2012 acres
Forestland[A]	5,483,205	5,630,435	5,484,718	5,787,419
Non-forestland[B]	1,302,516	1,155,286	1,301,003	998,302
Percent	80.8%	83.0%	80.8%	85.3%

Source: Forest Inventory and Analysis estimate compiled by Minnesota Forest Resources Council.

[A] FIA defines forestland as: Land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and not currently developed for a non-forest use. The minimum area for classification as forest land is one acre. Roadside, stream-side, and shelterbelt strips of timber must be at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams and other bodies of water, or natural clearings in forested areas are classified as forest, if less than 120 feet in width or one acre in size. Grazed woodlands, reverting fields, and pastures that are not actively maintained are included if the above qualifications are satisfied. Forest land includes three sub-categories: timberland, reserved forestland, and other forestland.

[B] All terrestrial acres not designated as forestland.

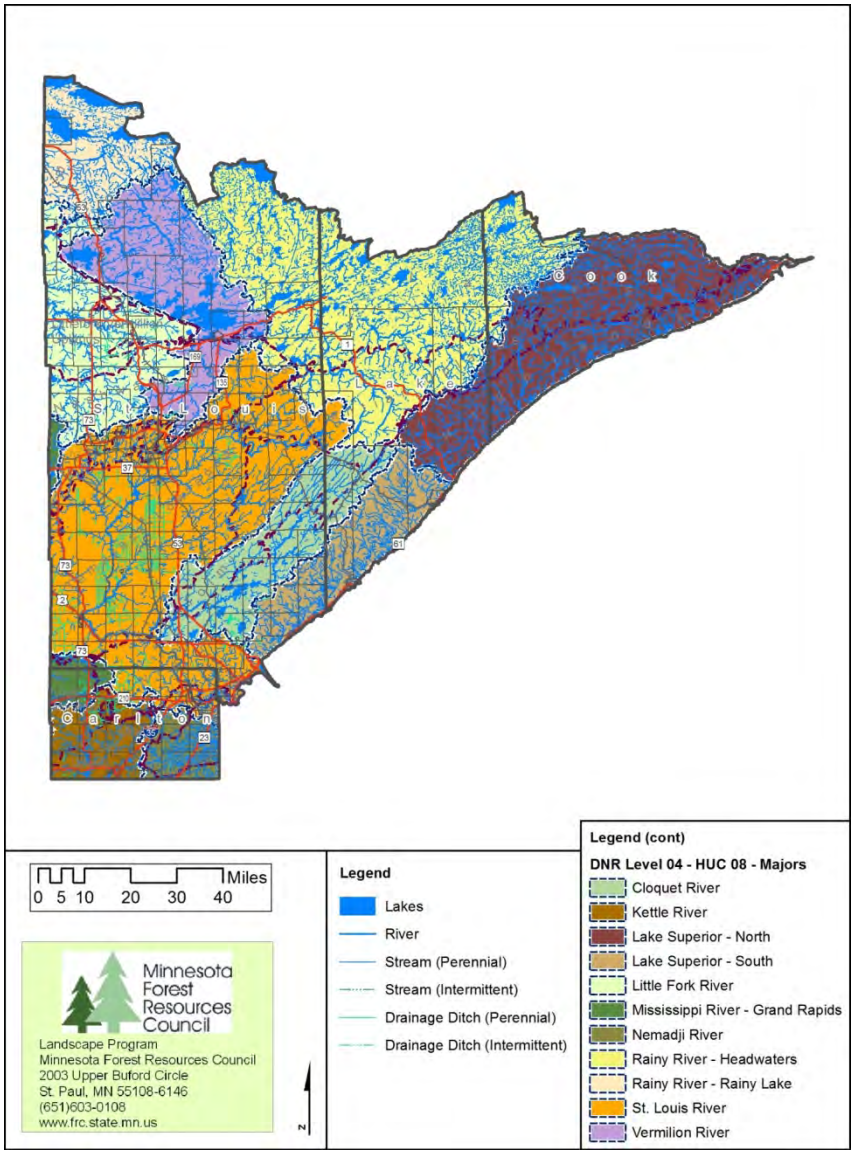
Note: Area estimates are based on FIA samples and affected by stratification of the sample into categories and by non-sampled rates leading to some artificial variability in area estimates from survey to survey.

Water quality in lakes and streams

Figure 2.3. Major watersheds in the NE Landscape

This map from the MFRC NE landscape team shows the HUC 08 watersheds in the planning area.

Data Source:Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us



The NE Landscape is an area of rich water resources. Water in this region flows north through the Rainy River to Hudson's Bay, east through the Great Lakes to the Atlantic Ocean, and south through the Mississippi River to the Gulf of Mexico. These are three of the most important water basins in North America and forestry practices within them can directly affect stream and lake health.

The Minnesota DNR developed the Watershed Health Assessment Framework (WHAF) http://www.dnr.state.mn.us/whaf/index.html to provide a comprehensive overview of the ecological health of Minnesota's watersheds. By applying a consistent statewide approach, the WHAF expands understanding of processes and interactions that create healthy and unhealthy responses in Minnesota's watersheds. Health scores are used to provide a baseline for exploring patterns and relationships in emerging health trends. The Saint Louis River watershed scored lower than the other watersheds in the region (see Figure 2.4 below, which displays watershed health scores in the NE Landscape).

Figure 2.4. Watershed health scores in the NE Landscape

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council). This map shows the scores from 1-100 of the major watersheds in this landscape. Scores in this area are between 51 and 70, 0 – 10 being the lowest score possible.

Data source: Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at www.frc.state.mn.us

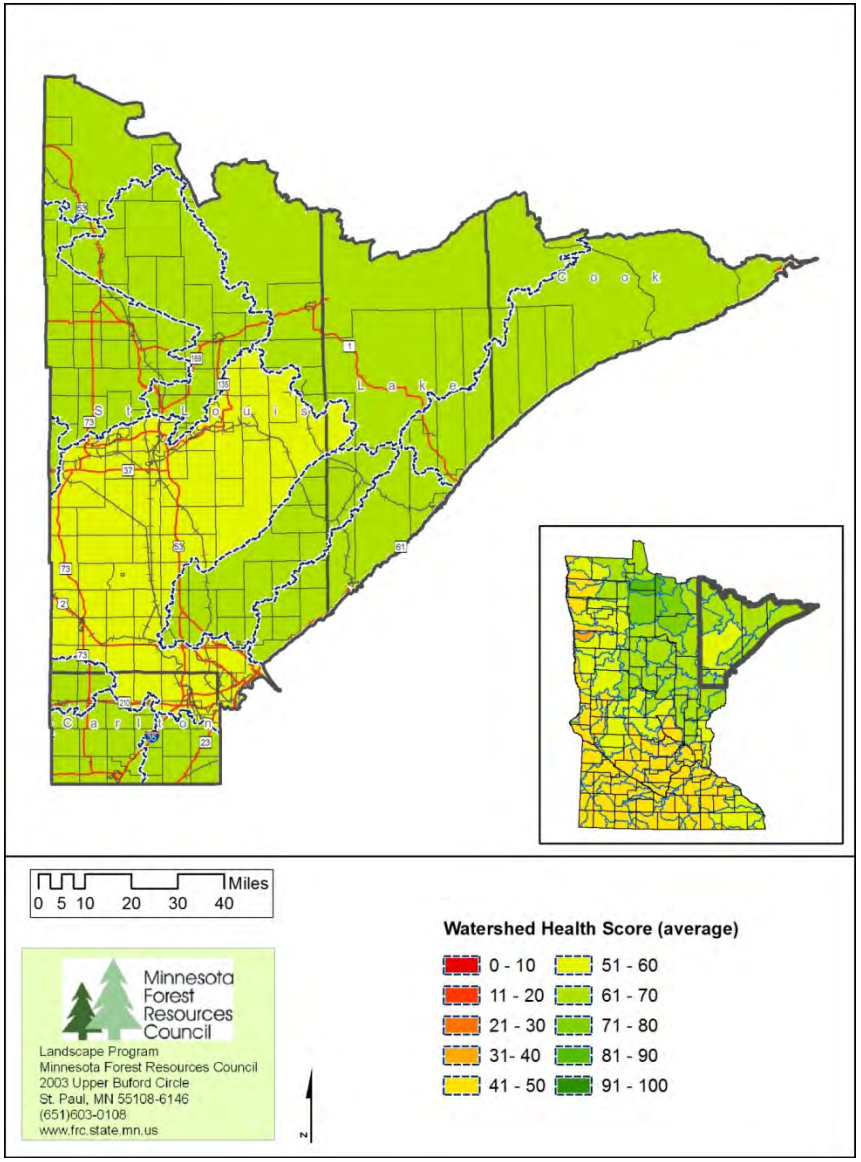
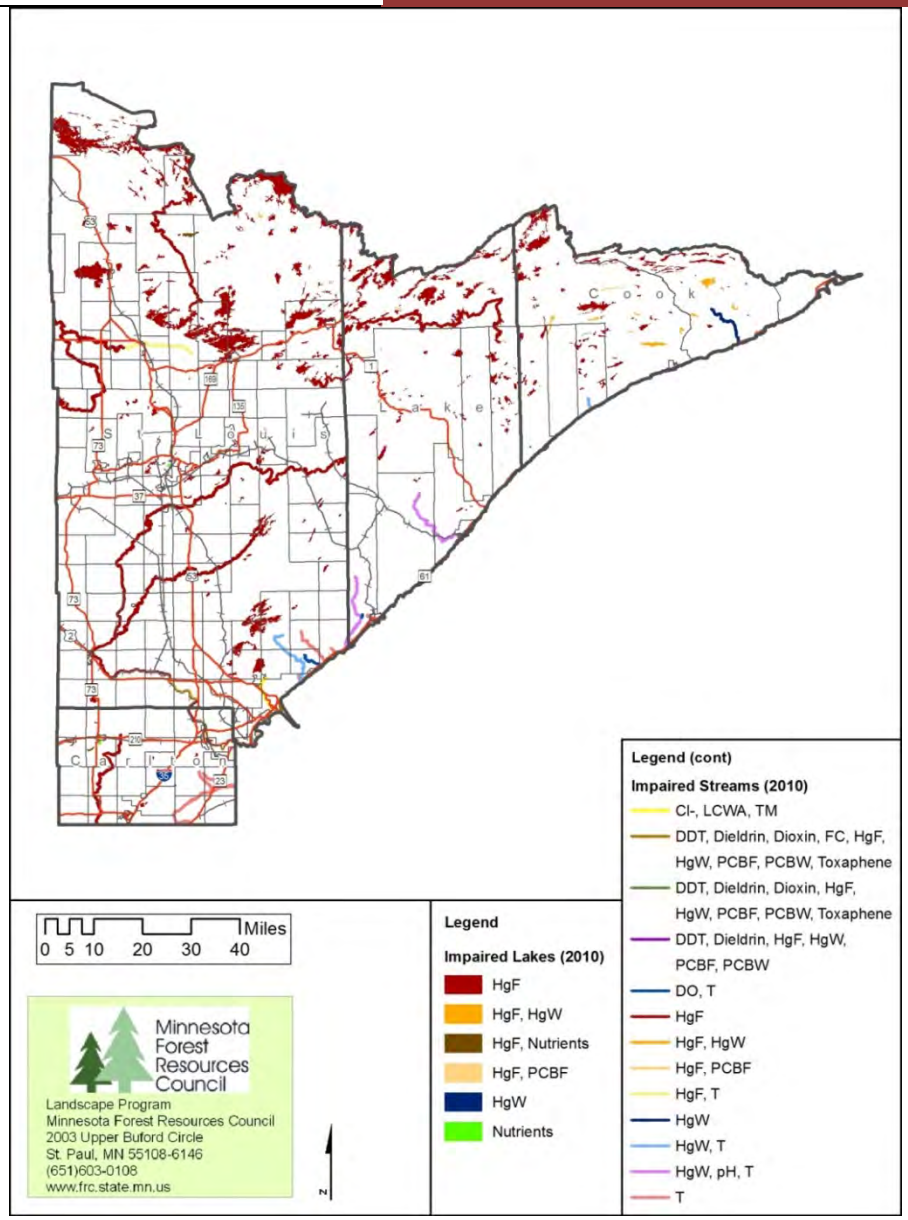


Figure 2.5. Impaired waters in the NE Landscape, 2010

Impaired lakes and streams in the NE landscape are shown on this map, coded by color for the substance causing the impairment.

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council).

In 2008, the Minnesota Pollution Control Agency (MPCA) adopted a watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands that complements its work on impaired waters. This watershed approach was recommended by Minnesota's Clean Water Council and directed by the Minnesota Legislature. This approach centers on intensive monitoring of each of Minnesota's 81 major watersheds on a continuous 10-year cycle. A primary product of this effort is the development and application of a Watershed Restoration and Protection Strategy (WRAPS) that contains strategies and actions designed to achieve and maintain water quality standards and goals. Partnerships with state agencies (including DNR) and various local units of government are critically necessary to the development and implementation of the WRAPS. More information about WRAPS can be found at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html

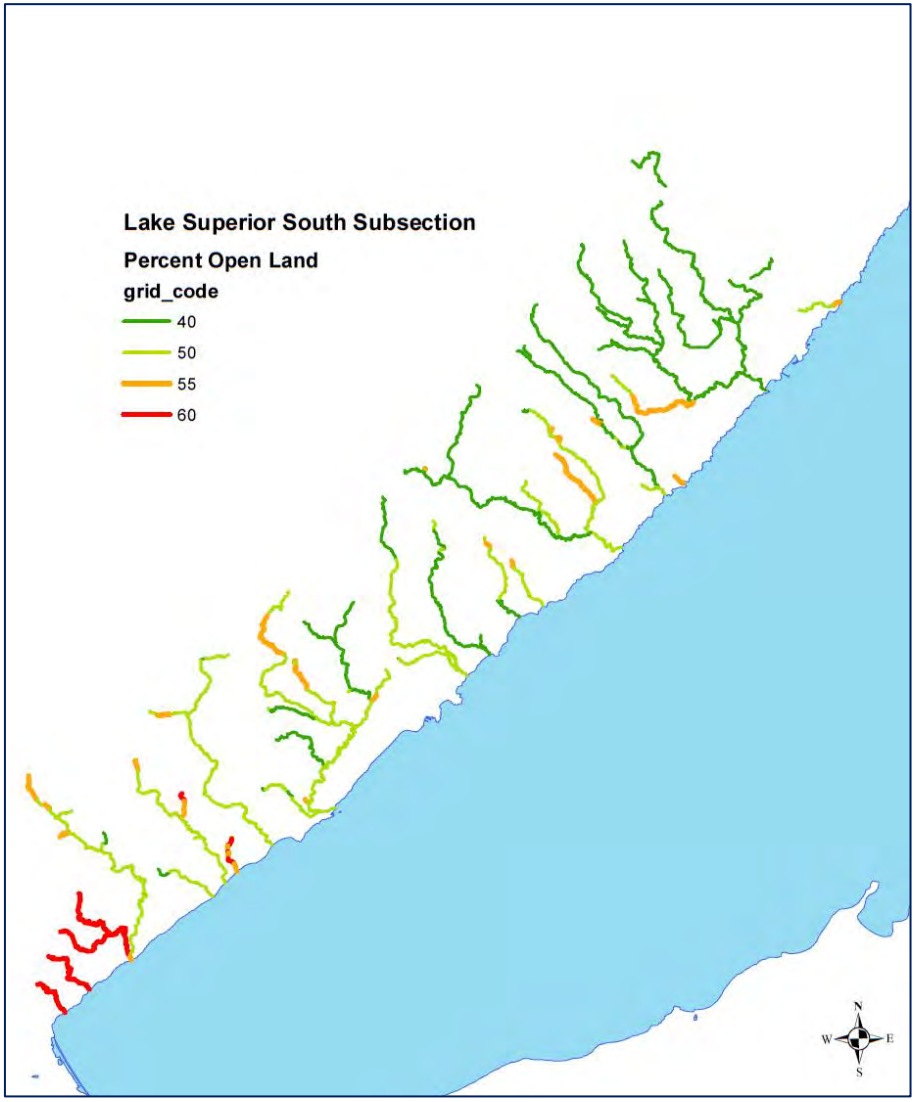


Forest cover and water quality

Figure 2.6. Percent open land and young forest in southern Lake Superior watersheds

This map color codes the watersheds to show the percentage of open land, from 40-60 percent.

Source: Minnesota DNR-Fisheries and the EPA's Mid-Continent Ecology Division



Forestlands are an important storm filter and are a key component in sustaining high quality water and hydrology. Forests buffer pounding rains and hold soil in place, allowing moisture to seep into the ground water and reducing erosion and unwanted runoff. Beyond just having forested cover, the age distribution of forests within a watershed can have an impact on water quality through effects on peak flows, loss of base flow, sedimentation and erosion, turbidity, nutrient levels, and water temperatures. These effects in turn can impact the health and distribution of aquatic organisms within the watershed.

Changes in vegetation cover from forestland to farmland or young forest can cause snow to melt faster and allow rainfall to reach streams faster. These changes may not have an impact on peak flows during large flood events, but they do impact smaller peak flow events as well as annual peak flows. These impacts begin to appear as the percentage of open land or young forest within a watershed rises above 60 percent (Verry, 2000; *Land Fragmentation and Impacts to Streams and Fish in the Central and Upper Midwest*; Society of American Foresters).

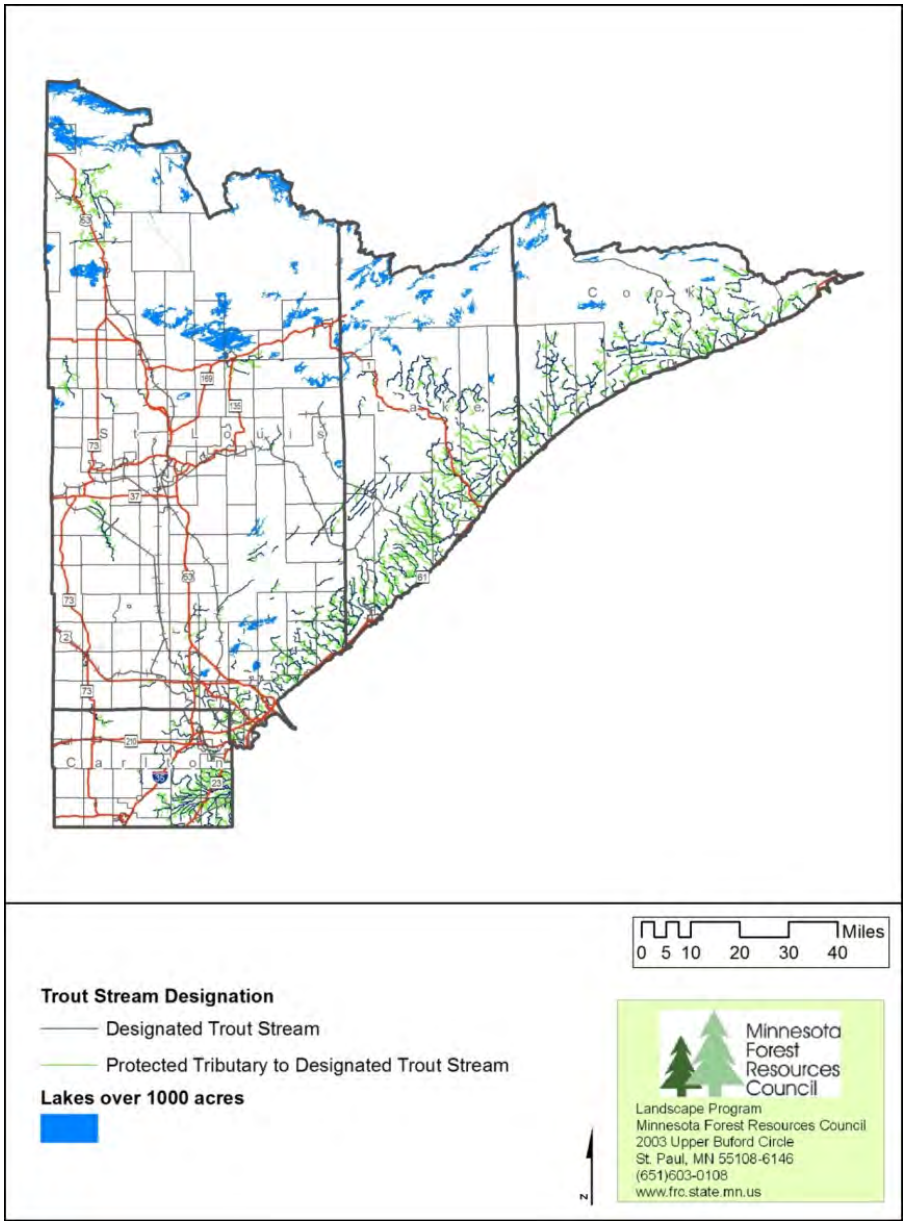
Minnesota DNR Fisheries and Ecological and Water Resources divisions; and the EPA's Mid-Continent Ecology Division in Duluth have initiated work to identify points within watersheds in the southern portion of the Lake Superior basin that may be at risk due to impacts related to the amount of open

land/young forest within the watershed. Some of the results of this work are shown here in figure 2.6. This work will inform forest management decisions within potentially impacted watersheds and possible outcomes of this use may include reforestation efforts in locations where such work can reduce the percentage of open land/young forest below the impact threshold, and coordination of timber sale activity across land ownerships to avoid increasing the amount of young forests at points within watersheds known to be at or above the impact threshold.

Figure 2.7. Designated Trout Streams inLake Superior watersheds

This map shows designated trout streams in the NE landscape area of Minnesota, as well as protected tributaries to those streams.

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council)



Following appropriate management practices in these riparian areas as outlined in the MFRC Voluntary Site-Level Forest Management Guidelines will contribute to keeping northeast Minnesota's lakes, rivers, wetlands and fisheries healthy. These healthy forests maintain high quality aquatic systems such as cold water trout streams through shading and water temperature maintenance, erosion and nutrient loading reduction, and providing course woody debris and structural cover. The NE Landscape contains 2,153 miles of designated trout streams and an additional 1,270 protected tributaries to designated trout streams

MFRC Voluntary Site-Level Forest Management Guidelines are available at:

www.frc.state.mn.us/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 3: Land Ownership and Administration

MNDNR

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Land Ownership and Administration

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Thirty-five percent of the land area in the NE Landscape is privately owned; another 64 percent is publicly owned and less than one percent is owned by sovereign Indian nations. The 1854 Treaty ceded territory covers approximately 81 percent of the NE Landscape.

St. Louis, Lake, and Cook Counties are the three main county land managers in the NSU Section.

Minnesota DNR administers just under one million acres in the NE Landscape; the Division of Forestry administers the majority of those acres through the Two Harbors, Littlefork, Hibbing, Tower-Orr, and Cloquet Forestry Areas.

The maps and charts from the NE Landscape Plan were borrowed from the MFRC Northeast Landscape Committee and carry the MFRC logo or a Data Source line acknowledging the source of the data.

Table 3.1. Land Ownership in the Northeast Landscape based on GAP data

Table columns display the name of the land owner, the Public Ownership by agency, the acres in each ownership category, and the percentage of the total land area. Public ownership is 65 percent of the area; tribal 0.8 percent; private 35 percent. Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council).

Owner Description	GAP Public Ownership	Acres	% of Total
Federal	Army Corps of Engineers	34	0.0
	Bureau of Indian Affairs	16,772	0.2
	Bureau of Land Management	1,518	0.0
	U.S. Forest Service	2,334,185	31.7
	U.S. Park Service	180,810	2.5
	Unknown	11,692	0.2
Total Federal		**2,545,011**	**34.6**
State	County Admin/State Forest	612,819	8.3
	County Admin/State Owned	539,532	7.3
	Department of Military Affairs	42	0.0
	Department of Transportation	1,493	0.0
	Division of Ecological Services	2,872	0.0
	Division of Fish and Wildlife	27,949	0.4
	Division of Forestry	897,874	12.2
	Division of Lands and Minerals	1,989	0.0
	Division of Parks and Recreation	42,191	0.6
	Division of Trails and Waterways	3,351	0.0
	Division of Waters	253	0.0
	Minnesota DNR (Undifferentiated)	152	0.0
	State (Undifferentiated)	2,609	0.0
Total State		**2,133,125**	**29.0**
County	County	31,960	0.4
Total County		**31,960**	**0.4**
Other Public	Other Public	16,235	0.2
Total Other Public		**16,235**	**0.2**
Total Public Ownership		**4,726,330**	**64.2**
Tribal	Bois Forte Band, Vermilion	652	0.0
	Fond Du Lac Tribe	18,440	0.3
	Grand Portage Tribe	32,409	0.4
	Minnesota Chippewa Indians	678	0.0
	Bois Forte Band, Nett Lake	9,513	0.1
Total Tribal		**61,693**	**0.8**
Private Conservancy	The Nature Conservancy	9,962	0.1
Private	Private	2,565,659	34.8
Total Private Ownership		**2,575,621**	**35.0**
Total Project Area		**7,363,644**	**100.0**

Figure 3.1. Map showing land ownership in the Northeast Landscape, which includes the NSU

Colors indicate the GAP land ownership classes in this map.

Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council).

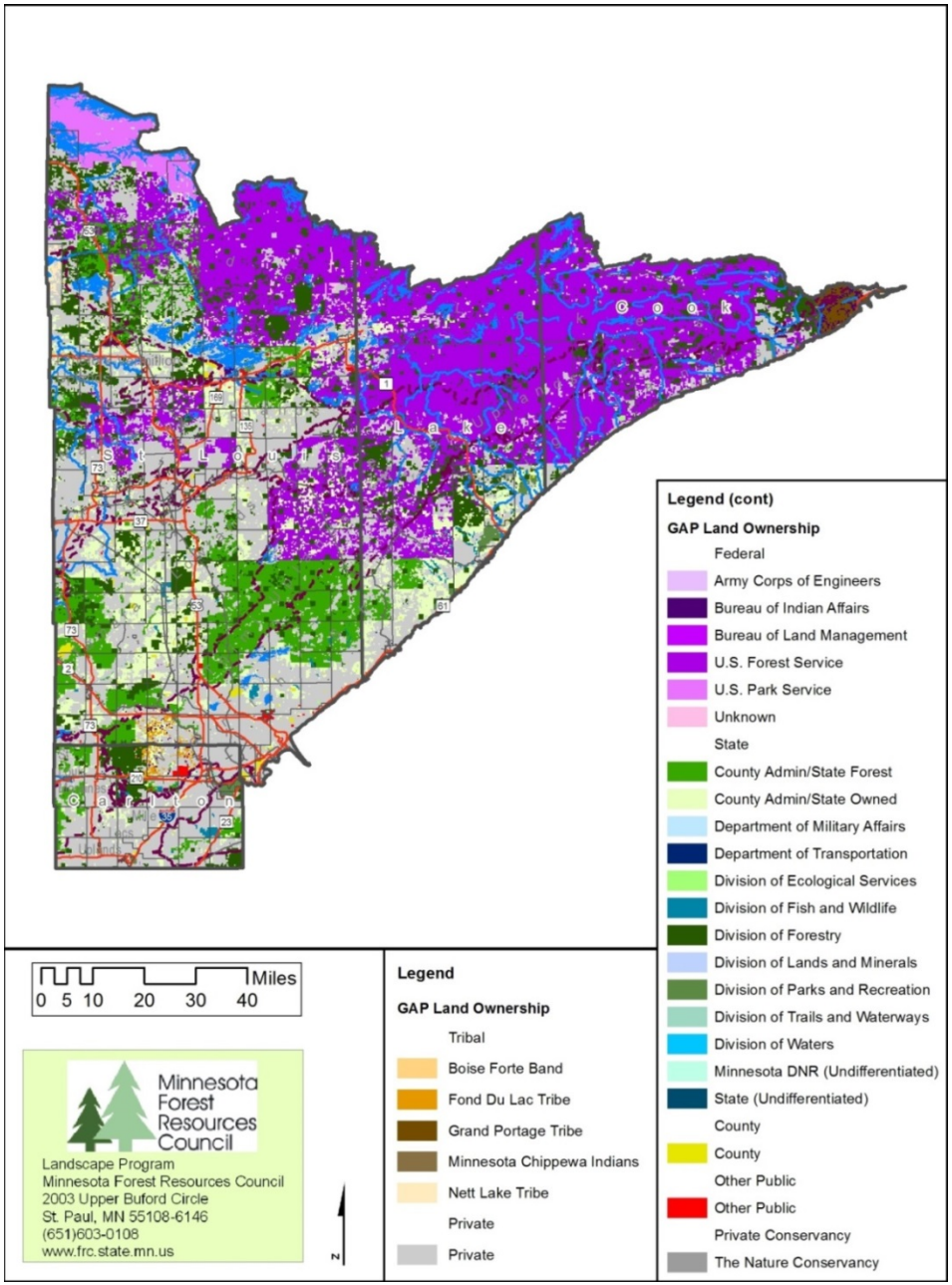


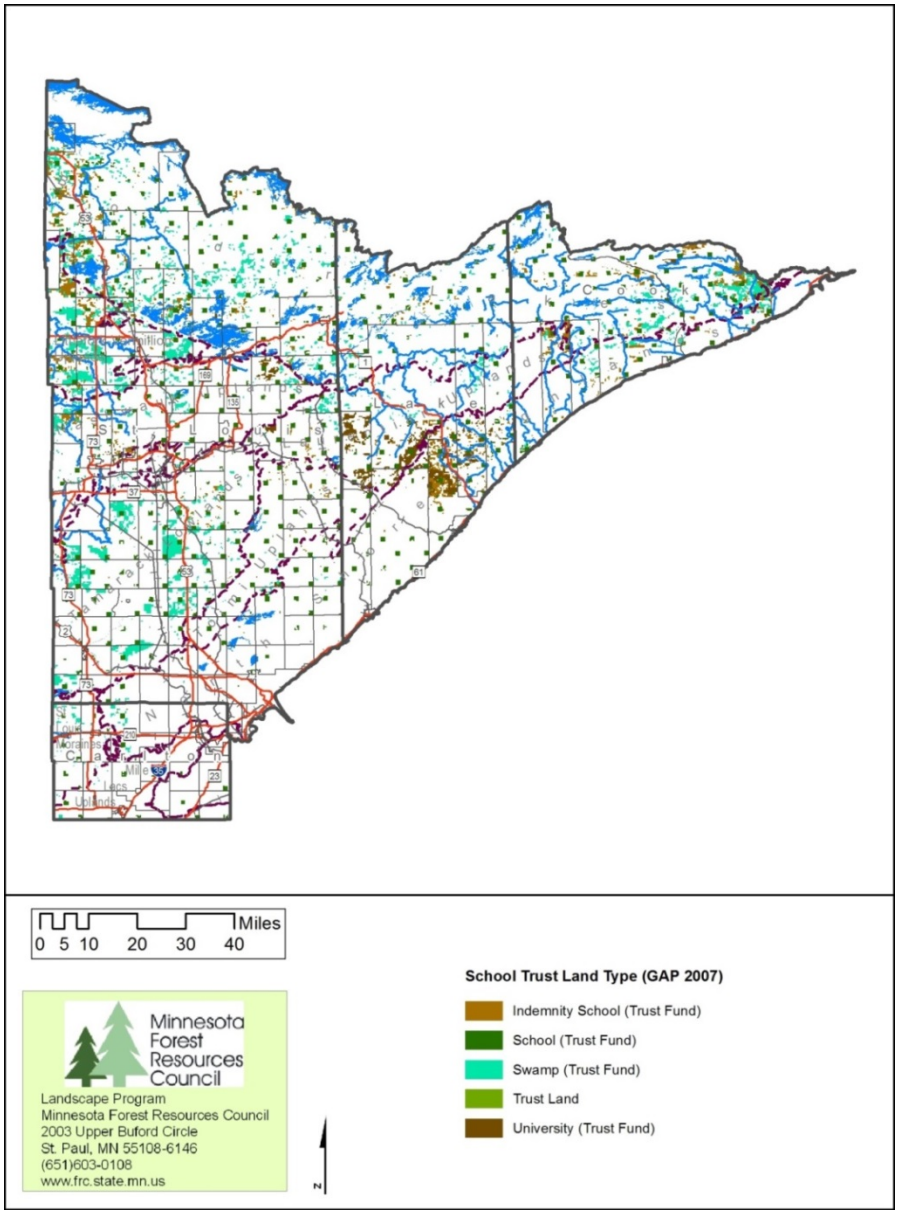
Table 3.2. Minnesota DNR Land Administration

Columns in this table display the Minnesota DNR divisions and the Boundary Waters Canoe Area, the acreage of land each administers, and the percentage of total DNR-administered land in the Section. The greatest number of acres (87 percent) is administered by the Division of Forestry; the total land area administered by DNR in the Section is about 710,000 acres.

Administrator	Acres	Percent
Minnesota DNR Division		
Eco/Water Resources	5,278	<1
Wildlife Section	5,128	<1
Forestry	620,889	87
Parks	30,068	4
Trails & Waterways	12,817	2
Fisheries Section	13,206	2
Minerals	1,954	<1
BWCA	20,955	3
Total	**710,295**	**100**

Figure 3.2. School trust lands in the NE Landscape, 2007

Five categories of school trust land in the Northeast landscape are color coded. *Source: Minnesota DNR GIS Data Deli.*



School Trust Lands

When Minnesota became a state in 1858, sections 16 and 36 of every township were granted to Minnesota from the federal government to support schools. Alternative sections, referred to as Indemnity Lands, were granted when sections 16 and 36 had already been claimed, were reserved for an Indian reservation, or were under water. The grant ultimately resulted in 2.9 million acres being given to the state for the use of the public schools and the Minnesota Constitution established the Permanent School Fund (PSF) to ensure long-term funding would be generated from accumulated revenues from the land for public education. As a result, these lands are owned by the state in trust for all public schools of Minnesota, they are not owned by the local school district. Also included in school trust lands today are remaining lands from two other federal land grants: the Swampland grant of about 4.7 million acres in 1860, and the Internal Improvement grant of 500,000 acres in 1866.

By 1900, much of this land had been sold to support public schools. Today roughly 2.4 million acres (31 percent of the original 8.1 million acres) of school trust lands and an additional 1 million acres of mineral rights remain and are managed by the DNR. The vast majority of these lands are located in the northern forested portion of the state with nearly 800,000 (33 percent) acres found in the Northeast Landscape, accounting for almost 11 percent of the regional land cover (Table 3.3). Almost 11 percent of the NE landscape is classified as school trust land of one kind or another, compared to 4.4 percent statewide.

In 2013, the Minnesota Legislature established the 12-member Legislative Permanent School Fund Commission to advise the DNR and the school trust lands director on the management of permanent school fund land and review legislation affecting permanent school fund land. The Commission is required to review statutes and recommend any changes necessary for provident utilization of school trust lands. It reports annually to the Legislature with recommendations for management of school trust fund lands to secure long-term economic return for the permanent school fund. The impact of this new commission on management of school trust lands in Northeast Minnesota is unknown but there may be changes in ownership and/or management of these lands in the near future.

For more information visit the Minnesota DNR School Trust Lands web site: www.dnr.state.mn.us/aboutdnr/school_lands/index.html

Table 3.3. School trust lands in the Northeast Landscape

The rows in this table display the seven different classifications of school trust land, along with the acreage of school trust land in the NE landscape (which includes the NSU), the acreage of school trust land in the State as a whole, and the percentages of school trust land in the NE landscape and the State, respectively. Totals acreages are provided in the bottom two rows. *Data Source: Minnesota Data Deli (compiled by Minnesota Forest Resources Council).*

School Trust Land Type (GAP Land Ownership 2007)	Northeast Landscape		Minnesota	
	Acres	% of Total	Acres	% of Total
Indemnity School (Trust Fund)	146,339	2.0	286,344	0.5
Internal Imp (Trust Fund)	--	--	6,093	0.0
School (Trust Fund)	270,259	3.7	641,892	1.2
Swamp (Trust Fund)	315,432	4.3	1,376,894	2.5
Trans. School (Trust Fund)	--	--	80	0.0
Trust Land	73	0.0	73	0.0
University (Trust Fund)	67,413	0.9	80,772	0.1
Total Trust Lands	**799,515**	**10.9**	**2,392,148**	**4.4**
Totals Region and State	**7,363,644**	**-**	**53,997,289**	**-**

Table 3.4. Acres of school trust lands in the NSU Section

The first column lists the subsections that make up the NSU Section; the second and third columns list Trust and Non-trust land by subsection; the third column lists percentages by subsection based on total acres on state-administered land. Source: *DNR Division of Forestry, Forest Inventory Module, 2014.*

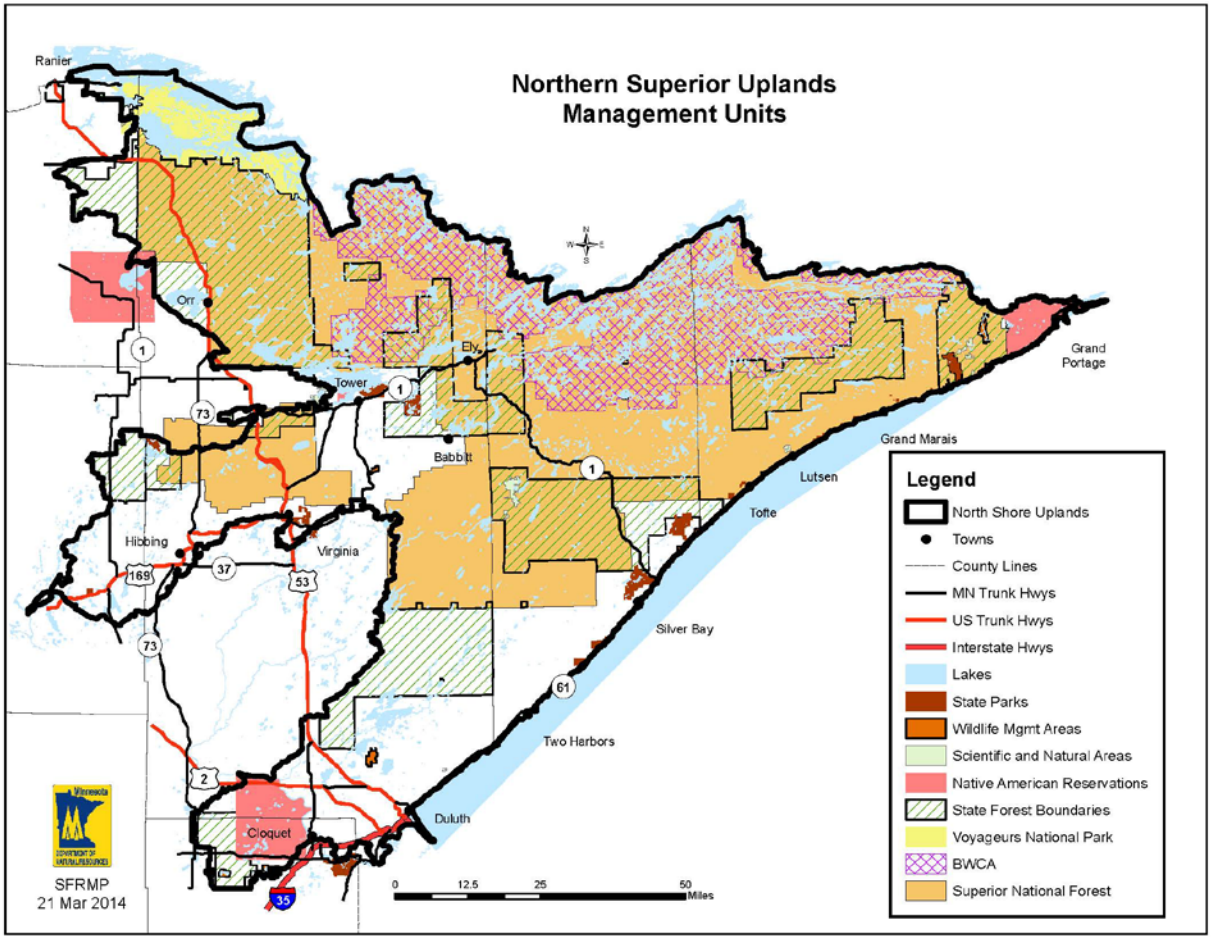
Subsection Name	Trust Acres	Non-Trust Acres	% of Subsection
Border Lakes	262,341	48,548	84%
Laurentian Uplands	76,170	4,421	95%
Nashwauk Uplands	67,096	19,215	78%
North Shore Highlands	117,684	83,711	58%
Toimi Uplands	23,745	7,358	76%
Total	**547,036**	**163,253**	**77%**

Management Units in the NSU

The NSU includes a number of management units on State, federal, and tribal land that may or may not be included in the SFRMP process. They may have special statutory or policy attributes that make them different from other state forest lands.

Figure 3.3. This map shows management units of significance in the NSU Section

Shown in color on this map are Indian Reservations, Wildlife Management Areas, State Parks, National Forests, National Parks, the Boundary Waters Canoe Area Wilderness, Ruffed Grouse Management Areas, and Scientific and Natural Areas. Major highways and cities in the Section are also displayed.



Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 4: Forest Composition and Structure

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Northern Northern Superior Uplands Section Forest Resources Management Plan* website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
Alternative Formats available on request.
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Contents

Composition and Structure of Commercial Forest Types in the Northern Superior Uplands Section

The following series of tables display the current age class distribution of each forest type by subsection. For each subsection, the age class distribution of stands currently under development is also given. After each table, a series of charts displays the data graphically, both for current forest and as a comparison between 2006 and 2014 data for these same forest cover types.

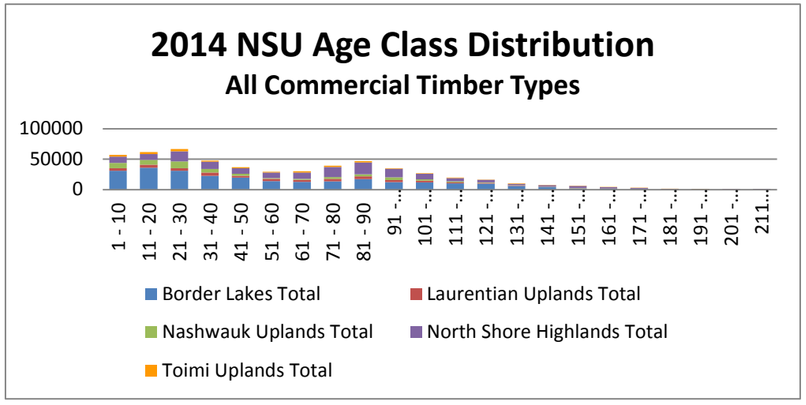
Table 4.1. 2014 Age-class distribution of all commercial forest types by ten-year age class

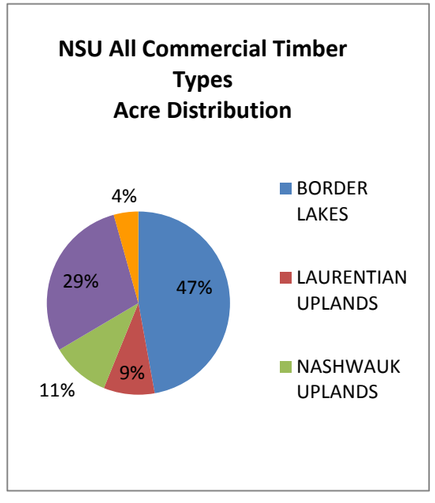
The first column displays the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

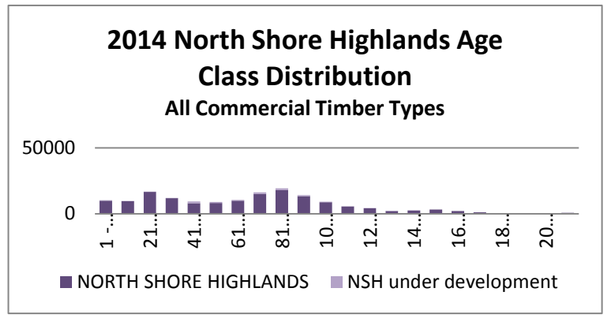
All	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	30638	36090	30714	22536	18320	11669	11052	11128	14069	11483	11107	9608	9409	5852	3876	2099	1333	1289	306	262	227	**300**	**243367**
BL under development	210	0	166	363	1404	2224	1750	2537	3364	1040	709	646	382	207	39	56	90	43	2	0	0	**0**	**15232**
Border Lakes Total	30848	36090	30880	22899	19724	13893	12802	13665	17433	12523	11816	10254	9791	6059	3915	2155	1423	1332	308	262	227	**300**	**258599**
LAURENTIAN UPLANDS	4151	5121	4415	5211	3003	3586	3187	4026	4137	2987	2587	1560	1138	669	626	267	140	165	71	67	28	**33**	**47175**
LU under development	34	0	114	60	134	132	104	173	546	328	273	115	21	130	15	0	0	0	0	0	0	**0**	**2179**
Laurentian Uplands Total	4185	5121	4529	5271	3137	3718	3291	4199	4683	3315	2860	1675	1159	799	641	267	140	165	71	67	28	**33**	**49354**
NASHWAUK UPLANDS	8636	7576	10933	5446	2900	1389	1147	1980	2393	3983	2247	1313	803	619	464	319	305	86	77	0	0	**42**	**52658**
NU under development	142	64	184	407	270	175	508	932	656	372	56	182	29	85	3	112	0	0	34	13	0	**0**	**4224**
Nashwauk Uplands Total	8778	7640	11117	5853	3170	1564	1655	2912	3049	4355	2303	1495	832	704	467	431	305	86	111	13	0	**42**	**56882**
NORTH SHORE HIGHLANDS	9885	9636	16595	11845	8052	8340	9908	15156	18120	13414	8881	5531	4219	2046	2417	3352	2021	1231	639	489	165	**715**	**152657**
NSH under development	446	5	73	283	1301	629	565	1179	1292	717	399	176	99	18	10	0	0	0	0	0	0	**0**	**7192**
North Shore Highlands Total	10331	9641	16668	12128	9353	8969	10473	16335	19412	14131	9280	5707	4318	2064	2427	3352	2021	1231	639	489	165	**715**	**159849**
TOIMI UPLANDS	2425	3122	3508	1388	1234	889	1983	1593	1521	562	580	504	158	475	200	95	88	47	28	6	0	**0**	**20406**
TU under development	477	119	127	294	342	191	181	678	736	117	9	100	37	27	14	0	0	0	0	0	0	**0**	**3449**
Toimi Uplands Total	2902	3241	3635	1682	1576	1080	2164	2271	2257	679	589	604	195	502	214	95	88	47	28	6	0	**0**	**23855**
	57044	**61733**	**66829**	**47833**	**36960**	**29224**	**30385**	**39382**	**46834**	**35003**	**26848**	**19735**	**16295**	**10128**	**7664**	**6300**	**3977**	**2861**	**1157**	**837**	**420**	**1090**	**548539**

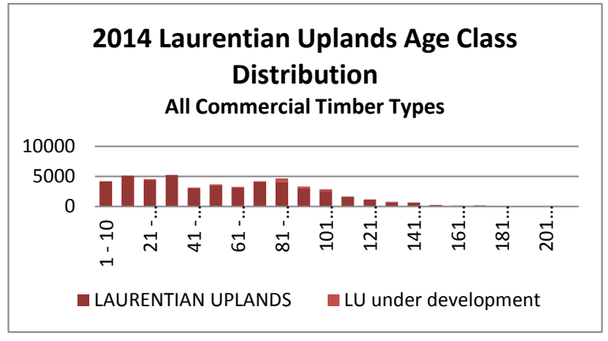
Figure 4.1. 2014 Age-class distribution charts for all commercial cover types

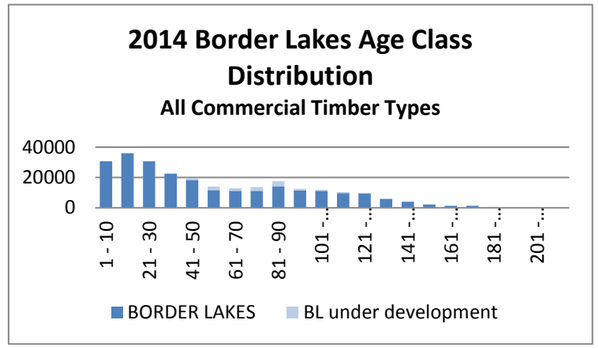
The following seven charts display the 2014 age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the commercial forest is located in each subsection.

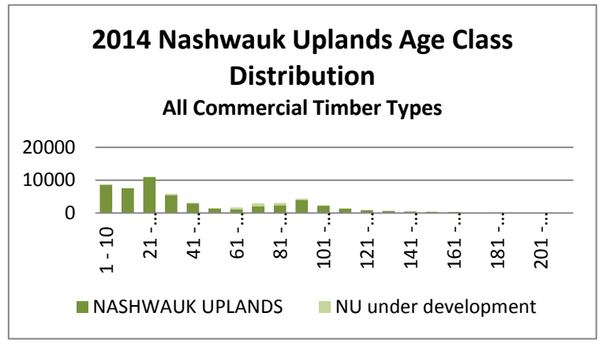












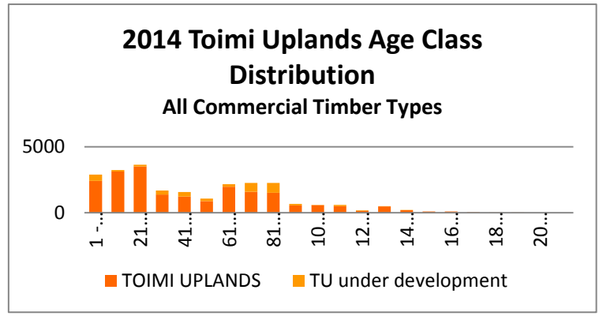


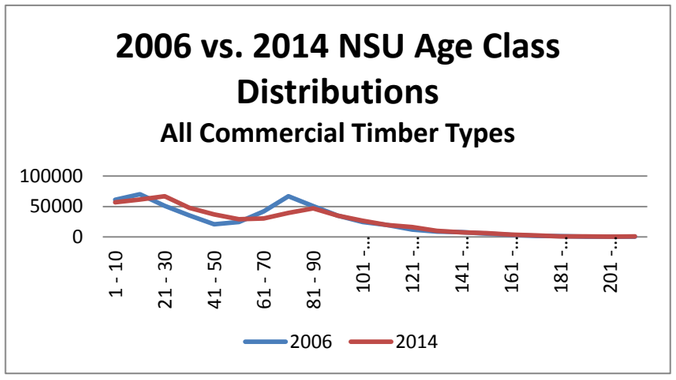
Table 4.2. 2006 Age-class distribution of all commercial covertypes combined, by subsection and ten-year age class

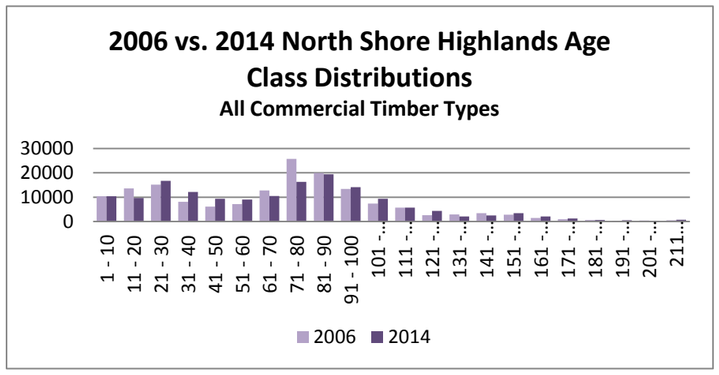
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

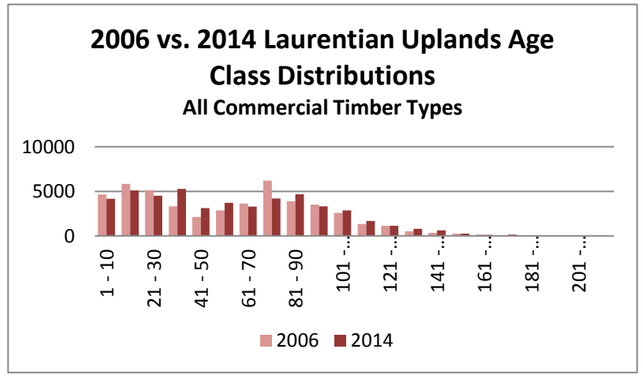
All	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 +	Total
BORDER LAKES	35102	35777	22629	18823	9594	11567	18489	25922	19483	13968	12798	11121	7184	4631	3557	2034	1951	495	944	414	231	260	**256974**
LAURENTIAN UPLANDS	4663	5854	5135	3340	2140	2872	3637	6223	3896	3518	2592	1355	1151	517	347	258	146	75	20	79	3	42	**47863**
NASHWAUK UPLANDS	8218	10925	6710	3700	1999	1805	3893	5731	5629	3489	1343	1274	685	639	501	437	93	153	28	13	9	30	**57304**
NORTH SHORE HIGHLANDS	10413	13573	15139	8113	6088	7187	12725	25728	19892	13366	7312	5718	2522	2876	3377	2732	1425	895	582	218	375	459	**160715**
TOIMI UPLANDS	2546	4191	1741	1416	1215	1340	3227	3517	1889	657	666	294	491	310	165	109	40	40	6	0	0	0	**23860**
	60942	**70320**	**51354**	**35392**	**21036**	**24771**	**41971**	**67121**	**50789**	**34998**	**24711**	**19762**	**12033**	**8973**	**7947**	**5570**	**3655**	**1658**	**1580**	**724**	**618**	**791**	**546716**

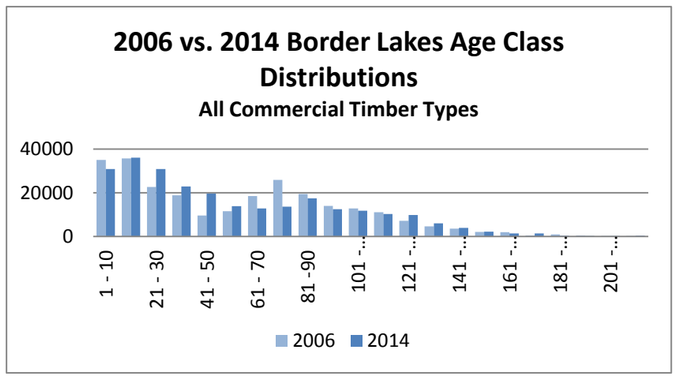
Figure 4.2 Comparison between 2006 and current (2014) age-class distributions for all commercial cover types combined

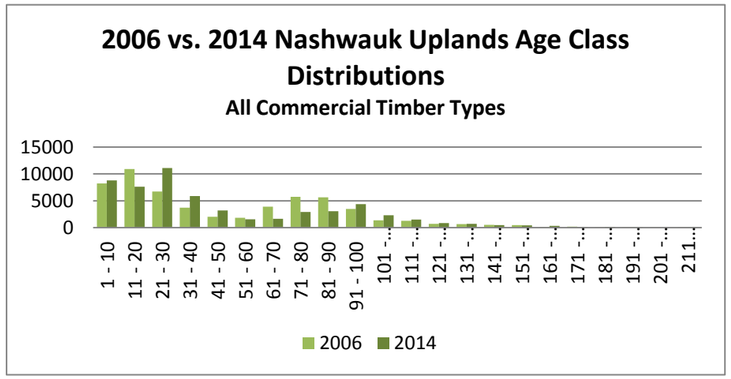
A line graph displays the age-class distribution of all commercial cover types combined for the section as a whole; five individual bar charts display the age-class distribution of all commercial cover types combined for the individual subsections that make up the NSU.











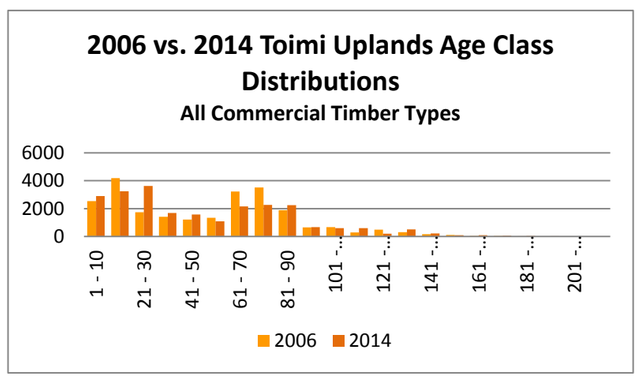


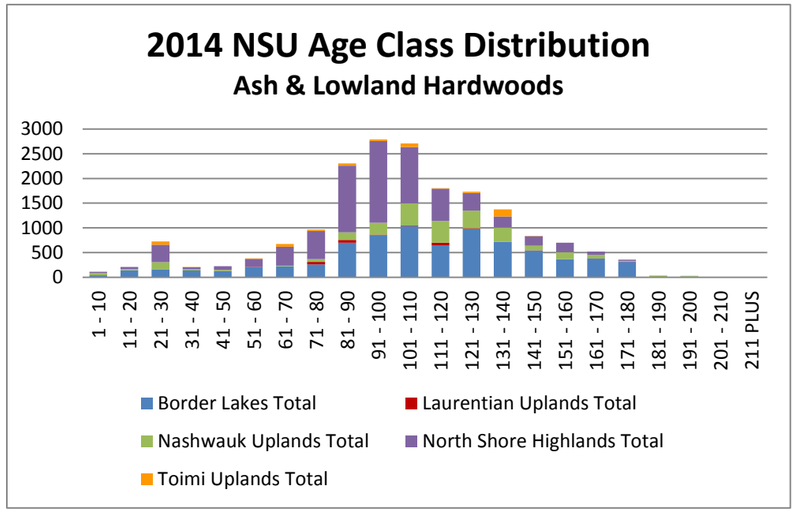
Table 4.3. 2014 Age-class distribution of ash and lowland hardwoods by ten-year age class

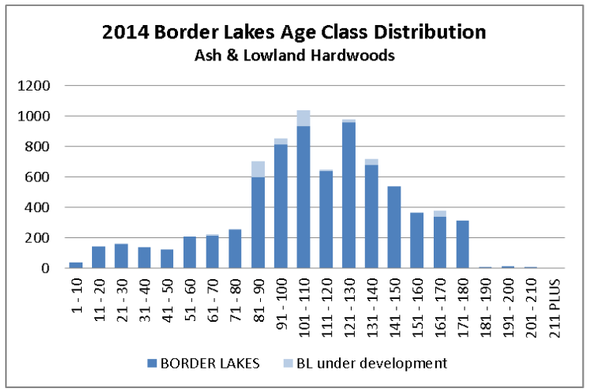
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

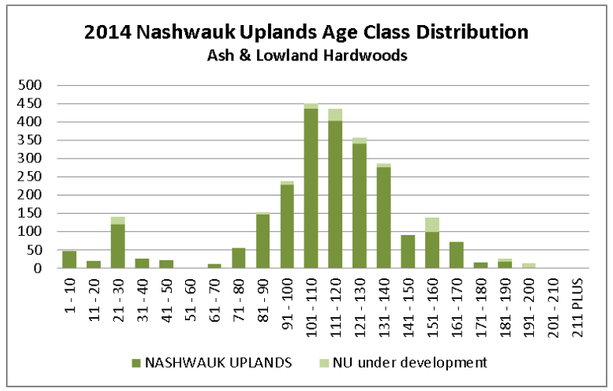
Ash & Lowland Hardwoods - 1	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	38	143	159	135	122	207	210	251	597	813	930	637	958	677	538	361	338	311	5	13	8	0	**7451**
BL under development	0	0	5	0	0	0	12	7	104	38	108	9	17	42	0	5	41	0	0	0	0	0	**388**
Border Lakes Total	38	143	164	135	122	207	222	258	701	851	1038	646	975	719	538	366	379	311	5	13	8	0	**7839**
LAURENTIAN UPLANDS	0	0	0	0	0	6	0	53	55	12	7	53	15	0	9	0	3	4	0	0	0	0	**217**
LU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Laurentian Uplands Total	0	0	0	0	0	6	0	53	55	12	7	53	15	0	9	0	3	4	0	0	0	0	**217**
NASHWAUK UPLANDS	47	19	120	26	22	0	12	55	147	228	437	404	341	275	90	99	71	15	18	0	0	0	**2426**
NU under development	0	0	21	0	0	0	0	0	6	10	13	33	16	11	0	40	0	0	9	13	0	0	**172**
Nashwauk Uplands Total	47	19	141	26	22	0	12	55	153	238	450	437	357	286	90	139	71	15	27	13	0	0	**2598**
NORTH SHORE HIGHLANDS	25	45	353	40	81	156	382	567	1351	1563	1135	581	360	218	186	195	67	26	0	0	0	7	**7338**
NSH under development	0	0	0	0	0	0	0	6	0	94	7	74	0	6	6	0	0	0	0	0	0	0	**193**
North Shore Highlands Total	25	45	353	40	81	156	382	573	1351	1657	1142	655	360	224	192	195	67	26	0	0	0	7	**7531**
TOIMI UPLANDS	0	0	65	4	0	11	56	23	45	31	72	10	24	144	8	0	0	0	0	0	0	0	**493**
TU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Toimi Uplands Total	0	0	65	4	0	11	56	23	45	31	72	10	24	144	8	0	0	0	0	0	0	0	**493**
	110	**207**	**723**	**205**	**225**	**380**	**672**	**962**	**2305**	**2789**	**2709**	**1801**	**1731**	**1373**	**837**	**700**	**520**	**356**	**32**	**26**	**8**	**7**	**18678**

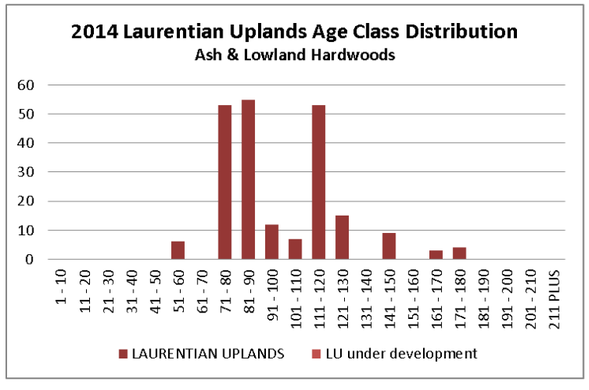
Figure 4.3. 2014 Age- class distribution of ash and lowland hardwood stands

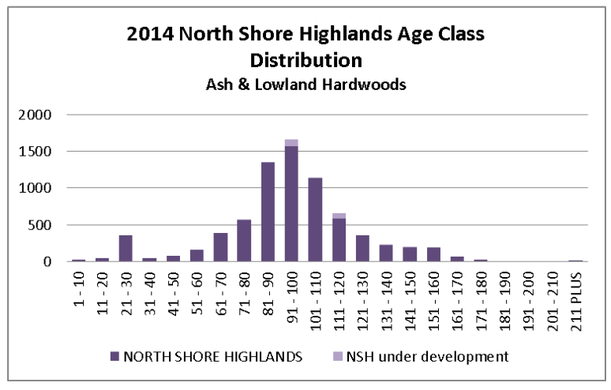
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection.

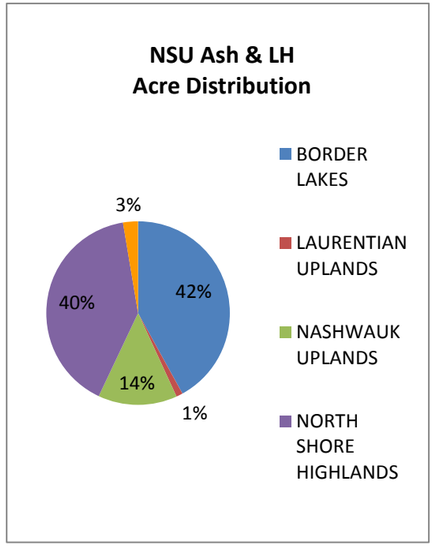












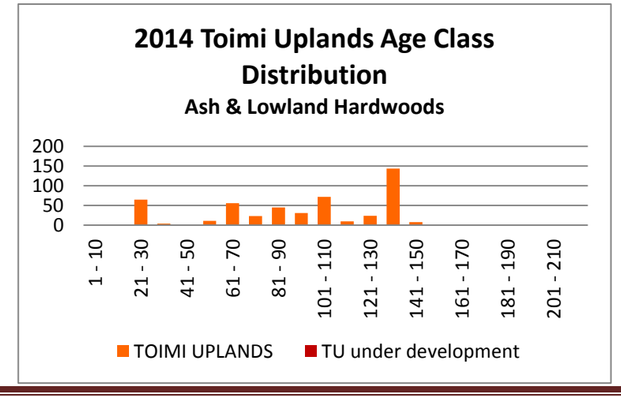


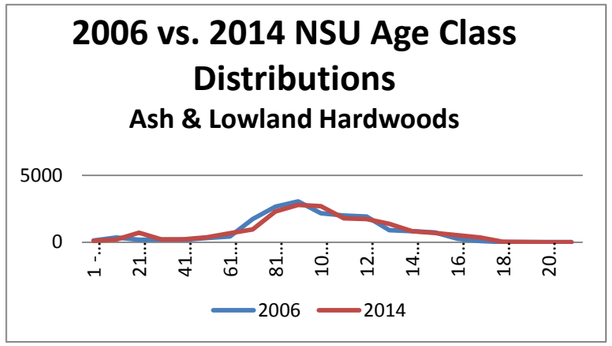
Table 4.4. 2006 Ash and lowland hardwoods acreage by subsection and ten-year age class

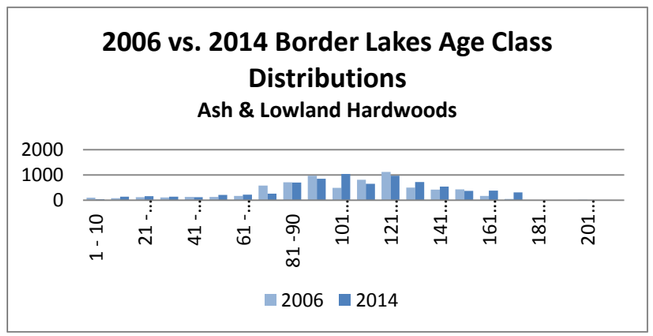
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

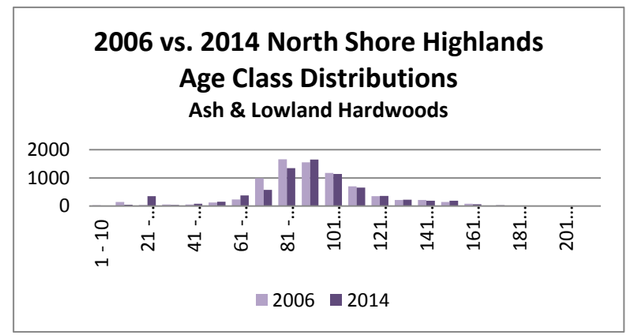
Ash & Lowland Hardwoods - 1	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	96	77	123	105	130	125	168	576	710	972	494	806	1123	499	423	431	167	46	9	6	19	4	**7109**
LAURENTIAN UPLANDS	0	0	0	0	6	0	0	0	36	4	42	24	9	10	45	3	4	0	6	0	0	0	**189**
NASHWAUK UPLANDS	0	84	28	41	0	4	23	61	246	428	448	434	345	172	142	148	0	53	10	13	0	0	**2680**
NORTH SHORE HIGHLANDS	33	142	38	54	54	130	236	989	1659	1553	1177	703	351	218.0	215.0	148	84	0	0	0	7	6	**7797**
TOIMI UPLANDS	0	46	4	0	0	52	12	108	13	96	11	43	95	12.0	0.0	3	0	0	0	0	0	0	**495**
	129	**349**	**193**	**200**	**190**	**311**	**439**	**1734**	**2664**	**3053**	**2172**	**2010**	**1923**	**911**	**825**	**733**	**255**	**99**	**25**	**19**	**26**	**10**	**18270**

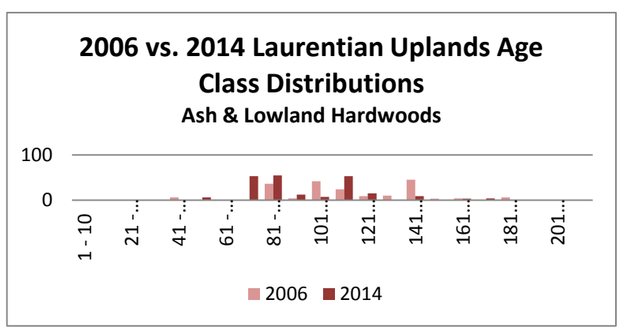
Figure 4.4. Comparison between 2006 and current (2014) ash and lowland hardwoods age class distributions

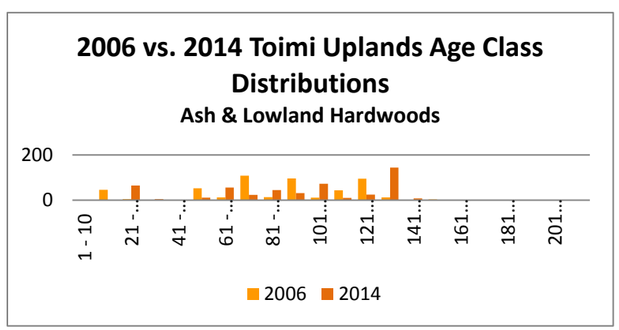
A line graph displays the age-class distribution of ash and lowland hardwoods cover type for the section as a whole; five individual bar charts display the age-class distribution of the cover type for the individual subsections that make up the NSU.











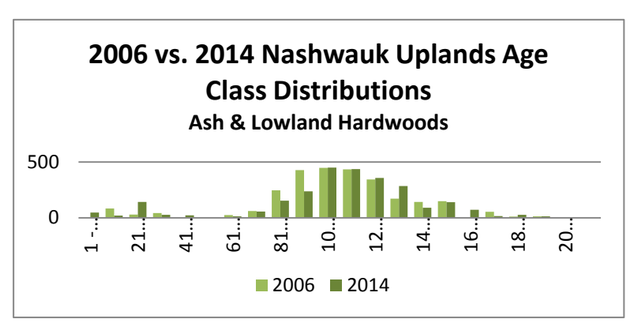


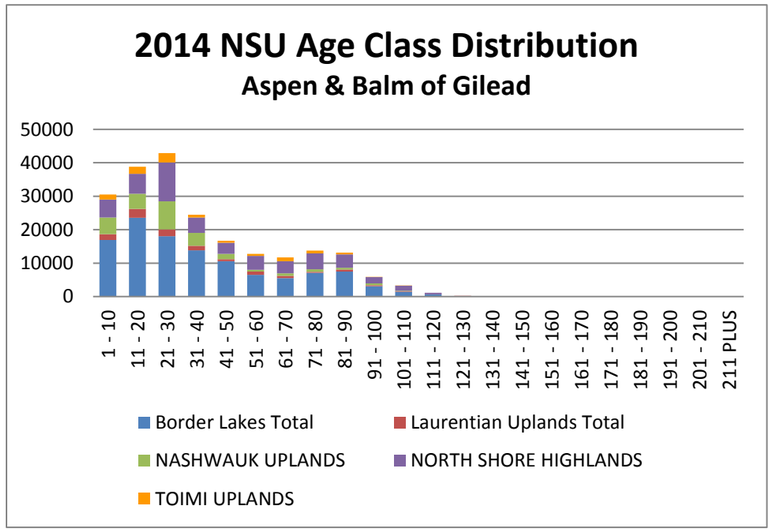
Table 4.5. 2014 Age-class distribution of aspen and balm of Gilead stands by ten-year age class

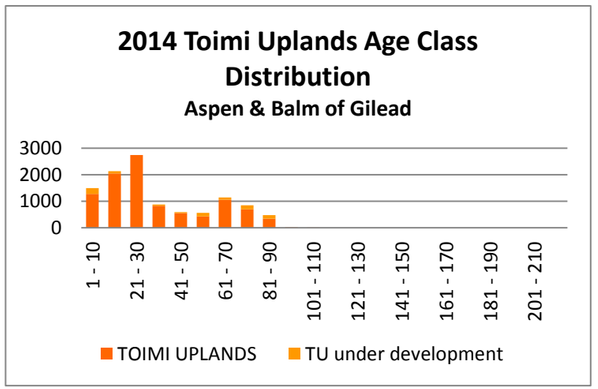
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

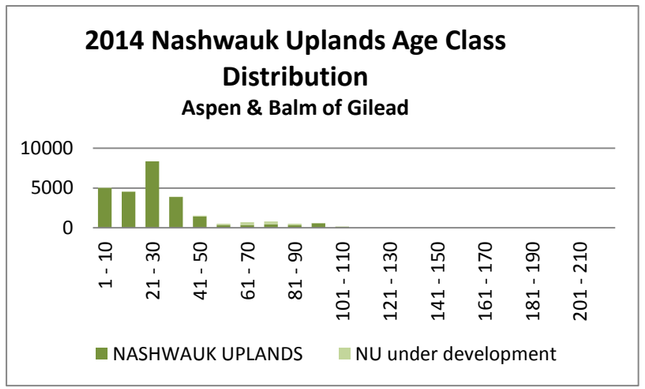
Aspen & Balm of Gilead - 12	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	16866	23598	18070	13773	9521	4657	4119	5089	5201	2690	1379	554	101	6	0	0	0	0	0	0	0	0	**105624**
BL under development	83	0	0	21	1087	1864	1371	1990	2261	453	44	118	29	0	0	0	0	0	0	0	0	0	**9321**
Border Lakes Total	16949	23598	18070	13794	10608	6521	5490	7079	7462	3143	1423	672	130	6	0	0	0	0	0	0	0	0	**114945**
LAURENTIAN UPLANDS	1651	2593	2064	1406	594	932	678	265	421	205	139	19	42	0	0	0	0	0	0	0	0	0	**11009**
LU under development	34	0	0	0	0	16	66	61	231	40	27	13	0	0	0	0	0	0	0	0	0	0	**488**
Laurentian Uplands Total	1685	2593	2064	1406	594	948	744	326	652	245	166	32	42	0	0	0	0	0	0	0	0	0	**11497**
NASHWAUK UPLANDS	4998	4532	8352	3865	1419	360	358	457	327	563	142	0	0	0	0	0	0	0	0	0	0	0	**25373**
NU under development	45	42	0	9	119	154	362	332	177	21	31	0	0	0	0	0	0	0	0	0	0	0	**1292**
Nashwauk Uplands Total	5043	4574	8352	3874	1538	514	720	789	504	584	173	0	0	0	0	0	0	0	0	0	0	0	**26665**
NORTH SHORE HIGHLANDS	5026	5944	11606	4504	2931	3900	3550	4301	3689	1844	1429	412	0	0	41	0	0	0	0	0	0	0	**49177**
NSH under development	287	5	41	48	433	290	92	444	335	26	40	0	0	0	0	0	0	0	0	0	0	0	**2041**
North Shore Highlands Total	5313	5949	11647	4552	3364	4190	3642	4745	4024	1870	1469	412	0	0	41	0	0	0	0	0	0	0	**51218**
TOIMI UPLANDS	1279	2046	2749	833	551	426	1061	701	348	25	11	0	0	0	0	0	0	0	0	0	0	0	**10030**
TU under development	223	91	0	42	38	139	80	152	129	0	0	0	0	0	0	0	0	0	0	0	0	0	**894**
Toimi Uplands Total	1502	2137	2749	875	589	565	1141	853	477	25	11	0	0	0	0	0	0	0	0	0	0	0	**10924**
	30492	**38851**	**42882**	**24501**	**16693**	**12738**	**11737**	**13792**	**13119**	**5867**	**3242**	**1116**	**172**	**6**	**41**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**215249**

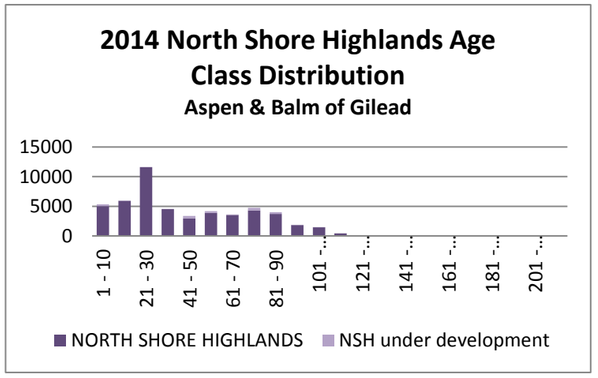
Figure 4.5. 2014 Age class distribution of aspen and balm of Gilead stands

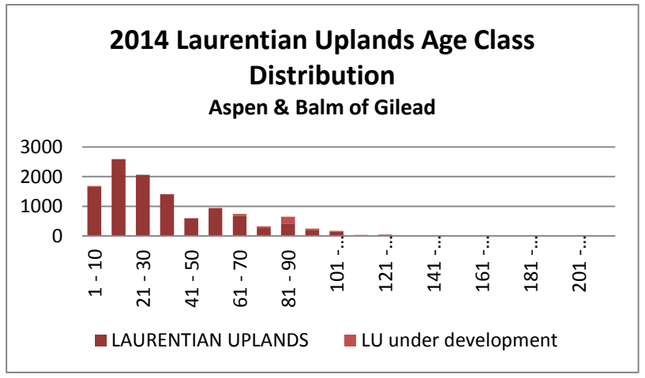
The following seven charts display the 2014 age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the commercial forest is located in each subsection.

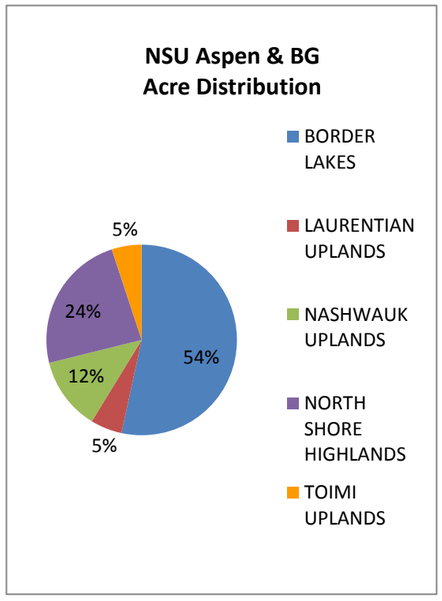












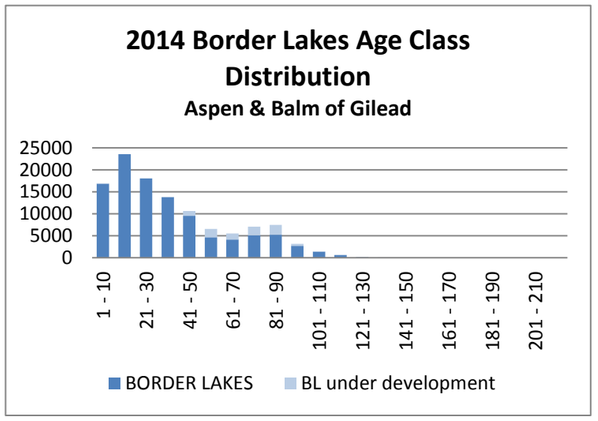


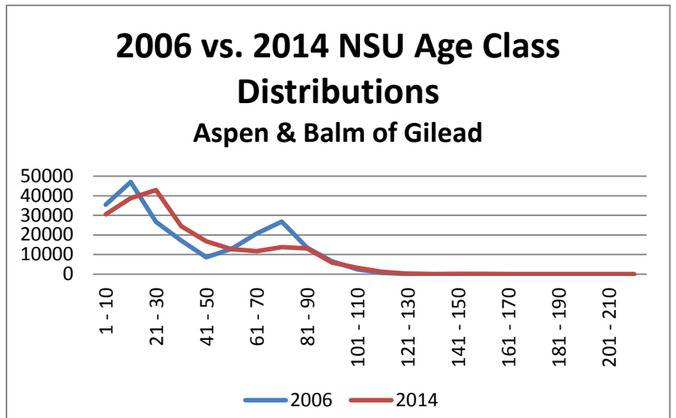
Table 4.6. 2006 Aspen and balm of Gilead acreage by subsection and ten-year age class

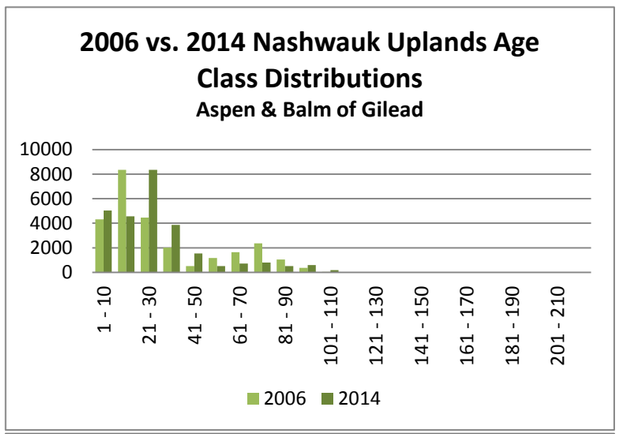
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

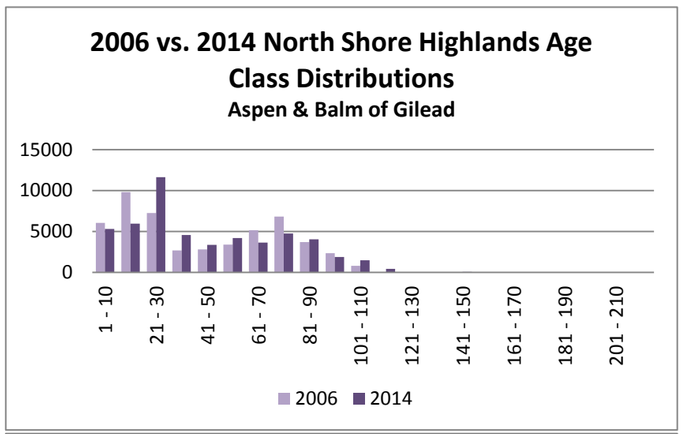
Aspen & Balm of Gilead - 12	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	22304	22344	12551	11084	4135	6992	11480	14796	7771	3455	1501	512	64	0	0	40	0	0	0	0	0	0	**119029**
LAURENTIAN UPLANDS	1516	3393	1519	828	512	673	531	1462	547	339	69	60	0	0	0	0	0	0	0	0	0	0	**11449**
NASHWAUK UPLANDS	4310	8352	4453	2017	497	1164	1647	2358	1041	355	30	0	0	0	0	0	0	0	0	0	0	0	**26224**
NORTH SHORE HIGHLANDS	6032	9811	7241	2662	2799	3384	5162	6817	3687	2329	793	0	8	25	0	0	0	0	0	0	0	0	**50750**
TOIMI UPLANDS	1294	3137	910	568	699	723	1976	1419	412	13	0	0	0	0	0	0	0	0	0	0	0	0	**11151**
	35456	**47037**	**26674**	**17159**	**8642**	**12936**	**20796**	**26852**	**13458**	**6491**	**2393**	**572**	**72**	**25**	**0**	**40**	**0**	**0**	**0**	**0**	**0**	**0**	**218603**

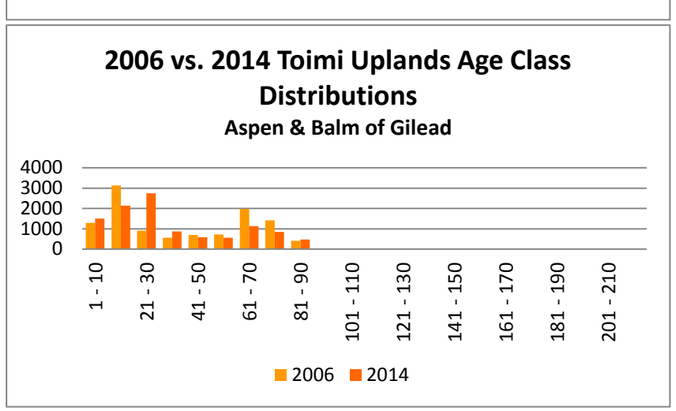
Figure 4.6. Comparison between 2006 and current (2014) aspen and balm of Gilead age class distributions

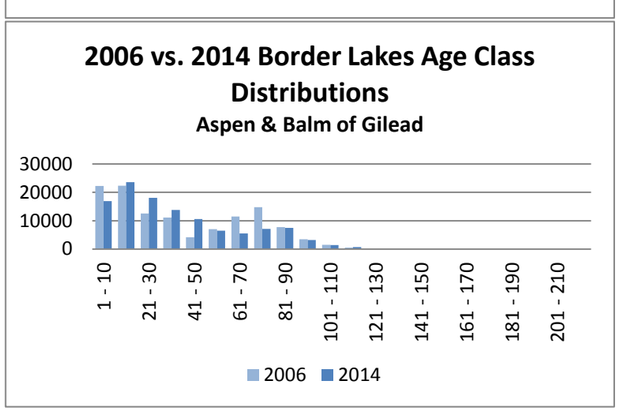
A line graph displays the age-class distribution of aspen/balm-of-Gilead cover type for the section as a whole; five individual bar charts display the age-class distribution of the cover type for the individual subsections that make up the NSU.











