Minnesota
Department of Natural Resources

FY 2015 – FY 2024

Blufflands/Rochester Plateau

Final Subsection Forest Resource Management Plan

June 2015

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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 uponrequest.

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 the 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 oldgrowth.

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 moreopen 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
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Chapter 1. Introduction and Background

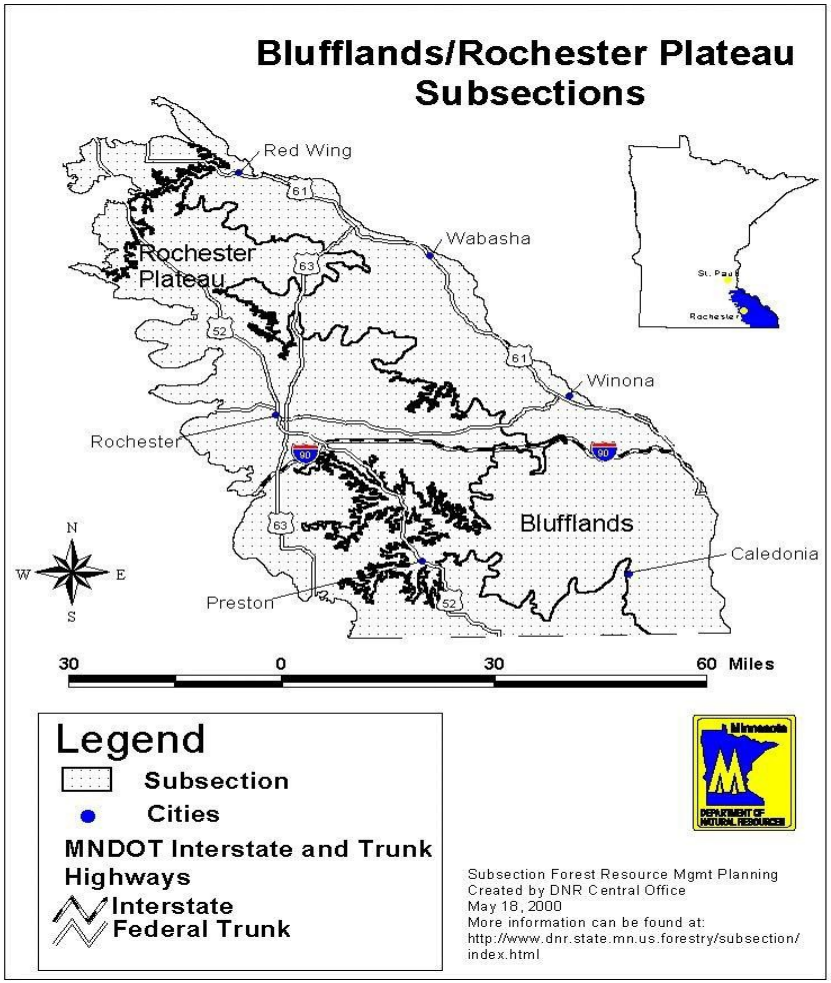
Planning Area Description

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 public webpage for the Blufflands/Rochester Plateau SFRMP

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 public webpage for the Blufflands/Rochester Plateau SFRMP

Map 1.1 Location of Blufflands/Rochester Plateau subsections.



Map 1.2 Blufflands/Rochester Plateau State and Federally owned publiclands

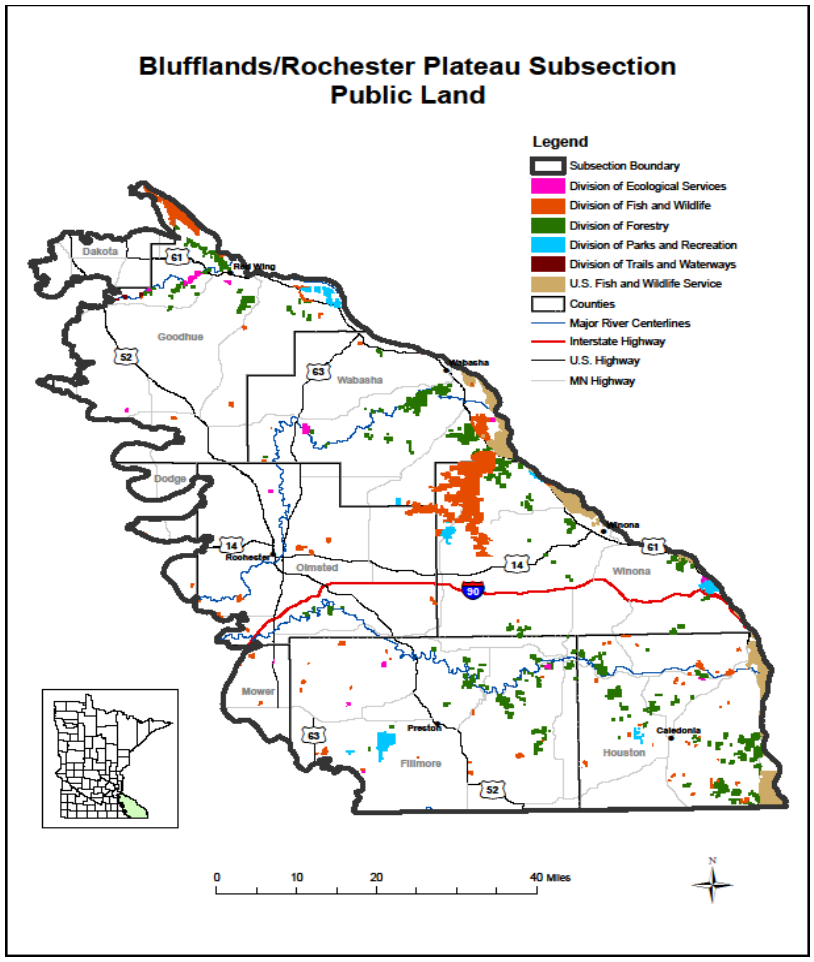
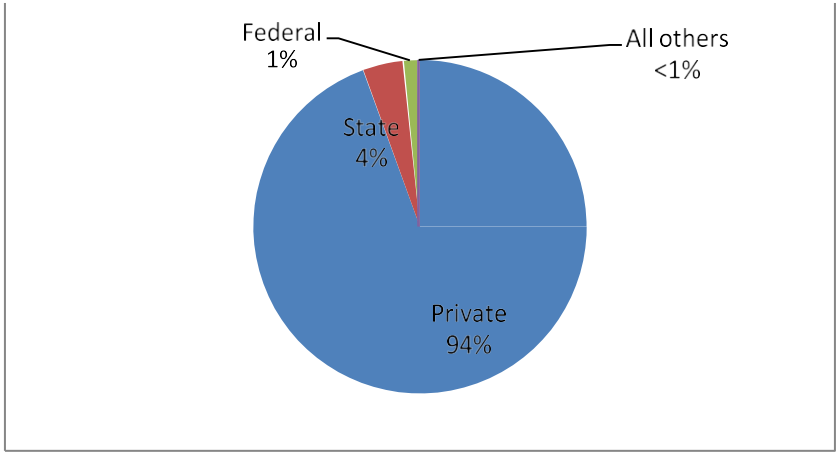


Figure 1.1 identifies the land ownership in the Blufflands/Rochester Plateau Subsections.

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)

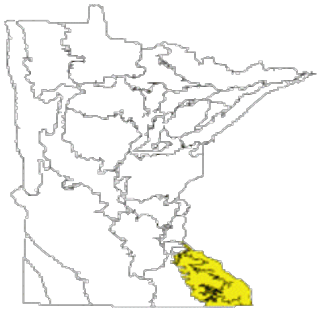
Cover Type	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111 -120	121-130+	131-140+	TOTAL
Ash	26	5	10	204	42	48	93	80	8	14	4				534
Lowland Hardwood	354	245	253	662	1,016	1,405	1,395	1,019	753	534	90	29	100		7,855
Aspen	90	147	108	99	230	159	85	42	7	17					984
Birch	15	4	20	10	84	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

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.



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 covertype 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 Website. • 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. • 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. • Finalized plan distributed, including summary of public comments and DNR

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, covertype 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: public webpage for the Blufflands/Rochester Plateau SFRMP, 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 overtime.

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 thesubsections?

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 overtime.

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	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	**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

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.

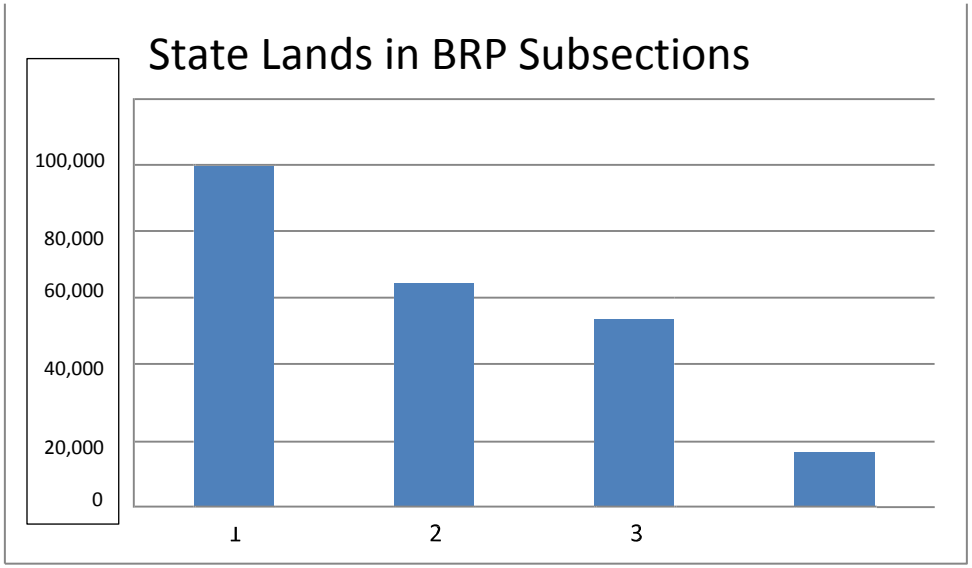
In situations where there is currently an ability to measure and quantify progress, DFC goals were identified. DFC goals are long-term (50+ years) goals for the desired condition of DNR forest lands in the subsections. Examples of DFC goals are: cover type acres, age-class distribution, amount of young 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 otherwetlands.

[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.

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 covertypes.

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 covertypes.

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 Table3.1a.

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.

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.

[3] MNDNR guidelines on ash management

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 specific NPCs 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 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 overtime.

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.

During the final approval process for this plan, DNR completed a Rotation Age Review effort that resulted in the adoption of new "economic rotation ages" for planted red pine on DNR lands included in the SFRMP process. As a result, any planted red pine stands on the BRP 10-year stand list that are at or beyond these new economic rotation ages should be considered for final regeneration harvest (see final Rotation Age Review report). This is expected to have minimal effect during the current 10-year planning period since very few acres in the BRP subsections are currently near, at, or beyond the new economic rotation ages.

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 and 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 thesubsections.

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

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 covertype.

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 gravellysoils.

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 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 2013 FIM 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 MNDNR forest management directions

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: Minnesota Forest Resources Council webpage

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

* During the final approval process for this plan, DNR completed a Rotation Age Review effort that resulted in the adoption of new "economic rotation ages" for planted red pine on DNR lands included in the SFRMP process. As a result, any planted red pine stands on the BRP 10-year stand list that are at or beyond these new economic rotation ages should be considered for final regeneration harvest (see final Rotation Age Review report). This is expected to have minimal effect during the current 10-year planning period since very few acres in the BRP subsections are currently near, at, or beyond the new economic rotation ages.

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
Scots Pine		4	71
White Spruce		19	117
Red Cedar		16	88
Totals		**848**	**16,183**

[1] *includes ash, willow, cottonwood*

* During the final approval process for this plan, DNR completed a Rotation Age Review effort that resulted in the adoption of new "economic rotation ages" for planted red pine on DNR lands included in the SFRMP process. As a result, any planted red pine stands on the BRP 10-year stand list that are at or beyond these new economic rotation ages should be considered for final regeneration harvest (see final Rotation Age Review report). This is expected to have minimal effect during the current 10-year planning period since very few acres in the BRP subsections are currently near, at, or beyond the new economic rotation ages.

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 overtime.

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%

** During the final approval process for this plan, DNR completed a Rotation Age Review effort that resulted in the adoption of new "economic rotation ages" for planted red pine on DNR lands included in the SFRMP process. As a result, any planted red pine stands on the BRP 10-year stand list that are at or beyond these new economic rotation ages should be considered for final regeneration harvest (see final Rotation Age Review report). This is expected to have minimal effect during the current 10-year planning period since very few acres in the BRP subsections are currently near, at, or beyond the new economic rotation ages.*

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	-	-
Scots Pine	60	-	-	-	-	67
White Pine	130	-	-	139	135	130
White Spruce	60	-	62	-	-	79

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

*** During the final approval process for this plan, DNR completed a Rotation Age Review effort that resulted in the adoption of new "economic rotation ages" for planted red pine on DNR lands included in the SFRMP process. As a result, any planted red pine stands on the BRP 10-year stand list that are at or beyond these new economic rotation ages should be considered for final regeneration harvest (see final Rotation Age Review report). This is expected to have minimal effect during the current 10-year planning period since very few acres in the BRP subsections are currently near, at, or beyond the new economic rotation ages.*

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%
Scots 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
Scots 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
Scots 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] MFRC guidelines on biomass harvesting

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 covertypes;
- 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 forestlands.

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:

MNDNR webpage on Old Growth forests

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 forestconditions.
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 DNRguidelines.
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 *DNROld-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: MNDNR forest management directions

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:

Comprehensive Wildlife Conservation Strategy

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 covertypes.

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 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 *BRPSFRMP.*

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:

Fact Sheet prepared by MNDNR explaining high conservation value forests

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:
MNDNR recommendations on tree species management
(*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] MNDNR silvicultural interpretations

- 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 and land managers 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] Natureserve: An Online Encyclopedia of Life - 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 staff 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 staff 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
Scots 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 these subsections. 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 forested lands 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.

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]

[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.

GDS-4A Strategies

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

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.

[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.

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

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 andgrasslands.

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 plantcommunities;
- 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-gamespecies.

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 orenhanced.
- 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.

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 speciesto 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 riverotter.

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 theirhabitat:

- 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:

table showing Wildlife Habitat Relationships to forest cover types

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. Among 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 youngtrees will be suitable for game species.

e. Create and maintain within-stand diversity to benefit gamespecies.

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: Minnesota's State Wildlife Action Plan: Tomorrow's Habitat for the Wild and Rare*

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:
Silvicultural and Road Contracts on DNR Administered Lands Invasive Species Program Directive

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 beused:

- 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 anddiseases.

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.

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. Carbon sequestration by forests and wetlands may be affected because of accelerated decomposition rates.

[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, AGlobally 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.

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.

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

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)(by the Division of Fish and Wildlife, Minnesota Department of Natural Resources, January 2012 Version 1)*.
- Use the *DNR Site-Level Design and Development Guidelines for Recreational Trails* for guidance on post-sale treatment.

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

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

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 anddevelopment.

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: MNDNR webpage on School Trust Lands

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 HCV F 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
Total	61,360	647	998	0	1,329	0	14,202	240

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 publiclands

State ownership is relatively limited in these subsections, 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 section 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 for 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.

APPENDIX A
Ecological Classification System (ECS)

Contents

I. Definition

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

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

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

Province: Largest units representing the major climate zones in North America, each covering several states. Minnesota has three provinces: eastern broadleaf forest, northern boreal forest and prairie.

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

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

Land type association: Landscapes within subsections, characterized by glacial formations, bedrock types, topographic roughness, lake and stream patterns, depth to ground water table, and soil material. Example: Alexandria Moraine.

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

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

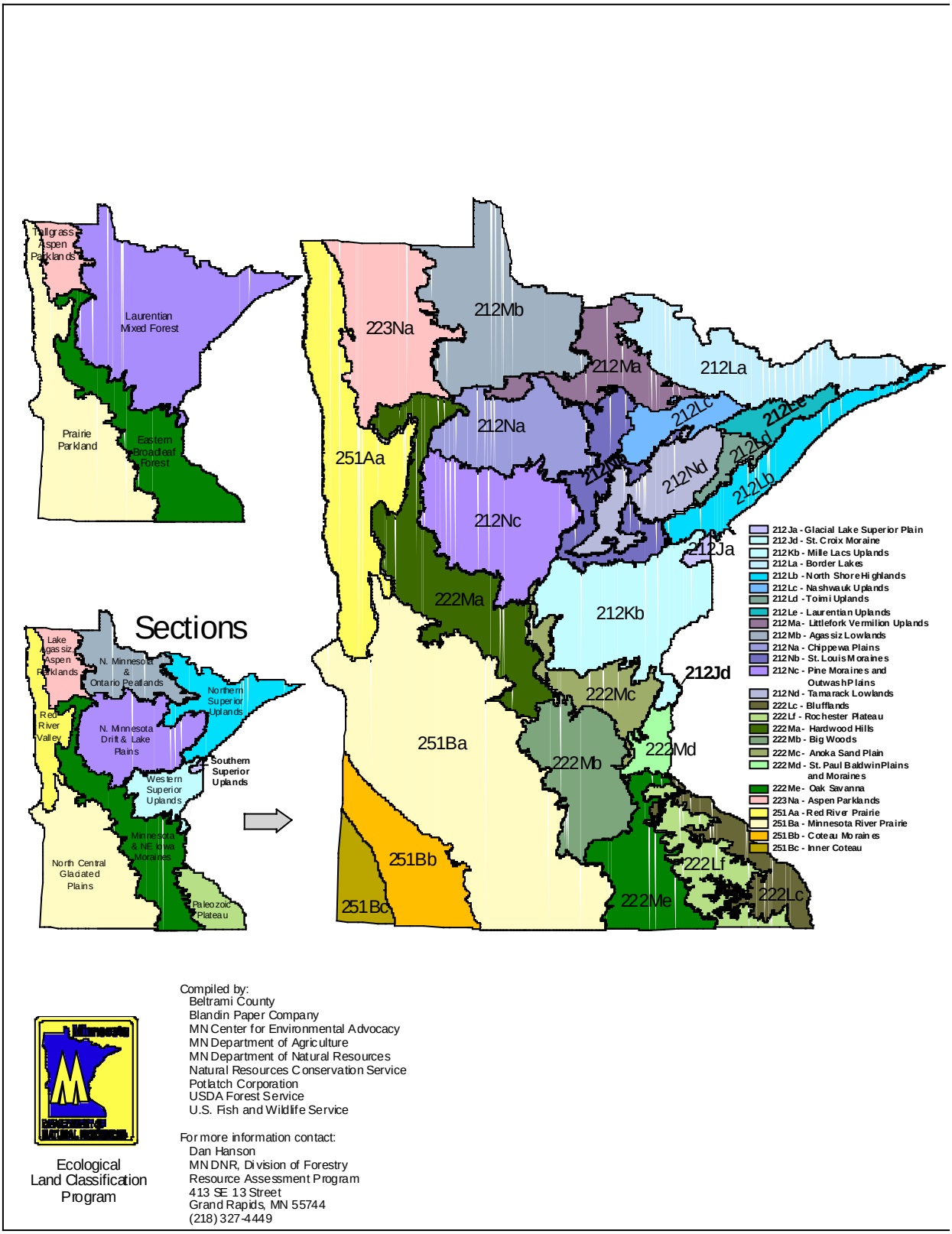
II. Purpose of an Ecological Classification System

- Define the units of Minnesota's landscape using a consistent methodology.
- Provide a common means for communication among a variety of resource managers and with the public.
- Provide a framework to organize natural resource information.

- Improve predictions about how vegetation will change over time in response to various influences.
- Improve our understanding of the interrelationships between plant communities, wildlife habitat, timber production, and water quality.

III. End Products

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



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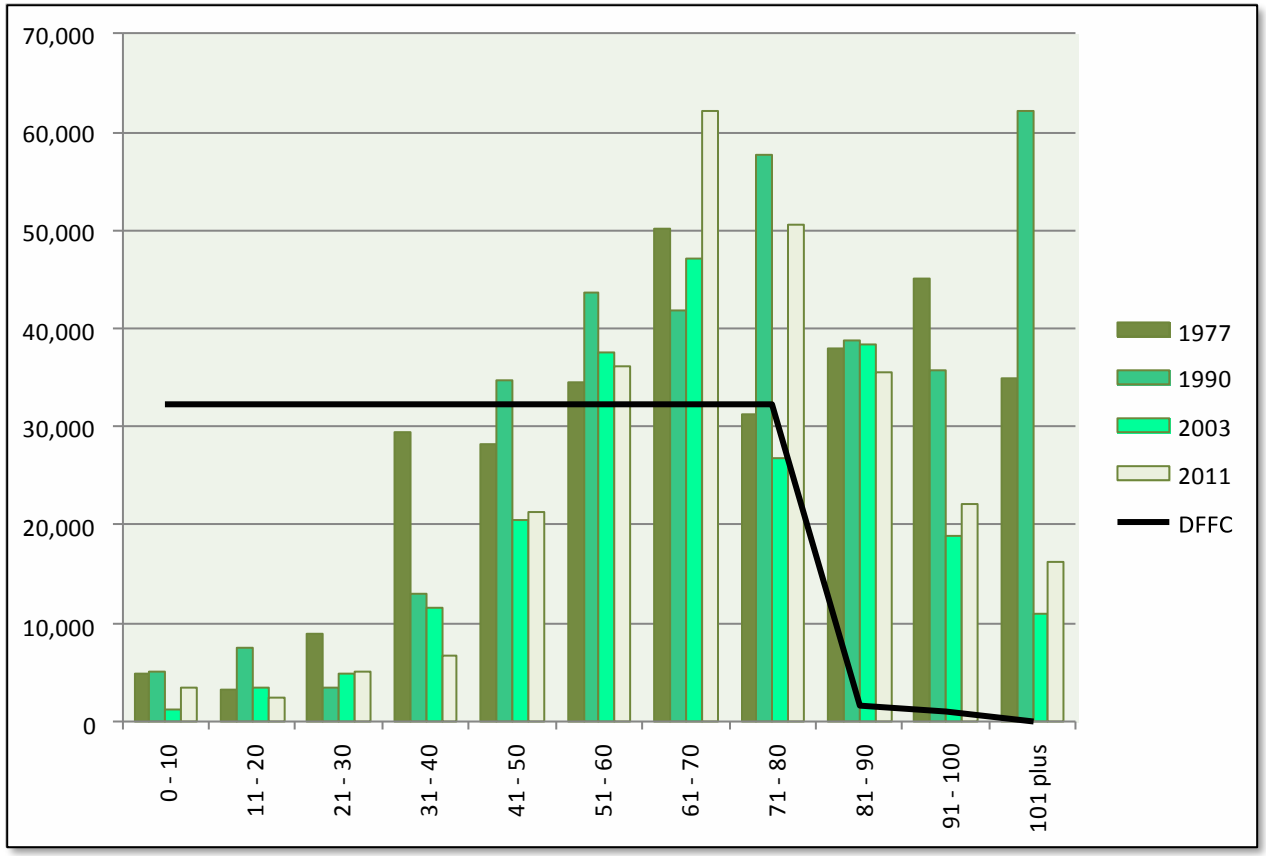
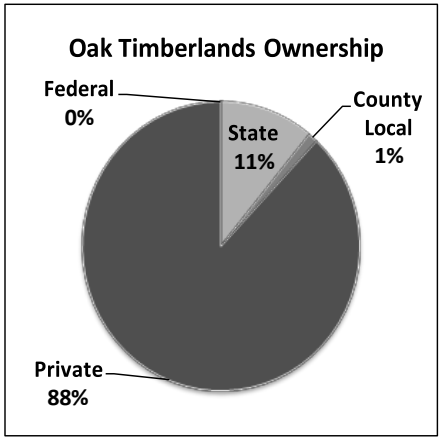
Ecological Land Classification Program

Figure A.1: Ecological Provinces, Sections, and Subsections of Minnesota, 1999

Appendix B

ERF Chart: Acres of **Oak Timberlands** by age class for all ownerships - **Blufflands / Rochester Plateau Unit**





	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 plus	Total
1977	4,800	3,200	8,901	29,400	28,301	34,599	50,199	31,199	38,000	45,101	35,002	308,702
1990	5,002	7,502	3,400	12,999	34,619	43,620	41,809	57,597	38,701	35,700	62,105	343,054
2003	1,245	3,393	4,835	11,579	20,438	37,599	47,187	26,769	38,262	18,833	11,025	221,165
2011	3,334	2,404	4,947	6,613	21,235	36,111	62,121	50,455	35,550	22,090	16,242	261,102
DFFC	32,31	32,311	32,311	32,311	32,311	32,311	32,311	32,311	1,593	1,018	0	261,099

Source: FIA Data MN DNR P. Olson – Oct 2012

DEPARTMENT OF NATURAL RESOURCES:

DIVISION OF FORESTRY

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Collischan Bottoms

(VERMILLION BOTTOMS AND LOWER CANNON RIVER AREA)

December 2002

Division of Forestry Planning Document
Printed December 2002

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

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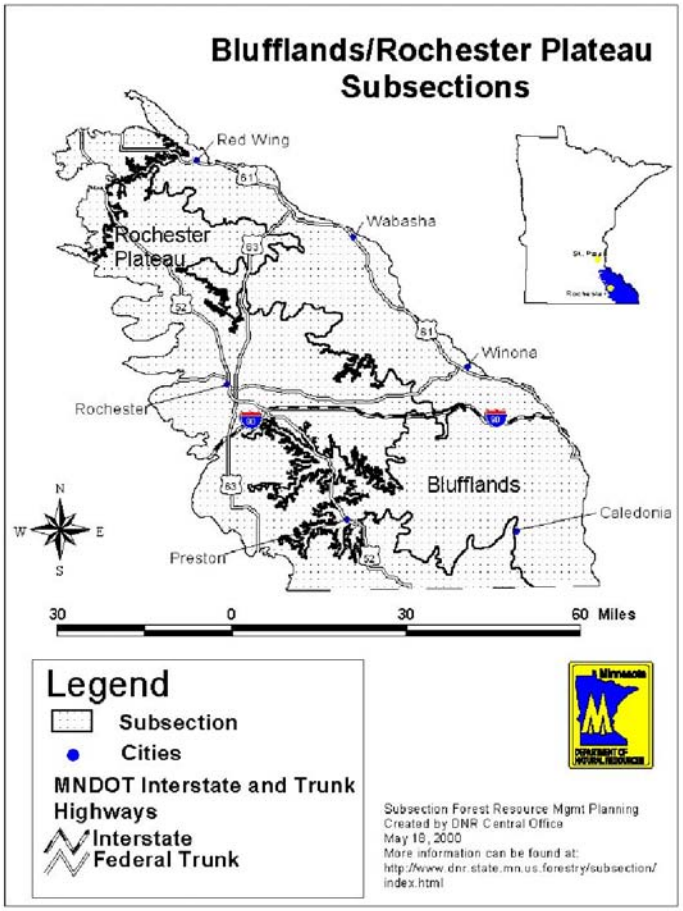
OTHER APPENDICES (available upon request)

1. General location map
2. CSA forest inventory type map
3. Native plant communities map
4. Age distribution map
5. Copy of Dunnevitz writeup
6. Copy of Goodhue County history

Introduction



This plan will guide management decisions and practices within the Vermillion Bottoms and Lower Cannon River Area, one of 13 areas of high biodiversity identified within the Blufflands and Rochester Plateau subsections, locally know as the Collischan Bottoms.

During the development of the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP), DNR forest stands within the high biodiversity areas were reserved from treatment pending completion of area-specific management plans. This is the first of such area-specific management plans and is presented as an addendum to Blufflands/Rochester Plateau SFRMP.

SFRMP plans are scheduled for revision every seven years. It is expected that management plans for high biodiversity areas will also be revisited every seven years, or sooner if need be, as part of an adaptive management process.

An Evaluation of the Ecological Significance of The Vermillion Bottoms and Lower Cannon River Area (Dunevitz, 2000) describes an area between Red Wing and Hastings that covers 37,717 acres; parts of six townships, two counties and two DNR Regions. Of that gross acreage, 9,451 are currently in State Ownership and managed by three different DNR divisions.

Of the 9,451 acres, 2,836 are currently under custodial control of the DNR Division of Forestry. While this plan will primarily address management of the Forestry lands, it is recognized that land under the custodial control of other DNR disciplines must be included in the overall planning effort if this area is truly to be managed at a landscape level. This will require sharing of data between regions and completion of the DNR cooperative stand assessment (CSA) forest inventory on all lands.

The project evaluation (Dunevitz, 2000) stresses that this area is one of the three largest flood plain systems in SE Minnesota and that cooperative agreements and partnerships with other individuals and organizations will need to be formed in order to best manage this noteworthy area. For this unique area to truly be managed on a landscape level other landowners will need to become involved in the planning process as soon as possible. Ideas on how to accomplish this are presented in the body of the plan.

Management planning will be done on the State Forest land to retain the quality of the lowland hardwood and floodplain forests and to assure that this management helps to retain populations of the interior bird species that currently call the area home. As there is much still unknown about habitat needs of these species, experimental management techniques will be applied and monitored. The Divisions of Ecological Services and Forestry will work cooperatively to secure funding for the monitoring efforts that cannot be accomplished with existing staff.

The overall goal of this and the plans for the other 12 high biodiversity areas will be to perpetuate the native plant communities that support the unique flora and fauna that make the areas exceptional. Recommendations will only be made for state-owned land at this time. Recommendations listed in this plan, however, will need to remain flexible. This is so that as partners agreeing to work with the DNR in managing this area on a landscape level come on board their lands can be inventoried to determine how they can be used to contribute to the success of the project.

Background

Land was acquired for the Richard J Dorer Memorial Hardwood State Forest beginning in the early 1960's. In the early days of acquisition any available land was acquired when budgets permitted. By the mid 1970's a fairly large block of State land was becoming evident in the Collischan Bottoms area near Red Wing. The Collischan Bottoms received their name from early settlers in the area whose descendents continued to live in the river flood plain at the end of Collischan Road until the early 1980's.

The Collischan's house was torn down by Division of Forestry personnel in 1981 and the rafters were used to build the picnic shelter in the Zumbro Bottoms Main Assembly Area.

Humans have impacted this project area for well over 1000 years. A former Indian Village site has been verified on State Forest Land. The Bryan site near the Anderson Center in Red Wing is one of the premier archeological sites in the State. Plans have been drafted for an archeological interpretive center next to the Anderson Center. Diggings in this area have shown the mound building culture farmed the area and had soil losses that exceeded 100 tons per acre per year in some of the more sandy areas.

The Dakota Indians likewise historically used this area, particularly the Prairie Island locale. The Dakota culture was based on hunting rather than agriculture so they manipulated the natural communities by extensive burning to maintain oak savannahs and prairie grasses in the landscape.

From History of Goodhue County ; page 628 the following excerpts were taken:
"The Forest Products Company" **{**tc "TheForestProductsCompany "**}**

"……..The "bottoms", a maze of winding sloughs, swamp, and tangled woods, frequented only by hunters, wood choppers, and campers are the wide bed of the swollen river when melting snows or heavy rains crowd it over its low banks. …….Here and there are found the rotting houses of settlers who have wasted their best years in striving with ax and fire to clear meadows and tillable fields and who have at length given up the struggle against flood and vigorous timber growth and have left the land stripped of its good timber.

….The lumbermen who swarmed upon the river …… a source of fuel supply for the steamboats which consumed all the most valuable and accessible timber.

….the wonderful productive capacity of this land, adapted to no purpose but to raising timber, the plan was evolved of purchasing the land instead of the stumpage.

….undertaking the enormous task of restocking (reforesting) these abused lands and bringing them up to their normal yield.

…..the company was incorporated in October, 1908.

…..In August the mill started on its first short season's run and is expected to produce from five to ten million feet of lumber in every succeeding year.

….a quarter of a million trees of many varieties and sizes have been planted under various conditions of soil, moisture, and exposure and their growth will be watched with great interest. The native young timber is thinned and culled to increase its growth and the mature timber is removed as fast as it can be handled."

The Forest Products Company worked closely with a University of Minnesota Forestry professor, S.B. Detweiler ."

The complete article is attached as one of the appendices.

It would be interesting to check with the Secretary of State's Office for corporate records of this company and at the U of M for research from Professor Detweiler. This information, if available, could shed light on the history of management in the area and give ideas for future management activities.

In addition to the major logging and tree planting events that occurred nearly 100 years ago, DNR Forestry has done extensive forest management in this area more recently. A detailed listing of management activities is included in Appendix A. Summarized, the management consisted of:

Logging	336 acres	1.2 million board feet (29 sales)
TSI	292 acres	
Planting	136 acres	

Site Description

The following is excerpted from An Evaluation of the Ecological Significance of the Vermillion Bottoms and Lower Cannon River Area.(Dunnevitz 2000)

> "The Vermillion River Bottoms area encompasses the 20 mile stretch of the Vermillion River between Hastings and Red Wing. Most of the area is floodplain along the Vermillion and Mississippi Rivers but it also includes bluffs on the south side of the river and Prairie Island, a six mile long island of outwash-derived sand and gravel. The lower Cannon River area includes a six mile long stretch of the Cannon River and the delta where the Cannon and Vermillion meet and enter the Mississippi River. This area is also primarily floodplain but includes the bluffs on both sides of the river. The Vermillion Bottoms and Lower Cannon River together make up one of the 3 most significant Mississippi River floodplain sites in southeastern Minnesota in terms of biological diversity and expanse of native plant communities. They are considered together in this report because they are linked geographically and support many of the same communities and species.
>
> The combination of communities in this site constitute nearly the full range of Paleozoic Plateau habitats, ranging from upper bluffs to outwash terraces to floodplain and aquatic habitats. This site contains one of the largest areas of floodplain native plant communities in southeast Minnesota. These communities experience an annual hydrologic fluctuation that more closely resembles the historic natural cycle than in many portions of the Mississippi River, resulting in high habitat and native species diversity. Lowland communities in this site include floodplain forest, lowland hardwood forest, mixed emergent marsh, wet meadow, and calcareous seepage fen. Outwash terraces include sand-gravel prairie and sand-gravel oak savannah. The bluffs support bedrock bluff prairie, dry oak forest, mesic oak forest, maple-basswood forest, and oak woodland-brushland communities."

Long Range Goals

The long range management goal for this area will be to maintain and regenerate native plant

communities and the plant and animal species that reside in the area. Over the project area it will be the intent to have timber age classes spatially distributed to provide habitat both now and in the future for flora and fauna that have adapted to survive in this area. Processes that mimic the disturbances that helped to establish and maintain these communities will be used to achieve this goal.

The goals of biodiversity protection, timber management, recreation, and wildlife management will all be included in management decisions to achieve this goal. As new research or management techniques become available, they may be incorporated into management practices prescribed in this plan to achieve the long- range goals.

Implementation

Background Information

Sixty-nine stands were selected during the SFRMP process for treatment over the next 7 years in townships 113-15, 113-16, and 114-16 on Division of Forestry land. In addition, 12 stands were identified on Division of Wildlife administered land for treatment, the majority of them in Dakota County.

The DNR CSA forest inventory data for the Wood Turtle SNA, which was formerly administered by the Division of Forestry, for some reason has been removed from the DNR Lake City Area forest development module (FDM) database. This inventory needs to be located or the stands need to be re-inventoried so DNR managers have a complete picture of lands that will be managed as part of this project. (See project timetable at end of writeup.)

As stated earlier, DNR ownership amounts to only 9,451 acres out of a gross project area of 37,717 acres. Obviously an incredible amount of effort will be required to work with all the other landowners in the area.

To get started on this tremendous undertaking, the first contacts will be made with institutional landowners. It is felt these organizations will be more likely to have interest in a project such as this and will also serve as an example to the non-industrial private landowners.

Organizations which fall into this category are:

- Red Wing Wildlife Protective League
- EXCEL Energy
- Prairie Island Tribal Community
- Lutheran Social Service
- River Region Health Service
- Independent School District 256
- Red Wing Shoe Company
- Red Wing Publishing Company
- Welch Ski Village
- USA- USFWS and Corps of Engineers

After this plan is adopted by the department, DNR managers in the area will meet with representatives of all these organizations to discuss the long-term benefits of coordinating management of the Vermillion Bottoms and Lower Cannon River Area across ownerships. As organizations agree to partner with the DNR in the management of these areas, their lands will be inventoried by a DNR team and a Forest Stewardship plan developed.

One of the key concepts of this plan is having vegetation management done within the entire project area rather than on an ownership by ownership basis. Computer programs such as ArcView will allow managers to look at the entire project area and plan how to manage the area. As new partners to this project come on board inventory data from their ownership will be added to the state lands CSA forest inventory and new maps can be generated.

The sheer size of this high biodiversity area make writing a plan such as was done for the Upper West Indian Creek Area a near impossibility. Just the State Forest ownership within this project area is three times the size of the entire West Indian Creek area.

Because of this, the implementation section of this plan will not be written as it was in the West Indian plan with a long-range goal and short-term directive for each type. What will be done in this plan is to list long-term objectives for management of the major timber types/natural communities on State Forest Land that fall within the project area and suggestions on how to achieve the desired goal. The natural communities represented within the timber types will be described in the narrative portion of the plan that describes prescribed management activities.

Thirteen different native plant communities fall within the Vermillion/Cannon Bottoms Area. There are seven different timber types represented in the stands selected for treatment.

Similar timber types as defined by DNR CSA forest inventory will be combined and natural communities that are associated with these types will be described. Following the description, a management objective for the timber type/natural community will be listed. For the most part, these objectives will be the intended management activities to occur over the next seven years.

The major issue that needs to be addressed is the size of disturbance or harvest that is required to maintain habitat for interior bird species. (See project timetable at end of writeup.)

Sizes of stands selected during the SFRMP process range from three to 114 acres. If, for example, it is determined that habitat requirements for interior forest birds is 100 acres, a management regiment will need to be implemented that creates spatially distributed stands of that size. Achievement of this objective may mean cutting one stand, combining two or more selected stands to obtain the 100 acres, or even combining a selected stand with vegetation management on a non-selected stand to obtain the desired acreage. This stand selection issue will need to be addressed whether the habitat essential to interior birds is five acres, 50 acres, 100 acres or even a larger size.

Timber Types And Associated Native Plant Communities

Lowland Hardwoods; Cottonwood

1. *ASSOCIATED NATIVE PLANT COMMUNITIES:*
   a. LOWLAND HARDWOOD FOREST
   Lowland hardwood forests are typically wet-mesic lowland forests on alluvial soils above the normal flood level in small valleys. The lowland hardwood forests in the Vermillion Bottoms and Lower Cannon River Area are found periodically on river terraces above normal flood levels. Basswood, bur oak, black ash (*Fraxinus nigra),* hackberry (*Celtis occidentalis),* and green ash *(Fraxinus pennsylvanica)* dominate the canopy. The understory is a diverse array of spring ephemeral early in the year and becomes dominated by wood nettle *(Laportea canadensis)* and cleavers (*Galium aparine)* later into the summer. Ecological quality of these

forests ranges from AB to C rank.

b. FLOODPLAIN FOREST-silver maple subtype
These forest occur on seasonally flooded river bottoms. The dominant canopy species is silver maple *(Acer saccharinum)*. Other species such as American elm *(Ulmus americana)* and green ash *(Fraxinus pennsylvanica)* also occur in the canopy. These forests have an open and diverse groundlayer. Ecological quality of these forests ranges from AB to C rank.

c. FLOODPLAIN FOREST-undifferentiated subtype
These forests occur on seasonally flooded river bottoms. The dominant canopy species can include a combination of silver maple *(Acer saccharinum)*, or a mix of silver maple and cottonwood *(Populus deltoides)*, and black willow *(Salix nigra)*. Other canopy trees can include green ash *(Fraxinus pennsylvanica)*, bur oak *Quercus macrocarpa)*, American elm *(Ulmus americana)*, and slippery elm *(Ulmus rubra)*. The herbaceous understory is variable. Areas along the Vermillion bottoms are relatively low in species diversity. Areas along the lower Cannon River are more diverse and support an array of spring ephemerals. Ecological quality of these forests ranges from AB to C rank.

d. MIXED EMERGENT MARSH (prairie section)
These communities are found in open wetlands and on mineral soils in shallow basins or along stream margins. There is standing water present most of the year and the dominant species vary. Species typical of these areas include cattails *(Typha spp.)*, bulrushes *(Scirpus spp.)*, and broad-leaved arrowhead *(Sagittaria latifolia)*. Ecological quality of these communities ranges from B to BC rank.

e. WET MEADOW
These communities are open wetland areas that occur adjacent to floodplain forest and emergent marsh communities. They are typically dominated by lake sedge (*Carex lacustris)* or tussuck sedge (*Carex stricta)* with other species such as boneset (*Eupatorium perfoliatum)*, false indigo (*Amorpha fruticosa)*, and swamp milkweed (*Asclepias incarnata*) present. Ecological quality of this community is B ranked.

f. CALCAREOUS SEEPAGE FEN (southeast section, prairie subtype)
Calcareous Seepage Fen- These fens are an open wetland community on organic soils in areas of calcareous groundwater discharge. Species common to these communities include *Carex stricta, Carex prairiea, Carex interior, Carex comosa,* Virginia mountain-mint, marsh marigold, and great lobelia *(Lobelia siphilitica)*. Ecological quality of this community is BC ranked.

2. SILVICULTURE OF LOWLAND HARDWOODS AND COTTONWOOD

The silviculture of the flood resistant species that comprise the forest in a lowlandhardwood type is reasonably well understood. The area provides habitat for a variety of species including a number of forest interior birds and is an important part of the larger Mississippi migratory route. There is growing concern over the future of the floodplain habitat itself. Reed Canary grass has invaded many of the areas and is a continuing threat. The older forest is fairly even aged and the altered flood regime has resulted in little regeneration. Careful planning needs to be undertaken to address the native plant community concerns while providing the needed habitat for the species that depend on this area.

In addition, much of the floodplain area, especially along the Cannon River, provides habitat for wood turtles. Winter logging will be done so as not to disturb turtles during their nesting and foraging period. As with interior bird species, there is much that needs to be learned about habitat requirements for wood turtles. A literature search will be done to determine if there is an optimal size of undisturbed forest for turtles. Research and monitoring will also be conducted by local field staff.

One method found successful for regeneration of lowland hardwoods involves harvest, mowing rows within the harvest area with a Seppi type mower, treating the strips with herbicide, and planting. This practice combined with natural regeneration has been successful where it has been tried. A set of herbicide test plots for control of canary grass was placed in the Zumbro Bottoms in the summer of 2001. Several treatments provided control through late summer and 2 treatments provided control into November.

Reed canary grass will have to be controlled if the bottomlands harvested are to be adequately regenerated. More research is needed on the control of canary grass. Ecological Services will work with the Division of Forestry to set up experimental plots to determine ways to reduce the invasion of reed canary grass and how to control it if it becomes established.

Another major problem that occurs in management of these forests is flooding. On several occasions what appeared to be regeneration success stories were wiped out by prolonged flooding. This is more of a problem in the Mississippi River floodplain than in the smaller river floodplains where inundation does not last as long and seedlings have a better chance to recover. Sites where seedling survival is decimated by flooding will need to be replanted until the area is successfully regenerated.

Direct seeding also can play a role in forest regeneration. Silver Maple and Cottonwood seed can be gathered in the spring and broadcast on silt left as soon as flood-waters recede. Direct seeded areas look more natural than planted areas.

Because regeneration of harvested stands will be critical to the overall success of this high biodiversity area, special emphasis will need to be placed on doing timely regeneration surveys and determining successive treatments if the first treatment is not successful.

The management of the area will require a balance between maintaining canopy for forest interior species and addressing the need to effectively manage the forest for long-term maintenance.

3. *MANAGEMENT OBJECTIVES*
    a. The acreage of the lowland hardwood type within the project area will be maintained or increased over the next 7 years.
    b. The 67 stands recommended for treatment in the SFRMP process will be revisited and will be combined where necessary to achieve a stand size that meets the acreage requirement determined to be crucial to interior bird species. In some instances this may mean treating a stand not identified in the SFRMP process. Because there are now markets for hardwood pulpwood, this should not be a problem to achieve.
    c. All areas harvested will be intensively treated to assure they are adequately regenerated . This will require regeneration surveys at least annually. It will also require that the Department be prepared to invest the dollars and time needed to regenerate these sites.
    d. Types harvested in past years will also have regeneration surveys done to assure regeneration is adequate. Areas where reed canary grass has invaded will be treated to control it and then planted or seeded to native species.

Oak And Central Hardwoods

1. *ASSOCIATED NATIVE PLANT COMMUNITIES*

a. OAK WOODLAND-BRUSHLAND (southeast section)

Oak woodland-brushland are dry to dry-mesic woodlands. The canopy cover is 50-70% and dominated by one or more oak species including northern pin oak *(Quercus ellipsoidalis)*, northern red oak, and/or bur oak *(Quercus macrocarpa)*. Other canopy trees may include paper birch *(Betula papyrifera)*, and red cedar *(Juniperus virginiana)*. These areas exhibit a dense shrub layer and the understory is a mix of species found in savannas and forests. Oak woodland-brushlands will be managed to encourage regeneration of the oak forest and/or oak savanna communities through controlled burning and, to open up canopies, carefully planned logging. Areas that are threatened by invasion of nonnatives will be managed to reduce the threat of these species.Ecological quality of these forests ranges from BC to C rank.

b. OAK FOREST (southeast section) DRY SUBTYPE

Oak woodland-brushland are dry to dry-mesic woodlands. The canopy cover is 50-70% and dominated by one or more oak species including northern pin oak *(Quercus ellipsoidalis)*, northern red oak, and/or bur oak *(Quercus macrocarpa)*. Other canopy trees may include paper birch *(Betula papyrifera)*, and red cedar *(Juniperus virginiana)*. These areas exhibit a dense shrub layer and the understory is a mix of species found in savannas and forests. Oak woodland-brushlands will be managed to encourage regeneration of the oak forest and/or oak savanna communities through controlled burning and, to open up canopies, carefully planned logging. Areas that are threatened by invasion of nonnatives will be managed to reduce the threat of these species.Ecological quality of these forests ranges from BC to C rank.

c. OAK FOREST (southeast section) MESIC SUBTYPE

Oak Forests (mesic subtype) are typically mesic forests, often on west and east-facing slopes and broad ridge crests. Dominant canopy trees include red oak and white oak (*Quercus alba)*. Other canopy species include basswood, quacking aspen, and black cherry. These communities often transition to maple-basswood in wetter, steeper areas. Understory species include summer-blooming species such as wild geranium (*Galium concinnum)* and elm-leaved goldenrod (*Solidago ulmifolia)*. The ecological quality of these forest ranges from B to C rank.

d. DRY OAK SAVANNAH (southeast section) SAND GRAVEL SUBTYPE

Dry oak savannas are dry savannas that occur on outwash sands on Mississippi River terraces. Canopy cover ranges from 10-70% and is dominated by bur oak *(Quercus macrocarpa*). Red oak (*Quercus rubra)* is sometimes present as a canopy tree. The shrub layer is patchy to dense and the understory is dominated by grasses and forbs typical of dry prairies including species such as little bluestem (*Schizachyrium scoparium),* big bluestem (*Andropogon gerardii),* birdfoot coreopsis *(Coreopsis palmata),* and silky aster *(Aster sericeus).* Ecological quality of these forests ranges from C to CD rank.

2. SILVICULTURE

Generally speaking a central hardwood type is an oak type that does not have enough oak in it to be classified an oak type by DNR CSA forest inventory. The threshold for CSA is that 40% or more of the volume must be oak in order to be classed as an oak type. (By contrast, the Natural Heritage program considers a stand an oak type if 30% or more of the canopy is oak.)

Because of the high component of oak present in central hardwood stands, they will be managed to

increase the oak component wherever possible. If conversion to a northern hardwood type is inevitable, oak will be retained as a component in the stand as long as possible.

These forests vary in moisture across the site. Areas that are more mesic, have well established maple regeneration, and grade into maple-basswood will be allowed to succeed to the maple-basswood community type. Other areas that are drier, have invasive species problems, or are not regenerating to maple will be managed to retain oak using various silvicultural techniques. As with the other hardwood plant communities, research from the DNR as well as other agencies will be used to determine the best management technique to achieve the desired natural community.

Management to maintain or increase oak requires an aggressive cutting regime. Oak is a shade intolerant species that grows in even age stands. Perpetuation of the cover type will require that areas be clearcut.

Two stands of oak cover type were identified for harvest during the stand selection process. One is located in 35-113-16 and will be managed along with the walnut in that section.

The second stand is stand 1 in section 2-113-16. It is a 40 acre type that is adjacent to other State Forest land in 35-114-16. The lowland hardwood type in section 35 was selected for harvest but the oak and northern hardwood types were not.

Two central hardwood stands were selected for harvest during the stand selection process: stand 7 in section 8 of 113-15 and stand 6 in section 16 of 113-15. The stands are less than ½ mile apart.

3. MANAGEMENT OBJECTIVES
   a. Only four stands were identified for harvest in these two types. They were described above.
   b. All will be examined for the possibility for harvest over the next seven years.
   c. Due to steep slopes on portions of these types as much as 40% of these stands may be inoperable.
   d. To achieve the goal of managing the Collischan area as an ecosystem rather than as a series of timber stands, some stands that were not selected during the SFRMP process may be added as additions to the planned cut list

Northern Hardwoods

1. ASSOCIATED NATIVE PLANT COMMUNITY

a. *MAPLE-BASSWOOD FOREST (SOUTHEAST)*

Maple-basswood forests are typically mesic to wet-mesic forest on steep north-to east-facing slopes. Sugar maple (*Acer saccharum),* basswood (*Tilia americana),* Lowland hardwood forests are wet-mesic forests that occur on river terraces above the normal flood levels. The canopy is typically dominated by bur oak *(Quercus macrocarpa),* basswood (*Tilia americana),* and red oak (*Quercus rubra).* These forests have a well established groundlayer with a variety of spring ephemerals including some rare species such as American ginseng (*Panax quinquefolium)* and Moschatel (*Adoxa moschatellina).* The ecological quality of these forests ranges from AB to BC rank.

2. SILVICULTURE

The long term goal for these forests is to to maintain the maple basswood plant communities while retaining a diverse shrub layer and maintaining or increasing rare plants in the herbaceous layer.

Northern hardwood timber types are predominated by sugar maple and basswood, and are managed on an uneven age basis.

A total of seven northern hardwood stands were identified for harvest.

- Two of the stands are in section 7-113-15, two in section 16-113-15, one in section 1-113-16, one in section 34-113-16, and one in 35-114-16.
- With the exception of the stand in 34-113-16, all of the stands fall within the Collischan Bottoms area.

As was the case with the oak and central hardwood types, slopes are extremely steep and in several areas within the types they will be inoperable.

The northern hardwood type will be managed according to the management guidelines developed by the North Central Forest Experiment Station where trees of all age classes are represented. Research in maple-basswood plant communities in Northern Minnesota has indicated that logging in this community may increase the invasion of non-native species and impact some spring ephemeral plants. Research plots are being established in the West Indian Creek area to determine if this is the case in Southeastern Minnesota. This monitoring effort will study both long-term and short-term effects of logging on the understory of the maple-basswood plant community.

3. MANAGEMENT OBJECTIVES
    a. Management of northern hardwoods will be done on an ecosystem basis rather than a stand basis. Local resource managers will determine size of blocks that are most advantageous to the various species of flora and fauna that utilize the area as well as considering economies of scale for setting up timber sales. They will also determine where sales should be spatially set up to maximize benefits of non-timber crops of the forest.
    b. Most of the northern hardwood stands have been mentioned in the descriptions of other forest types and will be managed in conjunction with these types

Walnut

1. ASSOCIATED NATIVE PLANT COMMUNITY

a. NOT APPLICABLE

2. SILVICULTURE

Because of its high value, walnut is managed on an individual tree basis.

Type 2 of 36-113-16 was the only walnut type identified in the SFRMP process. It totals 10 acres. This is an upland walnut type that is landlocked. An oak type adjacent to it was harvested 8 years ago and is regenerating nicely.

Poor access will make long- term management of this area difficult. Nonetheless, because of the high value species present, the costs can be justified.

3. MANAGEMENT OBJECTIVES
    a. Mark individual walnut trees for harvest and sell at annual Lake City Area timber auction. Maintain an adequate stocking of Walnut.

b. Two other timber types in section 36, an oak type and an aspen type were also identified for harvest. These types should also be marked and sold along with the walnut.

Aspen

1. ASSOCIATED NATIVE PLANT COMMUNITY

a. NOT APPLICABLE

2. SILVICULTURE

Aspen is managed on an even age basis. As Southeast Minnesota is a fair distance from most pulp markets, aspen in this section of the state is usually made into pallets. It has high value for wildlife.

Only one aspen stand was identified for harvest during the stand selection process within the project area: type 3 of 36-113-16.

3. MANAGEMENT OBJECTIVES

As mentioned in the previous text regarding walnut, this type will be managed along with the walnut type and oak type adjacent to it.

Native Plant Communities In The Collischan Bottoms Not Associated With Timber Types

1. Dry prairie (southeast section) bedrock bluff subtype

These prairies occur on thin loess over bedrock on steep south-to west-facing bluffs with frequent rock outcrops. Dominant species in these prairies can include little bluestem *(Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), Indian grass (S*orghastrum nutans),* side-oats grama *(Bouteloua curtipendula),* procupine grass *(Stipa spartea),* prairie dropseed *(Sporobolus heterolepis),* plains muhly *(Muhlenberia cuspidata),* birdfoot coreopsis (*Coreopsis palmata),* gray goldenrod *(Solidago nemoralis),* silky aster *(Aster sericeus),* and leadplant *(Amorpha canescens).* These areas will be maintained with periodic fire and brush cutting to control woody competition. Ecological quality of these praries are BC ranked.

2. Dry prairie (southeast section) sand-gravel subtype

These prairies occur on alluvium (with gravel fraction > 10%), on river terraces. common species include little bluestem (*Schizachyrium scoparium),* big bluestem (*Andropogon gerardii),* birdgoot coreopsis *(Coreopsis palmata),* clammy-weed *(Polanisia dodecandra),* pasque-flower *Pulsatilla nuttaliana),* and silky aster *(Aster sericeus).* Ecological quality of these prairies ranges from C to CD rank.

Action Items

For this plan to be effective, several action items will need to be acted on. The local resource managers will work cooperatively to assure these tasks are completed on a timely basis. The following timetable was agreed upon by the Lake City Area Biodiversity Team:

1. By 6/1/02
   Inform managers in Region VI of this plan and request their involvement and cooperation
   Mike Tenney and Ann Pierce
2. By 7/1/02
   Make individual contact with the Corps of Engineers, the Red Wing Wildlife Protective League, XCEL Energy, and the Prairie Island Indian Community to seek their partnership in the project. (To be worked on in conjunction with #8. These 4 organizations are highest priority.)

Terry Helbig and Mike Tenney	RWWPL
Walt Popp	Xcel Energy and Corps of Engineers
Jaime Edwards and Ann Pierce	Prairie Island

3. By 7/15/02
   Arrange meeting with the 4 organizations listed in number 2 along with other appropriate partners to answer group questions about the project.
   Tim Schlagenhaft
4. By 10/1/02
   Determine what size management blocks are appropriate for this area by synthesizing available research on interior forest birds and other unique elements found within the project area.
   Jamie Edwards, Mike Tenney and Ann Pierce
   Other resource professionals as available
5. By 11/1/02
   Check with Grand Rapids Inventory to relocate lost Phase II data. Reinventory areas where data is missing.
   Kathy Kruger
6. By 12/31/02
   Based on recommendations from number 4, develop an initial plan for vegetative management combining DNR and institutional partners land.
   Lake City Area and Region VI Biodiversity Teams
7. By 2/1/03
   Begin to implement management agreement including marking timber sales in approved areas.
   Lake City Area Forestry Staff
8. By 4/1/03
   Arrange meeting to solicit support for project from cooperating agencies (e.g. Corps of Engineers), private conservation organizations (e.g. Izaak Walton League) and remaining institutional partners.
   Lake City Area and Region VI Biodiversity Teams

Over the long term this project will require investments of time and dollars from all DNR disciplines involved. The Lake City Area Biodiversity Team feels the investments will be well worth the time and effort involved. The Team hopes to continue to have the Division Directors' approval to pursue the above timetable and take other actions necessary to achieve the end goal of protecting this unique area. The Team will provide periodic reports on the status of the project.

