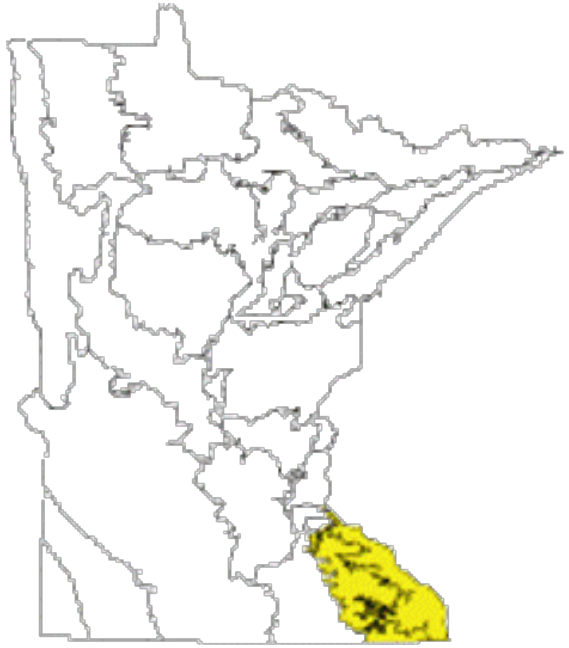
Minnesota
Department of Natural Resources

FY 2015 – FY 2024

Blufflands/Rochester Plateau



Draft Subsection Forest Resource Management Plan

December 2013

Printed December 2013

This document and additional information about the Minnesota DNR Subsection Resource Management Plan (SFRMP) process can be found on the Internet at:
http://www.dnr.state.mn.us/forestry/subsection/index.html

This information is available in an alternative format upon request.

Executive Summary

This Subsection Forest Resource Management Plan (SFRMP) process considers state forest lands administered by the Department of Natural Resources (DNR), Divisions of Forestry and Fish and Wildlife, Section of Wildlife in the *Blufflands and Rochester Plateau* (BRP) subsections landscape units. These units cover approximately 2.6 million acres in an area from near the Twin Cities metropolitan area on the north, southeastward to the Iowa border.

The subsection is located in southeast Minnesota These Ecological Classification System (ECS) subsections includes parts of ten counties (Dakota, Goodhue, Wabasha, Winona, Houston, Fillmore, Mower, Olmsted, Dodge and Rice counties, the majority of timberlands subject to this SFRMP are located in: Dakota, Wabasha, Winona, Houston and Fillmore counties.

This subsection forest resource management plan (SFRMP) strategic direction and stand selection document includes management direction, goals and strategies, and a 10-Year Stand Examination List guiding vegetation management on state forestlands administered by the Department of Natural Resources (DNR), divisions of Forestry, Fish and Wildlife. DNR lands comprise 102,000 acres (4 percent) of the land ownership in these subsections. Of the DNR lands, approximately 63,000 acres (62% of all DNR lands) are considered Managed Acres. Acres in state parks and Scientific and Natural Areas (SNAs) are beyond the scope of this management plan

This BRP SFRMP considers Department directions, guidelines and policy to recommend a plan for vegetation management. In addition to Department directives, this plan is consistent with direction of the Minnesota Forest Resource Council (MFRC) Landscape Program; the Southeast Regional Landscape Committee completed the Southeast Landscape Management Plan in 2003, and a supplemental document the Strategic Policy Framework: Southeast Landscape Plan in 2009. These documents included desired future forest conditions for all forest lands in the southeast landscape region. The goals and strategies identified in the BRP SFRMP for state-administered forest lands are consistent with those recommended by the MFRC Southeast Landscape Management Plan.

Old forest will be maintained in the subsections. Implementing the Department's old forest policy shows that 65% of the primary commercial cover type, oak is currently over normal rotation age. In future decades, after applying the recommended treatment levels, oak over rotation age varies from 19 to 51 percent over the plan implementation period. Old forest conditions will also be provided in uneven-age managed cover types (e.g., northern hardwoods, lowland hardwoods) and designated old-growth stands. A total of 998 acres have been designated as old growth.

Young forest will be maintained on state lands. The 0-30 age classes of aspen, cottonwood, oak, and birch cover types represent young, early succession forest in this plan. The goal is to essentially maintain the same number of acres in these cover types.

This plan recommends that at the end of this plan implementation period (2024) red cedar, white spruce, plantation red pine, and some off-site oak be converted to native plant community (savanna, prairie, grasslands). Total acres of lowland hardwoods, birch and willow will remain the same. Acres of northern hardwoods, white pine, cottonwood, oak, walnut and central hardwoods will increase. Acres of ash, red cedar and white spruce will be

decreased. Efforts will also be made to increase white pine as a component of other cover types. An increase will be seen in more open landscapes, oak savanna, and prairie, as a significant direction in this SFRMP is to manage for the native plant community which in many cases was a more open landscape with periodic disturbance by fire. Stands will be managed to maintain or increase within-stand species and structural diversity. Some stands will be managed using techniques such as variable retention and variable density, and will retain some trees of species and sizes typically found in older growth stages.

Vegetation management will provide a broad range of habitats that meet the needs of game and nongame species while providing specific habitat needs for individual species when needed. The goal is to provide healthy, self-sustaining populations of all native and desirable introduced plant, fish, and wildlife species.

Riparian areas will be managed to provide habitat for fish, wildlife, and plant species. The MFRC Voluntary Site-Level Forest Management Guidelines will be applied on all state lands. Appropriate vegetation management adjacent to streams is critical in Southeastern Minnesota.

A variety of special management areas has been identified in the BRP SFRMP. Among them are specific high biodiversity areas covering over 20,000 acres; high conservation value forests covering over 14,000 acres; representative sample areas covering over 1,300 acres and 998 acres of designated old growth. On all state lands, known locations of rare plants and animals and their habitats and rare native plant communities will be protected, maintained, or enhanced in these subsections.

The 10-year Stand Exam List identifies 848 stands (16,183 acres) to be site visited and possibly treated during the plan implementation period (fiscal years 2015 through 2024). The treatment level (i.e., harvest, etc.) recommended for the 10-year plan is approximately 4,200 cords per year. Strategies such as intermediate treatments and harvests in older age classes have been implemented to increase timber productivity and quality, and to increase the average harvestable volume per acre growing on state lands over time.

Other topics addressed in the plan include: limiting damage from insects, disease, and non-native invasive species; minimizing forest management impacts on visual quality; recognizing climate change effects on forest lands; protecting cultural resources; manage to allow use of prescribed fire; evaluating disturbance events (e.g., fire and wind) and, recognizing the challenges of landscape level planning on a fragmented landscape.

DNR Personnel Involved in Developing the SFRMP

Team Members

Division of Forestry
- Kurt Hinz
- Lance Sorensen

Division of Fish and Wildlife
- Tim Pharis
- Bob Tangen

Division of Ecological and Water Resources
- Jaime Edwards

Field Participants

Section of Wildlife
- Jon Cole
- Don Nelson
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- Steve Klotz
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Ecological and Water Resources
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Geographic Information Systems (GIS) Support

John Carlson

Planning Support

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1. Introduction and Background

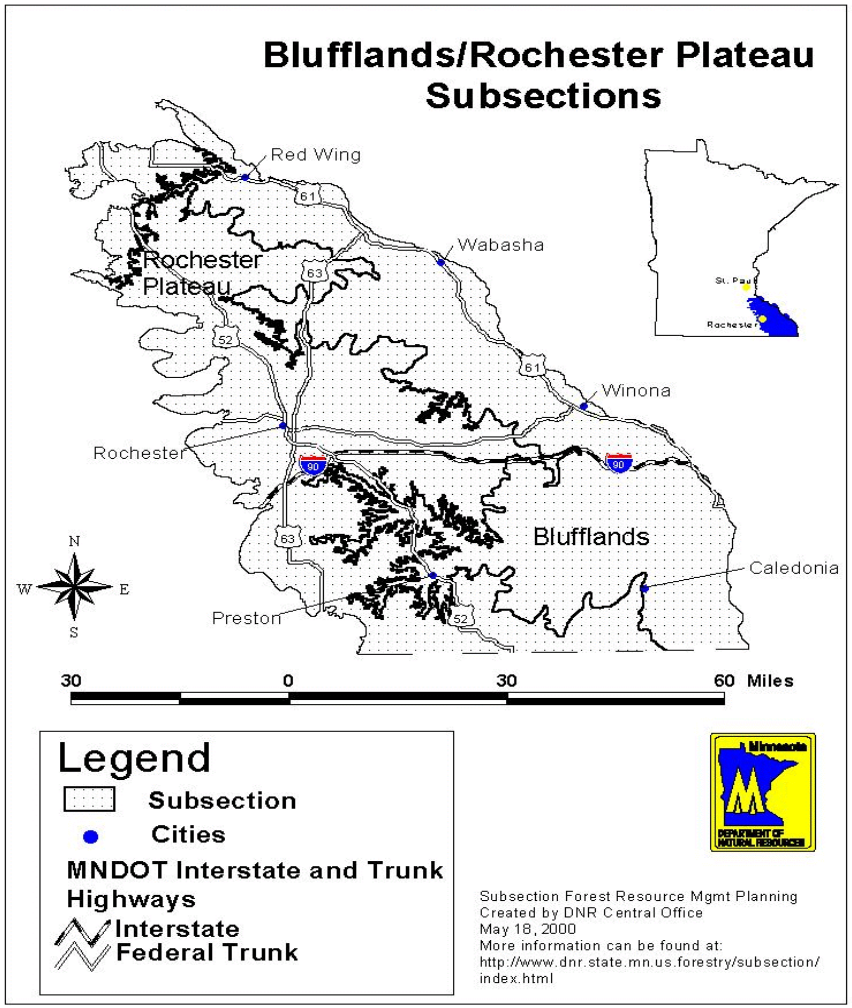
Planning Area Description

This Subsection Forest Resource Management Plan (SFRMP) process considers state forest lands administered by the Department of Natural Resources (DNR), Divisions of Forestry, Parks and Trails and Wildlife Section in the *Blufflands/Rochester Plateau Subsections* landscape units (Blufflands ecological landscape unit and the Rochester Plateau ecological landscape unit). These units cover approximately 2.6 million acres in an area from near the Twin Cities metropolitan area on the north, southeastward to the Iowa border (See Map 1.1). For more detailed land descriptions, refer to Chapters 1 through 3 of the *Preliminary Issues and Assessment document*, at http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html

Agriculture, grasslands, pasture and forested lands are the primary land uses in these two subsections. Public agencies administer approximately 5 percent of the total land area, with the state portion being approximately 102,000 acres or 4 percent of the total land area. Approximately 65,000 acres of the state land is timber land that will be considered for wood products production and other resource management objectives in this plan. Other state lands totaling 55,000 acres (approximately 40 percent of state lands) include State Parks and Scientific and Natural Areas, which will not be considered under this plan (See Map 1.2).

In addition, the federal government owns approximately 37,000 acres (26 percent of publicly held lands) that are managed by the U.S. Fish and Wildlife Service primarily as part of the upper Mississippi River basin. Counties and cities manage approximately 6,500 acres of timberlands (less than 1 percent of public ownership). Private owners manage approximately 2.5 million acres of the total land base in the two subsections (94 percent). For more details about land ownership, refer to Chapter 2 of the *Preliminary Issues and Assessment document*, at http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html

Map 1.1 Location of Blufflands/Rochester Plateau subsections.



Map 1.2 Blufflands/Rochester Plateau State and Federally owned public lands

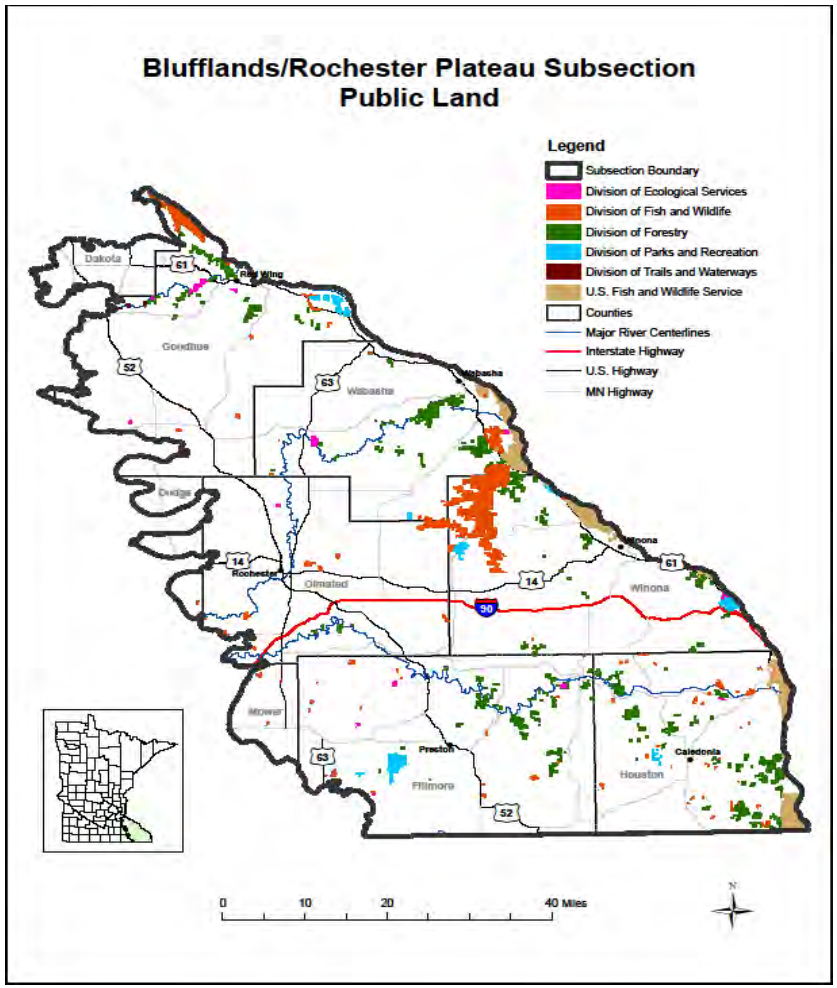
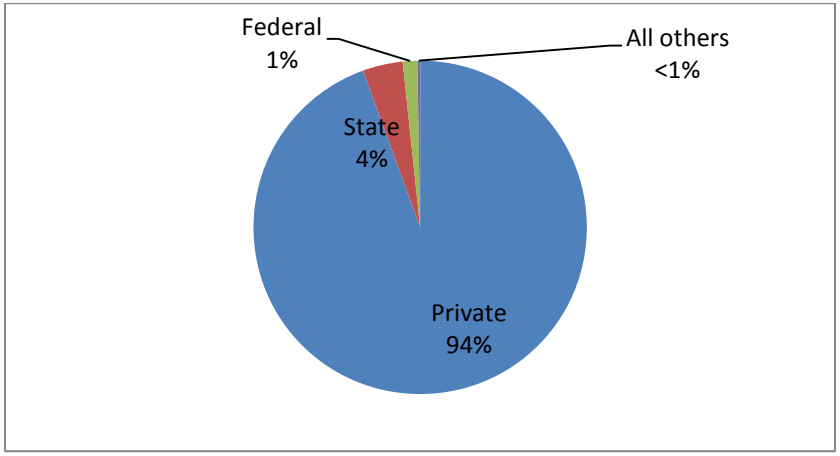


Figure 1.1 identifies the land ownership in the Blufflands/Rochester Plateau subsections

Figure 1.1 Land Ownership in the Blufflands/Rochester Plateau



Source: MN DNR GAP Stewardship 2008 – All Ownership Types

Table 1.1 below identifies the land ownership in the Blufflands/Rochester Plateau subsections.

Table 1.1 Land Ownership: Blufflands/Rochester Plateau

Owner	Acres	Percent
Private	2,495,827	94
State	102,634	4
Federal	37,335	1
Private Non-Industrial	6,931	<1
County	3,211	<1
Private Conservancy	2,938	<1
Tribal	330	<1
Other Public	317	<1
Total	2,649,523	100

Source: MN GAP Stewardship 2008 – All Ownership Types

Table 1.2 below identifies the age class distribution of the major cover types making up state timberlands in the Blufflands/Rochester Plateau subsections.

Table 1.2 Blufflands/Rochester Plateau State1 Timberland2 Cover-Type Acres by Age-Class (2013)

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	121-130+	131-140+	TOTAL
Ash	26	5	10	204	42	48	93	80	8	14	4				534
Lowland Hardwood	354	245	253	662	1,016	1,405	1,395	1,019	753	534	90	29	100		7,855
Aspen	90	147	108	99	230	159	85	42	7	17					984
Birch	15	4	20	10	84	27	59	58	31	17					325
Cottonwood		63	40	75	192	128	194	236	38						966
Northern Hardwoods	553	490	339	588	841	725	927	885	1,316	579	397	315	419	15	8,389
Walnut	112	48	304	456	536	338	119	133	55	56	8	42	2		2,209
Oak	3,353	812	310	510	712	1,295	2,937	3,341	4,827	4,067	4,847	2,741	2,277	1,247	33,276
Offsite Oak	84	2		6	11	10	24	59	62	136	733	692	822	1,023	3,664
Norway Pine	11	35	127	147	152	42	33								547
Central Hardwoods	210	427	307	154	253	281	340	127	116	100	64	61	65		2,505
White Pine	147	354	646	537	228	71	17	10		5	15	24	13		2067
Red Cedar		6	15	47	96	52	33	37		8	17			4	315
Total	4,955	2,638	2,479	3,495	4,393	4,581	6,256	6,027	7,213	5,533	6,175	3,904	3,698	2,289	63,636

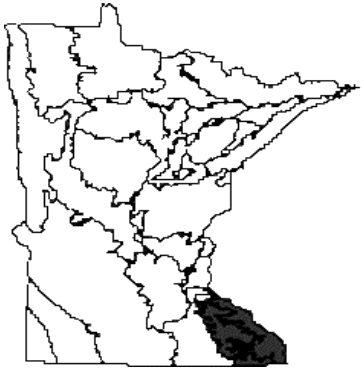
[1] *Includes only Forestry- and Wildlife-administered lands within the Ecological Classification System (ECS) subsection boundary and based on Minnesota DNR FIM 2013.*
[2] *Timberland is defined as forest land capable of producing timber of marketable size and volume at the normal harvest age, not including lands withdrawn from timber utilization by law, statute or department guideline.*

Scope of Subsection Forest Resource Management Plan

Subsection Forest Resource Management Plan (SFRMP)

A SFRMP is a DNR plan for vegetation management on forest lands administered by the DNR divisions of Forestry, Fish and Wildlife, and Parks and Trails. Vegetation management includes actions that affect the composition and structure of forest lands, such as timber harvesting, thinning, prescribed burning, biomass harvest, and reforestation. The geographic area covered by these plans is defined by *Ecological Classification System (ECS)* subsections (Appendix A). The SFRMPs will also consider the condition and management of forest lands not owned by the DNR, but will only propose forest management direction and actions for DNR lands. The amount of DNR-administered forest lands within forested subsections varies across the state. Examples of forest resource management planning activities that are beyond the scope of SFRMPs are: OHV trail system planning, comprehensive road access plans, state park land management planning, old-growth forest designation, SNA establishment, wilderness designation, wildlife population goals, cumulative effects analysis at the watershed-level, fire management, and recreation facilities/systems planning.

ECS Subsections in Minnesota



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

The SFRMP process is divided into three steps. In Steps 1 and 2, the SFRMP team prepares information to assess the current forest resource conditions in the subsection(s) and identify forest resource management issues that will be addressed in the subsections' plan. In Step 3, the SFRMP team finalizes the issues and develops general directions and strategies to address these issues. The strategies will help in developing the cover type management recommendations, stand-selection criteria, and stand treatment levels. In this step, stands to be evaluated for treatment during the 10-year plan period are also selected and preliminary prescriptions are assigned. There are two opportunities for public input during plan development.

ECS Subsections

The DNR has developed an Ecological Classification System (ECS) as a tool to help identify, describe, and map ecosystems. ECS units are defined by climatic, geologic, hydrologic, topographic, soil, and vegetation data. The DNR ECS divides the state into six levels of ecological units, each level nested together within the next higher level. Subsections are the third level down in the ECS hierarchy in Minnesota. There are 17 forested subsections in the state, ranging in size from 339,285 to 3,657,011 acres.

Goals for the Planning Effort

While the planning process will produce many tangible "products," such as assessment information, issues, and strategies, the end result of the planning process will be two key products:

- **Desired Future Composition (DFC) Goals:** The goals will include long-term (50 years or more) and short-term (10 years) desired changes in the structure and composition of DNR forest lands in the subsections. Composition goals could include the amount of various cover types, age-class distribution of cover types, and their geographic distribution across the subsections. DFC goals for state forest lands will be developed from assessment information, issues, the general direction identified in response to the issues, and strategies to implement the desired management direction.

- **List of DNR Forest Stands to be Treated over the next 10-year period.** SFRMPs will identify forest stands on DNR Forestry- and Fish and Wildlife-administered lands that are proposed for treatment (e.g., harvest, thinning, regeneration, and re-inventory) over the 10-year plan implementation period. Forest stands will be selected using criteria developed to begin moving DNR forest lands toward the long-term DFCs. 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:
    - Identifying areas to be managed as older forest
    - Identifying areas to be managed at normal rotation age;
    - Management of riparian areas;
    - Age and cover type distributions; and
    - Regeneration, thinning, and prescribed burning needs.

Desired Future Conditions will be determined based upon the management activities (including no action) that will best move the forest landscape toward the goals for state forest lands.

Who Develops SFRMPs?

SFRMP team members include DNR forestry, wildlife, and ecological and water resources staff. These teams have primary responsibility for the work and decision making involved with the subsections plans. Decision-making by the team is through an informed consent process. Managers of adjacent county, federal, tribal, and industrial forest lands may be invited to provide information about the condition of their forest lands and their future management direction. Data relating to all ownerships are used at times in the planning process. This information will help the DNR make better decisions on the forest lands it administers.

SFRMP and MFRC Regional Landscape Planning

The recommended desired outcomes, goals, and strategies developed for the applicable landscape regions by regional landscape committees under the direction of the Minnesota Forest Resources Council (MFRC) Landscape Program were considered in developing this SFRMP. By considering the

recommendations from the landscape region plans, the decisions for management of DNR-administered lands incorporate recommendations from a broader landscape perspective across all ownerships and assists in cooperation across ownerships in this larger landscape area.

SFRMP Process Overview

Table 1.1c outlines the steps in the DNR SFRMP process. Figure 1.1b shows the opportunities for public involvement during the planning process.

Table 1.1c: SFRMP Process Overview

Step 1	**Initiating the Planning Process** • DNR forms interdisciplinary team for the subsections. • DNR staff assembles base assessment information. • Web page is established for the subsections on the DNR Web site. • DNR develops mailing list of public/stakeholders. • Public is informed that the planning process is beginning in the subsections, the estimated schedule for the planning process, and how and when they can be involved.
Step 2	**Preliminary Issue and Assessment Identification** • Subsection team adjusts and supplements the base resource assessment information for the subsections. • Team identifies the preliminary issues to be addressed in the plan. • DNR distributes assessment information and the preliminary issues for public review and input.
Step 3	**Strategies, Desired Future Composition, and Stand Selection Criteria** • DNR finalizes the list of issues to be addressed in the plan based on public input from Step 2. • SFRMP team develops general direction statements (GDSs) in response to the final list of issues. • SFRMP team and work groups develop strategies and desired future composition (DFC) goals consistent with the general direction. • Team develops stand-selection criteria to help identify DNR forest stands for treatment over the 10-year plan implementation period to move toward the goals. • DNR distributes GDSs, DFC goals, strategies, and stand-selection criteria for public review and comment. **Draft List of Stands to be Treated and New Access Needs** • SFRMP team finalizes DFC goals, strategies, and stand-selection criteria. • DNR personnel identify state forest land stands to be considered for treatment over the 10-year plan implementation period. • DNR personnel identify new access needs associated with the list of stands proposed to be treated. • Draft list of stands to be treated and new access needs is distributed for public review and comment.

Step 4	**Final Plan** • SFRMP team summarizes public comments and develops DNR responses. • A summary of comments, responses, and plan revisions are presented to the Department for the commissioner's approval. • Commissioner approves final plan. • Final plan is distributed, including summary of public comments and DNR responses.

Public involvement will, at a minimum, occur through:

- Distribution of the *Preliminary Issues and Assessment* document information (individual stakeholder notification and Web site).
- A public comment period to help identify key forest management issues.
- A public comment period to review the draft plan and strategic direction (i.e., general direction, forest management strategies, and DFCs proposed by the DNR to address identified issues) along with the 10-year list of stands proposed for treatment and associated new access needs.

Contents of Document and Focus of Current Review

This document contains products developed by the SFRMP interdisciplinary team for public review as part of Step 3 in the planning process. Those products include the final list of issues addressed in the plan, GDSs and strategies to address the issues, DFC goals, stand-selection criteria, cover type management recommendations, draft 10-year stand examination list, a list of new access needs, and a summary of public comments from Step 2.

In Step 2 of the process, the SFRMP team identified a preliminary list of issues to be addressed in the plan. These issues were developed based on the general field knowledge of department staff and forest resource information assembled by the SFRMP team in the Preliminary Issues and Assessment. The preliminary list of issues and their descriptions were distributed for public review and comment. The preliminary list of issues was revised based on input from DNR staff and the public. This revised list of issues is presented in Chapter 2 of this draft plan as the final list of issues to be addressed in the plan.

In Step 3, the SFRMP team developed GDSs and strategies to address the final list of issues. Strategies developed by the SFRMP team are based on existing DNR policies and legal requirements, technical expertise from within and outside the SFRMP team, forest resource information from the Preliminary Issues and Assessment and other sources, and public input from Step 2 of the process. Strategies developed to address the various issues were then examined to ensure consistency with each other, and to identify and group similar strategies. The strategies presented in this document are the product of this effort to develop a refined list of strategies to address the final list of issues.

The SFRMP team developed the DFC goals based on current conditions on DNR forest lands in the subsections, and on the output of the Remsoft harvest-scheduling model. DFC goals are most commonly expressed in terms of desired changes in the age-class structure, the amount of various forest types within the subsections, and the geographic distribution of forest types and age classes across the subsections.

General Direction Statements, Strategies, DFC goals, and cover type management recommendations were used to define proposed criteria to select a pool of forest stands for treatment over the 10-year plan implementation period. Stand selection criteria and Strategies can include: "normal" rotation ages (i.e., ages at which most forest stands will be harvested; potential productivity of the site for timber (i.e., site index); soil types; stand density, or stocking measures (e.g., basal area); tree species composition; brush and ground cover; stand size; stand location; insect and disease occurrence; and other specific criteria needed to address issues. Stand selection criteria and Strategies presented in this document are those identified by the SFRMP team as most likely to move DNR forest lands toward the identified DFC goals for the subsections.

The final plan includes summaries of comments received during the public review of the draft plan. Where appropriate, specific references are provided as to where and how comments and concerns were incorporated into the final Issues, Strategies, DFC goals, or stand-selection criteria.

Public Review Period and How to Provide Input

The GDSs, strategies, DFC goals, stand-selection criteria, cover type management recommendations, draft stand examination list, and list of new access needs in this draft plan will be available for a 30-day public review and comment period. This document is available on the DNR web site at: http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html**,** or upon request as hard copy or CD.

Chapter 2: SFRMP Issues

Introduction

How SFRMP Issues Were Identified

Subsection Forest Resources Management Plan (SFRMP) teams used assessment information[1], Minnesota Department of Natural Resources (DNR) policies and guidelines, local knowledge, existing plans, and public input to identify the final issues relevant to the scope of this plan. The SFRMP team began with a common set of issues developed from previous SFRMPs. These common SFRMP issues were refined and supplemented based on subsection-specific conditions and considerations and public comments.

Issue Definition

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 Divisions of Forestry, Fish and Wildlife, and Parks and Trails. Relevant issues were 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 a SFRMP is whether the issue can be addressed in whole or substantial part by vegetation management decisions on DNR-administered lands.