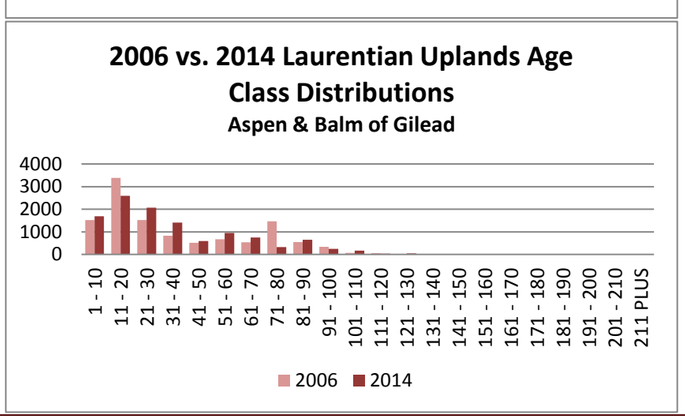


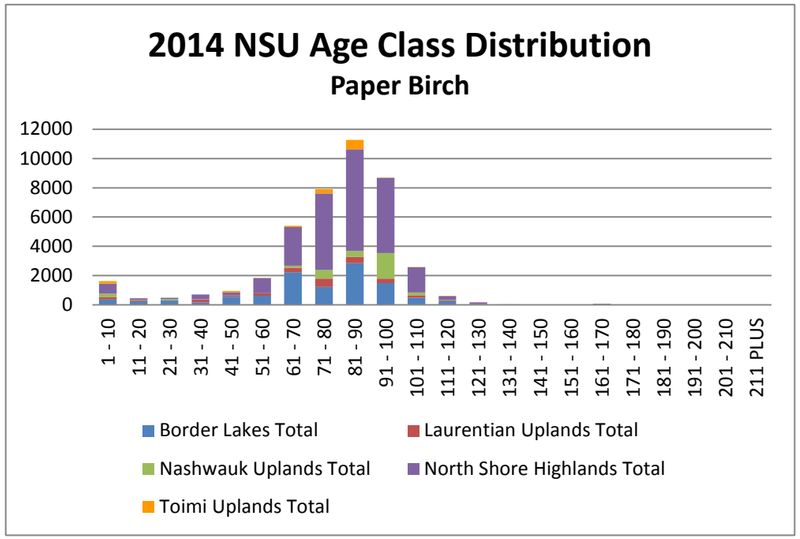
Table 4.7. 2014 Age-class distribution of paper birch stands by ten-year age class

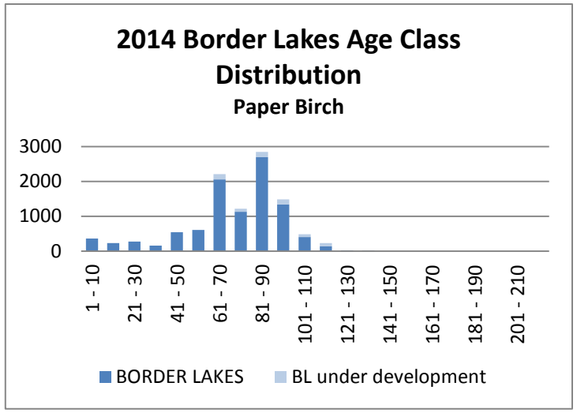
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

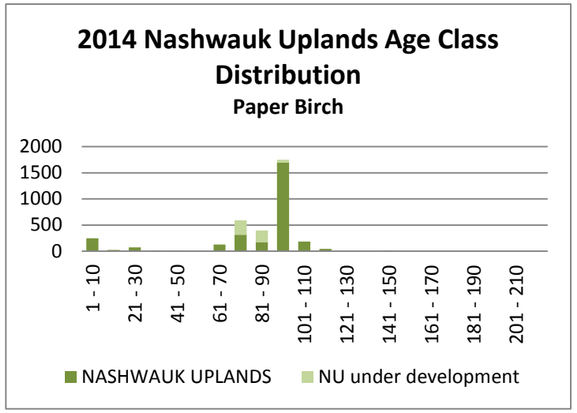
Paper Birch - 13	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	361	235	278	162	545	606	2060	1128	2701	1340	404	141	23	17	0	0	0	0	0	0	0	0	**10001**
BL under development	0	0	0	0	0	0	154	91	148	145	79	92	0	0	0	0	0	0	0	0	0	0	**709**
Border Lakes Total	361	235	278	162	545	606	2214	1219	2849	1485	483	233	23	17	0	0	0	0	0	0	0	0	**10710**
LAURENTIAN UPLANDS	154	58	16	201	76	181	307	575	387	234	75	20	35	0	0	0	0	0	0	0	0	4	**2323**
LU under development	0	0	0	0	0	0	11	0	38	70	91	28	0	0	0	0	0	0	0	0	0	0	**238**
Laurentian Uplands Total	154	58	16	201	76	181	318	575	425	304	166	48	35	0	0	0	0	0	0	0	0	4	**2561**
NASHWAUK UPLANDS	245	26	75	12	4	0	121	315	172	1697	185	45	0	0	9	0	0	0	0	0	0	0	**2906**
NU under development	0	5	0	0	6	0	14	273	226	54	0	0	0	0	0	0	0	0	0	0	0	0	**578**
Nashwauk Uplands Total	245	31	75	12	10	0	135	588	398	1751	185	45	0	0	9	0	0	0	0	0	0	0	**3484**
NORTH SHORE HIGHLANDS	677	124	103	324	215	976	2511	4864	6670	5023	1703	213	105	6	0	0	54	0	0	0	0	0	**23568**
NSH under development	0	0	0	0	15	57	144	374	298	118	29	49	0	0	0	0	0	0	0	0	0	0	**1084**
North Shore Highlands Total	677	124	103	324	230	1033	2655	5238	6968	5141	1732	262	105	6	0	0	54	0	0	0	0	0	**24652**
TOIMI UPLANDS	181	13	0	0	74	16	71	254	392	16	8	27	0	0	0	0	0	0	0	0	0	0	**1052**
TU under development	0	0	0	0	0	10	9	33	247	0	0	0	0	0	0	0	0	0	0	0	0	0	**299**
Toimi Uplands Total	181	13	0	0	74	26	80	287	639	16	8	27	0	0	0	0	0	0	0	0	0	0	**1351**
	1618	**461**	**472**	**699**	**935**	**1846**	**5402**	**7907**	**11279**	**8697**	**2574**	**615**	**163**	**23**	**9**	**0**	**54**	**0**	**0**	**0**	**0**	**4**	**42758**

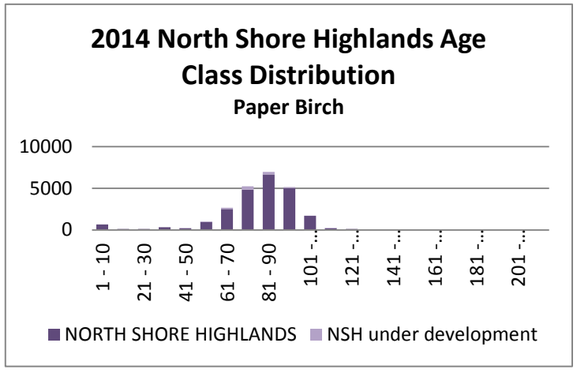
Figure 4.7. 2014 Age class distribution of paper birch for the NSU Section

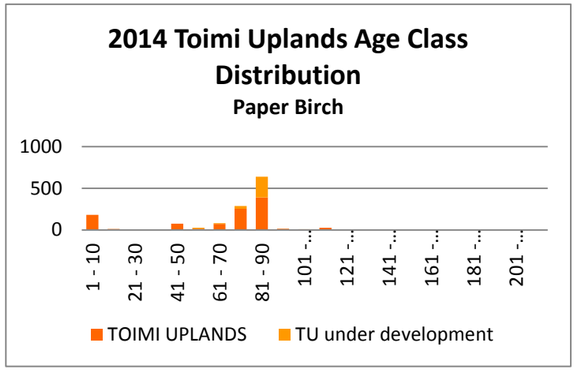
The following seven charts display the 2014 age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the commercial forest is located in each subsection.

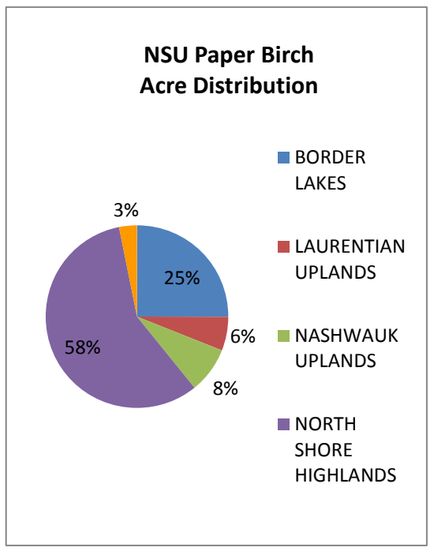












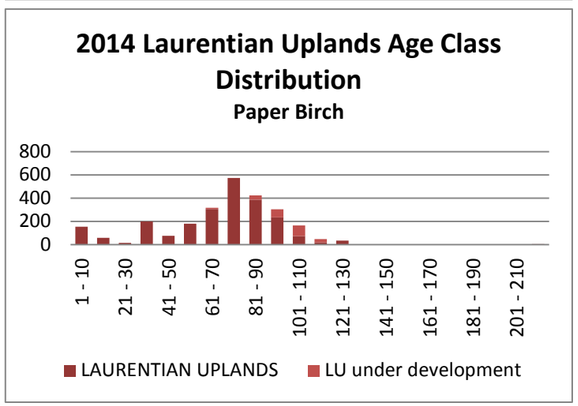


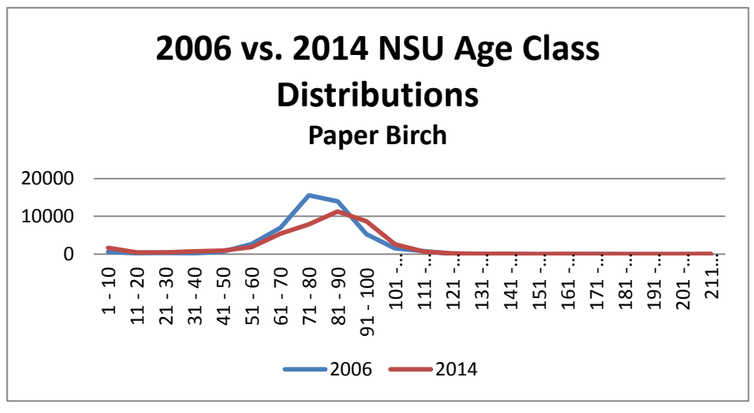
Table 4.8. 2006 Paper birch acreage by subsection and ten-year age class

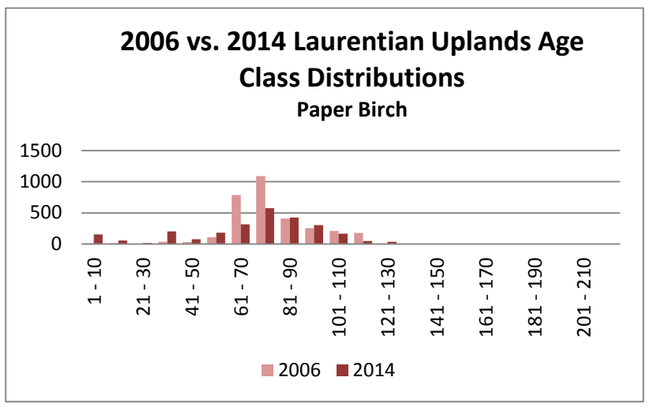
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

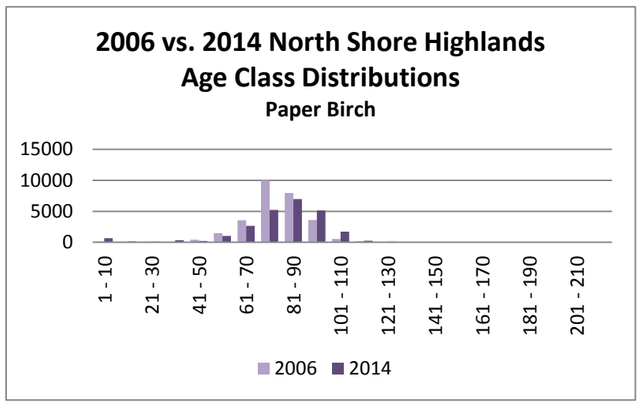
Paper Birch - 13	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	227	86	184	153	125	859	1668	2697	2695	856	711	405	15	4	52	0	0	5	0	0	0	0	**10742**
LAURENTIAN UPLANDS	12	11	0	35	32	108	787	1093	410	256	210	180	9	0	0	0	0	0	0	0	0	0	**3143**
NASHWAUK UPLANDS	149	21	27	12	3	43	678	937	2332	473	61	7	0	10	0	0	0	0	0	0	0	0	**4753**
NORTH SHORE HIGHLANDS	154	105	91	21	411	1498	3569	10046	7972	3615	545	188	38	0	0	0	0	0	0	0	0	0	**28253**
TOIMI UPLANDS	54	0	0	0	93	125	210	840	554	48	9	25	0	0	0	0	0	0	0	0	0	0	**1958**
	596	**223**	**302**	**221**	**664**	**2633**	**6912**	**15613**	**13963**	**5248**	**1536**	**805**	**62**	**14**	**52**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**48849**

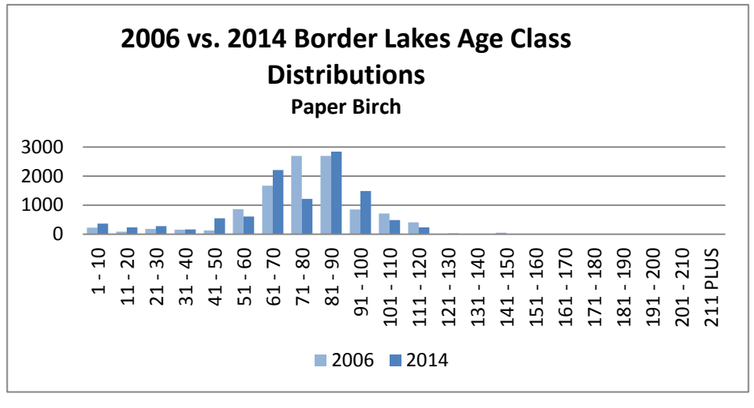
Figure 4.8. Comparison between 2006 and current (2014) paper birch age class distributions

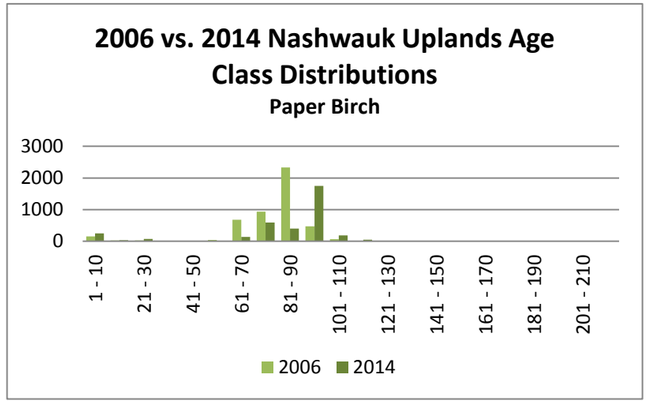
A line graph displays the age-class distribution of the birch cover type for the section as a whole; five individual bar charts display the age-class distribution of the cover type for the individual subsections that make up the NSU.











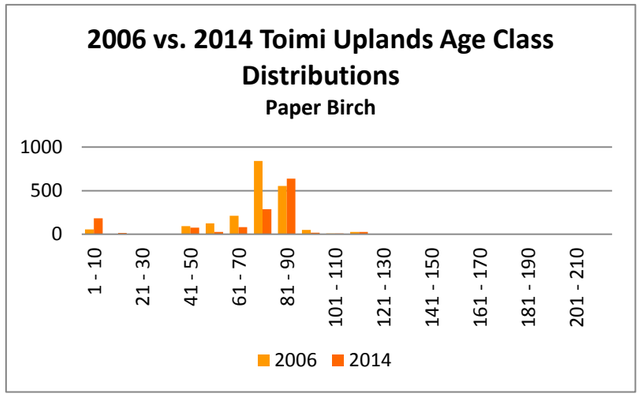


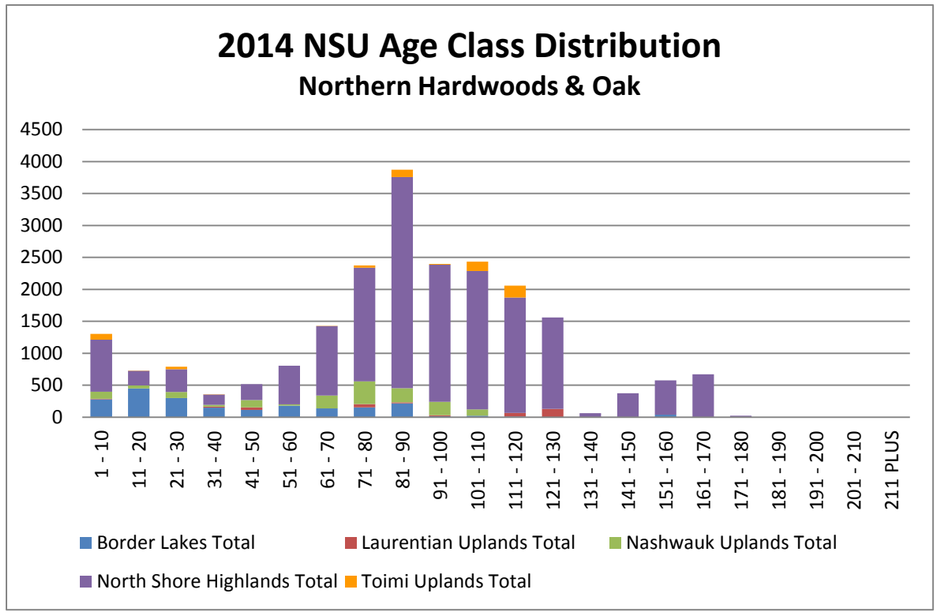
Table 4.9. 2014 Age-class distribution of northern hardwoods and oak stands

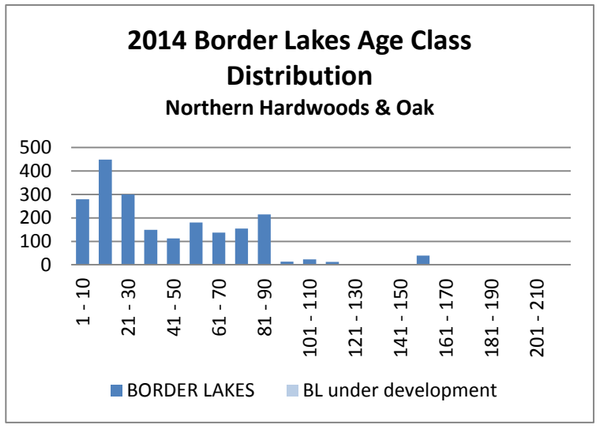
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

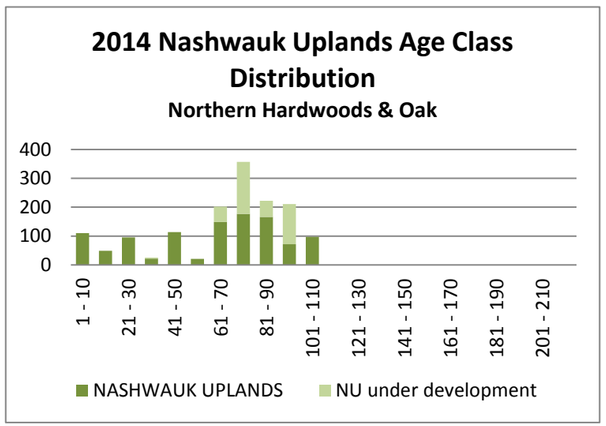
Northern Hardwoods & Oak - 20	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	279	449	300	149	113	180	137	154	215	13	23	12	0	0	0	39	0	0	0	0	0	0	**2063**
BL under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Border Lakes Total	279	449	300	149	113	180	137	154	215	13	23	12	0	0	0	39	0	0	0	0	0	0	**2063**
LAURENTIAN UPLANDS	10	0	0	17	40	0	0	49	17	16	0	55	130	0	0	0	0	0	0	0	0	0	**334**
LU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Laurentian Uplands Total	10	0	0	17	40	0	0	49	17	16	0	55	130	0	0	0	0	0	0	0	0	0	**334**
NASHWAUK UPLANDS	110	49	95	22	114	21	149	177	166	72	97	0	0	0	0	0	0	0	0	0	0	0	**1072**
NU under development	0	0	0	3	0	0	53	180	56	139	0	0	0	0	0	0	0	0	0	0	0	0	**431**
Nashwauk Uplands Total	110	49	95	25	114	21	202	357	222	211	97	0	0	0	0	0	0	0	0	0	0	0	**1503**
NORTH SHORE HIGHLANDS	790	228	356	164	249	593	1030	1635	2902	1821	2131	1796	1429	63	376	535	672	23	0	0	0	0	**16793**
NSH under development	23	0	0	0	0	13	56	145	403	324	35	9	0	0	0	0	0	0	0	0	0	0	**1008**
North Shore Highlands Total	813	228	356	164	249	606	1086	1780	3305	2145	2166	1805	1429	63	376	535	672	23	0	0	0	0	**17801**
TOIMI UPLANDS	33	4	37	4	0	0	6	35	111	13	146	184	0	0	0	0	0	0	0	0	0	0	**573**
TU under development	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**59**
Toimi Uplands Total	92	4	37	4	0	0	6	35	111	13	146	184	0	0	0	0	0	0	0	0	0	0	**632**
	1304	**730**	**788**	**359**	**516**	**807**	**1431**	**2375**	**3870**	**2398**	**2432**	**2056**	**1559**	**63**	**376**	**574**	**672**	**23**	**0**	**0**	**0**	**0**	**22333**

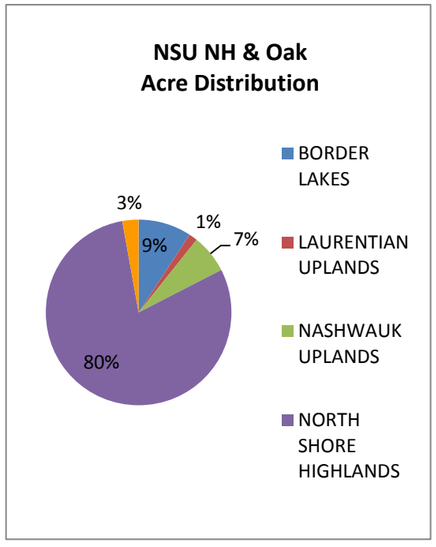
Figure 4.9. 2014 Age-class distribution of northern hardwoods and oak

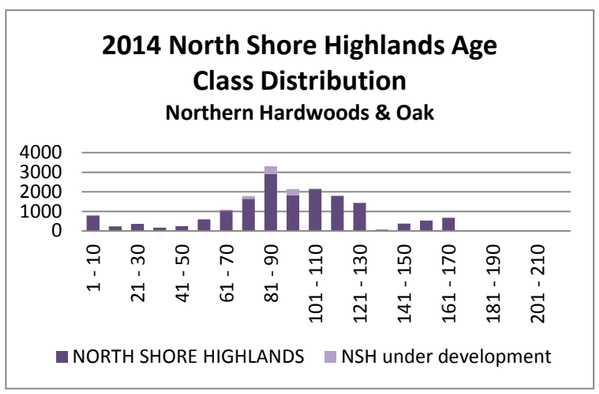
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection.

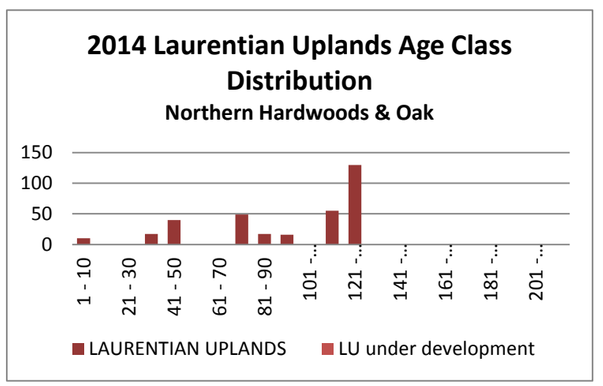












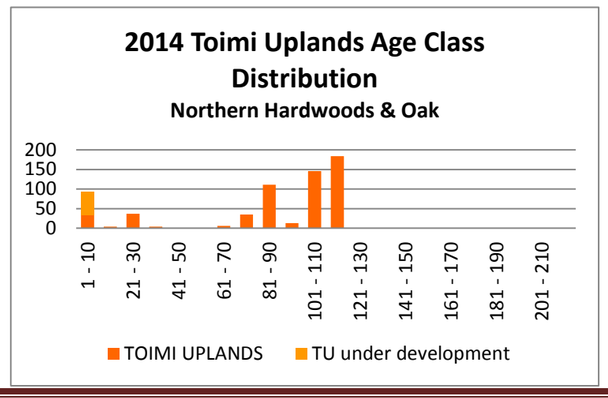


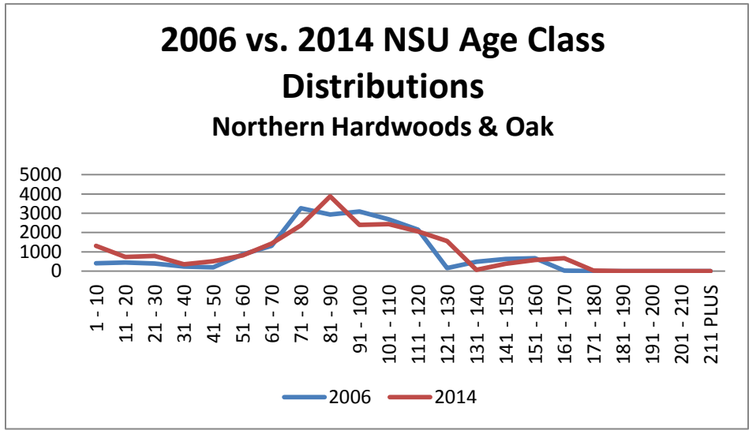
Table 4.10. 2006 Northern hardwoods and oak acreage by subsection and ten-year age class

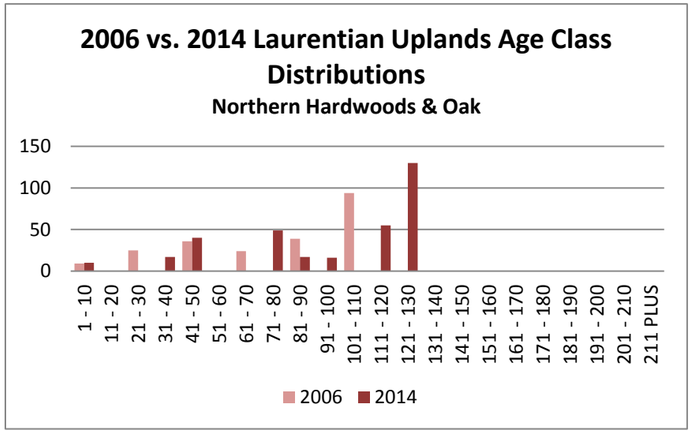
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

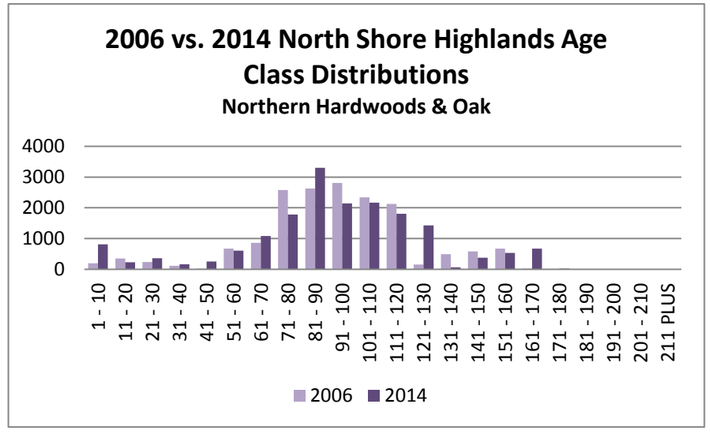
Northern Hardwoods & Oak - 20	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	193	49	132	108	12	64	136	188	17	18	49	2	0	0	41	0	0	0	0	0	0	0	1009
LAURENTIAN UPLANDS	9	0	25	0	36	0	24	0	39	0	94	0	0	0	0	0	0	0	0	0	0	0	227
NASHWAUK UPLANDS	21	14	0	22	124	126	269	395	233	182	0	15	0	0	0	0	0	0	0	0	0	0	1401
NORTH SHORE HIGHLANDS	190	350	237	109	21	671	864	2576	2630	2807	2340	2124	156	488	583	672	23	0	0	0	0	0	16841
TOIMI UPLANDS	0	36	4	0	0	6	20	100	20	90	206	10	0	0	0	0	0	0	0	0	0	0	492
	413	**449**	**398**	**239**	**193**	**867**	**1313**	**3259**	**2939**	**3097**	**2689**	**2151**	**156**	**488**	**624**	**672**	**23**	**0**	**0**	**0**	**0**	**0**	19970

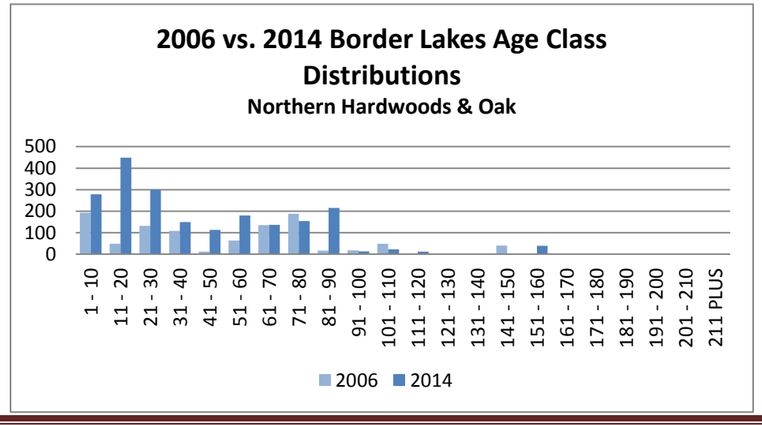
Figure 4.10. Comparison between 2006 and current (2014) northern hardwoods and oak age class distributions

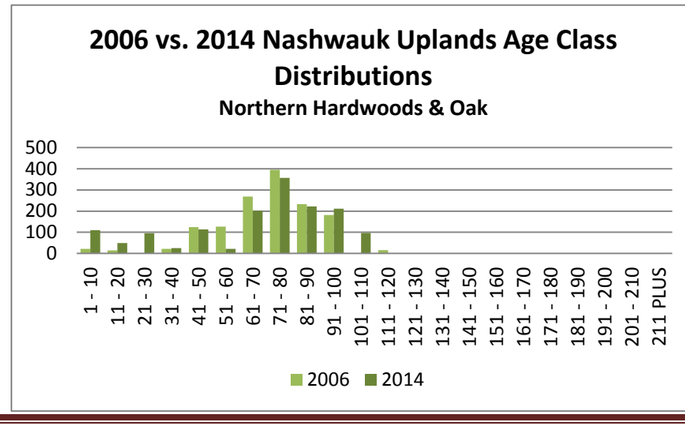
A line graph displays the age-class distribution of the northern hardwoods and oak cover types for the section as a whole; five individual bar charts display the age-class distribution of the cover types for the individual subsections that make up the NSU.











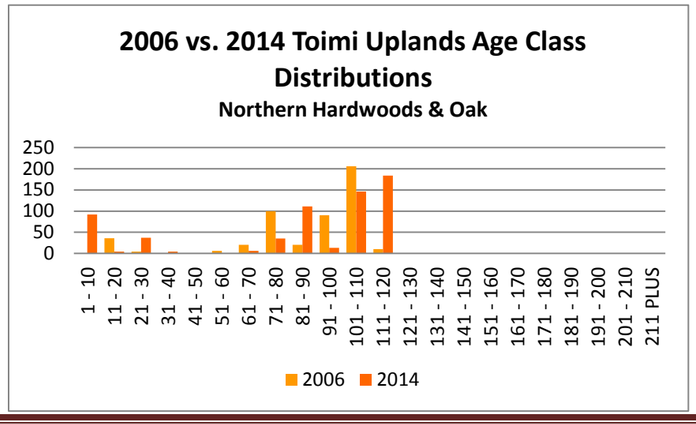


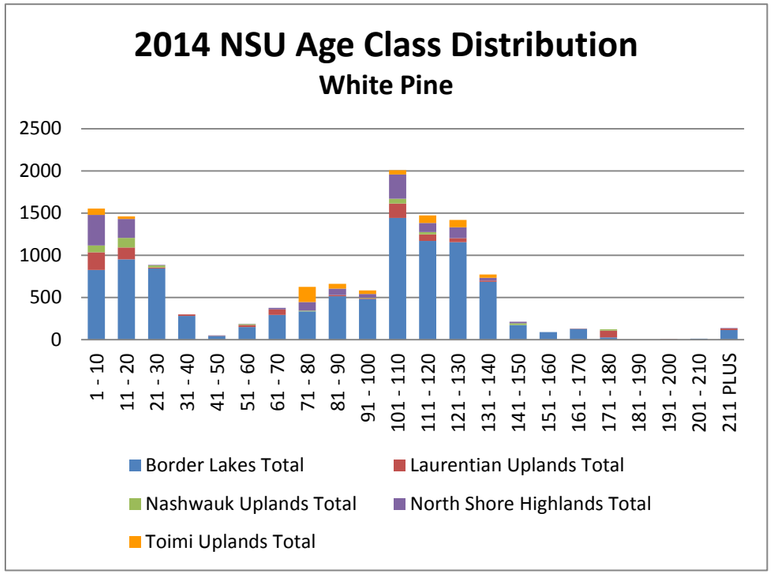
Table 4.11. 2014 Age-class distribution of white pine stands

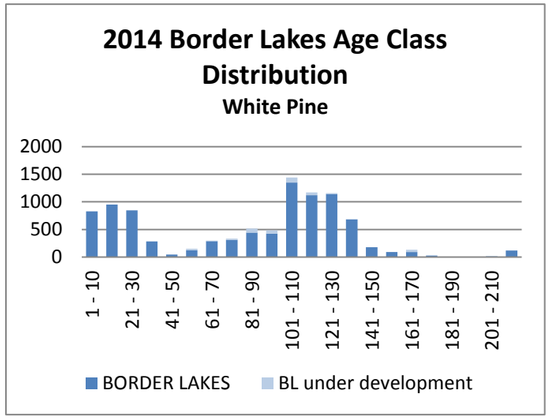
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

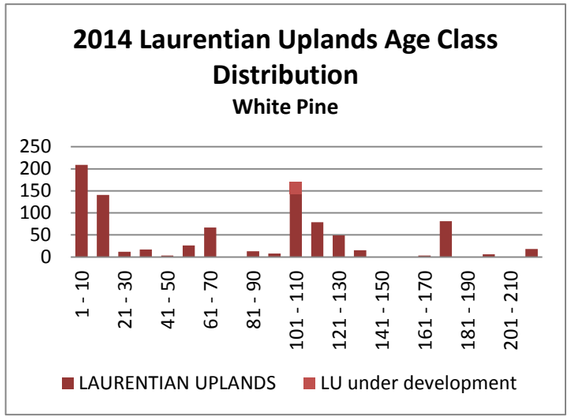
White Pine - 51	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	827	953	845	282	46	121	288	309	441	423	1352	1119	1143	679	175	92	89	27	0	0	12	116	**9339**
BL under development	0	0	0	0	0	29	6	26	76	60	91	51	13	8	0	0	41	0	0	0	0	0	**401**
Border Lakes Total	827	953	845	282	46	150	294	335	517	483	1443	1170	1156	687	175	92	130	27	0	0	12	116	**9740**
LAURENTIAN UPLANDS	209	141	12	17	3	26	67	0	13	8	143	79	49	15	0	0	3	81	0	6	0	18	**890**
LU under development	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	**27**
Laurentian Uplands Total	209	141	12	17	3	26	67	0	13	8	170	79	49	15	0	0	3	81	0	6	0	18	**917**
NASHWAUK UPLANDS	82	103	23	0	0	10	0	11	0	6	58	27	0	0	21	0	0	15	0	0	0	0	**356**
NU under development	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**11**
Nashwauk Uplands Total	82	114	23	0	0	10	0	11	0	6	58	27	0	0	21	0	0	15	0	0	0	0	**367**
NORTH SHORE HIGHLANDS	363	225	7	0	1	5	16	100	77	32	217	81	128	32	18	0	0	0	0	0	0	6	**1308**
NSH under development	0	0	0	0	0	0	0	0	0	13	69	28	0	0	0	0	0	0	0	0	0	0	**110**
North Shore Highlands Total	363	225	7	0	1	5	16	100	77	45	286	109	128	32	18	0	0	0	0	0	0	6	**1418**
TOIMI UPLANDS	24	28	0	0	0	0	0	17	0	44	53	0	51	40	0	0	0	0	0	0	0	0	**257**
TU under development	49	0	0	0	0	0	0	165	57	0	0	88	37	0	0	0	0	0	0	0	0	0	**396**
Toimi Uplands Total	73	28	0	0	0	0	0	182	57	44	53	88	88	40	0	0	0	0	0	0	0	0	**653**
	1554	**1461**	**887**	**299**	**50**	**191**	**377**	**628**	**664**	**586**	**2010**	**1473**	**1421**	**774**	**214**	**92**	**133**	**123**	**0**	**6**	**12**	**140**	**13095**

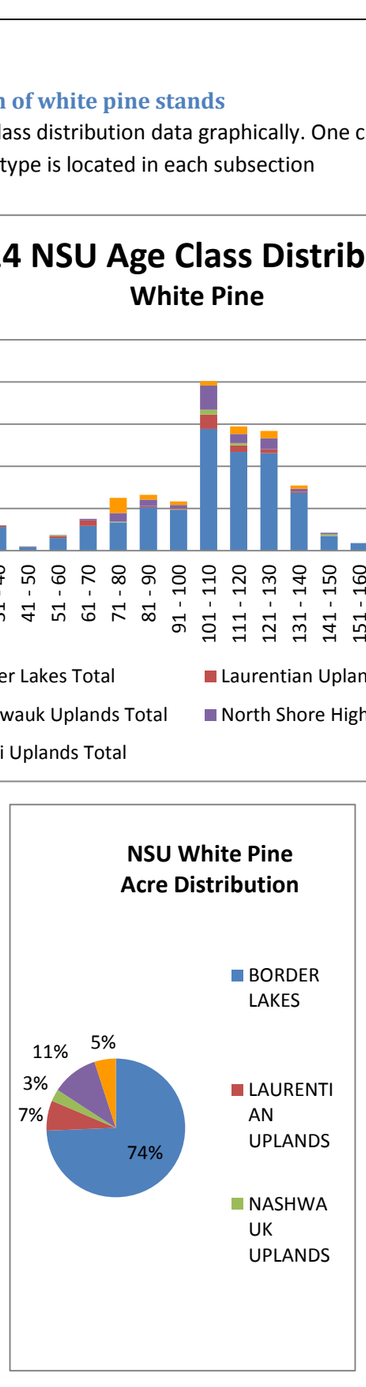
Figure 4.11. 2014 Age-class distribution of white pine stands

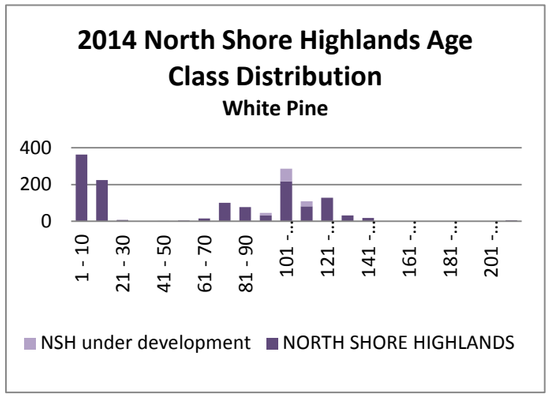
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

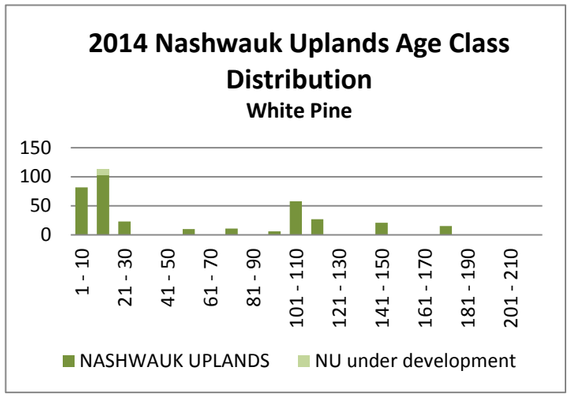












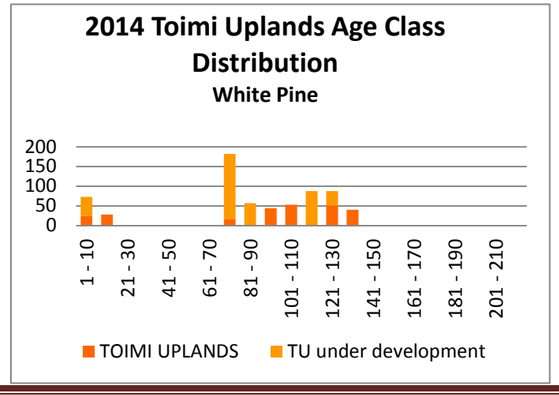


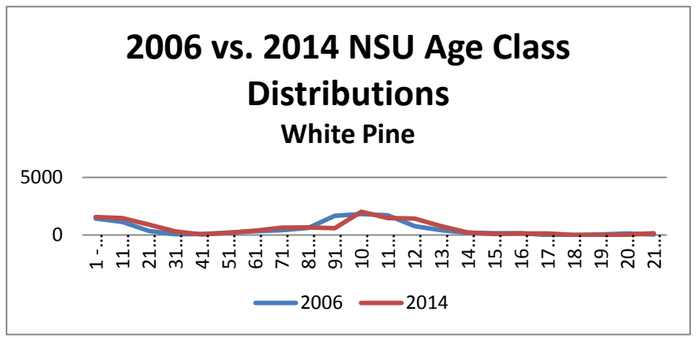
Table 4.12. 2006 White pine acreage by subsection and ten-year age class

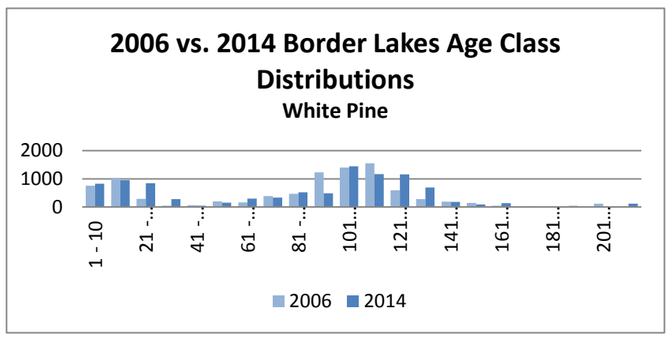
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

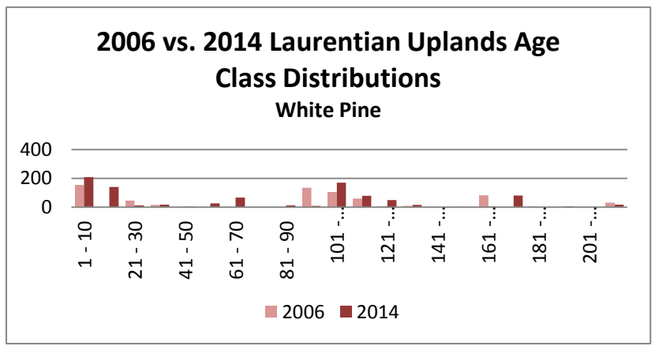
White Pine - 51	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	754	1024	288	44	63	194	157	389	465	1234	1400	1551	594	280	185	141	41	0	0	46	118	0	**8968**
LAURENTIAN UPLANDS	154	0	45	15	0	0	0	0	0	136	105	59	5	8	0	3	82	0	6	0	0	31	**649**
NASHWAUK UPLANDS	112	33	8	0	10	0	32	0	7	45	38	0	0	23	0	0	32	0	0	0	0	0	**340**
NORTH SHORE HIGHLANDS	387	43	0	0	5	0	53	6	10	238	151	87	133	75	0	0	0	0	0	0	0	6	**1194**
TOIMI UPLANDS	7	33	0	0	0	0	87	11	118	21	116	22	34	32	0	0	0	0	0	0	0	0	**481**
	1414	**1133**	**341**	**59**	**78**	**194**	**329**	**406**	**600**	**1674**	**1810**	**1719**	**766**	**418**	**185**	**144**	**155**	**0**	**6**	**46**	**118**	**37**	**11632**

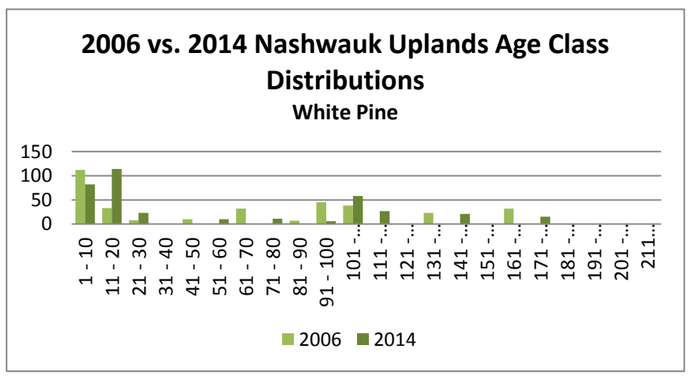
Figure 4.12. Comparison between 2006 and current (2014) white pine age-class distributions

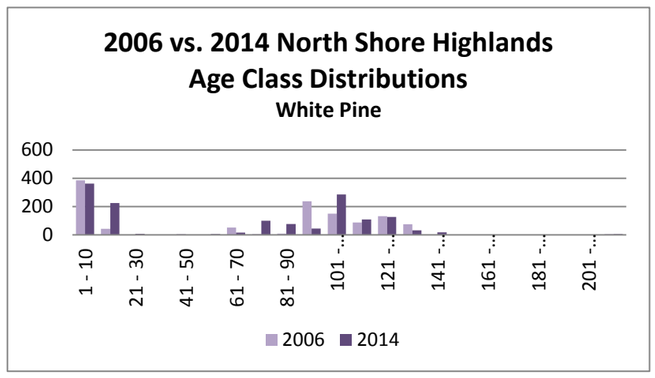
A line graph displays the age-class distribution of the white pine cover type for the section as a whole; five individual bar charts display the age-class distribution of the cover types for the individual subsections that make up the NSU.











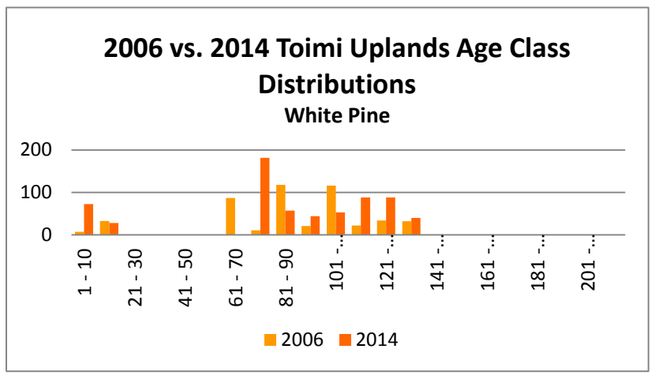


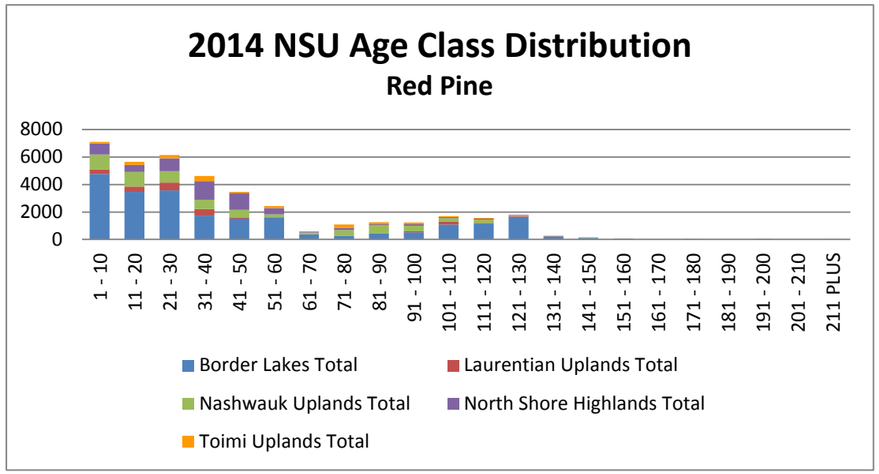
Table 4.13. 2014 Age-class distribution of red pine stands

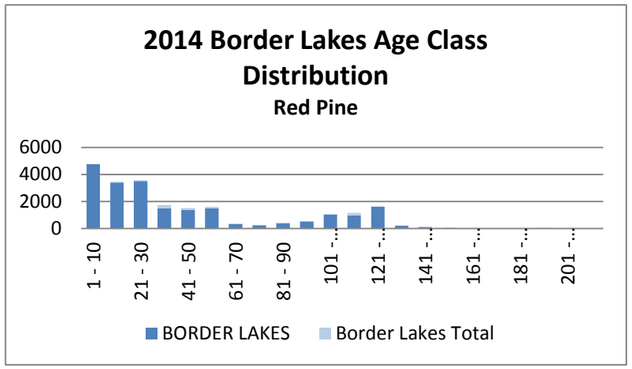
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

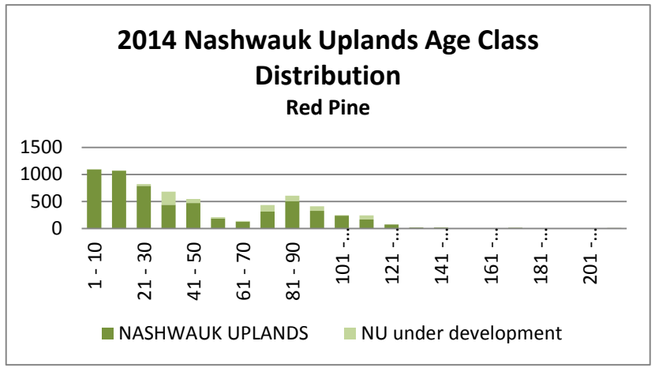
Red Pine - 52	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 +	TOTAL
BORDER LAKES	4770	3414	3516	1504	1380	1503	329	246	381	517	1033	974	1604	214	112	37	15	28	0	46	0	11	**21634**
BL under development	0	44	56	231	134	100	39	14	45	8	61	188	36	21	10	19	0	0	0	0	0	0	**1006**
Border Lakes Total	4770	3458	3572	1735	1514	1603	368	260	426	525	1094	1162	1640	235	122	56	15	28	0	46	0	11	**22640**
LAURENTIAN UPLANDS	304	385	485	412	86	5	0	0	11	63	199	32	67	4	0	0	0	0	0	0	0	0	**2053**
LU under development	0	0	92	60	0	0	0	0	0	9	10	0	0	2	0	0	0	0	0	0	0	0	**173**
Laurentian Uplands Total	304	385	577	472	86	5	0	0	11	72	209	32	67	6	0	0	0	0	0	0	0	0	**2226**
NASHWAUK UPLANDS	1096	1071	789	441	472	189	128	316	507	329	239	169	73	17	18	0	0	16	5	0	0	9	**5884**
NU under development	5	6	36	242	76	21	15	119	102	82	10	76	0	0	0	0	0	0	0	0	0	0	**790**
Nashwauk Uplands Total	1101	1077	825	683	548	210	143	435	609	411	249	245	73	17	18	0	0	16	5	0	0	9	**6674**
NORTH SHORE HIGHLANDS	725	513	903	1222	982	334	67	97	69	108	70	64	34	0	0	0	0	0	0	0	0	0	**5188**
NSH under development	92	0	32	137	251	136	0	41	0	0	0	5	0	0	4	0	0	0	0	0	0	0	**698**
North Shore Highlands Total	817	513	935	1359	1233	470	67	138	69	108	70	69	34	0	4	0	0	0	0	0	0	0	**5886**
TOIMI UPLANDS	54	213	103	126	46	139	14	89	29	39	77	57	0	13	0	0	0	0	0	0	0	0	**999**
TU under development	48	12	127	236	37	8	0	163	121	79	4	8	0	10	0	0	0	0	0	0	0	0	**853**
Toimi Uplands Total	102	225	230	362	83	147	14	252	150	118	81	65	0	23	0	0	0	0	0	0	0	0	**1852**
	7094	**5658**	**6139**	**4611**	**3464**	**2435**	**592**	**1085**	**1265**	**1234**	**1703**	**1573**	**1814**	**281**	**144**	**56**	**15**	**44**	**5**	**46**	**0**	**20**	**39278**

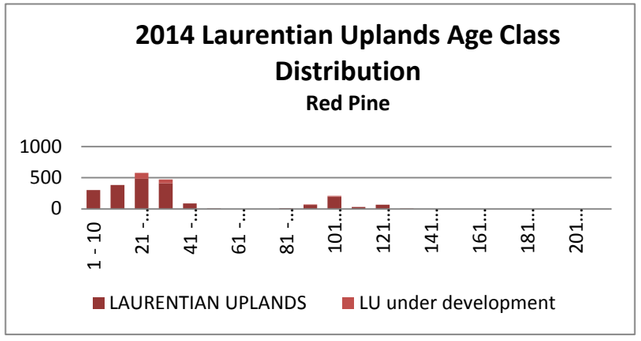
Figure 4.13. 2014 Age-class distribution of red pine stands

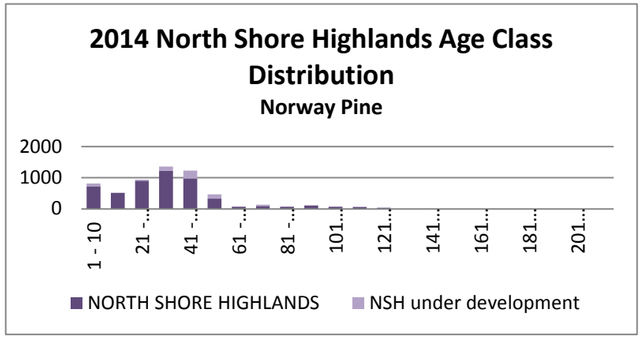
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

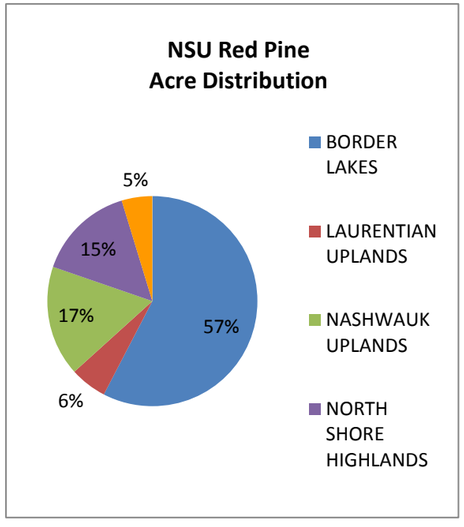












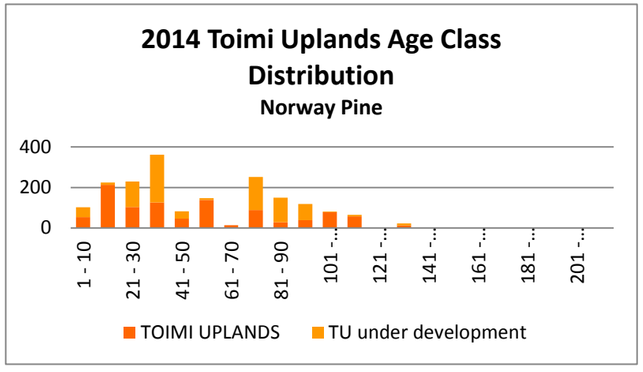


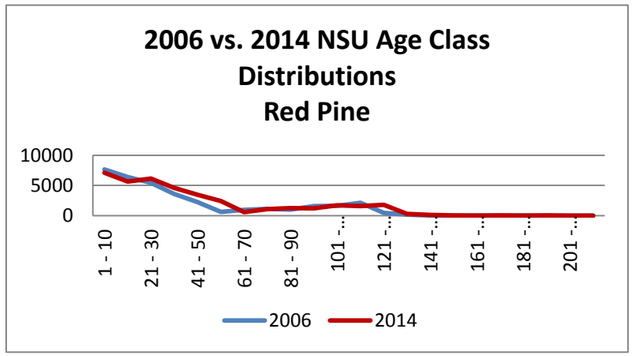
Table 4.14. 2006 Red pine acreage by subsection and ten-year age class

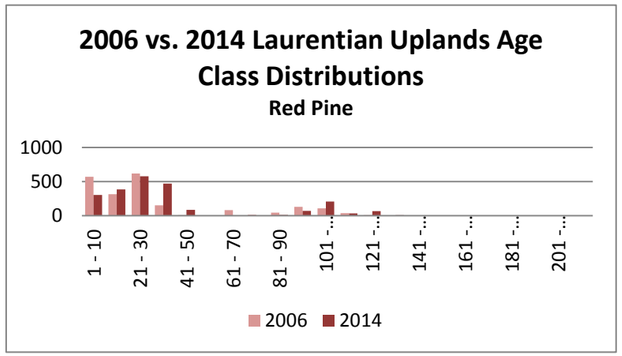
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

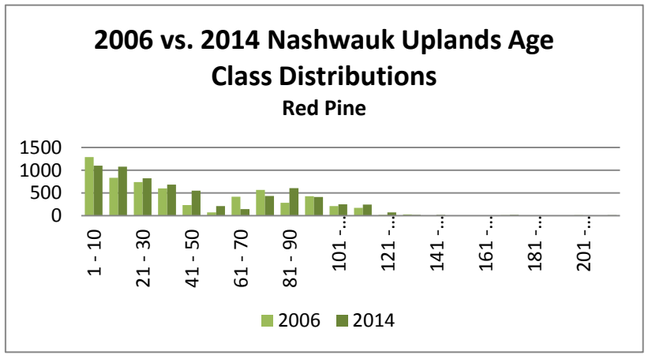
Red Pine - 52	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	4701	4324	1945	1548	1405	403	312	316	486	809	1182	1829	444	128	46	17	28	0	44	3	0	10	**19980**
LAURENTIAN UPLANDS	572	317	619	153	7	0	82	16	46	129	108	39	7	0	0	0	0	0	0	0	3	0	**2098**
NASHWAUK UPLANDS	1292	833	738	599	235	70	415	565	285	430	214	170	15	26	0	0	0	14	5	0	9	0	**5915**
NORTH SHORE HIGHLANDS	843	625	1682	1191	470	129	43	110	63	160	74	34	0	0	7	0	0	0	0	0	0	0	**5431**
TOIMI UPLANDS	243	307	460	109	134	36	121	118	109	77	51	53	0	0	0	0	0	0	0	0	0	0	**1818**
	7651	**6406**	**5444**	**3600**	**2251**	**638**	**973**	**1125**	**989**	**1605**	**1629**	**2125**	**466**	**154**	**53**	**17**	**28**	**14**	**49**	**3**	**12**	**10**	**35242**

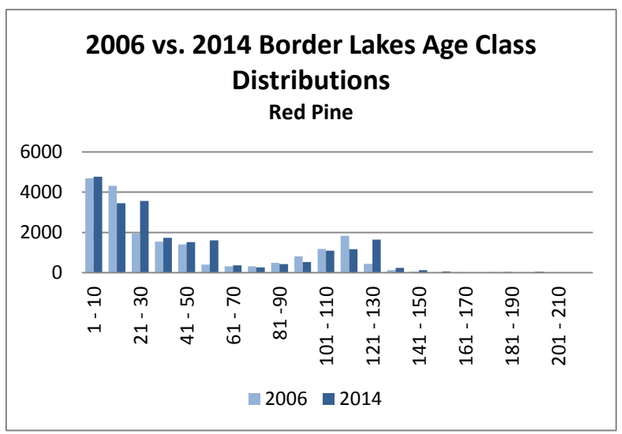
Figure 4.14. Comparison between 2006 and current (2014) red pine age-class distributions

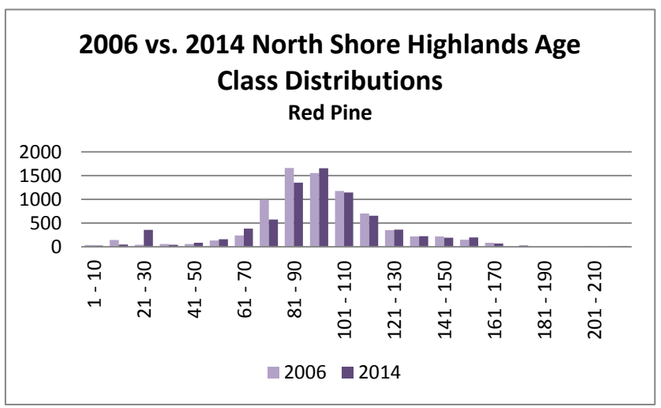
A line graph displays the age-class distribution of the red pine cover type for the section as a whole; five individual bar charts display the age-class distribution of the cover types for the individual subsections that make up the NSU.











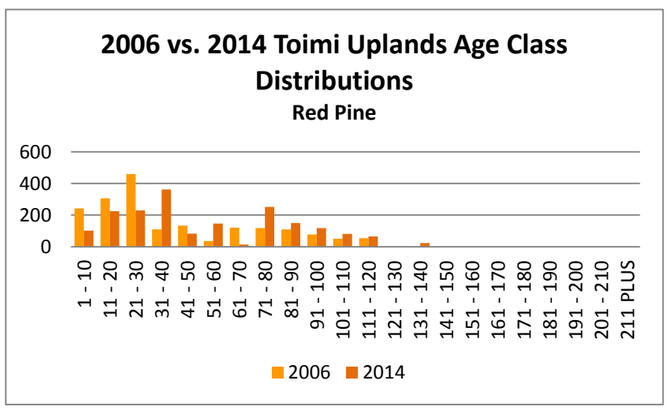


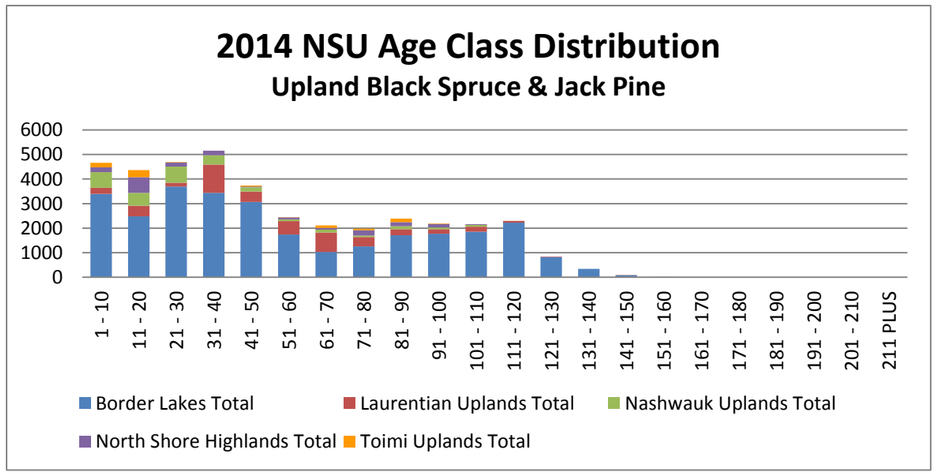
Table 4.15. 2014 Age-class distribution of upland black spruce and jack pine stands

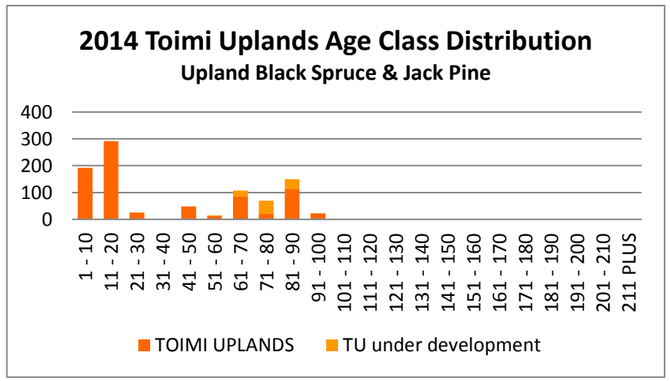
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

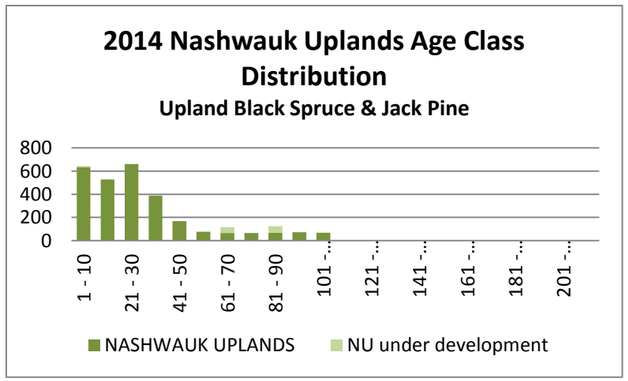
Upland Black Spruce & Jack Pine - 53	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	3360	2486	3681	3375	2902	1683	990	1034	1259	1665	1750	2186	813	336	83	2	0	0	0	0	0	0	**27605**
BL under development	38	0	15	69	165	58	38	228	450	104	101	39	6	11	0	0	0	0	0	0	0	0	**1322**
Border Lakes Total	3398	2486	3696	3444	3067	1741	1028	1262	1709	1769	1851	2225	819	347	83	2	0	0	0	0	0	0	**28927**
LAURENTIAN UPLANDS	245	429	154	1144	425	496	765	338	130	140	175	67	17	0	4	0	0	0	0	0	0	0	**4529**
LU under development	0	0	0	0	0	45	27	38	121	45	35	9	0	0	0	0	0	0	0	0	0	0	**320**
Laurentian Uplands Total	245	429	154	1144	425	541	792	376	251	185	210	76	17	0	4	0	0	0	0	0	0	0	**4849**
NASHWAUK UPLANDS	632	527	662	388	169	77	66	66	69	72	69	0	0	0	0	0	0	0	0	0	0	0	**2797**
NU under development	12	0	0	0	0	0	51	0	56	0	0	0	0	0	0	0	0	0	0	0	0	0	**119**
Nashwauk Uplands Total	644	527	662	388	169	77	117	66	125	72	69	0	0	0	0	0	0	0	0	0	0	0	**2916**
NORTH SHORE HIGHLANDS	187	633	158	176	32	70	66	199	54	133	35	0	4	0	0	0	0	0	0	0	0	0	**1747**
NSH under development	0	0	0	0	0	11	4	10	102	11	0	0	0	0	0	0	0	0	0	0	0	0	**138**
North Shore Highlands Total	187	633	158	176	32	81	70	209	156	144	35	0	4	0	0	0	0	0	0	0	0	0	**1885**
TOIMI UPLANDS	192	292	25	0	48	11	85	20	114	22	0	0	0	0	0	0	0	0	0	0	0	0	**809**
TU under development	0	0	0	0	0	4	22	49	35	0	0	0	0	0	0	0	0	0	0	0	0	0	**110**
Toimi Uplands Total	192	292	25	0	48	15	107	69	149	22	0	0	0	0	0	0	0	0	0	0	0	0	**919**
	4666	**4367**	**4695**	**5152**	**3741**	**2455**	**2114**	**1982**	**2390**	**2192**	**2165**	**2301**	**840**	**347**	**87**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**39496**

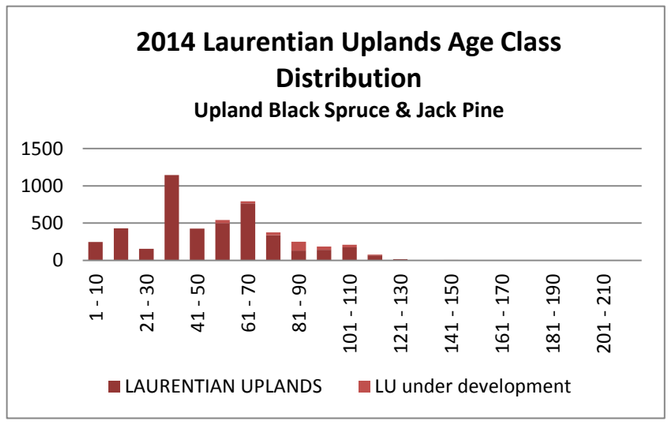
Figure 4.15. 2014 Upland black spruce and jack pine age-class distributions

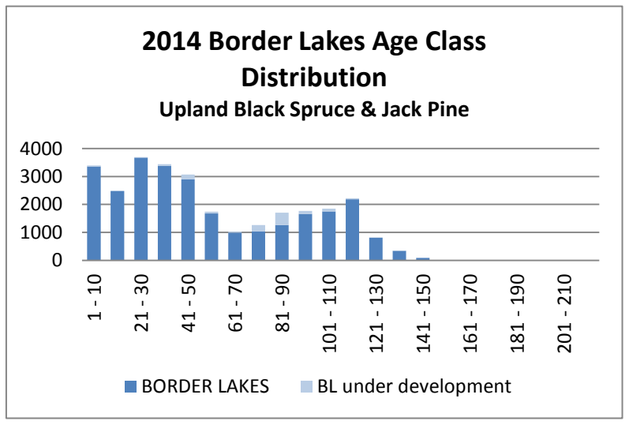
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection.

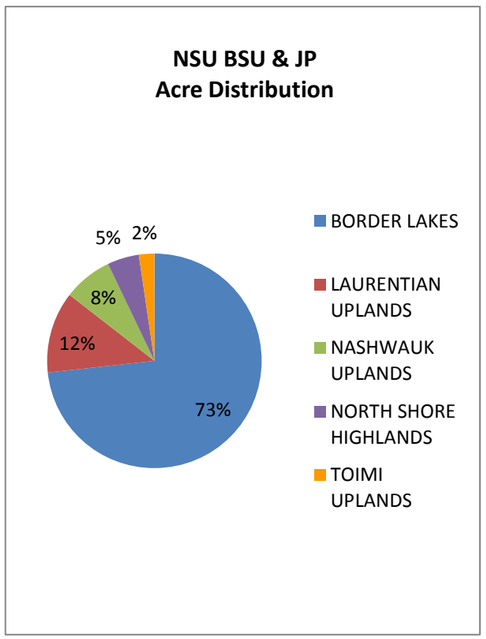












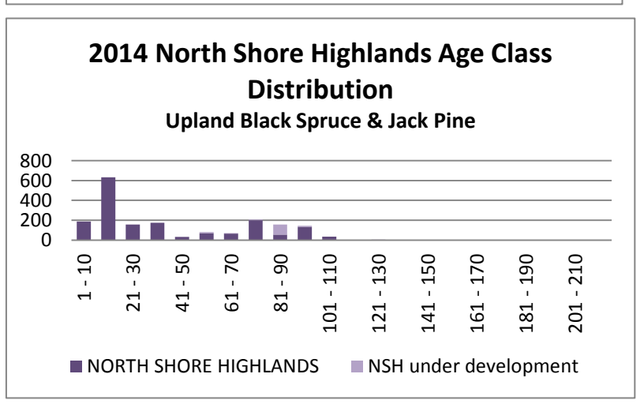


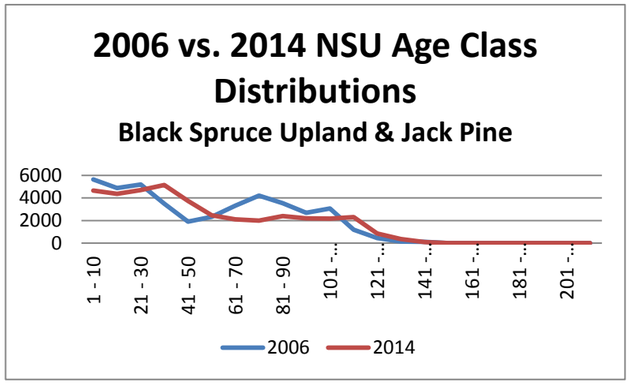
Table 4.16. 2006 Upland black spruce and jack pine age-classes by subsection and ten-year age class

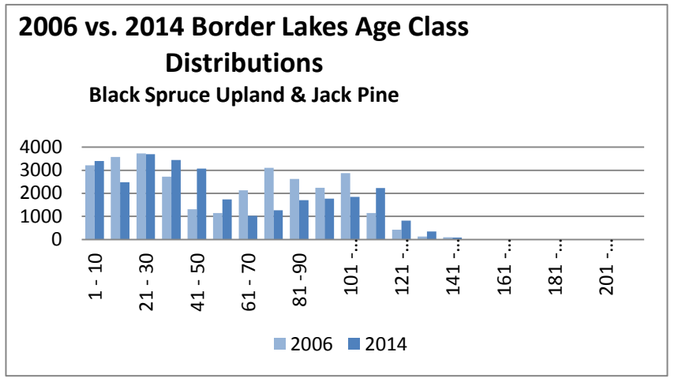
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

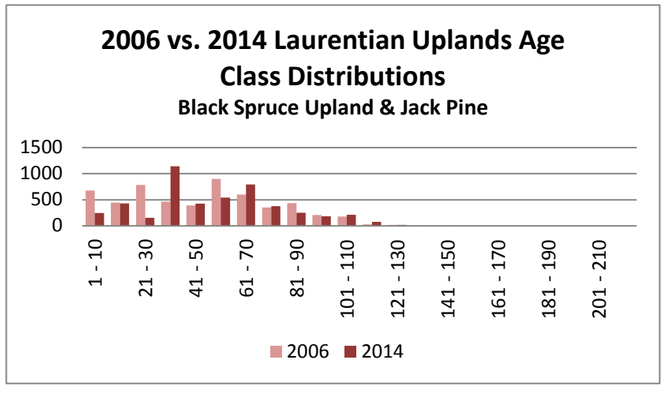
Black Spruce Upland & Jack Pine - 53	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	3217	3578	3725	2725	1310	1142	2128	3102	2619	2244	2875	1148	423	130	99	0	0	0	0	0	0	0	**30465**
LAURENTIAN UPLANDS	677	444	783	465	392	900	598	353	436	206	179	26	18	9	0	0	0	0	0	0	0	0	**5486**
NASHWAUK UPLANDS	570	710	473	238	128	146	247	318	137	143	7	0	0	0	0	0	0	0	0	0	0	0	**3117**
NORTH SHORE HIGHLANDS	744	87	211	72	68	86	249	390	249	104	3	14	12	0	0	0	0	0	0	0	0	0	**2289**
TOIMI UPLANDS	429	67	0	0	0	61	85	45	104	0	0	0	0	0	0	0	0	0	0	0	0	0	**791**
	5637	**4886**	**5192**	**3500**	**1898**	**2335**	**3307**	**4208**	**3545**	**2697**	**3064**	**1188**	**453**	**139**	**99**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**42148**

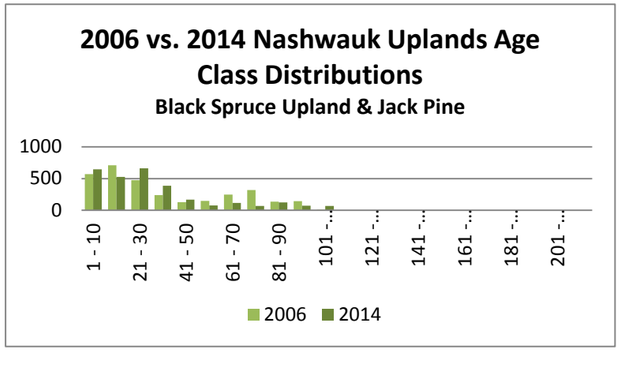
Figure 4.16. Comparison between 2006 and current (2014) age class distributions of upland black spruce and jack pine

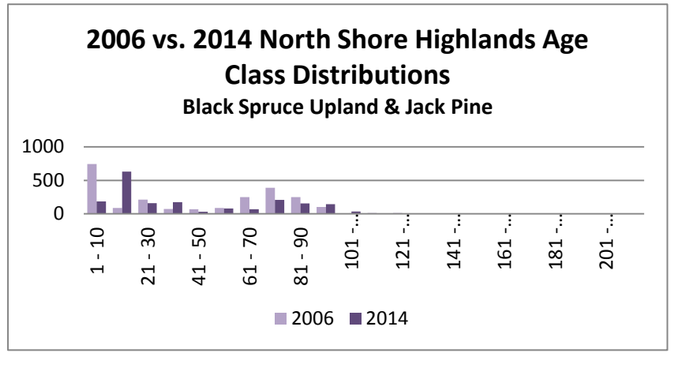
A line graph displays the age-class distribution of the upland black spruce and jack pine cover types for the section as a whole; five individual bar charts display the age-class distribution of the cover types for the individual subsections that make up the NSU.











