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at DNR Bemidji Region Forestry Office: 6603 Bemidji Avenue North; Bemidji, Minnesota 56601 and the DNR Central Office (Forestry, 5th Floor).

This report is available on the DNR Web site at: <u>www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html</u>

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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on compact disk by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

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¹Swamp Conifers and Stagnant conifers are consolidated into the lowland conifer cover type for this planning effort.

Color maps may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html

Brief Description of the Planning Area

This Subsection Forest Resource Management Plan (SFRMP) process considers state forest lands especially those administered by the Department of Natural Resources (DNR), Divisions of Forestry, and Fish and Wildlife – Wildlife Section in the *Aspen Parklands Subsection*. This subsection covers approximately 2.9 million acres in an area from near Gully in the southeast to Roseau in the northeast, and from Lancaster in the northwest to Crookston in the southwest. (See *Map i*) For more detailed land descriptions, refer to chapters 1 through 3.

Recreation and agriculture are the major uses of land in this subsection. Public agencies (state and federal) administer 16 percent of the land with the state portion being approximately 355,000 acres or 12 percent. Approximately 96,000 acres of the state land is forest and woodlands and will be considered for the resource management objectives in this plan. Other cover types on Forestry or Wildlife lands totaling 250,000 acres are non-forested and may be considered for biomass to meet resource management objectives. Other state lands (approximately 9,000 acres) such as State parks and Scientific and Natural Areas (SNAs) will not be considered for timber management under this plan, however these areas may contribute to some of the plan goals.

In addition, the federal government owns approximately 68,000 acres (2 percent) that are managed by the U.S. Fish and Wildlife Service including Agassiz National Wildlife Refuge, Glacial Ridge National Wildlife Refuge and numerous Waterfowl Production Areas (WPA). Kittson, Roseau, Marshall, Pennington, Red Lake, and Polk counties own and manage approximately 24,000 acres (less than 1 percent). Private owners control approximately 2.4 million acres (83 percent), of this The Nature Conservancy (TNC) owns approximately 40,000 acres (1 percent). There is no industrial forest land in this subsection. For more details about land ownership, refer to Chapter 2.

Chart i Land Ownership *Aspen Parklands* 2,873,293 Acres

Aspen Parklands Subsection Land Administration



Based on the Gap Analysis Program (GAP) classification completed by the DNR Division of Forestry using satellite imagery of all lands in the subsection, 3.3 percent of the land area (non-water) is covered by forest. Based on the DNR forest inventory of timberland that will be considered in this plan; Aspen and birch cover types comprise 85,211 acres or 89 percent of these timberlands on state land. Non-forested brush lands and lowlands comprise 250,000 acres or 8.6 percent of the subsection's land area under state ownership. For details about cover types, refer to Chapter 3.

Subsection 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 DNR Subsection Forest Resource Management Plan (SFRMP) process was designed to provide a more standardized, formal process and opportunities for increased public involvement. In addition, it is based at the subsection level of the DNR's ecological classification system (ECS) rather than DNR administrative areas as in the past (i.e., DNR area forestry boundaries).

The SFRMP process is divided into two phases. In Phase I, the subsection team will identify important forest resource management *issues* that need to be addressed in the subsection plan and *assess* the current forest resource conditions in the subsection. In Phase II, the subsection team will develop recommended strategies to address these issues and help shape the desired future forest composition goals and stand-selection criteria. The DNR will seek public input during each phase.

Currently, during Phase I, the DNR seeks public input on the issues and assessments contained in this Preliminary Issues and Assessment document.

Goals for the Planning Effort

SFRMP will constitute DNR planning for *vegetation management* on state forest lands administered in the subsections by the Divisions of Forestry, Fish and Wildlife, and Trails and Waterways. The focus of this effort will be:

- Identifying a desired future forest composition (DFFC) 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 forest 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 DFFC 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:
 - 1) Identifying areas to be managed as older forest or extended rotation forest (ERF);
 - 2) Identifying areas to be managed at normal rotation age;
 - 3) Identifying areas for various sizes of patch management;
 - 4) Management of riparian areas and visually sensitive travel corridors;
 - 5) Age and cover-type distributions;
 - 6) Regeneration, thinning, and prescribed burning needs. And,

7) Identifying Ecologically Important Lowland Conifers (EILC) and Old Forest Management Complexes (OFMC's)

The DNR will select management activities (including "no action") that best move the forest landscape toward the DFFC 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.

Process

The objectives of the DNR SFRMP process are:

- To effectively inform and involve the public and stakeholders;
- To complete the process in each ecological classification system (ECS) subsection within a reasonable amount of time (the target is to complete a SFRMP plan in 12 months);
- To conduct a process that is reasonable and feasible within current staffing levels and workloads; And,
- To develop plans which 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 Resources and other agency staff 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 Aspen Parklands Subsection, the goals, strategies, and coordination efforts of the Minnesota Forest Resources Council (MFRC) Northern Landscape Committee 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 (i.e., chapters in this document):

- Land use and cover
- Administration and ownership
- Forest composition and structure
- Historic harvest and silvicultural practices
- Ecological information
- Forest insects and disease

- Wildlife species and trends
- Forest and habitat fragmentation (preliminary analysis completed but not included in this assessment; this information will be included in the next step of the plan).

In Phase II of the SFRMP process, the subsection team will 1) finalize the issues, 2) determine general future direction in response to the issues, 3) develop strategies to implement the general future direction, 4) identify DFFC goals, and 5) develop the stand-selection criteria for determining the stands and acres to be treated over the next 10 years.

Relationship of SFRMP to Other DNR Planning Efforts

While the SRFMP process focuses on developing vegetation management plans for state-administered forest lands within the subsection, it does not operate in a vacuum. SFRMP teams do their best to stay connected to other state, federal, and even local planning efforts affecting the subsection, particularly as they relate to management direction, decisions, and products that can assist in determining appropriate vegetation management direction on DNR lands. The following sections highlight a number of efforts that that SFRMP teams need to be aware of in order to incorporate relevant information, management direction, and products in the SFRMP process.

1. Off-Highway Vehicle (OHV) Planning Process

The DNR is currently in the midst of a major OHV planning process. The process began with a statewide road and trail inventory effort on DNR and county lands in the state. This inventory process was completed in 2005 and the resulting road/trail inventory maps are available for consideration in the SFRMP process. This road/trail inventory is most useful when SFRMP teams work to identify new access needs for proposed vegetation management.

The remaining work to be done in the OHV planning process is the OHV Forest Classification and Road/Trail Designation process. These OHV system plans are being developed for each state forest within DNR Division of Forestry administrative areas. During the OHV system planning process, area OHV system planning teams classify state forests for OHV use and identify roads, trails, and areas open to OHV use. Area planning teams are responsible for leading a separate public input process for each OHV system plan.

While the SFMRP process does not include OHV system planning, SFRMP teams need to consider existing OHV trails and OHV system plans (where available), as well as other recreational trails and facilities, in making decisions on forest stand management

next to these facilities and in determining new access needs. Likewise, OHV system plans should consider management direction and the results of stand selection (e.g., large patch areas, areas where temporary access is preferred, areas where new access is needed) developed through the SFRMP process.

For more information about the OHV planning process, visit the DNR Web site at <u>http://www.dnr.state.mn.us/input/mgmtplans/ohv/designation/index.html</u>.

2. Minnesota State Park Unit Planning Process

The SFRMP process will not address the management of DNR forest lands within the boundaries of state parks. The management of state parks (i.e., facilities and natural resources) is established via a separate state park planning process. Individual state park management plans address a park's ecological and recreational role in the context of the surrounding ecological community subsection(s) and its role in furthering Conservation Connection objectives. Park plans document existing natural and cultural

resource conditions, and future management objectives. Existing recreational use and recreation trends are assessed, and a balance of sustainable recreational opportunities is recommended.

State park plans are developed through an open public process. The plan recommendations are developed through extensive involvement by interested citizens, recreation, and resource management professionals, and elected officials with local, regional, and statewide responsibilities. Usually this involvement is coordinated through a series of advisory committee meetings, area team meetings, public open houses, news releases, Internet Web site information, and review opportunities.

The SFRMP process should consider state park plans in making decisions on forest stand management adjacent to state parks. Likewise, state park plans need to consider the vegetation management direction and objectives in SFRMPs. Additionally, the SFRMP process should consider the role of state parks in the subsection in meeting desired future compositions and associated goals (e.g., biodiversity, wildlife habitat, community types, etc.).

For more information on state park management planning, contact the Division of Parks and Recreation Planning, Public Affairs and MIS manager at 651-259-5578 or toll free at 1-888-646-6367.

3. Incorporating Biodiversity Considerations in SFRMP

Biological diversity is defined in statute as the "variety and abundance of species, their genetic composition, and the communities and landscapes in which they occur, including the ecological structure, function, and processes occurring at all of these levels." Protecting areas of significant biodiversity is consistent with state policy (Minnesota Statutes 89A) to pursue the sustainable management, use, and protection of the state's forest resources to achieve the state's economic, environmental, and social goals.

The DNR SFRMP process provides an immediate opportunity to incorporate biodiversity considerations in planning for forest systems on DNR lands. Ecological Resources staff provides ecological information pertinent to managing for biodiversity

to each of the subsection forest management teams (e.g. Minnesota County Biological Survey data, Natural Heritage information, Scientific and Natural Area biodiversity management techniques experience). SFRMP direction in addressing issues and developing strategies, desired future forest compositions, and ten-year lists of stands to be treated will reflect consideration of this information and the current, best understanding of how to manage for biodiversity.

In the future, the DNR will enhance and expand in partnership with affected stakeholders, biodiversity management planning efforts. However, the DNR's immediate focus is to incorporate biodiversity consideration into the SFRMP process.

4. Wildlife Plans and Goals

SFRMP plans are not wildlife habitat plans. Their implementation, however, affects forest habitats and consequently, wildlife distribution and abundance. Because state forest management under a multiple-use policy requires the consideration of wildlife habitat, several wildlife plans are considered during the SFRMP process.

a) Division of Fish and Wildlife Strategic Plan

The Minnesota DNR's Division of Fish and Wildlife Strategic Plan has recently established population and or harvest objectives for many of the state's wildlife species that are hunted and trapped. These objectives have been determined by a variety of processes that involve some level of stakeholder involvement and public review. Population objectives consider both biological and

social carrying capacities tempered by economic needs or constraints (e.g., crop depredation). Among other tools, the division establishes annual harvest levels to meet desired population goals. During SFRMP, wildlife managers work toward the development of a plan that facilitates achievement of the wildlife population and/or harvest goals for key wildlife species outlined in the division's strategic plan.

b) Division of Fish and Wildlife "Fall Use Plan"

The Division of Fish and Wildlife's *Restoring Minnesota's Wetland and Waterfowl Heritage Plan*, also known as the Fall Use Plan, identifies harvest goals for waterfowl. This plan was consulted for determining extended forest management (ERF) needs with these subsections, as the amount of ERF influences cavity-nesting waterfowl populations.

c) Bird Plans

Several bird plans under the umbrella of the North American Bird Conservation Initiative provide a continental synthesis of priorities and objectives that can guide bird conservation actions. These plans identify species of continental importance, give a continental population objective, identify issues, and recommend actions. Similarly, the North American Waterfowl Management Plan provides long-term trend information and population objectives for waterfowl species. Wildlife managers involved in SFRMP use this information to form their planning recommendations and decisions, particularly as they relate to desired future forest conditions and age-class composition.

d) Comprehensive Wildlife Conservation Strategy

The Minnesota Comprehensive Wildlife Conservation Strategy (CWCS) plan identifies wildlife species that are considered "species in greatest conservation need" because they are rare, their populations are declining, or they face serious threats of decline. The U.S. Congress has mandated that partnerships within states develop a CWCS to manage their "species in greatest conservation need."

This plan identifies problems, threats, and opportunities that face the species; it develops 10-year objectives for species populations, habitats, and priority research and information needs, and develops conservation actions that address the 10-year objectives. Wildlife managers use this information to form SFRMP recommendations and decisions.

e) Wildlife Management Area Master Plans (Comprehensive Management Plans)

The Department of Natural Resources prepared comprehensive management plans for the state wildlife management areas having resident managers. The plans include present and projected regional perspectives, resource inventories, and demand and use analyses, as well as acquisition and development plans, cost estimates, and resource management programs. These are ten-year management plans, and will be revised as new management practices develop, new resource philosophies evolve, and new problems are encountered.

Under a cooperative agreement with the State Planning Agency, the Department of Natural Resources completed plans for the Whitewater, Carlos Avery, Mille Lacs, Talcot Lake, and Lac Qui Parle Wildlife Management Areas during the 1976-77 biennium. Plans for the Roseau River, Red Lake, Hubble Pond, and Thief Lake Wildlife Management Areas were completed during the 1980-81 biennium.

f) Management Guidance Documents – Individual Wildlife Management Areas

The intent of Management Guidance Documents is to describe the purpose of individual Wildlife Management Areas (WMAs) and provide basic information to resource managers within the Minnesota Department of Natural Resources (MNDNR). These documents are developed by consolidating several Geographic Information Systems (GIS) and other databases along with input from MNDNR Area Wildlife Staff. These administrative documents include purpose and history of acquisition, habitat emphasis, natural and cultural feature information, facility development, and public access.

Relationship of SFRMP to Other Landscape Planning Efforts.

1. Minnesota Forest Resource Council (MFRC) Landscape Planning Efforts

The 1995 Sustainable Forest Resources Act (Minn. Stat. Chapter 89A) directed the MFRC to establish a landscape-level forest resources planning and coordination program to assess and promote forest resource sustainability across ownership boundaries in large forested landscapes.

Volunteer, citizen-based regional forest resource committees are central to carrying out the general planning process. Within each landscape region, committees of citizens and representatives of various organizations work to:

- Gather and assess information on a region's current and future ecological, economic, and social characteristics
- Use information about a region to identify that region's key forest resource issues
- Plan ways to address key issues in order to promote sustainable forest management within the region
- Coordinate various forest management activities and plans among a region's forest landowners and managers in order to promote sustainable forest management

The MFRC Northern and North Central Regional Landscapes encompass small portions of the Aspen Parklands Subsection. Recommended "desired outcomes, goals, and strategies" for the MFRC Northern Landscape has been completed. These recommendations will be considered and incorporated into the SFRMP process. This information will help the DNR make better decisions on DNR-administered lands and assist in cooperating with management in the larger landscape.

2. Agassiz National Wildlife Refuge Comprehensive Conservation Plan

This plan articulates the management direction for Agassiz NWR and its Management District for the next 15 years. It does not address Land Utilization Project lands. Through the development of goals, objectives, and strategies, this plan describes how the Refuge and District also contribute to the overall mission of the National Wildlife Refuge System. Several legislative mandates within the National Wildlife Refuge System Improvement Act of 1997, and principles identified in "Fulfilling the Promise" (a strategic vision document for the Refuge System) have guided the development of this plan. These mandates and principles include:

- Wildlife has first priority in the management of refuges.
- Wildlife-dependent recreation activities, namely hunting, fishing, wildlife observation, wildlife, photography, environmental education and interpretation are priority public uses of refuges. We will facilitate these activities when they do not interfere with our ability to fulfill the Refuge's purpose or the mission of the Refuge System.

Other uses of the refuge will only be allowed when determined appropriate and compatible with Refuge purposes and mission of the Refuge System. The plan will guide the management of Agassiz NWR and the RMD by:

- Providing a clear statement of direction for the future management of the Refuge and the District.
- Making a strong connection between Refuge activities and those activities that occur off-Refuge in the District.
- Providing Refuge and District neighbors, users, and the general public with an understanding of the Service's land acquisition and management actions on and around the Refuge.
- Ensuring the Refuge and District management actions and programs are consistent with the mandates of the National Wildlife Refuge System.
- Ensuring that Refuge and District management considers federal, state, and county plans.
- Establishing long-term continuity in Refuge and District management.
- Providing a basis for the development of budget requests on the Refuge's and District's operational, maintenance, and capital improvement needs.
- 3. Conservation Area Plan for the Tallgrass Aspen Parkland. Nature Conservancy of Canada, Manitoba Region, Winnipeg, Manitoba/The Nature Conservancy, Karlstad Field Office This conservation area plan was developed by a planning team made up of Nature Conservancy Canada (NCC) and The Nature Conservancy (TNC) staff and conservation partners. Conservation area plans develop landscape-specific conservation strategies in preparation for direct conservation action and monitoring, thus providing NCC and TNC with a "conservation blueprint" for action. Through this plan the teams identify conservation targets, stresses to the targets, causes of stress, strategies to threat abatement and system restoration, and finally measures to determine success.

For more information on the MFRC landscape planning and coordination program, visit the MFRC Web site at: <u>http://www.frc.state.mn.us/Landscp/Landscape.html</u>.

Application of Statewide Plans and Guidelines

The DNR uses a variety of written vehicles (e.g., policies, guidelines, recommendations, memos, operational orders, agreements) to communicate direction to DNR staff on a range of forest management issues including old-growth forests,

inter-divisional coordination, site-level mitigation, rare habitats and species, and accelerated management. Interdisciplinary and external involvement has varied in the development of these direction documents, as have the expectations for their implementation (i.e. must follow, follow in most cases, follow when possible). *Figure i* places a number of DNR direction documents within a defined policy hierarchy that clarifies decision authority and expected actions. This can serve as a useful reference for the public in understanding the array of forest management guidance available to staff and serve as a starting place for DNR staff to help provide more consistent application across the state.

The following sections highlight several of the more prominent direction documents and their relation to the SFRMP process.

1. DNR Strategic Conservation Agenda 2009–2013 and DNR Directions 2000.

The department's strategic planning documents, *DNR Strategic Conservation Agenda 2009–2013* and *DNR Directions 2000*, provide broad goals, strategies, and performance indicators for forest resources in Minnesota (see DNR Directions 2000, Forest Resources Section in Appendix A and DNR Strategic Conservation Agenda, Forests Section at <u>http://www.dnr.state.mn.us/conservationagenda/index.html</u>). This broad statewide direction will be used as a platform from which to develop additional complementary/supplemental goals and strategies specific to each subsection.

2. Old-Growth Forest Guidelines

The 1994 DNR Old-Growth Forest Guideline was developed via a stakeholder involvement process that led to consensus on old-growth forest goals by forest type by ECS subsection for DNR lands. Following the completion of the guideline, the DNR undertook and completed an old-growth nomination, evaluation and designation process for DNR lands. The latest information on old-growth forest policy and results can be found at <u>http://www.dnr.state.mn.us/forests/oldgrowth/policy.html</u>.

Old-growth stand designation has been completed statewide and additional old-growth designation is not part of the SFRMP process. The primary significance of old growth in the SFRMP process is determining how DNR forest stands adjacent to and connecting adjacent old growth stands will be managed (e.g., as extended rotation forests, part of large patches, scheduling of harvest, conversion to other forest types, etc.). If not done prior to the SFRMP process, old forest management complexes (see Old-Growth Guideline Amendment #5) will be identified in conjunction with the SFRMP process.

3. Extended Rotation Forest Guideline

The 1994 DNR Extended Rotation Forest (ERF) Guideline was developed through a previous public and stakeholder input process. The primary purpose of the ERF Guideline is to provide adequate acreages of forest older than its normal rotation age to provide for species and ecological processes requiring older forests. During the SFRMP process, the ERF Guideline is to be applied to landscapes by designating particular areas of forest or stands for ERF management. An area designated for ERF management will include all cover types and age classes within that designated ERF area.

Normal rotation ages will be established for each forest type managed primarily under even-aged silvicultural systems within the subsection based on site-quality characteristics related primarily to timber production (e.g., site index, growth rates, soils, insect and diseases, etc.). Maximum rotation ages for these forest types will also be established based on the maximum age at which a stand will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Final harvest of an ERF stand will occur sometime between the normal rotation age for the cover type and the maximum rotation age. A forest stand is considered to be old forest whenever its age exceeds the normal rotation age for that cover type and is considered "effective ERF."

According to the statewide ERF Guideline, a minimum of 10 percent of the DNR Forestry- and Wildlifeadministered timberlands within a subsection are to be managed as ERF. No maximum amount is identified in the guideline, although the guideline states it may be appropriate to designate 50 percent or more of DNR timberlands as ERF in some subsections. Determining the amount of DNR timberlands to be managed as ERF within each subsection involves consideration of wildlife habitat needs, visual and riparian corridors, and implications for timber production (both quantity and quality). The condition and future management of other forest lands in the subsection (i.e., other DNR and non-DNR lands) are considered to the extent possible in determining the amount of designated ERF on DNR timberlands.

4. Minnesota Forest Resource Council's (MFRC) Voluntary Site-level Forest Management Guidelines

The MFRC's *Voluntary Site-Level Forest Management Guidelines* establish integrated forest resource management practices intended to provide cultural resource, soil productivity, riparian, visual, water quality, wetlands, and wildlife habitat protections in a balanced approach. These guidelines were developed through a collaborative statewide effort and received extensive input during development from stakeholders, DNR staff, and other agency staff. The DNR adopted and strongly endorses the *Voluntary Site-Level Forest Management Guidelines* developed through that collaborative process. These guidelines are the standard in managing DNR lands, i.e., they are not voluntary on DNR-administered lands. As the department standard, departures from the guidelines will not be proposed in SFRMPs for entire subsections or geographic areas within subsections. There is flexibility and various options are available in application of the guidelines, but departures from the guideline standards need to be documented on a site-by-site basis. If departures above or below guideline recommendations (e.g., recommended minimums for riparian management zone [RMZ] width and residual basal area in the RMZ) are made, they will be documented during the timber sale appraisal and forest development processes.

5. DNR Forest-Wildlife Habitat Management Guidelines

DNR forest-wildlife habitat management guidelines provide direction to DNR wildlife and forestry staff for integrated management on state-administered lands. The guidelines were last revised in 1985. As such, some portions of the guidelines are out-of-date. Some areas of the guideline overlap with the MFRC site-level forest management guidelines. MFRC site-level guidelines will prevail when they overlap with DNR forest-wildlife habitat management guidelines. Species-specific sections of the guidelines that are still considered current are relevant in the SFRMP process in determining management around known species locations (i.e., eagles nests) or in the management of areas for particular types of habitat (e.g., open landscapes, ruffed grouse management areas, deer yards, etc.).

6. DNR Interdisciplinary Forest Management Coordination Framework

The DNR Interdisciplinary Forest Management Coordination Framework is a policy to ensure effective and timely coordination between the Divisions of Forestry, Fish and Wildlife and Ecological Resources as a means to improve decision-making and achieve sustainable forest management. The scope of the framework is focused on the coordination of the planning and implementation of fish and wildlife, and forestry management practices primarily on lands administered by the divisions of Forestry, and Fish and Wildlife.

Figure i

Grouping of DNR Direction Documents by 3-level Hierarchy

Nomenclature	Who Developed	Level of Review	Expectations	Departure Authority		
Policies						
Old Growth Forest Guideline	DNR			 No departures allowed 		
ERF Guideline	DNR			No departures allowed		
Forest/Wildlife Coordination Policy	DNR			No departures allowed		
WMA Policy	Wildlife			Region - Interdisciplinary		
SNA Est. & Admin. Op. Order	Eco Resources			No departures allowed		
MFRC Site-Level Guidelines	MFRC			Field appraiser w/ documentation		
ID and Mgmt of EILC	CO/FRIT			Region - Interdisciplinary		
Guidelines						
Rare Species Guides	Eco Resources			Known locations: Area ID Otherwise: field appraiser w/ doc		
Covertype Mgmt. Recommendations	SFRMP Teams			Field appraiser w/ documentation		
NE Region Wood Turtle	NE Region (For, Wild, Trails)			Region - Interdisciplinary		
Decorative Tree Harvest Guidelines	Forestry			Area - Interdisciplinary		
Accelerated Management	Forestry			Area - Interdisciplinary		
Gypsy Moth Mgmt. Guidelines	Forestry/Dept. o: Agr.	f OOO		Field appraiser w/ documentation		
For/Wild Habitat Guidelines	Wildlife/Forestry			Area - Interdisciplinary		
Integrated Pest Management	Forestry			Field appraiser w/ documentation		
Silvicultural Mgrs. Handbooks	NCES, Forestry			Field appraiser w/ documentation		
NE R. Grouse Mgmt. Areas	Wildlife			Area - Interdisciplinary		

Recommendations					
Goshawk Considerations	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	
MCBS H/O Biodiversity	Eco Resources			Consider if site conditions differ from FIM	
ECS Field Guide Interps.	Eco Resources/Forestry			Field appraiser w/ documentation	
MCBS Rare NPC	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	
Red-Shouldered Hawk	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	
Four-toed Salamander	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	
Black-throated Blue warblers	Eco Resources			Document use	
Seasonal ponds	Eco Resources			Document use	
Boreal owl guidelines	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	
Botrychium guidelines	Eco Resources			Known locations: Area - Interdisciplinary Otherwise, document use	

KEY	
	Must follow; no departures
	Expected to follow; documented & approved departures OK
	Expected to follow to the degree possible
	Recommended in usual circumstances; departures OK based on site conditions
	Recommended when opportunities and conditions suitable
	Incorporate if possible
	Broad external technical & public
	Broad public/stakeholder
	Limited public/stakeholder
	Department ID review
	Local ID team review
	Division review w/ peer technical input
	Division review

Figure ii



Public involvement will, at a minimum, occur through:

- Distribution of the initial assessment information (mailings and Web site).
- A public comment period 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, and desired future forest conditions (DFFCs) proposed by the DNR to address identified issues) along with the 10-year list of stands proposed for treatment and associated new access needs.
- Public review and comment on proposed plan revisions.