Appendix 7. Collischan Bottoms Management History

Timber Sales

Description	S-T-R	Year	Activity Summary
NWSW	15-113-15	1997	98,000 BF bottomland hardwoods partial harvest 16 acres
SW1/4	15-113-15	1999	142,000 BF bottomland hardwoods clearcut harvest 30 acres
SWSE NWNE NENW	9/16-113-15	1993	190,000 BF bottomland hardwoods clearcut harvest 44 acres
E1/2 NW1/4	22-113-15	1996	167,000 BF bottomland hardwoods partial harvest 33 acres
SWSE	9-113-15	1989	7500 BF mixed hardwoods commercial fuelwood harvest 1 acre
NW1/4	22-113-15	1996	1000 BF bottomland hardwoods clearcut harvest 1 acre
NWNE	16-113-15	1993	15,000 BF bottomland hardwoods salvage harvest 2 acres
SESE/SWSW	9/10	1990	54,410 BF bottomland hardwoods clearcut harvest 22 acres
NENE	22-113-15	1989	72,730 BF bottomland hardwoods partial harvest 14 acres
SENW	16-113-15	1983	40,000 BF mixed hardwoods partial harvest 5 acres
SESE	16-113-15	1984	25,000 BF oak partial harvest 5 acres

Description	S-T-R	Year	Activity Summary
SWNW	16-113-15	1984	7500 BF mixed hardwoods commercial fuelwood harvest 5 acres
SENW	16-113-15	1985	5000 BF mixed hardwoods commercial fuelwood harvest 3 acres
SWNW	16-113-15	1985	5000 BF mixed hardwoods commercial fuelwood harvest 18 acres
SENW	16-113-15	1984	10,000 BF mixed hardwoods commercial fuelwood harvest 3 acres
SWNW	16-113-15	1983	1,230 BF walnut logs partial cut 8 acres
SWNW	16-113-15	1983	1970 BF walnut logs partial harvest 4 acres
SWNW	16-113-15	1983	980 BF walnut logs partial harvest 5 acres
NENW	16-113-15	1983	102,000 BF bottomland hardwoods partial harvest 6 acres
SWNW	16-113-15	1982	30,200 BF oak clearcut 4 acres
S1/2NW	16-113-15	1982	3,590 BF walnut partial harvest 3 acres
S1/2NW	16-113-15	1984	35,080 BF oak clearcut harvest 10 acres
NWSE	16-113-15	1986	14,280 BF oak commercial fuelwood and salvage sale 5 acres

Description	S-T-R	Year	Activity Summary
SESE	15-113-15	1988	17,140 BF bottomland hardwoods clearcut harvest 12 acres
SESE	19-113-15	1984	64,490 BF bottomland hardwoods clearcut harvest 28 acres
SESE	15-113-15	1990	5080 BF bottomland hardwoods clearcut 10 acres
SESW	15/22-113-15	1986	22,040 BF bottomland hardwoods clearcut and salvage 25 acres
NENW	16-113-15	1986	5,000 BF mixed hardwoods commercial fuelwood sale 3 acres
SWNE	8-113-15	1982	50,000 BF bottomland hardwoods partial harvest 11 acres

TIMBER SALE ACTIVITY SUMMARY:

336 acres of harvest since 1982
1,193,220 BF of timber will be harvested to date by January 2001

Tree Planting

S-T-R	Year	Activity Summary
16-113-15	1992	Tree planting 23 acres bottomland hardwoods
16-113-15	1978	Tree planting 16 acres bottomland hardwoods
16-113-15	1978	Tree planting 15 acres bottomland hardwoods
16-113-15	1992	Tree planting 9 acres bottomland hardwoods
9-113-15	1992	Tree planting 9 acres bottomland hardwoods
9-113-15	1976	Tree planting/seeding 3 acres bottomland hardwoods

9/10-113-15	1978	Tree planting 4 acres bottomland hardwoods
19-113-15	1981	Tree planting 36 acres bottomland hardwoods
15-113-15	1992	Tree planting 12 acres bottomland hardwoods
16-113-15	1993	Tree planting 2 acres wildlife shrubs and spruce
16-113-15	1997	Tree planting 2 acres
16-113-15	2000	Tree planting 1 acre bottomland hardwoods
21-113-15	1979	Tree planting 4 acres hardwoods

TREE PLANTING ACTIVITY SUMMARY:

136 acres of trees planted or seeded

Miscellaneous Forest Management

S-T-R	Year	Activity
16-113-15	1991	Well Closure
16-113-15	1990	Building site cleanup - disposal/demolition of old farm buildings
9-113-15	1991	Well closure
9-113-15	1991	Well closure

Site Preparation

S-T-R	Year	Activity Summary
16-113-15	1983	Chemical/mechanical site preparation for tree planting 5 acres hack and frill
16-113-15	1978	Site preparation for tree planting by scalping and chemical weed control 12 acres
9-113-15	1991	Site preparation for tree planting 9 acres mechanical
15-113-15	1991	Site preparation for tree planting 12 acres mechanical/chemical

SITE PREPARATION SUMMARY:
29 acres site mechanical/chemical preparation
9 acres mechanical site preparation

Timber Stand Improvement

S-T-R	Year	Activity Summary
16-113-15	1985	Mechanical post sale timber stand improvement 9 acres
16-113-15	1985	Mechanical post sale timber stand improvement 6 acres
21-113-15	1979	Timber stand improvement 3 acres walnut pruning
15-113-15	2000	Pre-sale timber stand improvement 30 acres chemical/mechanical
15-113-15	1997	Pre-sale timber stand improvement 16 acres chemical/mechanical
16-113-15	1998	Timber stand improvement 7 acres tree pruning
22-113-15	1995	Timber stand improvement 33 acres pre-sale chemical/mechanical
9-113-15	1975	Post sale timber stand improvement 3 acres mechanical

TIMBER STAND IMPROVEMENT SUMMARY:
10 acres pruning
79 acres chemical/mechanical tsi
18 acres mechanical tsi

Tree Planting Release

S-T-R	Year	Activity Summary
16-113-15	1980	Chemical release of tree planting 23 acres
16-113-15	1981	Chemical release of tree planting 25 acres
16-113-15	1982	Chemical release of tree planting 10 acres
16-113-15	1983	Chemical release of tree planting 25 acres
16-113-15	1983	Chemical release of tree planting 25 acres
9-113-15	1992	Chemical release of tree planting 9 acres
19-113-15	1983	Mechanical/chemical release of tree planting 10 acres
19-113-15	1985	Mechanical release of tree planting 20 acres
21-113-15	1980	Mechanical release of tree planting 2 acres
21-113-15	1984	Chemical/mechanical release of tree planting 4 acres
15-113-15	1992	Chemical release of tree planting 12 acres
9/10-113-15	1991	Mechanical release of tree planting 17 acres
16-113-15	1998	Chemical release of tree planting 3 acres

TREE PLANTING RELEASE SUMMARY:
14 acres chemical/mechanical
132 acres chemical
39 acres mechanical

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Partridge Creek

Final

October 2005

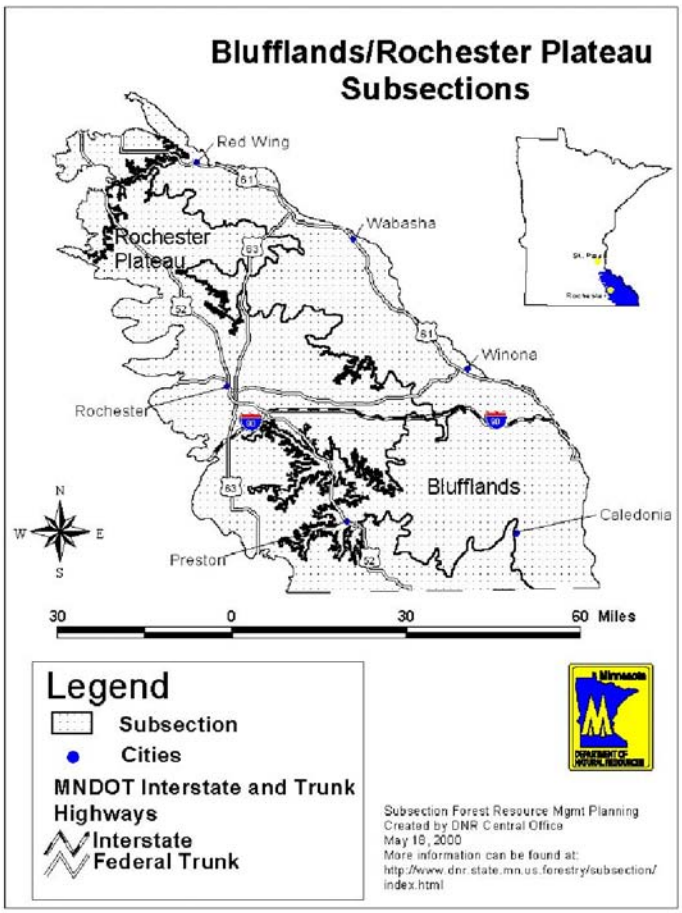
Division of Forestry Planning Document
Printed October 2005

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

The purpose of this plan is to provide a framework for forest management within the Partridge Creek Area. This is an area within the Partridge Creek watershed of Olmsted County and was identified as a high biodiversity site. This plan will be an addendum to the Blufflands Subsection Forest Resource Management Plan, which was completed by a Department of Natural Resources (DNR) interdisciplinary team in 2002. This plan, as well as the broader subsection plan, is to be reviewed and revised after seven years. The plan is for State-owned property only, however, some management recommendations in the plan may be appropriate for adjacent private lands as well.



The Partridge Creek Area is located approximately eight miles southeast of Rochester, MN. It lies within the Blufflands ecological landscape area. It is made up of a block of state land within the Richard J. Dorer State Forest as well as privately owned property. Partridge Creek runs through the middle of the area.

Following the completion of Minnesota County Biological Survey (MCBS) fieldwork in 1996, the Partridge Creek Area was noted as being one of 13 sites on State owned properties in southeast Minnesota with significantly high biodiversity. In his evaluation of the Partridge Creek Area, Fred Harris, a biologist with the MCBS, states that "As a whole, the site is one of the largest areas of unfragmented, continuous-canopied forest to be seen in Olmsted County". The MCBS proceeded to delineate two sets of boundaries for these sites. The broader boundary encompasses 846 acres and is referred to as the Project Area. Approximately 1/3 of this area is in State ownership as part of the Richard J. Dorer State Forest and 2/3 is in private ownership. The Critical Habitat Zone boundary contains the core area of rare natural feature locations. The Critical Habitat Zone contains 118 acres, 94 of which are part of the State Forest.

Division directors for the DNR Divisions of Wildlife, Forestry, and Ecological Services determined that long-term management plans would be developed for the 13 designated high biodiversity sites. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Background History & Site Description

Much of the State Forest Land in the Partridge Creek Area was purchased from Dr. Manfred Muenter in two transactions, the first in 1979 and the second in 1993. Dr. Muenter was interested in forest

management and planted many trees on his property, mainly in the open bottomlands. His forested land was enrolled in the Tree Farm Program. A Forest Management Plan was completed for his property in 1972 by DNR forester Bill Barnacle. Upon Bill's recent retirement the property has now been designated as the Barnacle Tract. The 1972 Barnacle forestry plan notes that logging had occurred on two sites on the Muenter property. One of these sites would include the northeast corner of the area now designated as the Critical Habitat Zone. Active grazing was also a concern discussed in the Barnacle plan. This grazing occurred on sites in the current Critical Habitat Zone as well as the rest of the watershed. In the document An Evaluation of the Ecological Significance of The Partridge Creek Area , MCBS ecologist Fred Harris notes that the stand structure of the Lowland Hardwood Forest and Mesic Oak Forest plant communities was a result of selective logging. He also mentions that grazing occurred on much of the area. Abandoned livestock fences are found throughout the area.

Three smaller privately owned parcels of land have also been acquired in the area, a ten acre parcel in 1979, a ten acre parcel in 1987 and a 32 acre parcel in the early 1990's.

The first comprehensive forest inventory by the Division of Forestry, a Cooperative Stand Assessment(CSA), was completed in 1982-83. A second inventory to update the original data was completed in 1996. Both of these inventories resulted in fairly broad typing of timber stands. As a result, management practices tend to be applied to less acreage than the CSA data might indicate as further field evaluation occurs. There are presently 16 CSA stands within the Partridge Creek project boundary.

Since the DNR Division of Forestry first acquired land in the Partridge Creek Area in the 1970's, there have been 39 permits issued for the harvesting of fuelwood. Many of these were in the Critical Habitat Zone area. A small, DNR-Wildlife funded, aspen recycling project resulted in a clear-cut of a small aspen clone in 1998. This project was also in the current Critical Habitat Zone. Two timber sales have been completed. One of these was in CSA oak type #9 in 1986 and the other was an 11-acre sale of three aspen clones within CSA type #3 in 1998. Both of these sales were outside the Critical Habitat Zone, but within the project boundary.

In 1995-96, field work was performed in the Partridge Creek Area by the Minnesota County Biological Survey. A forest bird survey was completed in 1996 by the Natural Resources Research Institute. Two birds of special concern status[1], the Acadian Flycatcher and the Bald Eagle were found to inhabit the site. The Cerulean Warbler is another species that has been seen in the Kinney Creek area, about ¼ to ½ mile to the east. One endangered plant species, Golden-seal, was found as well as four threatened plant species. The threatened species include Jame's Sedge, Spreading Sedge, Narrow-leaved Spleenwort, and False Mermaid. Three plant species of special concern, Moschatel, Goldie's Fern, and Ginseng, were found. The DNR Division of Fish and Wildlife did an evaluation of Partridge Creek shortly after the second purchase of land from Dr. Muenter. No trout were found in the stream and it was found to be marginal for trout habitat due to warm water temperatures.

The MCBS field project in the Partridge Creek Area provided the impetus for the establishment of a northern hardwoods old growth type. In 2000 a DNR interdisciplinary team performed a field evaluation of the stand and determined that it met the minimum standards for old growth. This old growth reserve is 30 acres in size and consists of one entire CSA stand and approximately 70% of a second stand.

[1] All the plant and animal species listed in this paragraph, with the exception of the Bald Eagle, have a special status only under Minnesota Statutes. Special Concern species do not require protection under Minnesota Statutes or associated Rules. The Bald Eagle has a threatened status under federal law. SEE APPENDIX #5.

Long Range Vegetation Management Goals

Seven of the eight endangered, threatened, and special concern plant species located in the Partridge Creek Area are located within the two northern hardwoods old growth stands and their 330' SMZ. One special concern plant, ginseng, was located in CSA type number 6. Total protection of the old growth stands and that portion of the SMZ where endangered and threatened plant species occur should help to protect the species located there in the short term. If new scientific research indicates that certain land management practices would be beneficial to these species, these practices would be implemented only after consultation with the regional plant ecologist and/or non-game wildlife specialist. According to the regional non-game wildlife specialist, the special concern bird species should be adequately protected with the old growth reserve and SMZ management guidelines.

DNR Ecological Services has established long range goals for native plant communities that are applicable throughout the landscape. In the Partridge Creek Area the native communities and the associated goals include:

MAPLE-BASSWOOD

Description – Maple basswood forests are typically mesic to wet-mesic dense canopy forests on steep north to east facing slopes. Sugar maple (*Acer saccharum*), basswood (*Tilia Americana*), and red oak (*Quercus rubra*) are the dominant canopy trees. In the Partridge Creek Area the maple-basswood forest becomes wet-mesic where it transitions to the lowland hardwood forest of the bottomlands. Most of the maple basswood forest areas of the Partridge Creek Area are typed as northern hardwood stands under the CSA database.

Long Term Objective- The goal for this native plant community is to maintain the maple basswood native plant community while retaining a diverse shrub layer and maintaining or increasing the diversity of native plants in the herbaceous layer.

Short Term Plan – All or portions of seven CSA forest cover types in the Partridge Creek Project Area make up the maple-basswood plant community designated by the MCBS. They are as follows:

Section #	CSA Type
11	9 NH59
14	3 NH59
14	6 NH57
14	9 O56
14	10 NH69
14	12 NH66
14	13 NH56

Two of these CSA stands, #'s 10 and 13 of section 14, are designated as old growth stands. No management activities are planned for these stands.

CSA stand numbers 3, 6, and 12 of section 14 and stand 9 of section 11 have met the stand selection criteria for harvest as established by the subsection forest resource management plan. Except for stand #12, which has poor access, the stands will be harvested within the 7-year period of time covered by this SFRMP plan addendum. The long-term management objectives of the maple basswood plant community, as stated above, provide the overall management goals of the timber harvests for the portions of the stands

that are maple-basswood. Best Management Practices will be followed. In addition, the sale preparation, specifications, monitoring, and evaluation will be guided by additional direction provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (Appendix 2).

CSA type # 9 of section 14 did not meet the harvesting criteria and no management activities are planned for this type.

LOWLAND HARDWOOD FOREST

Description – Lowland hardwood forests are typically wet-mesic lowland forests on alluvial soils above the normal flood level in small valleys. The lowland hardwood forest in the Partridge Creek Area has groundwater seepage areas that occur where the side slopes meet the valley bottom. The herbaceous layer in these areas is dominated by marsh marigolds. The canopy has frequent gaps, dead falls, and occasional standing dead snags. Early in the year, the lowland forests of higher quality have an understory that is a diverse and continuous array of spring ephemerals. In the Partridge Creek Area these native plant communities are classified as a lowland hardwood cover type in the CSA database.

Long Term Objective -The goal for this plant community is to maintain a quality lowland hardwood community while protecting the groundwater seepage springs and herbaceous ground cover. There is one plant community of this type in the Partridge Creek Area. The management focus in this area will be protection of ETS species locations, protection of springs, and adherence to riparian area and SMZ zone guidelines. Any timber harvesting that is done should protect the plant community and remove non-natives.

Short Term Plan- CSA type # 5 in section 14 is the only cover type that contains any lowland hardwood forest plant community. Type #5 is classed as a LH64 type, however, the average size and density of the trees appears to be somewhat less than what the inventory would indicate. For this reason as well as limited access and the management constraints due to the adjacent old growth stands, no management activity is planned in this cover type during the 7-year planning period.

MESIC OAK FOREST

Description – Oak forests (mesic subtype) are typically dry-mesic to mesic forests, often on gradual west and east-facing slopes and broad ridge crests. Dominant canopy trees can include red oak and white oak (*Quercus Alba*). In the Partridge Creek Area these communities grade to maple-basswood on east and north-facing slopes and to dry-mesic oak forest where sugar maple completely drops out and the herbaceous flora changes. At Partridge Creek the red oak and basswood predominate and occur with white oak and sugar maple.

Long Term Objective - As mesic oak forest is designated as an S2 natural community, it should be actively managed to ensure its perpetuation. Management practices, where possible, should be used to retain these as oak types. In areas where maple-basswood succession is inevitable, the stands will be allowed to succeed to maple basswood.

Short Term Plan- All or portions of eight CSA cover types in the Partridge Creek Project Area make up the Mesic Oak Forest plant community designated by the MCBS. They are as follows:

Section #	CSA Type
11	2 NH57
11	9 NH59

14	3	NH59
14	4	NH56
14	6	NH57
14	9	O56
14	10	NH69
14	11	CH45

CSA cover type #'s 2 and 9 of section 11 and #'s 3,4, and 6 of section 14 have met the stand selection criteria for harvest. These stands will be harvested during the 7 year period covered by this SFRMP plan addendum. The long term management objectives of the mesic oak forest plant community, as stated above, provide the overall management goals of the timber harvests for the portions of the stands that are mesic oak. Best Management Practices will be followed. In addition, the sale preparation, specifications, monitoring, and evaluation will be guided by additional direction provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (Appendix 2).

Monitoring of the effects of various harvesting techniques will be ongoing at Caledonia Oaks in Houston County. Information from these studies may be used, if applicable, to revise future plan updates.

CSA type #10 of section 14 is an old growth stand and no management activities will be implemented there. Access problems preclude management activities in type # 11 and no management needs have been identified for type #9.

DRY OAK FOREST

Description – Oak forest (dry subtype) often occurs on south to west- facing slopes with a canopy dominated by northern pin oak (*Quercus ellipsoidalis*), and/or bur oak (*Quercus macrocarpa*). Generally, these dry oak forests occur on areas where succession has led to a relatively closed canopy.

Long Term Objective - The goal in dry oak forest management is to encourage regeneration of the oak community through controlled burning and carefully planned logging to open up the community. Eliminating non-native species is also a high priority.

Short Term Plan- In the Partridge Creek Area the dry oak forest is found in two CSA cover types; # 10 and # 3 of section 14. No management is planned for CSA type #10 because of its status as an old growth type. CSA type #3 has met the criteria for harvest by the SFRMP process. This type will be harvested in the next seven years using Best Management Practices and with the long-term objectives for the plant community as a guide. Steep slopes, poor access, and low timber value may limit the extent of prescribed burning and harvest management activities.

WHITE PINE-HARDWOOD FOREST

Description - Dry to mesic forest on steep slopes, often associated wit cliffs and bedrock outcrops. At Partridge Creek a mesic variant of this community occurs on the east to north-facing slopes where the pines occur with sugar maple, red oak, and basswood and a dry variant on steep west to south-facing slopes where the pine occur with bur oak. White pines dominate the canopy of these areas with deciduous trees in the sub-canopy.

Long Term Objective - Management should ensure the perpetuation of the white pine-hardwood forest. Scarification and release would be practices to utilize to enhance survival, growth, and regeneration of white pine.

Short Term Plan- CSA cover type #'s 6, 10, and 11 of section 14 all contain some white pine- hardwood forest plant community type. Release and scarification activities to enhance white pine survival and regeneration will be implemented in type # 6 when harvesting activities, as noted above, take place. These management actions will follow the long term objectives for the plant community and will, likewise, be guided by the additional direction provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (Appendix 2).

No management will occur in cover type #10 because of its status as an old growth type. No management activities are planned for type # 11 during the 7- year plan period because of limited access to this area.

MIXED OAK WOODLAND

Description- Oak woodland occurs on dry to mesic sites throughout the deciduous forest-woodland zone. Oak woodland is floristically and structurally intermediate between Oak Savanna and Oak Forest, with a patchy tree canopy and an understory dominated by shrubs and tree saplings. In the Partridge Creek Area the oak woodland overstory is dominated by open-grown bur oak.

Long Term Objective – The management goal in this plant community would be perpetuation of the fairly open oak canopy through carefully implemented prescribed burns and/or through timber harvesting.

Short Term Plan – CSA type # 12 of section 14 contains a couple of acres of mixed oak woodland plant community. This area has poor access because of steep slopes and adjacent private property. No management activities are planned in this cover type in the 7-year period covered by this plan.

ASPEN

Description – Aspen is a pioneer, short lived, trees species that is found in small pockets or small stands throughout the Blufflands and Rochester Plateau subsections. These pockets can be found imbedded in several plant communities such as maple-basswood, mesic oak, and dry oak forest.

Long Term Objective – The goal for aspen in the SFRMP plan is to maintain or increase its acreage to benefit various wildlife and non-game wildlife species.

Short Term Plan- CSA cover type #'s 3, 6, and 11 of section 14 have pockets or inclusions of aspen. As provided in Appendix 2, harvesting of aspen clones should only be done in conjunction with a timber harvest of the surrounding stand. Thus planned harvests in CSA type #'s 3 and 6 would include aspen harvesting or felling at that time. Other from Appendix 2 which pertain to aspen pockets, maple-basswood management, and mesic oak management will also be followed.

Access problems with type 11 will prevent aspen cutting during the 7 year plan period.

Enhance game and non-game wildlife habitat

Narrative -DNR wildlife and fisheries managers have been consulted in the past with regard to improving habitat in the Partridge Creek Area. The aspen recycling project, funded by the Ruffed Grouse Society, was one result of this collaboration. The cooperative effort in improving wildlife habitat will continue. This is a popular area for hunting deer, squirrels, grouse, wild turkeys and other game animals. It has probably been hunted by some of the same local families for generations. The area also provides good habitat for non-game birds and mammals. The aquatic wildlife habitat appears to be fairly healthy and stable, but information on this resource is not readily available.

As the forest stands in this area continue to age and move toward more shade tolerant species, the habitat for wildlife will change as well. The diversity of species may increase, but species dependent on mast for food may decline in numbers. Uneven-age management will also be detrimental to species such as rough grouse that need some areas of young forest.

Short Term Plan – A stream survey by DNR Fisheries will be requested for Partridge Creek in the seven year planning period. Changing land use patterns in the area could influence stream quality. Proven practices that enhance wildlife habitat will be incorporated whenever possible. Select harvests should not create any additional forest edge areas.

Provide sustainable recreation opportunities

Narrative - Hunting, horseback riding, OHV use, hiking/running, and bird watching are some of the present activities that occur in the Partridge Creek Area. The majority of the forest roads have been gated to stop pick-up trucks and passenger car traffic. However, 4-wheelers still bypass these barriers. Most of this is local traffic. This traffic is increasing and getting to be more of a problem. Other recreational uses of the site have been low impact and have not caused problems.

Short Term Plan – Additional signs/fencing will be put up to delineate boundary lines and permitted activities. Additional enforcement activity will be needed to get better compliance with OHV regulations.

Update CSA and MCBS data

Narrative- Plan implementation and future management planning for the Partridge Creek Area would be much easier if the type boundaries of CSA and the plant community boundaries of the MCBS inventory were more closely aligned. Timber harvests and other management activities should bring further refinements to the CSA inventory data as stand boundaries are adjusted in pre and post sale field visits.

Short Term Plan – CSA alterations will be completed as management activities are planned or completed, after regeneration checks, etc.

Acquisition of key private land parcels

Narrative- There is a significant amount of private land within the Partridge Creek Area and some private land in the Critical Habitat Zone as well. It would make sense to try to acquire this parcel to add to the State Forest system. Other land purchases in the Partridge Creek Area that would allow DNR - Forestry to square off boundaries, add management efficiencies, and protect riparian areas will be pursued. Acquisition of lands further up the Partridge Creek watershed would enhance stream protection. Partnering in acquisition efforts with other DNR divisions, other government agencies, and private organizations may be necessary.

Appendix 1: Stands Scheduled for Harvest

Stand #	Type	Acres	Harvest Type	FY Sale
3 Section 14	Northern Hardwoods	115	Select	04
4 Section 14	Northern Hardwoods	4	Select	04
6 Section 14	Northern Hardwoods	26	Variable	03
2 Section 11	Northern Hardwoods	28	Variable	04
9 Section 11	Northern Hardwoods	4	Select	06

Appendix 2: Additional Management Guidance

Harvest of high quality maple-basswood communities

Selective harvest will be allowed if site teams jointly develop detailed plans that include joint on-site visits. The following conditions will apply:

- Oak resources can be salvaged as these sites are converted to purer maple basswood communities. This should be done by selective, individual or small group marking and removals.
- Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns.
- Seasonal and equipment restrictions should be used to limit soil disturbance; horse logging on frozen ground should be done where appropriate in the most sensitive sites).
- Trees should be jointly marked as well as the layout for access and skid trails to minimize any additional permanent fragmentation.
- Portions of stands that support unique or rare resources (such as a rare species or a rich spring ephemeral flora) may be delineated for no harvest.
- A pre and post treatment monitoring and evaluation protocol for species and communities of concern (both native and exotic) should be developed and implemented in each stand. Harvest plans should also take into account whether or not invasive exotic species occur in stands immediately adjacent to those being harvested.

With respect to the last bullet, Ecological Services staff will continue discussions with USDA Forest Service staff to further explore the opportunities to collect pre-treatment data during the 2004 field season.

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. To promote natural regeneration and protect soil productivity, look for opportunities to clear-cut the forested type on more level terrain following pre-sale soil scarification. Harvesting on steeper slopes, where appropriate, would be restricted to shelterwood, group selection, or variations of these harvest methods without soil scarification

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority

for prescribed fire funding. Wildlife will work with the Divisions of Ecological Services and Forestry to ensure that these sites are regenerated through the application of fire.

Aspen and white pine pockets

The cover type goal as listed in the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan is to maintain or moderately increase the white pine acreage and increase the aspen acreage for various wildlife and non-game species. As stated in the plan, there are relatively few stands of aspen larger than five-acres in size in southeastern Minnesota.

Native white pine stands are limited in number, but provide multiple benefits to numerous game and non-game species from roosting sites for wild turkeys to perches and roost areas for bald eagles. The department believes it is necessary to access some of the sites for management to ensure natural regeneration occurs.

Options to minimize any intrusion through the maple-basswood communities should include the following:

- A search for any pre-existing old homestead roads or trails that could be used for access and whether exotic species are present in the area which might be introduced along such a corridor if made active again;
- List alternate means to access the white pine such as through private land, through other disturbed communities, etc; and
- Timing of access whereby any mechanical scarification would take place during fall or early winter, reducing the "footprint" upon the trail used to access such stands. The department believes such efforts to maintain or increase the native white pine acreage in this landscape outweigh the minor impacts to surrounding northern hardwood communities.

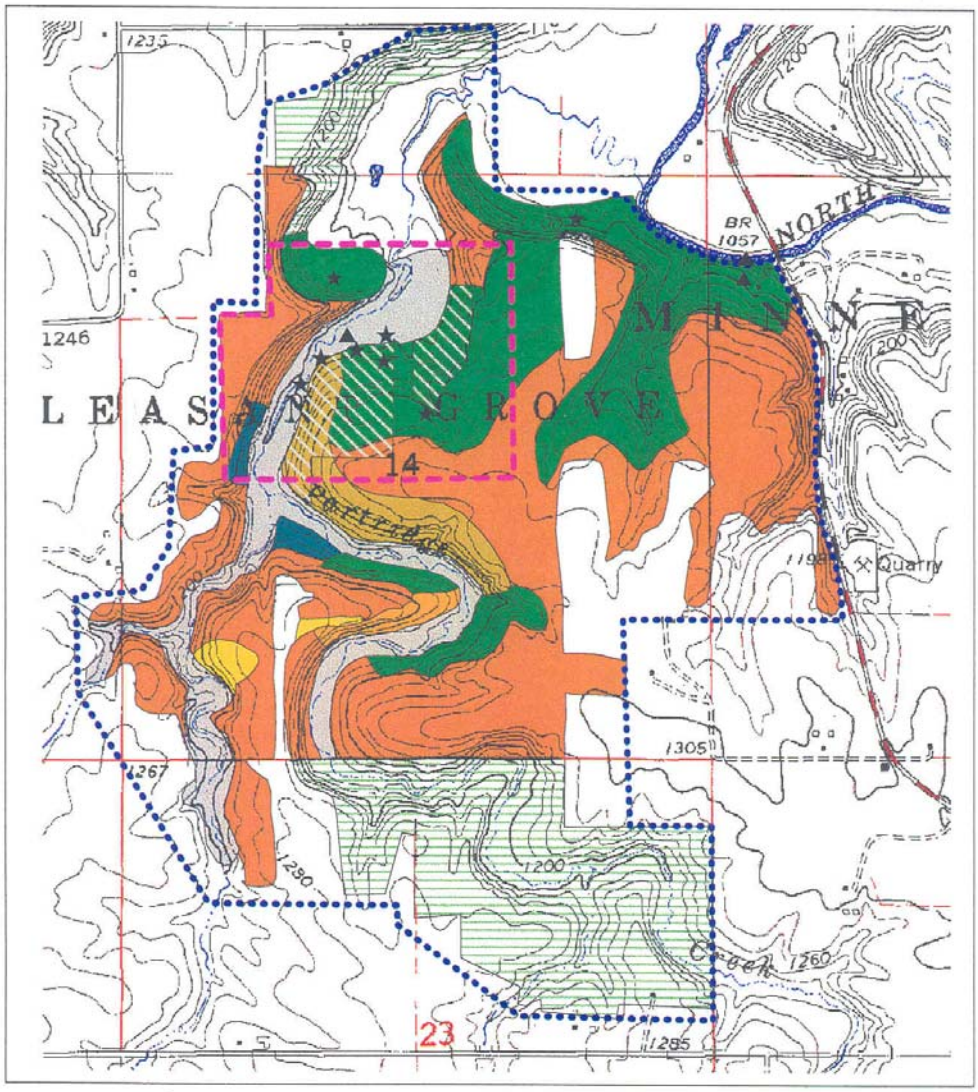
Small aspen clones in high quality sites should only be harvested when a harvest is already planned and approved by the team, at the same time, within the immediately surrounding stand in which the clone is embedded. Other conditions mentioned under the high quality maple-basswood communities section above should also be addressed. If harvest in the stand in which the aspen is embedded is not planned, then a special effort to cut the aspen should not be made.

Appendix 3: Native Plant Communities

Partridge Creek, Olmsted County, Minnesota

T105N R13W

Minnesota County Biological Survey - Map Version: 24 March, 2000

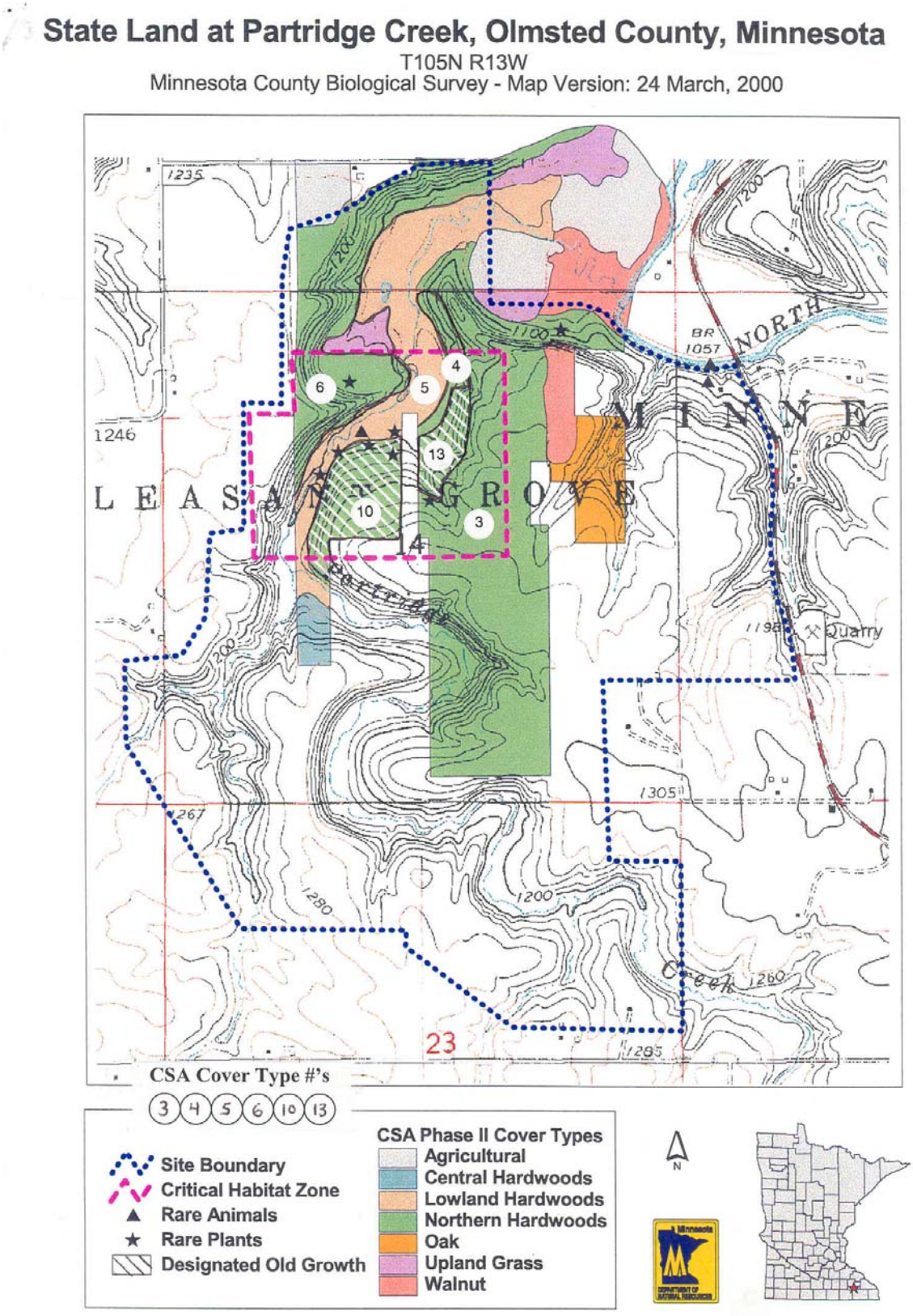


Site Boundary
Critical Habitat Zone
Rare Animals
Rare Plants
Designated Old Growth
Disturbed Forest

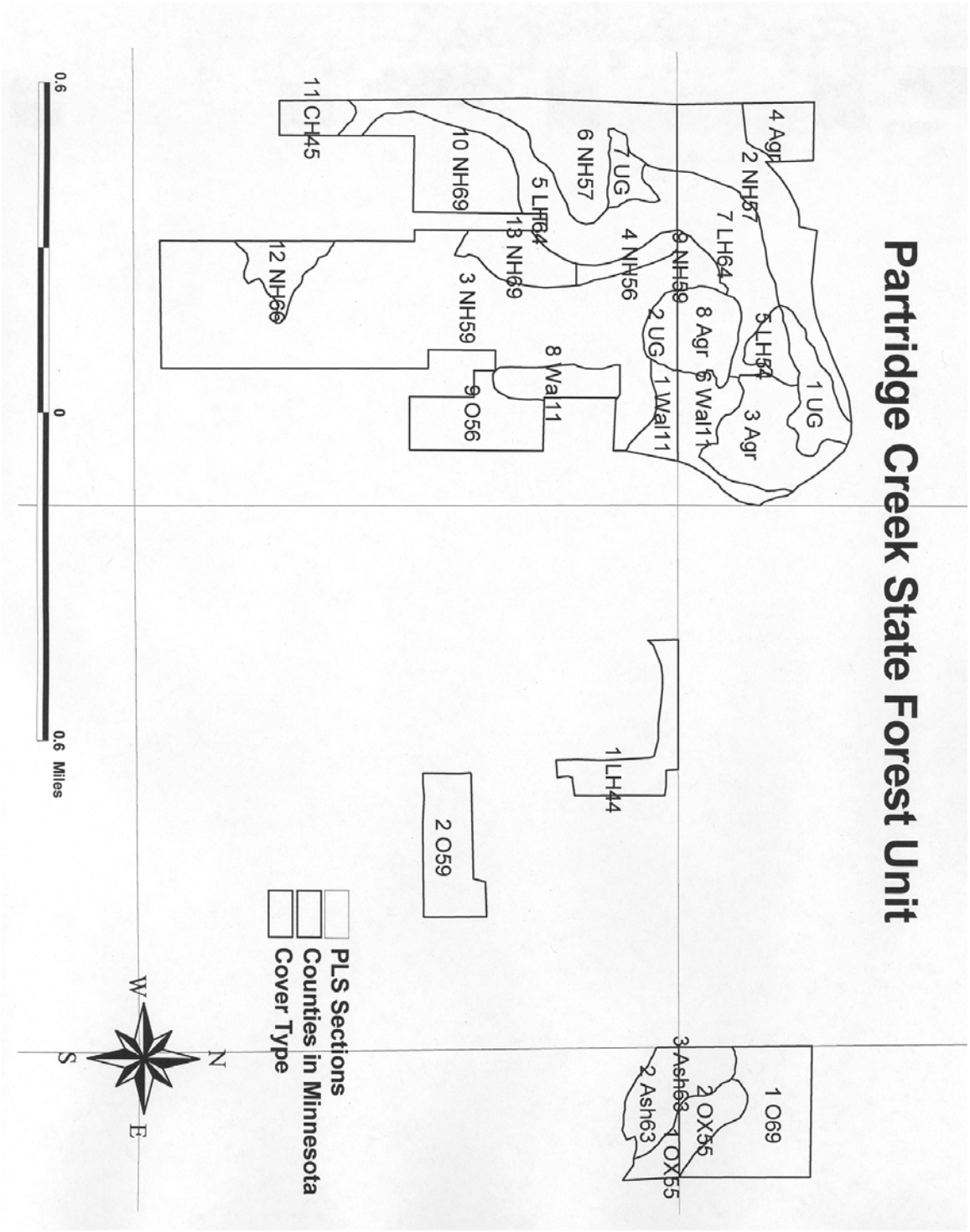
Native Plant Communities
Dry Prairie - bedrock bluff subtype
Lowland Hardwood Forest
Maple-basswood Forest
Oak Forest - dry subtype
Oak Forest - mesic subtype
Mixed Oak Woodland
White Pine - Hardwood Forest

N

Appendix 4: CSA types in the Critical Habitat Zone



Appendix 5: CSA types in the Partridge Creek State Forest Unit



Appendix 6: MCBS Evaluation of Partridge Creek

DRAFT

An Evaluation of the Ecological Significance of

THE PARTRIDGE CREEK AREA

Paleozoic Plateau ECS Section; Blufflands Subsection
Olmsted County, Minnesota
DNR Quad Code: W20a
T105N R13W: sections 14, 23

Approximate Acres:
Total Site area: 846 acres (state land: 297 acres)
Critical Habitat Zone area: 118 acres (state land: 94 acres)

Prepared by: Fred Harris
Minnesota County Biological Survey
Section of Ecological Services
Department of Natural Resources
Box 25, 500 Lafayette Rd
St. Paul, Minnesota 55155

April 26, 2000

ECOLOGICAL SIGNIFICANCE:

Overview

The Partridge Creek area, with its large area of high quality forests and high diversity of rare species, is among the top four natural areas left in Olmsted County and is an important natural area in southeastern Minnesota. The site consists mostly of little-disturbed, young to mature forest stands with intact canopies and high species diversity. These stands include areas of maple-basswood, lowland hardwood, white pine-hardwood, mesic oak, and dry-mesic oak forest. One mature maple-basswood stand has received Old Growth designation.

These forests contain a high diversity of the native plant species found in southeastern Minnesota forests. Several rare plant species have been documented in the site. These include populations of five species with state endangered or threatened status, three of which are the only locations known in Olmsted County: false mermaid (*Floerkia proserpinacoides*), goldenseal (*Hydrastis canadensis*), James' sedge (*Carex jamesii*), narrow-leaved spleenwort (*Diplazium pycnocarpon*), and spreading sedge (*Carex laxiculmis*). Four other rare plant species present in the site are ginseng (*Panax quinquefolius*), Goldie's fern (*Dryopteris goldiana*), moschatel (*Adoxa moschatellina*), and silvery spleenwort (*Athyrium thelypterioides*).

The large area of continuous forest canopy provides habitat for numerous bird species that require interior forest conditions in unfragmented forest stands. These include the Acadian flycatcher (*Empidonax virescens*), a Special Concern species that breeds within the site. A bald eagle (*Haliaeetus leucocephalus*) nest has also been sighted within the site.

Geologic Features and Context

The Partridge Creek site consists of the lowermost two miles of the Partridge Creek valley and adjacent portions of the North Branch of the Root River valley. The site forms part of the Red Wing-La Crescent Geomorphic Area, a highly dissected portion of the Paleozoic Plateau. Within the site, the creek flows through a narrow, winding, bedrock-controlled ravine, with several small outcrops and escarpments of Galena formation dolomite along the steep valley side-slopes. Several sinkholes, circular depressions connected to fissures in underlying bedrock layers, occur on uplands on the edge of the creek valley.

Soils on the bottomlands in the site consist mostly of poorly-drained silt loams formed in alluvium, with muck spots in areas of groundwater seepage. The valley's steep, highly-drained side-slopes contain shallow, flagstone-laden soils, ranging from silty clay loam to sandy loams, formed predominantly in bedrock residuum. Soils on the more shallow, convex slopes and ridge tops on uplands contain silt loam soils formed in Wisconsinan loess deposits of depths varying from a few inches to over 60 inches over underlying shallow till deposits or bedrock.

Plant Communities

Lowland hardwood forest with frequent canopy gaps and dominated by mostly mid-age black ash (*Fraxinus nigra*), basswood (*Tilia americana*) and sugar maple (*Acer saccharum*) predominates on the bottomlands within the site. Box elder (*Acer negundo*) and elms (*Ulmus* sp.) are prevalent as smaller trees in lower canopy layers. Frequent large canopy gaps, numerous deadfalls and occasional standing dead snags are evidence of the past die-off of American elms (*Ulmus americana*) that were once an important component of the community. Some past selective logging has also resulted in a fairly even-aged forest. The herbaceous groundlayer on these bottomlands is continuous and highly diverse, with numerous spring wildflower species. Frequent areas of groundwater seepage occur where the side slopes meet the valley bottoms and are dominated by marsh marigolds (*Caltha palustris*). Few such intact lowland forest communities remain in southeastern Minnesota.

Maple-basswood forests with continuous, dense canopies of mostly sugar maple, basswood and red oak (*Quercus rubra*) dominate most north-facing slopes within the site. A particularly fine example of this community occurs on the gradual to steep slope located just north of the center of section 14. This mature stand contains oaks and maples reaching approximately 120 or more years of age, as determined by a few tree cores, and has been designated an Old Growth stand. Two 80+ centimeter dbh oaks (one red oak and one white oak (*Quercus alba*)) were also recorded within the stand. This stand has a continuous and diverse herbaceous layer that includes a rich diversity of spring ephemeral wildflowers. Downslope to the north, the forest grades into rich, wet-mesic maple-basswood forest at the transition to lowland hardwood forest on the bottomlands.

White pine-hardwood forest prevails as narrow bands on steeper slopes with shallow soils over bedrock on both sides of the creek valley. White pine (*Pinus strobus*) dominates these zones in two recognizable subtypes of this forest type: a mesic variant on east to north-facing slopes in which the pines co-occur with sugar maple, red oak and basswood on east-facing slopes; and a dry variant on steep west to south-facing slopes in which the pines co-occur with bur oak (*Quercus macrocarpa*).

Mesic oak forest dominates the loess-derived soils on the highest uplands. Red oak and basswood predominate in these stands, and co-occur with white oak, sugar maple, and yellow-bud hickory (*Carya cordiformis*). These stands are generally even-aged with oaks averaging approximately 35-40 cm dbh due to past selective logging. A couple of large big-tooth aspen (*Populus grandidentata*) clones are present. It appears that much of the area was grazed many years ago, as evidenced by old barbed wire fencing. These stands have a rich plant species diversity and appear to have recovered from any past grazing. On south to west-facing slopes, the forest grades into a dry-mesic variant of oak forest where sugar maple completely drops out and the herbaceous flora changes to species tolerant of drier soil conditions. On steep south-facing slopes, the forest becomes **mixed oak woodland** dominated by open-grown bur oak.

Rare Animals

The **Acadian flycatcher** is a Special Concern bird species that was recorded within the site during the 1996 breeding bird survey. This bird occupies small stream valleys within unfragmented areas of mature forest. Other non-listed bird species with similar habitat requirements were also recorded in the site, including ovenbird, scarlet tanager, eastern wood-pewee, yellow-throated vireo, red-eyed vireo and wood thrush. The site appears to have excellent habitat for the Louisiana waterthrush (*Seiurus motacilla*), a Special Concern species. A search for this species has not yet been conducted within the site.

Bald eagles, listed as Special Concern, were observed nesting near the Root River within the site in 1995.

Rare Plants

Many of the rare plant species found within the site occur within the older maple-basswood forest stand located north of the center of section 14. Small populations of the **golden-seal** (State Endangered) and **ginseng** (Special Concern) were recorded on upper slopes within this forest. **James' sedge** (Threatened), **spreading sedge** (Threatened), and a rare fern, **silvery spleenwort** (non-listed)**,** were recorded on the lower slopes in the wet-mesic maple-basswood forest and on adjacent bottomlands within the lowland hardwood community. With the exception of the more widespread ginseng, these species are exceedingly rare--their Minnesota distribution is limited to the Paleozoic Plateau region in the southeastern-most portion of the state.

Two other rare ferns, **Goldie's fern** (a Special Concern species) and **narrow-leaved spleenwort** (a Threatened species), were recorded from mesic white-pine hardwood forests on a steep, sheltered northeast-facing slope in an adjacent portion of the Root River valley.

Thousands of plants of the Special Concern species, **moschatel,** were recorded on cool, sheltered north-facing slopes within maple-basswood forests in several parts of the site.

A large, robust population of **false mermaid,** a Threatened species, occupies over a quarter mile of seepage zones located on the edge of the Partridge Creek bottomlands at its juncture with steep valley side slopes. This early spring ephemeral is known from very few locations in the state.

RECOMMENDATIONS:

The Partridge Creek Area is a significant area with natural features of statewide importance due to the high-quality condition of its forests and its high diversity of native plant and animal species. This area merits special consideration for protection and management.

Several very rare plant species occur on north-facing slopes and valley bottomlands in the north half of section 14. These species require moist, highly-shaded, interior forest conditions. The

primary area of concern for protection of these species is identified as a Critical Habitat Zone on the maps accompanying this report. To maintain these species, this portion of the site should be protected from disturbance, including logging. Much of this area has been designated as Old Growth forest, which is an excellent step toward maintaining this high-quality forest habitat.

As a whole, the site is one of the largest areas of unfragmented, continuous-canopied forest to be seen in Olmsted County. Portions of the forest are in excellent condition, whereas other parts are in moderate condition due to past land uses. These lesser-quality areas generally have an excellent diversity and abundance of native plants, and few exotic species, and so should greatly improve in condition in the future. If it is allowed to remain as a large, unfragmented block of mature forest, this site will continue to be an excellent refuge for forest songbirds, many of which have been documented in the site.

The remaining private lands within the site boundaries should be protected by fee title acquisition or conservation easements. Given the high natural area value of the site, there should be many public and private organizations interested in assisting with the site's protection. Protection of the rest of the site is particularly urgent as the site is within easy commuting distance of Rochester and is vulnerable to housing developments.

In summary, the Partridge Creek Area is a large, high-quality forested site containing one of few old-growth forest stands in southeastern Minnesota and occurrences of several very rare species. The site merits a high level of protection for its natural area values.

INFORMATION SOURCES:

Minnesota County Biological Survey (1995-1996) field data from: Fred Harris
Minnesota Forest Bird Survey (1996) Carol Pearson
University of Minnesota Agricultural Experiment Station (1973) Minnesota Soil Atlas - St. Paul Sheet
USDA-SCS (1980) Soil Survey of Olmsted County

Partridge Creek
ELEMENT SUMMARY:

	Status*	Rank@	# Statewide EOs	# EO's in Paleoz. Plat.
Plant Communities				
Lowland hardwood forest	S4	C	91	33
Maple-basswood forest (southeast)	S2	AB,B	186	179
Oak forest (southeast) mesic subtype	S2	BC	298	258
Oak woodland-brushland (southeast)	S4	BC	53	42
White pine-hardwood forest (southeast) dry subtype	S2	B	7	4
White pine-hardwood forest (southeast) mesic subtype	S2	B	26	25
Animals				
Acadian flycatcher (*Empidonax virescens*)	SC		58	35
Bald Eagle (*Haliaeetus leucocephalus*)	SC		1218	63
Black Redhorse [fish] (*Moxostoma duquesnei*)	NON		40	37
Plants				
Moschatel *(Adoxa moschatellina)*	SC		103	74
Silvery spleenwort *(Athyrium thelypterioides)*	NON		41	41
James' sedge *(Carex jamesii)*	T		14	14
Spreading sedge *(Carex laxiculmis)*	T		19	19
Goldie's fern *(Dryopteris goldiana)*	SC		48	37
Narrow-leaved spleenwort *(Dyplazium pycnocarpon)*	T		19	19
False mermaid *(Floerkea proserpinacoides)*	T		12	10
Golden-seal *(Hydrastis canadensis)*	E		15	15
Ginseng *(Panax quinquefolius)*	SC		225	115

*Status:

For Rare Species	For Natural Communities
E = endangered	(program-defined; no legal status)
T = threatened	S1=critically endangered
SC = special concern	S2=endangered
NON = no legal status but tracked in NHP database	S3=threatened
	S4=special concern
	S5 = demonstrably secure

@ Element ranks are given where available

Appendix 7: Habitat Needs for Cerulean Warblers & Acadian Flycatchers

Habitat Needs for Cerulean Warblers & Acadian Flycatchers

Jaime Edwards – 3/22/04

- **Need large tracts (100ac+) of bottomland hardwoods and mesic slopes**
- **Need a close canopy and an open understory**
- **Canopy closure should be a minimum of 60% over a 200 acre parcel, but prefer up to 85% canopy and larger dbh trees should create the canopy – so a mature forest**
- **Zonation of canopy to show horizontal layers ~ mixed age forest**
- **Small canopy gaps are preferable ~ indicating select harvest may be a preferred management technique for these species**
- **Select harvest should retain a percentage (1-2 "taller than surrounding stand" trees per acre) of tall, large, mature trees (i.e. if the majority of stand trees are 10" dbh, it would be good to leave a few trees with dbh greater than 10"). This will insure that some of the highest canopy trees remain for nesting and cover.**
- **Retain snags for foraging – snags of 6" or greater dbh**

Appendix 8: October 2000 Aerial Photo of Partridge Creek

Appendix 9: CSA Key for Partridge Creek State Forest Unit

CSA cover types on maps and in the plan are identified with a code (e.g., NH57) comprised of three components:

- Main cover type code. This identifies the main type, based on predominant cover or tree species, indicated by a series of letters or abbreviations (e.g., **NH**57).
- Main cover type size class, based on predominant diameter of main species. This is the first numeric digit in the code (e.g., NH**5**7).
- Main cover type density, based on the number of stems, cords or board feet per acre. This is the second numeric digit in the code (e.g., NH5**7**).

Main Cover Type Code

Symbol	Type	Description
Ash	Ash	A bottomland type composed of ash.
LH	Lowland hardwoods	Bottomland hardwoods (ash, elm , Balm of Gilead, silver maple, etc.)
NH	Northern hardwoods	Northern or upland hardwood species
Wal	Walnut	Walnut predominating
O	Oak	Oak species predominating
CH	Central Hardwoods	Dense hardwoods with oak , hickory, cherry, butternut
OX	Offsite oak	Scrubby oak type below site index 40.
UG	Upland grass	An upland grass or weed area less than 10% stocked with a commercial tree species
Agr	Agricultural	Land being actively used for agricultural purposed – cropland, orchard, pasture, etc.

Main Cover Type Size Class (Diameter)

Code	Description	Corresponding Density Units
0	Not applicable for the type	
1	0 to .9 inches	Stems per acre
2	1 to 2.9 inches	Stems per acre
3	3 to 4.9 inches	Stems per acre
4	5 to 8.9 inches	Cords per acre
5	9 to 14.9 inches	Cords per acre
6	15 to 19.9 inches	Board feet per acre
7	20 to 24.9 inches	Board feet per acre
8	25+ inches	Board feet per acre

Main Cover Type Density

Code	Stems/Acre	Cords/Acre	Bd. Ft./Acre
0	0-250	0.0-2.9	0-1,250
1	251-750	3.0-7.5	1,251-3,750
2	751-1,250	7.6-12.5	3,751-6,250
3	1,251-1,750	12.6-17.5	6,251-8,750
4	1,751-2,250	17.6-22.5	8,751-11,250
5	2,251-2,750	22.6-27.5	11,251-13,750
6	2,751-3,250	27.6-32.5	13,751-16,250
7	3,251-3,750	32.6-37.5	16,251-18,750
8	3,751-4,250	37.6-42.5	18,751-21,250
9	4,251 and up	42.6 and up	21,251 and up

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

West Indian Creek

December 2002

Division of Forestry Planning Document
Printed December 2002

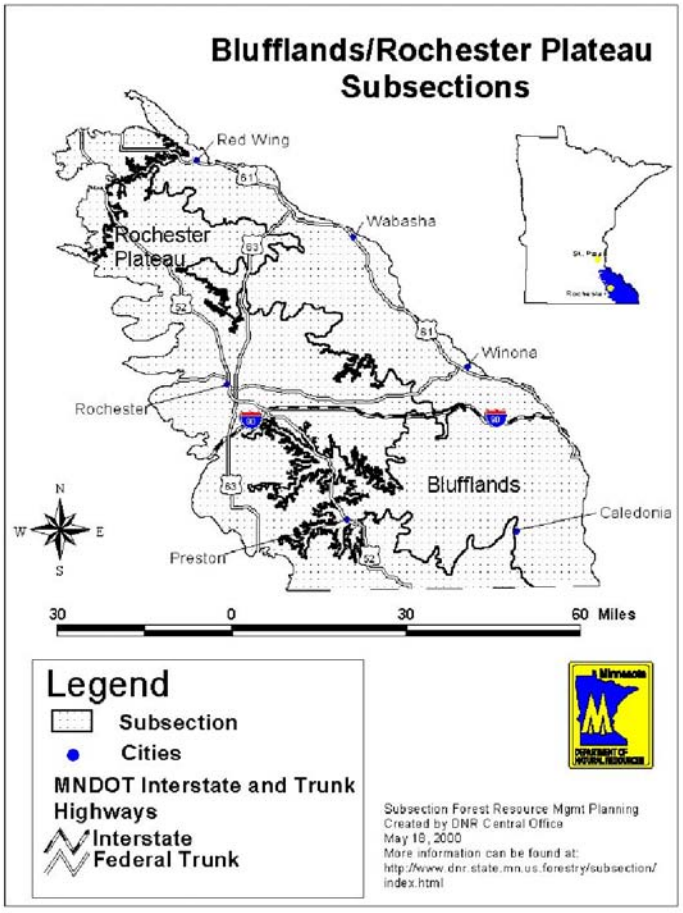
This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

OTHER APPENDICES (available upon request)

1. General location map
2. Native plant communities map
3. Natural Heritage areas registry agreement for site.
4. Old growth evaluations for site.
5. List of rare species present.
6. CSA summary sheets for each type.
7. Spring ephemeral monitoring study.

Introduction



This plan will guide management decisions and practices within the Upper West Indian Creek Valley. Upper West Indian Creek Valley is one of 13 areas of high biodiversity identified within the Blufflands and Rochester Plateau subsections.

During the development of the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP), DNR forest stands within the high biodiversity areas were reserved from treatment pending completion of area-specific management plans. This is the second of such area-specific management plans and is presented as an addendum to Blufflands/Rochester Plateau SFRMP.

SFRMP plans are scheduled for revision every seven years. It is expected that management plans for high biodiversity areas will also be revisited every seven years, or sooner if need be, as part of an adaptive management process.

The Upper West Indian Creek Valley proposed project boundary consists of 950 acres of which 315 acres are Forestry acquired land. Within the overall project boundary, DNR staff have identified a "critical habitat zone" of 460 acres of which 260 are state forest land.

The main body of the area in section 21 was acquired in 1978 with the balance of the land in section 28 being acquired through a land exchange in 1993. Both areas were heavily grazed at the time of acquisition. Photos taken at the time of acquisition are available for viewing at the Lake City DNR Forestry office (651.345.3216).

The management philosophy for the state forest land within this area is the same as for all other forestry lands within the Richard J. Dorer Memorial Hardwood Forest and is based on the landscape level perspective of ecosystems and the species that use those ecosystems. The goals are to maintain natural communities while providing the multiple uses that healthy forest ecosystems can provide.

The resource managers who work in and manage the area developed the management plan for this area cooperatively. It will be an adaptive management plan. As scientific knowledge increases regarding management of ecosystems, plant communities, and individual species, some management recommendations within this plan may change.