Issues that *cannot be addressed* in whole or substantial part by vegetation management decisions on DNR-administered lands *are outside the scope of the SFRMP process*. For example, a SFRMP will not address recreation trails system issues or planning. However, aesthetic concerns along existing recreational trail corridors can be a consideration in determining forest stand management direction in these areas. Another example is that with respect to wildlife populations, the plan establishes wildlife habitat goals (e.g., amount of various cover types and age-class distribution) but not goals for wildlife population levels.

Issues

Issue topics A through P were identified as "Preliminary Issues" in the first steps of the SFRMP process.

A. Desired Age-Class Distribution

[1] Minn. DNR January 2013, *Preliminary Issues and Assessment*, Subsection Forest Resource Management Plan.

Focused Issue A1. What are the desired age-class and growth-stage distributions of forest types across the landscape?

Adequate representation of all age classes and growth stages provides a supply of wildlife habitats, timber products, and ecological values over time. A forest with a variety of stand ages and growth stages provides habitat suitable for more species and has greater potential to provide a sustainable yield of timber. A diverse forest is healthier and more resilient to widespread insect and disease outbreaks and the effects of climate change, than a less diverse forest. Adequate representation in this context means considering the age class distributions of other ownerships consistent with the Department's adaptive management strategy.

There are many likely consequences of managing a non-diverse forest (lacking adequate representation of all age classes and growth stages). A forest with too few age classes and growth stages risks epidemic insect and disease outbreaks, loss of species with age-specific habitat requirements, long-term loss of forest productivity, and the 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 particular forest products over time.

Focused Issue A2. What are the appropriate amounts, types, and locations of old forest?

Old forest, in the context of this issue, is defined as stands that exceed their normal rotation age. The distribution of old forest represents age classes and growth stages of forest beyond the normal rotation age of each cover type. Old forest provides essential habitat for some animal, plant, and fungi species and provides optimal habitat for other species. Old forest also allows the development of late successional growth stages and communities, and increases overall structural and species diversity on the forest landscape. Old forest can also reduce timber quantity and quality for some types of forest products over time by holding timber longer between harvests. Old forest also produces large trees for sawing into lumber. Therefore, a balance is needed that considers essential habitats, forest diversity, and timber production. The amount of old forest on the landscape is evaluated through the SFRMP process by considering age class distributions across all ownerships consistent with the Department's adaptive management strategy.

The likely consequences of managing a forest *without* age classes beyond the normal rotation age are: 1) the loss of individuals or populations of species with old forest-specific habitat requirements; 2) loss of diversity; 3) reduced recreational and economic opportunities associated with the loss of old forest values such as rare bird watching, fall color viewing, mushroom gathering, and camping; 4) reduced ecological services associated with old forest values such as maintaining water quality, natural disturbance regimes, and biodiversity; and 5) the loss of potential for some large-diameter forest products (sawtimber, cabin logs, etc.); greater risk associated with having the same acreage distributed across fewer age-classes. The likely consequences of managing a forest *with* an overabundance of age classes beyond the normal rotation age are: 1) reduction in populations of species that use younger forest habitats; 2) decreased timber production; and 3) decreased timber quality and quantity due to decay, disease, windthrow, and mortality.

Focused Issue A3. What are the appropriate amounts, types, and locations of young, early successional forest?

Young, early successional forest is defined here as the 0-30 age group of aspen, birch, jack pine, Boxelder and elm cover types.

Young, early successional forest is an issue because it provides important habitat for several plant and animal species that must be represented on the landscape to maintain overall biodiversity. These plant, game, and nongame species are important to those who use state forestlands. Some species depend on dense young forests to provide cover from predation and an ample supply of available foods while other species depend on the edges between young forest and adjacent forest types. In addition, the patch size and spatial distribution of this young forest on the landscape is an important element of habitat quality. Currently, significant acres of young age classes exist in the aspen, birch, jack pine, Boxelder and elm cover types.

If an appropriate amount of early successional forest does not occur in the landscape, the likely consequences of *not* addressing this issue are: 1) reduced populations of important game species, such as ruffed grouse, deer and American woodcock; 2) reduced recreational hunting opportunities associated with these game species; 3) reductions in some associated songbird populations; 4) loss of social, economic, and ecological value of these species; and 5) loss of traditional use of the natural resources associated with these young forests (e.g., berry picking).

B. Desired Mix of Forest Composition, Structure, Spatial Arrangement, Growth Stages, and Native Plant Communities

Focused Issue B1. What are the appropriate forest composition, structure, representation of growth stages, within-stand diversity, spatial arrangement of vegetative types, and native plant community distributions necessary to maintain sustainability goals for biodiversity, forest health, and productivity across the subsections?

The subsections have experienced changes that represent a movement away from ecological diversity. Since European settlement, forest composition and structure have been simplified. Many forest stands today are not as diverse as they were historically. The age structure of the forest has been truncated (cut short) compared to historical conditions. Currently more of the forest is in older age classes and less in younger age classes. Harvesting and other factors have reduced forest patch size. The forest is becoming increasingly fragmented by construction of roads and agriculture and residential development. Habitat connectivity has suffered as a result of these changes.

The likely consequences of *not* addressing this issue are: 1) loss of wildlife habitat; 2) loss or reduction of species associated with declining habitats; 3) increase in non-native invasive species; 4) increase in populations of desirable species to the point where they reach undesirable levels; 5) dominance of a few species (i.e., loss of biodiversity); 6) loss of ecologically intact landscapes; and 7) loss of ability to produce a diversity of forest products (e.g., sawtimber, aesthetics, non-timber forest products, recreation, and tourism).

Focused Issue B2. How will the Department ensure restoration of important component tree species that have declined within forest communities in the subsections?

Some declines in species have occurred in the subsections. For example lowland hardwoods, aspen, birch and oak have declined from 2001 to 2013. These declines have resulted from any of several reasons including harvests that were not sustainable, insect infestations, disease, drought, and browsing (by wildlife). As a result, the composition, structure, and function of many forest stands no longer resemble that of (historic) native plant communities. This results in a loss of regenerative capacity for these tree species, and also the composition and structure necessary to sustain associated species. Many of these tree species are difficult to regenerate due to browsing (e.g., white-tailed deer), lack of large downed trees (for nurse logs and to create micro-sites for seed germination and plant and wildlife habitat), spruce bark beetles, white pine blister rust, and a lack of seed trees. Climate change projections may also impact decisions over what cover types are most appropriate for future vegetation management decisions.)

The likely consequences of *not* addressing this issue are: 1) loss of native tree species diversity within forest communities; 2) simplified forest stands and landscapes; 3) loss of native plant community composition, structure, and function; 4) loss of associated wildlife to the ecosystem; and 5) loss of the social, economic, and ecological values provided by these species and the forest communities that sustain them.

Focused Issue B3. How will forest native plant communities of conservation concern in the subsections be maintained or enhanced?

Certain native plant communities are of conservation concern in the subsections because of their global or statewide rarity, limited occurrence in the subsection(s), known association with rare species or significant changes in composition as compared to historical examples. Examples of these types of forest communities in the subsections are: MHs39 (Southern Mesic Maple-Basswood Forest), MHs49 (Southern Wet-Mesic Hardwood Forest), MHc38 (Central Mesic Cold-Slope Hardwood-Conifer Forest), FDs27 (Southern Dry-Mesic Pine-Oak Woodland), and WFs57 (Southern Wet Ash Swamp). There is a concern for maintaining the composition, structure, function and component species of high-quality examples of these native plant communities.

The likely consequences of *not* addressing this issue are: 1) loss of examples of high-quality intact native plant communities used as controls to compare and monitor the effects of management; 2) continued forest stand and landscape simplification; 3) loss of habitat for rare species; and 4)a loss of overall forest biodiversity and sustainability.

Focused Issue B4. How can intensive management of forest communities be adapted to retain some of the characteristics of natural stand-replacement disturbance events?

Intensive management of forest communities often results in forest simplification and homogenization and fragmentation of native plant communities at the stand and landscape scale. Even in fire-dependent systems, where natural disturbance events (e.g., wind and fire) are relatively

frequent, the resulting forest mosaic includes undisturbed vegetation and many legacies that survive within the disturbed zone. These areas and features often function as *refugia* areas where plants and animals persist through a natural disturbance event. In addition, within the disturbed portion of the natural forest many legacies persist such as standing dead or living trees and coarse woody debris that often function as habitat for species in the regenerating stand.

Plantations often include ground-disturbing activities such as rock-raking and herbicide application that can further reduce plant species and structural diversity in the forest community. It may result in disruption of the soil profile, soil compaction, loss of native herbaceous species diversity, reduced structural complexity, and an increase in non-native invasive plants such a smooth brome grass and reed canary grass and aggressive native plants such as bracken fern, Canada blue-joint grass, and raspberry.

The likely consequences of not addressing this issue are increasing: 1) simplification of forest stand and landscape communities; 2) fragmentation of native plant communities and forest cover types; 3) loss and fragmentation of habitat for associated wildlife and native plant species; and 4) loss of forest sustainability.

B5. How can management on state lands, better reflect natural landscape patterns (the size and configuration of growth stages and types resulting from broad-scale natural disturbances) in the subsections?

Existing landscape patterns do *not* reflect natural disturbance patterns and the composition, structure, and function of native plant communities that have developed historically over long periods of time. In particular, large patches and older growth stages are much less frequent in managed forest landscapes than they were historically. This has resulted in problems with 1) fragmentation and simplification of forest ecosystems at the landscape scale, 2) lowered availability of habitat complexes and associations, and 3) reduced habitat for native animals and plants.

The likely consequences of *not* addressing this issue are: 1) increasing isolation of wildlife and plant populations; 2) species loss or decline; 3) reduced resilience of forest ecosystems to disturbance events; and 4) increases of certain populations to undesirable levels resulting in negative impacts to forest communities.

Focused Issue B6. How Do We Limit Forest Fragmentation and Maintain Connectivity Among Habitats?

In the subsection(s), harvesting and other factors such as road and trail construction and residential development have reduced forest patch size, composition, structure, and age. These changes have reduced biodiversity and lessened the ability of the forest to produce a range of forest products. Ongoing sales of large tracts of land by private corporations will undoubtedly exacerbate forest change. Habitat connectivity has suffered. Forest fragmentation results in a loss of habitat and loss or reduction in the population of species associated with those habitats. Loss of connectivity will result in the loss of ecologically intact landscapes.

The likely consequence of *not* addressing this issue is a reduction in forest patch size and less connectivity between habitats.

C. Harvest Levels for Timber and Non-Timber Forest Products

Focused Issue C1. What is the appropriate timber harvest level on state lands with consideration for the sustainability of all forest resources?

One of the primary outcomes of this plan is to develop a timber harvest plan for state forest lands in the subsections for the next 10 years. The harvest level will determine the future age-class distribution of the forest. Some of the cover types in the planning area have a pronounced age-class imbalance and the harvest level will be the primary tool used to correct this imbalance over time.

Establishing an appropriate timber harvest level will require the successful integration of economic, social, and ecological factors. Timber harvest provides forest products for society and jobs for those in forest-related industries. Managing for sustainability requires that balancing timber harvest with other forest benefits. Sustainably managed forests can support a healthy and competitive timber industry, provide the diversity of habitats needed by plant and animal species, maintain water quality, and provide a wide array of recreational opportunities.

The likely consequences of not addressing this issue are: 1) inability to provide a consistent harvest level over time in the subsections due to imbalanced age-classes of certain cover types; 2) Loss of diversity in habitats throughout the subsections; and reduction or loss of certain animal species occurrence in the subsections due to habitat loss.

Focused Issue C2. How can the Department ensure adequate and sustainable "non-timber forest products" for the future?

Demand for some of these types of forest products has been light, for others it is increasing. Non-timber forest products (e.g., ginseng, diamond willow) provide diversification for local economies and are a traditional harvest for some groups. Non-timber forest products are particularly important in areas where employment opportunities in the mainstream economy are limited. They help support local individuals, families, and cottage industries in an expanding worldwide market.

The consequences of *not* addressing this issue include: 1)the possible unsustainable harvest of these resources; 2) adverse impacts to wildlife habitat and native plant communities; and 3) inadvertent harvest of rare species.

D. Biological Diversity

Focused Issue D1. How can management of stands within larger areas of biodiversity significance be designed to enhance biodiversity and native plant community composition, structure, and function?

Larger areas with biodiversity significance (e.g. some HCVFs, MBS Sites of Biodiversity Significance) provide, among others, reference areas to improve our understanding of these ecosystems and help us evaluate the effects of vegetation management. These areas present opportunities for the maintenance, enhancement or restoration of native plant communities at landscape scales. These areas have great potential for addressing biodiversity-related goals of the Minnesota Department of Natural Resources and other landowners.

The likely consequences of *not* addressing this issue are: 1) degradation of existing biodiversity and ecosystem function; and 2) loss of opportunities for maintaining or restoring patch relationships that are ecologically based (e.g., based on natural disturbance processes, wildlife habitat connectivity, and wildlife-habitat associations).

Focused Issue D2. How does the Department plan to retain and restore within-stand structural complexity (e.g., vertical structure, stem size and density, coarse woody debris, and pit and mound micro-topography) on actively managed lands where natural succession pathways are cut short?

Forests are dynamic ecosystems. Management has altered the rate and direction of natural change. Current practices tend to reduce within-stand structural complexity and diversity of vegetation, both directly and indirectly (through substrate modification). The concern is that structure is impacted directly by management where the objective is usually maintenance of a simplified structure and by silvicultural practices where existing woody debris and finer organics are removed and micro-topographic features are reduced or eliminated.

The likely consequences of *not* addressing this issue are: 1) loss of composition and vertical structure necessary to sustain native plant and animal species; 2) loss of regeneration sites for some species; 3) loss of native tree species diversity within forest communities; 4) simplified forest stands and landscapes; 5) loss of native plant community composition, structure, and function; and 6) loss of associated wildlife.

E. Rare Features

Focused Issue E1. How will rare plants and animals, their habitats, and other rare features be protected in the subsections?

Protecting rare features on state lands is a key component of ensuring species, community, and forest-level biodiversity in the subsections.
The DNR acknowledges its role in advocating for the maintenance and protection of habitat for rare features throughout the state, regardless of ownership, and in protecting and providing habitat for rare and threatened species on state lands (*Directions 2000*). As vegetation management is implemented on state lands, the DNR ensures that rare species and habitats are protected by consulting information collected through the Minnesota Natural Heritage Program database. This database addresses Minnesota's significant biological resources including the distribution, abundance, and ecology of rare species, their habitats, and other rare features information gathered by the DNR (e.g. Minnesota Biological Survey).
In addition, the Sustainable Forest Resources Management Act of 1995 provides the overarching stewardship framework for forest management in the state. DNR is required, under this statute, 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 Act further defines forest resources as: *"those natural assets of forest lands, including timber and other forest crops; biological diversity; recreation; fish and wildlife habitat; wilderness; rare and distinctive flora and fauna; air; water; soil; and educational, esthetic, and historic values."*

The possible consequences of *not* addressing this issue are: 1) rare species extirpation at the local and state level; 2) rare species declines leading to status changes (e.g., special concern species changed to a threatened or endangered species); 3) rare species habitat loss or degradation; and 4) loss of biodiversity at the species (genetic), community, and/or landscape level.

Focused Issue E2. How will land managers implement HCVF directions and balance all other priorities?

As a Department, MN DNR is committed and required by statute *(MS 89 and MS89A)* to manage for a broad set of objectives and forest resources, including the management and protection of rare species, communities, features, and values across the landscape. This commitment coincides with Principle 9 in the Forest Stewardship Council (FSC) Forest Management Standard, which requires certificate holders to identify High Conservation Value Forests (HCVFs) and manage such areas to "maintain or enhance" identified High Conservation Values (HCVs). FSC broadly defines HCVFs as *"areas of outstanding biological or cultural significance."* Certificate holders are required to develop a practical definition and process for implementing the HCVF Principle, relative to their scope and scale of operations.

Since May 2009, MN DNR has been operating under interim guidance relative to the management of HCVFs. All decisions regarding HCVFs have been based on the interpretation that most sites managed as HCVFs will remain working forests. This interpretation and expectation was based on a careful review of Principle 9 and the HCVF Assessment Framework in the FSC--- US National Forest Management Standard, Draft 7. Principle 9 states: *"Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach."* Management activities within HCVFs and prescriptions to maintain and enhance HCVs will be determined through interdisciplinary discussions and consensus. This process will be ongoing, likely handled at the Area/Region level. As continued progress is made, additional management and documentation direction will be provided by the Statewide HCVF Workgroup.

The possible consequences of *not* addressing this issue are: 1) rare species extirpation at the local and state level; 2) rare species declines leading to status changes (e.g., special concern species changed to a threatened or endangered species); 3) rare species habitat loss or degradation; and 4) loss of biodiversity at the species (genetic), community, and/or landscape level.

Focused Issue E3. How will land managers accommodate Representative Sample Areas?

Representative Sample Areas (RSAs) are ecologically viable representative samples designated to serve one or more of three purposes:

1) To establish and/or maintain an ecological reference condition;
2) To create or maintain an under-represented ecological condition; or,
3) To serve as a set of protected areas or refugia for species, communities and community types not captured in other criteria of the Forest Stewardship Certification Council (FSC) Standards …

One of the primary provisions for RSAs is to ensure that examples of ecosystem types that are not protected elsewhere in FSCs standards are protected in their natural state within the landscape. As a general guideline, if at least five (5) multiple samples of a specific ecosystem type are protected in a landscape (e.g., ecological section) then no additional samples for that RSA purpose need to be protected. Five is not to be considered an absolute number; fewer or more might be appropriate.

The possible consequences of *not* addressing this issue are: 1) rare species extirpation at the local and state level; 2) rare species declines leading to status changes (e.g., special concern species changed to a threatened or endangered species); 3) rare species habitat loss or degradation; and 4) loss of biodiversity at the species (genetic), community, and/or landscape level.

F. Wildlife Habitat

Focused Issue F1. How does the Department manage forest vegetation to balance the habitat needs of game and nongame species?

Forest wildlife is important to society. A wide range of factors, from timber harvest to development, has an effect on wildlife species and populations. Interest groups advocating for wildlife are many and varied. Some are interested in the full range of species while others are species specific. Interests include the preservation of biodiversity and management of individual species for hunting opportunities or for wildlife viewing. At times, the goals of these groups may conflict. Forest wildlife depends on healthy forest ecosystems. Legal mandates, the expectations of stakeholders, and Minnesota DNR internal policies require the ecological integrity of the forest to be maintained and enhanced. Practical reasons to maintain ecological integrity include: 1) the economic vitality of forest and tourism industries; 2) the maintenance of recreation opportunities for the public; 3) the health of wildlife species and populations; 4) public health; and 5) the control of forest insects and disease. Forest change affects forest wildlife. Some species' populations have increased in the subsections and decreased in others. Several species listed by the state as either threatened or of special concern live in these areas. Loss of important vegetative habitat types is a reason for concern for a number of other species.

The likely consequences of *not* addressing this issue are: 1) loss of wildlife habitat; 2) loss or reduction of species associated with declining habitats; 3) economic losses resulting from a decline in recreational activity associated with wildlife viewing and hunting; and 4) social losses because of a decline in enjoyment associated with wildlife viewing, hunting, and aesthetics.

G. Riparian and Aquatic Areas

Focused Issue G1. How will the impacts of vegetation management on surface waters (wetlands, streams, oxbows, sinkholes and lakes) be addressed?

MFRC Site-Level Guidelines serve as the DNR minimum standard for protections and mitigations related to surface water. Site-level considerations and guidelines that are routinely applied, without considering site-specific conditions, may not be adequate to protect surface waters. Consideration of guidelines with site-specific conditions is a key ingredient for an effective approach to surface water protection.

Relying strictly on existing guidelines without considering specific conditions associated with a given site, such as soils, topography, hydrology, past management, existing vegetation, and desired vegetation may negatively affect these ecosystems. These impacts include loss or degradation of these communities and loss of associated wildlife. There is also concern for impacts to permanent wetlands from management activities in adjacent upland stands, such as skid trails along the wetland-upland boundary.

What happens in the surrounding uplands may affect the surface water feature. For example skid trails along the wetland-upland boundary can lead to increased sediment inputs to the surface water while the presence of young forest in the adjacent landscape can lead to faster and increased water runoff.

Focused Issue G2. How will vegetative management activities within the riparian management zone (RMZ) be designed to minimize the impacts and maximize the benefits of vegetation management activities on water quality, quantity and associated biodiversity?

Forest management activities carried out within the RMZ can affect the functions associated with riparian areas and adjacent surface waters. Riparian Management Zones are areas of special concern along streams, lakes, and open water wetlands and are among the most diverse parts of the forest ecosystem. Forest management activities in the RMZ should retain a relatively continuous forest cover for the protection and maintenance of aquatic and wildlife habitat, aesthetics, recreation, and forest products.

Historically, many Minnesota streams maintained cold-water temperatures, but over the last 100 years the vegetation has changed dramatically due not only to turn-of-the-century logging practices and subsequent fires, but also to more recent changes in land use such as commercial and residential development near lakes and streams. Stream temperatures have increased, becoming marginal for trout in a number of streams.

The subsections include lakes, rivers, and trout and non-trout streams. Failure to protect riparian zone functions may cause negative impacts to the water quality, fisheries, and wildlife habitat in the planning area.

H. Timber Productivity

Focused Issue H1. How can the Department increase timber productivity on state lands?

Minnesota's forests provide a range of environmental services including timber and other forest products. Markets for timber products wax and wane, and because timber sales are the means by which Minnesota DNR accomplishes its forest management activities covered under this SFRMP, maintaining a variety of forest industries is a critical component of our ability to manage forests. This is one reason why forests on public lands are managed using a variety of management strategies that produce a variety of timber products.

Timber productivity on state lands can be improved by managing for native plant communities that are best suited to the landscape, by increasing the resilience of the forest by enhancing the natural diversity of plant species and by actively and intensively managing cover types appropriate to the sites on which they grow. Timber productivity can also be increased by methods associated with industrial forest management.

The likely consequences of not addressing this issue are: 1) a reduction in timber products available in the subsection(s); 2) loss of sustainability of providing forest products over time; and 3) loss of forest product industries throughout the state due to a reduction in forest products quality, availability and sustainability.

I. Disturbance Impacts on Forest Ecosystems

Focused Issue I1. How can the Department address the impacts of forest insects and disease on forest ecosystems?

Forest insects and disease influence forest ecosystem dynamics. These influences have both positive and negative impacts. What is perceived to be beneficial from one perspective may be viewed as detrimental from another. Insects and diseases can reduce timber production and lumber grade and increase fire hazard. Alternatively, they promote diversity of tree species and forest structure and generate dead wood, which provides important habitat and soil nutrients. Widespread pest outbreaks outside their natural range cause high levels of tree mortality and can have significant ecological and economic consequences. If attempts at control are too heavy, there may be an imbalance in pest populations. If control is not adequate, timber volume, aesthetics, and recreational enjoyment of the forest may be negatively impacted.

The likely consequences of not addressing the issue are: 1) Loss or degradation of forest products due to widespread forest insects or disease outbreaks in the subsection(s); loss or reduction of important ecosystems found in the subsection(s); and 3) Increased occurrence of non-native invasive species found in the subsection(s).

Focused Issue I2. How will non-native invasive species threats and invasions be addressed?

Natural resource managers are concerned about non-native and invasive species on public land. Non-native invasives have the potential to displace native species, carry or cause diseases, or disrupt natural community functions. While there are a growing number of good examples of the control of non-native and invasive species, most non-native and invasive species lack effective control methods. For example, the control of European buckthorn is well-understood at the site-scale but how to prevent the spread of this species across the landscape is still largely unknown. Increased use of public lands results in greater risk for the transport of invasive species of all kinds.

Failure to address the non-native invasive species issue could result in permanent changes to native communities through invasion or displacement.

Focused Issue I3. How will natural disturbances such as fire and blowdown be considered in forest management decisions?

Catastrophic natural disturbance events such as wind and fire may have a negative impact on the amount of forestland available for harvest during the 10-year plan implementation period. They may also impact the short-term goals and long-term desired future condition (DFC) goals of the subsection plan. It is difficult to predict when and where a catastrophic event may occur however this plan is designed to be adaptive in this regard. However, failure to consider what forest management practices might be allowed in disturbed areas could result in a loss of marketable timber available for sale, as well as an increase in fire danger in the vicinity of the catastrophic event.

Focused Issue I4. How will vegetation management address herbivory, crop depredation, nuisance animals, potential spread of animal disease, and possible human health issues (e.g., Lyme disease)?

Vegetation management directly affects wildlife populations. Undesirable increases in certain wildlife populations can have adverse impacts on plant communities and desirable tree species resulting from the browsing and grazing by wildlife (herbivory), crop depredation, nuisance animal complaints, potential spread of wildlife disease, and possible human health issues (e.g., Lyme disease).

The likely consequences of *not* addressing this issue are: 1) loss of public support for management programs; 2) undesirable competition between species; 3) increased non-native invasive and other undesirable species; 4) an increase in populations to the point they become a nuisance; and 5) negative economic impacts, and 6) negative impacts to native plant communities.

J. Climate Change

Focused Issue J1. How should forest management respond to global climate change within the planning period?

Predictions for the Midwest (*Canadian and Hadley Models - 2000*) suggest that the average temperature will have increased two to five degrees Fahrenheit by 2030 and five to 12 degrees Fahrenheit by 2095. Precipitation is expected to increase 99 to 109 percent by 2030 and 124 to 127 percent by 2095 (Jeff Price). Scientists believe that predicted climate change will affect the size, frequency, and intensity of disturbances such as fires and windstorms (blowdown). It will affect the survival of existing plant and animal species and the distributions of plants and animals. Increases in the reproductive capability and survival of non-native invasive species, insect pests, and pathogens will affect forests and wildlife. Certain tree species, will respond negatively to increased soil warming and decreased soil moisture. Carbon sequestration by forests and wetlands may be affected.

The likely consequences of *not* addressing this issue are: 1) acceleration and exacerbation of climate change effects to forest communities; 2) lost opportunity to begin directing management toward mitigating and slowing the effect of climate change on most vulnerable species and native plant communities; 3) species and community losses; and 4) reduced habitat for use and occupation by native wildlife and plants.

K. Visual Quality

Focused Issue K1. How will forest management activities minimize impacts on visual quality?

Scenic beauty, or visual quality, is a primary reason people choose to spend their recreation and vacation time in or near forested areas. Where forests include or are adjacent to recreational trails, lakes, waterways, or near public roads and highways there is a need to consider the impacts of forest management activities on the visual quality of the site after the forest management activity is completed. The Minnesota Forest Resource Council Site Level Guidelines are implemented to ensure visual quality impacts are minimized.

Lack of sensitivity to the visual quality impacts of any management activity may result in: 1) a negative experience for the vacationing and recreating public in forested areas of the state; and 2) increased regulations for forest management activities.

L. Access to State Land

Focused Issue L1. How will access to stands identified for management be provided?

Access routes are necessary to effectively manage forest stands identified for management during the 10-year planning period. These access routes will have both positive and negative attributes. They provide access for forest management activities, insect and disease control, fire response, and recreation. However, the development, construction, and maintenance of forest access routes also results in land disturbance, loss of acres from the timberland base, increased spread of non-native invasive species and undesirable native plants and animals, potential conflicts with adjacent private landowners, potential for user-developed trails, degradation of water quality, destruction of fish habitat, forest fragmentation, and increased road densities..

The likely consequence of *not* addressing this issue is the lost opportunity to have a well thought-out forest access plan to minimize the negative attributes.

M. Cultural Resources

Focused Issue M1. How will cultural resources be protected during forest management activities on state-administered lands?

Cultural resources are scarce, nonrenewable features that provide physical links to our past. A cultural resource is an archaeological site, cemetery, historic structure, historic area, or traditional use area that is of cultural or scientific value. Cultural resources are remaining evidence of past human activities. To be considered important, a cultural resource generally has to be at least 50 years old. A cultural resource may be the archaeological remains of a 2,000- year-old Indian village, an abandoned logging camp, a portage trail, a cemetery, food gathering sites such as wild rice harvesting and maple sugaring camps, or a pioneer homestead. They often possess spiritual, traditional, scientific, and educational values and should be treated as assets. In addition to federal and state laws that protect certain types of cultural resources, the *Voluntary Site-Level Forest Management Guidelines* provide information and recommendations to assist private and public land managers in taking responsible actions when cultural resources are encountered. Leading up to stand examinations, the cultural resource database is consulted to determine if cultural resources could potentially be impacted through stand treatment. Appropriate actions are taken to ensure no impacts.