SFRMP planning documents will be available at DNR area forestry offices, selected public locations, and the DNR Web site <u>www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html</u>

Summary information will be available upon request to: Pat Matuseski via mail at 6603 Bemidji Ave North; Bemidji, Minnesota; 56601 or by call (218)308-2381. Additionally, requests for information may be submitted via e-mail at pat.matuseski@state.mn.us.

Looking Toward the Future

While the initial focus of SFRMP is on forest composition and vegetation management, the intention is for its scope to broaden in the future. Changes in this direction will likely be incremental as the process becomes more familiar to DNR staff and the public. The likely progression in future years will be to include other aspects of forest land management on DNR lands (e.g., recreation facilities/systems, land acquisition/sales) and other DNR Forestry programs including private forest management and fire management. A subsequent step may be to include lands administered by other units of DNR (i.e., Fisheries, Parks, etc.), making this a

department-wide plan that is not limited to Forestry, Wildlife, and Trails and Waterways land.

SFRMP Process Table

The Aspen Parklands Subsection team is in the initial stages of the SFRMP process. The team has developed the preliminary issues and assessment information and is now requesting public input, the first of two such opportunities in the SFRMP process.

Subsection Forest Resource Management Planning Steps	Public Notification/Participation	Public Comment Period	Length of Step ¹
 I. 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
II. Assessment and Issue Identification (CURRENT STAGE)	 Inform the public of planning efforts, schedule, and how and when they can be involved. Mail Assessment and Issues Summary to mailing list. Provide complete maps and documents in key locations and on Web/CD. 	2 Weeks	60 days
 III. Develop Draft Plan a. Strategic Direction (GDSs, Strategies, DFFCs to address issues and Stand Selection Criteria) b. Draft Stand Examination List and New Access Needs 	 Mail summary to mailing list. Provide complete maps and documents in key locations and on Web/CD. Identify SFRMP contacts for questions. Offer meetings by appointment 	30 days	225 days (7½ months)
 IV. Finalize Plan Planners summarize public comments and DNR responses. Present revised plan to Department for Commissioner's approval. Commissioner approves final plan & posts written notice in state register. 	 Inform public of final plan. Provide summary of public comments and how DNR responded. Provide final plans in key locations and on Web/CD and in. Mail plan summaries to mailing list. 	None	75 days
Total*			360 days (12 months)

Table i	Public	Involvement	and Process	Timelines

¹ Time frames for process steps include public review/comment period

Aspen Parklands SFRMP Assessment

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 a SFRMP Issue?

Issues that cannot be addressed in whole or substantial part by vegetation management decisions on DNRadministered lands are outside the scope of the SFRMP process. For example, SFRMP will <u>not</u> 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 distributed for a two-week public review and comment period. The assessment will be available at DNR area offices and selected public libraries in the subsection, as well as electronically through the DNR Web site. There are no public open houses for this step in the process.

After public review, the subsection team will finalize the list of issues by considering public comments. The final list of issues will be made available on the SFRMP Web site and included in the public review draft of the DFFC, Strategies, and Stand-Selection Criteria document.

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. The next step of the SFRMP process will determine how vegetation management on DNR-administered lands will address these issues. Comments on the preliminary issues and identification of additional issues by the public are welcome.

Preliminary Issues

The Aspen Parklands Subsection team has begun identifying important issues in these subsections that should guide forest planning. A preliminary issues list was developed to stimulate thought on issues that may impact forest planning in these four subsections. The team is asking four critical questions for each of the issues it identified:

- 1) What is the issue?
- 2) Why is it an issue?
- 3) How might DNR vegetation management address the issue?
- 4) What are possible consequences for not addressing the issue?

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 Aspen Parklands Subsection team is looking for additional issues that affect our forests and could be mitigated or avoided by forest planning and vegetation management. The team invites the public to submit issues and comment on those that follow, and requests that issues be submitted following the same format and addressing the same four questions listed above. A form on which to submit issues and amend those already outlined is located on the Web site at:

www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html

It is also available upon request from the Aspen Parklands Subsection Forest Planner:

Pat Matuseki DNR Forestry 6603 Bemidji Ave North Bemidji, MN 56601 Phone: (218) 308-2381 Email: pat.matuseski@state.mn.us

See cover letter or Web site for comment deadline.

Preliminary Issues

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

• 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.

• How might DNR vegetation management address this issue?

Vegetation management can provide for a balance of all forest types and age classes.

• What are possible consequences of not addressing this issue?

A forest without representation of all age classes and growth stages exposes itself to: 1) Increased insect and disease problems, 2) Loss of species with age-specific habitat requirements, And 3) 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.

• Other considerations?

B. In your opinion, what are appropriate mixes of vegetation composition, structure, spatial arrangement, growth stages, and plant community distribution on state lands across the landscape?

• Why is this an issue?

The Lake Agassiz, Aspen Parklands Section is a transition, or ecotone, between the prairies to the west and semi-humid mixed conifer-deciduous forests to the east. The historic vegetation was a complex mosaic of prairies, brushland, wetlands, and oak savanna/aspen woodlands. Historic vegetation patterns in this subsection relate to the frequency and intensity of fire across the landscape, which was influenced by climate and hydrology. Fire suppression and alterations to hydrology have shifted plant communities away from prairie, savanna, and brushlands toward aspen forest. Current fire regimes (return intervals, intensity, and scope) are not characteristic of the historic fire patterns that shaped this landscape. Fire in this area has been effective at a local scale; however, it is not at the level that is needed to maintain the mosaic of habitat that was historically found on conservation lands in this subsection. Fragmentation of ownership often impedes an effective fire program leading to increased aspen on both the private and public lands and a loss of ecological diversity across the landscape.

• 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.

• What are possible consequences of not addressing this issue?

Loss of wildlife habitat and associated species; 2) increase in invasive exotics; 3) loss of biodiversity;
 simplification of stand and landscape communities; 5) loss of ecologically intact landscapes; 6) loss of the ability to produce a diversity of forest products, e.g., saw timber, balsam boughs and other nontimber products, and tourism; And, 7) decreased resilience to climate change.

• Other considerations?

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

• Why is this an issue?

Riparian and aquatic areas are critical to fish, wildlife, and certain forest resources.

• 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.

• What are possible consequences of not addressing this issue?

Failure to consider vegetation management that affects riparian and aquatic areas could result in: 1) Increased run-off and erosion; 2) More conspicuous run-off events; 3) Less stable stream flows; And, 4) Negative impacts to water quality, fisheries, and wildlife habitat.

• Other considerations?

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

• 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.

• 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.

• What are possible consequences of not addressing this issue?

Not planning for access needs could result in: 1) Unfulfilled management goals; 2) Poorly located access routes; 3) Negative impacts on wildlife habitat; And, 4) Excessive costs for development, maintenance, and road closure.

• Other considerations?

E. 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?

• 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.

• 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

• 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; 4) Economic losses due to loss of site capability to maintain desired species, And, 5) Social and economic losses resulting from a decline in recreational activity associated with wildlife viewing and hunting.

• Other considerations?

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

• 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.

• How might DNR vegetation management address this issue?

DNR can select vegetation management techniques that provide a variety of wildlife habitats and ecosystem functions.

• 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.

• Other considerations?

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

• 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.

• 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.

• 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.

• Other considerations?

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

• 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, have been increasing.

• 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 even-aged cover types and propose regulations to protect some nontimber species.

• 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; And, 3) Unintended harvest of rare species.

• Other considerations?

I. How can we increase the quantity and quality of timber products on state lands?

• Why is this an issue?

The demand for timber has increased, while demand for other forest values has also increased. Minnesota's forest industry requires a sustainable and predictable supply of wood.

• 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).

• What are possible consequences of not addressing this issue?

1)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; And, 2)Wood and wood product imports might increase from countries that have fewer environmental controls, effectively exporting U.S. environmental issues.

• Other considerations?

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

• 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.

• 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.

• 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.

• Other considerations?

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

• 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.

• How might DNR vegetation management address this issue?

Vegetation management will take administrative land status and relevant statutes into consideration during the planning process.

• 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.

• Other considerations?

L. How will cultural resources be protected during forest management activities on stateadministered lands?

• 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.

• 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.

• What are possible consequences of not addressing this issue?

Loss or damage to cultural resources.

• Other considerations?

M. How can we ensure that rare plants and animals, their habitats, and other rare features are protected in this subsection?

• 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 this subsection.

• How might DNR vegetation management address this issue?

The Minnesota County Biological Survey (MCBS) has been completed in some counties, is in progress in other counties, and has not started in a few counties within the subsection. DNR managers will check the Rare Features Database for the location of known rare features in this subsection. The needs of rare features will be addressed in the management plan.

• 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.

• Other considerations?
CHAPTER 1

Land Cover

Aspen Parklands

1.1 ... GAP Classification

Table 1.1 Aspen Parklands Subsection GAP Cover Type Acres and PercentagesChart 1.1 Aspen Parklands Subsection GAP Cover Type PercentagesMap 1.1 GAP Land Cover Classification of the Aspen Parklands Subsection

Notes relating to this chapter:

Color maps and graphs may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html

Maps in this chapter depict information for an area within a "planning boundary." This boundary closely approximates the subsection(s) 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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on CD by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

1.1 GAP Classification

What Is a GAP Classification?

The Gap Analysis Program (GAP) was a project sponsored and coordinated by the Biological Resources Division of the U.S. Geological Survey. The Minnesota DNR participated in this nationwide project. Coordination of GAP activities with neighboring states is done to ensure the development of regionally compatible information.

The GAP Web site defines the project as "... a scientific method for identifying the degree to which native animal species and natural communities are represented in our present-day mix of conservation lands. Those species and communities not adequately represented in the existing network of conservation lands constitute conservation 'gaps.'" The purpose of GAP is to provide broad geographic information on the status of ordinary species (those not threatened with extinction or naturally rare) and their habitats in order to provide land managers, planners, scientists, and policy makers with the information they need to make better-informed decisions. Further information is available at <u>www.gap.uidaho.edu/default.htm</u>.

The basic statewide geographic information systems (GIS) datasets of GAP include land cover, distributions of native vertebrate species, major land-ownership patterns, and land management. Gap analysis is conducted by overlaying vegetation and species richness maps with ownership and management maps so that gaps in the management for biodiversity can be identified. The data layers are developed, displayed, and analyzed using GIS techniques.

Land-Cover Classification

The GAP classification of current vegetation (land cover map), which is a part of the larger project, was produced by computer classification of satellite imagery (Landsat 5 Thematic Mapper imagery) by the Resource Assessment Unit of the DNR Division of Forestry. Units of analysis are divided by Ecological Classification System (ECS) subsections. The minimum mapping unit is one acre.

GAP Land Cover Classification Descriptions for Aspen Parklands Subsection

Non-Vegetated: Includes developed land types and barren land types. Developed land types include structures and areas associated with intensive land use. Barren land types include land of limited ability to support life and in which less than one-third of the area has vegetation or other cover. Examples of barren types include sand, bare soil, and exposed rock.

Crop and Grass: Includes agricultural and grass land types. Agriculture includes land under cultivation for food or fiber (including bare or harvested fields). Examples include corn, beans, alfalfa, wheat, and orchards. Grasslands are covered by non-cultivated herbaceous vegetation predominated by grasses, grass-like plants or forbs. Examples include cool or warm season grasses, restored prairie, abandoned fields, golf course, sod farm and hay fields.

Shrubland: Includes upland and lowland shrub land types. Upland shrubs include vegetation with a persistent woody stem, generally with several basal shoots, low growth of less than 20 feet and coverage of at least one-third of the land area with less than 10 % tree cover interspersed. Lowland shrubs include woody vegetation, less than 20 feet tall, with a tree cover of less than 10 % and occurring in wetland areas. Examples include willow, alder and stagnant black spruce.

Aquatic Environments: Include areas of open water or marsh type environments. Open water areas are areas of water without emergent vegetation. Marsh type environments include areas with water at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and with soils indicative of wet conditions. Vegetation in emergent or wet meadow types include persistent and nonpersistent herbaceous plants standing above the surface of the water or soil. Examples include cattails, marsh grass and sedges.

Upland Conifer Forest: Includes pine and spruce fir upland forests. Crown closure of the area must be greater than 10%. The coniferous component of the area must be greater than one-third, reaching a mature height of at least 6 feet tall. If deciduous species group is present, it should not exceed one-third of the canopy. Examples include Jack Pine, Red Pine and White Spruce.

Lowland Conifer Forest: Wetlands dominated by woody perennial plants, with a canopy cover greater than 10%, and trees reaching a mature height of at least 6 feet. Examples include stands of coniferous trees consisting of black spruce, northern white cedar and tamarack.

Upland Deciduous Forest: Crown closure of the area must be greater than 10%. Includes areas whose canopies have predominance (greater than one-third) of trees, reaching a mature height of at least 6 feet tall, which lose their leaves seasonally. If the coniferous species group is present, it should not exceed one-third of the canopy. Examples include Aspen, Oak and Maple.

Lowland Deciduous Forest: Wetlands dominated by woody perennial plants, with a canopy cover greater than 10%, and trees reaching a mature height of at least 6 feet. Examples include stands of deciduous trees consisting of Black Ash and Red Maple

Upland Coniferous-Deciduous Forest Mix: Upland areas where deciduous and evergreen trees are mixed so that neither species group is less than one-third dominant in the canopy. Examples include Aspen/Balsam Fir mixed forest.

Lowland Coniferous-Deciduous Forest Mix: Wetlands dominated by woody perennial plants, with a canopy cover greater than 10%, and trees reaching a mature height of at least 6 feet.

Source: Upper Midwest Gap Analysis Program Image Processing Protocol, U.S. Department of the Interior, U.S. Geological Survey, Environmental Management Technical Center, June 1998.

09/01/09 Public Review Draft

The following table, chart and map show the GAP land-cover classification of the subsection in this plan. Chapter Two of this document contains the land ownership and land management information classification of the subsection in this plan.

Cover Type	Acres	Percent ¹
Aquatic Environments	261,454	9
Crop/Grass ²	2,104,160	73
Lowland Conifer Forest	7,183	<1
Lowland Conifer-Deciduous mix	2	<1
Lowland Deciduous Forest	3,509	<1
Non-Vegetated	10,292	<1
Shrubland	196,450	7
Upland Conifer Forest	151	<1
Upland Conifer-Deciduous mix	55	<1
Upland Deciduous Forest	289,389	10
Subsection Total	2,872,646	100

Table 1.1 Aspen Parklands Subsection GAP Cover Type Acres and Percentages

¹Decimal percentages are rounded to the nearest one percent.

 2 Aprox. 620,000 acres Crop/Grass are enrolled in the Conservation Reserve Program (CRP).

Chart 1.1 Aspen Parklands Subsection GAP Cover Type Percentages



Parklands Subsection GAP Cover Type Percentages





A color version of this document can be found on the Aspen Parklands Forest Resource Management Plan (SFRMP) Web site at: <u>www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html</u> This page intentionally left blank

CHAPTER 2

Land Ownership and Administration

Aspen Parklands Subsection

2.1 ... Land Ownership

Table 2.1 Aspen Parklands Subsection Land Administration Chart 2.1 Aspen Parklands Subsection Land Administration Map 2.1 Aspen Parklands Subsection – Land Ownership Map Map 2.2 Aspen Parklands Subsection – Management Units

Notes relating to this chapter:

Color maps may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on compact disk by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

2.1 Land Ownership

Ownership	Acres	Percent
Private ²	2,382,236	83%
Private – Conservancy ³	40,322	1%
State Included in Plan	343,907	12%
Forestry	7,227	< 1%
Wildlife	336,680	12%
State Excluded from Plan ⁴	9,256	< 1%
Federal	68,324	2%
County ⁵	24,415	< 1%
Tribal	4,034	< 1%
Local Government ⁶	832	< 1%
Total	2,873,326	

Table 2.1 Aspen Parklands Subsection Land Administration¹

¹Source: 1976 to 2006 Minnesota DNR GAP Stewardship---"All Ownership Types" data.

² Private – Includes all private land except for Private Conservancy land listed separately.

³Private-Conservency Lands: The Nature Conservancy

⁴State lands excluded from plan – Scientific and Natural Areas, Parks and Trails, Department of Transportation, Section of Fisheries, and Division of Waters.

⁵ County includes both County Fee and County Administered State Owned lands.

⁶ Local Government– Independent School Districts and City Ownerships.

Chart 2.1 Aspen Parklands Subsection Land Administration





Map 2.1 Aspen Parklands Subsection – Land Ownership





CHAPTER 3

Forest Composition and Structure

Aspen Parklands Subsection

<u> Part 1</u>

- 3.1 ... Forest Cover-Type Acres on State Land Administered by DNR Forestry and Wildlife—Aspen Parklands Subsection
 Map 3.1 Aspen Parklands Subsection, Generalized Cover Types on DNR Lands
 Table 3.1 Aspen Parklands State Timberland Cover Type Acres by Age-Class
- 3.2 ... Cover-Type Percent of Timberlands and Age-Class Distribution, 2009—Aspen Parklands Subsection
 Table 3.2 State Timberland Cover Type Acres and Percentages Charts 3.2.1—3.2.9 Age-Class Distributions by Cover Type

<u>Part 2</u>

- 3.3 ... Old-Growth Forests Table 3.3 Designated old-growth acres in the Aspen Parklands Subsection
- 3.4 ... An Estimate of Historical Forest Composition Compared to Today's Forest *Table 3.4 Historical Forest Composition Comparison*

Notes relating to this chapter:

Color maps and graphs may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: <u>www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html.</u>

Maps in this chapter depict information for an area within a "planning boundary." This boundary closely approximates the subsection(s) 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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on CD by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

3.1 Forest Cover-Type Acres on State Land Administered by DNR Forestry and Wildlife





¹Swamp Conifers and Stagnant conifers are consolidated into the lowland conifer cover type for this planning effort.

Color maps may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html.

Aspen Parklands State ¹ Timberland ² Cover Type Acres by Age-Class (2009)														
Cover Type	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 +	TOTAL
Ash/Lowland Hdwds. ³	3	93	472	111	171	436	735	491	321	132	50	84	0	3,101
Aspen / Balm of Gilead	14,568	9,755	16,495	21,714	9,782	6,512	4,14	1,792	280	67	95	0	11	85,211
Balsam Fir	0	0	0.0	15	11	52	0	20	0.0	0	0	0	0	98
Birch	0	0	0	6	76	11	0	0	0.0	0	0	0	0	94
Hybrid Poplar	0	0	0	5	0	0	0	0	0.0	0	0	0	0	5
Black Spruce Lowland	24	64	8	21	119	467	374	87	132	19	0	140	240	1,697
Jack Pine	28	72	2	2	25	5	19	12	0.0	0	0	0	0	166
White Cedar	0	0	0	0	0	5	0	20	22	53	23	52	39	215
Northern Hardwoods	0	4	27	26	0	86	0	88	0	0	0	0	0	233
Red Pine	1	0	6	71	0	0	0	0	0	0	0	0	0	80
Oak	0	35	100	9	44	240	86	94	129	21	57	23	128	967
Tamarack	124	124	189	332	58	425	255	202	538	72	76	569	257	3,754
White Pine	0	0	0	3	0	0	0	0	0	0	0	0	0	4
White Spruce	0	0	141	6	0	0	0	0	0	0	0	0	0	148
Total	14,750	10,151	17,444	22,325	10,817	8,239	5,611	2,807	1,421	365	300	869	675	95,770

Table 3.1 Aspen Parklands State Timberland Cover Type Acres by Age-Class

1 Includes only Forestry- and Wildlife-administered lands within the planning boundary and based on Minnesota DNR 2009 Forest Inventory Module (FIM) forest inventory.

2 Timberland is defined as forest land capable of producing timber of marketable size and volume at the normal harvest age, not including lands withdrawn from timber utilization by law or statute (see Appendix D: Glossary). However, 357 acres of designated old-growth stands have been included in the 2009 data to more accurately depict the change over time and the range of age classes on the landscape.

3 This type also includes willow and cottonwood cover types.

3.2 Cover-Type Percent of Total Timberland, 2009 — Aspen Parklands

 Table 3.2 State Timberland Cover Type Acres and Percentages

Aspen Parklands				
Cover Type	Acres	Percent		
Ash/Lowland Hdwds. ³	3,101	3.2		
Aspen / Balm of Gilead	85,211	89.0		
Balsam Fir	98	0.1		
Birch	94	0.1		
Hybrid Poplar	5	0.0		
Black Spruce Lowland	1,697	1.8		
Jack Pine	166	0.2		
White Cedar	215	0.2		
Northern Hardwoods	233	0.2		
Red Pine	80	0.1		
Oak	967	1.0		
Tamarack	3,754	3.9		
White Pine	4	0.0		
White Spruce	148	0.2		
Total Acres	95,770	100.0		

Percent State¹ Timberland² Cover Type Acres, 2009 Aspen Parklands

1 Includes only Forestry- and Wildlife-administered lands within the planning boundary and based on Minnesota DNR 2009 Forest Inventory Module (FIM) forest inventory.

2 Timberland is defined as forest land capable of producing timber of marketable size and volume at the normal harvest age, not including lands withdrawn from timber utilization by law or statute (see Appendix D: Glossary). However, 357 acres of designated old-growth stands have been included in the 2009 data to more accurately depict the change over time and the range of age-classes on the landscape.

3 Type includes willow and cottonwood cover types.

Charts 3.2.1— 9 show age-class distribution by cover type for state-administered timberlands (i.e., DNR Forestry and Wildlife lands) for the year 2009.



Reader's Guide to the Following Assessment Pages

Readers should note that the commentary section is *not* intended to be a wholly science-based assessment, but rather, is based on a forestry assessment of conditions and forces influencing the cover types. While the commentary is intended to suggest some likely forces acting on the cover types in this subsection, it should by no means be considered an extensive account of forces acting on these complex forest systems. For example, historic events and practices—such as logging at the turn of the century, ongoing fire suppression, and the 1930s drought—have influenced the forest landscape in this subsection, but have not been discussed in depth here.

Finally, please note that there may be some unresolved professional debates between different natural resource disciplines about the significance of some of the factors influencing the forest cover types described on these pages. These debates are not addressed in the commentary sections. The SFRMP team is seeking public and professional input throughout the plan development process to better inform debaters and enhance management of this subsection in the coming years. The SFRMP planning process is designed to be annually adaptive so additional information and science can be incorporated as it becomes available.



Chart 3.2.1 Age-Class Distribution for all Timberland Cover Types

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

This chart shows the acreage of all state owned timberland cover types in 2009. These cover types encompass an area of 95,770 acres in the Aspen Parklands Subsection.



Chart 3.2.2 Ash/Lowland Hardwoods Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

Due to small amounts of acres and similarity of ecological communities, both willow (140 acres) and cottonwood (153 acres) are included in the ash/ lowland hardwood cover type. In total, this type had 3,101 acres or 3.2 percent of the Aspen Parklands Subsection's state timberlands.

There are limited markets for the low- to medium-quality material found in many of these stands. The majority of these stands are only accessible in winter due to the wet sites they occupy and a desire to avoid soil damage.

Some partial-cut harvesting has occurred in stands with higher-quality trees. Most of this harvesting does not remove enough to set these stands back into the zero to 10 year age class, so they continue to show up as maturing ash and lowland hardwood stands.



Chart 3.2.3 Aspen and Balm of Gilead Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

The aspen and balm of Gilead cover types are the dominant forest type on state timberlands within the Aspen Parklands Subsection. In 2009 the types occupied 89.2 percent (85,216 acres) of state-administered timberlands in the Aspen Parklands Subsection.

The preponderance of acres in the younger age classes reflects harvesting over the past decades in response to markets in which these species are heavily used in the production of paper and structural panels. A significant amount of this younger acreage can also be attributed to the expansion of aspen and balm of Gilead into non-forested areas due to hydrologic changes and the lack of fire.



Chart 3.2.4 Lowland Black Spruce Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

In 2009, the lowland black spruce cover type occupied 1.8 percent (1,697 acres) of stateadministered lands in the Aspen Parklands Subsection.

Black spruce has had markets and been harvested for many years. A combination of ebbs and flows in the markets with the limited amount of resource within state lands in this subsection has produced an asymmetrical age-class distribution.

It is important to understand that black spruce occupies sites having a broad range of productivity. Trees on the poorer sites take many years to produce marketable products in harvestable quantities.





Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database..

The jack pine cover type is a minor forest type on state timberlands in the Aspen Parklands Subsection occupying just 0.2 percent (166 acres).



Chart 3.2.6 Northern White Cedar Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database..

The northern white cedar cover type is also a minor forest type with just 0.2 percent (215 acres) on state timberlands in the Aspen Parklands Subsection.

Harvesting of white cedar has been all but suspended on state land for some time. This is due to its significant value for wintering cover for deer and the difficulty experienced in regenerating cedar. Little or no harvesting has resulted in the bulk of the cover type moving into older age-classes.



Chart 3.2.7 Northern Hardwoods Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

The northern hardwoods cover type occupies a small portion of state timberlands in the Aspen Parklands Subsection -0.2 percent (233 acres).





Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

In 2009, the oak cover type occupied 1.0 percent (967 acres) of state-administered timberlands in the Aspen Parklands Subsection.

In high site index stands, oak is commonly managed through thinning, which removes volume but does not alter the cover type designation. This contributes to increased acreage in the older age-classes.



Chart 3.2.9 Tamarack Age-Class Distribution

Source: 2009 Minnesota DNR Forest Inventory Module (FIM) database.

In 2009, at 3.9 percent (3,754 acres) the tamarack cover type was the second most common forest type on state-administered timberlands in the Aspen Parklands Subsection.