The overall goal of writing the plans for this and the other 12 high biodiversity areas is to perpetuate the plant communities that support the unique flora and fauna that make these areas exceptional. Recommendations in this plan are written for state–owned land. Private landowners within the project boundary will be contacted and offered management assistance for their land if they desire it.

Background

The DNR cooperative stand assessment (CSA) forest inventory was completed on all DNR Forestry-administered land within this area in the mid to late 1980's. In addition, the DNR county biological survey (CBS) was completed for Wabasha County in the mid 1990's. The results of these two databases provide information regarding the status of plant communities and distribution of rare species in the West Indian Creek vicinity.

West Indian Creek is a designated trout stream. DNR Fisheries has invested considerable dollars to improve trout habitat on this stream. The stream receives heavy angling pressure.

At the time the land was acquired, there was a known population of Snow Trillium, a state special concern species, present in section 21. For that reason, the site was designated a Natural Heritage Registry Site shortly after its acquisition.

Site Description

"Upper West Indian Creek valley is significant for its large contiguous acreage of native plant communities, the quality of these communities, the presence of rare specialized habitats, and the large concentration of rare plants and animals all occurring in a large, intact, natural landscape setting." (from 5/23/2000 project evaluation by Michael Lee)

West Indian Creek, a designated trout stream, is the areas main natural feature. Within the block of DNR Forestry-administered land there are two forks of the creek. The DNR Division of Fisheries has invested considerable dollars doing stream improvement work. All of the work has been done downstream of the critical habitat zone but falls within the overall proposed project boundary.

Kruger Cave, one of the largest maze caves in the state, is another significant natural feature that occurs within the boundaries of state forest land in this area.

The native plant communities identified in the 6/15/2000 project evaluation are: Maple-basswood forest, Lowland hardwood forest, Mixed hardwood seepage swamp, Algific talus slopes, Moist cliffs, Dry cliffs, Oak forest (mesic subtype), White pine-hardwood forest, and Oak woodland-brushland (native plant community map available upon request). Most of these plant communities correspond with timber types identified on CSA forestry inventory maps (see appendix 1).

More detailed descriptions of these types will be presented in the implementation section of this plan. A list of rare and endangered species that are present in the area is available upon request.

Management History

Following is a summary of forest management practices that have occurred on this unit since it's acquisition in 1978:

1	Timber Sale MBF	1981	30 acres	$3777.30 income
2.	Post sale and TSI	1982	80 acres	$2010.00 expense
3.	Tree planting	1982	25 acres	$1950.11 expense
		2000 walnut		
		2500 ash		

		1500 silver maple		
4.	Release spraying	1982	25 acres	$446.46 expense
5.	Release spraying	1984	25 acres	$359.40 expense
6.	TSI (NH type)	1985	18 acres	$633.96 expense
7.	Timber Trespass	1989	10 acres	$8857.65 income
		30,255 board feet		
8.	TSI (NH type)	1991	20 acres	$590.20 expense
9.	Tree planting	1996	2 acres	$325.25 expense

As evident from the data above, forest management activities have occurred over a high percentage of the state land in this area. Nearly all of this management activity took place prior to completion of the CBS.

Long Range Goals

The long-range management goal for this area is to maintain native plant communities and plant and animal species that reside in the area. This will be done using processes that mimic the disturbances that helped to establish and maintain these communities.

The goals of biodiversity protection, timber management, understory species management, recreation, game and non-game species management, and trout stream management will all be considered in management decisions to achieve this goal. As new research or management techniques become available, they may be incorporated into management practices prescribed in this plan to achieve the long-range goals.

Implementation

Introduction

This section is organized into the major plant communities that occur within the Upper West Indian Creek Valley Area. Management goals have been shown only for state-owned land.

For each plant community a long-term goal has been set. This will be a statement that describes what managers would like the area to look like 50 or more years in the future. In most cases this will be a description of an ideal plant community of the type that is being designated for perpetuation.

Following a description of the plant community a short-term management directive is also provided that describes vegetation management activities that are prescribed over the next seven years to help achieve the long-term management goal. Short-term directives will be addressed at least every seven years when SFMRP plans are completed. Long-term goals will likely remain unchanged.

Management Direction for Native Plant Communities

MAPLE-BASSWOOD FOREST (Southeast Section)

1. DESCRIPTION

Maple-basswood forests are typically mesic to wet-mesic forest on steep north-to east-facing slopes. Sugar maple (*Acer saccharum),* basswood (*Tilia americana*), and red oak (*Quercus rubra)* are the

dominant canopy trees. The maple-basswood forest in the West Indian Creek area has a well-established array of spring ephemerals in the herbaceous layer and supports populations of nine rare species. In the project site evaluation (6/15/2000), Lee states that most of the nine rare plant species along the base and lower slopes of north facing bluffs. Ecological quality of these forest ranges from B to C ranks.

This type consists of 140 acres in the project boundary area (public and privately owned). CSA forest inventory data shows that there are 10 stands totaling 78 acres of this type occurring on state forest land within the project boundary. Ages of dominant or co-dominant trees on the state land range from 47 to 124 years.

2. TYPE AND SITE MANAGEMENT

Past forest management practices in this type on state land have included harvest, a 10 acre timber trespass, a partial cut, release of sugar maple, and removal of boxelder.

Future forest management will be somewhat limited by the steep slopes present for much of this type. Any management done will be done without the construction of permanent roads. It will be done during the dormant season to minimize disturbance to the ground layer of plants.

There are well-defined forest management guidelines for Maple Basswood forests developed by North Central Forest Experiment Station in their Manager's Handbook series. The guidelines call for maintaining trees of all age classes in the stand through selective harvesting.

Research in maple-basswood plant communities in northern Minnesota has indicated that logging in this community may increase invasions of non-native species and impact some spring ephemeral plants. It is currently unclear if this is the case in SE Minnesota. Monitoring plots will be established on various sites throughout Southeastern Minnesota. The plots will study both long term and short-term effects of logging in maple-basswood types in SE Minnesota.

There were four stands that met criteria for harvest selected during the SFRMP process. They are listed below in the short-term directive summary.

Because of the sensitivity of this area, prior to setting up harvest in any of these stands, a team consisting of forestry, wildlife, non-game wildlife, fisheries, and the regional plant ecologist will walk through these stands to determine where harvest is feasible and how to proceed to protect the natural community as a whole.

3. LONG-TERM GOAL

To maintain the maple basswood cover type while retaining a diverse shrub layer and maintaining or increasing rare plants in the herbaceous layer

4. SHORT-TERM DIRECTIVE

Four stands of maple-basswood were identified as meeting the criteria for harvest over the next seven year period in the SFRMP process. (See appendix ___ for location map)

Stand 4-21-109-11 3 acres
Stand 7-21-109-11 2 acres

Stand 8-21-109-11 6 acres
Stand 3-28-109-11 18 acres

Stand 4 and stand 8 in section 21 show little disturbance and will not be logged during this seven year SFRMP. Stand 7 in section 21 and stand 3 in section 28 show more recent disturbance and may be logged using partial harvest techniques.

The regional plant ecologist will set up permanent plots in all four of these types in spring 2002 and monitor populations of spring ephemerals annually.

Monitoring sites will be established in all four stands. This data along with other research being conducted on management of northern hardwood plant communities will be used to help guide future management decisions. The study plan and results of the monitoring are available upon request.

Plots will also be instituted in the area of timber trespass to determine how spring ephemeral populations responded to that significant disturbance.

Forestry staff, the regional plant ecologist and other interested Lake City Area Biodiversity Team members will work together to design skid trails to avoid damaging any sensitive species. Logging will be restricted to winter months to further reduce any impacts to the ground. The timber sale will be set up by the team of area managers.

All maple basswood stands will be monitored for invasion of buckthorn or other non-native species. These will be removed if populations become too high. Boxelder populations will also be monitored and the numbers will be reduced if they threaten to reduce the quality of this natural community.

LOWLAND HARDWOOD FOREST

1. DESCRIPTION

Lowland hardwood forests are typically wet-mesic lowland forests on alluvial soils above the normal flood level in small valleys. The lowland hardwood forest in the West Indian Creek area are interspersed with spring-fed side channels and is a heterogeneous plant community. Basswood, black ash (*Fraxinus nigra),* sugar maple, and rock elm (*Ulmus thomasii)* dominate the canopy. The understory is a diverse array of spring ephemerals early in the year and becomes dominated by wood nettle (*Laportea canadensis)* and cleavers (*Galium aparine)* later into the summer. This area supports a variety of rare species including Goldie's Fern (*Dryopteris goldiana),* and Louisiana Waterthrush (*Seiurus motacilla).* Ecological quality of these forest ranges from AB to C rank.

2. TYPE/SITE MANAGEMENT

The CSA data shows 33 acres as lowland hardwoods with an additional 31 acres that was harvested in 1981 as central hardwoods. The *project evaluation (6/15/00)* by Lee shows 55 acres of lowland hardwoods plus an additional 5 acres of mixed hardwood seepage swamp. The four acres difference in the total may be due to a small section of woods where the trespass occurred being typed as lowland hardwoods by Lee and as northern hardwoods by the CSA forest inventory.

Thirty-nine acres have been designated as old growth. This would correspond with the 33 acres lowland hardwood type shown on CSA forest inventory. The stand age for this type is 101 years. No

harvesting activity will occur in the old growth area.

The remaining lowland hardwood area would be the area that was harvested in 1981 and replanted. This area will continue to be managed for forest biodiversity. To provide maximum habitat for interior bird species, it will continue to be managed as a 31-acre type.

3. LONG-TERM GOAL

To maintain a quality lowland hardwood type while protecting the groundwater seepage springs and herbaceous ground cover in addition to maintaining the minimal shrub layer.

4. SHORT-TERM DIRECTIVE

No management will occur in the designated old growth area.

The remaining area will continue to be managed for forest biodiversity. No harvesting is planned over the next seven years but timber stand improvement (TSI) may be done if needed to keep box elder populations at manageable levels. Future management concerns will be similar to the maple basswood plant community and will be addressed next time this plan is updated. Plots to monitor spring ephemerals should be set up in this type for future reference.

MIXED HARDWOOD SEEPAGE SPRING

1. DESCRIPTION

Mixed Hardwood seepage spring forests are characterized as lowland forest on saturated soil in calcium-rich groundwater seepage areas at the base of slopes. This is a rare community in southeastern Minnesota and occurs on approximately five acres that occupy a seepage area at the base of a north-facing bluff in West Indian Creek along with small pockets of inclusions that occur in the lowland hardwood forest. Black ash, basswood, and bur oak (*Quercus macrocarpa)* dominate the patchy canopy. This community supports large populations of two state threatened species, smooth sheathed-sedge *(Carex laevivaginata), and* false mermaid *(Floerikea proserpinacoides),* and a variety of other rare species. Ecological quality of this forest ranges from B to C rank.

2. LONG-TERM GOAL

To maintain this sensitive natural area.

3. SHORT-TERM DIRECTION

This area falls within the old growth lowland hardwood type and will have no management activities planned on it over the next seven years.

ALGIFIC TALUS SLOPE

1. DESCRIPTION

Algific talus slopes are typically wet-mesic communities on dolomitic talus on steep north-facing

slopes and are restricted to areas continuously cooled by air draining through caves and fissures. These slopes occur in the upper most reaches of the valley of the West Indian Creek area. These slopes support vegetation typical of northern Minnesota. Yellow birch (*Betula alleghaniensis)* occurs as an understory and canopy tree. Other northern species found here include Canada yew (*Taxus canadensis)* and highbush cranberry (*Viburnum trilobum).* The algific talus slope communities are shaded by the canopy of the surrounding forests. Ecological quality of these communities ranges from BC to C rank.

2. LONG-TERM GOAL

To maintain this unique area in an undisturbed condition.

3. SHORT-TERM DIRECTIVE

Prior to any activity in adjacent forest types, the regional plant ecologist will be consulted to clearly define these areas. No activities are planned in the next seven years.

MOIST CLIFFS

1. DESCRIPTION

Moist cliffs are typically moist to wet communities on north- to east-facing dolomite cliffs. Mosses, liverworts, and lichens are common in these communities. In the West Indian Creek area these cliffs are associated with the algific talus slopes and are shaded by a canopy of white pine (*Pinus strobus*).

DRY CLIFFS

1. DESCRIPTION

Dry communities generally occur on south- to west-facing dolomite cliffs. Lichens are common and vascular plants are sparse. In the West Indian Creek area these cliffs occur on the mid to upper slopes in the northern part of the area. The state species of Special Concern, cliff golden rod (*Solidago sciaphila)* occurs on several of the drier cliffs.

2. LONG-TERM GOAL

To protect these cliffs no management activities will occur on them.

3. SHORT-TERM DIRECTIVE

When timber harvest occurs on adjacent stands, the local forester, wildlife manager, fisheries manager, non-game wildlife manager, and regional plant ecologist will meet on site to determine how close to the cliffs management may occur.

OAK FOREST (mesic subtype)

1. DESCRIPTION

Oak Forest (mesic subtype) are typically dry-mesic to mesic forests, often on gradual west and east-facing slopes and broad ridge crests. Dominant canopy trees include red oak and white oak (*Quercus alba).* These communities transition to maple-basswood in wetter areas and oak woodland in drier areas. Understory species include summer-blooming species such as wild geranium (*Galium concinnum)* and elm-leaved goldenrod (*Solidago ulmifolia).*

WHITE PINE-HARDWOOD FOREST (southeast section)

1. DESCRIPTION

White pine-hardwood forests are typically dry to mesic forest on steep slopes, often associated with cliffs and bedrock outcrops. This community occurs on the upper portion of a steep west to northwest-facing slope in the southern portion of the West Indian Creek area. White pines dominate the canopy of this area with deciduous trees in the sub-canopy. The understory is similar to the mesic oak forest in the area.

2. TYPE/SITE MANAGEMENT (Oak Forest and White Pine-Hardwood Forest)

CSA data show 110 acres of oak type in State Forest ownership. 5 acres of this is planted and the balance is natural. The 6/15/200 project evaluation shows 15 acres of White Pine-Hardwood Forest plant community. (southeast section). This is included in the 110 acres of oak that the CSA forest inventory shows.

This native plant community varies in moisture across the site. Areas that are more mesic, have well established maple regeneration, and grade into maple-basswood will be allowed to succeed to the maple-basswood community type. Other areas, such as those in the southern end of the site, that are drier, have invasive species problems, or are not regenerating to maple will be managed to retain oak using various silvicultural techniques.

As with the other hardwood plant communities, research from the DNR as well as other agencies will be used to determine the best management technique to achieve the desired natural community.

CSA data shows oak stand ages to be between 82 and 101 years old. Stands of this age are quite manageable and can be retained as oak fairly easily. Retention of the oak type will be done where it is feasible. There are not too many box elder and elm in the understory or sugar maple in the overstory so management costs to retain oak will not be prohibitive in at least some portions of this plant community.

3. LONG-TERM GOAL (Oak Forest and White Pine-Hardwood Forest)

As oak forest (southeast section) mesic subtype is designated as an S2 natural community, it should be actively managed to ensure its perpetuation.

Manage, where possible, to retain these types as oak types. In areas where white pine is present management will be done to protect and increase the white pine component. In areas where maple-basswood succession is inevitable, the stands will be allowed to succeed. Winter logging will be done to minimize ground disturbance.

4. SHORT-TERM DIRECTIVE (Oak Forest and White Pine-Hardwood Forest)

No oak stands were identified in the SFRMP process for harvesting over the next seven years. Because of the advancing stand ages, an addition to the annual timber harvest plan may need to be looked at while the probability of regenerating oak remains high.

The oak old growth stand should be re-evaluated.

OAK WOODLAND-BRUSHLAND (southeast section)

1. DESCRIPTION

Oak woodland-brushland are typically dry woodlands on south to west-facing slopes in the northern part and as small inclusions in the oak forests of the West Indian Creek area. Short open grown bur oak and northern pin oak (*Quercus ellopsoidalis)* dominate the canopy. Where the canopy is open, species typical of dry bluff prairies are found in the understory. In areas where the shrub layer is dense the understory herbaceous diversity is typically low.

2. TYPE/SITE MANAGEMENT

This is another type that would have been identified as an oak type in the CSA forest inventory. Canopy cover is 50-70% and is dominated by pin oak, black oak and bur oak. Paper birch, red oak, and red cedar are also present.

3. LONG-TERM GOAL

Manage to encourage regeneration of oak savanna and oak woodland-brushland communities through use of understory treatments, fire and logging.

4. SHORT-TERM DIRECTIVE

Manage to encourage restoration of oak savanna communities through the use of prescribed fire and/or understory treatments. No stands were identified for treatment in the next seven years. Burning may be done when staff and weather conditions permit. Selective logging will be done in combination with better quality oak stands with the objective of restoring examples of the oak savanna natural community

ASPEN

1. DESCRIPTION

Aspen was not recognized as a natural community in Mike Lee's site write-up.

2. TYPE/SITE MANAGEMENT

Two stands of aspen were identified in CSA forest inventory. Type 7 in section 28 was selected for treatment during the SFRMP process.

Markets are now available for traditionally non-marketable species. This will give managers an opportunity to utilize current wood fiber on the land and to regenerate the site to better quality aspen, possibly mixed with more mast species.

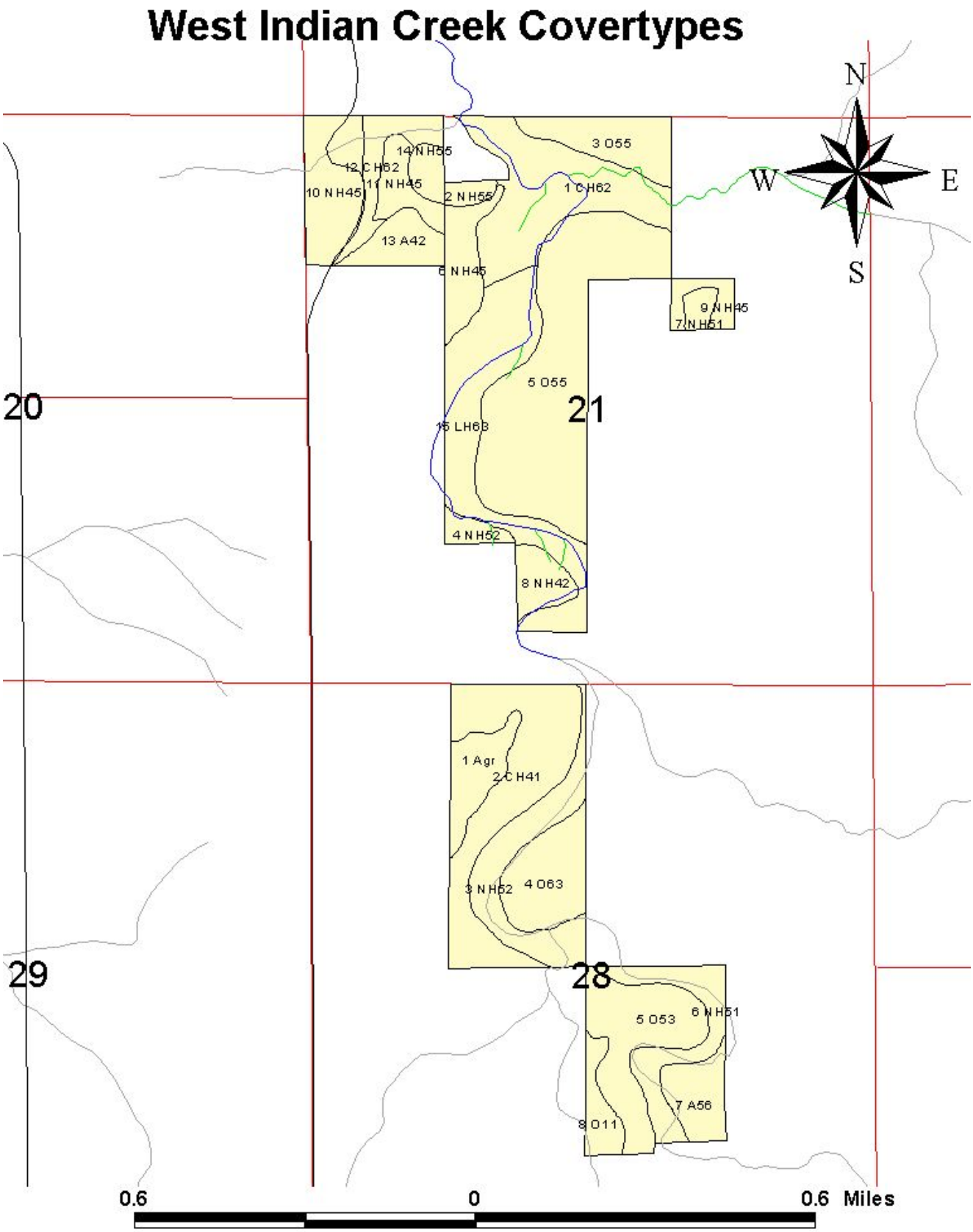
3. LONG-TERM GOAL

To maintain aspen stands for biological diversity in the area and to provide wildlife habitat.

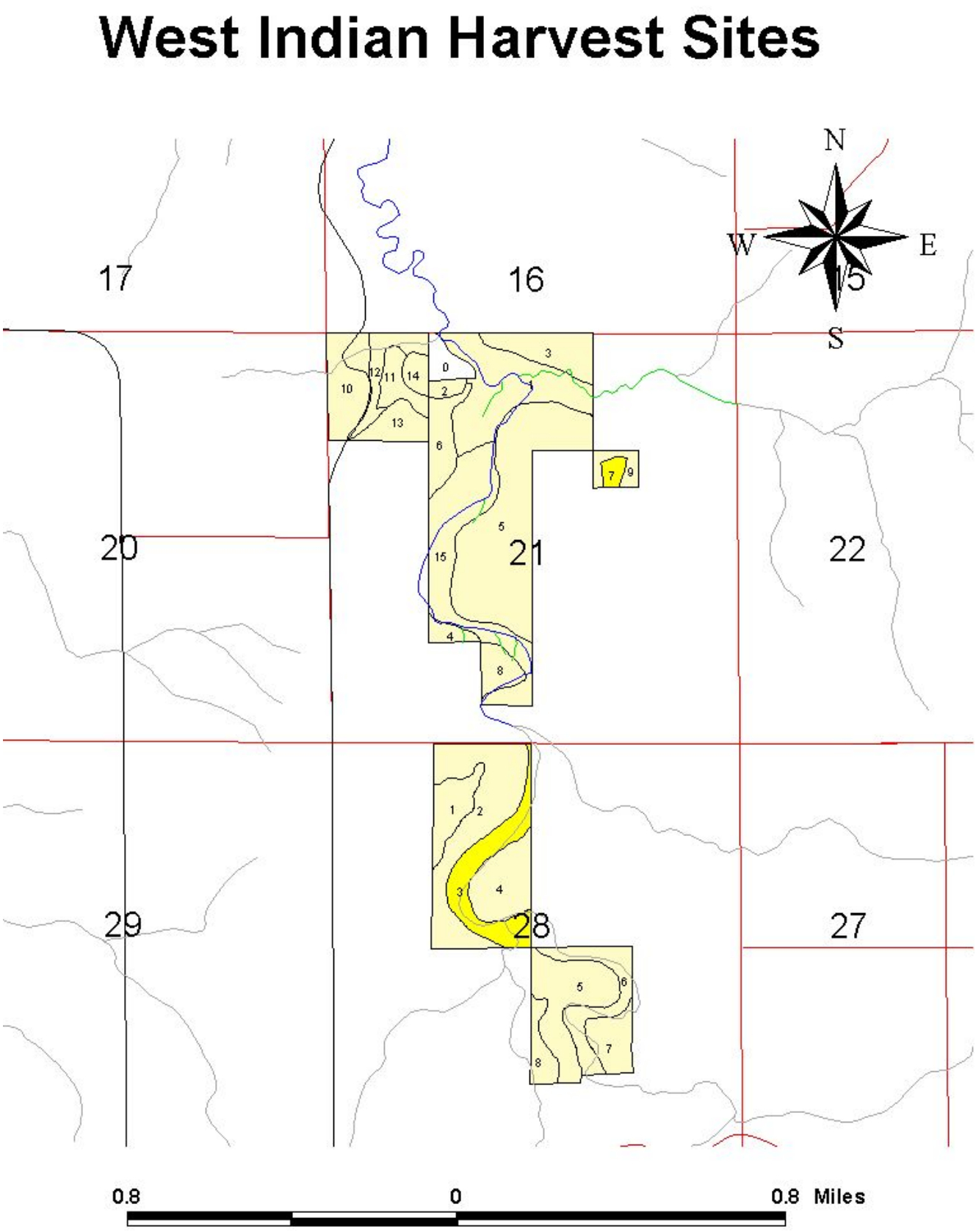
4. SHORT-TERM DIRECTIVE

Stand 7 in section 28 (7 acres) should be harvested within the next seven years. Because of the amount of old growth the West Indian Creek area contains, having areas of regeneration will be critical to healthy wildlife populations. Harvesting will be done to increase populations of mast trees.

Appendix 1. CSA Forest Inventory Type Map



Appendix 2. Types Scheduled for Treatment Over Next Seven Years



Appendix 3. Glossary

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

Adaptive Management: A dynamic management approach in which the effects of treatments and decisions are continually monitored and used, along with research results, to modify management on a continuing basis to ensure that objectives are being met.

Age Class: An interval into which the age range of trees or forest stands is divided for classification or use.

Age Class Distribution: The proportionate amount of various age classes of a forest or forest cover type within a defined geographic area (e.g., ECS subsection).

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

Annual Plan Additions: Stands on state-administered forest lands that are proposed to be or have been added to the Annual Timber Harvest Plan. These adjustments to annual harvest plans are needed at times because of new information from field surveys, changes in resource conditions, or nearby harvest activities. They are additional stands recommended by field personnel for timber harvest during the current fiscal year (July 1 - June 30).

Annual Timber Harvest Plan: A work plan that consists of the pool of stands, each tagged with a management prescription (e.g., regeneration harvest, re-inventory, etc.) that will be field-checked in a given year.

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

Canopy: The foliar cover in a forest stand consisting of one or several layers.

Cooperative Stand Assessment (CSA): The forest stand mapping and information system used by the Minnesota Department of Natural Resources to inventory the approximately 5 million acres (7800 sq. mi.) owned and administered by the state.

Cover Type: Expressed as the tree species having the greatest presence (i.e., in terms of volume for older stands or number of trees for younger stands) in a forest stand.

Disturbance: Any relatively discrete event that disrupts the stand structure and/or changes resource availability or the physical environment.

Dominant trees: Trees that are in the upper layer of the forest canopy.

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

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

Forest Stand: A contiguous group of trees similar in age, species composition, and structure, and growing on a site of similar quality, to be a distinguishable forest unit. A forest is comprised of many stands. A **pure stand** is composed of essentially a single species, such as a red pine plantation. A **mixed stand** is composed of a mixture of species, such as a northern hardwood stand consisting of maple, birch, basswood, and oak.

Habitat: Place where an animal or plant normally lives, often characterized by a dominant plant form or physical characteristic

High Biodiversity Sites: High biodiversity sites are sites with significant populations of federal or state-listed species; or large or high-quality examples of native plant communities; or larger areas in the ECS subsection composed of relatively undisturbed native plant communities.

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

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

Mast: Fruits or nuts used as a food source by wildlife. **Hard mast** is the fruit or nuts of trees such as oaks. **Soft mast** includes the fruits and berries of dogwood, viburnums, elderberry, grape, raspberry, and blackberry

Mesic: Moderately moist.

Native plant community: 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 units, such as an oak forest, a prairie, or a marsh, that tend to repeat across the landscape and over time. The classification of native plant communities currently used by MCBS is described in: *Minnesota's native vegetation: a key to natural communities* version 1.5. 1993. Biological Report No. 20. Minnesota Department of Natural Resources Natural Heritage Program. 111 p.

Old Growth Forests: Forests defined by age, structural characteristics, and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances, contain old trees (generally over 120 years old), large snags, and downed trees. Additional detail on the management of old growth forests on DNR-administered lands are contained in *Old Growth Guidelines (1994).*

Overstory: The tallest trees in a stand of trees.

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

Prescribed Burning: To deliberately burn wildlands (e.g., forests, prairie or savanna); in either their natural or their modified state) and under specified conditions within a predetermined area to meet management objectives for the site.

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

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

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

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

Shade tolerance: Relative ability of a tree species to reproduce and grow under shade; the capacity to withstand low light intensities due to shading by surrounding vegetation. Tolerant species are tolerant of shade, intolerant species require full sunlight.

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

Skid trail: An access route established for hauling logs from the point of harvest to a collection point.

Slope: A measure of change in surface value over distance, expressed in degrees or as a percentage (e.g., a rise of 2 feet over a distance of 100 feet describes a 2 percent slope.

Spring ephemerals: Short-lived plants that occur primarily in the spring.

Subsection: A subsection is one level within the Ecological Classification System (ECS). From largest to smallest in terms of geographic area, the ECS is comprised of the following levels: Province --> Section --> Subsection --> Land Type Association --> Land Type --> Land Type Phase. Subsections are generally 1-4 million acres in size in Minnesota, with the average being 2.25 million acres. Seventeen subsections are scheduled for the SFRMP process (see subsection map and SFRMP schedule).

Subsection Forest Resource Management Plans (SFRMP): A DNR plan for vegetation management on forest lands administered by DNR Forestry and Wildlife that uses ECS subsections as the basic unit of delineation. Initial focus will be to identify forest stands and road access needs for the duration of the seven_year plan. There is potential to be more comprehensive in the future.

Succession: The gradual supplanting of one plant community by another, e.g., a cover-type of one species gradually changing over to a different cover-type over time.

Thinning: A silvicultural treatment made to reduce the density of trees within a forest stand primarily to

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

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

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

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

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

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

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

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Whitewater Sand Savanna

Final

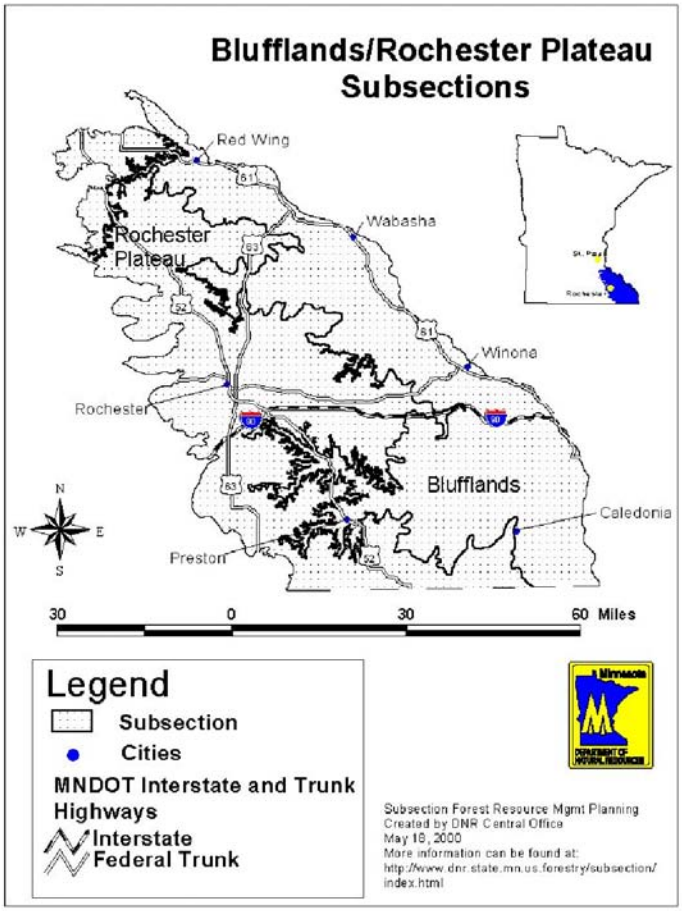
February 2006

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on state owned land in the Whitewater Sand Savanna area (Appendix 1). The Whitewater Sand Savanna Area is one of 13 MCBS sites of outstanding biodiversity on lands administered by the DNR Division of Forestry, and Section of Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended to be used in conjunction with the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every 7-years as part of an adaptive management process.



The Blufflands/Rochester Plateau SFRMP addressed management of vegetation on State Forest and Wildlife lands. There were 13 "priority areas of significant biodiversity" identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county. Of the 745 sites of biodiversity significance in the two subsections, 62 sites are contained within these thirteen priority areas. Ecological evaluations that mapped and described rare natural features were prepared by MCBS ecologists for these thirteen sites in the years 2000 through 2001. The thirteen priority areas and associated information about them are listed in Appendix 7.

Division directors for the DNR Divisions of Wildlife, Forestry, and Ecological Services determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Background & Rationale

The Minnesota Department of Natural Resources (MNDNR) completed the Minnesota County Biological Survey (MCBS), a systematic survey of the natural areas within the Whitewater Wildlife Management Area (WWMA) in the mid-nineties (Appendix 2). The results of this survey provide increased knowledge of the status and distribution of rare species and native plant communities. An ecological evaluation was written for this area in May 2000 to provide more detailed interpretation of the biodiversity significance of the area. The availability of this information and other existing data such as the WWMA Master Plan, Minnesota County Biological Survey, Cooperative Stand Assessment (CSA) forest inventory data, and the Blufflands/Rochester Plateau SFRMP provides an opportunity to develop long-term management plans for this area that will help to manage and enhance the natural resources of this area. Thoughtful

management planning in this area is of critical importance in the face of escalating development pressure in the surrounding landscape, increasing fragmentation, and global change.

Site Description

The Whitewater Sand Savanna Area can be divided into three ecological units: terrace, bluff, and floodplain (Appendix 3). This area incorporates a variety of native plant communities and the large integrated landscape provides habitat for a variety of rare species. The terrace unit exists in areas of Plainfield Sand on terraces above the Whitewater River and consists of barrens oak savanna, jack pine barrens, barrens sand prairie, small areas of white pine-hardwood forests, and dry oak forest. The bluff unit exists on the slopes above the terrace unit and the floodplain unit. This area consists of bedrock bluff prairies, oak forests, oak woodland-brushland, and small areas of mesic prairie. The floodplain unit exists along the Whitewater River and consists of floodplain forests, and small areas of wet meadows. A description of these communities and the Endangered, Threatened and Special Concern Species that occur within them will follow in the implementation section of this management plan.

The Whitewater Sand Savanna Area is one of 13 MCBS sites of outstanding biodiversity on State Wildlife and Forestry lands in southeast Minnesota and one of 4 high biodiversity sites located within the WWMA. Two boundaries delineate the areas of significance addressed by this plan and are shown on the maps in appendices 2-5. The Critical Habitat Zone boundary denotes the core area of locations of rare natural features. This area encompasses 5,975 acres (5,613 acres of State Land). The vast majority of the lands in the critical zone are part of the WWMA. This management plan, as stated above, guides management decisions and practices on only the state-owned lands within this boundary. The Project Boundary is12,797 acres (11,015 acres of State Land) and refers to a larger area that would allow for additional habitat and buffering. Here too, not all lands are state-owned and the plan only focuses on state lands. There may be opportunities however, for partnering with private landowners to protect and manage the unique resources in the area. Conservation easements, cost-share programs to establish permanent cover and management agreements might be pursued.

Long Range Vegetation Management Goals

The long-range management goal for the area is to manage and enhance native plant communities and the plant and animal species that reside in this area using processes that mimic the disturbances processes that helped to establish and maintain these communities. This plan will meld the goals of biodiversity protection, game species management, and recreation into an adaptive management process. Management goals and recommendations will be based on current management knowledge and be directed by Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. These recommendations may change as more information from research and monitoring becomes available.

Implementation

This section is organized by ecological unit and then by major native plant community types that occur in the area. Management objective**s** are identified for each community type within the ecological unit. Short-term management directives are also identified for most of the community types and include management activities that will take place over the next seven years. This plan will be reviewed as part of an adaptive management process during the Blufflands/Rochester Plateau SFRMP process every seven years.

The Whitewater Sand Savanna Area has a variety of rare species and community types (Appendix 6). Management in these areas will be performed in a manner that mimics natural disturbance processes and

is sensitive to the maintenance of the native plant communities and the species found within these communities. The Whitewater Sand Savanna landscape is a mix of closed canopy upland and lowland forest, and open savanna and prairie communities. The goal for this area is to maintain the mix of community types providing a variety of habitat for numerous rare species. Any logging used in the management of these areas will be designed to mimic natural disturbance process and will be performed in a way that minimizes soil compaction and damage to the understory species. Management will be performed using existing road and trail systems and the construction of new roads will be kept to a minimum.

The majority of the Whitewater Sand Savanna Area is a mix of oak forest, oak woodland-brushland, jack pine barrens, and dry oak savanna. Areas will continue to be burned with an emphasis on enlarging the burn area to encourage expansion of the oak savanna in the dryer oak brushland and oak forest communities-particularly those areas of Plainfield Sand soils. This management will focus on three areas, two of which are adjacent to occupied Karner blue butterfly habitat (Historic and Cuthrell Valleys as identified under the Karner blue management plan written by Cynthia Lane (1994)). The third is located in Section 1, Whitewater Township (Lupine Valley). Management will include, selective cutting and girdling of trees, herbicide application to create patchy openings, firewood sales, as well as prescribed fire. Turkey Valley and Fabel Ravine will be considered for future savanna restoration work since active management within occupied Karner Blue sites may be limited due to their Federally Endangered Status. Management techniques will be designed to mimic natural disturbances such as blow downs, diseases native to the area, and fire. Non-game wildlife and area wildlife managers currently cooperatively manage much of this area. Management of this area is largely based on recommendations outlined by Cynthia Lane (1998). Approximately 500 acres of the Sand Savanna area, located just northeast of the old town site of Beaver, is a SNA Natural Registry Site (Appendix 4). Habitat Management will continue to follow a Memorandum of Understanding providing input and considerations from SNA personnel (Appendix 8).

Terrace Unit

Occupies an area from the bluffs to the floodplain of the Whitewater River below. This unit includes the jack pine barrens, barrens oak savanna, barrens sand prairie, and white pine hardwood forest community types. The oak barrens, prairie, and jack pine barrens communities provide habitat for numerous rare species. The endangered Karner blue (*Lycaeides melissa samuelis)* and persius dusky wing *(Erynnis persius)* butterflies require the sand savanna habitat and lupine *(Lupinis perennis)* that occurs within this disturbance dependant habitat. The barrens also provide nesting habitat for the state-listed Blanding's turtle *(Emydoidea blandingii*). Seven listed plants occur in the barrens including the endangered rough-seeded flameflower *(Talinum rugospermum)* and the threatened fernleaf false foxglove *(Aureolaria pedicularia).* The white pine-hardwood upland forest provides important habitat for three special concern species (acadian flycatcher *(Empidonax virescens),* cerulean warbler *(Dendroica cerulea),* and red-shouldered hawk *(Buteo lineatus)*) that require forest interior habitat.

Jack Pine Barrens

Description - This area represents the largest jack pine barrens in southeast Minnesota. These communities have a canopy cover of 10-70% and jack pine (Pinus banksiana) is the dominate tree species. The shrub layer is typically patchy and the ground layer is dominated by dry prairie species. A number of steep open sand prairies occur within the jack pine barrens community. Jack pine barrens are located adjacent to an occupied Karner blue butterfly site (Historic) in Section 14, T108N R10W. The butterflies are located in a small barrens dry prairie within the jack pine barrens. Exotic species including Tartarian honeysuckle and buckthorn have moved into this area. And, white-tailed deer have greatly reduced jack pine seedling survival due to browsing. Management activities that open the habitat and encourage the reproduction of Jack Pine are on going in this area.

Long-term objective - The management goal for this area is to enhance the jack pine barrens communities in the area while being sensitive to the Karner blue butterfly population. Management activities that open the habitat and encourage the reproduction of Jack Pine are on going in this area and should continue. Current work to expand Karner blue butterfly habitat will continue with creating a patchwork of open savanna adjacent to the occupied areas. Management treatments may include, commercial firewood sales or other timber sales, girdling and herbicide application, scarification, and prescribed burning.

Short-term management directive - Continue the current management through the use of prescribed fire on habitat adjacent to wetlands, mesic prairies, bluff prairies, and barren oak savanna with reference to both the Natural Heritage Registry agreement and the recommendations of the Karner Blue Recovery Plan. Continue management to maintain and enhance the oak savanna habitat and Jack Pine Barrens based on current management practices and Karner Blue butterfly recovery plan in the areas identified in this plan. This will include selective cutting, girdling and chemical application to create a patchy habitat. Expand Karner blue habitat work into the jack pine barrens community to eliminate competing oak and release jack pine. Conduct a large scale prescribed burn throughout the entire Natural Heritage Registry site excluding the occupied Karner blue butterfly site within four years.

Dry prairie (barrens subtype)

Description - These communities occur scattered with in the jack pine barrens and barrens oak savanna communities on very steep slopes, that are somewhat different from the surrounding savanna areas. The dominant grass species in these communities typically include: little bluestem *(Schizachyrium scoparium),* big bluestem *(Andropogon gerardii),* and Junegrass *(Koeleria macrantha).* The common forb species include: horsemint *(Monarda punctata),* wild lupine *(Lupinus perennis),* tall wormwood *(Artemisai campestris),* and Hairy puccoon *(Lithospermum caroliniense).* The federally endangered Karner blue butterfly is located in small patches of these prairies within the jack pine barrens.

Long-term management objective - The management goal for this area is to enhance the dry prairie communities in the area while being sensitive to the Karner blue butterfly population. Management activities that open the habitat are on going in this area and should continue. Current work to expand Karner blue butterfly habitat will continue with creating a patchwork of open savanna adjacent to the occupied areas.

Short-term management directive - Continue the current management through the use of prescribed fire and brush removal with reference to both the Natural Heritage Registry agreement and the recommendations of the Karner Blue Recovery Plan. Continue management to maintain and enhance the oak savanna habitat based on current management practices and Karner Blue butterfly recovery plan in the areas identified in this plan.

Barrens oak savanna

Description - Barren oak savanna occur on Plainfield Sand on river terraces. The canopy cover is 10-70% and dominated by black oak (*Quercus velutina).* Other canopy trees can include northern pin oak, paper birch *(Betula papyrifera),* and black cherry *(Prunus serotina).* The shrub layer is patchy to dense and dry prairie grasses and forbs dominate the ground layer.

Long-term management objective - Barrens oak savannas will be managed to encourage regeneration of the savanna community and current work to expand Karner Blue butterfly habitat will continue with creating a patchwork of open savanna adjacent to the occupied areas. Management treatments might include, commercial firewood and other timber sales, girdling and herbicide application, scarification, and prescribed burning. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species.

Short-term management directive - Continue the current management through the use of prescribed fire and brush removal with reference to both the Natural Heritage Registry agreement and the recommendations of the Karner Blue Recovery Plan. Continue management to maintain and enhance the oak savanna habitat based on current management practices and Karner Blue butterfly recovery plan in the areas identified in this plan.

White Pine-Hardwood Forest (mesic subtype)

Description - White pine-hardwood forest communities are located on Plainfield Sand in the Southern portion of the project area on cool, shady, north facing slopes. White pine *(Pinus strobus)* typically forms 20-80% of the canopy cover and sugar maple *(Acer saccharum*) is a co-dominant canopy species. Plants with fundamentally northern affinity occur in this community.

Long-term management objective - The management goal is to maintain the White Pine-Hardwood Forest plant community. These areas do not naturally experience frequent or intense disturbance patterns and should be maintained naturally with out disturbance. Any management in this area should be conducted in a manner that is sensitive to the needs for the community as a whole, including the forest interior birds that breed in this area.

Short-term management directive - Manage these areas in a fashion compatible with the long-term objectives stated above. Conduct field inventories in these communities to determine amount of advanced regeneration. Consider and initiate management techniques including prescribed burning to encourage white pine regeneration on these sites.

Bluff Unit

This area occupies the steep bluffs and the tops of the bluffs. This area includes bedrock bluff prairie, oak forest, mesic prairie, and oak woodland-brushland native plant communities. Twelve rare species occupy this unit and a number of rare animal species, including timber rattlesnakes *(Crotalus horridus)* a state threatened species, also utilize the barrens community and travel through various bluff habitats. Mesic prairies in this area contain populations of plains wild indigo *(Baptisia bracteata* var. *leucophaea)* and rattlesnake master *(Eryngium yuccifolium)*- two state listed species. Bluff prairies include five listed species including plains wild indigo *(Baptisia bracteata* var. *leucophaea),* valerian *(Valeriana edulis),* and the only known occurrence of prairie moon wort *(Botrychium campestre)* in southeast Minnesota. Three listed butterflies use a variety of prairie habitats in this bluff unit. Prairie voles *(Microtus ochrogaster)* were recorded in a bluff prairie in the bluff unit. The upland oak forest in the bluff unit provides important habitat for three special concern species that require forest interior habitat: acadian flycatcher *(Empidonax virescens),* cerulean warbler *(Dendroica cerulea),* and red-shouldered hawk *(Buteo lineatus)*. The upland oak forest is also valuable to a number of other game and non-game species on the wildlife area. White-tailed deer, ruffed grouse, wood ducks and turkeys rely heavily upon mast produced in oak forests. Young oak forest is especially important to ruffed grouse and wood-cock and successful regeneration of oak by such practices as prescribed burning or timber harvest on Wildlife areas in southeast Minnesota is of high priority.

Oak forest (dry subtype)

Description - Oak forest (dry subtype) often occur on south-to-west-facing slopes with a canopy dominated by northern pin oak *(Quercus ellipsoidalis),* and/or bur oak *(Quercus macrocarpa).*

Long-term management objective - In most cases, dry oak forests will be managed to encourage regeneration of the oak forest communities through controlled burning and, where necessary to open up

canopies, carefully planned logging. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species.

Short term management directive - Stand 6, Section 2, T107N R10W will be managed according to the Long-term management objective above considering management techniques such as group selection harvest and prescribed burning (Appendix 5).

Oak woodland-brushland

Description - The canopy cover is 50-70% and dominated by one or more oak species including northern pin oak *(Quercus ellipsoidalis),* and/or bur oak *(Quercus macrocarpa)*. Other canopy trees may include paper birch *(Betula papyrifera),* red oak *(Quercus rubra)* red cedar *(Juniperus virginiana),* and shagbark hickory *(Carya ovata)*. These areas exhibit a denser shrub layer and canopy cover than the oak savanna, but the understory is a mix of species found in savannas and forests.

Long-term management objective - Oak woodland-brushlands will be managed to encourage regeneration of the savanna communities through controlled burning and, where necessary to open up canopies, carefully planned logging. Many of these areas have been disturbed by past grazing and have dense understories of prickly ash and other native shrubs that follow grazing. A management goal is to reduce these invasive shrubs. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species.

Short-term management directive - Continue to manage these areas with the use of fire and brush removal to encourage the regeneration of the savanna communities.

Oak forest (mesic subtype)

Description - These forests generally occur on north-to east facing slopes. Dominant canopy species include one or more oak species including red oak *(Quercus rubra),* bur oak *(Quercus macrocarpa),* and white oak *(Quercus alba).* Other canopy species may include basswood *(Tilia americana),* black cherry *(Prunus serotina),* and butternut *(Juglans cinerea).* Subcanopy species can include sugar maple *(Acer saccharum),* basswood *(Tilia americana),* and ironwood *(Ostrya virginiana).*

Long-term management objective - Many of the high quality mesic oak forests are succeeding to more mixed hardwood communities and eventually will succeed to a maple-basswood community. These areas contain red and white oak, basswood, cherry aspen and other hardwood species in the canopy. Those areas with a preponderance of maple/basswood and northern hardwood regeneration will be allowed to succeed to maple/basswood forests. Consultation with Ecological Services personnel will then need to be made to determine if/when future timber harvests are desirable to manage for a diverse age class within these stands.

Those stands that have a high component of oak and other shade intolerant regeneration (central hardwoods as identified in the CSA) will be managed to augment the oak component. Some of these stands are threatened by invasion of nonnative species such as buckthorn and honeysuckle. Management options might include prescribed fire, timber harvest, supplemental planting of oak both pre- and post-harvest, and post-sale treatment efforts. Prescribed fire in adjacent communities of barrens oak savannas, oak forest-dry subtype, oak woodland-brushlands, or dry prairies may be allowed to carry into the mesic oak type as part of larger landscape burns to take advantage of natural firebreaks. Areas that are in valleys managed for the karner blue recovery project will be managed according to the goals of this project.

The high quality mesic oak forest communities located at the upper ends of valleys are important forest interior habitat to rare species such as Acadian flycatcher (Empidonax virescens), cerulean warbler

(Dendroica cerulea), and red-shouldered hawk (Buteo lineatus); these areas will be allowed to succeed without intensive management. Portions of stands that fall outside these "interior" areas then, may be managed differently as outlined above.

Short-term management directive - These areas will be managed in a fashion that is compatible with the long-term objectives stated above. Appendix 5 lists stands that may have some form of vegetation management applied to them during the next seven (7) years. Oak and lowland hardwoods make up the majority of stands listed. Vegetation management could include: prescribed burning, partial cutting, shelterwood or group selection and/or clearcutting to regenerate oak. Acreages listed in Appendix 5 do not necessarily mean that vegetation management will occur on any or the entire stand. Field visits to determine need of management action; desirability of action, or site level prescription will be determined at that time.

Mesic Prairies

Description - These prairies occur at the tops of slopes. Dominant species in these prairies include big bluestem (*Andropogon gerardii),* Indian grass *(Sorghastrum nutans),* gray headed coneflower *(Ratibida pinnata),* stiff goldenrod *(Solidago rigida),* white prairie clover *(Petalostemon candidum),* wild bergamot *(Monarda fistulosa),* and heart-leaved alexanders *(Zizia aptera).*

Long-term management objective - These areas will be maintained with fire and brush cutting to control woody competition. Management in the mesic prairie located in the southern end of the project area has included selective girdling and herbicide application to elms.

Short-term management directive - Continue the current management through the use of prescribed fire on habitat adjacent to wetlands, mesic prairies, bluff prairies, and barren oak savanna.

Bedrock bluff prairie

Description - These prairies occur on thin loess over bedrock on steep south-to west-facing bluffs with frequent rock outcrops. Dominant species in these prairies can include little bluestem *(Schizachyrium scoparium),* big bluestem (*Andropogon gerardii),* Indian grass *(Sorghastrum nutans),* side-oats grama *(Bouteloua curtipendula),* procupine grass *(Stipa spartea),* prairie dropseed *(Sporobolus heterolepis),* plains muhly *(Muhlenberia cuspidata),* birdfoot coreopsis (*Coreopsis palmata),* gray goldenrod *(Solidago nemoralis),* silky aster *(Aster sericeus),* and leadplant *(Amorpha canescens).*

Long-term management objective - These areas will be maintained with periodic fire and brush cutting to control woody competition.

Short-term management directive - Continue the current management through the use of prescribed fire on habitat adjacent to wetlands, mesic prairies, bluff prairies, and barren oak savanna.

Floodplain Unit

Occupies the seasonally flooded river bottoms of the Whitewater River. Though the floodplain unit is highly disturbed by past cultivation and invasion of reed canary grass *(Phalaris arundinacea),* it provides habitat for eight rare animal species. The floodplain unit includes small patches of floodplain forests and wet meadows. Three listed species including acadian flycatcher *(Empidonax virescens),* cerulean warbler *(Dendroica cerulea),* and red-shouldered hawk *(Buteo lineatus)* require forest interior habitat and use both the floodplain forest and the adjacent upland forest communities. Healthy populations of pickerel frogs *(Rana palustris)* are found in ponds and wet, shrubby floodplains in the unit. The American brook lamprey *(Lampetra appendix)* inhabits portions of the Whitewater River in this area.

Floodplain Forest

Description - These forests occur on alluvium on seasonally flooded river bottoms. The dominant canopy species can include a combination of silver maple *(Acer saccharinum),* cottonwood *(Populus deltoides),* and black willow *(Salix nigra).* Other canopy trees can include green ash *(Fraxinus pennsylvanica),* bur oak *(Quercus macrocarpa),* river birch *(Betula nigra),* American elm *(Ulmus americana),* and slippery elm *(Ulmus rubra).*

Long-term management objective - The floodplain forest in the Whitewater Sand Savanna are fairly degraded and the goal for these areas will be managed to restore a diverse floodplain forest community type and to encourage the continued existence of the forest interior bird species that currently occupy these areas. At present these forests are relatively low in diversity, as most are young forests that regenerated following agricultural use. Areas that are not threatened by reed canary grass and are regenerating the overstory species such as cottonwood and silver maple will be maintained with minimal management. Areas of floodplain forest that are dominated by reed canary grass will be managed to minimize this risk. Areas that are regenerating box elder as the major understory species will be managed to encourage the regeneration of overstory species such as cottonwood and silver maple and decrease the dominance of box elder.

Short-term management directive – Appendix 5 lists stands that may have some form of vegetation management applied to them during the next seven (7) years. Oak and lowland hardwoods make up the majority of stands listed. Vegetation management could include: prescribed burning, partial cutting, shelterwood or group selection and/or clearcutting to regenerate oak. Acreages listed in Appendix 5 do not necessarily mean that vegetation management will occur on any or the entire stand. Field visits to determine need of management action; desirability of action, or site level prescription will be determined at that time.

Based on the condition of seedling regeneration, stands 5,6, Section 3, T107N R10W; stands 3,4,5, Section 10, T107N R10W; and stands 12, Section 34; stand 14, Section 35, of T108N R10W (as identified in the CSA database) of Floodplain Forest will be managed to remove the dominant box elder canopy and regenerate the area to a diverse floodplain forest community. Practices might include commercial timber harvest, direct seeding, scarification with bull-dozer to remove undesirable competition (i.e., reed canary grass) or tree planting. A portion of Stand 12, SWSW Section 11, T108N R10W that is currently in agriculture will be direct seeded to diverse lowland hardwoods (Appendix 5).

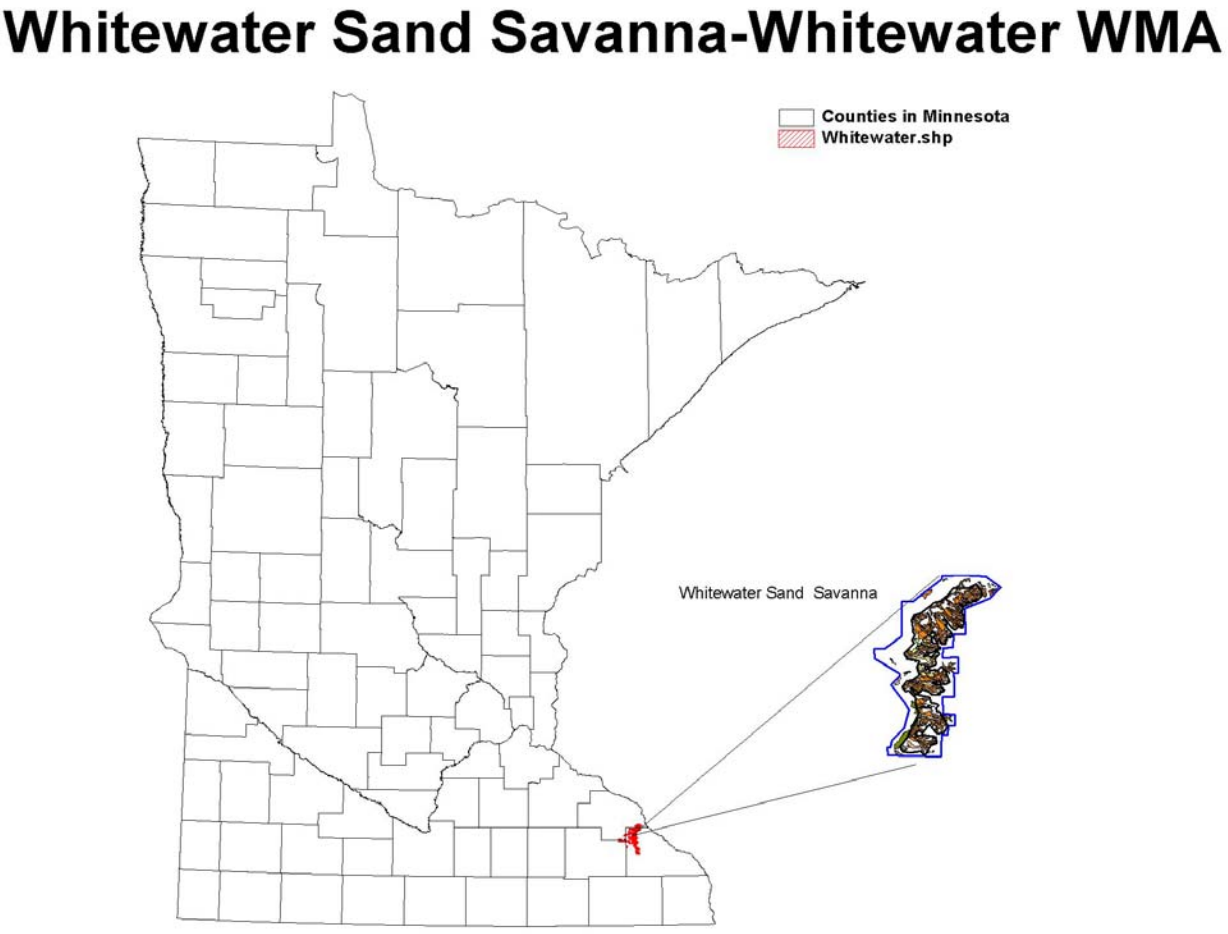
Wet meadow

Description - Open wetlands occurring as dense mats of floating vegetation in old channels of the river. Dominant species include lake sedge *(Carex lacustris),* tussock sedge *(Carex stricta),* bristly sedge *(Carex comosa),* spotted joe-pye weed *(Eupatorium maculatum),* and Labrador bedstraw *(Galium labradoricum).*

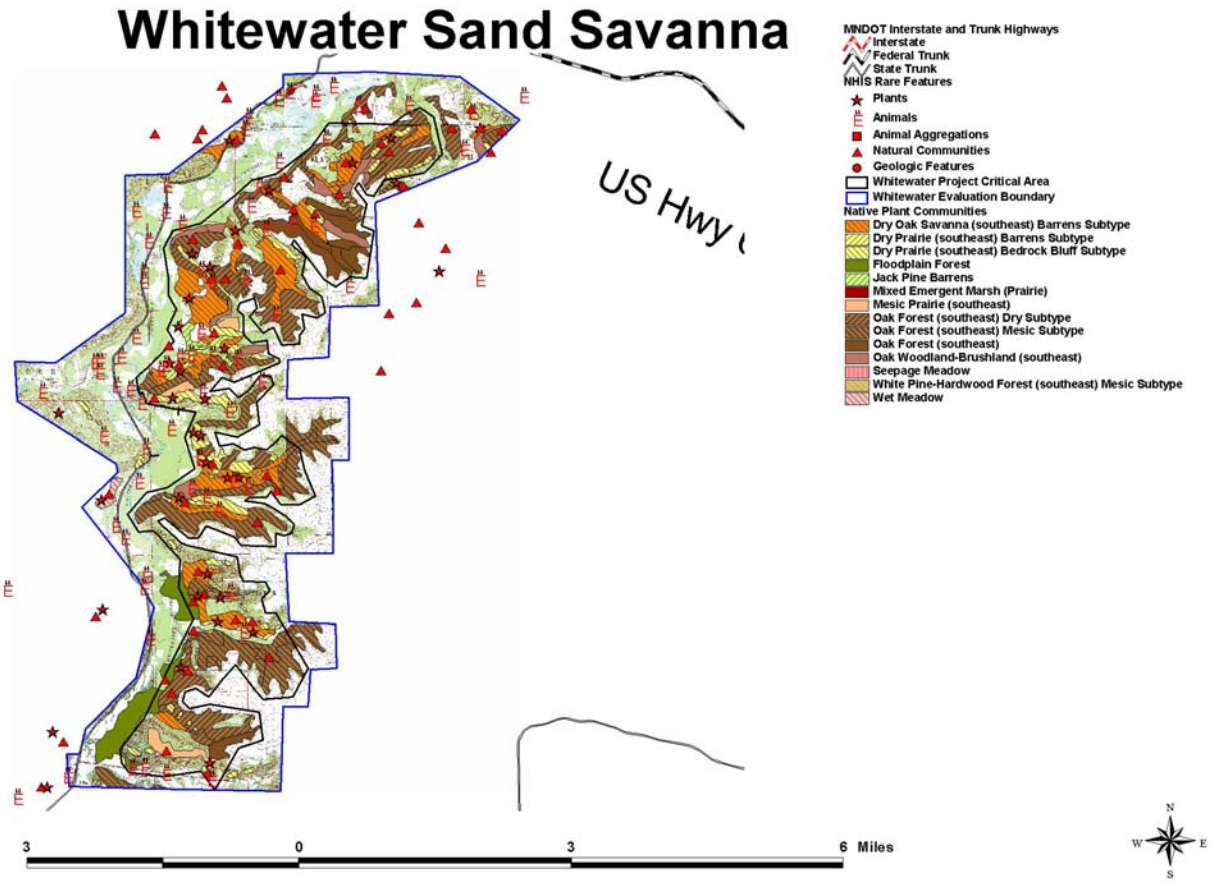
Long-term management objective - These areas will be managed to maintain the wet meadow community. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species.