Failure to follow the recommended management practices to protect cultural resources could result in loss of or damage to the cultural resource.

N. Balancing Forest Management Needs with Legal requirements

Focused Issue N1. How will land managers uphold various state and federal legal requirements?

Divisions in the DNR must follow legal mandates, while fulfilling both Department and Division missions. For example, State Trust Fund lands must generate income for trust accounts under state law. Timber sales are one means of achieving this goal. In contrast, wildlife habitat management and protection, not timber sales, is the mandate for acquired Wildlife Management Area (WMA) lands.

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

Failure to follow these mandates and legislative intent may be a violation of federal or state law.

O. Natural Resource Management impacted by Structural and Agricultural Development

Focused Issue O1. How can land managers effectively implement comprehensive resource management while impacted by structural and agricultural development?

This is an issue because increasing populations, urbanization and land use change adjacent to public lands hinders the DNR's ability to implement the full range of management options. Further, development pressures can result in conflicting land uses adjacent to public lands and fragments public land holdings, resulting in degradation of the resource. The development patterns and associated stakeholder comments will influence how forestry management is implemented in the Blufflands/Rochester Plateau subsections.

The Department can address this Issue by seeking opportunities for coordination with adjacent land owners and coordinate with other land managers in the subsection. Work with local governments to achieve more appropriate land uses adjacent to state land through land use management and land protection strategies, such as park designation and conservation easements.

The consequences of not addressing this Issue include continued conflicting land uses adjacent to public lands, isolation of natural areas, and loss of connectivity between state-managed forested lands.

P. Landscape Resource Management on Limited Public Lands

Focused Issue P1: How can land managers achieve "landscape" level management with the relatively limited public land base found in the Blufflands/Rochester Plateau subsections?

This is an issue because state ownership is limited in these subsections. Further, accommodating the full range of forest resource management given the land base will prove to be a challenge due to the continued development pressures projected in the subsection. Subsection resource management planning as implemented through SFRMPs considers the wide range of resource management issues affecting vegetation on state administered lands. These issues include forest production, wildlife habitat management and ecological issues such as management for rare and unique species. Accommodating all issues adequately can be less of a challenge with a broader state administered land base to work with. For example achieving many forest management objectives relies on the private logging industry to harvest selected stands. Harvests are a key technique to affect age classes, convert cover types, and respond to disease outbreaks and disturbance events. With a limited land base, the availability and interest of loggers due to markets and volumes offered, to buy timber sales is not as widespread as is found in more forested regions of the state. Without this harvest activity, many forest management strategies cannot be fully implemented.

The Department will address this Issue by continuing to cooperate and coordinate with adjacent land owners (public and private). Continue efforts to seek stakeholder recommendations throughout the planning process. Disseminate final plans to other land managers to use in their planning

processes and use it to influence management on private lands through Private Forest Management efforts. Continue education efforts supporting the overall multiple use and enjoyment concept that applies to state administered lands.

The consequences of not addressing this Issue include further conflicts between users and the recommended management of state forested lands is possible. Missed opportunities for coordination among public and private forest land managers, resulting in not achieving the highest potentials for forest lands to accommodate the multiple goals required given the limited land base and increasing development pressures.

General Direction Statements Generated from SFRMP Issues

Following identification of Issues and their refinement into the more specific Focused Issues, SFRMP teams develop Desired Future Condition objectives/goals (i.e., DFCs), General Direction Statements in response to Issues, Strategies to achieve the General Direction Statements. The DFCs, General Direction Statements, Strategies are then used to define the criteria (e.g., rotation age, basal area, location, site-index, etc.) used to select potential stands for treatment (e.g., harvest, thinning, regeneration, prescribed burning, etc.).

Table 2.1a identifies the relationship between the Issues described in Chapter 2 and the associated General Direction Statements (GDSs) and Strategies in Chapter 3.

Table 2.1a: Focused Issues and General Direction Statements Generated from SFRMP Issues *(from Preliminary Issues and Assessment document)*

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
Desired Age-class Distribution	*What are the desired age-class and growth-stage distribution of forest types across the landscape?*	1A: Some stands on State lands will be managed to reflect the composition, structure, and function of native plant communities.	a. Use the *Field Guide to the Native Plant Communities in Minnesota: the Eastern Broadleaf Forest* and associated ECS Silvicultural Interpretations to classify stands to NPC and prepare silvicultural prescriptions. b. Follow Strategies in GDS-2C relating to retaining components of various growth stages in stands.
	What are the Appropriate Amounts, Types, and Locations of Old Forest?	1B: Species, age, and structural diversity within some stands will be maintained or increased.	a. Use selective harvesting to encourage diversity of species, ages, and stand structures. b. Meet or exceed the *Site-Level Guidelines* designed to maintain a diversity of tree species within a stand. c. Use the NPC Field Guide,[2] Site Index, Soils Data, and ECS Silvicultural Interpretations to aid in determining the species composition and structure appropriate for the site. d. Reserve seed trees in harvest areas and site preparation areas, where possible e. Use the least intensive site preparation

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			methods possible to ensure success. f. Retain tree species, stand structure, and ground layer diversity within stands when prescribing timber stand improvement and thinning activities. g. Use harvest systems or methods that protect advance regeneration. Retain conditions that favor regeneration and understory initiation. h. Identify some stands where succession is allowed to occur to encourage development of within-stand diversity. Movement to the next successional stage may be achieved with or without Harvest. i. Increase and/or maintain by reserving from harvest, target species including quality oak species that would serve as a seed source after harvest as components within appropriate cover types. Silvicultural practices that may add or increase the presence of these target species will include planting, inter-planting, and artificial or natural seeding. j. Manage planted and seeded stands to Represent the array of plant diversity. k. Encourage fruit and mast-producing species
Projected Harvest Levels		2A: The SFRMP treatment level for each cover type moves toward the desired age-class structure for even-aged managed cover types and improves the age-structure and timber quality of uneven-aged managed cover types.	a. Select stands for treatment to address age-class imbalances. b. Give emphasis to treating stands older than normal rotation age. c. Identify and properly manage adequate old forest acres. d. Treatment levels result from rotation ages that will maintain adequate acres of young forest. e. Identify and account for planned increases/decreases in cover type acres in selecting acres to be included on the stand exam list. f. Provide a sustainable supply of timber while maintaining all other Strategies identified in this SFRMP.

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			g. Apply selective harvest treatments to cover types managed through uneven-aged practices and thinning. h. Consider and account for potential biomass harvesting. i. Identify and defer stands identified as Old Growth
		2B The harvest of non-timber forest products is managed to provide a sustainable supply for humans while providing for wildlife habitat and biodiversity.	a. Consider known traditional gathering areas when managing other forest resources. b. Supervise and enforce special product permit regulations to ensure that the site's capacity for future production is not jeopardized. c. Consider the known locations of important wildlife habitats, rare native plant communities or species, and the possible impacts of non-timber forest products harvest practices before issuing special product permits. d. Forest managers should judiciously monitor the gathering of species where there is little knowledge and understanding of their ecological sustainability requirements
Desired Mix of Forest Composition, Structure, Spatial Arrangement, Growth Stages, and Native Plant Communities	*What are the Appropriate Forest Composition, Structure, Representation of Growth Stages, Within-stand Diversity, Spatial Arrangement of Vegetative Types, and Native Plant Community Distributions Necessary to Maintain Sustainability Goals for Biodiversity, Forest Health, and Productivity Across the Subsections?* *How will the Department Ensure Restoration of Important Component Tree Species that have Declined Within Forest Communities in the Subsections* *How will Forest Native Plant Communities of Conservation Concern in the Subsections be Maintained or*	3A: Old forest in the subsections is distributed across the landscape to account for timber products, wildlife habitat, and ecological diversity.	a. Monitor old forest over the decades in even-aged managed cover types so that the desired amount of old forest across all ownerships continues to be provided. b. Manage riparian zones primarily to reflect old forest conditions. c. Allow some stands to naturally succeed to long-lived cover types with, or without the use of harvest. d. Manage designated Old-Growth stands according to DNR guidelines. e. Meet or exceed the MFRC *Voluntary Site-Level Forest Management Guidelines (Site-Level Guidelines)* to retain components of Old Forest in even-aged managed cover types f. Use silvicultural treatments that retain Old Forest components in some stands. g. consider the status of Old Forest within

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
	Enhanced? *How can Intensive Management of Forest Communities be Adapted to Retain Some of the Characteristics of Natural Stand-replacement Disturbance Events?* *How can Management on State Lands, Better Reflect Natural Landscape Patterns (the Size and Configuration of Growth Stages and Types Resulting from Broad-scale Natural Disturbances) in the Subsections?* *How Do We Limit Forest Fragmentation and Maintain Connectivity Among Habitats?*		subsections when making decisions to add and offer unplanned wood for harvest.
Biological Diversity	*How can management of stands within large areas of biodiversity significance be designed to enhance biodiversity and native plant community composition, structure, and function?* *How do we plan to retain and restore within-stand structural complexity (e.g. vertical structure, stem size and density, coarse woody debris, and pit and mound micro-topography) on actively managed lands where natural succession pathways are truncated (cut short)?* *How will Rare Plants and Animals, Their Habitats, and Other Rare Features be Protected in the Subsections?* *How Will Land Managers Implement HCVF Directions and Balance All Other*	**3B: Endangered, Threatened, and Special Concern Species and their key habitats are protected, maintained, or enhanced in the subsections.**	a. Provide access to the Natural Heritage Information System to DNR staff through the DNR Quick Layers in Arc Map. b. During the development of the 10-year Stand Examination and Annual Stand Examination Lists, land managers check the rare features database and identify for follow-up consultation all stands proposed for treatment that includes a rare feature. c. Harvest prescriptions and management objectives identify and implement measures that protect rare features. d. Apply Current *SGCN* and *Key Habitat* data to management decisions. e. Incorporate new *SGCN* and *Key Habitat* locations and data as they are collected in the subsections. f. Stand-level management accounts for *SGCN* and *Key Habitats*.

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
	Priorities?		g. Apply special management recommendations for known rare features, *Species of Greatest Conservation Concern*, and *Key Habitats*. h. Management proposals identify and implement measures that protect rare features.
Rare Features	*How Will Land Managers Accommodate Representative Sample Areas?*	3C: Plan for forest cover types that historically occurred within these ecosystems together with current knowledge about potential climate change scenarios.	a. Increase the acres of native prairie, savanna and grasslands primarily on dry unproductive red cedar cover types. b. Increase mixed-forest conditions in some stands in all cover types. c. Forest composition goals and objectives are consistent with the *MFRC Landscape Plans*.
		3D: Managers of State Lands in MBS Sites of Statewide High and Outstanding Biodiversity Significance and High Conservation Value Forests will implement Measures to sustain or minimize the Loss to the Biodiversity Significance.	a. Identify HCVF and consult the *High Biodiversity Plan Guidance* document for that HCVF as stand management is implemented. b. Consider the broader context and significance of the HCVF site as a whole when assigning management objectives and designing silvicultural prescriptions. c. Determine location and composition of stand conversions based on NPCs. d. Allow some stands to succeed to the next Native Plant Community Growth Stage, with or without harvest. e. Emulate the within-stand composition, structure, and function of NPC Growth Stages when managing stands in HCVF sites. f. Apply variable density thinning during harvest or reforestation. g. Apply variable retention harvest techniques during harvest. h. Increase the use of prescribed fire as a silvicultural technique in managing fire-dependent NPCs. i. Locate roads to minimize fragmentation of a

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			HCVF site. j. Emulate natural disturbance conditions in stand management. k. Land status and timber productivity will be considered while implementing the other Strategies on stands identified for management in these HCVF sites. l. Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources personnel will communicate with other landowners, as opportunities arise, to inform them of the significance of these HCVF sites and management options that could be implemented to address the biodiversity objectives of these HCVF sites.
		3E: Rare Native Plant Communities are protected, maintained, or enhanced in the subsections.	a. Document and manage known locations of NPCs with a Global rank of Critically Imperiled (G1) or Imperiled (G2), and manage to maintain their ecological integrity. b. Document and manage known locations of NPCs with a Statewide rank of Critically Imperiled (S1) or Imperiled (S2), and manage to maintain their ecological integrity, as part of identified HCVF sites and High Biodiversity Areas. c. Apply special management to stands that are identified as high quality examples of rare native plant communities.
		3F: State Lands will attempt to provide for a representation of each growth stage in each Native Plant Community	a. Document growth stages of the stands selected for treatment in the subsections. b. Strive to emulate the within-stand composition, structure, and function of NPC growth stages when managing stands. c. Consider the contribution of inoperable stands and reserved areas (e.g., old growth, SNAs,

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			state parks) in providing representations of growth stages when developing prescriptions. d. Manage designated representative ecosystems (RSAs) and High Conservation Value Forests (HCVF) consistent with DNR direction to achieve distributions of native plant communities. e. Apply ECS Silvicultural Interpretations when proposing stand management prescriptions.
Wildlife Habitat	*How Do We Manage Forest Vegetation to Balance the Habitat Needs of Game and Nongame Species?* *What are the Appropriate Amounts, Types, and Locations of Young, Early Successional Forest?*	4A: Adequate habitat and habitat components exist, simultaneously at multiple scales, to provide for nongame species found in the subsections.	a. Provide old forest distributed across the landscape to accommodate the needs of non-game species. b. Provide young forest distributed across the landscape to accommodate the needs of non-game species. c. Manage to retain the integrity of riparian areas and provide protection for seasonal and permanent wetlands. d. Provide stand management that addresses the needs of species that depend on perches, cavity trees, bark foraging sites, and downed-woody debris. e. Provide for the needs of wildlife species associated with characteristics of important native plant communities in the subsections. f. Create and maintain within-stand diversity to benefit non-game species. g. Manage to favor native plant communities and retain elements of biodiversity Significance. h. Consider Natural Heritage Program Data and other rare species information during development of both the 10-year and Annual Stand Examination Lists. h. Apply the DNR management recommendations for habitats of nongame species as described in DNR guidelines and policies.

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
		4B: Adequate habitat and habitat elements exist, simultaneously at multiple scales, to provide for game species found in the subsections	a. Provide young forest distributed across the landscape to accommodate the needs of game species. b. Provide old forest distributed across the landscape to accommodate the needs of game species. c. Provide a balanced age-class structure in cover types managed with even-aged silvicultural systems. d. Increase the productivity and maintain the health of even-aged managed cover type stands. e. Create and maintain within-stand diversity to benefit game species.
Riparian and Aquatic Areas	*How Will the Impacts of Vegetation Management on Surface Waters (Wetlands, Streams, Oxbows, sinkholes and Lakes) be Addressed?* *How will Vegetative Management Activities within the Riparian Management Zone (RMZ) be designed to Minimize the Impacts and Maximize the benefits of Vegetation Management Activities on Water Quality, Quantity and Associated Biodiversity?*	5A Riparian areas are managed to provide critical habitat for fish, wildlife, and plant species.	a. Meet or exceed the *MFRC Site-Level Guidelines* relating to riparian areas. b. Using the NPC Field Guide and associated ECS Silvicultural Interpretations, manage for a species appropriate for the site. c. Follow the recommendations identified in local and regional water resource management agency plans as they relate to and affect state-administered lands. d. Follow strategies outlined in *Tomorrow's Habitat for the Wild and Rare*.
		5B: Forest management on state lands adequately protects wetlands, seasonal ponds including oxbows, and sinkholes.	a. Meet or Exceed MFRC *Site-Level Guidelines*. b. Consider landforms (e.g., St. Laurence formation and Decorah Edge geologic layers) that have seasonal ponds, side hill seeps, perched wetlands and sinkholes, and address those features in site-specific prescriptions that are developed during the Stand Examination

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			Field Visit.
Timber Productivity	*How Can Timber Productivity be increased on State Lands?*	6A: Even-aged managed cover types will be managed to move toward a balanced age-class structure.	a. Target the selection of stand treatment acres to the appropriate age-classes.
		6B: Timber productivity and quality on state timber lands is increased.	a. Move toward harvesting stands in even-aged managed cover types at their normal rotation ages. b. As opportunities exist, thin or selectively harvest in some oak, lowland hardwood and walnut stands. c. Include silvicultural treatments such as site preparation, inter-planting, release from competition (e.g., herbicide application or hand release), and timely thinning in plantation management, to increase productivity. d. Apply and supervise the implementation of the *MFRC Site-Level Guidelines* on treatment sites. *e.* Continue to implement, supervise, and enforce current DNR timber sale regulations to protect and minimize damages to sites or residual trees from treatment activities. f. Manage some stands for large diameter, high-quality sawtimber products by retaining adequate stocking and basal area. g. Respond to insect and disease problems, as appropriate. (See GDS-7A)
Forest Pests, Pathogens and Non-native Invasive Species	*How can the Impacts of Forest Insects and Disease on Forest Ecosystems be addressed?* **How Will Non-native Invasive Species Threats and Invasions be Addressed?**	7A Limit Damage to Forests from Insects, Disease, and Non-native Invasive Species to Acceptable Levels Where Feasible.	a. Identify and monitor insect, disease, and non-native invasive species populations as part of the forest health monitoring program and document their occurrence on state-managed lands. b. Follow Minnesota DNR Operational Order 113 (Invasive Species) and appropriate Division guidelines to minimize the spread of non-

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
	How Will Vegetation Management Address Herbivory, Crop Depredation, Nuisance Animals, Potential Spread of Animal Disease, and Possible Human Health Issues (e.g., Lyme Disease)?		native invasive species during forest management activities. c. Adhere to the Minnesota DNR 2010 Invasive Species Program Directive on forestry lands d. Manage existing forest insect and disease problems, as appropriate. e. Use the least intensive site preparation methods possible to ensure success. f. Manage stands to reduce the potential impact of insects and diseases.
		7B Reduce the Negative Impacts Caused by Wildlife Species on Forest Vegetation on State Forest Lands.	a. Improve implementation of Strategies to prevent wildlife depredation b. Consider the potential for wildlife impacts to planted or naturally regenerating trees before damage occurs. c. Focus forest regeneration efforts in areas less likely to be negatively impacted by wildlife. d. On sites where damage from wildlife species is anticipated, use mitigation techniques to reduce damage when planting susceptible tree species. e. When deciding what to plant, consider species or stock sources that are less palatable to wildlife.
Climate Change	*How Should Forest Management Respond to Global Climate Change Within the Planning Period?*	8A: Forest Management on State Lands Attempts to foster adaptation to the effects of Global Climate Change. Management is Based on our Current Knowledge and will be Adjusted Based on Future Research Findings.	a. Maintain or increase species diversity across the subsections. b. Maintain or increase structural diversity across the subsections. c. Maintain connectivity that permits the migration of plants and animals as climate changes the landscape. d. Evaluate site conditions with respect to climate change when selecting tree species for

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
			regeneration. e. Consider the effects of forest management on carbon sequestration and carbon stocks. f. Consult Tree Suitability tables in determining conversions and stand management. g. Apply the MFRC *Site-Level Guidelines* for tree species at the edge of their range.
Visual Quality	*How Will Forest Management Activities Minimize Impacts on Visual Quality?*	9A Minimize Forest Management Impacts on Visual Quality in Sensitive Areas.	a. Apply the *Site-Level Guidelines* on visual quality on all vegetative management activities. b. Work to resolve conflicts between recreational users and forest management to assure sustainability of forest resources and plant communities. c. Resolve conflicts between forest management directions and constraints of HCVF, RSAs, or OG with recreation uses.
Access to State Land	*How will Access to Stands Identified for Management be Provided?*	10A Forest access routes are well planned and there is a high level of collaboration with adjacent landowners to share access and minimize new construction.	a. Continue to seek cooperation with adjacent landowners to retain existing access to State land and to coordinate new road access development and maintenance across multiple ownerships. b. Follow Minnesota Statutes and guidelines and DNR Policies for state forest roads. c. Apply the Department direction regarding access roads across sensitive areas that have been reserved from treatment or identified for special management during the 10-year implementation period. d. Follow Strategies identified under other General Direction Statements that apply to roads throughout the planning, development, and disposition of forest roads. e. Implement timber access planning. f. Acquire lands to enhance access to State owned lands.
Cultural resources	*How will cultural resources be protected during forest management activities on state-administered lands?*	11A Cultural Resources are Protected on State-administered Lands.	**a.** Annual stand exam lists are reviewed by DNR archeologists; recommendations for mitigation are implemented as part of sale design.

Issue Area (from Chapter 2)	Focused Issue (from Chapter 2)	General Direction Statements (GDSs) (to address the Focused Issue)	Strategies (to implement the GDS)
Natural Disturbance Events	*How Will Natural Disturbances such as Fire and Blowdown be Considered in Forest Management Decisions?*	12A Natural Disturbance Events that Occur on State Land Within the Subsections are Promptly Evaluated to Determine the Appropriate Forest Management Needed to their Impacts.	a. The Subsections' planning Team will evaluate large-scale (100's to 1000's of acres) disturbance events to determine appropriate action. b. Local land managers will evaluate and determine appropriate actions for small-scale (10s of acres) disturbance events.
Balancing forest management needs with legal requirements	*How Will Land Managers Uphold Various State and Federal Legal Requirements?*	13A School Trust Lands will be Managed for Long-Term Economic Return to the Minnesota School Trust Fund. 13B The Minnesota School Trust Fund will be Compensated for any Management Activities That Limit the Economic Return for School Trust Lands.	
Natural Resource Management impacted by structural and agricultural development	*How can land managers effectively implement comprehensive resource management while impacted by structural and agricultural development?*	14A The changing structural and agricultural development pattern will be considered as forest management is implemented in the subsection.	a. Inform adjacent landowners of nearby management activities on the state lands and, when feasible, mitigate any impacts. b. Encourage private landowners, local governments and other land managers to implement compatible land uses adjacent to state land through land use management actions. c. Work with other divisions to mitigate the impacts of forest management on recreational users.
Landscape Resource Management on Limited Public Lands	*How can land managers achieve "landscape" level management with the relatively limited public land base found in the Blufflands/Rochester Plateau subsections?*	15A Continue to cooperate and coordinate with adjacent land owners (public and private) supporting the overall multiple use and enjoyment concept that applies to state administered land.	a. influence management on private lands through stewardship planning efforts. b. Disseminate final plans to other land managers to use in their planning processes. c. Strategically purchase lands with conservation values.

Chapter 3: General Direction Statements and Strategies

3.0 Introduction

In response to the final list of issues identified in Chapter 2, the subsection team developed General Direction Statements (GDSs) to address the Issues, Strategies to achieve the general directions, and Desired Future Composition (DFC) goals. General Direction Statements take into account the direction provided in State statutes and rules, Department policies, guidelines, and direction (e.g., *A Strategic Conservation Agenda 2009-2013),* and management that will sustain the forest resources on state-administered forest lands in the subsections. General Direction Statements provide general direction such as: increase, decrease, maintain, or protect a certain condition, output, or quality. Strategies were developed for each of the GDSs to achieve the general direction.

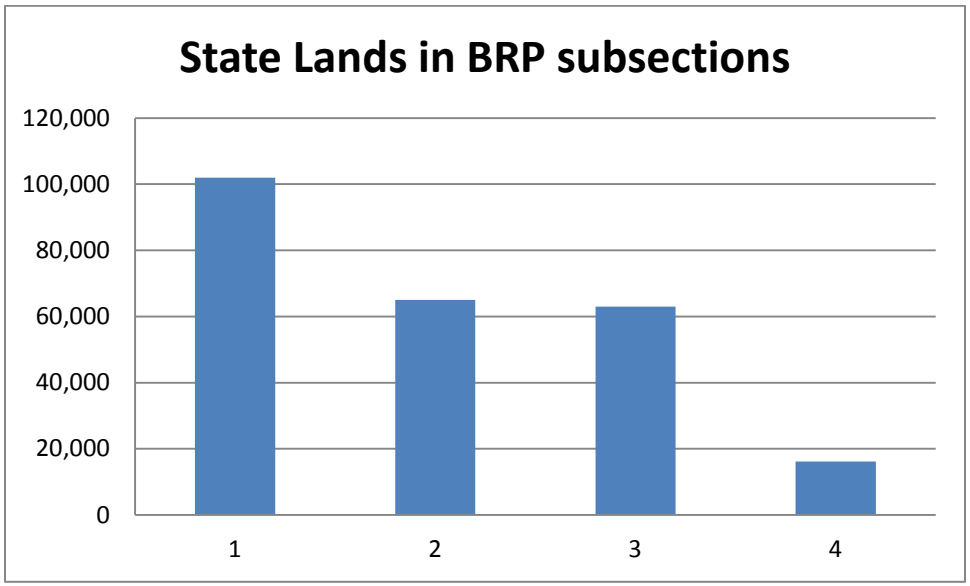
In situations where there is currently an ability to measure and quantify progress, DFC goals were identified. DFC goals are long-term (50+ years) goals for the desired condition of DNR forest lands in the subsections. Examples of DFC goals are: cover type acres, age-class distribution, amount of young and old forest, and cover type treatment levels (e.g., harvest levels). Desired Future Condition goals, General Direction Strategies , and cover type management guidance documents were used to develop stand selection criteria used to identify a pool of stands from which to select stands to be treated during this 10-year plan implementation period. Treatment levels by cover type were also established. Selection and treatment of stands from this pool is expected to move state-administered forests in the subsections toward the DFC goals. The GDSs, Strategies, and DFC goals presented in this chapter guided the selection of stands and the application of treatments to stands selected for treatment.

For most even-aged managed cover types, recommendations assume that achieving the desired age-class distribution is a long-term goal, even though it may take more than one rotation to achieve for most cover types. In some cover types such as oak, this will be very difficult to achieve, due to species characteristics and changing disturbance regimes.

This plan has been developed consistent with the Department's newly developed extended rotation forest policy (ERF) direction. In past SFRMPs, ERF were designated to assure an adequate supply of older forest on the landscape. The Department's new ERF direction continues to recognize these values of older forests but in the future will consider the age class distributions as found across all ownerships to establish the desired ERF levels on state administered lands.

The figure below shows the acres of state land included in this plan:

Figure 3.0a State-Administered Lands, Forest Lands, Managed Acres and 10-Year Stand Exam List Acres in the Blufflands/Rochester Plateau Subsections



[1] *State-administered lands include all Divisions of Forestry, Fish and Wildlife, Trails and Waterways, and state park-administered lands in the subsection(s).*
[2] *Forest land* consists of all lands included in the DNR forest stand inventory (i.e., Cooperative Stand Assessment, or CSA), including cover types from aspen to stagnant conifers, lowland brush, and other wetlands.
[3] *Managed* acres are those Division of Forestry and Section of Wildlife forest land acres in this plan that are available for timber management purposes (i.e., excludes forest lands reserved as old growth, SNAs; inoperable stands, brush and grass).
[4] The 10-year stand exam list is a total of the acres that are proposed to be site-visited and managed in the first decade of the planning period.

Forest land consists of all lands included in the DNR forest stand inventory (i.e., Cooperative Stand Assessment, or CSA), which includes all recorded cover types from commercial types to lowland brush, wetlands and other non-timbered cover types. *Timber land* includes those cover types that are capable of producing merchantable timber. In this plan, *managed* acres are those timberland acres available for timber management purposes (i.e., excludes timberlands reserved as old growth, SNAs; inoperable stands, etc.).

Subsection Forest Resource Management Plans are organized in the following manner: Issues are identified to be addressed; Desired Future Conditions are stated as primary goals; General Direction Statements are developed to address the Issues; Strategies are then fashioned to support the GDSs. In this chapter, the GDSs and associated Strategies are grouped under fifteen forest resource management topic areas or categories. Some categories have several GDSs to address the associated issues.