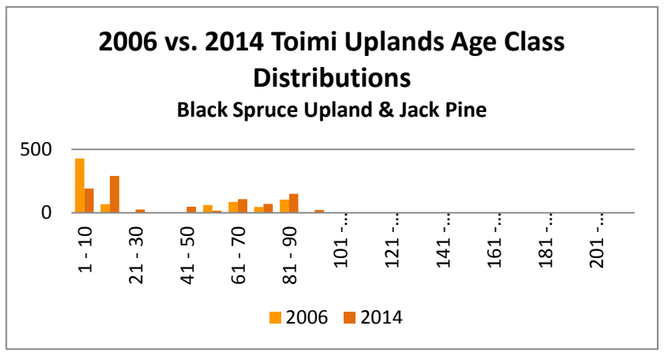


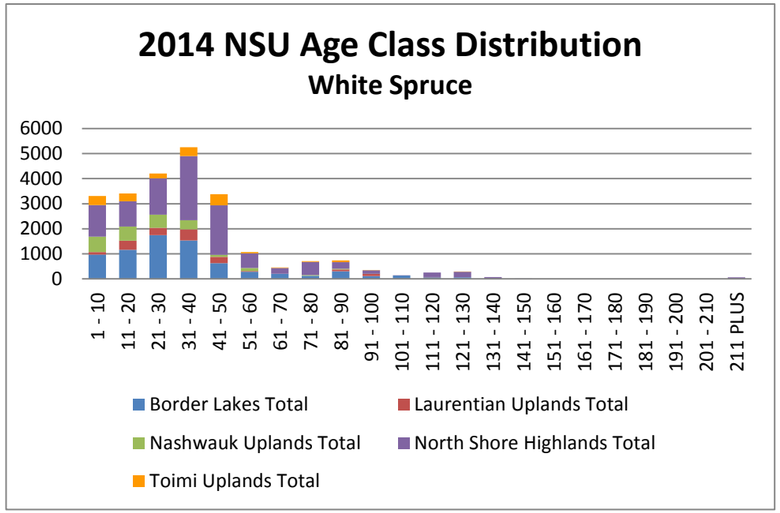
Table 4.17. 2014 Age-class distribution of white spruce stands

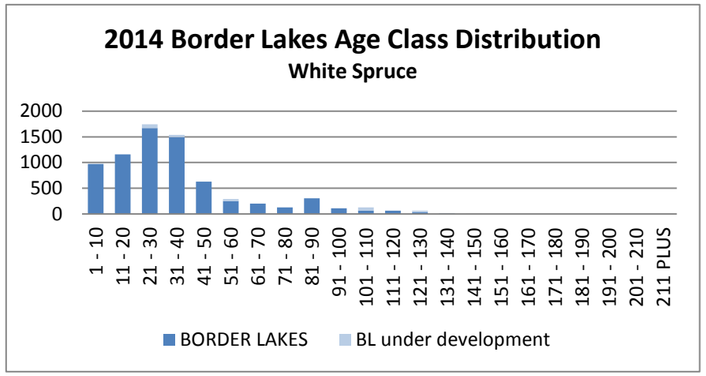
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

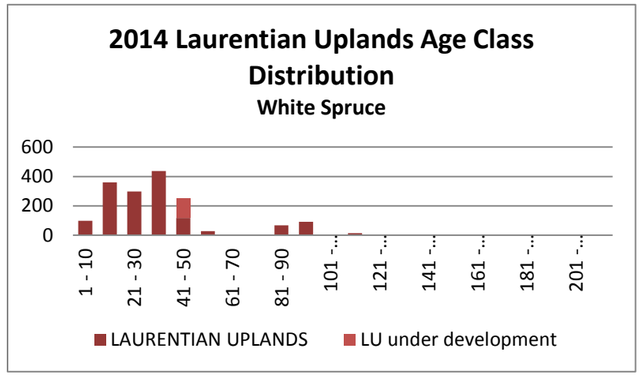
White Spruce - 61	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	972	1160	1669	1493	629	247	202	124	305	108	62	61	33	15	0	0	0	0	0	0	0	0	**7080**
BL under development	0	0	75	42	0	40	0	0	0	3	66	0	31	0	4	0	0	0	0	0	0	0	**261**
Border Lakes Total	972	1160	1744	1535	629	287	202	124	305	111	128	61	64	15	4	0	0	0	0	0	0	0	**7341**
LAURENTIAN UPLANDS	98	359	297	437	117	28	0	0	67	92	0	14	0	0	0	0	0	0	0	0	0	0	**1509**
LU under development	0	0	0	0	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**134**
Laurentian Uplands Total	98	359	297	437	251	28	0	0	67	92	0	14	0	0	0	0	0	0	0	0	0	0	**1643**
NASHWAUK UPLANDS	545	567	396	325	20	124	0	24	29	0	0	0	0	0	0	0	0	0	0	0	0	0	**2030**
NU under development	68	0	127	45	57	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	**300**
Nashwauk Uplands Total	613	567	523	370	77	124	0	24	29	3	0	0	0	0	0	0	0	0	0	0	0	0	**2330**
NORTH SHORE HIGHLANDS	1223	1011	1446	2462	1435	457	234	508	233	133	12	182	223	61	0	0	0	0	0	0	0	56	**9676**
NSH under development	44	0	0	98	548	122	0	20	37	0	6	0	0	0	0	0	0	0	0	0	0	0	**875**
North Shore Highlands Total	1267	1011	1446	2560	1983	579	234	528	270	133	18	182	223	61	0	0	0	0	0	0	0	56	**10551**
TOIMI UPLANDS	269	310	199	337	169	52	21	21	0	19	0	0	2	0	0	0	0	0	0	0	0	0	**1399**
TU under development	87	0	0	16	267	0	0	12	66	0	0	0	0	0	0	0	0	0	0	0	0	0	**448**
Toimi Uplands Total	356	310	199	353	436	52	21	33	66	19	0	0	2	0	0	0	0	0	0	0	0	0	**1847**
	3306	**3407**	**4209**	**5255**	**3376**	**1070**	**457**	**709**	**737**	**358**	**146**	**257**	**289**	**76**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**23712**

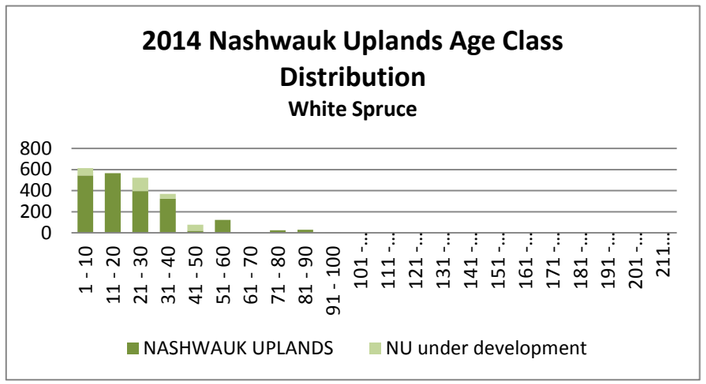
Figure 4.17. 2014 White spruce age-class distribution

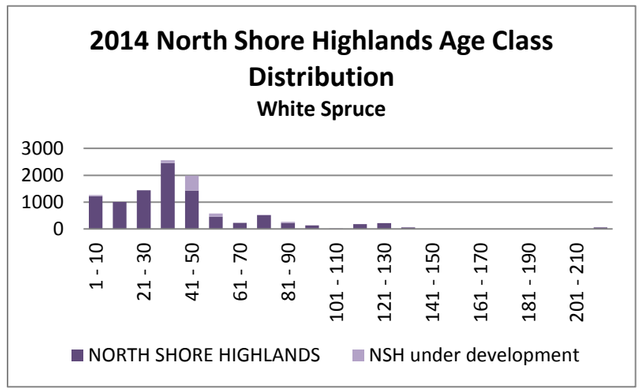
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection.

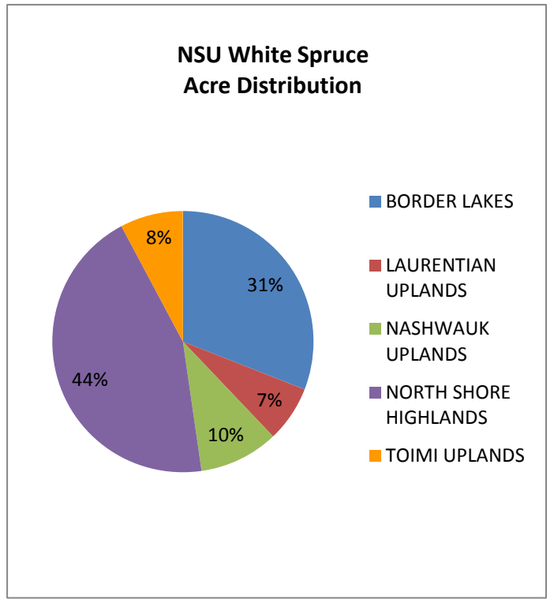












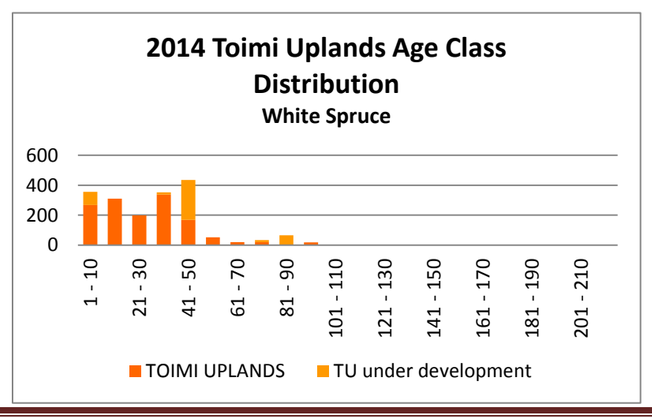


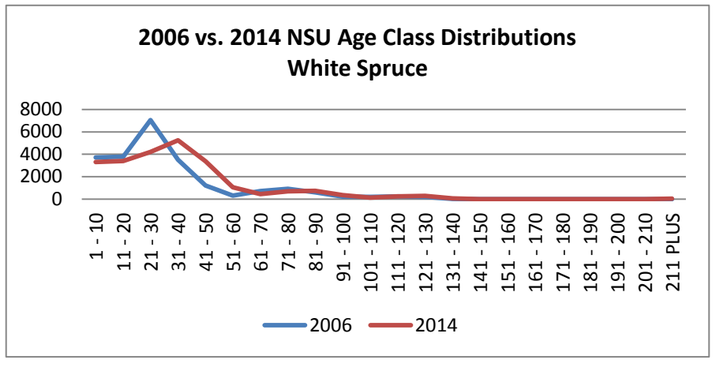
Table 4.18. 2006 Age-class distribution of white spruce stands

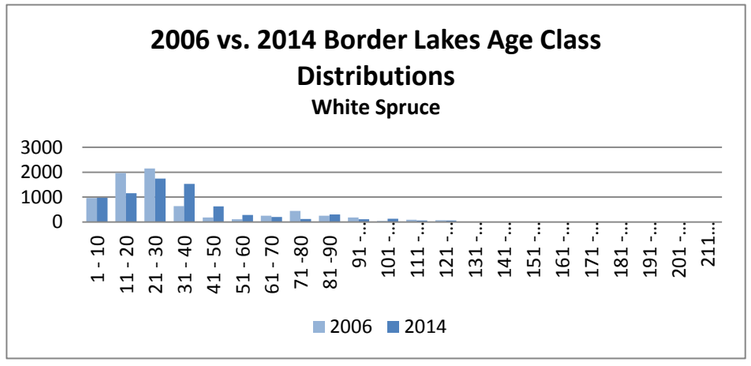
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

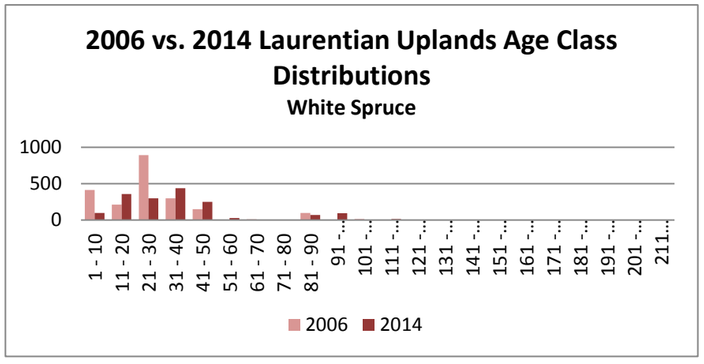
White Spruce - 61	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	967	1971	2149	643	181	117	255	450	251	183	43	89	70	5	0	0	0	0	0	0	0	0	**7374**
LAURENTIAN UPLANDS	414	211	894	297	149	0	9	0	97	0	13	0	0	0	0	0	0	0	0	0	0	0	**2084**
NASHWAUK UPLANDS	833	398	660	25	184	0	20	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2143**
NORTH SHORE HIGHLANDS	1216	1009	3151	2043	596	199	368	350	255	30	155	155	130	16	0	0	0	0	0	0	0	0	**9673**
TOIMI UPLANDS	284	186	203	505	112	13	74	114	0	8	0	0	0	0	0	0	0	0	0	0	0	0	**1499**
	3714	**3775**	**7057**	**3513**	**1222**	**329**	**726**	**937**	**603**	**221**	**211**	**244**	**200**	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22773**

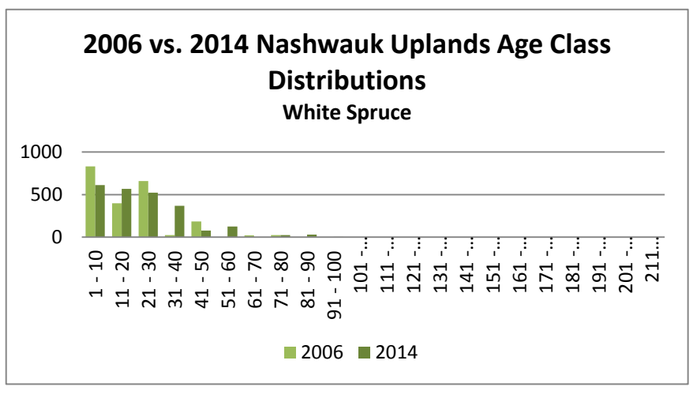
Figure 4.18. Comparison between 2006 and current (2014) age-class distributions for white spruce stands

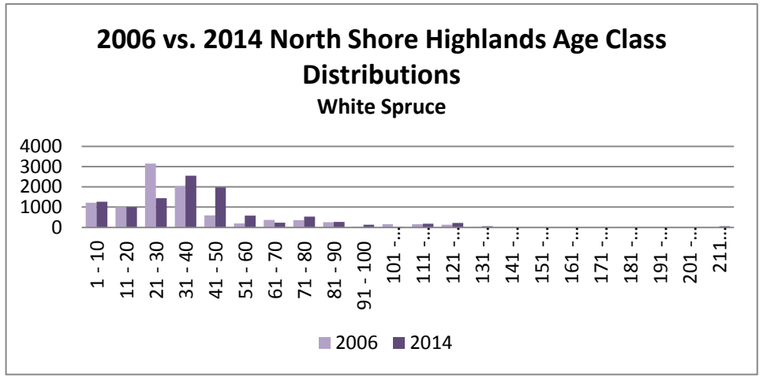
A line graph displays the age-class distribution of all commercial cover types combined for the section as a whole; five individual bar charts display the age-class distribution of all commercial cover types combined for the individual subsections that make up the NSU.











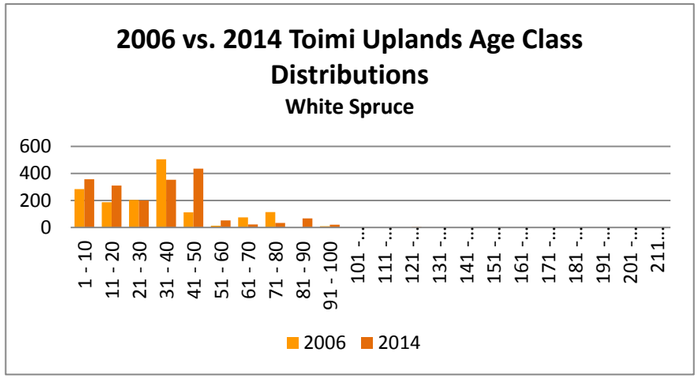


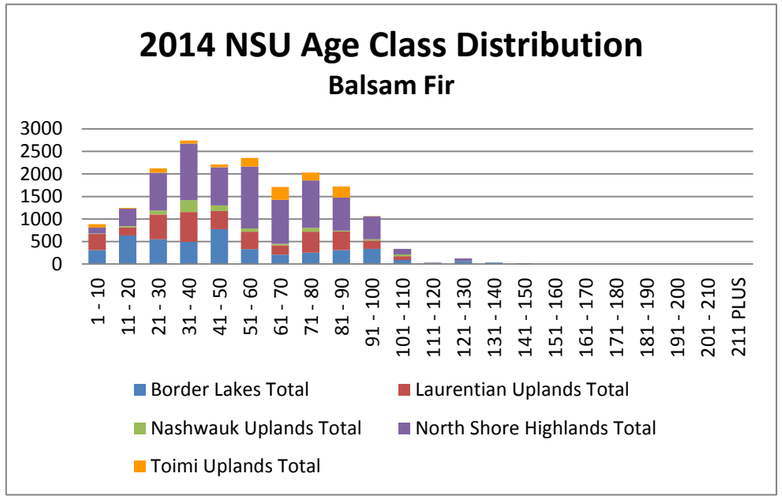
Table 4.19. 2014 Balsam fir age-lass distribution by ten-year age class

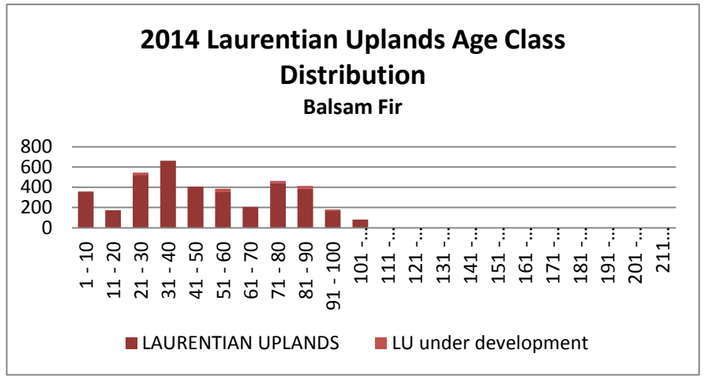
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

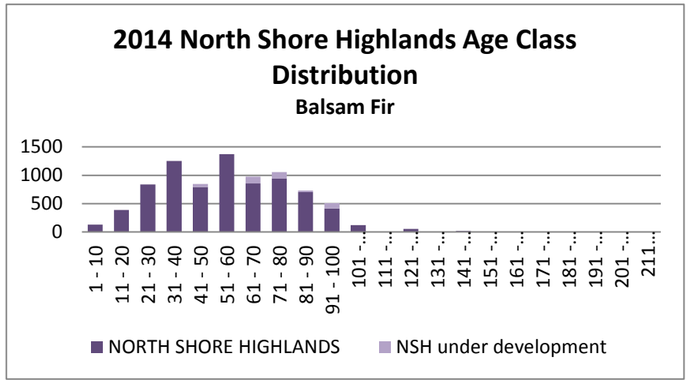
Balsam Fir - 62	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	311	638	537	495	761	334	174	122	270	289	88	9	72	35	0	0	0	0	0	0	0	0	**4135**
BL under development	0	0	15	0	12	0	37	134	41	52	6	7	0	0	0	0	0	0	0	0	0	0	**304**
Border Lakes Total	311	638	552	495	773	334	211	256	311	341	94	16	72	35	0	0	0	0	0	0	0	0	**4439**
LAURENTIAN UPLANDS	358	174	524	663	406	353	207	443	385	172	80	0	0	0	0	0	0	0	0	0	0	0	**3765**
LU under development	0	0	22	0	0	33	0	21	29	9	0	0	0	0	0	0	0	0	0	0	0	0	**114**
Laurentian Uplands Total	358	174	546	663	406	386	207	464	414	181	80	0	0	0	0	0	0	0	0	0	0	0	**3879**
NASHWAUK UPLANDS	14	31	90	155	112	72	30	54	19	22	41	11	0	0	0	0	0	0	0	0	0	0	**651**
NU under development	0	0	0	108	12	0	4	28	0	8	0	0	0	0	0	0	0	0	0	0	0	0	**160**
Nashwauk Uplands Total	14	31	90	263	124	72	34	82	19	30	41	11	0	0	0	0	0	0	0	0	0	0	**811**
NORTH SHORE HIGHLANDS	128	387	840	1253	794	1374	854	940	705	413	121	7	52	0	18	0	0	0	0	0	0	0	**7886**
NSH under development	0	0	0	0	54	0	122	115	27	96	0	0	0	0	0	0	0	0	0	0	0	0	**414**
North Shore Highlands Total	128	387	840	1253	848	1374	976	1055	732	509	121	7	52	0	18	0	0	0	0	0	0	0	**8300**
TOIMI UPLANDS	64	0	100	66	60	163	245	130	182	0	0	0	0	0	0	0	0	0	0	0	0	0	**1010**
TU under development	11	16	0	0	0	28	39	45	63	5	0	0	0	0	0	0	0	0	0	0	0	0	**207**
Toimi Uplands Total	75	16	100	66	60	191	284	175	245	5	0	0	0	0	0	0	0	0	0	0	0	0	**1217**
	886	**1246**	**2128**	**2740**	**2211**	**2357**	**1712**	**2032**	**1721**	**1066**	**336**	**34**	**124**	**35**	**18**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	18646

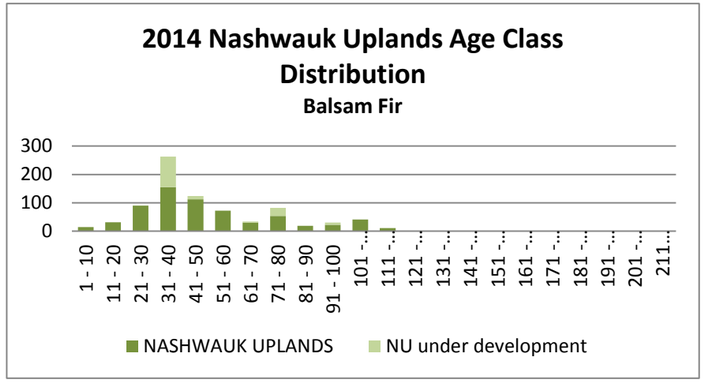
Figure 4.19. 2014 Balsam fir age-class distribution

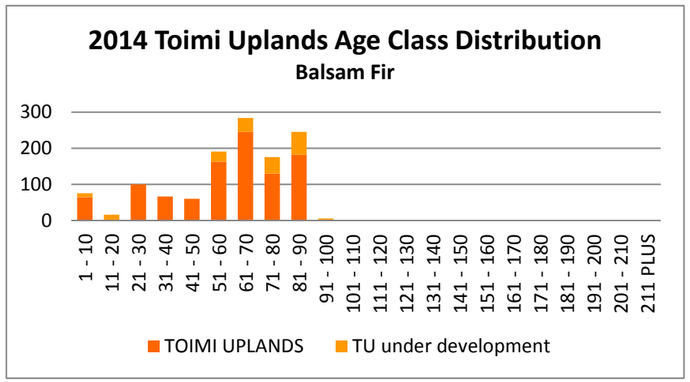
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

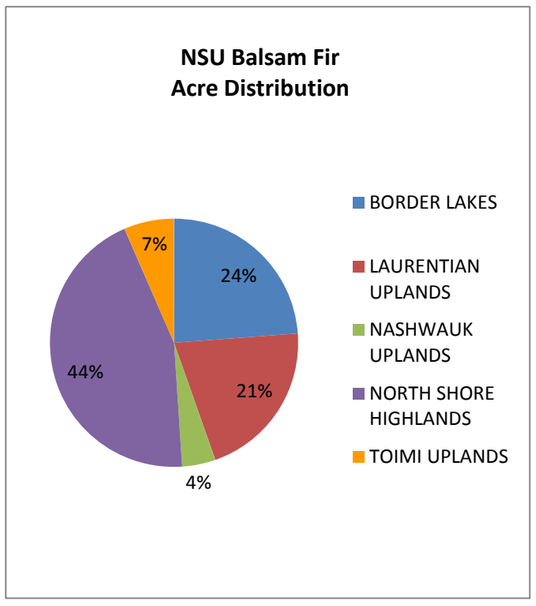












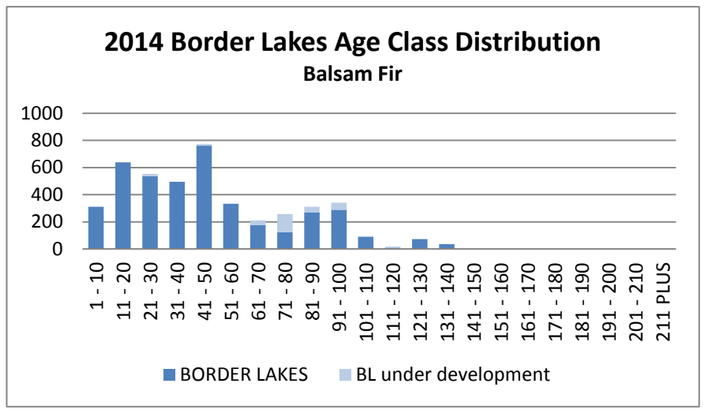


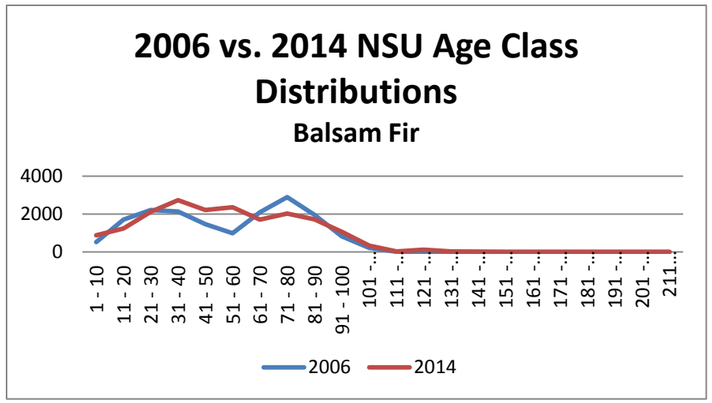
Table 4.20. 2006 Balsam fir age-class distribution by subsection and ten-year age class

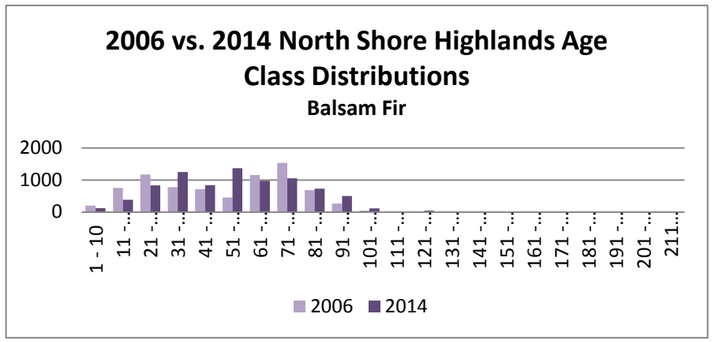
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

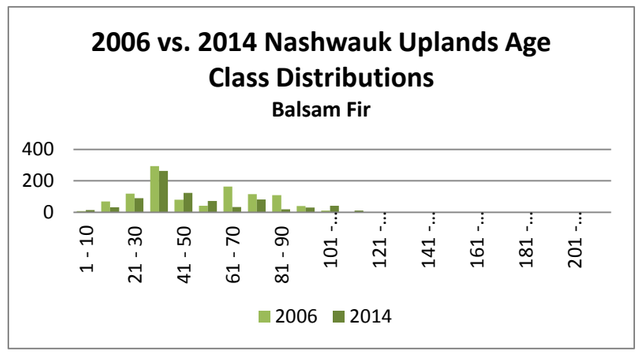
Balsam Fir - 62	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	226	363	316	543	295	247	288	517	892	248	69	10	0	0	0	0	0	0	0	0	0	0	4014
LAURENTIAN UPLANDS	84	492	477	409	300	142	182	379	249	236	85	0	0	0	0	0	0	0	0	0	0	0	3035
NASHWAUK UPLANDS	7	68	118	294	80	41	164	115	109	40	11	0	0	0	0	0	0	0	0	0	0	0	1047
NORTH SHORE HIGHLANDS	210	756	1176	784	717	462	1161	1539	684	270	47	7	12	0	0	0	0	0	0	0	0	0	7825
TOIMI UPLANDS	0	37	134	104	80	98	302	350	26	33	0	0	0	0	0	0	0	0	0	0	0	0	1164
	527	**1716**	**2221**	**2134**	**1472**	**990**	**2097**	**2900**	**1960**	**827**	**212**	**17**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17085**

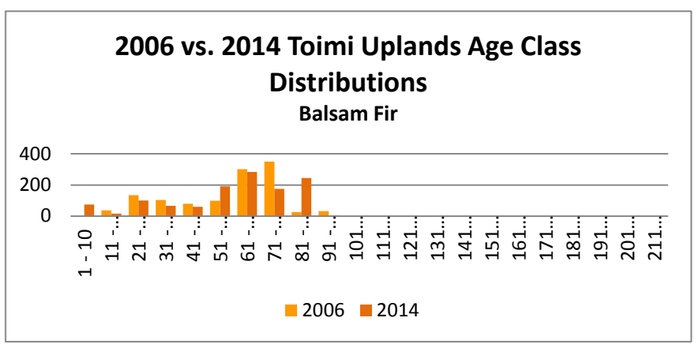
Figure 4.20. Comparison between 2006 and current (2014) age-class distribution of balsam fir stands

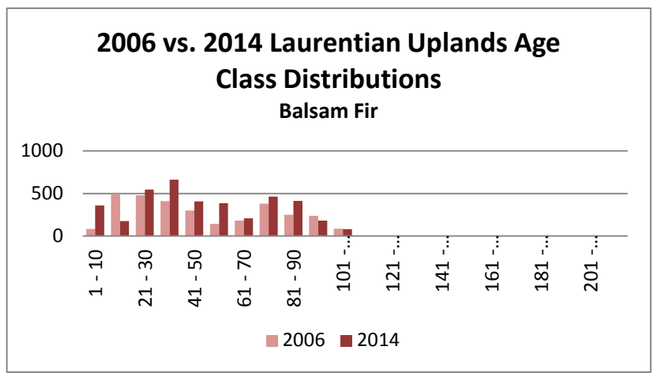
A line graph displays the age-class distribution of balsam fir cover type for the section as a whole; five individual bar charts display the age-class distribution of balsam fir stands for the individual subsections that make up the NSU.











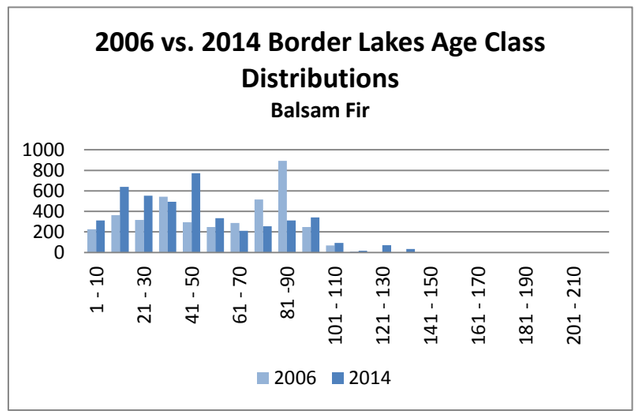


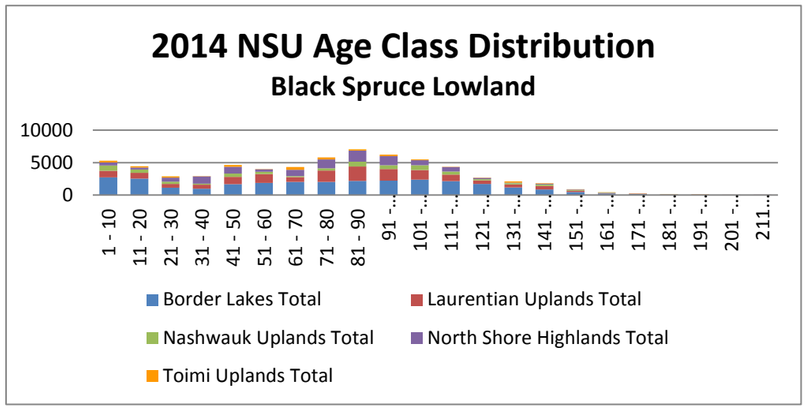
Table 4.21. 2014 Lowland black spruce age-class distribution by ten-year age class

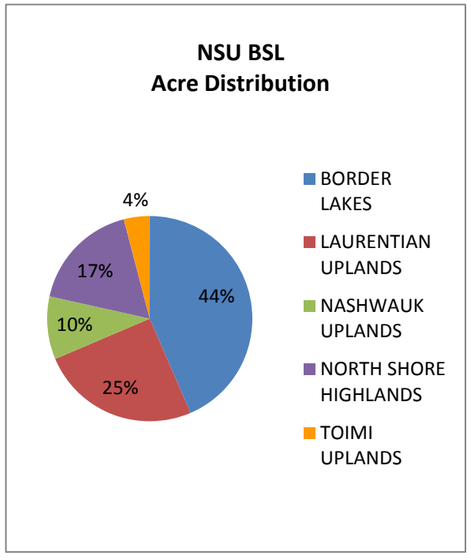
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

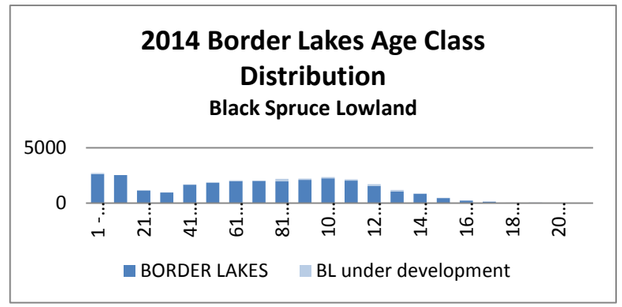
Black Spruce Lowland - 71	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	2626	2537	1141	963	1675	1815	1985	1997	1963	2088	2236	2040	1554	1048	834	447	224	114	23	29	0	0	**27339**
BL under development	89	0	0	0	6	67	61	42	238	130	125	108	152	125	25	32	0	43	2	0	0	0	**1245**
Border Lakes Total	2715	2537	1141	963	1681	1882	2046	2039	2201	2218	2361	2148	1706	1173	859	479	224	157	25	29	0	0	**28584**
LAURENTIAN UPLANDS	1043	880	594	647	1109	1309	734	1717	2074	1672	1428	936	534	368	523	177	52	29	36	11	19	11	**15903**
LU under development	0	0	0	0	0	38	0	15	127	120	80	65	21	113	15	0	0	0	0	0	0	0	**594**
Laurentian Uplands Total	1043	880	594	647	1109	1347	734	1732	2201	1792	1508	1001	555	481	538	177	52	29	36	11	19	11	**16497**
NASHWAUK UPLANDS	781	517	331	147	505	360	149	361	702	530	742	440	180	110	228	57	77	0	0	0	0	0	**6217**
NU under development	8	0	0	0	0	0	9	0	33	38	0	27	13	63	3	72	0	0	25	0	0	0	**291**
Nashwauk Uplands Total	789	517	331	147	505	360	158	361	735	568	742	467	193	173	231	129	77	0	25	0	0	0	**6508**
NORTH SHORE HIGHLANDS	470	294	642	1141	1079	381	880	1344	1713	1365	737	684	149	62	128	66	33	9	50	0	0	3	**11230**
NSH under development	0	0	0	0	0	0	91	0	13	35	24	11	59	12	0	0	0	0	0	0	0	0	**245**
North Shore Highlands Total	470	294	642	1141	1079	381	971	1344	1726	1400	761	695	208	74	128	66	33	9	50	0	0	3	**11475**
TOIMI UPLANDS	265	216	182	7	247	37	365	279	177	222	117	10	3	190	80	60	21	16	28	6	0	0	**2528**
TU under development	0	0	0	0	0	2	31	59	18	17	5	0	0	0	14	0	0	0	0	0	0	0	**146**
Toimi Uplands Total	265	216	182	7	247	39	396	338	195	239	122	10	3	190	94	60	21	16	28	6	0	0	**2674**
	5282	**4444**	**2890**	**2905**	**4621**	**4009**	**4305**	**5814**	**7058**	**6217**	**5494**	**4321**	**2665**	**2091**	**1850**	**911**	**407**	**211**	**164**	**46**	**19**	**14**	**65738**

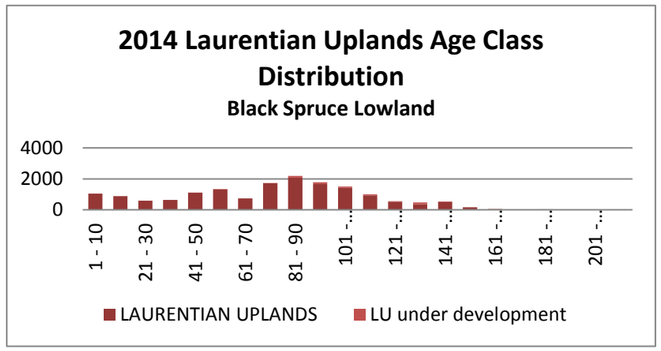
Figure 4.21. 2014 Lowland black spruce age-class distribution

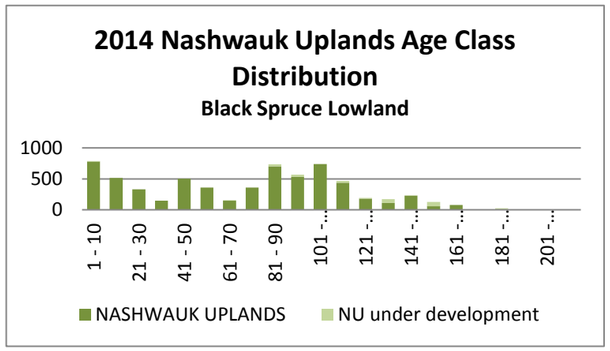
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

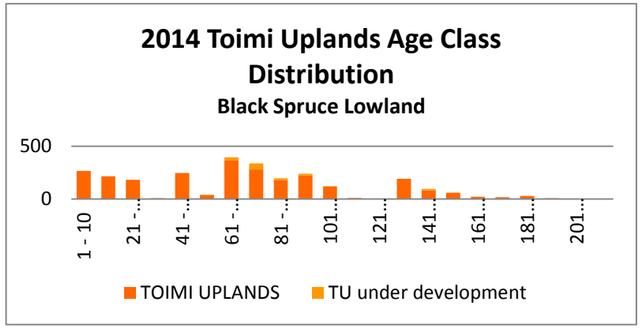












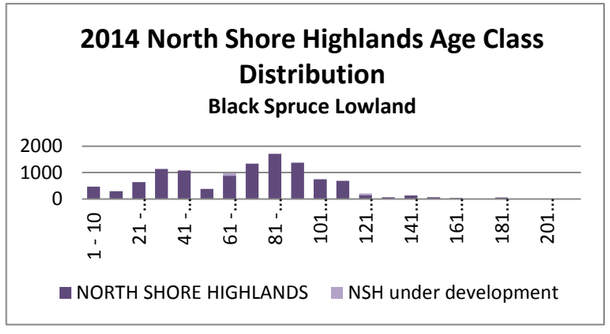


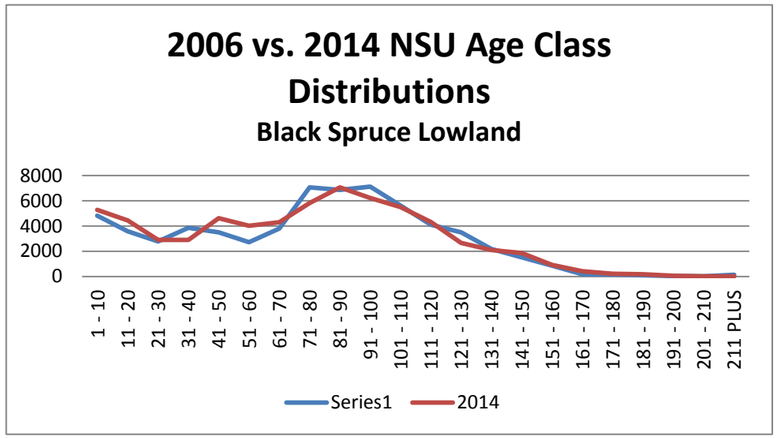
Table 4.22. 2006 Age-class distribution of lowland black spruce by subsection and ten-year age class

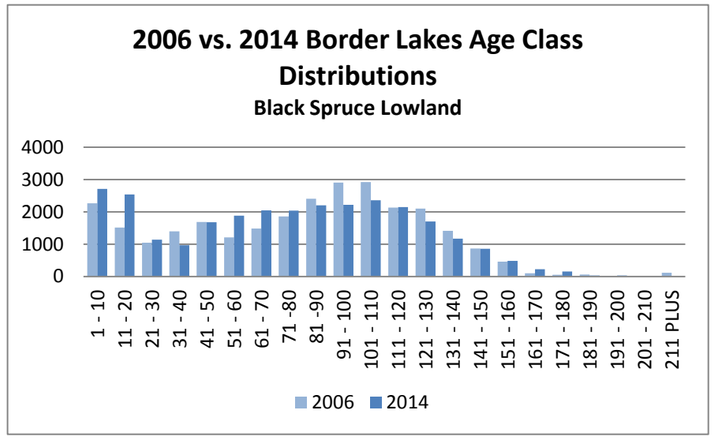
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

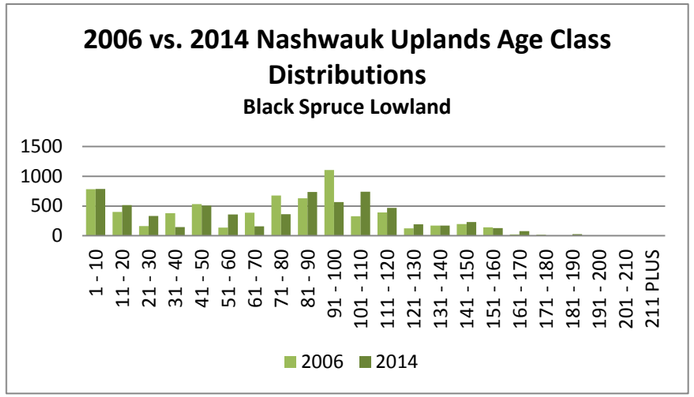
Black Spruce Lowland - 71	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	2268	1516	1042	1394	1683	1207	1484	1862	2404	2908	2922	2133	2105	1413	866	456	98	54	56	7	0	114	**27992**
LAURENTIAN UPLANDS	1185	832	642	1002	650	824	796	2460	1786	1769	1450	674	808	337	219	186	16	17	8	18	0	11	**15690**
NASHWAUK UPLANDS	784	400	161	381	533	139	388	675	631	1107	329	391	126	169	195	142	24	19	0	0	0	0	**6594**
NORTH SHORE HIGHLANDS	378	546	897	984	573	352	811	1755	1623	1122	751	837	250	187	118	29	19	29	25	9	3	0	**11298**
TOIMI UPLANDS	198	292	26	101	51	193	309	308	420	211	162	59	215	63	115	33	11	31	6	0	0	0	**2804**
	4813	**3586**	**2768**	**3862**	**3490**	**2715**	**3788**	**7060**	**6864**	**7117**	**5614**	**4094**	**3504**	**2169**	**1513**	**846**	**168**	**150**	**95**	**34**	**3**	**125**	**64378**

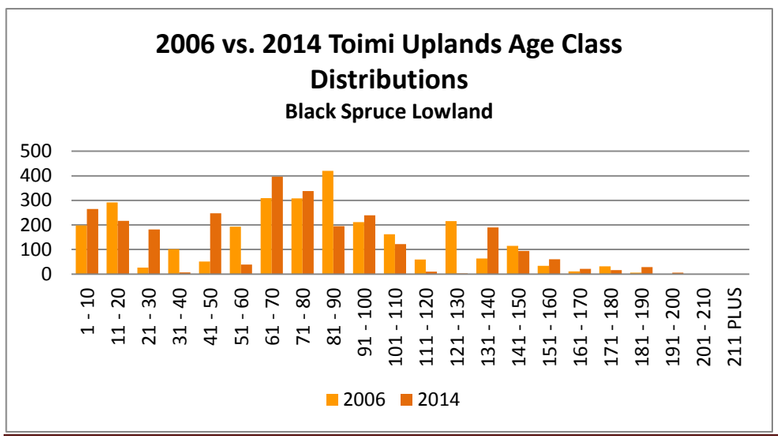
Figure 4.22. Comparison between 2006 and current (2014) age-class distribution of lowland black spruce stands

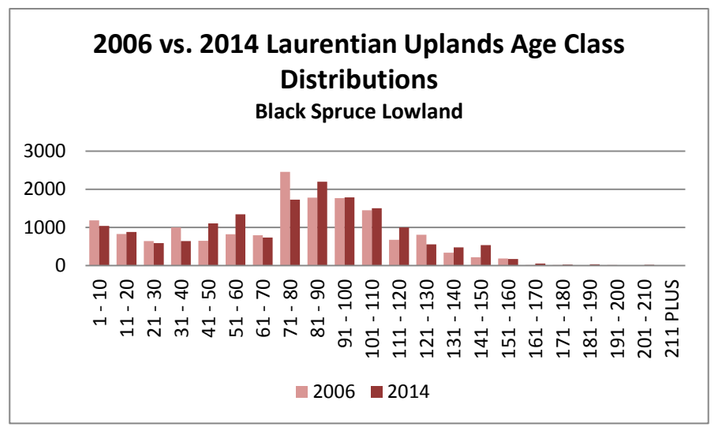
A line graph displays the age-class distribution of lowland black spruce for the section as a whole; five individual bar charts display the age-class distribution of the cover type for the individual subsections that make up the NSU











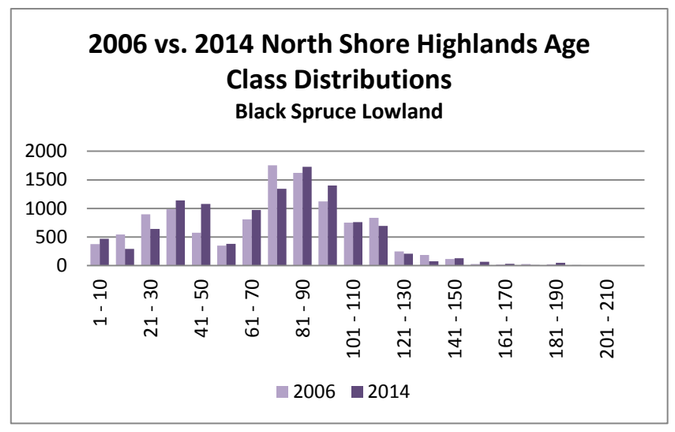


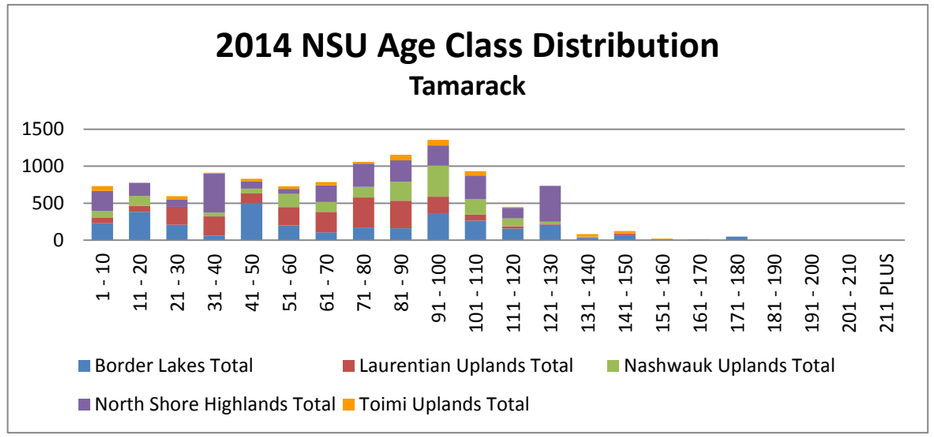
Table 4.23. 2014 Tamarack age-class distribution by ten-year age class

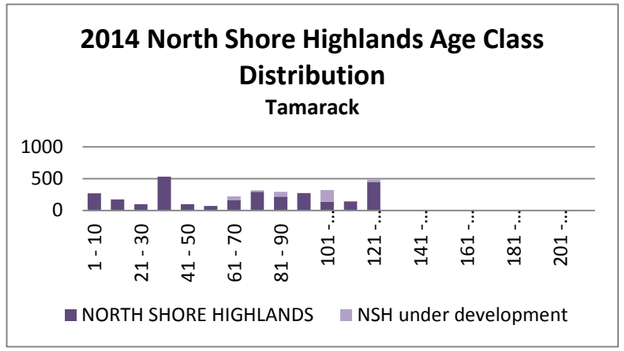
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

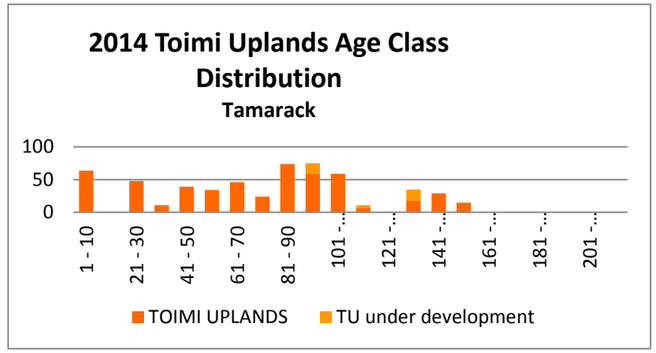
Tamarack - 72	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	228	384	209	61	501	133	100	166	158	309	235	154	113	29	69	0	0	46	0	0	0	0	**2895**
BL under development	0	0	0	0	0	66	7	5	1	47	28	2	97	0	0	0	8	0	0	0	0	0	**261**
Border Lakes Total	228	384	209	61	501	199	107	171	159	356	263	156	210	29	69	0	8	46	0	0	0	0	**3156**
LAURENTIAN UPLANDS	79	81	241	260	132	250	276	367	374	198	79	33	11	6	21	0	0	0	0	0	0	0	**2408**
LU under development	0	0	0	0	0	0	0	38	0	35	3	0	0	0	0	0	0	0	0	0	0	0	**76**
Laurentian Uplands Total	79	81	241	260	132	250	276	405	374	233	82	33	11	6	21	0	0	0	0	0	0	0	**2484**
NASHWAUK UPLANDS	86	134	0	52	63	176	134	144	255	401	208	58	27	0	5	0	0	0	0	0	0	0	**1743**
NU under development	4	0	0	0	0	0	0	0	0	17	2	46	0	11	0	0	0	0	0	0	0	0	**80**
Nashwauk Uplands Total	90	134	0	52	63	176	134	144	255	418	210	104	27	11	5	0	0	0	0	0	0	0	**1823**
NORTH SHORE HIGHLANDS	271	175	98	530	97	69	167	292	216	275	138	144	446	0	0	4	0	0	0	0	0	0	**2922**
NSH under development	0	0	0	0	0	0	56	24	77	0	182	0	40	0	0	0	0	0	0	0	0	0	**379**
North Shore Highlands Total	271	175	98	530	97	69	223	316	293	275	320	144	486	0	0	4	0	0	0	0	0	0	**3301**
TOIMI UPLANDS	64	0	48	11	39	34	46	24	74	59	59	7	0	18	29	15	0	0	0	0	0	0	**527**
TU under development	0	0	0	0	0	0	0	0	0	16	0	4	0	17	0	0	0	0	0	0	0	0	**37**
Toimi Uplands Total	64	0	48	11	39	34	46	24	74	75	59	11	0	35	29	15	0	0	0	0	0	0	**564**
	732	**774**	**596**	**914**	**832**	**728**	**786**	**1060**	**1155**	**1357**	**934**	**448**	**734**	**81**	**124**	**19**	**8**	**46**	**0**	**0**	**0**	**0**	**11328**

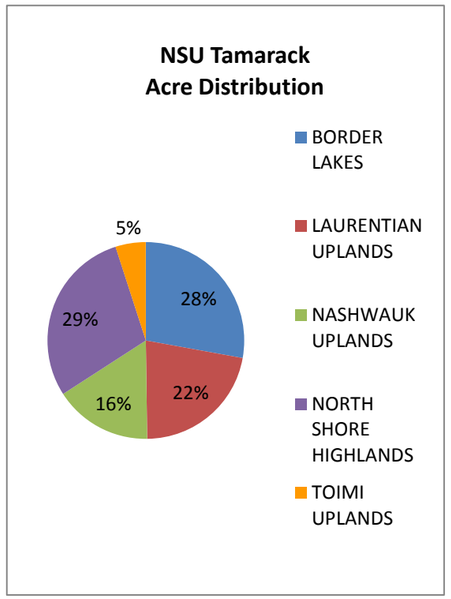
Figure 4.23. 2014 Tamarack age-class distribution

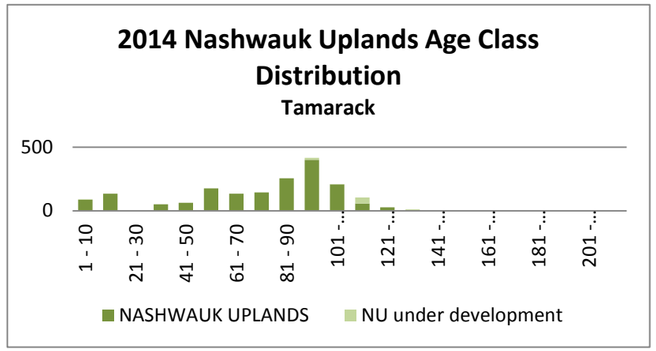
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

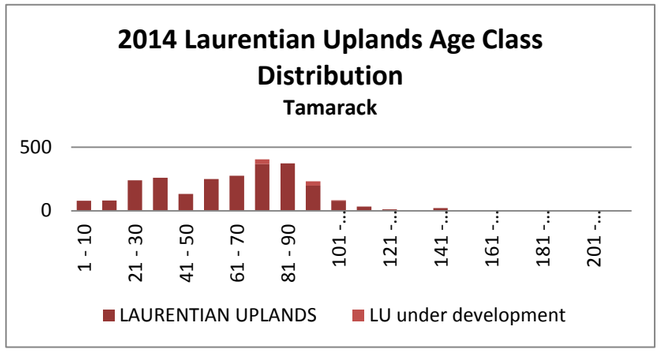












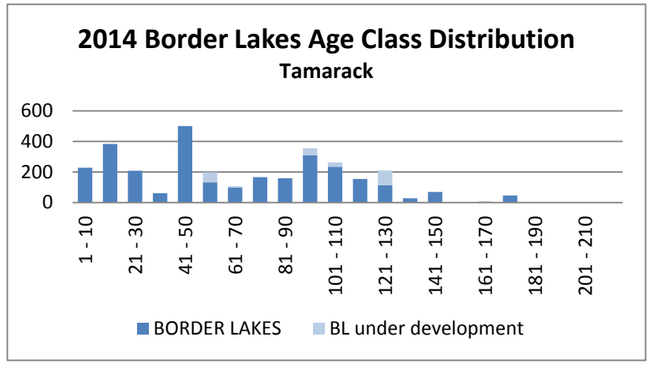


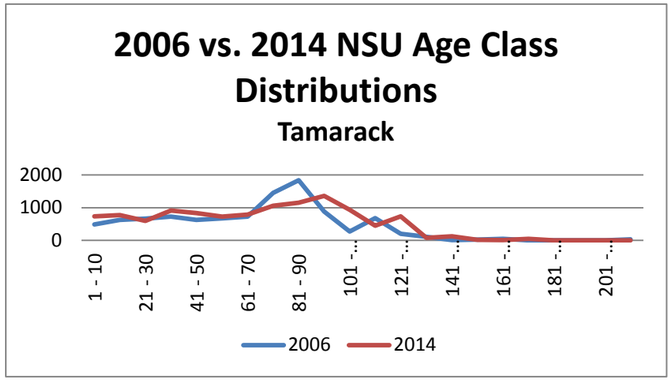
Table 4.24. 2006 Tamarack age-class distribution by subsection and ten-year age class

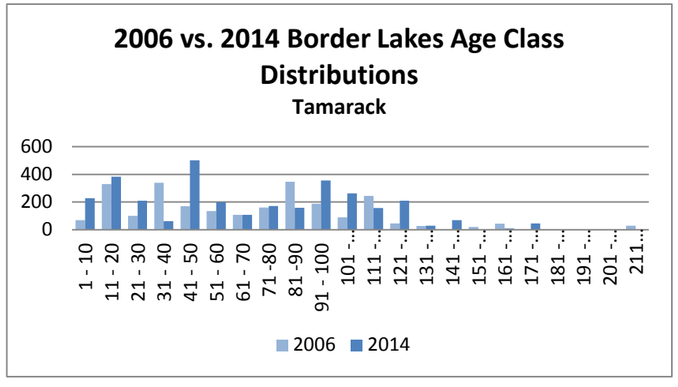
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

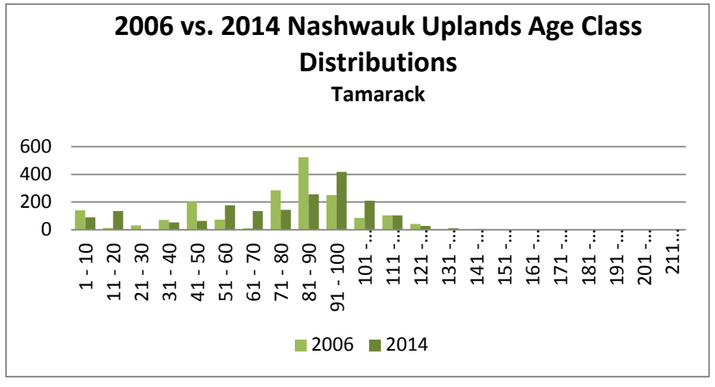
Tamarack - 72	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180
BORDER LAKES	69	331	101	339	170	134	108	160	347	188	89	245	45	28	0	19	44	0
LAURENTIAN UPLANDS	19	154	116	107	40	208	444	329	217	125	40	11	27	21	0	0	0	0
NASHWAUK UPLANDS	140	12	30	71	205	72	10	284	524	249	85	103	41	6	0	0	0	0
NORTH SHORE HIGHLANDS	226	81	415	177	166	224	135	604	667	267	41	324	44	26	3	0	0	0
TOIMI UPLANDS	37	50	0	29	46	33	31	76	83	55	13	0	43	25	6	5	0	0
	491	**628**	**662**	**723**	**627**	**671**	**728**	**1453**	**1838**	**884**	**268**	**683**	**200**	**106**	**9**	**24**	**44**	**0**

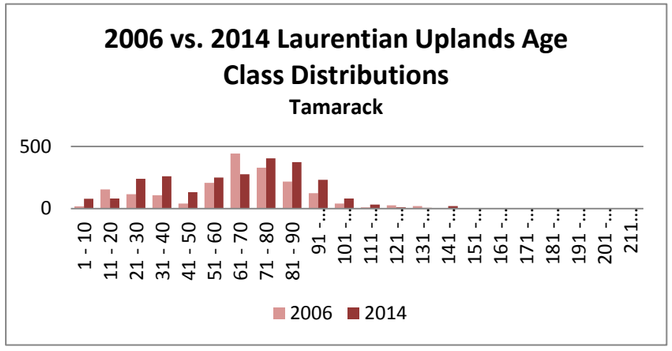
Figure 4.24.Comparison between 2006 and current (2014) age-class distributions tamarack stands

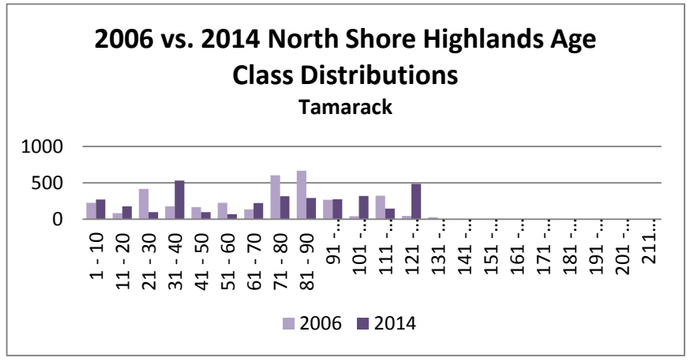
A line graph displays the age-class distribution of tamarack cover type for the section as a whole; five individual bar charts display the age-class distribution of tamarack stands for the individual subsections that make up the NSU.











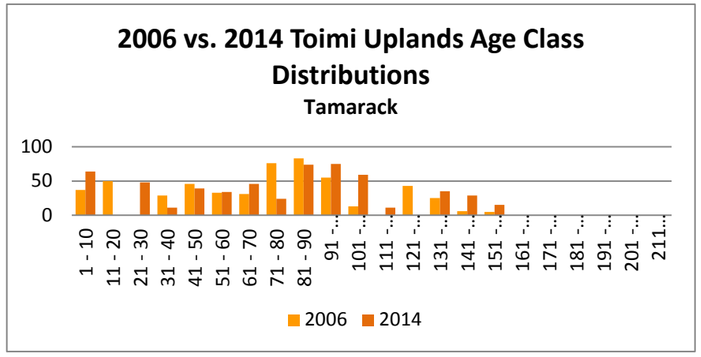


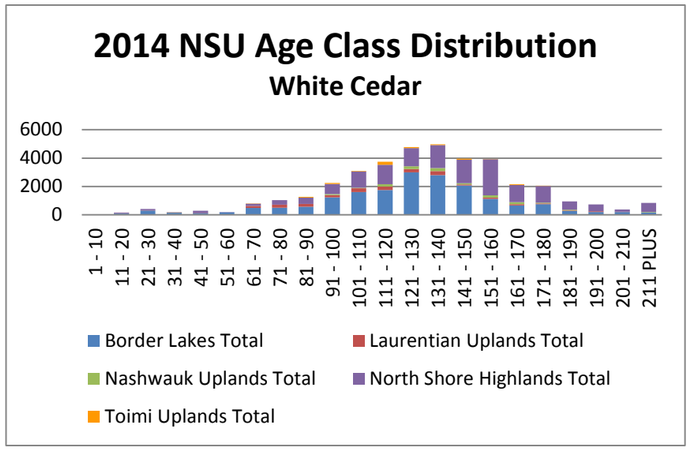
Table 4.25. 2014 White cedar age-class distribution by ten-year age class

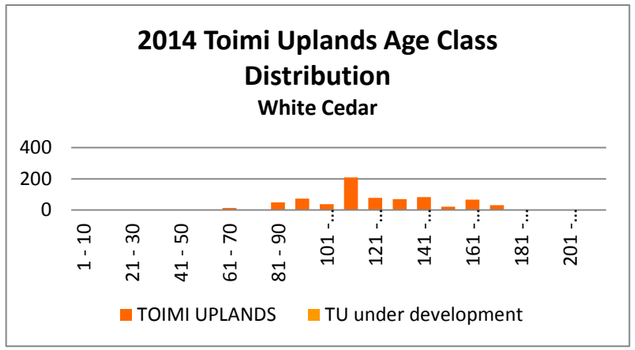
The first column lists the subsections (stands that are under development are displayed separately under each); remaining columns are acres by ten-year age class. Totals acreages are given for each age class, and each subsection.

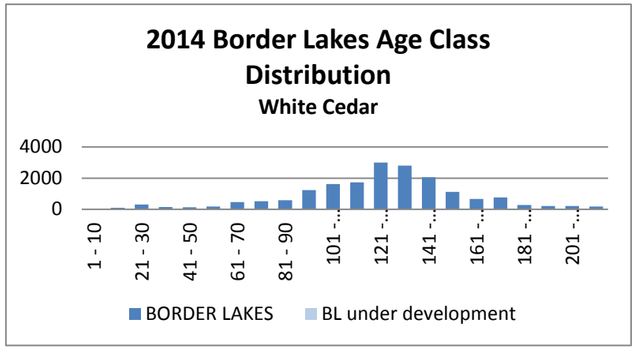
White Cedar - 73	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	TOTAL
BORDER LAKES	0	93	309	144	125	183	458	508	578	1228	1615	1721	2995	2796	2065	1121	667	763	278	203	207	173	**18230**
BL under development	0	0	0	0	0	0	25	0	0	0	0	32	1	0	0	0	0	0	0	0	0	0	**58**
Border Lakes Total	0	93	309	144	125	183	483	508	578	1228	1615	1753	2996	2796	2065	1121	667	763	278	203	207	173	**18288**
LAURENTIAN UPLANDS	0	21	28	7	15	0	153	219	203	175	262	252	238	276	69	90	82	51	35	50	9	0	**2235**
LU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	**15**
Laurentian Uplands Total	0	21	28	7	15	0	153	219	203	175	262	252	238	291	69	90	82	51	35	50	9	0	**2250**
NASHWAUK UPLANDS	0	0	0	13	0	0	0	0	0	65	29	159	182	217	93	163	157	40	54	0	0	33	**1205**
NU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Nashwauk Uplands Total	0	0	0	13	0	0	0	0	0	65	29	159	182	217	93	163	157	40	54	0	0	33	**1205**
NORTH SHORE HIGHLANDS	0	57	83	29	156	25	151	309	441	704	1153	1367	1289	1604	1650	2552	1195	1173	589	489	165	643	**15824**
NSH under development	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	**7**
North Shore Highlands Total	0	57	83	29	156	25	151	309	441	704	1160	1367	1289	1604	1650	2552	1195	1173	589	489	165	643	**15831**
TOIMI UPLANDS	0	0	0	0	0	0	13	0	49	72	37	209	78	70	83	20	67	31	0	0	0	0	**729**
TU under development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Toimi Uplands Total	0	0	0	0	0	0	13	0	49	72	37	209	78	70	83	20	67	31	0	0	0	0	**729**
	0	**171**	**420**	**193**	**296**	**208**	**800**	**1036**	**1271**	**2244**	**3103**	**3740**	**4783**	**4978**	**3960**	**3946**	**2168**	**2058**	**956**	**742**	**381**	**849**	**38303**

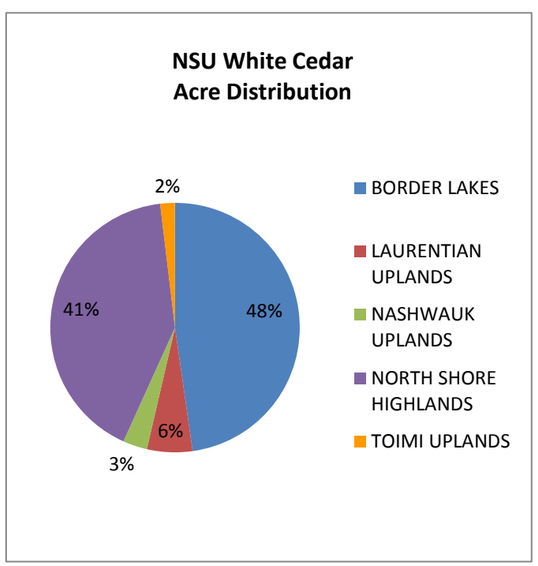
Figure 4.25. 2014 White cedar age-class distribution

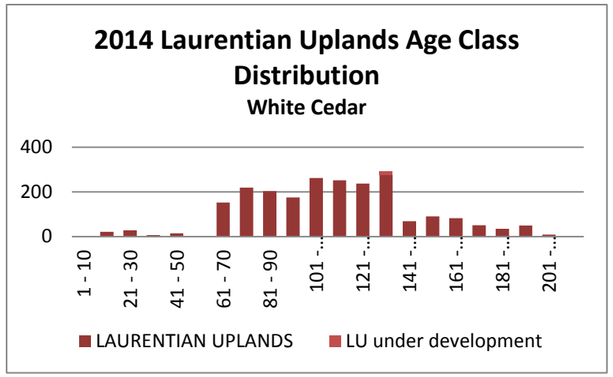
The following seven charts display the age-class distribution data graphically. One chart shows data for the combined subsections in bar chart format; five bar charts display the individual subsection data; and a pie chart displays the data for the section as a whole, showing how much of the cover type is located in each subsection

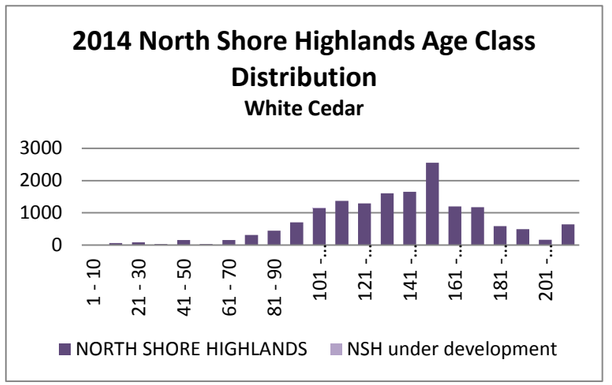












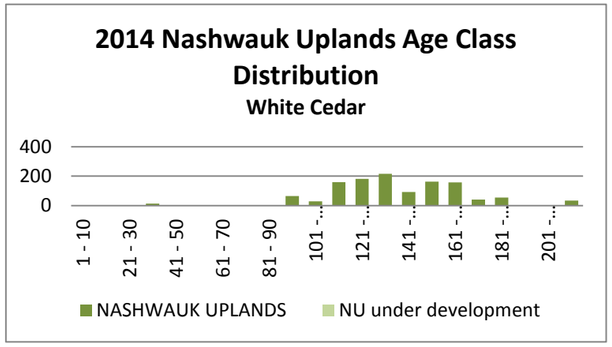


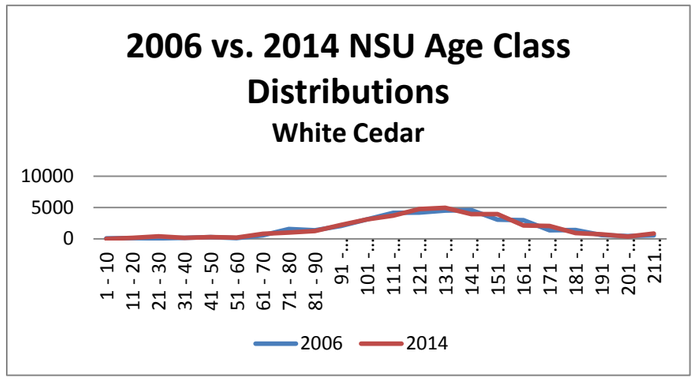
Table 4.26. 2006 White cedar age-class distribution by subsection

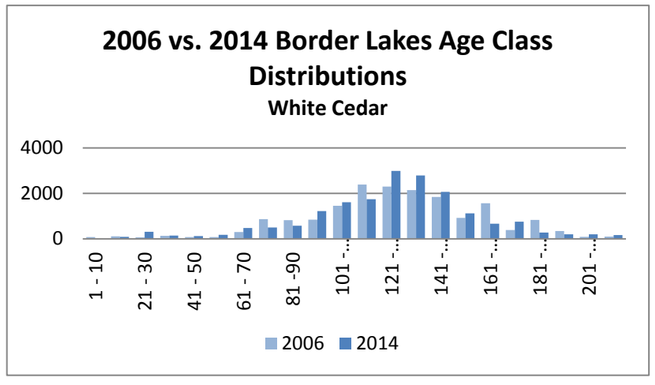
The first column lists the subsections; subsequent columns are for each ten-year age class. Totals are given for each age class and subsection.

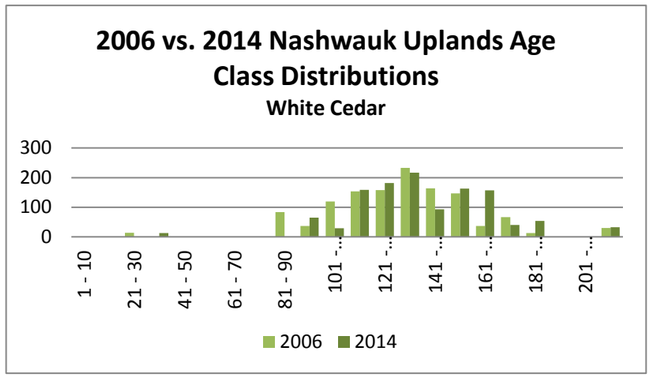
White Cedar - 73	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 -80	81 -90	91 - 100	101 - 110	111 - 120	121 - 130	131 - 140	141 - 150	151 - 160	161 - 170	171 - 180	181 - 190	191 - 200	201 - 210	211 PLUS	Total
BORDER LAKES	80	114	73	137	85	83	305	869	826	853	1463	2391	2301	2144	1845	930	1573	390	835	352	94	103	**17846**
LAURENTIAN UPLANDS	21	0	15	29	16	17	184	131	33	318	197	282	268	132	83	66	44	58	0	61	0	0	**1955**
NASHWAUK UPLANDS	0	0	14	0	0	0	0	0	84	37	120	154	158	233	164	147	37	67	13	0	0	30	**1258**
NORTH SHORE HIGHLANDS	0	18	0	16	208	52	74	546	393	871	1235	1245	1388	1841	2451	1883	1299	866	557	209	365	447	**15964**
TOIMI UPLANDS	0	0	0	0	0	0	0	28	30	5	98	82	104	178	44	68	29	9	0	0	0	0	**675**
	101	**132**	**102**	**182**	**309**	**152**	**563**	**1574**	**1366**	**2084**	**3113**	**4154**	**4219**	**4528**	**4587**	**3094**	**2982**	**1390**	**1405**	**622**	**459**	**580**	**37698**

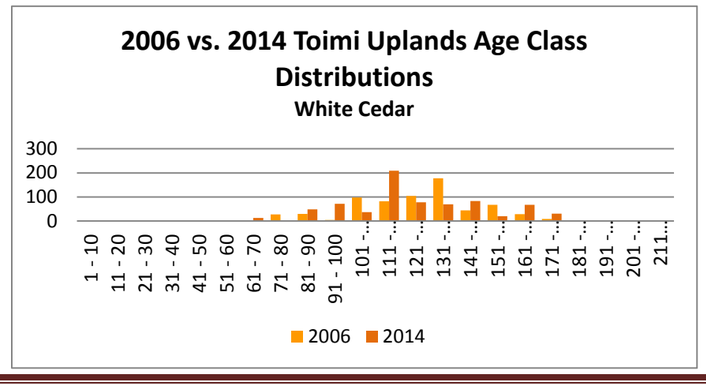
Figure 4.26.Comparison between year 2006and current (2014) white cedar age-class distribution

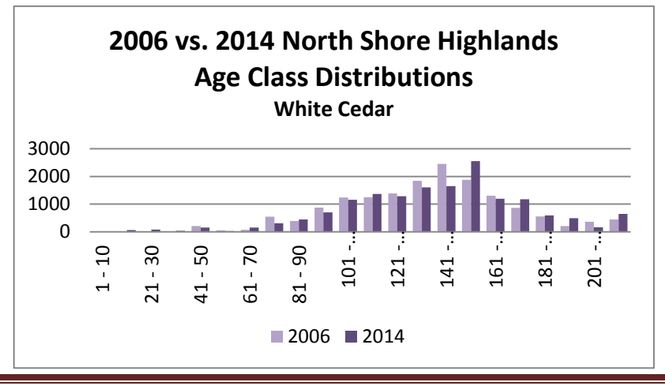
A line graph displays the age-class distribution of the white cedar covertype for the section as a whole; five individual bar charts display the age-class distribution of white cedar stands for the individual subsections that make up the NSU.

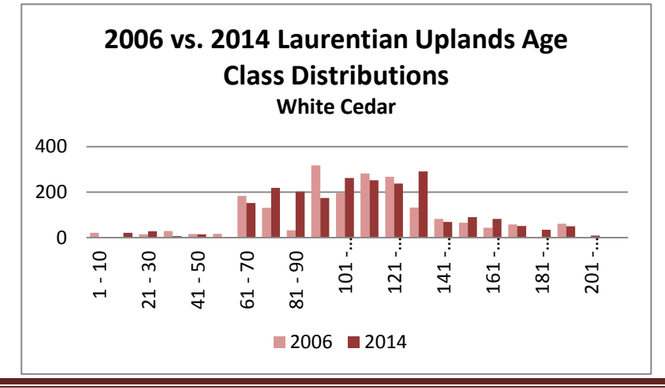












Old-Growth Forest

Minnesota DNR's old-growth forest management goal is to identify and protect the highest quality remaining old-growth forest communities on state-administered lands. DNR old-growth policy allows for the establishment of old-growth in other lowland forest types including black spruce, tamarack and cedar. A process to identify and designate old growth lowland conifers (LCOG) is currently underway. This process is not finalized or available for inclusion in the current NSU Assessment.

Old-growth forest stands are defined by age, structural characteristics, size, landscape context, and degree of human disturbance. These forests are essentially free from recent catastrophic disturbances and contain old trees (>120 years old generally), snags, and downed trees. DNR old-growth identification methods distinguish between two types of old-growth forest: Type I (primary, natural origin forest without any evidence of timber harvest) and Type II (forests >120 years old but with evidence of some past timber harvest).

Old-growth forest represents the latter stages of succession in forested ecosystems. Remaining old-growth forests are important for their scientific and educational values, as well as their aesthetic and spiritual appeal. Old-growth forests provide special habitats for native plants, important features for wildlife, and examples of the maximum limits of individual tree and stand production. Because old-growth forests developed for a long time without catastrophic disturbance, the study of plants, animals, soils and ecosystem processes in old-growth forests provides important insights into the natural function of these forests. Such insights can be crucial for understanding the influences of management on forest systems (i.e. reference sites) and for biodiversity conservation.

The original DNR old-growth designations occurred between 1994 and about 2003. DNR old-growth policy allows for adding to the designated pool of stands and delisting existing designated stands. To-date there have been very few adjustments to the old-growth network since the original designation process was completed. However, DNR staff in the Northeast Region are currently reviewing a number of nominations for addition to the old-growth network along with a number of nominations to delist existing designated stands. DNR intends to complete this process within the planning timeframe of the NSU SFRMP.

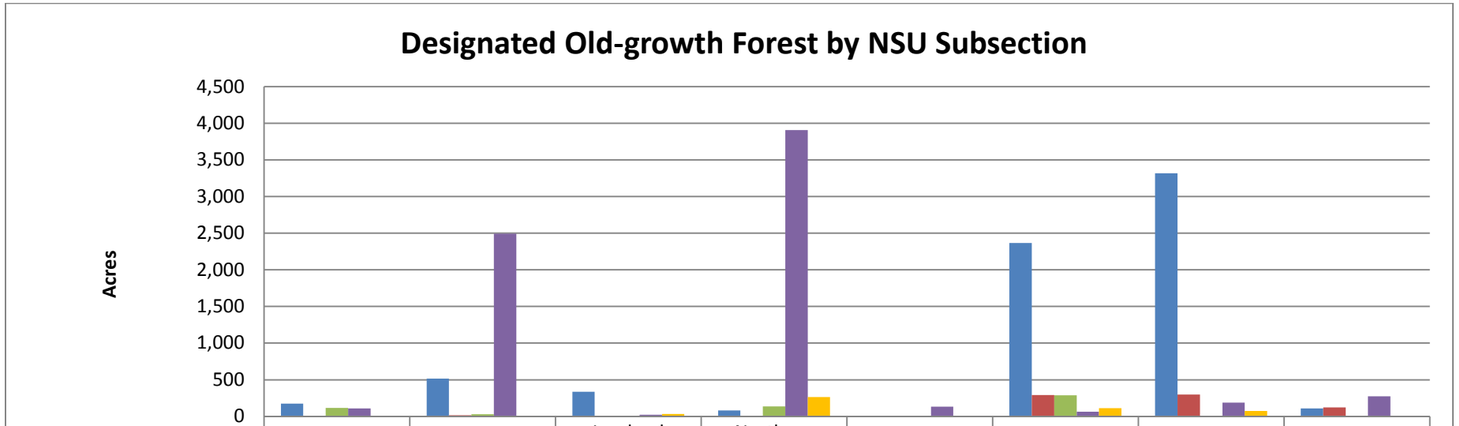
Table 4.27. Designated old-growth forest by NSU subsection

Columns in this table show acres of designated old-growth forest by forest cover type on DNR lands in the Northern Superior Uplands subsections covered in this plan. The total number of acres of designated old-growth forest is 15,890. The largest number of acres is in the northern hardwoods cover type.

	Designated Old-Growth Forest by NSU Subsection					
Covertype	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
Ash	173	0	116	110	0	399
Cedar	516	17	30	2,494	7	3,064
Lowland Hardwoods	338	0	0	24	34	396
Northern Hardwoods	81	0	137	3,909	264	4,391
Oak	0	0	0	132	0	132
Red Pine	2,367	293	287	63	113	3,123
White Pine	3,317	297	0	189	76	3,879
White Spruce	110	123	0	273	0	506
Total	**6,902**	**730**	**570**	**7,194**	**494**	**15,890**

Figure 4.27. Designated old-growth forest by NSU Subsection

This chart is a graphical representation of data in the previous table. Chart bars for each of the five subsections are grouped by forest cover type to show acres by cover type and subsection.



	Ash	Cedar	Lowland Hardwoods	Northern Hardwoods	Oak	Red Pine	White Pine	White Spruce
Border Lakes	173	516	338	81	0	2,367	3,317	110
Laurentian Uplands	0	17	0	0	0	293	297	123
Nashwauk Uplands	116	30	0	137	0	287	0	0
North Shore Highlands	110	2,494	24	3,909	132	63	189	273
Toimi Uplands	0	7	34	264	0	113	76	0

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 5: Forest Products Harvest

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Northern Northern Superior Uplands Section Forest Resources Management Plan* website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
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Contents

Forest Products Harvest from DNR-Administered Land in the Northern Superior Uplands Section

The sales of forest products from land administered by the Minnesota Department of Natural Resources (DNR) are collected by the Timber Sales Unit of the Forestry Division. These data provide a historical view of trends in sales and value of forest products over time.