Short-term management directive - Continue to manage this area in a way that helps to maintain the wet meadow community.

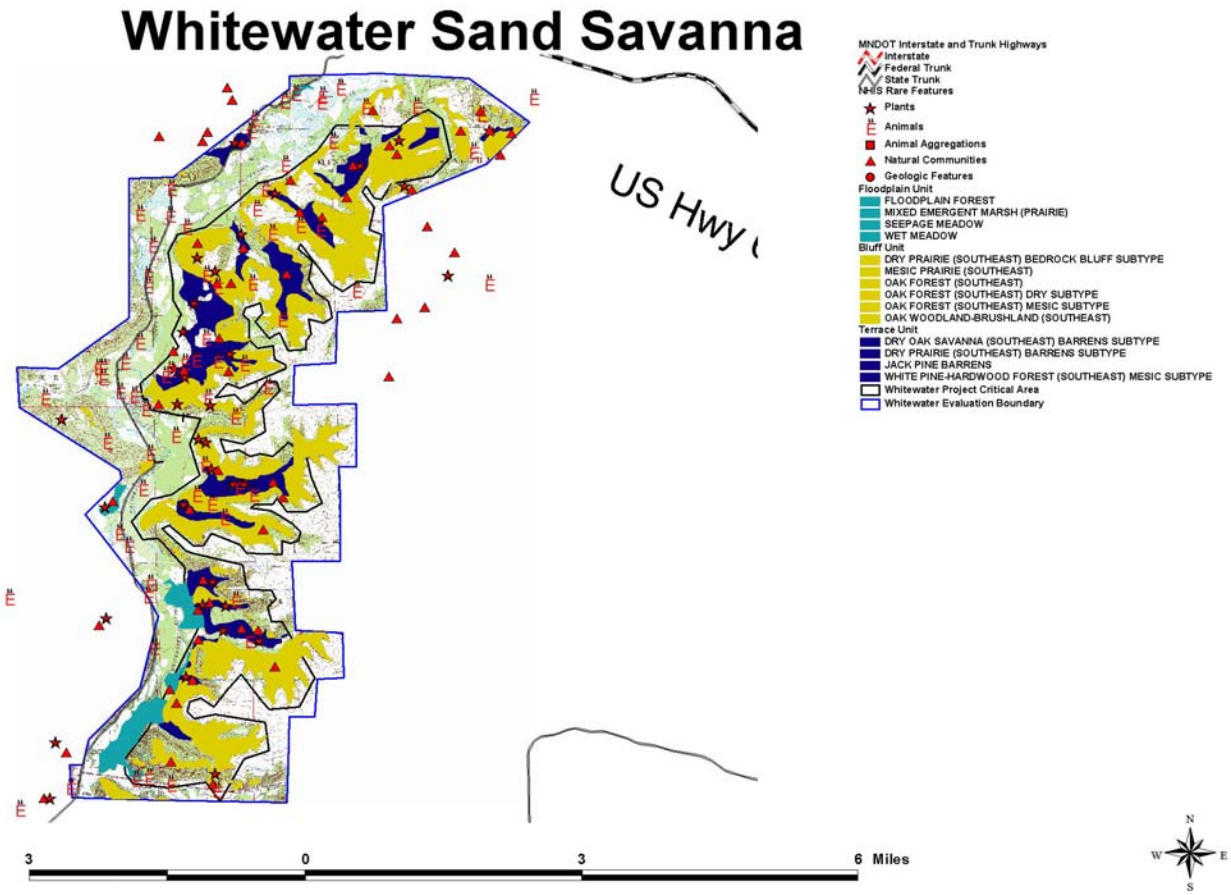
Appendix 1: Whitewater Sand Savanna Project Area Location



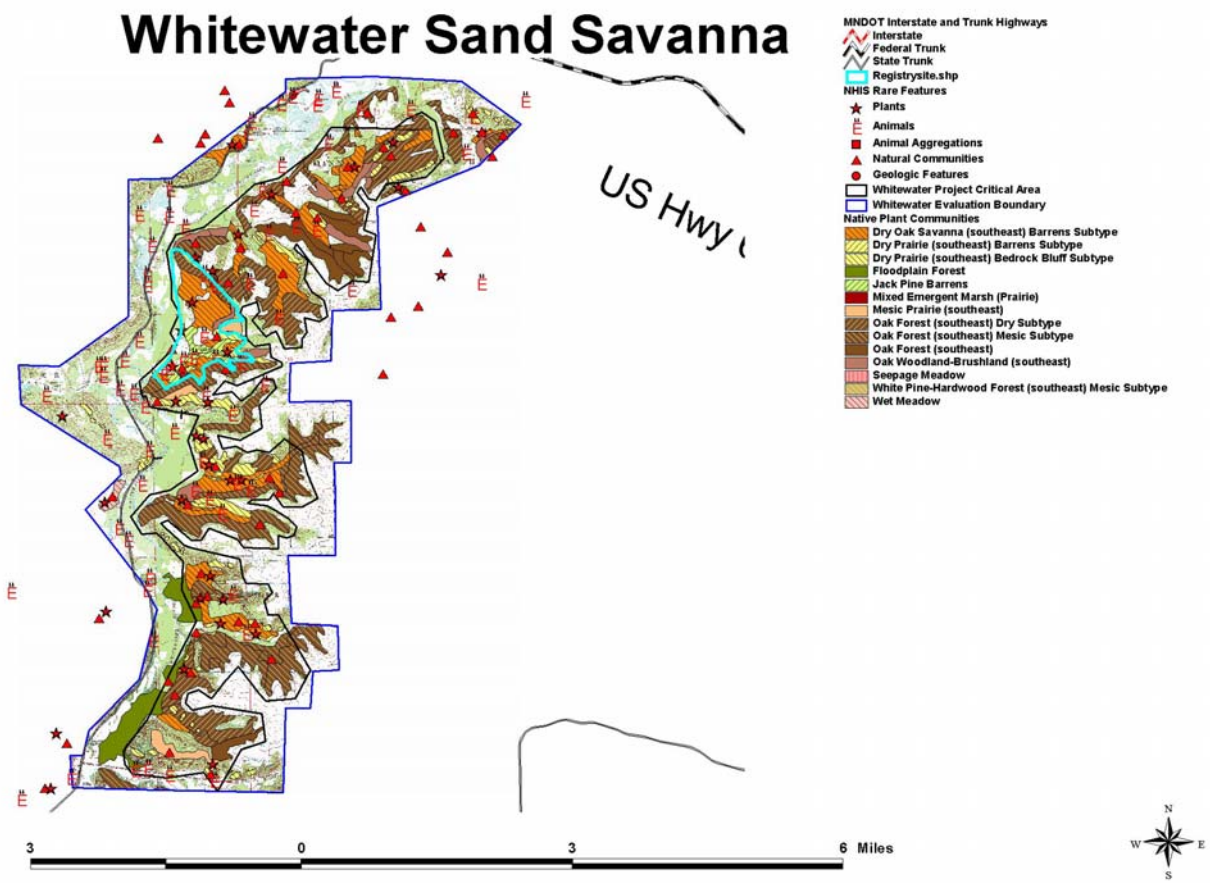
Appendix 2: Native Plant Communities & Rare Elements



Appendix 3: Terrace, Bluff, and Floodplain Units



Appendix 4: Registry Site



Appendix 5: Stands Selected for Management Review

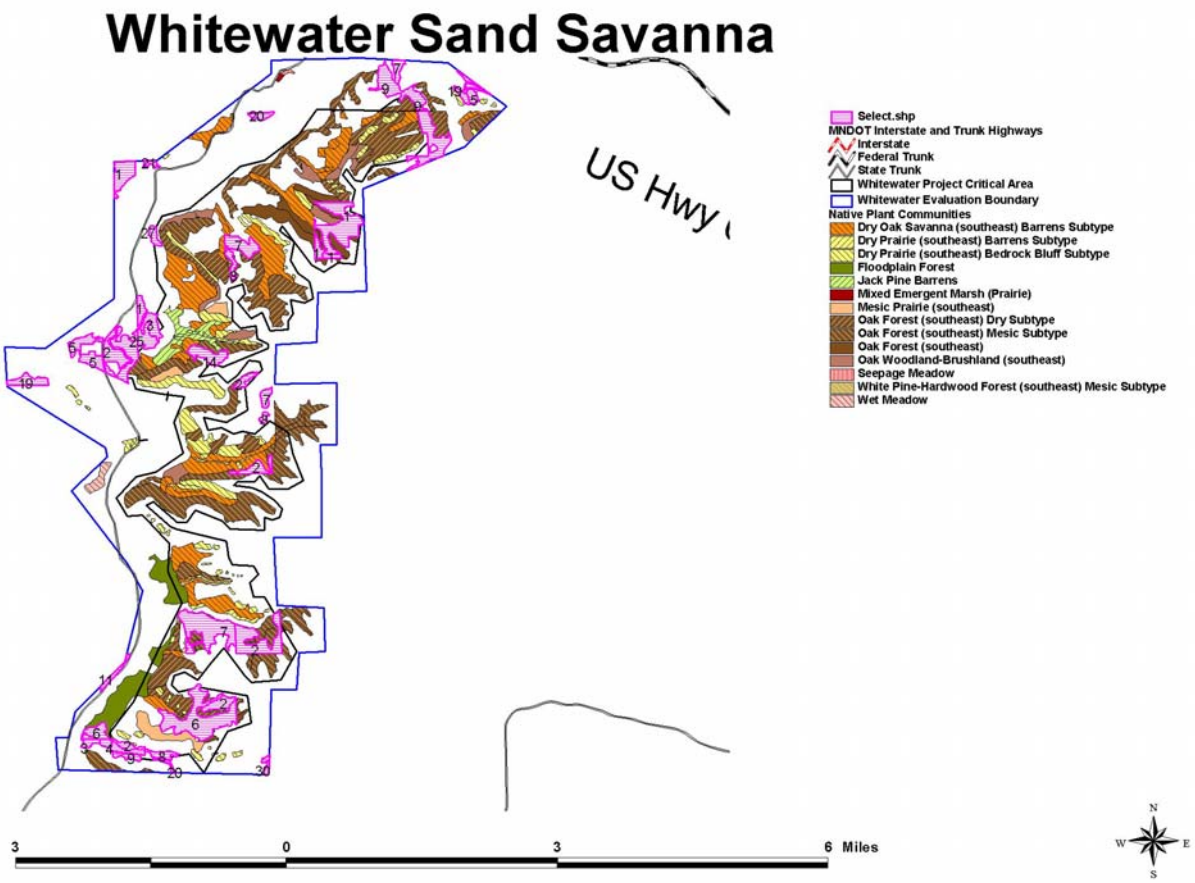


Table 1. Stands listed as potential candidates for vegetation management during next 7 years.

Township	Range	Section	Stand #	CSA Type[1]	Natural Community	Acreage [2]
107	**10**	2	2	NP	*	21
		2	6	Oak	Oak Dry	131
		3	5	LH	Floodplain Forest	4
		3	6	LH	Floodplain Forest	21
		3	11	Red Cedar	*	22
		10	2	LH	Floodplain Forest	10
		10	3	LH	Floodplain Forest	8

[1] CSA Types: NP=Norway pine; RP=Red Pine; WP=White Pine; LH=Lowland Hardwood; CH=Central Hardwood
[2] Acreage of Stands – Vegetation management will not necessarily be conducted on entire stand.

		10	4	LH	Floodplain Forest	14
		10	5	LH	Floodplain Forest	6
		10	9	LH	*	10
		11	8	LH	*	13
		11	20	LH	*	32
		12	30	Oak	*	114
		12	31	LH	*	22
108	**9**	5	4	LH	*	82
		7	1	Oak	Oak SE	105
		7	2	Oak	Oak SE	7
108	**10**	1	20	Willow	*	10
		2	21	LH	Oak Brush	19
		3	1	Oak	Oak Brush	268
		11	27	Walnut	*	11
		12	7	Oak	Oak Dry	35
		12	8	Birch	Oak Dry	11
		13	2	Oak	Mesic Oak	11
		14	1	LH	*	14
		14	3	LH	*	23
		14	14	Oak	Mesic Oak	33
		14	25	LH	*	25
		15	2	LH	*	38
		15	3	LH	*	49
108	**10**	16	19	Oak	*	26
		24	2	Oak	Mesic Oak	22
		24	7	RP	*	12
		24	8	WP	*	5
		35	7	Oak	Mesic Oak	101
		36	2	Oak	Mesic Oak	72
109	**9**	31	7	LH	*	14
		31	9	LH	*	61
		32	1	WP	*	8
		32	4	Oak	*	30
		32	5	Ash	Dry Prairie	9
		32	19	CH	Dry Prairie	9

* Type not mapped as native plant community in Project Boundary

Appendix 6: Rare Features Summary – Sand Savanna Area

Native Plant Communities	**EO-Rank[1]**
Dry oak savanna (Southeast Section) barrens subtype	**C**
Dry Prairie (Southeast Section) Bedrock Bluff Subtype	A, **B, C**
Mesic prairie	**BC, CD**
Jack pine barrens	**BC**
Oak Forest (Southeast section) Dry subtype	B, **BC**
Oak Woodland-brushland (Southeast Section)	**C**
Oak Forest (Southeast Section) Mesic Subtype	**B, C**
Floodplain forest	**CD**
White Pine-Hardwood Forest (Southeast Section) Mesic subtype	A**B**
Wet Meadow	C

Rare Plants	**Status**
Talinum rugospermum (rough-seeded fameflower)-18	**E**
Aureolaria pedicularia (fernleaf false foxglove)-1	**THR**
Valeriana edulis var. *ciliate* (valerian)-30	**THR**
Arisitida tuberculosa (sear-beach needlegrass)-10	**SPC**
Asclepias amplexicaulis (clasping milkweed)-28	**SPC**
Baptisia bracteata v. *leucophaea* (Plains wild indigo)—46	**SPC**
Botrychium campestre (prairie moonwort)-1	**SPC**
Cirsium hillii (Hill's thistle)-19	**SPC**
Eryngium yuccifolium (rattlesnake-master)-17	**SPC**
Hudsonia tomentosa (Beach-heather)-6	**SPC**
Orobanche uniflora (one-flowered broomrape)-5	**SPC**
Solidago sciaphila (Cliff Goldenrod)-84	**SPC**
Tephrosia virginiana (goat's rue)-36	**SPC**
Helianthemum canadense (Canada frostweed)-17	**NON**
Hieracium longipilum (long-bearded hawkweed)-18	**NON**
Linaria Canadensis (old filed toadflax)-10	**NON**
Liparis lilifolia (lilia-leaved twayblade)-28	**NON**
Oxypolis rigidior (cowbane)-8	**NON**

Lichens	**Status**
Buellia nigra –1	**E**

Rare Animals	**Status**
Ammodramus henslowii (Henslow's sparrow)-8	**E**
Crotalus horridus (Timber Rattlesnake)-2	**THR**
Emydoidea blandingii (Blanding's turtle)-47	**THR**
Buteo lineatus (red-shouldered hawk)-8	**SPC**
Coluber constricto (racer)-27	**SPC**
Dendroica cerulean (Cerulean warbler)-56	**SPC**
Empidonac virescens (Acadian flycatcher)-35	**SPC**
Haliaeetus leucocephalus (bald eagle)-63	**SPC**
Gallinula chloropus (common moorhen)-13	**SPC**
Microtus ochrogaster (prairie vole)- 6	**SPC**
Pituophis catenifer (gopher snake)-30	**SPC**
Elaphe vulpine (Fox snake)-73	**NON**
Grus Canadensis (sandhill crane)-9	**NON**
Heterodon platirhinos (eastern hognose snake)-15	**NON**
Lampropeltis triangulum (milk snake)-68	**NON**
Rana palustris (pickerel frog)-57	**NON**
Vireo bellii (Bell's vireo)-9	**NON**

Fish	**Status**
Lampetra appendix (American brook lamprey)-86	**NON**

Jumping spiders	**Status**
Metaphidippus arizonensis-3	**SPC**
Sassacus papenhoei-1	**SPC**

Butterflies	**Status**
Erynnis persius (persius dusky wing)-1	**E**
Lycaeides Melissa samuelis (Karner blue)-5	**E**
Hesperia ottoe (ottoe skipper)-7	**THR**
Atrytone arogos (arogos skipper)-1	**SPC**
Speyeria idalia (regal fritillary)-4	**SPC**

Key:

[1] ecological quality rank where A=highest quality and D=lowest quality (multiple ranks indicate multiple occurrences)
[2] number following rare species listing refers to number of occurrences recorded in the area

Appendix 7. Areas of Significant Biodiversity in the Paleozoic Plateau

The Minnesota County Biological Survey identified 745 sites of biodiversity significance in the Paleozoic Plateau Ecological Section (Blufflands and Rochester Plateau Subsections). The breakdown of sites, their biodiversity significance rankings, and the number of sites of each ranking that contain state lands administered by various DNR divisions is summarized in the following table:

Table 1. MCBS Sites in the Paleozoic Plateau

Biodiversity Significance	**Total Number of MCBS Sites**	**Percent of Total**	**Number of MCBS Sites Containing State Lands**	**Number of MCBS Sites Containing State Forest Lands**	**Number of MCBS Sites Containing State Wildlife Lands**	**Number of MCBS Sites Containing State Park Lands**	**Number of MCBS Sites Containing SNA Lands**
Outstanding	121	16	65	40	22	8	11
High	187	25	91	51	21	8	14
Moderate	437	59	159	95	23	8	2
Total	**745**	**100**	**315**	**186**	**66**	**24**	**27**

For DNR managed state lands in Minnesota, strategies for managing sites of biodiversity significance differ according to the degree of biodiversity significance, statutory restrictions on land designations, and conservation needs of species and communities within the sites. In Scientific and Natural Areas (SNAs), management is done with rare natural features protection as the highest priority. For State Parks, comprehensive planning processes address protection of biodiversity, and in some cases SNAs or Natural Areas Registry sites are designated within park boundaries. [Natural Areas Registry sites are areas of biodiversity significance on public lands, for which a memorandum of understanding (MOU) has been signed by the agency or DNR division that manages the site and by the SNA Program supervisor. This MOU contains information about the management and protection needs of the rare features in the site.] For Wildlife Management Areas (WMAs), state statutes prohibit SNA designation within WMAs. Management is addressed as part of the Subsection Forest Resource Management Planning (SFRMP) process, and in some cases Natural Areas Registry sites are designated within WMA boundaries. For State Forests, management is addressed as part of the SFRMP process, and in some cases SNAs or Natural Areas Registry sites are designated within State Forest boundaries.

The SFRMP process for the Paleozoic Plateau addressed management of vegetation on State Forest and Wildlife lands. There were 13 “priority areas of significant biodiversity” identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county.

Appendix 8: MOU for Registry Site

Memorandum of Understanding
For Inclusion of Portions of Sections 11 and 14
of Whitewater Wildlife Management Area
of the Minnesota Natural Heritage Register

The Minnesota Natural Heritage Register recognizes tracts of public land that contain natural features of statewide ecological significance and honors those agencies and individuals that manage these lands to protect and perpetuate the features of interest. Many of Minnesota's finest natural areas occur on public lands. Through careful management of these lands it is possible to preserves and protect a cross section of the rich natural diversity of Minnesota.

This memorandum describes those ecologically significant features that occur within the boundaries of the Whitewater Wildlife Management Area. A map showing the location of the feature(s) and any other information on the occurrence is attached. Included are comments on the appropriate management of the feature and surrounding land to insure the perpetuation of the feature.

The recently developed DNR policy for wildlife management areas recognizes the importance of areas containing these special features. Uncommon species and plant communities of concern are noted as factors that are considered in the management of state wildlife areas. This agreement recognizes specific parcels within wildlife management areas harboring important natural features and establishes management guidelines that will protect and if possible enhance the features.s

Natural Features of Interest

The registered area of Whitewater WMA consists of portions of sections 11 and 14 described on the map including most of southcentral section 11 and northern section 14. These sections contain a variety of plant and animal species considered rare in Minnesota and listed on the state endangered, threatened and special concern list. The rare plant species include: Talinum rugospermum (rough-seeded fameflower), Desmodium illinoense (tick-trefoil sp.), Tephrosia virginiana (goat's rue), Asclepias amplexicaulis (clasping milkweed) and Aristida tuberculosa (sea-beach needlegrass). Three additional plant species are on the Natural Heritage Program unofficial watch list. These species are: Hieracium longipilum (long-beared hawkweed), Heliathemum canadense (Canadian frostweed) and Linaria Canadensis (old-field toadflax. The rare animal species include: Hesperia ottoe (ottoe skipper butterfly), Plebejus melissa samuelis (karner blue butterfly), Sassacus pappenhoei (a species of jumping spider) and Phiddippus apacheanus (a species of jumping spider). Also occurring in this portions of Whitewater Wildlife Management Area are five ecologically significant plant communities including two excellent examples of bluff (goat) praire, a sand dune prairie and an oak savanna. The oak savanna and dune communities are of particularly high quality. The fifth significant occurrence is a southern outlier population of native jack pine. All but the last of these plant communities are considered threatened in the state. For further details on any of the mentioned elements, refer to enclosed status sheets.

Management Guidelines

Beyond the first steps of recognizing the significance of the features mentioned above and knowledge of their exact occurrence, the adaptation of management guidelines that will perpetuate and promote natural processes at this site is very important. The registered area of Whitewater Wildlife Management Area has prairie and forested regions.

As has been well documented, prairies are ecologically adapted to fire. Prescribed burning is the best method for controlling or reducing noxious weeds while maintaining native prairie species. Prescribed burning is recommended for the sand dune prairie and goat prairie. We urge that care be taken in designing a prescribed burn. There are many factors to consider, for example, it is advisable to set up burn compartments so that an entire habitat is not burned at once. If assistance is needed in designing an appropriate prescribed burn plan or any management plan for the area, please contact the management staff of the Scientific and Natural Areas Program.

Thinning of trees and removal of dead wood and windfalls in forested areas, especially the jack pine stand, should be avoided. Cover planting and seeding of non-native vegetation is not recommended unless restricted to old fields already heavily disturbed.

Off-road vehicles would be damaging to this natural area.

Summary

It is agreed that, in order to have opportunity to comment on possible impacts of proposed management activities on the natural features of interest, the area wildlife manager will inform the Natural Heritage Program of proposed developments or actions on the registered portions of this WMA. Of particular interest are actions concerning cutting of grass, or other vegetation, water inundation or appropriation, prescribed burning, or the introduction of live plant material including live seeds and woody cover. Unless carefully planned, activities such as these can alter the scientific value and natural qualities of the registered area.

Howard Shepperd_____
Regional Wildlife Manager
Region V - Wildlife

Date 9-10-84

Roger Holmes_____
Chief, Section of Wildlife

Date Sept. 4, 1984

Jon Cole, Manager
Whitewater Wildlife Management Area

Date 9-10-84

Barbara Coffin
Coordinator, Natural Heritage Program

Date August 30, 1984

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Whitewater South Fork

Final

July 2006

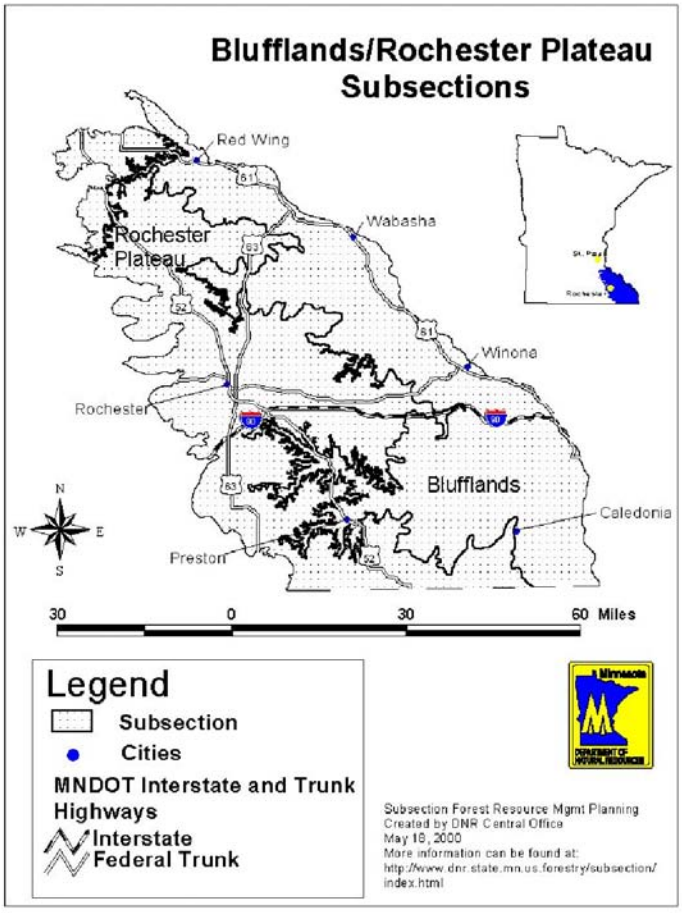
MN Department of Natural Resources Planning Document
Printed July 2006

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the DNR Subsection Resource Management Plan process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on state owned land in the Whitewater South Fork area (appendix 1). The Whitewater South Fork Area is one of 13 Minnesota County Biological Survey (MCBS) sites of outstanding biodiversity on lands administered by the Minnesota Department of Natural Resources (DNR) Division of Forestry, and Section of Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended for use in conjunction with the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every seven years as part of an adaptive management process.



The Blufflands/Rochester Plateau SFRMP addressed management of vegetation on DNR Forestry- and Wildlife-administered lands. There were 13 "priority areas of significant biodiversity" identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county. Of the 745 sites of biodiversity significance in the two subsections, 62 sites are contained within these thirteen priority areas. Ecological evaluations that mapped and described rare natural features were prepared by MCBS ecologists for these thirteen sites in the years 2000 through 2001. The 13 priority areas and associated information about them are listed in appendix 7.

Division directors for the DNR Divisions of Wildlife, Forestry, and Ecological Services determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Background & Rationale

The DNR completed the MCBS, a systematic survey of the natural areas within the Whitewater Wildlife Management Area (WWMA) in the mid-nineties. The results of this survey provide increased knowledge of the status and distribution of rare species and native plant communities. An ecological evaluation was written for this area in May 2000 to provide more detailed interpretation of the biodiversity significance of the area. The availability of this information and other existing data such as the WWMA Master Plan, Cooperative Stand Assessment (CSA) forest inventory data, and the Blufflands/Rochester Plateau SFRMP provides an opportunity to develop long-term management plans for this area that will help to manage and enhance the natural resources of this area. Thoughtful management planning in this area is of critical importance in the face of escalating development pressure in the surrounding landscape, increasing fragmentation, and global change. Recommendations in this plan are written for DNR-

administered lands. Private landowners within the project boundary will be contacted and offered management assistance for their land if they desire.

Site Description

The Whitewater South Fork Area is one of the most significant sites for native biodiversity in southeastern Minnesota. It contains one of the largest expanses of mature high-quality maple-basswood forest in the Minnesota portion of the Paleozoic Plateau. The site includes one algific talus slope and three maderate cliffs, which are communities associated with cold-air slopes and are found only in the Paleozoic Plateau. In this site these communities provide habitat for two rare snail species: the bluff vertigo (*Vertigo meramecensis)* and Hubricht's vertigo *(Vertigo hubrichti)*. Other native plant communities include northern hardwood-conifer forest, white pine-hardwood forest, oak forest, lowland hardwood forest, black ash swamp, dry cliff, and moist cliff many of these occurrences are high quality communities (see appendices 2 and 3). The Whitewater South Fork Area is one of the top ten sites for rare forest birds in southeastern Minnesota and includes occurrences of 19 listed species. These include the two snail species mentioned above, three rare bird species, and fourteen listed plant species (see appendix 6 for listing).

There is a black ash swamp occurring in a clay-lined basin in this site that appears to be unique to the Paleozoic Plateau portion of Minnesota. The swamp is characterized by concentric vegetation zones and is surrounded by a maple-basswood forest. The maple-basswood forest proceeds up the steep slopes on the north to east-facing direction. The maple-basswood forest is notable for its quality and diverse species composition. The Whitewater South Fork Area contains the largest expanse of high-quality maple-basswood forest in the Paleozoic Plateau. Several large stands are designated old-growth stands (see appendix 2). This slope and valley area has the highest concentration of rare animal and plant species and many of these are dependant on the cool moist habitat created by the above community types. The Whitewater South Fork Area also has dryer native plant communities that should be maintained through a variety of management techniques including fire and brush removal.

The Whitewater South Fork Area is one of 13 MCBS sites of outstanding biodiversity on DNR Forestry and Wildlife administered lands in southeast Minnesota and one of four high biodiversity sites located within the WWMA. Two boundaries delineate the areas of significance with this plan. The Critical Habitat Zone boundary denotes the core area of locations of rare natural features. This area encompasses 1,765 acres (1,034 acres of State-owned land). The majority of the lands in the critical zone are part of the WWMA (see appendix 2). This management plan, as stated above, guides management decisions and practices on only the State-owned lands within this boundary. The Project Boundary is 4,697 acres (2,649 acres of State Land). Here too, not all lands are state-owned and the plan only focuses on state lands. There may be opportunities however, for partnering with private landowners to protect and manage the unique resources in the area. Conservation easements, cost-share programs to establish permanent cover and management agreements might be pursued.

Long-Range Vegetation Management Goals

The long-range management goal for the area is to maintain and regenerate native plant communities and the biodiversity of the area using processes that mimic the natural disturbances that helped to maintain and establish these communities. This plan will meld the goals of biodiversity enhancement, game management, and recreation into an adaptive management process. Management goals and recommendations will be based on current management knowledge and be directed by Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. These recommendations may change as more information from research and monitoring becomes available.

Implementation

This section is organized by major native plant community type (see appendices 2 and 6). Management objectives are identified for each community type within the area. Short-term management directives are also identified for most of the community types and include management activities that will take place over the next seven years. This plan will be reviewed as part of an adaptive management process during the DNR SFRMP process every seven years.

As noted earlier, the Whitewater South Fork Area has a variety of rare species and community types. Management in these areas will be performed in a manner that mimics natural disturbance processes and is sensitive to the maintenance of the native plant communities and the species found within these communities. The Whitewater South Fork landscape is a mix of closed canopy-moist upland and lowland forest, and dryer woodland and prairie communities. The goal for this area is to maintain the mix of community types providing a variety of habitat for numerous rare species. Any logging used in the management of these areas will be designed to mimic natural disturbance process and will be performed in a way that minimizes soil compaction and damage to the understory species. In general, much of the harvest related management activities will take place in the northern portion of this site. This area has historically received more management focus and is an important area for wildlife management activities. The southern portion of the site provides habitat for most of the rare species found in this area and many of the more sensitive native plant communities and will be managed accordingly. Management will be performed using existing road and trail systems and the construction of new roads will be kept to a minimum.

Native Plant Communities

Oak forest (southeast section) mesic subtype

Description - These forests generally occur on north-to east-facing slopes. Dominant canopy species include one or more oak species including red oak *(Quercus rubra),* bur oak *(Quercus macrocarpa),* and white oak *(Quercus alba).* Other canopy species may include basswood *(Tilia americana),* black cherry *(Prunus serotina),* and butternut *(Juglans cinerea).* Subcanopy species can include sugar maple *(Acer saccharum),* basswood *(Tilia americana),* and ironwood *(Ostrya virginiana).* Nearly all of the oak forest in this site has been selectively logged in recent years. The exception is the oak forest in Section 14 (T107N, R10W) that is free of signs of past heavy grazing and has a diverse ground layer. These forests contribute habitat for forest birds and rare snake species.

Long-term objective - Many of the high quality mesic oak forests are succeeding to more mixed hardwood stands. These areas have sugar maple, elm, basswood, oak, and other hardwoods regenerating in the understory. Some of these areas will lend themselves well to oak regeneration through various sized timber harvests while others will convert to northern hardwood species like maple, basswood, elm, and hackberry. Opportunities to incorporate shelterwood or group selection harvests should be explored when possible. Non-game Wildlife and MCBS data will be utilized to identify critical habitat for management in small, medium, and large patches, i.e., red-shouldered hawks. Other areas of mesic oak forest are not succeeding to the more mixed hardwood forest types and are threatened by invasion of nonnative species such as buckthorn and honeysuckle. Management decisions on these areas will be designed to encourage the oak community type and may include fire and timber harvest.

Short-term management directive – Five CSA forest stands met stand selection criteria for harvest and fall in the Mesic Oak Forest plant community designated by the MCBS (see appendix 5).

The following stands may be harvested over the next seven years:

Stand # 1, T106N R9W Section 6;
Stand # 13, T106N R10W Section 1;
Stand # 4, T107N R10W Section 14;
Stand # 6, T107N R10W Section 24;
Stand # 12 T107N R10W Section 25;
Stand # 3 T107N R9W Section 30, an aspen type within oak community.

Timber management should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds. As noted in the additional management direction provided by the division directors of DNR Forestry, Wildlife, and Ecological Services (see appendix 8), clear cuts for oak regeneration is the normal practice, efforts to apply group selection and shelterwood cuts should be applied where appropriate. Management in the mesic oak forest areas will be designed to minimize canopy loss and techniques such as group selection will be examined for their effectiveness.

Oak woodland-brushland

Description - The canopy cover is 50-70% and dominated by one or more oak species including northern pin oak *(Quercus ellipsoidalis),* and/or bur oak *(Quercus macrocarpa)*. Other canopy trees may include paper birch *(Betula papyrifera),* red oak *(Quercus rubra)* red cedar *(Juniperus virginiana),* and shagbark hickory *(Carya ovata)*. These areas exhibit a denser shrub layer and canopy cover than the oak savanna, but the understory is a mix of species found in savannas and forests.

Long-term objective: The management of these areas will be designed to encourage the maintenance of the oak woodland-brushland community and will include fire and timber harvest. Areas that are threatened by invasion of nonnative species will be managed to reduce the threat of these species. Management techniques will be designed to mimic natural disturbances such as blow downs, disease, and fire.

Short-term management directive – There are no stands meeting selection criteria over the next seven years.

Lowland hardwood forest

Description - Flat to slightly sloping valley floors along the creeks support lowland hardwood forest, dominated by bur oak *(Quercus macrocarpa)* with black willow *(Salix nigra),* sugar maple *(Acer saccharum),* basswood *(Tilia americana),* and cottonwood *(Populus deltoids).* Boxelder *(Acer negundo)* is a common subcanopy tree. High native herb diversity is present in this part of the site including nodding wild onion *(Allium cermium)*. The bottomland forests are an important component of the habitat for many forest birds that occupy the area, including the three rare bird species Acadian flycatcher *(Empidonaz virescens),* Cerulean warbler *(Dendroica cerulean),* and Louisiana waterthrush *(Seiurus motacilla).*

Long-term objective - These areas will be managed to maintain the lowland hardwood forest community type and to encourage the continued existence of the forest interior bird species that currently occupy these areas. Areas that are not threatened by reed canary grass and are regenerating the overstory hardwood species will be maintained with minimal management. Areas of lowland hardwood forest that are dominated by reed canary grass will be managed to minimize this risk. Areas that are exhibiting canopy regeneration will be managed to encourage the regeneration of overstory hardwood species and restore the lowland hardwood forest community.

Short-term management directive – Two stands were identified through the SFRMP process in this community for limited harvesting over the next seven years (see appendix 5).

Stand # 3, T107N R10W Section 36;
Stand # 14, T107N R10W Section 36.

These two stands have previously been selectively cut for walnut and, upon field review a selective harvest may be conducted over the next seven years. Management will be determined based on current condition, exotic species cover, and other threats to the lowland forest system. Stands that are not threatened by box elder conversion or invasion of exotics species will not be managed with harvest.

Maple-basswood forest

Description - The maple-basswood forest in this site is notable for its quality and extent. Dominated mostly by sugar maple, basswood, and red oak occur on steep, north-facing slopes within the site. At the tops of the slopes, the stands grade into mesic oak forest dominated principally by red oak. These are mature stands with highly diverse assemblages of plant species, including numerous spring ephemerals. Seven of the fourteen rare plants species in the site were documented in this forest type including Moschatel *(Adoxa moschatellina),* Golden-seal, and nodding wild onion *(Allium cermium).*

Long-term objective - These areas will be managed to maintain the maple basswood forest community and the full canopy cover that is typical of this native plant community. Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns. Seasonal and equipment restrictions should be used to limit soil disturbance. In the Whitewater South Fork Area, maple-basswood plant communities are found on steep slope and the soils and understory species found in these communities are sensitive to disturbance. Areas should be monitored for nonnative species invasion. Where nonnative species invasion is prevalent management action should be taken. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term management directive – Harvest planned in this community type will follow the additional management guidance provided by the division directors of DNR Forestry, Wildlife, and Ecological Services (see appendix 8).

Old growth stands are located in:
Stands # 2,3,6,10, & 11, T106N R10W Section 1. No management actions will be implemented here.

White pine-hardwood forest

Description - The stands occur on dry to wet-mesic sites, mostly as narrow bands. White pine *(Pinus strobes)* is present as a dominant canopy or super canopy tree and varies from scattered to dense cover. The composition of these stands varies with site moisture, ranging from stands co-dominated by red oak, basswood, sugar maple and white oak in mesic to dry-mesic sites, to dryer sites with bur oak and northern pin oak. Many plants typical of mesic hardwood forests are found in these stands. These plant communities are associated with maderate cliffs and there may be additional northern-hardwood conifer forests associated with other cold air slopes in the site. Several include all size classes of white pine, indicating regeneration is occurring successfully. Some of the driest slopes in the site have small dry prairies associated with the white pines.

Long-term objective - The management goal for this area is to maintain the white pine-hardwood forest plant community. These areas are sensitive to loss of canopy cover that results from timber harvests. In order to maintain this community type, areas should be monitored for white pine regeneration. Those areas that exhibit white pine regeneration should be allowed to continue natural regeneration. Those areas that exhibit a lack of white pine regeneration should be managed to encourage white pine regeneration. This management may include some form of scarification or logging to encourage white pine regeneration. Any management in this area should be conducted in a manor that is sensitive to the needs for the community as a whole.

Short-term management directive – The white pine-hardwood forest community contains one CSA stand that met harvest criteria during the next seven years, stand # 7 (oak), T107N R10W Section 36. Harvest in this community will follow the additional management guidance provided by the division directors of DNR Forestry, Wildlife, and Ecological Services (see appendix 8). Because this particular community did not have an extensive MCBS inventory conducted, it is recommended that a thorough ground survey be conducted by staff from the Divisions of Ecological Services, Forestry and Wildlife prior to any timber harvest to detail plans for ensuring retention of this unique community. Opportunities to encourage white pine regeneration will be explored while maintaining a healthy oak component in this type. In addition, should a timber harvest be proposed, only a portion of the community will be harvested to better monitor impacts on ground cover and any subsequent white pine regeneration within this type.

Old growth stands are located in a portion of Stand # 2, T107N R10W Section 26, and Stand # 2, T107N R10W Section 36. No harvesting activity will take place in the old growth areas.

Northern hardwood-conifer forest

Description - These native plant communities occur on the steepest (70 –80 %) slopes in the site and are extremely rare in southeast Minnesota. They are mesic to wet-mesic forests on north-facing bluffs, with a canopy of yellow birch, white pine *(Pinus strobes)*, sugar maple, basswood, and red oak. The ground layer includes a diversity of herbaceous species. These communities occur on cool, steep north-facing slopes and include several plant species generally found much further north. Canada *yew (Taxus Canadensis)* is found in most of these pine stands that also have other species rarely seen in southeastern Minnesota, including yellow birch *(Betula alleghaniensis)* and twisted stalk *(Streptopus roseus)*. These northern hardwood-conifer forest are associated with maderate cliffs.

Long-term objective - The management goal for this area is to maintain the northern hardwood-conifer forest plant community. These areas are sensitive to loss of canopy cover that results from timber harvests. These areas will be managed to maintain the northern hardwood-conifer forest community and the full canopy cover that is typical of this native plant community. In the Whitewater South Fork Area, northern hardwood-conifer plant communities are found on steep slope and the soils and understory species found in these communities are sensitive to disturbance. Areas should be monitored for nonnative species invasion. Where nonnative species invasion is prevalent management action should be taken.

Short-term management directive - No activities are planned during the next seven years.

Talus slope (algific subtype) and moist cliff (southeast section) maderate subtype

Description - These communities occur on north-facing exposures. These two kinds of features have unusually cold microclimates as a result of systems of fissures extending back into the bedrock layers where ice persists throughout much of the summer. Cold water and air emerge from the cliff face or talus. Algific talus slopes accumulate areas of peat as a result of cold temperatures and slow soil decomposition rates. These cold microhabitats support an unusual biota adapted to cold environments, including several

rare, disjunct plant and snail species. Pleistocene relict plant that persists on the maderate cliffs and algific talus slopes within the site. Other disjunct plant species typical of more northern distributions associated with maderate cliffs and algific talus slopes in the site include Canada yew, yellow birch, and mountain maple *(Acer spicatum)*. Species of land snails have been identified on the algific talus slopes, including locations for two Pleistocene relict species listed as rare in Minnesota these include Bluff vertigo and Hubricht's vertigo *(Vertigo hubrichti)*.

Long-term management objectives - Maintain and protect the sensitive habitat of these areas. Avoid management activities that would threaten these areas. Include buffers between adjacent sites when management is implemented.

Short-term management directives - No activities planned during the next seven years.

Dry cliffs (southeast section)

Description - Numerous, small-disturbed dry cliffs of dolomite and sandstone occur on south-facing slopes throughout the site. These cliffs are sparsely vegetated with a distinctive flora, including the rare cliff goldenrod *(Solidago sciaphila)*.

Long-term management objective - Maintain and protect these habitats. Avoid management activities that would threaten these areas.

Short-term management directive - No activities planned during the next seven years.

Dry prairie (southeast section) bedrock bluff prairie

Description - Occur on well-drained bedrock outcrops on the uppermost parts of steep south-facing slopes and narrow ridge tops. These bluff prairies are dominated mostly by sideoats grama *(Bouteloua curtipendula)*, little bluestem *(Schizachyrium scoparium)*, and plains muhly *(Muhlenbergia cuspidate)*. Big bluestem *(Andropogon gerardii)* often dominates in small areas of deeper soils. A diverse set of shrubs are scattered in these prairies, including leadplant *(amorpha canescens)*, ninebark *(Physocarpus opulifolius)*, and prairie willow *(Salix humilis)*. Species diversity in these prairies is generally high. Timber rattlesnakes *(Crotalus horridius)*, is a State threatened species and has been documented on a south-facing bluff above the South Fork River.

Long-term management objective - These areas will be maintained with periodic fire and brush cutting to control woody competition. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term management directive - Continue to maintain the Bedrock bluff prairie communities in the Whitewater South Fork Area through prescribed burning to renovate and increase bluff prairie acreage in this area.

Moist cliff (southeast section)

Description - These plant communities are moist to wet communities on exposed north- to east-facing dolomite or sandstone cliffs and on well-shaded south- to wets-facing cliffs. Mosses, liverworts, and lichens are common. Vascular plants include bulblet fern *(Cystopteris bulbifera)* and slender cliff-brake *(Cryptogramma stelleri)*.

Long-term management objectives - Maintain and protect the sensitive habitat of these areas. Avoid management activities that would threaten these areas. Include buffers between adjacent sites when management is implemented.

Short-term management directives - No activities planned during the next seven years.

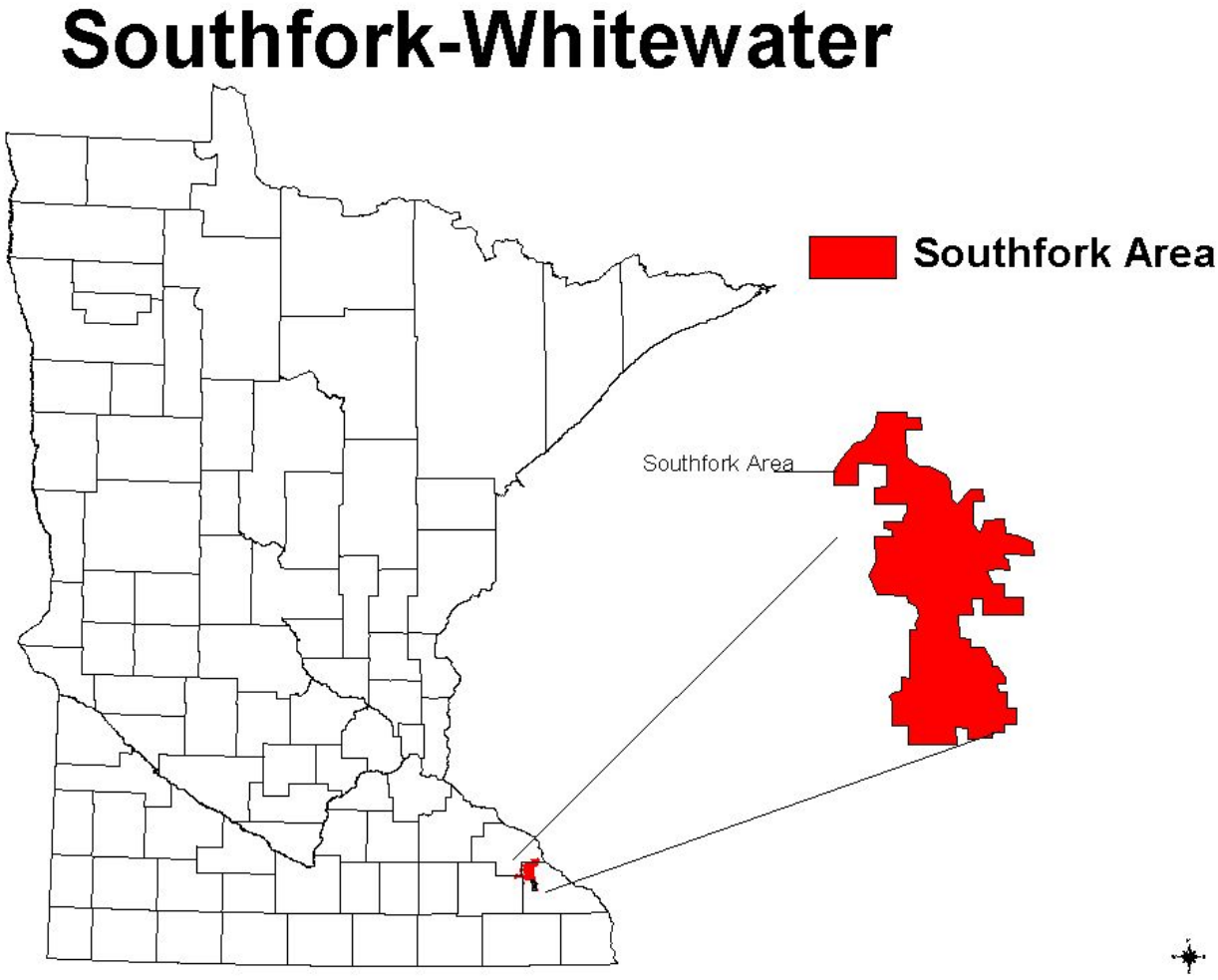
Black ash swamp

Description - These communities are lowland forests on organic soil in clay-lined basins on glacial till. The soils are continuously saturated. The outer rims of basins are dominated by black ash *(Fraxinus nigra)* and the interior by distinct zones of emergent herbaceous vegetation. The black ash swamp in this site occurs on clay-lined basin and provides habitat for the only known occurrence of the rare blunt-lobed grapefern *(Botrychium oneidense)* in the Paleozoic Plateau.

Long-term management objectives - These areas will be managed to maintain the black ash swamp community and the canopy cover and emergent vegetation that is typical of this native plant community. In the South fork area the black ash swamp plant communities is found on the valley floor and the soils and understory species found in this community are sensitive to disturbance. Areas should be monitored for nonnative species invasion. Where nonnative species invasion is prevalent management action should be taken.

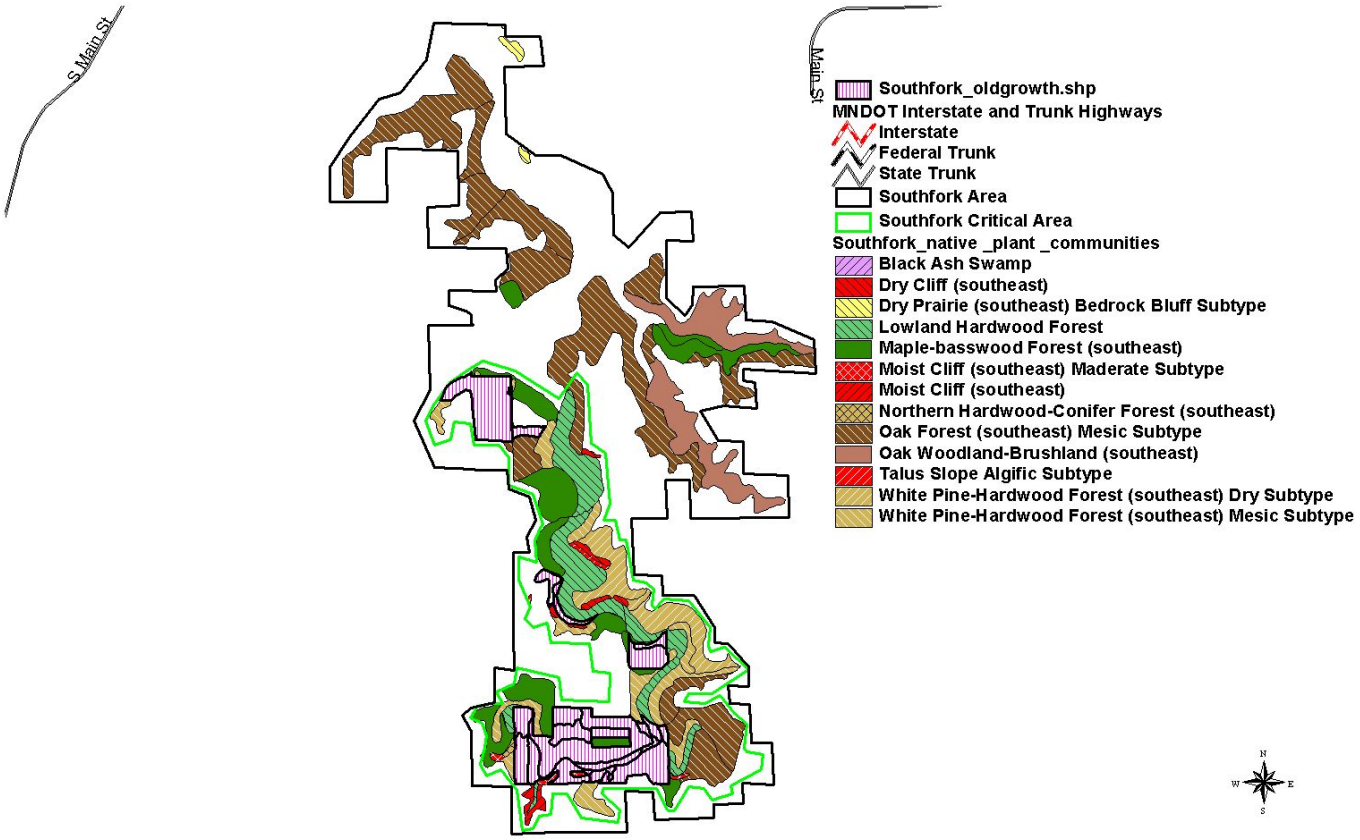
Short-term management directives - No activities planned during the next seven years.