3.3 Old-Growth Forests

The DNR's old-growth management goal is to identify and protect the highest quality remaining natural old-growth forest communities on state-administered lands. Old-growth forest stands are defined by age, structural characteristics, and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances and contain old trees (generally more than 120 years old), large snags, and downed trees.

Old-growth forest represents the latter stages of succession in forested ecosystems. Remaining oldgrowth 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 habitat features for wildlife, and examples of the maximum limits of individual tree and stand production. Because oldgrowth ecosystems developed for a long time without large-scale disturbance, the study of plants, animals, soils, and ecosystem processes in old-growth stands provides important insights into the natural function of forest ecosystems. Such insights can be crucial for future forest management and for maintenance of biological diversity.

Old-growth designations are based on the 1994 DNR Old-Growth Guidelines. Designation of old-growth stands in the Aspen Parklands Subsection was completed in the 1990's. Some of the subsection's old-growth boundaries have changed since the goals were established due to revisions of the DNR Old-Growth Guidelines made in 1999. More high quality old growth was found than originally expected, so the designated acreage exceeded the target.

The 1994 goals for acreage and number of sites may be adjusted in the future. If new information becomes available on the extent, quality, and distribution of potential old-growth stands meeting prescribed selection criteria, the goals may be adjusted. If individual stands that appear to meet requirements are discovered on state land during the SFRMP process or in subsequent years, they may be evaluated and given official old-growth status.

The following tables provide information on the 1994 goals and the designated acres in the Aspen Parklands Subsection.

Table 3.3 Designated old-growth acres in the Aspen Parklands Subsection

Designated old-growth acres in the Aspen Parklands Subsection. From a candidate pool of 670 candidate acres, 452 acres were designated as old growth and 218 acres were released from candidacy.

Forest Type	Old-Growth 1994 Acreage Goal	Old-Growth Acres Designated
Black Ash	40	73
White Cedar	0	0
Lowland Hardwoods	80	204
Northern Hardwoods	0	0
Oak	30	175
Red Pine	0	0
White Pine	0	0
White Spruce	0	0
Total	150	452

Information contained in this table is from the 2002 Old Growth Implementation report

3.4 Historical Forest Composition Compared to Today's Forest – An Estimate

Table 3.4 Historical Forest Composition Comparison

1 1				
Aspen Parklands				
Historical Forest Composition Comparison				
	Magnitude		Magnitude	
Species	BT	FIA	of Change	
Aspen	25.6	57.6	2.3	
Balsam Fir	0.1	0.5	4.0	
Balm of Gilead	3.1	17.6	5.7	
Basswood	0.1	0.7	7.9	
Black Spruce	0.7	0.2	-2.9	
Box Elder	0.0	1.6	294.7	
Bur Oak	0.5	8.5	18.1	
Cottonwood	0.1	0.1	1.3	
Elm	1.1	4.2	3.9	
Jackpine	0.1	0.2	3.3	
Paper Birch	0.3	0.7	2.2	
Red Maple	0.0	0.1	19.3	
Tamarack	8.9	0.8	-11.1	
White Cedar	0.0	0.8	20.7	
White Spruce	0.6	0.1	-4.4	

Table Explanation

This table shows the relative abundance of public land survey (PLS) bearing tree (BT) species marked as witness trees in the mid-1800s compared to 1990 Forest Inventory and Analysis (FIA) tree species. It provides an estimate of the abundance of certain kinds of tree species before the land was logged and settled, compared to today's forest. Magnitude of change was calculated by comparing FIA data to original bearing trees. For example, a -2.0 in this column represents a 2-fold decline of that tree species since the original public land survey was conducted, while 4.5 would represent a 4.5-fold increase.

Methodology

Relative abundance of BT trees is the percent by tree species identified as BTs in the original land survey records in the subsection. FIA data were modified to mimic the establishment of a survey corner by recording only one tree in each quadrant of the FIA sampling point similar to the selection of BT trees in the past. The relative abundance of FIA tree species is based on this estimate. Relative abundance data have been produced at subsection and the LTA (land type association) levels. This assessment includes only the subsection data. The LTA level data can provide land managers more detailed information on where in the larger subsection the composition changes are greater. LTA data can be used to assist in determining where it would be appropriate to attempt restoration of a species, if that is desired, within a subsection.

Summary of Table 3.4

Subsection-level data for the Aspen Parklands should be interpreted with caution because 11 of 20 LTAs in this subsection had questionable data due to low FIA sampling intensity. Based on the available data, important species showing a significant increase were aspen, balsam fir, balm of Gilead, basswood, box elder, elm, paper birch, bur oak, and white cedar. Black spruce, tamarack, and white spruce were the only important tree species showing a significant decline. *Note: Where a species is rare in the BT data, the data may not be as reliable.*

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CHAPTER 4

Timber Harvest

Aspen Parklands Subsection

- 4.1 ... Acres of Timber Sold on DNR Lands in the Subsection Chart 4.1 Acres of Timber Sold, FY 2000-2009 Table 4.1 Acres of Timber Sold, FY 2000-2009
- 4.2 ... Volume of Timber Sold From DNR Lands in the Subsection Chart 4.2 Timber Volume Sold by Fiscal Year, 2000-2009
- 4.3 ... Total Value of Timber Sold From DNR Lands Per Fiscal Year (FY) in the Subsection *Chart 4.3 Value of Timber Sold by Fiscal year, 2000-2009*
- 4.4 ... Average Stumpage Price Paid Per Cord for Timber From DNR Lands in the Subsection Chart 4.4 Average Price Paid Per Cord for Timber Sold by Fiscal Year
- 4.5 ... Average Volume Sold Per Fiscal Year by Species From DNR Lands in the Subsection *Chart 4.5 Average Volume Sold by Species, 2000-2009*

How graphics are labeled:

All charts and tables apply to activities on DNR Division of Forestry and Division of Fish and Wildlife lands ("*DNR lands*") in the Aspen Parklands Subsection.

Notes relating to this chapter:

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Maps in this chapter depict information for an area within a "planning boundary." This boundary closely approximates the subsection(s) while capturing data summary and planning efficiencies by using survey or jurisdiction lines in some cases.

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Introduction:

Volume and acres of timber sold is sporadic for the AP Subsection for FY2000-2009. Timber management decisions in the past decade were largely driven by Timber Management Planning Information System (TMPIS) plans until roughly 2003. After that period timber management planning was done via interim plans on an annual basis. During this period of interim planning timber management was more specifically targeted towards wildlife habitat manipulation. Broad forest management goals such as age class distribution and cover type composition were not specifically stated or pursued. In most cases fewer acres were planned annually on interim plans than were planned on TMPIS plans. It is likely that adoption of a subsection plan will result in an increase in the number of acres planned for evaluation annually.

Most of the subsection is located a great distance from the traditional markets of Bemidji, International Falls and Grand Rapids. This distance not only has a negative impact on stumpage value but often pushes offered volume beyond the margin of profitability. It is common for a high percentage of offered volume to go un-purchased. In addition, a high percentage of the acres examined annually do not contain volume of sufficient quantity or quality to make commercial harvest feasible.

4.1 Acres of Timber Sold on DNR Lands in the Subsection

The annual harvest on DNR lands is allocated and tracked in acres. One reason for differences in the yearly harvest level is the variation in timber markets and the resulting amount sold each fiscal year (i.e., July 1–June 30). FY 2009 data is an estimate based upon partial year sales information.



Chart 4.1 Acres of Timber Sold, FY 2000-2009

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

An average of 1,291 acres per year was sold from DNR lands in the Aspen Parklands Subsection during 2000 - 2009.

Aspen Parklands Acres of Timber Sold FY 2000-2009				
Year Acres				
2000	959			
2001	2,477			
2002	2,061			
2003	1,931			
2004	959			
2005	561			
2006	608			
2007	488			
2008	1,391			
2009 (est)	1,475			

Table 4.1 Acres of Timber Sold, FY 2000-2009

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

4.2 Volume of Timber Sold From DNR Lands in the Subsection

The annual harvest on DNR lands is allocated and tracked in acres. The following chart shows the total *volume* sold per year in cords for the subsection.

Chart 4.2 Timber Volume Sold by Fiscal Year, 2000-2009



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

It must be noted that in FY 2009, a total of 16,205 cords were forfeited by buyers and returned to the state. The volume sold in FY 2008 and FY 2009 as shown on Chart 4.2 does not include re-offered forfeitures.

4.3 Total Value of Timber Sold From DNR Lands Per Fiscal Year in the Subsection

The following chart shows the *value* of timber sold from DNR lands in the subsection during the past 10 fiscal years. To portray the markets at the time sales were initially made, the values shown for FY 2008 and FY 2009 have *not* been reduced to reflect the value of forfeited sales.



Chart 4.3 Value of Timber Sold by Fiscal year, 2000-2009

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

4.4 Average Stumpage Price Paid Per Cord for Timber From DNR Lands in the Subsection

The following chart shows how the **stumpage value** of timber sold from DNR lands in the subsection has changed from 2000 to 2009. To portray the markets at the time sales were initially made, the values shown for FY 2008 and FY 2009 have *not* been reduced to reflect the value of forfeited sales.



Chart 4.4 Average Price Paid Per Cord for Timber Sold by Fiscal Year

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

4.5 Average Volume Sold Per Fiscal Year by Species From DNR Lands in the Subsection

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 chart shows volumes sold by species. Because of the overwhelming dominance of aspen species in the sales, the chart has two scales so that the figures for the other species can be seen.



Chart 4.5 Average Volume Sold by Species, 2000-2009

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

During the period of 2000 to 2009, an average of 21,524 cords was sold per year from DNR forestlands in the subsection. The aspen volume includes volumes sold as aspen species, which includes both aspen species and balm of Gilead.

CHAPTER 5

Ecological Information

Aspen Parklands Subsection

- 5.1 ... Summary Descriptions of the Aspen Parklands Subsection Map 5.1 Aspen Parklands Subsection
- 5.2 ... Native Plant Communities of the Aspen Parklands Subsection
- 5.3 ... Minnesota's List of Endangered, Threatened, and Special Concern Species Table 5.1 Aspen Parklands Subsection: Minnesota Listed Species – Animals Table 5.2 Aspen Parklands Subsection: Minnesota Listed Species – Plants Table 5.3 Aspen Parklands Subsection: Minnesota "NONs" – Animals Table 5.4 Aspen Parklands Subsection: Minnesota "NONs" – Plants Table 5.5 Aspen Parklands Subsection: Minnesota Species of Greatest Conservation Needs-Animals
- 5.4 ... Minnesota County Biological Survey (MCBS) Table 5.6 Aspen Parklands Subsection: MCBS Status
- 5.5 ... References

Notes relating to this chapter:

Color maps and graphs may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html

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5.1 Summary Description of the Aspen Parklands Subsection







The Aspen Parklands Subsection, located in northwestern Minnesota, is a mix of lacustrine plain and shoreline (beach) ridges formed by Glacial Lake Agassiz, with extensive forested peatlands to the east and tallgrass prairie to the west. The subsection is the southern end of a much larger province that stretches north and west into Canada and serves as the transition zone between the prairie and forest areas. The large Roseau and Red Rivers are in this subsection, and flooding is common due to the level topography. Deep lakes are rare. This subsection contains large complexes of wetlands, aspen and brush prairie with dry prairie on beach ridges.

Low dunes, beach ridges, and wet swales mark the western edge of the subsection. They provided a barrier that reduced fire frequency and intensity, resulting in increased dominance by quaking aspen, balsam poplar, and shrubs. To the east, low ridges of water-reworked till are surrounded by herbaceous wetlands (Albert 1993).

Landform

This subsection is part of an extensive glacial lake plain, the basin of Glacial Lake Agassiz. It consists of two regions, a lacustrine plain to the west and a water-reworked till plain on the east. Most of the lacustrine lake plain is relatively level, but there are also small dunes and a series of low beach ridges and swales, marking successively lower levels of the glacial lake as it drained. The beach ridges are commonly gravelly and swales often contain abundant cobbles and boulders (Cummins and Grigal,1981). The water-worked till plain has low relief due to wave action of Glacial Lake Agassiz. The topography is level to gently rolling.

Bedrock geology

Bedrock is overlain by 100 to 400 feet of calcareous glacial drift. Ordovician dolomite, sandstone, and shale underlie the western portion of the subsection (Morey et al. 1982). Precambrian undifferentiated granites and volcanic rocks underlie the eastern part of the subsection (Albert 1993).
Soils

Soils of the lacustrine plain range from loams and silts to sands and gravels. Calcareous fens and saline seeps occur at the base of sand dunes and beach ridges. These soils are classified as Entisols (Psamments and Aquents), Histosols (Hemists), and Mollisols (Aquolls) (Soil Conservation Service 1967, Cummins and Grigal 1981). On the water-worked till plain, soils are generally loamy. The till often contains large boulders that restrict land use (Cummins and Grigal 1981). In the deeper portions of Glacial Lake Agassiz, the till is partially mantled with silt and clay deposits.

Climate

Total annual precipitation is 20 to 22 inches. Forty percent of this comes during the growing season. Only 11 to 14 percent of the annual precipitation falls from November through February (estimated from Midwestern Climate Center 1992). This low amount of snowfall in combination with extreme cold and desiccating winds, causes increased spring fires and severe stress on most shrub and tree species. As a result, open woodland vegetation was most common (Albert 1993). The growing season length is about 120 days.

Hydrology

This subsection drains to the north and west. The major river is the Roseau River, which flows through the northern quarter of the subsection and into Canada. The drainage network is undeveloped. Rivers and streams commonly meander extensively. Flooding can be a problem due to level topography. Lakes are rare.

Natural disturbance

Fire was the most common natural disturbance before settlement. Fire suppression has allowed woodlands to develop from what was previously oak openings or brush prairies. Other causes of disturbance are tornados and floods.

Presettlement vegetation

There is no clear correlation between vegetation and parent material, as transitions between landforms are gradual. Historic patterns of vegetation appear mostly related to frequency and intensity of fire, which were influenced by variation in water table and soil moisture. The historic patchiness of fire created a complex mosaic of prairies, brushland, woodlands, and forests on uplands; and wet prairies, meadows, fens, and wet forests in wetlands. Upland prairie and wetland prairie communities were most extensive, covering 40% of the section. Wet meadow and marsh communities were common in seasonally wet depressions, occupying 14% and 7% of the section, respectively. Areas where the regional water table was at the land surface supported open rich peatland, forested rich peatland, and wet forest communities. These open and forested wetlands covered 10% of the section. Fire-dependant forest/woodland communities were present where seasonally wet depressions, peatlands, and river valleys isolated upland sites from fire, enabling survival of trees. These woodland communities covered 22% of the Lake Agassiz Aspen Parklands Section (LAP) and were variously described by early land surveyors in Minnesota as brush, brush with scattered timber, or timber, depending on length of time since the last fire on the site. Mesic hardwood forest and floodplain forest communities were present on sites exceedingly well protected from fire and were rare in the subsection.

Summarized, the presettlement vegetation consisted of a combination of aspen and oak savanna, tallgrass prairie, wet prairie, and dry gravel prairie (on gravelly beach ridges). The uncommon floodplain forests of silver maple, elm, cottonwood, and ash occurred along rivers and streams.

Present land use and vegetation

Agriculture is the dominant land use in the southern half of the subsection. In the north, extensive areas have been cleared recently for farming. Remnants of presettlement vegetation are more common and in larger blocks than many other subsections where agriculture is important. Wild rice cultivation is common in the eastern portion of this area. Motorized recreation is on the rise.

5.2 Native Plant Communities of the Aspen Parklands Subsection

Minnesota's Native Plant Community Classification

The process of revising the Minnesota Department of Natural Resources' native plant community classification 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 (MCBS), 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. This classification replaces the plant community classification presented in *Minnesota's Native Vegetation: A Key to Natural Communities, Version 1.5, 1993.* The volume, *Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Provinces,* was published in 2005 and includes the Aspen Parklands Subsection addressed in this plan. The field keys to Minnesota's plant communities contained within this field guide are being used with other ECS and native plant community (NPC) information to assist in making land management decisions.

Classification of Plant Communities

The delineation of plant communities in the new classification is based on statistical analyses of vegetation plots collected from relatively undisturbed examples of native vegetation throughout the state. The relevé plot method was primarily used and approximately 5200 releve's were analyzed to develop this classification. The data from this sampling effort are housed in the MN DNR's Natural Heritage Information System Relevé Database. Attempts were made in the classification to recognize natural breaks or important thresholds along physical environmental gradients. Releve data were supplemented by scientific literature, and field observations from plant ecologists and botanists, especially for those communities that were not well sampled with releves, plus with the more generalized information from county soil surveys and geologic maps. The classification of the upland and wet prairie communities was completed in a different way than the wooded and open wetland communities whereby the releves were used to compliment and expand upon the 1993 community classification.

Analyses of the vegetation plot data were organized within the framework of ecologically defined land units developed by ELCP (see Ecological Classification System map of Minnesota in Appendix A). The result is a classification of plant communities that relates more deliberately to variation in physical features of the landscape than the previous classification and has an ecologically based hierarchy. The hierarchy of Minnesota's plant community classification is:

Ecological System (such as Fire-Dependent Forest/Woodland System)

Floristic Region (such as Western Floristic Region)

Native Plant Community Class (such as Dry-Mesic Oak Woodland)

Native Plant Community Type (such as Bur Oak – (Forest Herb) Woodland)

(Sometimes with subtypes)

Native plant community classifications differ from forest cover types (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.

Following is a list of the wooded native plant community systems, classes, types and subtypes known to occur in the Lake Agassiz Aspen Parklands Section (LAP). Both the codes and their associated names are provided. Much more detailed information about each plant community in this section, including distribution maps, can be found in *Field Guide to the Native Plant Communities of Minnesota: the Prairie Parkland and Tallgrass Aspen Parklands Provinces*. A copy of this publication will be available at sites where hard copies of this Issues and Assessment document are available for public viewing. In addition, the field guide is available through the Minnesota Bookstore at http://www.comm.media.state.mn.us/bookstore.

Wooded Native Plant Community Systems, Classes, Types documented in the Aspen Parklands Subsection

FIRE-DEPENDENT FOREST/WOODLAND SYSTEM

FDw24 Northwestern Dry-Mesic Oak Woodland
FDw24a Bur Oak – (Prairie Herb) Woodland
FDw24b Bur Oak – (Forest Herb) Woodland
FDw34 Northwestern Mesic Aspen-Oak Woodland
FDw34a Aspen – (Prairie Herb) Woodland
FDw34b Aspen – (Beaked Hazel) Woodland
FDw44 Northwestern Wet-Mesic Aspen Woodland
FDw44a Aspen – (Cordgrass) Woodland
FDw44b Aspen – (Chokecherry) Woodland

MESIC HARDWOOD FOREST SYSTEM

MHn44 Northern Wet-Mesic Boreal Hardwood-Conifer Forest MHn44a Aspen-Birch-Red Maple Forest MHn44b White Pine – White Spruce – Paper Birch Forest Type MHn44c Aspen – Fir Forest Type MHs38 Southern Mesic Oak-Basswood Forest MHw36 Northwestern Wet-Mesic Hardwood Forest MHw36a Green Ash – Bur Oak – Elm Forest

FLOODPLAIN FOREST SYSTEM

FFn57 Northern Terrace Forest FFn57a Black Ash-Silver Maple Terrace Forest Type FFn67 Northern Floodplain Forest FFn67a Silver Maple-(Sensitive Fern) Floodplain Forest Type

WET FOREST SYSTEM

WFn53 Northern Wet Cedar Forest

WFn53b Lowland White Cedar Forest (Northern) Type WFn55 Northern Wet Ash Swamp WFn55a Black Ash-Aspen-Balsam Poplar Swamp (Northeastern) Type WFn55b Black Ash – Yellow Birch – Red Maple – Basswood Swamp (Eastcentral) Type WFn55c Black Ash-Mountain Maple Swamp (Northern) Type WFw54 Northwestern Wet Aspen Forest

FORESTED RICH PEATLAND SYSTEM FPn63 Northern Cedar Swamp FPn63b White Cedar Swamp (Northcentral) Type FPw63 Northwestern Rich Conifer Swamp

ACID PEATLAND SYSTEM APn81 Northern Poor Conifer Swamp APn81a Poor Black Spruce Swamp Type APn81b Poor Tamarack-Black Spruce Swamp Type APn81b1 Black Spruce Subtype APn81b2 Tamarack Subtype

5.3 Minnesota's List of Endangered, Threatened, and Special Concern Species

Rare Features Information

Assessment products have been prepared by staff of the Division of Ecological Resources, Natural Heritage and Nongame Research Program (NHNRP), Minnesota Department of Natural Resources (DNR).

Additional information about rare features assessment products is available by contacting the Minnesota DNR.

Purpose, Scope, and Relationships to Federal Laws

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the Minnesota DNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern (ETS). The resulting List of Endangered, Threatened, and Special Concern Species (<u>http://www.state.mn.us/rsg/index.html</u>) is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also authorizes the DNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are codified as Minnesota Rules, Parts 6212.1800 to 6212.2300.

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

Note that the federal Endangered Species Act of 1973, as amended (16 USC 1531 _ 1544; see <u>http://www.fws.gov/endangered/policies/index.html</u>) requires the U.S. Department of the Interior to identify species as endangered or threatened according to a separate set of definitions, and imposes a separate set of restrictions for those species. Five species on the federal list of endangered or threatened species occur in the Aspen Parklands subsection: gray wolf, Canada lynx, Dakota Skipper, Piping Plover, and Western Prairie Fringed Orchid. See: <u>http://www.fws.gov/midwest/endangered/lists/minnesot-spp.html</u>

Minnesota Heritage Information System

Records of known locations of listed species are maintained in the Minnesota Heritage Information System. All DNR offices have this information available for review prior to forest management activities to determine if a known location of a rare species is in the vicinity of a stand. When reviewing forest stands for management activities during the planning process, this information will be available when assigning stand prescriptions. If an ETS species is known to exist or found on a site, management activities are modified to protect, promote, or enhance the ETS species on the site.

Survey Methods

Much of the information about rare features in the Minnesota Heritage Information System is the result of rare features survey work done since the 1970s by the Conservation Management and Rare Resources Unit (CMRP) and Minnesota County Biological Survey (MCBS) (starting the 1980s), and contained within historic records and collections. While survey process and protocols for plants and animals are necessarily different in some ways, methods common to both include:

- Review of existing information;
- Selection of targeted species and survey sites;
- Field survey using techniques appropriate to the species; And,
- Information management.

A more detailed description of rare plant and animal survey procedures can be found in the MCBS page of the Minnesota DNR Web site at ://www.dnr.state.mn.us/eco/mcbs/index.html

Minnesota Listed Species

Copyright (2009), State of Minnesota, Department of Natural Resources. Rare features data included here were provided by the Natural Heritage and Nongame Research Program of the Division of Ecological Resources, Minnesota Department of Natural Resources (DNR), and were current as of July 2009. 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.

The rare feature products prepared for the Aspen Parklands subsection plan include information on species of plants and animals listed as endangered, threatened, and special concern (ETS). *Minnesota's List of Endangered, Threatened, and Special Concern Species* was created in 1984 and was last revised in 1996. The list, created under Minnesota's Endangered and Threatened Species Statute, draws attention to species that are at greatest risk of extinction within the state and applies special regulations to species listed as endangered or threatened. By alerting resource managers and the public to species in jeopardy,

activities can be reviewed and prioritized to help preserve the diversity and abundance of Minnesota's flora and fauna. Because the list influences resource use and management activities in Minnesota, it is critical that it reflect the most current information regarding the distribution, abundance, and security of species within the state. Consequently, Minnesota law requires periodic revisions to the list. The DNR submitted a set of proposed revisions to *Minnesota's List of Endangered, Threatened, and Special Concern Species* to the 2006-07 Minnesota Legislature that await legislative action at the time of this report. The proposed revisions are not reflected in the following tables. To understand the tables it is useful to understand what the state ranking of endangered, threatened, and special concern mean.

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.