Table 5.1 Timber acres sold by subsection for fiscal years 2008-2013

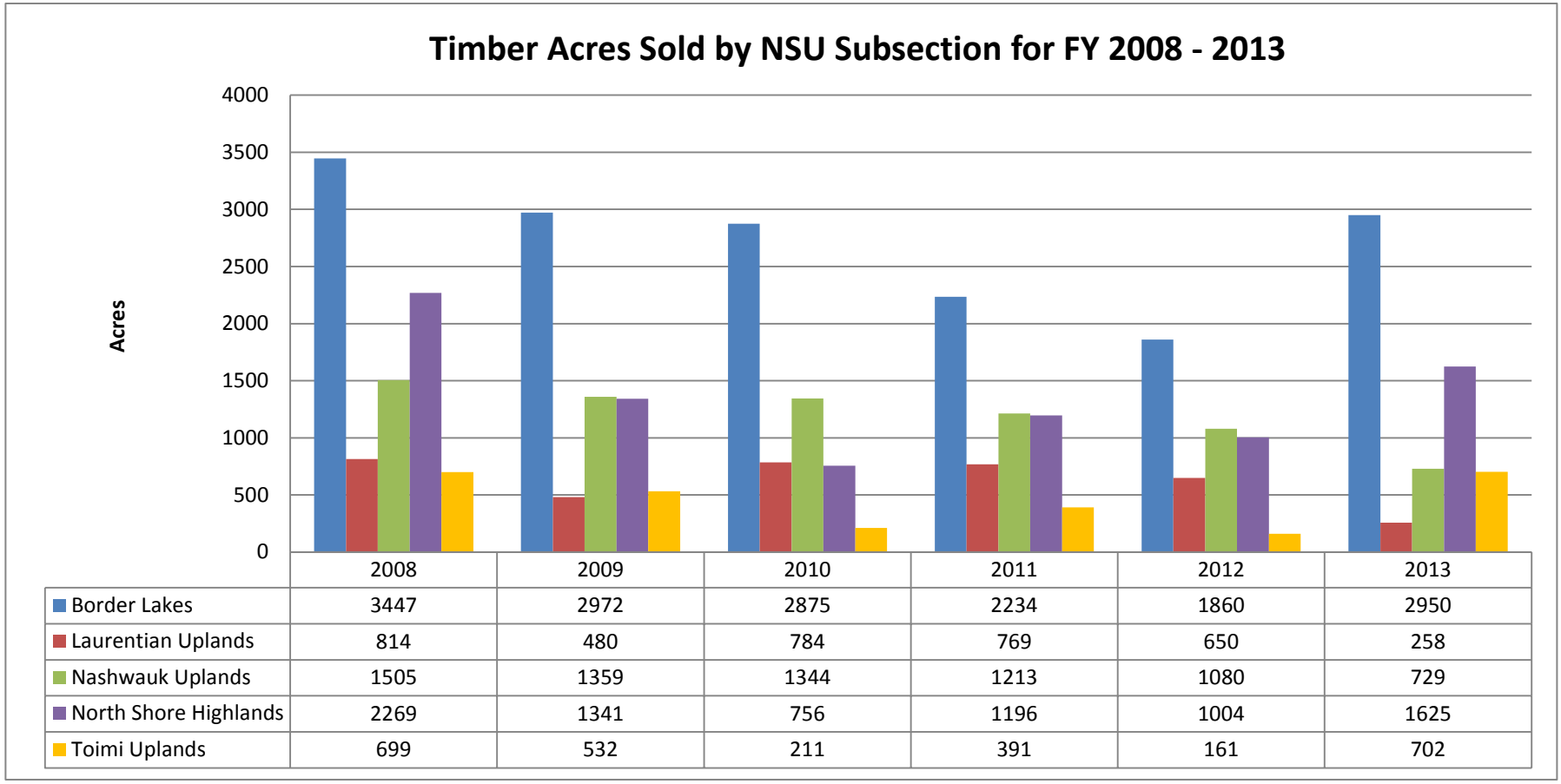
The first column lists the years 2008 to 2013; remaining columns display the acreage of timberland sold for each subsection. The average acreage for the NSU Section for these years is 5,919 acres.

	Timber Acres Sold by NSU Subsection for FY 2008 - 2013					
FY	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
2008	3,447	814	1,505	2,269	699	8,035
2009	2,972	480	1,359	1,341	532	6,152
2010	2,875	784	1,344	756	211	5,759
2011	2,234	769	1,213	1,196	391	5,412
2012	1,860	650	1,080	1,004	161	4,594
2013	2,950	258	729	1,625	702	5,562
Avg.	*2,723*	*626*	*1,205*	*1,365*	*449*	*5,919*

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.1. Annual harvest of timber from DNR lands in acres

One reason for differences in yearly harvest level is the variation in timber markets and the resulting amount sold each fiscal year (i.e. July 1–June 30). An average of 5,919 acres per year was sold from DNR lands in the NSU Subsections during FY 2008-2013.



	2008	2009	2010	2011	2012	2013
Border Lakes	3447	2972	2875	2234	1860	2950
Laurentian Uplands	814	480	784	769	650	258
Nashwauk Uplands	1505	1359	1344	1213	1080	729
North Shore Highlands	2269	1341	756	1196	1004	1625
Toimi Uplands	699	532	211	391	161	702

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.2. Volume in cord equivalents of timber sold from DNR lands during fiscal years 2008 to 2013

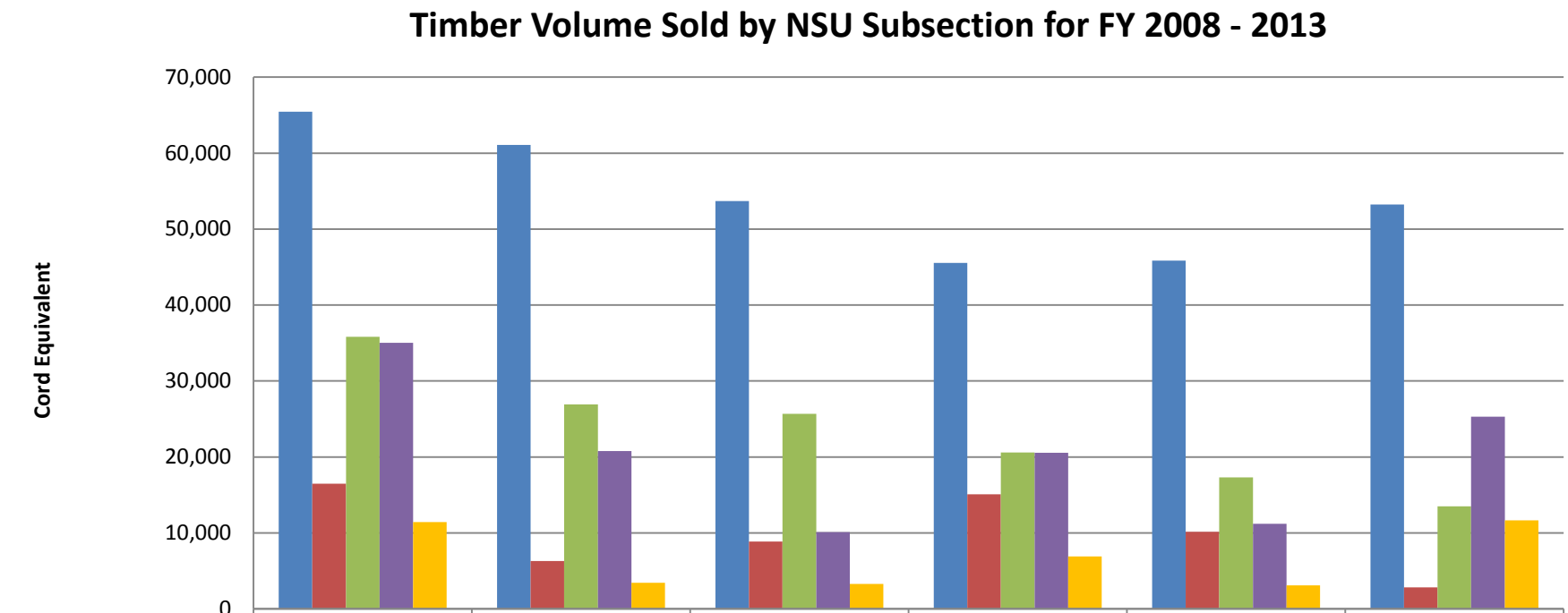
Column headings are the individual subsections making up the planning area and a total for the NSU Section; row headings are fiscal years. There is a totals row with the averages over the six fiscal years by subsection. An average of 114,550 cords per year was sold from DNR lands during FY 2008-2013 in the NSU Subsections combined.

	Timber Volume (cd eq) Sold by NSU Subsection for FY 2008 - 2013					
FY	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
2008	65,443	16,492	35,833	35,029	11,420	164,217
2009	61,060	6,300	26,916	20,794	3,444	118,514
2010	53,703	8,858	25,673	10,125	3,291	101,651
2011	45,556	15,098	20,609	20,566	6,926	108,755
2012	45,861	10,169	17,325	11,206	3,100	87,661
2013	53,237	2,842	13,487	25,288	11,646	106,499
Avg.	*54,143*	*9,960*	*23,307*	*20,502*	*6,638*	*114,550*

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.2 Volume in cord equivalents of timber sold from DNR lands during fiscal years 2008 to 2013

This figure is a chart showing the same data presented in Table 5.2 in graphic form. Each subsection is shown as a separate column for each year.



	2008	2009	2010	2011	2012	2013
Border Lakes	65,443	61,060	53,703	45,556	45,861	53,237
Laurentian Uplands	16,492	6,300	8,858	15,098	10,169	2,842
Nashwauk Uplands	35,833	26,916	25,673	20,609	17,325	13,487
North Shore Highlands	35,029	20,794	10,125	20,566	11,206	25,288
Toimi Uplands	11,420	3,444	3,291	6,926	3,100	11,646

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.3. Stumpage value in dollars of timber sold from DNR lands during fiscal years 2008 to 2013

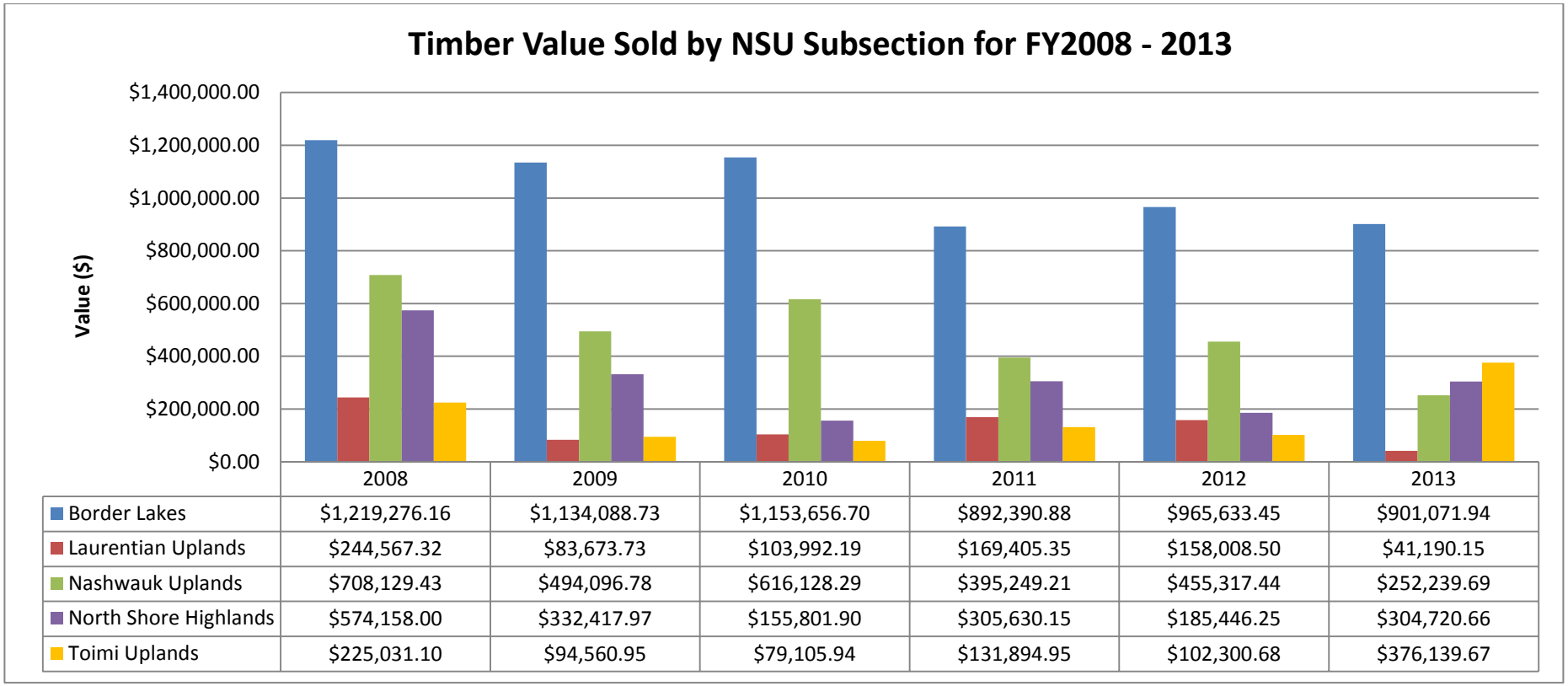
This table shows the stumpage value in dollars of timber sold from DNR lands during fiscal years 2008 to 2013. Column headings are the individual subsections making up the planning area and a total for the NSU Section; row headings are fiscal years. There is a totals row with the averages over the six fiscal years by subsection. An average of $2,142,554.03 per year was sold from DNR lands during FY 2008-2013 in the NSU Subsections combined.

	Timber Value ($) Sold by NSU Subsection for FY 2008 - 2013					
FY	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
2008	$1,219,276.16	$244,567.32	$708,129.43	$574,158.00	$225,031.10	$2,971,162.01
2009	$1,134,088.73	$83,673.73	$494,096.78	$332,417.97	$94,560.95	$2,138,838.16
2010	$1,153,656.70	$103,992.19	$616,128.29	$155,801.90	$79,105.94	$2,108,685.02
2011	$892,390.88	$169,405.35	$395,249.21	$305,630.15	$131,894.95	$1,894,570.54
2012	$965,633.45	$158,008.50	$455,317.44	$185,446.25	$102,300.68	$1,866,706.32
2013	$901,071.94	$41,190.15	$252,239.69	$304,720.66	$376,139.67	$1,875,362.11
Avg.	*$1,044,352.98*	*$133,472.87*	*$486,860.14*	*$309,695.82*	*$168,172.22*	*$2,142,554.03*

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.3. Stumpage value in dollars of timber sold from DNR lands during fiscal years 2008 to 2013

This figure is a chart showing the same data presented in Table 5.3 in graphic form. Each subsection is shown as a separate column for each year.



	2008	2009	2010	2011	2012	2013
Border Lakes	$1,219,276.16	$1,134,088.73	$1,153,656.70	$892,390.88	$965,633.45	$901,071.94
Laurentian Uplands	$244,567.32	$83,673.73	$103,992.19	$169,405.35	$158,008.50	$41,190.15
Nashwauk Uplands	$708,129.43	$494,096.78	$616,128.29	$395,249.21	$455,317.44	$252,239.69
North Shore Highlands	$574,158.00	$332,417.97	$155,801.90	$305,630.15	$185,446.25	$304,720.66
Toimi Uplands	$225,031.10	$94,560.95	$79,105.94	$131,894.95	$102,300.68	$376,139.67

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.4. Volume in cord equivalents of timber harvested from DNR lands during fiscal years 2008 to 2013

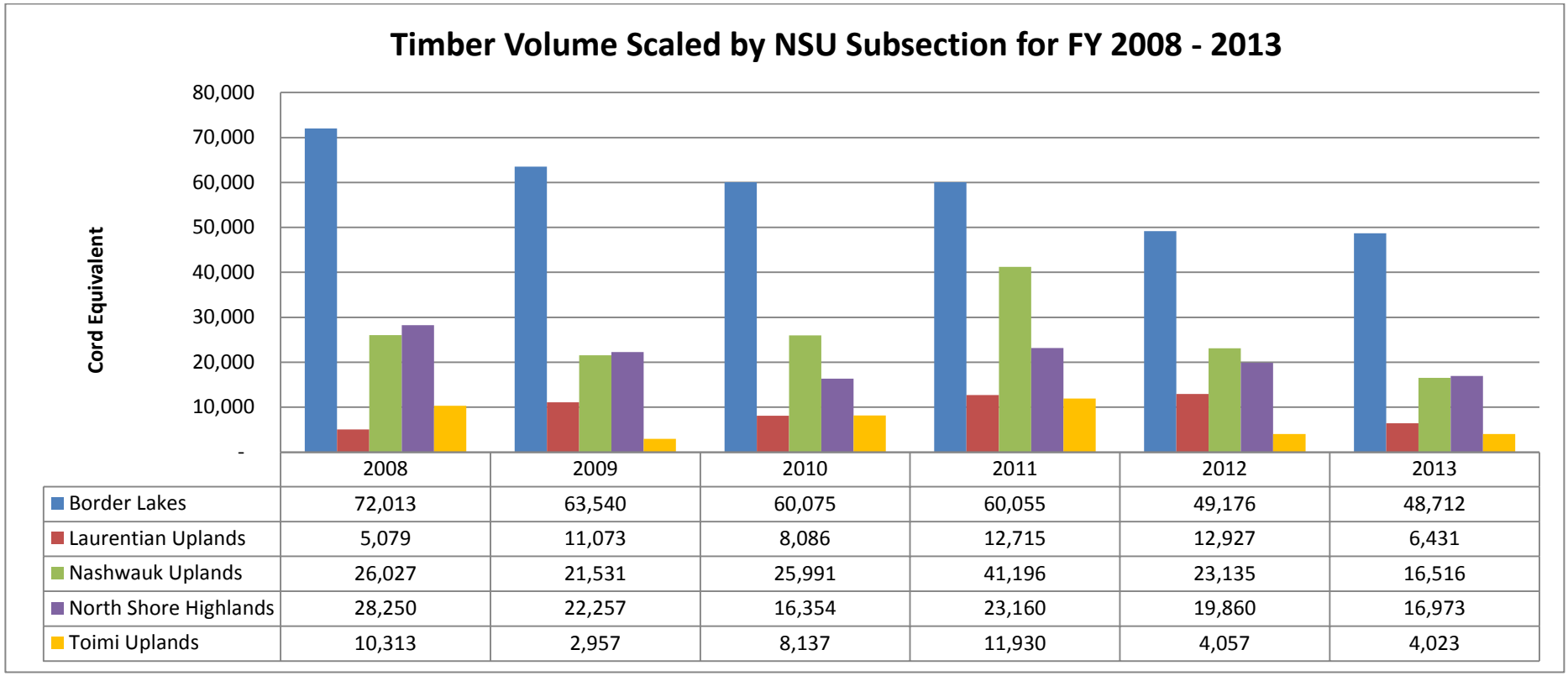
Column headings in this table are the individual subsections making up the planning area and a total for the NSU Section; row headings are fiscal years. There is a totals row with the averages over the six fiscal years by subsection. An average of 122,091 cords per year was harvested from DNR lands during FY 2008-2013 in the NSU subsections combined.

	Timber Volume (cd eq) Scaled by Subsection for FY 2008 - 2013					
FY	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
2008	72,013	5,079	26,027	28,250	10,313	141,683
2009	63,540	11,073	21,531	22,257	2,957	121,358
2010	60,075	8,086	25,991	16,354	8,137	118,643
2011	60,055	12,715	41,196	23,160	11,930	149,055
2012	49,176	12,927	23,135	19,860	4,057	109,154
2013	48,712	6,431	16,516	16,973	4,023	92,654
Avg.	*58,928*	*9,385*	*25,732*	*21,142*	*6,903*	122,091

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.4. Volume in cord equivalents of timber harvested from DNR lands during fiscal years 2008 to 2013

This figure is a chart showing the same data presented in Table 5.4 in graphic form. Each subsection is shown as a separate column for each year.



	2008	2009	2010	2011	2012	2013
Border Lakes	72,013	63,540	60,075	60,055	49,176	48,712
Laurentian Uplands	5,079	11,073	8,086	12,715	12,927	6,431
Nashwauk Uplands	26,027	21,531	25,991	41,196	23,135	16,516
North Shore Highlands	28,250	22,257	16,354	23,160	19,860	16,973
Toimi Uplands	10,313	2,957	8,137	11,930	4,057	4,023

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.5. Average stumpage price paid per cord for timber from DNR lands by fiscal year

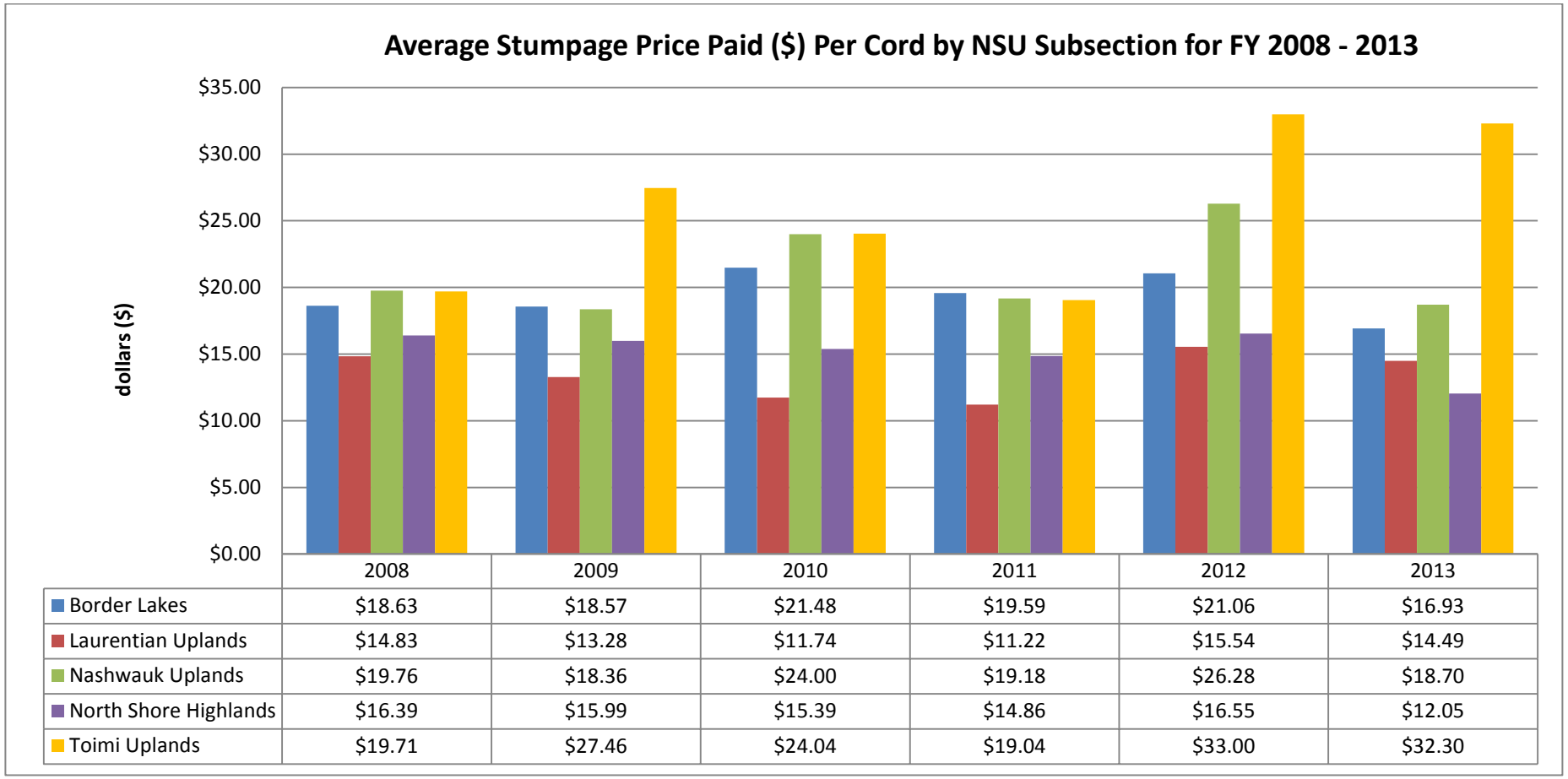
This table shows average stumpage prices; columns are fiscal year (first column); subsection name; and a total column for the NSU subsections combined. Averages for subsections and the Section as a whole are in the bottom row.

	Average Stumpage Price Paid Per Cord by NSU Subsection for FY 2008 - 2013					
FY	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU Total**
2008	$18.63	$14.83	$19.76	$16.39	$19.71	$18.09
2009	$18.57	$13.28	$18.36	$15.99	$27.46	$18.05
2010	$21.48	$11.74	$24.00	$15.39	$24.04	$20.74
2011	$19.59	$11.22	$19.18	$14.86	$19.04	$17.42
2012	$21.06	$15.54	$26.28	$16.55	$33.00	$21.29
2013	$16.93	$14.49	$18.70	$12.05	$32.30	$17.61
Avg.	*$19.29*	*$13.40*	*$20.89*	*$15.11*	*$25.34*	*$18.70*

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.5. Average stumpage price paid per cord for timber from DNR lands by fiscal year

This figure is a chart showing the same data presented in Table 5.5 in graphic form. Each subsection is shown as a separate column for each year.



	2008	2009	2010	2011	2012	2013
Border Lakes	$18.63	$18.57	$21.48	$19.59	$21.06	$16.93
Laurentian Uplands	$14.83	$13.28	$11.74	$11.22	$15.54	$14.49
Nashwauk Uplands	$19.76	$18.36	$24.00	$19.18	$26.28	$18.70
North Shore Highlands	$16.39	$15.99	$15.39	$14.86	$16.55	$12.05
Toimi Uplands	$19.71	$27.46	$24.04	$19.04	$33.00	$32.30

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.6. Average volume of timber sold by species group

This table shows the average fiscal year volume in cords of timber sold by species group from DNR lands in the Northern Superior Uplands. Forest cover types normally consist of a variety of species, while the name of the cover type is based on the predominant species. The DNR bases harvest levels on cover type ***acres***, but timber is sold by tree ***species volume and value***. The following table shows volumes sold by species. During the period of FY 2008 to FY 2013, an average of 110,463 cords was sold per year from DNR forestlands in the Northern Superior Uplands.

Average Fiscal Year Volume (cd) of Timber Sold by Species Group During FY 2008 - 2013 in the Northern Superior Uplands						
Species Group	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Toimi Uplands**	**NSU**
Lowland Hardwoods	176	0	119	55	30	381
Aspen Species	30812	4546	8127	10298	2831	56613
Spruce-Fir Species	8300	2735	3432	4151	1641	20259
Pine Species	5628	611	4664	2172	842	13918
Northern Hardwoods	3116	414	3542	1638	138	8848
Lowland Conifers	5329	1649	916	2053	496	10444
Total	53,361	9,954	20,800	20,368	5,979	110,463

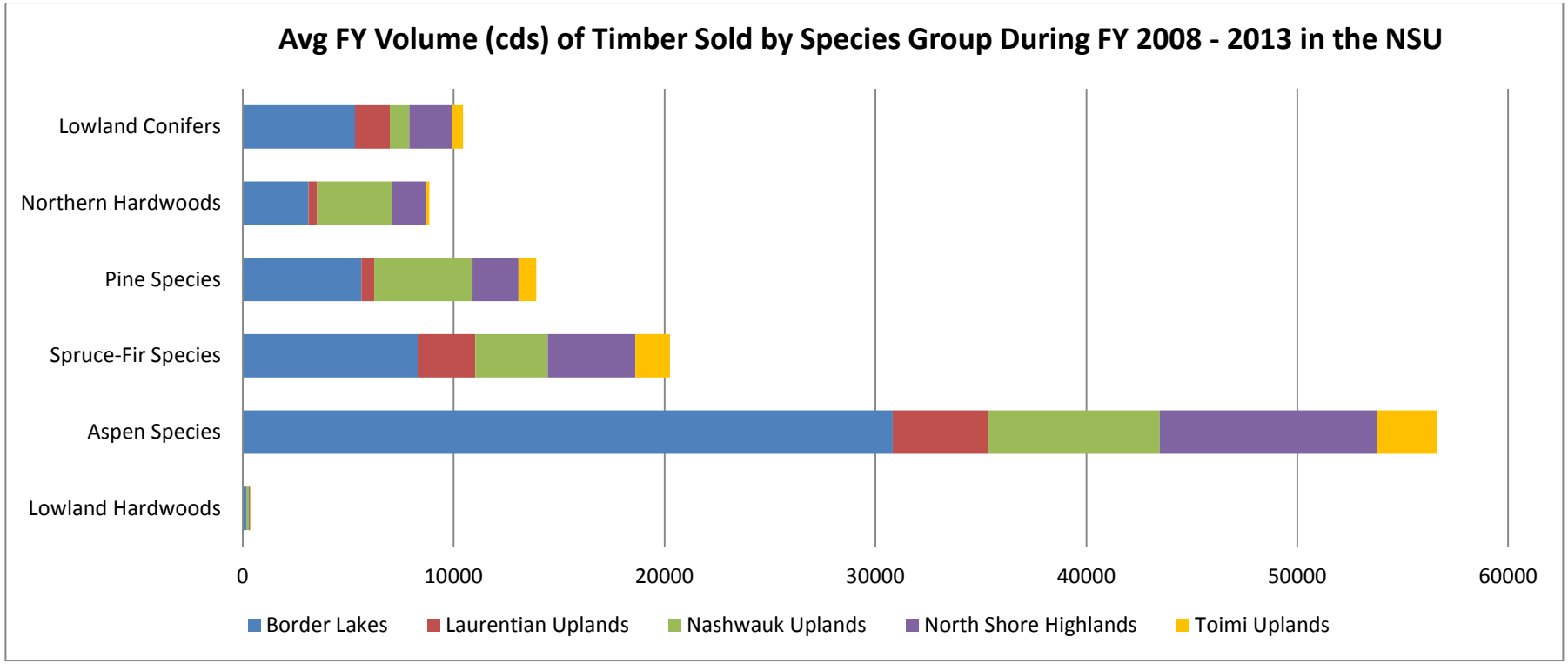
Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Species Groups:

- Lowland Hardwoods includes Ash and Lowland Hardwoods
- Aspen Species includes Trembling Aspen, Largetooth Aspen, Balm of Gilead, Aspen Species, Paper Birch and Yellow Birch
- Spruce-Fir includes White Spruce, Balsam Fir, Mixed Spruce and Spruce-Balsam
- Pine Species includes White Pine, Norway Pine, Jack Pine and Pine Species
- Northern Hardwoods includes Maple Species, Red Maple, Sugar Maple, Basswood and Northern Hardwoods
- Lowland Conifers includes Black Spruce, Tamarack, White Cedar and Lowland Conifers
- *Only those species and products sold under cords or MBF are included.*

Figure 5.6. Average volume of timber sold by species group

This figure is a chart showing the same data presented in Table 5.6 in graphic form. Each subsection is shown as a separate column for each year.



Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Table 5.7. Decorative Trees (Pieces) Sold by Subsection for FY 2009-2013

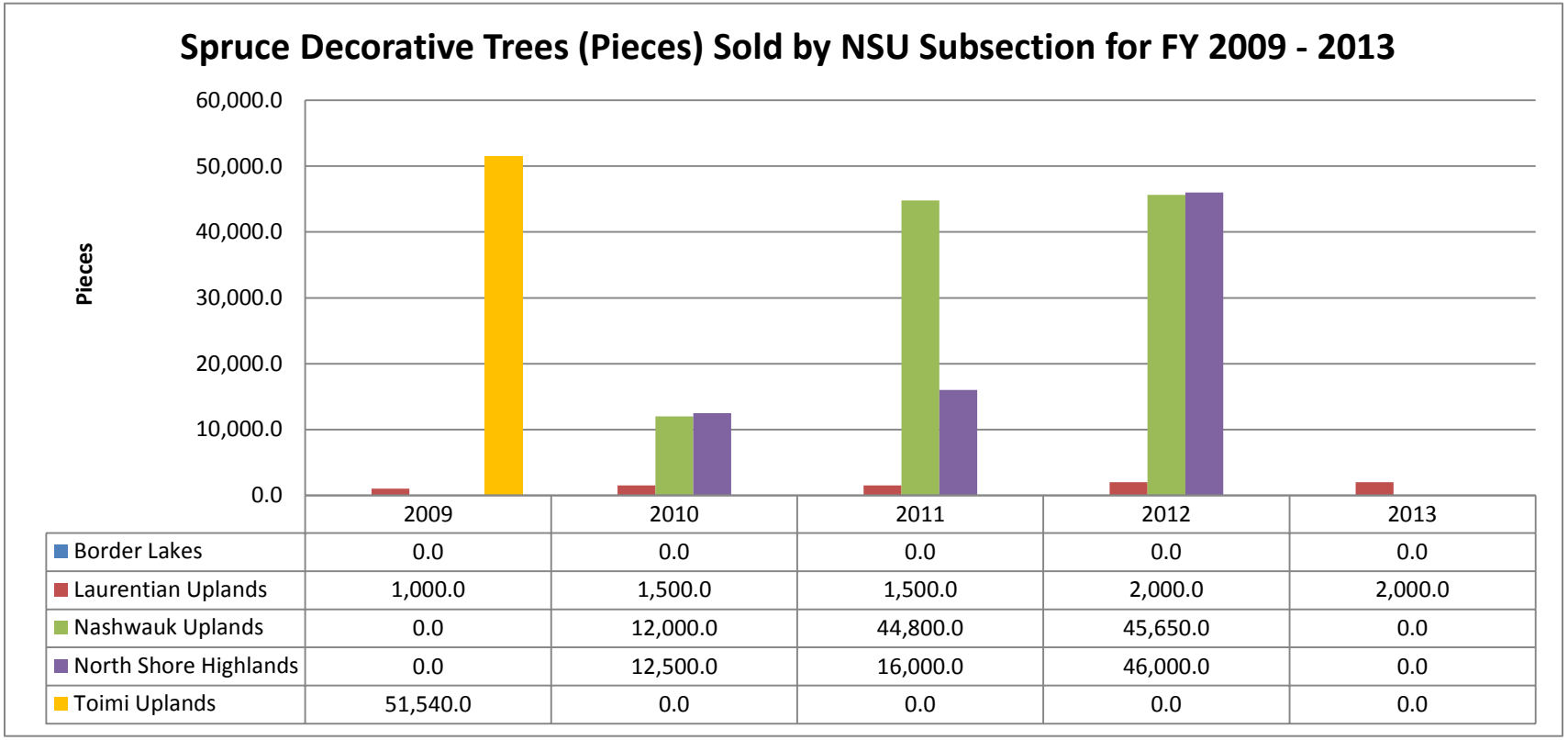
The first column in this table lists the years 2009 to 2013; for each subsection a pair of columns displays the number of pieces harvested and the value in dollars for each year. Averages are given for number of pieces and value in dollars for each subsection. The NSU average for the period is 47,298 pieces, with a value of $10,461.58.

	Black Spruce Decorative Trees (Pieces) and Value ($) Sold by NSU Subsection for FY 2009 - 2013											
FY	Border Lakes		Laurentian Uplands		Nashwauk Uplands		North Shore Highlands		Toimi Uplands		NSU Total	
	Pieces	Value	Pieces	Value	Pieces	Value	Pieces	Value	Pieces	Value	Pieces	Value
2009	0.0	$0.00	1,000.0	$350.00	0.0	$0.00	0.0	$0.00	51,540.0	$10,823.40	52,540.0	$11,173.40
2010	0.0	$0.00	1,500.0	$405.00	12,000.0	$2,160.00	12,500.0	$3,750.00	0.0	$0.00	26,000.0	$6,315.00
2011	0.0	$0.00	1,500.0	$375.00	44,800.0	$8,064.00	16,000.0	$5,120.00	0.0	$0.00	62,300.0	$13,559.00
2012	0.0	$0.00	2,000.0	$540.00	45,650.0	$7,760.50	46,000.0	$12,420.00	0.0	$0.00	93,650.0	$20,720.50
2013	0.0	$0.00	2,000.0	$540.00	0.0	$0.00	0.0	$0.00	0.0	$0.00	2,000.0	$540.00
Avg.	*0.0*	*$0.00*	*1600.0*	*$442.00*	*20490.0*	*$3,596.90*	*14900.0*	*$4,258.00*	*10308.0*	*$2,164.68*	*47,298.0*	*$10,461.58*

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.7. Decorative Trees Sold by NSU Subsection for Fiscal Years 2009-2013

This figure is a chart displaying the same data presented in table 5.7. The number of "pieces" is shown for each subsection. Each subsection is displayed as a column for each fiscal year. The data are also displayed for each subsection below each graphical representation for each fiscal year.

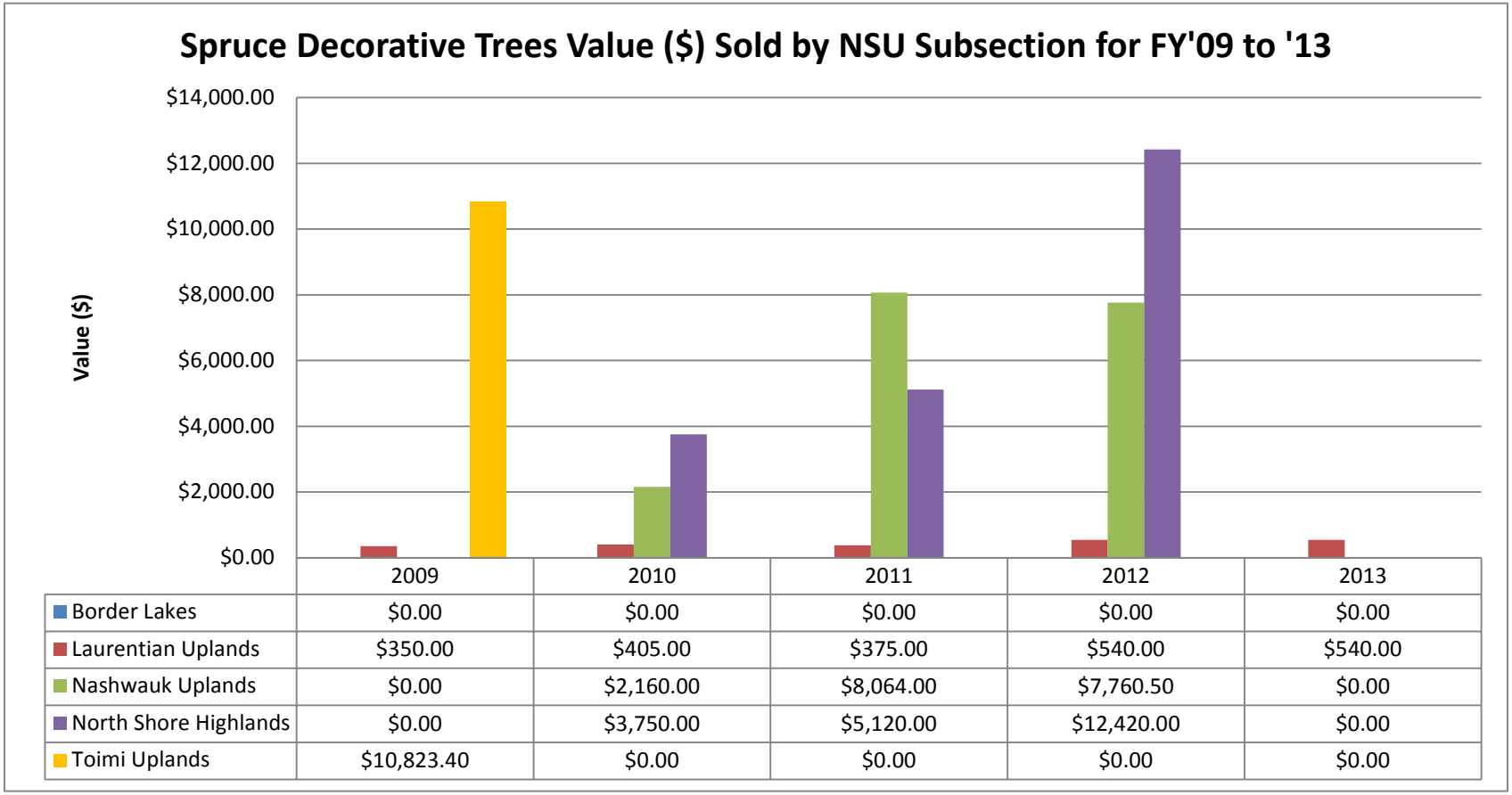


	2009	2010	2011	2012	2013
Border Lakes	0.0	0.0	0.0	0.0	0.0
Laurentian Uplands	1,000.0	1,500.0	1,500.0	2,000.0	2,000.0
Nashwauk Uplands	0.0	12,000.0	44,800.0	45,650.0	0.0
North Shore Highlands	0.0	12,500.0	16,000.0	46,000.0	0.0
Toimi Uplands	51,540.0	0.0	0.0	0.0	0.0

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Figure 5.8. Value of Decorative Trees Sold in NSU Subsections in Fiscal Years 2009-2013

This figure is a chart displaying the same data presented in table 5.7. The value of product sold in dollars is shown for each subsection. Each subsection is displayed as a column for each fiscal year. The data are also displayed for each subsection below each graphical representation for each fiscal year.



	2009	2010	2011	2012	2013
Border Lakes	$0.00	$0.00	$0.00	$0.00	$0.00
Laurentian Uplands	$350.00	$405.00	$375.00	$540.00	$540.00
Nashwauk Uplands	$0.00	$2,160.00	$8,064.00	$7,760.50	$0.00
North Shore Highlands	$0.00	$3,750.00	$5,120.00	$12,420.00	$0.00
Toimi Uplands	$10,823.40	$0.00	$0.00	$0.00	$0.00

Source: Timber Sales Historical Records database, Minnesota DNR, St. Paul

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 6: Ecological Information

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Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Northern Northern Superior Uplands Section Forest Resources Management Plan* website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
Alternative Formats available on request.
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Contents

How graphics are labeled:

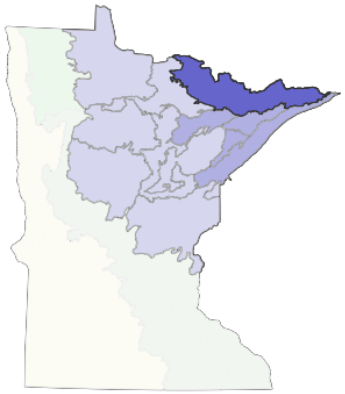
Graphics referring to all five subsections combined (Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, Toimi Uplands) are indicated by a "Northern Superior Uplands" after the chart designation.

Notes relating to this chapter:

Plan documents and color maps may be viewed as PDF files on the Northern Superior Uplands Subsection Forest Resource Management Plan (SFRMP) Web site at: http://www.dnr.state.mn.us/forestry/subsection/nsu/index.html . *Maps in this chapter depict information for an area within a "planning boundary." This boundary is designed to closely approximate the subsection while capturing data summary and planning efficiencies by using survey or jurisdiction lines in some cases.*

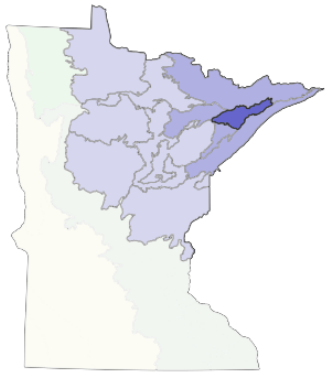
Printed documents will be available for review at the Minnesota DNR Grand Rapids Region Headquarters at 1201 E Hwy 2, Grand Rapids, Minnesota, and on compact disk by request to Lynn Sue Mizner at (218) 429-3022, or lynn.mizner@state.mn.us

Figure 6.1. The Five Subsections That Make Up the Northern Superior Uplands



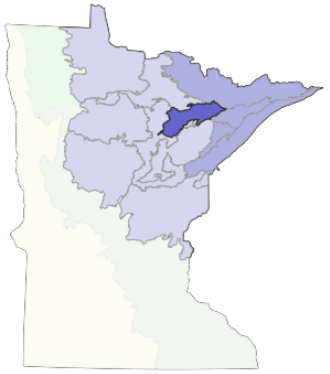
Border Lakes Subsection 212La

A description of the Border Lakes Subsection can be found at http://www.dnr.state.mn.us/ecs/212La/index.html



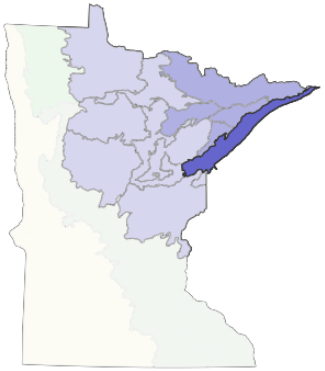
Laurentian Uplands Subsection 212Le

A description of the Laurentian Uplands can be found at http://www.dnr.state.mn.us/ecs/212Le/index.html



Nashwauk Uplands Subsection 212Lc

Information about the Nashwauk Uplands Subsection can be found at http://www.dnr.state.mn.us/ecs/212Lc/index.html



North Shore Highlands 212Lb

Information about the North Shore Highlands Subsection can be found at http://www.dnr.state.mn.us/ecs/212Lb/index.html

Toimi Uplands 212Ld

Information about the Toimi Uplands Subsection can be found at http://www.dnr.state.mn.us/ecs/212Ld/index.html

Land Type Associations

A Land Type Association (LTA) is an area of land with common characteristics such as glacial landform, depth to bedrock, bedrock type, topographic roughness, pre-European settlement vegetation, and surface water features (lakes, streams, and wetlands) or combinations of the above occurring in repeating patterns. LTAs range in size from 10,000 acres to 2,000,000 acres. Descriptions of the LTAs in the NSU Section are included in the appendices to this plan (Chapter 9).

Landform Descriptions

A glossary of the landforms used in the LTA descriptions follows the LTA descriptions in Appendix B in Chapter 9 of this Assessment.

Native Plant Communities of the Northern Superior Uplands

Minnesota's Native Plant Community Classification System

The process of revising the Minnesota Department of Natural Resources' native plant community classification system began in 1996 as a collaborative project among the Division of Ecological Resource's Natural Heritage and Nongame Research Program (NHNRP), the Minnesota County Biological Survey (now Minnesota Biological Survey or MBS), and the Division of Forestry's Ecological Land Classification Program (ELCP). The revised community classification is integrated with the ELCP's ecological land classification of Minnesota and is based on extensive analyses of vegetation plot data. The new classification replaces the plant community classification presented in *Minnesota's Native Vegetation: A Key to Natural Communities, Version 1.5*. The first volume of the new classification*, Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province,* was published in 2003 and includes the Northern Superior Uplands Subsections addressed in this plan. The field keys to Minnesota's forested plant communities contained within this field guide are being used with other ECS and native plant community (NPC) information to assist forest management decisions on state lands. A list of Native Plant Communities with their State Conservation Ranks (S-Ranks) is located in Appendix B of this Assessment.

Classification of Wooded Plant Communities

The delineation of wooded plant communities in the new classification is based on ordination analyses of vegetation plot data (relevé) which are housed in the DNR's Natural Heritage Information System. A total of 2,756 relevés were analyzed to develop the classification of wooded communities. These plot data reflect much of the variation in wooded plant communities across Minnesota, although there are some areas of the state for which few relevés exist. Analyses of the vegetation plot data were organized within the Ecological Classification System. The result is a classification of wooded plant communities that relates vegetation variation to physical features and processes of the landscape. The hierarchy of Minnesota's wooded plant community classification is:

Ecological System (such as Fire-Dependent Forest/Woodland System)
Floristic Region (such as Northern Floristic Region)
Native Plant Community Class (such as Northern Mesic Mixed Forest)
Native Plant Community Type (such as Aspen-Birch Forest, sometimes with subtypes)

Native plant community classifications differ from forest cover type classifications (such as those used in cooperative stand assessment forest inventory) in that they are based on all vascular plant species, not just the dominant canopy tree species.

Endangered, Threatened, and Special Concern Species

Purpose, Scope, and Relationships to State and Federal Laws

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the Minnesota DNR to maintain a list of species that are at risk of disappearing from the State. Listed species are placed into one of three categories in decreasing order of concern: endangered, threatened, and special concern. Minnesota's List of Endangered, Threatened and Special Concern species was first established in 1984 and is periodically updated, with the most recent update effective August 2013. The resulting List of Endangered, Threatened, and Special Concern species is codified as Minnesota Rules, Chapter 6134. Tables 6.1 to 6.4 below provide a summary of rare species occurrences in the NSU.

Minnesota's Endangered Species Statute and the associated rules impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as *endangered* or *threatened*. These regulations are codified as Minnesota Rules, Parts 6212.1800 to 6212.2300. A person may not take, import, transport, or sell any portion of an endangered or threatened species. However, these acts may be allowed 1) by permit issued by the DNR, 2) for exempt plants on certain agricultural lands and plants destroyed in consequence of certain agricultural practices, and 3) for the accidental, unknowing destruction of designated plants. Persons are advised to read the full text of the statute and rules in order to understand all regulations pertaining to species that are designated as endangered, threatened, or species of special concern. For more information see about Minnesota's Endangered, Threatened, and Special Concern species, go to http://www.dnr.state.mn.us/ets/index.html

The federal Endangered Species Act of 1973, as amended (16 USC 1531_1544; see http://www.fws.gov/endangered/laws-policies/index.html) requires the U.S. Department of the Interior to identify species as endangered or threatened according to a set of definitions, and imposes a set of restrictions for those species. This is entirely separate from the State process. Two species that occur in the NSU are on the federal list of endangered or threatened species: Canada lynx and piping plover. Two species that occur in the NSU are currently being proposed to be added to the federal list of endangered or threatened species: northern long-eared bat and rufa red knot (bird). See: http://www.fws.gov/midwest/endangered/lists/minnesot-spp.html for more information about those four Minnesota species.

Minnesota Heritage Information System

The Minnesota DNR Natural Heritage Information System (NHIS) rare features database is the recognized standard in Minnesota for establishing presence or absence of rare species data for specific locations (i.e., environmental review). The NHIS is the primary source for rare species occurrences information

presented in Tables 6.1 to 6.4. These data were supplemented by input and review by Natural Heritage and Nongame Research Program (NHNRP) and Minnesota Biological Survey staff.

DNR Rare Species Guide

The DNR Natural Heritage and Nongame Research Program has created the Rare Species Guide (http://www.dnr.state.mn.us/rsg/index.html) that contains fact sheets on Minnesota's Endangered, Threatened, and Special Concern species. These fact sheets provide information such as life history, habitat use, and management considerations for each species. The Rare Species Guide is both an informational and technological update to the 1988 publication, *Minnesota's Endangered Flora and Fauna,* by Coffin and Pfannmuller. Fact sheets are not yet available for species added to the Endangered, Threatened, and Special Concern list during the list revision in 2013.

Species in Greatest Conservation Need

Minnesota's State Wildlife Action Plan (SWAP) identifies wildlife species that are considered Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats of decline (see http://www.dnr.state.mn.us/cwcs/index.html for SWAP and list of SGCN). The SWAP identifies problems, threats, and opportunities that face SGCN. It develops 10-year objectives for SGCN populations, habitats, and priority research and information needs, and it develops conservation actions that address the 10-year objectives. The information in SWAP is used to form SFRMP recommendations and decisions. The U.S. Congress has mandated that states develop a SWAP (which must be updated every 10 years) to be eligible for federal funding through the State Wildlife Grants program. The DNR is currently revising the SWAP, which will be completed in October 2015. The revised SWAP will be a 10-year operational plan that identifies priority conservation actions and priority conservation areas for SGCN.

NSU Rare Species Occurrences

Table 6.1. Minnesota listed animal species

Columns in this table display listed animal species by scientific name, common name, occurrence by subsection, state rank, and native plant community system in which they occur.

MINNESOTA LISTED SPECIES - ANIMALS								
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands								
		OCCURRENCE[1]						
SCIENTIFIC NAME	COMMON NAME	BL	LU	NU	NSH	TU	MN RANK[2]	NPC SYSTEM[3]
Charadrius melodus	Piping Plover				O		END	LK
Cicindela hirticollis rhodensis	Hairy-necked Tiger Beetle				O		END	LSS
Actinonaias ligamentina	Mucket				O		THR	AR
Chilostigma itascae	Headwaters Chilostigman Caddisfly		O				THR	
Emydoidea blandingii	Blanding's Turtle	O			O		THR	AR, MR, O
Glyptemys insculpta	Wood Turtle		O		O	O	THR	AR, RV, MH, FD
Limnephilus rossi	A Northern Caddisfly				O		THR	
Sterna hirundo	Common Tern	O			O		THR	AL
Accipiter gentilis	Northern Goshawk	O	O	O	O	O	SPC	FD, MH
Acipenser fulvescens	Lake Sturgeon	O			O		SPC	AR, AL
Aegolius funereus	Boreal Owl	O	O		O		SPC	FD, MH, FP, AP
Buteo lineatus	Red-shouldered Hawk				O		SPC	MH, FF, MR
Cicindela denikei	Laurentian Tiger Beetle	O	O				SPC	O
Coregonus kiyi	Kiyi				O		SPC	AL
Coregonus zenithicus	Shortjaw Cisco	O			O		SPC	AL
Coturnicops noveboracensis	Yellow Rail				O		SPC	MR, WM

MINNESOTA LISTED SPECIES - ANIMALS								
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands								
		OCCURRENCE[1]						
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**	**NPC SYSTEM[3]**
Cygnus buccinator	Trumpeter Swan	O	O	O	O		SPC	A
Erebia mancinus	Disa Alpine		O		O	O	SPC	FP
Falco peregrinus	Peregrine Falcon	O		O	O		SPC	CT, LK
Hemidactylium scutatum	Four-toed Salamander				O	O	SPC	MH, FP (shrub swamp)
Ichthyomyzon fossor	Northern Brook Lamprey	O		O			SPC	AR
Lasmigona compressa	Creek Heelsplitter	O	O	O	O	O	SPC	AR
Ligumia recta	Black Sandshell	O	O	O	O	O	SPC	AR
Lycaeides idas nabokovi	Nabokov's Blue	O	O		O	O	SPC	O
Myotis septentrionalis	Northern Long-eared Bat	O			O		SPC	
Ophiogomphus anomalus	Extra-striped Snaketail	O			O		SPC	AR
Oxyethira itascae	A Purse Casemaker Caddisfly				O		SPC	A
Perimyotis subflavus	Tri-colored Bat				O		SPC	
Phenacomys ungava	Eastern Heather Vole	O	O				SPC	
Pyrgus centaureae freija	Grizzled Skipper				O		SPC	
Sorex fumeus	Smoky Shrew	O	O		O		SPC	
Synaptomys borealis	Northern Bog Lemming	O					SPC	AP, OP, FP

Table 6.2 Minnesota "Watchlist" animal species

Columns in this table display species' scientific name, common name, occurrence by subsection, state rank, and native plant community system in which they occur.

MINNESOTA WATCHLIST SPECIES - ANIMALS								
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands								
		OCCURRENCE[1]						
SCIENTIFIC NAME	COMMON NAME	BL	LU	NU	NSH	TU	MN RANK[2]	NPC SYSTEM[3]
Bartramia longicauda	Upland Sandpiper	O					Watchlist	O
Bat Colony	Bat Concentration	O			O		Watchlist	
Botaurus lentiginosus	American Bittern	O	O	O	O		Watchlist	MR, WM
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	O	O	O	O	O	Watchlist	A, MR, WF, FF, LK
Grus canadensis	Sandhill Crane		O		O		Watchlist	MR, WM
Haliaeetus leucocephalus	Bald Eagle	O	O	O	O	O	Watchlist	U
Hydroptila novicola	A Caddisfly	O			O	O	Watchlist	
Microtus chrotorrhinus	Rock Vole	O	O	O	O		Watchlist	FD, MH
Setophaga caerulescens	Black-throated Blue Warbler	O	O	O	O		Watchlist	MH
Strix nebulosa	Great Gray Owl	O	O		O	O	Watchlist	FP, AP, FD

Table 6.3. Minnesota listed plant and fungus species

Columns in this table display species' scientific name, common name, occurrence by subsection and State rank.

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Allium schoenoprasum	wild chives				O	O	END
Astragalus alpinus var. *alpinus*	alpine milk-vetch		O				END
Botrychium ascendens	upswept moonwort			O			END
Botrychium lineare	slender moonwort			O			END
Calamagrostis purpurascens	purple reedgrass	O					END
Caloplaca parvula	a species of lichen	O	O				END
Caltha natans	floating marsh marigold	O	O	O	O	O	END
Carex pallescens	pale sedge			O	O		END
Carex supina ssp. *spaniocarpa*	weak arctic sedge	O					END
Castilleja septentrionalis	northern paintbrush				O		END
Draba cana	hoary whitlow grass	O			O		END
Elodea bifoliata	two leaf waterweed				O		END
Erigeron acris var. *kamtschaticus*	bitter fleabane				O		END
Juncus subtilis	slender rush	O					END
Listera auriculata	auricled twayblade	O	O		O		END
Lobaria scrobiculata	textured lungwort		O				END
Osmorhiza berteroi	Chilean sweet cicely	O			O		END
Oxytropis viscida	sticky locoweed	O					END

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Packera indecora	elegant groundsel	O			O		END
Parmelia stictica	a species of lichen				O		END
Polemonium occidentale ssp. *lacustre*	western Jacob's-ladder			O			END
Potamogeton confervoides	algae-like pondweed	O					END
Potamogeton oakesianus	Oakes' pondweed	O			O		END
Prosartes trachycarpa	rough-fruited fairybells	O					END
Pseudocyphellaria crocata	yellow specklebelly lichen	O	O		O		END
Sagina nodosa ssp. *borealis*	knotty pearlwort				O		END
Saxifraga cernua	nodding saxifrage	O					END
Schistostega pennata	luminous moss	O			O		END
Tofieldia pusilla	small false asphodel				O		END
Tsuga canadensis	eastern hemlock				O		END
Vaccinium uliginosum	alpine bilberry				O		END
Allocetraria oakesiana	yellow ribbon lichen		O		O		THR
Ammophila breviligulata ssp. *breviligulata*	beachgrass				O		THR
Arnica lonchophylla	long-leaved arnica	O			O		THR
Asplenium trichomanes ssp. *trichomanes*	maidenhair spleenwort	O			O		THR
Bistorta vivipara	alpine bistort				O		THR
Boechera retrofracta	Holboell's rock cress	O			O		THR
Botrychium lanceolatum ssp. *angustisegmentum*	narrow triangle moonwort		O	O	O	O	THR

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Botrychium lunaria	common moonwort	O	O		O	O	THR
Botrychium mormo	goblin fern			O	O		THR
Botrychium oneidense	blunt-lobed grapefern	O		O			THR
Callitriche heterophylla	larger water starwort	O			O		THR
Cardamine pratensis	cuckoo flower	O		O			THR
Carex garberi	Garber's sedge				O		THR
Carex novae-angliae	New England sedge		O		O	O	THR
Carex rossii	Ross' sedge	O			O		THR
Crassula aquatica	water pigmyweed	O					THR
Cypripedium arietinum	ram's head orchid	O	O	O	O		THR
Deschampsia flexuosa	slender hair grass				O		THR
Eleocharis flavescens var. *olivacea*	olivaceous spikerush	O					THR
Eleocharis robbinsii	Robbins' spikerush	O					THR
Hudsonia tomentosa	beach heather				O		THR
Huperzia porophila	rock fir moss	O			O		THR
Luzula parviflora	small-flowered woodrush	O	O		O		THR
Moehringia macrophylla	large-leaved sandwort	O			O		THR
Nymphaea leibergii	small white waterlily		O		O		THR
Phacelia franklinii	Franklin's phacelia	O	O		O		THR
Piptatherum canadense	Canadian ricegrass	O	O			O	THR

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Platanthera flava var. *herbiola*	tubercled rein orchid			O			THR
Polystichum braunii	Braun's holly fern	O			O		THR
Protopannaria pezizoides	brown-gray moss-shingle lichen				O		THR
Rubus chamaemorus	cloudberry	O			O	O	THR
Salix pellita	satiny willow				O		THR
Spiranthes casei var. *casei*	Case's ladies' tresses			O			THR
Subularia aquatica ssp. *americana*	awlwort	O	O				THR
Trichocolea tomentella	a species of lungwort				O		THR
Trichophorum clintonii	Clinton's bulrush	O					THR
Utricularia geminiscapa	hidden-fruited bladderwort	O	O				THR
Utricularia resupinata	lavender bladderwort	O	O	O			THR
Viola lanceolata var. *lanceolata*	lance-leaved violet	O			O		THR
Woodsia alpina	alpine woodsia	O			O		THR
Woodsia glabella	smooth woodsia	O			O		THR
Woodsia scopulina ssp. *laurentiana*	Rocky Mountain woodsia	O			O		THR
Adlumia fungosa	Allegheny vine				O		SPC
Ahtiana aurescens	eastern candlewax lichen	O	O	O	O		SPC
Anaptychia crinalis	hanging fringe lichen	O			O		SPC
Arctoparmelia centrifuga	concentric ring lichen		O				SPC
Bidens discoidea	discoid beggarticks	O			O		SPC

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Botrychium acuminatum	tailed grapefern				O		SPC
Botrychium campestre	prairie moonwort		O	O			SPC
Botrychium minganense	Mingan moonwort	O	O	O	O	O	SPC
Botrychium pallidum	pale moonwort	O	O	O	O	O	SPC
Botrychium rugulosum	St. Lawrence grapefern	O	O	O	O	O	SPC
Botrychium simplex	least moonwort	O	O	O	O	O	SPC
Calamagrostis lacustris	narrow reedgrass	O			O		SPC
Carex exilis	coastal sedge		O	O	O		SPC
Carex flava	yellow sedge	O	O		O		SPC
Carex media	intermediate sedge	O	O		O		SPC
Carex michauxiana	Michaux's sedge	O	O		O	O	SPC
Carex ormostachya	necklace sedge	O		O	O	O	SPC
Carex praticola	prairie-dweller sedge	O					SPC
Carex scirpoidea	northern single-spike sedge				O		SPC
Carex xerantica	dry sedge	O					SPC
Cladium mariscoides	twig rush	O					SPC
Cladonia pseudorangiformis	a species of lichen	O	O				SPC
Crataegus douglasii	black hawthorn	O			O		SPC
Draba arabisans	Arabian whitlow grass	O			O		SPC
Drosera anglica	English sundew	O	O	O	O		SPC

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Drosera linearis	linear-leaved sundew		O				SPC
Elatine triandra	three stamened waterwort	O			O		SPC
Eleocharis nitida	neat spikerush	O	O		O	O	SPC
Eleocharis quinqueflora	few-flowered spikerush	O	O	O	O		SPC
Euphrasia hudsoniana var. *ramosior*	Hudson Bay eyebright	O			O		SPC
Fimbristylis autumnalis	autumn fimbry	O	O				SPC
Frullania selwyniana	Selwyn's ear-leaf liverwort		O		O		SPC
Huperzia appalachiana	Appalachian fir moss	O			O		SPC
Juncus stygius var. *americanus*	bog rush	O	O	O	O	O	SPC
Juniperus horizontalis	creeping juniper	O			O		SPC
Listera convallarioides	broad-leaved twayblade				O		SPC
Littorella americana	American shore plantain	O	O	O	O	O	SPC
Malaxis monophyllos var. *brachypoda*	white adder's mouth	O			O		SPC
Menegazzia terebrata	port-hold lichen				O		SPC
Muhlenbergia uniflora	one-flowered muhly	O	O		O		SPC
Myriophyllum heterophyllum	broadleaf water milfoil	O					SPC
Najas gracillima	slender naiad	O		O	O		SPC
Osmorhiza depauperata	blunt-fruited sweet cicely	O			O		SPC
Peltigera venosa	fan lichen	O			O		SPC
Pinguicula vulgaris	butterwort				O		SPC

MINNESOTA LISTED SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	**COMMON NAME**	**BL**	**LU**	**NU**	**NSH**	**TU**	**MN RANK[2]**
Platanthera clavellata	small green wood orchid	O	O	O	O	O	SPC
Poa wolfii	Wolf's bluegrass				O		SPC
Pyrola minor	small shinleaf	O	O	O	O		SPC
Ramalina thrausta	angel's hair lichen		O		O		SPC
Ranunculus lapponicus	Lapland buttercup	O	O	O	O	O	SPC
Rubus vermontanus	Vermont blackberry		O				SPC
Sarcosoma globosum	a species of fungus	O					SPC
Saxifraga paniculata	encrusted saxifrage	O			O		SPC
Shepherdia canadensis	soapberry	O					SPC
Sticta fuliginosa	peppered moon lichen	O	O	O	O	O	SPC
Torreyochloa pallida	Torrey's mannagrass	O	O	O	O	O	SPC
Torreyochloa pallida var. *fernaldii*	Torrey's mannagrass	O	O	O	O	O	SPC
Trisetum spicatum	spike trisetum				O		SPC
Usnea longissima	Methuselah's beard lichen	O	O		O		SPC
Waldsteinia fragarioides var. *fragarioides*	barren strawberry	O	O	O	O	O	SPC
Woodsia oregana ssp. *cathcartiana*	Oregon woodsia	O			O		SPC
Xyris montana	montane yellow-eyed grass	O	O	O	O	O	SPC

Table 6.4. Minnesota "Watchlist" plant and fungus species

Columns in this table display species' scientific name, common name, occurrence by subsection, and State rank.

MINNESOTA WATCHLIST SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	COMMON NAME	BL	LU	NU	NSH	TU	MN RANK[2]
Actaea pachypoda	white baneberry			O	O		Watchlist
Adoxa moschatellina	moschatel				O		Watchlist
Agrostis scabra	rough bentgrass	O			O		Watchlist
Arethusa bulbosa	dragon's mouth	O	O	O	O	O	Watchlist
Artemisia campestris	field sagewort	O			O		Watchlist
Botrychium matricariifolium	matricary grapefern	O	O	O	O	O	Watchlist
Botrychium michiganense	Michigan moonwort	O	O	O	O	O	Watchlist
Carex conoidea	field sedge	O	O				Watchlist
Carex gynandra	nodding sedge	O	O		O		Watchlist
Carex woodii	Wood's sedge				O		Watchlist
Ceratophyllum echinatum	spiny coontail	O			O		Watchlist
Claytonia caroliniana	Carolina spring beauty	O	O		O	O	Watchlist
Cystopteris laurentiana	hybrid bladder fern				O		Watchlist
Geocaulon lividum	northern comandra	O	O		O		Watchlist
Huperzia x bartleyi	Bartley's clubmoss				O		Watchlist
Hypericum kalmianum	Kalm's St. John's-wort	O	O				Watchlist
Liparis liliifolia	lily-leaved twayblade			O			Watchlist
Lobaria quercizans	smooth lungwort	O	O	O	O	O	Watchlist
Myriophyllum tenellum	leafless water milfoil	O	O	O	O	O	Watchlist

MINNESOTA WATCHLIST SPECIES - PLANTS & FUNGI							
Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands Subsections							
		OCCURRENCE[1]					
SCIENTIFIC NAME	COMMON NAME	BL	LU	NU	NSH	TU	MN RANK[2]
Potamogeton vaseyi	Vasey's pondweed	O	O	O	O	O	Watchlist
Ranunculus gmelinii	small yellow water crowfoot	O	O	O	O	O	Watchlist
Rhynchospora fusca	sooty-colored beak rush	O	O	O	O	O	Watchlist
Sagittaria graminea	grass-like arrowhead	O					Watchlist
Scirpus georgianus	Georgia bulrush	O					Watchlist
Scirpus pedicellatus	woolgrass	O	O	O	O	O	Watchlist
Sparganium glomeratum	clustered bur-reed	O	O	O	O	O	Watchlist
Splachnum ampullaceum	a species of moss	O	O				Watchlist
Tetraplodon angustatus	a species of dung moss	O					Watchlist
Thalictrum revolutum	purple meadow-rue	O					Watchlist
Tomenthypnum falcifolium	curved-leaved golden moss		O				Watchlist
Triglochin palustris	marsh arrowgrass			O			Watchlist
Utricularia gibba	humped bladderwort	O	O	O	O	O	Watchlist
Vitis riparia	wild grape	O					Watchlist

Key to Rare Features Codes In Tables 6.1 to 6.4

[1]Occurrence

O – Documented occurrence in the subsection

[2]MN Rank

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

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

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

Watchlist – Plant or animal species with no legal status, but for which data are being compiled in the Natural Heritage Information System because the species falls into one of the following categories:

The species is being considered for addition to the state list.

The species was removed from the state list but records for the species are still entered and maintained as a precautionary measure.

The species has been recently discovered in the state.

The species is presumed extirpated from the state.

[3]NPC (Native Plant Community) System

Most of the following codes were adapted from native plant community systems in *Field Guide to the Native Plant Communities of Minnesota: the Laurentian Mixed Forest Province*. Exceptions to this, created for the NSU SFRMP and not part of the field guide, include A, AL, AR, LSS, U, and O.

A – Aquatic general **AL** – Aquatic (lake) **AP** – Acid peatland (includes open bogs) **AR** – Aquatic (river) **CT** – Cliff (includes both forested and open) **FD** – Fire dependent forest **FF** – Floodplain forest **FP** – Forested/treed peatland (includes both rich and acid forested/treed peatlands) **LK** – Lakeshore **LSS** – Lake Superior Shore	**MH** – Mesic hardwood forest **MR** – Marsh **O** – Openings (natural and anthropogenic) **OP** – Open rich peatland (includes rich fens) **RV** – River shore **U** – Wide-ranging and/or associated with a wide variety of habitats **WF** – Wet forest **WM** – Wet meadow/carr (patchy graminoid and deciduous shrub on permanently wet, organic soil.)

Minnesota Rare Species Data Copyright and Limitations

current as of February 2014. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present. In addition, there may be inaccuracies in the data, of which the DNR is not aware and shall not be held responsible for. Permission to use these data does not imply endorsement or approval by the DNR of any interpretations or products derived from the data.

Sources for Additional Rare Species Information

The Nature Conservancy. *Element Occurrence Abstracts*

NatureServe. A network connecting science with conservation that includes an online encyclopedia of rare plants and animals. http://www.natureserve.org/

U.S. Department of Agriculture – Forest Service Region 9. Regional Forester *Sensitive Species Conservation Assessment Documents*

Coffin B. and L. Pfannmuller, eds. 1988. *Minnesota's Endangered Flora and Fauna.* University of Minnesota Press, Minneapolis, Minnesota. 473 pp.

MN DNR. 2003. *Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province.* Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. MN DNR St. Paul, MN. 352 pp.

Minnesota Biological Survey

The Minnesota Biological Survey (MBS) systematically collects information on the distribution and ecology of rare plants, rare animals, native plant communities, and functional landscapes. MBS fieldwork has been completed in some counties and is in progress in other counties and regions within the NSU subsections. See Table 6.5 below for the status of the MBS in the NSU subsections. The SFRMP team will use MBS survey information available in the DNR NHIS database, the DNR data deli, and from other sources. Where MBS survey work is in progress, the SFRMP team will incorporate information into the planning process as it becomes available.

Information on MBS site delineation process and survey procedures can be found on the MBS website at http://www.dnr.state.mn.us/mbs/index.html.

Table 6.5. Status of MBS field surveys and data management in the NSU subsections

Columns in this table display status of field surveys, rare plant data, rare animal data, relevé data, preliminary sites, final sites, and site ranks by county and subsection.

County/Subsection	Field Surveys	Rare Plant Data	Rare Animal Data	Relevé Data	Preliminary Sites	Final Sites	Site Ranking
Border Lakes Subsection - Cook County		<		<		<	<
Border Lakes Subsection - Lake County		<		<		<	<
Border Lakes Subsection - St. Louis County	>>	>>		>>			
Carlton County							
Itasca County							
Koochiching County	>>	>>		>>			
Laurentian Uplands Subsection							
Nashwauk Uplands Subsection							
North Shore Highlands Subsection							
Toimi Uplands Subsection							

Legend for Table 6.5
Work Complete
Work Continuing
< Moderate amount of work to complete
>> Significant amount of work to complete
Work Initiated

Contact: Carmen Converse, **carmen.converse@dnr.state.mn.us,** (651) 296-9782
DNR Data Deli–Department of Natural Resources Data Deli (http://deli.dnr.state.mn.us/)

Special Management Areas

Representative Sample Area (RSA)

Representative Sample Areas (RSA) are required under Forest Stewardship Council (FSC) certification standards. RSAs are ecologically viable examples of native plant community types designated to maintain an ecological reference condition for managed NPC types. Management activities within RSAs must maintain or enhance the ecological condition of the NPC for which the RSA was identified. More information on RSAs can be found in Appendix E in Chapter 9 of this Assessment.

Table 6.6. Representative Sample Areas in the NSU subsections

Columns in this table display subsection, RSA name, acres, NPC type name, NPC Identification number, and State rank.

Subsection	Name	Acres	NPC Type Name	NPC ID	S-rank
North Shore Highlands					
	Cloquet River FDn32d	10.8	Jack Pine - Black Spruce Woodland (Sand)	FDn32d	S2
	Horseshoe Bay	39.8	Spruce - Fir Woodland (North Shore)	FDn32e	S1
	Little Cloquet River FFn57a	TBD	Black Ash - Silver Maple Terrace Forest	FFn57a	S3
Laurentian Uplands					
	Stony Lake	7.7	Jack Pine - Black Spruce Woodland (Sand)	FDn32d	S2

High Conservation Value Forests (HCVF)

High Conservation Value Forests (HCVF) are required under Forest Stewardship Council (FSC) certification standards. HCVFs are broadly defined as areas of outstanding biological or cultural significance. Management activities within HCVFs must maintain or enhance the high conservation values for which the HCVF was identified. DNR HCVFs are in a currently in a candidate status as HCVFs are currently being reviewed by stakeholders prior to final DNR HCVF designation. More information on HCVF can be found at http://www.dnr.state.mn.us/forestry/certification/hcvf.html.

Table 6.7. HCVF in the NSU subsections

Columns in this table display the NSU subsection names, the candidate HCVF names, and the total acreage on all ownerships for each unit.

Subsection	Candidate High Conservation Value Forest	Total Acres (All Ownerships)
Laurentian Uplands	Headwaters	12,525
	Spur End Fen - Osier Creek Lowland Conifers	7,841
	Temperance Pines	2,304
North Shore Highlands		
	Cloquet River Pequaywan	5,684
	Lookout - Egge Hardwood Ridges	1,683
	Lookout Mt. Ridge	712
	Lower Beaver - Fault Line Ridges	989
	Ninemile - Moose - Crooked Lakes and Ridges	1,830
	Onion River Hardwoods	738
	Poplar Agnes	784
	Swamp Lake - Andy Lake Hardwoods	5,390

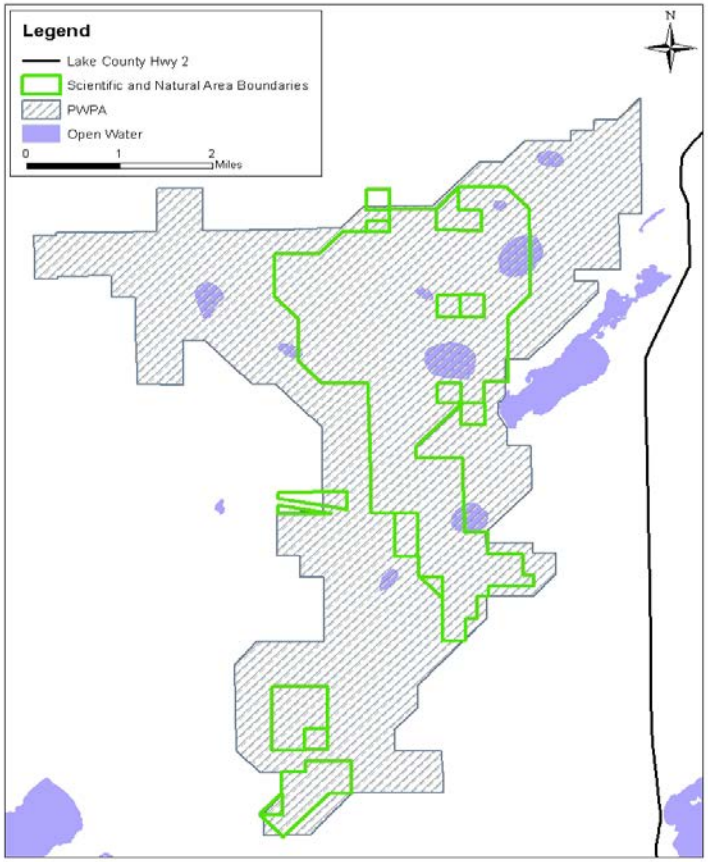
Peatland Watershed Protection Areas

Peatland Scientific and Natural Areas (SNA) and their associated Peatland Watershed Protection Areas (PWPA) were delineated by a Task Force on Peatlands of Special Interest, as described in the 1984 *Recommendations for the Protection of Ecologically Significant Peatlands in Minnesota*. More information can be found in Minnesota State Statues 84.035 and 84.036 and in DNR Rules 6132.200 and 6131.0100. The SFRMP process will not address the management of DNR lands within the boundaries of SNAs; however, it will address the management of PWPAs.

Because of the intimate interdependence between peatland features and the surrounding hydrologic regime, the Task Force on Peatlands of Special Interest recommended a two-level management approach. The processes that perpetuate the peatland ecosystem, as well as plant communities and rare species, are extremely sensitive to changes in water levels and water chemistry. Accordingly, adequate protection of significant peatland features requires

two types of protection. First, the peatland features must be protected directly from onsite physical disturbance. Second, the hydrology of the surrounding peatland area must be sufficiently protected in order to maintain the ecological integrity of the features under special protection. To accommodate this two-level approach, the Task Force defined two management zones; a core preservation zone (the designated peatland SNA) and a peatland watershed protection zone (the PWPA).

Figure 6.1. Map of the Sand Lake Peatland SNA and PWPA



The PWPA is the buffer surrounding the SNA required to maintain the ecological integrity of the SNA. Management in this area should be restricted to those activities unlikely to have a hydrologic impact on the SNA. General recommendations for timber harvest within the PWPA are as follows:

a. Winter harvest only unless silvicultural and ecological requirements dictate otherwise.

b. Standard review procedures (DNR Forest Coordination Framework) apply.

c. No over-the-counter sales or annual plan additions without interdisciplinary review.

d. Strongly discourage creation of new routes where existing routes are present. All winter roads will follow site-level guidelines whether existing or new.

e. Manage for science-based best practices for native plant communities.

f. Consider hydrology in decision making. For example, conduct ecological classification (ECS) on all stands within the WPA being proposed for any action.

The only PWPA in the NSU surrounds the Sand Lake Peatland SNA in the Laurentian Uplands subsection. The PWPA encompasses 13,845 acres.

G1-G2 Native Plant Communities (G1-G2 NPC)

G1-G2 Native Plant Communities (G1-G2 NPC) are ranked as critically imperiled (G1) or imperiled (G2) on a global scale. The protection of viable occurrences of G1-G2 NPCs is required under Sustainable Forestry Initiative (SFI) certification standards. Management activities within G1-G2 NPCs must maintain or enhance the ecological integrity of the NPC. More information on G1-G2 NPCs can be found in Appendix G in Chapter 9, Appendices to this Assessment. MHn45b (White Cedar – Yellow Birch) is the only G1-G2 NPC identified in the NSU subsections.

Table 6.8 G1-G2 NPC (MHn45b) in the NSU subsections

This table lists the three subsections in the NSU that contain the globally imperiled white cedar-yellow birch native plant community; the second and third columns display the number of forest stands and the acreage of each.

Subsection	# of stands	Total Acres
Toimi Uplands	3	20
Laurentian Uplands	8	364
North Shore Highlands	18	259

Management Opportunity Areas

Timber Management Emphasis

Aspen and conifer emphasis areas were delineated in the Border Lakes and North Shore Highlands SFRMPs. A description of their management intent can be found on page A37 of Appendix N from the North Shore SFRMP: http://files.dnr.state.mn.us/forestry/subsection/northshorearea/appendix.pdf

Table 6.9. Timber Management Emphasis Areas in the NSU subsections

The first column in this table lists the North Shore Highlands and Border Lakes subsections; three additional columns list the timber management emphasis areas by name, the number of DNR timber *stands*, and the number of acres in each area, respectively.

Subsection Plan	SMA Name/Code	# of DNR stands	Acres
North Shore Highlands	Aspen Emphasis Areas (AE)	389	8,085
	Conifer Emphasis Areas (CONE)	2,425	43,699
Border Lakes	Conifer Emphasis Areas (CONE)	500	11,692

Wildlife Management Emphasis

Moose and two types of deer habitat management areas (deer yards and general deer management areas) were delineated in the Border Lakes, North Shore, and North 4 SFRMPs. Ruffed grouse management areas were delineated during the same SFRMPs, but have been added to or altered since completion of the plans. A description of the management intent of these wildlife management opportunity areas can be found on page A38 of Appendix N from the North Shore SFRMP: http://files.dnr.state.mn.us/forestry/subsection/northshorearea/appendix.pdf

Table 6.10. Wildlife Management Opportunity Areas in the NSU subsections

The first column in this table lists the North Shore Highlands and Border Lakes subsections, and the North 4 SFRMP area; three additional columns list the wildlife management opportunity areas (formerly called special management areas) by name, the number of DNR timber *stands* in each, and the number of acres in each area.