Appendix 1: Whitewater South Fork Project Area Location

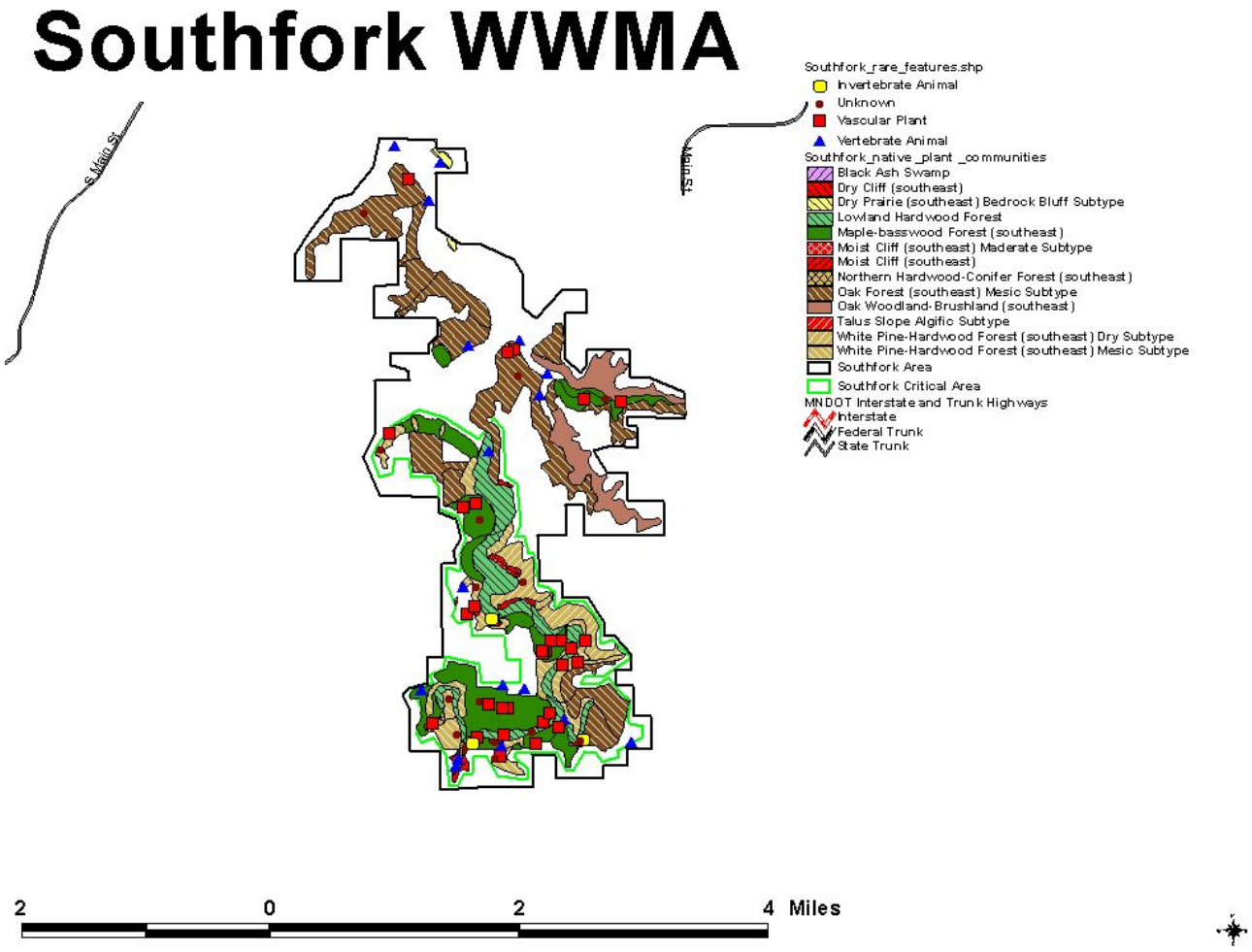


Appendix 2: Native Plant Communities & Old Growth Stands

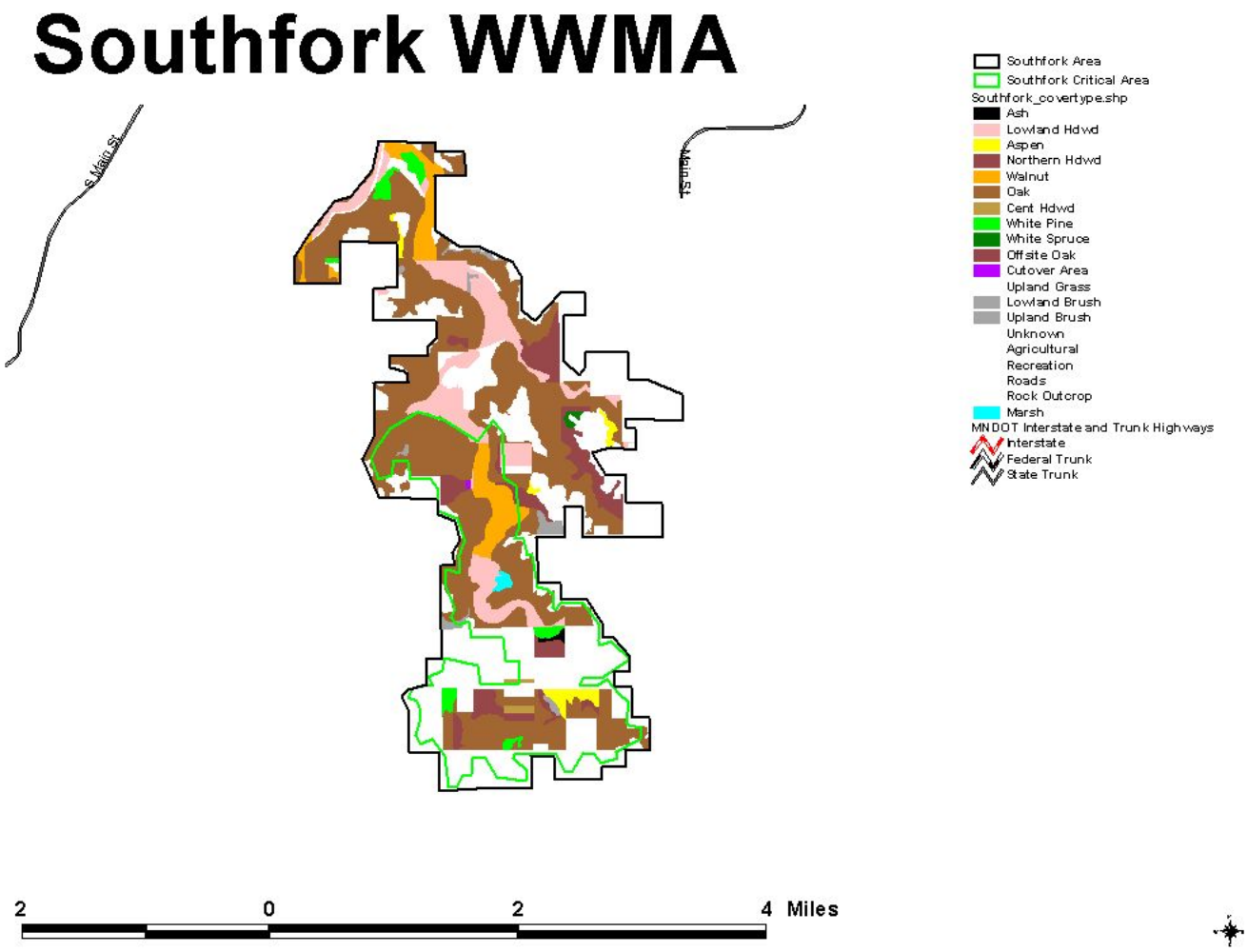
Southfork WWMA



Appendix 3: Native Plant Communities & Rare Elements

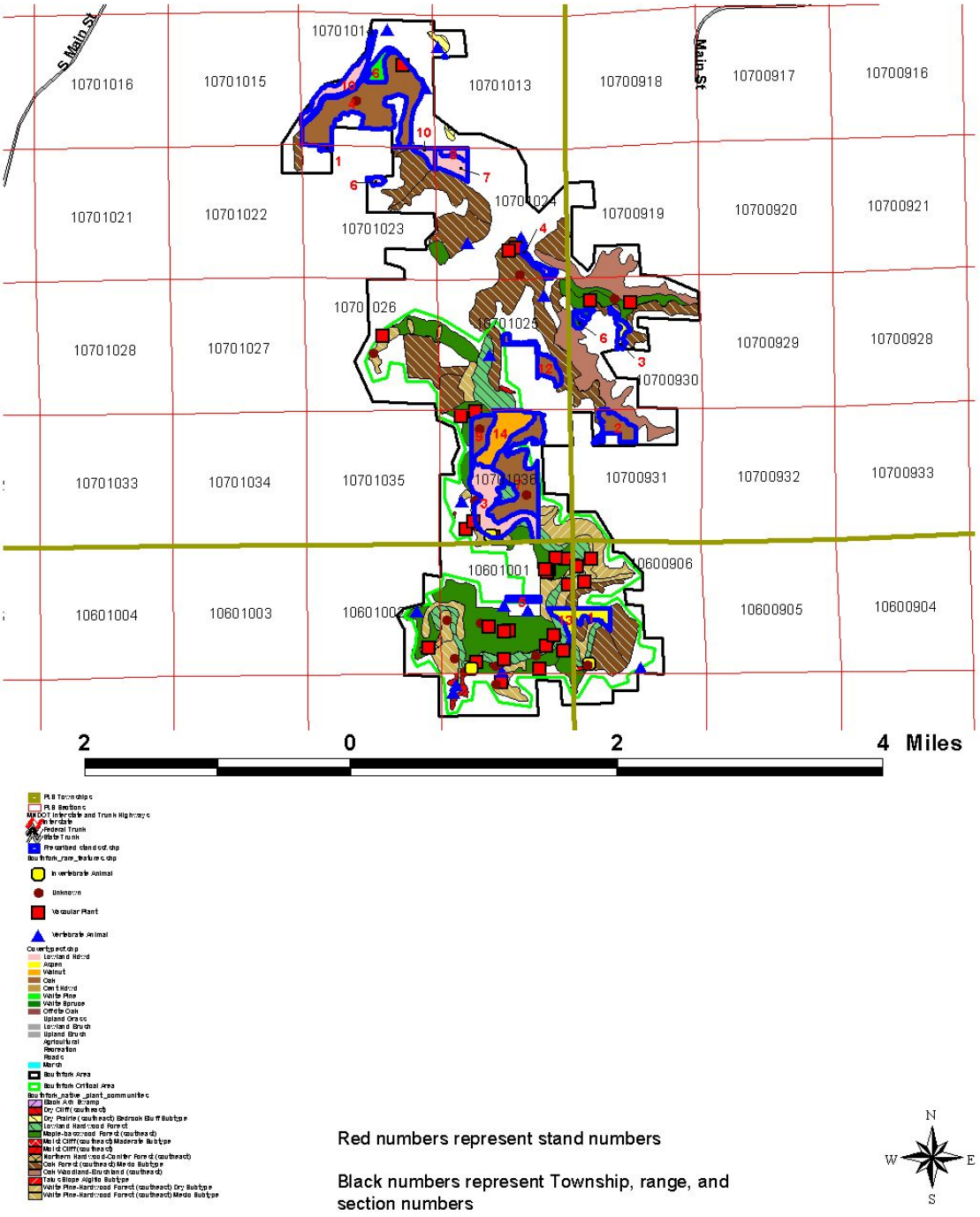


Appendix 4: Cooperative Stand Assessment Cover Types



Appendix 5: Stands Selected for Management Review[1]

Southfork WWMA



[1] Stands selected for vegetation management are outlined in blue on the map.

Table 1. Stands within the Evaluation Project Boundary that meet SFRMP and MCBS Plant Community Criteria and are potential candidates for vegetation management during next seven years.

Township	Range	Section	Stand/Acres	Action
106	9	6	1/17	Harvest- Even Age(aspen)
106	10	1	13/14	Harvest-Even Age(aspen)
107	9	30	3/10	Harvest-Even Age(aspen)
107	10	14	4/188	Group Selection
107	10	25	2/3	Selective Harvest
107	10	36	3/76	Selective Harvest
107	10	36	7/101	White Pine Regeneration
107	10	36	14/54	Selective Harvest

Table 2. Stands within the Evaluation Project Boundary that met SFRMP criteria (but not MCBS plant community criteria) and are potential candidates for vegetation management over the next seven years.

Township	Range	Section	Stand/Acres	Action
106	10	1	5/5	Stand has been selected to have some harvest activity based on multi-disciplinary review.
107	9	30	6/7	“ ”
107	9	31	2/28	“ ”
107	10	14	10/38	“ ”
107	10	22	2/6	“ ”
107	10	23	6/8	“ ”
107	10	23	10/8	“ ”
107	10	24	4/8	“ ”
107	10	24	7/22	“ ”
107	10	24	8/8	“ ”
107	10	25	12/22	Group/Selective Harvest

Appendix 6: Rare Features Summary – South Fork Area

Native Plant Communities	**EO-Rank[1]**
Black Ash Swamp	B
Dry cliff (Southeast Section)	
Dry Prairie (Southeast Section) Bedrock Bluff Subtype	
Lowland Hardwood Forest	B
Maple-basswood Forest (Southeast Section)	AB, B
Moist Cliff (Southeast Section Maderate Subtype	B, C
Moist Cliff (Southeast Section)	
Northern Hardwood-conifer Forest (Southeast Section)	A
Oak Forest (Southeast Section) Mesic Subtype	**B, C**
Oak Woodland-brushland (Southeast Section)	
Talus Slope (Algific Subtype)	BC
White Pine-Hardwood Forest (Southeast Section) Dry subtype	
White Pine-Hardwood Forest (Southeast Section) Mesic subtype	A, **B**

Rare Plants	**Status**
Botrychium oneidense (blunt-lobed grapefern)-1	**E**
Hydrastis canadensis (goldenseal)-15	**E**
Allium cernuum (nodding wild onion)-74	**THR**
Aster shortii (Short's aster)-27	**THR**
Carex Laevivaginata (smooth-sheathed sedge)-24	**THR**
Diplazium pycnocarpon (narrow-leaved spleenwort)-43	**THR**
Adoxa moschatellina (moschatel)-74	**SPC**
Carex woodii (Wood's sedge)-64	**SPC**
Dicentra Canadensis (squirrel corn)-43	**SPC**
Dryopteris goldiana (Goldie's fern)-37	**SPC**
Jeffersonia diphylla (twinleaf)-32	**SPC**
Panax quinquefolius (ginseng)-115	**SPC**
Sanicula trifoliate (black snakeroot)-38	**SPC**
Solidago sciaphila (Cliff Goldenrod)-84	**SPC**
Actaea pachypoda (white baneberry)-33	**NON**
Athyrium thelypterioides (Silvery spleenwort)-41	**NON**
Liparis lilifolia (lilia-leaved twayblade)-28	**NON**
Poa sylvestris (woodland bluegrass)-6	**NON**

Rare Animals	**Status**
Crotalus horridus (timber rattlesnake)-109	**THR**
Dendroica cerulean (Cerulean warbler)-56	**SPC**
Empidonax virescens (Acadian flycatcher)-35	**SPC**
Seiurus motacilla (Louisiana waterthrush)-46	**SPC**
Rana palustris (pickerel frog)-57	**NON**

Fish	**Status**
Lampetra appendix (American brook lamprey)-86	**NON**

Snails	**Status**
Vertigo meramecensis (Bluff vertigo)-6	**THR**
Vertigo hubrichti (Hubricht's vertigo)-10	**Unknown**

Key:

[1] ecological quality rank where A=highest quality and D=lowest quality (multiple ranks indicate multiple occurrences)

[2] number following rare species listing refers to number of occurrences recorded in the area

Appendix 7. Areas of Significant Biodiversity in the Paleozoic Plateau

The Minnesota County Biological Survey identified 745 sites of biodiversity significance in the Paleozoic Plateau Ecological Section (Blufflands and Rochester Plateau Subsections). The breakdown of sites, their biodiversity significance rankings, and the number of sites of each ranking that contain state lands administered by various DNR divisions is summarized in the following table:

Table 1. MCBS Sites in the Paleozoic Plateau

Biodiversity Significance	**Total Number of MCBS Sites**	**Percent of Total**	**Number of MCBS Sites Containing State Lands**	**Number of MCBS Sites Containing State Forest Lands**	**Number of MCBS Sites Containing State Wildlife Lands**	**Number of MCBS Sites Containing State Park Lands**	**Number of MCBS Sites Containing SNA Lands**
Outstanding	121	16	65	40	22	8	11
High	187	25	91	51	21	8	14
Moderate	437	59	159	95	23	8	2
Total	**745**	**100**	**315**	**186**	**66**	**24**	**27**

For DNR managed state lands in Minnesota, strategies for managing sites of biodiversity significance differ according to the degree of biodiversity significance, statutory restrictions on land designations, and conservation needs of species and communities within the sites. In Scientific and Natural Areas (SNAs), management is done with rare natural features protection as the highest priority. For State Parks, comprehensive planning processes address protection of biodiversity, and in some cases SNAs or Natural Areas Registry sites are designated within park boundaries. [Natural Areas Registry sites are areas of biodiversity significance on public lands, for which a memorandum of understanding (MOU) has been signed by the agency or DNR division that manages the site and by the SNA Program supervisor. This MOU contains information about the management and protection needs of the rare features in the site.] For Wildlife Management Areas (WMAs), state statutes prohibit SNA designation within WMAs. Management is addressed as part of the Subsection Forest Resource Management Planning (SFRMP) process, and in some cases Natural Areas Registry sites are designated within WMA boundaries. For State Forests, management is addressed as part of the SFRMP process, and in some cases SNAs or Natural Areas Registry sites are designated within State Forest boundaries.

The SFRMP process for the Paleozoic Plateau addressed management of vegetation on State Forest and Wildlife lands. There were 13 “priority areas of significant biodiversity” identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county.

Appendix 8: Additional Management Guidance

Harvest of high quality maple-basswood communities

Selective harvest will be allowed if site teams jointly develop detailed plans that include joint on-site visits. The following conditions will apply:

- Oak resources can be salvaged as these sites are converted to purer maple basswood communities. This should be done by selective, individual or small group marking and removals.
- Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns.
- Seasonal and equipment restrictions should be used to limit soil disturbance; horse logging on frozen ground should be done where appropriate in the most sensitive sites).
- Trees should be jointly marked as well as the layout for access and skid trails to minimize any additional permanent fragmentation.
- Portions of stands that support unique or rare resources (such as a rare species or a rich spring ephemeral flora) may be delineated for no harvest.
- A pre and post treatment monitoring and evaluation protocol for species and communities of concern (both native and exotic) should be developed and implemented in each stand. Harvest plans should also take into account whether or not invasive exotic species occur in stands immediately adjacent to those being harvested.

With respect to the last bullet, Ecological Services staff will continue discussions with USDA Forest Service staff to further explore the opportunities to collect pre-treatment data during the 2004 field season.

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. Look for opportunities to clear-cut the steeper portions of the forested type while scarifying the soil pre-sale. Shelterwood or group selection harvest should be applied on the more level terrain.

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority for prescribed fire funding. Wildlife will work with the Divisions of Ecological Services and Forestry to ensure that these sites are regenerated through the application of fire.

Aspen and white pine pockets

The cover type goal as listed in the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan is to maintain or moderately increase the white pine acreage and increase the aspen acreage for various wildlife and non-game species. As stated in the plan, there are relatively few stands of aspen larger than five-acres in size in southeastern Minnesota.

Native white pine stands are limited in number, but provide multiple benefits to numerous game and non-game species from roosting sites for wild turkeys to perches and roost areas for bald eagles. The department believes it is necessary to access some of the sites for management to ensure natural regeneration occurs.

Options to minimize any intrusion through the maple-basswood communities should include the following:

- A search for any pre-existing old homestead roads or trails that could be used for access and whether exotic species are present in the area which might be introduced along such a corridor if made active again;
- List alternate means to access the white pine such as through private land, through other disturbed communities, etc; and
- Timing of access whereby any mechanical scarification would take place during fall or early winter, reducing the "footprint" upon the trail used to access such stands. The department believes such efforts to maintain or increase the native white pine acreage in this landscape outweigh the minor impacts to surrounding northern hardwood communities.

Small aspen clones in high quality sites should only be harvested when a harvest is already planned and approved by the team, at the same time, within the immediately surrounding stand in which the clone is embedded. Other conditions mentioned under the high quality maple-basswood communities section above should also be addressed. If harvest in the stand in which the aspen is embedded is not planned, then a special effort to cut the aspen should not be made.

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Whitewater Upper Beaver Creek

Final

September 2005

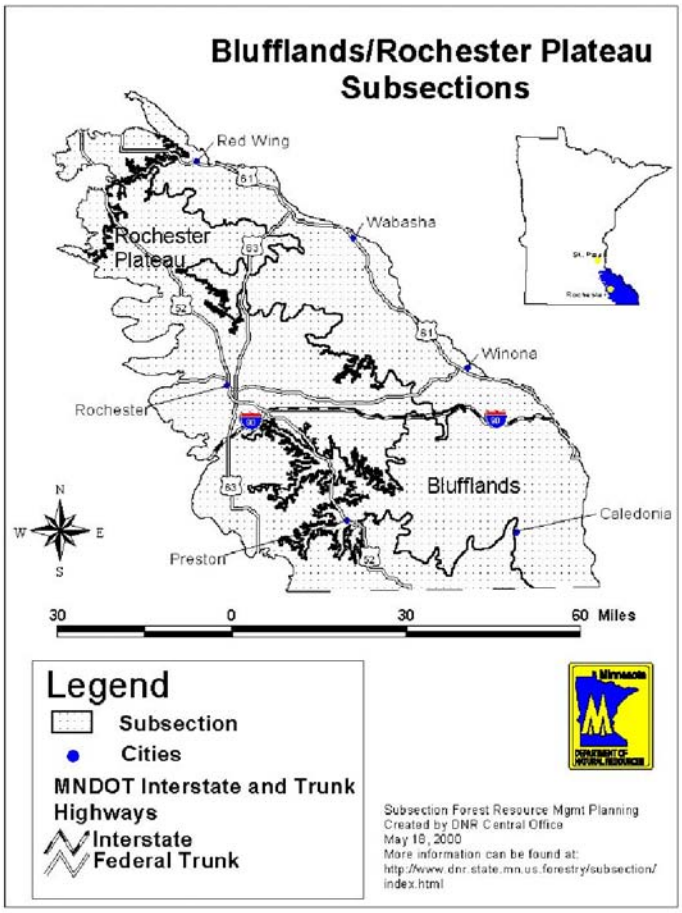
Division of Forestry Planning Document
Printed September 2005

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on the Whitewater Upper Beaver Creek area (Appendix 1). The Whitewater Upper Beaver Creek area is one of 13 MCBS sites of outstanding biodiversity on lands administered by the DNR Division of Forestry, and Section of Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended to be used in conjunction with the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every 7-years as part of an adaptive management process.



Background & Rationale

The Minnesota Department of Natural Resources (MNDNR) completed the Minnesota County Biological Survey (MCBS), a systematic survey of the natural areas within the Whitewater Wildlife Management Area (WMA) in the mid-nineties. The results of this survey provide increased knowledge of the status and distribution of rare species and native plant communities. An ecological evaluation was written for this area to provide more detailed interpretation of the biodiversity significance of the area. The availability of this information and other existing data such as the Whitewater WMA Master Plan, MCBS, SFRMP, and Cooperative Stand Assessment (CSA) forest inventory data provides an opportunity to develop long-term management plans for this area that will help to maintain and enhance the natural resources of this area. Thoughtful management planning in this area is of critical importance in the face of escalating development pressure in the surrounding landscape, increasing fragmentation, and global change. Recommendations in this plan are written for State-owned land. Private landowners within the project boundary will be contacted and offered management assistance for their land if so desired

Division directors for the DNR Divisions of Wildlife, Forestry, and Ecological Services determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Site Description

The Whitewater Upper Beaver Creek area is one of the top areas of native biodiversity in southeastern Minnesota. The area is significant because it contains large, contiguous acreage of high-quality native

plant communities, rare specialized habitats, and a high concentration of rare plants and animals occurring in a large intact landscape setting. The Whitewater Upper Beaver Creek area incorporates a variety of diverse native plant communities including: algific talus slopes, and maple-basswood forest on steep north-facing slopes; lowland hardwood forest, mixed hardwood seepage swamp, and seepage meadow on bottomlands, mesic and dry-mesic oak forest on shallow slopes, and dry cliffs, bedrock bluff prairies and oak woodland on steep south-facing slopes. The Upper Beaver Creek area contains some of the State's most significant examples of the rare mixed hardwood seepage swamp community. The large integrated valley provides habitat for a variety of rare species that are dependant on the varied habitat conditions found in the diverse native plant community types. Seven species listed as State Endangered or Threatened were identified in this area. These include: False Mermaid *(Florekea proserpinacoides),* narrow-leaved spleenwort *(Diplazium pycnocarpon),* Christmas Fern *(Polystichum acrostichoides),* Carey's Sedge *(Carex careyana),* James' Sedge *(Carex jamesii),* Smooth-sheathed Sedge *(Carex laevivaginata),* and Spreading Sedge *(Carex laziculmis).* Eight plant species of special concern including Moschatel *(Adoxa moschatellina),*Twinleaf (*Jeffersonia diphylla*), Squirrel-corn (*Dicentra canadensis*), Ebony Spleenwort (*Asplenium platyneuron*), Woods' Sedge (*Carex woodii*), Goldie's fern (*Dryopteris goldiana*), American Ginseng (*Panax quinquefolius*), and Cliff goldenrod (*Solidago sciaphila*). Four species of State-listed animals have been recorded in the Whitewater Upper Beaver Creek area. These include: Timber rattlesnake (*Crotalus horridus*), Red-shouldered hawk (*Buteo lineatus*), Woodland Vole (*Microtus pinetorum*), and Louisiana Waterthrush (*Seiurus motacilla*).

The Whitewater Upper Beaver Creek area contains the source of Beaver Creek, a state-designated trout stream. Along the main valley floor, the interface between the dolomite and sandstone layers occurs at or just below the surface along a roughly one-mile segment centered near the Winona/Wabasha County line.

The Whitewater Upper Beaver Creek area is one of four (4) high biodiversity sites located within Whitewater Wildlife Management Area (WWMA). Two boundaries delineate the areas of significance with this plan. The Critical Habitat Zone boundary denotes the core area of locations of rare natural features. This area encompasses 1,035 acres (500 acres of State Land). A large portion of the land in the critical zone is part of the WWMA (Appendix 2). This management plan, as stated above, guides management decisions and practices on only the state-owned lands within this boundary. The Project Boundary is 2,000 acres (830 acres of State Land). There may be opportunities for partnering with private landowners to protect and manage the unique resources in the area. Conservation easements, cost-share programs to establish permanent cover and management agreements might be pursued.

Long Range Vegetation Management Goals

The long-range management goal for the area is to maintain and regenerate native plant communities and the biodiversity of the area using processes that mimic the natural disturbances that helped to maintain and establish these communities. This plan will meld the goals of biodiversity enhancement, game management for species such as wild turkeys, white-tailed deer, and ruffed grouse, and recreation into an adaptive management process. Management goals and recommendations will be based on current management knowledge. This document is designed to be an adaptive management plan. Monitoring data and current scientific knowledge will be used to determine the effectiveness of this plan and any appropriate change. To help achieve these goals some of the stands identified in the CSA database have been set aside from timber management or designated as Extended Rotation Forest (ERF) (Appendix 5).

Implementation

This section is organized by major native plant community types that occur in the area. Management objectives are identified for each community type within the area. Short-term management directives are also identified for most of the community types and include management activities that will take place over the next seven years. This plan will be reviewed as part of an adaptive management process during the DNR SFRMP process every seven years.

The Whitewater Upper Beaver Creek Area has a variety of rare species and community types (Appendices 3&4). Management in these areas will be performed in a manner that mimics natural disturbance processes and is sensitive to the maintenance of the native plant communities and the species found within these communities. The Whitewater Upper Beaver Creek landscape is a mix of closed canopy-moist upland and lowland forest, and dryer woodland and prairie communities. The goal for this area is to maintain the mix of community types providing a variety of habitat for numerous rare species. Any logging used in the management of these areas will be designed to mimic natural disturbance process and will be performed in a way that minimizes soil compaction and damage to the understory species. Management will be performed using existing road and trail systems and the construction of new roads will be kept to a minimum. As will other DNR forest management activities, the Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines (MN Forest Resources Council. 1999) will be incorporated as appropriate in the management of these sites.

Oak forest Mesic Subtype

Description - The canopy is dominated by red oak (*Quercus rubra*) and white oak (*Quercus alba*) with a significant component of basswood (*Tilia americana)* and black cherry (*Prunus serotina)*. Sugar maple (*Acer saccharum*) and ironwood (*Ostrya virginiana*) are common understory species. Herbaceous layer species are a mix of those typical of oak forest on dryer sites and those typical of maple-basswood forest on moister sites. This forest type occurs on approximately 350 acres of gradual to steep, east to northwest-facing slopes scattered throughout the area. The State listed species American ginseng *(Panax quinquefolius)* occurs in these communities.

Long-term objective - Many of the high quality mesic oak forests are succeeding to more mixed hardwood communities and eventually will succeed to a maple-basswood community. These areas contain red and white oak, basswood, cherry, aspen and other hardwood species in the canopy. Those areas with a preponderance of maple/basswood and northern hardwood regeneration will be allowed to succeed to maple/basswood forests. Consultation with Ecological Services personnel will then need to be made to determine if/when future timber harvests are desirable to manage for a diverse age class within these stands. Management techniques will be designed to mimic natural disturbances such as blow downs, disease, and fire. Management in the mesic oak forest areas will be designed to minimize canopy loss and techniques such as group selection will be examined for their effectiveness.

Those stands that have a high component of oak and other shade intolerant regeneration (central hardwoods as identified in the CSA forest inventory) will be managed to augment the oak component for the benefit of numerous game and non-game species. Some of these stands are threatened by invasion of nonnative species such as buckthorn and honeysuckle. Management options might include prescribed fire, small, medium, and large-scale timber harvest (including clear-cut, shelterwood, or group selection), supplemental planting of oak both pre- and post- harvest, and post-sale silvicultural treatment efforts. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - Two (2) stands of CSA oak cover type 30 within the Oak forest mesic community were identified as meeting the criteria for harvest over the next 7 year period in the SFRMP Process (Figure 4 and 5).

- Stand 3-19-108N-10W--upon field review, this stand was determined to be beyond salvage due to blow down which occurred during 1998. No treatment is scheduled within this stand during this 7-year period.
- Stand 10-20-108N-10W

An additional stand of aspen is located adjacent to stand 10 (Stand 15-19-108N-10W). This stand could be included during the harvest of stand 10 to regenerate this type and improve habitat for ruffed grouse and woodcock. Stand 10 is identified as CSA oak cover type 30 and as MCBS-Oak forest mesic subtype on the east end of the stand. The western two-thirds of the stand are identified as MCBS- Maple-basswood forest. Management will be based on native plant community description following additional guidance provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (Appendix 8). Site visit will be conducted to determine best mix of management practices addressing the needs of each community type and the species identified within them.

Oak forest southeast

Description - Consists of dry-mesic stands. The major difference between this community and the oak forest mesic subtype is the composition of the understory and to a lesser degree the canopy. The canopy is dominated by bur oak (*Quercus macrocarpa),* green ash (*Fraxinus pennsylvanica)* and northern pin oak (*Quercus ellipsoidalis)* and red oak and basswood are less common. Sugar maple and mesic shrubs such as blue beech (*Carpinus caroliniana)* and bladdernut (*Staphylea trifolia)* are rare in the understory while ironwood and grey dogwood (*Cornus racemosa)* are more common. Common herbaceous species include honewort (*Cryptotaenia Canadensis),* lady fern (*Athyrium angustum),* and Clayton's sweet cicely (*Osmorhiza claytonia)*. Dry-mesic oak forest cover approximately 170 acres in the Beaver Valley area.

Long-term objective - The management of these areas will be based on the community composition. Areas that are succeeding to a more mixed hardwood forest will be allowed to succeed. Areas that have oak regeneration will be managed to promote the continuation of the oak forest including fire, and/or timber harvest. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species.

Management techniques will be designed to mimic natural disturbances such as blow downs, disease, and fire. Management in the mesic oak forest areas will be designed to minimize canopy loss and techniques such as group selection will be examined for their effectiveness. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - There is no management activities planned for the next seven years for this native plant community.

Oak Woodland-Brushland

Description - This community is dominated by short, open-grown bur oak and northern pin oak with a dense shrub layer. The understory herbaceous layer is low in diversity except in small canopy gaps were dry prairie species are found. Fire suppression has allowed the canopy to close as brush has encroached. These communities occur on steep south to southwest-facing slopes.

Long-term objective - Oak woodland-brushlands will be managed to encourage the maintenance of the oak woodland-brushland community or encourage regeneration of the savanna communities through controlled burning and, where feasible to open up canopies, carefully planned logging. Many of these areas have been disturbed by past grazing and have dense understories of prickly ash and other native shrubs that follow grazing. A management goal is to reduce these invasive shrubs. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - No activities are planned during the next 7 years.

Bedrock Bluff Prairie

Description - These prairies have an unusual savanna-like character with short, open-grown, wind-sculpted white pine (*Pinus strobes),* red cedar (*Juniperus virginiana*), and northern pin oak. Typical bluff prairie plants here include side-oats grama (*Bouteloua curtipendula),* little bluestem (*Schizachrium scoparium),* plains muhly (*Muhlenbergia cuspidate),* and pasqueflower *(Anemone patens).* Ericaceous plant species, otherwise rarely encountered in the Blufflands, are a distinctive element of this expression of bedrock bluff prairie. These species include: bearberry (*Arctostaphylos uva-ursi)* and lowbush blueberry (*Vaccinium angustifolium).* Two rattlesnake dens are located within these prairies. These communities occur on top of dry dolomite cliffs on narrow ridge-spurs.

Long-term objective - These areas will be maintained with periodic fire and brush cutting to control woody competition.

Short-term plan - No activities are planned during the next 7 years.

Dry Cliffs

Description - These communities are associated with steep west to southeast-facing bluffs. These cliffs are associated with oak woodland-brushland and bluff prairie communities. White pines occur on and around these dry cliffs on the more mesic slopes. Typical plant species identified in these communities include cliff-brake (*Pellaea glabella),* cliff goldenrod (*Solidago sciaphila),* and harebells (*Campanula rotundifolia).*

Long-term objective - These areas will be maintained as open cliff communities.

Short-term plan - No activities are planned during the next 7 years.

Mixed Hardwood Swamp

Description - Black ash (*Fraxinus nigra)* is the most common canopy tree and is also common in the understory. Black current (*Ribes americanum)* occurs in the sparse shrub layer. The herbaceous layer of this community type is among the most diverse in the state. Plants typical of maple-basswood, lowland hardwood forests, or wet meadow grow in this community with plants unique to calcium-rich groundwater seepages. Herbaceous species identified in this community include: marsh marigold (*Caltha palustris),* fowl manna grass (*Glyceria striata),* water cress (*Nasturtium officinale)* occurs in shallow flowing-water areas, and the rare false mermaid (*Floerkea proserpinacoides).* These communities occur in the main valley bottom on and around saturated organic soil fed by groundwater. These seepage zones

occur at the base of steep bluffs as well as in the middle of the valley floor. Shade from trees in the adjacent forest is important to maintaining higher humidity and cooler temperatures of these swamps.

Long-term objective - Management in these areas will be designed to maintain the community type. Brush cutting to control woody competition may be necessary in the wet meadow. These areas should be monitored for nonnative species invasion and seedling regeneration.

Short-term plan - No activities are planned during the next 7 years.

Seepage Meadow

Description - This community is co-dominated by large patches of Emoryi's sedge (*Carex emoryi)* and hairy-fruited sedge (*Carex trichocarpa).* Species diversity is low due to a dense root mat formed by clones of the dominant sedges. The meadow is fed by groundwater and seems to be maintained by impounded water, possibly due to past beaver activity or flooding debris that has created a slight berm. This sedge-dominated variant of the seepage meadow is rare in the Blufflands where only a handful of occurrences are known.

Long-term objective - Maintain a healthy seepage meadow community.

Short-term plan - No activities are planned during the next 7 years.

Lowland Hardwood Forest

Description - The canopy of this community is often patchy and the dominant trees include basswood, black ash, and American elm (*Ulmus Americana).* Many of the canopy gaps are due to dead elms. The sub-canopy and shrub layers are quite open and the herbaceous layer is dominated by spring ephemerals early in the season and summer blooming species, mainly wood nettle (*Laportea Canadensis)* and cleavers (*Galium aparine)* later in the season. At least five rare plants and four rare animals depend on the lowland hardwood forest including: Carey's sedge (*Carex careyana),* James' sedge (*Carex jamesii),* spreading sedge (*Carex laxiculmis),* Wood's sedge (*Carex woodii),* and Louisiana waterthrushes (*Seiurus motacilla).* These communities occur along nearly the entire length of the main valley bottomland and grades into hardwood seepage swamp communities and grades to maple-basswood forest on well-drained terraces.

Long-term objective - These areas will be managed to maintain the lowland hardwood forest community type and to encourage the continued existence of the forest interior bird species that currently occupy these areas. Areas that are not threatened by reed canary grass and are regenerating the overstory hardwood species will be maintained with minimal management. Areas of lowland hardwood forest that are dominated by reed canary grass will be managed to minimize this risk. Areas that are exhibiting canopy regeneration will be managed to encourage the regeneration of overstory hardwood species and restore the lowland hardwood forest community. Objectives are to maintain a riparian corridor connecting these two sections of high biological diversity while allowing timber harvest entry to restore and manage for a diverse lowland hardwood forest. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - No activities are planned during the next 7 years.

Maple Basswood Forest

Description - Sugar maple and basswood dominates the canopy of this community. Blue beech (*Carpinus caroliniana),* sugar maple, and bladdernut are common in the well-developed understory and shrub layer. These communities have a diverse herbaceous layer with a variety of spring ephemerals including bloodroot (*Sanquinaria Canadensis),* hepatica (*Hepatica acutiloba),* and trillium (*Trillium flexipes).* The maple-basswood forest community supports populations of 12 State-listed plants including: Carey's sedge (*Carex careyana),* James' sedge, and Moschatel (*Adoxa moschatellina).* This community was identified on approximately 330 acres on north-facing slopes and east and west-facing slopes in small ravines, and on the narrow valley floor in the far upstream reaches of the site.

Long-term objective - These areas will be managed to maintain the maple basswood forest community and the full canopy cover that is typical of this native plant community. In the Upper Beaver Creek area maple basswood plant communities are found on steep slope and the soils and understory species found in these communities are sensitive to disturbance. Areas should be monitored for nonnative species invasion. Where nonnative species invasion is prevalent management action should be taken. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - No activities are planned for the next 7 years.

White Pine-Hardwood Forest

Description - White pine is present in the canopy of these communities. White pines are associated with dolomite cliffs and outcrops on upper steep slopes in the Upper Beaver Creek area. Moisture conditions vary from moist on the north-facing bluffs to dry on the south to west-facing bluffs. Oak or maple-basswood associated species are common depending on the moisture conditions. Species such as rose twisted-stalk (*Streptopus roseus),* mountain maple (*Acer specatum),* yellow birch (*Betula allegheniensis),* and high-bush cranberry (*Viburnum trilobum)* typically associated with Northern hardwood-conifer forest are present in the eastern ½ of section 19 where white pine stumps were identified.

Long-term objective - The management goal for this area is to maintain the White Pine-Hardwood Forest plant community. These areas are sensitive to loss of canopy cover that results from timber harvests. In order to maintain this community type, areas should be monitored for white pine regeneration. Those areas that exhibit white pine regeneration should be allowed to continue natural regeneration. Those areas that exhibit a lack of white pine regeneration should be managed to encourage white pine regeneration. This management may include some form of scarification or logging to encourage white pine regeneration. Any management in this area should be conducted in a manor that is sensitive to the needs for the community as a whole. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - No activities are planned for the next 7 years.

Algific Talus slope

Description - These communities occur on north-facing exposures. These two kinds of features have unusually cold microclimates as a result of systems of fissures extending back into the bedrock layers where ice persists throughout much of the summer. Cold water and air emerge from the cliff face or talus. Algific talus slopes accumulate areas of peat as a result of cold temperatures and slow soil decomposition rates. These cold microhabitats support an unusual biota adapted to cold environments, including several rare, disjunct plant and snail species. One of the northern-most occurrences of the algific talus slope

community occurs in the upstream reaches of the Upper Beaver Creek area. Disjunct plant species typical of more northern distributions associated algific talus slopes in the site include mountain maple. The herbaceous layer includes bulbet fern (*Cystopteris bulbifera),* swamp saxifrage (*Saxifraga pennsylvanica),* and the rare moschatel (*Adoxa moschatellina),* and squirrel-corn (*Dicentra Canadensis).*

Long-term objective - Maintain and protect the sensitive habitat of these areas. Avoid management activities that would threaten these areas. Include buffers between adjacent sites when management is implemented.

Short-term plan - No activities are planned.

Summary and other considerations for short-term management direction

As mentioned above in the long-term goals, some of the stands identified by the CSA database will be placed in a reserved and ERF status during the current and upcoming stand review process of the DNR SFRMP. At the present, this is a seven (7) year vegetation management plan (Appendix 5&6).

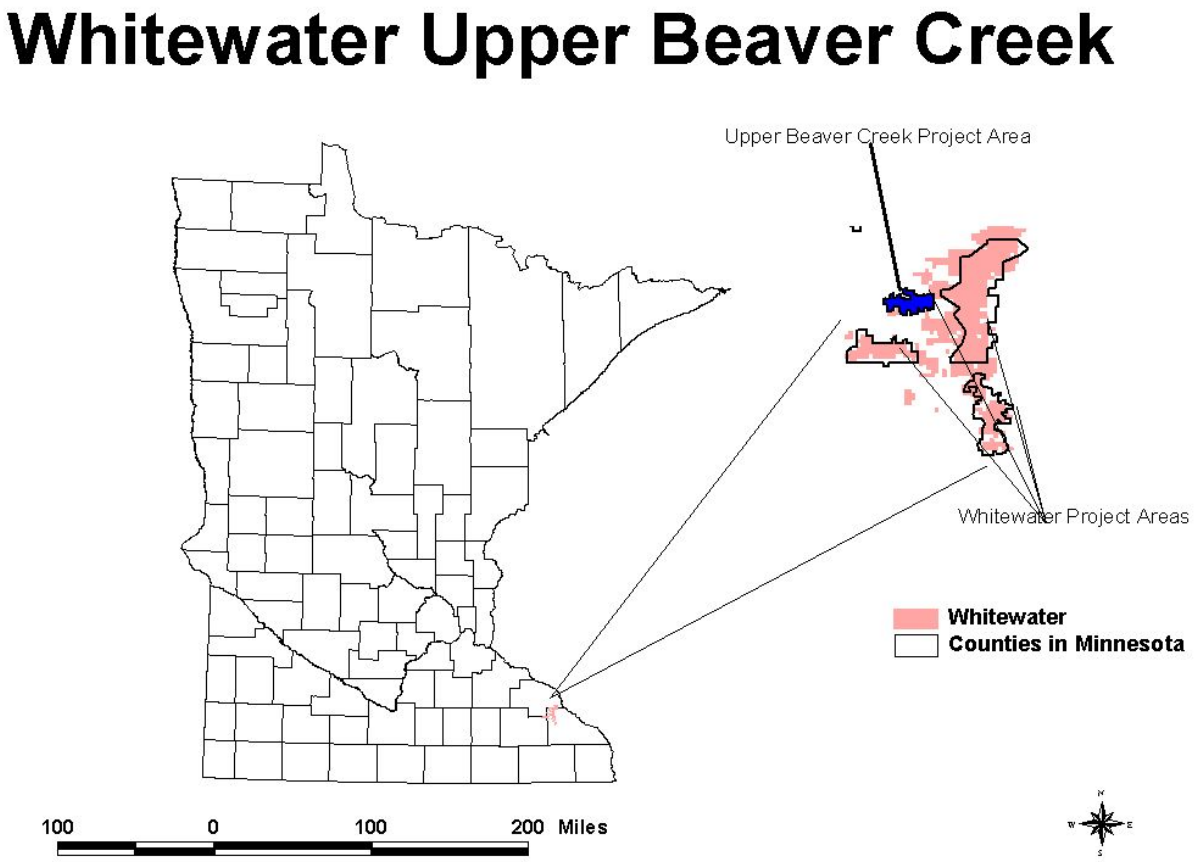
Stands placed in reserve include stands 11, 12, and 16; Section 19, T108N R10W and stand 1, Section 20, T108N R10W. These stands are associated with the well-shaded, wet-mesic microhabitat of forested toe slopes rich in state-listed plants and animals. It is intended that these same stands will be reserved upon future timber stand review.

These entire slopes encompassing the above stands will be managed to avoid disturbances that might compromise the unique species and microhabitats as identified in the Project Evaluation while allowing some form of timber harvest/management on stands which break over the top of the slopes into the uplands. These stands would include stand 15, Section 19, T108N R10W, and stand 10, Section 20, T108N R10W. Group selection should be considered upon the review of the Division of Ecological Services to mimic small blow downs that may have occurred in the past. Management concerns such as undue edge effects on interior birds will be considered when examining management technique that allow for oak regeneration.

Stands 1, Section 19 T108N R10W, and stand 16, Section 20 T108N R10W have been designated as ERF. Objectives are to maintain a riparian corridor connecting these two sections of high biological diversity while allowing timber harvest entry to manage for a diverse lowland hardwood forest.

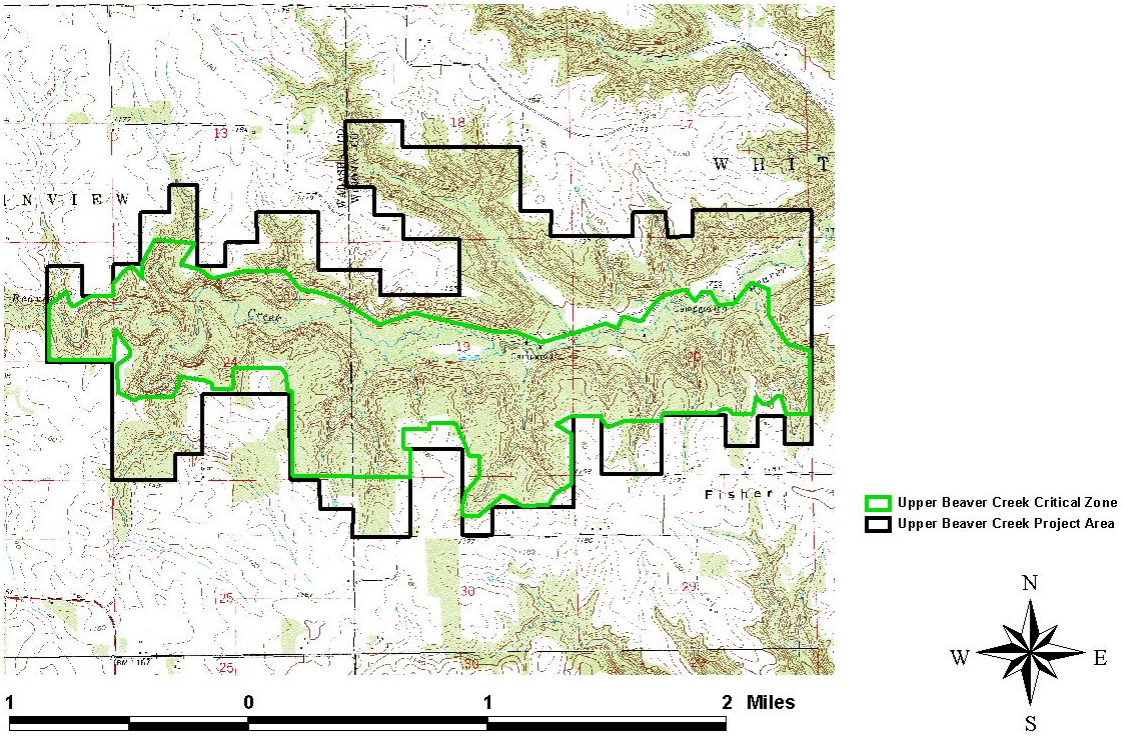
The Project Evaluation also mentioned that forest habitats could be enhanced by planting native hardwoods on level uplands to round out the jagged edges of the old agricultural fields. These options will be explored particularly in S1/2 Section 19, T108N R10W and NE Section 20, T108N R10W.

Appendix 1: Whitewater WMA & Upper Beaver Creek Project Area



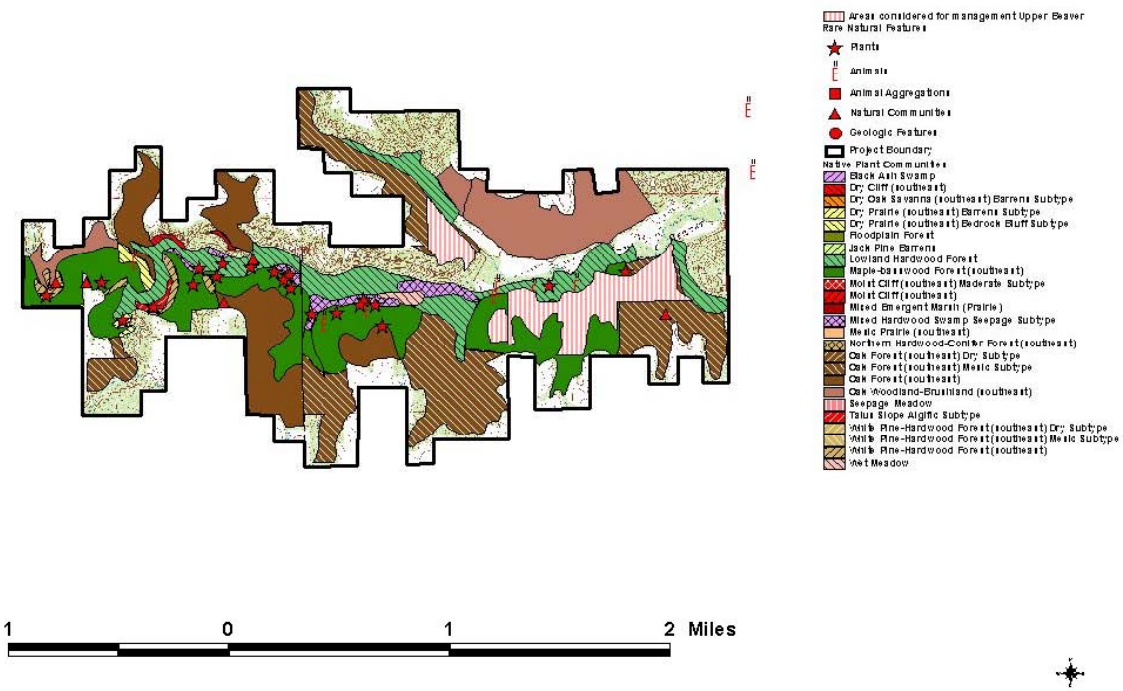
Appendix 2: Project Area and Critical Zone

Upper Beaver Creek Area



Appendix 3: Native Plant Communities & Rare Elements

Whitewater Upper Beaver Creek



Appendix 4: Rare Features Summary

Native Plant Communities	**EO-Rank[1]**	**Acres in Site**
Dry Cliff (Southeast Section)	**BC**	**5**
Dry Prairie (Southeast Section) Bedrock Bluff Subtype	**B, BC**	**5**
Lowland Hardwood Forest	**BC, C**	**190**
Maple-Basswood Forest (Southeast Section)	**B, B, B**	**330**
Mixed Hardwood Swamp-Seepage Subtype	**BC, C**	**35**
Oak Forest (Southeast Section)	**BC**	**170**
Oak Forest (Southeast Section) Mesic Subtype	**B, B**	**350**
Seepage Meadow	**BC**	**5**
Talus Slope (Algific Subtype)	**AB**	**5**
White Pine-Hardwood Forest (Southeast Section)	**BC**	**15**

Rare Plants	**EO-Rank[1]**	**Status**
Carex careyana (Carey's Sedge)-2[2]	**BC, C**	**THR**
Carex jamesii (James' Sedge)-1	**BC**	**THR**
Carex Laevivaginata (Smooth-sheathed Sedge)-2	**B, C**	**THR**
Carex laxiculmis (Spreading Sedge)-1	**BC**	**THR**
Diplazium (Athyrium) pycnocarpon (Narrow-leaved Spleenwort)-1	**A, C**	**THR**
Floerkea proserpinacoides (False Mermaid)-2	**A, AB**	**THR**
Polystichum acrostichoides (Christmas Fern)-1		**THR**
Adoxa moschatellina (Moschatel)-7	**A, A, B, B, B**	**SPC**
Asplenium platyneuron (Ebony Spleenwort)-1		**SPC**
Carex woodii (Wood's Sedge)-3	**A, B**	**SPC**
Dicentra Canadensis (Squirrel-corn)-2	**A, B**	**SPC**
Dryopteris goldiana (Goldie's fern)-1	**B**	**SPC**
Jeffersonia diphhylla (Twinleaf)-4	**B, B, BC, CD**	**SPC**
Panax quinquefolius (American Ginseng)-2	**C**	**SPC**
Solidago sciaphila (Cliff Goldenrod)-1		**SPC**
Actaea pachypoda (White Baneberry)-1	**C**	**NON**
Athyrium thelypteroides (Silvery Spleenwort)-2	**A, B**	**NON**
Poa sylvestris (Woodland Bluegrass)-1	**B**	**NON**

Rare Animals		
Crotalus horridus (Timber Rattlesnake)-1		**THR**
Buteo lineatus (Red-shouldered Hawk)-1		**SPC**
Microtus pinetorum (Woodland Vole)-1		**SPC**
Seiurus motacilla (Louisiana Waterthrush)-1		**SPC**
Rana palustris (Pickerel Frog)-4		**NON**

Key:

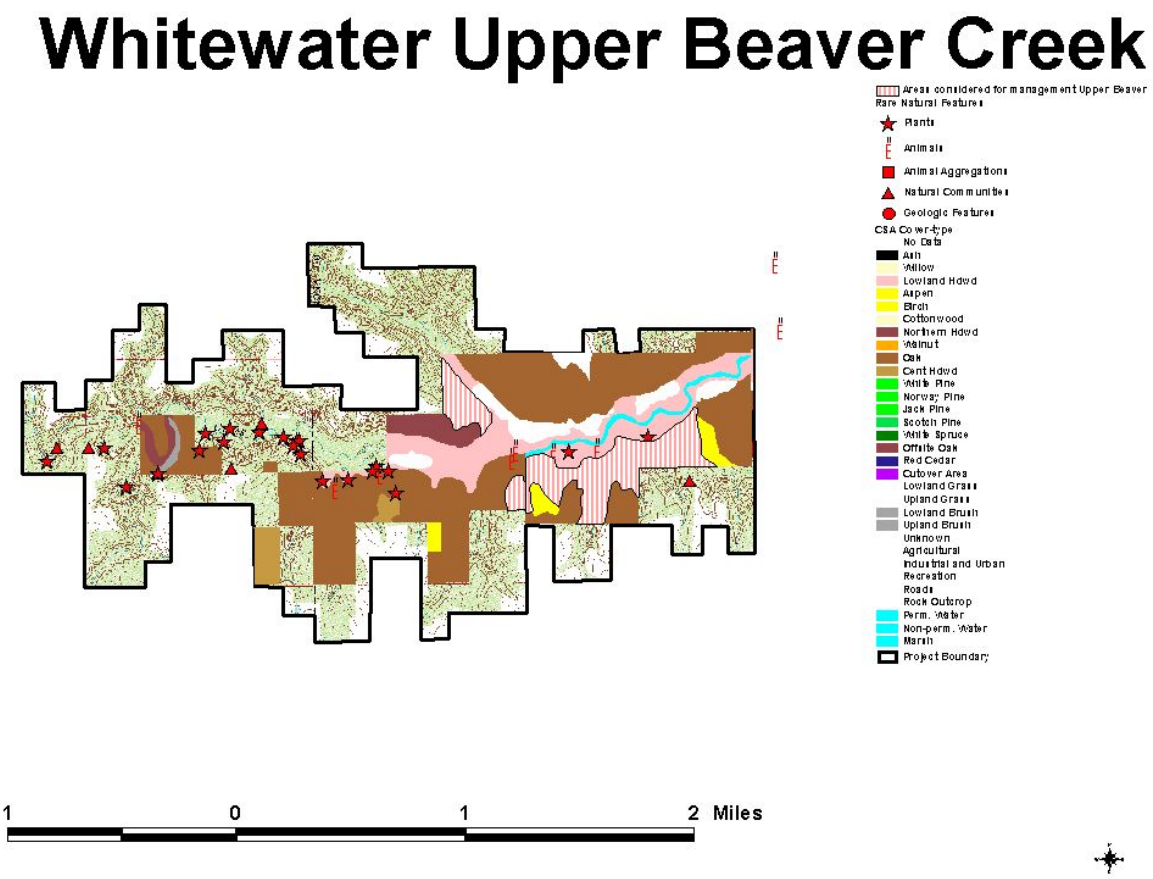
[1] ecological quality rank where A=highest quality and D=lowest quality (multiple ranks indicate multiple occurrences)

[2] number following rare species listing refers to number of occurrences recorded in the area

Appendix 5: Proposed Management Actions

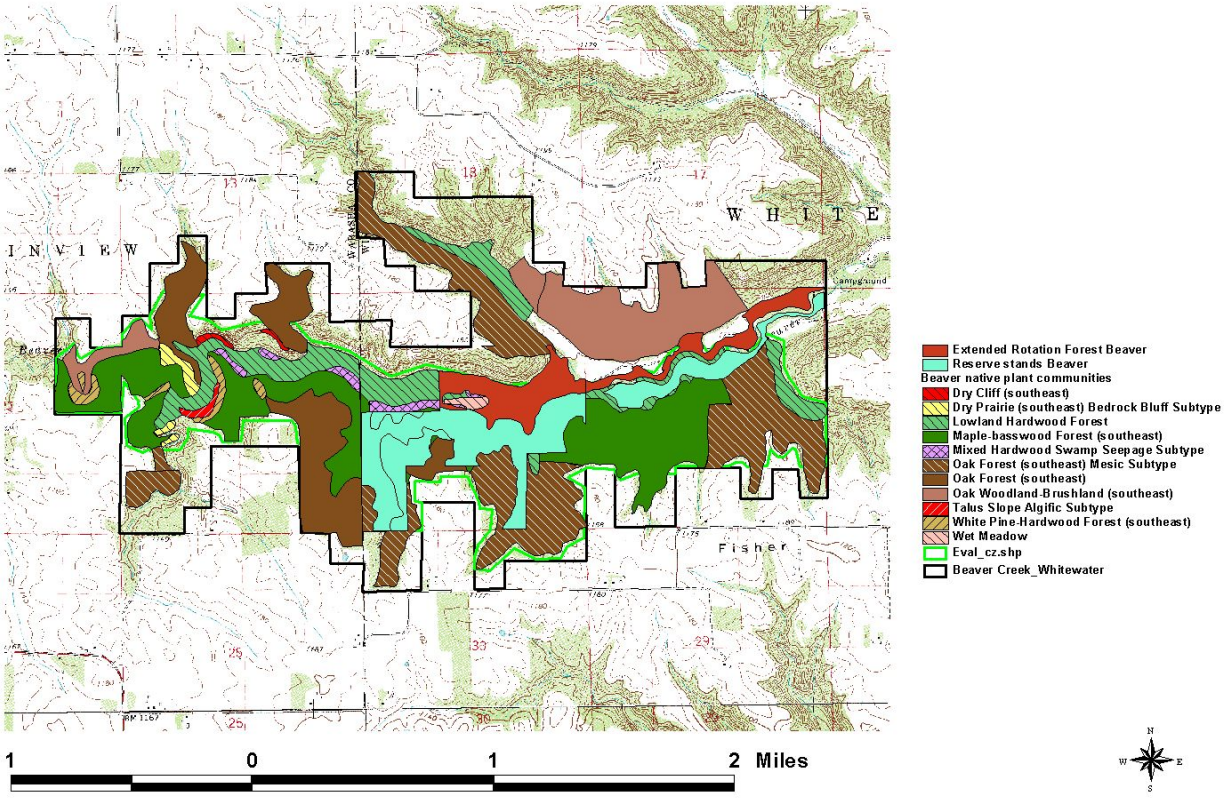
Township	**Range**	**Section**	**Stand**	**Action**
108	**10**	**19**	**3**	**Field visit during 2004 dictates no management necessary in next 7 years**
108	**10**	**19**	**15**	**Clearcut Aspen**
108	**10**	**20**	**10**	**Selective Harvest Maple-basswood portion (west end) – Group Selection/clearcut Oak portion (east end)**
108	**10**	**19**	**11,12,16**	**Reserve**
108	**10**	**20**	**1**	**Reserve**
108	**10**	**19**	**1**	**ERF**
108	**10**	**20**	**16**	**ERF**

Appendix 6: CSA Cover Types



Appendix 7: Reserved and ERF Stands

Beaver Creek



Appendix 8: Additional Management Guidance

Harvest of high quality maple-basswood communities

Selective harvest will be allowed if site teams jointly develop detailed plans that include joint on-site visits. The following conditions will apply:

- Oak resources can be salvaged as these sites are converted to purer maple basswood communities. This should be done by selective, individual or small group marking and removals.
- Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns.
- Seasonal and equipment restrictions should be used to limit soil disturbance; horse logging on frozen ground should be done where appropriate in the most sensitive sites).
- Trees should be jointly marked as well as the layout for access and skid trails to minimize any additional permanent fragmentation.
- Portions of stands that support unique or rare resources (such as a rare species or a rich spring ephemeral flora) may be delineated for no harvest.
- A pre and post treatment monitoring and evaluation protocol for species and communities of concern (both native and exotic) should be developed and implemented in each stand. Harvest plans should also take into account whether or not invasive exotic species occur in stands immediately adjacent to those being harvested.