Role of Department guidance documents, policy and management recommendations

In addition to DFCs, General Direction Statements, Strategies and stand selection criteria identified in this SFRMP, vegetation management is directed by appropriate planning documents, guidelines, policies, objectives and initiatives implemented by the Department. Vegetation management must consider all these directives as they apply to individual site-level decisions.

3.1 Major Cover Types in the Subsections – Background Information

Following is a summary of the current and desired future condition of the commercial cover types found in the Blufflands/Rochester Plateau subsections.

Aspen

Current Conditions

Cover Type Acres

Aspen is a minor cover type in the subsections. Mature aspen stands are typically comprised of a mixture of species, with aspen being the major component as measured by volume. In 2013 the aspen cover type totaled approximately 984 acres or 1.5 percent of the BRP timberlands

Age-Class Distribution:

The current aspen age-class distribution does not reflect the desired balanced age-class structure for even-aged managed cover types.

Stand Composition:

A mixture of species comprises the typical mature aspen stand, with aspen being the major component as measured by volume. In this planning area, aspen is a minor component of the total forest land acres and is generally found in smaller acreages as part of other cover types.

Native Plant Communities:

Aspen is found in the following plant communities: FDs38 and MHs37

Conversion Goals:

There are no conversion goals out of the aspen cover type for the BRP SFRMP. Aspen is important to maintain as a cover type to provide diverse habitat for several wildlife species. Conversion targets for the subsections are included in Table 3.1a.

Future Direction

Cover Type Acres:

A goal of the BRP SFRMP is to have 1,000 (1.5%) acres of aspen at the end of the first decade. The DFC for aspen is to maintain or slightly increase the acres of this cover type. After 50 years of plan implementation, the goal is to increase slightly the acreage now inventoried as aspen cover type. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:

After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes, although with such a limited land base and limited aspen markets balancing age classes over future decades will be a challenge. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the aspen cover type beyond normal rotation age on state administered lands. Aspen is not identified as a commercial cover type in the BRP, reducing the need for extended rotation forests

Stand Composition:

Within stand composition for the aspen cover type will typical include a mix of hardwood species.

Special Concerns or Limiting Factors:

Due to topography, selective harvest in most cover types proves challenging as damage to downhill trees can occur. There are no particular goals for the aspen cover type identified in this plan other than to offer aspen acres upon reaching normal rotation age.

Birch

Current Conditions

Cover Type Acres

The birch cover type most often refers to stands of paper birch within the planning area. Current acres of the birch cover type total 325 acres or less than one percent of total forest acres. Although offered for sale as a component of mixed species or as part of adjacent sales, birch is not a primary commercial cover type in the subsections.

Age-Class Distribution:

The current birch age-class distribution does not reflect the desired balanced age-class structure for even-age managed cover types. Due to the small number of acres of this cover type in the planning area, it is not a goal to achieve a balanced age-class distribution for birch.

Stand Composition:
Within-stand species composition of mature birch stands (51+ years old) in the BRP subsections typically includes significant amounts of species in addition to birch such as aspen. The stand history (both natural and anthropogenic) and the native plant communities of the site account for most of the species variation within the birch cover type.

Native Plant Communities:
Birch is a component of these native plant communities: FDs 27 and FDs38.

Conversion Goals:
There are no specific goals to convert birch to other cover types in the BRP subsections.

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to have 325 acres (less than 1% of timberlands) of birch cover type at the end of the first decade. After 50 years of plan implementation, the goal is to maintain this acreage at 325 on the landscape. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes.
Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the birch cover type beyond normal rotation age on state administered lands.

Stand Composition:
There are no goals to alter the stand composition of the birch cover type.

Ash/Lowland Hardwoods

Current Conditions

Cover Type Acres:
Ash: Ash cover type often is mixed in the lowland hardwoods type. There are, however several pure ash stands that occur on upland sites. In 2013 the ash cover type totals 534 acres or less than 1 percent of the total timberlands in the BRP subsection. Ash is currently under threat from emerald ash borer in all counties but has been identified in Houston and Winona counties in the subsection**.**

Lowland Hardwoods: Ash and lowland hardwoods are combined into one management category for this SFRMP because these two cover types are commonly associated with each other and are managed under the same management prescriptions. In 2013 lowland hardwoods total 7,855 acres or approximately 12 percent of timberland acres.

Age-Class Distribution:
The ash and lowland hardwood cover types are managed using uneven-aged treatments thus a balanced age-class is not a goal. The majority of ash acres are found in the 31-40 age class. The majority of the lowland hardwood acres are found in the 41-80 age classes.

Stand Composition:
Ash: On upland sites ash is a sturdy well rooted tree and grows to large diameters. The ash on lowland sites are often shallow rooted and may exhibit a great deal of ring-shake which degrades the timber for most lumber and wood product uses. It may be mixed with other northern hardwood species.

Lowland Hardwoods: This type is a combination of species including silver maple, bur oak, box elder, American and rock elm, green and black ash, and basswood (depending on site NPC). Some areas also have river birch and swamp white oak as components. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the ash or lowland hardwoods cover types beyond normal rotation age on state administered lands.

Native Plant Communities:
Ash is found in several native plant communities including MHs38, MHs49, FFs59 and FFs68.
Lowland Hardwood cover type is found in native plant communities FFs59 and FFs68.

Conversion Goals:
Ash will be managed consistent with Department guidance in the face of the emerald ash borer invasion.[3] Ash will be retained to a degree possible in the face of the EAB threat. No specific conversion goals are identified for ash during this plan implementation period.

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to accept a reduction of ash to 300 acres then to maintain this acreage over 50 years. The 50 year goal is to maintain lowland hardwoods at 7,855 acres. The 50-year DFC for the subsections can be found in Table 3.1a.

[3] http://files.dnr.state.mn.us/forestry/ecssilviculture/policies/guidelinesManagingAshMinnesotaForestryLands-100723.pdf

Age-Class Distribution:
The ash and lowland hardwood cover types are managed using uneven-aged treatments thus a balanced age-class is not a goal.

Stand Composition:
The goal for Lowland hardwoods is to manage for a mix of species. Efforts will be made to salvage ash consistent with Department directives.

Special Concerns or Limiting Factors:
Emerald ash borer was discovered in Minnesota in 2009 in Houston County and is now also found in Winona County. The extent to which ash populations will be affected is yet to be fully determined. In addition to ash on Department administered lands, EAB is a threat to urban planted ash. Harvest of lowland hardwood acres is complicated by invasion of reed canary grass. The impacts of this invasive species must be considered on each potential treatment of lowland hardwood acres.

Ash stands in seepage zones are classified as the native plant community WFs57 (Southern Wet Ash Swamp), which is listed as a native plant community of conservation concern (listed under Focused Issue B3). These communities are rare and often contain concentrations of rare plant species. The hydrologic integrity of these swamps and the rare species occurring in them should be considered as part of potential treatment of these stands.

Northern Hardwoods
Current Conditions
Cover Type Acres:
In 2013 the northern hardwood cover type totaled 8,389 acres (13 percent of the timberlands) on state lands in the subsection.

Age-Class Distribution:
Northern hardwoods are managed as an uneven-aged cover type so a balanced age-class distribution is not a goal in this plan. Northern hardwoods show a relatively even distribution across all age classes. Some northern hardwood stands will have a higher component of oak which will be managed more on an even aged regime. Even-aged management or uneven-aged management of northern hardwood stands depends on the primary species component of the stand. Even-aged or uneven-aged management of the stand will be determined on site visit.

The most northern hardwood acreage is found in the 81-90 age class. At present northern hardwoods are not considered out of balance except for an abundance of 81-90 year old age class. This will need some attention during this plan implementation period in order to avoid this age class from growing into a 100 year old plus age class.

Stand Composition:

Natural, mature northern hardwood stands are mixed stands. Species in the northern hardwood cover type are: sugar maple, red maple, red oak, basswood, green ash, black ash, quaking aspen, bigtooth aspen, paper birch, ironwood, white pine, hackberry, bitternut hickory and butternut.

Native Plant Communities:
Northern Hardwoods are found in several plant communities including MHs37, MHs38, MHs 39 and MHs49.

Conversion Goals:
There are no specific goals to convert northern hardwood stands in the BRP subsections.

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to maintain of the landscape 9,200 acres (14% of timberland) of northern hardwoods at the end of the first decade. This represents a slight increase from the current cover type acreage. The 10 year DFC is to minimize the increase of northern hardwoods. Northern hardwoods tend to increase because of aging of the oak cover types and unsuccessful regeneration of oak in the years after a timber harvest. Northern hardwoods, being a shade tolerant plant community, can overtake the less shade tolerant types such oak species. Those species may appear in the understory and linger until the canopy is removed and more sunlight reaches the ground. After 50 years of plan implementation, the goal is to have approximately 9,200 acres of northern hardwoods cover type which reflects efforts to minimize the cover type increase. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
Northern hardwoods are managed as an uneven-aged cover type so a balanced age-class distribution is not a goal in this plan. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the northern hardwood cover type beyond normal rotation age on state administered lands.

Stand Composition:
Northern hardwoods can overtake less shade tolerant cover types such as oak. As the oak cover type ages it is more difficult to regenerate and can become a northern hardwood type with a varied component of species.

Special Concerns or Limiting Factors:
Butternut is disappearing as a species found in northern hardwood stands due to continued infection with butternut canker which has been slowly decimating the butternut population. Due to topography, selective harvest in most cover types proves challenging as damage to downhill trees can occur.

Northern hardwood forests include a number of native plant communities of conservation concern (listed under Focused Issue B3): MHs39 (Southern Mesic Maple-Basswood Forest), MHs49 (Southern Wet-Mesic Hardwood Forest), MHc38 (Central Mesic Cold-Slope Hardwood-Conifer Forest). These plant communities often contain concentrations of rare plant and animal species. Their natural disturbance regimes involved infrequent catastrophic disturbance, and many of the rare species that occur in them are there because of the conditions created by high canopy cover, deep litter layers, and rich soils. Management regimes and prescriptions should take these habitat requirements into account.

Oak

Current Conditions

Cover Type Acres:

In 2013 the oak cover type totaled 33,267 acres or 52 percent of the timberland acres on state administered lands. Oak is the primary commercial cover type in the subsections.

Age-Class Distribution:

A balanced age class distribution is a goal of the BRP SFRMP. Currently the oak cover type does not reflect a balanced age-class distribution. Oak acres are under-represented in the 0 to 60 age classes and over represented in the 81-110 year age classes.

Balancing age classes is a long term goal and will take the five decade plan implementation period to accomplish. Much of the state forestland in the subsections has been under state ownership and management for approximately 50 years. Currently, 35 percent of the oak type is 100 years old and older. Some effort is necessary to reduce the amount of older oak and move it to a young age class. In the BRP SFRMP prepared in 2002 no effort was made to separate the offsite oak type and some was classified in other types or ignored because of low site indexes. In updating inventory and also in continuing annual stand exams, the Division is finding some of those sites considered "offsite" to have merchantable timber growing. An effort to re-examine those sites to assess them for silvicultural treatment will be needed during this plan implementation period and future plans as well. There was progress made as a result of the initial BRP SFRMP (2002). Currently 11 percent of the oak acres are in the 0-40 year age classes showing improvement from the original plan where less than 3 percent were in these age classes.

Stand Composition:

Natural, mature oak stands range from nearly pure oak to mixed stands. Secondary species in the Oak cover type are: aspen, paper birch, sugar maple, red maple and black walnut. Off-site oak is differentiated in this SFRMP. During the stand exam process these types will be inventoried and more correctly characterized to reflect the quality and operability of the sites.

Native Plant Communities:

Oak species are often found in these native plant communities: UPs14a, FDs27, FDs38, MHs37, MHs38, MHs39, MHs49 and FFs59.

Conversion Goals:
As the primary commercial cover type in the BRP subsections there are no conversion goals out of the oak cover type. There are goals to convert some cover types (e.g. red cedar, white spruce) to the NPC which in some cases will include some degree of oak cover type including conversion to oak savanna.

Future Direction

Cover Type Acres:
A goal of this plan is to have 34,000 acres of oak (52 percent of timberland) at the end of the first decade. This represents a slight increase in acres from present. After 50 years of plan implementation, the goal is to maintain these 34,000 acres of oak cover type on the landscape. Increasing the number of acres can be a goal but as the older age classes go untreated they may naturally succeed to northern hardwoods. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the oak cover type beyond normal rotation age on state administered lands. The old forest analysis identified adequate oak beyond normal rotation ages across all ownerships. Currently thirty-five percent of the oak cover type is 100 years plus on state administered lands. *(See Appendix B Old Forest Analysis).*

Stand Composition:
It is expected that the Department will continue to emphasize the management and regeneration of oak in the BRP subsections with the caveat that some older stands may already be succeeding to northern hardwoods and not be cost effective to retain in oak cover types. Oak will be a component of these cover types but likely not the dominant species.

Special Concerns or Limiting Factors:
Oak wilt is continues as an impact in many parts of the BRP subsections. A mixed composition forest is the best way to combat oak wilt threats. Markets for oak timber have always been volatile. Recent years have been especially difficult for sawmills and primary processors. The value of the hardwood timber has been improving in the last few months and it is hoped that this trend continues. Forest Certification also began during the prior planning period and this has presented several special challenges for forest managers. Due to topography, selective harvest in most cover types proves challenging as damage to downhill trees can occur. Efforts should be made by field staff during the plan implementation period to more definitively identify the red oak from the white oak species. The normal rotation age varies greatly between the groups with the white and bur oak able to live much longer than the red, black and pin oak species. This complicates the age class distribution especially with older outdated inventory. These stands may appear on the stand selection list and inventory would need to be updated during the stand exam process.

White Pine

Current Conditions

Cover Type Acres:

In 2013 the white pine cover type totaled 2,067 acres or 3.2 percent of the timberland. White pine is found both as pure plantation stands and as a component of other upland cover types in the subsections, especially along river bluffs.

Age-Class Distribution:

White pine is managed as an uneven-aged cover type, balancing age classes is not a goal for this cover type. The current age class distribution of white pine shows an overabundance in younger age classes, particularly in the 11-70 age classes. Under most circumstances white pine is managed as an even-aged cover type, but under specific silvicultural situations white pine can be managed as an uneven aged type.

Stand Composition:

Natural, mature white pine stands are typically mixed stands. Secondary species in the white pine cover type are: red pine, jack pine, aspen, birch, and possibly a scattering of northern hardwoods.

Native Plant Communities:

White pine is often found in these native plant communities: FDs27, MHC38 and MHs38.

Conversion Goals:

There are no specific goals to convert into or out of white pine. The goal is to essentially maintain the current acres of this cover type.

Special Concerns or Limiting Factors:

Natural white pine has difficulty regenerating. Deer browse is a challenge to regenerating white pine in the BRP subsections. Some naturally occurring white pine stands are within native plant communities of conservation concern (listed under Focused Issue B3): FDs27a, FDs27b, and MHc38. These plant communities are very rare in Minnesota, occurring in just a few places and limited to the Paleozoic Plateau. The goal of maintaining or enhancing the composition and structure of these native plant communities should be taken into account when considering active management.

Future Direction

Cover Type Acres:

The goal of the BRP SFRMP is to have 2,100 acres (3.2 percent of timberland) of white pine at the end of the first decade, a slight increase in white pine acres. After 50 years of plan implementation, the goal is to have approximately 2,100 acres of white pine cover type essentially maintaining the current cover type acres on the landscape. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
White pine is an uneven-aged managed cover type and therefore balancing the age classes is not consistent with silvicultural practices. Stands will be managed as multi-age and mixed-species stands. Consistent with the Department's adaptive management approach, no acreage goal is identified for maintaining the white pine cover type beyond normal rotation age on state administered lands.

Stand Composition:
The goal for plantation grown white pine includes allowing hardwood species to develop over time.

Special Concerns or Limiting Factors:
White pine can experience some difficulties in regeneration due to deer browse. Some protection with bud capping can be applied in heavily deer-populated areas. Occasionally white pine blister rust shows up in plantation raised stands. Sanitation guidelines to address white pine blister rust are common practice within the Department.

Red (Norway) Pine

Current Conditions

Cover Type Acres:
In 2013 there were 547 acres of red pine in the subsections or less than 1 percent of timberlands. Red pine are typically found as plantations that originated when the Department purchased the land in the 1960's and 70's and planted the red pine to stabilize old fields and pastures that were in poor condition. Red pine is not a native species in the BRP subsections and has not been planted as heavily in recent decades.

Age-Class Distribution:
Red pine is managed as an even aged cover type. The current age class distribution shows unbalanced age classes with more acres in the 21 – 50 age classes. There will be variation in harvest from decade to decade because of the current unbalanced age-class distribution of the red pine. Some of the imbalance occurs since the Department and the Division has discouraged planting red pine over the last 20 years.

Stand Composition:
Natural, mature red pine stands are typically mixed stands. Since all red pine in the BRP subsections is planted, mixed stands occur as thinning continues and hardwood species become established in the plantation.

Native Plant Communities:
Red pine does not occur naturally in the BRP subsections. No native plant communities have red pine as a natural component.

Conversion Goals:
The 10-year goal identifies that 47 acres of red pine will be converted to a native plant community. The decision of whether to convert a stand to another cover type will be determined when the stand is field visited. The outcome of a NPC-ECS field evaluation will determine the appropriate species conversions. Some plantations may be maintained in red pine.

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to have 500 acres (less than 1 percent of timberland) of red pine at the end of the first decade. After 50 years of plan implementation, the goal is to maintain 500 acres of red pine cover type on the landscape. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the red pine cover type beyond normal rotation age on state administered lands. Without the continued management scheme, the red pine cover type would gradually be replaced with cover types associated with the native plant community.

Special Concerns or Limiting Factors:
Red pine is not a native species in the subsections and will be managed and regenerated on a limited basis where it is deemed to be appropriate.

Central Hardwoods

Current Conditions

Cover Type Acres:
Central hardwoods are typically found as stands consisting of oak species, shagbark hickory Bitternut hickory, black walnut and black cherry. In 2013 central hardwoods totaled 2,505 acres or 4 percent of timberlands. Central Hardwoods are mixed species stands where none of the component species is dominant. Some species may be more prevalent than others depending on soils, aspect and location on the slope. Shagbark Hickory is often found in central hardwood stands but does not appear to occur naturally north of Highway 42 in Wabasha County. This cover type is very desirable for wildlife habitat with the varied mast food source produced.

Age-Class Distribution:
The current age-class distribution of central hardwoods shows a relatively even distribution.

Stand Composition:
Mature central hardwoods stands typically consist of red oak, white and bur oak, hickories, walnut, black cherry, hackberry, ironwood and elm.

Native Plant Communities:
Most central hardwood stands occur in NPC Classes that are woodlands and should have canopy cover ranging from 100 percent down to 25 percent. Canopy closure generally increases as these stands age. Central hardwoods occur in these plant communities: FDs38, MHs37 and MHs38.

Conversion Goals:
The 10-year goal is to increase the central hardwood cover type in the BRP subsections on appropriate sites (i.e., with reference to site-level NPC classification).

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to have 3,000 acres (4.6 percent of total timberlands) of central hardwoods at the end of the first decade. After 50 years of plan implementation, the goal is to maintain this acreage on the landscape. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the central hardwood cover type beyond normal rotation age on state administered lands.

Stand Composition:
Stand composition direction includes moving to a mixture of oak and hickory to maintain mast production and merchantable species.

Special Concerns or Limiting Factors:
Following harvest, control undesirable species such as ironwood elm. In addition on some stands the bitternut hickory component can become too high.

Cottonwood

Current Conditions

Cover Type Acres:
In 2013, the cottonwood cover type comprised 1.5 percent (966 acres) of state-managed acres in the subsections.

Age-Class Distribution:
In the BRP subsections, the current age-class distribution of the cottonwood cover type does not reflect a balanced age-class structure described for even-age managed cover types. The majority of stands are in the 41-80 age classes. Due to the limited harvest in cottonwood, there is no overriding goal to balance age classes in this cover type.

Stand Composition:
Mature cottonwood stands are typically mixed with soft maple, green and black ash, Boxelder and elm species. River birch, swamp white oak, hackberry, bur oak and basswood are typical secondary tree species, depending on the water table and soil types.

Native Plant Communities:
Cottonwood is often found in floodplain forest communities FFs59 and FFs68.

Conversion Goals:
There are no specific goals to convert into or out of the cottonwood cover type.

Future Direction

Cover Type Acres:
A goal of the BRP SFRMP is to have 1,000 acres (1.5 percent of timberland) of cottonwood at the end of the first decade. After 50 years of plan implementation, the goal is to maintain the planned acreage at 1,000 acres of cottonwood cover type. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:
After this plan is implemented, the age-class distribution is expected to more closely approach the desired balance among age-classes. Consistent with the Department's adaptive management approach for extended rotation forest, no acreage goal is identified for maintaining the cottonwood cover type beyond normal rotation age.

Special Concerns or Limiting Factors:
Managing cottonwood and maintaining the type is difficult when faced with invasion of reed canary grass. Careful planning must precede any management activity that opens the stand too much and allows enough sunlight to reach the forest floor. Also frequent flooding can promote a new seed crop of reed canary grass with each occurrence.

Alternate silvicultural treatments and harvest prescriptions are currently being conducted and assessed for effectiveness. These alternatives may provide solutions to the difficult problem in regenerating cottonwood after harvest.

Black Walnut

Current Conditions

Cover Type Acres:

In 2013 black walnut comprised 2,209 acres (3.5 percent of timberland) in the BRP subsections. Black Walnut is the second most important cover type in terms of economic impact in the subsections. Black walnut is found growing in a variety of locations in the BRP subsections. It can survive on most well drained soils but not rocky or gravelly soils.

Age-Class Distribution:

In the BRP subsections, walnut is managed as an uneven aged cover type. There is no goal to balance age classes over time. The Black Walnut cover type is reasonably well balanced except for the 0-20 age class.

Stand Composition:

Black walnut can be found growing in a variety of locations. Pure stands are often found in river terraces and benches. Mixed stands with oak and other central hardwood species are found in coves and shallow hillsides on north and east facing hillsides. It prefers silt-loam and well drained soils. It cannot withstand long term inundation from flooding or poor soil drainage. Secondary species in the walnut cover type are: aspen, white pine, and possibly a scattering of northern hardwoods.

Native Plant Communities:

Black walnut is found in these plant communities FDs38, MHs37 and MHs38.

Conversion Goals:

No specific goals to convert into or out of black walnut are identified in the BRP SFRMP however more walnut acres will be added in appropriate sites.

Future Direction

Cover Type Acres:

A goal of the BRP SFRMP is to have approximately 2,500 acres (3.8 percent of timberland) of black walnut at the end of the first decade. After 50 years of plan implementation, the goal is to have approximately up to 3,000 acres of black walnut cover type. The 50-year DFC for the subsections can be found in Table 3.1a.

Age-Class Distribution:

In the BRP subsections, walnut is managed as an uneven aged cover type so there is no goal to balance age classes over time. More walnut acres will be added on appropriate sites. Sites to be determined following stand visit.

Stand Composition:
Black walnut grows either in pure stands or as a component in central hardwoods stands. The BRP SFRMP recommends that black walnut should be maintained wherever it occurs.

Special Concerns or Limiting Factors:
While there are no current serious threats except for planting walnut in locations where it is not meant to grow, a new insect/disease combination has occurred in the western states. Further, Thousand Canker Disease has been found in southern states and central hardwood stands in Indiana and Ohio. The Minnesota Department of Agriculture and the University of Minnesota have begun to study the need for quarantine of wood imported into the Minnesota.

Table 3.1a Comparison of Forest Inventory Information (2001-2008-2013)[1]

	2001		2008			2013			2024		2064
Cover Type	**2001 acres**	**2008 DFC**	**2008 acres**	**% DFC**	**DFC Statement**	**2013 acres[3]**	**% of 2008 DFC**	**2008 DFC achieved?**	**DFC Statement**	**2024 DFC**	**2064 DFC**
Uneven Aged											
Ash	536	600	607	101%	Constant	534	89%	Yes	Reduce	300	Maintain
Lowland Hardwoods	8,431	8,200	8,583	105%	Fight to Retain	7,855	96%	Yes	Fight to retain	7,855	Fight to Maintain
Northern Hardwoods	2,484	6,100	4,021	66%	Minimize Increase	8,389	138%	No	Minimize increase	9,200	Minimize increase
Walnut	1,306	1,300	1,491	115%	Maintain or Increase	2,209	170%	Yes	Maintain on some sites and increase on others	2,500	Maintain or increase
White Pine	1,514	1,600	1,644	103%	Increase	2,067	129%	Yes	Slight decrease in plantations / increase as a component	2,100	Slight decrease in plantations / increase as a component in other cover types
Even Aged											
Aspen	1,025	1,000	1,139	114%	Maintain or Increase	984	98%	Yes	increase	1,000	increase
Birch	463	450	426	95%	Small Decrease	325	72%	Yes	Maintain	325	Maintain (shows as a component)
Cottonwood	729	775	745	96%	Constant	966	125%	no	Maintain	1,000	Maintain
Oak	35,374	31,500	33,984	108%	Minimize Loss	33,267	106%	Yes	Fight to maintain	34,000	Fight to maintain
Offsite Oak						3,664			Reduce/reinventory	2,800	convert some acres to savanna/ Blufflands /prairie
Central Hardwoods	4,410	4,830	3,959	82%	Minimize Increase	2,505	52%	Yes	increase	3,000	increase
Red Pine	569	575	562	98%	Decrease	547	95%	Yes	Reduce	500	Reduce
Jack Pine	151	150	86	57%	Constant	6	4%	No	Increase	6	Maintain
White Spruce	92	90	110	122%	Decrease	117	130%	No	Convert to NPC	90	Continue to convert to NPC
Red Cedar	222	200	235	117%	Retain where desirable	315[2]	158%	Yes	Decrease	230	Decrease / Maintain some component in other cover types
Willow	383	400	339	85%	Constant	35	9%	Yes	Maintain	360	Maintain

*** convert to upland prairie, savanna, some merchantable, some remains as off- site oak*

Source: Blufflands/Rochester Plateau SFRMP 3-Year Extension, and 2013FIM updates.

[1] CSA Timberland cover types on lands where Forestry or Wildlife are the primary administrator, excluding old growth

[2] does not include 24 acres of stagnant cedar

[3] from FIM updates completed January 2013

3.1 Within-Stand Composition and Structure

GDS-1A Some stands on State lands will be managed to reflect the composition, structure, and function of native plant communities.

A *native plant community* (NPC) is a group of native plants that interact with each other and the surrounding environment in ways not greatly altered by humans or by introduced plant or animal species. These groups of native plants form recognizable NPC classes (e.g., mesic hardwoods, fire dependent, floodplain forest, upland prairie) that tend to repeat across the landscape and over time. The goal is to retain NPC characteristics in some managed stands.

This GDS differs from GDS-1B in that it emphasizes managing for the suite of species, growth stages, and disturbance regimes appropriate to the NPC class or type identified using the NPC Field Guide. Whereas GDS-1B emphasizes species, age, and structural diversity in and of itself without direct connection to the native plant community. In managed stands, defining tree species diversity and relative abundance, age-class distribution, and structural diversity within a native plant community paradigm lends support to the development and/or maintenance of NPC composition, structure, and function through time. Forest management that incorporates native plant community form and function is more likely to accommodate a greater proportion of Minnesota's native biodiversity than forest management focused on a single or select group of species.

GDS-1A Strategies

a. Use the Field Guide to the Native Plant Communities in Minnesota: the Eastern Broadleaf Forest and associated ECS Silvicultural Interpretations to classify stands to NPC and prepare silvicultural prescriptions.

This plan incorporates NPC information in vegetation management whenever possible. The following NPCs are found in the BRP subsections:

1. Mesic hardwoods (MHs37, MHs38, MHs39, MHs49, MHc38)
2. Fire Dependent (FDs27, FDs38)
3. Flood Plain Forest FFs59, FF68)
4. Upland Prairie (UP 13, UP 14, UPs23, UPs24)

To learn more about NPCs typically found in the subsections, refer the *Field Guide to Native Plant Communities of Minnesota: The Eastern Broadleaf Forest*.

b. Follow Strategies in GDS-2C relating to retaining components of various growth stages in stands.