Listed Animals for the Aspen Parklands				
Таха	Taxa Latin Name Common Name		State Rank	Federal Rank
BI	Ammodramus bairdii	Baird's Sparrow	END	NL
BI	Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	SPC	NL
BI	Anthus spragueii	Sprague's Pipit	END	NL
BI	Asio flammeus	Short-eared Owl	SPC	NL
BI	Coturnicops noveboracensis	Yellow Rail	SPC	NL
BI	Cygnus buccinator	Trumpeter Swan	THR	NL
BI	Haliaeetus leucocephalus	Bald Eagle	SPC	THR
BI	Larus pipixcan	Franklin's Gull	SPC	NL
BI	Limosa fedoa	Marbled Godwit	SPC	NL
BI	Phalaropus tricolor	Wilson's Phalarope	THR	NL
BI	Podiceps auritus	Horned Grebe	THR	NL
BI	Sterna forsteri	Forster's Tern	SPC	NL
BI	Tympanuchus cupido	Greater Prairie-chicken	SPC	NL
FI	Acipenser fulvescens	Lake Sturgeon	SPC	NO
IN	Aflexia rubranura	Red Tailed Prairie Leafhopper	SPC	NL
IN	Hesperia comma assiniboia	Assiniboia Skipper	END	NL
IN	Hesperia dacotae	Dakota Skipper	THR	CAND
IN	Oarisma garita	Garita Skipper	THR	NL
IN	Oarisma powesheik	Powesheik Skipper	SPC	NL
IN	Speyeria idalia	Regal Fritillary	SPC	NL
MA	Canis lupus	Gray Wolf	SPC	THR

Table 5.1 Minnesota Listed Species – Animals

Listed Animals for the Aspen Parklands						
Таха	TaxaLatin NameStateFederaRankRankRank					
MA	Cervus elaphus	Elk	SPC	NL		
MA	Mustela nivalis	Least Weasel	SPC	NL		
MA	Spilogale putorius	Eastern Spotted Skunk	THR	NL		
MA	Thomomys talpoides	Northern Pocket Gopher	SPC	NL		
MO	Lasmigona compressa	Creek Heelsplitter	SPC	NL		
MO	Lasmigona costata	Fluted-shell	SPC	NL		
MO	Ligumia recta	Black Sandshell	SPC	NL		
RE	Chelydra serpentina	Common Snapping Turtle	SPC	NL		
SP	Marpissa grata	A Jumping Spider	SPC	NL		

Taxa Key:		
BI	Birds	
FI	Fish	
IN	Insects	
MA	Mammals	
MO	Mollusks	
RE	Reptiles	
SP	Spiders	

Rank Key:		
CAND	Candidate	
END	Endangered	
SPC	Special Concern	
THR	Threatened	
NL	Not Listed	

Table 5.2 Minnesota Listed Species – Plants

Listed Plants for the Aspen Parklands				
Plant Type Latin Name Common Name		State Rank	Federal Rank	
Vascular	Achillea sibirica	Siberian Yarrow	THR	NL
Vascular	Androsace septentrionalis ssp. puberulenta	Northern Androsace	SPC	NL
Vascular	Antennaria parvifolia	Small-leaved Pussytoes	SPC	NL
Vascular	Arabis holboellii var. retrofracta	Holboell's Rock-cress	THR	NL
Vascular	Botrychium campestre	Prairie Moonwort	SPC	NL
Vascular	Botrychium gallicomontanum	Frenchman's Bluff Moonwort	END	NL
Vascular	Botrychium simplex	Least Moonwort	SPC	NL
Vascular	Calamagrostis montanensis	Plains Reedgrass	SPC	NL
Vascular	Carex garberi	Garber's Sedge	THR	NL
Vascular	Carex hallii	Hall's Sedge	SPC	NL
Vascular	Carex obtusata	Blunt Sedge	SPC	NL
Vascular	Carex scirpoidea	Northern Singlespike Sedge	SPC	NL
Vascular	Carex sterilis	Sterile Sedge	THR	NL
Vascular	Carex xerantica	Dry Sedge	SPC	NL

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Listed Plants for the Aspen Parklands				
Plant Type Latin Name Cc		Common Name	State Rank	Federal Rank
Vascular	Cladium mariscoides	Twig-rush	SPC	NL
Vascular	Cypripedium candidum	Small White Lady's-slipper	SPC	NL
Vascular	Drosera anglica	English Sundew	SPC	NL
Vascular	Eleocharis quinqueflora	Few-flowered Spike-rush	SPC	NL
Vascular	Eleocharis rostellata	Beaked Spike-rush	THR	NL
Vascular	Gaillardia aristata	Blanket-flower	SPC	NL
Vascular	Gentiana affinis	Northern Gentian	SPC	NL
Vascular	Gentianella amarella ssp. acuta	Felwort	SPC	NL
Vascular	Helictotrichon hookeri	Oat-grass	SPC	NL
Vascular	Hudsonia tomentosa	Beach-heather	SPC	NL
Vascular	Juniperus horizontalis	Creeping Juniper	SPC	NL
Vascular	Vascular Minuartia dawsonensis Rock Sandwort		SPC	NL
Vascular	Vascular Orobanche fasciculata Clustered Broomrape		SPC	NL
Vascular Orobanche Iudoviciana Louisiana Broomrape		SPC	NL	
Vascular	Vascular Platanthera praeclara Western Prairie Fringed Orchid		END	THR
Vascular	Potamogeton vaginatus	Sheathed Pondweed	SPC	NL
Vascular	Ranunculus lapponicus	Lapland Buttercup	SPC	NL
Vascular	Rhynchospora capillacea	Hair-like Beak-rush	THR	NL
Vascular	Salicornia rubra	Red Saltwort	THR	NL
Vascular	Salix maccalliana	McCalla's Willow	SPC	NL
Vascular	Scirpus clintonii	Clinton's Bulrush	SPC	NL
Vascular	Senecio canus	Gray Ragwort	END	NL
Vascular	Shinnersoseris rostrata	Annual Skeletonweed	THR	NL
Vascular	Silene drummondii	ondii Drummond's Campion SPC NL		NL
Vascular	Stellaria longipes	Long-stalked Chickweed	SPC	NL
Vascular	Trimorpha lonchophylla	Shortray Fleabane	SPC	NL

Rank Key:				
CAND	Candidate			
END	Endangered			
SPC	Special Concern			
THR	Threatened			
NL	Not Listed			

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Additional Species Data

In addition to information on listed species, the Aspen Parklands Subsection plan includes information on species labeled as "NONs and Species of Greatest Conservation Need (SGCNs)."

"NONs" are defined as a plant or animal species with no legal status, but for which data are being compiled in the Natural Heritage Information System because the species falls into one of the following categories:

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

Table 5.3 Minnesota "I	NONs" – Animals
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State Non-listed Animals for the Aspen Parklands				
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Taxa	Latin Name	Common Name		
BI	Bartramia longicauda	Upland Sandpiper		
BI	Botaurus lentiginosus	American Bittern		
BI	Grus canadensis	Sandhill Crane		
IN	Lycaena epixanthe michiganensis	Bog Copper		
MA	Onychomys leucogaster	Northern Grasshopper Mouse		

Taxa Key:	
BI	Birds
IN	Insects
MA	Mammals
RE	Reptiles

Table 5.4 Minnesota "NONs" - Plants

Non-listed Plants in the Aspen Parklands				
Plant Type	Latin Name	Common Name		
Vascular	Arethusa bulbosa	Dragon's-mouth		
Vascular	Astragalus neglectus	Cooper's Milk-vetch		
Vascular	Botrychium matricariifolium	Matricary Grapefern		
Vascular	Carex capillaries	Hair-like Sedge		
Vascular	Chamaerhodos nuttallii	Nutall's Ground-rose		
Vascular	Gentianopsis procera	Macoun's Gentian		
Vascular	Juncus gerardii	Black Grass		
Vascular	Poa arida	Bunch Speargrass		
Vascular	Puccinellia nuttalliana	Alkali Grass		
Vascular	Spartina gracilis	Alkali Cord-grass		
Vascular	Triglochin palustris	Marsh Arrow-grass		

Species of Greatest Conservation Need (SGCNs) are animal species whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. There are 292 species in Minnesota that meet this definition, 84 of which reside in the Aspen Parklands Subsection.

Species in Greatest Conservation Need for the Aspen Parklands			
Таха	Latin Name	Common Name	
AM	Necturus maculosus	Common Mudpuppy	
BI	Aechmophorus occidentalis	Western Grebe	
BI	Ammodramus bairdii	Baird's Sparrow	
BI	Ammodramus leconteii	Le Conte's Sparrow	
BI	Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	
BI	Ammodramus savannarum	Grasshopper Sparrow	
BI	Anas acuta	Northern Pintail	
BI	Anthus spragueii	Sprague's Pipit	
BI	Arenaria interpres	Ruddy Turnstone	
BI	Asio flammeus	Short-eared Owl	
BI	Aythya affinis	Lesser Scaup	
BI	Bartramia longicauda	Upland Sandpiper	
BI	Botaurus lentiginosus	American Bittern	
BI	Buteo swainsoni	Swainson's Hawk	
BI	Calidris alpina	Dunlin	
BI	Calidris fuscicollis	White-rumped Sandpiper	
BI	Calidris pusilla	Semipalmated Sandpiper	
BI	Caprimulgus vociferus	Whip-poor-will	
BI	Catharus fuscescens	Veery	
BI	Chlidonias niger	Black Tern	
BI	Chordeiles minor	Common Nighthawk	
BI	Circus cyaneus	Northern Harrier	
BI	Cistothorus palustris	Marsh Wren	
BI	Cistothorus platensis	Sedge Wren	
BI	Coccyzus erythropthalmus	Black-billed Cuckoo	
BI	Contopus cooperi	Olive-sided Flycatcher	
BI	Contopus virens	Eastern Wood-pewee	
BI	Coturnicops noveboracensis	Yellow Rail	
BI	Cygnus buccinator	Trumpeter Swan	
BI	Dolichonyx oryzivorus	Bobolink	
BI	Empidonax minimus	Least Flycatcher	

Species in Greatest Conservation Need for the Aspen Parklands			
Таха	Latin Name	Common Name	
BI	Empidonax traillii	Willow Flycatcher	
BI	Gavia immer	Common Loon	
BI	Haliaeetus leucocephalus	Bald Eagle	
BI	Ixobrychus exilis	Least Bittern	
BI	Larus pipixcan	Franklin's Gull	
BI	Limnodromus griseus	Short-billed Dowitcher	
BI	Limosa fedoa	Marbled Godwit	
BI	Limosa haemastica	Hudsonian Godwit	
BI	Melanerpes erythrocephalus	Red-headed Woodpecker	
BI	Melospiza georgiana	Swamp Sparrow	
BI	Numenius phaeopus	Whimbrel	
BI	Nycticorax nycticorax	Black-crowned Night-heron	
BI	Oporornis agilis	Connecticut Warbler	
BI	Phalaropus tricolor	Wilson's Phalarope	
BI	Pheucticus Iudovicianus	Rose-breasted Grosbeak	
BI	Pluvialis dominica	American Golden-plover	
BI	Podiceps auritus	Horned Grebe	
BI	Podiceps grisegena	Red-necked Grebe	
BI	Podiceps nigricollis	Eared Grebe	
BI	Rallus limicola	Virginia Rail	
BI	Recurvirostra americana	American Avocet	
BI	Scolopax minor	American Woodcock	
BI	Seiurus aurocapillus	Ovenbird	
BI	Sphyrapicus varius	Yellow-bellied Sapsucker	
BI	Stelgidopteryx serripennis	Northern Rough-winged Swallow	
BI	Sterna forsteri	Forster's Tern	
BI	Toxostoma rufum	Brown Thrasher	
BI	Tringa melanoleuca	Greater Yellowlegs	
BI	Troglodytes troglodytes	Winter Wren	
BI	Tryngites subruficollis	Buff-breasted Sandpiper	
BI	Tympanuchus cupido	Greater Prairie-chicken	
BI	Tympanuchus phasianellus	Sharp-tailed Grouse	
BI	Zonotrichia albicollis	White-throated Sparrow	
FI	Acipenser fulvescens	Lake Sturgeon	
IN	Aflexia rubranura	Red Tailed Prairie	
IN	Hesperia comma assiniboia	Assiniboia Skipper	
IN	Hesperia dacotae	Dakota Skipper	

Species in Greatest Conservation Need for the Aspen Parklands					
Таха	Latin Name	Common Name			
IN	Oarisma garita	Garita Skipper			
IN	Oarisma powesheik	Powesheik Skipper			
IN	Papaipema beeriana	Blazing Star Stem			
IN	Speyeria idalia	Regal Fritillary			
MA	Canis lupus	Gray Wolf			
MA	Cervus elaphus	Elk			
MA	Mustela nivalis	Least Weasel			
MA	Spermophilus franklinii	Franklin's Ground Squirrel			
MA	Spilogale putorius	Eastern Spotted Skunk			
MA	Taxidea taxus	American Badger			
MA	Thomomys talpoides	Northern Pocket Gopher			
MO	Lasmigona compressa	Creek Heelsplitter			
MO	Lasmigona costata	Fluted-shell			
MO	Ligumia recta	Black Sandshell			
RE	Chelydra serpentina	Common Snapping Turtle			
RE	Liochlorophis vernalis	Smooth Green Snake			
SP	Marpissa grata	A Jumping Spider			

Taxa Key:	
AM	Amphibians
BI	Birds
FI	Fish
IN	Insects
MA	Mammals
МО	Mollusks
RE	Reptiles
SP	Spiders

Natural Heritage and Nongame Research Program Rare Species Fact Sheets

The Natural Heritage and Nongame Research Program is in the process of preparing and publishing fact sheets about each of Minnesota's rare species. This effort is not completed, but much of the information on these species is available at ://www.dnr.state.mn.us/rsg/index.html. Species information is web-based and uses an interactive database approach that allows users to search on selected fields and create customized reports. Users are also able to perform alphabetical searches and generate standard printouts of rare species accounts.

In total, the rare species fact sheet project will provide published accounts of about 200 endangered and threatened species and about 240 species of special concern.

Information Resources

The Minnesota (DNR) Natural Heritage Information System (NHIS) rare features database is the primary source for species occurrences information presented in tables 5.1 - 5.4. These data were supplemented by input and review by Natural Heritage and Nongame Research Program staff.

Sources for Additional Rare Species Information

- 1. The Nature Conservancy. *Element Occurrence Abstracts*.
- 2. NatureServe. A network connecting science with conservation that includes an online encyclopedia of rare plants and animals. ://www.natureserve.org/.
- 3. U.S. Department of Agriculture Forest Service Region 9. Regional Forester *Sensitive Species Conservation Assessment Documents* (also on the Web at: ://www.fs.fed.us/r9/wildlife/tes/.
- 4. DNR Data Deli Department of Natural Resources Data Deli (http://deli.dnr.state.mn.us/.

5.4 Minnesota County Biological Survey

Process for Conducting Minnesota County Biological Survey (MCBS) Landscape Assessments

The Minnesota County Biological Survey (MCBS) fieldwork has been completed in almost all counties in the subsection. However, these counties were some of the first done by the survey in the 1980's and much has changed since then. The data from many of these counties is being updated and much of the draft information is available for this subsection planning. The SFRMP team will include in its assessment package MCBS survey information available in the DNR rare features database, the DNR data deli, and from other sources. Where MCBS survey work is in progress, the SFRMP team will incorporate information into the planning process as it becomes available.

Status of MCBS in the Aspen Parklands Subsection

County	Field Data Collection Scheduled	Notes on Sites and NPCs
Kittson	Completed	Draft sites are digital, NPC mapping in-progress
Marshall	Completed	Draft sites are being digitized; NPC mapping in progress
Pennington	Completed	Draft sites are digital, NPC mapping in-progress
Polk	Completed	Draft sites are digital, need revisions
Red Lake	Completed	Draft final sites are digital, need revisions
Roseau	In progress	Preliminary survey sites digitized, prioritized for survey
Clearwater	In progress	Field Survey begun in 2009
Beltrami	In progress	Field survey begun in 2009

Table 5.6 Aspen Parklands Subsection: MCBS Status

MCBS Site Delineation Process

MCBS ecologists analyze survey areas (a county or ECS subsection) using historic and current ecological information, including remotely sensed data, to identify and delineate areas that appear to have some level of biodiversity significance. These locations are considered MCBS sites. A site can be isolated from other sites or it can be part of a larger area and therefore contiguous with other sites. In either case, the site is the primary unit around which most MCBS data (such as field evaluations, native plant community records, and ecological evaluations) are organized.

MCBS Procedures - site and native plant community surveys

1. Review existing information

Within each county or ecological subsection, site and native plant community surveys begin with a review of existing records and information about areas of native vegetation.

Among the sources consulted are:

- Climate, geomorphology, soils data.
- Museum and herbarium records.
- Existing records in the Natural Heritage Information System and other historical records such as the public land surveys Bearing Tree Data Base conducted in Minnesota from 1847 to 1907.
- Other inventories, such as timber stand inventories and the National Wetlands Inventory.
- Knowledgeable individuals.

2. Site selection

Sites that appear to contain important areas of native vegetation are digitized in a Geographic Information System (GIS) or delineated on topographic maps using aerial photography, satellite imagery, and other related resource maps and data. These sources of information are used to determine boundaries and provide a preliminary determination of the types of native plant communities that are present within each site.

MCBS has developed guidelines for determining which sites to map within each county or ecological unit. These include guidance for site evaluation based on size, current condition (including type and extent of human disturbance), landscape context, spatial distribution of native plant communities, and availability of critical rare plant or rare animal habitat. A site most often contains several different kinds of native plant communities (for example, oak forests, sedge meadows, and tamarack swamps); the boundaries of each community type are usually delineated within the site.

3. Field surveys of selected sites

For sites that appear to be of good quality with little evidence of disturbance, the ecologist conducts a field survey, recording notes about the type and structure of vegetation present, the most common plants, and evidence of disturbance such as cut stumps, soil erosion, and abundant weedy or exotic plant species.

If there are good quality examples of native plant communities at the site, the ecologist will often do a vegetation plot sample, or relevé, within one or more of the communities.

4. Information management

After site and native plant community surveys are completed, the ecologist determines which sites and locations of native plant communities meet minimum MCBS standards for size and quality. Poor-quality sites are eliminated from further consideration. For good-quality sites the ecologist enters data into the <u>Natural Heritage Information System</u> (NHIS) that include:

- Descriptive summaries of the site (landforms, soils, hydrology, plant community types, kinds of disturbance, etc.)
- Descriptive records on good-quality plant community locations.
- Relevé samples.

5. Final Steps

- 1. Refine the boundaries of the sites and native plant communities on topographic maps or GIS files and the final boundaries and associated data reside in the NHIS.
- 2. Write ecological evaluations for selected high-quality sites. These are used to guide conservation activity, such as special vegetation management or acquisition as a park or natural area.

MCBS Procedures – Rare Species Surveys

MCBS field biologists also conduct surveys for rare plants and rare animals. Data gathered during these surveys inform decisions about the biodiversity importance of MCBS sites in the survey area. Detailed descriptions of methods can be found at the following MN DNR websites:

Plants: http://www.dnr.state.mn.us/eco/mcbs/procedures_plants.html

Animals: http://www.dnr.state.mn.us/eco/mcbs/procedures_animals.html

For further information on the MCBS, contact the Unit of Monitoring and Inventory at (651) 259-5100

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For more information on listed species and the MCBS contact: Minnesota Department of Natural Resources 500 Lafayette Rd, Box 25St. Paul, MN 55155; phone: 651-259-5100 or 1-888-646-6367 (toll free)

CHAPTER 6

Stand Damage and Mortality

Aspen Parklands Subsection

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Table 6.3 Acres of aspen damage by symptom, causal agents unknown.Statewide. 2004 to 2008Map 6.1 Forest Tent Caterpillar Defoliation 2000-2002

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Map 6.2 Risk Assessment for Mortality Caused by Gypsy Moth

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Map 6.3 Larch Beetle Mortality 2001-2006 Jack pine White pine Red pine Balsam fir White spruce Black spruce

6.5... Additional Information Sources

6.6... Literature Cited

Notes relating to this chapter:

Color maps and graphs may be viewed as PDF files on the Aspen Parklands Subsection Forest Resource Management Plan (SFRMP) Web site at: www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html.

Maps in t his c hapter de pict i nformation f or an ar ea within a "planning boundar y." T his boundar y closely approximates the subsection(s) 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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on CD by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

6.1 Introduction

This is an assessment of native forest insects and diseases known to cause tree mortality, growth loss, and quality reduction in forest stands in the Lake Agassiz, Aspen Parklands Section (LAP). 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 (MN DNR), Forest Health Team; University of Minnesota; USDA Forest Service, State and Private Forestry; and North Central Forest Experiment Station. The potential impact of exotic pests and climate change are also discussed.

6.2 Role of native insects and diseases contrasted with exotics and climate change

Native forest insects and disease organisms influence forest ecosystem dynamics as pests and agents of stress, but also play a beneficial role in the 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 woodpeckers are attracted to trees with decay where they excavate cavities for nesting. Many animals use dead wood to roost, nest, or forage.

Climate change expectations for Minnesota:

- Increased levels of CO2 and O3 in atmosphere;
- In winter, minimum temps will be warmer;
- Growing season will be longer;
- Drier weather during the growing season;
- Relative humidity peaks higher in summer;
- More and stronger wind storms;
- More thunderstorms;
- Less percolation of rain water into soil; And,
- More "blowdown events".

These same native forest insect and diseases are perceived as problems or pests by some 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, Leatherberry, 1995). Surveys conducted by the MN DNR- Division of Forestry of oak and birch mortality triggered by drought and 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.

In the last decade, scientists have noted that climate change is affecting the environment in the temperate forests of North America. Based on Frelich and Reich's predictions, "the climate change expectations for Minnesota" are listed in the box.

As tree becomes stressed by drought and higher temperatures, changes in tree chemistry can occur. Certain pests, called "opportunistic pests," can key in on these stress-related chemicals and successfully attack the stressed tree. In the short-term, weather and climate changes will allow opportunistic insects and pathogens and abiotic declines to accelerate the demise of tree species no longer suited to their current sites. Other tree species will move into MN or become more prevalent as their range expands. Eventually, the forest prairie ecotone will likely move north-eastward as a culmination of the all the disturbances (Frelich and Reich). The harsher (drier) habitat, large herbivore populations and local insects and diseases will make it difficult to re-establish tree seedlings. Additionally, the occurrence of exotic forest pests would accelerate all the negative consequences of climate change on affected native forest tree species and communities.

The USFS has developed a series of maps showing where climate change is likely to have effects for the 130+ tree species in the NE USA. Forest layer is based on FIA plots. (Iverson, Prasad, et al Northern Research Station, 2007) In MN, 12 of 22 forest species will have hotspot(s) of change where that tree species will be under stress and the population is likely to diminish. In the LAP, only bur oak is expected to have an increase in its suitable habitat. Quaking aspen, balm of Gilead, black spruce, tamarack, jack pine and red pine are expected to have a 10% decrease in the area of suitable habitat in the next 50 years.

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. Successful exotic organisms have historically 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. Emerald ash borer was found first in St. Paul in 2009 and is expected to decimate the ash species in Minnesota. Gypsy moth, while not yet established in Minnesota, is established in Wisconsin and Michigan and is expected to be found along the North Shore or in southeastern Minnesota in the next few years. While future impacts of these insects in Minnesota are difficult to predict, they have the potential to cause widespread mortality oak and ash and will alter the composition and structure of many forest communities.

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/ invasive 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 then needed. Dutch elm disease and white pine blister rust are exotics that have become "naturalized" and are now considered permanent components of

forested ecosystems. This will also happen with gypsy moth and emerald ash borer after they become established and spread in Minnesota.

Damage and Mortality Tables

The damage and mortality table summarizes acres affected and acres of mortality from the Cooperative Stand Assessment (CSA) inventory on state lands in this subsection.

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Table 0. TACres	Апесіеа	ana Acres	of <i>Morialliv</i>	DV SDecles
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r	Table 6.1 Acres affected and acres of mortality by species			
Cover Type		Acres		
			Percent Affected ¹	Percent Mortality²
Aspen		79,118	29,739	24,213
Oak		966	331	173
Birch		93	24	0
Ash		2063	519	299
Tamarack		3753	746	546
Jack pine		166	23	18
Red pine		79	12	0
Balsam fir		98	12	11
White spruce		148	0	0
Blk spruce		1696	725	247

1 Each stand is assessed for the presence or absence of damage. These numbers reflect the sums of all acres in a cover type that are damaged or have died. In reality, the number of damaged and dead trees per acre is usually very low.

2 Percent affected and percent mortality are not additive. A stand cannot have mortality unless it also is affected.

Table 6.2 Native and Exotic Insects and Disease in the Aspen Parklands Subsection

The table below summarizes the insect and disease agents that are known to cause mortality or volume losses in this subsection.

Table 6.2 Native and exotic insects and diseases that cause tree mortality or volume loss				
Tree species	Agents known to cause tree mortality	Agents known to cause volume or quality reductions	Exotic agents** known to cause tree mortality	
All cover types	Armillaria root rot	Stem and root decay fungi		
Aspen	Hypoxylon canker	White trunk rot Forest tent caterpillar Poplar borer	Gypsy moth	
Oak	Forest tent caterpillar Two-lined chestnut borer		Gypsy moth	
Birch	Birch decline		Gypsy moth	
Ash	Ash decline		Emerald ash borer	
Tamarack	Larch beetle		Sirex woodwasp	
Jack pine	Jack pine budworm	Red rot	Heterobasidion root disease	
Red pine	Bark beetles	Diplodia blight	Heterobasidion root disease Sirex woodwasp	
Balsam fir	Spruce budworm		<i>Heterobasidion</i> root disease	
White spruce	Spruce budworm		Heterobasidion root disease Sirex woodwasp	
Black spruce	Eastern dwarf mistletoe		Heterobasidion root disease Sirex woodwasp	

** = Exotic insect or disease that has recently arrived or is expected to arrive in Minnesota.

6.4 Insects and Diseases Common to Each Tree Species

The following assessment is organized by tree species. Each species includes a description of the Damage Agent(s) followed by a discussion of Management Implications that can both increase and decrease outbreaks of damage agents as well as their impacts. Decisions on which pests and information to include in this assessment are based on literature, surveys, and reports of state and federal agencies and university forest pathologists and entomologists, and on personal experience.

ALL SPECIES

Damage Agents

□ Stem decay and root rot — Many species of decay-causing fungi.

All tree species are subject to stem decay or root rot by an array of fungi. The prevalence of stem decay in all species increases as tree age increases. Wounds such as dead branch stubs, fire scars, and logging injuries serve as sites where decay fungi can enter the trees. Many tree species have the ability to confine decay to the wood present at the time of wounding, but with multiple wounds, decay columns tend to coalesce and the total amount of decay in the stem increases significantly. As the stand ages, the proportion of trees in the stand with decay will increase and the volume of decay in each tree will increase. Stem decay does not kill trees outright, but it does lead to more stem breakage from wind and can greatly reduce merchantable volume.