With respect to the last bullet, Ecological Services staff will continue discussions with USDA Forest Service staff to further explore the opportunities to collect pre-treatment data during the 2004 field season.

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. To promote natural regeneration and protect soil productivity, look for opportunities to clear-cut the forested type on more level terrain following pre-sale soil scarification. Harvesting on steeper slopes, where appropriate, would be restricted to shelterwood, group selection, or variations of these harvest methods without soil scarification.

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority

for prescribed fire funding. Wildlife will work with the Divisions of Ecological Services and Forestry to ensure that these sites are regenerated through the application of fire.

Aspen and white pine pockets

The cover type goal as listed in the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan is to maintain or moderately increase the white pine acreage and increase the aspen acreage for various wildlife and non-game species. As stated in the plan, there are relatively few stands of aspen larger than five-acres in size in southeastern Minnesota.

Native white pine stands are limited in number, but provide multiple benefits to numerous game and non-game species from roosting sites for wild turkeys to perches and roost areas for bald eagles. The department believes it is necessary to access some of the sites for management to ensure natural regeneration occurs.

Options to minimize any intrusion through the maple-basswood communities should include the following:

- A search for any pre-existing old homestead roads or trails that could be used for access and whether exotic species are present in the area which might be introduced along such a corridor if made active again;
- List alternate means to access the white pine such as through private land, through other disturbed communities, etc; and
- Timing of access whereby any mechanical scarification would take place during fall or early winter, reducing the "footprint" upon the trail used to access such stands. The department believes such efforts to maintain or increase the native white pine acreage in this landscape outweigh the minor impacts to surrounding northern hardwood communities.

Small aspen clones in high quality sites should only be harvested when a harvest is already planned and approved by the team, at the same time, within the immediately surrounding stand in which the clone is embedded. Other conditions mentioned under the high quality maple-basswood communities section above should also be addressed. If harvest in the stand in which the aspen is embedded is not planned, then a special effort to cut the aspen should not be made.

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Money Creek Bluff

Final

May 2010

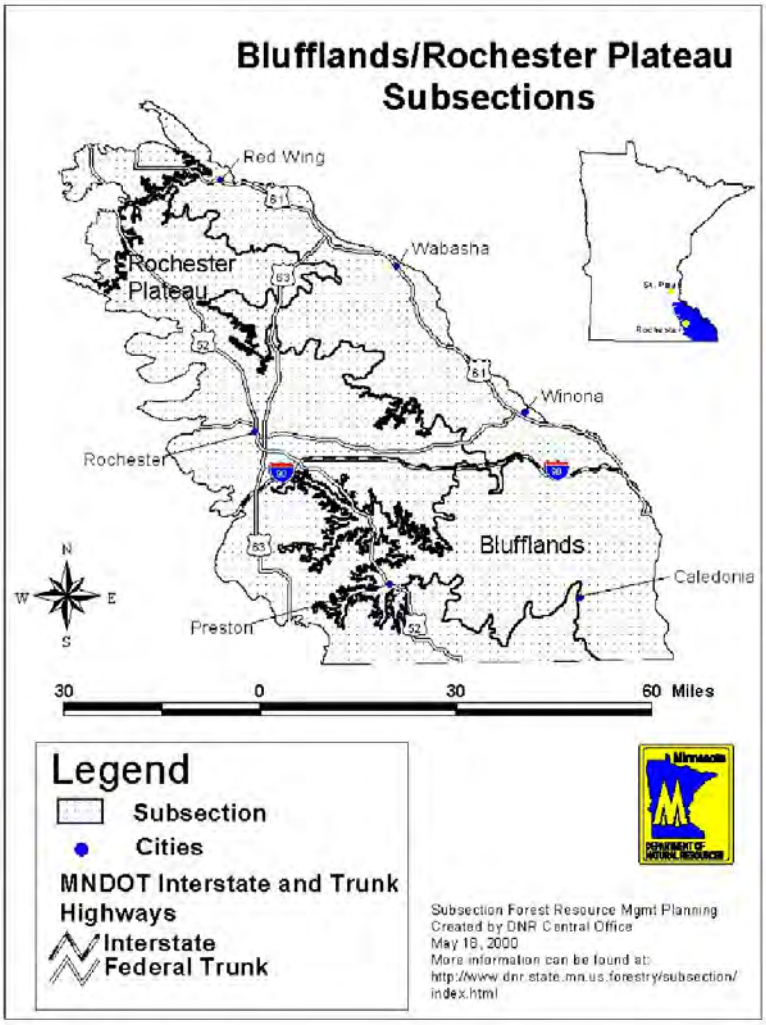
MN Department of Natural Resources Planning Document
Printed May 2010

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the DNR Subsection Resource Management Plan process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on state owned land in the Money Creek Bluff/Vinegar Ridge area in Houston county Minnesota (Appendix 1). The Money Creek Bluff/Vinegar Ridge area is one of 13 MCBS sites of outstanding biodiversity on lands administered by the DNR Divisions of Forestry and Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended to be used in conjunction with the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every 10 years as part of an adaptive management process.



The Blufflands/Rochester Plateau SFRMP addressed management of vegetation on State Forest and Wildlife lands. There were 13 "priority areas of significant biodiversity" identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site. Of the 745 sites of biodiversity significance in the 2 subsections, 62 sites are contained within these 13 priority areas. Ecological evaluations that mapped and described the rare natural features were prepared by MCBS ecologists for these 13 sites prior to the SFRMP planning process.

Division directors for the DNR Divisions of Forestry, Wildlife, and Ecological Resources determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the area as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Following the completion of Minnesota County Biological Survey (MCBS) fieldwork in 2001, the Money Creek Bluff area was noted as being one of 13 sites in southeast Minnesota with significantly high biodiversity. The project site area at Money Creek Bluff is 1307 acres in size of which 885 acres is in state ownership as part of the Richard J. Dorer State Forest. The remainder of the project area consists of 371 acres of privately owned land, 51 acres of the Root River, and 31 acres of the Root River State Bike Trail. The Critical Habitat Zone boundary contains the core area of rare natural feature locations and encompasses the entire 1307 acres at Money Creek Bluff.

The management philosophy for the state forestland within this area is the same as for all other forestry lands within the Richard J. Dorer Memorial Hardwood Forest and is based on the landscape level perspective of ecosystems and the species that use those ecosystems. The goals are to maintain natural communities while providing the multiple uses that healthy forest ecosystems can provide.

The resource managers who work in and manage Money Creek Bluff developed the management plan for this area cooperatively. It will be an adaptive management plan. As scientific knowledge increases regarding management of ecosystems, plant communities, and individual species, some management recommendations within this plan may change.

The overall goal of writing the plans for this and the other 12 high biodiversity areas is to perpetuate the plant communities that support the unique flora and fauna that make these areas exceptional. Recommendations in this plan are written for state-owned land. Private landowners within the project boundary may be contacted and offered management assistance for their land if they desire it.

Background History and Site Description

The Money Creek Bluff/Vinegar Ridge area is located approximately 4 miles southeast of Rushford, Minnesota. It lies within the Blufflands Subsection and is made up of a block of state land within the Richard J. Dorer State Forest as well as privately owned property (Appendix 4). The Root River flows along the southern edge of the plan area.

Humans have been impacting the Money Creek Bluff area for thousands of years. An archeological survey done along the Root River at the project site was done in 1979 and significant evidence of past human use was found. Native American habitation and artifact sites were found on some sand terraces and a series of 11 mounds were also found on some higher terraces that overlook the Root River. Another lone mound was just discovered by DNR foresters in the spring of 2010. Evidence of early European settlement was also found in the form of harness hardware, nails, glassware, and other random items. The last documented Native American use of this area was by the Winnebago Tribe of the Dakota in 1852.

Early settlement of the area began approximately in the 1830's with fur trappers. Slowly others followed and claimed the cold-water springs and adjacent tall grass prairies to graze their livestock. In 1854-1855 contracted surveyors hired by the Public Land Survey surveyed the land. The whole area was then homesteaded and intensively farmed. All the acreage found at Money Creek Bluff was burned on a regular basis by the landowners to help with grazing. This continued until the 1930's when the Township Fire Warden system was established to help control woodland fires.

State land acquisition in the Money Creek Bluff area began in the early 1960's with the dedication of the first parcel of state land by Houston County Supervisors in section 34 along the Root River. This parcel was tax-forfeited woodland. Other acquisitions of privately owned woodland from 6 local farmland owners quickly followed in the late 1960's and 1970's, eventually forming the 885 acre block of state owned forest land that makes up a good portion of the Money Creek Bluff area.

The DNR cooperative stand assessment (CSA) forest inventory was completed on all DNR Forestry-administered lands within the Money Creek Bluff project area in the mid to late 1980's (Appendix 2). In addition, the Minnesota County Biological Survey was completed for this area in the late 1990's. The results of these two databases provide information regarding the status and distribution of natural plant communities and rare species found in the Money Creek Bluff project area.

Scott Zager and Carol Hall from the Minnesota County Biological Survey provide an excellent description of the project area. The following is excerpted from their description of the high-bio project site:
"Money Creek Bluff is an outstanding example of the geologic and ecological features of the Blufflands Subsection of the Paleozoic Plateau". The "site is within a two-mile wide oxbow meander of an ancient glacial river that cut its valley into the bedrock of the surrounding plateau. The four hundred foot high bluffs resemble a natural citadel or fortress on a promontory surrounded on three sides by the modern floodplain of the Root River. The main bluff has several lateral ridge-spurs whose narrow crests radiate in all directions from a central knoll creating a series of secluded canyons or glens. The Root River State Trail passes through the site on an abandoned railroad bed at the base of the bluff." (Appendix 3).

"The rich biodiversity found at the site is attributed to its varied landscape and geology. The site's unique combination of land formations supports one of the largest areas of native vegetation…Ten different native plant communities cover approximately 900 acres within the Money Creek Bluff…The native plant communities at Money Creek Bluff are continuous across the landscape and include various habitats important to animals and plants. For example, the limestone rock outcrops and dry prairies provide critical den sites for three species of state-listed snakes. In addition, the sand terrace which formed during the ice-age is inhabited by some of Minnesota's rarest species."

"Outside the Mississippi River Valley, few large alluvial forests remain in the Southeast and many of these are comprised of young, early-successional trees. Money Creek Bluff has the largest floodplain forest of mature trees in the Root River watershed and is one of the few places where the river meanders in a natural setting."

"Of further biogeographic interest, Plainfield sand is found in unusual situations at Money Creek Bluff providing habitat for native plant communities such as barrens prairie on knoll crests…This unique phenomenon may have occurred during various episodes when glacial ice reached its farthest extent…winds swept the Root River Valley, they picked up fine sand off the dry floodplain of a then braided stream…Money Creek Bluff acted as a natural drift fence for the valley…Fine particles of eolian sand became deposited on the bluff crests and upper ridge slope-areas that are generally occupied by wind-blown silts or loess. Consequently, Money Creek Bluff has Plainfield sand at all slope positions thereby enlarging and otherwise limited habitat."

The Minnesota County Biological Survey identified many rare species in the Money Creek Bluff area. A list of these species is as follows:

1. State Endangered: Rough-seeded Fameflower (*Talinum rugospermum*)

2. State Threatened: Canadian Forked Chickweed (*Paronychia Canadensis*), Ovate-leaved Skullcap (*Scutellaria ovata*), Three-flowered Melic (*Melica nitens*), Upland boneset (*Eupatorium sessiliforium*), Timber Rattlesnake (*Crotalus horridus*)

3. State Special Concern: Clasping Milkweed (*Ascelpias amplexicaulis*), Cliff Goldenrod (*Solidago sciaphila*), Goat's-Rue (*Tephrosia virginiana*), Plains Wild Indigo (*Baptisia bracteata* var. *leucophaea*), Purple Cliff-brake (*Pellaea atropurpurea*), Rhombic-petaled Evening primrose (*Oenothera rhombipetala*), Sea-beach Needlegrass (*Aristida tuberculosa*), Three-leaved Coneflower (*Rudbeckia triloba*), Witch-hazel (*Hamamelis virginiana*), Gopher Snake (*Pituophis catenifer*), Racer (*Coluber constrictor*), Acadian Flycatcher (*Empidonax virescens*)

The Minnesota County Biological Survey also identified 8 different native plant communities found in the Money Creek Bluff project area. These plant communities are listed as follows: Dry Cliff, Dry oak savanna (barrens subtype), Dry prairie (barrens subtype), Dry prairie (bedrock bluff subtype), Floodplain forest, Oak forest (dry subtype), Oak forest (mesic subtype), and river beach.

More detailed descriptions of these types will be presented in the implementation section of this plan.

Management History

Following is a summary of forest management practices that have occurred on the Money Creek Bluff state forestland from 1963 to present.

Tree Planting

Section Number	FIM Type	Acres/Year planted	Species
27	177	8 / 1965	8,000 White Pine, 8,000 Walnut nuts
27	178	16 / 1965	3,000 White pine, 5,000 Walnut nuts
28	166	5 / 1970	4,000 Walnut
28	173	24 / 1975,1978,1979,1983	Total of 52,000 Red pine, 2500 Ponderosa pine, 1250 White pine
28	93	22 / 1970	20,500 Red pine, 11,500 White pine
28	229	20 / 1997	2,000 Red oak and 2,000 White oak underplanted

Timber Stand Improvement

Walnut pruning and release was done in the mid 1970's throughout the entire base of state forestland located at Money creek Bluff. This includes FIM types 165, 166, 175,180, 187, 192, 193, 196, 203, 223, 224, 225, 226, 227, 228, 229, 256, 257, 258.

Timber Harvest

Section Number	FIM Type	Acres/Harvest Year	Sale Type
27	177, 178	20 / 2001	Pine Thinning
27	170	7 / 1987	Oak Select Cut
27	225	23 / 1997	Oak Select Cut
27	224	6 / 1997	Oak Select Cut
28	228	85 / 2008 to present	Oak Select Cut/Fuel wood Sale
28	229	16 / 1997	Oak Select Cut
28,33,34	227	50 / 1997	Oak Select Cut/Walnut Harvest
28	94	12 / 1975	Oak Select Cut

Recreational Development

Section Number	FIM Type	Recreation Project
27	170	Vinegar Ridge hunter parking lot
27	NA	Vinegar Ridge trail, Root River State Trail
28	171	Vinegar Ridge campground
28	NA	Vinegar Ridge trail, Root River State Trail
33	NA	Vinegar Ridge trail, Root River State Trail
34	201	Root River canoe campsite
34		Vinegar Ridge trail, Root River State Trail

Bluff Prairie Management

Section	FIM Type	Year	Activity	Acres
27	220, 224	2006	Cedar Removal	9
28	87	2006	Cedar Removal	9.75

As evident from the above tables and information, forest management activities have occurred over a large portion of state land on Money Creek Bluff during the period of state ownership. Nearly all of this management activity took place prior to the completion of the Minnesota County Biological Survey. It is also of note that the state forest land located at Money Creek Bluff is also part of an Adaptive Forest Management Plan (AFMP), is a High Conservation Value Forest (HCVF), and part of a Representative Sample area for certain types of plant communities.

Long range Goals

The long-range management goal for this area is to maintain native plant communities and plant and animal species that reside in the Money Creek Bluff area. This will be done using processes that mimic the historic disturbances that helped establish and maintain these communities.

The goals of biodiversity protection, timber management, understory species management, recreation development based on demand, and game and non-game species management will all be considered in management decisions to achieve this goal. Management goals and recommendations will be based on current management knowledge and be directed by, Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. As new research or management techniques become available, they may be incorporated into management practices prescribed in this plan to achieve long-range goals. This high-biological area is also an adaptive forest management area. Any new management techniques derived from adaptive forest management may be implemented in managing this high-bio area.

Implementation

Introduction

This section is organized into the major plant communities that are found within the Money Creek Bluff area (Appendix 1). Management goals have been shown for state owned lands only but management assistance will be given to those private landowners who desire it.

For each plant community a long-term goal has been set. This will be a statement that describes what managers would like the specific plant community to resemble 50 or more years in the future. In most cases this will be a description of an ideal plant community of the type that is being designated for perpetuation.

Following a description of the plant community, a desired short-term management directive is also provided that describes vegetation management activities that may be prescribed over the next 10 years to help achieve the long-term management goal for that community. Short-term directives will be addressed at least every 10 years when SFRMP plans are completed. Long-term goals will likely remain unchanged. The SFRMP plan for the Blufflands/Rochester Plateau is currently in the first year of a three-year addition to the original seven-year plan. Currently, only one stand in the Money Creek Bluff area is listed as having potential management activities occurring during the next 2 years. The rest of the stands will be assessed for potential management activities on a stand-by-stand basis during the next Blufflands/Rochester Plateau SFRMP planning process.

Management Direction for Native Plant Communities

Oak Forest (mesic subtype)
Native Plant Community: Red Oak – White Oak – (Sugar Maple) Forest (MHs37b)

1. Description

Mesic oak forest types are typically found on north to east facing slopes or on broad ridge crests. The canopy of mesic oak forests is typically dominated by red oak (*Quercus rubra*) and white oak (*Quercus alba*). Other significant canopy species may include basswood (*Tilia Americana*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), and black walnut (*Juglans nigra*). Sub-canopy species may include sugar maple, basswood, red oak, American elm (*Ulmas americana*), and ironwood (*Ostrya virginiana*). Understory species composition can be quite variable in these stands and may depend on slope position and aspect. A few understory species found in these mesic oak forests are nodding trillium (*Trillium cernuum*) and common enchanter's nightshade (*Circaea lutetiana*). The state threatened species ovate-leaved skullcap (*Scutellaria ovata*) and state special concern species witch hazel (*Hamamelis virginiana*) were found in mesic oak forests on Money Creek Bluff during the Minnesota County Biological Survey. FIM stands in the mesic oak forest type at Money Creek Bluff include 175O55, 180O63, 187O62, 223O64, 226O62, 227O62, 258O63,and 257O62.

2. Long-term management objective

The long-term management objective will be to maintain or enhance the mesic oak forest native plant community, including the structure and species composition of all vegetation layers. In addition, habitat for rare species such as the state threatened witch hazel will be maintained in these forests. In the hardwood forests here in southeast Minnesota we typically see mesic oak stands transitioning to a more maple-basswood type plant community with the absence of fire and other disturbances such as harvests. At Money Creek Bluff however we aren't seeing a lot of that. Most of the mesic oak stands aren't transitioning to the more shade tolerant maple-basswood communities. Sugar maple and basswood are very minor components of the mesic oak stands in this area while red and white oak dominates the canopy.

Those mesic stands that have a high component of oak will be managed to perpetuate that oak resource to ensure its survival and dominance well into the future. Management options for regenerating that oak resource may include the use of prescribed fire, various types of timber harvests (which may include even-aged, shelterwood, or group selection techniques), supplemental understory planting of oak seedlings prior to harvest, and post sale timber stand improvement projects (Appendix 5). For these sites, management options will be chosen that help perpetuate oak as well as help to maintain or improve the mesic oak forest native plant community.

3. Short-term management directive

Currently, as mentioned earlier, there are no mesic oak stands selected for examination at Money Creek Bluff, but stands will be looked at for possible treatment during the next SFRMP planning process. It is worth noting that many of the mesic oak stands were selected for a field exam during fiscal year 2009 but were put on hold pending the completion of this plan. The only management activities that will be occurring in some of these stands during the next two years prior to the next planning process will be prescribed burns to help control brush competition and encourage oak regeneration.

Oak Forest (dry subtype)
Native Plant Community: Oak – Shagbark Hickory Woodland (FDs38a)

1. Description

Dry oak forests are typically found on steep west to south facing slopes and have intermittent to closed canopies dominated by white oak, bur oak, and pin oak (*Quercus ellipsoidalis*) with lesser amounts of red oak and basswood. Other canopy species that may occur in the dry oak forest type at Money Creek Bluff are shagbark hickory (*Carya ovata*), black walnut, american elm, and black oak (*Quercus velutina*). Common sub-canopy species include ironwood, american elm, black cherry, shagbark hickory, and white oak. The understory layer can consist of american hazel (*Corylus americana*), prickly ash (*Zanthoxylum americanum*), and gray dogwood (*Cornus racemosa*). Common herbaceous species include hog peanut (*Amphicarpaea bracteata*), pennsylvania sedge (*Carex pensylvanica*), pointed-leaved tick trefoil (*Desmodium glutinosum*), and honewort (*Cryptotaenia Canadensis*). The state-threatened upland boneset is found in this dry oak forest type where it transitions to more open oak savanna. FIM stands in the dry oak forest type at Money Creek Bluff include 175O55, 212O72, 219OX52, 222O33, 225O21, 228O53, 229O21, and 256O53.

2. Long-term management objective

The management of these community types at Money Creek Bluff will lean heavily toward a goal of successful regeneration and retention of oak species within the dry oak forest plant communities. Management will also maintain or enhance the structure and composition of all vegetation layers of the dry oak forest native plant community. The habitat for the rare species that inhabit these forests will also be maintained. Areas with little to no oak that are more of a mixed hardwood stand will be allowed to succeed to that mixed hardwood type while areas with a strong oak component will be actively managed to ensure that strong oak presence remains many years in the future. Management strategies for these stands at Money Creek Bluff will include the use of prescribed fire to reduce brush competition and encourage oak regeneration, timber harvests

of varying techniques to release the oak regeneration, planting of oak and other tree species, and timber stand improvement projects to eliminate invasive species and remove undesirable competition from the regenerating oak. Management strategies will be designed to mimic natural disturbances such as large and small-scale wind events, disease mortality, and catastrophic fire. Small and large group selection harvests and shelterwood harvest techniques will be examined for their effectiveness at regenerating oak in these stands. These types of harvest strategies have been used minimally here in southeast Minnesota and little about their success at regenerating oak is known for this region. Due to this fact, even-aged harvest techniques may be used if other harvest strategies fail to deliver adequate oak regeneration.

3. Short-term management directive

Currently, no dry oak type stands are selected for examination during the next two years. All of the oak forest (dry subtype) stands at Money Creek Bluff will be looked at for possible treatment during the next SFRMP planning process. The only management that will take place in the dry oak forest type during the next two years will be the use of prescribed fire.

Lowland Hardwood Forest (Root River floodplain)
Native Plant Community: Elm – Ash – Basswood Terrace Forest (FFs59c)

1. Description

This plant community is found in the seasonally flooded areas of the Root River that flows at the southern portion of the Money Creek Bluff project area. The canopy of this cover type is often quite patchy due to elm mortality and other factors. Old stream channels that divert flood runoff and old oxbows are also very abundant throughout the lowland forest type. Canopy species tend to include silver maple (*Acer saccarinum*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), and hackberry (*Celtis occidentalis*). The lowland hardwood forest at Money Creek Bluff is a healthy example of this plant community type. The canopy of this floodplain forest along the Root River is quite diverse with a wide range of species occupying space. These species include silver maple, cottonwood, black willow, boxelder (*Acer negundo*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), hackberry, sugar maple, black walnut, american elm, red elm (*Ulmus rubra*), and bitternut hickory (*Carya cordiformis*). The subcanopy is sparse and contains mainly boxelder and hackberry with some pockets of young, shade-intolerant cottonwood and black willow found in canopy gaps. Herbaceous cover includes healthy populations of stinging nettle (*Urtica dioica*), tall coneflower (*Rudbeckia laciniata*), Virginia waterleaf (*Hydrophyllum virginianum*), and wood nettle (*Laportea Canadensis*). Reed Canary grass (*Phalaris arundinacea*), a highly invasive species, has been found in numerous locations where canopy gaps were created from elm mortality and other tree mortality. Rare animal species in this forest type include pickerel frogs and bald eagles. Rare plants include the three-leaved coneflower. FIM stands in the floodplain forest plant community at Money Creek Bluff include 166LH83, 193LH42, 196LH52, 200LH52, 201LH11, and 203LH52.

2. Long-term management objective

The floodplain forests in the Money Creek Bluff high biodiversity area are very mature, healthy examples of this type of plant community. This area is one of the largest contiguous floodplain forests along the Root River Valley with much of the other surrounding floodplain converted to agricultural uses. These high quality lowland hardwood forests should be maintained in their

current state with an emphasis on filling canopy gaps with quality lowland hardwood tree species. With reed canary grass being such an aggressive invader of these lowland sites, minimal management that opens the canopy up will be recommended to help slow the spread of this invasive plant.

3. Short-term management directive

No stands in the lowland hardwood plant community were selected for field evaluation during the next 2 years. They will be field visited and discussed for future treatment options during the next SFRMP planning process.

Dry Oak Savanna (barrens subtype)
Native Plant Community: Dry Barrens Oak Savanna (Southern) Oak Subtype (Ups14a2)

1. Description

The dry oak savanna (barrens subtype) plant community is a fairly rare community type that happens to be found in a relatively high quantity in the Money Creek Bluff high biological area. Five separate areas of barrens oak savanna are mapped in the Money Creek Bluff area. All of these areas occur on Plainfield Sand on river terraces along the Root River and into some of the larger valleys. Black oak and pin oak dominate the canopy in these plant communities. White oak and bur oak are also found in some locations. The canopy varies greatly with open areas of dry prairie to closed canopy areas dominated by black oak resulting from the elimination of fire from the landscape many years ago. The sub-canopy in the dry oak savanna at Money Creek Bluff is mainly sparse with a few pockets of young white and black oak beginning to develop. Ideally, the understory in this plant community consists of American hazelnut (*Corylus Americana*), smooth sumac (*Rhus glabra*), poison ivy (*Toxicodendron rydbergii*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), and gray goldenrod (*Solidago nemoralis*). The state threatened species, Canadian forked chickweed is found in three locations in the barrens oak savanna and this represents one third of all known locations statewide. Additional rare plant species found in this forest type include the rough-seeded fameflower, three-flowered melic, goat's rue, cliff goldenrod, rhombic-petaled evening primrose, sea-beach needlegrass, and clasping milkweed. Rare animal species include the gopher snake and racer. All of these species thrive in relatively open, diverse oak savanna with areas of bare sand. The understory in the barrens oak savanna stands at Money Creek Bluff is somewhat different. Due to the lack of fire in these stands invasive honeysuckle has become a dominant shrub along with young oak seedlings and saplings. These oak seedlings and saplings have also helped close the canopy and encourage Pennsylvania sedge (*Carex pensylvanica* var. *pensylvanica*), a woodland species, to become the dominant ground cover throughout the savanna plant communities. FIM stands in the barrens oak savanna plant community at Money Creek Bluff include 94O14, 222O33, 228O53, and 256O53.

2. Long-term management objective

The long-term objective for this plant community is to restore the areas of barrens oak savanna to native vegetation and community structure. This will include the use of prescribed fire throughout the stands, individual and commercial fuelwood sales to reduce the excess of woody vegetation and invasive species removal through mechanical and chemical treatments.

3. Short-term management directive

FIM stand 228O53 was scheduled for harvest during the last SFRMP planning process. This is the only barrens oak savanna stand selected for treatment. This stand was field visited by representatives from the divisions of forestry, wildlife, and ecological resources and a joint decision was made to try and restore the stand back to oak savanna using small fuelwood permits, prescribed fire, and invasive species removal. The stand was re-visited and leave trees were marked with paint throughout the stand and stand boundaries were established. Currently there are 5 active, individual fuelwood permits in this stand where each individual may harvest up to five cords of firewood. They may harvest any tree not marked with paint within the stand boundary. The marked reserve trees will be the ones that will make up the savanna canopy when the site is fully restored. They include a mix of black oak, white oak, black walnut, and bur oak and include a mixture of young and mature individuals. The first prescribed fire for this stand is scheduled to occur in the spring of 2010. The remaining barrens oak savanna stands will be discussed for future treatment options during the next SFRMP planning process.

Dry Prairie (barrens subtype)
Dry Barrens Prairie (Southern) (Ups13a)

1. Description

These plant communities tend to occur on Plainfield sand scattered throughout the barrens oak savanna communities. They're typically found on southern aspects of some of the sand dunes in the barrens oak savanna communities located at Money Creek Bluff. Many of these prairies in the high biological area are located on the south to southwest edge of the sand terraces that overlook the Root River. The Root River State Trail offers a great vantage point for many of these prairies. Other examples of this plant community type are located on some of the sand dunes located in some of the larger valleys. They can be sparsely vegetated due to unstable sandy slopes and some of the dominant grasses found in this community type are big bluestem, little bluestem, prairie dropseed (*Sporobolus heterolepis*), and Indian grass. Some common forb species include purple prairie clover (*Dalea purpurea*), hoary puccoon (*Lithospermum canescens*), and wild bergamot (*Monarda fistulosa*). Most occurrences of rare plant species documented at Money Creek Bluff occur in the sandy plant communities such as the barrens prairie and barrens oak savanna. Five occurrences of the State Endangered rough-seeded fameflower (*Talinum rugospermum*) were documented in the barrens prairie communities in the project area. These five occurrences represent nearly one quarter of all known occurrences statewide. FIM stands in the barrens dry prairie plant community at Money Creek Bluff include 256O53.

2. Long-term management objective

The management goal for these plant communities will be to maintain the small prairie openings with the use of prescribed fire that follows rattlesnake management guidelines and potentially enlarge some of the openings by removing encroaching woody vegetation along the prairie perimeters.

3. Short-term management directive

None of these small prairie types were selected for treatment although a few of the prairies located in barrens oak savanna stands will be burned in the spring of 2010. The rest of these plant

communities will be looked at for management strategies during the next SFRMP planning process.

Dry Prairie (bedrock bluff subtype)
Native Plant Community: Dry Bedrock Bluff Prairie (Southern) (Ups13c)

1. Description

There are seven different areas classified as Southern Dry Bedrock Bluff Prairie in the Money Creek Bluff area. The three largest areas are on south to west facing bluffs on the southern edge of state ownership, and one larger area on the northern edge of the property, north of River Drive. These prairies are grass-dominated plant communities located on steep south to west facing slopes. They also contain a high diversity of forbs. This plant community is characterized by dry, thin soil covering Oneota dolomite and Jordan sandstone on the middle to upper slopes, and silty limestone of the St. Lawrence Formation is exposed in areas on the lower slopes. FIM stands in the bedrock bluff prairie plant community at Money Creek Bluff include 87RO, 97RO, a small portion of 175O55, 188RO, 191RO, 218RO, 220RC13, 221RC13, a small portion of 226O62, and 231RO.

Many mesic and dry-mesic species occupy open areas where Indian grass (*Sorghastrum nutans*) and big bluestem *(Andropogon gerardii)* are dominant, as well as little bluestem (*Schizachyrium scoparium*) and prairie dropseed (*Sporobolus heterolepis*) in drier areas. Common forb species include sky blue aster *(Aster oolentangiensis),* gray goldenrod *(Solidago nemoralis),* Western sunflower *(Helianthus occidentalis*), purple prairie-clover *(Petalostemon purpureum),* flowering spurge (*Euphorbia corollata*), and hoary puccoon (*Lithospernum canescens*). In dry areas where vegetation is sparse, the grasses poverty dropseed (*Sporobolus vaginiflorus*) and hairy grama (*Boeuteloua hirsuta*) are common, along with forbs lyre-leaved rock cress (*Arabis lyrata*), silky aster *(Aster sericeus*), cylindrical blazing star (*Liatris* cylindracea), green milkweed (*Asclepias* viridiflora), plains wild indigo (*Baptisia* bracteata), and small skullcap (*Scutellaria parvula*).

Compass-plant *(Silphium laciniatum)* is also found on Money Creek Bluff sites, which is an indication of the high ecological quality of this site. Additionally, the abundance of species such as lead plant (*Amorpha canescens*) and showy goldenrod (*Solidago speciosa*) indicate the sites were never severely grazed by livestock, a rare occurrence on many bluffs in southeastern Minnesota.

Historically, Southern Dry Bedrock Bluff Prairies were considerably open with few to no trees or shrubs. Bur oak (*Quercus macrocarpa*) was commonly found toward the top and bottom of the bluffs, with an occasionally tree mid slope. Without fire and grazing to maintain the open nature of this plant community, trees and brush begin to move in. A dominant invader of bluff prairies is red cedar (*Juniperus virginiana*), which can take over and significantly alter the native plant composition. Other species that commonly invade bluff prairies include aspen species (*Populus sp*.), paper birch (*Betula papyrifera*), gray dogwood (*Cornus racemosa*), smooth sumac (*Rhus glabra*), prickly ash (*Zanthoxylum americanum*), ninebark (*Physocarpus opulifolius*), and two non-native species European buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera sp.*).

Several of the prairies at Money Creek Bluff have large amounts of bush juniper (*Juniperus communis*), which grows over the thin, rocky soils. The bluffs at this site are getting encroached by red cedar (*Juniperus virginiana*), aspen (*Populus sp*), and native brush including smooth sumac (*Rhus glabra*), and ninebark (*Physocarpus opulifolius*). Recent management activity has opened

up two of the bluffs north of River Drive and bluffs south of River Drive will be evaluated for cedar removal in the next few years.

Money Creek Bluff contains at least two timber rattlesnake (*Crotalus horridus*) dens, and likely has more. Adult snakes have been documented on site as recently as 2007. Timber rattlesnakes are a state threatened species and depend on bluff prairies for denning sites, which are a critical habitat component for this species. Because larger den sites are becoming increasingly rare in Minnesota, management of Money Creek Bluff should give special consideration to perpetuating the timber rattlesnake.

Scott Zager and Carol Hall provide a great description of the quality of some of the bedrock bluff prairies found at Money Creek in the following excerpt from their description of the site in the Minnesota County Biological Survey:
"…Two-hundred and forty-four bluff prairies were documented in the Southeast. However, only a few of these are considered to be of exceptional quality. Money Creek Bluff has one of the five best prairies in Houston County."

2. Long-term management objective

Maintain and enhance these bluff prairies through the use of prescribed fire and woody vegetation removal. Red cedar is a coniferous woody species that poses a large threat to these plant communities. With the absence of fire they will take over and dominate the prairie habitat over time. Mechanical removal and prescribed fire will be used to combat the intrusive red cedar on the bluff prairies at Money Creek Bluff.

3. Short-term management directive

Many of the bluff prairies will be burned in the prescribed fire planned for the spring of 2010. This burning regime will continue into the future to help maintain the valuable bluff prairies at Money Creek Bluff.

Dry Cliff
Native Plant Community: Southern Dry Cliff (CTs12a; CTs12b)

1. Description

These plant communities are commonly found on very steep south to west facing slopes and are defined as being vertical rock walls greater than ten feet in height. Only one area was mapped as dry cliff at Money Creek Bluff although smaller examples of dry cliff plant communities can be found in the bedrock bluff prairies in the project area. The cliffs tend to include several layers of exposed bedrock that formed a step pattern going up the steep slope. Some of the cliffs in the high biological area approach 120 feet in height. Vegetation tends to grow on the ledged formed between the bedrock layers and can include the State Special Concern species cliff goldenrod (*Solidago sciaphila*), harebells (*Campanula rotundifolia*), and the State Special Concern species purple cliff-brake (*Pellaea atropurpurea*). The five documented locations of purple cliff-brake represent one quarter of all known locations statewide. There are also three known den sites for timber rattlesnakes (*Crotalus horridus*) on steep cliffs at Money Creek Bluff. FIM stands in the dry cliff plant community at Money Creek Bluff include 87RO.

2. Long-term management objective

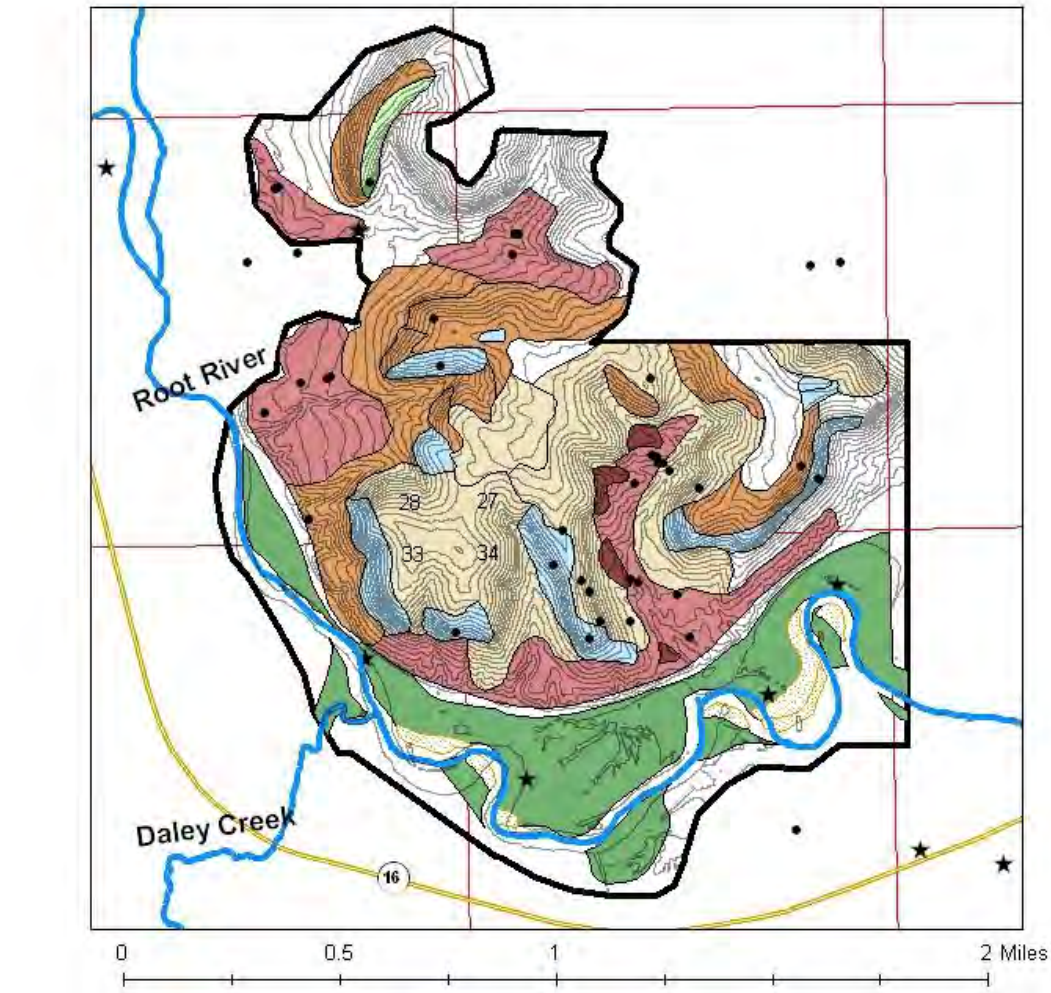
These unique plant communities will be maintained as dry cliffs.

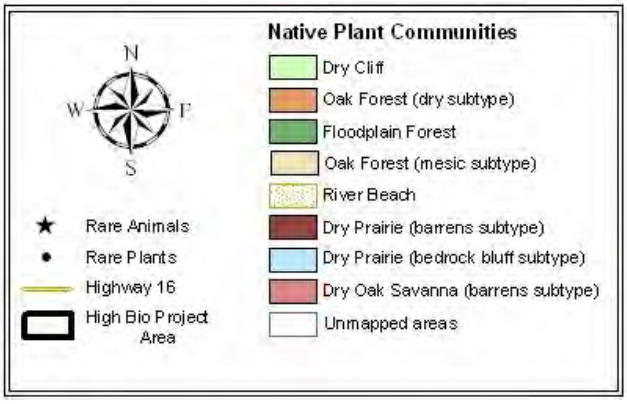
3. Short-term management directive

No management activities are planned for these communities

Appendix 1: Native Plant Communities

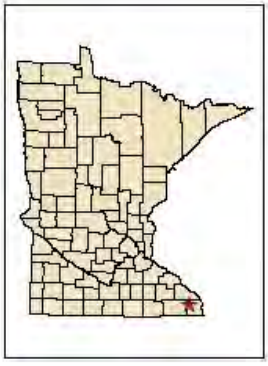
Money Creek Bluff, Houston County, Minnesota
T104N R07W





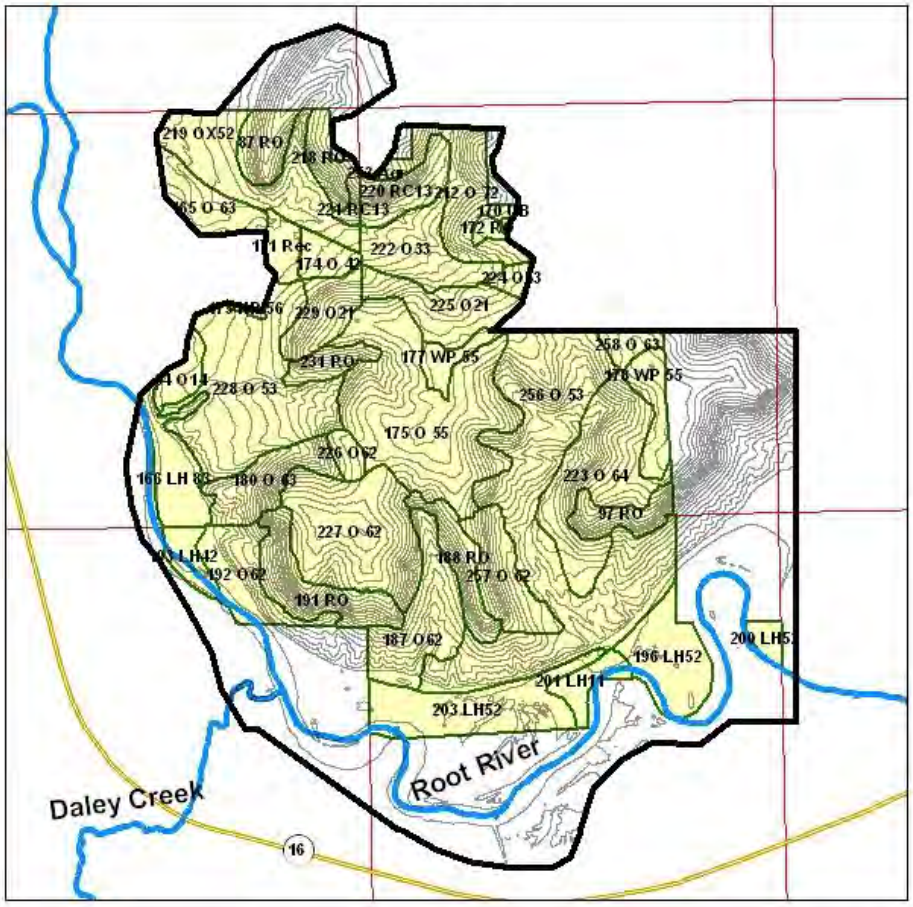
Minnesota
DEPARTMENT OF NATURAL RESOURCES

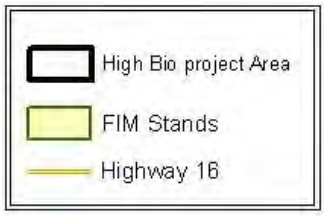
DNR Forestry
December 2, 2009

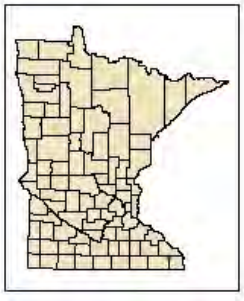


Appendix 2: State Ownership/Fim Stands

Money Creek Bluff, Houston County, Minnesota
T104N R07W



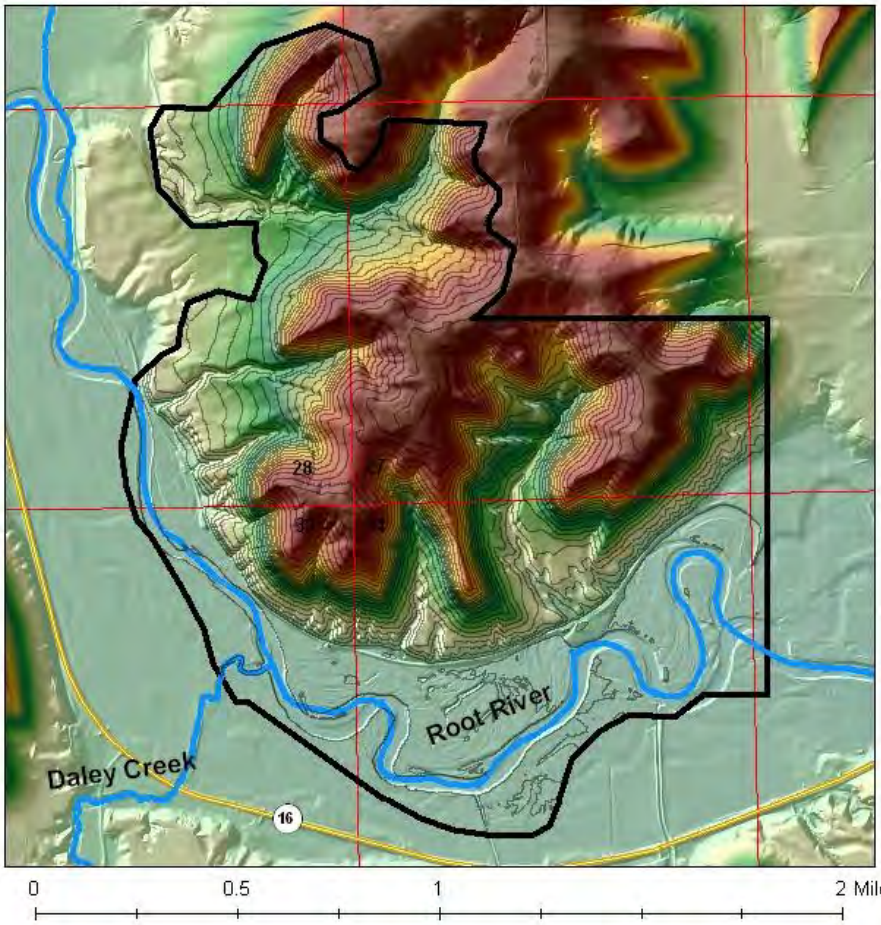




DNR Forestry
December 2, 2009

Appendix 3: Topography

Money Creek Bluff, Houston County, Minnesota
T104N R07W



0 0.5 1 2 Miles

High Bio Project Area

3-Meter High Resolution DEM

High

Low

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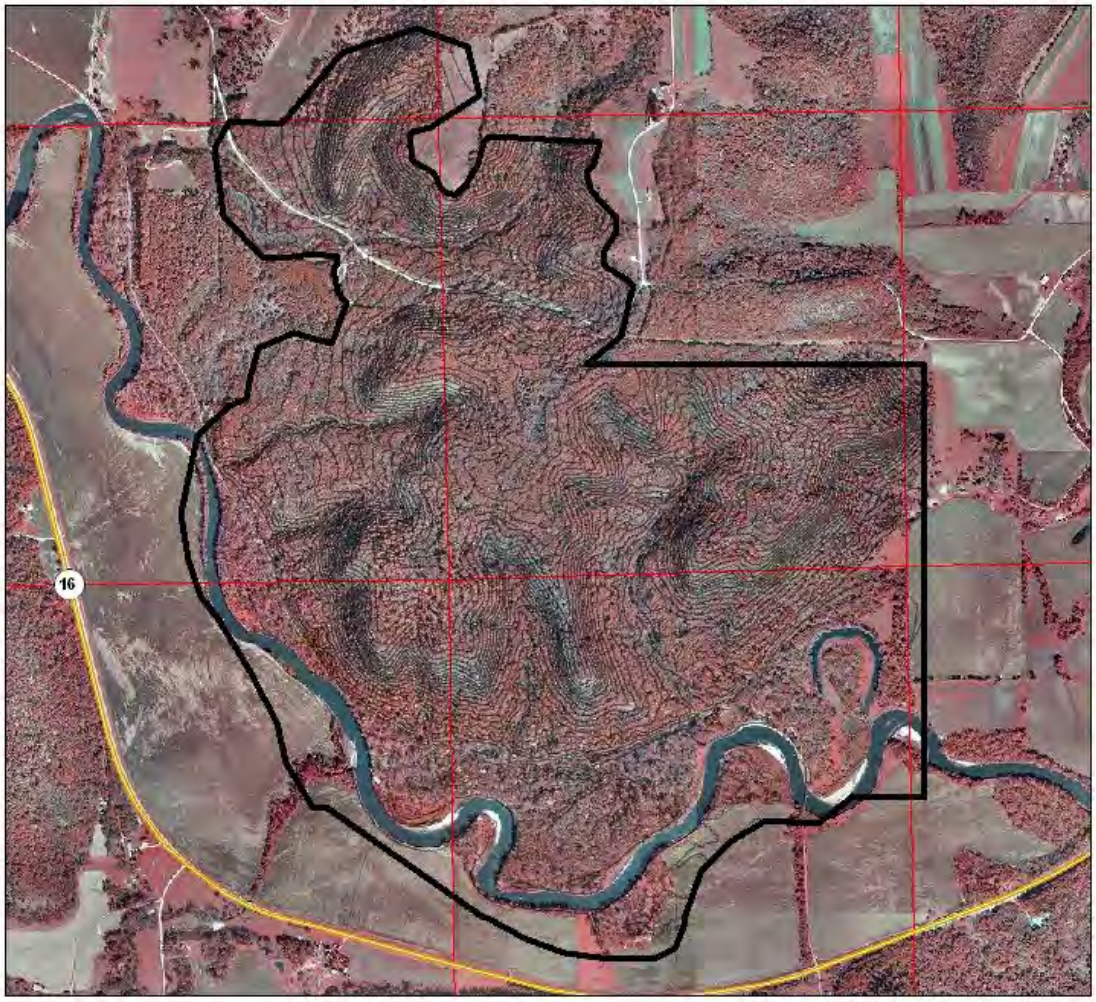
Minnesota
DEPARTMENT OF NATURAL RESOURCES

DNR Forestry
December 2, 2009

Appendix 4: Aerial Photo

Money Creek Bluff, Houston County, Minnesota
T104N R07W



0 0.45 0.9 1.8 Miles

High Bio Project Area

DNR Forestry
December 2, 2009

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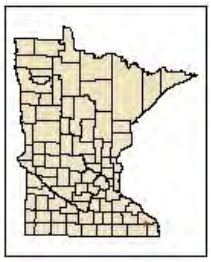
Minnesota
DEPARTMENT OF NATURAL RESOURCES



Appendix 5: Additional Management Guidance

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. Look for opportunities to clear-cut the steeper portions of the forested type while scarifying the soil pre-sale. Shelterwood or group selection harvest should be applied on the more level terrain.

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority for prescribed fire funding. Wildlife will work with the Divisions of Ecological Resources and Forestry to ensure that these sites are regenerated through the application of fire.

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Whitewater North Fork Area

Final

November 2004

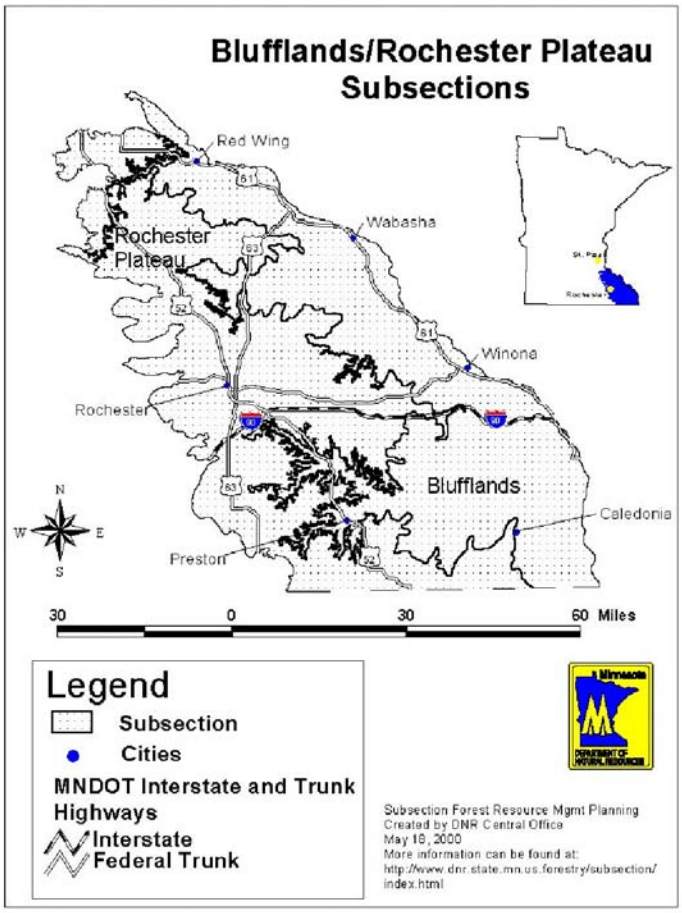
Division of Forestry Planning Document
Printed October 2004

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on the Whitewater North Fork area (Appendix 1). The Whitewater North Fork area is one of 13 MCBS sites of outstanding biodiversity on lands administered by the DNR Division of Forestry, and Section of Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended to be used in conjunction with the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every 7-years as part of an adaptive management process.



Background & Rationale

The Minnesota Department of Natural Resources (MNDNR) completed the Minnesota County Biological Survey (MCBS), a systematic survey of the natural areas within the Whitewater Wildlife Management Area (WMA) in the mid-nineties. The results of this survey provide increased knowledge of the status and distribution of rare species and native plant communities. An ecological evaluation was written for this area to provide more detailed interpretation of the biodiversity significance of the area. The availability of this information and other existing data such as the Whitewater WMA Master Plan, MCBS, SFRMP, and Cooperative Stand Assessment (CSA) forest inventory data provides an opportunity to develop long-term management plans for this area that will help to maintain and enhance the natural resources of this area. Thoughtful management planning in this area is of critical importance in the face of escalating development pressure in the surrounding landscape, increasing fragmentation, and global change. Recommendations in this plan are written for State-owned land. Private landowners within the project boundary will be contacted and offered management assistance for their land if they desire.

Division directors for the DNR Divisions of Wildlife, Forestry, and Ecological Services determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Site Description

The Whitewater North Fork area includes the largest and most significant natural area in Olmsted County and is an important natural area in southeastern Minnesota. The Whitewater North Fork area incorporates a variety of native plant communities including: maderate cliffs, algific talus slopes, and maple-basswood

forest on steep north-facing slopes; floodplain forests on bottomlands, mesic and dry-mesic oak forest on shallow slopes, and dry cliffs, bedrock bluff prairies and oak woodland on steep south-facing slopes. The large integrated valley provides habitat for a variety of rare species that are dependant on the shade and hydrological regimes of mesic closed canopy forest types. Six species listed as State Endangered or Threatened were identified in this area. These include: a Pleistocene relict snail, the bluff vertigo (*Vertigo meramecensis)* glade mallow *(Napaea dioica)*, golden-seal *(Hydrastis Canadensis)*, narrow-leaved spleenwort *(Diplazium pycnocarpon)*, and Leedy's roseroot *(Sedum integrifolium ssp. Leedyi)*. The Leedy's roseroot population is one of only six locations of this subspecies presently identified in the world and is a federally listed Threatened species (Appendices 2 and 3).

Maintenance of the maple-basswood community type on the slopes and the floodplain forest on the valley floor is the major goal of this area. This slope and valley area has the highest concentration of rare animal and plant species and many of these are dependant on the cool moist habitat created by the above community types. The steep slopes in this area result in sensitivity to altered drainage patterns that may result form certain management operations. The North Fork Project area also has dryer native plant communities that should be maintained through a variety of management techniques including fire and brush removal.

The Whitewater North Fork area is one of four high biodiversity sites located within Whitewater WMA. Two boundaries delineate the areas of significance with this plan. The Critical Habitat Zone boundary denotes the core area of locations of rare natural features. This area encompasses 1,556 acres (1,161 acres of State Land). The majority of the lands in the critical zone are part of the Whitewater WMA (Appendix 2). As stated above, this management plan guides management decisions and practices on only the state-owned lands within this boundary. The Project Boundary is 3,877 acres (2,324 acres of State Land). There may be opportunities for partnering with private landowners to protect and manage the unique resources in the area. Conservation easements, cost-share programs to establish permanent cover and management agreements might be pursued.

A large portion of Section 3, T107N R11W, is designated as Old Growth. These stands as well as those listed under the last Short-Term Management Directive will be placed in reserve forming a large continuous block of forested lands. These areas are associated with well-shaded, wet-mesic habitat of the forested toe of the slopes and are rich in state-listed plants and animals. A riparian corridor will connect this Section 3 to the eastern Critical Habitat Zone in Section 1, T107 R11W, another large block of continuous forest.

Stands not identified as "reserve" or "ERF" will continue to be managed through other techniques including timber harvest. Opportunities will be explored to convert some of the state-owned agricultural lands to deciduous hardwood forests or native grasses to further buffer sensitive slopes (Appendix 4).

A minimum maintenance road runs through the entire north fork, parallel to and crossing the stream several times. The Wildlife Area Manager will continue to work with Quincy Township Board to encourage them to vacate this road to reduce erosion, which continues in this right-of-way.