GDS-1B Species, age, and structural diversity within some stands will be maintained or increased.

Diverse forest stands are more resilient to perturbations than less diverse forest stands. A forest stand with a mix of tree species and ages provides habitat for a wider variety of associated species while providing a diversity of forest products. The net economic, social, and ecological values and functions of most forest stands are related to the composition of trees, shrubs, ground flora, and structural characteristics. Structural characteristics include the sizes (diameter and height), abundance, and distribution of overstory trees; understory vegetation; and the arrangement (scattered or clumped) of vegetation in the stand. Structural characteristics also include the distribution, size, and decay class of snags and coarse woody debris. Retaining large-diameter structures provides micro-sites for seed germination, cavities for nesting and den sites, and important escape and nesting cover within stands.

GDS-1B Strategies

a. Use selective harvesting to encourage diversity of species, ages, and stand structures.

Refer to forest management direction documents http://intranet.dnr.state.mn.us/forest_mgmt_direction/index.html

b. Meet or exceed the Site-Level Guidelines designed to maintain a diversity of tree species within a stand.

The MFRC guidelines provide direction on retaining leave trees and snags, conifer retention and regeneration, and timber stand improvement (TSI) activities, among others. For further direction see: http://www.frc.state.mn.us/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf

c. Use the NPC Field Guide,[4] Site Index, Soils Data, and ECS Silvicultural Interpretations to aid in determining the species composition and structure appropriate for the site.

d. Retain tree species, stand structure, and ground layer diversity within stands when prescribing timber stand improvement and thinning activities.

Implement this Strategy by:

- Rather than managing for one tree species when thinning or performing TSI, manage for the variety of species found in the stand.

[4] Minn. DNR, 2003, *Field Guide to Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province*. Ecological Land Classification Program, Minnesota County Biological Survey, Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources St. Paul, MN 55155.

- Based on current stand composition and other considerations (e.g., insect and disease concerns or wildlife habitat), take advantage of opportunities to diversify stands when prescribing thinning. Thinning intensities in stands may vary depending on current stand condition, such as trees per acre, tree size, and species composition, or the future desired within-stand composition.

e. Reserve seed trees in harvest areas and site preparation areas, where possible.

Resistance to windthrow, insect and disease risks, and the quality, number, and distribution of seed trees must all be considered when selecting seed trees. Consider the following techniques:

- Timber harvesting techniques and site preparation methods that expose mineral soil may be used on some sites to facilitate natural seeding;
- Select seed trees that have the potential to survive to produce seeds; and,
- Use of shelterwood harvest systems and patch cuts in cover types where regeneration can be enhanced or to minimize the infestation of non-native species.

f. Use the least intensive site preparation methods possible to ensure success.

Site preparation can create conditions favorable to non-native invasive species and alter structural diversity in the ground layer. Striving to minimize site preparation intensity will minimize these threats.

g. Use harvest systems or methods that protect advance regeneration. Retain conditions that favor regeneration and understory initiation.

When it is desirable to protect the existing seedlings and saplings in a stand, timber sale regulations will specify outcomes to protect these regenerating trees. In some cases, portions of the stand will be delineated to protect regeneration by restricting harvest activity in those areas. To enhance seedling recruitment of some species, a partial canopy may be retained to meet needed moisture and light requirements of the seedlings. Some hardwood cover types are pre-planted with seedlings prior to harvesting. It is important to remove the overstory to allow adequate sunlight to reach the forest floor and give the seedlings a chance to establish the next stand.

h. Identify some stands where succession is allowed to occur to encourage development of within-stand diversity. Movement to the next successional stage may be achieved with or without harvest.

Use field evaluation of stands to determine if a stand should be allowed to succeed to the understory species. Consult *NPC Field Guide* and ECS Silvicultural Interpretations for help in reaching these decisions.

i. Increase and/or maintain by reserving from harvest, target species including quality oak species that would serve as a seed source after harvest as components within appropriate cover types. Silvicultural practices that may add or increase the presence of these target species will include planting, inter-planting, and artificial or natural seeding.

Oak species were dominant after settlement when frequency of fire was reduced and the oaks that survived burning established quickly and created the current older age class oaks now found in the subsections. The original BRP SFRMP called for focusing on certain age classes of oak for harvest to encourage stump sprouting and thus satisfactory regeneration. Regeneration also included planting sites prior to harvest to bolster the recruitment of seedlings. The *NPC Field Guide*, site index, soils data, and ECS Silvicultural Interpretations, and observations that the species is now naturally occurring and doing well on the site, can aid in determining the appropriate species for the site.

j. Manage planted and seeded stands to represent the array of plant diversity.

Planted and seeded stands will be managed to meet aesthetic and biodiversity goals. This may be accomplished by:

- Accepting lower stocking levels of planted species in younger plantations if other desirable species are present;
- Planting or seeding mixed species appropriate to the site;
- Use the least intensive site preparation necessary to successfully regenerate the site, while favoring retention of the existing ground-layer plant species; and,
- Stands that are affected by oak wilt and are salvaged must be planted with a mix of species to discourage recurrence of oak wilt. Oak can remain a component but not the dominant species.

Some plant communities can naturally exhibit low species diversity particularly in the oak cover types. Low species diversity can be natural and has occurred historically associated with large-scale disturbances, particularly fire.

k. Encourage fruit and mast-producing species.

Meet or exceed MFRC *Site-Level Guidelines* for retaining and enhancing hard and soft mast production.

3.2 Projected Harvest Levels

GDS-2A The SFRMP treatment level for each cover type moves toward the desired age-class structure for even-aged managed cover types and improves the age-structure and timber quality of uneven-aged managed cover types.

SFRMP treatment levels reflect the number of acres that will be divided into annual stand examination lists and field visited over the 10-year plan implementation period. After field visits, treatments may include timber harvest, inventory alteration (i.e., correcting or updating forest inventory data), forest development without harvest, or deferring treatment (treat in a future planning period).

Treatment levels were developed for this plan by considering the General Direction Statements (GDSs), and specifically the following factors:

- Age-class imbalances for even-aged managed cover types;
- Oak cover types are the dominant species group in the subsection. The age classes are not balanced. The older age classes need to be examined and assessed for stand treatment;
- A majority of the oak cover type acres are over rotation age; and,
- Representation of young and old forest.

Table 3.2a identifies the rotation ages for even-aged cover types in the subsections.

Table 3.2a Rotation Ages for Even-aged Managed Forest Cover Types in the BRP subsections

Cover Type	Site Index	Normal Rotation Age
Aspen	all	50
Birch	all	60
Cottonwood	45	60
Oak	55	80
Central Hardwoods	all	85
Red Pine	all	80

Table 3.2b summarizes the total acres of even-aged and uneven-aged managed cover types on the 10-Year Stand Exam List selected for treatment during the 10-year plan implementation period.

Table 3.2b Ten Year Stand Exam List for the Blufflands/Rochester Plateau Subsections

Cover type	Rotation Age	Total 10 Year Period	
		Stands	Acres
Lowland Hardwoods[1]		123	2,698
Northern Hardwoods		128	3,177
Walnut		6	66
White Pine	130	132	1,023
Aspen	50	44	342
Birch	60	15	192
Oak	80	185	5,168
Offsite Oak		103	2,537
Central Hardwoods	85	7	170
Red Pine	80	64	529
Jack Pine		2	5
Scotch Pine		4	71
White Spruce		19	117
Red Cedar		16	88
Totals		**848**	**16,183**

[1] *includes ash, willow, cottonwood*

GDS-2A Strategies

a. Select stands for treatment to address age-class imbalances.

For even-aged managed cover types the long-term goal (DFC) is to move toward a balanced age-class distribution. This goal was compared to the current age-class distribution for all even-age managed cover types. A Remsoft harvest-scheduling model was used to schedule harvest over the next 50 years for forest cover types managed under even-age silvicultural systems (*See Appendix F Description of the Blufflands/Rochester Plateau Stand Selection Criteria*). Treatment levels were developed to move the current age distributions closer to goals by the end of the 50-year planning period. At that time, most even-age managed cover types will be closer to a balanced age-class structure. Due to existing imbalances, a balance will not always be achieved in 50 years

b. Give emphasis to treating stands older than normal rotation age.

Oak stands that are over rotation age begin to lose the ability to stump sprout vigorously. Some stands may need to be planted with seedlings to begin the regeneration process. Some stands may already be dominated by northern hardwoods (maple – basswood) in the understory. In this scenario it is extremely difficult and expensive to regenerate oak species as the dominant species. Oak can be a component of the stand but will be inventoried as northern hardwood.

Currently, in most even-aged managed cover types there is a surplus of acres beyond the normal rotation ages established by this plan. Treatment levels were developed to address many of these acres in the next 10 years. This will effectively bring the average treatment age closer to the normal rotation age for the even-aged cover types. For many cover types however, the imbalance of acres are so large that treating them all in the next decade would exacerbate the future age class imbalances. For these cover types, some over-rotation age stands will be carried through this 10-year period and into the following decade to facilitate balancing the age classes. For some cover types in succeeding decades, the average treatment age increases as a result of holding stands longer to better balance the age-class distribution over time.

Table 3.2c focuses on acres of timber land over rotation age in the BRP subsections.

Table 3.2c Acres Over Rotation Age by Cover Type for the Blufflands/Rochester Plateau Subsections for even aged managed types

Cover Type	Rotation Age	Acres over rotation age 2013	Percent over rotation age
Aspen	50	338	34%
Birch	60	165	51%
Cottonwood	60	471	49%
Oak	80	21,635	65%
Central Hardwoods	85	437	17%
Red Pine	80	0	0%

Table 3.2d identifies the average treatment age for even-aged managed cover types following application of the Remsoft modeling.

Table 3.2d Rotation Age and Modeled Average Stand Treatment Age for Even-Aged Managed Cover Types in the Blufflands/Rochester Plateau Subsections *

Cover Type	Rotation Age	Average Treatment Age per decade of planning period				
		2015-2024	2025-2034	2035-2044	2045-2054	2055-2064
Aspen	50	65	59	56	-	-
Birch	60	76	60	-	70	70
Oak	80	131	122	121	120	121
Offsite Oak	80	131	120	118	120	120
Central Hardwoods	85	123	-	-	140	141
Red Pine	80	-	-	-	-	90
Jack Pine	60	-	80	65	-	-
Scotch Pine	60	-	-	-	-	67
White Pine	130	-	-	139	135	130
White Spruce	60	-	62	-	-	79

**all values dependent and based on appraised acres.*

c. Identify and properly manage adequate old forest acres.

Providing for adequate and sustainable amounts of old forest across the landscape over time requires:

1. Maintaining and updating DNR's current network of Old Growth Forest stands.
2. Applying the Department's adaptive approach to determining if each SFRMP should identify extended rotation forests by:
   - Using an adaptive approach to management of older forests. The amount of older forest on the landscape and harvest levels will be monitored to determine if there is a need to designate ERF on DNR-administered timberlands.
   - Preparing an older forest analysis as part of each SFRMP to determine the status of forests over normal rotation age. The analysis is done separately for DNR-managed timberlands and for all forest ownerships in the subsection.
   - If older forest acreage exceeds the desired age class distribution from the prior SFRMP, normal rotation ages can be used for stand selection on state timberlands. In this case, there would be no ERF designation on state timberlands for the upcoming planning period.
   - If the current older forest acreage for a given cover type (or group of similar cover types) on all ownerships is less than the desired age class distribution for that cover type on DNR-managed timberlands in the prior SFRMP, ERF designation should be used to ensure older forest exists on DNR timberlands in the future.
   - Monitoring forest conditions and management activities as part of the adaptive management approach for older forest management.
   - Recognizing that only a portion of stands placed on the 10-year Stand Exam List actually result in timber sales. Stands not harvested will continue to age, mature beyond normal rotation age and provide older forest values.

See Appendix B, *Old Forest Analysis,* outlining age class distributions across all ownerships for the primary cover type in the BRP subsections.

Table 3.2e identifies the percent of old forest per decade for even-aged managed cover types following application of the Remsoft modeling.

Table 3.2e Percent Old Forest by Decade for Even-aged Managed Cover types in the BRP Subsections

Cover Type	NRA	Percentage of cover type considered old forest per decade of planning period				
		2015-2024	2025-2034	2035-2044	2045-2054	2055-2064
Aspen	50	21%	10%	4%	20%	31%
Birch	60	0%	0%	3%	5%	3%
Oak	80	57%	51%	41%	29%	19%
Offsite Oak	80	37%	10%	5%	3%	1%
Central Hardwoods	80	14%	20%	33%	43%	49%
Red Pine	80	0%	6%	11%	36%	19%
Jack Pine	60	38%	0%	31%	0%	0%
Scotch Pine	60	0%	11%	21%	26%	13%
White Pine	130	1%	2%	0%	0%	0%
White Spruce	60	6%	14%	45%	59%	1%

d. Treatment levels result from rotation ages that will maintain adequate acres of young forest.

Moving toward and eventually maintaining a balanced age-class distribution in even aged managed cover types will ensure that young forest (0-30 years old) exists on the landscape over time (see GDS-3K for specific discussion about young, *early successional* forest). Currently FIM data for the oak cover type indicates that 63 percent of the oak acres are over rotation. However, this information can be misleading as there is no division of red oak and white oak groups in FIM. White oak and bur oak have longer maximum rotation ages than red oak group species. Without making a distinction it is difficult to make a judgment concerning how much of each species is actually over normal rotation age. There currently exists an imbalance of older oak in the subsections. Stand selection criteria were adjusted to reflect this imbalance. The stand selection criteria included a review of all oak stands over rotation age to ensure each older oak stand is reviewed for possible site visit. This process ensures that field staff determines stand suitability for treatment or to tag it in FIM so that it does not continually show up on the annual stand exam list.

e. Identify and account for planned increases/decreases in cover type acres in selecting acres to be included on the stand exam list.

The long-term (50-year) desired future condition calls for decreases in the ash, red pine, white spruce and red cedar cover types. Conversions will result in changes to these cover type acreages based on NPC site classification. Cover type increases will be seen in native prairie, savanna, and grasslands. Conversions were determined through team discussions considering historical cover types, wildlife needs and efforts to convert to the native plant community. Acreage goals were identified for conversions of white spruce and red cedar to native plant community, no acreage goals

were identified for conversion of off-site oak to the native plant community. Stands suitable for conversions will be determined at the time of site visit.

Table 3.2f identifies the cover type conversion goals for the first decade and 50 year plan goals.

Table 3.2f: Cover type Conversion Goals for the First Decade and 50-year plan Implementation Period

Cover Type	Current Cover Type Acres 2013	Cover Type Direction (2015-2024)	Final Cover Type Acres after 10 years (2024)	Final Cover Type DFC Statement (2024)
Ash	534	Reduce by 234 acres	300	Reduce
Lowland Hardwood	7,855	No change	7,855	Fight to Maintain
Northern Hardwood	8,389	Increase by 811 acres	9,200	Minimize increase
Walnut	2,209	Increase by 291 acres	2,500	Maintain on some sites and increase on others
White Pine	2,067	Increase by 33 acres	2,100	Slight decrease in plantations / increase as a component
Aspen	984	Increase by 16 acres	1,000	Increase
Birch	325	No change	325	Maintain (shows as a component)
Cottonwood	966	Increase by 34 acres	1,000	Maintain
Oak	33,276	Increase by 733 acres	34,000	Fight to maintain
Off-site Oak	3,664	Reduce / reinventory	2,800	convert some acres to savanna/ bluffland /prairie
Central Hardwoods	2,505	Increase by 495 acres	3,000	Increase
Red Pine	547	Reduce by 47 acres	500	Reduce
Jack Pine	6	maintain	6	Maintain
White Spruce	117	Reduce by 27 acres	90	Convert to NPC
Red Cedar	315	Reduce by 85 acres	230	Continue to convert to NPC/ maintain some as component
Willow	35	maintain	35	Maintain component in other cover types

f. Provide a sustainable supply of timber while maintaining all other Strategies identified in this SFRMP.

A Remsoft harvest-scheduling model was used to achieve a sustainable treatment level, taking into consideration any planned increases or decreases in each cover type over the next 50 years (see Table 3.2f) *(See Appendix F, Description of the Blufflands/Rochester Plateau Stand Selection Criteria*). The long-term goal is to narrow the peaks and valleys in harvest levels to provide a relatively stable supply of timber from state lands. Tables 3.2g, 3.2h, and 3.2i below summarize treatment levels in acres by decade.

g. Apply selective harvest treatments to cover types managed through uneven-aged practices and thinning.

The majority of uneven-aged and some even-aged managed cover types will be managed using selective harvest treatments (see Tables 3.2g and 3.2h for cover type treatment levels for the 50-year plan implementation period). The uneven-aged managed cover types include ash, lowland hardwoods, northern hardwoods, walnut and white pine over age 90.

Table 3.2g: Treatment Levels for Even-aged Managed Cover Types by Decade for Blufflands/Rochester Plateau subsections

Cover type	Treatment Level (acres) for Even-aged Managed Cover Types by decade				
	2015 – 2024	2025 – 2034	2035 – 2044	2045 – 2054	2055-2064
Aspen	23	13	9	0	0
Birch	13	6	0	1	1
Oak	1126	1189	1130	1022	857
Offsite Oak	127	37	7	3	3
Central Hardwoods	28	0	0	11	23
Red Pine	35	33	34	32	33
Jack Pine	6	6	6	4	6
Scotch Pine	5	5	5	5	5
White Pine	66	65	58	70	99
White Spruce	27				
Red Cedar	85				
Total	1541	1354	1249	1148	1027

Table 3.2h: Treatment Levels for Uneven-aged Managed Cover Types for Blufflands/Rochester Plateau subsections*

Cover Type	Treatment Level (acres) for Uneven-aged Managed Cover Types by decade				
	2015 – 2024	2025 – 2034	2035 – 2044	2045 – 2054	2055-2064
Lowland Hardwood[1]	2,600	5,607	2,600	6,560	2,610
Northern Hardwood	3,113	3,386	3,254	3,363	3,122
Walnut	66	686	66	1,679	299

**all values dependent and based on appraised acres.*
[1]*includes ash, willow, and cottonwood cover types*

Table 3.2i: Thinning Treatment Levels for Blufflands/Rochester Plateau Subsections *

Cover Type	Treatment Level (acres) thinning by decade				
	2015 – 2024	2025 – 2034	2035 – 2044	2045 – 2054	2055-2064
Red Pine[1]	529	496	511	477	127
White Pine[1]	997	980	823	1,049	1,464
White Spruce	90	55	90	62	34
Scotch Pine	71	71	71	71	0
Jack Pine	6	4	2	0	6

**all values dependent and based on appraised acres.*
[1]*includes both natural and plantation*

h. Consider and account for potential biomass harvesting.

Although there is no target or DFC for biomass harvest at this time, the Blufflands/Rochester Plateau SFRMP estimates that roughly 20,000 - 40,000 tons of biomass would be available as tops and limbs, and saplings, from roundwood harvests proposed in this plan. The topography of the BRP subsections poses real challenges to effective biomass harvest. Further the relatively high percentage of timberlands associated with rare and unique plant and wildlife species and Strategies to limit disturbance of the understory in these unique areas, also limits potential biomass harvests. This is an emerging market in response to demand for alternative energy production.

Biomass harvest in the Blufflands is a difficult market. Some sawmills do market chips from slabs for electrical generation at two plants; one located in St Paul and one in La Crosse Wisconsin. In most timber harvests where access is possible Residential Fuelwood Permits are offered to private

citizens. Typical biomass harvesting is not currently done in the BRP subsections due mainly to steep terrain and also lack of infrastructure for processing the tops and limbs. There have been special projects to harvest biomass on Wildlife Management Areas and Scientific and Natural Areas. These are often conducted in order to create an open landscape plant community or to remove non-native invasive species.

Beyond subsection specific biomass factors, Minnesota DNR policy is changing in response to this changing market:

- Biomass as tops and limbs will be available for purchase on most timber sale sites where roundwood is harvested. Sites not available for biomass harvest are defined in the *MFRC Biomass Harvesting Guidelines*[5];
- In addition some non-commercial forest sites are available for biomass harvest consistent with biomass harvesting guidelines as markets demand;
- Some potential for slabs to be chipped and marketed to paper mills; and,
- The wildlife section will be vigilant of the potential for biomass harvest resulting from wildlife projects.

i. Identify and defer stands identified as Old Growth

A total of 998 acres of old growth are designated in the Blufflands/Rochester Plateau subsections. See Table 3.2j for the total amount of designated old growth acres by forest type.

Table 3.2j Designated old-growth acres in the Blufflands/Rochester Plateau Subsection

Forest Type	All Administrations	Forestry and Wildlife lands
Lowland Hardwoods	33	33
Northern Hardwoods	276	201
Oak	616	255
White Pine	42	42
Central Hardwoods	31	31
Total	**998**	**562**

Source: FIM January 2013. Includes designated old growth across all Department Divisions (All Admin).

Acreage Comparison between Past Plans and Recommended SFRMP Treatment Levels

After applying the Strategies that affect the overall supply of timber (listed above), the volumes to result from the 10-Year Stand Exam List can be projected.

Volume Comparison between the Past Plan and the Recommended SFRMP Treatment Levels

[5] http://www.frc.state.mn.us/FMgdline/Final_Draft_for_MFRC_Approval_Forest_BiomassHarvest_Guidelines.pdf

Minnesota DNR develops annual planned treatment levels on a cover type acreage basis rather than a volume basis. The BRP SFRMP identifies the 2015 -2024 plan implementation period volumes provided in Tables 3.2l by the Remsoft harvest-scheduling model, based on treatment acres, yield equations,[6] treatment method,[7] and cords per acre based on forest inventory data and preliminary prescriptions. It is a rough projection because not all treatment acres are suitable, or result in timber sales; the treatment method (prescription) may change after the field examination of the stand; and the forest inventory volume data (cords per acre) is typically not as accurate as the more intensive appraisals that are completed for timber sales.

Table 3.2l: Projection of Volume (cords) to be Offered for Sale in First Plan Decade by Treatment Group*

	Projected Cords based on 10-year stand list*		Projected Cords based on 10-year list estimated to be sold	
Treatment Group	**FY2015-FY2024**	**Average per year**	**FY2015-FY2024**	**Average per year**
Total Volume Even-age Harvest	68,205	6,821	30,135	3,014
Total Volume Thinning	16,928	1,693	4,232	423
Total Volume Uneven aged	17,907	1,791	8,408	841
Total Volume all treatments	103,040	10,304	42,775	4,278

**Assumes all acres site visited result in a harvest prescription and all actually sell. Forest inventory volume data (cords per acre) is typically not as accurate as the more intensive appraisals following site visit. All values dependent and based on appraised acres.*
Source: *"FINAL_YIELD_SUMMARY.xls" Walters and Ek yield equations/tables were used in the W-S model (Walters, David K. and Alan R. Ek Whole Stand Yield and Density Equations for Fourteen Forest Types in Minnesota; Department of Forest Resources, University of Minnesota, 1530 North Cleveland Avenue, St. Paul, MN 55108). However for all thinnable types volume yield was assumed to be 10 cd/acre, and all uneven-aged systems used 33 percent of nominal Walters and Ek volumes).*

[6] Walters, David K. and Alan R. Ek. Whole Stand Yield and Density Equations for Fourteen Forest Types in Minnesota; Department of Forest Resources, University of Minnesota, 1530 North Cleveland Avenue, St. Paul, MN 55108.
[7] For all thin-able types, volume yield was assumed to be 10 cd/acre, and all uneven-age systems used 33% of nominal Walters and Ek volumes.

GDS-2B The harvest of non-timber forest products is managed to provide a sustainable supply for humans while providing for wildlife habitat and biodiversity.

Non-timber forest products, also known as special forest products, can be categorized into five general areas: decorative materials, foods, herbs, medicinal materials, and specialty items. Non-timber forest products include: berries and nuts, burls, conks, furniture pieces, ginseng, mushrooms, pussy willow, bittersweet, plant seeds, and syrup).

The social importance, ecological role, and function of special forest products resources are only beginning to be understood. Improving our species-specific knowledge, as well as broadening forest inventories and developing appraisal methods for most types of non-timber forest products, will make determining sustainable harvest levels possible in the future. Special product permits or informal timber sales are issued at the field level for a number of non-timber forest products to ensure that harvest operations do not damage the site's potential for future production. Harvest of non-timber forest products is restricted on SNAs and on some other state-administered forest lands such as WMAs, and aquatic management areas (AMAs).

The following Strategies will be used to protect the long-term availability of these forest resources.

GDS-2B Strategies

a. **Consider known traditional gathering areas when managing other forest resources.**

For example, consider forest management effects on known areas such as those traditionally used for gathering maple syrup (sugarbush areas) when planning forest management activities.

b. **Supervise and enforce special product permit regulations to ensure that the site's capacity for future production is not jeopardized.**

Consider managing or using some forest stands for non-timber forest products, such as berry patches or sugar bushes.

c. **Consider the known locations of important wildlife habitats, rare native plant communities or species, and the possible impacts of non-timber forest products harvest practices before issuing special product permits.**

Examples would include rattlesnake dens, bald eagle nests and high biodiversity areas.

d. **Forest managers should judiciously monitor the gathering of species where there is little knowledge and understanding of their ecological sustainability requirements.**

For species where sustainable levels are not fully understood, forest managers will proceed cautiously when approving or considering special product requests. An example would be the collection of native plant seed.

3.3 Biological Diversity, Forest Composition, and Spatial Distribution

GDS-3A Old forest in the subsections is distributed across the landscape to account for timber products, wildlife habitat, and ecological diversity.

In determining the adequacy of old forest resources in the planning area, this plan considers:

- Age class distributions as provided by the old forest analysis across all ownerships *(see Appendix B Old Forest Analysis)*;
- forest on other ownerships and/or administrations;
- designated High Conservation Value Forests with old forest as a value;
- the representation of older stands and old forest components within even-aged cover types;
- visual quality concerns and recreation potentials;
- the integrity of forested riparian areas;
- habitat needs of wildlife species associated with old forest;
- markets for large-diameter timber products; and
- current policy on carbon sequestration on state forest lands.

A forest stand of any particular even-aged managed forest cover type is considered old forest whenever its age exceeds the normal rotation. Determining the amount of old forest to be sustained in the subsections required balancing many factors: timber productivity, economic impacts, historical forest conditions, habitat requirements, forest health, old forest protected on other ownerships, and timber quality. The goal is to provide a representation of older forest stands and old forest components that is sustainable over time, balanced with the need to provide a stable timber supply, increased timber productivity, and early successional forest habitat. Information about Minnesota's old-growth forest policy can be found at:

http://www.dnr.state.mn.us/forests_types/oldgrowth/index.html

The type, acreage, and general location of old-growth forests in the subsections can be found in the Subsection's *Preliminary Issues and Assessment.*

Providing for adequate and sustainable amounts of old forest across the landscape over time requires:

1. Maintaining and updating DNR's current network of Old-growth Forest stands.
2. Applying the Department's adaptive approach to determining if each SFRMP should identify extended rotation forests:
   - Using an adaptive approach to management of older forests. The amount of older forest on the landscape and harvest levels will be monitored to determine if there is a need to designate ERF on DNR-administered timberlands.
   - Preparing an older forest analysis as part of each SFRMP to determine the status of forests over normal rotation age. The analysis should be done separately for DNR-managed timberlands and for all forest ownerships in the subsection.

- If older forest acreage exceeds the desired age class distribution from the prior SFRMP, normal rotation ages can be used for stand selection on state timberlands. In this case, there would be no ERF designation on state timberlands for the upcoming planning period.
- If the current older forest acreage for a given cover type (or group of similar cover types) on all ownerships is less than the desired age class distribution for that cover type on DNR-managed timberlands in the prior SFRMP, ERF designation should be used to ensure older forest exists on DNR timberlands in the future.
- Monitoring forest conditions and management activities as part of the adaptive management approach for older forest management.
- Recognizing that only a portion of stands placed on the 10-year Stand Exam List actually result in timber sales. Stands not harvested will continue to age, mature beyond normal rotation age and provide older forest values.