Subsection Plan	SMA Name/Code	# of DNR stands	Acres
North Shore Highlands	Ruffed Grouse Management Areas (GMAR)	151	7,702*
	Moose Management Areas (MMA)	1,252	21,380
	Deer Management Areas (DMA)	425	10,009
	Deer Management Area, Yard (DMAY)	1	8
Border Lakes	Ruffed Grouse Management Areas (GMAR)*	144	3,655*
	Moose Management Areas (MMA)	20	547
	Deer Management Areas (DMA)	499	9,219
	Deer Management Area, Yard (DMAY)	459	6,753
North 4	Ruffed Grouse Management Areas (GMAR)	269	11,056*

* Includes acres on DNR and non-DNR (e.g. County, USFS) acreage

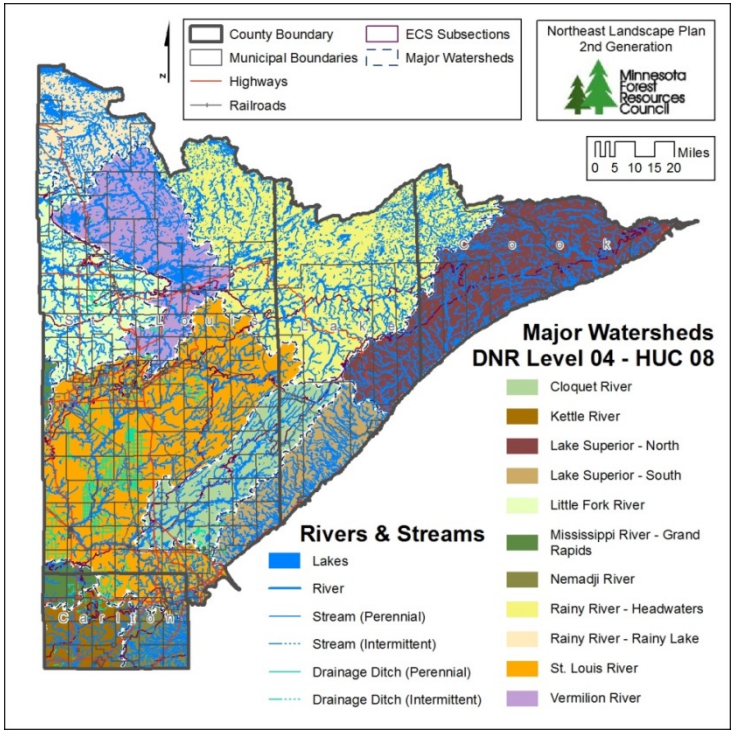
Watershed Assessment

Water quality in lakes and streams

The Northeast Landscape (75 percent of which overlaps the NSU Section) is an area of rich water resources. Water in this region flows north through the Rainy River to Hudson's Bay, east through the Great Lakes to the Atlantic Ocean, and south through the Mississippi River to the Gulf of Mexico These are three of the most important water basins in North America and forestry practices within them can directly affect stream and lake health.

Figure 6.2. Major watersheds in northeastern Minnesota

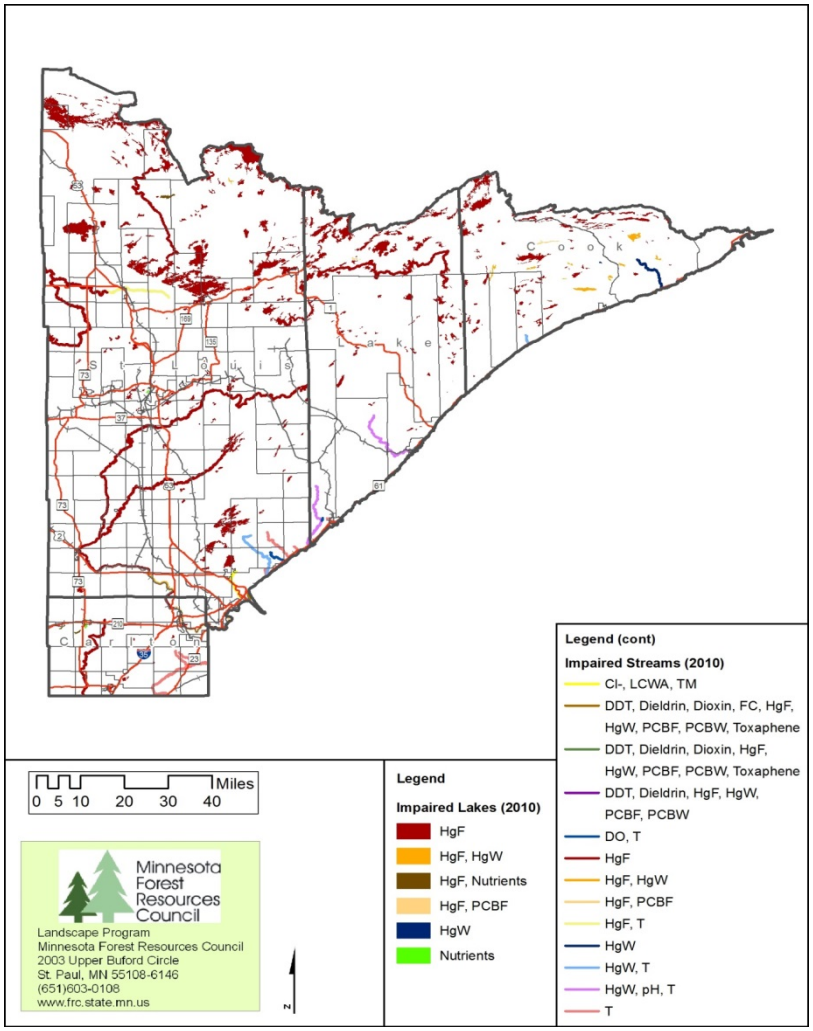
This map from the Minnesota Forest Resources Council Northeast Landscape Plan (2014) displays the major watersheds in the planning area



Minnesota DNR developed the Watershed Health Assessment Framework (WHAF) to provide a comprehensive overview of the ecological health of Minnesota's watersheds. By applying a consistent statewide approach, the WHAF expands understanding of processes and interactions that create healthy and unhealthy responses in Minnesota's watersheds. Health scores are used to provide a baseline for exploring patterns and relationships in emerging health trends. According to Watershed Health Assessment Framework, the waters of northeastern Minnesota are healthier than many other regions of the state; however, all watersheds at the Hydrologic Unit Code (HUC) level 08 have some degree of impairment as do many smaller sub-watersheds and important stream catchments. The Saint Louis River watershed scored lower than the other watersheds in the region

Figure 6.3. Impaired waters in the Northeast Landscape, 2010

This map from the Minnesota Forest Resources Council Northeast Landscape Plan (2014) displays impaired waters in the planning area.



The Minnesota Pollution Control Agency (MPCA) is the state agency responsible for protecting Minnesota's water quality. Water quality standards are fundamental tools that help protect Minnesota's abundant and valuable water resources from pollution. "*Beneficial uses*" are the uses that water resources and their associated aquatic communities provide. Under the federal Clean Water Act, states are required to monitor and assess their waters to determine if they meet water quality standards and thereby support the beneficial uses they are intended to provide. Waters that do not meet their designated uses because of water quality standard violations are impaired. States are then required to develop a list of impaired waters that require Total Maximum Daily Loads (TMDL) studies, and to submit an updated list to the U.S. Environmental Protection Agency every even-numbered year for approval. These studies identify both point and nonpoint sources of each pollutant that fails to meet water quality standards and define how much of the pollutant can be in the surface and/or ground water while still allowing the waterbody to meet its designated uses, such as drinking water, fishing, swimming, irrigation or industrial purposes. Rivers and streams may have several TMDLs, each one determining the limit for a different pollutant. Most of the impaired lakes and streams in the Northeast Landscape are the result of mercury in fish tissue

More information about impaired waters in Minnesota can be found at www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/minnesotas-impaired-waters-and-total-maximum-daily-loads-tmdls.html

In 2008, the MPCA adopted a watershed approach to restoring and protecting

Minnesota's rivers, lakes, and wetlands that complements its work on impaired waters. This watershed approach was recommended by Minnesota's Clean Water Council and directed by the Minnesota Legislature. This approach centers on intensive monitoring of each of Minnesota's 81 major watersheds on a continuous 10-year cycle. A primary product of this effort is the development and application of a Watershed Restoration and Protection Strategy (WRAPS) that contains strategies and actions designed to achieve and maintain water quality standards and goals. Partnerships with state agencies (including DNR) and various local units of government are critically necessary to the development and implementation of the WRAPS. More information about WRAPS can be found at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html

Forest cover and water quality

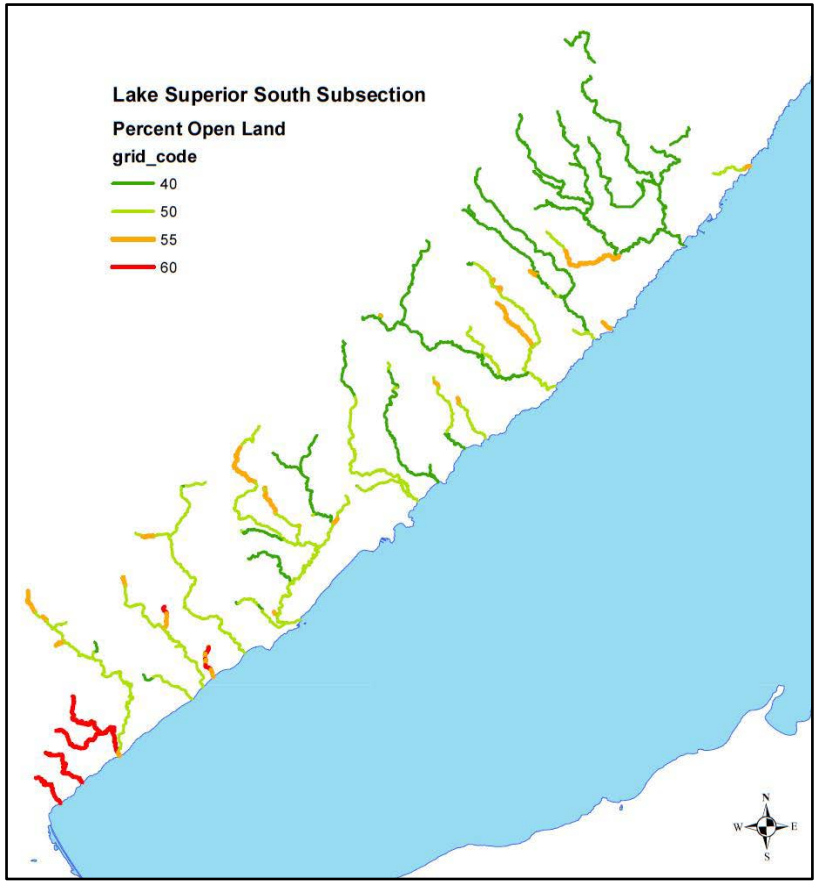
Forestlands can be a great storm filter and are a key component in sustaining high quality water and hydrology. Forests buffer pounding rains and hold soil in place which allows moisture to seep into the ground water and therefore reduce erosion and unwanted runoff. Beyond just having forested cover, the age distribution of forests within a watershed, can have an impact on water quality through effects on peak flows, loss of base flow, sedimentation and erosion, turbidity, nutrient levels, and water temperatures. These effects in turn can impact the health and distribution of fish and invertebrates within the watershed.

Changes in vegetation cover from forestland to farmland or young forest can cause snow to melt faster and allow rainfall to reach streams faster. These changes may not have an impact on peak flows during large flood events, but they do impact smaller peak flow events as well as annual peak flows. These impacts begin to appear as the percentage of open land or young forest within a watershed rises above 60% (Verry, 2000; *Land Fragmentation and Impacts to Streams and Fish in the Central and Upper Midwest*; Society of American Foresters).

Minnesota DNR Fisheries and Ecological & Water Resources and the EPA's Mid-Continent Ecology Division in Duluth have initiated work to identify points within watersheds in the southern portion of the Lake Superior basin that may be at risk due to impacts related to the amount of open land/young forest within the watershed. This work will inform forest management decisions within potentially impacted watersheds and possible outcomes of this use may include reforestation efforts in locations where such work can reduce the percentage of open land/young forest below the impact threshold, and coordination of timber sale activity across land ownerships to avoid increasing the amount of young forests at points within watersheds known to be at or above the impact threshold.

Figure 6.4. Percent open land in southern Lake Superior watersheds

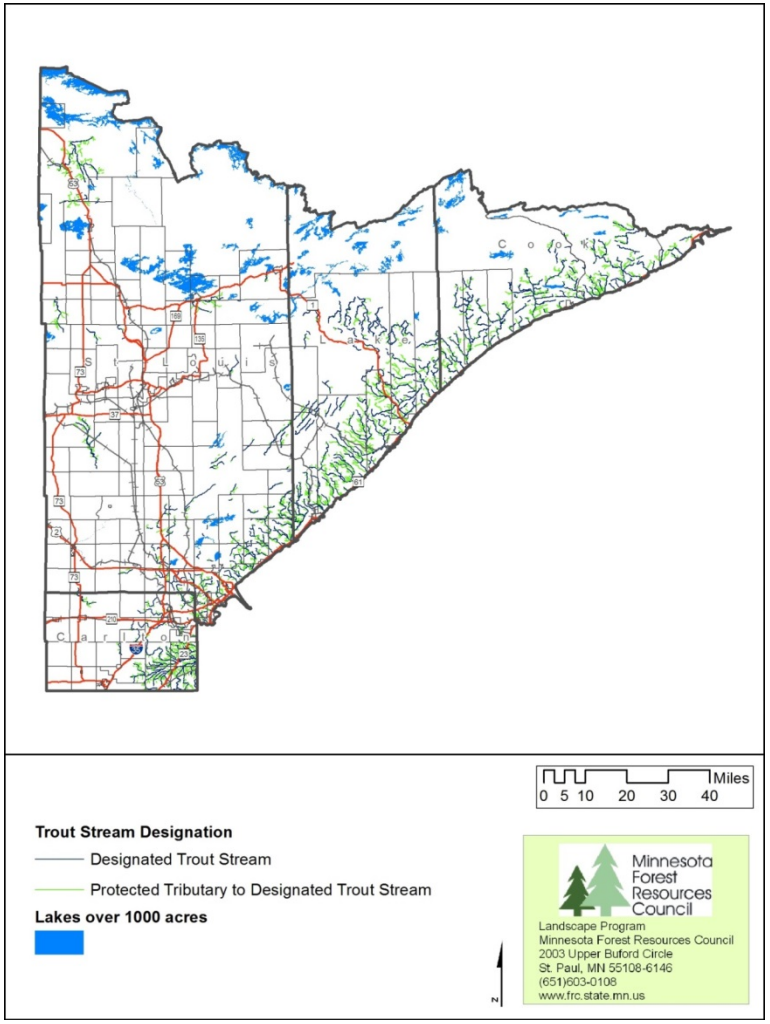
This map is taken from Figure 3.31 in the MFRC NE Landscape Plan Conditions and Trends (2014)



Following appropriate management practices in these riparian areas as outlined in the MFRC Voluntary Site-Level Forest Management Guidelines will contribute to keeping Northeast Minnesota's lakes, rivers, wetlands and fisheries healthy. These healthy forests maintain high quality aquatic systems such as cold water trout streams through shading and water temperature maintenance, erosion and nutrient loading reduction, and providing course woody debris and structural cover. The Northeast Landscape contains 2,153 miles of designated trout streams and an additional 1,270 protected tributaries to designated trout streams (See Figure 6.13).

Figure 6.5. Designated trout streams and protected tributaries in the Northeast Landscape

This map is taken from Figure 3.31 in the MFRC NE Landscape Plan Conditions and Trends (2014).



MFRC Voluntary Site-Level Forest Management Guidelines are available at:

www.frc.state.mn.us/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf

Patch Assessment

There is broad consensus among scientists that managed forest landscapes are more fragmented and contain fewer large patches currently, than landscapes where spatial patterns are determined primarily by natural disturbance and physical factors. It is estimated that the average overall patch size has declined nearly 50 percent since the 1930s in northeastern and north-central Minnesota (Northern Superior Uplands and Drift and Lakes Plains sections).[1,2] Stand selection and treatment as part of the SFRMP process can significantly reduce forest habitat fragmentation and maintain and promote larger patches over time. The best available information on natural spatial patterns in these subsections was used as a guide to understanding the distribution of patch sizes, cover-type groupings, and age classes for patch management on state lands.[3] Although this plan considered management activities on other ownerships, patch management primarily focuses on identifying opportunities that exist on state land.

To guide patch management on state lands, *a **patch** is defined as one or more adjoining stands that is relatively homogenous in structure, primarily in height and density, and is similar in vegetation cover and age*. *A **future patch** is defined as a group of adjoining stands that do not currently meet the patch definition, but that will be managed to enhance patch attributes over time.*

Patches are defined by age, size, and general cover-type grouping; Patch ages are defined as old, intermediate, and young with an age range by category dependent on cover type. Patch sizes range from small (less than 40 acres) to large (greater than 640 acres). Patches may have smaller areas (e.g., 10-15 percent of the patch area) within them that are not in the same patch category as the main patch, such as inclusions, residual islands, legacy patches, corridors, and buffers.

Using Cooperative Stand Assessment (CSA) forest inventory data, the DNR Division of Forestry conducted an initial (current – 2014) patch assessment for state lands in these subsections. Patches were created in a GIS data layer by dissolving common stand boundaries between stands of the same cover-type group and age class. This initial patch assessment information was used as one of the tools for delineating the *current* patches on state lands in these subsections.

[1] Manolis, J. December 2003. *Project Summary: Results from the Minnesota Spatial Analysis and Modeling Project*. Minnesota Forest Resources Council and Minnesota DNR.
[2] MFRC. March 2003. *Recommended Desired Outcomes, Goals, and Strategies: Northeast Landscape Region*. Minnesota Forest Resources Council Landscape Program, Northeast Regional Landscape Committee.

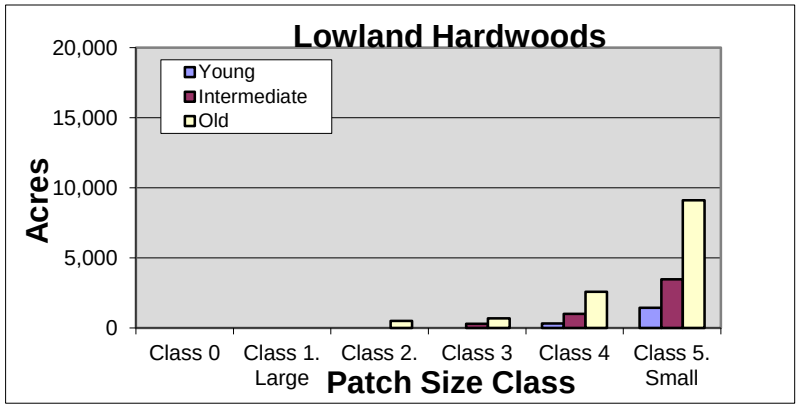
Table 6.11. Patch size groupings for SFRMP

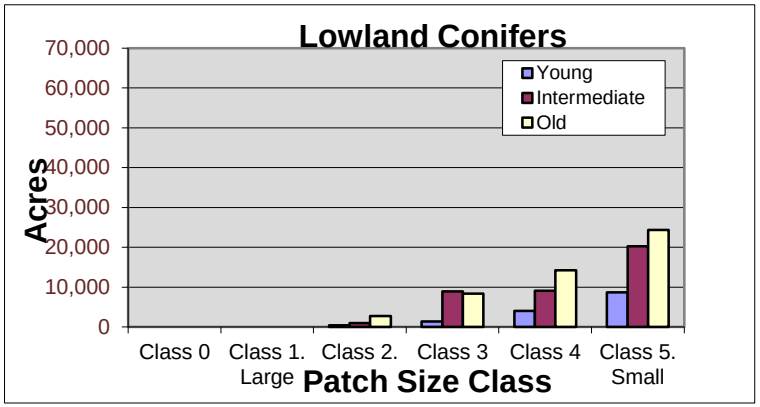
The first column lists the six size classes of patch in SFRMPs, and the second column lists the acreage range for each patch class.

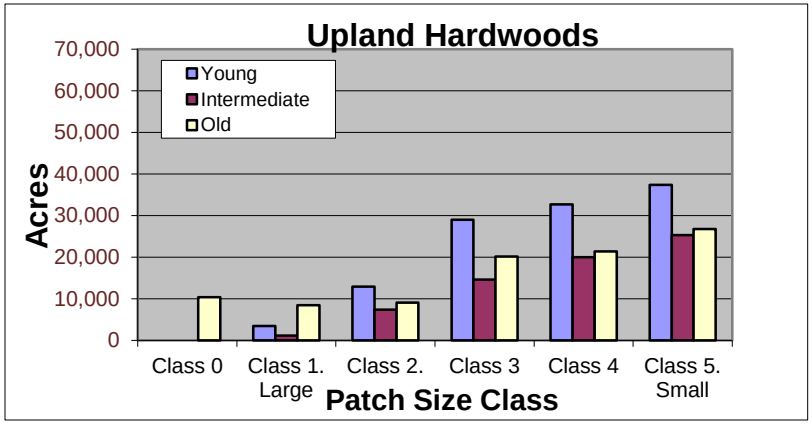
Size Class	Acre Range
Class 0	>1,501
Class 1. Large	641 - 1,500
Class 2.	251 - 640 acres
Class 3	101 - 250 acres
Class 4	41 - 100 acres
Class 5. Small	< 40 acres

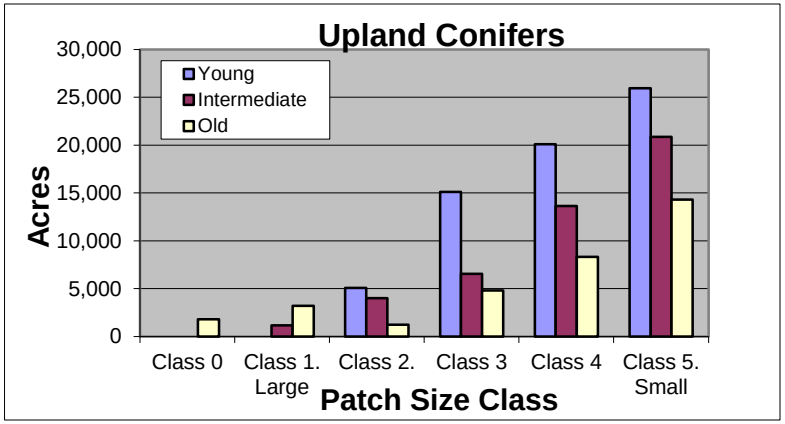
Figure 6.6. Current (2014) acres in each of five patch size classes by forest cover type group

The following four bar charts display the acres in size classes 0-5 for young, intermediate, and old patches in four cover type groupings: lowland hardwoods, lowland conifers, upland hardwoods, and upland conifers. *Data source: FIM 1(a) Northern Superior Uplands.*









Climate Change

Forest ecosystems in northern Minnesota are affected by climate change, and will continue to be throughout the timeframe of this plan. Although the impacts of climate change on a specific location will be influenced by variety of factors, including site conditions, forest health, and past management, forest systems which are adapted to a narrow range of conditions or contain few tree species are expected to be more vulnerable than communities adapted to a wide range of conditions or those with higher tree diversity. In general, projected climate change is likely to lead to declines in suitable habitat conditions for the region's boreal species like balsam fir, black spruce, and quaking aspen while suitable habitat conditions for species adapted to warmer climates like oaks may increase. Vulnerability determinations for Native Plant Community Systems (see page 6.6 in this chapter, and Appendix B in Ch. 9 of this assessment) range from low-moderate (Floodplain Forests) to high (Wet Forests, Forested Rich Peatlands, and Acid Peatlands) although local characteristics may amplify or buffer these predicted vulnerabilities. Additionally, the secondary effects of climate change, such as longer growing seasons or increased insect pest activity, may create new beneficial or stressful interactions.

Table 6.12. Climate change vulnerability determination summaries

Information in this table is taken from analysis in the Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis produced by the Northern Institute of Applied Climate Science.

Climate change vulnerability determination summaries for the forest systems analyzed in the Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis produced by the Northern Institute of Applied Climate Science.

Forest System	Potential Impacts	Adaptive Capacity	Vulnerability	Evidence	Agreement
Fire-Dependent Forest	Negative	Moderate-High	Moderate	Medium	Medium
Mesic Hardwood Forest	Moderate	Moderate-High	Moderate	Medium	Medium
Floodplain Forest	Moderate-Positive	Moderate	Low-Moderate	Limited-Medium	Medium
Wet Forest	Negative	Low	High	Limited-Medium	Medium
Forested Rich Peatland	Negative	Low	High	Medium	Medium-High
Acid Peatland	Negative	Low	High	Medium	Medium-High
Managed Aspen	Moderate-Negative	Moderate	Moderate-High	Medium	High
Managed Red Pine	Moderate-Negative	Moderate-Low	Moderate-High	Medium	Medium

Source: Handler et al. 2013; Forest Ecosystem Vulnerability Assessment and Synthesis (FEVAS)

Note: More information on native plant communities can be found at: www.dnr.state.mn.us/npc/classification.html

Table 6.13. Potential changes in suitable habitat for merchantable tree species

Predicted declines, increases, and mixed changes in forest tree species habitats in the NSU subsections based on climate change modeling scenarios. Data source is the Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis produced by the USFS Northern Institute of Applied Climate Science.

	Tree Species	Model Predictions
Decline	Balsam Fir	Decrease to Large Decrease
	Balsam Popular	Large Decrease
	Black Spruce	Large Decrease
	Northern White Cedar	Decrease to Large Decrease
	Quaking Aspen	Decrease to Large Decrease
	Tamarack	Decrease
	White Spruce	Decrease
Increase	American Elm	Increase to Large Increase
	Bitternut Hickory	Large Increase
	Boxelder	Increase to Large Increase
	Eastern Cottonwood	Increase to Large Increase
	Eastern White Pine	Increase
	Northern Pin Oak	Large Increase
	Red Maple	Increase
	Silver Maple	Large Increase
	Sugar Maple	Increase to Large Increase
	White Ash	Large Increase
	White Oak	Large Increase
Mixed Results	American Basswood	No Change to Increase
	Bigtooth Aspen	No Change to Decrease

	Tree Species	Model Predictions
	Black Ash	No Change to Decrease
	Bur Oak	No Change to Increase
	Green Ash	No Change to Large Increase
	Jack Pine	No Change to Decrease
	Northern Red Oak	No Change to Increase
	Paper Birch	No Change to Large Decrease
	Red Pine	No Change to Increase
	Yellow Birch	Decrease to Large Increase

For more information on climate change in northeastern Minnesota, please refer to Appendix F of the MFRC Northeast Landscape Plan, the Forest Ecosystem Vulnerability Assessment and Synthesis (FEVAS), and Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers (FAR) at www.nrs.fs.fed.us/niacs/.

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 7: Forest Health

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Northern Northern Superior Uplands Section Forest Resources Management Plan* website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
Alternative Formats available on request.
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Contents

Forest Insects and Diseases

Introduction

This is an assessment of forest insects and diseases known to cause tree mortality, growth loss, and quality reduction in forest stands in the Northern Superior Uplands (NSU) Section. The presence of forest insect and disease agents, as well as animal and abiotic agents, have been documented in reports by the Minnesota Department of Natural Resources (DNR), Forest Health Team; University of Minnesota; USDA Forest Service, State and Private Forestry; and North Central Forest Experiment Station.

Role of Insects and Pathogens in the Forest

Native Insect and Disease Organisms

Native forest insects and disease organisms influence forest ecosystem dynamics as pests and agents of stress, but also play a beneficial role in natural processes. Many native insects and diseases are an essential natural component of healthy forests and may contribute to compositional, structural, and functional diversity. By selectively affecting tree growth and mortality rates, they alter forest composition, structure, and succession. They thin and prune host populations, reducing density and competition. They can slow or stall the process of succession, or they can accelerate it. Through decay and biomass decomposition, they contribute significantly to carbon cycling, nutrient cycling, and energy flow in forest ecosystems. Insect and disease organisms serve as food for many invertebrates and vertebrates. Of vertebrates, birds consume the most tree-feeding insects, but many mammals consume insects to some degree as well. Insects and diseases create structural habitat for shelter and nesting. Many species of woodpecker are attracted to trees with decay where they excavate cavities for nesting. Many animals use dead wood to roost, nest, or forage.

These same native forest insect and diseases are perceived as problems or pests when occurring at a level or on a site where they interfere with human goals, plans, and desires for trees and forests. Native insects and diseases can reduce timber productivity, lumber grade, site aesthetics, wildlife habitat, and water quality, and can increase the hazard of falling trees and branches and the occurrence of fire hazards, etc. Data from the 1990 Forest Inventory and Analysis for Minnesota indicate that 37 percent of the wood volume produced by all tree species annually is lost due to mortality. Insects and disease organisms account for more than 53 percent of this loss or more than 143 million cubic feet of wood. (Miles, Chen, and Leatherberry, 1995). Surveys conducted by DNR Division of Forestry looking at oak and birch mortality triggered by drought, attacks by boring insects, and root rot organisms; found in excess of 300,000 oaks and 200 million birch dying during the late 1980s and early 1990s (Albers, 1998). More than 40 percent of the birch type in Minnesota was affected.

What is perceived to be beneficial from one perspective may be viewed as detrimental from another. A very low level of decay would be required on a

site being managed for high timber productivity; a higher level of decay may be acceptable on a site being managed for older forest attributes, while any level may be acceptable on an old-growth site. Some level of decay will occur on every site regardless of the level of management. A forest tent caterpillar outbreak might be viewed as both beneficial and detrimental. The outbreak may benefit some birds that eat them but, be detrimental to others by leaving nests exposed to predators and bright sunlight, which can overheat, dehydrate, and kill young birds in nests.

A forest tent caterpillar outbreak may increase the growth of shade-tolerant understory trees due to increased nutrients from insect droppings and dead caterpillars, and due to increased sunlight getting through the defoliated overstory canopy. The same outbreak is detrimental to the overstory aspen due to slower growth and increased mortality caused by the loss of leaves.

Non-native (Exotic) Insect and Disease Organisms

While native insect and disease organisms have co-evolved with native trees and forests, exotic insects and disease organisms have not. Exotics do not have a natural "role" in our native ecosystems and have, and will continue to alter forest ecosystem diversity, function, and productivity. Exotics historically have caused intensive and severe disturbances over large areas. In extreme cases they have virtually eliminated their host species. The elm resource has been devastated by introduction of the Dutch elm disease fungus and its bark beetle vector. The white pine blister rust fungus, accidentally introduced near the start of the 20th century, has played an important role in reducing the amount of white pine in Minnesota. Gypsy moth is becoming established in northeastern Minnesota and will eventually spread through the state. While future impacts of gypsy moth in Minnesota are difficult to predict, especially in the northern aspen-birch forest, the insect has the potential to cause widespread mortality and will alter the composition and structure of the forest.

Forest Management Implications

An ecosystem perspective requires that strategies to maintain the health of individual stands consider the beneficial, as well as the detrimental effects of insects and disease organisms. Forests must be considered as an ecosystem and manipulation to one part of that ecosystem affects the other parts. Pests have long influenced forest management, but forest management also affects pest populations. Vigorous trees tend to suffer less damage from these agents. Forest management aims to promote stand vigor and productivity by matching tree species to the planting site; manipulating rotation age, stand density, and species composition; avoiding wounding and root damage during thinning and harvesting; removing diseased and infested trees during harvesting operations, etc. Forest management does not attempt to eliminate native insect and diseases or their processes, but rather to control their activity and impact to a level that allows goals for timber production, water quality, aesthetics, recreation, wildlife, etc. to be realized.

In contrast, a much more aggressive approach is needed with exotic (non-native) organisms. It is important to avoid the introduction of exotics and attempt to contain and eradicate them when first found. Often it is not possible to eradicate or contain exotics once they are established. Attempts to slow their spread and management techniques to minimize their damage are utilized to limit damage and buy time for development of possible effective

control measures. Dutch elm disease and white pine blister rust are exotics that have become permanent components of the ecosystem. This will also happen with gypsy moth and Emerald ash borer as they continue to spread through Minnesota.

Table 7.1. Insects, pathogens and declines known to cause volume reductions or mortality losses

The first column lists tree species grouped ("All Species") and as individual forest cover types. The remaining two columns list agents that cause mortality for the listed covertypes, and agents that cause volume reductions, respectively.

Covertype	*Agents that cause mortality*	*Agents that cause volume reductions*
All species	*Armillaria* root disease http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_043192.pdf Storm damage http://files.dnr.state.mn.us/assistance/backyard/treecare/stormDamagetoForests.pdf	Stem decay and root rot fungi http://na.fs.fed.us/pubs/misc/decay/first_look_decay.pdf Stem decay and root rot fungi (2) http://www.na.fs.fed.us/spfo/pubs/fidls/decay/decay.htm
Aspen	Aspen decline http://www.forestpathology.org/pdfs/worrall2013aspendeclineNA.pdf Hypoxylon canker http://www.na.fs.fed.us/spfo/pubs/fidls/hypoxylon/hypoxylon.htm Bronze poplar borer http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5349702.pdf	White trunk rot http://www.na.fs.fed.us/spfo/pubs/howtos/ht_aspen/ht_aspen.htm Forest tent caterpillar http://www.dnr.state.mn.us/treecare/forest_health/ftc/index.html Gypsy moth * http://www.dnr.state.mn.us/invasives/terrestrialanimals/gypsymoth/index.html (see GM silvicultural considerations for Minnesota)
Ash	Ash decline http://www.nrs.fs.fed.us/pubs/gtr/gtr_wo079/gtr_wo079_115.pdf Emerald ash borer * http://files.dnr.state.mn.us/forestry/ecssilviculture/policies/guidelinesManagingAshMinnesotaForestryLands-100723.pdf	

Birch	Bronze birch borer http://www.na.fs.fed.us/spfo/pubs/fidls/bbb/bbb.htm	Gypsy moth * http://www.dnr.state.mn.us/invasives/terrestrialanimals/gypsymoth/index.html
Oak	Two-lined chestnut borer http://www.dnr.state.mn.us/treecare/forest_health/tlcb/index.html	Gypsy moth * http://www.dnr.state.mn.us/invasives/terrestrialanimals/gypsymoth/index.html (see GM silvicultural considerations for Minnesota)
Tamarack	Eastern larch beetle http://files.dnr.state.mn.us/forestry/ecssilviculture/policies/tamarackAssessmentProject2013.pdf	Larch casebearer http://www.na.fs.fed.us/spfo/pubs/fidls/larch/larch.htm
Jack pine	Jack pine budworm (fed) http://www.na.fs.fed.us/spfo/pubs/howtos/ht_jack/ht_jack.htm Jack pine budworm (state) http://www.dnr.state.mn.us/treecare/forest_health/annualreports.html for 2012	Red rot http://en.wikipedia.org/wiki/Phellinus_pini
Red pine	*Ips* bark beetles http://files.dnr.state.mn.us/assistance/backyard/treecare/forest_health/barkbeetles/barkbeetlebroch.pdf *Diplodia pinea* http://www.dnr.state.mn.us/treecare/forest_health/diplodia/index.html	Red rot http://en.wikipedia.org/wiki/Phellinus_pini
White pine	White pine blister rust * http://www.na.fs.fed.us/spfo/pubs/howtos/ht_white/white.htm	Red rot http://en.wikipedia.org/wiki/Phellinus_pini
Black spruce	Eastern dwarf mistletoe http://www.na.fs.fed.us/pubs/fidls/ed_mistletoe/ed_mistletoe.pdf	

White spruce	Spruce budworm http://www.na.fs.fed.us/spfo/pubs/fidls/sbw/budworm.htm	Red rot http://en.wikipedia.org/wiki/Phellinus_pini
White cedar		Red rot http://en.wikipedia.org/wiki/Phellinus_pini
Balsam fir	Spruce budworm http://www.na.fs.fed.us/spfo/pubs/fidls/sbw/budworm.htm	
* = Exotic insect or disease		

Assessment of selected agents in Northern Superior Uplands

Emerald ash borer

Emerald ash borer (EAB) first detected in North America in 2002 has killed untold millions of ash trees in forest, riparian, and urban settings. It appears likely that EAB could functionally extirpate one of our most widely distributed tree genera (Fraxinus) with devastating economic and ecological impacts. EAB was first confirmed in Minnesota in 2009. Currently the counties of Olmstead, Dakota, Ramsey, Hennepin, Houston and Winona are quarantined for EAB. The 2012 find of the beetle in the City of Superior Wisconsin puts in within a mile of the Northern Superior Uplands. Cold winters in northern Minnesota may slow its spread but will likely not prevent it from spreading throughout the state.

Ash management guidelines which consider the impact of EAB have been developed by the divisions of Forestry, and Fish and Wildlife. Both sets of guidelines share many of the same goals and provide similar direction. Differences in management objectives and guidelines for all stands with ash are noted below.

Guidelines for Ash Management on Forestry-Administered Lands

Management Objectives:

•Landscape perspective: Manage ash populations in the landscape to protect sensitive wetland ecotypes, reduce outbreak losses and costs without eliminating ash within forest ecosystems.

•Stand perspective: Create conditions that will reduce impacts and increase the resiliency of forested stands by keeping forested sites forested, increasing tree species diversity, and maintaining an ash component but reducing the amount of ash in the stand.

•Management objectives should focus on ecosystem health and management, not on the emerald ash borer. The intent is to increase stand resilience.

Guidelines for Ash Management on Fish and Wildlife Administered Lands

Management Objectives:

•Landscape perspective: Manage ash populations in the landscape to protect sensitive wetland habitats and reduce outbreak costs without eliminating ash within forest ecosystems.

•Stand perspective: Create conditions that will reduce potential impacts and increase the resiliency of forest stands by:

- keeping forested sites forested,
- maintaining an ash component while increasing the presence of other tree species, and
- increasing tree species diversity.

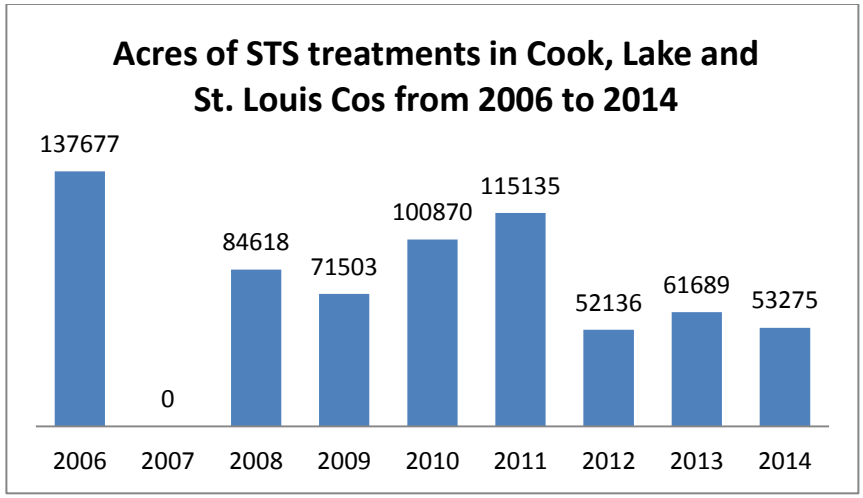
• Management objectives should focus on fish and wildlife habitat and ecosystem health and management, not on the emerald ash borer. The management intent is to maintain habitat value and increase stand resilience.

Gypsy Moth

Gypsy moth (GM) is an exotic insect pest spreading across the United States and Canada. Minnesota became a member of the Slow the Spread (STS) Foundation in 2004 due to the increase in moth captures and expansion of the action zone into Houston and Winona counties. In the fall of 2004, due to increase in moth captures in northeast Minnesota, the action boundary was expanded to include all of Cook and Lake Counties. (See Figure 7.1) The goal of the STS program is not to eradicate gypsy moth but to slow the increase of gypsy moth behind the action boundary and to slow the spread of gypsy moth within and out of the area to surrounding areas. This is accomplished with the use of pesticides such as the biological insecticide Btk (Foray 48B) to kill gypsy moth caterpillars, or through mating disruption using Disrupt II. The first STS treatment in northeast Minnesota occurred in 2006 with the aerial application of Btk on 2,015 acres and Disrupt II on 135,662 acres in Cook County. Treatments in 2008 included Cook and Lake Counties. The first STS program treatment in St Louis County was in 2010 (see Figure 7.1, below).

Figure 7.1. Acres of slow-the-spread (STS) treatments for Gypsy moth Minnesota

This bar chart shows the acres of slow-the-spread treatments in Cook, Lake, and St. Louis counties for the years 2006 to 2014.



With continued increases in moth catches and the finding of alternate life stages such as caterpillars, pupae and egg masses, Cook and Lake Counties were quarantined for gypsy moth by Minnesota Department of Agriculture and the US Department of Agriculture APHIS starting July 1, 2014. Gypsy moth is now considered to be established in both Cook and Lake counties; STS pesticide treatments will no longer be conducted in either county. Information about the Gypsy moth quarantine can be found at http://www.mda.state.mn.us/gmquarantine.aspx

Aspen is a preferred host of GM. Outbreaks may build and decline faster in aspen-dominated stands than in oak stands according to observations in Michigan (Program Staff, GM Education Program, 1997). The impact of GM on aspen stands is not yet well known. The combination of back-to-back defoliations by GM and Forest Tent Caterpillar could have substantial impacts especially if coupled with drought and over-mature aspen.

Table 7.2. Gypsy moths caught in traps by northeast Minnesota county and statewide

This table displays number of moths trapped for each of Cook, Lake, St. Louis Counties, as well as those three counties combined. The statewide total catch is also displayed for context. In 2013, the combined catch for the three counties was 99 percent of the statewide total.

Year	Cook County	Lake County	St. Louis County	Cook + Lake + St Louis Counties	Statewide Total Catch
1996	0	0	1	1	155
1997	0	1	0	1	261
1998	0	0	1	1	953
1999	33	37	26	96	286
2000	22	6	4	32	182
2001	26	0	3	29	429
2002	23	0	1	24	118
2003	30	2	12	44	535
2004	198	49	39	286	396
2005	1068	114	52	1234	1310
2006	210	71	7	288	412
2007	2583	450	66	3099	3608
2008	3111	2942	1810	7863	12255
2009	5380	14232	7967	27599	27870
2010	435	779	1931	3145	4242
2011	928	2470	1292	4690	5059
2012	5979	4083	290	10352	10445
2013	4130	59823	6002	69955	71258
2014	7	98	236	341	523

Figure 7.2. Gypsy moths caught in traps by county and statewide

This bar chart displays the same data as the previous table. Colored bars represent the data for each of Cook, Lake, St. Louis Counties, as well as those three counties combined. The statewide total catch is also displayed for context.

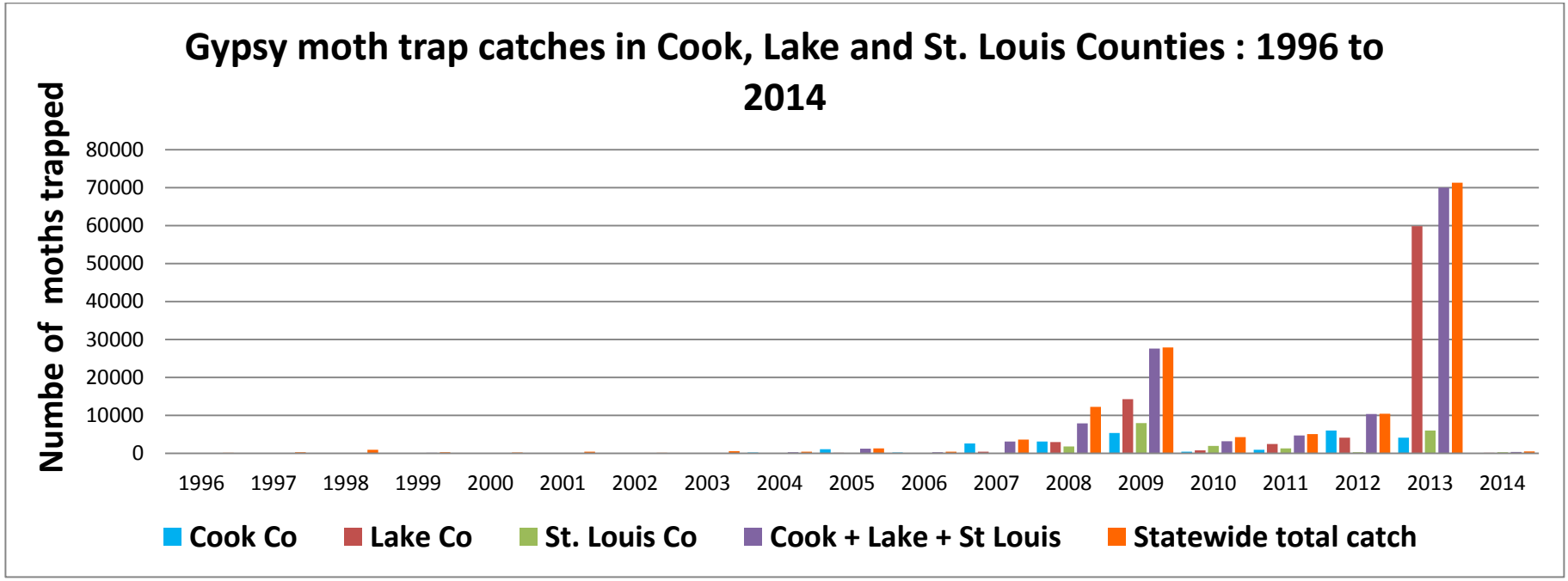
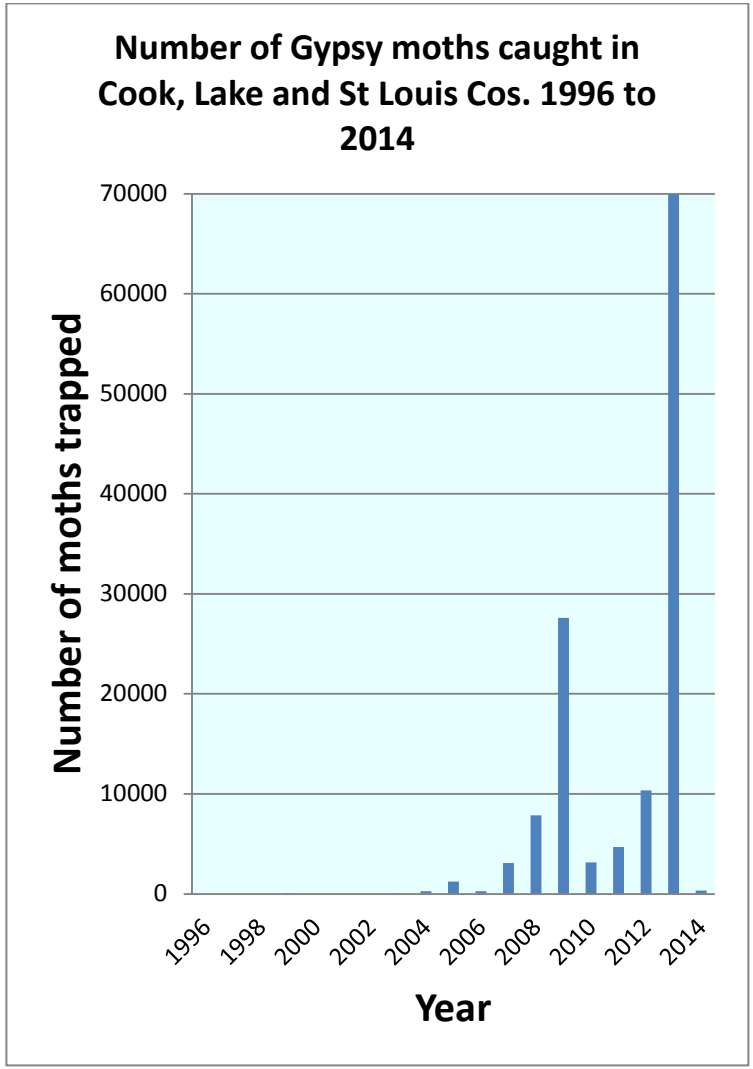


Figure 7.3. Gypsy moths trapped in Cook, Lake and St Louis Counties from 1996 to 2014

This chart is a subset of the previous one, showing only the data for the three counties in the NSU.

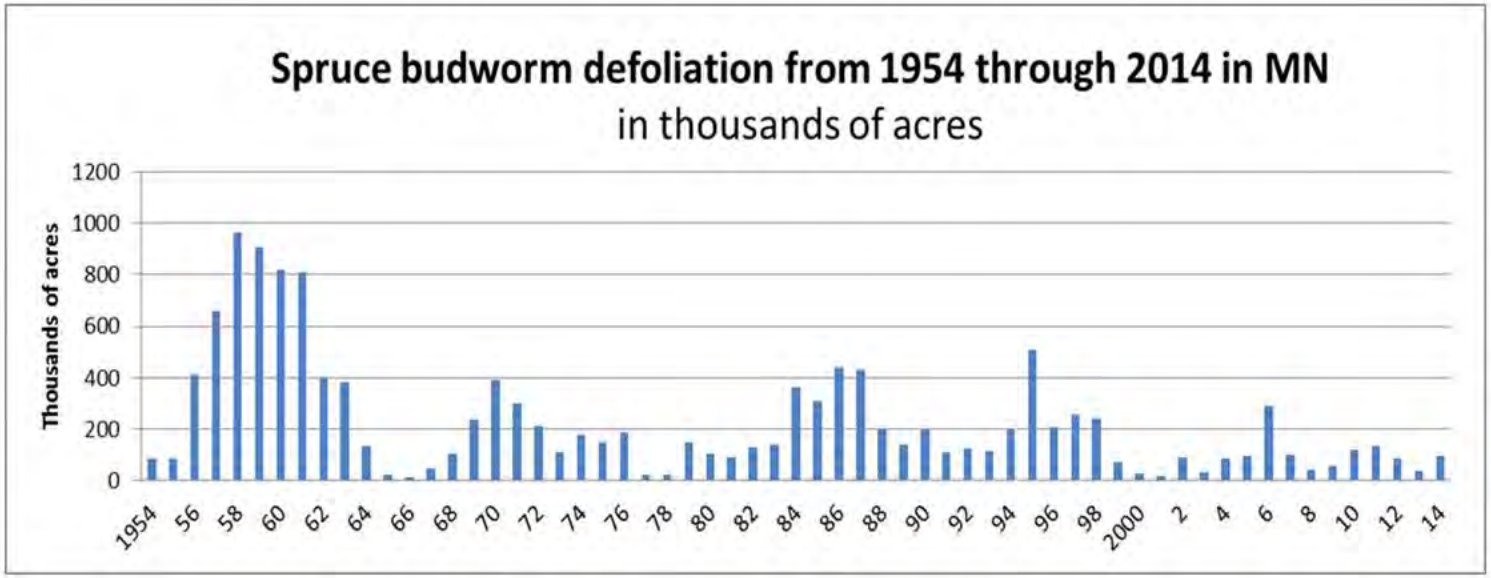


Spruce Budworm

Spruce budworm is a perennial defoliator of balsam fir and white spruce in northeastern Minnesota. Since 1954 there have been continuous outbreaks of spruce budworm (SBW) in northeast Minnesota resulting in defoliation and mortality. See chart below.

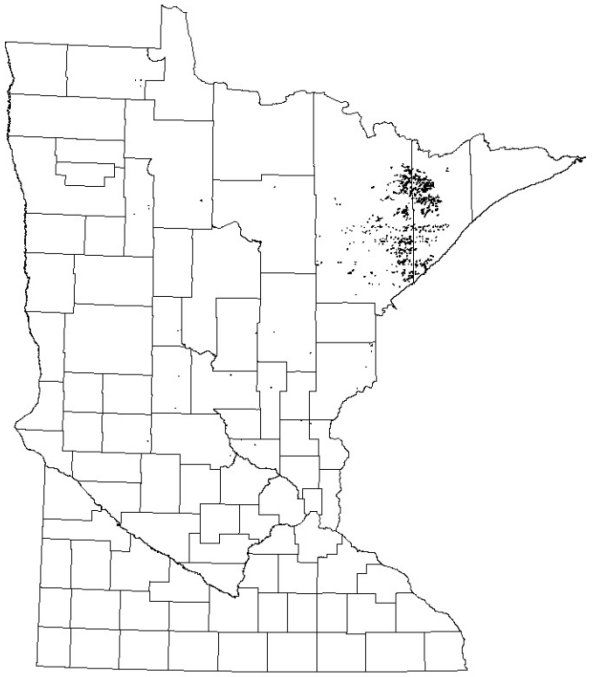
Figure 7.4. Spruce budworm defoliation from the years 1954 to 2014

This figure is a bar chart showing thousands of acres .affected, by year. *Source: Mike Albers, Minnesota DNR Forest Health Unit*



With the recent expansion of the spruce budworm outbreak in the NSU, it would be advisable to accelerate the sale and harvesting of stands with a high volume of merchantable balsam fir. Length of time to harvest fir timber sales should be short because there will be a lot of balsam fir mortality starting soon and it deteriorates rapidly after it dies. On harvest sites that will be regenerated to white spruce and/or balsam fir, neither spruce nor balsam fir should be left as leave trees. In 2014 the defoliated acres more than doubled in Lake and St. Louis counties going from 38,400 acres in 2013 to 96,640 acres at present. Within the NSU, 90,640 acres were defoliated in 2014. Extensive mortality of balsam fir has occurred in northern Lake and St. Louis counties and is just beginning in southern Lake and southern St. Louis counties.

Figure 7.5. Extent of spruce budworm outbreaks in Minnesota (2014)



Spruce budworm is considered the most destructive forest pest of spruce-fir forests in North America. Outbreaks last 7 to 10 years and cover wide geographic areas. Mortality will occur throughout the outbreak and cease about 12 years after the start of the outbreak. Mortality varies greatly from stand to stand but generally ranges from 70 to 100 percent in mature fir stands, and 30 to 70 percent in immature stands. Balsam fir is the preferred host and outbreaks typically collapse due to a shortage of food for spruce budworm larvae. Budworm moths are attracted to the spires of large fir and spruce where they will lay a significant number of eggs. The larvae hatching from these eggs will drop down from these trees onto nearby understory or regenerating trees increasing the damage to the regenerating stand.

During a spruce budworm outbreak, the first priority should be to harvest balsam fir in the most vulnerable stands with the highest merchantable volume. Host trees, especially balsam fir, will die during an outbreak, so land managers should not wait until trees start to die. Pre-salvage is much better than trying to salvage dead trees. In general, high levels of mortality are to be expected in vulnerable stands with the following characteristics:

- Stands with a large balsam fir component/high basal area of balsam fir,
- Mature fir stands, 50 or more years old.
- Small percent of non-host species,
- Stands in which spiked tops of host species protrude above the forest canopy,
- Stands on poorly drained soils that are abnormally dry or wet.

Work done in Minnesota by Batzer and Hasting (1981) found that stand composition greatly influences its vulnerability to spruce budworm. Generally, the more balsam fir there is in the stand the greater the potential balsam fir mortality. And the more species other than fir or spruce in the stand the less damage to balsam fir. Table 7.3 is based on their study on the Superior National Forest. The table shows the potential for dead balsam fir in square feet of

basal area per acre. This table does not include an estimate for dead white spruce because they found that although white spruce may be severely defoliated, they are usually not killed by spruce budworm.

Table 7.3. Potential dead balsam fir basal area/acre

The shaded portion of the table displays estimated basal area of dead balsam fir, in feet per acre, after 5 years of attack by the spruce budworm.

Basal area of other species present (%)	Original balsam fir basal area (ft^2/acre)					
	20	40	60	80	100	120
0	15	35	54	73	93	112
10	11	30	50	69	89	108
20	7	26	46	65	84	104
30	3	22	41	61	80	100
40		18	37	57	76	95
50		14	33	52	72	91
60		9	29	48	68	87

Data source: Batzer, H.O., and A.R. Hastings. 1980. How to rate spruce-fir vulnerability to budworm in Minnesota. North Central Forest Service, St. Paul, MN 55108.

Balsam fir tends to deteriorate quickly following mortality, limiting the time available for salvage. Spruce budworm defoliation results in a sharp decline in sapwood moisture. This may result in more broken stems during harvest, affecting volume and transportation costs. Moisture content of pulpwood for ground wood mills is a critical factor. While trees retaining green needles may be acceptable, trees with only red needles or no needles are unlikely to be usable by these mills. Stain and sapwood rot set in quickly with balsam fir mortality. A study done by Canadian researchers near Whyte Minnesota in the late 1970's found that sapwood rot levels one year after mortality may be high enough to limit salvage opportunities.

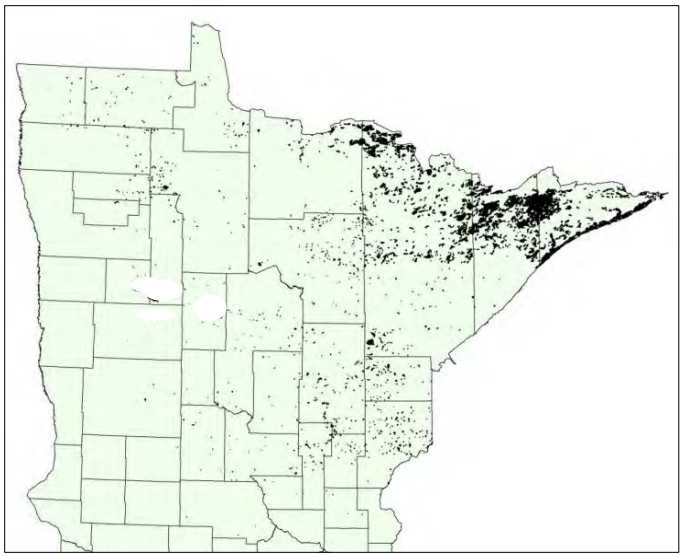
A loss assessment of balsam fir and white spruce was conducted by Campbell and Albers in 1983 when spruce budworm was last in this portion of the state. In southern St. Louis and Lake counties, spruce budworm-caused mortality occurred on 185,000 acres. This study found that approximately 500,000 cords of balsam fir and 8,000 cords of white spruce were killed in the years 1977 through 1982. The budworm outbreak in this area lasted from about 1974 through 1986.

Because of the abundance of balsam fir and the persistence of spruce budworm in northeastern Minnesota, the long term impacts of forest management decisions must be kept in mind during planning. Balsam fir is a prolific seed producer and has the ability to persist and even increase in the aftermath of an outbreak. **Long term management strategies that increase the component of balsam fir will only lead to more frequent and more severe spruce budworm outbreaks.** Since the older stands tend to serve as the niches in which the budworm builds up, strategies to retain older balsam fir will only add to the potential for stand-destroying budworm populations to develop

Aspen Decline

Since 2004, aspen with symptoms of decline have been mapped during the Insect and Disease aerial survey in northern Minnesota, especially in the NSU. Symptoms have included a combination of defoliation, discoloration, thin crowns, small leaves, branch dieback, and tree mortality. Dieback is the most common symptom but tree mortality has also occurred. Mortality varies from scattered individual dead trees to patches of 30 to 40 dead trees scattered through stands, to almost 100 percent mortality of the oldest cohort of trees. Ground surveys have found bronze poplar borer as well as *Armillaria* root disease on many of the dead and dying trees. Stands of trees affected are 30 years and older, with most being 45 or more years old.

Figure 7.6. Areas affected by aspen decline in 2003



Many of the affected stands of aspen were stressed by 3 or 4 years of heavy defoliation by forest tent caterpillar between 2000 through 2003. In combination with defoliation they were also stressed by severe summer droughts every year from 2003 through 2009. In addition much of the northern portion of the NSU occurs on the Canadian Shield where soils are often shallow over bedrock. These sites have limited water holding capacity due to the limited volume of the soil over the rock.

Climate change can result in trees having less moisture available during the growing season by:

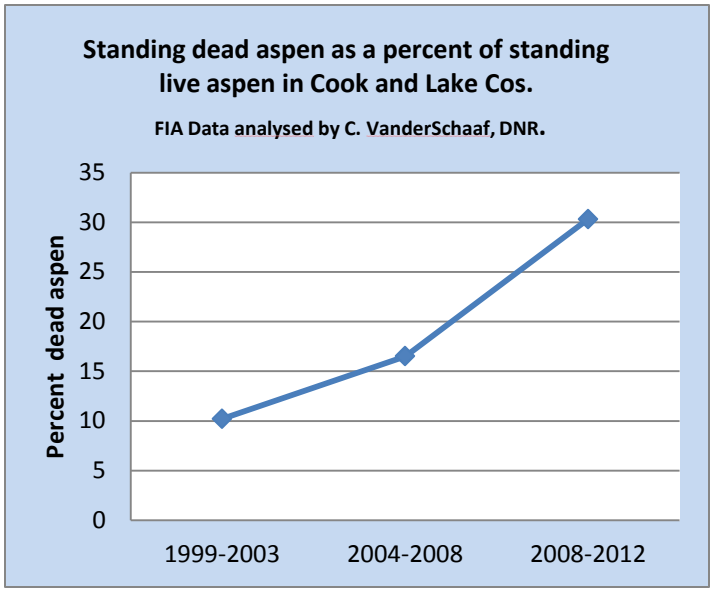
- resulting in longer growing seasons that put higher demands on soil moisture;
- warmer temperatures resulting in more evapotranspiration; and
- increased summer precipitation, coming in in the form of high intensity thunderstorm events that are more localized and release higher volumes of rain in shorter periods of time creating more runoff.

This combination of factors stresses the aspen. Insects and fungi like bronze poplar borer and *Armillaria* then attack and kill the stressed trees.

Additional information about aspen decline can be found in **Recent declines of Populus tremuloides in North America linked to climate. Forest Ecology and Management 299:35-51; Worrall JJ, Rehfeldt GE, Hamann A, Hogg EH, Michaelian M, Marchetti SB, Gray LK. 2013**.

Figure 7.7. Standing dead aspen as a percentage of standing live aspen in Cook and Lake counties

This figure is a line graph showing the linear increase in standing dead aspen as a percentage of standing live aspen in Cook and Lake counties, Minnesota. The periods charted are 1999 to 2003, 2004 to 2008, and 2008 to 2012. The increase over this period was from ten percent to 30 percent.



Eastern Dwarf Mistletoe

Eastern dwarf mistletoe (DMT) is a native parasitic flowering plant that causes the most serious disease of black spruce throughout its range. Black spruce is primarily a lowland species and is often the only commercially important species that can grow on those sites. Therefore it is important to protect black spruce from dwarf mistletoe infection (Baker et al 2006). DMT can reduce the volume of infested stands so much that a harvest is not economically feasible. Anderson (1949) estimated that up to 11 percent of the black spruce type in the Big Falls Management Unit was out of production because of dwarf mistletoe. The area of mortality was up to 19 percent in his survey. A recent study Baker et al., (2012) reported that the FIA survey grossly underestimates the amount of DMT in Minnesota. FIA data lists 11 percent of plots as infested with DMT, whereas Baker found that up to 55 percent of FIA plots actually were infested and that 20 percent of stand area was infested and volume losses were at least 14 percent of the rotation volume.

The acreage of black spruce infested with DMT in Minnesota is increasing over time, as pockets of infection continue to expand. The spread rate through a stand, as indicated by the enlargement of mortality centers, is 4.7 feet per year on average. Birds and other animals spread the sticky mistletoe seeds to new sites creating new mortality centers. Dwarf mistletoe kills black spruce trees quickly, often within 15 years of infection. Once DMT infests a stand, it remains infested as long as live black spruce trees (of any size) remain on the site. There are no effective insects or diseases of DMT that serve as natural control agents, so DMT is not eliminated from infested sites naturally. Therefore the amount of DMT in black spruce in Minnesota is increasing.

It is important to try to protect black spruce from DMT infection in order for stands to produce enough volume so that harvest is economically feasible. Elimination of DMT from infested sites can only be accomplished if all black spruce on the site are killed at the time of harvest. This is difficult if not impossible to accomplish. In most stands DMT infections remain on sites after harvest. Even prescribed burning of a site following harvest leave areas unburned where potentially infected live black spruce are left to continue the infection of the regenerating stand. The larger the trees and the more trees left on harvest sites the more likely DMT is to be left on the site. The more DMT left on site, the faster infection will spread to the regenerating black trees, the faster mortality centers will develop, and the greater the reduction in volume of wood produced on the site.

The 5-foot cutting rule requiring loggers to cut or kill all black spruce trees 5 feet tall or taller, was instituted as a means of reducing dwarf mistletoe and its spread within a stand. Even implementing this rule seldom eliminates DMT from the site, and follow up treatment is often necessary to further reduce DMT infection on the site. Hand felling as well as shearing after the harvest has sometimes been used to reduce DMT infection in an attempt to ensure production of an adequate volume to allow commercial harvest. A survey of sites should be conducted one year or so after harvest, to determine if follow-up treatment is necessary. Leaving infected trees standing on or next to harvested sites will ensure that the regenerating stand is infected by mistletoe. **If dwarf mistletoe is not aggressively controlled in black spruce stands when harvesting and regenerating the stands, the total merchantable acreage of this cover type will decline over time.**

Additional information about Eastern Dwarf Mistletoe can be found in **THE INCIDENCE OF DWARF MISTLETOE IN MINNESOTA BLACK SPRUCE STANDS DETECTED BY OPERATIONAL INVENTORIES; BAKER, HANSEN, SHAW, MIELKE, SHELSTAD 2012**.

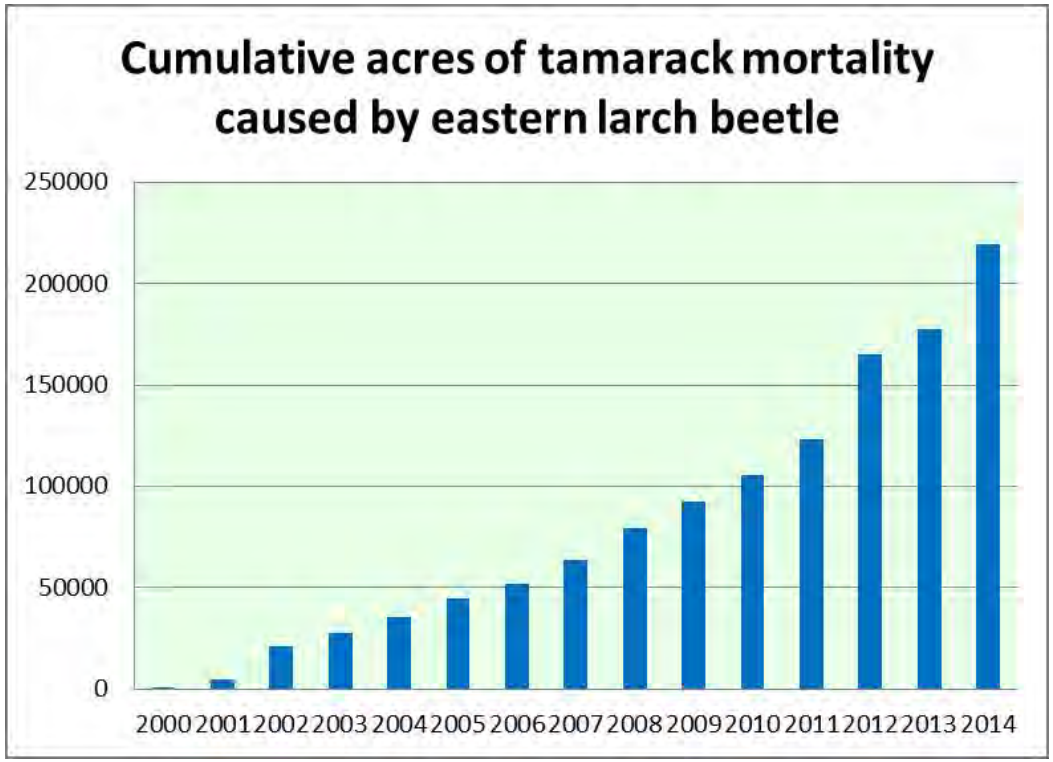
Eastern Larch Beetle

Currently, Minnesota and neighboring Canada are experiencing an outbreak of eastern larch beetle *Dendroctonus simplex* (ELB), a native insect that has been previously categorized as a "secondary pest", a pest that is only successful on a weakened or stressed tree. Following outbreaks in the 1970s and 1980s in Canada and Alaska, eastern larch beetle has been acting as a "primary pest", killing otherwise healthy trees. Mortality from the current Minnesota outbreak started to be mapped in 2000 and has accelerated at a steady pace since then. By the end of 2013, most of the tamarack trees larger than 4 inches DBH had been killed on 180,000 acres; 42,000 acres of tamarack mortality was caused by larch beetle in 2014 (see Figure 7.4). No widespread predisposing factor such as drought, flooding, defoliation, or off site conditions have been found to explain the cause or extent of the

outbreak. It appears that changing climate resulting in longer growing seasons and warmer winters has allowed the eastern larch beetle to develop larger populations that overwhelm even health tamarack and kill them. Mortality has occurred on lowland sites, upland sites, and in pure and mixed stands of tamarack.

Figure 7.8. Cumulative acres of tamarack mortality

The bar chart in Figure 7.7 shows the number of acres of tamarack forest killed by eastern larch beetle during the period 2000 to 2014; the total is approximately 200,000 acres.



At this time the outbreak continues, and a silvicultural solution to this insect outbreak is not apparent. Entomologists at the University of Minnesota are investigating the biology and population dynamics of eastern larch beetle in order to offer insights on the causes of the outbreak, why it is perpetuating itself, and possible silvicultural solutions. Faced with thousands of acres of dead and dying tamarack, poor markets and limited experience regenerating this species, the development of silvicultural systems to enhance and maintain this resource will remain a challenge for foresters well into the future. Beetle-killed stands should be surveyed to evaluate regeneration and to determine whether aerial seeding or some other effort is needed to ensure the regeneration of the site. Even though seed trees left on harvest sites are killed rapidly by the beetle, this practice should be continued. It will not increase the problem.

Figure 7.9. Eastern larch beetle defoliation in 2014

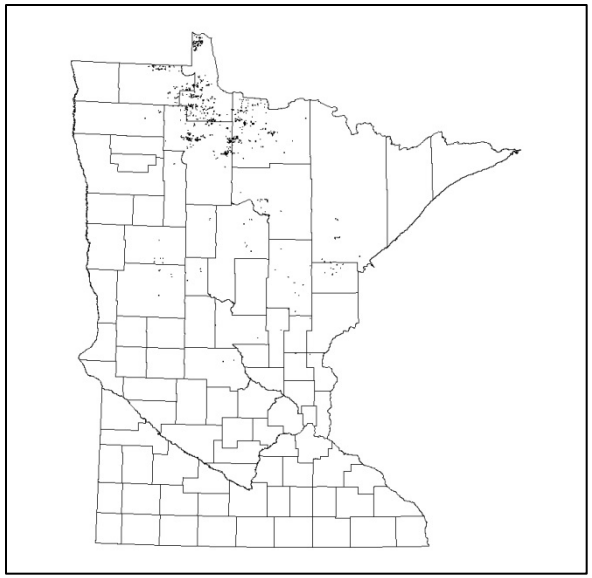
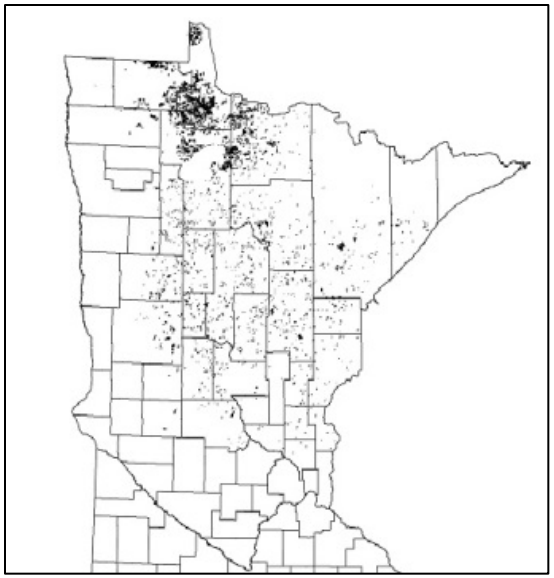


Figure 7.10. Cumulative Eastern larch beetle-caused mortality 2000-2014



Diplodia and red pine regeneration

Diplodia pinea is a fungal pathogen that can kill red and jack pine regeneration. It is suspected that the fungus was introduced into Minnesota about 50 years ago when foresters started noticing a shoot blight problem in red pine. The fungus is now widespread in Minnesota. A 2004 DNR study of 92 red pine sites found *Diplodia* on 97 percent of the sites surveyed. *Diplodia* can and does affect all aspects of red pine silviculture, as well as, red pine productivity.

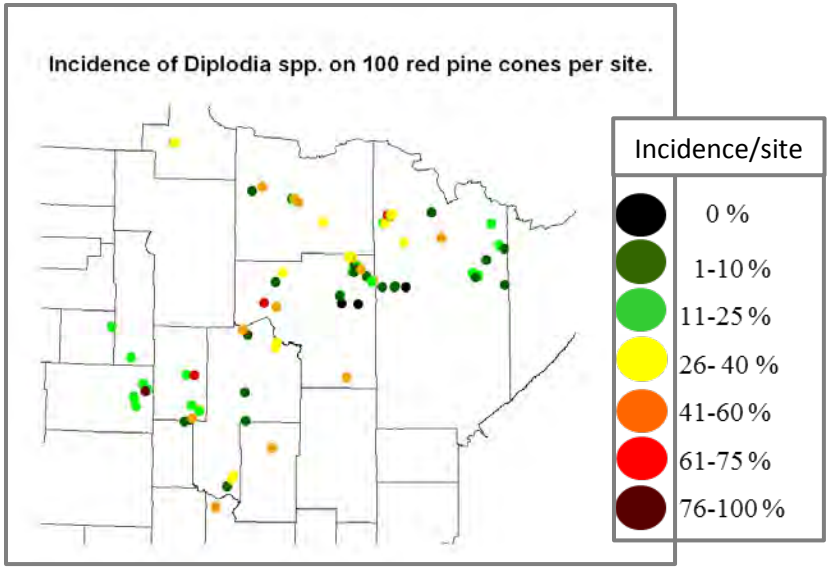
Diplodia and other shoot blights have necessitated changes in red pine management. As Dr. Brian Palik said in USFS NRS Research Review No.25, January 2015, “Quite simply we can’t go back; red pine shoot blight, fire suppression, and deer over-population have been let out of Pandora’s box. Both managers and forests must adjust to contemporary and also to anticipated future conditions and needs.” Studies in the lakes states have resulted in recommendations to avoid growing multi-cohort red pine, planting red pine under or near large red pine residual trees or adjacent to red pine stands known to be affected by shoot blights.

Figure 7.11. Incidence of Diplodia species on red pine cones

The map below shows the location of 92 red pine sites included in a 2004 DNR study of *Diplodia*. To be included in the study each site needed to have a mature stand of red pine along a single edge of a young red pine plantation. *Diplodia* was found on 97 percent of the sites.

Diplodia produces fruiting bodies and spores on blighted twigs and second-year red pine cones. Early research showed that *Diplodia* spores from nearby mature trees were spread onto seedlings in rain-drops. It is believed that spores are carried from stand-to-stand by cone insects. In 1997, Dr. Glen Stanosz determined that the fungus can cause "latent infections". This means that this fungus can infect shoots and not cause any visible symptoms (asymptomatic). Latent infections in shoots do not cause blighting, so the shoot looks healthy but *Diplodia* remains alive inside the tree. Latent infections can be activated by stress such as: transplant shock, drought, or hail damage; and can produce blight and canker symptoms years after the tree was first infected.

Diplodia is present and abundant throughout northern Minnesota including the Northern Superior Uplands. The lack of a study site in portions of northeast Minnesota does not indicate an absence of Diplodia, just the absence of a site included in this particular study.

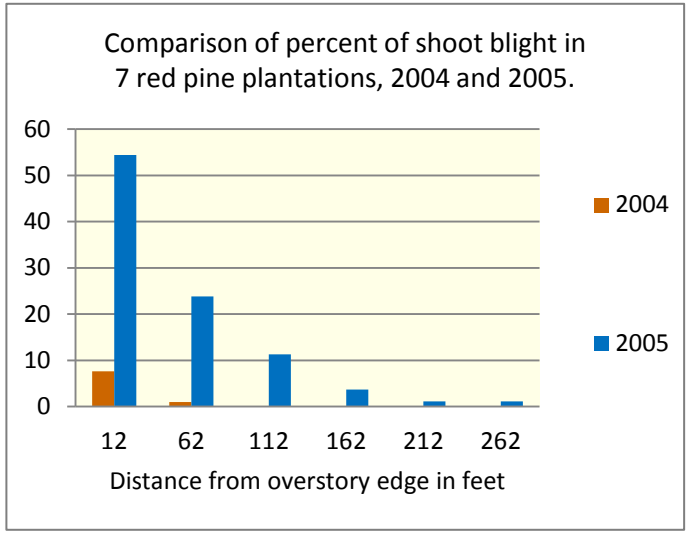


In the past, before widespread establishment of shoot blight diseases, as many as five age classes of red pine could be found in mature pine stands. Now it is rare to find advanced red pine regeneration more than fifteen feet tall under a red pine overstory. In the 2004 survey, only one stand out of 92 had a sapling more than fifteen feet tall in the understory.

Diplodia has the greatest impact on red pine seedlings growing in the understory directly below infected overstory red pines. Although some red pine regeneration may be present in the understory, it should not be counted on to survive to create multi-storied or multi-aged red pine stands due to the accumulation of symptomatic and asymptomatic infections that are eventually fatal. In DNR studies at Itasca State Park and in north central counties, latent infections were 2 to 6 times more abundant than blighted seedlings in the understory. In a survey of 92 sites across Minnesota in 2004, the average incidence of shoot blight symptoms in current-year shoots was 15 percent in the understory. So, the total incidence of Diplodia infections (symptomatic + asymptomatic seedlings) could easily range from 45 percent to 100 percent of the seedlings in the understory.

Figure 7.12. Chart comparing shoot blight levels in red pine plantations over two years

This chart shows that some growing seasons are more conducive to spore spread and infection than others. Cool and wet weather during these years creates suitable conditions for infection and are termed “wave years” of infection. In the graph, 2005 was a “wave year” of infection while 2004 was a



typically warm and dry year and less suitable for disease spread. See. Latent infections commonly occur, persist and accumulate for several years in red pine regeneration until drought, hail damage, overstory harvest or other damage occurs. Both shoot blight and latent infections are activated by these stressors so the fungus grows throughout the seedlings/saplings and nearly all of them die over the next couple of years.

The Minnesota DNR Forest Health Unit recommends careful selection of sites for establishment of red pine regeneration under red pine trees. See table 7.4 (below) to determine if the site in question is suitable for red pine regeneration in the understory.

Table 7.4. Determining suitability of a red pine stand for red pine regeneration in the understory

Evaluate existing red pine seedlings and saplings in the understory	**Evaluate the incidence of cone infection* by *Diplodia***	**Determine the relative risk for proceeding with understory regeneration**	**Percentage of sites fitting this category based on 2004 survey**
Some or all of the seedlings are blighted or dead	Cones do not need to be evaluated.	Risky to attempt red pine regeneration.	19% of sites
None of the seedlings are blighted or dead	Cone infection is low, less than or equal to 3%	Best opportunity to attempt red pine regeneration	7% of sites
	Cone infection is greater than 3%	Risky to attempt red pine regeneration	27% of sites
No red pine seedlings were found in the understory	Cone infection is low, less than or equal to 3%	Opportunity to attempt red pine regeneration. Also need to investigate competition, light, seedbed quality, etc on the site prior to attempting.	4% of sites
	Cone infection is greater than 3%	Risky to attempt red pine regeneration	43% of sites

* = Cone evaluation: Collect 100 fresh, open cones (brown not gray) from the ground and have the UM Plant Disease Clinic determine the percentage of infected cones by the DNR method.

On sites where *Diplodia* is present in the canopies of mature trees, red pine shelterwoods and other gap regeneration methods are unlikely to be successful. Natural and artificial regeneration adjacent to infected overstory trees are likely to become infected and die due to the accumulation of *Diplodia* infections. Similarly, seedlings in small and narrow or sinuous clearcuts in red pine stands are vulnerable because they are too close to infected overstory pines. Large gaps (101 feet radius) did not provide a sufficient distance from the surrounding overstory trees to avoid the disease in a study conducted by the USFS. Ostry et al found that there was no difference in shoot blight incidence on dead red pine seedlings among the study treatments: solid overstory, evenly thinned, small gaps and large gaps.

Diplodia spores can be spread from overstory trees to red pine seedlings and saplings in plantations. Directly below the mature trees, the incidence of infected seedlings is the greatest. As you travel further into the plantation, disease incidence decreases and trails off into nothing. A survey of 92 young red pine plantations growing adjacent to mature red pine stands was conducted in 2004. On average, when seedlings were one chain away from the overstory, the incidence of shoot blight in the current year's shoots was about 5 percent.

Haugen and Ostry conducted a 14-year study of the impact of shoot blight diseases on saplings survival, form, and height growth in plantations with and without residual, mature red pines in their midst. Saplings (12-18 years old), growing near individual or groups of large residual red pines suffered higher levels of mortality and reduced height growth compared to those growing without nearby residual trees. Shoot blight infected saplings growing within a distance of two times the height of residual trees experienced higher mortality (31 percent) than trees growing in the open and not infected (1 percent).