Long Range Vegetation Management Goals

The long-range management goal for the area is to maintain and regenerate native plant communities and the biodiversity of the area using processes that mimic the natural disturbances that helped to maintain and establish these communities. This plan will meld the goals of biodiversity enhancement, game management for such species as wild turkeys, white-tailed deer, ruffed grouse, and recreation into an

adaptive management process. Management goals and recommendations will be based on current management knowledge and be directed by Minnesota Voluntary Site-Level Forest Management Guidelines. These recommendations may change as more information from research and monitoring becomes available. To help achieve these goals some of the stands identified in the CSA database have been set aside from timber management or placed in Extended Rotation Management (Appendix 4).

Implementation

This section is organized by the major native plant community types that occur in the area. Management objectives are identified for each community type within the area. Short-term management directives are also identified for most of the community types and include management activities that will take place over the next seven years. This plan will be reviewed as part of an adaptive management process during the DNR SFRMP process every seven years.

The Whitewater North Fork Area has a variety of rare species and community types (see list in Appendix 3). Management in these areas will be performed in a manner that mimics natural disturbance processes and is sensitive to the maintenance of the native plant communities and the species found within these communities. The Whitewater North Fork landscape is a mix of closed canopy-moist upland and lowland forest, and dryer woodland and prairie communities. The goal for this area is to maintain the mix of community types providing a variety of habitat for numerous rare species. Any logging used in the management of these areas will be designed to mimic natural disturbance process and will be performed in a way that minimizes soil compaction and damage to the understory species. Management will be performed using existing road and trail systems and the construction of new roads will be kept to a minimum.

Oak forest (mesic and dry-mesic subtype)

Description - Dominated mostly by red oak *(Quercus rubra)* and basswood *(Tilia americana),* with lesser amounts of white oak *(Quercus alba),* and sugar maple *(Acer saccharum),* occurs on steep north-facing slopes on the south sides of the river valley, and on less sloping terrain on the upper parts of the valley sides. These stands are mostly even aged and floristically have a lot in common with maple-basswood stands, though they lack many of the spring ephemerals. The dry-mesic variant of the forest is dominated by red and white oak, with some bur and northern pin oak *(Quercus macrocarpa* and *Q. ellipsoidalis),* is also present in some locations in this area. Two rare plant species were documented in the mesic oak stands on this site.

Long-term objective - Many of the high quality mesic oak forests are succeeding to more mixed hardwood communities and eventually will succeed to a maple-basswood community. These areas contain red and white oak, basswood, cherry, aspen and other hardwood species in the canopy. Those areas with a preponderance of maple/basswood and northern hardwood regeneration will be allowed to succeed to maple/basswood forests. Consultation with Ecological Services personnel will then need to be made to determine if/when future timber harvests are desirable to manage for a diverse age class within these stands. Management techniques will be designed to mimic natural disturbances such as blow downs, disease, and fire. Management in the mesic oak forest areas will be designed to minimize canopy loss and techniques such as group selection will be examined for their effectiveness.

Those stands that have a high component of oak and other shade intolerant regeneration (central hardwoods as identified in the CSA) will be managed to augment the oak component for the benefit of numerous game and non-game species. Some of these stands are threatened by invasion of nonnative

species such as buckthorn and honeysuckle. Management options might include prescribed fire, timber harvest, supplemental planting of oak both pre- and post- harvest, and post-sale silvicultural treatment efforts. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - Stand 1, Section 31, T108N R10W; and Stand 8, Section 6, T107N R10W, were identified in the SFRMP process for harvesting over the next 7 years. Because of the advancing age of the oak resource, further investigation and on-site fields visits may be necessary to better identify those additional stands of oak with the greatest probability of future regeneration (Appendix 5). This may necessitate adding an addendum to the current planned timber harvest list. The United States Forest Service (USFS) is initiating a research project focusing on management of mesic oak forests including oak regeneration and invasive species response. Some of the sites selected in the North Fork Project area may be identified as research sites. Management activities will be designed in cooperation with the Whitewater WMA Manager, Area Forester, Regional Ecologist, Non-game Specialist, and USFS investigators to fit research and management needs.

Oak woodland-brushland

Description - Dominated by open-grown bur and northern pin oaks. These areas were once savanna that succeeded to woodland with fire suppression. Most of the woodland now has a very dense thicket of a wide variety of shrubs and small trees underneath the oaks. Dry-mesic to mesic forest herbs are common in much of the woodland, indicating succession to forest. A few woodland slopes are more open and savanna-like, such as most of the steep south-facing slopes in the northeast quarter of section 1 of Quincy Township (Olmsted County) and could revert to savanna with prescribed burning. The effects of past grazing are evident in much of the woodland portion of the site, as armed shrubs are frequent. Some areas have been invaded by the exotic shrub common buckthorn *(Rhamnus cathartica)*.

Long-term objective - Oak woodland-brushlands will be managed to encourage the maintenance of the oak woodland-brushland community or encourage regeneration of the savanna communities through controlled burning and, where feasible to open up canopies, carefully planned logging. Many of these areas have been disturbed by past grazing and have dense understories of prickly ash and other native shrubs that follow grazing. A management goal is to reduce these invasive shrubs. Areas that are threatened by invasion of non-natives will be managed to reduce the threat of these species. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - An aspen stand was identified in the SFRMP process in this community for harvesting over the next 7 years. It is stand number 13, Section 2, T107N R11W.

Floodplain forest and lowland hardwood forest

Description - These areas are in moderate to poor condition dominated by variable amounts of basswood, black willow *(Salix nigra)*, cottonwood *(Populus deltoids)*, silver maple *(Acer saccharinum)*, bur oak, black ash *(Fraxinus nigra)*, and hackberry *(Celtis occidentalis)* occupies a large area on level bottomlands within the site. Boxelder *(Acer negundo)* is a common subcanopy tree. There are several large, standing snags, deadfalls and canopy gaps caused by the death of American elms *(Ulmus Americana)* and past logging. High native herb diversity is present in this part of the site. Exotic species prevalent in this community include creeping charley *(Glechoma hederacea)* and reed canary grass *(Phalaris arundinacea)*. The latter is colonizing drifts of sand and silt along the river margin that are washing into the valley from upstream and upslope erosion. These forests constitute a significant amount of the total

forest cover within the site and provide larger, more continuous areas for forest than if the forest was limited to steep slopes. As such, the bottomland forests are an important component of the habitat for many forest birds that occupy the area, including the three rare bird species Acadian flycatcher *(Empidonaz virescens)*, Cerulean warbler *(Dendroica cerulean)*, and Louisiana waterthrush *(Seiurus motacilla)*.

Long-term objective - These areas will be managed to maintain a diverse floodplain forest community type and to encourage the continued existence of the forest interior bird species that currently occupy these areas. Areas that are not threatened by reed canary grass and are regenerating the overstory species such as cottonwood and silver maple will be maintained with minimal management. Areas of floodplain forest that are dominated by reed canary grass will be managed to minimize this risk. Areas that are regenerating box elder as the major understory species will be managed to encourage the regeneration of overstory species such as cottonwood and silver maple and decrease the dominance of box elder. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - Stand number 2, Section 3, T107N R11W, was identified in the SFRMP process for harvesting over the next 7 years. This timber type is predominately box elder, elm and bur oak. On-site field evaluation may allow this area to be managed as a more diverse lowland hardwood forest in the future (Appendix 5).

Maple-Basswood Forest

Description - Dominated mostly by sugar maple, basswood, and red oak occur on steep, north-facing slopes within the site. At the tops of the slopes, the stands grade into mesic oak forest dominated principally by red oak. On the lowermost toe slopes, the forest grades into a richer, wet-mesic variant of maple-basswood forest in which oaks drop out and species more tolerant of high soil moisture become important, such as black ash. The maple-basswood stands in the site are mostly mature, second-growth stands, with a few areas containing sugar maples of status. Blowdowns are a common fate for larger trees in stands on steep, talus-laden soils. Although much of the area was grazed many years ago, grazing effects are not visible in these stands, perhaps because cattle avoided the steep slopes where these occur. These are mature stands with highly diverse assemblages of plant species, including numerous spring ephemerals. Seven of the fifteen rare plants species in the site were documented in this forest type including Moschatel *(Adoxa moschatellina)*, Golden-seal, and Twinleaf *(Jeffersonia diphylla)*.

Long-term objective - These areas will be managed to maintain the maple basswood forest community and the full canopy cover that is typical of this native plant community. Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns. Seasonal and equipment restrictions should be used to limit soil disturbance. In the North Fork area, maple basswood plant communities are found on steep slope and the soils and understory species found in these communities are sensitive to disturbance. Areas should be monitored for nonnative species invasion. Where nonnative species invasion is prevalent management action should be taken. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - No activities are planned during the next 7 years.

White Pine-Hardwood Forest

Description - The stands occur on dry to wet-mesic sites, mostly as narrow bands. White pine *(Pinus strobes)* is present as a dominant canopy or super canopy tree and varies from scattered to dense cover.

The composition of these stands varies with site moisture, ranging from stands co-dominated by red oak, basswood, sugar maple and white oak in mesic to dry-mesic sites, to dryer sites with bur oak and northern pin oak. Many plants typical of mesic hardwood forests are found in these stands. Canada *yew (Taxus Canadensis)* is found in most of these pine stands. Cool, moist north-facing slopes, particularly above maderate cliffs or algific talus slopes, also have other species rarely seen in southeastern Minnesota, including shining clubmoss *(Lycopodium lucidulum),* bunchberry *(Cornus Canadensis),* one-sided pyrola *(Pyrola secunda),* and yellow birch *(Betula alleghaniensis).* There is an old growth stand along the Logan Branch dominated by 130 year old trees. This stand contains some unusual plants such as partridge berry *(Mitchella repens),* velvet-leaved blueberry *(Vaccinium myrtilloides),* and the State Endangered golden-seal.

Long-term objective - The management goal for this area is to maintain the White Pine-Hardwood Forest plant community. These areas are sensitive to loss of canopy cover that results from timber harvests. In order to maintain this community type, areas should be monitored for white pine regeneration. Those areas that exhibit white pine regeneration should be allowed to continue natural regeneration. Those areas outside the Old Growth stand that exhibit a lack of white pine regeneration should be managed to encourage white pine regeneration. This management may include some form of scarification or logging to encourage white pine regeneration. Any management in this area should be conducted in a manor that is sensitive to the needs for the community as a whole. Field visits will be performed to determine best management for any stands listed in the short-term management directive. In addition, a collaborative effort by the Section of Wildlife, Division of Ecological Services, and the Division of Forestry to develop a management plan for the old growth stand should be considered.

Short-term plan - Evaluate and monitor these stands over the next seven (7) years to determine whether white pine regeneration is evident. Develop management strategy should no natural regeneration be present. Timber stand number 1, Section 34, T108N R11W was identified during the SFRMP process for selective harvest during the next seven years. While it includes predominately central hardwood species, white pines are present and there may be opportunities to increase white pine regeneration in this area (Appendix 5).

Maderate cliffs and Algific Talus slopes

Description - These communities occur on north-facing exposures. These two kinds of features have unusually cold microclimates as a result of systems of fissures extending back into the bedrock layers where ice persists throughout much of the summer. Cold water and air emerge from the cliff face or talus. Algific talus slopes accumulate areas of peat as a result of cold temperatures and slow soil decomposition rates. These cold microhabitats support an unusual biota adapted to cold environments, including several rare, disjunct plant and snail species. Leedy's roseroot is an extremely rare, Pleistocene relict plant that persists on one massive maderate cliff within the site. Other disjunct plant species typical of more northern distributions associated with maderate cliffs and algific talus slopes in the site include northern black current *(Rives hudsonianum),* Canada yew, yellow birch, alpine enchanter's nightshade *(Circaea alpine),* and mountain maple *(Acer spicatum).* Fourteen species of land snails have been identified from algific talus slopes, including locations for two Pleistocene relict species listed as rare in Minnesota these include Bluff vertigo and Hubricht's vertigo *(Vertigo hubrichti).*

Long-term objective - Maintain and protect the sensitive habitat of these areas. Avoid management activities that would threaten these areas. Include buffers between adjacent sites when management is implemented.

Short-term plan - See final Summary of Short Term Management Directive on Page 7.

Dry cliffs

Description - Numerous, small-disturbed dry cliffs of dolomite and sandstone occur on south-facing slopes throughout the site. These cliffs are sparsely vegetated with a distinctive flora, including slender lip-fern *(Cheilanthes feei),* smooth cliff brake *(Pellaea glabella),* and the rare cliff goldenrod *(Solidago sciaphila).*

Long-term objective - Maintain and protect these habitats. Avoid management activities that would threaten these areas.

Short-term plan - No activities planned during the next 7 years.

Bedrock bluff prairie

Description - Occur on well-drained bedrock outcrops on the uppermost parts of steep south-facing slopes and narrow ridge tops. These bluff prairies are dominated mostly by sideoats grama *(Bouteloua curtipendula),* little bluestem *(Schizachyrium scoparium),* and plains muhly *(Muhlenbergia cuspidate).* Big bluestem *(Andropogon gerardii)* often dominates in small areas of deeper soils. A diverse set of shrubs are scattered in these prairies, including leadplant *(amorpha canescens),* ninebark *(Physocarpus opulifolius),* and prairie willow *(Salix humilis).* Species diversity in these prairies is generally high. Plains wild indigo *(Baptisia bracteata var leucophaea)* is a Special Concern species growing on three of the prairies within the site.

Long-term objective - These areas will be maintained with periodic fire and brush cutting to control woody competition. Field visits will be performed to determine best management for any stands listed in the short-term management directive.

Short-term plan - Conduct inventory of the Bedrock bluff prairie communities in the North Fork and initiate burn frequency to renovate and increase bluff prairie acreage in this area.

Summary of short-term management direction

As mentioned above in the long-term goals some of the stands identified by the CSA database will be placed in a reserved and ERF status during the current and upcoming stand review process of the Blufflands/Rochester Plateau SFRMP. At the present, this is a seven (7) year vegetation management plan.

Stands placed in reserve include stands 3, 4, 8, 9, 13, and 14, Section 1, T107N R11W; stands 16 and 9, Section 2, T107N R11W; and stands 4, 5, 6, 8, 10, 22, and 24, Section 3, T107N R11W. These stands are associated with the well-shaded, wet-mesic microhabitat of forested toe slopes rich in state-listed plants and animals. It is intended that these same stands will be reserved upon future timber stand review.

The entire slopes encompassing the above stands will be managed to avoid disturbances that might compromise the unique species and microhabitats as identified in the Project Evaluation while allowing some form of timber harvest/management on stands which break over the top of the slopes into the uplands. These timber harvest/management stands would include CSA Type (stand) 1, Section 31, T108N R10W, and CSA Type (stand) 8, Section 6, T107N R10W. Group selection should be considered upon the review of the Division of Ecological Services to mimic small blow downs that may have

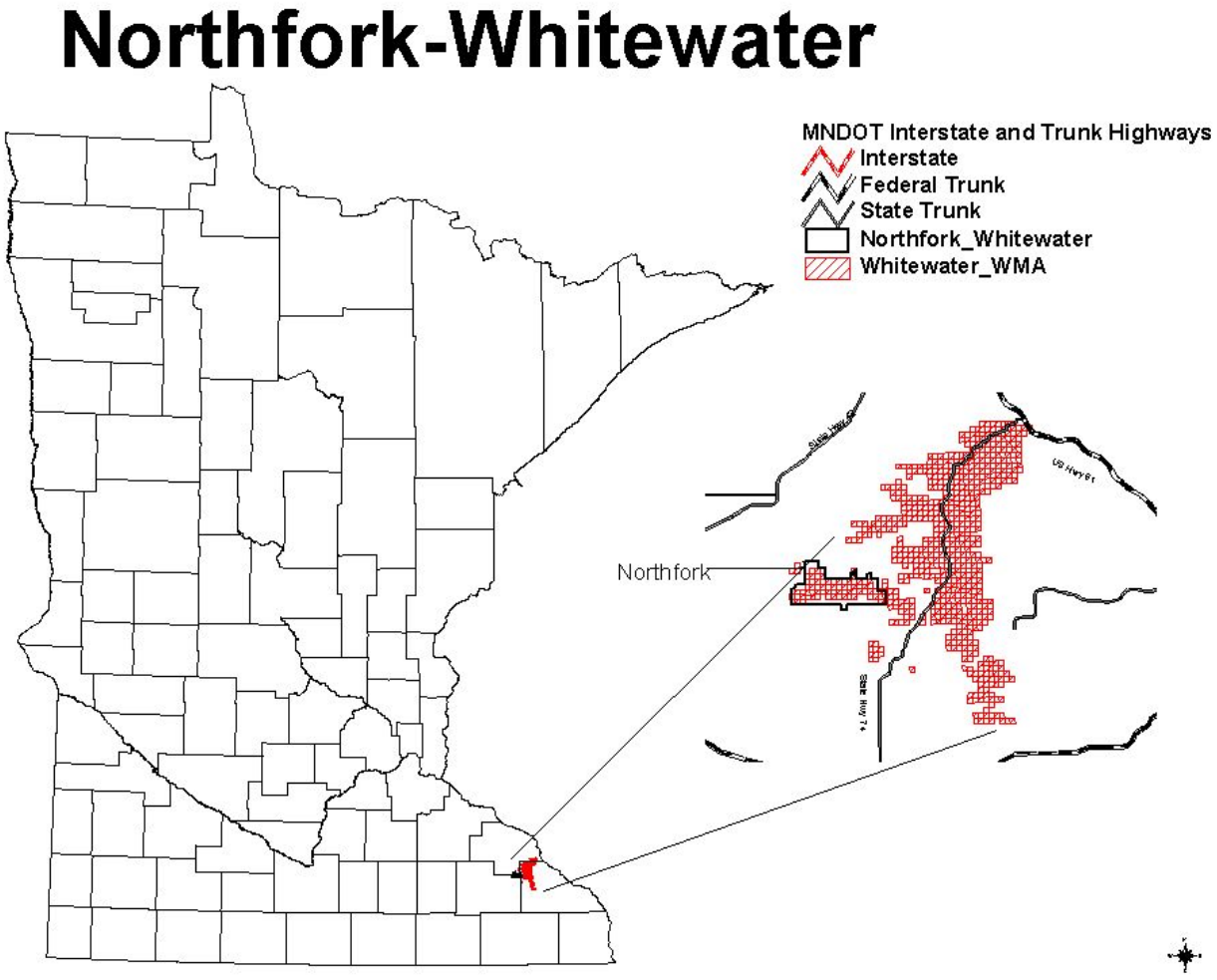
occurred in the past. Management concerns such as undue edge effects on interior birds will be considered when examining management technique that allow for oak regeneration.

Extended Forest Rotation has been slated for stands (types) 6 and 11, Section 1, T107NR11W; stands 10 and 11, Section 2, T107N R11W; and stands 6, and 9, Section 6, T107N R10W. Objectives are to maintain a riparian corridor connecting these two sections of high biological diversity while allowing timber harvest entry to manage for a diverse floodplain forest.

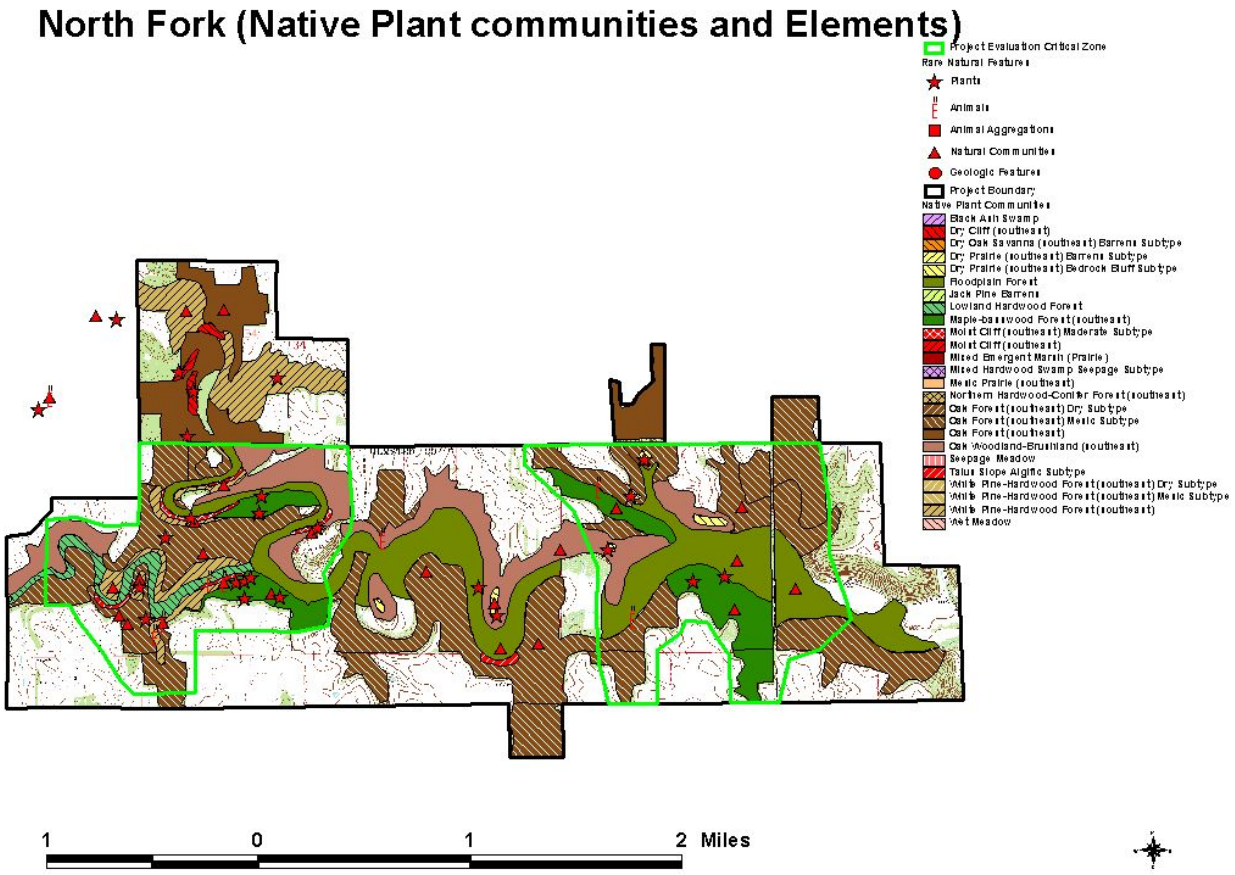
Short-term Stand Management

Township	Range	Section	Stand #	Action
107	10	6	8	Harvest
107	11	2	13	Harvest
107	11	3	2	Harvest
108	11	34	1	Encourage White Pine Regen.
107	11	1	3,4,8,9,13,14	Reserve
107	11	2	9,16	Reserve
107	11	3	4,5,6,8,10,22,24	Reserve
107	10	6	6,9	ERF
107	11	1	6,11	ERF
107	11	2	10,11	ERF
108	10	31	1	Harvest

Appendix 1: Whitewater WMA & North Fork Project Area



Appendix 2: Native Plant Communities & Rare Elements



Appendix 3: Rare Features Summary – North Fork Area

Native Plant Communities	**EO-Rank[1]**
Dry Cliff (Southeast Section)	**BC**
Dry Prairie (Southeast Section) Bedrock Bluff Subtype	**B, BC**
Maple-Basswood Forest (Southeast Section)	**B, B, B**
Moist Cliff (southeast	**BC**
Moist cliff-maderate subtype	**A, C, C**
Oak Woodland-brushland (Southeast Section)	**BC**
Oak Forest (Southeast Section) Mesic Subtype	**B, B**
Talus Slope (Algific Subtype)	**AB**
White Pine-Hardwood Forest (Southeast Section) Mesic subtype	**BC**

Rare Plants	**EO-Rank[1]**	**Status**
Hydrastis Canadensis (Golden-seel)-2	**C**	**E**
Sedum integrifolium ssp. *Leedyi* (Leedy's roseroot)-1	**A**	**E**
Napaea dioica (Glade mallow)-1		**THR**
Diplazium (Athyrium) pycnocarpon (Narrow-leaved Spleenwort)-1	**B**	**THR**
Adoxa moschatellina (Moschatel)-4	**A, A, C**	**SPC**
Baptisia bracteata v. *leucophaea* (Plains wild indigo)—2	**C, C**	**SPC**
Carex woodii (Wood's Sedge)-1		**SPC**
Dryopteris goldiana (Goldie's fern)-2	**A, C**	**SPC**
Jeffersonia diphhylla (Twinleaf)-2	**B, B**	**SPC**
Panax quinquefolius (American Ginseng)-1		**SPC**
Solidago sciaphila (Cliff Goldenrod)-5		**SPC**
Actaea pachypoda (White Baneberry)-3	**B, C**	**NON**
Athyrium thelypteroides (Silvery Spleenwort)-2	**A**	**NON**
Arabis laevigata (Smooth rock-cress)-1		**NON**
Taenidia integerrima (Yellow pimpernel)-1	**C**	**NON**

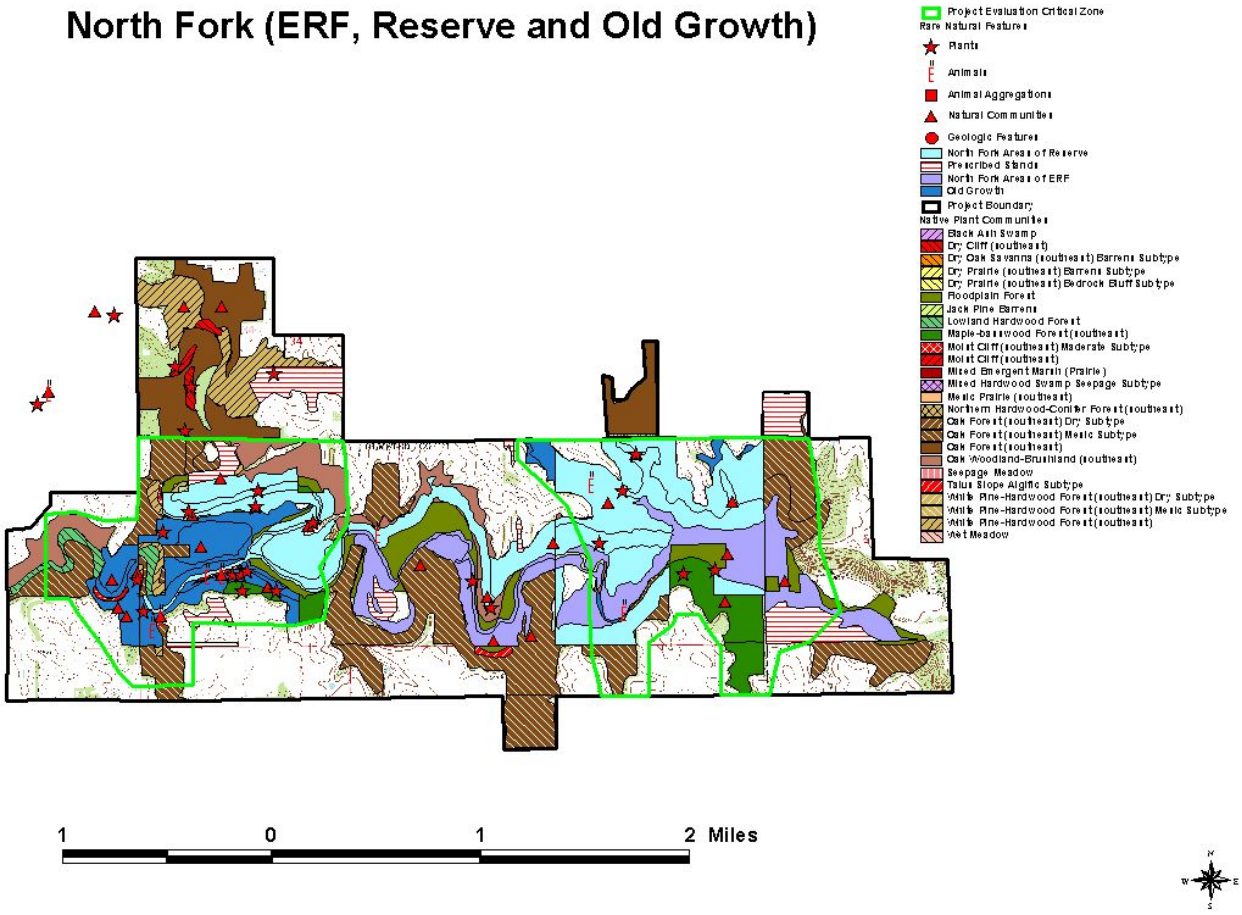
Rare Animals	
Empidonac virescens (Acadian flycatcher)-1	**SC**
Vertigo meramecensis (Bluff vertigo [snail])-2	**T**
Crotalus horridus (Timber Rattlesnake)-2	**THR**
Vertigo hubrichti (Hubricht's vertigo [snail])-1	**NON**
Seiurus motacilla (Louisiana Waterthrush)-2	**SPC**
Lampropeltis triangulum (Milk snake)-1	**NON**

Key:

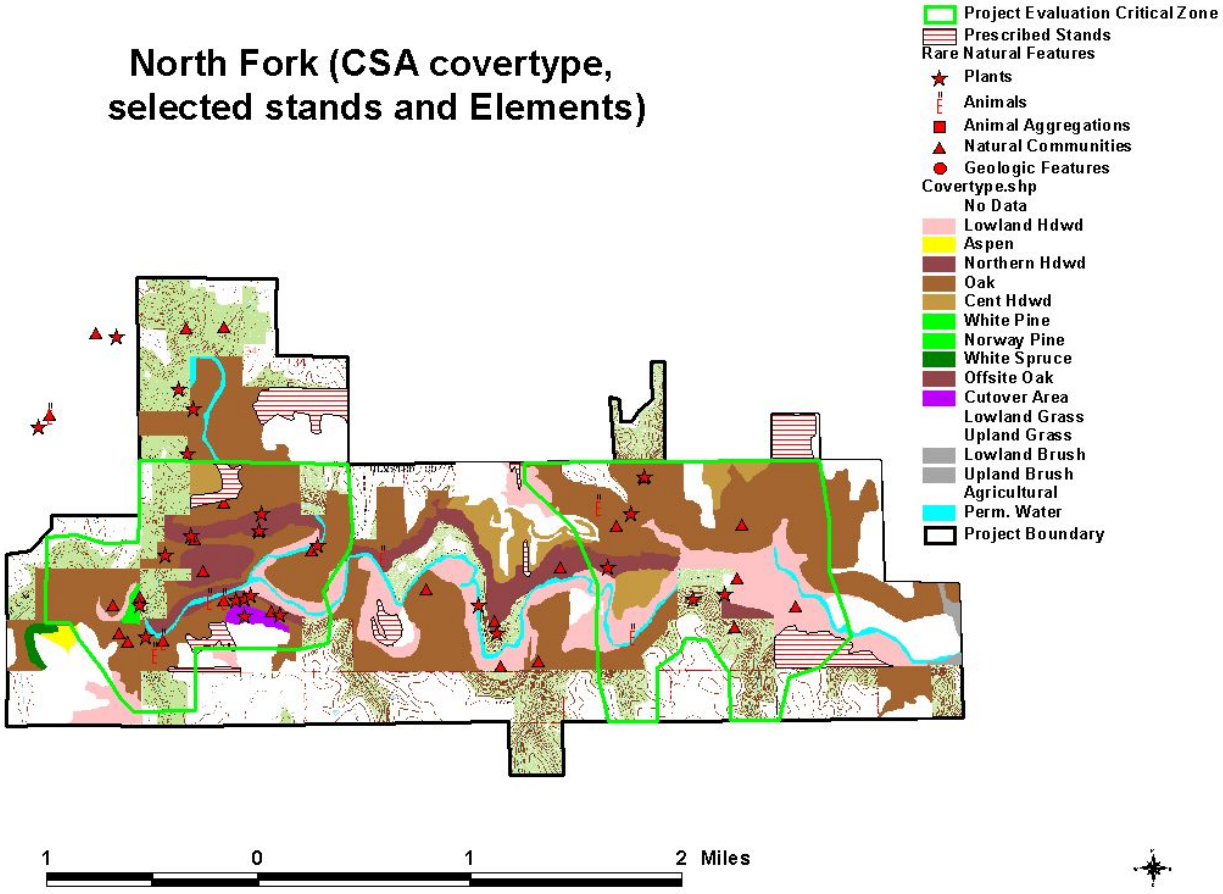
[1] ecological quality rank where A=highest quality and D=lowest quality (multiple ranks indicate multiple occurrences)

[2] number following rare species listing refers to number of occurrences recorded in the area

Appendix 4: Reserved, ERF and Old Growth Stands



Appendix 5: CSA Types, Selected Stands and Rare Elements



Appendix 6: Additional Management Guidance

Harvest of high quality maple-basswood communities

Selective harvest will be allowed if site teams jointly develop detailed plans that include joint on-site visits. The following conditions will apply:

- Oak resources can be salvaged as these sites are converted to purer maple basswood communities. This should be done by selective, individual or small group marking and removals.
- Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns.
- Seasonal and equipment restrictions should be used to limit soil disturbance; horse logging on frozen ground should be done where appropriate in the most sensitive sites).
- Trees should be jointly marked as well as the layout for access and skid trails to minimize any additional permanent fragmentation.
- Portions of stands that support unique or rare resources (such as a rare species or a rich spring ephemeral flora) may be delineated for no harvest.
- A pre and post treatment monitoring and evaluation protocol for species and communities of concern (both native and exotic) should be developed and implemented in each stand. Harvest plans should also take into account whether or not invasive exotic species occur in stands immediately adjacent to those being harvested.

With respect to the last bullet, Ecological Services staff will continue discussions with USDA Forest Service staff to further explore the opportunities to collect pre-treatment data during the 2004 field season.

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. Look for opportunities to clear-cut the steeper portions of the forested type while scarifying the soil pre-sale. Shelterwood or group selection harvest should be applied on the more level terrain.

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority

for prescribed fire funding. Wildlife will work with the Divisions of Ecological Services and Forestry to ensure that these sites are regenerated through the application of fire.

Aspen and white pine pockets

The cover type goal as listed in the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan is to maintain or moderately increase the white pine acreage and increase the aspen acreage for various wildlife and non-game species. As stated in the plan, there are relatively few stands of aspen larger than five-acres in size in southeastern Minnesota.

Native white pine stands are limited in number, but provide multiple benefits to numerous game and non-game species from roosting sites for wild turkeys to perches and roost areas for bald eagles. The department believes it is necessary to access some of the sites for management to ensure natural regeneration occurs.

Options to minimize any intrusion through the maple-basswood communities should include the following:

- A search for any pre-existing old homestead roads or trails that could be used for access and whether exotic species are present in the area which might be introduced along such a corridor if made active again;
- List alternate means to access the white pine such as through private land, through other disturbed communities, etc; and
- Timing of access whereby any mechanical scarification would take place during fall or early winter, reducing the "footprint" upon the trail used to access such stands. The department believes such efforts to maintain or increase the native white pine acreage in this landscape outweigh the minor impacts to surrounding northern hardwood communities.

Small aspen clones in high quality sites should only be harvested when a harvest is already planned and approved by the team, at the same time, within the immediately surrounding stand in which the clone is embedded. Other conditions mentioned under the high quality maple-basswood communities section above should also be addressed. If harvest in the stand in which the aspen is embedded is not planned, then a special effort to cut the aspen should not be made.

DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Pine-Hemingway Creek

Final

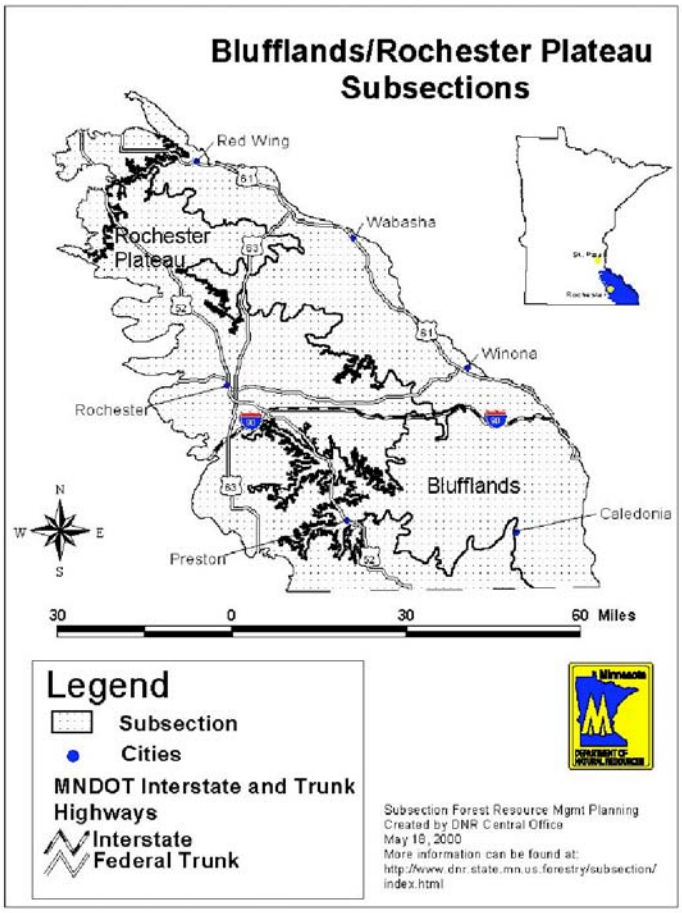
October 2009

This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at the same web address. This information is available in an alternative format upon request.

Table of Contents

Introduction

This plan will guide management decisions and practices on state-owned land in the Pine-Hemingway Creek area (Appendix 1). This is an area within the Pine and Hemingway creek watersheds in Winona and Fillmore counties that was identified by the Minnesota County Biological Survey (MCBS) as one of 13 MCBS sites of outstanding biodiversity on lands administered by the DNR Division of Forestry or the Division of Fish and Wildlife in southeastern Minnesota. This plan is intended to be used in conjunction with the Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every seven-years as part of an adaptive management process. The plan is for state-owned property only, however, some management recommendations in the plan may be appropriate for adjacent private lands as well



The Blufflands/Rochester Plateau SFRMP addressed management of vegetation on State Forest and Wildlife lands. There were 13 "priority areas of significant biodiversity" identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county. Of the 745 sites of biodiversity significance in the two subsections, 62 sites are contained within these thirteen priority areas. Ecological evaluations that mapped and described rare natural features were prepared by MCBS ecologists for these thirteen sites in the years 2000 through 2001. The thirteen priority areas and associated information about them are listed in Appendix 7.

Division directors for the DNR Divisions of Fish and Wildlife, Forestry, and Ecological Resources determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the site as a whole, employ practices that perpetuate endangered, threatened, and special concern species and native plant communities while following the mandates of forestry or wildlife administered lands.

Site Description

The Pine-Hemingway Creek Area is approximately 14 miles south of Lewiston, MN. It lies within the Blufflands subsection ecological landscape area. It is made up of a unit of State Forest land within the Richard J. Dorer Memorial Hardwood Forest (RJDMHF) as well as a larger amount of privately owned property. Pine Creek is the major watershed with Hemingway and Coolridge Creeks being tributaries to it. The DNR Division of Fish and Wildlife has evaluated all three streams as trout habitat and has selected portions of them to be designated trout streams. Trout habitat improvement work has also been done on portions of Pine creek.

Following the completion of the MCBS fieldwork in 1996, the Pine-Hemingway Creek Area was noted in "An Evaluation of the Ecological Significance of the Pine-Hemingway Creek Area" as being one of 13 sites in southeast Minnesota with significantly high biodiversity. The MCBS delineated two boundaries for this property. The broader boundary encompasses what is referred to as a Project Area. The other boundary is identified as the Critical Habitat Zone, and contains the core area of rare natural feature locations. The Pine-Hemingway Creek Critical Habitat Zone is made up of 2,452 acres, of which 871 acres, or 35%, are State Forest land. The majority of the acreage within the Zone is private land. This plan is primarily intended for use within the Critical Habitat Zone.

The concentration of rare features in the Pine- Hemmingway Area makes it one of the more biologically significant sites in southeastern Minnesota. There are several areas of high quality forest. In addition there are two algific talus slopes and a maderate cliff that provide habitat for a rare snail species. Five species of rare birds occupy portions of the site, making it, according to the MCBS Ornithologist, a top ten site for rare birds in this region. Two caves in the area provide potential bat habitat. One of them provides a winter hibernaculum for the eastern pipistrelle, a state Species of Special Concern. Populations of 15 state listed plant species occur in the area: goldenseal, nodding onion, Short's aster, James' sedge, smooth-sheathed sedge, spreading sedge, moschatel, Wood's sedge, stemless tick-trefoil, squirrel corn, Goldie's fern, false mermaid, ginseng, black snakeroot, and cliff goldenrod. Multiple locations for many of these species have been documented in the area. Current threats to the existing biodiversity of the area are, in order of importance, land conversion to agriculture or residential uses, livestock grazing, invasive species such as reed canary grass or buckthorn, and logging which results in excessive site disturbance.

Background History

The State Forest land in this area was purchased from a number of different landowners in eighteen separate parcels during the period from 1964 to 1991. Due to this dispersed acquisition and a lack of acquisition funding the ownership is not contiguous and the access to portions of the area is limited. Since much of this land was acquired during the tenure of local area forester who wrote this section, it reflects personal experience concerning the land's condition at or before the time of purchase. Almost without exception these lands were grazed when the state bought them. On some of the parcels such as the Dau tract in Sec 25 and the Johnson tract in Sec 27 this grazing was quite heavy and extended across the entire parcel.

All of these properties also had histories of varying degrees of logging. The presence of old logging roads, stumps, and tops was noted during the appraisal for acquisition or the first forest inventory following purchase. Other notable land treatments resulting from previous private ownership were the construction of private trout ponds in Type 60, Sec 23, 26 and the establishment of an informal dump in Type 38, Sec 25. Lastly there were building sites in Type 96, Sec 35 and Type 35, Sec 27.

Since the Division of Forestry started purchasing property for the RJDMHF in this area there has been extensive land management activities. Some of these include the clean up of two old building sites, the closure of one well, the removal of miles of internal and former boundary fences, and the removal or burial of tons of garbage. In addition, miles of new boundary fences have been constructed between the state and adjacent private land to prevent livestock grazing. Three erosion control structures were built to reduce soil erosion and provide wildlife habitat. An old field in the SWSW, Sec25 and the SESE, Sec 26 was sold to a private landowner in accordance of Minnesota Statute 89.022. This statute relates to the RJDMHF and requires the sale of tillable land purchased after 1979 that meets certain requirements.

Forest management activities that have been done in the area include the following. There have been five state timber sales between 1981 and 1997. They covered 54 acres and harvested 125 thousand board feet

(mbf) of primarily oak and northern hardwoods. In addition there were a number of fuelwood sales to individuals of accessible tops, slash, diseased trees and wood of low quality. The commercial sales include both clearcuts and partial cuts. The first forest inventory by the Division of Forestry, a Cooperative Stand Assessment (CSA), was completed in 1993. Updates and additions of newly acquired lands have been done as needed. In 2003 CSA was replaced by the Forest inventory module (FIM). All DNR Forestry stands in this document are identified by their FIM numbers.

Another forest management activity is tree planting on 147 acres with approximately 82,000 trees. The species planted include white pine, white spruce, walnut, red oak, white oak, bur oak, white ash, sugar maple, silver maple, and cottonwood. This planting has resulted in the conversion of 33 acres of fields and pasture to conifer and hardwood plantations. The rest of the planting has been done in natural stands with inadequate natural regeneration of species such as oak, northern hardwoods, and white pine.

Work in natural stands and plantations which falls under the heading of timber stand improvement (TSI) has been completed on 253 acres. This involves a variety of practices such as seedling release from grass and annual weeds or release of desirable tree species from competing less desirable ones. In some stands this type of weeding has been done to promote regeneration of northern hardwoods and oak versus boxelder, elm, and ironwood. This was usually done on recently acquired property to address the lack of desired regeneration due to grazing. Additionally there has been some pruning to prevent white pine blister rust disease and to improve stem quality for timber in white pine and walnut.

Much of the work mentioned above was done in the area identified as the Critical Habitat zone. Earlier in the 1990's, several stands in the area had been nominated for Old Growth designation. As part of this process an interdisciplinary team examined all the candidate stands and released those that they felt did not meet the required criteria. Subsequently two oak types and one white pine type, which did qualify, have been designated and reserved as Old Growth. In the spring of 2004 the boundaries of these types were corrected.

Long Range Vegetation Management Goals

The long-range management goal for the area is to manage and enhance native plant communities and the plant and animal species that reside in this area using processes that mimic the disturbances processes that helped to establish and maintain these communities. The goals of biodiversity protection, timber management, understory species management, recreation, game and non-game wildlife species management and trout stream management will all be considered when making management decisions for this property. Management goals and recommendations will be based on current management knowledge and be directed by Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. These recommendations may change as more information from research and monitoring becomes available.

Implementation

This section is organized into the major plant communities that occur within the Pine-Hemingway Creek area. Management goals have been shown only for state-owned land. Following a description of the plant community a short-term management directive is also provided that describes vegetation management activities that are prescribed over the next seven years to help achieve the long term management goal. It should be noted that MCBS native plant community definitions and Forest Inventory Module (FIM) types are different. Consequently a stand may be called something different depending on the definition being used. Also, the mapped boundaries of these two vegetative description systems do not always coincide. When determining which plant community a particular FIM stand fell within, the majority plant community was chosen.

Maple-Basswood Forest (Southeast Section)

Description - Maple-basswood forests are typically mesic to wet-mesic on steep north-to east-facing slopes. Sugar maple, basswood, and red oak are the dominant canopy trees. The maple-basswood forests in the Pine-Hemingway creek area have a well-established array of spring ephemerals in the herbaceous layer and support populations of twelve rare plant species.

Long-term objective - The goal for this native plant community is to maintain the maple-basswood forest native plant community while retaining a diverse shrub layer and maintaining or increasing the diversity of native plants in the herbaceous layer. This will help maintain or improve habitat for the 12 state-listed rare plant species and the three state-listed rare bird species that occur in these forests in this site.

Short-term plan - All or portions of ten FIM stands in the project area make up the maple-basswood plant community designated by the MCBS. They are as follows:

Stand #	FIM Type
70	O52
78	CH52
42	O52
90	O62
91	A23
56	NH62
100	O63
54	NH63
18	O55
59	O63

Stands number 54 and 59 are designated DNR old growth stands. No management activities are planned for these stands. FIM stands 90 and 100 have met the stand selection criteria for harvest but will be deferred for this planning period as directed by the 7/20/2006 Commissioner's Office memo (see Appendix 6). The long term management objective of the maple basswood plant community, as stated above, provide the overall management goals for timber harvests in portions of the stands that are maple-basswood. Where rare elements are found in stands scheduled for harvest some or all of the following actions will be taken to remediate the proposed action. Buffering and avoiding heavy cutting or skidding in the vicinity of the known locations of rare plants will be the main methods. In addition, timber sales preparation and specifications, monitoring, and evaluation will be guided by additional direction provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (see Appendix 5). The remaining stands listed above do not meet the harvesting criteria and no management activities are planned for them at this time.

Lowland Hardwood Forest

Description - Lowland hardwood forests are typically wet-mesic lowland forests on alluvial soils above the normal flood level in small valleys. Some areas of the lowland hardwood forest in the Pine-Hemingway Creek area have groundwater seepage areas that occur where the side slopes meet the valley bottom. The herbaceous layer in these areas is dominated by marsh marigolds. The canopy has frequent gaps, dead falls, and occasional standing dead snags. Early in the year, the lowland forests of higher quality have an understory that is a diverse and continuous array of spring ephemerals. There are five

plant communities of this type in the Pine-Hemingway Creek area. The lowland hardwood forest community is classified as lowland hardwoods in the FIM database also.

Long-term management objective - The goal for this plant community is to maintain a quality lowland hardwood community while protecting the groundwater seepage springs and herbaceous ground cover. The management focus in this area will be protection of ETS species locations, including the three special concern bird species, pickerel frogs, and the four state-listed rare plant species; protection of springs, and adherence to riparian management zone guidelines. Any timber harvesting that is done should protect the plant community and remove non-natives.

Short-term plan - All or portions of six FIM stands in the project area make up the lowland hardwood forest community designated by MCBS. They are as follows:

Stand #	FIM Type
39	LH63
43	LH64
45	LH64
60	LH52
76	UG
97	UB

Stands 39, 45, and 60 have met the stand selection criteria for harvest as established by the subsection forest management plan. However, due to concerns about potential logging impacts to rare species and the spread of reed canary grass and other invasive species, no management activities are planned for these stands during the current planning period. Stands 76 and 97 are classified nonforest by FIM standards and no management activities are planned for them. Stand 43 did not meet the harvesting criteria and no management activities are planned for this type during the current planning period.

Mesic Oak Forest

Description - Oak forests (mesic subtype) are typically dry-mesic to mesic forests, often on gradual west and east-facing slope and broad ridge crests. Dominant canopy trees can include red oak and white oak. In the Pine-Hemingway creek area these communities grade to maple-basswood on east and north –facing slopes and to dry-mesic oak forest where sugar maple completely drops out and the herbaceous flora changes.

Long-term management objective - As mesic oak forest is designated as an S2 native plant community, it should be actively managed to ensure its perpetuation as well as the rare species that occur in them. Management practices where possible, should be used to retain these as oak types. In areas where maple basswood succession is inevitable, the stands will be allowed to succeed to maple-basswood.

Short-term plan - All or portions of nine FIM stands in the Pine-Hemingway creek area make up the Mesic Oak Forest plant community designated by the MCBS. They are as follows:

Stand #	FIM Type
17	O53
31	O53
35	CH19

42	O52
65	O63
72	OX43
73	O63
78	CH52
87	O63

Stand 17 lies in Township 104 - Range 9 in Fillmore County. The remaining stands are in Township 105 – Range 9 in Winona County.

Stand 65 has met the stand selection criteria for harvest. This stand will be harvested during the current planning period. Stands 17 and 87 will be deferred for this planning period as directed by the Commissioner's Office memo of 7/20/2006 (see Appendix 6). In addition, the sale preparation, specifications, evaluation, and post sale treatments will be guided by additional direction provided by the division /section directors of DNR Forestry, Wildlife, and Ecological Services (see Appendix 5).

Stands 31, 35, 42, 72, 73, 87 have not met the harvest criteria and no management activities are planned for them at this time.

Dry Oak Forest

Description - Oak forest (dry subtype) often occurs on south to west-facing slopes with a canopy dominated by northern pin oak and/or bur oak. Generally, these dry oak forests occur on areas where succession has led to a relatively closed canopy.

Long-term management objective - The goal in dry oak forest management is to encourage regeneration of the oak community through controlled burning and carefully planned logging to open up the community. Eliminating non-native species is also a high priority.

Short-term plan - In the Pine-Hemingway Creek area the Dry Oak Forest plant community designated by MCBS is found in all or portions of three FIM stands. They are as follows:

Stand #	FIM Type
59	O63
93	OX41
98	OX41

No management is planned in stand 59 since it is designated DNR old growth. Stand 98 did not meet the harvest criteria. Only stand 93 met the harvest criteria and will be examined for harvest during the current planning period and with the long-term objective for the plant community as a guide. Steep slopes, poor access, and low timber value may limit the extent of prescribed burning and harvest management activities.

Northern Hardwood – Conifer and White Pine-Hardwood Forest

Description - Northern hardwood –conifer forests, rare in southeast Minnesota, occur on cool, steep north-facing slopes and include several plant species generally found much further north: white pine, yellow birch, Canada yew, mountain maple, and twisted stalk. White pine-hardwood forests are found on moist to dry steep slopes, often associated with cliffs and bedrock outcrops. White pines dominate the canopy of these areas with deciduous trees in the sub-canopy.

Long-term management objective - Management should ensure the perpetuation of these natural communities and associated rare species.

Short-term plan - Stand 101 (WP66) is the only representative of this type on state forest land in the Pine-Hemingway Creek area. This stand has been designated as DNR old growth. As such, no management activities are planned for this stand.

Disturbed Woods

Description - This type was not specifically addressed in the Pine-Hemingway creek area MCBS evaluation. It is characterized by a history of heavy grazing and logging, and an understory of armed shrubs. Some of these areas were previously cleared for agriculture and have been planted to trees since their acquisition by the DNR.

Long-term management objective – Stands that comprise this type will be managed for the tree species to which they have been planted.

Short-term plan - Manage stands in this type for timber production and wildlife habitat. This will allow them to act as buffers between the adjacent private agricultural land and the more sensitive portions of the Pine-Hemingway Creek area. The following stands meet the criteria for harvest during this planning period:

Stand #	FIM Type
15	CH51
16	NH72
37	WP53
44	O54
55	WAL31
68	NH52
94	O63
95	WP33
96	O63
99	WP33

A portion of stand 15 is proposed to clear-cut harvested and regenerated to aspen-birch. The remainder of stand 15 is proposed to be partial cut. Under planting for advanced regeneration has already been done on the latter portion of this stand. Stands 68, 16, 37, 55, 94, 44, 95, 99 and 96 are all to be partial cut to adjust stocking levels. Market considerations will have an important impact on the timing of this work.

Algific Talus Slope

Description - Algific talus slopes are typically wet-mesic communities on dolomitic talus on steep north-facing slopes and are restricted to areas continuously cooled by air draining through caves and fissures. The algific talus slope communities are shaded by the canopy of the surrounding forest.

Long-term management objective – The goal is to maintain these unique communities in an undisturbed condition and provide habitat for the rare plants and animals that occur in them.

Short-term plan - Prior to any activity in adjacent forest types, the regional plant ecologist will be consulted to clearly define these areas. No activities are planned for the life of this plan.

Additional Management Goals

Enhance Wildlife Habitat

Narrative - DNR wildlife and fisheries managers have been consulted in the past with regard to improving habitat in the Pine-Hemingway Creek Area. As part of their wildlife habitat activities the Lewiston Area has carried out one aspen recycling project, two prescribed burns for grassland habitat, and built three erosion control structures which provide added water bird habitat. The Division of Fisheries has carried out extensive habitat improvement work along Pine creek going west from the township road in Sec 25. Additional fisheries work is presently under consideration by the Lanesboro Area Fisheries Office.

Short Term Plan – Any planned work in riparian types will be done after consultation with the Area Fisheries staff. Input from the Area Wildlife will be obtained relative to the design of timber sales and forest management activities.

Recreation

Narrative - Hunting, fishing, and snowmobiling are the main recreational activities that occur in the Pine-Hemingway Creek Area. All of the forest roads have been gated to stop truck and car traffic. However, four-wheelers do bypass these barriers and travel on the roads and trails found in the area. Most of this is local people attempting to reach portions of the streams that are not accessed by public roads.

Three “hunter parking lots” have been built at main entry points by Area Forestry staff. These are heavily used during spring and fall hunting seasons and when the stream trout season is open. The parking lot where Pine creek meets the Fremont township road in Section 26 receives particularly heavy use. The township recently replaced the bridge there and the parking lot was rebuilt to accommodate this change in access. A Grant in Aid snowmobile trail traverses stands 38, 70, and 80. This trail goes over an existing forest road. A good working relationship is in place with the snowmobile club that maintains this trail.

Short Term Plan – Signing and fencing to prevent trespassing onto adjacent private land is an ongoing activity. Additional enforcement activity will be needed to get better compliance with OHV regulations.

Improve Forest Inventory Data and Management Practices

Narrative- Timber harvests and other management activities will bring further refinements to the FIM inventory data as stand boundaries are adjusted in pre- and post-sale visits. Additional data on species will also be collected during this process. As new information and management techniques become available, practices may be tested or implemented after consultation with silviculturalists, ecologists, wildlife managers, and fisheries managers.

Short Term Plan – Inventory alterations will be completed as management activities are completed, after regeneration checks, and at intervals as the stands age and their information needs updating.

Acquisition of Private Lands

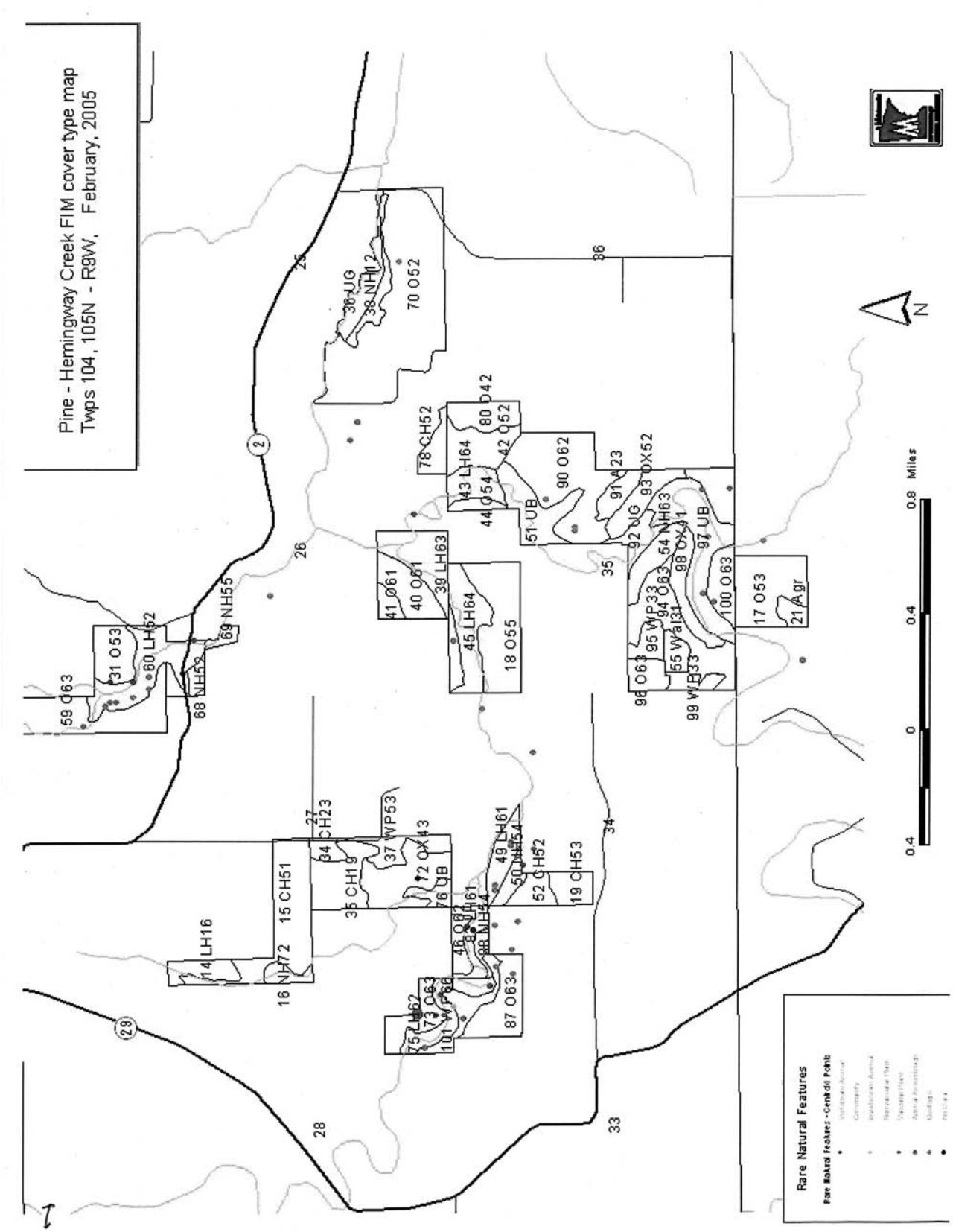
Narrative- There is a large amount of private land within the Critical Habitat Zone including some that abuts all three of the designated old growth stands. This private land is often the location of land uses which conflict with the goal of maintaining or increasing the uncommon species and the native plant communities, which support them. Land clearing, agricultural management practices, cattle grazing, unmanaged logging, and road and housing construction are examples of practices, which may conflict with this goal. That these activities are occurring with greater frequency recently is evidenced by the recent construction of three houses within the Critical Habitat Zone.