3. Specifying situations under which forest managers will create or maintain old forest components within treated stands, based on site factors found there (e.g., some patch management; management within some High Conservation Value Forest and Minnesota Biological Survey (MBS) sites of High and Outstanding biodiversity significance).

Uneven-aged managed stands and other state lands (e.g., State Parks and SNAs) also contribute to old forest conditions. In addition, compositional changes to more long-lived conifers will provide more forest with longer rotations in the future.

GDS-3A Strategies

a. Monitor old forest over the decades in even-aged managed cover types so that the desired amount of old forest across all ownerships continues to be provided.

Fluctuations in the amount of old forest on the landscape can always be expected, either due to current age-class imbalances in some cover types or to unpredictable natural disturbances such as wind or fire.

Table 3.3a Old forest acres for Even-aged Managed Cover Types 2013

Cover type	2013 Acres	NRA	Ac >NRA	% >NRA
Aspen	984	50	310	32
Birch	325	60	165	51
Cottonwood	966	60	468	48
Oak	33,267	80	20,006	60
Offsite Oak	3,664	80	3,468	95
Central Hardwoods	2,505	80	406	16
White Pine*	2,067	130	0	0

**under most circumstances white pine is managed as an even-aged cover type, but under specific silvicultural situations white pine can be managed as an uneven-aged type.*

b. Manage riparian zones primarily to reflect old forest conditions.
Site-level forest management guidelines recommend managing for older forests within riparian management zones (RMZs). Some portions of RMZs will continue to be managed for early successional species (see GDS-5A, Strategies b and c).

c. Allow some stands to naturally succeed to long-lived cover types with, or without the use of harvest.
Field evaluation tools include use of the *Field Guide to the Native Plant Communities of Minnesota: Eastern Broadleaf Forest* [8] *(Native Plant Community (NPC) Field Guide)* and associated Silvicultural Interpretations.

d. Manage designated Old-Growth stands according to DNR guidelines.
Complete and follow long-term management plans for designated old-growth stands and the surrounding acres in the special management zones that are to be managed for old forest characteristics. Use the *DNR Old-Growth Forest Guidelines, Amendments 5 and 6* as a guide. High-quality native plant communities (NPCs) and other stands that meet old-growth criteria can be nominated for designation as old growth following the *DNR Old-Growth Forest Guidelines*.

e. Meet or exceed the MFRC Voluntary Site-Level Forest Management Guidelines (Site-Level Guidelines) to retain components of Old Forest in even-aged managed cover types

Examples of retention of old forest components include retaining leave trees, legacy patches, snags, and coarse woody debris.

f. Use silvicultural treatments that retain Old Forest components in some stands.
(See GDS 1B and *DNR Forest Management Direction Documents* at: http://intranet.dnr.state.mn.us/forest_mgmt_direction/index.html

Examples of silvicultural treatments that can retain old forest components include:
- Selective harvest (i.e., group selection and single tree selection);
- Intermediate harvest (i.e., thinning);
- Shelterwood harvest with reserves;
- Seed tree harvest with reserves;
- Variable retention harvest; and,
- Variable density thinning.

g. Consider the status of Old Forest within subsections when making decisions to add and offer unplanned wood for harvest.

[8] Minn. DNR, 2003, *Field Guide to Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province*. Ecological Land Classification Program, Minnesota County Biological Survey, Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources St. Paul, MN 55155.

GDS-3B: Endangered, Threatened, and Special Concern Species and their key habitats are protected, maintained, or enhanced in the subsections.

The DNR takes a leadership role in protecting and providing habitat for rare plants and animals in Minnesota by managing the listing of rare species in the state. Protecting rare plants and animals and their habitat is a key component of ensuring the continuance/long-term viability of Minnesota's species, community, and landscape- level biodiversity. Implementation of the strategies below will assist the DNR's ability to protect rare species and their habitats in the subsections.

Minnesota's List of Endangered, Threatened, and Special Concern Species (ETS List) was created in 1984 and has been revised since then. Created under Minnesota's Endangered and Threatened Species Statute, the ETS List draws attention to species that are at greatest risk of extinction within the state with special regulations applied to those species listed as endangered or threatened. *Species of Greatest Conservation Needs* (SGCN) are defined as native animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Minnesota's *SGCN* list includes 292 native animal species. *Key Habitats* are defined as those habitats most important to the greatest number of *SGCN* in a subsection. Minnesota's *Comprehensive Wildlife Conservation Strategy* (CWCS) identifies *Key Habitats*. A listing of *SGCNs* and *Key Habitats* known to occur in the subsections can be found at:

http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/chapters_appendix/tomorrows_habitat_toc.pdf

By alerting resource managers and the public to *SGCN* and *Key Habitats*, activities can be reviewed and prioritized to complement Minnesota's CWCS.

GDS-3B Strategies

a. Provide access to the Natural Heritage Information System to DNR staff through the DNR Quick Layers in Arc Map.

DNR staff from all divisions will have access to the most up-to-date locations of endangered, threatened, and special concern species, as well as locations of other rare features such as bat hibernacula and colonial waterbird nesting sites.

b. During the development of the 10-year Stand Examination and Annual Stand Examination Lists, land managers check the rare features database and identify for follow-up consultation all stands proposed for treatment that includes a rare feature.

If rare feature locations occur in stands proposed for treatment, land managers confer with the appropriate Wildlife or Ecological and Water Resources staff to determine if adjustments to proposed treatments are needed to protect the rare plant or animal or its habitat

- The rare features database is regularly updated and available to area offices.
- Area staff persons are trained in the use of the Natural Heritage Information System and regularly consult the rare features database as management or development activities are planned and implemented.
- Stand selections or treatments are adjusted or stand prescriptions include mitigation measures to protect the rare plants or animals and their habitat within the stand. Often adjustments are to be deferred until the field visit (see next strategy).

c. Harvest prescriptions and management objectives identify and implement measures that protect rare features.
Prescriptions for stands selected for treatment, access routes, and other management or development activities include mitigation measures that protect the rare feature(s) within the stand. Mitigation includes measures that reduce the likelihood of the introduction or spread of non-native invasive species (and the impacts of the control measures for non-native invasive species, e.g., effects on rare species and/or habitat from use of herbicides to eradicate non-native invasive species).

d. Apply Current SGCN and Key Habitat data to management decisions.
Department of Natural Resource staff from all Divisions have access to the most up-to-date *SGCN* and *Key Habitat* locations by coordinating with the Division of Ecological and Water Resources.

e. Incorporate new SGCN and Key Habitat locations and data as they are collected in the subsections.
SGCNs and *Key Habitats* were considered during the selection of stands. *SGCN* and *Key Habitat* data are collected by MBS and various other programs. As these new data are compiled they will be made available to DNR staff and applied to management decisions consistent with the *Interdisciplinary Forest Management Coordination Framework*[9] *(Coordination Framework).*

f. Stand-level management accounts for SGCN and Key Habitats.
Species of Greatest Conservation Need and *Key Habitats* were considered during the selection of stands for the Stand Exam List. The Department will use the *Coordination Framework* to maintain or enhance SGCNs and Key Habitats.

Ecological and Water Resources Division will deliver *SGCN* and *Key Habitat* management considerations to forest managers for use in making forest management decisions for stands selected for treatment, access routes, and other management or development activities consistent with processes outlined in the *Coordination Framework*.

g. Apply special management recommendations for known rare features, Species of Greatest Conservation Concern, and Key Habitats.
Rare features include rare plants, rare animals, and their habitats. Additional rare feature locations are likely to be discovered in the subsections. Management activities will be carried out in a manner that protects, maintains, or enhances rare features according to DNR policy and state statute.

h. Management proposals identify and implement measures that protect rare features.
Prescriptions for stands selected for treatment, access routes, and other management or development activities include mitigation measures that protect the rare feature(s) within the stand. Mitigation includes measures that reduce the likelihood of the introduction or spread of non-native invasive species (and the impacts of the control measures for non-native invasive species, e.g., effects on rare species and/or habitat from use of herbicides to control non-native invasive species).

[9] DNR Divisions of Forestry, Fish and Wildlife, and Ecological Resources: *Interdisciplinary Forest Management Coordination Framework*. St. Paul, Minnesota. December 2007.

GDS-3C Plan for forest cover types that historically occurred within these ecosystems together with current knowledge about potential climate change scenarios.

The proposed cover type change goals in this plan reflect an attempt to increase the acreage of cover types that have declined historically (caused either by lack of disturbance events, settlement impacts or climate change) while maintaining or enhancing important wildlife habitats and plant communities, and providing a sustainable level of forest products. The ecological, economic, and social considerations used in developing the cover type change goals for the subsections include:

- Historical forest composition;
- Historical disturbance regimes/range of natural variation;
- Wildlife habitat;
- Forest insects and diseases;
- Forest productivity (e.g., match the species to the site using *NPC Field Guide*);
- Increase availability of certain forest products (e.g., sawtimber);
- Recreational values; and,
- Historic climate changes and potential future climate change scenarios.

GDS-3C Strategies

a. Increase the acres of native prairie, savanna and grasslands primarily on dry unproductive red cedar cover types.

Use the *NPC Field Guide* as a tool to guide the on-site evaluation of stands for conversion from one cover type to another or managing for mixed forest conditions (species composition and stand structure).

Options available include:

- Allow some stands to convert through natural succession to savanna or grasslands. Artificially convert some stands through mechanical site preparation, prescribed burning, planting, or seeding.
- Selectively harvest some stands to facilitate movement toward the desired cover type and within-stand composition.
- Convert some off-site oak to savanna/ bluffland prairie.

Vegetation throughout the BRP subsections has undergone a shift in structure and species composition in the last 100 years or so, as many areas of oak savanna, prairie, and oak openings have converted to more closed woodlands. Use accepted oak savanna and prairie restoration management tools, including timber harvest, prescribed burning, and invasive species control, to manage for the native plant community. Conversions can be immediate or can take place over the span of a rotation period through thinning, partial cuts, and intermediate treatments.

b. Increase mixed-forest conditions in some stands in all cover types.

Implementation of this Strategy may range from application of the *Site-Level Guidelines* (e.g., legacy patches and conifer retention) in harvest operations, to other management such as mechanical site preparation, prescribed burning, seeding, and planting (see Strategies for within-stand diversity in GDS-1B).

The strategy to achieve this goal is to favor species found in native plant communities appropriate to the site, especially cover types that have either significantly declined or increased from historical levels (e.g. declines of prairie openings, grasslands and savanna and increases in oak). *(See* http://files.dnr.state.mn.us/forestry/ecssilviculture/treetables2.pdf *for the Suitability of Tree Species by Native Plant Community).*

c. Forest composition goals and objectives are consistent with the MFRC Landscape Plans.

Department personnel are involved in the *MFRC Regional Landscape* planning efforts. Although the planning processes differ in scope and scale, they share a number of goals and are committed to maintaining close relationships. The *MFRC's Forest Resource Management Plan for the Southeast Landscape* has been reviewed for applicability to the *BRP SFRMP*. The desired future forest conditions identified in the *Landscape Plan* are consistent with the *DFCs*, *GDSs* and *Strategies* contained in the *BRP SFRMP*.

Patch Analysis in the BRP SFRMP

Using Cooperative Stand Assessment (CSA) forest inventory data, a patch assessment for state lands in the subsections was conducted. Patches were created in a GIS data layer by dissolving common stand boundaries between stands of the same cover type group and age-class. The initial patch assessment information was used as the tool for determining the role of patches in the *BRP SFRMP.*

Following review of the patch assessment, no patches were designated in the *BRP SFRMP* based on the following factors:

- Limited Department administered lands challenged the identification of patches;
- Existing special designations and the required management for these designations, duplicated the purpose of designating additional stands as patches. These designations include High Biodiversity Areas, Representative Sample Areas, Globally Significant NPCs (G1/G2), old growth designations and special management zones, and designated High Conservation Value Forests;
- Many of the existing special designations have specific management plans that are incorporated into the *BRP SFRMP* as Appendices; and,
- Additional patch designations were not viewed as adding to the management of the stands or areas in question, existing plans were viewed as adequate to achieve the purpose of patch designations.

GDS-3D Managers of State Lands in MBS Sites of Statewide High and Outstanding Biodiversity Significance and High Conservation Value Forests will implement Measures to sustain or minimize the Loss to the Biodiversity Significance.

In the previous SFRMP, sites with rare plant communities or wildlife features were recognized as areas of high biodiversity, and were referred to as *High Biodiversity Sites.* There were 13 *Sites* in the BRP subsections with this designation. In 2009, the DNR began implementing the *High Conservation Value Forest* policy in response to a Forest Certification Corrective Action Request (CAR). This policy states that on certified state forestry and wildlife lands, all MBS sites of outstanding biodiversity significance and a subset of MBS sites of high biodiversity significance will be considered *High Conservation Value Forests* (HCVFs). These sites will be managed to maintain or enhance identified high conservation values. A process was put in place for designating HCVF sites, and the DNR is currently in the process of reviewing proposed sites. Final HCVF sites are expected to be designated by June 2012. A *Fact Sheet describing High Conservation Value Forests* can be viewed at:

http://files.dnr.state.mn.us/forestry/certification/hcvf-factsheet.pdf

Rather than maintain two designation layers for the same land, this plan will recognize agreed upon HCVFs rather than *High Biodiversity Sites.* All previous *High Biodiversity Sites* fall within current HCVFs, so their significance will be maintained. The management plans developed for *High Biodiversity Sites* are appended to this SFRMP as the management guidance documents for the HCVFs they fall within (*See Appendix C High Biodiversity Site Plans).* Resource managers will consult the *SFRMP Implementation Dataset* in preparation for field visits to ensure that HCVF information is considered.

HCVFs serve as ecological reference areas that help the Department to: (1) improve our understanding of ecosystem form and function; (2) improve our understanding of Minnesota's native biodiversity; and (3) evaluate the effects of management on biodiversity, rare species, native plant communities, and ecosystem form and function.

Table 3.3b identifies the current High Conservation Value Forests in the subsections.

Table 3.3b: Summary of High Conservation Value Forests That Contain State-Administered Lands

High Conservation Value Forest (alternative name)	State-Administered Land Unit	Acres	High Biodiversity Site Plan Document
Vermillion Bottoms and Lower Cannon River HCVF (Collisan Bottoms)	Collisan Bottoms SF unit Gores Pools WMA	5896	Yes
Perched Valley HCVF	Perched Valley WMA	348	Yes
Zumbro Bottoms HCVF	Zumbro Bottoms SF unit	1032	No
Upper West Indian Creek Valley HCVF	West Indian Creek SF unit	293	Yes
Upper Beaver Creek Valley HCVF	Whitewater WMA	751	Yes
Whitewater Sand Savanna HCVF	Whitewater WMA	5856	Yes
South Fork Whitewater River HCVF	Whitewater WMA	988	Yes
North Fork Whitewater River Valley HCVF	Whitewater WMA	1353	Yes
Callahan HCVF	Whitewater WMA	203	No
Partridge Creek HCVF	Partridge Creek SF unit	226	Yes
Pine Hemmingway Creek HCVF	Pine Hemmingway SF unit	833	Yes
Rushford Bluffs HCVF	Rushford North SF unit	119	Yes
Peterson Prairie HCVF	Peterson SF unit	61	Yes
Brightsdale HCVF	Brightsdale SF unit	781	No
Upper Diamond Creek Valley HCVF	Upper Diamond Creek SF unit	268	No
Money Creek Bluff HCVF (Vinegar Ridge)	Money Creek SF unit	892	Yes
Mound Prairie HCVF	Mound Prairie SF unit	316	No
Shattuck Creek Valley HCVF	Shattuck Creek SF unit	268	No

Forest management activities such as timber harvesting, site preparation, access route construction and maintenance, and tree planting will occur on Forestry- and Wildlife-administered lands within HCVF sites following the guidance and directions contained in this plan. Forest management activities carried out in those sites will emphasize the following Strategies to help minimize the loss of the factors on which the HCVF sites were ranked.

GDS-3D Strategies

a. **Identify HCVF and consult the High Biodiversity Site Plan Guidance document for that HCVF as stand management is implemented.**
HCVF sites of greatest concern or importance have been identified and recorded in FIM. For sites that have a *High Biodiversity Plan Guidance document* developed, forest management will follow the BMPs recommended. For HCVFs without a *High Biodiversity Plan Guidance document*, a joint site visit between staff from Wildlife, Forestry and Ecological and Water Resources will be conducted to determine the best management practices for the site.

b. Consider the broader context and significance of the HCVF site as a whole when assigning management objectives and designing silvicultural prescriptions.

Management decisions should be made considering the broader context and factors that contribute to the significance of the HCVF site as a whole. Silvicultural prescriptions incorporate connections between stand-level actions and their effect on a site's high conservation value. Final management objectives will be carried out consistent with the *Coordination Framework*.

c. Determine location and composition of stand conversions based on NPCs.

Foresters will determine the NPC Class for stands planned for site preparation and tree planting forest development activities using the *Field Guide to the Native Plant Communities of Minnesota: Eastern Broadleaf Forest Province*. Additional information to help determine the NPC class of a stand will become available as MBS completes NPC mapping for MBS sites of outstanding and high statewide biodiversity significance, and as various other efforts continue to expand the collection and application of NPC data in Minnesota.

The NPC Field Guide and associated ECS Silvicultural Interpretations[10], and information in:

http://files.dnr.state.mn.us/forestry/ecssilviculture/treetables2.pdf

(*Suitability of Tree Species by Native Plant Community*) will help foresters determine appropriate management direction for the identified NPC.

Whenever possible and practical, manage stand cover type conversions with less intensive site preparation or plantations with less intensive timber stand improvement (TSI).

d. Allow some stands to succeed to the next Native Plant Community Growth Stage, with or without harvest.

Most likely candidates for succession would be stands that contain adequate regeneration stocking levels and structural characteristics for the site to convert to a later growth stage. Other candidates would include stands whose location, condition, or rare species occurrences are critical factors to a site's biodiversity significance.

e. Emulate the within-stand composition, structure, and function of NPC Growth Stages when managing stands in HCVF sites.

Determine which species to harvest and retain and their spatial and temporal arrangement based on NPC tree succession and disturbance ecology. DNR Forestry's ECS Silvicultural Interpretations will be used to make the link between stand-level considerations and NPC ecology.

Examples include:

- Coarse woody debris and snags – species, size class distribution, spatial distribution, availability through time;
- Leave trees and legacy patch selection and design are influenced by how the NPC would have been disturbed under natural conditions;

[10] http://www.dnr.state.mn.us/forestry/ecs_silv/interpretations.html

- Include super-canopy trees as leave trees and in legacy patches;
- Diameter classes in uneven-aged managed stands reflect the range and abundance expected for the NPC;
- Retain or create a legacy of species and structural features that are found in older growth stages, so that maintenance or movement of the stand towards other growth stages is an option. Natural disturbances rarely destroy all biological and physical features of the NPC, so older growth stage species and structures often persist in young stands regenerating from catastrophic disturbances;
- Use silvicultural techniques during forest management activities to recruit desired species through natural regeneration – leave trees that are likely to produce seeds, leave and remove trees that help create/maintain microclimate conditions favorable to seedling establishment and growth;
- Use silvicultural techniques that take advantage of opportunities to increase recruitment of desired species from adjacent stands of the same and adjacent native plant communities; and
- Manage stands based on NPC boundaries recognizing that a change in cover type may or may not relate to a change in NPC.

f. Apply variable density thinning during harvest or reforestation.

Variable density techniques may be prescribed during the planning of timber sales and/or forest development activities. Using this approach, harvest (clear-cut or thinning) and planting (or seeding) would be accomplished in a pattern (clumped or dispersed) that more closely replicates patterns created after natural disturbance. For example, retain legacy patches versus scattered reserves in clear-cuts to retain islands of residual vegetation that include tree species present at older growth stages.

g. Apply variable retention harvest techniques during harvest.

The main objectives of variable retention are to retain the natural range of stand structure and forest functions. With retention systems, forest areas to be retained are determined before deciding which areas will be cut. Standing trees are left in a dispersed or aggregate form to meet objectives such as retaining NPC form and function, old-growth structure, habitat protection, and visual qualities. Variable retention retains structural features (e.g., snags, large woody debris, and live trees of varying sizes and canopy levels) as habitat for a host of forest organisms.

- See legacy patches recommendations in *MRFC Voluntary Site-level Forest Management Guidelines, Wildlife Habitat Section, pages 43-47.*
- During harvest, retain tree species and diameters present at older growth stages, in clumps or dispersed, to more closely replicate pattern after natural disturbance. Include retention of large, downed logs. For example: Leave legacy patches throughout the stand; islands of residual vegetation that include tree species present at older growth stages.

h. Increase the use of prescribed fire as a silvicultural technique in managing fire-dependent NPCs.

i. Locate roads to minimize fragmentation of a HCVF site.

Roads contribute to a decrease in interior forest conditions and an increase in terrestrial non-native invasive species abundance. All efforts should be taken to minimize new road construction and enlarging existing roads/trails in these sites.

j. Emulate natural disturbance conditions in stand management.

k. Land status and timber productivity will be considered while implementing the other Strategies on stands identified for management in these HCVF sites.
With the exception of designated old growth, no stands are identified as deferred from treatment in this plan, in the future should any be deferred during the plan implementation period, Forestry Areas will follow DNR policy regarding replacing stands that are deferred from treatment.

l. Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources personnel will communicate with other landowners, as opportunities arise, to inform them of the significance of these HCVF sites and management options that could be implemented to address the biodiversity objectives of these HCVF sites.
For example:

- DNR resource management staff will seek to implement stand-level management activities that achieve landscape-level biodiversity goals and objectives across ownerships.
- When assisting private landowners with woodland stewardship plans, provide information on the biodiversity significance of these MBS sites.
- MBS personnel will communicate and deliver information about priority MBS sites of biodiversity significance to other landowners within these MBS sites.

The intent of this Strategy is to provide information on the HCVF sites and cooperate in forest land management across ownerships in the landscape when possible and agreed upon by the landowners affected. This does not imply or mandate how other landowners should manage their lands.

GDS-3E Rare Native Plant Communities are protected, maintained, or enhanced in the subsections.

Minnesota's NPCs have been evaluated and assigned a conservation status rank that estimates the risk of elimination of that native plant community on state (S-rank) and global (G-rank) scale. These rankings were developed based on the Heritage Conservation Status Rank system developed by NatureServe[11]. Sites are ranked on a scale from 1 = critically imperiled to 5 = demonstrably widespread, abundant and secure. Native plant communities ranked of statewide importance are included in HCVF sites and High Biodiversity Sites. These designations are identified with corresponding plans and management directions consulted as stand treatments are prescribed. This SFRMP, focuses on globally recognized plant communities that are ranked as either G1 or G2.

In addition, certain sites have been recognized as areas that are ecologically viable representatives of a native plant community. These sites are referred to as Representative Sample Areas (RSAs) and serve to establish or maintain an ecological reference condition, create or maintain an under-

[11] http://www.natureserve.org/explorer/ NatureServe - In cooperation with the Network of Natural Heritage Programs and Conservation Data Centers. 2002. Element Occurrence Data Standard. Arlington, VA.

represented ecological condition, or serve as a set of protected areas or refugia for species, communities and community types not captured in other protection/management criteria. See Appendix H, Representative Sample Area Factsheet.

Table 3.3l identifies the RSAs designated in the BRP subsections.

Table 3.3c: Statewide Heritage Conservation Ranks (G-Ranks) for Native Plant Community Types

NPC Type G-Rank	Definition
G1	Critically imperiled across its entire range.
G2	Imperiled.
G3	Rare or uncommon.
G4	Widespread, abundant, and apparently secure, but with cause for long-term concern.
G5	Demonstrably widespread, abundant, and secure.

Locations of the rare NPC types or subtypes listed will be documented and may be assigned a relative rank for the quality of the NPC occurrence. Generally, NPCs are ranked for quality based on factors associated with size, condition, and landscape context. Specifications for condition ranking of NPCs are currently being revised by the MN DNR Division of Ecological and Water Resources to complement the Minnesota DNR's three-volume *Field Guide to the Native Plant Communities of Minnesota* (version 2.0). Condition codes along with NPC size and landscape context information are used to rank the quality of an NPC occurrence. The quality of the NPC is assigned on a continuum from "A" through "D", with an "A" rank indicating an excellent quality NPC, and a "D" rank indicating a poor quality NPC. The DNR is committed through forest certification to maintaining or enhancing all G1 and G2 NPCs.

Table 3.3d: Representative Sample Areas in the BRP Subsections

Land Unit	Acres	Native Plant Community type	NPC ID
Zumbro Bottoms SF	65	White Pine – Oak Woodland (sand)	FDs27b
		Dry Sand-Gravel Oak Savanna	UPs14b
Hemmingway Creek Cold Slopes SF	~100	Algific Talus, Dolomite subtype	CTs46a2
		Maderate Cliff, Dolomite subtype	CTs43a2
		White Pine-Sugar Maple-Basswood Forest (cold slope)	MHc38a
		White Pine-Oak-Sugar Maple Forest	MHs38a
		Red Oak-Sugar Maple-Basswood-(Bitternut Hickory) Forest	MHs38c
		Elm-Basswood-Black Ash-(Blue Beech) Forest	MHs49b
Money Creek Bluff SF (Vinegar Ridge)	~135	Dry Barrens Oak Savanna, oak subtype	UPs14a
		Elm-Ash-Basswood Terrace Forest	FFs59c
North Fork Whitewater Terrace Forest, Whitewater WMA	370	Elm-Ash-Basswood Terrace Forest	FFs59c
Whitewater Sand Savanna Historic Site, Whitewater WMA	433	Dry Bedrock Bluff Prairie	UPs13c
		Dry Barrens Oak Savanna, oak subtype	UPs14a2
		Dry Barrens Oak Savanna, jack pine subtype	UPs14a1
		Dry Barrens Prairie	UPs13a
		Red Oak-White Oak Forest	MHs37a
		Southern Mesic Prairie	UPs23
Fabel Ravine, Whitewater WMA	222	Southern Dry-Mesic Pine-Oak Woodland	FDs27b
		Black Oak-White Oak Woodland	FDs27c
		Elm-Ash-Basswood Terrace Forest	FFs59c
		Dry Barrens Prairie	UPs13a
		Dry Barrens Oak Savanna, oak subtype	UPs14a2
Lupine Valley, Whitewater WMA	223	Black Oak-White Oak Woodland (sand)	FDs27c

GDS-3E Strategies

a. **Document and manage known locations of NPCs with a Global rank of Critically Imperiled (G1) or Imperiled (G2), and manage to maintain their ecological integrity.**

b. Document and manage known locations of NPCs with a Statewide rank of Critically Imperiled (S1) or Imperiled (S2), and manage to maintain their ecological integrity, as part of identified HCVF sites and High Biodiversity Areas.
Where rare NPCs occur associated with a timberland cover type, vegetation management within and adjacent to these NPCs will protect, maintain, or enhance the ecological integrity of NPCs. Some locations of NPCs of concern are best managed by avoidance, while other sites can either be maintained or enhanced by using the appropriate harvesting or other forest management activities (e.g. application of ECS silvicultural interpretations).

DNR personnel have been trained in the use of the *Field Guide to the Native Plant Communities of Minnesota: Eastern Broadleaf Forest Province* for identification of NPCs. Additional ECS products, such as silvicultural interpretations for management of NPCs, have been developed for use by field staff for implementing ECS-based management on state lands.

c. Apply special management to stands that are identified as high quality examples of rare native plant communities.
Coordination (joint site visits) between divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources staff will determine if adjustments to proposed treatments are needed to protect, maintain, or enhance the ecological integrity of the rare NPCs.

For a discussion of key habitats and species in greatest conservation need, go to GDS-3B.
See Appendix D that identifies the designated *HCVF, RSAs, G1/G2, High Biodiversity Sites* and *Old Growth.*

GDS-3F State Lands will attempt to provide for a representation of each growth stage in each Native Plant Community

Growth stages are successional stages within a native plant community class that develop over time following a catastrophic disturbance. By implementing this plan efforts are made to provide for all growth stages in all native plant communities In the past, growth stages developed following natural disturbances such as wind and fire. Now, many characteristics of older growth stages can be created through forest management activities such as timber harvest, prescribed burns, and forest development activities.