In addition to killing trees, *Diplodia* and other shoot blights reduce the growth of infected living trees. During the 14 years of the study, height growth of infected saplings near large reserve red pines was about 50 percent less than height growth of healthy trees growing in the open. Haugen and Ostry suggest that leaving residual red pine trees should be avoided. They also suggest removing trees with severely damaged crowns or deformed stems during the first thinning since they will not develop into crop trees.

Invasive Plants

Introduction

This is an overview of invasive plants that pose a significant threat to forest communities in the NSU Section. The plants included here do not include every invasive plant present; they are examples of those capable of adversely affecting long-term forest sustainability. There are many other invasive plants present in the Section.

Impacts associated with invasive plants

By their very nature invasive plants have a competitive edge over native plants, which is what allows them to become invasive. Habit, physiology, phenology, absence of adapted herbivores, reproduction, and dispersal traits can contribute alone or in combination to allowing these plants to dominate certain native plant communities.

A few of the more common traits that can provide a competitive edge include:

- Longer season of growth, allowing invasive plants a better chance at critical resources like water, light and nutrients. Examples: buckthorn, black locust, honeysuckle
- Dense foliage able to shade out competition. Examples: buckthorn, black locust, honeysuckle
- Heavy vines capable of breaking or smothering native plant growth. Example: Oriental bittersweet
- Berry production favoring seed scarification as well as dispersal by animals. Examples: Oriental bittersweet, buckthorn, Japanese barberry
- Abundant seed production, increasing the odds of seed survival and dispersion. Examples: garlic mustard, wild parsnip, spotted knapweed
- Multiple dispersal strategies, increasing the odds that seed will find a suitable habitat. Examples: garlic mustard (seeds float & stick to fur, hair and clothing), Canada thistle (seeds, rhizomes and root pieces)
- Perennial life-cycle able to resprout from strong root systems. Examples: Japanese barberry and other woody species
- Nitrogen fixing, providing critical nutrients that might otherwise be limiting. Example: Siberian peashrub
- Allelopathic root exudes that can suppress other plants. Example: spotted knapweed

Of critical importance in forest settings is the ability of invasive plants to 1) outcompete regeneration needed to ensure the success of future stands, or 2) disfavor key species required to maintain stand functions. An example of the latter is the interaction between buckthorn and exotic earthworms which alters soil chemistry and disfavors sugar maple and basswood in northern hardwood stands.

In the NSU, woody invasive plants are the species most likely to impact long-term forest sustainability. Currently a number of woody species are present in the section. In some cases, entire stands are thoroughly infested such that local eradication is no longer feasible, at least not without substantial work. But those cases are relatively rare and isolated. Overall, the Section is relatively free of invasive plant species when compared to southeastern Minnesota.

Invasive plants to know

Common buckthorn

Common buckthorn (*Rhamnus cathartica*) is a tall understory shrub or small tree that can grow up to 25 feet tall. Often multi-stemmed, the branches have no terminal bud and instead have a thorn at the tip of each stem. With broad rounded leaves that emerge early in the spring and go dormant late in the season, buckthorn can easily shade out small native plants including tree seedlings and sprouts. In dry upland sites, common buckthorn can create dense thickets which eventually eliminate native species growing beneath them. The seed, four to each black drupe, are attractive to birds, but give them diarrhea when eaten. As a result, viable seeds are quickly dispersed. Because buckthorn was originally introduced from Europe as an ornamental landscape plant, infestations are generally associated with urban areas or flight corridors moving away from urban areas. The species is listed as a Minnesota noxious weed in the "Restricted" category. That means it cannot be sold, planted or transported (except to a disposal site) without a permit from the Minnesota Department of Agriculture. However, eliminating the plants or controlling reproduction is not required by law. Given the wide-spread nature of the infestation in the southern half of the state, requiring control isn't feasible. In the NSU, the worst infestations are in the Duluth and Two Harbor areas, and along nearby river corridors. Isolated infestations have been reported elsewhere, but plants are occurring as scattered 4 to 10 foot tall plants rather than dense uniform thickets.

Glossy buckthorn

Glossy buckthorn *(Frangula alnus)*, also from Europe, has been sold by the nursery trade in three different forms. The cultivar *Columnaris* has a narrow and tall form; the cultivars *Aspenifolia* and *Ron Williams* have narrow leaves that give them a fern-like texture. This buckthorn aggressively invades wetlands including acidic bogs, fens and sedge meadows. However, it is much less common than common buckthorn. Only a handful of infestations have been reported in the Northern Superior Uplands. Because glossy buckthorn prefers better quality sites, restoration once glossy buckthorn has been removed may be easier. Even after removing dense thickets, replanting or reseeding may not be needed, while replanting or reseeding is almost always needed after removing dense thickets of common buckthorn. Because their preferred habitat and phenology are similar to native alder, detection can be more difficult. Recent detection projects have produced far more false positives than infestations of glossy buckthorn. Like common buckthorn, glossy buckthorn is a restricted noxious weed.

Japanese Barberry

Like the buckthorns, Japanese barberry (*Berberis thunbergii*) was introduced as an ornamental landscape plant. Its unique structure, fall color and ornamental berries have made it a popular ornamental shrub for sale in landscape nurseries in Minnesota and elsewhere. Unfortunately, it is showing signs of being capable of damaging native habitats much like buckthorn. It is forming dense understories in forests in southern Minnesota. The shrub is relatively small, growing to no more than 3 to 6 feet tall. It produces small tear-drop shaped leaves clustered around spines along the stem. In autumn, the leaves turn red to purple; easily seen through the woods. The berries are bright red when mature and are borne in pairs at each leaf node. The stems are arched and can re root when they touch the ground. The thorns make passage through barberry thickets nearly impossible, and control is difficult. Japanese barberry is a "specially regulated plant" under the Minnesota state noxious weed law. The nursery industry is gradually phasing out cultivars that are prolific seed-producers. At the end of the phase-out period, the listed cultivars will become restricted noxious weeds, regulated like buckthorn. Currently there is only one known, serious infestation in the Two Harbors area. But there is barberry in a number of the other communities, poised to spread into surrounding forests. Before this species becomes permanently established in native habitats, there is an opportunity to address the threat to northern forests.

Japanese Knotweed

Japanese knotweed (*Polygonum cuspidatum*) is sometimes referred to (incorrectly) as ornamental bamboo. It is a large shrub that can grow 10 to 15 feet tall (and as wide) with stout reddish stems and large leaves alternating on swollen leaf nodes. The flowers are small and white, borne in clusters at the leaf axils. Knotweed spreads primarily through root sprouts or root pieces that can float down stream to take hold and start another clump. These clumps, often united in one giant root ball, can get quite large. Because of the interconnected root ball and ability to sprout from small root pieces, this plant can be very difficult to control. Fortunately reproduction by seed is minimal, so infestations are not common except along riparian corridors downstream of an ornamental planting. Japanese knotweed and its cousin giant knotweed (*Polygonum sachalinense*) are "specially regulated plants". Sale as an ornamental plant is allowed as long as distributors affix a warning to the plant indicating that it is inadvisable to plant within 100 feet of a water body, stream or flood plain. There are only a handful of infestations known to occur in the NSU. Two are within communities, and two are on private lands within state forest boundaries. Because of the potential to move downstream, it is important that these areas be monitored, and any infestations destroyed while they are small.

Exotic Honeysuckles

There are three species of exotic honeysuckle (*Lonicera tartarica*, L. *morrow,* and L. x *bella*), which are difficult to tell apart unless they are in bloom. The flowers in early summer are fragrant. The leaves are opposite and oval to oblong. Berries are red or yellow borne in pairs at each leaf node. Each fruit contains many seeds, which are spread easily by birds. Seed germination is highest on open ground, or where the understory is sparse. The shrubs can grow from 5 to 12 feet high. Like buckthorn, exotic honeysuckle has a longer growing season than many native plants and can produce thickets that

exclude native plants and tree regeneration. While thickets are not common in the NSU at this time, they are common in other parts of Minnesota. Exotic honeysuckles have been reported more broadly than buckthorn across the NSU. Because control methods are the same, buckthorn and honeysuckle can be targeted in the same treatments where they occur together. Exotic honeysuckles are not currently regulated and *L. tartarica* is sold in a few Minnesota nurseries. The Noxious Weed Advisory Committee recommended listing the three species as restricted noxious weeds, which would end sale. If the Minnesota Department of Agriculture commissioner accepts that recommendation, they would become restricted noxious weeds in 2017.

Common tansy

Common tansy (*Tanacetum vulgare*) is a perennial herbaceous plant. It can grow up to 3 feet tall and has yellow button-like flowers. Common tansy is toxic to humans and livestock so infestations reduce the amount of livestock that land can support. Tansy can outcompete desired vegetation, which can make reforestation and restoration efforts difficult. Tansy was introduced to the United States for medicinal and horticultural uses; through purposeful plantings and natural spread, common tansy is now present across most of the northern United States and in Canada. In the NSU, it is common along roadsides and abandoned farmyards and along the north shore of Lake Superior. South sloping open areas are most vulnerable. Common tansy is a prohibited noxious weed on the "control" List in Minnesota, meaning that control is required by law. Efforts must be made to prevent the spread, maturation and dispersal of seeds.

Knapweeds

Spotted knapweed (*Centaurea stoebe* spp. *micranthos*) is a biennial or short-lived herbaceous perennial plant. It grows 2 to 3 feet tall and has pink to purple flowers. Spotted knapweed can be a skin irritant, so cover your skin when working with it. Spotted knapweed is poisonous to other plants and can dominate an area, spreading rapidly in artificial corridors, gravel pits, agricultural field margins and overgrazed pastures. It especially threatens dry prairie, oak and pine barrens, dunes and sandy ridges. Spotted knapweed is common in the NSU, and there are three other knapweed species that are either uncommon in Minnesota, or found in the Midwest, but not found in Minnesota. These include diffuse knapweed (*C. diffusa*), meadow knapweed (*C. x moncktonii*), and brown knapweed (*C. jacea*).Knapweeds can hybridize making identification challenging and potentially resulting in "superweeds" that combine properties of multiple species. Spotted knapweed is a prohibited noxious weed on the "control" list in Minnesota, meaning that control is required by law (efforts must be made to prevent the spread, maturation and dispersal of seeds). Brown knapweed and meadow knapweed are prohibited noxious weeds on the "eradicate" list, meaning that the plants must be eradicated (all of the above and below ground parts of the plant must be destroyed).

Reed canary grass

Reed canary grass (*Phalaris arundinacea*) is a perennial cool season grass that grows 2 to 6 feet tall. One of the first grasses to sprout in the spring, it can reproduce vegetatively through horizontal stems (rhizomes) that grow beneath the soil surface. This creates a thick impenetrable mat that makes growth

difficult for other species. Reed canary is a major threat to wetlands, out-competing most native species and forming single-species stands. It can become more abundant when soil is disturbed such as through ditch building, stream channeling, sedimentation, and intentional planting. Reed canary grass has been widely planted in the United States for forage and erosion control. Many organizations no longer plant reed canary grass, but it is still planted in Minnesota and is common in the NSU. There are no laws prohibiting the planting of reed canary grass or mandating its control.

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Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 8: Wildlife Species and Trends

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

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Northern Superior Uplands SFRMP
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Contents

Wildlife Species and Trends For the Northern Superior Uplands Section

Border Lakes, Laurentian Uplands, Nashwauk Uplands, North Shore Highlands, and Toimi Uplands subsections

Introduction

This chapter provides information on the occurrence, legal status, habitat associations, and population trends of wildlife species in these five subsections in the Northern Superior Uplands (NSU). Species presence information is summarized from data collected by the Minnesota Gap Analysis Project (MN-GAP), a project organized to provide a state assessment of the conservation status of native vertebrate species and natural land cover-types.

Minnesota completed its first State Wildlife Action Plan in 2006 (known as *Tomorrow's Habitat for the Wild and Rare;* http://www.dnr.state.mn.us/cwcs/index.html). It is a strategic plan that sets objectives and conservation actions for species in greatest conservation need (SGCN). SGCN include all wildlife species listed as endangered, threatened, or special concern as well as species that are rare, declining, or vulnerable to decline. The State Wildlife Action Plan includes goals for stabilizing and increasing populations of SGCNs, improving knowledge about these species, and enhancing people's appreciation and enjoyment of them. The plan also identifies habitats that are most important to the greatest number of SGCN in a subsection, known as a Key Habitats.

Within the five subsections in the NSU, Border Lakes has 69 SGCN, Laurentian Uplands has 58 SGCNs, Nashwauk Uplands has 60 SGCN, North Shore Highlands has 84 SGCN, and Toimi Uplands has 52 SGCN (see Appendix G in the *State Wildlife Action Plan* for the list of SGCN in each subsection). The Key Habitats of Forest-Upland Coniferous, Forest-Lowland Coniferous, and River-Headwater to Large were identified for all five of the subsections in the NSU. The Key Habitat of Shrub/Woodland-Upland (jack pine woodland) was identified for all the subsections except the North Shore Highlands. The Key Habitat of Forest-Upland Deciduous (mixed hardwood-pine) was identified for the Nashwauk Uplands, Shoreline-dunes-cliffs/talus was identified for the North Shore Highlands, and Lake-Deep was identified for the Border Lakes and North Shore Highlands. See the subsection profiles in Chapter 5 and the habitat descriptions in Chapter 6 of the *State Wildlife Action Plan* for more information on SGCN and Key Habitats in each subsection.

The *State Wildlife Action Plan* identified habitat loss and habitat degradation as the most significant challenges facing SGCN in the five subsections in the NSU. Priority conservation actions identified in the plan for these subsections include maintaining, enhancing, and protecting key habitats, conducting surveys and research on SGCN populations and habitat, and monitoring long-term trends in SGCN populations and habitat. Minnesota is currently revising the *State Wildlife Action Plan*, which will be available in October 2015. The revised plan will include an updated list of SGCN and will delineate priority conservation areas for SGCN.

Long-term monitoring of wildlife populations is necessary for assessing population trends and the response of species to land management activities. Information used to assess population status and health comes from a variety of sources, including direct and indirect surveys, habitat quality surveys, and

harvest surveys (see table below for most recent data sources). DNR's Division of Fish and Wildlife conducts annual population and harvest assessments and research, and publishes annual population status, harvest, and research reports online at http://www.dnr.state.mn.us/publications/wildlife/index.html . The DNR Department of Ecological and Water Resources conducts annual surveys for a variety of species including northern goshawks, common loons, colonial waterbirds, and frogs and toads. In addition, the DNR's Minnesota Biological Survey (http://www.dnr.state.mn.us/mbs/index.html) and the Minnesota Breeding Bird Atlas (http://www.mnbba.org/) collect baseline data on wildlife that can be used to assess trends over time, while the US Fish and Wildlife Service conducts ongoing waterfowl, dove, sandhill crane, and woodcock surveys (http://www.fws.gov/migratorybirds/NewReportsPublications/).

Table 8.1. Wildlife survey data locations and availability

Survey	Data Availability
Breeding Bird Survey	https://www.pwrc.usgs.gov/**BBS**
Forest Bird Monitoring Program	http://www.nrri.umn.edu/mnbirds/default.htm
Western Great Lakes Owl Monitoring	http://www.hawkridge.org/research/springowl.html
Northern Goshawk Monitoring	MN DNR – Nongame Wildlife Program
Minnesota Loon Monitoring Program	http://www.dnr.state.mn.us/eco/nongame/projects/mlmp_state.html
Colonial Waterbird Survey	MN DNR – Nongame Wildlife Program
Minnesota Frog and Toad Survey	http://www.dnr.state.mn.us/volunteering/frogtoad_survey/index.html

Survey	Data Availability
Minnesota Dragonfly Survey	http://www.mndragonfly.org/
Grouse Surveys Grouse surveys PDF	http://www.dnr.state.mn.us/hunting/grouse/reports.html http://files.dnr.state.mn.us/recreation/hunting/grouse/grouse_survey_report14.pdf
Sandhill Crane Survey	http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus/SandhillCrane/2014%20Status%20and%20Harvest%20Sandhill%20Cranes.pdf
Mourning Dove Survey	http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus/MourningDove/Mourning%20Dove%20Population%20Status%202014.pdf
Wetland Wildlife Population Survey	http://files.dnr.state.mn.us/publications/wildlife/population2013/4-wetland-wildlife.pdf
Woodcock Survey	http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus/Woodcock/American%20Woodcock%20Population%20Status2014.pdf
Small Game, Goose, Turkey, Moose Harvest Report	http://files.dnr.state.mn.us/publications/wildlife/population2013/5-hunting-harvest.pdf
Furbearer Scent Station	http://files.dnr.state.mn.us/recreation/hunting/trapping/scent_station

Survey	Data Availability
Surveys Furbearer Track Surveys	.pdf http://files.dnr.state.mn.us/recreation/hunting/trapping/wintertrack.pdf
Furbearer Harvest Report	http://files.dnr.state.mn.us/recreation/hunting/trapping/harvest_13-14.pdf
Bear Survey	http://files.dnr.state.mn.us/publications/wildlife/population2013/5-hunting-harvest.pd
Bear Harvest Report	http://files.dnr.state.mn.us/recreation/hunting/bear/2013_bearharvest.pdf
Deer Survey	http://files.dnr.state.mn.us/publications/wildlife/population2013/1-farmland-wildlife.pdf
Deer Harvest Report	http://files.dnr.state.mn.us/wildlife/deer/reports/harvest/deerharvest_2013.pdf
Grouse/Moose Survey	http://files.dnr.state.mn.us/publications/wildlife/population2013/3-forest-wildlife.pdf
Wolf Survey	http://files.dnr.state.mn.us/fish_wildlife/wildlife/wolves/2013/wolfsurvey_2013.pdf

Wildlife species within the planning area face many threats including forest loss, forest fragmentation, changes in forest ages, forest types, and forest patch sizes, invasive species, and climate change (MFRC 2014). Forest management activities can have a positive or negative influence on these threats.

Over the past 150 years as timber harvest replaced fire as the dominant disturbance factor on the landscape, the forests of the NSU have become simplified in terms of composition and structure. There has been a loss of species diversity and structural complexity at the stand-level (Franklin et al. 2007), as well as significant changes in forest composition, forest ages, and patch sizes on a landscape scale (Host and White 2003, MFRC 2014, White and Host 2003). Within-stand species diversity has been altered, most notably a reduced abundance of long-lived conifers due to lack of seed trees (MFRC 2014). Within-stand horizontal and vertical structure has been reduced so that stands tend to have fewer snags, fewer large live trees, less diversity in tree sizes, fewer large downed trees, and more uniform tree distribution (Franklin et al. 2007). On a landscape scale, forest composition and age have been altered so that today's forests are dominated by younger-aged stands of early successional species (MFRC 2014, White and Host 2003). Forest patches are smaller and have become more uniform in shape, there has been an increase in the amount of edge and a decrease in the amount of interior forest area, and large patches tend to be underrepresented on the landscape (Host and White 2003, MFRC 2014, White and Host 2003).

These changes have decreased habitat quality for many wildlife species, particularly species that require older forest and larger patches of forest. However, these changes have led to increased habitat quality for some wildlife species, particularly species that prefer edge and early successional habitats. Forest management can be an important tool for increasing habitat quality for wildlife and maintaining and enhancing components of the forest that have been compromised over the past 150 years.

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Terrestrial Vertebrate Species List, Status and Trends

Notes regarding the following six tables:

Species Criteria: Species criteria for MN-GAP includes the following: 1) Be known to breed in Minnesota (evidence of breeding 5 of the past 10 years) and be a regularly occurring non-accidental, 2) Be listed as state endangered, threatened, or special concern or as federally endangered or threatened, 3) Be listed as a furbearer, big game, small game, or migratory bird in Minnesota, and, 4) Be an exotic species in Minnesota that impacts native species or is of management interest.
Species Group: Animals are assigned to one of four major species groups - Amphibians, Birds, Mammals, and, Reptiles.
[a] **Species Common and Scientific Names:** Notes standard MN-GAP protocol based on NatureServe and it's related searchable plant, animal and ecological database called NatureServe Explorer located at www.natureserveexplorer.org
[b]**Minnesota Legal Status:** E = State Endangered; T = State Threatened; SC = State Species of Special Concern; BG = Big Game; SG = Small Game; F = Furbearer; MW = Migratory Waterfowl; UB = Unprotected Bird; PB = Protected Bird; PWA = Protected Wild Animal; UWA = Unprotected Wild Animal. Note: A species may have more than one Minnesota Legal Status notation.
[c]**Federal Legal Status:** T = Federal Threatened; E = Federal Endangered; P = Federal Protection by the Migratory Bird Treaty Act or Bald Eagle Protection Act or CITES.
[d]**Species Occurrence:** For all ECS Subsections, the following codes note a species specific range modifier: B = Breeding; PR = Permanent Resident; a = absent; m = migrant; m/sv = migrant/summer visitor; wv = winter visitor. Also, an (L) may be listed with these range codes if the species has a limited distribution in the Subsection due to specific habitat needs. Note: These range notations by ECS subsections represent the current occurrence of these wildlife species based on ECS subsections. Animal distributions are dynamic and revisions may be made as new information becomes available.
DISCLAIMER: Information and data listed in these tables has been produced by ongoing wildlife species assessment efforts conducted under the MNDNR Division of Wildlife's Minnesota Wildlife Resource Assessment Project (MN-WRAP) and Minnesota Gap Analysis Project (MN-GAP). These efforts and related tables noted here are initial products that are currently in various stages of literature and expert review. Review and comments on these tables and contents is encouraged. Please contact the MNDNR Division of Wildlife at 218-833-8620 for comments or suggestions

Table 8.2.a. Bird species list

Northern Superior Uplands (NSU) Subsections

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABNBA01030	Common Loon	*Gavia immer*	R	PB	P	B	B	B	B	B
ABNCA02010	Pied-billed Grebe	*Podilymbus podiceps*	R	PB	P	B	B	B	B	B
ABNCA03020	Red-necked Grebe	*Podiceps grisegena*	R	PB	P	B	B	B	B	B
ABNFD01020	Double-crested Cormorant	*Phalacrocorax auritus*	R	UB	P	B	B	B	B	B
ABNGA01020	American Bittern	*Botaurus lentiginosus*	R	PB	P	B	B	B	B	B
ABNGA04010	Great Blue Heron	*Ardea herodias*	R	PB	P	B	B	B	B	B
ABNGA08010	Green Heron	*Butorides virescens*	R	PB	P	B	A	A	A	A
ABNJB0230	Trumpeter Swan	*Cygnus buccinator*	R	SC	P	M	M	M	B	B
ABNJB05030	Canada Goose	*Branta canadensis*	R	PB, MW	P	B	B	B	B	B
ABNJB09010	Wood Duck	*Aix sponsa*	R	PB, MW	P	B	B	B	B	B
ABNJB10040	American Black Duck	*Anas rubripes*	R	PB, MW	P	B	B	B	B	B
ABNJB10060	Mallard	*Anas platyrhynchos*	R	PB, MW	P	B	B	B	B	B
ABNJB10130	Blue-winged Teal	*Anas discors*	R	PB, MW	P	B	B	B	B	B
ABNJB10010	Green-winged Teal	*Anas crecca*	R	PB, MW	P	M	M	M	B	M
ABNJB10180	American Wigeon	*Anas americana*	R	PB, MW	P	M	B	M	M	B
ABNJB11040	Ring-necked Duck	*Aythya collaris*	R	PB, MW	P	B	B	B	B	B
ABNJB18010	Common Goldeneye	*Bucephala clangula*	R	PB, MW	P	WV	B	B	B	B
ABNJB20010	Hooded Merganser	*Lophodytes cucullatus*	R	PB, MW	P	B	B	B	B	B
ABNJB21010	Common Merganser	*Mergus merganser*	R	PB, MW	P	B	B	B	B	B
ABNJB21020	Red-breasted Merganser	*Mergus serrator*	R	PB, MW	P	B	M	M	M	M
ABNKA02010	Turkey Vulture	*Cathartes aura*	R	PB	P	B	B	B	B	B

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABNKC01010	Osprey	*Pandion haliaetus*	R	PB	P	B	B	B	B	B
ABNKC10010	Bald Eagle	*Haliaeetus leucocephalus*	R	PB	P	B	B	B	B	B
ABNKC11010	Northern Harrier	*Circus cyaneus*	R	PB	P	B	B	B	B	B
ABNKC12020	Sharp-shinned Hawk	*Accipiter striatus*	R	PB	P	B	B	B	B	B
ABNKC12040	Cooper's Hawk	*Accipiter cooperii*	R	PB	P	B	M	B	M	M
ABNKC12060	Northern Goshawk	*Accipiter gentilis*	PR	SC	P	B	B	B	B	B
ABNKC19050	Broad-winged Hawk	*Buteo platypterus*	R	PB	P	B	B	B	B	B
ABNKC19110	Red-tailed Hawk	*Buteo jamaicensis*	R	PB	P	B	B	B	B	B
ABNKD06020	American Kestrel	*Falco sparverius*	R	PB	P	B	B	B	B	B
ABNKD06030	Merlin	*Falco columbarius*	R	PB	P	B	B	B	B	B
ABNKD06070	Peregrine Falcon	*Falco peregrinus*	R	PB, SC	P	B	M	M	M	B
ABNLC09010	Spruce Grouse	*Falcipennis canadensis*	PR	PB, SG		A	A	P	P	A
ABNLC11010	Ruffed Grouse	*Bonasa umbellus*	PR	PB, SG		P	P	P	B	B
ABNME05030	Virginia Rail	*Rallus limicola*	R	PB, SG	P	B	B	B	A	B
ABNME08020	Sora	*Porzana carolina*	R	PB, SG	P	B	B	B	B	B
ABNMK01010	Sandhill Crane	*Grus canadensis*	R	PB	P	M / B (L)	B	B	M	M
ABNNB03070	Piping Plover	*Charadrius melodus*	R	PB, E	P, E&T	M / B (L)	M	M	A	M
ABNNB03090	Killdeer	*Charadrius vociferus*	R	PB	P	B	B	B	B	B
ABNNF04020	Spotted Sandpiper	*Actitis macularia*	R	PB	P	B	B	B	B	B
ABNNF18030	Wilson's Snipe	*Gallinago delicata*	R	PB, SG	P	B	B	B	B	B
ABNNF19020	American Woodcock	*Scolopax minor*	R	PB, SG	P	B	B	B	B	B
ABNNM03100	Ring-billed Gull	*Larus delawarensis*	R	PB	P	B	M	M	M	M
ABNNM03120	Herring Gull	*Larus argentatus*	R	PB	P	B	B	B	B	B
ABNNM08070	Common Tern	*Sterna hirundo*	R	PB, T	P	B	M	M	M	M
ABNPB0401a	Rock Dove	*Columba livia*	PR	PB		P	P	P	P	P
ABNPB04040	Mourning Dove	*Zenaida macroura*	R	PB	P	B	M	M	M	B
ABNRB02010	Black-billed Cuckoo	*Coccyzus erythropthalmus*	R	PB	P	B	B	B	B	B
ABNSB05010	Great Horned Owl	*Bubo virginianus*	PR	UB	P	P	P	P	P	P
ABNSB07010	Northern Hawk Owl	*Surnia ulula*	PR	PB	P	WV	WV	P	P	P
ABNSB12020	Barred Owl	*Strix varia*	PR	PB	P	P	P	P	P	P
ABNSB12040	Great Gray Owl	*Strix nebulosa*	PR	PB	P	WV	P	P	P	P
ABNSB13010	Long-eared Owl	*Asio otus*	R	PB	P	B	B	B	B	B
ABNSB15010	Boreal Owl	*Aegolius funereus*	PR	SC	P	WV /P (L)	WV	P	P	WV

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABNSB15020	Northern Saw-whet Owl	*Aegolius acadicus*	R	PB	P	B	B	B	B	B
ABNTA02020	Common Nighthawk	*Chordeiles minor*	R	PB	P	B	B	B	B	B
ABNTA07070	Whip-poor-will	*Caprimulgus vociferus*	R	PB	P	B	B	B	B	B
ABNUA03010	Chimney Swift	*Chaetura pelagica*	R	PB	P	B	B	B	B	B
ABNUC45010	Ruby-throated Hummingbird	*Archilochus colubris*	R	PB	P	B	B	B	B	B
ABNXD01020	Belted Kingfisher	*Ceryle alcyon*	R	PB	P	B	B	B	B	B
ABNYF04040	Red-headed Woodpecker	*Melanerpes erythrocephalus*	R	PB	P	B	B	A	A	B
ABNYF05010	Yellow-bellied Sapsucker	*Sphyrapicus varius*	R	PB	P	B	B	B	B	B
ABNYF07030	Downy Woodpecker	*Picoides pubescens*	PR	PB	P	P	P	P	B	B
ABNYF07040	Hairy Woodpecker	*Picoides villosus*	PR	PB	P	P	P	P	P	P
ABNYF07080	Three-toed Woodpecker	*Picoides tridactylus*	PR	PB	P	WV	WV	P	P	WV
ABNYF07090	Black-backed Woodpecker	*Picoides arcticus*	PR	PB	P	P	P	P	P	P
ABNYF10020	Northern Flicker	*Colaptes auratus*	R	PB	P	B	B	B	B	B
ABNYF12020	Pileated Woodpecker	*Dryocopus pileatus*	PR	PB	P	P	P	P	P	P
ABPAE32010	Olive-sided Flycatcher	*Contopus cooperi*	R	PB	P	B	B	B	B	B
ABPAE32060	Eastern Wood-Pewee	*Contopus virens*	R	PB	P	B	B	B	B	B
ABPAE33010	Yellow-bellied Flycatcher	*Empidonax flaviventris*	R	PB	P	B	B	B	B	B
ABPAE33030	Alder Flycatcher	*Empidonax alnorum*	R	PB	P	B	B	B	B	B
ABPAE33070	Least Flycatcher	*Empidonax minimus*	R	PB	P	B	B	B	B	B
ABPAE35020	Eastern Phoebe	*Sayornis phoebe*	R	PB	P	B	B	B	B	B
ABPAE43070	Great Crested Flycatcher	*Myiarchus crinitus*	R	PB	P	B	B	B	B	B
ABPAE52060	Eastern Kingbird	*Tyrannus tyrannus*	R	PB	P	B	B	B	B	B
ABPAU01010	Purple Martin	*Progne subis*	R	PB,SC	P	B	B	B	B	B
ABPAU03010	Tree Swallow	*Tachycineta bicolor*	R	PB	P	B	B	B	B	B
ABPAU07010	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	R	PB	P	B	B	B	B	B
ABPAU08010	Bank Swallow	*Riparia riparia*	R	PB	P	B	B	B	B	B
ABPAU09010	Cliff Swallow	*Petrochelidon pyrrhonota*	R	PB	P	B	B	B	B	B

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABPAU09030	Barn Swallow	*Hirundo rustica*	R	PB	P	B	B	B	B	B
ABPAV01010	Gray Jay	*Perisoreus canadensis*	PR	PB	P	P	P	P	P	P
ABPAV02020	Blue Jay	*Cyanocitta cristata*	PR	PB	P	P	P	P	P	P
ABPAV10010	American Crow	*Corvus brachyrhynchos*	PR	PB	P	P	P	P	B	P
ABPAV10110	Common Raven	*Corvus corax*	PR	PB	P	P	P	P	P	P
ABPAW01010	Black-capped Chickadee	*Poecile atricapillus*	PR	PB	P	P	P	P	P	P
ABPAW01060	Boreal Chickadee	*Poecile hudsonicus*	PR	PB	P	P	P	P	P	P
ABPAZ01010	Red-breasted Nuthatch	*Sitta canadensis*	PR	PB	P	P	P	P	P	P
ABPAZ01020	White-breasted Nuthatch	*Sitta carolinensis*	PR	PB	P	P	P	P	P	P
ABPBA01010	Brown Creeper	*Certhia americana*	R	PB	P	B	B	B	B	B
ABPBG09010	House Wren	*Troglodytes aedon*	R	PB	P	B	B	B	B	B
ABPBG09050	Winter Wren	*Troglodytes troglodytes*	R	PB	P	B	B	B	B	B
ABPBG10010	Sedge Wren	*Cistothorus platensis*	R	PB	P	B	B	B	B	B
ABPBJ05010	Golden-crowned Kinglet	*Regulus satrapa*	R	PB	P	B	B	B	B	B
ABPBJ05020	Ruby-crowned Kinglet	*Regulus calendula*	R	PB	P	B	B	B	B	B
ABPBJ15010	Eastern Bluebird	*Sialia sialis*	R	PB	P	B	B	B	B	B
ABPBJ18080	Veery	*Catharus fuscescens*	R	PB	P	B	B	B	B	B
ABPBJ18100	Swainson's Thrush	*Catharus ustulatus*	R	PB	P	B	B	B	B	B
ABPBJ18110	Hermit Thrush	*Catharus guttatus*	R	PB	P	B	B	B	B	B
ABPBJ19010	Wood Thrush	*Hylocichla mustelina*	R	PB	P	B	B	B	B	B
ABPBJ20170	American Robin	*Turdus migratorius*	R	PB	P	B	B	B	B	B
ABPBK01010	Gray Catbird	*Dumetella carolinensis*	R	PB	P	B	B	B	B	B
ABPBK06010	Brown Thrasher	*Toxostoma rufum*	R	PB	P	B	B	B	B	B
ABPBK0607a	European Starling	*Sturnus vulgaris*	PR	UB		P	P	P	P	P
ABPBN01020	Cedar Waxwing	*Bombycilla cedrorum*	R	PB	P	B	B	B	B	B
ABPBW01160	Blue-headed Vireo	*Vireo solitarius*	R	PB	P	B	B	B	B	B
ABPBW01170	Yellow-throated Vireo	*Vireo flavifrons*	R	PB	P	A	A	A	A	A

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABPBW01210	Warbling Vireo	*Vireo gilvus*	R	PB	P	B (L)	A	A	A	A
ABPBW01230	Philadelphia Vireo	*Vireo philadelphicus*	R	PB	P	B	B	B	B	B
ABPBW01240	Red-eyed Vireo	*Vireo olivaceus*	R	PB	P	B	B	B	B	B
ABPBX01030	Golden-winged Warbler	*Vermivora chrysoptera*	R	PB	P	B	B	B	B	B
ABPBX01040	Tennessee Warbler	*Vermivora peregrina*	R	PB	P	B	B	B	B	B
ABPBX01060	Nashville Warbler	*Vermivora ruficapilla*	R	PB	P	B	B	B	B	B
ABPBX02010	Northern Parula	*Parula americana*	R	PB	P	B	B	B	B	B
ABPBX03010	Yellow Warbler	*Dendroica petechia*	R	PB	P	B	B	B	B	B
ABPBX03020	Chestnut-sided Warbler	*Dendroica pensylvanica*	R	PB	P	B	B	B	B	B
ABPBX03030	Magnolia Warbler	*Dendroica magnolia*	R	PB	P	B	B	B	B	B
ABPBX03040	Cape May Warbler	*Dendroica tigrina*	R	PB	P	B	B	B	B	B
ABPBX03050	Black-throated Blue Warbler	*Dendroica caerulescens*	R	PB	P	B	M	B	B	M
ABPBX03060	Yellow-rumped Warbler	*Dendroica coronata*	R	PB	P	B	B	B	B	B
ABPBX03100	Black-throated Green Warbler	*Dendroica virens*	R	PB	P	B	B	B	B	B
ABPBX03120	Blackburnian Warbler	*Dendroica fusca*	R	PB	P	B	B	B	B	B
ABPBX03170	Pine Warbler	*Dendroica pinus*	R	PB	P	B	B	B	M	B
ABPBX03210	Palm Warbler	*Dendroica palmarum*	R	PB	P	M	B	B	M	B
ABPBX03220	Bay-breasted Warbler	*Dendroica castanea*	R	PB	P	M	M	B	M	B
ABPBX05010	Black-and-white Warbler	*Mniotilta varia*	R	PB	P	B	B	B	B	B
ABPBX06010	American Redstart	*Setophaga ruticilla*	R	PB	P	B	B	B	B	B
ABPBX10010	Ovenbird	*Seiurus aurocapillus*	R	PB	P	B	B	B	B	B
ABPBX10020	Northern Waterthrush	*Seiurus noveboracensis*	R	PB	P	B	B	B	B	B
ABPBX11020	Connecticut Warbler	*Oporornis agilis*	R	PB	P	B	B	B	B	B
ABPBX11030	Mourning Warbler	*Oporornis philadelphia*	R	PB	P	B	B	B	B	B
ABPBX12010	Common Yellowthroat	*Geothlypis trichas*	R	PB	P	B	B	B	B	B
ABPBX16020	Wilson's Warbler	*Wilsonia pusilla*	R	PB	P	M	B	B	B	M
ABPBX16030	Canada Warbler	*Wilsonia canadensis*	R	PB	P	B	B	B	B	B
ABPBX45040	Scarlet Tanager	*Piranga olivacea*	R	PB	P	B	B	B	B	B
ABPBX60010	Northern Cardinal	*Cardinalis cardinalis*	PR	PB	P	P	WV	WV	A	WV

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABPBX61030	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	R	PB	P	B	B	B	B	B
ABPBX64030	Indigo Bunting	*Passerina cyanea*	R	PB	P	B	B	B	B	B
ABPBX94020	Chipping Sparrow	*Spizella passerina*	R	PB	P	B	B	B	B	B
ABPBX94030	Clay-colored Sparrow	*Spizella pallida*	R	PB	P	B	B	B	B	B
ABPBX99010	Savannah Sparrow	*Passerculus sandwichensis*	R	PB	P	B	B	B	B	B
ABPBXA0040	Le Conte's Sparrow	*Ammodramus leconteii*	R	PB	P	B	B	B	B	B
ABPBXA3010	Song Sparrow	*Melospiza melodia*	R	PB	P	B	B	B	B	B
ABPBXA3020	Lincoln's Sparrow	*Melospiza lincolnii*	R	PB	P	B	B	B	B	B
ABPBXA3030	Swamp Sparrow	*Melospiza georgiana*	R	PB	P	B	B	B	B	B
ABPBXA4020	White-throated Sparrow	*Zonotrichia albicollis*	R	PB	P	B	B	B	B	B
ABPBXA5020	Dark-eyed Junco	*Junco hyemalis*	R	PB	P	B	B	B	B	B
ABPBXA9010	Bobolink	*Dolichonyx oryzivorus*	R	PB	P	B	B	B	B	B
ABPBXB0010	Red-winged Blackbird	*Agelaius phoeniceus*	R	UB	P	B	B	B	B	B
ABPBXB2020	Eastern Meadowlark	*Sturnella magna*	R	PB	P	B	B	B	B	B
ABPBXB5010	Rusty Blackbird	*Euphagus carolinus*	R	PB	P	M	M	M	B	M
ABPBXB5020	Brewer's Blackbird	*Euphagus cyanocephalus*	R	UB	P	B	A	A	A	B
ABPBXB6070	Common Grackle	*Quiscalus quiscula*	R	UB	P	B	B	B	B	B
ABPBXB7030	Brown-headed Cowbird	*Molothrus ater*	R	PB	P	B	B	B	B	B
ABPBXB9190	Baltimore Oriole	*Icterus galbula*	R	PB	P	B	B	B	B	B
ABPBY04020	Purple Finch	*Carpodacus purpureus*	R	PB	P	B	B	B	B	B
ABPBY04040	House Finch	*Carpodacus mexicanus*	PR	PB	P	P	A	A	A	B
ABPBY05020	White-winged Crossbill	*Loxia leucoptera*	R	PB	P	B	B	B	B	WV
ABPBY06030	Pine Siskin	*Carduelis pinus*	PR	PB	P	P	P	P	P	P
ABPBY06110	American Goldfinch	*Carduelis tristis*	R	PB	P	B	B	B	B	B
ABPBY09020	Evening Grosbeak	*Coccothraustes vespertinus*	PR	PB	P	P	P	P	P	P

Birds										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
ABPBY0902a	House Sparrow	*Passer domesticus*	PR	UB		P	P	P	P	P

Table 8.2.b. Mammal species list

For the Northern Superior Uplands subsections

Mammals										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
AMABA01010	Cinereus Shrew	*Sorex cinereus*	PR			P	P	P	P	P
AMABA01150	Water Shrew	*Sorex palustris*	PR			P	P	P	P	P
AMABA01180	Smoky Shrew	*Sorex fumeus*	PR	SC		P	A	P	P	P
AMABA01190	Arctic Shrew	*Sorex arcticus*	PR			P	P	P	P	P
AMABA01250	Pygmy Shrew	*Sorex hoyi*	PR			P	P	P	P	P
AMABA03010	Northern Short-tailed Shrew	*Blarina brevicauda*	PR			P	P	P	P	P
AMABB05010	Star-nosed Mole	*Condylura cristata*	PR			P	P	P	P	P
AMACC01010	Little Brown Myotis	*Myotis lucifugus*	PR	SC		B	B	B	B	P
AMACC01150	Northern Myotis	*Myotis septentrionalis*	PR	SC		P	B	B	P	B
AMACC02010	Silver-haired Bat	*Lasionycteris noctivagans*	R			B	B	B	B	B
AMACC03020	Eastern Pipistrelle	*Pipistrellus subflavus*	PR	SC		P	A	A	P	B
AMACC04010	Big Brown Bat	*Eptesicus fuscus*	PR	SC		B	B	B	B	P
AMACC05010	Eastern Red Bat	*Lasiurus borealis*	R			B	B	B	B	B
AMACC05030	Hoary Bat	*Lasiurus cinereus*	R			B	B	B	B	B
AMAEB01040	Eastern Cottontail	*Sylvilagus floridanus*	PR	PWA, SG		P	P	P	A	B
AMAEB03010	Snowshoe Hare	*Lepus americanus*	PR	PWA, SG		P	P	P	P	P
AMAFB02020	Least Chipmunk	*Tamias minimus*	PR			P	P	P	P	P
AMAFB02230	Eastern Chipmunk	*Tamias striatus*	PR			P	P	P	P	P

Mammals										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
AMAFB03010	Woodchuck	*Marmota monax*	PR			P	P	P	P	P
AMAFB05090	Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	PR			P	P	P	A	P
AMAFB05120	Franklin's Ground Squirrel	*Spermophilus franklinii*	PR			P	P	P	A	P
AMAFB07010	Eastern Gray Squirrel	*Sciurus carolinensis*	PR	PWA, SG		P	A	A	A	P
AMAFB08010	Red Squirrel	*Tamiasciurus hudsonicus*	PR			P	P	P	P	P
AMAFB09020	Northern Flying Squirrel	*Glaucomys sabrinus*	PR			P	P	P	P	P
AMAFE01010	American Beaver	*Castor canadensis*	PR	PWA, SG, F		P	P	P	P	P
AMAFF0304a	Woodland Deer Mouse	*Peromyscus maniculatus gracilis*	PR			P	P	P	P	P
AMAFF03070	White-footed Mouse	*Peromyscus leucopus*	PR			P	A	A	A	A
AMAFF09020	Southern Red-backed Vole	*Clethrionomys gapperi*	PR			P	P	P	P	P
AMAFF10050	Eastern Heather Vole	*Phenacomys ungava*	PR	SC		A	A	P	P	A
AMAFF11010	Meadow Vole	*Microtus pennsylvanicus*	PR			P	P	P	P	P
AMAFF11090	Rock Vole	*Microtus chrotorrhinus*	PR			P	A	P	P	A
AMAFF15010	Muskrat	*Ondatra zibethicus*	PR	PWA, SG, F		P	P	P	P	P
AMAFF17010	Southern Bog Lemming	*Synaptomys cooperi*	PR			P	P	P	P	P
AMAFH01010	Meadow Jumping Mouse	*Zapus hudsonius*	PR			P	P	P	P	P
AMAFH02010	Woodland Jumping Mouse	*Napaeozapus insignis*	PR			P	P	P	P	P
AMAFJ01010	North American Porcupine	*Erethizon dorsatum*	PR	UWA		P	P	P	P	P
AMAJA01010	Coyote	*Canis latrans*	PR	UWA		P	P	P	P	P
AMAJA01030	Gray Wolf	*Canis lupus*	PR	PWA,F	P	P	P	P	P	P
AMAJA03010	Red Fox	*Vulpes vulpes*	PR	PWA, SG, F		P	P	P	P	P
AMAJA04010	Gray Fox	*Urocyon*	PR	PWA,		P	A	A	A	A

Mammals										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
		cinereoargenteus		SG, F						
AMAJB01010	American Black Bear	*Ursus americanus*	PR	PWA, BG	P,	P	P	P	P	P
AMAJE02010	Northern Raccoon	*Procyon lotor*	PR	PWA, SG, F		P	P	P	P	P
AMAJF01010	American Marten	*Martes americana*	PR	PWA, SG, F		P	P	P	P	P
AMAJF01020	Fisher	*Martes pennanti*	PR	PWA, SG, F		P	P	P	P	P
AMAJF02010	Ermine	*Mustela erminea*	PR	UWA		P	P	P	P	P
AMAJF02050	American Mink	*Mustela vison*	PR	PWA, SG, F		P	P	P	P	P
AMAJF04010	American Badger	*Taxidea taxus*	PR	PWA, SG, F		P	P	P	A	P
AMAJF06010	Striped Skunk	*Mephitis mephitis*	PR	UWA		P	P	P	P	P
AMAJF10010	Northern River Otter	*Lontra canadensis*	PR	PWA, SG, F		P	P	P	P	P
AMAJH01020	Puma	*Puma concolor*	PR	PWA, SG, SC	P,	P	P	P	P	P
AMAJH03010	Canada Lynx	*Lynx canadensis*	PR	PWA, SG, SC	T, P	P	P	P	P	P
AMAJH03020	Bobcat	*Felis rufus*	PR	PWA, SG, F	P,	P	P	P	A	P
AMALC02020	White-tailed Deer	*Odocoileus virginianus*	PR	PWA, BG		P	P	P	P	P
AMALC03010	Moose	*Alces alces*	PR	PWA, SC		P	P	P	P	P

Table 8.2.c. Amphibian and reptile species list

For the Northern Superior Uplands subsections

Amphibians and Reptiles										
Element Code[a]	Common Name[a]	Scientific Name	Resident Status[b]	State Legal Status[c]	Federal Legal Status[d]	North Shore Highlands ECS Subsection[e]	Toimi Uplands ECS Subsection[e]	Laurentian Uplands ECS Subsection[e]	Border Lakes ECS Subsection[e]	Nashwauk Uplands ECS Subsection[e]
AAAAA01060	Blue-spotted Salamander	*Ambystoma laterale*	PR			P	P	P	P	P
AAAAA01140	Tiger Salamander	*Ambystoma tigrinum*	PR			P	P	P	A	P
AAAAD08010	Four-toed Salamander	*Hemidactylium scutatum*	PR	SC		P (L)	A	A	A	A
AAAAD12020	Redback Salamander	*Plethodon cinereus*	PR			P	P	P	P	P
AAAAF01030	Eastern Newt	*Notophthalmus viridescens*	PR			P	P	P	P	P
AAABB01020	American Toad	*Bufo americanus*	PR	PWA		P	P	P	P	P
AAABC02130	Gray Treefrog	*Hyla versicolor*	PR	PWA		P	P	P	P	P
AAABC05070	Western Chorus Frog	*Pseudacris triseriata*	PR	PWA		P	P	P	P	P
AAABC05090	Spring Peeper	*Pseudacris crucifer*	PR	PWA		P	P	P	P	P
AAABH01090	Green Frog	*Rana clamitans*	PR	PWA		P	P	P	P	P
AAABH01170	Northern Leopard Frog	*Rana pipiens*	PR	PWA		P	P	P	P	P
AAABH01190	Mink Frog	*Rana septentrionalis*	PR	PWA		P	P	P	P	P
AAABH01200	Wood Frog	*Rana sylvatica*	PR	PWA		P	P	P	P	P
ARAAB01010	Snapping Turtle	*Chelydra serpentina*	PR	PWA		P	P	P	P	P
ARAAD01010	Painted Turtle	*Chrysemys picta*	PR	PWA		P	P	P	P	P
ARAAD02020	Wood Turtle	*Clemmys insculpta*	PR	PWA, T		P (L)	P	A	A	A
ARAAD04010	Blanding's Turtle	*Emydoidea blandingii*	PR	PWA, T		P (L)	A	A	A	A
ARADB10010	Ringneck Snake	*Diadophis punctatus*	PR			P	A	A	A	A
ARADB34030	Redbelly Snake	*Storeria occipitomaculata*	PR			P	P	P	P	P
ARADB36130	Common Garter Snake	*Thamnophis sirtalis*	PR			P	P	P	P	P

[a] **Element Code and Species Common Name:** Are standardized nomenclature for GAP protocol uses through NatureServe and it's related searchable plant, animal and ecological communities database called NatureServe Explorer (2002) located at <www.natureserveexplorer.org>.
[b] **Resident Status (2006): R**=Regular resident as Breeding, Nesting, or Migratory (acceptable record exists in at least eight of the past ten years); **PR=**Permanent Resident (exists year-round).
[c] **State Legal Status (2014): E**=State Endangered; **T**=State Threatened; **SC**=State Species of Special Concern; **BG=**Big Game; **SG=**Small Game; **F**=Furbearer; **MW**=Migratory Waterfowl; **UB**=Unprotected Bird; **PB=**Protected Bird; **PWA**=Protected Wild Animal; **UWA**=Unprotected Wild Animal.
[d] **Federal Legal Status(2014): T**=Federal Threatened; **E**=Federal Endangered; **P**=Federal Protection by Migratory Bird Treaty Act and/or Bald Eagle Protection Act and/or CITES.
[e] **ECS Subsection Resident Status(2006): B**=Minnesota breeding record exists for the species; **P**=Presence known or predicted, as year around resident; **(L)**=Limited distribution within ECS Subsection; **M=**Spring or fall migrant, non-breeder; **SV**= Summer visitor, non-breeder; **WV**=Winter visitor, non-breeder; **A**=Absent.
[A] **MNWRAP Disclaimer**: This species list is a representation of the occurrence of these species as of 2006, based upon Minnesota Ecological Classification System Subsections. The species may not occur everywhere within the Subsection. Animal distributions are dynamic and occurrence revisions may be made as new information becomes available.

Habitat Relationships by Minnesota GAP Analysis Project (MN-GAP) land cover type

Table 8.3.a. Mammal habitat relationships

Mammal habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type — NSU Section

Non-Forest land cover types>>> | Forest land cover types>>>

SPECIES GROUP Species common name	habitat Feature		Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest									Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest					Forest size class				
		Barren	High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix	Seedling	Sapling	Pole timber	Saw timber	Uneven
INSECTIVORES																																														
Northern Short-tailed Shrew	D			Y			Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y				Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Arctic Shrew	R									Y	Y			Y	Y										Y	Y	Y	Y	Y	Y	Y										Y	Y	Y	Y	Y	Y
Cinereus Shrew	D						Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Smoky Shrew	D	Y																	Y		Y				Y				Y												Y	Y	Y	Y	Y	Y
Pygmy Shrew	D						Y	Y	Y	Y	Y			Y	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y				Y		Y			Y	Y	Y	Y	Y	Y	Y
Water Shrew	DR									Y	Y	Y		Y	Y										Y	Y	Y	Y	Y	Y	Y													Y	Y	Y
Star-nosed Mole	DR									Y	Y			Y	Y										Y	Y	Y	Y	Y	Y	Y						Y	Y		Y	Y			Y	Y	Y
BATS																																														
Big Brown Bat	CRS			Y			Y	Y				Y				Y	Y	Y		Y	Y			Y								Y	Y	Y		Y			Y	Y	Y			Y	Y	
Silver-haired Bat	CRS											Y					Y	Y		Y			Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Eastern Red Bat	CR		Y	Y			Y		Y	Y		Y			Y					Y	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y					Y	Y
Hoary Bat	R			Y			Y		Y			Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
Eastern Pipistrelle	MCER			Y			Y	Y	Y			Y	Y																			Y	Y	Y	Y	Y	Y	Y	Y	Y					Y	Y
Little Brown Myotis	CRS						Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y		Y	Y	Y				
Northern Myotis	CRS		Y	Y			Y	Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y		Y	Y				Y	Y
CARNIVORES																																														
Coyote	M	Y		Y		Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gray Wolf	M					Y	Y		Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gray Fox	CDM					Y	Y	Y	Y	Y																							Y	Y	Y	Y	Y	Y	Y	Y					Y	Y
Red Fox		Y		Y		Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Bobcat	CD								Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y
Canada Lynx									Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y			Y	Y	Y	Y	Y	Y	Y
Northern River Otter												Y	Y	Y	Y																															
American Marten	CDS															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y										Y			Y	Y	Y
Fisher	CDR S									Y									Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
Ermine	DR								Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
American Mink	DR									Y		Y	Y	Y	Y																															
American Badger						Y	Y	Y	Y																								Y													
Striped Skunk	DM			Y		Y	Y	Y	Y							Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y						Y	Y	Y	Y	Y
Northern Raccoon	CMR S	Y		Y		Y	Y		Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Black Bear	CDM R								Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
EVEN-TOED UNGULATES																																														
White-tailed Deer						Y	Y	Y	Y							Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Moose	R					Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y			Y	Y	Y	Y	Y	Y	Y
RODENTS																																														
Northern Flying Squirrel	CDM S															Y	Y	Y	Y	Y	Y	Y	Y	Y											Y						Y				Y	Y
Woodchuck				Y		Y	Y		Y	Y																							Y	Y								Y				
Eastern Gray Squirrel	CDM			Y		Y																		Y									Y	Y	Y	Y	Y								Y	
Franklin's Ground Squirrel				Y			Y	Y	Y																																			Y	Y	
Thirteen-lined Ground Squirrel				Y		Y	Y	Y	Y																																					
Least Chipmunk	DM							Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y					Y			Y				Y						Y	Y	Y	Y	Y
Eastern Chipmunk	DM			Y			Y		Y	Y							Y	Y		Y	Y	Y	Y	Y								Y	Y	Y	Y	Y			Y			Y	Y	Y	Y	Y
Red Squirrel	CDM S															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y										Y			Y	Y	Y
American Beaver	R								Y	Y		Y																				Y				Y						Y	Y	Y	Y	Y
Woodland Jumping Mouse	DM																		Y	Y	Y		Y												Y	Y	Y			Y			Y	Y	Y	Y
Meadow Jumping Mouse							Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y		Y																			Y				
Woodland Deer Mouse							Y		Y							Y	Y	Y	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
White-footed Mouse	CDM S								Y							Y	Y	Y	Y	Y	Y		Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
Southern Red-backed Vole	DM								Y	Y	Y					Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Meadow Vole							Y		Y					Y	Y	Y	Y	Y														Y	Y	Y	Y	Y										
Eastern Heather Vole		Y								Y	Y			Y		Y			Y		Y	Y			Y	Y																				
Rock Vole	Ro	Y								Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y							Y					Y					Y	Y	Y	Y	Y

Muskrat	R										Y		Y	Y		Y																																
Southern Bog Lemming								Y	Y	Y	Y	Y			Y					Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y		Y	Y		Y			Y	Y
North American Porcupine	CDS																Y	Y	Y	Y	Y	Y		Y	Y											Y	Y					Y				Y	Y	Y
RABBITS AND HARES																																																
Snowshoe Hare	E									Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
Eastern Cottontail	E			Y	Y		Y	Y	Y	Y	Y																						Y	Y	Y	Y	Y			Y	Y	Y		Y	Y			

Table 8.3.b. Bird habitat relationships

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
LOONS AND GREBES																																														
Common Loon												Y	Y																																	
Pied-billed Grebe												Y	Y	Y	Y																															
Red-necked Grebe												Y	Y		Y																															
PELICANS AND CORMORANTS																																														
Double-crested Cormorant	RS											Y	Y	Y	Y																	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
HERONS AND BITTERNS																																														
American Bittern	R						Y	Y		Y		Y	Y	Y	Y																															
Great Blue Heron	RS											Y	Y	Y	Y																	Y	Y	Y		Y	Y	Y	Y	Y	Y				Y	Y
Green Heron	R								Y	Y		Y	Y	Y	Y												Y	Y									Y	Y	Y	Y	Y				Y	Y
VULTURES																																														
Turkey Vulture	S						Y	Y	Y							Y	Y	Y	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y								Y	Y	
SWANS AND GEESE																																														
Canada Goose	R			Y		Y	Y	Y	Y	Y		Y	Y	Y	Y																															
Trumpeter Swan										Y		Y	Y	Y	Y																															
DUCKS AND MERGANSERS																																														
Wood Duck	CM RS									Y		Y	Y		Y																	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
American Wigeon	R						Y	Y	Y	Y		Y	Y	Y	Y																															
American Black Duck	R						Y	Y	Y	Y		Y	Y	Y	Y																						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mallard	RM			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																				Y	Y	Y	Y	Y				Y	Y
Blue-winged Teal	R					Y	Y	Y	Y	Y		Y	Y	Y	Y																				Y	Y	Y	Y	Y					
Green-winged Teal	R						Y	Y	Y	Y		Y	Y	Y	Y																															
Ring-necked Duck										Y		Y	Y	Y	Y																															
Common Goldeneye	CRS											Y	Y		Y																				Y	Y	Y	Y		Y	Y	Y	Y			Y	Y
Hooded Merganser	CRS									Y		Y	Y	Y	Y																				Y	Y	Y	Y		Y	Y	Y	Y			Y	Y
Common Merganser	CRS											Y																							Y	Y	Y	Y		Y	Y	Y	Y			Y	Y
OSPREYS																																														
Osprey	RS											Y																																	Y	Y	
HAWKS AND EAGLES																																														
Bald Eagle	R											Y					Y	Y					Y	Y										Y	Y	Y	Y	Y	Y		Y	Y		Y	Y
Northern Harrier						Y	Y	Y	Y		Y																Y		Y									Y	Y	Y	Y	Y					
Sharp-shinned Hawk																Y	Y	Y	Y	Y	Y		Y	Y	Y																				Y	Y
Cooper's Hawk							Y		Y							Y	Y	Y																Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Northern Goshawk																Y	Y	Y	Y	Y	Y		Y	Y										Y	Y	Y	Y	Y							Y	Y
Red-shouldered Hawk	R																																	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y
Broad-winged Hawk							Y		Y							Y	Y	Y	Y	Y			Y	Y										Y	Y	Y	Y	Y							Y	Y
Red-tailed Hawk							Y	Y						Y		Y	Y	Y						Y										Y	Y	Y	Y	Y						Y	Y	Y	Y	
FALCONS																																														

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest								Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
American Kestrel	CS					Y	Y	Y																Y																					
Merlin							Y	Y	Y		Y			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y								Y							Y				Y	Y
Peregrine Falcon	MR	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y	Y	Y											Y		Y		Y	Y													
GROUSE AND TURKEYS																																													
Ruffed Grouse									Y	Y														Y								Y	Y	Y	Y	Y						Y	Y	Y	Y	
Spruce Grouse	D										Y					Y			Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y												Y	Y	Y
RAILS AND COOTS																																													
Virginia Rail	R									Y		Y	Y	Y	Y																													
Sora	R									Y		Y	Y	Y	Y																													
CRANES																																													
Sandhill Crane						Y	Y	Y		Y	Y		Y	Y	Y																														
PLOVERS																																													
Killdeer	R	Y		Y		Y	Y	Y	Y																																			
Piping Plover	R	Y										Y																																	
SANDPIPERS																																													
Spotted Sandpiper	R	Y		Y			Y	Y	Y		Y	Y		Y	Y																													
Wilson's Snipe										Y	Y	Y		Y	Y											Y		Y		Y	Y													
American Woodcock							Y		Y	Y																						Y	Y	Y	Y	Y						Y				
JAEGERS, GULLS AND TERNS																																													
Ring-billed Gull	R	Y		Y		Y	Y					Y		Y	Y																													
Herring Gull	R	Y		Y			Y					Y																																	
Common Tern		Y										Y	Y		Y																													

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

SPECIES GROUP / Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
Non-Forested types>>> / Forest land cover types>>>																																												
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PIGEONS AND DOVES																																												
Rock Dove							Y																																					
Mourning Dove				Y		Y	Y									Y	Y	Y	Y	Y	Y		Y																		Y		Y	Y	Y
CUCKOOS																																												
Black-billed Cuckoo									Y	Y																																		
OWLS																																												
Great Horned Owl	CS			Y			Y		Y							Y	Y	Y	Y	Y	Y		Y	Y							Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Northern Hawk Owl										Y	Y			Y						Y			Y	Y	Y	Y	Y	Y	Y	Y														
Barred Owl	C															Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Great Gray Owl	S								Y	Y	Y			Y											Y	Y	Y	Y	Y	Y	Y					Y				Y				Y	Y
Long-eared Owl							Y							Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Boreal Owl	C										Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y							Y	Y	
Northern Saw-whet Owl	C								Y							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y				Y	
NIGHTJARS																																												
Common Nighthawk			Y	Y	Y		Y	Y	Y																																			
Whip-poor-will	FD						Y		Y							Y								Y							Y	Y	Y	Y	Y						Y	Y	Y	Y	
SWIFTS																																												
Chimney Swift	CS		Y	Y	Y																										Y	Y	Y	Y	Y						Y	Y	Y	Y	
HIMMINGBIRDS																																												
Ruby-throated Hummingbird	R				Y		Y		Y																						Y			Y		Y	Y	Y		Y			Y	Y

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
KINGFISHERS																																												
Belted Kingfisher	B	Y										Y	Y		Y																															
WOODPECKERS																																												
Red-headed Woodpecker	CMS																																Y	Y	Y	Y							Y	Y	
Yellow-bellied Sapsucker	CMS																							Y							Y	Y	Y	Y	Y								Y	
Downy Woodpecker	CDS																							Y							Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y
Hairy Woodpecker	CDS															Y	Y	Y						Y	Y		Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y					Y	Y
Three-toed Woodpecker	CDS															Y			Y	Y	Y			Y	Y		Y																Y	Y	Y
Black-backed Woodpecker	CDS															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y			Y	Y	Y
Northern Flicker	CS								Y	Y						Y	Y	Y	Y	Y	Y		Y	Y								Y	Y	Y	Y	Y						Y			Y	Y
Pileated Woodpecker	CDMS																							Y								Y	Y	Y	Y	Y	Y	Y		Y				Y	Y	Y
FLYCATCHERS																																												
Eastern Kingbird	MRS				Y			Y	Y	Y	Y				Y	Y	Y	Y							Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					
Olive-sided Flycatcher	RS									Y	Y					Y			Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y												Y	Y	Y
Eastern Wood-Pewee					Y												Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					Y	
Yellow-bellied Flycatcher	D										Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y												Y	Y	
Alder Flycatcher	R									Y																																		
Least Flycatcher									Y	Y														Y								Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y
Eastern Phoebe	R				Y	Y				Y	Y		Y																			Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
Great Crested Flycatcher	CS			Y						Y	Y													Y								Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	
SHRIKES																																													
Northern Shrike							Y		Y																							Y	Y	Y	Y	Y						Y	Y			
Loggerhead Shrike						Y	Y	Y	Y																							Y	Y	Y	Y	Y										
VIREOS																																													
Yellow-throated Vireo	R				Y				Y	Y														Y								Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y
Blue-headed Vireo																Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y												Y	Y	
Warbling Vireo	R			Y					Y																							Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y
Philadelphia Vireo	ER																															Y			Y	Y									Y	Y
Red-eyed Vireo																	Y	Y		Y	Y		Y									Y	Y	Y	Y	Y								Y	Y	
JAYS, CROWS AND RAVENS																																													
Gray Jay	M															Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y													Y	Y	
Blue Jay	M															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
American Crow	M			Y		Y	Y	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common Raven	M															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
SWALLOWS																																													
Purple Martin	RS		Y	Y			Y					Y			Y																															
Tree Swallow	CS						Y	Y		Y	Y	Y	Y	Y	Y																	Y	Y	Y	Y	Y	Y	Y	Y	Y						
Northern Rough-winged Swallow	BR	Y		Y								Y																																	
Bank Swallow	BR	Y		Y			Y	Y				Y	Y																																	
Cliff Swallow	R			Y	Y	Y	Y					Y																																	
Barn Swallow				Y	Y	Y	Y					Y	Y	Y	Y																															
CHICKADEES																																													

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest								Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
Black-capped Chickadee	CS			Y					Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Boreal Chickadee	CS								Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y			Y	Y	Y
NUTHATCHES																																													
Red-breasted Nuthatch	CS															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y			Y	Y	Y
White-breasted Nuthatch	CS																														Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y
CREEPERS																																													
Brown Creeper	CS																																				Y	Y		Y	Y				Y	Y	Y
WRENS																																													
House Wren	CS				Y				Y	Y																					Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y			
Sedge Wren							Y	Y		Y				Y	Y												Y		Y		Y															
Winter Wren	SD															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y		Y	Y	Y	Y	Y		Y	Y				Y	Y
KINGLETS																																													
Golden-crowned Kinglet																Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y			Y	Y	Y
Ruby-crowned Kinglet																Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y			Y	Y	Y
THRUSHES																																													
Eastern Bluebird	CS				Y			Y	Y	Y	Y																				Y	Y	Y	Y	Y						Y				
Veery	M															Y								Y							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Swainson's Thrush	M															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y								Y			Y	Y	
Hermit Thrush	M															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y												Y	Y	Y
Wood Thrush	M				Y																			Y							Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
American Robin	M				Y			Y		Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MIMICS AND																																													

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
THRASHERS																																												
Gray Catbird	MR			Y					Y	Y	Y															Y		Y		Y	Y	Y	Y	Y	Y						Y	Y			
Brown Thrasher	M			Y					Y																						Y	Y	Y	Y	Y						Y	Y			
WAXWINGS																																												
Cedar Waxwing	MR			Y					Y							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y	Y
WARBLERS																																												
Golden-winged Warbler	R								Y	Y						Y	Y	Y	Y					Y							Y	Y	Y			Y	Y		Y		Y	Y	Y	Y	
Tennessee Warbler																										Y		Y		Y	Y												Y	Y	
Nashville Warbler									Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Northern Parula																Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y												Y	Y	
Yellow Warbler	R			Y					Y	Y																									Y	Y		Y		Y	Y				
Chestnut-sided Warbler				Y					Y																						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y			
Magnolia Warbler																Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y											Y	Y		
Cape May Warbler																			Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y										Y	Y	Y	Y	
Black-throated Blue Warbler																																			Y										Y	Y
Yellow-rumped Warbler																Y	Y		Y	Y	Y		Y		Y	Y	Y	Y			Y										Y			Y	Y	Y
Black-throated Green Warbler																Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y							Y	Y	Y
Blackburnian Warbler																Y	Y	Y	Y	Y	Y		Y	Y																				Y	Y	Y
Pine Warbler																Y	Y	Y					Y	Y																					Y	
Palm Warbler											Y															Y		Y		Y	Y											Y	Y	Y	Y	
Bay-breasted Warbler																Y		Y	Y	Y	Y			Y	Y																					Y	Y
Black-and-white Warbler	D								Y	Y						Y	Y	Y					Y	Y		Y						Y	Y	Y	Y	Y		Y	Y		Y	Y	Y			

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
American Redstart									Y	Y						Y															Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	
Ovenbird																Y	Y	Y	Y	Y			Y	Y								Y	Y	Y	Y	Y							Y	Y	
Northern Waterthrush	DR									Y															Y	Y	Y	Y	Y	Y	Y						Y	Y		Y	Y			Y	Y	Y
Connecticut Warbler											Y					Y									Y	Y	Y	Y	Y	Y	Y												Y	Y	Y	Y	
Mourning Warbler									Y	Y						Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
Common Yellowthroat	R								Y	Y				Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y												Y	Y			
Wilson's Warbler	R									Y	Y															Y		Y		Y	Y																
Canada Warbler	D								Y		Y							Y	Y	Y	Y	Y	Y	Y	Y		Y		Y			Y			Y	Y							Y	Y	
TANAGERS																																													
Scarlet Tanager																Y								Y							Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	
TOWHEES AND SPARROWS																																													
Chipping Sparrow					Y				Y							Y	Y	Y	Y	Y	Y	Y	Y	Y																Y			Y	Y	
Clay-colored Sparrow							Y	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y		Y		Y		Y			Y	Y			Y	Y	Y	Y	Y	Y	Y		Y	Y	
Savannah Sparrow						Y	Y	Y	Y	Y	Y			Y	Y													Y		Y	Y		Y													
Le Conte's Sparrow						Y	Y	Y		Y	Y			Y	Y																															
Song Sparrow									Y	Y				Y		Y															Y					Y	Y	Y	Y		Y	Y	Y		
Lincoln's Sparrow											Y					Y									Y	Y	Y	Y		Y										Y		Y				
Swamp Sparrow							Y			Y	Y			Y	Y																															
White-throated Sparrow									Y	Y						Y			Y	Y	Y		Y	Y	Y		Y		Y											Y		Y	Y	Y		
Dark-eyed Junco									Y							Y			Y	Y	Y		Y	Y																	Y		Y	Y	Y	Y
GROSBEAKS																																													
Northern Cardinal	M				Y				Y	Y													Y								Y	Y	Y	Y	Y	Y	Y		Y		Y	Y			
Rose-breasted	M				Y																										Y	Y	Y	Y	Y								Y	Y	

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> NSU Section

Non-Forested types>>> Forest land cover types>>>

SPECIES GROUP Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest								Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
Grosbeak																																													
Indigo Bunting									Y	Y																					Y	Y	Y	Y	Y	Y	Y		Y						
BLACKBIRDS AND ORIOLES																																													
Bobolink						Y	Y	Y	Y	Y	Y			Y																																
Red-winged Blackbird	R					Y	Y		Y	Y		Y	Y	Y	Y																														
Eastern Meadowlark						Y	Y	Y		Y				Y	Y																		Y												
Rusty Blackbird	RS								Y	Y																Y		Y		Y	Y													
Brewer's Blackbird	R				Y		Y	Y	Y	Y	Y			Y	Y											Y		Y		Y	Y	Y	Y						Y					
Common Grackle					Y		Y	Y	Y		Y			Y	Y																													
Brown-headed Cowbird							Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y						Y				
Baltimore Oriole	MR				Y																				Y								Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
FINCHES																																													
Purple Finch	M				Y													Y	Y	Y	Y		Y				Y		Y	Y	Y	Y								Y			Y	Y	Y
House Finch	M			Y	Y																																								
White-winged Crossbill	M																		Y	Y	Y			Y	Y		Y																	Y	Y
Pine Siskin	M				Y											Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y									Y			Y	Y	
American Goldfinch					Y		Y		Y	Y																						Y	Y	Y	Y	Y						Y				
Evening Grosbeak	M															Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y													Y	Y	Y	Y	

Table 8.3.c. Amphibian and Reptile habitat relationships

Amphibian habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type — NSU Section

Non-Forest land cover types>>> | Forest land cover types>>>

SPECIES GROUP / Species Common Name	Habitat feature	Barren	Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest								Up. coniferous/deciduous mix	Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest				Low. deciduous/coniferous mix	Forest type size class				
			High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer		Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
AMPHIBIANS TOADS AND FROGS																																												
American Toad	RV		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gray Treefrog	DRV									Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Spring Peeper	DRV			Y						Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
Western Chorus Frog	RV		Y	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Green Frog	R									Y	Y	Y	Y	Y	Y										Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y					
Northern Leopard Frog	R							Y	Y	Y		Y	Y	Y	Y											Y		Y		Y	Y						Y	Y	Y	Y	Y					
Mink Frog	R										Y	Y	Y		Y										Y	Y	Y	Y	Y	Y	Y										Y					
Wood Frog	DV									Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
SALAMANDERS																																													
Blue-spotted Salamander	DV									Y		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Tiger Salamander	V		Y	Y		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
Four-toed Salamander	DV																								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	
Redback Salamander	D															Y	Y	Y					Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Eastern Newt	DR											Y				Y	Y	Y					Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
REPTILES SNAKES																																												

Amphibian habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type NSU Section

Non-Forest land cover types>>> Forest land cover types>>>

			Urban/ Dev.			Ag./Grass			Shrub			Aquatic				Upland Coniferous Forest									Lowland Coniferous Forest							Upland Deciduous Forest					Lowland Deciduous Forest					Forest type size class				
SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix	Seedling	Sapling	Pole timber	Saw timber	Uneven
Redbelly Snake	D						Y							Y		Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					
Ringneck Snake	DS			Y	Y																												Y	Y	Y	Y										
Common Garter Snake	D		Y	Y			Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					
TURTLES																																														
Snapping Turtle	R											Y	Y		Y																															
Painted Turtle	DR										Y	Y	Y		Y																															
Wood Turtle	DR	Y		Y		Y	Y	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					
Blanding's Turtle							Y	Y				Y	Y	Y	Y																															

Northern Superior Uplands

Section Forest Resources Management Plan

Preliminary Issues and Assessment Chapter 9: Appendices to the Assessment

MNDNR

Data and maps borrowed from the Minnesota Forest Resources Council Northeast Landscape Plan are credit as follows:
Minnesota Forest Resource Council. 2014. Northeast Landscape Conditions & Trends Report. Landscape Program Document #LT0114. Minnesota Forest Resource Council, St. Paul, Minnesota. Available online at the Minnesota Forest Resource Council web site www.frc.state.mn.us

Notes relating to this document:
This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Northern Northern Superior Uplands Section Forest Resources Management Plan* website at:
Northern Superior Uplands SFRMP
Information about the Section Resource Management Plan (SFRMP) process can be found at:
Information about SFRMP
Alternative Formats available on request.
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Contents

Appendices to the Northern Superior Uplands SFRMP

Appendix A: Background on DNR Forest Inventory

The Minnesota Department of Natural Resources (DNR) uses a forest stand mapping and information system to classify the approximately 5 million acres (7,800 sq. mi.) owned and administered by the state. The system is designed to be a coarse classification of forest stands adequate to guide management decisions. It is commonly referred to as the "forest inventory".

The forest inventory system maps the boundaries and tabulates the contents of all forest stands five acres and larger on state-owned land. A forest stand is a group of trees uniform enough in composition to be managed as a unit. Boundaries are drawn by interpretation of aerial photographs. All other stand data are collected in the field on plots within each stand and boundaries may be adjusted at the time of the field visit.

The general descriptive term for the content of a stand is "cover-type". Although cover-types commonly bear the name of the primary tree species, they are usually an association of multiple tree species along with shrubbery and herbaceous plants.

When it originated in 1952, the forest inventory was called the Cooperative Stand Assessment (CSA) and was based on pencil-drawn maps with a computer punch-card database. Over the years, the system matured into a geographic information system (GIS) database accessible to DNR forest managers online. Forest inventory is now managed using a computer program called the Forest Inventory Module (FIM). Consequently, the inventory is now referred to as "FIM" rather than "CSA".

FIM data are not compatible with the previous CSA layers. FIM follows an internal DNR Division of Forestry classification and attribute-coding scheme not used by CSA. Also, comparisons between past inventory data (CSA) and current conditions (FIM) encounter some difficulty due to CSA stands being limited by Public Land Survey (PLS) section lines. This limitation does not exist with FIM data and stand boundaries can extend all the way to a township line if the stand characteristics warrant it.

The accuracy of forest inventory is limited by the method used to establish stand boundaries. Features are digitized on screen over standard electronic topographical maps [24k Digital Raster Graphic (DRG) images] and electronic aerial photography [USGS Digital Orthophoto Quads (DOQs)] and inherit the horizontal positional accuracy of these products.

FIM allows foresters to update data as changes to stands occur due to the passage of time, natural events, or management activities. However, many stands do not receive field visits or re-measurement for 20 years or more if they are established but not approaching maturity. These stands have their age brought up-to-date by computer calculation, but other attributes such as volume, disease, and understory composition are not updated until a field visit. Attempts to model these attributes forward have met with some success, but they have not become standard practice.

Appendix B: Ecological Classification System (ECS)

Definition

The ECS is part of a nationwide mapping initiative developed to improve our ability to manage all natural resources on a sustainable basis.

ECS is a method to identify, describe, and map units of land with different capabilities to support natural resources. This is done by integrating climatic, geologic, hydrologic, and topographic, soil, and vegetation data.

In Minnesota, the classification and mapping is divided into six levels of detail. These levels are:

Province: Largest units representing the major climate zones in North America, each covering several states. Minnesota has three provinces: Eastern Broadleaf Forest, Northern Boreal Forest and Prairie.

Section: Divisions within provinces that often cross state lines. Sections are defined by the origin of glacial deposits, regional elevation, distribution of plants, and regional climate. Minnesota has 10 sections (e.g., Red River Valley).

Subsection: County-sized areas within sections that are defined by glacial land-forming processes, bedrock formations, local climate, topographic relief, and the distribution of plants. Minnesota has 24 subsections (e.g., Mille Lacs Uplands).

Land Type Associations are units within subsections that are defined using glacial landforms, bedrock types, topographic roughness, lake and stream distributions, wetland patterns, depth to ground water table, soil parent material, and pre-European settlement vegetation PDF. Minnesota has 291 land type associations. Though not described here, a GIS cover of land type associations is available on the DNR Data Deli http://deli.dnr.state.mn.us/index.html

Land Types are units within Land Type Associations that are defined using pre-European settlement vegetation PDF, historic disturbance regime, associations of native plant communities (the System level of Native Plant Community Classification), wetland distribution, and soil types. Land Type maps have been made for the Chippewa National Forest.

Land Type Phases are units within Land Types that are defined using a native plant community class, soil type, and topography. Land Type Phase maps exist for portions of the Chippewa National Forest and several State Parks.

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

Purpose of an Ecological Classification System

- Defines the units of Minnesota's landscape using a consistent methodology.
- Provides a common means for communication among a variety of resource managers and with the public.
- Provides a framework to organize natural resource information.
- Improves predictions about how vegetation will change over time in response to various influences.
- Improves our understanding of the interrelationships between plant communities, wildlife habitat, timber production, and water quality.

End Products

- Maps and descriptions of ecological units for provinces through land types.
- Field keys and descriptions to determine which communities are present on a parcel of land.
- Applications for management for provinces through communities.
- Mapping of province, section, subsection, and land-type association boundaries is complete throughout Minnesota (See map on next page).