Wounds that occur to residual trees during a partial harvest or other management activities can be critically important. Minimizing wounding during logging, maintaining a level of stocking to promote natural branch shedding, and, rotation age management can be keys to controlling the amount of stem decay.

□ **Root disease**—*Armillaria* spp. and others

All tree species are susceptible to root disease caused by *Armillaria spp.* Damage and death from root diseases are likely very common, but impact is not well documented since the damage is hidden below ground. Root diseases reduce the growth of trees and, if severe, can result in death or wind throw. *Armillaria* spp. is present on all forested sites. Hardwood and softwood trees weakened by drought, defoliation, wounding, soil compaction, or old age are predisposed to Armillaria root disease. This is especially a concern when hardwood sites are converted to softwoods. The fungus is able to use stumps as a food base in order to grow through the soil and infect live roots of the planted softwoods. Partial cutting has also been shown to increase Armillaria root disease.

Management Implications for all species

As a general rule, as stands of trees are allowed to age, the incidence and impact of stem decay and root rot increase. The presence of stem decay and root rot decreases stand productivity. Stem decay is the primary defect of most species, and as such, has been dealt with in this plan by managing the rotation age of each tree species. Root rot is a concern when hardwood sites are converted to softwoods. Partial cutting has also been shown to increase Armillaria root rot. Trees weakened by drought, defoliation, wounding, soil compaction, and old age can be predisposed to Armillaria root disease and tree mortality.

ASPEN

Damage Agents

□ **Hypoxylon canker**—*Entoleuca mammata (=Hypoxylon mammatum)*

A common disease of aspen, Hypoxylon canker causes mortality and is the most destructive pathogen of young aspen in the Lake States. It is estimated that Hypoxylon canker infects 12 percent and kills 1 percent to 2 percent of the aspen in the Lake States each year (Schipper and Anderson, 1976). Hypoxylon canker is primarily a disease of quaking aspen, but bigtooth aspen is also occasionally infected. Aspen of all age classes is susceptible; however, mortality is usually greatest in young trees. The fungus kills the trees by girdling the stem, which leads to stem breakage. Some clones appear to

be much more susceptible to Hypoxylon canker than others, and mortality in susceptible clones may approach 100 percent. Infection levels are not strongly correlated to site characteristics, but do appear to be related to stand density. Insect wounds made by cicadas, poplar-gall saperdas, and tree hoppers serve as infection courts for the fungus causing Hypoxylon canker. These insects prefer open-grown stands and stand edges. Because of this preference, there tends to be a greater amount of insect wounding and Hypoxylon canker incidence in the more open-grown stands and along stand edges (Ostry, et al., 1989).

Stem Decay (White trunk rot)—*Phellinus tremulae*

White trunk rot is the major cause of decay in aspen. Decay becomes apparent in stands at 20 years of age and increases as the stands age. There does not seem to be a strong correlation between amount of decay and site factors. The genetic susceptibility to decay of individual clones seems to override any observable correlations between decay and site factors. The best external indicator of decay is the presence of conks (Jones and Ostry, 1998). However, only about 50 percent of the trees with decay have visible conks, and lack of conks generally leads to an underestimation of decay. Wounds serve as infection sites. Stands with a larger incidence of wounds from such things as equipment scrapes, fire, hail, and storm breakage may have higher levels of decay. Studies have indicated that the pathological rotation age (the age at which the loss of wood volume from decay begins to exceed the annual increment of sound wood) is from 40 to 50 years of age (Schmitz and Jackson, 1927). Others indicate that in many parts of the Lake States, aspen stands begin to deteriorate rapidly when they reach 50 to 60 years of age (Ostry and Walters, 1984). Some stands (or clones) may have relatively little decay even when they exceed 50 years of age, while others may suffer high losses before 50 years. (Christensen et. al., 1951)

Forest tent caterpillar—*Malacosoma disstria*

Forest tent caterpillar (FTC) is a native defoliator that has likely caused outbreaks for hundreds or thousands of years. These outbreaks often occur about once a decade and usually last about three to four years, although some have lasted for five to eight years. Outbreaks result in defoliation of most

hardwood tree species especially aspen, birch, basswood, and oaks within the outbreak area. Significant growth loss is widespread during the outbreak. The latest FTC outbreak began in 2000, peaked at 7.5 million acres in 2002, and collapsed in 2004. (See map 6.1) Aspen decline and mortality occurred on 47,000 acres in 2004, across the northern third of the state because defoliation was concurrent with

Table 6.3Acres of aspen damage by symptom,causal agents unknown.Statewide.2004 to 2008							
	Defoliation Mortality Discoloration Dieback						
2004	14,570	27730	0	24,356			
2005	407,606	658	423	4,381			
2006	2,217	635	0	1,309			
2007	73,284	613	0	16,666			
2008	5,598	85	570	151,022			

a severe drought. Losses have continued and have expanded. See table 6.3. Hardwood decline occurred in 2008 on 22,000 acres and was attributed to FTC defoliation and continued drought stress. Climate change is expected to accelerate aspen losses due to combined drought and defoliation.



□ **Poplar borer**—*Saperda calcarata*

Poplar borer occurs wherever aspen grow. Larvae bore into sapwood and heartwood, and trees that have been attacked have swollen scars and holes in the trunk and larger branches. Moisture bleeds out of the holes, producing varnished-looking streaks running down the trunk. Extensive tunneling can girdle small trees and makes large trees susceptible to wind breakage. Attack is often concentrated in brood trees that are usually the larger and faster-growing trees in stands. Damage in forest stands can be severe and are associated with widespread aspen mortality noted in 2007 and 2008. Infestations tend to increase with a decrease in stand density. The best management practice is to maintain well-stocked stands that are clear-cut at maturity.

Gypsy Moth – *Lymantria dispar*

See Oak section below. FTC outbreaks usually average two to three years of defoliation in each 10 to 12 year period. The beginnings of FTC outbreaks usually coincide with droughty weather. When GM outbreaks coincide or are closely timed to FTC outbreaks, there is a high risk of oak, aspen and birch mortality due to combined defoliation.

Aspen Management Implications

As aspen stands are set aside to meet extended-rotation and old-growth targets, or aspen clumps are left behind to meet leave-tree guidelines, white trunk rot is expected to increase as the ages of these aspen stands increase. Harvesting strategies that reduce the number of acres of older aspen will decrease the amount of decay. Sequential or partial harvesting of aspen stands will wound the residual stems and root systems. An increase in wounding will increase decay incidence and volume of decay. If wounding is done early in the life of the stand, time will become an enemy in producing sound wood volume. The

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longer the decay is present in aspen, the less sound volume there will be since white trunk rot has the ability to breach the defenses of the trees and continue to grow at will throughout the infected trees.

Management practices, such as creating irregular stand shapes, using intermediate cuts to capture mortality, partially harvesting stands at the end of the rotation, or leaving scattered patches of standing live aspen in the stand at the end of the rotation, increase the incidence and severity of poplar borer and Hypoxylon canker. To reduce poplar borer and Hypoxylon canker occurrence and impact, larger clear-cuts, which produce fully stocked stands and minimal edge, are preferred. If clones have greater than 25 percent of the basal area infected with Hypoxylon canker, it is recommended to convert those clones to other species or other clones more resistant to Hypoxylon canker (Schipper and Anderson, 1976). Both bigtooth aspen and balm of Gilead are more resistant to Hypoxylon canker. If these species exist in proximity to aspen clones with a high infection rate from Hypoxylon, consider favoring these species when regenerating the stands.

Defoliator occurrence and impacts are difficult to predict and to influence by management practices. If forest tent caterpillar continues to cause widespread defoliation every 10 or 12 years, delay the harvest in intensively managed aspen stands on good sites to accommodate reductions in growth rate every decade during the rotation. If forest tent caterpillar defoliation and drought are simultaneous, expect decline and mortality in aspen, birch, and oaks that occur on light soils and higher elevations where defoliation was prolonged.

<u>OAK</u>

Damage Agents

- □ **Forest tent caterpillar**—*Malacosoma disstria* See aspen section above.
- **Two-lined chestnut borer**—*Agrilus bilineatus*

This insect is an opportunistic insect that attacks weakened oak trees. It is a native beetle known to attack all oak species found in Minnesota, red oak being its preferred host. When trees and stands are healthy, two-lined chestnut borer (TLCB) confines its attack to low-vigor trees, broken branches or windthrown trees. When drought stress and/or forest tent caterpillar defoliation have reduced tree and stand vigor, oaks are predisposed to TLCB attack. Under severe stress and/or defoliation conditions, widespread outbreaks of TLCB can occur. Climate change will likely accelerate TLCB-caused oak mortality on the more mesic sites and on the extremely dry sites in the LAP.

Gypsy moth—*Lymantria dispar*

Gypsy moth (GM) is an exotic insect pest spreading across the United States and Canada. While GM is currently not established in the state, it was included in this assessment because of its occurrence in Wisconsin and because it will spread into and become established here. GM is invading Minnesota from the east. The invasion pressure will increase as the populations in Wisconsin get closer to Minnesota. Pressure may also increase from Ontario, Canada. Natural spread of GM is slow, but the unintentional spread by humans can be very rapid. Egg masses are transported on cars, recreational vehicles, logs, firewood, nursery stock, etc. Gypsy moth caterpillars feed on most hardwood trees and shrubs and in heavy infestations will also feed on conifers. Repeated defoliations lead to tree decline and death. Trees under stress suffer higher levels of mortality. Oaks, aspen, birch, basswood, tamarack, willows, hazelnut, and ironwood- are among the gypsy moth's preferred trees.

Pheromone traps are the primary method used to detect and monitor GM populations. The DNR is a member of the Gypsy Moth Program Advisory Council and cooperates with the Minnesota Department of Agriculture in its pheromone-trapping program and the federal Slow-the-Spread program.

The extent and severity of impact in this area is unknown at this time; however, GM will likely cause changes in the forest composition once it is established. According to the latest analysis of GAP data, when GM arrives, hardwood stands will have different vulnerabilities to the effects of multi-year defoliation. A risk potential map was developed in 2003. (See map 6.2)



Oak Management Implications

A goal in oak management should be to promote stand vigor by manipulating stocking in order to prevent and minimize TLCB-caused oak mortality. Once the damage from a population of TLCBs becomes evident, management options are postponement of any activity in the stand for at least one growing season then salvage and sanitation. Thinning during an outbreak should be strictly avoided because thinning activities wound trees and create droughty conditions for the remaining crop trees.

FTC outbreaks usually average two to three years of defoliation in each 10 to 12 year period. The beginnings of FTC outbreaks usually coincide with droughty weather. When GM outbreaks coincide or are closely timed to FTC outbreaks, there is a high risk of oak, aspen and birch mortality due to combined defoliation.

When it arrives, GM defoliation and mortality will make forest management and planning more difficult.

According to GAP analysis, 89% of the forested lands are in the aspen cover type, 1% is in the oak cover type and the remaining forest lands are in other, low-risk cover types. The riskiest areas for gypsy moth impact are in the northern half of the subsection on sandier soils from NE Kittson County to SE Marshall County.

The predominance of aspen and oak makes the likelihood of forest tent caterpillar defoliation impact even greater when gypsy moth and FTC outbreaks are concurrent or separated by only a year or two. There is a high risk of mortality due to the duration and severity of defoliation when both defoliators are present.

Silvicultural considerations for gypsy moths are:

- Encourage species diversification, especially to conifers, that will slowly make the stands less vulnerable to both GM and FTC.
- Once infested, there will be a slow spread rate between stands because stands are so widely separated. Spraying a bio-rational insecticide (Btk) to control defoliation and impact would be most effective in these isolated stands.
- Treating either or both FTC and GM caterpillars with bio-pesticides would prevent mortality after two years of consecutive defoliation or after a single year of defoliation concurrent with droughty weather.

BIRCH

Damage Agents

- □ **Forest tent caterpillar**—*Malacosoma disstria* See Aspen section above.
- □ Birch decline—unknown etiology and causal agents, such as bronze birch borer, *Agrilus anxius*.
 Birch decline is a complex disease caused by a combination of factors including stress from drought, high temperatures, insect defoliation that culminates in branch or death by the bronze birch borer. Birch decline starts as a thinning of the crown with dieback of branches. As the stress continues, the bronze birch borer begins to make successful attacks on the birch and mortality often results. The amount of mortality due to birch decline can increase dramatically as a result of severe and lengthy drought. A study of the effects of the drought in the early 1990s estimated that 40 percent of the birch

on FIA plots died in Minnesota from 1988 to 1992 as a result of birch decline. Based on the findings on the FIA plots, it was estimated that 228 million birch trees died during this period (Anonymous, 1992).

□ **Gypsy Moth** – *Lymantria dispar*

See Oak section. FTC outbreaks usually average two to three years of defoliation in each 10 to 12 year period. The beginnings of FTC outbreaks usually coincide with droughty weather. When GM outbreaks coincide or are closely timed to FTC outbreaks, there is a high risk of oak, aspen and birch mortality due to combined defoliation.

Birch Management Implications

Birch decline depends on stress such as drought, defoliation and disturbance. This makes it difficult to predict a trend in birch decline over the life of the subsection plan. Older, decadent birch stands will reflect stress conditions and resultant dieback and decline before younger, thriftier stands. If stands of birch are set aside in legacy patches or rotations are extended, the vulnerability of these stands to birch decline will increase. Partial harvesting birch stands can create stress to the residual trees from an increase in soil temperatures as the stands are opened up. Partially harvesting birch and using birch to provide leave-tree clumps will likely lead to significant mortality in these stands and residual birches.

ASH

Damage Agents

□ **Emerald ash borer** – *Agrilus planipennis*

Emerald ash borer (EAB) is an exotic insect first found in Michigan in 2002. EAB attacks and kills all species of *Fraxinus*, which includes white, black and green ash. The borer attacks healthy as well as stressed trees and trees of all sizes. Since it is an exotic, it has no native parasites or predators in North America. Initial control efforts in the forests of Michigan have involved cutting and chipping all infested trees as well as a $\frac{1}{2}$ mile buffer of un-infested trees around the infested trees. A newer approach, SLow Ash Mortality (SLAM), tries to limit natural spread and artificial spread from the point of introduction using an integrated management approach. Shade trees can be protected by injecting them with insecticides. Interstate quarantines have been enacted to control the possible movement of EAB from infested states to un-infested states. However it is easily moved on firewood. The MDA and DNR are encouraging the recreational public to use locally grown firewood at recreational sites.

In 2009, EAB was found in St.Paul and along the Mississippi River in Victory,WI. APHIS and MDA have established quarantines in Ramsey, Hennepin and Houston Counties for ash trees, ash wood products, ash firewood and EAB.

If EAB is found or suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

□ Black Ash decline – Interacting biotic and abiotic factors

Black ash stands showing signs of branch dieback, declining crowns, epicormic shoots and tree death is a common sight along roads. Periodically the amount of ash showing signs of decline increases. This was apparent in the early 1990's and again in 2004. Aerial survey, in 2004 identified 27,000 acres of declining black ash. While the majority of the acreage was centered in Aitkin, Carlton and southwestern St Louis counties, declining ash can be found throughout its

range. Additional but decreasing acreages of decline were identified by aerial survey in 2005 and 2006. An analysis of Forest Inventory and Analysis (FIA) and Forest Health Monitoring (FHM) data by the Northern Research Station (NRS) in St Paul was recently conducted. Findings included:

-Trees growing on wetter sites had greater decline symptoms than trees growing on drier sites. -Severity of decline was greater in older trees than in younger trees.

-Black ash regeneration was greater on better-drained plots.

-Trees growing closer to roads had more decline symptoms than those farther from roads.

In field studies conducted by the NRS and the MN DNR Forest Health Unit, no biotic agent was found to be responsible for the decline. Further study is needed and will continue. It appears the decline is caused by a number of interacting factors. Different combinations may be involved on different sites. Some of the factors likely involved include tree age, proximity to roads likely involving changes in hydrology, closed drainages, droughts and above normal precipitation causing fluctuations in water tables, open winters possibly injuring roots, defoliation, soil type, etc.

Ash Management Implications

It is assumed EAB populations will begin spreading from the initially infested sites into the rest of the state. When it does arrive in this subsection, it is expected that most or all of the ash trees will eventually be killed. At the present time there are no management options to control EAB in forests. In the mean time, ash will likely be managed much as it has been in the past. However, if there are opportunities to encourage other tree species in order to increase diversity on sites dominated by black ash they should be pursued. This will be difficult to do on the wetter sites but might be possible around the edges of wet stands and in riparian areas where the ash is growing on drier sites.

Black ash decline is a periodic recurring problem especially on the wetter sites in closed drainages. Management on these sites is difficult and it is very easy to degrade the site. Black ash management is more likely to be possible where it is growing onto drier sites and may need some help such as thinning to help it compete with other species growing on the sites. Keeping EAB in mind, any management efforts should try for increased species diversity.

TAMARACK

Damage Agents

□ Larch beetle—*Dendroctonus simplex*

This is a native bark beetle that attacks tamarack and exotic larches. Mapped since 2003, larch beetle mortality has been detected on a total of 1140 acres, and of that 751 acres were mapped in 2008. See map 6.3. Presently, populations and attacks are on the increase, and in some stands 30 percent to 90 percent tree mortality has been observed. Flooding, droughts, defoliation by larch casebearers, and old age have been associated with larch beetle attacks. Larch beetle also appears to be able to kill healthy trees as well. Populations can build up in tamarack blowdowns or logging slash and then attack and kill live trees left for seed production as well as live trees in surrounding stands. Beetles over-winter in attacked trees, so wood peckers can find these insects year-round.



□ Sirex woodwasp – Sirex noctilio

<u>This invasive exotic insect is not known to be in Minnesota</u> in 2008, but it can be spread very rapidly in fresh logs and firewood. This insect will kill all pines, all spruces, balsam fir and tamarack. *Sirex* is an exotic that could be a very serious mortality agent in natural stands and plantations. Sirex wood wasps thrive in decadent and dying pines and spruces where they build up population numbers and are able to mass attack healthy trees and kill them. If *Sirex* is suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

Tamarack Management Implications

Apparent healthy trees can be successfully attacked when there are high populations of larch beetles. Harvesting can also create stress conditions on residual trees left for seed production or biodiversity objectives by affecting water table levels and by increasing temperatures. Most harvesting plans are salvage operations due to larch beetle mortality.

JACK PINE

Damage Agents

□ Jack pine budworm—*Choristoneura pinus pinus*

Jack pine budworm (JPBW) larvae eat the needles of jack pine causing defoliation, which leads to top kill and mortality. In this subsection, JPBW is a very infrequent defoliator. Since 1954, JPBW was only mapped once, in 1986, when 6000 acres were defoliated in central Roseau Co.

□ Stem decay (red rot) - Phellinus pini

This organism is the most destructive decay organism in the United States. It attacks most softwoods and causes significant decay. It is a "canker rot" organism. This type of decay organism cannot be walled off and confined to the portion of the stem present at the time infection takes place. This organism will grow and cause decay throughout the stem as the stem increases in size. Often red rot is not discovered until harvesting takes place. For more details see both discussions of stem decay for the aspen and tamarack cover types.

□ Heterobasidion root disease – *Heterobasidium* spp.

Not known to be in Minnesota in 2008, this exotic fungal disease affects wounded pines and spruces causing tree mortality. Once carried into a plantation, in debris, fruiting bodies, diseased roots or wood, this fungus infects cut stumps and root systems. Infected trees die and the fungus spreads through root systems to adjacent healthy trees, creating an ever-expanding disease pocket. Neither pines nor spruces can grow in the infection centers for many decades.

□ Sirex woodwasp – Sirex noctilio

<u>This invasive exotic insect is not known to be in Minnesota</u> in 2008, but it can be spread very rapidly in fresh logs and firewood. This insect will kill all pines, all spruces, balsam fir and tamarack. *Sirex* is an exotic that could be a very serious mortality agent in natural stands and plantations. Sirex wood wasps thrive in decadent and dying pines and spruces where they build up population numbers and are able to mass attack healthy trees and kill them. If *Sirex* is suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

Jack Pine Management Implications

Management strategies that call for holding jack pine beyond 50 years of age will lead to conditions where stands begin to break up because of the incidence of red rot caused by *Phellinus pini*.

RED PINE

Damage Agents

Diplodia tip blight and canker – Diplodia pinea

Diplodia damage can be locally high on sites where large infected red pine and jack pine are left on or next to sites being regenerated to red pine or jack pine. It causes a tip blight as well as a canker that can girdle branches and stems and kill trees. It spreads most during wet weather where it can infect through wounds, but this fungus does not require a wound for infection. A strain of this fungus can cause latent infections, which become activated when the host trees become stressed from such things as drought, overcrowding, or "j" rooting.

□ Bark beetles (pine engraver beetle) - Ips pini

Many species of conifer bark beetles exist in Minnesota. The pine engraver beetle is very common and sometimes very abundant in pine plantations. Stress from drought, overcrowding, equipment and fire scarring, and weather events such as hail, snow, and ice breakage can reduce tree vigor and predispose the trees to bark beetle attack. Stressed trees cannot defend themselves against bark beetle attacks and it becomes easy for the beetles to kill the trees.

□ **Heterobasidion root disease** – *Heterobasidium* spp.

Not known to be in Minnesota in 2008, this exotic fungal disease affects wounded pines and spruces causing tree mortality. Once carried into a plantation, in debris, fruiting bodies, diseased roots or wood, this fungus infects cut stumps and root systems. Infected trees die and the fungus spreads through root systems to adjacent healthy trees, creating an ever-expanding disease pocket. Neither pines nor spruces can grow in the infection centers for many decades.

□ Sirex woodwasp – Sirex noctilio

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Red Pine Management Implications

This is a long-lived tree species that is relatively free of potential catastrophic pests problems. Concerns are more directed at young stands regenerating under existing stands of pine. As management strategies lead to more partial harvesting and development of all-aged stands, understory pines will be susceptible to both shoot blights. Bark beetle problems will arise in plantations when they're under drought stress and/or slash-creating activities have occurred in the spring or summer. Efforts should be taken to prevent the movement of *Heterobasdion* into pine plantations. See the DOF – Invasives Species OP Order for more information.

BALSAM FIR

Damage Agents

□ Spruce budworm - Choristoneura fumiferana

Spruce budworm, a native insect defoliator of balsam fir and spruce, causes topkill and mortality.

In the LAP, the occurrence of spruce budworm defoliation and mortality is generally linked to large and expanding outbreaks in northern Ontario or Lake of the Woods County. Damage tends to be higher in older-age fir, but in outbreaks, fir of all ages can be killed. Stands with multiple ages of fir often experience greater levels of damage to the young fir trees than would normally occur in singleage stands. Balsam fir is the preferred host, but since 1990 budworm has been causing defoliation, top kill, and mortality in plantations of white spruce that are 25 years and older.

□ Sirex woodwasp – Sirex noctilio

<u>This invasive exotic insect is not known to be in Minnesota</u> in 2008, but it can be spread very rapidly in fresh logs and firewood. This insect will kill all pines, all spruces, balsam fir and tamarack. *Sirex* is an exotic that could be a very serious mortality agent in natural stands and plantations. Sirex wood wasps thrive in decadent and dying pines and spruces where they build up population numbers and are able to mass attack healthy trees and kill them. If *Sirex* is suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

Balsam Fir Management Implications

Spruce budworm is a sporadic invader of this subsection; however, management strategies that increase the component of balsam fir will only lead to more frequent and more severe SBW outbreaks. Since the older stands tend to serve as the niches in which the budworm builds up, strategies to develop extended rotation balsam fir will only add to the potential for stand-destroying budworm populations to develop.

WHITE SPRUCE

Damage Agents

□ Spruce budworm - Choristoneura fumiferana

See spruce budworm discussion under the balsam fir cover type.

□ **Heterobasidion root disease** – *Heterobasidium* spp.

Not known to be in Minnesota in 2008, this exotic fungal disease affects wounded pines and spruces causing tree mortality. Once carried into a plantation, in debris, fruiting bodies, diseased roots or wood, this fungus infects cut stumps and root systems. Infected trees die and the fungus spreads through root systems to adjacent healthy trees, creating an ever-expanding disease pocket. Neither pines nor spruces can grow in the infection centers for many decades.

□ Sirex woodwasp – Sirex noctilio

<u>This invasive exotic insect is not known to be in Minnesota</u> in 2008, but it can be spread very rapidly in fresh logs and firewood. This insect will kill all pines, all spruces, balsam fir and tamarack. *Sirex* is an exotic that could be a very serious mortality agent in natural stands and plantations. Sirex wood wasps thrive in decadent and dying pines and spruces where they build up population numbers and are able to mass attack healthy trees and kill them. If *Sirex* is suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

White Spruce Management Implications

The occurrence of spruce budworm in white spruce plantations may be related to the plantations being overcrowded and not managed. Commitments must be made to do early and periodic thinning in the white spruce plantations.

BLACK SPRUCE

Damage Agents

Eastern dwarf mistletoe - *Arceuthobium pusillum*

Dwarf mistletoe is a disease caused by a parasitic seed plant and is the major mortality agent of black spruce. It primarily affects black spruce, but occasionally is found on white spruce and tamarack. It causes witches brooms on infected trees, and trees of all sizes become infected and killed. Catastrophic fires were the major factor in keeping this disease in check in the past. Once a stand is infected, it remains infected until all the mistletoe-infected trees are killed by fire, harvesting, or shearing. Residual infected trees left behind after harvesting introduce the disease to the regenerating stand. Mistletoe spreads locally by seeds that are explosively discharged and can travel up to 60 feet. Long-distance spread is by birds carrying the sticky seeds on their feet and feathers. When an evenaged stand becomes infected, the large trees are killed, creating openings in the stand. Young trees seed into these openings and become infected. The stand then gradually changes to an all-aged stand with heavy infections of all ages and very little to no merchantable volume.