These growth stages are important to the wildlife species that inhabit these plant communities because both physical structure and vegetation composition differ among growth stages. Thus, wildlife habitat and the species occurrence can vary with growth stage, for example, white-tailed deer may use the early growth stage of MHs37 for feeding, but use the old forest and mature growth stage for winter thermal cover.

This SFRMP does not establish acreage goals for growth stages by ecosystem type or native plant community because both physical structure and vegetation composition differ among growth stages. The Strategies in this SFRMP will provide representation of all NPC growth stages. Stands can be managed to maintain the existing growth stage or assist in moving the stand to an older or younger growth stage. The Strategies identified below, the *Field Guide to Native Plant Communities*, and the Silvicultural Interpretations can provide options to field staff for accomplishing these goals.

GDS-3F Strategies

a. Document growth stages of the stands selected for treatment in the subsections.

Stands in this SFRMP will be classified to NPC consistent with DNR policy. Field staffs are encouraged to use growth-stage information in developing stand management prescriptions.

b. Strive to emulate the within-stand composition, structure, and function of NPC growth stages when managing stands.

Field staffs should consider methods to increase acres of younger growth stages due to their relative scarcity, in actively managed stands.

c. Consider the contribution of inoperable stands and reserved areas (e.g., old growth, SNAs, state parks) in providing representations of growth stages when developing prescriptions.

d. Manage designated representative ecosystems (RSAs) and High Conservation Value Forests (HCVF) consistent with DNR direction to achieve distributions of native plant communities.

e. Apply ECS Silvicultural Interpretations when proposing stand management prescriptions.

GDS-3G Young, early-successional forest is distributed across the landscape over time.

Aspen, birch and cottonwood represent early successional cover types and in the BRP subsections. Currently an average of 55 percent of the acres of these cover types are over rotation age. Jack pine is a very minor young forest species in the subsections and is at the extreme southern edge of the range. In many cases it is off site and should be left unmanaged. Comprehensive management is difficult due to the small number of acres with poor markets for these species. Some of the older aspen are Big-tooth and can live longer than trembling aspen. The market for the aspen species is primarily pallets and not pulpwood as found in northern Minnesota markets. Aspen is harvested for lumber and pallets when it is not so old as to exhibit conks and cankers. Cottonwood as a young forest species is harvested for lumber and pallets. It is regenerated by sprouting, natural seeding and artificial direct seeding as well as cuttings. It grows mostly as a primary component of lowland hardwoods and is typed as cottonwood when the density is sufficient. The difficulty in regeneration is the invasion of reed canary grass in harvested areas (see Table 3.3f).

Table 3.3f: Blufflands / Rochester Plateau Acres of Young Forest in Early-Successional Cover Types by Decade*

Early-Successional Forest Cover type Acres												
Cover type	**Current[1]**		**2015 - 2024**		**2025 - 2034**		**2035 - 2044**		**2045 - 2054**		**2055-2064**	
	Acres	**Percent**	**Acres**	**Percent[2]**	**Acres**	**Percent[2]**	**Acres**	**Percent[2]**	**Acres**	**Percent[2]**	**Acres**	**Percent[2]**
Aspen	349	35	541	55	632	64	683	69	411	42	158	16
Birch	38	12	205	63	292	90	277	85	106	33	25	8
Oak	4475	13	8019	24	12542	37	15209	45	15056	45	13714	41
Offsite Oak	87	2	2277	62	3275	89	3407	93	1273	35	338	9
Central Hardwoods	945	38	814	33	437	17	171	7	53	2	113	5
Red Pine	173	32	72	13	12	2	6	1	0	0	219	40
Jack Pine	0	0	0	0	2	38	4	69	6	100	4	62
Scotch Pine	56	79	53	74	26	37	0	0	0	0	36	50
White Pine	1147	55	757	36	201	10	51	3	54	3	72	4
White Spruce	35	30	3	3	35	38	35	38	35	38	54	60

**all values dependent and based on appraised acres.*
[1]From FIM 2013
[2]percent of total cover type

Regulated harvest of aspen, birch, jack pine cover types will ensure that young, early-successional forest will be adequately represented over time. Stands retained in these cover types will be managed to move towards a more balanced age-class structure than currently exists, which will provide a more consistent amount of young forest over time. Most of the harvest in these cover types will occur through clearcut methods. Harvest prescriptions will attempt to mimic the intense wildfires and wind events that occurred naturally to initiate fully stocked, early successional forest.

Early successional forest is difficult to achieve in this subsection. Often any neglected land regenerates to Boxelder first and that cycle would take 70-90 years to succeed to other desirable hardwood. Aspen, birch and jack pine are not important large patch cover types in the Driftless Area. Oak is a prime mid successional species that originated after European settlement occurred and fires were suppressed, allowing oak that existed to grow. American Indians used fire to maintain open landscapes for grazing ungulates (Bison and Elk). Since public agencies only managed 14 percent of the land base it is a challenge to effectively provide for broad landscape level management.

Young, early successional tree species will also be present in other cover types. Some cover type conversions will occur in early successional stands that are already in decline due to old age, insect or disease problems, or other damage agents.

GDS-3G Strategies

a. **Move even aged managed cover types toward a balanced age-class structure. (see also GDS-2A)**

b. **Increase the treatment level for the over mature oak cover type.**

c. **Regenerate the Oak cover type.**
Oak accounts for half the state owned acres in these subsections and 35 percent of this acreage is over-mature. These acres need to be examined to determine the amount of northern hardwood regeneration that already occurs. This will help determine the best harvest and silvicultural scheme to use. In many cases oak will be difficult to maintain as a component due to competition from shade tolerant species.

d. **Maintain young, early successional forest in a variety of stand sizes to provide habitat for associated species.**

3.4 Wildlife Habitat

GDS-4A Adequate habitat and habitat components exist, simultaneously at multiple scales, to provide for nongame species found in the subsections.

Nongame[12] *species* are an important indicator of the biological health of the forest and are important to society for their inherent values. Legal statutes, public expectations and desires of interest groups, and Department of Natural Resources (DNR) internal policies require the consideration of nongame species in the management of state-administered lands. The DNR strategic plan Directions 2000 (Minnesota DNR 2000) and the DNR's Conservation Agenda 2010-2013 calls for an objective of "healthy self-sustaining populations of all native and desirable introduced plant, fish, and wildlife species, especially those species listed as threatened or endangered." This region contains the Mississippi flyway which is significant and accommodates a great diversity of game and non-game species. Forest management decisions must take into consideration potential impacts on this resource.

Many tourists and residents appreciate and seek out opportunities to observe nongame species found in the subsections where there is a chance to observe a number of species that are rare elsewhere. Typical nongame species found in the BRP subsections include: eagles, trumpeter swans, warblers and other migratory birds, turtles, snakes, spring peepers and butterflies.

[12] In this plan, *nongame species* include amphibians, reptiles, and those mammal and bird species that are not hunted or trapped.

Managing the HCVFs, RSAs and G1/G2, old growth and SMZs will help reflect the patterns created by natural disturbance factors and efforts to reduce the effects of habitat fragmentation will help provide habitat for nongame species.

There are hundreds of nongame species and many game species known or predicted to occur within the subsections. Each species has different habitat requirements, some of which conflict. Individual consideration of management needs for each species is therefore impossible to accomplish with a single approach across the planning area[13]. To ensure that the subsections are managed to maintain and enhance the habitat of game species, a number of management techniques will be considered using both a coarse filter approach and a fine filter approach.

Several management techniques will be considered to ensure that the subsections are managed to maintain and enhance the habitat of nongame species. The three primary approaches are:

- A *coarse filter* approach (Hunter, 1990[14]) emphasizes management of forests from a local to landscape scale to: maintain the integrity of ecosystem processes, maintain components of the range of historic habitats and age-classes, and retain/enhance structural attributes within habitats. In using a coarse filter approach, it assumes that a broad range of habitats encompassing the needs of most species will be met, and their populations will remain viable on the landscape. Habitat analysis and management emphasis in this plan were primarily done at this level.

- A *fine filter* approach considers the specific habitat needs of selected individual species that may not be met by the broader coarse filter approach. Providing habitat at this level will be guided primarily by department policies and guidelines that provide recommendations for habitat management at this finer level for a number of species, such as state or federal listed species.

- A *meso filter* focuses on conservation of critical ecosystem elements such as structures (logs, snags, pools, springs, streams, and hedgerows) and processes (fire, flooding) that would be missed by a coarse or fine filter. An example of how these three scales work would be that a meso filter would focus on coarse woody debris, the processes that created the coarse woody debris, and the features it provides to associated biodiversity; a coarse filter would focus on the ecosystem in which the coarse woody debris exists, while a fine filter would focus on a species that may use the coarse woody debris.[15]

GDS-4A Strategies

a. Provide old forest distributed across the landscape to accommodate the needs of non-game species.

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[13] Minnesota Department of Natural Resources, 2006. *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources.

[14] Hunter, M.L. 1990. *Wildlife, Forests, and Forestry: Principles of Managing Forests for Biodiversity*. Prentice-Hall Inc., Englewood Cliffs, N.J.

[15] Hunter, Malcolm L. Jr. A Mesofilter Conservation Strategy to Complement Fine and Coarse Filters. Cons. Bio. Vol.19, No. 4. August 2005.

Old forest includes stands that are beyond the normal rotation age established for the cover type. There are hundreds of nongame species within the subsections that are associated with old forest and old forest conditions such as large-diameter trees and/or uneven-aged successional stages. Examples of species are red-shouldered hawk, cerulean warbler, and Acadian flycatcher. Designation and maintenance of areas to be managed for old forest conditions across the landscape over time (GDS-1A and 2B) will ensure available habitat for many of these species. Designated old-growth forest and special management zones are examples. The amount of old forest provided on state administered lands is determined by implementing the Department's adaptive management approach which takes into consideration the amount of old forest existing on the landscape across all ownerships. If adequate old forest is found to exist, no extended rotation forest is identified for management on state administered lands.

b. Provide young forest distributed across the landscape to accommodate the needs of non-game species.

Young forest in this plan refers to stands that are 0-30 years old. There are a large variety of nongame species within the subsections that are associated with young forest or young forest condition such as seedling and/or sapling successional stages. Examples of these species are chestnut-sided warbler, rose-breasted grosbeak, and Veery. Areas managed for young forest conditions will provide young forest habitat across the subsections.

c. Manage to retain the integrity of riparian areas and provide protection for seasonal and permanent wetlands.

Many nongame species are associated with forested wetlands or the riparian forest interface. These areas also serve as movement corridors for additional species. Consideration for the health and integrity of riparian areas and protection or mitigation of other wetlands will serve to provide such needs.

d. Provide stand management that addresses the needs of species that depend on perches, cavity trees, bark foraging sites, and downed-woody debris.

A number of species rely on tree perches, existing tree cavities or available trees that can be excavated to provide a cavity, insect foraging sites on dead or dying trees, or downed trees or slash for roosting, nesting, or cover. Historically, natural disturbances provided these habitat needs. Today, the frequency and size of these processes have declined.

e. Provide for the needs of wildlife species associated with characteristics of important native plant communities in the subsections.

A number of nongame species found within the subsections have some association or dependence on tree species and habitat structure characteristic of specific native plant communities.[16] Examples of these species include red-headed woodpeckers, bobolinks, Henslow sparrows. Cover types that have declined or changed in quality include savanna, oak woodlands and grasslands.

The following techniques will be used to increase acres of these important native plant communities:

- Use of prescribed burning;
- Conversion of non-native cover types to native plant communities;
- Restoration of oak savanna and grassland sites; and,
- Manage for oak woodlands by retaining the oak component (fire or harvest, emulating natural disturbances).

f. Create and maintain within-stand diversity to benefit non-game species.

Managing for a mix of tree species and ages along with a diversity of structural characteristics especially in northern hardwood stands. (e.g., tree diameter, tree height, and scattered or clumped distribution) in some stands will provide conditions for species that require within-stand diversity (GDS-3A). Apply the *Site-Level Guidelines* for leave trees, snags, coarse woody debris, riparian management zones, conifer and mast species retention and regeneration, and road maintenance or closure.

g. Manage to favor native plant communities and retain elements of biodiversity significance.

Habitat for nongame species associated with highly diverse native plant communities will be provided by the following techniques:

- Identify and manage high-quality and/or rare native plant communities so they are maintained or enhanced.
- Use the *NPC Field Guide* and associated *Silvicultural Interpretations* to manage some stands to reflect the composition, structure, and function of native plant communities.

h. Consider Natural Heritage Program Data and other rare species information during development of both the 10-year and Annual Stand Examination Lists.

Rare species data in the Natural Heritage Information System is considered during the 10-year and annual stand examination selection process. Before groundwork begins, field staff will check the database for known locations of rare nongame species in stands planned for treatment and, if present, will seek advice from appropriate staff or refer to established guidelines or considerations on avoiding negative impacts to these species.

[16] Green, J.C. 1995. *Birds and Forests: A Management and Conservation Guide*. Minnesota Department of Natural Resources.

i. Apply the DNR management recommendations for habitats of nongame species as described in DNR guidelines and policies.17

Apply considerations provided in DNR's *Rare Species Guides* and *Comprehensive Wildlife Conservation Strategy* also referred to as *Tomorrow's Habitat for the Wild and Rare).*

GDS-4B Adequate habitat and habitat elements exist, simultaneously at multiple scales, to provide for game species found in the subsections.

Game[18] species are an important indicator of the biological health of the forest and are important to society for their recreational, economic, and inherent values. Legal statutes, public expectations, the desires of interest groups, and DNR internal policies require the consideration of game species in the management of state-administered forest lands. The DNR strategic plan, *Directions 2000,* states that an "objective is healthy, self-sustaining populations of all native and desirable introduced plant, fish, and wildlife species," and for "populations of fish, wildlife and plant species to sustain recreational opportunities." [19]

The scarcity of public forest land in the BRP subsections results in concentration of use by hunters and trappers annually. White-tailed deer, wild turkey, waterfowl, ruffed grouse and squirrel hunting traditions are long standing and important to local economies. Trappers come from across the state to target thriving populations of beaver, raccoon, muskrat, mink, and river otter.

Many game species are dependent on the complex habitat associations found in the subsections to survive and thrive. A number of these species need such habitat at a landscape scale (hundreds to thousands of acres). Habitat loss or degradation – some of which can be affected by forest management decisions – has led to declines in a number of these species over time
Ecologically, there have been both historic and more recent changes to the subsections that have affected game species and their habitat:

- Changes in the abundance of tree species, age structure of the forest, and structural and species diversity;
- Increased habitat fragmentation from development and agricultural practices;
- Alteration of natural fire and grazing disturbance events; and,
- Alteration of natural hydrologic functions.

Both natural events and forest vegetation management through stand treatments, have the potential to positively or negatively affect game species.

[17] Minnesota DNR. 2007. *North 4 Subsections SFRMP Preliminary Issues and Assessment*, Figure 1, p. *xv.*
[18] In this plan, *game* species include those terrestrial species that are hunted and trapped.
[19] Minnesota DNR. 2000. *Directions 2000: The Strategic Plan.* St. Paul, MN.

GDS-4B Strategies

a. Provide young forest distributed across the landscape to accommodate the needs of game species.

Young forest in this SFRMP refers to stands that are 0-30 years old. There are at least five game species within the subsections that are associated with young forest or young forest conditions such as seedling and/or sapling successional stages. See:

http://files.dnr.state.mn.us/forestry/subsection/anoka/finalplan/sfrmp_anoka-AppendixI-WildlifeHabitat%20Relationships.pdf

Some examples of these species are white-tailed deer, ruffed grouse, cottontail rabbit, red fox and woodcock. Areas managed for young forest conditions will provide a distribution of young forest habitat across the subsections.

b. Provide old forest distributed across the landscape to accommodate the needs of game species.

Old forest includes stands that are beyond the normal rotation age established for the cover type. There are at least five game species within the subsections that are associated with old forest and old forest conditions, such as large-diameter trees and uneven-aged successional stages. Some examples of these species are wild turkey, gray and fox squirrels, gray fox, and wood duck.

Designation and maintenance of areas to be managed for old forest conditions across the landscape over time (GDS-1A) are intended to provide habitat for many of these species. Designated old-growth forest stands are examples of strategies that provide old forest values across the landscape, although all forest types are susceptible to destruction by catastrophic fire and wind events. The amount of old forest provided on state administered lands is determined by implementing the Department's adaptive management approach which takes into consideration the amount of old forest existing on the landscape across all ownerships. If adequate old forest is found to exist, no extended rotation forest is identified for management on state administered lands.

c. Provide a balanced age-class structure in cover types managed with even-aged silvicultural systems.

A balanced age-class structure leads to relatively equal acreages in each age-class out to the normal rotation age. To provide an even flow of early successional forest habitat, it is necessary to avoid large fluctuations in harvest levels within the oak, birch, cottonwood, lowland hardwood and aspen cover types. Future sustainability of game species is complemented by moving toward a more balanced age class distribution.

d. Increase the productivity and maintain the health of even-aged managed cover type stands.

There are significant game species that rely on dense young seedling and/or sapling stage successional stages within even-aged managed cover types for food or cover. Managing to improve stocking levels in these stages and maintain health and vigor will help to ensure that density of young trees will be suitable for game species.

e. Create and maintain within-stand diversity to benefit game species.
Managing for a mix of tree species, ages, and structural characteristics (such as tree diameter and height, and scattered or clumped distribution) in some stands will provide conditions for species that require such diversity.

- Apply the *Site-Level Guidelines* for leave trees, snags, coarse woody debris, riparian management zones, conifer and mast species retention and regeneration, and road maintenance or closure.

3.5 Riparian and Aquatic Areas

GDS-5A Riparian areas are managed to provide critical[20] habitat for fish, wildlife, and plant species.

Riparian areas encompass the transition zone between the terrestrial and aquatic habitats that occurs along lakes, streams, and open-water wetlands. A r*iparian management zone* (RMZ) is that portion of the riparian area where site conditions and landowner objectives are used to determine management activities that address riparian resource needs. Riparian areas are among the richest habitats in the subsections. The management of riparian areas can influence water quality, water temperature, erosion rates, and deposition of woody debris in lakes and streams and the overall diversity of wildlife and plant species found in the watershed. Riparian areas provide corridors and connecting links of habitat for plant and wildlife species. Well-managed riparian areas are critical to protect, maintain, or enhance aquatic and wildlife habitats, aesthetics, recreation, water quality, and forest products.

The emphasis for riparian areas along all trout streams in these subsections will be to manage for longer-lived, uneven aged, mixed species stands to better maintain cold-water temperatures in these streams. For other riparian areas, manage for the appropriate species for the site, which may include a range of age classes and forest types within and adjacent to these riparian areas. Of particular note in the BRP subsections are the riparian area management implemented by Fisheries Section of the Department. Trout stream management is a priority due to the high quality streams and habitat found in the BRP subsections. Efforts to reduce erosion potentials in general and removing specific cover types such as Boxelder and elm to provide and maintain grassy riparian buffers are priority management directions.

GDS-5A Strategies

a. Meet or exceed the MFRC Site-Level Guidelines relating to riparian areas.

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

DNR forestry personnel check the application of riparian guidelines as a part of timber sales supervision and inspections. Also, MFRC site-level monitoring will periodically sample sites in the subsections as part of the monitoring program at the statewide level. The objective of this statewide monitoring program is to evaluate the implementation of the *Voluntary Site-Level Forest Management Guidelines* through field visits to randomly selected, recently harvested sites distributed across the various forest land ownerships (state, county, national forest, tribal, forest industry, non-industrial private lands, etc.) in the state.

b. Using the NPC Field Guide and associated ECS Silvicultural Interpretations, manage for a species appropriate for the site.

c. Follow the recommendations identified in local and regional water resource management agency plans as they relate to and affect state-administered lands.

d. Follow strategies outlined in Tomorrow's Habitat for the Wild and Rare.

This document identifies *Species in Greatest Conservation Need* and associated *Key Habitats. See: http://www.dnr.state.mn.us/cwcs/index.html*

GDS-5B Forest management on state lands adequately protects wetlands, seasonal ponds including oxbows, and sinkholes.

Wetland areas and oxbows associated with stream and river environments include lowland forested areas (such as ash, flood plain forest and lowland hardwoods). These areas are protected using different site-level forest management than those required for riparian areas adjacent to lakes, streams, and rivers or permanent open water ponds. This management to be determined at site visit and included on the silvicultural worksheet.

GDS-5B Strategies

a. Meet or Exceed MFRC Site-Level Guidelines.

Some examples of recommendations from the guidelines are:

- Maintain filter strips;
- Avoid disturbances such as ruts, soil compaction, excessive disturbance to litter layer, and addition of fill;
- Use timber sale planning and administration to ensure that skidding and other equipment operations in upland stands take place outside of small non-open water wetlands and seasonal ponds. Meet with permittee/operator on site before the start of the permit activities to review details of the wetlands and protection measures within the sale area, and periodically visit the site during the harvest operation; and,

- Leave-tree guidelines recommend selecting leave trees in clumps, islands, or strips centered around or that coincide with small non-open water wetlands and seasonal ponds.

DNR forestry personnel will check the application of wetlands and seasonal pond guidelines as a part of their timber sales supervision and inspections.

b. Consider landforms (e.g., St. Laurence formation and Decorah Edge geologic layers) that have seasonal ponds, side hill seeps, perched wetlands and sinkholes, and address those features in site-specific prescriptions that are developed during the Stand Examination Field Visit.
Field staff routinely encounter sinkholes as site visits are made. New locations of sinkholes are reported and added to the sinkhole database. The presence of existing and newly detected sinkholes and specific stand management implications will be implemented with stand management prescriptions.

3.6 Timber Productivity

GDS- 6A Even-aged managed cover types will be managed to move toward a balanced age-class structure.

A balanced age-class structure has relatively equal acres in each 10-year age-class out to the normal rotation age. A goal is to provide an even flow of wildlife habitat and timber harvest. A steady supply of these resources over time is important to wildlife, recreation, the forest products industry, and the local economies that depend on them. Many cover types managed under even-aged regimes do not currently display a balanced age-class distribution.

GDS-6A Strategies

a. Target the selection of stand treatment acres to the appropriate age-classes.

Forest planning models include parameters that attempt to balance age-classes by selecting stands from specific age-classes based on criteria developed during the planning process, including normal rotation age, and site index.

As oak cover types and oak dominated plant communities comprise 61 percent of the forestland in the subsections, this is the cover type that the Divisions devote most time to developing management prescriptions. Oak is valuable as a timber species but also extremely important for many species of wildlife. It is also a cover type that is difficult to regenerate without attention to site requirements. Thirty-five percent of the cover type is over normal rotation age and needs to be treated to turn more of those acres into young oak stands. Oak is a mid –successional cover type that thrives on disturbance to regenerate. The Division of Forestry has been working to adapt methods for regeneration for over the last twenty years.

Currently the main practice is to pre-plant the harvest sites and remove the overstory within two years. Northern hardwoods are increasing as the older age classes go untreated and in order to maintain the current oak, managers must focus on the older age classes through the stand exam process.

GDS-6B Timber productivity and quality on state timber lands is increased.

Increasing the timber productivity of state forest lands is one method to continue to provide the current (or greater) harvest volume and improve timber quality, while managing some lands with less emphasis on timber productivity. Increases in timber productivity can be achieved during this 10-year plan by accelerating the rate at which the DNR addresses: the age-class imbalance over current levels; increasing intermediate stand treatments; converting to site-appropriate species; and, continuing to protect soil productivity by applying the site-level guidelines.

GDS-6B Strategies

a. Move toward harvesting stands in even-aged managed cover types at their normal rotation ages.

b. As opportunities exist, thin or selectively harvest in some oak, lowland hardwood and walnut stands.

These treatments are prescribed for normal rotation stands. This SFRMP has developed a 10-Year Stand Exam List that will be site visited for potential or selective harvest (*see Appendix E: 10-Year Stand Exam list).* Stand selection criteria is identified in *Appendix F: Description of the Blufflands/Rochester Plateau Stand Selection Criteria.*

c. Include silvicultural treatments such as site preparation, inter-planting, release from competition (e.g., herbicide application or hand release), and timely thinning in plantation management, to increase productivity.

The use of pesticides (herbicides, insecticides, etc.) will be minimized. When they must be used to control competing vegetation or forest insects and diseases on state lands, the following operational standards will be followed:

- DNR Operational Order No. 59 - Pesticides and Pest Control;
- Division of Forestry - Pesticide Use Guidelines;
- Adhere to pesticide labels;
- Material Safety and Data Sheets for each pesticide and adjuvant being used or recommended;
- *MFRC Site-Level Guidelines* relating to pesticide use; and,
- No products on the FSC list of Highly Hazardous Pesticides will be used.

d. Apply and supervise the implementation of the MFRC Site-Level Guidelines on treatment sites.

e. Continue to implement, supervise, and enforce current DNR timber sale regulations to protect and minimize damages to sites or residual trees from treatment activities.
For example, avoid damage to residual trees during harvest or thinning operations.

f. Manage some stands for large diameter, high-quality sawtimber products by retaining adequate stocking and basal area.

g. Respond to insect and disease problems, as appropriate.

3.7 Forest Pests, Pathogens and Non-native Invasive Species

GDS-7A Limit Damage to Forests from Insects, Disease, and Non-native Invasive Species to Acceptable Levels Where Feasible.

Forest insects and disease organisms influence forest ecosystem dynamics. At acceptable levels, they promote diversity of tree species and generate important elements of forest structure that are important as habitat and in nutrient cycling, such as snags and coarse (large) woody debris. However, epidemic populations of insect pests can cause high levels of tree mortality, and can have significant ecological and economic consequences. Native and introduced diseases can cause significant species-specific losses in volume and mortality. Forest management will not attempt to eliminate native insects and diseases or their processes from the landscape, but rather to limit their impact on individual sites to a level that allows goals for timber production, water quality, aesthetics, recreation, wildlife, and biodiversity to be realized.

Natural resource managers are concerned about the introduction and establishment of non-native invasive insect, disease, and plant species on public land. Invasion of forest ecosystems by non-native invasive species can cause significant economic losses and expenditures for control because they destroy or displace native plants and animals, degrade native species habitat, reduce productivity, pollute native gene pools, and disrupt forest ecosystem processes (e.g., hydrological patterns, soil chemistry, moisture-holding capability, susceptibility to erosion, and fire regimes). Examples of non-native invasive species with known adverse effects on Minnesota forest resources include: white pine blister rust, gypsy moth, and European buckthorn. There is potential for significant adverse impacts from other species present in the subsection(s), such as: emerald ash borer, garlic mustard, reed canary grass, multiflora rose, exotic honeysuckle, spotted knapweed, wild parsnip, and oriental bittersweet Management will seek to minimize impacts from these species, limit the introduction of new non-native invasive species, and minimize the impact of control measures on vulnerable native species.

Local introductions and spread of harmful non-native invasive plant species can happen through several activities. Forest management activities and recreation have significant potential as an avenue for unintentional introductions of non-native invasive plant species, especially in less developed portions of the subsection(s). Global warming effects and a variety of insect and disease concerns (e.g. oak wilt (*Ceratocystis fagacearum*), two-lined chestnut borer (*Agrilus bileneatus*), Emerald Ash borer *(Agrilus planipenis),* gypsy moth (*Lymantria dispar*), and armillaria root rot (*Armillaria spp*.)

may impact oak management on some sites. Establishing and promoting practices that minimize these introductions will slow the spread of non-native invasive species and harmful native species and reduce the associated losses.

GDS-7A Strategies

a. Identify and monitor insect, disease, and non-native invasive species populations as part of the forest health monitoring program and document their occurrence on state-managed lands.

Early identification and risk assessment of new non-native invasive species introductions improve potential to develop and implement appropriate responses. Monitoring known insect and disease pests, conditions conducive to outbreaks, and populations of non-native invasive plant species can provide useful information for predicting potential outbreaks and documenting and predicting range expansion. Involve private landowners and local units of government in gathering and disseminating information. This information helps determine when and where preventive measures to limit impacts or control action are needed.