Figure 9.1: Ecological Provinces, Sections, and Subsections of Minnesota, 1999

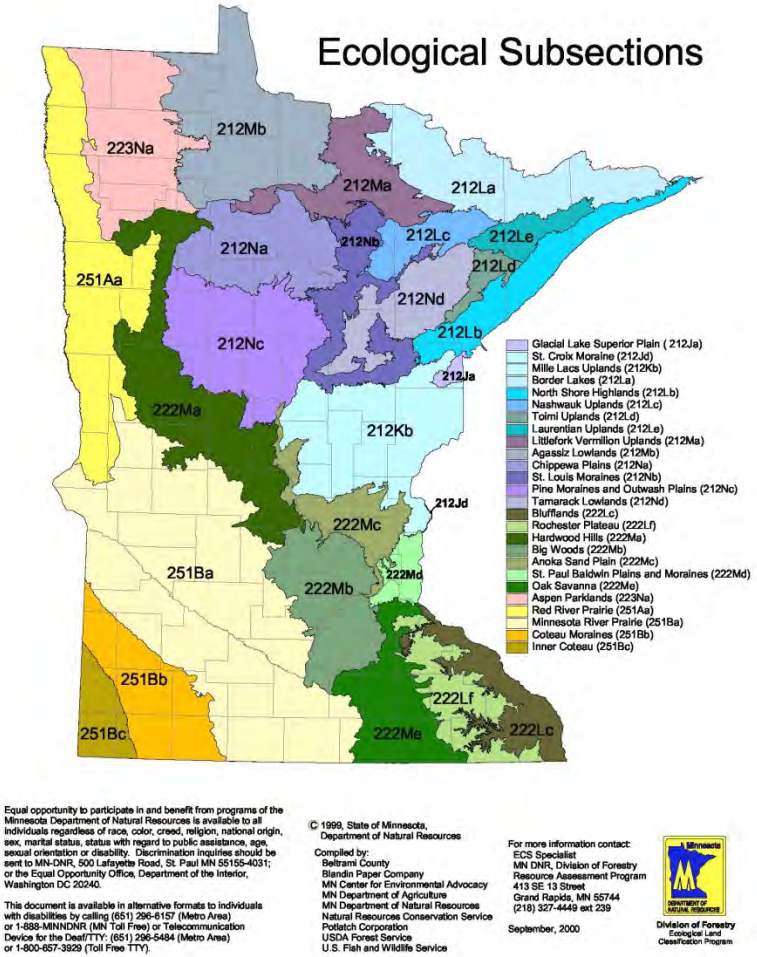

Table 9.1. Native Plant Communities in the Northern Superior Uplands

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Northern Spruce Bog	**APn80**	
Black Spruce Bog	APn80a	S4
Treed Subtype	*APn80a1*	*S4*
Semi-Treed Subtype	*APn80a2*	*S4*
Northern Poor Conifer Swamp	**APn81**	
Poor Black Spruce Swamp	APn81a	S5
Poor Tamarack - Black Spruce Swamp	APn81b	S4
Black Spruce Subtype	*APn81b1*	*S4*
Tamarack Subtype	*APn81b2*	*S4*
Northern Open Bog	**APn90**	
Low Shrub Bog	APn90a	S4S5
Graminoid Bog	APn90b	S2 or S4
Typic Subtype	*APn90b1*	*S4*
Northern Poor Fen	**APn91**	
Low Shrub Poor Fen	APn91a	S5
Graminoid Poor Fen (Basin)	APn91b	S3
Graminoid Poor Fen (Water Track)	APn91c	S3 or S4
Featureless Water Track Subtype	*APn91c1*	*S4*
Flark Subtype	*APn91c2*	*S3*
Northern Dry Cliff	**CTn11**	

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Dry Mafic Cliff (Northern)	CTn11a	S4
Dry Rove Cliff (Northern)	CTn11b	S2
Dry Felsic Cliff (Northern)	CTn11d	S3
Northern Open Talus	**CTn12**	
Dry Open Talus (Northern)	CTn12a	S3
Mesic Open Talus (Northern)	CTn12b	S2
Northern Scrub Talus	**CTn24**	
Dry Scrub Talus (Northern)	CTn24a	S3
Mesic Scrub Talus (Northern)	CTn24b	S3
Northern Mesic Cliff	**CTn32**	
Mesic Mafic Cliff (Northern)	CTn32a	S3
Mesic Rove Cliff (Northern)	CTn32b	S3
Mesic Thomson Cliff (Northern)	CTn32c	S2
Mesic Felsic Cliff (Northern)	CTn32d	S1
Northern Wet Cliff	**CTn42**	
Wet Mafic Cliff (Northern)	CTn42a	S2
Wet Rove Cliff (Northern)	CTn42b	S1
Wet Felsic Cliff (Northern)	CTn42c	S1
Wet Sandstone Cliff (Northern)	CTn42d	S1
Lake Superior Cliff	**CTu22**	
Exposed Mafic Cliff (Lake Superior)	CTu22a	S3

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Exposed Felsic Cliff (Lake Superior)	CTu22b	S2
Sheltered Mafic Cliff (Lake Superior)	CTu22c	S1
Central Dry-Mesic Pine-Hardwood Forest	**FDc34**	
Red Pine - White Pine Forest	FDc34a	S2
Northern Dry-Sand Pine Woodland	**FDn12**	
Red Pine Woodland (Sand)	FDn12b	S2
Northern Dry-Bedrock Pine (Oak) Woodland	**FDn22**	
Jack Pine Woodland (Bedrock)	FDn22a	S3
Red Pine – White Pine Woodland (Northeastern Bedrock)	FDn22b	S3
Pin Oak Woodland (Bedrock)	FDn22c	S3
Northern Poor Dry-Mesic Mixed Woodland	**FDn32**	
Red Pine - White Pine Woodland (Canadian Shield)	FDn32a	S3
Red Pine – White Pine Woodland (Minnesota Point)	FDn32b	S1
Black Spruce - Jack Pine Woodland	FDn32c	S2 or S3
Jack Pine - Balsam Fir Subtype	*FDn32c1*	*S2*
Black Spruce - Feathermoss Subtype	*FDn32c2*	*S3*
Jack Pine – Black Spruce – Aspen Subtype	*FDn32c3*	*S3*
Jack Pine - Black Spruce Woodland (Sand)	FDn32d	S2
Spruce - Fir Woodland (North Shore)	FDn32e	S1
Northern Dry-Mesic Mixed Woodland	**FDn33**	
Red Pine - White Pine Woodland	FDn33a	S3

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Balsam Fir Subtype	*FDn33a1*	*S3*
Mountain Maple Subtype	*FDn33a2*	*S3*
Aspen - Birch Woodland	FDn33b	S5
Black Spruce Woodland	FDn33c	S2
Northern Mesic Mixed Forest	**FDn43**	
White Pine - Red Pine Forest	FDn43a	S2
Aspen - Birch Forest	FDn43b	S5
Balsam Fir Subtype	*FDn43b1*	S5
Hardwood Subtype	*FDn43b2*	S5
Upland White Cedar Forest	FDn43c	S3
Northern Terrace Forest	**FFn57**	
Black Ash - Silver Maple Terrace Forest	FFn57a	S3
Northern Floodplain Forest	**FFn67**	
Silver Maple - (Sensitive Fern) Floodplain Forest	FFn67a	S3
Northern Rich Spruce Swamp (Basin)	**FPn62**	
Rich Black Spruce Swamp (Basin)	FPn62a	S3
Northern Cedar Swamp	**FPn63**	
White Cedar Swamp (Northeastern)	FPn63a	S4
White Cedar Swamp (Northcentral)	FPn63b	S3
Northern Rich Spruce Swamp (Water Track)	**FPn71**	
Rich Black Spruce Swamp (Water Track)	FPn71a	S3

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Northern Rich Tamarack Swamp (Eastern Basin)	**FPn72**	
Rich Tamarack Swamp (Eastcentral)	FPn72a	S3
Northern Rich Alder Swamp	**FPn73**	
Alder - (Maple - Loosestrife) Swamp	FPn73a	S5
Northern Rich Tamarack Swamp (Water Track)	**FPn81**	
Northern Rich Tamarack Swamp (Western Basin)	**FPn82**	
Rich Tamarack - (Alder) Swamp	FPn82a	S5
Extremely Rich Tamarack Swamp	FPn82b	S4
Southern Rich Conifer Swamp	**FPs63**	
Tamarack Swamp (Southern)	FPs63a	S2S3
Inland Lake Sand/Gravel/Cobble Shore	**LKi32**	
Sand Beach (Inland Lake)	LKi32a	S1
Gravel/Cobble Beach (Inland Lake)	LKi32b	S2
Inland Lake Rocky Shore	**LKi43**	
Boulder Shore (Inland Lake)	LKi43a	S4
Bedrock Shore (Inland Lake)	LKi43b	S4
Inland Lake Clay/Mud Shore	**LKi54**	
Mud Flat (Inland Lake)	LKi54b	S3
Non-Saline Subtype	*LKi54b2*	*S3*
Lake Superior Sand/Gravel/Cobble Shore	**LKu32**	
Beachgrass Dune (Lake Superior)	LKu32a	S1

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Juniper Dune Shrubland (Lake Superior)	LKu32b	S1
Sand Beach (Lake Superior)	LKu32c	S1
Beach Ridge Shrubland (Lake Superior)	LKu32d	S2
Gravel/Cobble Beach (Lake Superior)	LKu32e	S4
Lake Superior Rocky Shore	**LKu43**	
Dry Bedrock Shore (Lake Superior)	LKu43a	S4
Wet Rocky Shore (Lake Superior)	LKu43b	S2
Cobble Subtype	*LKu43b1*	*S2*
Bedrock Subtype	*LKu43b2*	*S2*
Northern Mesic Hardwood Forest	**MHn35**	
Aspen - Birch - Basswood Forest	MHn35a	S4
Red Oak – Sugar Maple – Basswood (Bluebead Lily) Forest	MHn35b	S4
Northern Wet-Mesic Boreal Hardwood-Conifer Forest	**MHn44**	
Aspen - Birch - Red Maple Forest	MHn44a	S4
White Pine - White Spruce - Paper Birch Forest	MHn44b	S2
Aspen - Fir Forest	MHn44c	S3S4
Aspen - Birch - Fir Forest	MHn44d	S3
Northern Mesic Hardwood (Cedar) Forest	**MHn45**	
Paper Birch – Sugar Maple Forest (North Shore)	MHn45a	S4
White Cedar – Yellow Birch Forest	MHn45b	S2

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Sugar Maple Forest (North Shore)	MHn45c	S3
Northern Wet-Mesic Hardwood Forest	**MHn46**	
Aspen - Ash Forest	MHn46a	S4
Black Ash - Basswood Forest	MHn46b	S4
Northern Rich Mesic Hardwood Forest	**MHn47**	
Sugar Maple - Basswood - (Bluebead Lily) Forest	MHn47a	S3
Northern Mixed Cattail Marsh	**MRn83**	
Cattail - Sedge Marsh (Northern)	MRn83a	S2
Cattail Marsh (Northern)	MRn83b	S2
Northern Bulrush-Spikerush Marsh	**MRn93**	
Bulrush Marsh (Northern)	MRn93a	S3
Spikerush - Bur Reed Marsh (Northern)	MRn93b	S2
Lake Superior Coastal Marsh	**MRu94**	
Estuary Marsh (Lake Superior)	MRu94a	S1
Northern Shrub Shore Fen	**OPn81**	
Bog birch - Alder Shore Fen	OPn81a	S5
Leatherleaf – Sweet Gale Shore Fen	OPn81b	S5
Northern Rich Fen (Water Track)	**OPn91**	
Shrub Rich Fen (Water Track)	OPn91a	S4
Graminoid Rich Fen (Water Track)	OPn91b	S2 or S3
Featureless Water Track Subtype	*OPn91b1*	*S3*

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Flark Subtype	*OPn91b2*	*S2*
Northern Rich Fen (Basin)	**OPn92**	
Graminoid Rich Fen (Basin)	OPn92a	S4
Graminoid - Sphagnum Rich Fen (Basin)	OPn92b	S4
Northern Bedrock Outcrop	**ROn12**	
Sandstone Outcrop (Northern)	ROn12a	S2
Crystalline Bedrock Outcrop (Northern)	ROn12b	S4
Northern Bedrock Shrubland	**ROn23**	
Bedrock Shrubland (Inland)	ROn23a	S3
Bedrock Shrubland (Lake Superior)	ROn23b	S1
Sand/Gravel/Cobble River Shore	**RVx32**	
Willow Sandbar Shrubland (River)	RVx32a	S4
Sand Beach/Sandbar (River)	RVx32b	S3
Permanent Stream Subtype	*RVx32b2*	*S2*
Gravel/Cobble Beach (River)	RVx32c	S3
Permanent Stream Subtype	*RVx32c2*	*S3*
Rocky River Shore	**RVx43**	
Bedrock/Boulder Shore (River)	RVx43a	S3
Intermittent Streambed Subtype	RVx43a1	*S3*
Permanent Stream Subtype	RVx43a2	*S3*
Clay/Mud River Shore	**RVx54**	

Native Plant Community Name	*Community Code*	*State Conservation Rank*
Slumping Clay/Mud Slope (River)	RVx54a	S2
Clay/Mud Shore (River)	RVx54b	S3
Permanent Stream Subtype	*RVx54b2*	*S3*
Northern Wet Cedar Forest	**WFn53**	
Lowland White Cedar Forest (North Shore)	WFn53a	S4
Lowland White Cedar Forest (Northern)	WFn53b	S3
Northern Wet Ash Swamp	**WFn55**	
Black Ash - Aspen - Balsam Poplar Swamp (Northeastern)	WFn55a	S4
Black Ash - Mountain Maple Swamp (Northern)	WFn55c	S4
Northern Very Wet Ash Swamp	**WFn64**	
Black Ash - Conifer Swamp (Northeastern)	WFn64a	S4
Black Ash - Alder Swamp (Northern)	WFn64c	S4
Northern Wet Alder Swamp	**WFn74**	
Alder - (Red Currant – Meadow Rue) Swamp	WFn74a	S3
Northern Wet Meadow/Carr	**WMn82**	
Willow - Dogwood Shrub Swamp	WMn82a	S5
Sedge Meadow	WMn82b	S4 or S5
Bluejoint Subtype	*WMn82b1*	*S5*
Beaked Sedge Subtype	*WMn82b3*	*S4*
Lake Sedge Subtype	*WMn82b4*	*S5*

Appendix C: Land Type Associations in the Northern Superior Uplands Section

Brief Descriptions and Boundary Documentation of Land Type Associations in the Northern Superior Uplands Section of the Laurentian Mixed Forest Province (212)

What are LTAs? National Hierarchy

A Land Type Association (LTA) is an area of land with common characteristics such as glacial landform, depth to bedrock, bedrock type, topographic roughness, pre-European settlement vegetation, and surface water features (lakes, streams, and wetlands) or combinations of the above occurring in repeating patterns. LTAs were delineated at a scale of 1:100,000. The size of map units ranges from 10,000 acres to 2,000,000 acres.

In theory, LTA concepts emphasize the interrelationships of biological and physical features. These interrelationships are discovered by overlaying single-theme maps of biotic and abiotic features and observing how patterns coincide. Landform maps are often a starting point for LTAs because they often integrate many of the individual features that show coincident pattern and reasonably explain spatial variations in physical characteristics of the landscape such as topography and soil material at this scale. These characteristics also strongly influence micro climate, surface and subsurface hydrologic characteristics, and historic disturbance regimes.

In practice, LTA definitions in province 212 and 251 were heavily biased by abiotic features; particularly glacial landforms and soil parent material. In province 223 and 222, pre-European settlement vegetation was used together with abiotic features.

Review process:

At the current time there is no formal review process in place within the DNR for revising LTA boundaries or names. Feedback from you, the user, will hopefully improve the probability that a future revision will take place. Proposed changes are being collected and archived in anticipation of a revision. Proposed changes should be sent to:

Dan Hanson
413 SE 13th Street
Grand Rapids, MN 55744
(218) 327-4449 ext. 239
dan.hanson@dnr.state.mn.us

Notes:

The percentage figures (based on acres) given for each topic, uplands/wetlands/lakes, soils, and presettlement vegetation will not always agree with one another. This is due to differences in resolution among the covers used. Of the three, the mnwet cover has the best resolution, however in some landforms the wetland-upland distinction is suspect. In landscapes where agriculture exists, the differences in wetland/upland percentages also reflect drainage practices. Direct comparison of the relative abundance of wetlands historically and now with these covers would be shaky because of resolution differences.

Province 212 – Laurentian Mixed Forest -- Subsection 212La - Border Lakes (Updated 2-18-00)

La07. Johnson Lake Bedrock Complex - 149,185 acres

Concept: This LTA is characterized by thin deposits of Rainy Lobe till over bedrock. The dominant bedrock type is the Vermilion Granite (migmatite) formation. Uplands occupy 75%, wetlands occupy 17%, and lakes occupy 8% of the LTA (MN DNR, 1998). There are 175 miles of streams. The terrain is steep and irregular. Bedrock outcrops are present on 75-100% of the area. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common. Clayey or silty sediment from the Koochiching Lobe &/or Lake Agassiz are present at lower elevations.

The presettlement vegetation was mixture of mixed white and red pine (42%), jack pine barrens (22%), and aspen-birch-conifer (22%) with minor amounts of conifer bog and swamp (6%) (Marschner, 1974).

La08 Lac LaCroix Bedrock Complex - 145,617 acres

Concept: This LTA is characterized by thin Rainy Lobe sediment over bedrock. The dominant bedrock type is Lac La Croix granite. Uplands occupy 66%, wetlands occupy 12%, and lakes occupy 22% of the LTA (MN DNR, 1998). There are 82 miles of streams. The terrain is steep and irregular. Bedrock outcrops are present on 75-100% of the area. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common.

The presettlement vegetation was mixture of mixed white and red pine (39%), jack pine barrens (25%), and aspen-birch-conifer (12%) with minor amounts of conifer bog and swamp (2%) (Marschner, 1974).

La09 Voyageurs Bedrock Complex - 198,827 acres

Concept: This LTA is characterized by a complex of large lakes and bedrock-controlled uplands with thin soils. The bedrock type is Vermilion Granite group, schist-rich migmatite. Uplands occupy 45%, wetlands occupy 11%, and lakes occupy 44% of the LTA (MN DNR, 1998). Bedrock outcrops are present over 75-100% of the area. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common. Clayey and silty soils, from the Koochiching Lobe and/or Lake Agassiz, are present at lower elevations, particularly in the west half.

The presettlement vegetation was mixture of jack pine barrens (20%), mixed white and red pine (20%), and aspen-birch-conifer (10%) with minor amounts of wet sedge meadow(2%) and conifer bog and swamp (1%) (Marschner, 1974).

La11 Swamp River Till Plain - 42,562 acres

Concept: This LTA is characterized by thick soils over bedrock. The bedrock is predominantly North Shore Volcanic Group basalt. Uplands occupy 69%, wetlands occupy 28%, and lakes occupy 3% of the LTA (MN DNR, 1998). The bedrock-controlled landscape has nearly level to gently rolling terrain; deposits of Rainy Lobe till and clayey lake sediments over bedrock. A variety of soil parent material is present. Textures include: sandy loam over bedrock (38%), silt loam or loam over sandy loam with a hardpan (25%), clay (22%), and acid peat (15%) (NRCS, 1994).

The presettlement vegetation was mixture of Conifer Bog and Swamp (50%), Mixed White and Red Pine (25%), and Aspen-Birch-Conifer (spruce-fir) (22%) (Marschner, 1974).

La13. Gabbro Lake Bedrock Complex - 453,589 acres

Concept: This LTA is characterized by thin soils over bedrock. The dominant bedrock type is Duluth Gabbro complex. Uplands occupy 71%, wetlands occupy 16%, and lakes occupy 13% of the LTA (MN DNR, 1998). The terrain is rolling to steep. Bedrock outcrops are present over 75-100% of the area. Faults are very common. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans are absent from the subsoil in the western two thirds of the LTA.

The presettlement vegetation was mixture of Aspen-Birch-Conifer (spruce-fir) (32%), Jack Pine Barrens (27%), Aspen-Birch-Hardwood (18%), Mixed White and Red Pine (9%) with minor amounts of Conifer Bog and Swamp (6%) (Marschner, 1974).

La14. Rove Slate Bedrock Complex - 81,995 acres

Concept: This LTA is characterized by thin soils over bedrock. The bedrock is a complex of the Virginia graywacke formation and Rove slate formation. Uplands occupy 71%, wetlands occupy 5%, and lakes occupy 24% of the LTA (MN DNR, 1998). Bedrock outcrops are present over 75-100% of the area. The terrain is steep with prominent east-west oriented ridges due to eroded bedrock faults. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common.

The dominant presettlement vegetation was Mixed White and Red Pine (66%) with minor amounts of Aspen-Birch-Conifer (pine) (11%) (Marschner, 1974).

La15. Trout Lake Bedrock Complex - 404,780 acres

Concept: This LTA is dominated by thin soils over bedrock. The bedrock is predominantly the Vermilion granitic complex formation. Uplands occupy 70%, wetlands occupy 17%, and lakes occupy 13% of the LTA (MN DNR, 1998). Bedrock outcrops are present over 75-100% of the area. The bedrock-controlled terrain has steep and irregular slopes. This LTA contains the highest point in elevation of the surrounding area. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common. Scattered inclusions of deep outwash sand occur. Gray clayey material (Koochiching Lobe or Lake Agassiz origin) is occasionally present in lower elevations.

The presettlement vegetation was mixture of Jack Pine Barrens (34%), Mixed White and Red Pine (24%), Aspen-Birch-Conifer (pine) (18%), and Conifer Bog and Swamp (12%) (Marschner, 1974).

La16. Myrtle Lake Till Plain - 297,135 acres

Concept: This LTA is characterized by thick soils over bedrock. Bedrock is predominantly the Vermilion granite formation. Uplands occupy 73%, wetlands occupy 19%, and lakes occupy 8% of the LTA (MN DNR, 1998). The terrain is rolling to steep. Bedrock outcrops

are present over 75-100% of the area. Seventy seven percent of the LTA has soil sandy loam textures (NRCS, 1994). Rocks and gravel are abundant. Hardpans in the subsoil are common. Gray clay from the Koochiching Lobe or Glacial Lake Agassiz is very common at lower elevations. An end moraine with deep sandy loam and sand is present at the southern end of the LTA.

The presettlement vegetation was mixture of Mixed White and Red Pine (48%), Aspen-Birch-Conifer (23%), and Conifer Bog and Swamp (15%) with minor amounts of Jack Pine Barrens (7%) (Marschner, 1974).

La17. Ash Lake Till Plain - 232,135 acres

Concept: This LTA is a transition between Lake Agassiz to the west and the bedrock controlled terrain to the east. It is characterized by thick soils on a rolling bedrock-controlled terrain. Uplands occupy 74%, wetlands occupy 26%, and lakes occupy <1% of the LTA (MN DNR, 1998). Bedrock outcrops are present over 25-50% of the area. The dominant bedrock type is the Vermilion granitic complex formation. A variety of soil parent material is present. Gray clayey soils from the Koochiching Lobe or Glacial Lake Agassiz occupy 46% of the LTA (NRCS, 1994). Most of the clay is found in the lower portions of the landscape, roughly below 1350 to 1400 feet in elevation. Sandy loam over bedrock soils (35% of the LTA) occur at higher elevations, usually on top of the bedrock-controlled hills (NRCS, 1994).

The presettlement vegetation was mixture of Aspen-Birch-Conifer (spruce-fir) (55%), Conifer Bog and Swamp (23%), Mixed White and Red Pine (18%) with minor amounts of Jack Pine Barrens (2%) (Marschner, 1974).

La21. Saganaga Lake Bedrock Complex - 52,062 acres

Concept: This LTA is characterized by thin soils over bedrock. Uplands occupy 58%, wetlands occupy 14%, and lakes occupy 28% of the LTA (MN DNR, 1998). The terrain is rolling to steep. The bedrock is dominated by the Saganaga granite formation. Bedrock outcrops are present over 75-100% of the area. Most soils (67%) have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common. A small area (8% of the LTA) southwest of Saganaga Lake has deep soils with loam or silt loam over sandy loam textures (NRCS, 1994).

The presettlement vegetation was mixture of Mixed White and Red Pine (46%) and Aspen-Birch-Conifer (pine) (10%) with minor amounts of Conifer Bog and Swamp (6%), Jack Pine Barrens (5%), and Aspen-Birch-Hardwood (3%) (Marschner, 1974).

La22. Poplar Lake Bedrock Complex - 56,187 acres

Concept: This LTA is characterized by thin soils over bedrock. Bedrock is dominated by a complex of Duluth gabbro and red granophyric granite. Uplands occupy 72%, wetlands occupy 15%, and lakes occupy 13% of the LTA (MN DNR, 1998). The terrain is rolling to steep. Bedrock outcrops are present over 75-100% of the area. Dikes form east-west linear ridges. Most soils have gravelly sandy loam or loam textures (NRCS, 1994). Hardpans in the subsoil are common if the soil is thick enough.

The dominant presettlement vegetation was Aspen-Birch-Conifer (spruce-fir) (80%) with minor amounts of Mixed White and Red Pine (12%) and Conifer Bog and Swamp (1%) (Marschner, 1974).

La23. Ely-Knife Lake Bedrock Complex - 233,910 acres

Concept: This LTA is characterized by thin soil over bedrock. Bedrock outcrops are present over 75-100% of the area. Bedrock is predominantly Greenstone (mafic metavolcanic) & Knife Lake Group-Newton Lake formations(sandstone, siltstone, conglomerate, slate). Uplands occupy 67%, wetlands occupy 13%, and lakes occupy 20% of the LTA (MN DNR, 1998). The terrain is steep and irregular. The majority (88%) of the LTA has soils with gravelly sandy loam or loam textures with minor amounts (5%) of acid peat (NRCS, 1994). Hardpans are common in the subsoil. Gray clayey soils from the Koochiching Lobe or Glacial Lake Agassiz are occasionally present in lower elevations.

The dominant presettlement vegetation was Mixed White and Red Pine (52%) with minor amounts of Aspen-Birch-Conifer (pine) (13%), Conifer Bog and Swamp (11%) Aspen-Birch-Hardwood (3%), Jack Pine Barrens (3%), (Marschner, 1974).

La24. White Iron Lake Bedrock Complex - 92,835 acres

Concept: This LTA is characterized by thin soils over bedrock. deposits of Rainy lobe till on rolling bedrock-controlled terrain. The dominant bedrock type is the Giants Range granitic batholith (granite to granodiorite). Bedrock outcrops are present in over 50-75% of the area. Uplands occupy 61%, wetlands occupy 21%, and lakes occupy 18% of the LTA (MN DNR, 1998). Most (76% of the LTA) soils have gravelly sandy

loam or loam textures. Hardpans in the subsoil are common when the soil is thick enough. A small area (7% of the LTA) of deep soils with silt loam texture is present north of Birch Lake. A small area (5% of the LTA) of deep soils with sandy loam texture is present northeast of Bear Island Lake (NRCS, 1994).

The presettlement vegetation was mixture of Aspen-Birch-Conifer (25%), Conifer Bog and Swamp (23%), Mixed White and Red Pine (18%), and Jack Pine Barrens (17%) (Marschner, 1974).

La34. Vermilion Bedrock Complex - 94,246 acres

Concept: This LTA is characterized by a complex of thin soil over bedrock and Lake Vermilion. Metamorphic bedrock (biotite schist, paragneiss, schist-rich migmatite) dominates the west half while the east has volcanic and volcaniclastic rock with inclusions of the Soudan iron formation. Uplands occupy 47%, wetlands occupy 11%, and lakes occupy 42% of the LTA (MN DNR, 1998). The terrain is steep and irregular. Bedrock outcrops are present over 75-100% of the area. A mixture of soil parent material is present. Thirty five percent of the LTA has gravelly sandy loam texture over bedrock. An end moraine (13% of the LTA) with deep sandy loam and sand textures is present on the south side of Lake Vermilion. The remaining areas (5%) have acidic peat and clay textures (NRCS, 1994).

The presettlement vegetation was mixture of Aspen-Birch-Conifer (pine) (24%), Mixed White and Red Pine (16%), Conifer Bog and Swamp (11%) with minor amounts of Jack Pine Barrens (2%) (Marschner, 1974).

La35. Northern Lights Lake Till Plain - 69,529 acres

Concept: This LTA is characterized by a complex of thick and thin soils over bedrock-controlled terrain. The dominant bedrock type is the North Shore Volcanic Group (basaltic lava flows) with ridges of mafic intrusive rock (Brule-Hovland gabbro). Uplands occupy 80%, wetlands occupy 18%, and lakes occupy 2% of the LTA (MN DNR, 1998). Bedrock outcrops are present over 50-75% of the area. Sixty percent of the LTA has thin sandy loam soils over bedrock. The remaining areas have silt loam or loam over sandy loam (24%), gravelly sandy loam over sand (15%), and clay (1%) textures (NRCS, 1994).

The presettlement vegetation was mixture of Mixed White and Red Pine (41%), Conifer Bog and Swamp (32%), Aspen-Birch-Conifer (spruce-fir) (22%), with minor amounts of Jack Pine Barrens (5%) (Marschner, 1974).

La36. Two Island Lake Moraine - 57,451 acres

Concept: This LTA is characterized by a complex of thin (<20") and moderately thick (20-40") with minor amounts of thick (>40") soils over bedrock (Superior National Forest). The bedrock is dominated by North Shore Volcanics (basalt and rhyolite) with a few mafic (diabase and gabbro) intrusive dikes. Uplands occupy 68%, wetlands occupy 24%, and lakes occupy 8% of the LTA (MN DNR, 1998). The terrain is rolling. Bedrock outcrops are present over 50-75% of the area. A variety of soil parent material is present. They include: deep gravelly sandy loam over sand (34%), gravelly sandy loam over bedrock (33%), deep sandy loam or silt loam over gravelly sandy loam, with hardpans (25%) and acidic peat (7%) (NRCS, 1994).

The presettlement vegetation was mixture of Mixed White and Red Pine (35%), Aspen-Birch-Conifer (spruce-fir) (34%), and Conifer Bog and Swamp (26%)(Marschner, 1974).

La37. Vegetable Lakes Till Plain - 109,415 acres

Concept: This LTA is characterized by moderately thick soils over bedrock. The dominant bedrock type is the Duluth complex-Felsic series (red granophyric granite), Hovland basaltic lava flows, and Brule-Hovland gabbro intrusion. Uplands occupy 82%, wetlands occupy 10%, and lakes occupy 8% of the LTA (MN DNR, 1998). The terrain is rolling to steep. Bedrock outcrops are present over 75-100% of the area. Most (85%) of the soils have 20-40" gravelly sandy loam or loam over bedrock. (NRCS, 1994). Hardpans in the subsoil are common. The remaining area has bedrock outcrops (5%), silt loam over gravelly sandy loam (4%), sandy loam over sand (4%) (NRCS, 1994).

Province 212 – Laurentian Mixed Forest --Subsection 212Lb – North Shore Highlands Updated March, 2002

Lb01. Split Rock Till Plain - 123,309 acres

Concept: This LTA is a complex containing a Superior lobe till plain and lake plain (Glacial Lake Duluth). The terrain is rolling and slopes towards lake Superior. Inclusions of steep bedrock-controlled hills are present. This LTA includes a very narrow strip of land directly adjacent to Lake Superior where the growing season starts later and lasts longer yet is cooler and moister than areas farther inland. This area is

too narrow to delineate at the scale used. Uplands occupy 88%, wetlands occupy 8%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are 1.48 miles of streams per square mile (USDA Forest Service. 1999). Streams are deeply incised due to the clayey material.
Most (80%) of the LTA is dominated by red clayey soils. The remaining areas have thin soil over bedrock & bedrock outcrops (10%), silt loam over clay loam (5%), silt loam over sandy loam (2%), and sand (3%) (NRCS, 1994).

Lb02: North Shore Till Plain - 150,667 acres

Concept: A level to rolling landscape with clayey soil parent material. The local microclimate is modified by Lake Superior. The growing season starts later and lasts longer yet is cooler and moister than areas further inland. Winters are warmer with lower accumulations of snow. Uplands occupy 92%, wetlands occupy 8%, and lakes occupy <1% of the LTA (MN DNR, 1998). There are 1.17 miles of streams per square mile (USDA Forest Service, 1998).

Soil parent materials are predominantly clayey sediments from Glacial Lake Duluth and lake-modified clayey till. Coarse (sandy loam) Superior lobe till is present at higher elevations. Soil textures include: clay (36%), outcrops of Northshore Volcanic bedrock (33%), silt loam over clay loam (15%), thin sandy loam over bedrock (8%), silt loam over sandy loam (3%), sandy loam over sand (2%), and unidentified (3%) (NRCS, 1994).

Lb03. Highland Moraine - 355,424 acres

Concept: A rolling to hummocky end moraine formed by the Superior lobe. Uplands occupy 68%, wetlands occupy 29%, and lakes occupy 3% of the LTA (MN DNR, 1998). There are .74 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (61%) is dominated by fine sandy loam soils with hardpans. Soils in the remaining areas have the following textures: sandy loam over sand (16%), silt loam over clay loam with hardpans (11%), acid peat (7%), and miscellaneous (5%) (NRCS, 1994).

Lb04. Cloquet Sand Plain - 140,475 acres

Concept: A level to rolling outwash plain formed by the Superior lobe. Uplands occupy 62%, wetlands occupy 28%, and lakes occupy 10% of the LTA (MN DNR, 1998). There are .80 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (53%) is dominated by sandy loam over sand & gravel soil textures. The remaining areas have sandy loam with hardpans (20%), acid peat (10%), stony sandy loam with a hardpan (7%) (NRCS, 1994).

Lb05.Cabin Lake Till Plain - 71,886 acres

Concept: A rolling till plain formed by the Superior lobe. Long linear ridges of till and bedrock (flutes) oriented NW-SE are present. Rivers commonly occur in the low areas in between the flutes. Uplands occupy 62%, wetlands occupy 36%, and lakes occupy 2% of the LTA (MN DNR, 1998). There are 1.08 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (75%) is dominated by sandy loam soils with a hardpan. The remaining areas have sandy loam over sand & gravel (18%), and thin sandy loam over bedrock (7%) (NRCS, 1994).

Lb08. Honeymoon Mountain Till Plain - 106,736 acres

Concept: A rolling till plain formed by the Superior Lobe. The soil parent material is generally >40" thick over bedrock. Bedrock outcrops occupy 25-50% of the LTA. Uplands occupy 67%, wetlands occupy 29%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are .93 miles of streams per square mile (USDA Forest Service, 1998). Streams are generally oriented northwest-southeast.

Most of the LTA (82%) is dominated by fine sandy loam soils with a hardpan. Stones are very common. The remaining areas have sandy loam over sand & gravel (8%) and acid peat (6%) (NRCS, 1994).

Lb10. Tettegouch Till Plain - 239,195 acres

Concept: A complex of Superior lobe till on a steep bedrock controlled terrain and rolling Superior lobe till plains. Bedrock outcrops with steep escarpments are common. The type of bedrock is predominantly the Beaver Bay Complex-gabbro, diabase formation. Uplands occupy 85%, wetlands occupy 13%, and lakes occupy 2% of the LTA (MN DNR, 1998). Stream density is .95 miles per square mile (USDA Forest Service. 1999).

Most of the LTA (65%) is dominated by fine sandy loam soils with a hardpan. The remaining areas have silt loam or loam over clay loam soils with a hardpan (14%), clay soils (11%), thin sandy loam over bedrock (5%), and bedrock outcrops (2%) (NRCS, 1994).

Lb11. Tettegouche Till Plain - 114,398 acres

Concept: A complex of thick and thin Superior lobe till on a steep bedrock controlled terrain. Beaver Bay Complex-gabbro - diabase formation bedrock outcrops occupy about 50% of the LTA. Uplands occupy 85%, wetlands occupy 13%, and lakes occupy 2% of the LTA (MN DNR, 1998). Stream density is .86 miles per square mile (USDA Forest Service, 1998).

A mixture of soil parent material is present. Forty five percent of the LTA has gravelly sandy loam texture over bedrock. Thirty seven percent has fine sandy loam soils with a hardpan. The remaining areas have silt loam or loam over clay loam soils with a hardpan (12%), and fine sandy loam over gravelly sand (4%) (NRCS, 1994).

Lb20. Brookston Moraine - 110,804 acres

Concept: A complex of hummocky end moraines and rolling till plains formed by the Superior Lobe glacier. Uplands occupy 47%, wetlands occupy 50%, and lakes occupy 3% of the LTA (MN DNR, 1998). Large peatlands are common. There are .69 miles of streams per square mile (USDA Forest Service. 1999).

The soil parent material is coarse loamy with many stones. Fifty nine percent of the LTA has fine sandy loam sandy loam textures. A hardpan is commonly present in the subsoil. Acid peatlands occupy 36% of the LTA. The remaining areas (5%) have sandy or and clayey textures (NRCS, 1994).

Lb21. Brimson Sand Plain - 68,996 acres

Concept: A level to rolling outwash plain formed by the Superior Lobe glacier. Moraine features are present for several miles on either side of the St. Louis River. Uplands occupy 57%, wetlands occupy 41%, and lakes occupy 2% of the LTA (MN DNR, 1998). There are .68 miles of streams per square mile (USDA Forest Service. 1999).

Soil parent material is predominantly sandy. Soil textures on the outwash plain (57% of the LTA) are loamy sand over sand. The moraines have fine sandy loam over sandy loam hardpans (28%). Remaining areas have clayey textures (8%) or acid peat (7%) (NRCS, 1994).

Province 212 – Laurentian Mixed Forest -- Subsection 212Lc - Nashwauk Uplands

Lc05. Pike-Sandy River Outwash Plain - 184,020 acres

Concept: A complex of Rainy lobe outwash plains and end moraines (Vermilion moraine). Uplands occupy 65%, wetlands occupy 32%, and lakes occupy 3% of the LTA (MN DNR, 1998). There are .62 miles of streams per square mile (USDA Forest Service, 1998). Soil materials are generally sandy in the outwash plain and a mix of loamy to sandy in the end moraine. Depth to bedrock is generally greater than 5 feet however, the predominance of bedrock-controlled terrain increases to the northeast of the Vermilion moraine. A narrow transition area next to the Giants range granite banded iron formation has areas of bedrock near the surface. The majority of the upland presettlement vegetation was wet-mesic hardwood-conifer (white pine), mixed white pine-red pine and dry-mesic pine-hardwoods (Shadis, 1999 and Marschner, 1974). Lowland presettlement vegetation was commonly conifer bog and swamp (Marschner, 1974).

Lc06. Whalsten Till Plain - 71,043 acres

Concept: A nearly level to rolling complex of a till plains and outwash plains formed by the Rainy lobe with scattered bedrock outcrops. Soil materials are sandy in the outwash plains and loamy in the till plains. The northern portion of the area is a transition unit to a landscape shaped by Glacial Lake Agassiz. Some of the adjacent till plains were reworked by wave action. Clayey lake sediments are occasionally present in the lower portions of the landscape. Uplands occupy 66%, wetlands occupy 33%, and lakes occupy 1% of the LTA (MN DNR, 1998). There are .45 miles of streams per square mile (USDA Forest Service,1998).

Lc07. Big Rice Moraine - 59,914 acres

Concept: A nearly level to rolling till plain formed by the Rainy Lobe glacier. Scattered outwash plains, end moraines and bedrock outcrops occur. Bedrock is generally granitic with some greenstone, graywacke, and slate. Soil material is generally loamy in the till plain and sandy in the outwash. Uplands occupy 67%, wetlands occupy 29%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are .61 miles of streams per square mile (USDA Forest Service, 1998).

Lc10. Mesabi Range - 116,909 acres

Concept: A rolling to steep till plain formed the Rainy lobe sediments on a bedrock-controlled terrain. Bedrock is predominantly the Giants Range batholith and the Biwabik iron formation. Uplands occupy 92%, wetlands occupy 4%, and lakes occupy 3% of the LTA (MN DNR, 1998). Depth to bedrock is variable from less than 2 feet to greater than 5 feet. Soil materials range from loamy to sandy. Mining areas are common. The presettlement vegetation was mixed hardwood (northern) and pine (white), mixed white and red pine (with birch), and wet-mesic hardwood-conifer (spruce-fir) (Shadis, 1999 and Marschner, 1974). Lowland presettlement vegetation was conifer bog and swamp (Marschner, 1974).

Lc20. Nashwauk Moraine - 268,886 acres

Concept: A nearly level to rolling Rainy lobe till plain with small scattered outwash plains and end moraines. Portions of the till plain have been lake-washed or mantled with a veneer of younger material. Topography is rolling on the till plain and hummocky on the end moraine. Uplands occupy 66%, wetlands occupy 29%, and lakes occupy 5% of the LTA (MN DNR, 1998). There are .64 miles of streams per square mile (USDA Forest Service). 1999. Soil materials are generally loamy on the till plains, loamy in the end moraines, and sandy in the outwash plains. A hard pan within the upper 4 feet is common in the till plain and end moraine.

The presettlement vegetation was wet-mesic hardwood-conifer (spruce-fir), wet-mesic hardwood-conifer (pine), dry mesic pine hardwood, and jack pine barrens, (Shadis, 1999 and Marschner, 1974). Lowland presettlement vegetation was conifer bog and swamp (Marschner, 1974).

Lc21. Pengilly Till Plain - 109,257 acres

Concept: A rolling till plain formed by the Rainy lobe. Uplands occupy 77%, wetlands occupy 14%, and lakes occupy 9% of the LTA (MN DNR, 1998). There are .85 miles of streams per square mile (USDA Forest Service). 1999. Underlying bedrock may be influencing the terrain in the western portion of the area. Soil materials are predominantly loamy. A hard pan within the upper 4 feet is common.

The presettlement vegetation was wet-mesic hardwood-conifer (pine), wet-mesic hardwood-conifer (spruce-fir), dry mesic pine-hardwood, and mixed hardwood (northern) and pine (white) (Shadis, 1999 and Marschner, 1974). Lowland presettlement vegetation was conifer bog and swamp (Marschner, 1974).

Province 212 – Laurentian Mixed Forest -- Subsection 212Ld - Toimi Uplands (K)

Ld01. Toimi Drumlin Plain - 339,285 acres

Concept: A rolling drumlin plain formed by the Rainy Lobe glacier with small scattered Superior lobe outwash plains. The cigar-shaped hills (drumlins) are abundant. They range from .25 to .33 miles wide and .5 to 3 miles long. They are oriented parallel to each other generally in a northeast-southwest direction. Wetlands commonly occur in between the drumlins, sandy in the outwash plains and peat in the wetlands. Uplands occupy 66%, wetlands occupy 31%, and lakes occupy 3% of the LTA (MN DNR, 1998). There are .80 miles of streams per square mile (USDA Forest Service, 1998).
Soil parent material is loamy till on the drumlins. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan (68%). Stones are common. Other areas on the drumlins have fine sandy loam over a sandy loam hardpan (4%). The soil parent material is sandy on the outwash plains. Soil textures are fine sandy loam over sand & gravel (8%). Remaining areas have clayey textures (2%) or acid peat (16%) (NRCS, 1994).

This LTA is part of a landscape that was not covered by ice during the later episodes of glacial activity (specifically the Automba phase of the Rainy Lobe; The Automba, Split Rock, and Nickerson phases of the Superior Lobes; and the Bemis and Alborn phase of the St. Louis Lobe). Radio

carbon dates of lake sediments suggest that this landscape has been vegetated since 15,850 years before present (Birks, 1981*); thousands of years before surrounding areas were vegetated. The exact extent of this older landscape is unknown.

Province 212 – Laurentian Mixed Forest – Subsection 212Le – Laurentian Uplands

Le01. Isabella Moraine Complex - 103,929 acres

Concept: A complex of several parallel east-west oriented end moraines with till plains and outwash plains in between. Topography is rolling to hummocky on the end moraines, and gently rolling in the till plains and outwash plains. Uplands occupy 72%, wetlands occupy 24%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are .68 miles of streams per square mile (USDA Forest Service, 1998).

Soil parent material is Rainy lobe origin in the end moraines and till plains and both Rainy and Superior lobe material in the outwash plains. Most of the soil material on the moraines and till plains has sandy loam over gravelly sandy loam (72% of the LTA). A hardpan is commonly present. Other areas (5%) have sandy loam over bedrock. The outwash plains have fine sandy loam over sand & gravel (15% of the LTA). Remaining areas have acid peat (8%) (NRCS, 1994).

Le02. Kelly-Sawbill Landing Till Plain - 89,703 acres

Concept: A rolling till plain formed by the Rainy lobe with minor areas of gently rolling Superior lobe outwash plains. The soil materials are generally thick however bedrock (Duluth Complex) outcrops are common especially on the ridges. This LTA is a transition from bedrock controlled terrain to the north and terrain with deeper glacial sediments to the south. Uplands occupy 64%, wetlands occupy 32%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are .89 miles of streams per square mile (USDA Forest Service, 1998).

Most (77% of the LTA) of the soil material has sandy loam over gravelly sand texture. Remaining areas have sandy loam material over bedrock (19%) or fine sandy loam over sandy loam hardpan (3%) (NRCS, 1994).

Le03. Timber Freer Till Plain - 50,579 acres

Concept: A complex of rolling Rainy lobe till plains with minor areas of Superior lobe outwash plains on a bedrock controlled terrain. The bedrock type is Duluth complex and red granoferric granite ("red rock"). Soil material is generally thick (>40") and is loamy on the till plains and sand and gravel on the outwash plains. Boulders are very common. Uplands occupy 79%, wetlands occupy 13%, and lakes occupy 8% of the LTA (MN DNR, 1998). There are .48 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (60%) has sandy loam soils over bedrock. Hardpans are common. Remaining areas have fine sandy loam over sandy loam hardpan (22%). Soil textures on the outwash plains are sandy loam over gravelly sand textures (18% of the LTA) (NRCS, 1994).

Le04. Temperance River Till Plain - 50,222 acres

Concept: A rolling till plain formed by the Rainy and Superior lobes. The area is dissected by north-south oriented drainages. The soil materials are predominantly thick (>40") loamy till. Uplands occupy 68%, wetlands occupy 27%, and lakes occupy 5% of the LTA (MN DNR, 1998). There are .87 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (57%) has sandy loam over a gravelly sandy loam soil textures. The remaining areas have sandy loam with a hardpan over bedrock (18%), acid peat (16%), or fine sandy loam over sandy loam with a hardpan (9%) (NRCS, 1994).

Le08. Seven Beavers Peatland - 29,635 acres

Concept: A nearly level landscape dominated by large contiguous peatlands with scattered upland islands. Soil materials are predominantly deep peat, loamy till and sand-gravel (eskers). Uplands occupy 15%, wetlands occupy 83%, and lakes occupy 2% of the LTA (MN DNR, 1998). There are .27 miles of streams per square mile (USDA Forest Service, 1998).

Most of the LTA (89%) has is acid peat soil parent material. The upland islands have fine sandy loam over gravelly sand (7%) or sandy loam over a gravelly sandy loam hardpan (4%) soils (NRCS, 1994).

Le09. Phantom Lake Peatland - 13,005 acres

Concept: A nearly level landscape dominated by large contiguous peatlands with scattered upland islands. Soil materials are predominantly deep peat, loamy till (till plain islands) and sand-gravel (eskers). Uplands occupy 16%, wetlands occupy 82%, and lakes occupy 2% of the LTA (MN DNR, 1998). There are .44 miles of streams per square mile (USDA Forest Service, 1998).

A mixture of soil parent material is present. Forty nine percent of the LTA is acid peat. Thirty two percent has sandy loam over a gravelly sandy loam hardpan. The remaining areas have fine sandy loam over gravelly sand (17%) and fine sandy loam over a sandy loam a hardpan (2%) (NRCS, 1994).

Le10. Greenwood Lake Till Plain - 124,416 acres

Concept: A nearly level to gently rolling till plain formed by the Rainy Lobe with scattered outwash plains formed by the Superior Lobe glacier. The underlying bedrock (Duluth Gabbro), while generally greater than 40" deep, influences the landscape features. A few widely scattered low cigar-shaped hills called drumlins are present. Uplands occupy 51%, wetlands occupy 45%, and lakes occupy 4% of the LTA (MN DNR, 1998). There are .58 miles of streams per square mile (USDA Forest Service, 1998). Streams are often oriented ne-sw.

A mixture of soil parent material is present. The till plain is sandy loam over a gravelly sandy loam hardpan (49% of the LTA). A 1-2 foot thick cap of silt loam on the surface is present in some areas. The outwash plains have fine sandy loam over gravelly sand soils (30%). Eighteen percent is acid peat. (NRCS, 1994).

This LTA may be part of a landscape that was not covered by ice during the later episodes of glacial activity (specifically the Automba phase of the Rainy Lobe; The Automba, Split Rock, and Nickerson phases of the Superior Lobes; and the Bemis and Alborn phase of the St. Louis Lobe). Radio carbon dates of lake sediments suggest that this landscape has been vegetated since 15,850 years before present (Birks, 1981*); thousands of years before surrounding areas were vegetated. The exact extent of this older landscape is unknown.

Le11. Big-Bird Lake Moraine - 105,792 acres

Concept: A nearly level to rolling till plain formed the Rainy Lobe glacier with scattered Rainy lobe end moraines and Superior lobe outwash plains. Low cigar-shaped hills called drumlins are present. The underlying Duluth Gabbro bedrock is generally greater than 40" deep, yet it influences the landscape features. Uplands occupy 65%, wetlands occupy 33%, and lakes occupy 2% of the LTA (MN DNR, 1998). There are .63 miles of streams per square mile (USDA Forest Service, 1998).

The soil textures in the till plain the end moraines are gravelly sandy loam soils with a hardpan (73% of the LTA). Remaining areas (2%) have sandy loam with hardpans over bedrock and acid peat (19%) soils. The outwash plains have fine sandy loam over gravelly sand soils (5%) (NRCS, 1994).

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Glossary of Landform Types

The Hobbs & Goebel Geologic map of Minnesota, Quaternary geology serves as the reference for these terms; the map can be downloaded from http://conservancy.umn.edu/handle/60085

Stagnation or pitted moraine – A hummocky landform deposited by a glacier that has stopped moving. It has tall hills, steep slopes, and numerous closed depressions that may or may not be occupied by wetlands or lakes. It is characterized by complex surface deposits that are sorted, partially sorted, or not sorted at all by meltwater as the ice melts and the landscape collapses.

These landforms are most frequently formed at the ice margin when a glacier reaches the end of an advance. Typically, the outer edge of the glacier was frozen at the base forming a dam to the faster moving ice up-glacier. The moving ice containing debris or sediment is thrust upward by the dam where it breaks into huge blocks. Sediment accumulates at the surface of the ice as it melts and buries the ice blocks. As the ice blocks melt deep valleys and depressions are formed. Modern soils are often highly variable and can change over short distances.

Moraine - A distinct hilly landscape with steep slopes that usually has the highest elevation of the local area. Moraines are formed at the outer edges of glaciers when the front edge of the ice was relatively stationary for a period of time. It was stationary because it was melting about as fast as the ice was flowing. In this situation, the glacier acts like a giant conveyor belt creating piles of sediment. The sediment is a mixture of sand, silt, clay, gravel, and boulders. It accumulates on the surface of the ice and often buries huge blocks of ice.

Outwash Plain - A broad relatively level or gently rolling plain. Sand and/or gravel sediment was deposited by flowing water. The primary source of the water and sediment is from melting glacial ice.

Outwash Channel, Outwash train, Valley train - Long narrow deposits of sand and/or gravel that are often sorted and stratified. Topographic relief is relatively flat. These landforms were created when water and sediment flowing away from melting glacial ice was restricted to old glacial stream channels either on the ground or on the ice.

Pitted Outwash Plain - A broad plain with rolling to steep hills. Soil material is commonly sand and/or gravel. These landforms are created by water flowing from melting glacial ice. Huge blocks of ice left behind by the retreating glacier were buried by the sand. As the ice melted, the soil collapsed to form depressions or pits.

Till Plain - A broad rolling landscape that was formed underneath a glacier as it retreated. Little or no sorting of materials occurred. Soil materials are a mixture of clay, sand, gravel, and boulders and are relatively uniform in texture. In Minnesota, till plains are often loam, sandy loam, or clay loam in texture.

Drumlin Plain - A broad landscape that has distinct long cigar-shaped hills or ridges. These ridges (called drumlins) are usually oriented in the same general direction. Soil materials are a mixture of clay, sand, gravel, and boulders and are relatively uniform in texture. In Minnesota, drumlin plains are commonly sandy loam in texture.

Lake Plain - A broad level to gently rolling landscape that was formed on the bottom of a post-glacial lake.

Appendix D: Age Class Distributions

The following charts display:

1) Acres of timberland in 10-year age classes by ECS subsection for covertypes typically managed as even-aged stands, from two sources:

    a. An *estimate* of total cover type acres (broken out into site index classes used in DNR forest planning) from 2012 FIA data;

    b. Actual acres by forest type from a compilation of available forest inventory data (labeled "NSU Combined") from MN DNR, Superior National Forest, Carlton County, Itasca County, Koochiching County, Lake County, and St. Louis County (see following "Combined Public Land Forest Inventory Metadata" description);

2) 95% confidence intervals (displayed as black vertical lines) for FIA derived age class estimates, and;

3) A superimposed Desired Future (age class) Composition (displayed as a red "DFC") line based on DFCs from first generation SFRMPs covering each subsection, linearly scaled to the total amount of forest in the subsection.

Table 9.2.Stand Age (10-Yr Classes) Estimate of Acres for Border Lakes Subsection

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Border	Border Lakes	Border	Border		Border	Border Lakes	Border	Border		Border	Border Lakes	Border	Border	
	Forest Type	Aspen-Balm	Aspen-Balm of	Aspen-Balm	Aspen-Balm		Birch	Birch	Birch	Birch		Black	Black spruce	Black	Black	
	Site class	All	All	All	All	DFFC	All	All	All	All	DFFC %	<30	<30	<30	<30	DFFC
Stand age (10 yr classes) Estimate of acres	Total	446,462	394,860				124,363	39,970				13,478	18,561			
	0 - 10	79,721	49,122			0.19	8,019	2,176			0.16		1,093			0.08
	11 - 20	97,643	64,446			0.19	8,644	1,009			0.16		295			0.08
	21 - 30	60,252	58,336			0.19	3,085	394			0.16		378			0.08
	31 - 40	46,731	37,265			0.19	0	286			0.16		442			0.08
	41 - 50	40,431	23,052			0.15	3,705	1,129			0.16		628			0.08
	51 - 60	22,110	12,114			0.02	13,933	1,413			0.16		720			0.08
	61 - 70	39,595	15,746			0.02	32,908	3,920			0.02		851			0.08
	71 - 80	27,100	31,643			0.01	23,943	5,512			0.01		890			0.08
	81 - 90	24,040	39,769			0.01	18,106	10,034			0.01		1,522			0.08
	91 - 100	6,234	31,356			0.00	8,259	7,962			0.00		1,833			0.08
	101 - 110		19,273			0.00	0	3,365			0.00		1,904			0.08
	111 - 120		9,639			0.00	0	1,798			0.00		2,213			0.08
	121 - 130	2,604	2,405				3,761	533					2,183			0.01
	131 - 140		456					265					1,133			0.01
	141 - 150		129										1,054			0.01
	151 - 175		79					133					985			0.04
	176 - 200							41					324			
	201+		31										113			
95% CI	Total	4713					5530									
	0 to 10	4920		4920			7329		7329					0		
	11 to 20	4802		4802			5771		5771					0		
	21 to 30	4702		4702			4671		4671					0		
	31 to 40	5225		5225			0		0					0		
	41 to 50	6030		6030			27909		27909					0		
	51 to 60	4361		4361			8036		8036					0		
	61 to 70	5861		5861			6458		6458					40314		
	71 to 80	5486		0			9249		9249					0		
	81 to 90	4851		0			6817		6817					0		
	91 to 100	39403		0			12115		12115					0		
	101 to 110	0		0			0		0					0		
	111 to 120	0		0			0		0					0		
	121 to 130	0		0			27945		27945					31589		
	131 to 140	0		0			0		0					0		
	141 to 150	0		0			0		0					0		
	151 to 175	0		0			0		0					0		
	176 to 200	0		0			0		0					0		
	201+	0		0			0		0					0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA estimate	NSU-combined	Better	DFFC	
	Subsection	Border	Border Lakes	Border	Border		Border	Border Lakes	Border	Border		Border Lakes	Border Lakes	Border Lakes	Border Lakes	
	Forest	Black	Black spruce	Black	Black		Black	Black spruce	Black	Black		Black spruce	Black spruce	Black spruce	Black spruce	
	Site class	30-39	30-39	30-39	30-39	DFFC %	>39	>39	>39	>39	DFFC %	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	52697	38,369				24488	16,231				24488				
	0 - 10	2975	2,483			0.09		1,446			0.12					0.14
	11 - 20	525	2,140			0.09		686			0.12					0.14
	21 - 30	4698	1,323			0.09		561			0.12					0.14
	31 - 40	3539	1,170			0.09	2936	410			0.12	2936				0.14
	41 - 50	3297	1,364			0.09	11813	807			0.12	11813				0.14
	51 - 60	10723	1,614			0.09	5409	1,092			0.12	5409				0.14
	61 - 70	6602	2,187			0.09	1393	927			0.12	1393				0.14
	71 - 80	4228	2,892			0.09		1,327			0.12					0.01
	81 - 90	3506	3,599			0.09		1,847			0.02					0.00
	91 - 100	9323	5,605			0.09		1,920			0.01					0.00
	101 - 110		3,455			0.01		1,426			0.01					0.00
	111 - 120		3,880				2936	1,926			0.00	2936				0.00
	121 - 130		2,425					873					668			
	131 - 140		1,572					291					518			
	141 - 150		1,004					144								
	151 - 175	3281	844					277					108			
	176 - 200		564					90								
	201+		248					180								
95% CI	Total															
	0 to 10			0					0					0		
	11 to 20			0					0					0		
	21 to 30			29906					0					0		
	31 to 40			25978												
	41 to 50													7178		
	51 to 60			6870					42943					34529		
	61 to 70			40964					10249					0		
	71 to 80			6833					0					0		
	81 to 90			0					0					0		
	91 to 100			8076					0					0		
	101 to 110			0					0					0		
	111 to 120			0												
	121 to 130			0					0					0		
	131 to 140			0					0					0		
	141 to 150			0					0					0		
	151 to 175								0					0		
	176 to 200			0					0					0		
	201+			0					0					0		

	Source	FIA	NSU-combined	Better	DFFC	
	Subsection	Border	Border Lakes	Border	Border	
	Forest Type	Jack pine	Jack pine	Jack pine	Jack pine	
	Site class	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	55,404	94,342			
	0 - 10		8,085			0.16
	11 - 20		7,861			0.16
	21 - 30		11,338			0.16
	31 - 40		14,008			0.16
	41 - 50		10,161			0.16
	51 - 60		4,265			0.16
	61 - 70		2,220			0.02
	71 - 80		2,249			0.02
	81 - 90		4,332			0.01
	91 - 100		8,930			0.01
	101 - 110		8,532			0.00
	111 - 120		9,250			0.00
	121 - 130		1,850			
	131 - 140		686			
	141 - 150		474			
	151 - 175		47			
	176 - 200		56			
	201+					
95% CI	Total					
	0 to 10			0		
	11 to 20			0		
	21 to 30			5989		
	31 to 40			0		
	41 to 50			5691		
	51 to 60			0		
	61 to 70			0		
	71 to 80			34369		
	81 to 90			38129		
	91 to 100			0		
	101 to 110			0		
	111 to 120			0		
	121 to 130			0		
	131 to 140					
	141 to 150			0		
	151 to 175			0		
	176 to 200			0		
	201+					

Table 9.3.Stand Age (10-Yr Classes) Estimate of Acres for Nashwauk Uplands Subsection

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk	
	Forest Type	Aspen-Balm	Aspen-Balm of	Aspen-Balm	Aspen-Balm		Birch	Birch	Birch	Birch		Black	Black spruce	Black	Black	
	Site class	All	All	All	All	DFFC %	All	All	All	All	DFFC %	<30	<30	<30	<30	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	294,226	109,627	305,238			44,801	11,452				27,028	9,809			
	0 - 10	42,124	17,043	42,124	53,722	0.18	0	1,270			0.18	0	267			0.07
	11 - 20	64,281	18,418	64,281	53,722	0.18	4,435	190			0.18	0	111			0.07
	21 - 30	45,892	28,617	45,892	53,722	0.18	6,326	324			0.18	0	123			0.07
	31 - 40	50,274	11,043	50,274	53,722	0.18	0	118			0.18	0	32			0.07
	41 - 50	20,858	8,443	20,858	53,722	0.18	3,073	68			0.18	4,231	323			0.07
	51 - 60	26,309	2,281	26,309	18,314	0.06	8,155	76			0.08	3,060	287			0.07
	61 - 70	17,260	2,730	17,260	12,210	0.04	6,241	329			0.04	3,297	178			0.07
	71 - 80	20,647	5,624	20,647	6,105	0.02	7,526	1,709			0.00	4,072	448			0.07
	81 - 90	2,935	9,438	9,438	-	0.00	3,680	3,401			0.00	0	524			0.07
	91 - 100	1,414	5,053	5,053	-	0.00	3,163	3,377			0.00	0	903			0.07
	101 - 110	0.0	813		-	0.00	0	367			0.00	3,073	1,449			0.07
	111 - 120	2,231	67	2,231	-	0.00	0	179			0.00	3,060	1,641			0.07
	121 - 130			-	-	0.00	2,201	7			0.00	2,936	989			0.03
	131 - 140		58	58	-	0.00		1			0.00	3,297	788			0.03
	141 - 150			-	-	0.00		24			0.00		689			0.03
	151 - 175			-	-			12					1,048			0.03
	176 - 200			-	-								8			0.03
	201+			-	-								-			0.02
95% CI	Total	5026		5026			5510		5510			6344		6344		
	0 to 10	4942		4942			0		0			0		0		
	11 to 20	5583		5583			7918		7918			0		0		
	21 to 30	5514		5514			39803		39803			0		0		
	31 to 40	6033		6033			0		0			0		0		
	41 to 50	5240		5240			0		0			29149		29149		
	51 to 60	5259		5259			7031		7031			0		0		
	61 to 70	4441		4441			39801		39801			0		0		
	71 to 80	6399		6399			11266		11266			29605		29605		
	81 to 90	0		0			0		0			0		0		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk	
	Forest Type	Black	Black spruce	Black	Black		Black	Black spruce	Black	Black		Jack pine	Jack pine	Jack pine	Jack pine	
	Site class	30-39	30-39	30-39	30-39	DFFC %	>39	>39	>39	>39	DFFC %	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	24,299	16,054	32,837			9,049	8,460	16,150			18,208	8,642	23,787		
	0 - 10	0	1,411	1,411	2,857	0.09	0	820	820	2,053	0.13	0	1,370	1,370	4,187	0.18
	11 - 20	0	572	572	2,857	0.09	0	404	404	2,053	0.13	2,231	1,099	2,231	4,187	0.18
	21 - 30	0	245	245	2,857	0.09	0	337	337	2,053	0.13	0	1,511	1,511	4,187	0.18
	31 - 40	0	145	145	2,857	0.09	336	109	336	2,053	0.13	7,826	725	7,826	4,187	0.18
	41 - 50	0	649	649	2,857	0.09	2,372	312	2,372	2,053	0.13	0	1,092	1,092	4,187	0.18
	51 - 60	3,987	209	3,987	2,857	0.09	3,281	267	3,281	2,053	0.13	0	244	244	1,570	0.07
	61 - 70	7,930	319	7,930	2,857	0.09	0	116	116	2,053	0.13	3,281	177	3,281	1,285	0.05
	71 - 80	5,490	1,108	5,490	2,857	0.09	3,060	670	3,060	799	0.05	0	832	832	-	0.00
	81 - 90	3,060	2,048	3,060	2,857	0.09		2,152	2,152	651	0.04	4,567	759	4,567	-	0.00
	91 - 100	3,831	4,018	4,018	2,857	0.09		1,742	1,742	326	0.02	302	424	424	-	0.00
	101 - 110		1,835	1,835	1,195	0.04		669	669	-	0.00		378	378	-	0.00
	111 - 120		1,899	1,899	1,195	0.04		668	668	-	0.00		32	32	-	0.00
	121 - 130		502	502	1,195	0.04		48	48	-	0.00			-	-	0.00
	131 - 140		430	430	683	0.02		131	131	-	0.00			-	-	0.00
	141 - 150		320	320	-	0.00		15	15	-	0.00			-	-	0.00
	151 - 175		307	307	-			-	-	-				-	-	
	176 - 200		32	32	-			-	-	-				-	-	
	201+		3	3	-			-	-	-				-	-	
95% CI	Total	5547		5547			5726		5726			4934		4934		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			11297		11297		
	41 to 50	0		0			0		0			0		0		
	51 to 60	29073		29073			22704		22704			0		0		
	61 to 70	7459		7459			0		0			20293		20293		
	71 to 80	34898		34898			0		0			0		0		
	81 to 90	0		0			0		0			28485		28485		
	91 to 100	29629		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk		Nashwauk	Nashwauk	Nashwauk	Nashwauk	
	Forest	Tamarack	Tamarack	Tamarack	Tamarack		Tamarack	Tamarack	Tamarack	Tamarack		White	White spruce	White	White	
	Site class	<40	<40	<40	<40	DFFC %	>39	>39	>39	>39	DFFC %	All	All			DFFC %
Stand age (10 yr classes) Estimate of acres	Total	20,185	3,355	21,755			13,400	2,181	14,117			3,692	6,209	7,604		
	0 - 10	2,461	60	2,461	2,055	0.09	0.0	108	108	2,000	0.14	0.0	1,116	1,116	1,141	0.15
	11 - 20	0.0	124	124	2,055	0.09	2,387	29	2,387	2,000	0.14	2,215	820	2,215	1,141	0.15
	21 - 30	0.0		-	2,055	0.09	482	15	482	2,000	0.14	734	1,669	1,669	1,141	0.15
	31 - 40	0.0	39	39	2,055	0.09	0.0	35	35	2,000	0.14	744	1,499	1,499	1,141	0.15
	41 - 50	0.0	99	99	2,055	0.09	615	17	615	2,000	0.14		206	206	1,141	0.15
	51 - 60	0.0	218	218	2,055	0.09	2,975	196	2,975	2,000	0.14		191	191	1,141	0.15
	61 - 70	4,774	184	4,774	2,055	0.09	0.0	20	20	847	0.06		115	115	570	0.08
	71 - 80	1,864	292	1,864	2,055	0.09	824	315	824	847	0.06		294	294	127	0.02
	81 - 90	2,975	615	2,975	2,055	0.09	2,935	578	2,935	282	0.02		206	206	63	0.01
	91 - 100	5,177	634	5,177	685	0.03	3,182	314	3,182	94	0.01		73	73	-	0.00
	101 - 110		291	291	685	0.03		56	56	31	0.00		16	16	-	0.00
	111 - 120		297	297	685	0.03		436	436	16	0.00			-	-	0.00
	121 - 130		387	387	685	0.03		54	54	-	0.00		5	5	-	0.00
	131 - 140		21	21	348	0.02		1	1	-	0.00			-	-	0.00
	141 - 150		26	26	174	0.01		0	-	-	0.00			-	-	0.00
	151 - 175		62	62	-			0	-	-				-	-	
	176 - 200	2,935	1	2,935	-			0	-	-				-	-	
	201+		6	6	-			6	6	-				-	-	
95% CI	Total	5803		5803			5458		5458			6220		0		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			0		0		
	41 to 50	0		0			0		0			0		0		
	51 to 60	0		0			0		0			0		0		
	61 to 70	4435		4435			0		0			0		0		
	71 to 80	0		0			0		0			0		0		
	81 to 90	0		0			0		0			0		0		
	91 to 100	34369		34369			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

Table 9.4.Stand Age (10-Yr Classes) Estimate of Acres for Laurentian Uplands Subsection

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian	
	Forest Type	Aspen-Balm	Aspen-Balm of	Aspen-Balm	Aspen-Balm		Balsam fir	Balsam fir	Balsam fir	Balsam fir		Birch	Birch	Birch	Birch	
	Site class	All	All	All	All	DFFC %	All	All	All	All	DFFC %	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	83,507	104,867	120,955			53,007	20,063				68,722	36,364			
	0 - 10	11,237	6,957	11,237	19,850	0.16	2,570	919			0.18	7,341	2,113			0.15
	11 - 20	10,963	13,341	13,341	19,850	0.16	7,007	906			0.18	8,816	366			0.15
	21 - 30	9,755	18,477	18,477	19,850	0.16	13,231	1,166			0.18	2,936	484			0.15
	31 - 40	11,168	12,616	12,616	19,850	0.16	3,163	1,591			0.18	700	647			0.15
	41 - 50	9,075	9,506	9,506	19,850	0.16	5,415	1,599			0.18	6,256	350			0.15
	51 - 60	18,112	6,304	18,112	13,143	0.11	7,845	1,415			0.04	6,602	954			0.10
	61 - 70	377	8,470	8,470	4,999	0.04	6,272	1,219			0.03	6,021	2,496			0.05
	71 - 80	6,555	6,658	6,658	2,672	0.02	5,873	3,125			0.02	12,029	5,075			0.05
	81 - 90	6,265	9,527	9,527		0.01		3,409			0.00	11,189	8,462			0.02
	91 - 100		5,308	5,308	-	0.00		2,884			0.00		8,155			0.00
	101 - 110		3,758	3,758	-	0.00		685			0.00	1,603	2,759			0.00
	111 - 120		2,428	2,428	-	0.00		605			0.00		2,382			0.00
	121 - 130		920		-	0.00		292			0.00	3,761	1,198			0.00
	131 - 140		413		-	0.00		186			0.00		592			0.00
	141 - 150		83	83	-	0.00		62			0.00		209			0.00
	151 - 175		48	48	-							1,468	117			
	176 - 200			-	-		1,631									
	201+		54	54	-								4			
95% CI	Total	4867		0			5542		5542			5122		5122		
	0 to 10	6941		6941			0		0			11166		11166		
	11 to 20	5514		0			10940		10940			12562		12562		
	21 to 30	4836		0			7850		7850			0		0		
	31 to 40	6699		0			0		0			0		0		
	41 to 50	12764		0			34791		34791			39969		39969		
	51 to 60	6677		6677			6853		6853			40964		40964		
	61 to 70	0		0			39925		39925			9688		9688		
	71 to 80	10231		0			38129		38129			5623		5623		
	81 to 90	10799		0			0		0			6894		6894		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			27945		27945		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian	
	Forest	Black	Black spruce	Black	Black		Black	Black spruce	Black	Black		Black	Black spruce	Black	Black	
	Site class	<30	<30	<30	<30	DFFC %	30-39	30-39	30-39	30-39	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	29,975	29,127				53,354	50,816				62,810	31,341			
	0 - 10	0	399			0.08	3,795	1,506			0.09	3,348	1,059			0.11
	11 - 20	0	175			0.08	0	741			0.09	0	981			0.11
	21 - 30	0	615			0.08	5,326	1,785			0.09	826	1,170			0.11
	31 - 40	1,488	538			0.08	0	1,256			0.09	5,383	908			0.11
	41 - 50	0	674			0.08	6,138	1,605			0.09	7,058	1,298			0.11
	51 - 60	0	1,012			0.08	0	2,005			0.09	6,218	2,518			0.11
	61 - 70	0	2,520			0.08	8,052	3,327			0.09	8,714	3,202			0.11
	71 - 80	0	2,729			0.08	12,874	6,512			0.09	20,439	2,984			0.11
	81 - 90	0	3,069			0.08	5,770	6,408			0.09	1,841	4,628			0.07
	91 - 100	5,409	2,520			0.08	2,461	7,880			0.09	0	4,994			0.04
	101 - 110	1,641	1,948			0.08	2,975	4,933			0.03	6,009	3,232			0.03
	111 - 120	8,096	3,166			0.08	2,202	4,254			0.03	2,975	1,394			0.01
	121 - 130	7,295	2,841			0.02	824	2,680			0.02		1,366			0.00
	131 - 140	1,913	1,896			0.02	2,936	2,295			0.01		924			0.00
	141 - 150	0	1,826			0.02		1,725			0.00		422			0.00
	151 - 175	4,132	2,471			0.02		1,438					197			
	176 - 200		453			0.01		233					64			
	201+		276			0.01		233					-			
95% CI	Total	6220		6220			5453		5453			5343		5343		
	0 to 10	0		0			28679		28679			29241		29241		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			8661		8661			0		0		
	31 to 40	0		0			0		0			4684		4684		
	41 to 50	0		0			39557		39557			11062		11062		
	51 to 60	0		0			0		0			38179		38179		
	61 to 70	0		0			6953		6953			12510		12510		
	71 to 80	0		0			10110		10110			7272		7272		
	81 to 90	0		0			35729		0			0		0		
	91 to 100	34529		34529			0		0			0		0		
	101 to 110	0		0			0		0			38958		38958		
	111 to 120	12049		12049			0		0			0		0		
	121 to 130	43344		43344			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian		Laurentian	Laurentian	Laurentian	Laurentian	
	Forest	Jack pine	Jack pine	Jack pine	Jack pine		Tamarack	Tamarack	Tamarack	Tamarack		Tamarack	Tamarack	Tamarack	Tamarack	
	Site class	All	All	All	All	DFFC %	<40	<40	<40	<40	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	32,213	25,143				10,357	3,102				8,153	2,154			
	0 - 10	820	1,656			0.15	0	65			0.09	0	90			0.11
	11 - 20	3,766	957			0.15	0	25			0.09	0	55			0.11
	21 - 30	4,238	1,629			0.15	0	190			0.09	2,473	165			0.11
	31 - 40	11,519	6,843			0.15	3,297	209			0.09	0	113			0.11
	41 - 50	6,996	3,813			0.15	0	107			0.09	2,473	123			0.11
	51 - 60	0	3,323			0.15	0	91			0.09	0	357			0.11
	61 - 70	0	4,029			0.06	2,291	58			0.09	0	394			0.11
	71 - 80	0	720			0.03	4,768	554			0.09	734	178			0.11
	81 - 90	4,873	401			0.00		500			0.09	2,473	271			0.07
	91 - 100		689			0.00		603			0.09		156			0.04
	101 - 110		291			0.00		271			0.03		115			0.03
	111 - 120		328			0.00		230			0.03		110			0.01
	121 - 130		188			0.00		152			0.03		28			0.00
	131 - 140		182			0.00		20			0.02		0			0.00
	141 - 150		93			0.00		28			0.01		0			0.00
	151 - 175										0.00					
	176 - 200										0.00					
	201+										0.00					
95% CI	Total	4981		4981			8461		8461			6657		6657		
	0 to 10	0		0			0		0			0		0		
	11 to 20	27191		27191			0		0			0		0		
	21 to 30	8185		8185			0		0			0		0		
	31 to 40	6755		6755			0		0			0		0		
	41 to 50	10956		10956			0		0			0		0		
	51 to 60	0		0			0		0			0		0		
	61 to 70	0		0			0		0			0		0		
	71 to 80	0		0			0		0			0		0		
	81 to 90	32495		32495			0		0			0		0		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

Table 9.5.Stand Age (10-Yr Classes) Estimate of Acres for North Shore Highlands Subsection

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	North	North Shore	North	North		North	North Shore	North	North		North	North Shore	North	North	
	Forest Type	Aspen-Balm	Aspen-Balm of	Aspen-Balm	Aspen-Balm		Balsam fir	Balsam fir	Balsam fir	Balsam fir		Birch	Birch	Birch	Birch	
	Site class	All	All	All	All	DFFC %	All	All	All	All	DFFC %	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	399,690	211,731	422,013			65,727	32,990				187,331	82,385			
	0 - 10	24,332	29,306	29,306	69,257	0.16	2,975	691			0.18	9,480	2,850			0.15
	11 - 20	48,935	29,045	48,935	69,257	0.16	8,292	855			0.18	13,466	714			0.15
	21 - 30	56,599	47,450	56,599	69,257	0.16	16,953	1,499			0.18	734	1,022			0.15
	31 - 40	39,869	21,871	39,869	69,257	0.16	6,503	2,187			0.18	3,954	596			0.15
	41 - 50	61,820	10,083	61,820	69,257	0.16	6,044	1,482			0.18	12,418	487			0.15
	51 - 60	51,594	8,890	51,594	45,855	0.11	4,839	2,608			0.04	30,546	2,091			0.10
	61 - 70	55,958	9,410	55,958	17,443	0.04	9,261	2,485			0.03	47,974	4,748			0.05
	71 - 80	37,950	15,694	37,950	9,324	0.02	3,911	4,746			0.02	30,376	12,581			0.05
	81 - 90	13,965	18,538	18,538	3,108	0.01	2,516	7,298			0.00	23,480	24,559			0.02
	91 - 100	5,732	11,317	11,317	-	0.00	2,202	4,656			0.00	9,765	18,281			0.00
	101 - 110	2,936	6,746	6,746	-	0.00	0	2,289			0.00	0	11,618			0.00
	111 - 120		2,611	2,611	-	0.00	0	1,264			0.00	2,202	1,516			0.00
	121 - 130		208		-	0.00	0	383			0.00	0	687			0.00
	131 - 140		470		-	0.00	2,231	307			0.00	2,936	300			0.00
	141 - 150		63	63	-	0.00		98			0.00		69			0.00
	151 - 175		17	17	-			26					257			
	176 - 200		12	12	-			115					9			
	201+			-	-											
95% CI	Total	4955		4955			4589		4589			5533		5533		
	0 to 10	4220		0			21934		21934			13435		13435		
	11 to 20	4947		4947			5264		5264			7058		7058		
	21 to 30	5987		5987			6345		6345			0		0		
	31 to 40	5543		5543			10174		10174			29031		29031		
	41 to 50	5333		5333			37714		37714			8815		8815		
	51 to 60	5418		5418			8534		8534			6349		6349		
	61 to 70	5510		5510			5741		5741			6261		6261		
	71 to 80	5389		5389			5836		0			6012		6012		
	81 to 90	6262		0			0		0			6933		0		
	91 to 100	36735		0			0		0			13747		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	North	North Shore	North	North		North	North Shore	North	North		North	North Shore	North	North	
	Forest	Black	Black spruce	Black	Black		Black	Black spruce	Black	Black		Black	Black spruce	Black	Black	
	Site class	<30	<30	<30	<30	DFFC %	30-39	30-39	30-39	30-39	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	16,062	10,847				17,316	27,457				23,334	15,260			
	0 - 10	0	155			0.08	458	890			0.09	0	601			0.11
	11 - 20	417	106			0.08	0	382			0.09	0	249			0.11
	21 - 30	929	267			0.08	0	782			0.09	0	945			0.11
	31 - 40	0	912			0.08	2,256	321			0.09	2,936	495			0.11
	41 - 50	0	728			0.08	0	852			0.09	1,702	539			0.11
	51 - 60	2,120	235			0.08	0	1,081			0.09	0	764			0.11
	61 - 70	0	440			0.08	826	2,378			0.09	11,744	1,353			0.11
	71 - 80	3,057	1,134			0.08	390	2,623			0.09	4,015	1,699			0.11
	81 - 90	3,242	1,522			0.08	824	4,834			0.09	2,936	2,895			0.07
	91 - 100	2,998	1,157			0.08	9,585	5,271			0.09		2,215			0.04
	101 - 110	0	807			0.08	0	2,465			0.03		1,186			0.03
	111 - 120	3,297	1,129			0.08	0	2,022			0.03		1,036			0.01
	121 - 130		491			0.02	2,975	870			0.02		286			0.00
	131 - 140		335			0.02		1,257			0.01		391			0.00
	141 - 150		540			0.02		467			0.00		161			0.00
	151 - 175		383			0.02		648					290			
	176 - 200		434			0.01		204					154			
	201+		72			0.01		108					-			
95% CI	Total	4498		4498			5376		0			5749		5749		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			0		0		
	41 to 50	0		0			0		0			0		0		
	51 to 60	0		0			0		0			0		0		
	61 to 70	0		0			0		0			7160		7160		
	71 to 80	22066		22066			0		0			29533		29533		
	81 to 90	23014		23014			0		0			0		0		
	91 to 100	19908		19908			13362		13362			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	North	North Shore	North	North		North	North Shore	North	North		North	North Shore	North	North	
	Forest	Jack pine	Jack pine	Jack pine	Jack pine		Tamarack	Tamarack	Tamarack	Tamarack		Tamarack	Tamarack	Tamarack	Tamarack	
	Site class	All	All	All	All	DFFC %	<40	<40	<40	<40	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	2,993	5,136				4,025	4,352				12,546	2,612			
	0 - 10	0	521			0.15	0	488			0.09	0	186			0.11
	11 - 20	0	833			0.15	0	26			0.09	0	192			0.11
	21 - 30	2,202	843			0.15	0	7			0.09	0	116			0.11
	31 - 40	791	1,490			0.15	0	312			0.09	0	266			0.11
	41 - 50		56			0.15	0	64			0.09	2,478	52			0.11
	51 - 60		112			0.15	3,281	218			0.09	777	11			0.11
	61 - 70		273			0.06	0	89			0.09	0	129			0.11
	71 - 80		454			0.03	744	216			0.09	3,304	301			0.11
	81 - 90		314			0.00		472			0.09	204	747			0.07
	91 - 100		119			0.00		1461			0.09	0	419			0.04
	101 - 110		29			0.00		297			0.03	0	111			0.03
	111 - 120		94			0.00		183			0.03	0	52			0.01
	121 - 130					0.00		501			0.03	3,304	26			0.00
	131 - 140					0.00		19			0.02	2,478	0			0.00
	141 - 150					0.00					0.01					0.00
	151 - 175							0			0.00		4			
	176 - 200										0.00					
	201+										0.00					
95% CI	Total	21446		0			29581		0			6083		6083		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			0		0		
	41 to 50	0		0			0		0			0		0		
	51 to 60	0		0			0		0			0		0		
	61 to 70	0		0			0		0			0		0		
	71 to 80	0		0			0		0			0		0		
	81 to 90	0		0			0		0			0		0		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

Table 9.6.Stand Age (10-Yr Classes) Estimate of Acres for Toimi Uplands Subsection

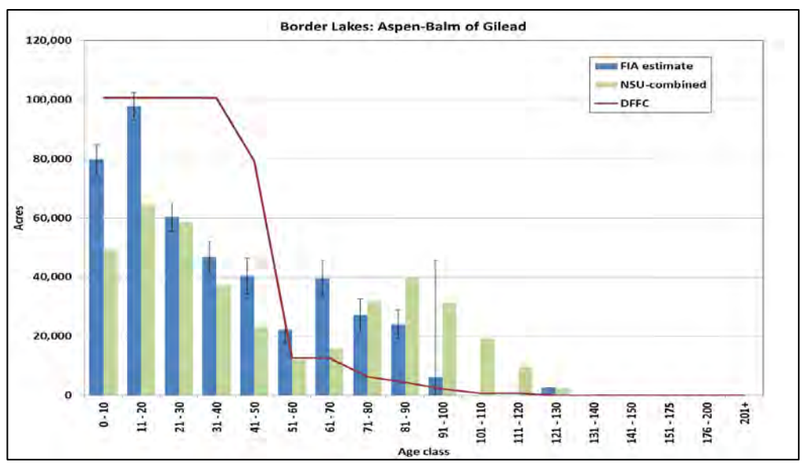
	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi	
	Forest Type	Aspen-Balm	Aspen-Balm of	Aspen-Balm	Aspen-Balm		Balsam fir	Balsam fir	Balsam fir	Balsam fir		Birch	Birch	Birch	Birch	
	Site class	All	All	All	All	DFFC %	All	All	All	All	DFFC %	All	All	All	All	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	124,601	103,297	156,182			20,032	12,346				30,712	15,180			
	0 - 10	26,524	16,143	26,524	25,631	0.16	0	355			0.18	0	808			0.15
	11 - 20	28,783	22,994	28,783	25,631	0.16	2,294	135			0.18	734	158			0.15
	21 - 30	3,781	23,838	23,838	25,631	0.16	1,598	617			0.18	2,461	25			0.15
	31 - 40	15,922	7,728	15,922	25,631	0.16	0	558			0.18	0	13			0.15
	41 - 50	5,453	3,690	5,453	25,631	0.16	2,936	428			0.18	0	134			0.15
	51 - 60	8,227	4,049	8,227	16,970	0.11	2,936	439			0.04	0	247			0.10
	61 - 70	26,969	5,592	26,969	6,455	0.04	4,490	1,126			0.03	7,199	1,096			0.05
	71 - 80	5,638	9,449	9,449	3,451	0.02	5,777	2,890			0.02	18,666	4,534			0.05
	81 - 90	0	7,187	7,187	1,150	0.01		3,410			0.00	1,652	5,549			0.02
	91 - 100	3,304	2,102	3,304	-	0.00		1,868			0.00		1,898			0.00
	101 - 110		388		-	0.00		321			0.00		456			0.00
	111 - 120		59	59	-	0.00		62			0.00		123			0.00
	121 - 130			-	-	0.00		65			0.00		57			0.00
	131 - 140		27	27	-	0.00					0.00					0.00
	141 - 150		13	13	-	0.00		22			0.00		7			0.00
	151 - 175		20	20	-								76			
	176 - 200		20	20	-			53								
	201+			-	-											
95% CI	Total	5224		5224			5631		5631			5519		5519		
	0 to 10	5864		5864			0		0			0		0		
	11 to 20	5300		5300			15353		15353			0		0		
	21 to 30	29246		0			0		0			0		0		
	31 to 40	5491		5491			0		0			0		0		
	41 to 50	35378		35378			0		0			0		0		
	51 to 60	12162		12162			0		0			0		0		
	61 to 70	6318		6318			28691		28691			10760		10760		
	71 to 80	35763		0			36297		36297			6708		6708		
	81 to 90	0		0			0		0			0		0		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

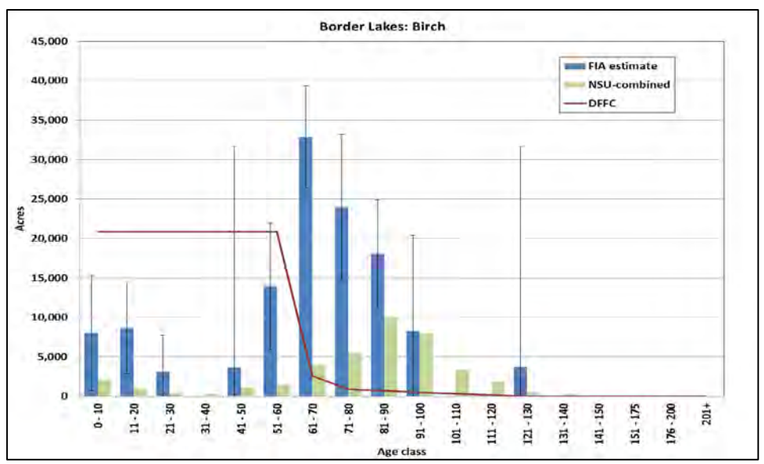
	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi	
	Forest	Black	Black spruce	Black	Black		Black	Black spruce	Black	Black		Black	Black spruce	Black	Black	
	Site class	<30	<30	<30	<30	DFFC %	30-39	30-39	30-39	30-39	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	5,911	7,742				9,395	17,397				31,643	10,317			
	0 - 10	0	22			0.08	0	755			0.09	0	433			0.11
	11 - 20	0	32			0.08	0	810			0.09	0	195			0.11
	21 - 30	0	52			0.08	0	511			0.09	0	306			0.11
	31 - 40	0	65			0.08	0	121			0.09	0	121			0.11
	41 - 50	0	134			0.08	0	232			0.09	0	110			0.11
	51 - 60	0	177			0.08	0	85			0.09	3,119	69			0.11
	61 - 70	744	352			0.08	0	458			0.09	12,165	482			0.11
	71 - 80	2,936	541			0.08	824	1276			0.09	2,305	1,441			0.11
	81 - 90	2,231	1,351			0.08	2,291	3189			0.09	13,687	2,562			0.07
	91 - 100		755			0.08	3,304	5715			0.09	0	1,937			0.04
	101 - 110		308			0.08	0	1407			0.03	0	1,074			0.03
	111 - 120		546			0.08	0	1097			0.03	0	792			0.01
	121 - 130		491			0.02	2,975	557			0.02	367	335			0.00
	131 - 140		1,421			0.02		460			0.01		122			0.00
	141 - 150		306			0.02		448			0.00		269			0.00
	151 - 175		943			0.02		244					34			
	176 - 200		70			0.01		31					36			
	201+		177			0.01		0					-			
95% CI	Total	10709		0			8156		0			4917		4917		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			0		0		
	41 to 50	0		0			0		0			0		0		
	51 to 60	0		0			0		0			4686		4686		
	61 to 70	0		0			0		0			5972		5972		
	71 to 80	0		0			0		0			0		0		
	81 to 90	0		0			0		0			7882		7882		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

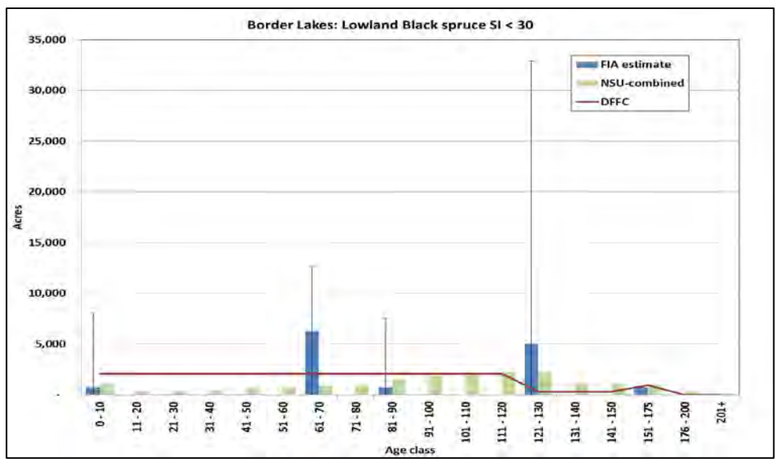
	Source	FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC		FIA	NSU-combined	Better	DFFC	
	Subsection	Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi		Toimi	Toimi Uplands	Toimi	Toimi	
	Forest	Jack pine	Jack pine	Jack pine	Jack pine		Tamarack	Tamarack	Tamarack	Tamarack		Tamarack	Tamarack	Tamarack	Tamarack	
	Site class	All	All	All	All	DFFC %	<40	<40	<40	<40	DFFC %	>39	>39	>39	>39	DFFC %
Stand age (10 yr classes) Estimate of acres	Total	7,430	3,698				2,790	5,001				10,804	2,592			
	0 - 10	0	788			0.15	0	75			0.09	0	156			0.11
	11 - 20	1,557	463			0.15	0	0			0.09	0				0.11
	21 - 30	0	375			0.15	0	0			0.09	0	89			0.11
	31 - 40	0	344			0.15	0	7			0.09	0	32			0.11
	41 - 50	0	130			0.15	645	66			0.09	2,975	48			0.11
	51 - 60	2,936	42			0.15	0	37			0.09	0	136			0.11
	61 - 70	0	176			0.06	1,652	43			0.09	0	108			0.11
	71 - 80	0	776			0.03	0	231			0.09	4,525	279			0.11
	81 - 90	2,936	191			0.00	493	799			0.09	3,304	860			0.07
	91 - 100		263			0.00		3218			0.09		455			0.04
	101 - 110		53			0.00		316			0.03		155			0.03
	111 - 120		97			0.00		80			0.03		187			0.01
	121 - 130					0.00		20			0.03		41			0.00
	131 - 140					0.00		46			0.02		27			0.00
	141 - 150					0.00		50			0.01		0			0.00
	151 - 175							14			0.00		18			
	176 - 200										0.00					
	201+										0.00					
95% CI	Total	11281		11281			4543		0			9036		9036		
	0 to 10	0		0			0		0			0		0		
	11 to 20	0		0			0		0			0		0		
	21 to 30	0		0			0		0			0		0		
	31 to 40	0		0			0		0			0		0		
	41 to 50	0		0			0		0			0		0		
	51 to 60	0		0			0		0			0		0		
	61 to 70	0		0			0		0			0		0		
	71 to 80	0		0			0		0			31317		31317		
	81 to 90	0		0			0		0			0		0		
	91 to 100	0		0			0		0			0		0		
	101 to 110	0		0			0		0			0		0		
	111 to 120	0		0			0		0			0		0		
	121 to 130	0		0			0		0			0		0		
	131 to 140	0		0			0		0			0		0		
	141 to 150	0		0			0		0			0		0		
	151 to 175	0		0			0		0			0		0		
	176 to 200	0		0			0		0			0		0		
	201+	0		0			0		0			0		0		

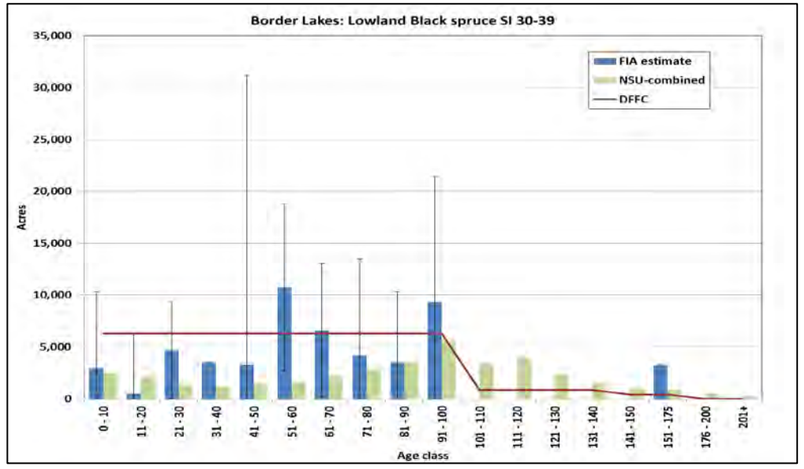
Figure 9.2. Age-class distribution charts for forest cover types in the Border Lakes Subsection

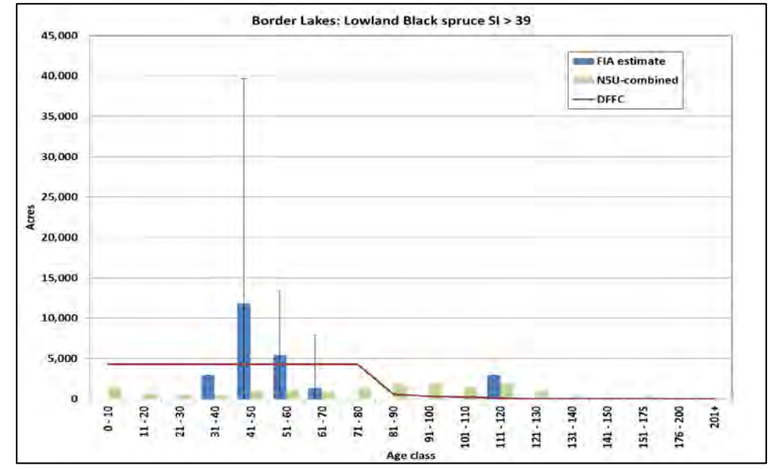
Each cover type, or cover type subset by site index is displayed in an individual chart.