□ Heterobasidion root disease – *Heterobasidium* spp.

<u>Not known to be in Minnesota in 2008</u>, this exotic fungal disease affects wounded pines and spruces causing tree mortality. Once carried into a plantation, in debris, fruiting bodies, diseased roots or wood, this fungus infects cut stumps and root systems. Infected trees die and the fungus spreads through root systems to adjacent healthy trees, creating an ever-expanding disease pocket. Neither pines nor spruces can grow in the infection centers for many decades.

□ Sirex woodwasp – Sirex noctilio

<u>This invasive exotic insect is not known to be in Minnesota</u> in 2008, but it can be spread very rapidly in fresh logs and firewood. This insect will kill all pines, all spruces, balsam fir and tamarack. *Sirex* is an exotic that could be a very serious mortality agent in natural stands and plantations. Sirex wood wasps thrive in decadent and dying pines and spruces where they build up population numbers and are able to mass attack healthy trees and kill them. If *Sirex* is suspected, please contact MDA (Hot-line is 1-888-545-6684) and your Regional Forest Health Specialist.

Black Spruce Management Implications

Incidence of this disease is increasing due to the absence of fire and because there is no practical means of killing all infected trees at the time of harvest. Shearing after the harvest has also met with a variety of successes and rarely eradicates mistletoe from the stand. Even young trees that are infected will live long enough to continue the cycle of dwarf mistletoe in the regenerating stand. These young, infected trees are nearly impossible to kill in the absence of fire. If dwarf mistletoe is not aggressively eradicated from black spruce stands when harvesting and regenerating the stands, the total acreage of this cover type will decline.

Additional Information Sources

Additional information on these and other insects and diseases of forest trees in Minnesota can be obtained by referring to the Minnesota Forest Health Reports prepared by the MN DNR, Division of Forestry, Forest Health Unit. They can be found in the DNR Library in St. Paul and in various other libraries in the state. They have been printed on an annual basis since at least 1974. The title has varied over the years from the Forest Pest Report, to the Forest Insect and Disease Report, to the current title of Minnesota Forest Health Annual Report. They contain data on the insect and diseases included in this assessment as well as others. Observations and annual survey results are included. Current information can be found in the Minnesota DNR Forest Insect and Disease Newsletter, which is published four or five times during the growing season and can be accessed online through the DNR Web site at http://www.dnr.state.mn.us/fid/index.html.

Other sources of information include reports from the USDA Forest Service, University of Minnesota, and Minnesota Department of Agriculture.

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CHAPTER 7

Wildlife Species Status & Trends

Aspen Parklands Subsection

Table 7.1 Terrestrial, Vertebrate Species List

Table 7.2 Mammal habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type

Table 7.3 Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type

Table 7.4 Amphibian and Reptile habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type.

Notes relating to this chapter:

Color m aps m ay be v iewed as P DF f iles on t he A spen P arklands Subs ection F orest R esource Management Plan (SFRMP) Web site at: <u>www.dnr.state.mn.us/forestry/subsection/aspenparklands/index.html</u>

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 Northwest Region Headquarters at 6603 Bemidji Ave N, Bemidji, Minnesota, and on compact disk by request to Pat Matuseski at (218) 308-2381 or pat.matuseski@state.mn.us.

Chapter 7 provides information on the occurrence, legal status and the population trends of wildlife species in this subsection. Species presence information is summarized from data collected by the Minnesota Gap Analysis Project (MN-GAP), a project organized to provide a state assessment on the conservation status of native vertebrate species and natural land cover types.

A recent initiative, *Minnesota's Comprehensive Wildlife Conservation Strategy*, is a strategic plan to better manage populations of "species in greatest conservation need (SGCN)". Species of greatest conservation need (SGCN) are defined as "animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability".

MN DNR was a partner in development of this plan, and is committed to working towards its implementation, both internally and with external partners. The plan includes goals and targets for stabilizing and increasing populations of species in greatest conservation need, improving knowledge about these species, and enhancing people's appreciation and enjoyment of them.

In this assessment, select information is presented on SGCN species presence in the Aspen Parklands subsection covered by this forest resource management plan. A copy of the full plan may be viewed on the MN DNR public website at this location: <u>http://www.dnr.state.mn.us/cwcs/strategy.html</u>

Table 7.1 Terrestrial Vertebrate Species List, Status and Trends.

Notes regarding the following four 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 <u>Species Common and Scientific Names:</u> Notes standard MN-GAP protocol based on NatureServe and it's related searchable plant, animal and ecological database called NatureServe Explorer located at <u>www.natureserveexplorer.org</u>

b<u>Minnesota Legal Status:</u> 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.

 $c_{\underline{Federal \ Legal \ Status:}}$ T = Federal Threatened; E = Federal Endangered; P = Federal Protection by the Migratory Bird Treaty Act or Bald Eagle Protection Act or CITES.

 $d_{\underline{Species Occurrence:}}$ 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

renteen die Speetes En	51			
Terrestrial Vertebrate February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
AMPHIBIANS(n=13)				
Blue-spotted Salamander	Ambystoma laterale			
Tiger Salamander	Ambystoma tigrinum			
Four-toed Salamander	Hemidactylium scutatum	SC		
Redback Salamander	Plethodon cinereus			
Eastern Newt	Notophthalmus viridescens			
American Toad	Bufo americanus	PWA		
Gray Treefrog	Hyla versicolor	PWA		
Western Chorus Frog	Pseudacris triseriata	PWA		
Spring Peeper	Pseudacris crucifer	PWA		

Table 7.1 Terrestrial Vertebrate Species List

Terrestrial Vertebrate February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Green Frog	Rana clamitans	PWA		
Northern Leopard				
Frog	Rana pipiens	PWA		
Mink Frog	Rana septentrionalis	PWA		
Wood Frog	Rana sylvatica	PWA		
REPTILES (n=6)				
Snapping Turtle	Chelydra serpentina	PWA, SC		
Painted Turtle	Chrysemys picta	PWA		
Wood Turtle	Clemmys insculpta	PWA. T		
Blanding's Turtle	Emydoidea blandingii	PWA, T		
	Storeria			
Redbelly Snake	occipitomaculata			
Common Garter Snake	Thamnophis sirtalis			
BIRDS (n=181)				
Pied-billed Grebe	Podilymbus podiceps	PB	Р	
Red-necked Grebe	Podiceps grisegena	PB	Р	
American White	Pelecanus			
Pelican	erythrorhynchos	PB, SC	Р	
Double-crested	Dhalaaraaaray auritus	UВ	D	
American Bittern	Potourus lentiginosus	DD	I D	
L aget Dittorn	Ivobruohus ovilis		n D	
Dirda n=191		ID	1	
Creat Dive Heren	Andre have dies	סת	D	
Great Blue Heron	Ardea nerodias	PB	P D	
Green Heron	Butorides virescens	PB MW	Р	
Trumpeter Swan	Cygnus buccinator	гь, мw, Т	Р	
Canada Goose	Branta canadensis	PB MW	P	
Wood Duck	Aix sponsa	PB MW	P	
Green-winged Teal	Anas crecca	PR MW	r P	
American Black Duck	Anas rubrines	PR MW	r P	
Mallard	Anas nlatyrhynchos	PR MW	r P	
Blue-winged Teal	Anas discors	PR MW	r P	
American Wigeon	Anas americana	PR MW	ı D	
Redhead	Authya americana	PR MW	D	
Ring necked Duck	Aythya colloric	DR MW	r D	
Common Coldonava	Rucenhala clangula		ı D	
Useded Marsaraar		\mathbf{PD} \mathbf{MW}	r D	
Common Mar	Lophodytes cucultatus	PB, MW	r D	
Common Merganser	Gatherite	РВ, MW	r D	
1 urkey Vulture	Catnartes aura	РВ	r D	
Osprey	Pandion haliaetus	PD CC	ľ D/T	
Bald Eagle	Haliaeetus	PB, SC	P/T	

Terrestrial Vertebrate	e Species List			
February 2007				
		MN legal	Federal legal	Species Occurrence by ECS
Common Name ^a	Scientific Name ^a	status ^b	status ^c	Subsection ^d
	leucocephalus			
Northern Harrier	Circus cyaneus	PB		
Sharp-shinned Hawk	Accipiter striatus	PB		
Northern Goshawk	Accipiter gentilis	PB		
Red-shouldered Hawk	Buteo lineatus	PB, SC		
Broad-winged Hawk	Buteo platypterus	PB		
Red-tailed Hawk	Buteo jamaicensis	PB		
American Kestrel	Falco sparverius	PB		
Merlin	Falco columbarius	PB		
Peregrine Falcon	Falco peregrinus	PB, T		
Spruce Grouse	Falcipennis canadensis	PB, SG		
Ruffed Grouse	Bonasa umbellus	PB, SG		
Sharp-tailed Grouse	Tympanuchus phasianellus	PB, SG		
	Coturnicops			
Yellow Rail	noveboracensis	PB, SC		
Virginia Rail	Rallus limicola	PB, SG		
Sora	Porzana carolina	PB, SG		
American Coot	Fulica americana	PB, SG		
Sandhill Crane	Grus canadensis	PB		
Piping Plover	Charadrius melodus	PB, E	E&T	
Killdeer	Charadrius vociferus	PB		
Spotted Sandpiper	Actitis macularia	PB		
Upland Sandpiper	Bartramia longicauda	PB		
Wilson's Snipe				
American Woodcock	Scolopax minor	PB, SG		
Wilson's Phalarope	Phalaropus tricolor	PB, T		
Ring-billed Gull	Larus delawarensis	PB		
Herring Gull	Larus argentatus	PB		
Common Tern	Sterna hirundo	PB, T		
Forster's Tern	Sterna forsteri	PB, SC		
Black Tern	Chlidonias niger	PB		
Rock Dove	Columba livia	PB		
Mourning Dove	Zenaida macroura	PB		
	Coccyzus	DD		
Black-billed Cuckoo	erythropthalmus	гв		
Great Horned Owl	Bubo virginianus	DB UR		
Northern Hawk Owl	Surnia ulula	ЪР		
Barred Owl	Strix varia	P.B.		
Great Gray Owl	Strix nebulosa	РВ		
Long-eared Owl	Asio otus	РВ		
Short-eared Owl	Asio flammeus	PB, SC		

Terrestrial Vertebrate February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Boreal Owl	Aegolius funereus	РВ		
Northern Saw-whet Owl	Aegolius acadicus	PB		
Common Nighthawk	Chordeiles minor	PB		
Whip-poor-will	Caprimulgus vociferus	PB		
Chimney Swift	Chaetura pelagica	PB		
Ruby-throated Hummingbird	Archilochus colubris	PB		
Belted Kingfisher	Ceryle alcyon	PB		
Red-headed	Melanerpes			
Woodpecker	erythrocephalus	PB		
Yellow-bellied Sapsucker	Sphyrapicus varius	PB		
Downy Woodpecker	Picoides pubescens	PB		
Hairy Woodpecker	Picoides villosus	PB		
Three-toed Woodpecker	Picoides tridactylus	PB		
Black-backed				
Woodpecker	Picoides arcticus	PB		
Northern Flicker	Colaptes auratus	PB		
Pileated Woodpecker	Dryocopus pileatus	PB		
Olive-sided Flycatcher	Contopus cooperi	PB		
Eastern Wood-Pewee	Contopus virens	PB		
Yellow-bellied Flycatcher	Empidonax flaviventris	PB		
Alder Flycatcher	Empidonax alnorum	PB		
Least Flycatcher	Empidonax minimus	PB		
Eastern Phoebe	Savornis phoebe	PR		
Great Crested Flycatcher	Myjarchus crinitus	PB		
Fastern Kinghird	Tyrannus tyrannus	PR		
Horned I ark	Fremonhila alpestris	PR		
Purple Martin	Progne subis	PR		
Tree Swellow	Taabyainata biaalar			
Northern Rough	Stelgidonteryy	гD		
winged Swallow	serripennis	PB		
Bank Swallow	Rinaria rinaria	PR		
	Petrochelidon	n D		
Cliff Swallow	pyrrhonota	РВ		
Barn Swallow	Hirundo rustica	PB		
Gray Jay	Perisoreus canadensis	PB		
Blue Jay	Cyanocitta cristata	PB		
Black-billed Magpie	Pica pica	UB		
American Crow	Corvus brachyrhynchos	PB		

Terrestrial Vertebrate	e Species List			
February 2007				
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Common Raven	Corvus corax	PB	200000	
Black-capped	Corvus corux	1.0		
Chickadee	Poecile atricapillus	PB		
Boreal Chickadee	Poecile hudsonicus	PB		
Red-breasted Nuthatch	Sitta canadensis	PB		
White-breasted				
Nuthatch	Sitta carolinensis	PB		
Brown Creeper	Certhia americana	PB		
House Wren	Troglodytes aedon	PB		
Winter Wren	Troglodytes troglodytes	PB		
Sedge Wren	Cistothorus platensis	PB		
Marsh Wren	Cistothorus palustris	PB		
Golden-crowned Kinglet	Regulus satrapa	PB		
Ruby-crowned Kinglet	Regulus calendula	PB		
Eastern Bluebird	Sialia sialis	PB		
Veerv	Catharus fuscescens	PB		
Swainson's Thrush	Catharus ustulatus	PB		
Hermit Thrush	Catharus guttatus	PB		
Wood Thrush	Hylocichla mustelina	PB		
American Robin	Turdus migratorius	PB		
Grav Cathird	Dumetella carolinensis	PB		
Brown Thrasher	Toxostoma rufum	PB		
European Starling	Sturnus vulgaris	UB		
Cedar Waxwing	Bombycilla cedrorum	PR		
Blue-headed Vireo	Vireo solitarius	PR		
Vellow-throated Vireo	Vireo flavifrons	PR		
Warbling Vireo	Vireo gilvus			
Philadelphia Vireo	Vireo philadelphicus			
Pad avad Viraa	Vireo olivacous			
Golden-winged	Vermiyora chrysoptera	PR		
Tennessee Warhler	Vermiyora pereorina	PR		
Nashville Warhler	Vermiyora ruficanilla	PR		
Northern Parula	Parula americana			
Vellow Warhler	Dendroica netechia	PR		
Chestnut-sided				
Warbler	Dendroica pensylvanica	РВ РВ		
Magnolia Warbler	Dendroica magnolia	РВ		
Cape May Warbler	Dendroica tigrina	PB		
Black-throated Blue Warbler	Dendroica caerulescens	РВ		
Yellow-rumped	Dendroica coronata	PB		

Terrestrial Vertebrate February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Warbler				
Black-throated Green	Dandasias sinona	מת		
Warbler	Dendroica virens	PB		
Blackburnian warbler	Dendroica fusca	PB		
Pine Warbler	Dendroica pinus	PB		
Palm Warbler	Dendroica palmarum	PB		
Bay-breasted Warbler	Dendroica castanea	PB		
Warbler	Mniotilta varia	PR		
American Redstart	Setophaga ruticilla	PR		
Ovenhird	Seiurus aurocapillus	PR		
Northern Waterthrush	Seiurus noveboracensis	PR		
Connecticut Warbler	Oporornis agilis	PR		
Mourning Warbler	Oporornis philadelphia	PR		
Common Vollouthroot	Coothlymia triches			
Wilson's Worklan	Wilconio musillo			
Wilson's warbler				
Canada Warbler	wilsonia canadensis	PB		
Scarlet Lanager	Piranga olivacea	РВ		
Grosbeak	Pheucticus Iudovicianus	PR		
Indigo Bunting	Passerina cyanea	PR		
Fastern Towhee	Pinilo erythronhthalmus	PR		
Chipping Sparrow	Spizella passerina	PR		
Clay colored Sparrow	Spizella pallida			
Versen Sparrow				
vesper Sparrow	Pooecetes gramineus	РВ		
Savannah Sparrow	sandwichensis	PB		
Le Conte's Sparrow	Ammodramus leconteii	PB		
Nelson's Sharp-tailed				
Sparrow+A178	Ammodramus nelsoni	PB, SC		
Song Sparrow	Melospiza melodia	PB		
Lincoln's Sparrow	Melospiza lincolnii	PB		
Swamp Sparrow	Melospiza georgiana	PB		
White-throated				
Sparrow	Zonotrichia albicollis	PB		
Dark-eyed Junco	Junco hyemalis	PB		
Bobolink	Dolichonyx oryzivorus	PB		
Red-winged Blackbird	Agelaius phoeniceus	UB		
Eastern Meadowlark	Sturnella magna	PB		
Western Meadowlark	Sturnella neglecta	PB		
Yellow-headed	Xanthocephalus			
Blackbird	xanthocephalus	UB		
Rusty Blackbird	Euphagus carolinus	UB		

Terrestrial Vertebrat February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Brewer's Blackbird	Euphagus cyanocephalus	UB		
Common Grackle	Quiscalus quiscula	UB		
Brown-headed Cowbird	Molothrus ater	PB		
Baltimore Oriole	Icterus galbula	PB		
Purple Finch	Carpodacus purpureus	PB		
House Finch	Carpodacus mexicanus	PB		
Red Crossbill	Loxia curvirostra	PB		
White-winged Crossbill	Loxia leucoptera	PB		
Pine Siskin	Carduelis pinus	PB		
American Goldfinch	Carduelis tristis	PB		
Evening Grosbeak	Coccothraustes vespertinus	PB		
House Sparrow	Passer domesticus	UB		

Terrestrial Vertebrate February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
MAMMALS (n=56)				
Cinereus Shrew	Sorex cinereus			
Water Shrew	Sorex palustris			
Smoky Shrew	Sorex fumeus	SC		
Arctic Shrew	Sorex arcticus			
Pygmy Shrew	Sorex hoyi			
Northern Short-tailed Shrew	Blarina brevicauda			
Star-nosed Mole	Condylura cristata			
Little Brown Bat	Myotis lucifugus			
Northern Myotis	Myotis septentrionalis	SC		
Silver-haired Bat	Lasionycteris noctivagans			
Eastern Pipistrelle	Pipistrellus subflavus	SC		
Big Brown Bat	Eptesicus fuscus			
Eastern Red Bat	Lasiurus borealis			
Hoary Bat	Lasiurus cinereus			
Eastern Cottontail	Sylvilagus floridanus	PWA, SG		
Snowshoe Hare	Lepus americanus	PWA, SG		
Least Chipmunk	Tamias minimus			
Eastern Chipmunk	Tamias striatus			
Woodchuck	Marmota monax			
Thirteen-lined Ground Squirrel	Spermophilus tridecemlineatus			
Franklin's Ground Squirrel	Spermophilus franklinii			
Eastern Gray Squirrel	Sciurus carolinensis	PWA, SG		
Eastern Fox Squirrel	Sciurus niger	PWA, SG		
Red Squirrel	hudsonicus			
Northern Flying				
Squirrel	Glaucomys sabrinus			
American Beaver	Castor canadensis	PWA, SG, F		
Woodland Deer	Peromyscus			
Willia front 1 2 fr	maniculatus gracilis			
White-footed Mouse Southern Red-backed	Clathrianon and and and a			
Fastern Heather Vole	Phenacomys ungava	SC		

Terrestrial Vertebrat February 2007	e Species List			
Common Name ^a	Scientific Name ^a	MN legal status ^b	Federal legal status ^c	Species Occurrence by ECS Subsection ^d
Meadow Vole	Microtus			
Pock Vole	Microtus chrotorrhinus			
KOCK VOIE	Microtus chrotorrinnus	PWA		
Muskrat	Ondatra zibethicus	SG, F		
Southern Bog				
Lemming	Synaptomys cooperi			
Northern Bog Lemming	Synaptomys borealis	SC		
Meadow Jumping Mouse	Zapus hudsonius			
Woodland Jumping Mouse	Napaeozapus insignis			
North American	Fuethings demostration	T 1337 A		
Porcupine	Conin lateran	UWA		
		UWA	TF.	
Gray Wolf	Canis lupus	SC DWA	1	
Red Fox	Vulpes vulpes	PWA, SG, F		
	Urocyon	PWA,		
Gray Fox	cinereoargenteus	SG, F		
		PWA,		
American Black Bear	Ursus americanus	BG		
Northern Raccoon	Procyon lotor	PWA, SG, F		
American Marten	Martes americana	PWA, SG, F		
Fisher	Martes pennanti	PWA, SG, F		
Ermine	Mustela erminea	UWA		
T / TT / 1		UWA,		
Least Weasel	Mustela nivalis	SC DWA		
American Mink	Mustela vison	PWA, SG, F		
American Badger	Taxidea taxus	PWA, SG, F		
Striped Skunk	Mephitis mephitis	UWA		
Northern River Otter	Lontra canadensis	PWA, SG, F		
Canada Lynx	Lynx canadensis	PWA, SG, F	Т	
Bobcat	Lynx rufus	PWA, SG, F		
White-tailed Deer	Odocoileus virginianus	PWA, BG		
Moose	Alces alces	PWA, BG		

WILDLIFE SPECIES LIST / HABITAT RELATIONSHIPS - ASPEN PARKLANDS

This page contains a standard table header format, column/row format, content description and selected species examples for the following tables: Amphibians and Reptiles, Birds, and Mammals.

	H M	Bird ha	abitat preste	relati	onship es>>>	s by N	Ainne	sota	Gap /	Analy	sis F For	Project est la	t (M nd c	IN-G	AP) type:	land s>>>	cove	er typ	pe>>	>			_										_			_
		Urb	an/ De	ev. Aj	g./Grass	S	hrub		Aquat	tic		Uplar	id Co	onifero	us For	rest		1	Lowla	and Co	onifero	ous Fo	rest	Upl	land I Fo	Decidu	uous	Dec	Lowla	ind Fores	t		Fore	st 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	Water	Floating aquatic	Sedge Meadow Broadleaf sedge/Cattail	Jack Pine	Red Pine	While Fine mix Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Coniter	Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak Manle/Basewood	Upland deciduous mix	Black Ash	Silver Maple	Cottonwood Lowland deciduous mix	Low. deciduous/coniferous mix	Condline	Sapling	Pole timber	Saw timber	Uneven
NUTHATCHES																																				
White-breasted Nuthatch	CS						-		_	-								1	1		-			Y	Y	YY	Y	Y	Y	YY		L		Y	Y	Y

The above table and its content serve to note vertebrate wildlife species and habitat relationships (i.e. land cover types, habitat features and forest size class) for those species that are known/predicted to occur and breed in the Aspen Parklands ECS subsection. Details to this information is as follows:

SPECIES GROUP:	Notes a common species group to search by.
Species common name:	Species common name as standardized through NatureServe located at <www.natureserveexplorer.org>.</www.natureserveexplorer.org>
Habitat feature:	C = Cavity, D = Dead/down material, M = Mast, R = Riparian, S = Snag, V = Vernal pool
Habitat relationships:	Y = species untilizes noted land cover type for at least part of its habitat needs (i.e. patch size or buffer distance not noted in this simplified matrix).
Forest size class/successional	
stage:	Y = species utilizes noted age class/successional stage for at least part of its habitat needs.

DISCLAIMER: Information and data listed in these tables has been produced by ongoing wildlife species assessment efforts conducted under the *Minnesota Gap Analysis Project (MN-GAP)*. This effort 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 suggested revisions.