Mutually established protocols for data collection and information sharing among federal (U.S. Environmental Protection Agency, U.S. Department of Agriculture) and state agencies improve capacity to respond to the spread of established non-native invasive species into new areas, new species introductions, and outbreaks of established pests and diseases.

b. Follow Minnesota DNR Operational Order 113 (Invasive Species) and appropriate Division guidelines to minimize the spread of non-native invasive species during forest management activities.

c. Adhere to the Minnesota DNR 2010 Invasive Species Program Directive on forestry lands.
This directive can be viewed at:
http://files-intranet.dnr.state.mn.us/forestry/manuals/roadManual/invasiveSpecies/rdman_invasivespeciesprogramdirective091201.pdf

d. Manage existing forest insect and disease problems, as appropriate.

e. Use the least intensive site preparation methods possible to ensure success.

Site preparation can create conditions favorable to non-native invasive species and alter structural diversity in the ground layer. Striving to minimize site preparation intensity will minimize these threats.

Information gathered and provided by the agencies mentioned above is used as a basis for decisions regarding where and when insect and disease problems require action involving vegetation management.

Prepare collaboratively developed intervention plans *before* pest outbreaks (e.g., the strategic plan for the cooperative management of gypsy moth in Minnesota involving Minnesota DNR, Minnesota Department of Agriculture, USDA-APHIS, and USDA-FS). These plans detail appropriate integrated pest management strategies, circumstances under which strategies can be appropriately and effectively used, responsibilities, and cost-sharing arrangements. Containment and eradication measures will seek to minimize impacts from these species, while minimizing the impact of control measures on vulnerable native species.

If pesticides are needed to control forest insects and diseases on state forest lands, the following operational standards will be used:

- DNR Operational Order No. 59 - Pesticides and Pest Control;
- Divisions of Forestry and Fish and Wildlife - Pesticide Use Guidelines;
- Adhere to pesticide labels;
- *MFRC Site-Level Guidelines* relating to pesticide use;
- Refer to Material Safety and Data Sheets for each pesticide and adjuvant being used or recommended; and,
- No products on the FSC list of Highly Hazardous Pesticides will be used.

f. Manage stands to reduce the potential impact of insects and diseases.

Several techniques to achieve this Strategy include:

- Develop and utilize existing management plans and stand treatment prescriptions (e.g., 2011 Ash Management Guidelines) using the DNR Forest Development Manual and other recognized insect and disease management sources, while considering ecological processes and functions and impacts to native species and habitats;
- Provide information and training via logger education programs to equipment operators and tree fellers regarding techniques that minimize damage to retained trees (e.g., leave trees or crop trees); and,
- Emphasize the use of fire in management for prevention of insect and disease outbreaks (e.g., burning pine slash that may harbor significant populations of bark beetles).

GDS-7B Reduce the Negative Impacts Caused by Wildlife Species on Forest Vegetation on State Forest Lands.

Wildlife species such as deer, cottontail rabbit, beaver, and other rodents impact forests and plant regeneration through browsing, stem damage, and girdling. Solutions require an understanding of the dynamics of herbivory, seasonal wildlife movements, population structure, population control tools and their effectiveness, and proven repellents or exclusion methods. Keys to success include coordination between department staff, adequate funding, and sharing information regarding successful exclusion or abatement methods. The management strategies below attempt to minimize adverse impacts.

GDS-7B Strategies

a. Improve implementation of Strategies to prevent wildlife depredation

- Conduct training sessions addressing the factors that affect damage, potential solutions, and prevention based on research and experience.
- Coordinate field visits at problem sites with area wildlife staff and the appropriate land manager.
- Collect information from damaged sites for database entry and analysis of wildlife damage.
- Use the expertise of the DNR – Section of Wildlife's Depredation Program and research units when regeneration plans call for use of repellents or exclusion techniques.

b. Consider the potential for wildlife impacts to planted or naturally regenerating trees before damage occurs.

Techniques include:

- Work with area wildlife staff to identify sites where significant damage may occur before forest management activities occur. Where necessary, incorporate plans for post-sale damage mitigation into forest regeneration and development plans.
- In riparian areas, favor tree species less palatable to beavers.

c. Focus forest regeneration efforts in areas less likely to be negatively impacted by wildlife.

Implement this Strategy by:

- Avoid unprotected plantings of susceptible species (i.e., those known to be a preferred food source such as oak and white pine) near known seasonal deer concentration areas.
- Avoid planting susceptible species in locations surrounded by habitat attractive to ungulates without some plan for protection from browsing.
- In mixed species plantations and under story plantings, scatter susceptible species among those that are less susceptible.
- In larger mixed species plantations, plant susceptible species in the middle of the site.
- Use direct seeding where appropriate to create high density plantings with random spacing.

d. On sites where damage from wildlife species is anticipated, use mitigation techniques to reduce damage when planting susceptible tree species.

Examples of techniques include:

- Favor planting on sites where edge (irregular boundaries) is minimized.
- Plant larger sites.
- Plant susceptible species away from the edge of the site.
- Use protective measures such as fenced enclosures, bud capping, repellents, tree shelters, etc.
- To more efficiently implement protection control measures, clump plantings and/or locate them to be easily accessible.
- Use direct seeding where appropriate to create high density plantings with random spacing.

e. When deciding what to plant, consider species or stock sources that are less palatable to wildlife.
Consider the potential for seedling damage and/or growth reduction from wildlife damage in selection of susceptible species planting stock.

3.8 Climate Change

GDS-8A Forest Management on State Lands Attempts to foster adaptation to the effects of Global Climate Change. Management is Based on our Current Knowledge and will be Adjusted Based on Future Research Findings.

Minnesota DNR recognizes that climate change, also known as global warming, is occurring at a rate that exceeds historical levels, and that the rate is likely to continue to increase. A growing body of evidence concludes that climate change is real and will have serious implications for people and the natural world upon which we depend. In an important step forward for Minnesota's environment, the Minnesota Climate Change Advisory Group in 2007 developed a comprehensive plan for reducing the state's greenhouse gas emissions.

Several climate models (e.g., atmospheric-ocean general circulation models[21]) in use around the world predict global climate change. The Intergovernmental Panel on Climate Change refers to climate change as any change in climate over time, whether due to natural variability or as a result of human activity. The models agree that average temperatures are increasing and predict more variable changes in precipitation. This global warming will affect forests and wildlife in Minnesota.[22,23]

Scientists believe the predicted climate change will affect the size, frequency, and intensity of disturbances such as fires, windstorms, and insect outbreaks. It will affect the survivorship of existing plant and animal species and the distributions of plants and animals. Even at modest levels, independent studies are finding mounting evidence that the current climate change influences plant and animal ranges and behavior.[24] Some plant and animal species may not be able to adapt to the rate of change. Increases in the reproductive capability and survivorship of non-native invasive species, insect pests, and pathogens will impact forests and wildlife. Certain tree species, such as black spruce, balsam fir, birch, and jack pine will respond negatively to increased soil warming and decreased soil moisture in. Carbon sequestration by forests and wetlands may be affected because of accelerated decomposition rates.

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[21] IPCC. 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). [Houghton, J.T., et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 881pp.
[22] Weflen, K., *The Crossroads of Climate Change*. Minnesota Conservation Volunteer, January-February 2001, Minnesota Department of Natural Resources, St. Paul, MN.
[23] Pastor, John, personal communication at March 13, 2003 North Shore SFRMP meeting. Natural Resources Research Institute, University of Minnesota-Duluth.
[24] Root, T. et al., *Fingerprints of Global Warming on Wild Animals and Plants*, Stanford University, Nature- January 2, 2003; and Parmesan, Camille, A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems, University of Texas.

Most tree species in Minnesota reach the limit of their geographic range somewhere within the boundaries of the forested portion of the state. Predictions have been made on the potential future distributions of trees.[25] There is a need to facilitate species adaptation to change in response to possible rapid climatic changes.

Although there are uncertainties about the effects of climate change on forest vegetation at the subsection scale, the following strategies will be used to help monitor and foster adaptation of the predicted effects of climate change on vulnerable species and native plant communities.

GDS-8A Strategies

a. Maintain or increase species diversity across the subsections.

The forest composition and within-stand diversity goals of this SFRMP will provide a more diverse forest across the subsections. By maintaining a variety of species at the stand and landscape levels across the subsections, the forest will be more resilient, more genetically diverse, and will utilize a broader range of site conditions (i.e., niches). This variety promotes forest survival as well as to serve as a reproductive source for forest plant and animal migration in the face of accelerated climate change. Maintaining species diversity at multiple scales will minimize the risk of widespread, stand-replacing insect and disease outbreaks that could result from accelerated climatic change.

b. Maintain or increase structural diversity across the subsections.

Structural characteristics include the size (diameter and height), abundance and distribution of overstory trees, understory vegetation, and their arrangement (scattered or clumped) within the stand. Structural characteristics also include the presence or absence of snags and coarse woody debris and the way these features are distributed in space. Appropriate structural types, amounts, and arrangements vary by native plant community and growth stage. By maintaining or increasing structural diversity across the subsections, the forest will provide habitat to a greater number of species than a forest with uniform structural diversity. For example, large-diameter structures, both standing and lying on the ground, provide micro-sites for seed germination, cavities for nesting and den sites, and important escape and nesting cover within stands. This variety will assist the forest to survive as well as serve as a reproductive source for forest plant and animal migration in the face of accelerated climate change.

c. Maintain connectivity that permits the migration of plants and animals as climate changes the landscape.

Maintaining NPC spatial patterns where patches of vegetation are connected will allow the flow of plants, animals, and processes (e.g., seed dispersal) between suitable habitats. The ability of species to move to a new more hospitable site is a critical survival tactic. Because of the existing fragmentation of state administered lands in these subsections, often times maintaining connectivity between management units requires

[25] Iverson, L, et al. 1999. *An Atlas of Current and Potential Future Distributions of Common Trees of the Eastern United States.* Gen. Tech. Rep. NE-265. Radnor, PA. USDA Forest Service. Northeastern Research Station. 245 p.

cooperation with intervening landowners. The following are some of the techniques that have been used during the planning phase to address this Strategy:

- High Conservation Value forests transcend all ownerships. Identification and management of HCVF will consider connectivity within these areas as stand management is implemented. Efforts are made by field staff to work with all landowners within HCVF to manage for the unique resource.

The following are some methods for addressing this Strategy during plan implementation:

- Where available, MBS sites of biodiversity significance are used as a means to identify, quantify, compare, and monitor NPC spatial patterns as they relate to the BRP SFRMP plan direction.
- Classification of stands to NPC and application of *ECS Silvicultural Interpretations* provide a means to maintain NPC spatial patterns on managed lands.
- Plan harvests to minimize road construction and landings. In the BRP subsections there is not a great deal of choice on road locations. The Department works with adjacent landowners for landings. Many times there is old infrastructure that can be renewed and improved.
- Stand management incorporates actions that minimize the potential for non-native invasive species establishment.

d. Evaluate site conditions with respect to climate change when selecting tree species for regeneration.

Use the NPC Field Guide, associated silvicultural references, existing tree distributions, and modeled future tree distributions when selecting the species most appropriate for the site.

e. Consider the effects of forest management on carbon sequestration and carbon stocks.

Climate models (e.g., *Hadley Centre for Climate Prediction and Research-UK, carbon cycle models*) predict that, as future atmospheric carbon dioxide concentrations increase, global temperatures will increase. Forests have the ability to remove carbon dioxide through photosynthesis and to store the carbon as woody material. Carbon is stored in all parts of the forest including living plants, dead plants, fallen leaves, and soil. The storage of carbon is called *carbon sequestration*. Carbon also remains stored in wood that is harvested and processed into wood products.[26] The carbon remains stored in wood until it is gradually released through slow decay or is released rapidly when it is burned.

Forest management activities, such as ensuring existing stands are adequately stocked and ensuring regeneration is adequate after harvest, sequester carbon. Basically, any activity that provides healthy and productive forests will increase carbon sequestration. In this plan, stands in a wide range of age-classes will be evaluated for treatment. Increasing the stocking and growth rate of timber will help in sequestering carbon. Stands that contain a variety of tree species are more likely to fully occupy a site, increasing the overall wood volume grown on the site. Increasing the woody biomass over what is currently on these under-stocked sites will help sequester carbon. The following are some examples of forest management strategies in this SFRMP that will help in carbon sequestration:

[26] Heath, L. 2000. *Carbon Sequestration: Yet Another Benefit of Forests*. Forest Legacy Program. USDA Forest Service, Durham, NH.

- Examine stands for treatment from a wide range of age-classes.
- Balance the age-class distribution in even-aged managed cover types.
- Emphasize longer rotations and longer-lived species
- Ensure that adequate old forest exists considering all ownerships.
- Reserve and maintain old-growth forests.
- Increase timber productivity in managed stands.
- Retain leave trees, legacy patches, snags, and coarse woody debris on harvested sites.
- Minimize roads and landings.
- Minimize slash burning.
- Utilize biomass for alternative energy supplies.
- Manage for quality timber with lower defect levels that will be available for a wider range of uses and require less processing.

f. Consult Tree Suitability tables in determining conversions and stand management.

g. Apply the MFRC Site-Level Guidelines for tree species at the edge of their range.

3.9 Visual Quality

GDS-9A Minimize Forest Management Impacts on Visual Quality in Sensitive Areas.

Scenic beauty is a primary reason people choose to spend their recreation and vacation time in or near forested areas. Where forests are near recreational trails, lakes, waterways, public roads, and highways, consider impacts of forest management activities to the visual quality of the site during and after management activities.

GDS-9 Strategies

a. Apply the Site-Level Guidelines on visual quality on all vegetative management activities.

The MFRC guidelines contain many recommended forest management techniques that will minimize the impacts of vegetative management activities on visual quality. *Directions 2000* (*Objective 3.3*)[27] states that the "DNR will apply the appropriate guidelines so that visual quality is not adversely impacted during forest management activities." Several examples of the recommended techniques included in the guidelines are listed below:

- Minimize visibility of harvest areas by limiting the apparent size of the harvest area.
- Avoid management operations during periods of peak recreational use whenever possible.
- Locate roads and trails to minimize visibility from nearby vantage points, such as scenic overlooks, streams, and lakes.
- Encourage long-lived species and other visually important species (e.g., paper birch) along high visual quality identified roadways. This will minimize the frequency of management activities. It will also provide larger-crowned, larger-diameter trees that improve forest aesthetics.
- Reduce visual penetration with appropriate curves in the road alignment.

DNR forestry staff checks the application of visual quality guidelines as a part of timber sales supervision and inspections. Roads have been classified based on visual quality ratings. Classifications can be viewed on the DNR Web site at:

http://www.dnr.state.mn.us/forestry/visual_sensitivity/index.html

b. Work to resolve conflicts between recreational users and forest management to assure sustainability of forest resources and plant communities.

c. Resolve conflicts between forest management directions and constraints of HCVF, RSAs, or Old Growth with recreation uses.

3.10 Access to State Land

GDS-10A Forest access routes are well planned and there is a high level of collaboration with adjacent landowners to share access and minimize new construction.

Access routes are needed to effectively manage forest stands identified for treatment during this 10-year plan implementation period. The overall density of roads in specific geographic areas can be minimized through cooperation with other landowners in the subsections. The access routes that are selected must be developed in a way that protects or minimizes the negative effects on other forest resources.

GDS-10 Strategies

[27] Minnesota Department of Natural Resources, *Directions 2000: The Strategic Plan*, Objective 3.3, p22.

a. Continue to seek cooperation with adjacent landowners to retain existing access to State land and to coordinate new road access development and maintenance across multiple ownerships.

Cooperative road planning that involves all affected landowners will be done whenever possible to maximize the efficiency of the transportation system. Use the DNR GIS-based road and trail inventory. The goal is to serve as many acres of forest land with as few miles of road as possible.

b. Follow Minnesota Statutes and guidelines and DNR Policies for state forest roads.

- Follow the *Site-Level Guidelines* for road design, construction, maintenance, reconstruction, and closure.
- Follow the guidelines and policies relating to roads and trails in the *DNR Forestry Road Manual* and the *Forestry-Wildlife Habitat Management Guidelines (page 50)*.
- Use the *DNR Site-Level Design and Development Guidelines for Recreational Trails* for guidance on post-sale treatment.

c. Apply the Department direction regarding access roads across sensitive areas that have been reserved from treatment or identified for special management during the 10-year implementation period.

Evaluate, on a case-by-case basis, (DNR Forestry administrative area review by Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources staff) as access is needed in these areas.

d. Follow Strategies identified under other General Direction Statements that apply to roads throughout the planning, development, and disposition of forest roads.

e. Implement timber access planning

Timber access planning will identify any new road or road repairs needed to access stands identified in SFRMP for field visit and/or treatment. Existing roads or previously used corridors of disturbance will be followed whenever feasible. Use of Lidar technology can help identify abandoned access routes that had been used many years ago. For new roads and temporary access, the road classification (whether it is winter or summer access), miles of new road, and proposed post-sale treatment will be documented.

Limiting unplanned secondary usage should also be considered in post-sale road planning. The timber sale appraiser will refine the proposed road access and post-sale treatment plan as part of the design of the timber sale. Final adjustments may be made at the pre-sale meeting between the timber sale administrator and the permittee.

Access across agricultural lands in the dormant season should be utilized whenever possible to minimize road construction and/or long skids through forest lands. Most temporary roads will not be maintained after harvest is completed. These access routes should be used again for future forest management activities instead of disturbing new areas.

f. Acquire lands to enhance access to State owned lands

One of the goals of additional state land acquisition is to obtain parcels that will provide access to current state ownership, improve the current access, or reduce or eliminate the need to construct new roads for forest management purposes.

3.11 Cultural Resources

GDS-11A Cultural Resources are Protected on State-administered Lands.

A cultural resource is an archaeological site, cemetery, historic structure, historic area, or traditional use area that is of cultural or scientific value. Cultural resources are remaining evidence of past human activities. To be considered important, a cultural resource generally has to be at least 50 years old. A cultural resource may be the archaeological remains of a 2,000 year-old Indian village, an abandoned logging camp, a portage trail, a cemetery, food gathering sites such as ricing camps and sugarbushes, or a pioneer homestead. They often possess spiritual, traditional, scientific, and educational values. In addition to federal and state laws that protect certain types of cultural resources, the *Voluntary Site-Level Forest Management Guidelines* provide information and recommendations to assist private and public land managers in taking responsible actions when cultural resources are encountered.

GDS-11 Strategies

a. Annual stand exam lists are reviewed by DNR archeologists; recommendations for mitigation are implemented as part of sale design.

3.12 Natural Disturbance Events

GDS-12A Natural Disturbance Events that Occur on State Land Within the Subsections are Promptly Evaluated to Determine the Appropriate Forest Management Needed to their Impacts.

By promptly evaluating known disturbance events (e.g., fire, wind, or insects and disease), land managers will be able to quickly recommend what, if any, forest management activities are necessary to mitigate the impacts of the event. Depending on the scale of the event and potential positive or negative impacts, management recommendations will range from no action to salvage harvesting and/or prescribed burning. Where quick action is needed to salvage harvest timber from damaged stands, the annual plan addition process for public review will be used.

GDS-12 Strategies

a. The Subsections' planning Team will evaluate large-scale (100's to 1000's of acres) disturbance events to determine appropriate action.

If large-scale disturbance events occur during the 10-year plan, the core team will assess the extent and significance of the event on the structure and condition of forest lands in the subsection(s). The team will propose forest management actions to be implemented within the area impacted by the event and determine whether adjustments to the short-term harvest levels are needed.

When large-scale disturbance events involve multiple ownerships, the DNR will cooperate in assessment and implementation of management actions with other agencies and landowners, when possible. To better inform the public of planned large-scale salvage harvest, a press release will be completed that includes information on the disturbance and the planned management actions.

b. Local land managers will evaluate and determine appropriate actions for small-scale (10s of acres) disturbance events.
After small-scale disturbances, local forest and wildlife managers will do a timely evaluation of the disturbance area and take the appropriate action needed to address the situation.

3.13 Trust Lands

The DNR acts as a trustee for School Trust lands, including minerals, with fiduciary duties to the beneficiaries of the Trust. This responsibility imposes obligations on the DNR that typically do not apply when the DNR manages acquired lands in accordance with its traditional natural resources mission which includes balancing a variety of values including outdoor recreation and natural resources protection and development.

The School Trust lands are not DNR lands, even when included within the boundaries of agency-designated management units, and the primary mission for School Trust lands is different than for other DNR-managed lands. Under the law, the primary management priority for School Trust lands is to maximize their long term economic return. This priority must be managed consistent with sound natural resource conservation and management principles. In most instances, these two goals are complementary and the appropriate balance can be achieved. This is true particularly with those natural resource management practices that are essential to maintaining a sustainable economic return such as ensuring good forest soil productivity for the long term health of timber harvest yields. However, in those circumstances where there is an unresolvable conflict between maximizing long term economic return and protecting natural resources and recreation values, the DNR must give precedence to long term economic return in its management duties on School Trust lands. The BRP subsections contain limited lands designated as School Trust Lands. In implementing recent legislation on management of School Trust Lands, the Department determines the occurrence of any deferred, reserved or special

designations which potentially affect School Trust Lands. Table 3.13 below identifies the total acres of School Trust Lands as they are potentially affected by special designations.

The complete policy and direction regarding management of School Trust Lands can be found at:
http://www.dnr.state.mn.us/aboutdnr/school_lands/index.html

Table 3.13 School Trust Lands and special designations identified in the BRP SFRMP

Cover-type	Total Wildlife and Forestry Acres	Total Trust Acres	Old Growth		RSAs		HCVF	
			Total Old Growth Acres (all admin)	Old Growth on Trust Acres	Total RSA Acres	RSA Acres on Trust lands	Total HCVF Acres	HCVF Acres on Trust lands
Ash	535	0	0	0	17	0	96	0
Lowland Hardwood	7,895	212	33	0	184	0	3,237	189
Northern Hardwood	8,736	58	276	0	331	0	2,853	5
Walnut	2,208	<1	0	0	0	0	296	0
White Pine	2,124	1	58	0	1	0	135	0
Aspen	996	3	0	0	0	0	111	0
Birch	326	0	0	0	0	0	17	0
Cottonwood	964	1	0	0	12	0	298	0
Oak	34,020	358	616	0	783	0	6,820	32
Central Hardwoods	2,537	14	31	0	1	0	278	14
Red Pine	547	0	0	0	<1	0	29	0
Jack Pine	6	0	0	0	0	0	0	0
White Spruce	117	0	0	0	0	0	2	0
Red Cedar	314	0	0	0	0	0	19	0
Willow	35	0	0	0	0	0	11	0

GDS-13A: School Trust Lands will be Managed for Long-Term Economic Return to the Minnesota School Trust Fund.

GDS-13B: The Minnesota School Trust Fund will be Compensated for any Management Activities That Limit the Economic Return for School Trust Lands.

3.14 Natural Resource Management impacted by structural and agricultural development

GDS 3.14A The changing structural and agricultural development pattern will be considered as forest management is implemented in the subsection.

The BRP subsection lies just to the south of the Twin Cities metropolitan area along the Mississippi River to the Iowa border. This area includes some of the fastest growing counties in Minnesota and includes relatively large and growing urban areas including the City of Rochester. In addition positive conditions for agricultural production continue, adding to potential conflicts with public forest management. Public lands are an attraction for residential development and large scale development.
Examples of conflicts include:

- Aesthetic concerns when implementing forest management in neighboring "backyards";
- Concerns with the use of fire from both a threat to values and smoke impacts;
- Dust and noise issues when using road systems for forest management activities;
- close proximity (housing development and state lands) leads to a greater scrutiny of management actions;
- Increased populations increase the movement of non-native invasives with people as the vector;
- Relatively small parcels of state land are surrounded by many land owners makes it difficult for management continuity (control of non-native invasives, pesticide use, access issues); and,
- Potential conflicts with recreationists using the state lands with forest management activities.

GDS 3.14A Strategies

a. Inform adjacent landowners of nearby management activities on the state lands and, when feasible, mitigate any impacts.

Many of the Department's forest management activities include routine public notice processes. Examples include notification of draft SFRMPs for comment, stakeholder notice of additions to annual stand exam lists; timber sales, prescribed burns and pesticide projects. In these cases, if a landowner expresses concerns about a project and implementing an alternative action to address the concern does not significantly affect the management goals of the project, the Department will address those concerns in carrying out the project.

Other projects are carried out without notification. This would include things such as tree planting and fuel wood sales and have less potential to raise concerns from adjacent landowners

b. Encourage private landowners, local governments and other land managers to implement compatible land uses adjacent to state land through land use management actions.

More compatible land uses adjacent to public lands will reduce the potential for conflicts resulting from professional forest management practices. Reduced conflicts will aid in forest management activities including invasive species control efforts, implementing prescribed fire actions and harvesting practices.

This Strategy can be implemented through land management strategies, such as park designation and conservation easements or lower density development adjacent to public lands.

c. Work with other divisions to mitigate the impacts of forest management on recreational users.

On wildlife lands this would include timing management activity so as not to coincide with heavy hunting activity. Many forest management routes are used as recreational trails. Annual coordination with the Area trail managers is implemented to identify potential user conflicts and mitigations.

d. Inform adjacent landowners, local governments and stakeholders of forest management planning processes.

Both adjacent landowners and those in the vicinity of state lands have interest in the management plans for public lands. Decisions made in these plans can affect neighboring landowners both directly and indirectly. Periodically, during planning processes, the general public and stakeholders are given the opportunity to review and comment on draft plans such as with subsection plans or annual stand exam lists or when a change occurs in management direction of the SFRMP. Over time many of these planning processes and the corresponding comment process have become internet based as opposed to actually holding public meetings. Advantages include: convenience for the public; availability around the clock; and, is in a format where managers at all levels can have access to and view the comments and public recommendations. The downside of internet based public review is that managers do not get the face to face interaction with the general public and in some cases stakeholders.

3.15 Landscape Resource Management on limited public lands

State ownership is relatively limited in this subsection, compared with other more forested subsections in Minnesota. Accommodating the full range of forest resource management objectives given the limited state-administered lands and fragmented cover-types in the BRP subsection proves to be

a challenge. This challenge is complicated by the continued development pressures projected in these subsections (limiting the interest in and ability of private forest lands to practice sustained forest management).

Subsection resource management planning as implemented through SFRMPs in Minnesota considers the wide range of resource management issues affecting vegetation on state administered lands. These issues include forest production, wildlife habitat management and ecological issues such as management for rare and unique species. Accommodating all issues adequately can be less of a challenge with a broader state administered land base to work with. For example achieving many forest management objectives relies on the private logging industry to harvest selected stands. Harvests are a key technique to affect age classes, convert cover types, and respond to disease outbreaks and disturbance events. With a limited land base, the availability and interest of loggers due to markets and volumes offered, to buy timber sales is not as widespread as is found in more forested regions of the state. Without this harvest activity, many forest management strategies cannot be fully implemented.

The BRP SFRMP has identified forest management objectives recognizing that challenges exist that result from a relatively limited land base to work with. Because state-administered lands are limited, the role private forest lands play in achieving landscape level DFFCs is elevated *(e.g. adaptive forest management relative to extended rotation forests)*. Landscape level DFFCs are recommended in the *MFRC Forest Resource Management Plan Southeast Landscape Plan.* As identified earlier, the overall directions of the *BRP SFRMP* are consistent with the recommendations contained in the *MFRC Southeast Landscape Plan* which includes recommendations on forest management across all land ownerships including privately held forest lands. Private forest land managers are encouraged to consider the desired future conditions recommended in both the *BRP SFRMP* and the *MFRC Southeast Landscape Plan*

Because of the limited state land base, and subsequent challenges to implementing subsection goals, opportunities and coordination among public and private forest land managers, as well as among the divisions within the Department, designed to achieve the highest potentials for forest lands to accommodate the multiple goals required, must be a high priority.

GDS 15A Continue to cooperate and coordinate with adjacent land owners (public and private) supporting the overall multiple use and enjoyment concept that applies to state administered land.

GDS 15A Strategies

a. influence management on private lands through stewardship planning efforts.

b. Disseminate final plans to other land managers to use in their planning processes.

c. Strategically purchase lands with conservation values.