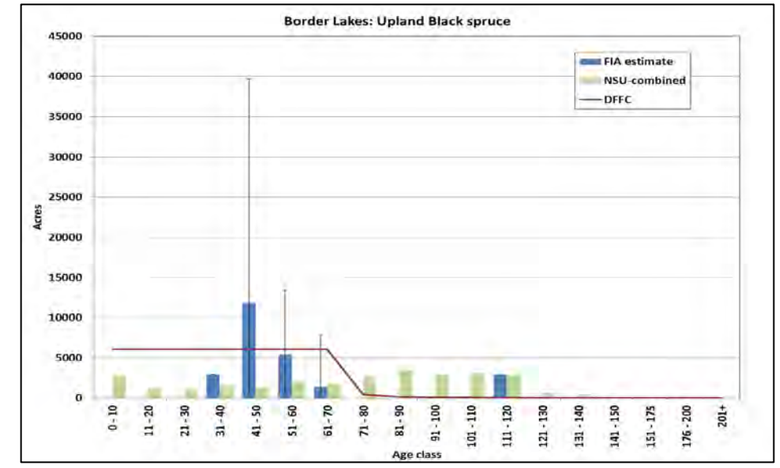
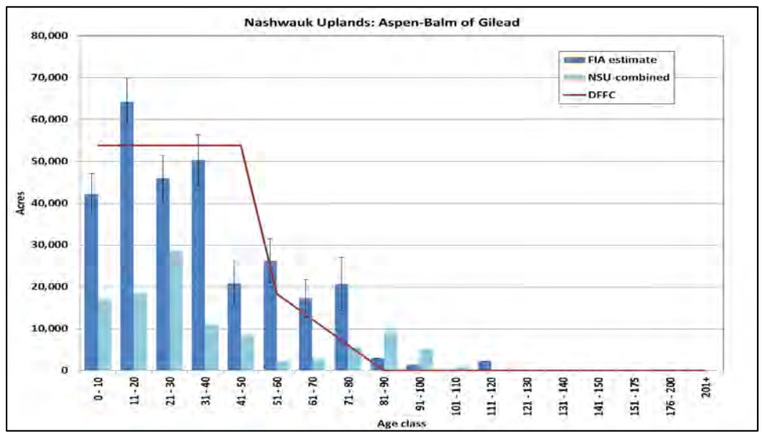
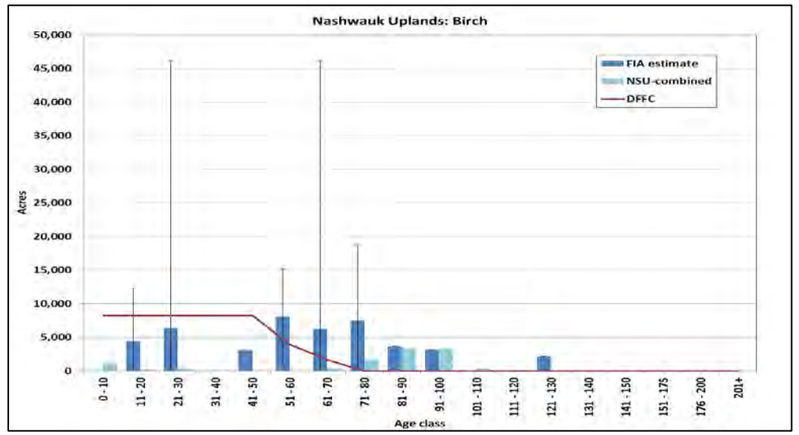
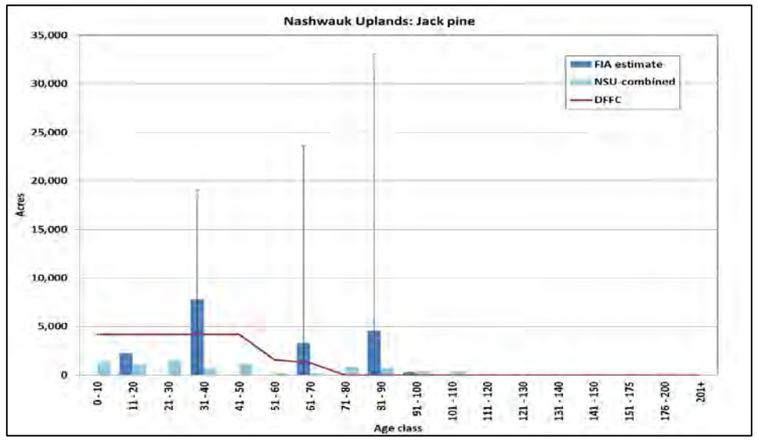


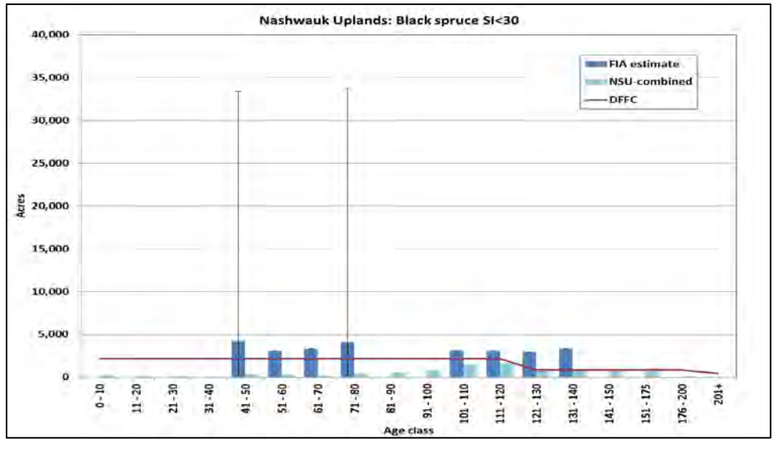
Figure 9.3. Age-class distribution charts for forest cover types in the Nashwauk Uplands Subsection

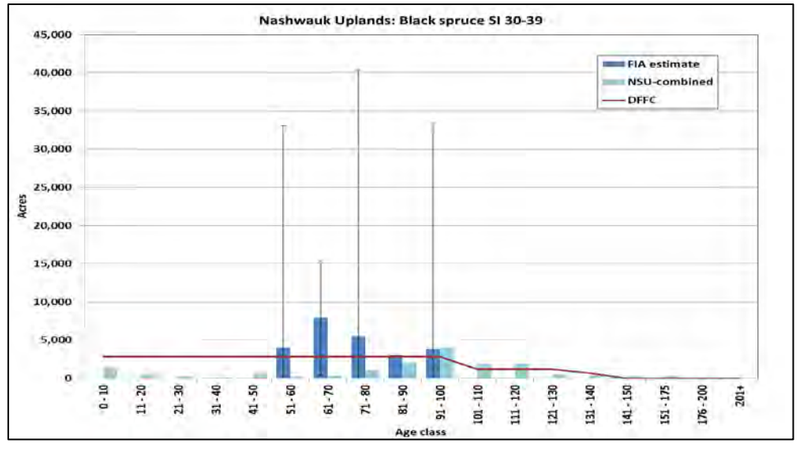
Each cover type, or cover type subset by site index is displayed in an individual chart.

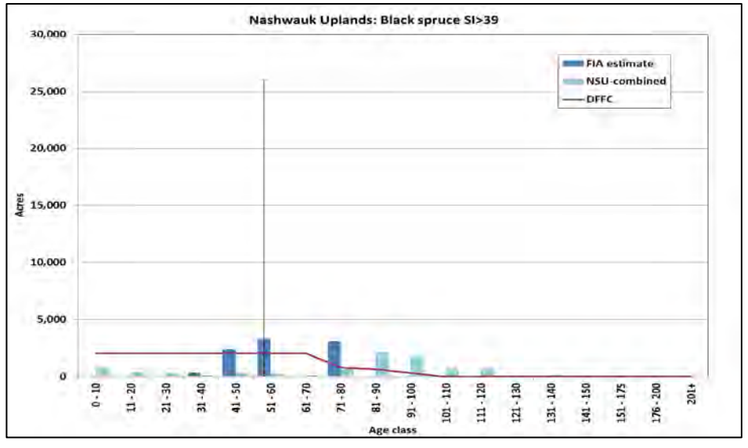


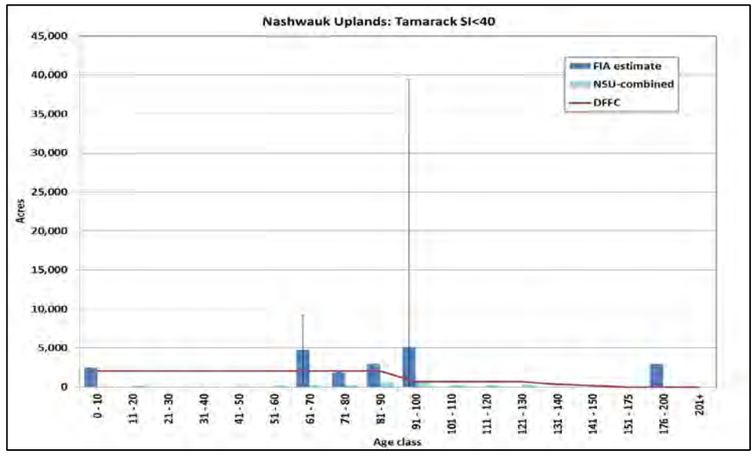


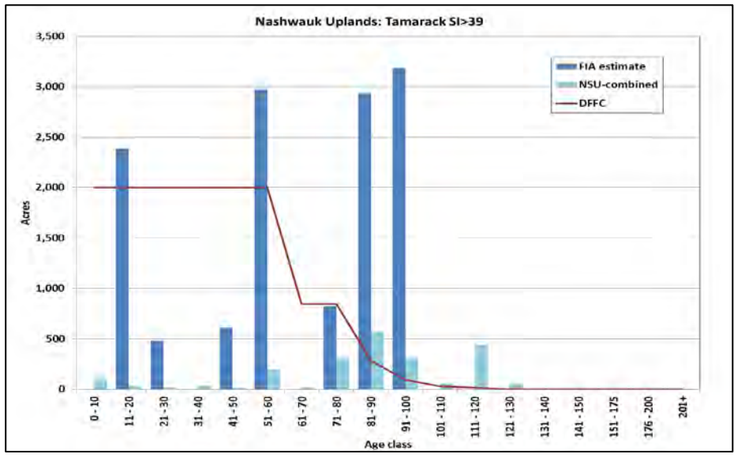









Nashwauk Uplands: Tamarack SI<40
FIA estimate
NSU-combined
DFFC
Acres
Age class
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
101 - 110
111 - 120
121 - 130
131 - 140
141 - 150
151 - 175
176 - 200
201+


Nashwauk Uplands: Tamarack SI>39
FIA estimate
NSU-combined
DFFC
Acres
Age class

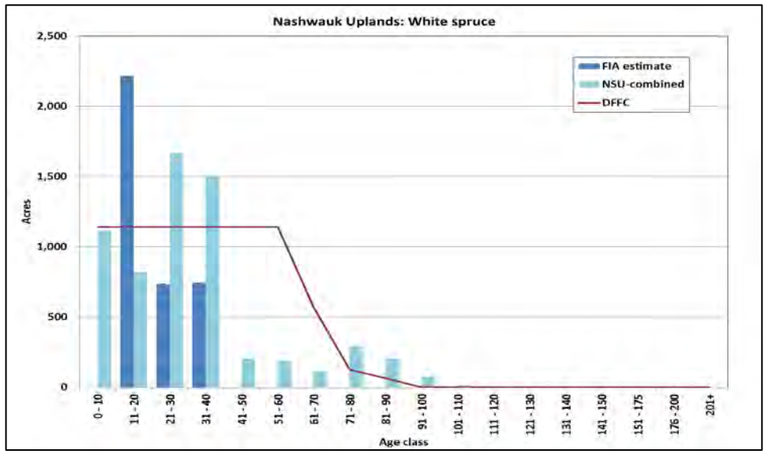
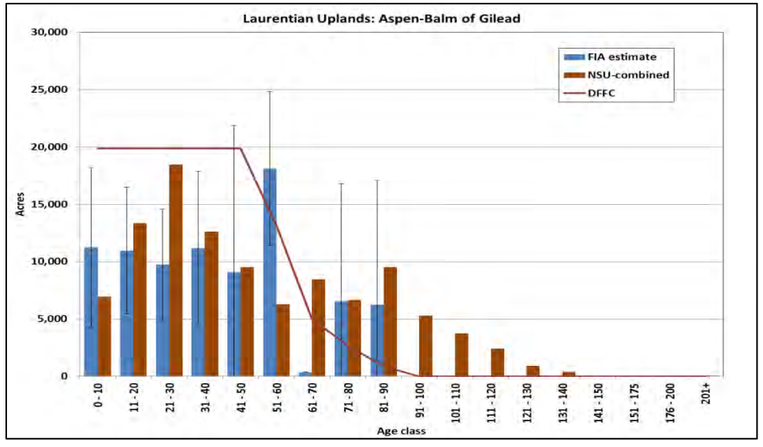
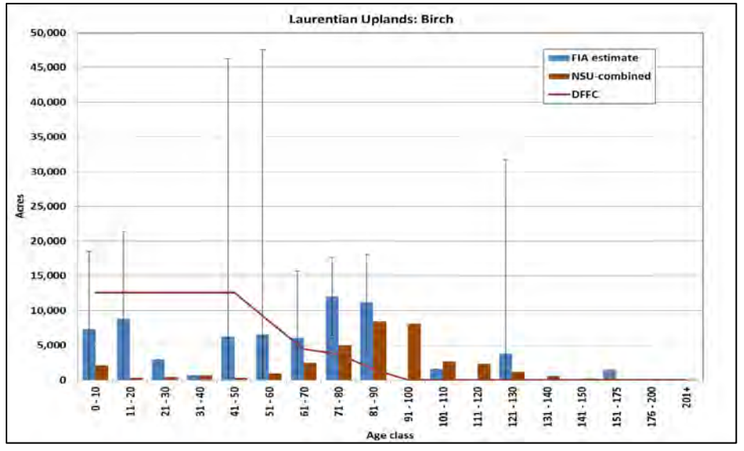
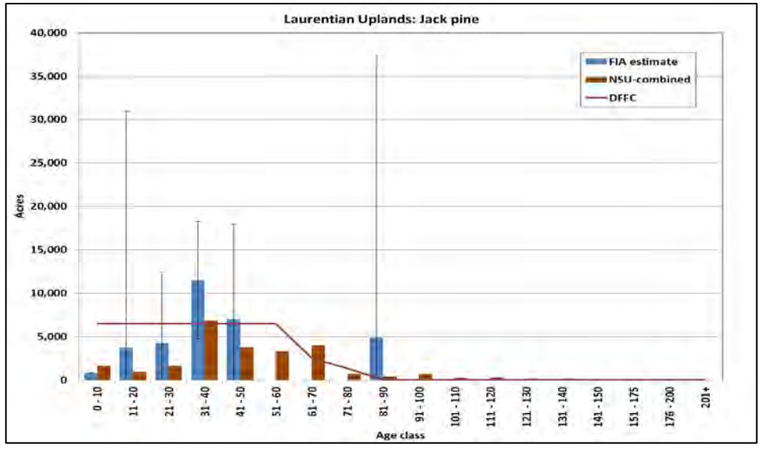

Nashwauk Uplands: White spruce
FIA estimate
NSU-combined
DFFC
Acres
Age class

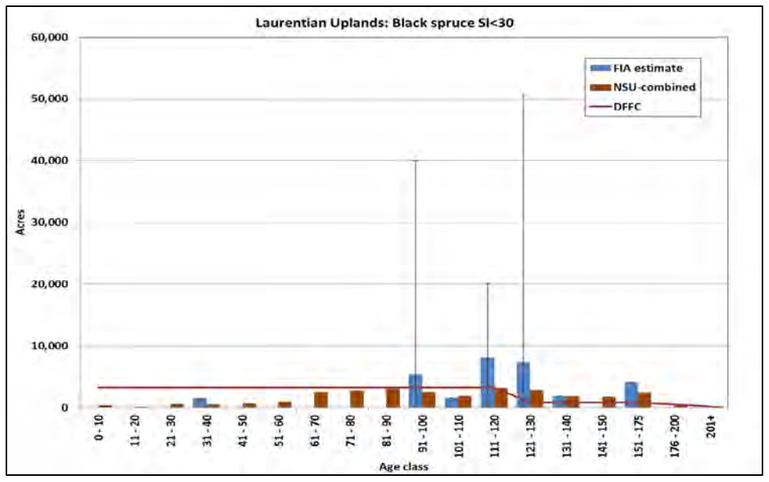
Figure 9.4. Age-class distribution charts for forest cover types in the Laurentian Uplands Subsection

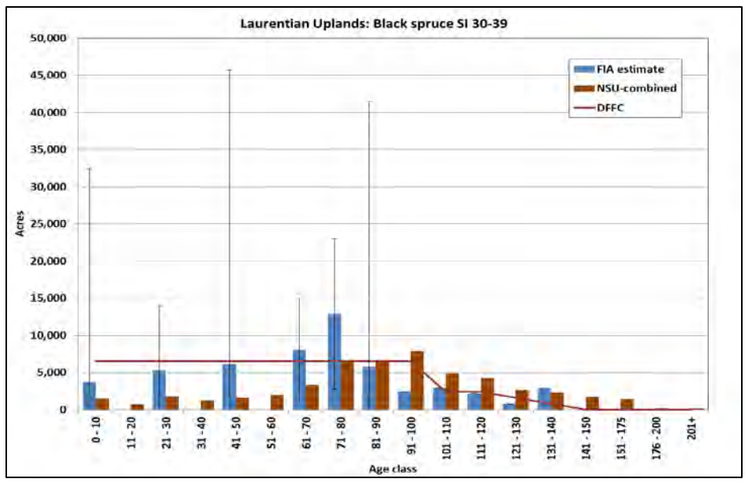
Each cover type, or cover type subset by site index is displayed in an individual chart

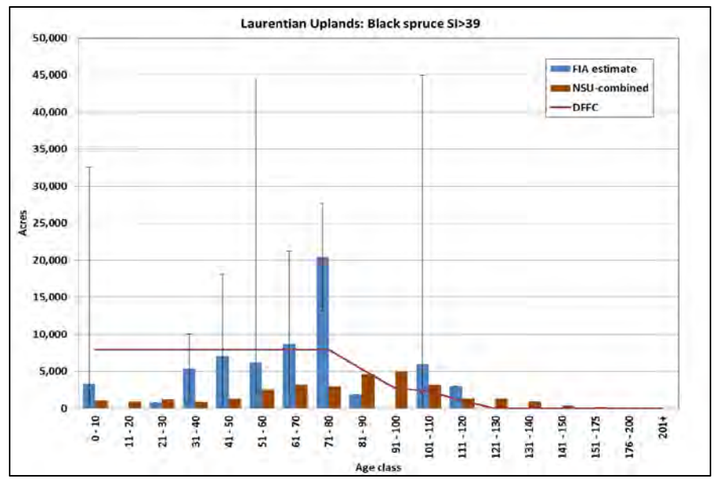


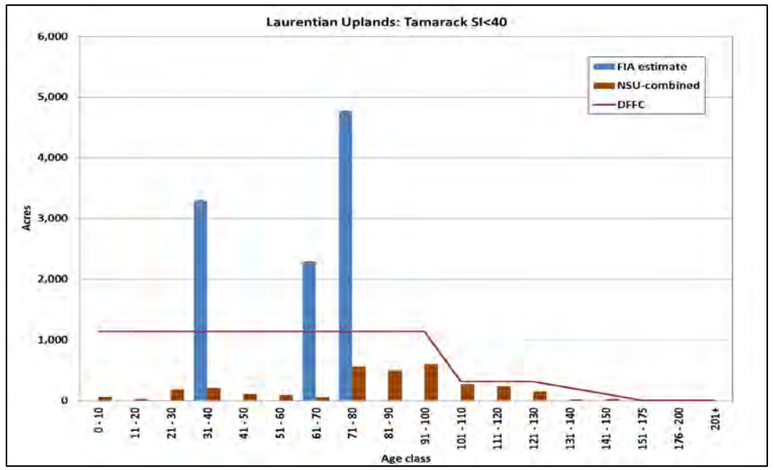


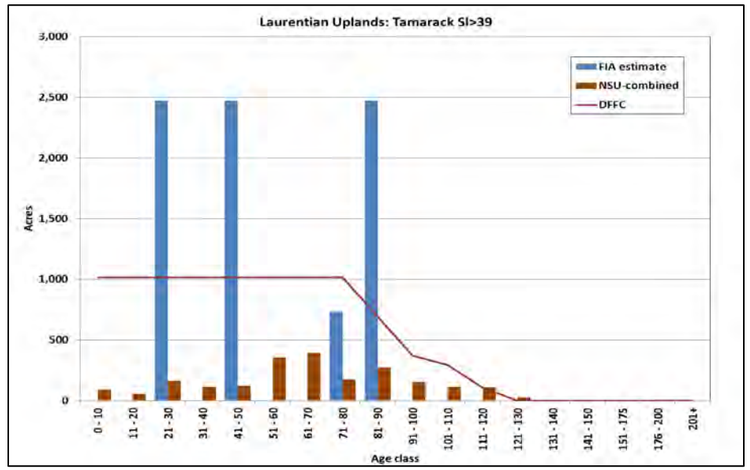









Laurentian Uplands: Tamarack SI<40
FIA estimate
NSU-combined
DFFC
Acres
6,000
5,000
4,000
3,000
2,000
1,000
0
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
101 - 110
111 - 120
121 - 130
131 - 140
141 - 150
151 - 175
176 - 200
201+
Age class


Laurentian Uplands: Tamarack SI>39
FIA estimate
NSU-combined
DFFC
Acres
3,000
2,500
2,000
1,500
1,000
500
0
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
101 - 110
111 - 120
121 - 130
131 - 140
141 - 150
151 - 175
176 - 200
201+
Age class

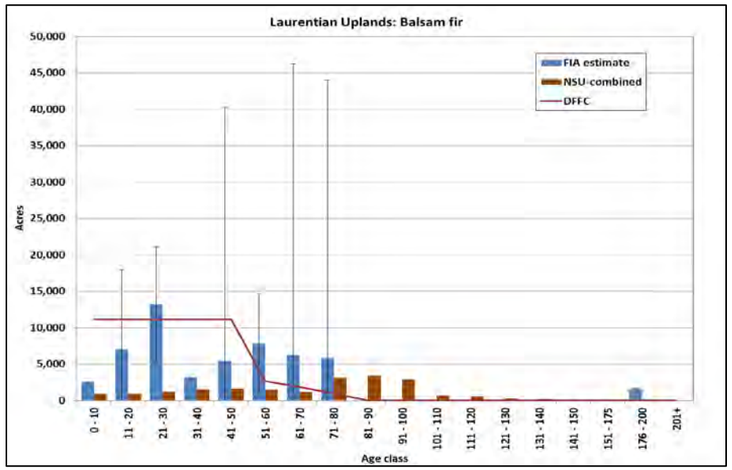
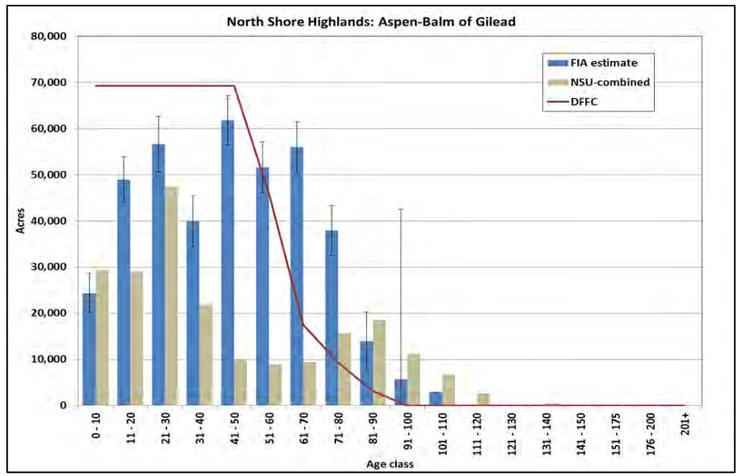
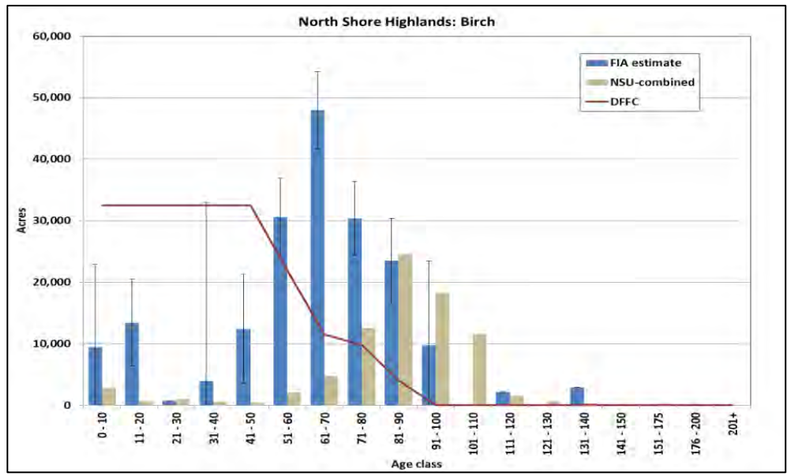
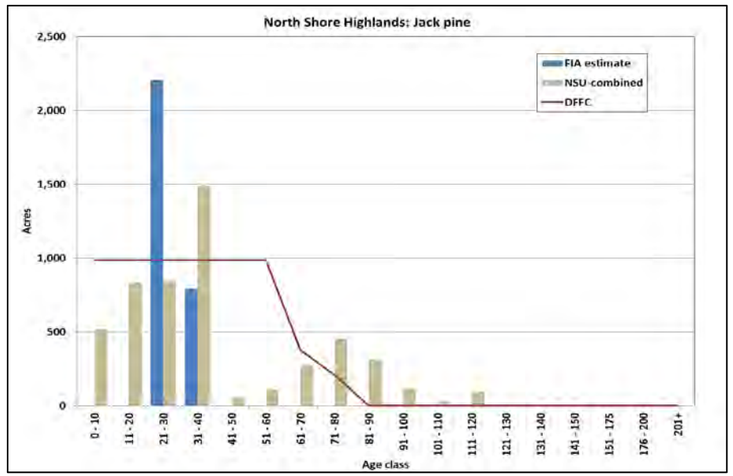

Laurentian Uplands: Balsam fir
FIA estimate
NSU-combined
DFFC
Acres
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
101 - 110
111 - 120
121 - 130
131 - 140
141 - 150
151 - 175
176 - 200
201+
Age class

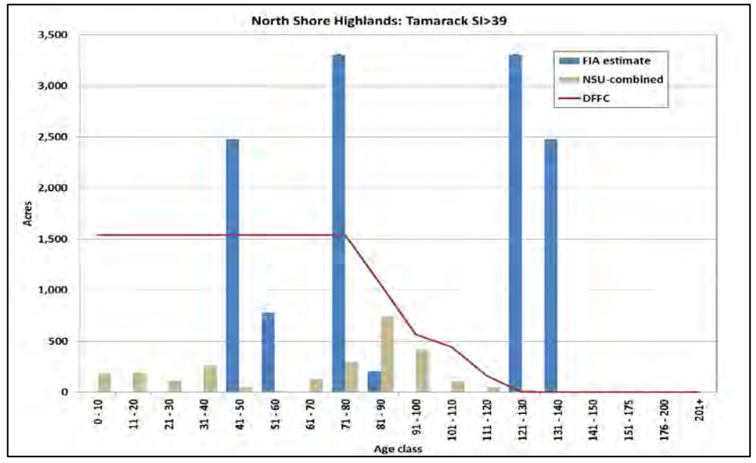
Figure 9.5. Age-class distribution charts for forest cover types in the North Shore Highlands Subsection

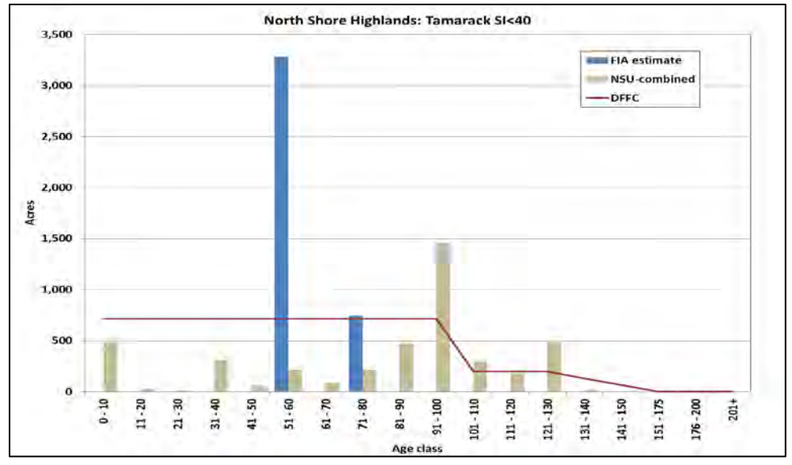
Each cover type, or cover type subset by site index is displayed in an individual chart

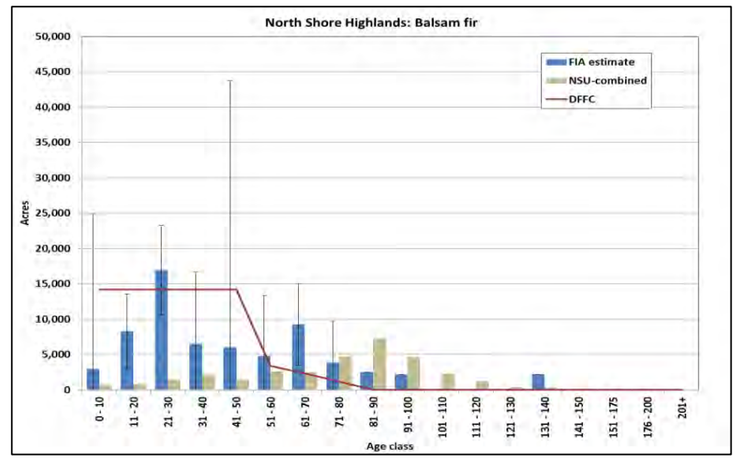


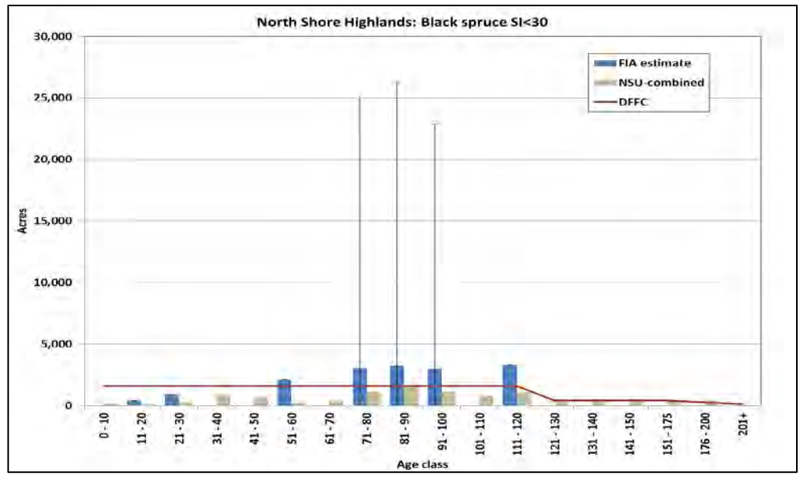


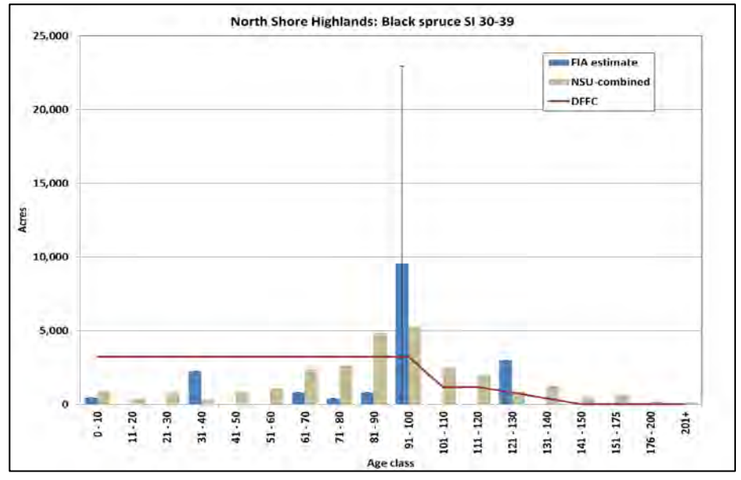












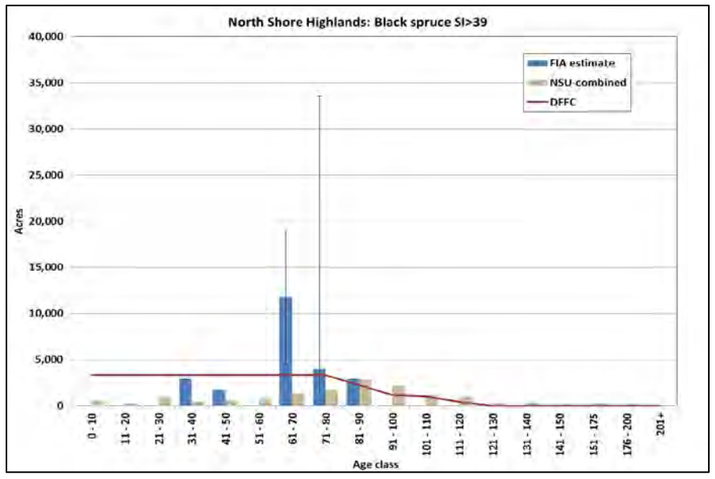
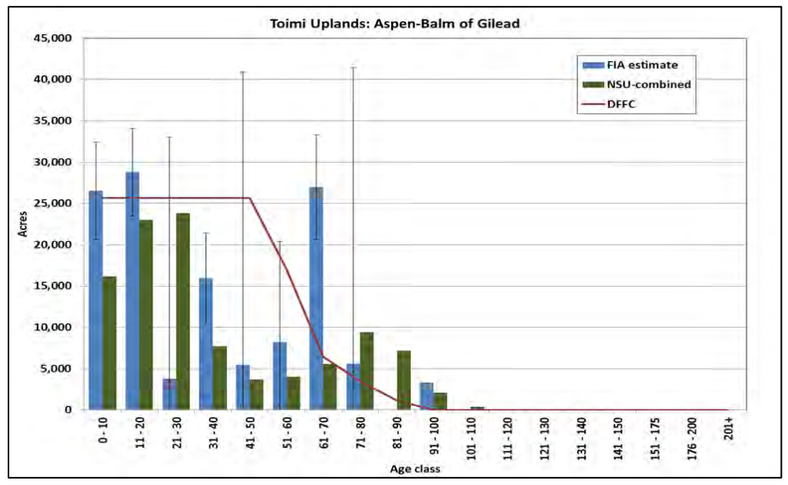
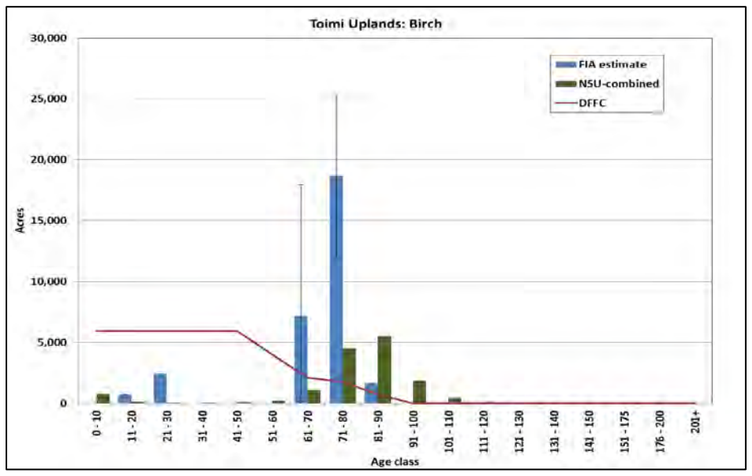
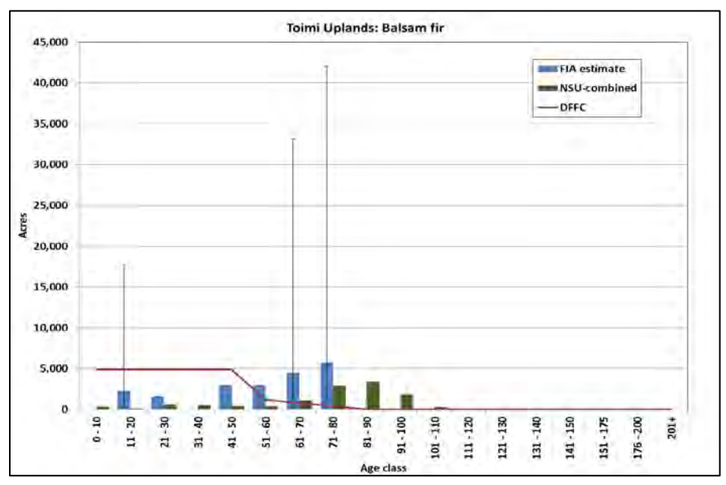


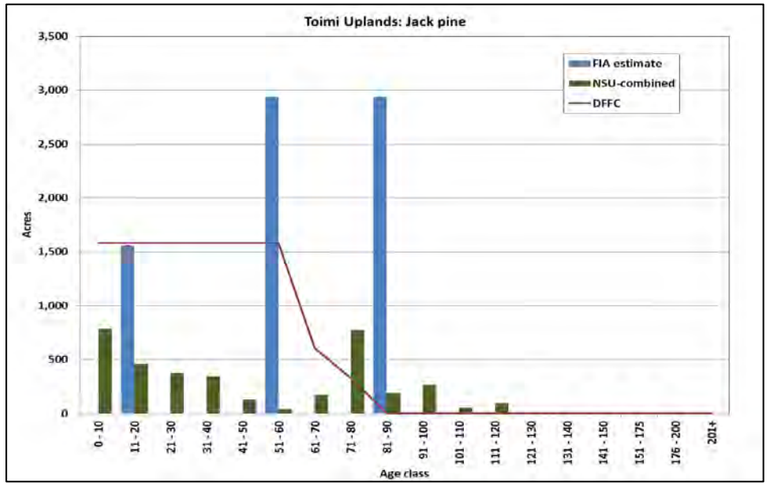
Figure 9.6. Age-class distribution charts for forest cover types in the Toimi Uplands Subsection

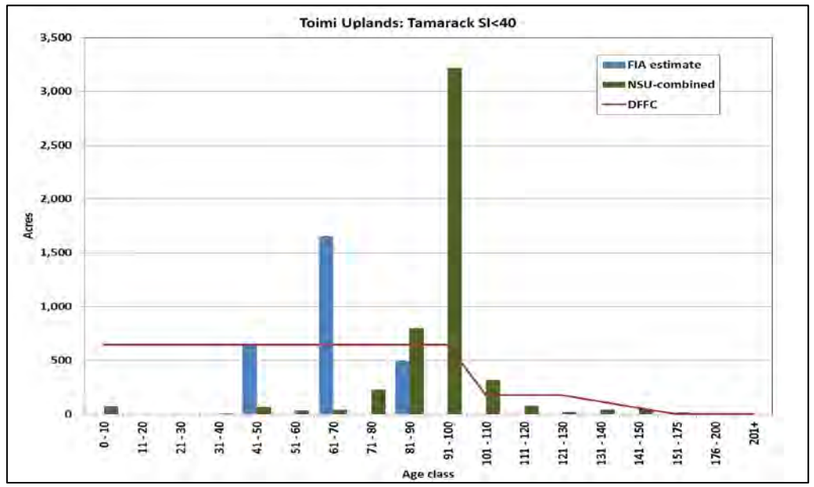
Each cover type, or cover type subset by site index is displayed in an individual chart

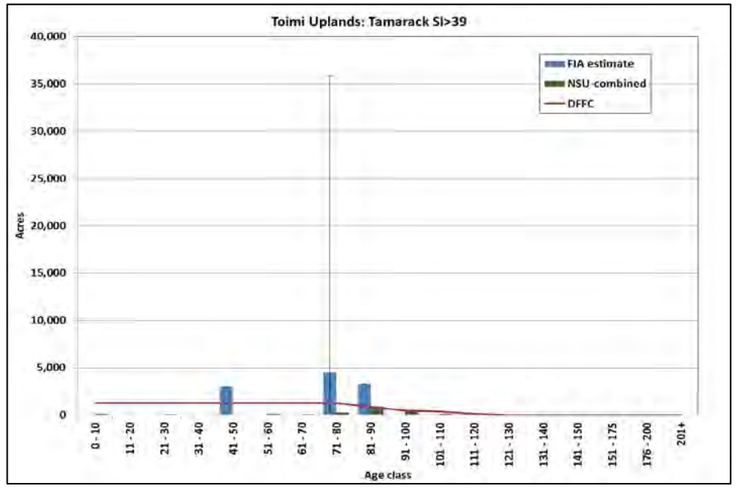


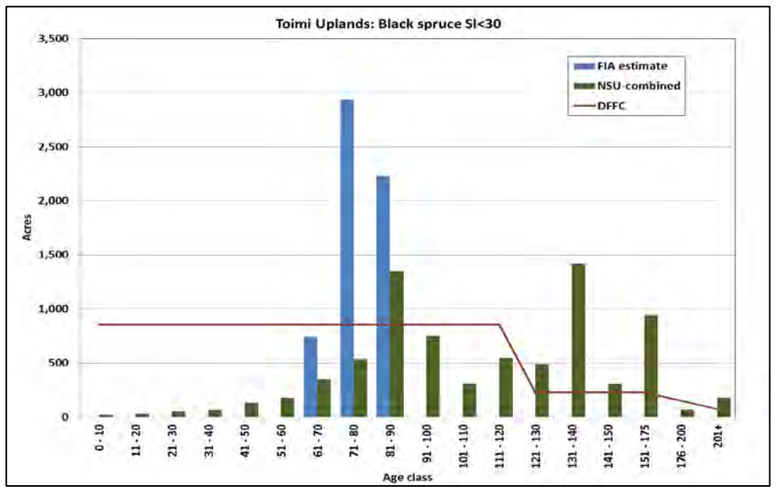


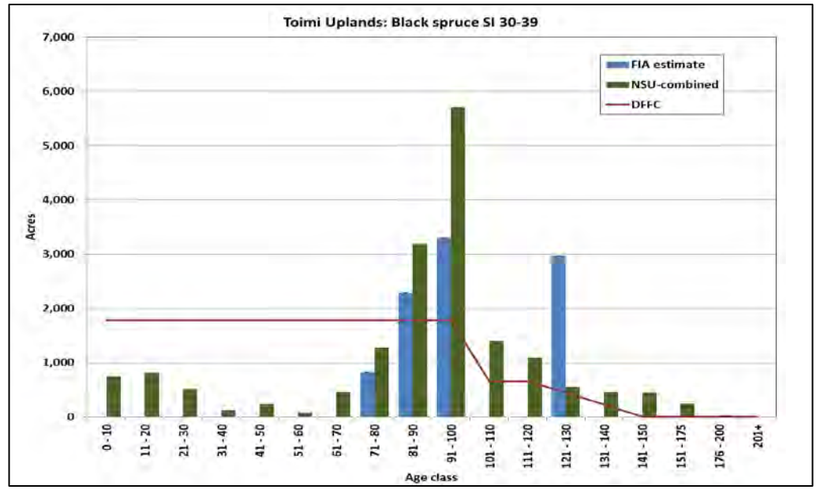


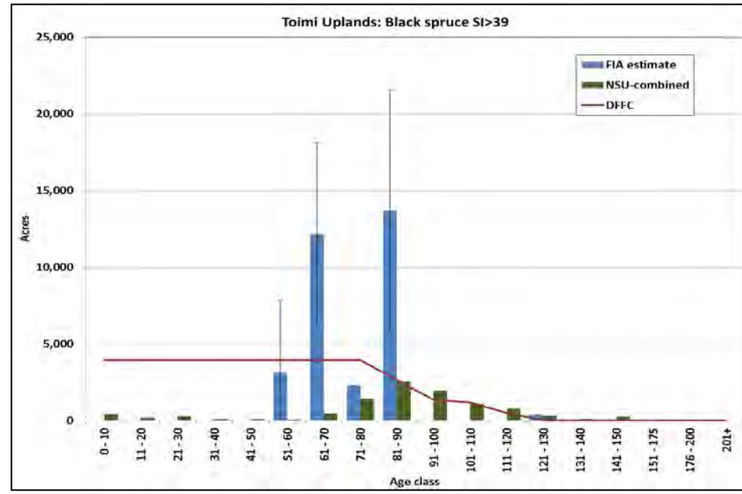

Toimi Uplands: Jack pine
FIA estimate
NSU-combined
DFFC
Acres
Age class
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
101 - 110
111 - 120
121 - 130
131 - 140
141 - 150
151 - 175
176 - 200
201+


Toimi Uplands: Tamarack SI<40
FIA estimate
NSU-combined
DFFC
Acres
Age class


Toimi Uplands: Tamarack SI>39
FIA estimate
NSU-combined
DFFC
Acres
Age class


Toimi Uplands: Black spruce SI<30
FIA estimate
NSU-combined
DFFC
Acres
Age class


Toimi Uplands: Black spruce SI 30-39
FIA estimate
NSU-combined
DFFC
Acres
Age class


Toimi Uplands: Black spruce SI>39
FIA estimate
NSU-combined
DFFC
Acres
Age class

Appendix E: Representative Sample Areas (RSAs)

(excerpt from Minnesota DNR RSA Fact Sheet)

What Are RSAs?

FSC's Definition and Guidance

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

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

One of the primary provisions in FSC Criterion 6.4 is to ensure that examples of ecosystem types that are not protected elsewhere in this Standard are protected in their natural state within the landscape.

As a general guideline, if at least five (5) multiple samples of a specific ecosystem type are protected in a landscape (e.g., ecological section) then no additional samples for that RSA purpose need to be protected … Five is not to be considered an absolute number; fewer or more might be appropriate …"

Note: The language above is a direct excerpt from FSC- US' National Forest Management Standard – Draft 8.1. This language is subject to change as FSC-US works to finalize their new National Standard in July 2010. Updated information will be provided as needed.

FSC's RSA Requirements

Criterion 6.4 of the Forest Stewardship Certification Council (FSC) US Standard requires that ***"Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources."*** In order to satisfy this criterion, the land manager must conduct an analysis to identify gaps in the protection of existing ecosystems within each section across the forest management unit. *(In the case of the DNR, the forest management unit is all DNR Forestry and Wildlife lands within the certified portion of the state.)* When identifying such gaps, managers of certified lands may

take into account those ecosystems/sites that are protected on state lands and other ownerships, such as SNAs, State Parks, National Parks, USFS wilderness areas, and TNC preserves.

Therefore, identifying and protecting RSAs will compliment, rather than duplicate, other efforts.

How Are RSAs Identified?

For Minnesota DNR, identification of potential RSAs dates back to several previous corrective action requests (CARs), assigned after the 2005, 2007 and 2008 audits. Earlier CARs required DNR to complete gap analyses at an Ecological Classification System (ECS) Section level, to identify opportunities that exist on DNR Forestry and Wildlife lands to protect examples of native plant communities (NPCs) that were not protected or poorly represented elsewhere within the landscape. To date, DNR has completed RSA gap analyses for seven of eight ECS Sections (Minnesota DNR's response to FSC Minor CAR 2007.1), plus an earlier gap analysis in the Blufflands subsection (see pilot project below). Per FSC guidance (above), protected DNR lands (State Parks, SNAs, Old Growth, etc.) plus protected lands in other ownerships were taken into account during development and review of the gap-analyses.

Management Implications and Site Designations

Minnesota DNR has carefully reviewed Indicator 6.4.c in FSC-US' Draft Standard, which reads, "Management activities within RSAs are limited to low impact activities compatible with the protected RSA objectives …" RSA site objectives must center around restoring, maintaining, or protecting the ecological condition or NPC for which the site was identified. Timber harvest activities can be conducted in RSAs when they contribute to the RSA objectives. Management options such as tree and shrub removal in oak woodlands/savannas, controlling invasive non-native species, conducting controlled burns to maintain or restore the desired NPC or successional stage, and management for disease and pest control are also appropriate.

Minnesota DNR is required to set short-term RSA targets, demonstrate that those targets have been met, and ensure that sites selected to serve as RSAs are managed in accordance with the FSC-US Standard. In response to its 2008 Major CAR, MN DNR proposed that sites selected to serve as samples of representative ecosystems, be managed under Natural Area Registry Agreements (Registry Agreements). (See page 5 of DNR's "Interdisciplinary Management Coordination Framework" document for more information on Registry Agreements) Registry Agreements and associated Memoranda of Understanding (yet to be developed) will eventually guide future management of these sites.

Until these Registry Agreements are completed, any proposed management within selected sites must be approved by the Regional RSA Project Team(s).

Current Status

Minnesota DNR has made significant progress since receiving its first RSA-related CAR following the 2007 audit. Examples of this progress include:

Step 1 – Formation of Interdisciplinary RSA Project Teams:

Interdisciplinary project teams were assigned to fill the gaps in the existing network of protected ecosystems have based on short term targets.

Step 3 – RSA Site Selection:

The RSA Project Teams were charged with the task of reviewing the short-term targets and selecting specific sites to serve as RSAs based on the identified opportunities. One site is still under review for selection within the NSU planning area. Other sites were selected based on the size and quality of the NPC, the presence of adjacent NPCs that could also be recommended for protection, and the ability to manage the sites to protect their ecological integrity. Because this process will be part of an ongoing, long-term effort, the RSA Project Teams, will receive communication, guidance, and some oversight from FCIT, Regional Managers, and Regional Directors.

Step 4 – Development of Natural Area Registry Agreements to guide management:

The RSA Project Teams, in cooperation with the SNA program, are working to formally protect selected sites via the development of Registry Agreements.

Step 5 – Long-Term Targets:

Minnesota DNR believes that its long-term goals must be flexible and continue to evolve as new data become available. While specific targets have not been established, DNR has developed a process and criteria for identifying the long-term targets. Essentially, DNR accepts FSC-US' suggested goal of protecting "five" examples of each NPC type per Section as an appropriate starting point, while

recognizing that for many NPCs, the portion for which DNR should be responsible will be reduced by a variety of factors. These are clearly outlined in DNR's 2009.1 CAR response.

Appendix F: Native Plant Community Conservation Status Ranks (S-ranks)

The native plant community (NPC) types and subtypes recognized in Minnesota have been assigned conservation status ranks (S-Ranks) that reflect the risk of elimination of the community from Minnesota. There are five ranks:

S1 = critically imperiled
S2 = imperiled
S3 = vulnerable to extirpation
S4= apparently secure; uncommon but not rare
S5 = secure, common, widespread, and abundant

These ranks are determined using methodology developed by the conservation organization NatureServe and its member natural heritage programs in North America. S-ranks were assigned to Minnesota's NPC types and subtypes based on information compiled by DNR plant ecologists on: 1) geographic range or extent; 2) area of range occupied; 3) number of occurrences; 4) number of good occurrences, or percent area of occurrences with good viability and ecological integrity; 5) environmental specificity; 6) long-term trend; 7) short-term trend; 8) scope and severity of major threats; and 9) intrinsic vulnerability.

A range in rank (for example*, S1S2*) indicates there is uncertainty in conservation status but it falls within a given range. For NPC types that are divided into subtypes, the S-rank of the NPC type is listed as the possible S-ranks for the subtypes (for example*, S1 or S2*)

(http://files.dnr.state.mn.us/natural_resources/npc/s_ranks_npc_types_&_subtypes.pdf)

Table 9.7. Northern Superior Uplands NPC Conservation Status Ranks (S-ranks)

NPC	Type Name	State Rank*
OW	Other Water Body	NA
AFP_CX	Alder Swamp/Forested Peatland Complex	NA
APn80	Northern Spruce Bog	S4
APn80a	Black Spruce Bog	S4
APn80a1	Black Spruce Bog: Treed Subtype	S4
APn80a2	Black Spruce Bog: Semi-Treed Subtype	S4
APn81	Northern Poor Conifer Swamp	S4 or S5
APn81a	Poor Black Spruce Swamp	S5
APn81b	Poor Tamarack - Black Spruce Swamp	S4
APn81b1	Poor Tamarack - Black Spruce Swamp: Black Spruce Subtype	S4
APn81b2	Poor Tamarack - Black Spruce Swamp: Tamarack Subtype	S4
APn90	Northern Open Bog	S2 or S3 or S4
APn90a	Low Shrub Bog	S4S5
APn90b	Graminoid Bog	S2 or S3 or S4
APn90b1	Graminoid Bog: Typic Subtype	S4
APn91	Northern Poor Fen	S3 or S4 or S5
APn91a	Low Shrub Poor Fen	S5
APn91b	Graminoid Poor Fen (Basin)	S3
APn91c	Graminoid Poor Fen (Water Track)	S3 or S4
APn91c1	Graminoid Poor Fen (Water Track): Featureless Water Track Subtype	S4
APn91c2	Graminoid Poor Fen (Water Track): Flark Subtype	S3
BD_CX	Beaver Disturbed Complex	NA

NPC	Type Name	State Rank*
BW_CX	Beaver Wetland Complex	NA
BYF_CX	Blowdown Young Forest Complex	NA
CSW_CX	Conifer Swamp Complex NA	NA
CTn11	Northern Dry Cliff	S1 or S2 or S3 or S4
CTn11a	Dry Mafic Cliff (Northern)	S4
CTn11b	Dry Rove Cliff (Northern)	S2
CTn11d	Dry Felsic Cliff (Northern)	S3
CTn12a	Dry Open Talus (Northern)	S3
CTn12b	Mesic Open Talus (Northern)	S2
CTn24	Northern Scrub Talus	S3
CTn24a	Dry Scrub Talus (Northern)	S3
CTn24b	Mesic Scrub Talus (Northern)	S3
CTn32	Northern Mesic Cliff	S1 or S2 or S3
CTn32a	Mesic Mafic Cliff (Northern)	S3
CTn32b	Mesic Rove Cliff (Northern)	S3
CTn32c	Mesic Thomson Cliff (Northern)	S1
CTn32d	Mesic Felsic Cliff (Northern)	S2
CTn42a	Wet Mafic Cliff (Northern)	S2
CTn42b	Wet Rove Cliff (Northern)	S1
CTn42c	Wet Felsic Cliff (Northern)	S1
CTn42d	Wet Sandstone Cliff (Northern)	S1
CTu22a	Exposed Mafic Cliff (Lake Superior)	S3
CTu22b	Exposed Felsic Cliff (Lake Superior)	S2
CTu22c	Sheltered Mafic Cliff (Lake Superior)	S1

NPC	Type Name	State Rank*
DCT_CX	Dry Mafic Cliff (Northern/Northern Talus Complex	NA
DPW_CX	Dry Prairie - Woodland Complex - Central	NA
FCT_CX	Felsic Cliff (Northern)/Northern Talus Complex	NA
FDc34	Central Dry - Mesic Pine - Hardwood Forest	S2 or S3
FDn12	Northern Dry - Sand Pine Woodland	S2
FDn12b	Red Pine Woodland (Sand)	S2
FDn22	Northern Dry - Bedrock Pine (Oak) Woodland	S2 or S3
FDn22a	Jack Pine Woodland (Bedrock)	S3
FDn22b	Red Pine - White Pine Woodland (Northeastern Bedrock)	S3
FDn22c	Pin Oak Woodland (Bedrock)	S3
FDn32	Northern Poor Dry-Mesic Mixed Woodland	S1 or S2 or S3
FDn32a	Red Pine - White Pine Woodland (Canadian Shield)	S3
FDn32b	Red Pine - White Pine Woodland (Minnesota Point)	S1
FDn32c	Black Spruce - Jack Pine Woodland	S2 or S3
FDn32c1	Black Spruce - Jack Pine Woodland: Jack Pine - Balsam Fir Subtype	S2
FDn32c2	Black Spruce - Jack Pine Woodland: Black Spruce - Feathermoss Subtype	S3
FDn32c3	Black Spruce - Jack Pine Woodland: Jack Pine - Black Spruce - Aspen Subtype	S3
FDn32d	Jack Pine - Black Spruce Woodland (Sand)	S2
FDn32e	Spruce - Fir Woodland (North Shore)	S1
FDn33	Northern Dry-Mesic Mixed Woodland	S2 or S3 or S5
FDn33a	Red Pine - White Pine Woodland	S3
FDn33a1	Red Pine - White Pine Woodland: Balsam Fir Subtype	S3
FDn33a2	Red Pine - White Pine Woodland: Mountain Maple Subtype	S3

NPC	Type Name	State Rank*
FDn33b	Aspen - Birch Woodland	S5
FDn33c	Black Spruce Woodland	S2
FDn43	Northern Mesic Mixed Forest	S2 or S3 or S4 or S5
FDn43a	White Pine - Red Pine Forest	S2
FDn43b	Aspen - Birch Forest	S5
FDn43b1	Aspen - Birch Forest: Balsam Fir Subtype	S5
FDn43b2	Aspen - Birch Forest: Hardwood Subtype	S5
FDn43c	Upland White Cedar Forest	S3
FFn57a	Black Ash - Silver Maple Terrace Forest	S3
FFn67a	Silver Maple (Sensitive Fern) Floodplain Forest	S3
FPn62a	Rich Black Spruce Swamp (Basin)	S3
FPn63	Northern Cedar Swamp	S3 or S4
FPn63a	White Cedar Swamp (Northeastern)	S4
FPn63b	White Cedar Swamp (Northcentral)	S3
FPn71a	Rich Black Spruce Swamp (Water Track)	S3
FPn72a	Rich Tamarack Swamp (Eastcentral)	S3
FPn73a	Alder - (Maple - Loosestrife) Swamp	S5
FPn81	Northern Rich Tamarack Swamp (Water Track)	S4
FPn82	Northern Rich Tamarack Swamp (Western Basin)	S4 or S5
FPn82a	Rich Tamarack - (Alder) Swamp	S5
FPn82b	Extremely Rich Tamarack Swamp	S4
FPs63a	Tamarack Swamp (Southern)	S3
FPT_CX	Forested Peatland/Upland Transition Complex	NA
FWMM_CX	Fen/Wet Meadow/Marsh Complex	NA

NPC	Type Name	State Rank*
JPSW_CX	Black Spruce Jack Pine Woodland Complex	NA
LKi32a	Sand Beach (Inland Lake)	S1
LKi32b	Gravel/Cobble Beach (Inland Lake)	S2
LKi43a	Boulder Shore (Inland Lake)	S4
LKi43b	Bedrock Shore (Inland Lake)	S4
LKi54b2	Mud Flat (Inland Lake): Non-Saline Subtype	S3
LKu32a	Beachgrass Dune (Lake Superior)	S1
LKu32b	Juniper Dune Shrubland (Lake Superior)	S1
LKu32c	Sand Beach (Lake Superior)	S1
LKu32d	Beach Ridge Shrubland (Lake Superior)	S2
LKu32e	Gravel/Cobble Beach (Lake Superior)	S4
LKu43	Lake Superior Rocky Shore	S4
LKu43a	Dry Bedrock Shore (Lake Superior)	S4
LKu43b	Wet Rocky Shore (Lake Superior)	S2
LKu43b1	Wet Rocky Shore (Lake Superior): Cobble Subtype	S2
LKu43b2	Wet Rocky Shore (Lake Superior): Bedrock Subtype	S2
MCT_CX	Mesic Mafic Cliff (Northern)/Northern Talus Complex	NA
MF_PDMW_CX	Mesic Forest Poor Dry-Mesic Woodland Complex	NA
MHn35	Northern Mesic Hardwood Forest	S4
MHn35a	Aspen - Birch - Basswood Forest	S4
MHn35b	Red Oak - Sugar Maple - Basswood - (Bluebead Lily) Forest	S4
MHn44	Northern Wet-Mesic Boreal Hardwood-Conifer Forest	S2 or S3 or S4
MHn44a	Aspen - Birch - Red Maple Forest	S4
MHn44b	White Pine - White Spruce - Paper Birch Forest	S2

NPC	Type Name	State Rank*
MHn44c	Aspen - Fir Forest	S3S4
MHn44d	Aspen - Birch - Fir Forest	S3
MHn45	Northern Mesic Hardwood (Cedar) Forest	S2 or S3 or S4
MHn45a	Paper Birch - Sugar Maple Forest (North Shore)	S4
MHn45b	White Cedar - Yellow Birch Forest	S2
MHn45c	Sugar Maple Forest (North Shore)	S3
MHn46	Northern Wet-Mesic Hardwood Forest	S4
MHn46a	Aspen - Ash Forest	S4
MHn46b	Black Ash - Basswood Forest	S4
MHn47	Northern Rich Mesic Hardwood Forest	S3
MHn47a	Sugar Maple - Basswood - (Bluebead Lily) Forest	S3
MMS_CX	Meadow - Marsh - Fen-Swamp Complex	NA
MMWF_CX	Mesic Mix / Wet Forest Complex	NA
MRn83	Northern Mixed Cattail Marsh	S2
MRn83a	Cattail - Sedge Marsh (Northern)	S2
MRn83b	Cattail Marsh (Northern)	S2
MRn93	Northern Bulrush - Spikerush Marsh	S2 or S3
MRn93a	Bulrush Marsh (Northern)	S3
MRn93b	Spikerush - Bur Reed Marsh (Northern)	S2
MRu94a	Estuary Marsh (Lake Superior)	S1
MSM_CX	Meadow- Shrub Swamp - Marsh - Wet-Mesic Hardwood Complex	NA
NPF_CX	Northern Poor Fen Complex	NA
NT_CX	Northern Talus Complex	NA
NWF_CX	Northwestern Upland Hardwood Forest Complex	NA

NPC	Type Name	State Rank*
OPn81	Northern Shrub Shore Fen	S5
OPn81a	Bog Birch - Alder Shore Fen	S5
OPn81b	Leatherleaf - Sweet Gale Shore Fen	S5
OPn91	Northern Rich Fen (Water Track)	S2 or S3 or S4
OPn91a	Shrub Rich Fen (Water Track)	S4
OPn91b	Graminoid Rich Fen (Water Track)	S2 or S3
OPn91b1	Graminoid Rich Fen (Water Track): Featureless Water Track Subtype	S3
OPn91b2	Graminoid Rich Fen (Water Track): Flark Subtype	S2
OPn92	Northern Rich Fen (Basin)	S4
OPn92a	Graminoid Rich Fen (Basin)	S4
OPn92b	Graminoid - Sphagnum Rich Fen (Basin)	S4
OSW_CX	Crystalline Bedrock Outcrop (Northern)/Bedrock Shrubland (Inland)/Woodland Complex	NA
ROn12	Northern Bedrock Outcrop	S2 or S4
ROn12a	Sandstone Outcrop (Northern)	S2
ROn12b	Crystalline Bedrock Outcrop (Northern)	S4
ROn23	Northern Bedrock Shrubland	S1 or S3
ROn23a	Bedrock Shrubland (Inland)	S3
ROn23b	Bedrock Shrubland (Lake Superior)	S1
RRS_CX	River/Rocky Shore Complex	NA
RRV_CX	Sand/Gravel/Cobble/Bedrock/Boulder Shore (River) Complex	NA
RSO_CX	Lake Superior Rocky Shore/Bedrock Shrubland/Bedrock Outcrop Complex	NA
RVx32a	Willow Sandbar Shrubland (River)	S4
RVx32b2	Sand Beach/Sandbar (River): Permanent Stream Subtype	S3

NPC	Type Name	State Rank*
RVx32c	Gravel/Cobble Beach (River)	S3
RVx32c2	Gravel/Cobble Beach (River): Permanent Stream Subtype	S3
RVx43a	Bedrock/Boulder Shore (River)	S3
RVx43a1	Bedrock/Boulder Shore (River): Intermittent Streambed Subtype	S3
RVx43a2	Bedrock/Boulder Shore (River): Permanent Stream Subtype	S3
RVx54a	Slumping Clay/Mud Slope (River)	S2
RVx54b	Clay/Mud Shore (River)	S3
RVx54b2	Clay/Mud Shore (River): Permanent Stream Subtype	S3
SFS_CX	Shrub Shore Fen/Low Gradient Stream Complex	NA
WFn53	Northern Wet Cedar Forest	S3 or S4
WFn53a	Lowland White Cedar Forest (North Shore)	S4
WFn53b	Lowland White Cedar Forest (Northern)	S3
WFn55	Northern Wet Ash Swamp	S3 or S4
WFn55a	Black Ash - Aspen - Balsam Poplar Swamp (Northeastern)	S4
WFn55c	Black Ash - Mountain Maple Swamp (Northern)	S4
WFn64	Northern Very Wet Ash Swamp	S4
WFn64a	Black Ash - Conifer Swamp (Northeastern)	S4
WFn64c	Black Ash - Alder Swamp (Northern)	S4
WFn74	Northern Wet Alder Swamp	S3
WFn74a	Alder - (Red Currant - Meadow Rue) Swamp	S3
WFWM_CX	Northern Wet Meadow Wet Forest Complex	NA
WMn82	Northern Wet Meadow/Carr	S4 or S5
WMn82a	Willow - Dogwood Shrub Swamp	S5
WMn82b	Sedge Meadow	S4 or S5

NPC	Type Name	State Rank*
WMn82b1	Sedge Meadow: Bluejoint Subtype	S5
WMn82b3	Sedge Meadow: Beaked Sedge Subtype	S4
WMn82b4	Sedge Meadow: Lake Sedge Subtype	S5
YF_CX	Young Forest Complex	NA

*S-rank is assigned at the type or subtype level. A range of ranks is provided at the class level in this list. NPC complexes are not ranked.
** These NPCs have been identified in the Rove Formation in the NSU, but have not been mapped.

Appendix G: G1-G2 Native Plant Communities (G1-G2 NPCs)

(**Excerpt** from MN DNR G1-G2 NPC Fact Sheet)

What Are G1-G2 NPCs?

The conservation status of native plant communities is assessed and documented at three distinct geographic scales: global (G), national (N), and state (S). Global ranks (G-ranks) are assigned by NatureServe. The conservation rank of native plant communities is based on a one to five scale:

1=critically imperiled
2=imperiled
3=vulnerable to extirpation or extinction
4=apparently secure
5 = demonstrably widespread, abundant, and secure

For example, a G1 rank indicates that a NPC is critically imperiled across its entire range (i.e., globally). In this sense, the community as a whole is regarded as being at very high risk of elimination.

SFI G1-G2 NPC Requirements

The Sustainable Forestry Initiative (SFI) certificate holders are required to have *"plans to locate and protect known sites associated with **viable** occurrences of critically imperiled and imperiled species and communities. Plans for protection may be developed independently or collaboratively and may include Program Participant management, cooperation with other stakeholders, or use of easements, conservation land sales, exchanges, or other conservation strategies."* (2005-2009 Sustainable Forestry Initiative Standard 4.1.3)

SFI does not required certificate holders who have information regarding NPCs existing on their lands to conduct new surveys or inventories. It is important to note that certificate holders are only required to protect ***viable*** G1-G2 NPCs.

What has been done to locate G1-G2 NPCs?

Using information obtained by the Minnesota County Biological Survey (MCBS), MN DNR has taken the following steps to locate known G1-G2 sites and make this information available to resource managers:

1) Ecological Resources GIS staff created a preliminary GIS cover including all the known and *potential* G1 and G2 NPC polygons.
2) This preliminary GIS cover was revised by:
   a. Removing polygons that were determined to not be G1 or G2 plant communities, and
   b. Removing very small polygons (<1.0 acre) that are either not viable or were the result of mapping errors by overlaying DNR Forestry and Wildlife ownership on existing NPC polygons.
3) This statewide GIS cover and list of known and *potential* G2 and G2 NPC polygons, along with written descriptions of National Vegetation Classification associations for these polygons, has been uploaded to the ftp site. (ftp://ftp.dnr.state.mn.us/pub/eco/HCVF/)

Management Implications

Management plans for G1 and G2 NPCs must identify *maintaining or enhancing* the ecological integrity of the NPC as the primary goal. (2005-2009 Sustainable Forestry Initiative Standard 4.1.3) Plans or prescriptions may range from no active management, prescribed fire, active management, or a combination where consistent with the primary goal for the site.

Current Status

Ecological Resources staff will annually update the GIS cover of G1 and G2 NPCs located on MN DNR's SFI-certified land base. Ecological Resources staff will alert Regional and Area Managers of new discoveries of G1-G2 NPC polygons within their work areas as soon as possible upon discovery.

Appendix H: Combined Public Land Forest Inventory Metadata

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DRAFT - February 21, 2014

Data Availability

Existing datasets received from federal and county lands for past work were utilized. The USFS and counties were also contacted by e-mail and asked to provide up-to-date data. No follow up was made for non-responses.

Table 9.8. Public land data used in the combined datasets for the NSU and NMOP sections

Dataset	Delivery Date	Contact	E-Mail
MN DNR CSA Data	Jan 2014	Paul Olson	paul.c.olson@state.mn.us
Superior National Forest	Nov 2013	Teresa Hanson	tmhanson@fs.fed.us
Chippewa National Forest	2011	Darryl Holman	dholman@fs.fed.us
Carlton County	2003	Greg Bernu	greg.bernu@co.carlton.mn.us
Itasca County	Feb 2007	Garrett Ous	garrett.ous@co.itasca.mn.us
Koochiching County	2006		
St. Louis County	Jan 2014	Tom Ziesler	zeislert@stlouiscountymn.gov
Lake County	Mar 2011		
Beltrami County	May 2013	DJ Bakken	DJ.bakken@co.beltrami.mn.us
Clearwater County	2004		

Data Processing

Where necessary (USFS and Itasca County data), cover types were reclassified to standard Minnesota cover types codes (MN_CTYPE, Table 2 and 3). Age information was used to calculate all stands to current age as of 2014. USFS NFS_LAND_C codes were converted to standard DNR timber status codes (Table 4). Inoperable stands (from CSA data and USFS data) were coded to timber status 10, and stands with no timber status information were coded to 99. Carlton stand inventory data seemed to be slightly off spatially and was manually moved to match PLS township and MN DNR CSA data boundaries.

Datasets were combined using the Union tool in ArcGIS using a 5 m tolerance. Only those stands with their centroid within the section boundary were included, with the exception of stands from the DNR CSA data that will be included in the NSU and NMOP plans. Where datasets overlapped, priority (i.e. source data used to populate the combined fields) was given to DNR CSA data where present, then to USFS National Forest data, and finally to county data. County data rarely overlapped other county data, but where this occurred selection was based on the county boundary). Features with an area of zero (i.e. no polygon for the record) were removed.

Data Attributes

Final attributes include source of the inventory data (SOURCE), MN cover type code (CTYPE), age in 2014 (AGE14), year of stand inventory (YEAR), site index (SI), site index species (SISPP), timber status indicating stands reserved from harvest but not those under development.