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH AND WILDLIFE Table 7.2 Mammal habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type

WILDLIFE SPECIES LIST/HABITAT RELATIONSHIPS - MAMMALS

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

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

			Urba	an/ D	ev.	Ag./	Grass		Shru	b		Aqua	atic			Uplar	nd Co	onifer	ous F	orest			L	owlar	nd Cor	iifero	us Fo	rest	U	oland F	Dec	iduou t	15	L Decid	owla uous	nd Fore	est			For	est si	ze cla	ass
SPECIES GROUP Species common name	habitat Feature	Barren	High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	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 Springe	Inland Black Springe	Up. N. White Cedar	Upland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Staonant N White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash		Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seeding	Data Data Data Data Data Data Data Data	Saw timber	Uneven
INSECTIVORES																																											
Northern Short-tailed Shrew	D			Y		1	YY	Y	Y	Y			Y	Y	Y	Y	Y	Y		T	Τ	Y	Y		Y	N		1	Y	Y	Y	Y	Y	Y	r	Y	Y	Y	Ŀ	YY	(Y	Y	Y
Arctic Shrew	R								Y	Y			Y	Y									Y	Y	Y	YY	Y	Y						-				Y		YY	Y	Y	Y
Pygmy Shrew	D						YY	Y	Y	Y			Y	Y		1	YY	YY	Y	1	Y	Y	Y	Y	Y	YY	Y	Y				Y		Y		1	Y	Y		YY	Y	Y	Y
Water Shrew	DR							T	Y	Y	Y		Y	Y									Y	Y	Y	YY	Y	Y											F		Y	Y	Y
Star-nosed Mole	DR								Y	Y			Y	Y									Y	Y	Y	YY	Y	Y						Y	Y	1	Y	Y	Γ		Y	Y	Y
BATS																																											
Big Brown Bat	CRS			Y			YY				Y				Y	Y	Y	1	Y	1		Y					Τ		Y	Y	Y		Y		1	Y	Y	Y	Г		Y	Y	
Silver-haired Bat	CRS										Y					Y	Y	1	1		Y	Y	Y		Y	1	1		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
Eastern Red Bat	CR		Y	Y		1	Y	Y	Y		Y			Y				3	(Y	1									Y	Y	Y	Y	Y	Y	Y	Y	Y					Y	Y
Little Brown Bat	CRS					1	YY	Y	Y		Y		Y	Y	Y	Y	YY	YY	Y	1	Y	Y	Y		Y	Y	(Y	Y	Y	Y	Y	Y	Y		Y	Y	1	Y			
CARNIVORES																																											
Coyote	M	Y		Y		Y	YY	Y	Y	Y			Y	Y	Y	Y	Y	YY	()	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		YY	Y	Y	Y
Gray Wolf	M					Y	Y	Y	Y	Y					Y	Y	Y	YY	()	Y	Y	Y	Y	Y	Y	YY	(Y	Y	Y	Y	Y	Y	Y	Y	Y	Y '	Y	Y	- [2	YY	7 Y	Y	Y
Gray Fox	CDM					Y	YY	Y	Y																					Y	Y	Y	Y	Y	Y	Y '	Y					Y	Y
Red Fox		Y		Y		Y	YY	Y	Y				Y	Y	Y	Y	Y	YY	()	Y	Y	Y							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Ľ	YY	7 Y	/ Y	Y
Bobcat	CD							Y	Y						Y	Y	Y	YY	()	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y		YY	Y	/ Y	Y
Canada Lynx								Y	Y	Y					Y	Y	Y	YY	1	Y	Y	Y	Y	Y	Y	YY	Y	Y					Y	Y				Y					
Northern River Otter											Y	Y	Y	Y													_						_										
American Marten	CDS														Y	Y	Y	YY	()	(Y	Y	Y	Y	Y	Y	Y	YY	Y		_								Y	L		Y	/ Y	Y
Fisher	CDRS								Y								1	YY	()	1	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L	_	Y	<u>/ Y</u>	'Y
Ermine	DR							Y	Y						Y	Y	Y	YY	()	(Y	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		YY	YY	Y	Y Y
Least Weasel		Y				Y	YY	<u></u>					Y	Y	Y	Y	Y	N	1	-		Y								Y									F		+		
Long-tailed Weasel	DR						_	Y	Y						_	Y	Y	YY	()	Y	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	- P	YY	YY	(Y)	Y
American Mink	DR				_	-	-		Y		Y	Y	Y	Y		_				_	-					_	_	_			_				-	_	4		H	-	+	+	
American Badger						Y	YY	Y	1												_									Y			_				\rightarrow		F	_	+	+	
Striped Skunk	DM			Y		Y	YY	Y					_		Y	Y	Y	YY	()	Y	Y	Y							Y	Y	Y	Y	Y		_	-	_		H	Y	rY	Y	Y
Northern Raccoon	CMRS	Y		Y	\downarrow	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	YY	()	Y	Y	Y				_	-	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y
American Black Bear	CDMR		1		_			Y						_		Y	YI	YIY	YIY	(Y)	Y	Y	Y	Y	Y	Y	YYY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	- 13	YIY	YY	1 Y	Y

Date: 8/27/2009

Mammal Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT, MNDNR - DIVISION OF FISH WILDLIFE

WILDLIFE SPECIES LIST/HABITAT RELATIONSHIPS - MAMMALS

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

		NO	n-Fo	rest l	and c	ove	r typ	es>	>>	_				Fo	rest	land	d cov	ver t	ypes	>>>		_																				_
*	Non-Forest land cover types Server types Forest land cover types Unband Dev. Ag./Grass Shrub Aquatic Upland Coniferous Forest Urban/ Dev. Ag./Grass Shrub Aquatic Upland Coniferous Forest Urban/ Dev. Ag./Grass Shrub Aquatic Upland Coniferous Forest Urban Urban Urban Urban Urban Urban V Y Y Y Y Y Y V Y Y Y Y Y Y Y V Y Y Y Y Y Y Y Y V Y Y Y Y Y Y Y Y V Y Y Y Y Y Y Y Y Y V Y Y Y Y Y Y Y Y Y V Y Y Y Y Y Y Y Y Y Y Y Y Y Y <th></th> <th>I</th> <th>Lowla</th> <th>nd Co</th> <th>nifero</th> <th>us For</th> <th>rest</th> <th>Uj</th> <th>pland Fo</th> <th>Decio</th> <th>duous</th> <th>s I</th> <th>Lo Decidu</th> <th>wland ous F</th> <th>l orest</th> <th></th> <th></th> <th>Fc</th> <th>orest</th> <th>size c</th> <th>lass</th> <th></th>								I	Lowla	nd Co	nifero	us For	rest	Uj	pland Fo	Decio	duous	s I	Lo Decidu	wland ous F	l orest			Fc	orest	size c	lass														
SPECIES GROUP Species common name	habitat Feature	Barren	High intensity urban	Low intensity urban	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	Water	Floating aquatic Sedoe Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar Ubland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	Tamarack	Stagnant tamarack	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Red Oak	Maple/Basswood	Upland deciduous mix	Black Ash Silver Manle	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seedling	Sapling	Pole timber	Jaw unious Uneven	
EVEN-TOED UNGULATES																																										
Elk					Y	Y	Y	Y	Y			Y	·															Y				T					П	Y	Y	YY	Y	-
White-tailed Deer					Y	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	YY	Y							Y	Y	Y	Y	Y	YY	Y	Y	Y	ΙΓ	Y	Y	YY	Y	
Moose	R				Y	Y		Y	Y			YY	Y	Y	Y	Y	Y	Y	Y	YY	Y							Y	Y		Y	Y	Y		Y	Y	1 [Y	Y	YY	Y	
RODENTS																																										
Northern Flying Squirrel	CDMS	1									T			Y	Y	Y	Y	Y	Y	YY	Y	\top				1	T				Y	+	T	T		Y	1 F	T		1	/ Y	1
Woodchuck				Y	Y	Y		Y	Y	1				\top							\top	\top							Y	Y		+	-	+			11	Y	+	-	1	
Eastern Gray Squirrel	CDM			Y	Y									Г							Y	1					1		Y	Y	Y	Y	Y	1			11		+	3	1	٦
Eastern Fox Squirrel	CDM			Y		Y								T							1	\square							Y	Y	Y	Y	Y	1			11			1	Y	7
Franklin's Ground Squirrel			\square	Y		Y	Y	Y													\top	\square										T		+			11			YY	1	1
Thirteen-lined Ground Squirrel				Y	Y	Y	Y	Y													T	Γ										T					1 1					٦
Least Chipmunk	DM						Y	Y	Y					Y	Y	Y	Y	Y	Y	YY	Y				N	1		Y				Y					1 [Y	Y	YY	(Y	1
Eastern Chipmunk	DM			Y		Y		Y	Y						Y	Y		Y	Y	YY	Y							Y	Y	Y	Y	Y		Y			1 [Y	Y	YY	(Y	
Red Squirrel	CDMS													Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	YY	Y	Y									Y				YY	(Y	
American Beaver	R							Y	Y		Y																	Y			1	Y						Y	Y	YY	/ Y	
Plains Pocket Gopher					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																	11	Y	\rightarrow		\perp	
Prairie Deer Mouse																																\perp					11	_		_		
White-footed Mouse	CDMS		\square					Y		_		_	-	Y	Y	Y	Y	Y	Y	Y	Y							Y	Y	Y	Y	Y	YY	Y	Y		11	Y	Y	YY	(Y	_
Southern Red-backed Vole	DM		\square			-		Y	Y	Y	_	_	_	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	11	Y	Y	YY	(Y)	1
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Muskrat	R		\vdash		_				Y		Y	Y	Y			-				_					_	_	-			\rightarrow		\downarrow		-	-		44	_	\rightarrow	-	-	
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Eastern Cottontail			Y	Y	Y	Y	Y	Y	Y					T	1	T					Y							Y	Y	Y	Y	Y		Y	Y		П	Y	Τ			
Snowshoe Hare								Y	Y	Y				Y	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	YY	Y	Y	Y] [Y	Y	YY	YY	1
White-tailed Jackrabbit						Y	Y	Y	Y		T																					T					Ιſ					1

51 Mammal species

Table 7.3 Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type

WILDLIFE SPECIES LIST / HABITAT RELATIONSHIPS - BIRDS

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			Urba	an/ Dev.	. Ag	,/Gras	s	Shr	ub		Aqu	atic			Upla	und C	onife	rous	Forest			La	owland	i Con	iferou	s For	est	Upl	and I Fo	Decid rest	uous	De	Lov	vland ous Fo	rest			For	est siz	ze cla	iss
SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban Transportation	Cropland	Grassland	Prairie	Upland shrub I owland decidnous shruh	Lowland evergreen shrub	Water	Floating aquatic	Sedge Meadow	Broadleaf sedge/Cattail	Jack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Up. N. White Cedar	Upland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	Tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Ked Oak	Maple/Basswood Unland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seedling	Pole timber	Saw timber	Uneven
LOONS AND GREBES																																									
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Horned Grebe							+	+	+	Ŷ	Y	-	Y		+	+	+	+	+	\square			-	+	+	+			+	+	+	┢	+	\vdash			ŀ		N	A	-
Red-necked Grebe							+	-	-	Ŷ	Y		Y		+	+	+	+	+					+	+	+			+	+	+	+	+	\vdash			ŀ		N/	A	_
Eared Grebe							+	+	+	Ŷ	Ŷ		Ŷ		-	+	-	+	-				-	+	+	+			+	+	+	+	+	+	+		ŀ		N/	A	
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SWANS AND GEESE																																									
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DUCKS AND MERGANSERS																																									
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Gadwall	Y				Y	Y	Y			Y	Y	Y	Y													1	1					1	1						N	A	

Date: 8/27/2009

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Bird Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH AND WILDLIFE

Aspen Parklands SFRMP Assessment

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

		NO	n-For	estec	1 typ	es>>	>>	_			_	_	_	F	ores	t lar	nd co	over	r typ	es>>	>>																				_				
			Urba	n/ Dev	/. A	.g./Gr	ass	5	Shrub		A	quat	ic		U	Jplan	d Cor	nifero	ous F	orest			L	owlar	id Co	nifer	ous l	Fores		Upl	and l Fc	Deci	luous	s I	Lo Decidu	owla 1005	and s Fore	est			Fe	orest	size	class	s
SPECIES GROUP Species Common Name	Habitat feature	Instruction Advance Uppendiction Advance Uppendiction Advance Uppendiction Advance Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction		Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Ked Uak	Maple/Basswood	Upland deciduous mix	Black Ash Silvar Manla		Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven																							
Northern Pintail	R				Y	Y	Y	_		1	YY	()	()	Y																				T			T	Т		Γ		1	NA		
Green-winged Teal	R					Y	Y	Y	Y	1	YY	()	$\langle \rangle$	Y																												1	NA		
Ring-necked Duck				_					Y	1	YY	()	1	Y		\perp																		\perp				\perp				1	NA		
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Northern Harrier					Y	Y	Y	Y	1	Y		+	+	+		-		+	+	+		-		Y		Y		+	+						YY	7	Y	Y	Y	ľ		+	-	-	-
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Broad-winged Hawk						Y		Y							YY	Z Y	Y	Y	7		Y	Y								Y	Y	Y	Y	Y		T	T	T		I				Y	Y
Swainson's Hawk					Y	Y	Y	Y	Y	Τ		1	Y		YY	Z Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	YY	1	Y	Y	Y						
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Date: 8/27/2009

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

	Montel correction 							_						_																														
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SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban	1 ransportation Cronland	Grassland	Forest land cover types>>> Shrub Aquatic Upland Coniferous Forest rass Shrub Aquatic Upland Coniferous Forest understand Rund Rund Rund understand Rund Rund Rund understand Rund Rund Rund understand Red Rund Rund Rund understand Red Rund Rund Rund understand Y Y Y Y understand Y Y Y Y		Upland Conifer	Up. coniferous/deciduous mix	Lowland Black Spruce	Stagnant black spruce	I amarack	Stagnant tamarack	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	Sapung Dela timbar	Pole unuce Caw timber	Jaw united	Uneven												
CRANES																																												
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Long-eared Owl					+	Y					+		Y	+	YY	Y	Y	Y	Y	Y	Y	Y	Y		Y	N	1	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		-	+	1	1	Y
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Date: 8/27/2009

Bird Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH AND WILDLIFE

Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>> Non-Forested types>>>

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			Urba	n/ De	v. 4	Ag./Gi	rass	S	hrub		А	quat	ic		Ul	pland	Con	iferou	ıs For	est			Lov	wland	Conif	erous	Fore	st	Uŗ	oland F	Deci orest	duous	E	Lo Decidu	wlan ious I	d Forest	t			Fore	st siz	e cla	ss
SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban	I ransportation Cronland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub	Lowland evergreen shrub	water	Floating aquatic Sedre Meedow	Broadleaf sedøe/Cattail	lack Pine	Red Pine	White Pine mix	Balsam Fir mix	White Spruce	Upland Black Spruce	Up. N. White Cedar	Upland Coniter	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 Asn Silver Manle	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
NIGHTJARS														Γ							Τ	Τ		T									T				Ĺ	1					
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Date: 8/27/2009

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

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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	while Spruce	Uptanu Black Spruce	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
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Bird Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH AND WILDLIFE

Aspen Parklands SFRMP Assessment

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

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SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shrub I owland 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 Uhland Conifer	Uptanta Conference/deciduous miv	T and Dlack Corner	Comment black opince	Jagilalit Diack spince Tamarack	Stagnant tamarack	Low. N. White Cedar	Stagnant N. White Cedar	Stagnant conifer	Aspen/White Birch	Bur/white Oak		Inland deciduous mix	Dial Ach	Silver Maple	Cottonwood	Lowland deciduous mix	I ow deciduous/coniferous mix	LOW, decidations contracted man	Sedling	Sapling	Pole timber	Saw timber	Uneven
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Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>>>

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SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban	Low intensity urban	Transportation	Cropianu	Prairie	Unland 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	I Inland Black Snnice	Un. 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	Sanling	Pole timber	Saw timber		Uneven
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Bird habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type>>

	1	Non	Fore	sted	type	es>>	>>	_	_	_		_	_		Fore	est la	and	cov	er ty	ypes	>>>	>		_	_																				
			Jrban/	Dev.	Ag	g./Gra	ass	S	hrub			Aqu	atic			Upla	und C	Conif	erous	Fore	est			Lo	wlan	d Co	nifero	ous F	orest	ť	Upl	and D For	Decidu rest	ious	De	Lov	wlanc ous F	i orest			I	Fores	st size	e clase	s
SPECIES GROUP Species Common Name	Habitat feature	Barren	High intensity urban I ow 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 Coniter	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 Manle/Rasswood	Unland deciduous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mix		Seedling	Sapling	Pole timber	Saw timber	Uneven
FINCHES																																													
Purple Finch	M		Y														Y	Y	Y	Y	1	Y			Y		Y	Y	Y	Y				Τ	T	T	Γ		Y	1			Y	Y	Y
House Finch	М		YY	~						Т																														1			\square		
Pine Siskin	М	Τ	Y	1						T					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					T				Y				Y	Y	
American Goldfinch			Y	1		Y		Y	Y	T												T								ľ	Y	YY	YY	Y						1	Y				

161 Bird species

Date: 8/27/2009

Bird Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH AND WILDLIFE

Table 7.4 Amphibian and Reptile habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type

WILDLIFE SPECIES LIST / HABITAT RELATIONSHIPS - AMPHIBIANS AND REPTILES

Amphibian habitat relationships by Minnesota Gap Analysis Project (MN-GAP) land cover type Non-Forest land cover types>>> Forest land cover types>>>

	ι	Jrba	ı∕ D	ev.	Ag	./Gr	ass	:	Shrut qn	p qr		Aqu	atic			Up	land	Coni	ferou	ıs Fo	rest	_		Lo	wlan	d Co	niferc	ous F	Forest	t	Upl	land I Fo	Decid	uous	De	Lo [,] ciduo	wland ous F	l orest	×	Fore	est tyj	24	e si
Barren	11: 1: 1: 1:	High intensity urban	Low intensity urban	Transportation	Cropland	Grassland	Prairie	Upland shrub	Lowland deciduous shr	Lowland evergreen shri	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 Ceda	Stagnant conifer	Aspen/White Birch	Bur/White Oak	Ked Oak	Inland decidnous mix	Black Ash	Silver Maple	Cottonwood	Lowland deciduous mix	Low. deciduous/coniferous mi	Seedling	Sapling	Pole timber	

AMPHIBIANS

SPECIES GROUP Species Common Name

TOADS AND FROGS

American Toad	RV	Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	YY	(Y		YY	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	1	Y	Y	Y	Y	Y
Canadian Toad		Γ		1	Y		T		Y	Y	Y															1			1	1									1		N	NA		
Cope's Gray Treefrog				1	YY	1	Y		Y	Y	Y	Y																	Y	1	Y								1			Т	Т	
Gray Treefrog	DRV					Τ	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y							Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	1				Y	Y
Western Chorus Frog	RV	Y	Y	1	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y							Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	1		Y	Y	Y	Y
Northern Leopard Frog	R	Г			Y	Y	Y		Y	Y	Y	Y											Y	N	7	1	YY	1		Т				Y	Y	Y	Y	Y	1					
Wood Frog	DV						Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	YY	Y	1	YY	(Y	Y	1	Y	Y	Y	Y	Y	Y	Y	Y	1				Y	Y

SALAMANDERS

Tiger Salamander	V	Y	Y	Y	Y	Y	YY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	7		N	1	Y	Y	Y	1
Mudpuppy								Y	Y																										Г		N	A		1
Eastern Newt	DR							Y				Y	Y	Y					Y	Y		1		Y	Y	Y	Y	Y	Y	Y	Y	Y	1	Y	Г			Y	Y	1

10 Amphibian species

REPTILES

LIZARDS

Prairie Skink				Y	Y										Y						
SNAKES																					

SINARES

Smooth Green Snake			Y		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y							1	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	1	Y	_										
Redbelly Snake	D				Y						Y		Y	Y	Y						N	1	Y	Y	Y	Y	Y	1	Y	Y	Y	Y	Y	Y	1	Y	Y	Y	Y	1	Ý	Y					
Plains Garter Snake			Y	16	Y	Y					Y	Y									Г	Т																						N.	A		
Common Garter Snake	D	Y	Y	1	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	(Y	Y	Y	Y		Y	Y				I	

TURTLES

Snapping Turtle	R						Y	Y	Y													NA	A	1
Painted Turtle	DR					Y	Y	Y	Y													NA	A]

Date: 8/27/2009

Amphibian and Reptile Species/Habitats

MINNESOTA GAP ANALYSIS PROJECT MNDNR - DIVISION OF FISH WILDLIFE

Aspen Parklands SFRMP Assessment

WILDLIFE SPECIES LIST / HABITAT RELATIONSHIPS - AMPHIBIANS AND REPTILES

	Urban/ D	Dev. Ag./Grass	Shrub	Aquatic	Upland Coniferous Forest	Lowland Coniferous Forest	Upland Deciduous Forest	Lowland Deciduous Forest	Forest type size class
SPECIES GROUP	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

7 Reptile species

Amphibian and Reptile Species/Habitats

Date: 8/27/2009

APPENDICES

- A. Background on DNR Forest Inventory and Data Currency *Table A1.1: Elapsed time since most recent stand inventory*
- B. Ecological Classification System Figure A: Ecological Provinces, Sections, and Subsections of Minnesota, 1999
- C. Glossary
- D. Acronyms

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APPENDIX A

Background on DNR Forest Inventory and Data Currency

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 course 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 data 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 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.

A synopsis of the currency of field inventory is shown in table A1.1, below. It is important to keep in mind that only selected stands are scheduled for a visit depending on a number of factors. These include the years since inventory, known natural factors that may have impacted the stand, potential merchantability, potential for treatment, etc. These factors must be taken into consideration when looking at inventory data, using it in analysis, and making management decisions.

Years Since	Number of	Total
Inventory	Stands	Acres
1	31	961
2	3005	52369
3	54	999
4	70	1231
5	64	1081
6	133	2474
7	156	2946
8	242	5253
9	136	3182
10	192	4589
11	127	3808
12	139	3238
13	40	1184
14	31	812
15	29	650
16	7	114
19	13	294
20	5	87
21	1	2
22	4	48
23	3	125
25	192	4084
26	87	1140
27	278	4754
28	1	9
29	34	556
Totals	5074	95990

APPENDIX B

Ecological Classification System (ECS)

Contents

- I. Definition
- II. Purpose
- III. End Products

I. Definition

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

Ecological Classification System 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 association: Landscapes within subsections, characterized by glacial formations, bedrock types, topographic roughness, lake and stream patterns, depth to ground water table, and soil material (e.g., Alexandria Moraine).

Land type: The individual elements of land type associations, defined by recurring patterns of uplands and wetlands, soil types, plant communities, and fire history(e.g., fire-dependent xeric pine-hardwood association).

Community: Unique combinations of plants and soils within land types, defined by characteristic trees, shrubs and forbs, elevation, and soil moisture (e.g., sugar maple-basswood forest).

II. 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.

III. 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 A: Ecological Provinces, Sections, and Subsections of Minnesota, 1999



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APPENDIX C Glossary

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

Area forest resource management plan (AFRMP): Successor to timber management planning (TMP), recognizing that TMP discussions and decisions affected or included a lot more than the decision to harvest. This should not be confused with the comprehensive FRMPs developed for a number of areas in the mid-to late-1980s.

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

Age class: An interval, commonly 10 years, into which the age range of trees or forest stands is divided for classification or use.

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

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

Animal aggregations: A concentration of animals (of rare or common species or a mixture of rare and common) that occurs during part or all the species life cycle, such that when these animals are in these aggregations, they are highly vulnerable to disturbance. Examples are colonial water bird nesting sites, bat hibernacula, and mussel beds.

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

Annual work plan: The annual work responsibilities at the area (i.e., Division of Forestry administrative boundary) documented for the fiscal year.

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

Assessment: A compilation of information about the trends and conditions related to natural and socioeconomic resources and factors. The initial round of Subsection Forest Resource Management Plans (SFRMP) will focus primarily on trends and conditions of forest resources. Standard core assessment information sources and products have been defined. **Basal area:** The cross-sectional area of a tree taken at the base of the tree (i.e., measured at 4.5 feet above the ground). Basal area is often used to measure and describe the density of trees within an geographic area using an estimate of the sum of the basal area of all trees cross-sectional expressed per unit of land area (e.g., basal area per acre).

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

Biodiversity Significance: The relative value, in terms of size, condition and quality, of native biological diversity for a given area of land or water. *(Adapted from: Guidelines for MCBS Statewide Biodiversity Significance Rank):* The Minnesota County Biological Survey uses a statewide ranking system to evaluate and communicate the biodiversity significance of surveyed areas (MCBS Sites) to natural resource professional, state and local government officials, and the public. MCBS Sites are ranked according to several factors, including the quality and types of *Element Occurrences*, the size and quality of native plant communities, and the size and condition of the landscape within the Site. Areas are ranked as *Outstanding, High, Moderate, or Below the Minimum Threshold* for statewide biodiversity significance. *(Draft definition 3/24/2004)*

Outstanding Sites: Those containing the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes present in the state.

High Sites: Those containing the Abest of the rest@, such as sites with very good quality occurrences of the rarest species, high quality examples of the rarest native plant communities, and/or important functional landscapes.

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

Board foot: A unit of measuring wood volumes equaling 144 cubic inches. A board foot is commonly used to measure and express the amount of wood in a tree, sawlog, veneer log, or individual piece of lumber. For example, a 16-inch diameter at breast height (DBH) standing tree that is 80 feet tall, contains approximately 250 board feet of wood and a tree with a 30-inch DBH and 80 feet tall contains about 1000 board feet or one metric board foot (MBF). A piece of lumber one cubic foot (1 foot x 1 foot x 1 inch) contains one board foot of lumber.

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

Carr: Deciduous woodland or scrub on a permanently wet, organic soil. A carr develops from a bog, fen or swamp.

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

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

Coarse filter: Management of lands from a local to landscape scale that addresses the needs of all or most species, communities, environments, and ecological processes. In using a coarse filter approach (Hunter, 1990), it assumes that a broad range of habitats encompassing the needs of most species needs will be met, and their populations will remain viable on the landscape.

Cohort: a group of trees developing after a single disturbance, commonly consisting of trees of similar age.

Collaboration: A group in which members identify with the group and seriously consider the group's overall charge. Group members assume collective responsibility for outcomes, are interdependent, and have a joint ownership of decisions.

Common forest inventory: Also, known as CCSA (Common Cooperative Stand Assessment). Forest inventory stand data compiled by the Minnesota Interagency Information Cooperative from public agencies including the Minnesota DNR, Superior and Chippewa National Forests, and county land departments (2001). The common format contains the common attributes found in the state, federal, and counties forest inventories.

Competition: The struggle between trees to obtain sunlight, nutrients, water and growing space. Every part of the tree, from the roots to the crown, competes for space and food.

Comprehensive DNR subsection plans: Address Minnesota Department of Natural Resources (DNR) programs and activities within the subsection. Involves programs and activities of multiple DNR divisions, not just the Division of Forestry.

Comprehensive Division of Forestry SFRMPs: Address other aspects of forest resource management on DNR Forestry lands (e.g., recreation, land acquisition/sales, fire management, private forest management).

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

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

Cooperative stand assessment (CSA): The forest stand mapping and information system used by the DNR to inventory the approximately five million acres (7,800 square miles) owned and administered by the state. The spatial information and stand attributes are now maintained in the Forest Inventory Module (FIM).

09/01/09 Public Review Draft

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

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

Cover type: Expressed as the tree species having the greatest presence (i.e., in terms of volume for older stands or number of trees for younger stands) in a forest stand. A stand where the major species is aspen would be called an aspen cover type.

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

Critical habitat: habitat or habitat elements that must be present and properly functioning to assure the continued existence of the species in question.

Crop tree: any tree selected or retained to be a component of a future commercial harvest.

Cruise: (v) A survey of forestland to locate timber and estimate its quantity by species, products, size, quality, or other characteristics. (n) An estimate derived from such a survey.

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

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

Desired future forest composition (DFFC) goals: Broad vision of landscape vegetation conditions in the long-term future. For the purposes of the initial round of subsection planning, DFFC goals will focus on future desired forest composition looking ahead 50 years. DFFC goals may include aspects like 1) the amount of various forest cover types within the subsection, 2) age-class distribution of forest cover types, 3) the geographic distribution of these across the subsection, and the related level of management for even-aged forest, 4) extended rotation forest, etc.

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

Disturbance regime: Natural or human-caused pattern of periodic disturbances, such as fire, wind, insect infestations, or timber harvest.
Dominant trees: Trees that are in the upper layer of the forest canopy, larger than the average trees in the stand.

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

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

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

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

Ecologically important lowland conifers (EILC): includes stands of black spruce, tamarack, and cedar, including stagnant lowland conifer stands, that are examples of high quality native plant communities (NPC) that are representative of lowland conifer NPC's found in the subsections. The designated EILC stands will be reserved from treatment during this 10-year planning period. Future management/designation of these stands is yet to be determined.

Ecosystem based management: The collaborative process of sustaining the integrity of ecosystems through partnerships and interdisciplinary teamwork. Ecosystem based management seeks to sustain ecological health while meeting social and economic needs.

Element Occurrence (EO): An area of land and/or water where a rare feature (plant, animal, natural community, geologic feature, animal aggregation) is, or was present. An Element Occurrence Rank provides a succinct assessment of estimated viability or probability of persistence (based on condition, size, and landscape context) of occurrences of a given Element. An Element Occurrence Record is the locational and supporting data associated with a particular Element Occurrence. Element Occurrence Records for the State of Minnesota are managed as part of the rare features database by the Natural Heritage and Nongame Research Program. (Draft definition 3/24/2004, Adapted from Biotics EO Standards: Chapter 2)

Endangered species: A plant or animal species that is threatened with extinction throughout all or a significant portion of its range in Minnesota.

Even-aged: A forest stand composed of trees of primarily the same age or age class. A stand is considered even-aged if the difference in age between the youngest and oldest trees does not exceed 20 percent of the rotation age (e.g., for a stand with a rotation age of 50 years, the difference in age between the youngest and oldest trees should be 10 years).

Evenflow: Providing a relatively consistent amount of timber (or other products) in successive management periods.

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

Extended rotation forests (ERF): Forest stands for which the harvest age is extended beyond the normal or economic harvest age. ERF provides larger trees, old forest wildlife habitat, and other nontimber values. Additional details regarding management of ERF on DNR-administered lands is contained in the DNR Extended Rotation Forest Guidelines (1994). **Prescribed ERF** is the cover type acreage designated for management as ERF. Stands designated as ERF will be held beyond the recommended normal rotation (harvest) age out to the established ERF rotation age(s). A stand of any age can be prescribed as ERF. **Effective ERF** is defined as the portion of the prescribed ERF acreage that is actually over the normal rotation age for the cover type at any one time.

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

Fine filter: Management that focuses on the welfare of a single or only a few species rather than the broader habitat or ecosystem. For example, individual nests, colonies, and habitats are emphasized. A *fine filter* approach (Hunter, 1990) considers the specific habitat needs of selected individual species that may not be met by the broader coarse filter approach.

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

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

Forest land: Consists of all lands included in the forest inventory from aspen and pine cover types to stagnant conifers, muskeg, lowland brush, and lakes.

Forest management: the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Note: forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.

From: The Dictionary of Forestry. 1998. The Society of American Foresters. J.A. Helms, ed.

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

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

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

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

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

FORIST: The **FOR**estry Information SysTem (FORIST) is a collection of integrated spatial applications and datasets supporting day-to-day operations across the Division of Forestry. The first two parts of the system are in operation: Forest Inventory Module (FIM) and Silviculture and Roads Module (SRM). A Timber Sales Module is scheduled to be operational in 2006.

Fragmentation: Breaking up of large and contiguous ecosystems into patches separated from each other by different ecosystem types. Breaking up a contiguous or homogeneous natural habitat through conversion to different vegetation types, age classes, or uses. *Forest fragmentation* occurs in landscapes with distinct contrasts between land uses, such as between woodlots and farms. *Habitat fragmentation*

occurs where a contiguous or homogeneous forest area of a similar cover type and age is broken up into smaller dissimilar units. For example, a conifer-dominated forest (or portion of it) is fragmented by clearcutting if it is converted to another type, such as an aspen-dominated forest.

Fully-stocked stand: A forest stand in which all growing space is effectively occupied but having ample space for development of the crop trees.

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

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

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

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

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

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

Herbivory: Plant communities resulting from the browsing and grazing of wildlife. A plant-animal interaction whereby an organism eats some or all of a plant and the plant responds immediately (stress, decline, or death) or over time (evolutionary adaptation). Herbivory occurs both above and below ground. As defined for the issues concerned with herbivory in the plan; the influence by dominant herbivores on forest composition, structure, forest dynamics and spatial patterns. Dominant herbivores include beaver, deer, moose, hares, rabbits, small mammals, and forest tent caterpillars.

High risk low volume (HRLV): HRLV stands are identified based on one or more of the following: 1) stands coded as high risk in FIM forest inventory, 2) significant insect or disease damage to the main species in the stand, 3) stands over normal rotation age at time of survey with total stand volume eight cords per acre (low volume), or 4) very old stand, e.g., aspen over than 80 years old.

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

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

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

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

Landform: Any physical, recognizable form or feature of the earth's surface, having a characteristic shape, and produced by natural causes. Examples of major landforms are plains, plateaus, and mountains. Examples of minor landforms are hills, valleys, slopes, eskers, and dunes. Together, landforms make up the surface configuration of the earth. The "landform" concept involves both empirical description of a terrain (land-surface form) class and interpretation of genetic factors ("natural causes"). (An Ecological Land Classification Framework for the United States, 1984, p. 40).

Landscape: A general term referring to geographic areas that are usually based on some sort of natural feature or combination of natural features. They can range in scale from very large to very small. Examples include watersheds (from large to small), the many levels of the ECS, and Minnesota Forest Resources Council (MFRC) regional landscapes. The issue being addressed usually defines the type and size of landscape to be used.

Landscape region: A geographic region that is defined by similar landforms, soils, climatic factors, and potential native vegetation. The landscape region used for this planning effort is the subsection level of the ECS.

Landscape study area (LSA): A large geographic area identified by the MCBS as a core area for the MCBS survey process in northern Minnesota. The LSA is intended to represent some of the landscapes within an ecological subsection (a unit in Minnesota's ECS. A LSA 1) generally captures the range of environmental gradients and ecological conditions found in large landscapes, 2) generally encompasses the range of native plant community complexes that exhibit repeatable patterns at the landform or ecological land-type association (LTA) scale, 3) exhibits the potential for intact landscape level processes to occur, 4) contains representative native plant communities functioning under relatively undisturbed

conditions, and 5) often contains habitat for rare species. An LSA area is typically thousands of acres and contains two to several MCBS sites. A LSA may encompass portions of one or more ecological LTAs and lie in more than one county. LSAs are identified prior to MCBS field surveys and boundaries are modified during the survey process. At the completion of the MCBS surveys, a LSA becomes a macrosite, two or more sites, or a combination of macrosites and sites. In some cases a LSA is eliminated from further survey consideration during the MCBS survey process.

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

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

Macrosite: A large area, generally thousands of acres, containing two or more sites that have some geographical and ecological connection relevant to conservation planning. MCBS sites within a macrosite are generally close to one another but are not necessarily contiguous. Thus, macrosites may contain some disturbed areas. In northern Minnesota, MCBS macrosites correspond to the final (post field-evaluation) boundaries of LSAs. (Areas less than 2,000 acres formerly labeled "preserve designs " are also macrosites).

Managed acres: Timberland acres that are available for timber management purposes.

Management pool: In this plan, the acres available for timber management purposes.

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

Marketable timber: Merchantable timber that is accessible now.

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

Maximum rotation age: In this plan, the maximum age at which a forest cover type will retain its biological ability to regenerate to the same cover type and remain commercially viable as a marketable timber sale.

Mean annual increment (MAI): Average annual growth of a stand up to a particular age. It is calculated by dividing yield at that age by the age itself (e.g., the mean annual increment for a stand at age 50 with 25 cords per acre total volume: 25) 50 years = 0.5 cords per year).

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

Mesic: Moderately moist.

MCBS Sites: Areas of land identified by Minnesota County Biological Survey (MCBS) staff, ranging from tens to thousands of acres in size, selected for survey because they are likely to contain relatively undisturbed native plant communities, large populations and/or concentrations of rare species, and/or critical animal habitat. The site provides a geographic framework for recording and storing data and compiling descriptive summaries.

Minnesota forest resources plan (MFRP): Statewide DNR strategic forest resources plan. Includes statewide vision, mission, preferred future, goals, strategies and objectives. For each of the division's programs, it includes goals, statewide direction, and major strategies and objectives.

Minnesota TAXA: Minnesota Taxonomy Database maintained by the DNR Division of Ecological Services.

Minnesota Wildlife Resource Assessment Project (MNWRAP): A wildlife species database and related information system that provides the overall data management, framework, analysis functions, and long-term support for statewide, landscape, and site level wildlife resource assessment efforts. It will cover the total spectrum of wildlife diversity and habitat associations in Minnesota.

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

Mixed forest conditions: In this plan, refers to vegetative composition and structure that is moving toward the mix and relative proportion (e.g., dominated by, common, occasional, or scattered) of species found in the native plant community for that site. Tree species mix and proportion depends not only on the targeted growth stage (based on the rotation age for the desired cover type) but also species found in older growth stages.

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

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

Multiple use: Using and managing a forested area to provide more than one benefit simultaneously. Common uses may include wildlife, timber, recreation, and water.

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

Natural Area: An area of land, with significant native biodiversity, where a primary goal is to protect, enhance or restore ecological processes and Native Plant Community composition and structure. An MCBS *Site* of Outstanding or High biodiversity significance is often recommended for nomination as a natural area. For these Sites, an MCBS *Ecological Evaluation* is written to characterize the ecological

significance of the Site as a whole and to serve as a guide for conservation action by the various landowners. Sites (or portions of Sites) that are recommended as natural areas may be identified by the landowner or land management agency for conservation activities such as designation as a (city, county, state, private) park, non-motorized recreation area, scientific and natural area, reserve, special vegetation management (e.g. natural disturbance based forest management for maintenance of mature growth stage), etc. (*Draft definition 3/24/2004*)

Natural Area Registry (NAR) Agreement: a memorandum of understanding between the Ecological Services Division and another governmental unit. The other governmental unit can be Division of Forestry, Wildlife, or Parks, depending on who the land administrator is for the parcel in question. It can also be city, county, tribal, or federal government. The NAR generally identifies the site, explains its significance, sets a proposed management direction, and states that before any management contrary to that direction occurs, the parties will get together and talk about it first. It is not a binding agreement. Examples of NAR's: an old growth yellow birch stand in Crosby-Manitou State Park; the South Fowl Lake cliff community on Division of Forestry land in Cook County; and a ram's-head orchid site on Hubbard County land.

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

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

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

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

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

Nontimber forest products: Foods, herbs, medicinals, decoratives and specialty items also known as special forest products. Special forest products might include berries, mushrooms, boughs, bark, Christmas trees, lycopodium, rose hips and blossoms, diamond willow, birch tops, highbush cranberries, burls, conks, Laborador tea, seedlings, cones, nuts, aromatic oils, extractives.

Normal rotation age: For even-aged managed cover types, the rotation age set by the SFRMP Team for non-ERF timberland acres. It is based on the culmination of mean annual increment (CMAI), other available data related to forest productivity that also considers wood quality, and local knowledge.

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

over 120 years old), large snags, and downed trees. Additional details on the management of old-growth forests on DNR-administered lands are contained in Old-Growth Guidelines (1994).

Old forest: A forest stand of any particular forest cover type is considered old forest whenever its age exceeds the normal rotation age established by the landscape team for that cover type. In this plan, it does not include designated old growth, state park lands, etc.

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

Old forest management complex: Represents an area of land, made up of several to many stands that are managed for old-growth, special management zone (SMZ), and extended rotation forest (ERF) in the vicinity of designated old growth stands.

Operational planning: What specifically will happen. The specific actions (i.e., projects, programs, etc.) that will be taken to move towards the desired future established by the various sources of strategic direction. Examples include stand examination lists, road projects, recreational trail/facilities projects, staffing, annual work plan targets, etc. Operational planning is also referred to as tactical planning.

Overmature: A tree or even-aged stand that has reached an age where it is declining in vigor and health and reaching the end of its natural life span resulting in a reduced commercial value because of size, age, decay, and other factors.

Overstocked: The situation in which trees are so closely spaced that they are competing for resources, resulting in less than full-growth potential for individual trees.

Overstory: The canopy in a stand of trees.

Partial cut: A cutting or harvest of trees where only some of the trees in a stand are removed.

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

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

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

Prescription: A planned treatment (clear-cut, selective harvest, thin, reforest, reserve, etc.) designed to change current stand structure to one that meets management goals. A written statement that specifies the practices to be implemented in a forest stand to meet management objectives. These specifications reflect

the desired future condition at the site and landscape level and incorporate knowledge of the special attributes of the site.

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

Pure forest or stand is defined as composed principally of one species, conventionally at least 80 percent based on numbers, basal areas, or volumes.

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

Rare Features Database is maintained by the Natural Heritage and Nongame Research Program and is comprised of locational records of the following features:

- **Rare plants.** Rare plants tracked are all species that are listed as Federally endangered, threatened or as candidates for Federal listing; all species that are State listed as endangered, threatened or special concern. Several rare species are also tracked which currently have no legal status but need further monitoring to determine their status.
- **Rare animals.** All animal species that are listed as Federally endangered or threatened (except the gray wolf) are tracked, as well as all birds, small mammals, reptiles, amphibians, mussels, and butterflies that are listed as State endangered, threatened or special concern.
- **Natural communities**. Natural communities are functional units of landscape that are characterized and defined by their most prominent habitat features a combination of vegetation, hydrology, landform, soil, and natural disturbance cycles. Although natural communities have no legal protection in Minnesota, the Natural Heritage and Nongame Research Program and the Minnesota County Biological Survey have evaluated and ranked community types according to their relative rarity and endangerment throughout their range. Locations of high quality examples are tracked in the Rare Features Database.
- **Geologic features**. Noteworthy examples of geologic features throughout Minnesota are tracked if they are unique or rare, extraordinarily well preserved, widely documented, highly representative of a certain period of geologic history, or very useful in regional geologic correlation.
- Animal aggregations. Certain types of animal aggregations, such as nesting colonies of waterbirds (herons, egrets, grebes, gulls and terns), bat hibernacula, prairie chicken booming grounds, and winter bald eagle roosts are tracked regardless of the legal status of the species that comprise them. The tendency to aggregate makes these species vulnerable because a single catastrophic event could result in the loss of many individuals.

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

Refuge/refugia: Area(s) where plants and animals can persist through a wind and/or fire event.

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

Regional landscapes: MFRC established eight regional landscapes covering Minnesota based on ecological, socio-economic, and administrative factors. These landscapes were established to undertake landscape-based planning and coordination across all forest ownerships. The subsections included in this plan are in the Northeast Landscape Region.

Release: Freeing a tree, or group of trees, from competition that is overtopping or closely surrounding them.

Relevés: Vegetation survey plot data.

Research natural areas (RNAs): Areas within national forests that the U.S. Forest Service has designated to be permanently protected and maintained in natural condition (e.g., unique ecosystems or ecological features, rare or sensitive species of plants and animals and their habitat, and high-quality examples of widespread ecosystems).

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

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

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

Rotation age: The period of years between when a forest stand (i.e., primarily even-aged) is established (i.e., regeneration) and when it receives its final harvest. This time period is an administrative decision based on economics, site condition, growth rates, and other factors.

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

Sanitation cut: A cutting made to remove trees killed or injured by fire, insects, disease, or other injurious agents (and sometimes trees susceptible to such injuries) for the purpose of preventing the spread of insects or disease.

Sapling: A tree that is 1 inch to 5 inches in diameter at breast height.

Sawlog: A log large enough to produce lumber or other products that can be sawed. Its size and quality vary with the utilization practices of the region.

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

Scarify: To break up the forest floor and topsoil preparatory to natural regeneration or direct seeding.

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

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

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

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

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

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

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

Silviculture and Roads Module (SRM): The SRM provides a database and application through which field foresters can record planned and actual forest development prescriptions (e.g., site preparation, tree planting projects, timber harvest, road maintenance, etc.) and follow-up surveys. SRM supports the geographic description of the extent of a development project separate from FIM stand boundaries. A variety of maps and other reports can be generated by the development system. SRM will also produce maps and reports that roll up forestry area data to the regional or statewide level. Part of the DNR's FORestry Information SysTem (FORIST).

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

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

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

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

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

Snag: A standing dead tree.

Soil productivity: The capacity of soils, in its normal environment, to support plant growth.

Special concern species: A plant or animal species that is extremely uncommon in Minnesota, or has a unique or highly specific habitat requirements, and deserves careful monitoring. Species on the periphery of their ranges may be included in this category, as well as species that were once threatened or endangered but now have increasing, or stable and protected, populations.

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

Stand: A contiguous group of trees similar in age, species composition, and structure, and growing on a site of similar quality, to be a distinguishable forest unit. A forest is comprised of many stands. A *pure stand* is composed of essentially a single species, such as a red pine plantation. A *mixed stand* is composed of a mixture of species, such as a northern hardwood stand consisting of maple, birch, basswood, and oak. An *even-aged stand* is one in which all of the trees present are essentially the same age, usually within 10 years of age for aspen and jack pine stands. An *uneven-aged stand* is one in which a variety of ages and sizes of trees are growing together on a uniform site, such as a northern hardwood stand with three or more age classes.

Stand age: The average age of the main species within a stand.

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

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

Stand-selection criteria: Criteria used to help identify stands to be treated as determined by the subsection team. Criteria will likely be based on include rotation ages, site index, basal area, cover type composition, understory composition, location, etc. Factors considered in developing stand-selection criteria will include: 1) desired forest composition goals, 2) timber growth and harvesting, 3) old-growth forests, 4) extended and normal rotation forests, 5) riparian areas, 6) wildlife habitat, 7) age and cover type distributions, 8) regeneration, 9) thinning and 10) prescribed burning needs.

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

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

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

Stumpage: The value of a tree as it stands in the forest uncut; uncut trees standing in the forest.

Stumpage price: The value that a timber appraiser assigns to standing trees or the price a logger or other purchaser is willing to pay for timber as it is in the forest.

Subsection: A subsection is one level within the ECS. From largest to smallest in terms of geographic area, the ECS is comprised of the following levels: Province \rightarrow Section \rightarrow Subsection \rightarrow Land Type Association \rightarrow Land Type \rightarrow Land Type Phase. Subsections areas are generally one to four million acres in Minnesota, with the average being 2.25 million acres. Seventeen subsections are scheduled for the SFRMP process.

Subsection forest resource management plan (SFRMP): A DNR plan for vegetation management on forest lands administered by DNR Divisions of Forestry and Fish and Wildlife that uses ECS subsections as the basic unit of delineation. DNR lands administered by other divisions, e.g., Trails and Waterways, may be included at the discretion of the administrator. Initial focus will be to identify forest stands and road access needs for the duration of the 10-year plan. There is potential to be more comprehensive in the future.

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

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

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

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

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

Tactical planning: See operational planning.

Temporary access: A temporary access route for short-term use that will not be needed for foreseeable future forest management activities. It is usually a short, temporary, dead-end access route.

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

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to improve growth, enhance forest health, or recover potential mortality. **Row thinning** is where selected rows are harvested, usually the first thinning, which provides equipment operating room for future selective thinnings. **Selective thinning** is where individual trees are marked or specified (e.g., by diameter, spacing, or quality) for harvest. **Commercial thinning** is thinning after the trees are of merchantable size for timber markets. **Pre-commercial thinning** is done before the trees reach merchantable size, usually done in overstocked (very high stems per acre) stands to provide more growing space for crop trees that will be harvested in future years.

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

Timberland: Forestland capable of producing timber of a marketable size and volume at the normal harvest age for the cover type. It does not include lands withdrawn from timber utilization by statute (e.g. Boundary Waters Canoe Area Wilderness) or administrative regulation such as designated old growth forest and state parks. On state forest lands this includes stands that can produce at least three cords per acre of merchantable timber at the normal harvest age for that cover type. It does not include very low productivity sites such as those classified as stagnant spruce, tamarack, and cedar, offsite aspen, or nonforest land.

Timber management plan: The same thing as vegetation management if used with the SFRMP process.

Timber management planning (TMP): Successor to the TMP information system (TMPIS). Recognizes the entire timber management planning process as being more than just the computerized system. Incorporates GIS technology and an interactive process with other resource managers.

Timber management planning information system (TMPIS): Circa mid-1980s. Original computerized system for developing 10-year stand treatment prescriptions by area.

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

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

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

Two-aged stand: a stand with trees of two distinct age class separated in age by more than 20 percent of the rotation age.

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

Understocked: A stand of trees so widely spaced that even with full growth potential realized, crown closure will not occur.

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

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

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

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

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

Vegetation growth stage: The vegetative condition of an ecosystem resulting from natural succession and natural disturbance, expressed as vegetative composition, structure and years since disturbance. The vegetation growth stage describes both the successional changes (i.e., the change in the presence of different tree species over time) and developmental changes (i.e., the change in stand structure overtime due to the regeneration, growth, and mortality of trees). Vegetation growth stages express themselves along the successional pathways for a particular ecosystem depending on the type and level of natural disturbance that has occurred. Forest tree and other vegetation composition, habitat features, and wildlife species use change with the various growth stages.

Vegetation management plan: In the process of developing the 10-year stand examination list, many decisions and considerations go beyond identifying what timber will be cut (i.e., broader than timber management). This includes designation of old growth, extended rotation forests, riparian areas, desired future forest composition, visually sensitive travel corridors, etc., all of which are intended to address wildlife habitat, biodiversity, and aesthetic and other concerns. Prescriptions assigned to stands reflect decisions based on these multiple considerations and are broader than decisions relative to final harvest (e.g., ERF designation, uneven-aged management, thinning, regeneration, underplanting, prescribed burning, etc.).

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

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

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

Wildlife management area (WMA): Areas established by the DNR, Division of Fish and Wildlife, to manage, preserve and restore natural communities, perpetuate wildlife populations, and provide recreational and educational opportunities.

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

Appendix C

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APPENDIX D

Acronyms

AFRMP	Area Forest Resource Management Plan
BT	Bearing Tree
CMAI	Culmination of Mean Annual Increment
CMT	Commissioner's Management Team
North-4	St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-
	Vermillion Uplands
CSA	Cooperative Stand Assessment
CWCS	Comprehensive Wildlife Conservation Strategy
DBH	Diameter at Breast Height
DFC	Desired Future Condition
DFFC	Desired Future Forest Composition
DMT	Division Management Team
DNR	Department of Natural Resources
DOQ	Digital Orthophoto Quadrangle
DRG	Digital Raster Graphics
ECS	Ecological Classification System
EILC	Ecologically Important Lowland Conifers
ELCP	Ecological Land Classification Program
ERF	Extended Rotation Forestry
ETS	Endangered, Threatened, or Special Concern
FIA	Forest Inventory and Analysis
FIM	Forest Inventory Module
FORIST	Forest Information System
FRIT	Forest Resource Issues Team
FTC	Forest Tent Caterpillar
FY	Fiscal Year
GAP	Gap Analysis Program
GEIS	Generic Environmental Impact Statement
GIS	Geographic Information System
GM	Gypsy Moth
HRLV	High Risk/Low Volume
HWDs	Hardwoods
LSA	Landscape Study Area
LSL	Laminated Strand Lumber
LTA	Land Type Association
MACLC	Minnesota Association of County Land Commissioners
MAI	Mean Annual Increment
MBF	Thousand Board Feet
MCBS	Minnesota County Biological Survey
MFRC	Minnesota Forest Resources Council
MFRP	Minnesota Forest Resources Plan
MnTAXA	Minnesota Taxonomy Database

MnWRAP	Minnesota Wildlife Resource Assessment Project
NAPP	National Aerial Photography Program
NAR	Natural Area Registry Agreement
NCFES	North Central Forest Experiment Station
NHIS	Natural Heritage Information System
NHNRP	Natural Heritage & Nongame Research Program
NPC	Native Plant Community
NRCS	Natural Resource Conservation Service
OFMC	Old Forest Management Complex
OHV	Off-Highway Vehicles
OSB	Oriented Strand Board
PM	Pine Moraines and Outwash Plains
RMT	Regional Management Team
RMZ	Riparian Management Zone
RNAs	Research Natural Areas
RNV	Range of Natural Variability
SFRMP	Subsection Forest Resource Management Plan
SGCN	Species in Greatest Conservation Need
SI	Site Index
SMC	Special Management Complex
SMZ	Special Management Area
SNA	Scientific and Natural Area
SNN	Shipstead-Newton-Nolan Act
SONAR	Statement of Need and Reasonableness
SPP	Species
SRM	Silviculture and Roads Module
TMP	Timber Management Plan
TMPIS	Timber Management Plan Information System
TNC	The Nature Conservancy
WMA	Wildlife Management Area