In addition to incompatible land uses the presence of so much intermingled private land leads to conflicts over trespassing and makes management of the state forest ownership difficult. The combined effect of the mixed ownership pattern and steep terrain create a situation where it may not be possible to carry out needed management activities due to problems with access.

Short Term Plan – Land acquisition that consolidates blocks of this unit or which buffer rare features or old growth stands or riparian areas or which improve public or management access should be a high priority. Other means of protection or of improving access such as conservation or access easements should be considered where fee title acquisition is not possible. Partnering in acquisition efforts with other DNR divisions, other government agencies, and private organizations may be necessary.

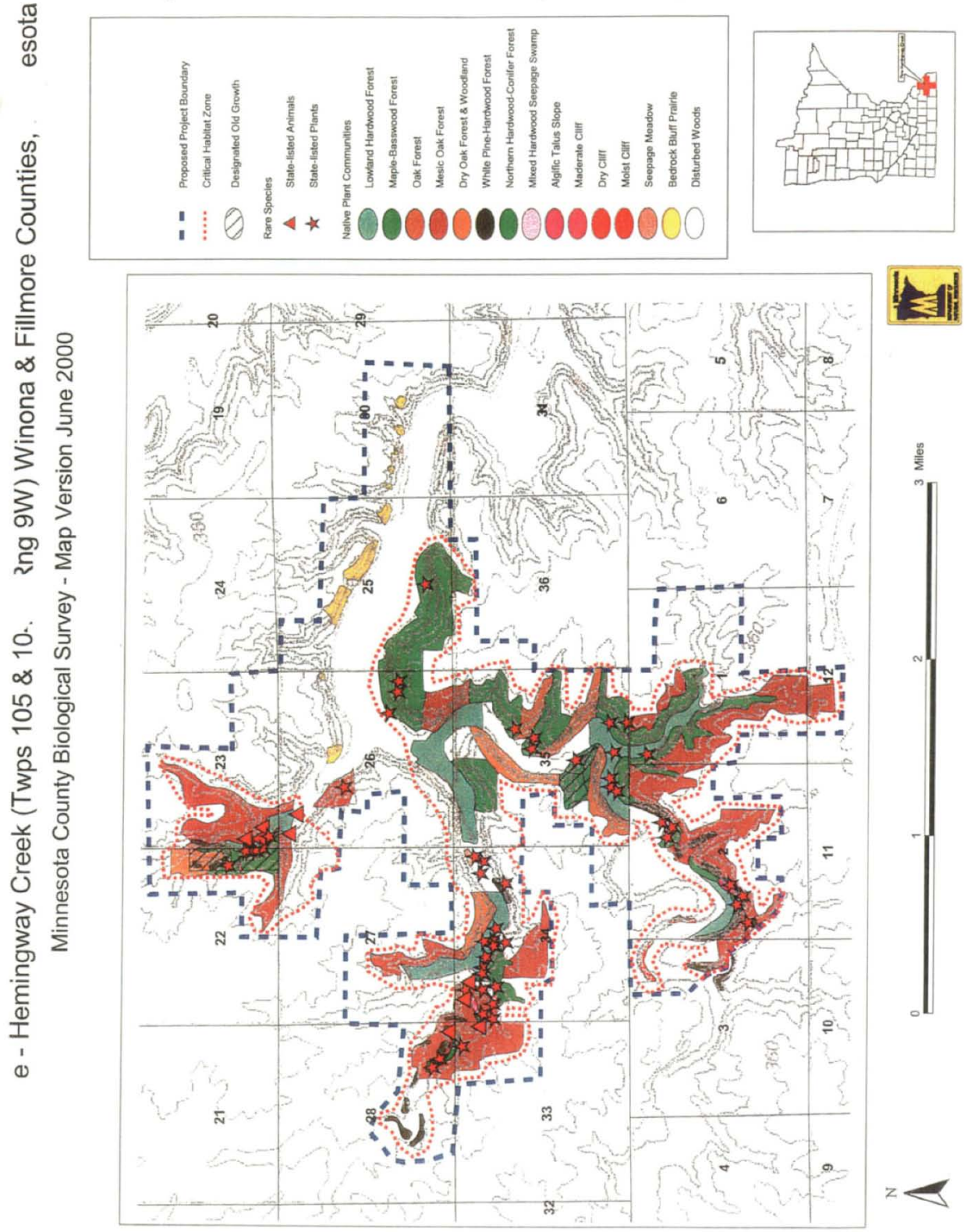
Appendix 1: Pine-Hemingway Creek Area Location

Appendix 2: FIM types in the Pine-Hemingway Creek Area



Appendix 3: Native Plant Communities & Rare Elements

Figure 1. Native Plant Communities and Rare Species of the Project Area



Appendix 4: MCBS Evaluation of the Pine-Hemingway Creek Area

An Evaluation of the Ecological Significance of

THE PINE-HEMINGWAY CREEK AREA

Paleozoic Plateau ECS Section; Blufflands Subsection
Winona and Fillmore Counties, Minnesota
DNR Quad Codes: W22a,b,c,d

T104N R09W: portions of sections 1, 2, 3, 12;
T105N R08W: portion of section 30;
T105N R09W: portions of sections 22, 23, 25, 26, 27, 28, 33, 34, 35, 36

Approximate Acreage
Proposed Project Boundary: 5,271 acres (state land: 1,000 acres)
Critical Habitat Zone: 2,452 acres (state land: 871 acres)

Prepared by: Hannah Dunevitz
Natural Heritage and Nongame Research Program
Section of Ecological Services
Minnesota Department of Natural Resources
1200 Warner Road
St. Paul, Minnesota 55106

Draft Date: 30 May 2000
Final Version: 18 June 2001

Project Evaluation—Pine Hemingway

Summary of the meeting with Dave Svien to discuss the Pine Hemingway Project evaluation: 12/12/00

Dave stated that he would not want to see this area become a Scientific and Natural Area. He felt that the biodiversity concerns could be addressed while maintaining this area in Forestry management. Dave is concerned that the department is focusing all efforts on the biodiversity of public lands and hopes that the private lands with high biodiversity will also be addressed. Dave stated that public lands are already protected in many ways including no housing development and no grazing. Dave felt that the statement "Much of the land in the site is owned and managed by the DNR's Division of Forestry" in the second paragraph of the Pine-Hemingway Project Evaluation was misleading since only 19% of the project boundary is owned by the state and only 35% of the Critical Habitat Zone is owned by the state. The state owned land is not contiguous, there are many private in holdings and there is a lack of an upland buffer. Dave's priority for this area would be to purchase buffer lands.

Dave does not plan on doing much in the western portion of Pine-Hemingway but might want to pull out some individuals and do some selective cutting of the oak stands. Dave also stated that there may be need to conduct a light timber sale to open up the white pine forest and scarification of the soil if the white pine is not regenerating. Dave stated that he would want to retain the ability to perform partial cuts in the lowland-forested areas. Because of the disconnected nature of this site and the many private in-holdings, Dave has limited access to the land. Dave stated that he would be willing to conduct alternative management techniques if he could get some help with the issue of this area that concern him. Dave's concerns about this site include the management on private

lands and the lack of enforcement of the fisheries easements. Dave stated that mainly hunters and fishermen use this area.

ECOLOGICAL SIGNIFICANCE:

Overview

The large concentration of rare features in Pine-Hemingway Creek makes it one of the most biologically significant sites in southeastern Minnesota. The site contains several areas of mature, high quality forest, including maple-basswood, mesic oak, dry oak, northern hardwood-conifer, and white pine-hardwood forest (Figure 1). Three forest stands have been designated old growth. In addition, extensive areas of lowland hardwood forest and younger but still high-quality tracts of the other forest types link the older stands and provide important rare species habitat. There are two algific talus slopes and a maderate cliff that provide habitat for a rare snail species that is a Pleistocene relic. Five species of rare birds occupy portions of the site, making it one of the ten top sites for rare forest birds in southeast Minnesota. Two caves in the site provide potential bat habitat; one of these is an important winter hibernaculum for the eastern pipistrelle *(Pipistrellus subflavus)*, a special concern species. Populations of 15 state-listed plants occur in the site: goldenseal *(Hydrastis canadensis)*, nodding wild onion *(Allium cernuum)*, Short's aster *(Aster shortii)*, James' sedge *(Carex jamesii)*, smooth-sheathed sedge *(Carex laevivaginata)*, spreading sedge *(Carex laxiculmis)*, moschatel *(Adoxa moschatellina)*, Wood's sedge *(Carex woodii)*, stemless tick-trefoil *(Desmodium nudiflorum)*, squirrel corn *(Dicentra canadensis)*, Goldie's fern *(Dryopteris goldiana)*, false mermaid *(Floerkea proserpinacoides)*, ginseng *(Panax quinquefolius)*, black snakeroot *(Sanicula trifoliata*, and cliff goldenrod *(Solidago sciaphila)*. Multiple locations of many of these species have been documented in the site.

Pine-Hemingway Creek is in the Red Wing-LaCrescent Uplands Geomorphic Region, a highly dissected portion of the Paleozoic Plateau in southeastern Minnesota characterized by steep bluffs, loess-covered uplands, and lowlands ranging from broad floodplains to narrow river valleys. It is part of the extensive Root River Watershed. The site consists of steep bluffs and floodplains along portions of three designated trout streams: Pine Creek, Hemingway Creek, and Coolridge Creek. About 1000 acres in this site is owned and managed by DNR's Division of Forestry (Figures 2 and 3).

Geologic Features

The site is geologically significant for its exposed Paleozoic bedrock strata and its north-facing cold air slopes. Cliffs and bedrock outcrops on the bluffs expose layers of 5 formations: the Shakopee, Oneota Dolomite, Jordan Sandstone, St. Lawrence, and Franconia Formations (from top to bottom). In two portions of the site, cold air trapped in fissures in the Oneota Dolomite layer create suitable conditions for algific talus slope and maderate cliff communities and rare snail species. These systems include sinkhole features on the uplands, generally within 1/4 mile of the slopes, necessary for air circulation into the fissures. These communities and snails are glacial relicts, found nowhere else in the world except on cold air slopes in the Paleozoic Plateau. In addition, caves occur beneath the ground's surface, including two that have been explored. Hermanson's Cave is located in the zone of contact between the Shakopee and Oneota Dolomite Formations and has several openings. This cave is too exposed to be suitable as a bat hibernaculum. Pine Valley Cave, a locally important bat hibernaculum, is in the Oneota Dolomite formation and is entered through a sinkhole and 5-meter chimney.

Native Plant Communities

Figure 1 shows the locations of native plant communities in this site. Flat to gently sloping valley floors along the creeks support lowland hardwood forest, ranked BC to CD, dominated by various combinations of bur oak *(Quercus macrocarpa)*, black ash *(Fraxinus nigra)*, sugar maple *(Acer saccharum)*, basswood *(Tilia americana)*, black walnut *(Juglans nigra)*, box elder *(Acer negundo)*, rock elm *(Ulmus Thomasi)*, red elm *(Ulmus rubra)*, and hackberry *(Celtis occidentalis)*. Lowland hardwood forests are rare in southeast Minnesota, as many of them have been converted to croplands and pastures. In this site, the ground flora is a mix of species found in floodplains and those found in upland forests. Most areas have been disturbed in the past by grazing, foot-trails, or logging but are still intact natural communities. In many places, seepage streams run through these forests, creating special habitat for several rare plant species. Where the seeps are extensive and run through open, sedge-dominated areas, they are classified as seepage meadow communities. Where seeps run through forested swamps, they are classified as mixed hardwood seepage swamps. These areas of lowland hardwood forests, swamp forests, streams, and seeps provide critical habitat for the rare birds found in this site.

The steepest (70 to 80 percent) slopes in the site support northern hardwood-conifer forests and white pine-hardwood forests. Northern hardwood-conifer forests, extremely rare in southeast Minnesota, occur on cool, steep north-facing slopes and include several plant species generally found much further north: white pine *(Pinus strobus)*, yellow birch *(Betula allegheniensis)*, Canada yew *(Taxus canadensis)*, mountain maple *(Acer spicatum)*, and twisted stalk *(Streptopus roseus)*. The northern hardwood-conifer forests in this site are mature, A to AB rank, excellent quality stands supporting several rare plant species. One (in sections 28 and 33) is designated old growth. White pine-hardwood forests are found on moist to dry steep slopes and include species characteristic of oak and maple-basswood forests along with white pine. Those visited were mature, AB to BC rank communities.

The four algific talus slopes and the maderate cliff are extremely rare and fragile natural communities. Their continued health is based on intact geologic and hydrologic systems that allow ice to accumulate in caves and air passages in the bedrock and allow cold air to reach the surface. The rare Pleistocene snails on these slopes rely on continual cold air and the absence of foot traffic or logging, which could disturb the fragile talus slopes.

Less steep slopes support maple-basswood forest and mesic oak forest on north to east-facing slopes and dry oak forest and oak woodland-brushland on south to west-facing slopes and ridgetops. There are at least eight stands of A to BC rank maple-basswood forest, all mature, including two designated old growth. Twelve of the rare plant species in the site occur in maple-basswood forests.

Ridge tops and drier slopes support oak forest, including both dry and mesic subtypes. Three stands of AB to B rank occur in the Winona County portion of the site: two are 20 acres, one 40 acres, and all three have populations of the threatened plant species stemless tick trefoil *(Desmodium nudiflorum)*. The remainder of the oak forest communities in the site that were surveyed by the Minnesota County Biological Survey (MCBS) have been logged, grazed, or both, though many are still intact natural communities (BC to CD rank) and will recover in time.

Many steep south and west-facing slopes are occupied by oak woodland-brushland that has been kept open primarily through grazing, and possibly by fire as well. Those woodlands not currently being grazed or burned are beginning to develop a forested character, with armed shrubs (indicative of past grazing) common. These areas would benefit from prescribed burning. Several of these slopes support bedrock bluff prairies not evaluated by MCBS.

Rare Plants

Each of the forested natural communities in this site provides rare species habitat. The moist north to east-facing slopes and lowland hardwood forests have the greatest concentrations of rare plants, though drier slopes and ridgetops also contain rare species. The most significant species in the site are described briefly below and their locations shown in Figure 1.

A number of rare plants in this site have been found nowhere else in the state except in mature rich maple-basswood forests in the Paleozoic Plateau. They generally occur on loam in relatively flat areas and at the base of north-facing slopes. One of these species, goldenseal, is state-endangered and has only been documented in nine other sites in Minnesota. Though it has always been rare in the state because it is on the northwest edge of its range, it has become even rarer because of intensive gathering for medicinal use. Two populations were found in this site in mature maple-basswood forests. Other rare species in these rich maple-basswood forests include one threatened species: Short's aster (*Aster shortii)*; three special concern species: Wood's sedge *(Carex woodii)*, Goldie's fern *(Dryopteris goldiana)*, and moschatel *(Adoxa moschatellina)*; and one species unlisted but tracked by the Natural Heritage Information System (NHIS): silvery spleenwort *(Athyrium thelypterioides)*.

Steeper north-facing slopes and portions of the lowland hardwood forests below them provide habitat for the state-threatened species nodding wild onion *(Allium cernuum)*, found in nine places in this site. It was associated with algific talus slopes, maderate cliffs, maple-basswood forests, and northern hardwood-conifer forests. The only other place this species has been found in Winona County is in similar forests along the South Branch of the Whitewater River. Two of these cool north-facing slopes also support populations of the special concern species squirrel corn *(Dicentra canadensis)*.

Stemless tick-trefoil *(Desmodium nudiflorum)* is a state-threatened species that occurs in the site in dry to dry-mesic oak forests. It has been found in oak forests in the St. Croix River Valley as well as the Paleozoic Plateau. Only 19 other occurrences are known in the state; this is the only known population in Winona County.

Several rare species occur in both maple-basswood and oak forests in this site. These include two special concern species: ginseng *(Panax quinquefolius)* and beaked snakeroot *(Sanicula trifoliata)*, and one species that is unlisted by tracked in the NHIS: white baneberry *(Actaea pachypoda)*.

Cliff goldenrod *(Solidago sciaphila)*, found on several cliffs in the Pine-Hemingway Creek Area, is a state special concern species that grows primarily on cliffs in the Paleozoic Plateau.

Lowland hardwood forests and the seepage streams that wind through them in the Pine-Hemingway Creek Area provide important habitat for a number of rare plant species. Seepage streams form essential habitat for false mermaid *(Floerkea proserpinacoides)*, a state-threatened annual species found in only seven other sites in the state. Smooth-sheathed sedge *(Carex laevivaginata)* is another state-threatened species associated with seepage areas in this site. State-threatened species in lowland hardwood forests in this site that are not directly associated with seeps include James' sedge *(Carex jamesii)* and spreading sedge *(Carex laxiculmis)*.

Rare Animals

Surveys for small mammals have not been conducted in Pine-Hemingway Creek. There is potential habitat for woodland voles *(Microtus pinetorum)*, which are limited to southeast Minnesota where they are extremely rare and on the edge of their range. In the region, this species, which uses both below-ground and above-ground habitat, is found in mature maple-basswood forest with a thick, uncompacted litter layer. Pine Valley Cave, one of two caves on the site, is an important hibernaculum for eastern pipistrelle *(Pipistrellus subflavus)*, a special concern bat species. The species little brown myotis *(Myotis lucifugus)*, a more common bat species, has been observed foraging over the stream in large numbers during summer, suggesting a maternity colony may be located in the vicinity. These colonies frequently occur in hollow tree trunks along stream edges.

Five rare bird species were documented in Pine-Hemingway Creek during the breeding season. This is one of the the top ten sites for rare forest birds in southeast Minnesota. The most important habitat features in the site for these species are the large relatively unfragmented nature of the forest, the intact lowland hardwood forest in the valleys, and the presence of clear, fast-moving streams. Five occurrences of Louisiana waterthrushes *(Seiurus motacilla)*, ranked special concern in the state, were found in the northern and western portions of the site along streams in lowland hardwood forests and maple-basswood forests. The birds require clear, flowing streams, steep-sided valleys, and adjacent mature deciduous forest, including a relatively closed canopy over the streams for breeding habitat. Acadian flycatchers *(Empidonax virescens)* and cerulean warblers *(Dendroica cerulea)*, both special concern species, were documented in similar habitat in the site. The cerulean warbler is also a federal candidate species. These two species are both associated with mature forests and are often found near streams. Veerys *(Catharus fuscescens)* and least flycatchers *(Empidonax minimus)* were found closely associated with the previous three species. These birds, common in northern Minnesota but rare in southeast Minnesota, are typically found in lowland forests. In Houston and Winona counties, veerys were found by MCBS in just four other sites, and least flycatchers in six other sites.

Healthy populations of pickerel frogs *(Rana palustris)* were found in lowland hardwood forests in this site. This species is on the edge of its range in southeast Minnesota, and requires good forest cover adjacent to clear, cool, flowing streams. It also uses areas of open vegetation such as wet meadows. Though this species is stable in the site at present, extensive logging of lowland hardwood forests could disrupt the population. Upland forests and bluff praires provide potential rare snake habitat, but there have not yet been surveys of these areas for herpetofauna.

One rare snail species occurs on algific talus slopes and maderate cliffs in the site. This species is extremely small and is limited in Minnesota to these highly specialized sites. The variable

Pleistocene vertigo (*Vertigo hubrichi. variabilis* n. subsp.) was found on the maderate cliff in section 34. Its shell is about 2 mm long. It is most common on cold undisturbed and well-forested sites in or immediately in front of open cold air vents in small patches of decaying deciduous tree leaves. It is found nowhere else in the world except the Paleozoic Plateau. This species is a candidate for federal listing as threatened and is listed as state threatened.

RECOMMENDATIONS:

The diverse combination of cold air slopes. forested lowlands. and the relatively large tract of uplands with mature forest creates ideal conditions for the native plant communities and rare species in this site. Some of the private land in the site was logged during a wet portion of the active growing season in recent years. resulting in soil erosion. the invasion of many annual weeds. and siltation in Hemingway Creek. Most of the site is in good condition. however. and if this kind of activity is limited in the future, the site as a whole should retain its value as a natural area and maintain habitat for rare species. The rare animals and many of the rare plants in this site depend on good canopy cover. thick leaf litter layers. and relatively undisturbed forested sites. The cold air flow that supports the algific slopes and maderate cliffs would best be protected with a buffer of at least 1/4 mile on the top of the slopes in which air is allowed to flow freely. At present. there are three forest stands designated as old growth. The remainder of the forest stands in this site are at present managed by private and state owners primarily for timber. The needs of the rare features in the site should be integrated into a comprehensive protection and management plan.

The Critical Habitat Zone (Figure 1) is the highest priority for biodiversity protection. The area within the Critical Habitat Zone would qualify as a candidate for a Scientific and Natural Area.

Those areas outside the Critical Habitat Zone and within the Proposed Project Boundary (Figure 1) provide additional important habitat and buffering. Protection of agricultural lands could include set aside programs that help landowners plant permanent native cover. Combinations of other protection strategies for these lands. such as conservation easements. registry agreements. and/or management agreements for private lands and Natural Heritage Registry agreements for state forest lands could be pursued to accomplish protection of biological objectives.

INFORMATION SOURCES: Minnesota County Biological Survey: Hannah Dunevitz. Plant Ecologist: Steve Stucker. Ornithologist: Carol Hall. Herpetologist; Gerda Nordquist. Mammalogist. Forestry Division: Dave Svien, Area Forester

Pine-Hemingway Creek
ELEMENT SUMMARY:

	*Status	**Rank	Statewide Eos	Paleozoic Plateau Eos
Native Plant Communities				
Talus slope (algific subtype)	S2	BC,C	80	79
Moist cliff (southeast section) maderate subtype	S3	B	18	18
Moist cliff (southeast section)	S3	B	28	23
Dry prairie (southeast section) bedrock bluff subtype	S3	-	291	244
Northern hardwood-conifer forest (southeast section)	S2	A	5	5
White pine-hardwood forest (southeast section) dry subtype	S2	AB	7	4
White pine-hardwood forest (southeast section) mesic subtype	S2	B, BC	26	25
Maple-basswood forest (southeast section)	S2	AB,B, BC	186	179
Oak forest (southeast section) dry subtype	S2	AB	50	46
Oak forest (southeast section) mesic subtype	S2	B, C, CD	298	258
Oak woodland-brushland (southeast section)	S4	BC	53	42
Lowland hardwood forest	S4	BC, CD	91	33
Seepage meadow	S3	CD	22	15
Birds				
Louisiana waterthrush *(Seiurus motacilla)*	SC		100	46
Acadian flycatcher *(Empidonax virescens)*	SC		58	35
Cerulean warbler *(Dendroica cerulea)*	SC		140	56
Amphibians and Reptiles				
pickerel frog *(Rana palustris)*	NON		57	57
Mammals				
eastern pipistrelle *(Pipistrellus subflavus)*	SC		20	14
Snails				
variable Pleistocene vertigo *(Vertigo hubrichti variabilis n. subsp.)*	T		6	6

Pine-Hemingway Creek
ELEMENT SUMMARY (continued):

		Status	Statewide Eos	Paleozoic Plateau Eos
Plants				
Actaea pachypoda	white baneberry	NON	71	33
Adoxa moschatellina	moschatel	SC	103	74
Allium cernuum	nodding wild onion	T	72	71
Arabis laevigata	smooth rock cress	NON	20	20
Aster shortii	Short's aster	T	27	27
Athyrium thelypterioides	silvery spleenwort	NON	41	41
Carex jamesii	James' sedge	T	14	14
Carex laevivaginata	smooth-sheathed sedge	T	25	24
Carex laxiculmis	spreading sedge	T	19	19
Carex woodii	Wood's sedge	SC	91	64
Desmodium nudiflorum	stemless tick-trefoil	SC	20	16
Dicentra canadensis	squirrel corn	SC	44	43
Dryopteris goldiana	Goldie's fern	SC	48	37
Floerkea proserpinacoides	false mermaid	T	12	10
Hydrastis canadensis	goldenseal	E	15	15
Panax quinquefolius	ginseng	SC	225	115
Sanicula trifoliata	black snakeroot	SC	41	38
Solidago sciaphila	cliff goldenrod	SC	85	84

*Status:

For Rare Species
E = endangered
T = threatened
SC = special concern
NON = no legal status but tracked in the Natural Heritage Information System

For Natural Communities
(program-defined; no legal status)
S1=critically endangered
S2=endangered
S3=threatened
S4=special concern
S5 = demonstrably secure

**Ecological quality rank where A = highest quality and D =lowest quality (multiple ranks indicate multiple occurrences)

Figure 2. CSA Phase II Stand Cover Types for State Owned Land in the Project Area

Figure 3. CSA Phase II Stand Ages for State Owned Land in the Project Area

e - Hemingway Creek (Twps 105 & 10· Rng 9W) Winona & Fillmore Counties, . esota

Minnesota County Biological Survey - Map Version June, 2000

Appendix 5: Additional Management Guidance

Harvest of high quality maple-basswood communities

Selective harvest will be allowed if site teams jointly develop detailed plans that include joint on-site visits. The following conditions will apply:

- Oak resources can be salvaged as these sites are converted to purer maple basswood communities. This should be done by selective, individual or small group marking and removals.
- Harvest activity should limit canopy gap creation wherever possible and account for fill in by remaining crowns.
- Seasonal and equipment restrictions should be used to limit soil disturbance; horse logging on frozen ground should be done where appropriate in the most sensitive sites).
- Trees should be jointly marked as well as the layout for access and skid trails to minimize any additional permanent fragmentation.
- Portions of stands that support unique or rare resources (such as a rare species or a rich spring ephemeral flora) may be delineated for no harvest.
- A pre and post treatment monitoring and evaluation protocol for species and communities of concern (both native and exotic) should be developed and implemented in each stand. Harvest plans should also take into account whether or not invasive exotic species occur in stands immediately adjacent to those being harvested.

With respect to the last bullet, Ecological Services staff will continue discussions with USDA Forest Service staff to further explore the opportunities to collect pre-treatment data during the 2004 field season.

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. To promote natural regeneration and protect soil productivity, look for opportunities to clear-cut the forested type on more level terrain following pre-sale soil scarification. Harvesting on steeper slopes, where appropriate, would be restricted to shelterwood, group selection, or variations of these harvest methods without soil scarification

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority for prescribed fire funding. Wildlife will work with the Divisions of Ecological Services and Forestry to ensure that these sites are regenerated through the application of fire.

Aspen and white pine pockets

The cover type goal as listed in the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan is to maintain or moderately increase the white pine acreage and increase the aspen acreage for various wildlife and non-game species. As stated in the plan, there are relatively few stands of aspen larger than five-acres in size in southeastern Minnesota.

Native white pine stands are limited in number, but provide multiple benefits to numerous game and non-game species from roosting sites for wild turkeys to perches and roost areas for bald eagles. The department believes it is necessary to access some of the sites for management to ensure natural regeneration occurs.

Options to minimize any intrusion through the maple-basswood communities should include the following:

- A search for any pre-existing old homestead roads or trails that could be used for access and whether exotic species are present in the area which might be introduced along such a corridor if made active again;
- List alternate means to access the white pine such as through private land, through other disturbed communities, etc; and
- Timing of access whereby any mechanical scarification would take place during fall or early winter, reducing the "footprint" upon the trail used to access such stands. The department believes such efforts to maintain or increase the native white pine acreage in this landscape outweigh the minor impacts to surrounding northern hardwood communities.

Small aspen clones in high quality sites should only be harvested when a harvest is already planned and approved by the team, at the same time, within the immediately surrounding stand in which the clone is embedded. Other conditions mentioned under the high quality maple-basswood communities section above should also be addressed. If harvest in the stand in which the aspen is embedded is not planned, then a special effort to cut the aspen should not be made.

Appendix 6: Commissioner's Office Memo July 20, 2006

Department of Natural Resources
COMMISSIONER'S OFFICE, Box 09

State of Minnesota
Office Memorandum

Date: July 20, 2006

To: Dave Epperly, Lee Pfannmuller, Dave Schad, Cheryl Heide, Joe Kurcinka, Jon Nelson, Keith Wendt

From: Brad Moore, Assistant Commissioner

Subject: Decision on management of three disputed stands in the Pine-Hemingway Creek Area

THE POLICY ISSUE: In 2000 the Minnesota County Biological Survey (MCBS) identified 13 predominantly DNR-administered land areas of high biodiversity significance in southeastern Minnesota. Since then, DNR staff have worked in an interdisciplinary process to ensure that these areas are managed to sustain their rare species and high quality native plant communities (see Timeline). However, staff have debated and left unresolved the status of three stands in the Pine-Hemingway Creek Area, specifically the question of whether silvicultural (harvest) or reserve management is the best strategy to maintain and enhance these stands. The debate has been respectful and constructive, generating multiple perspectives and management alternatives. Now it is time to make a decision on these stands so we can move forward on other important issues.

To that end, I recently visited the stands with two division directors, the southern regional director, and other staff to discuss management options and gather information needed to determine the best course of action.

THE DECISION: The three disputed stands in the Pine-Hemingway Creek Area will be placed in reserve status and be managed to maintain and enhance the high quality native plant communities and species within them. The stands (a total of 126 acres) are: 1) Type 87, Sec 33, T105N – R9W; 2) Type 90, Sec 35, T105N – R9W; and 3) 2 adjacent stands managed as one: Type 100, Sec 35 T105N – R9W; Type 17, Sec 2, T104N – R9W. These stands of outstanding biodiversity significance will serve as ecological benchmarks. On sites of moderate biodiversity significance we will use and evaluate silvicultural prescriptions to maintain conservation values and meet harvest goals.

RATIONALE: My rationale for this decision involves several key points (see Discussion Section):

1) ***Policy***: A range of policies and standards – from the *Conservation Agenda* and forest laws to Forest Certification standards – mandate the protection of uncommon and rare habitats and species.
2) ***Outstanding nature of the sites***: These sites are the "best of the best" forest biodiversity sites in southeastern Minnesota based on a comprehensive regional survey.
3) ***Range of tools:*** We will use a range of tools to protect uncommon and rare habitats, from silviculture to reserving no-harvest areas.
4) ***Need for benchmark stands:*** Unharvested benchmark stands are critical for understanding the effects of silvicultural management. They are one tool for meeting DNR forest policy and demonstrating accountability to Forest Certification standards.

DISCUSSION:

Policy

The *Conservation Agenda* states that Minnesota's forests will be managed for a full range of forest values, from providing timber and wildlife habitat to protecting and restoring uncommon and rare habitats. This directive is firmly established: The 1933 enabling act for state forests specifies "...the preservation and development of rare and distinctive species of flora native to such areas." The 2002 Sustainable Forests Resources Act underscores this commitment in its definition of forest resources as inclusive of "timber, biodiversity, and rare and distinctive flora and fauna." Furthermore, DNR's Forest Certification requires on-going documentation of our work to maintain rare and distinctive features by achieving a system of protected, representative samples of existing ecosystems within the landscape (FSC Principle 6.4) and ensuring appropriate management of high conservation value forests (FSC Principle 9). DNR is committed to continually improving its management by using both reserve prescription and silvicultural management to maintain and enhance high conservation values.

Outstanding Nature Of The Sites

Based on the MCBS and its systematic evaluation of biodiversity significance in the Blufflands/Rochester Plateau Subsection, it is clear that the three stands have high conservation value. They are forest sites of outstanding biodiversity significance within the Pine-Hemingway Creek Area and are among the highest value sites within the subsection. The critical question is how to manage them to sustain and enhance their future.

A Range Of Tools For A Full Range Of Values

A basic tenet of sustainable forestry is managing the whole forest system in integrated ways so all forest values are maintained. This means using both reserves and a variety of silvicultural treatments, i.e. the prudent use of the full diversity of management tools across the landscape. While I decided to reserve the three stands in question, silviculture that strives to maintain and enhance rare and distinctive species and other conservation values is appropriate in many sites, especially in sites of moderate biodiversity significance. As part of our adaptive management approach we need to maximize our opportunities to understand the effects of well-designed silvicultural prescriptions on rare and distinctive flora and fauna. For example, the Caledonia Oaks Regeneration Project includes moderate biodiversity sites and is designed to help us measure the effects of different silvicultural treatments on oak regeneration and biodiversity significance. Another example is the silviculture project occurring on a site of moderate biodiversity significance in the Manitou Forest Landscape in the North Shore Highlands Subsection.

Need For Benchmark Stands

Reserves protect some forest elements that cannot be reliably maintained in stands managed with timber harvest. They also provide important benchmarks of forest conditions to which harvested stands can be compared. As we strive to better manage our forests for a range of values, unharvested benchmark stands representing different ecosystem conditions across the landscape are essential for measuring the success of our management for multiple forest purposes. Reserving the three stands at Pine-Hemingway will provide important benchmarks for evaluating stands managed with silvicultural prescriptions.

As part of our commitment to Forest Certification, we will complete a GAP analysis (CAR 2005.6) to determine how well DNR has "protected representative samples of existing ecosystems within the landscape." Until this GAP analysis is completed (by the 2007 surveillance audit), we must maintain our options to adequately represent native plant communities and rare species. The sites of outstanding biodiversity significance identified by the MCBS are critical resources for doing this.

PRINCIPLES:

As we test and improve ways to manage for rare species/high conservation value forests, please use the following principles as starting points for further refinements.

- Manage for a full range of values using a diversity of tools including silviculture and reserves.

- Silviculture is an important tool for maintaining and enhancing forest biodiversity values on specific sites, particularly sites of moderate biodiversity significance.

- Unharvested reserves are important tools for maintaining and enhancing forest biodiversity values on specific sites, particularly sites of outstanding biodiversity significance.

- On all sites, ECS is our integrative tool to understand site and landscape potential for a full range of forest values and to explore the appropriate management prescriptions to meet specific purposes.

- Use interdisciplinary cooperation to evaluate options and make decisions.

- Use "Options Forestry" to test different approaches for maintaining biodiversity and forest productivity (see attached paper for details—options forestry is a simplified approach to adaptive management; recognizing uncertainty, testing and comparing different prescriptions).

As we continue our work to manage the public's forest for multiple purposes, please work together to refine and put these principles into operation. I appreciate the complexity of the task, the uncertainties involved, and most of all your ability to respect each other's points of view and work together as a team. Your work is vital to developing and implementing sound forest policy.

Timeline

- Between 1990 and 1996 the Minnesota County Biological Survey (MCBS) systematically surveyed 917 sites to collect and interpret data on rare species and native plant communities on public and private land in six counties of southeastern Minnesota (the Blufflands/Rochester Plateau Subsection).

- Based on these data MCBS classified 69 sites (7.5% of all sites surveyed) as having outstanding biodiversity significance. The Pine-Hemingway Creek Area includes 3 of these 69 sites and is one of 13 high biodiversity areas on lands predominantly administered by the divisions of Forestry and Fish & Wildlife.

- In August 2001 (8/3/01 memo) division directors for Wildlife, Forestry, and Ecological Services decided that a site team would cooperatively develop long-term management plans for each of the 13 high biodiversity areas.

- In December 2003 (12/22/2003 memo) the three division directors communicated guidelines to help resolve disagreement on the appropriate management of forest types within the 13 high biodiversity areas.

- In October 2004 Ecological Services staff expressed concerns over the draft management plan for the Pine-Hemingway Creek Area. An October 2005 field trip by an interdisciplinary team resulted in agreement on four stands in question within the Pine-Hemingway Creek Area, but failed to reach agreement on three stands totaling 126 acres (Type 87, Sec 33, T105N – R9W; Type 90, Sec 35, T105N – R9W; and 2 adjacent stands managed as one: Type 100, Sec 35, T105N – R9W; Type 17, Sec 2, T104N – R9W). These stands are classified as oak in the FIM database; and MCBS classified them as a mixture of mesic oak, maple-basswood, and lowland hardwood forest. Forestry staff recommended timber harvest, citing opportunities to regenerate oak and their confidence in the ability to work around concentrations of rare plants. Ecological Services staff recommended no timber harvest, citing the number and diversity of listed and non-listed native species, the lack of non-native invasive species, and concern that timber harvest could reduce native species diversity and facilitate invasion by non-native species.

- On July 7, 2006 Assistant Commissioner Brad Moore visited the Pine-Hemingway Creek Area with Lee Pfannmuller, Dave Epperly, Cheryl Heide, Jon Nelson, Keith Wendt, and field staff from Ecological Services, Forestry, and Fish & Wildlife to better understand management options for this site and gather information needed to decide the best course of action.

- On July 20, 2006 Assistant Commissioner Brad Moore directed staff to place the three disputed stands (126 acres) in the Pine-Hemingway Creek Area into reserve status. The stands will serve as ecological benchmarks and be managed to maintain and enhance the high quality native plant communities and species within them. On sites of moderate biodiversity significance we will use and evaluate silvicultural prescriptions to maintain conservation values and meet harvest goals.

Appendix 7. Areas of Significant Biodiversity in the Paleozoic Plateau

The Minnesota County Biological Survey identified 745 sites of biodiversity significance in the Paleozoic Plateau Ecological Section (Blufflands and Rochester Plateau Subsections). The breakdown of sites, their biodiversity significance rankings, and the number of sites of each ranking that contain state lands administered by various DNR divisions is summarized in the following table:

Table 1. MCBS Sites in the Paleozoic Plateau

Biodiversity Significance	**Total Number of MCBS Sites**	**Percent of Total**	**Number of MCBS Sites Containing State Lands**	**Number of MCBS Sites Containing State Forest Lands**	**Number of MCBS Sites Containing State Wildlife Lands**	**Number of MCBS Sites Containing State Park Lands**	**Number of MCBS Sites Containing SNA Lands**
Outstanding	121	16	65	40	22	8	11
High	187	25	91	51	21	8	14
Moderate	437	59	159	95	23	8	2
Total	**745**	**100**	**315**	**186**	**66**	**24**	**27**

For DNR managed state lands in Minnesota, strategies for managing sites of biodiversity significance differ according to the degree of biodiversity significance, statutory restrictions on land designations, and conservation needs of species and communities within the sites. In Scientific and Natural Areas (SNAs), management is done with rare natural features protection as the highest priority. For State Parks, comprehensive planning processes address protection of biodiversity, and in some cases SNAs or Natural Areas Registry sites are designated within park boundaries. [Natural Areas Registry sites are areas of biodiversity significance on public lands, for which a memorandum of understanding (MOU) has been signed by the agency or DNR division that manages the site and by the SNA Program supervisor. This MOU contains information about the management and protection needs of the rare features in the site.] For Wildlife Management Areas (WMAs), state statutes prohibit SNA designation within WMAs. Management is addressed as part of the Subsection Forest Resource Management Planning (SFRMP) process, and in some cases Natural Areas Registry sites are designated within WMA boundaries. For State Forests, management is addressed as part of the SFRMP process, and in some cases SNAs or Natural Areas Registry sites are designated within State Forest boundaries.

The SFRMP process for the Paleozoic Plateau addressed management of vegetation on State Forest and Wildlife lands. There were 13 “priority areas of significant biodiversity” identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county.

Appendix 8: FIM Key for Pine-Hemingway Creek

FIM cover types on maps and in the plan are identified with a code (e.g., NH57) comprised of three components:

- Main cover type code. This identifies the main type, based on predominant cover or tree species, indicated by a series of letters or abbreviations (e.g., **NH**57).
- Main cover type size class, based on predominant diameter of main species. This is the first numeric digit in the code (e.g., NH**5**7).
- Main cover type density, based on the number of stems, cords or board feet per acre. This is the second numeric digit in the code (e.g., NH5**7**).

Main Cover Type Code

Symbol	Type	Description
Ash	Ash	A bottomland type composed of ash.
LH	Lowland hardwoods	Bottomland hardwoods (ash, elm , Balm of Gilead, silver maple, etc.)
NH	Northern hardwoods	Northern or upland hardwood species
Wal	Walnut	Walnut predominating
O	Oak	Oak species predominating
CH	Central Hardwoods	Dense hardwoods with oak , hickory, cherry, butternut
OX	Offsite oak	Scrubby oak type below site index 40.
UG	Upland grass	An upland grass or weed area less than 10% stocked with a commercial tree species
Agr	Agricultural	Land being actively used for agricultural purposed – cropland, orchard, pasture, etc.

Main Cover Type Size Class (Diameter)

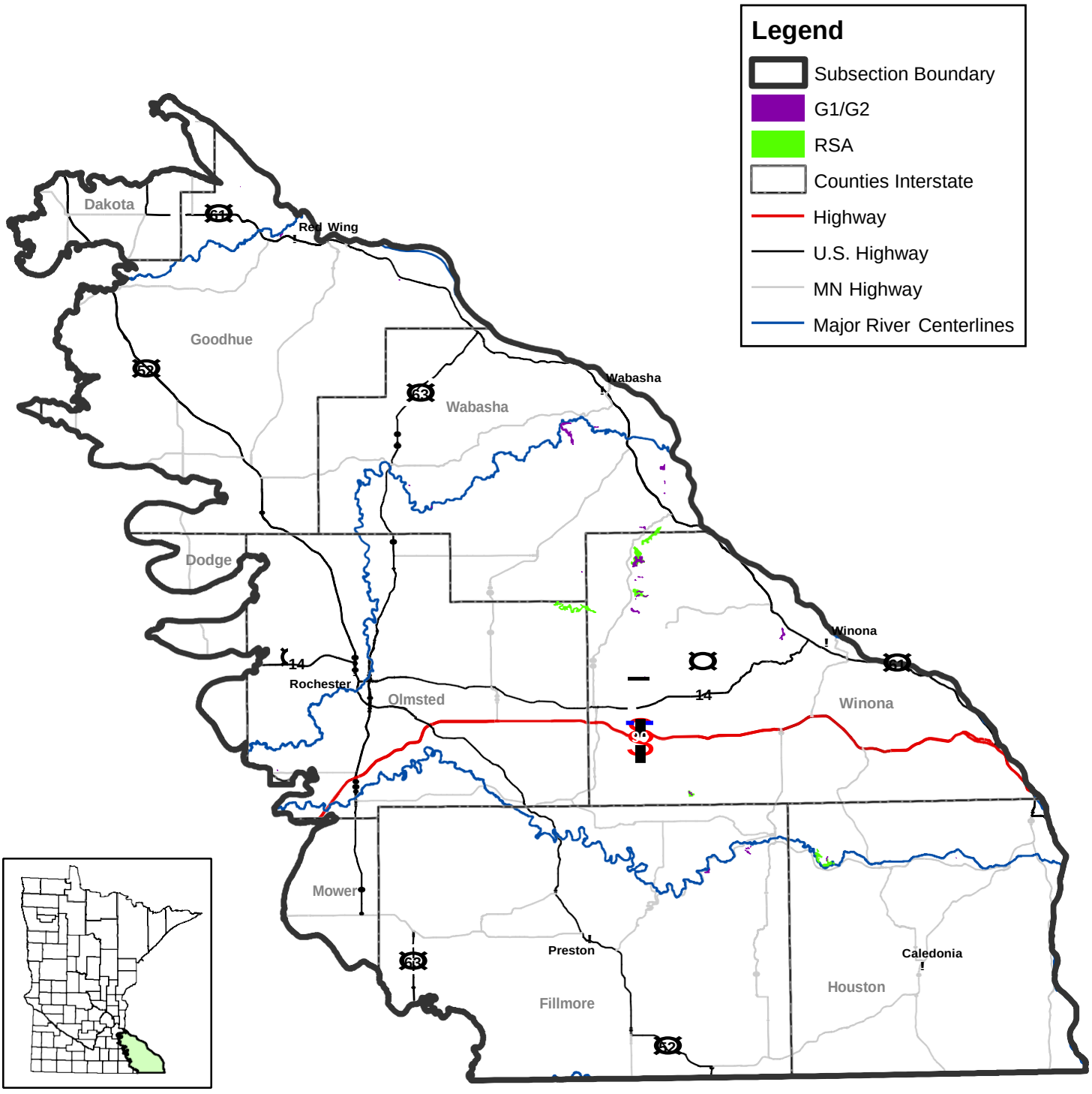
Code	Description	Corresponding Density Units
0	Not applicable for the type	
1	0 to .9 inches	Stems per acre
2	1 to 2.9 inches	Stems per acre
3	3 to 4.9 inches	Stems per acre
4	5 to 8.9 inches	Cords per acre
5	9 to 14.9 inches	Cords per acre
6	15 to 19.9 inches	Board feet per acre
7	20 to 24.9 inches	Board feet per acre
8	25+ inches	Board feet per acre

Main Cover Type Density

Code	Stems/Acre	Cords/Acre	Bd. Ft./Acre
0	0-250	0.0-2.9	0-1,250
1	251-750	3.0-7.5	1,251-3,750
2	751-1,250	7.6-12.5	3,751-6,250
3	1,251-1,750	12.6-17.5	6,251-8,750
4	1,751-2,250	17.6-22.5	8,751-11,250
5	2,251-2,750	22.6-27.5	11,251-13,750
6	2,751-3,250	27.6-32.5	13,751-16,250
7	3,251-3,750	32.6-37.5	16,251-18,750
8	3,751-4,250	37.6-42.5	18,751-21,250
9	4,251 and up	42.6 and up	21,251 and up

Map 2

Blufflands/Rochester Plateau Subsection RSA and G1/G2



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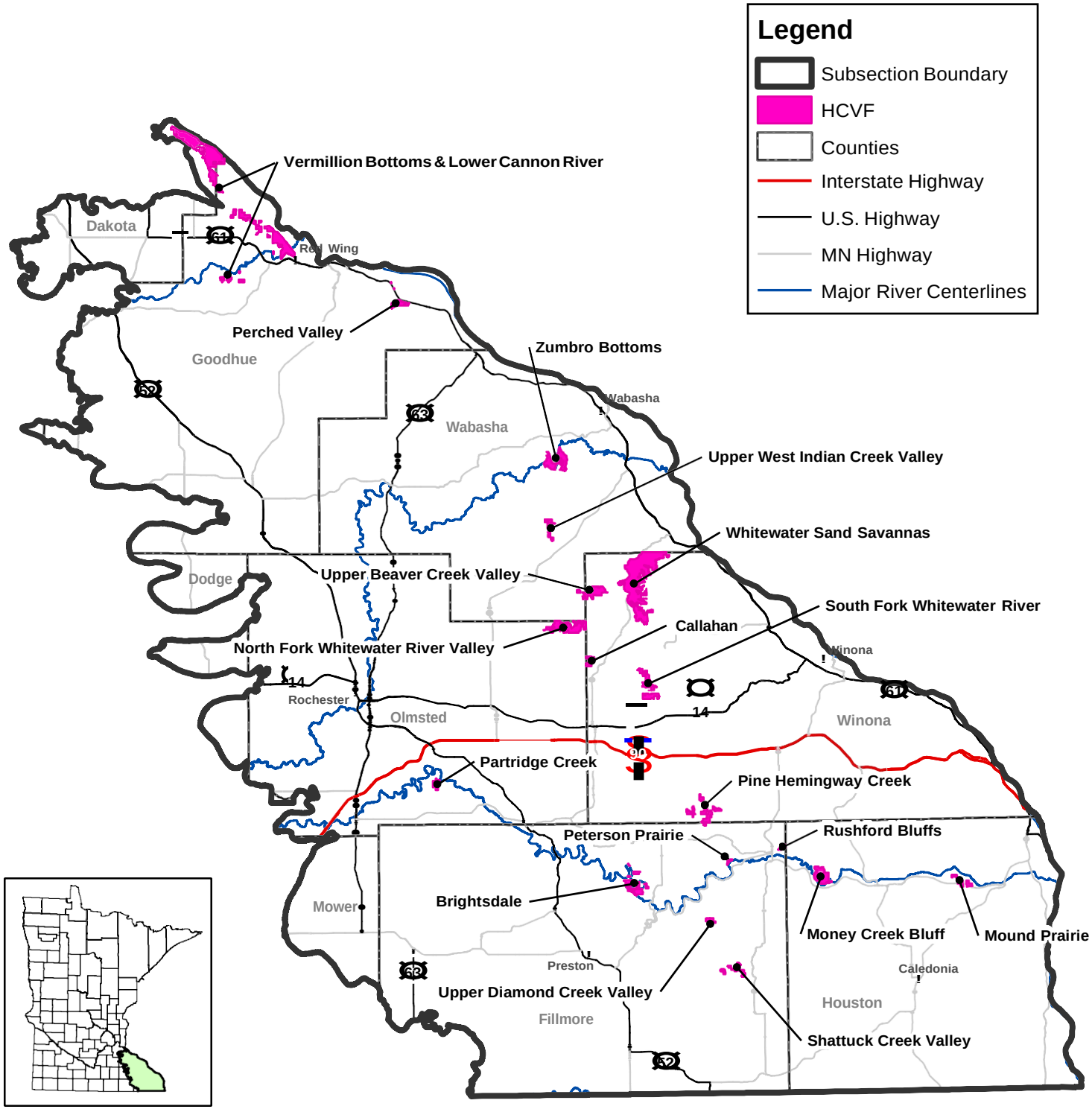
04/23/2013

0 10 20 40 Miles

Map 3

Blufflands/Rochester Plateau Subsection
High Conservation Value Forests (HCVF)



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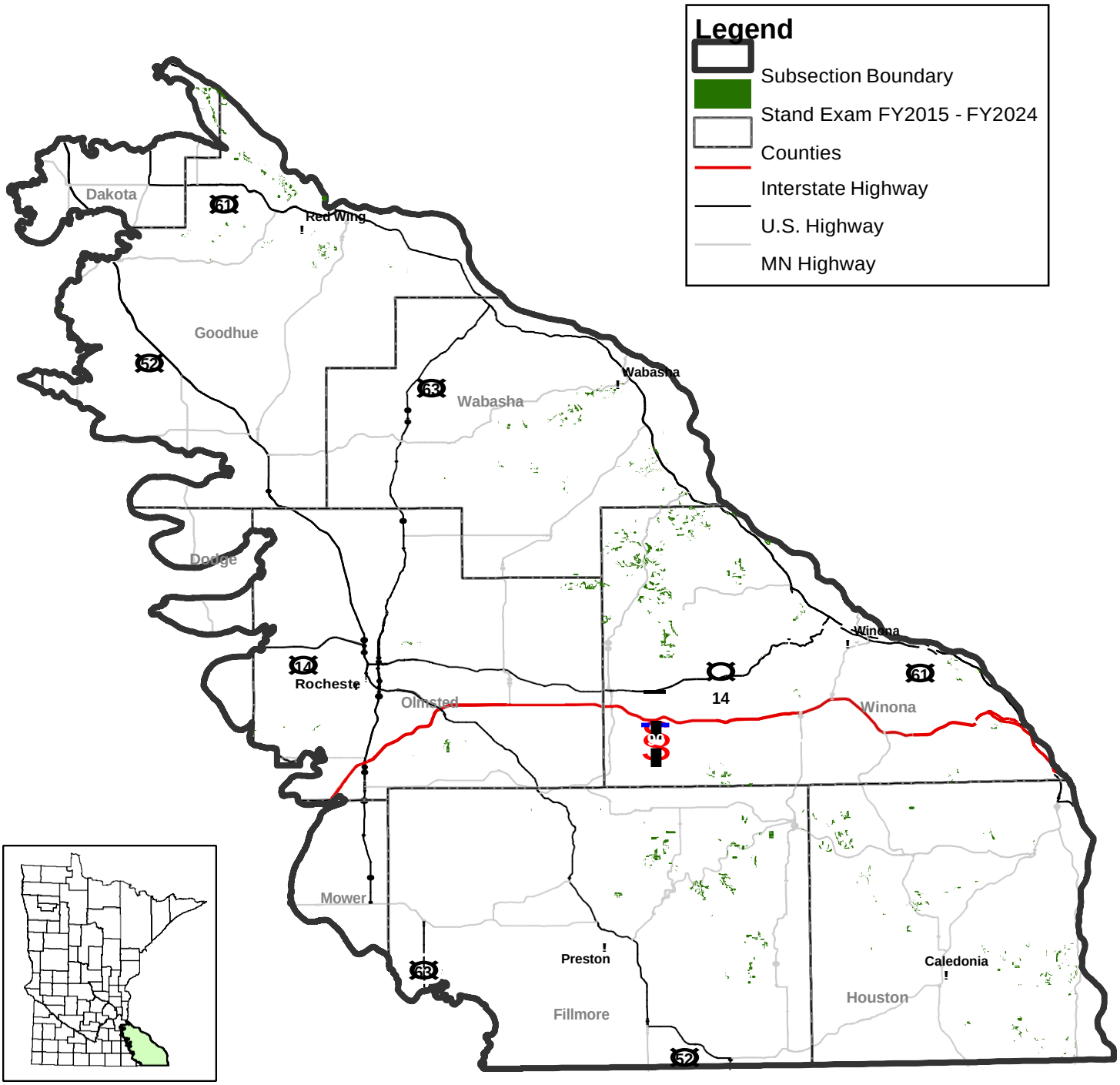
Map 4

Blufflands/Rochester Plateau Subsection Stand Exam FY2015 - FY2024

Individual stands can be viewed at: [MNDNR website designed to show the location and details of stands]



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Appendix E

10-Year Stand Exam List

COUNTY	LOCATION	Cover type	ADMIN	New Age	Treatment Acres	SE Year	Preliminary Prescription
Houston	t10407w1320250	Northern Hardwood	Wildlife	86	32	2022	1300
Houston	t10306w1270159	Oak	Forestry	166	4	2020	1111
Houston	t10305w1190060	Off site Oak	Forestry	115	23	2020	1111
Houston	t10204w1150096	Norway Pine	Forestry	48	10	2021	1810
Houston	t10105w1240122	Off site Oak	Forestry	112	30	2018	1111
Houston	t10407w1280173	Norway Pine	Forestry	35	24	2024	1810
Houston	t10407w1280219	Off site Oak	Forestry	125	40	2018	1111
Houston	t10306w1270132	Oak	Forestry	126	12	2023	1111
Houston	t10104w1020135	Aspen	Forestry	48	4	2022	1111
Houston	t10306w1260131	Oak	Forestry	132	28	2023	1111
Houston	t10306w1270154	Northern Hardwood	Forestry	85	17	2020	1300
Houston	t10407w1330192	Oak	Forestry	126	22	2016	1111
Houston	t10205w1160100	Oak	Forestry	124	10	2021	1111
Houston	t10406w1160051	Oak	Forestry	119	9	2013	1111
Houston	t10207w1130024	Oak	Forestry	124	10	2020	1111
Houston	t10306w1280149	Birch	Forestry	57	4	2020	1111
Houston	t10105w1130025	Off site Oak	Forestry	149	3	2015	1111
Houston	t10205w1360132	Oak	Forestry	123	4	2020	1111
Houston	t10206w1040024	Northern Hardwood	Forestry	121	64	2023	1300
Houston	t10306w1270140	Oak	Forestry	129	21	2016	1111
Houston	t10204w1350299	Lowland Hardwood	Forestry	66	14	2019	1300
Houston	t10204w1230164	Northern Hardwood	Forestry	90	7	2019	1300
Houston	t10205w1160102	Oak	Forestry	128	15	2021	1111
Houston	t10407w1340187	Oak	Forestry	126	31	2020	1111
Houston	t10407w1280180	Oak	Forestry	122	21	2020	1111
Houston	t10204w1220161	Norway Pine	Forestry	49	22	2021	1810

Houston	t10306w1280187	Oak	Forestry	129	15	2016	1111
Houston	t10204w1290234	Off site Oak	Forestry	137	30	2019	1111
Houston	t10104w1320215	Aspen	Forestry	54	5	2016	1111
Houston	t10204w1160083	Northern Hardwood	Forestry	88	17	2023	1300
Houston	t10104w1190042	White Pine	Forestry	17	7	2015	1810
Houston	t10104w1020140	Walnut	Forestry	98	7	2022	1300
Houston	t10204w1260209	White Pine	Forestry	39	5	2018	1810
Houston	t10104w1290071	Off site Oak	Forestry	120	25	2017	1111
Houston	t10204w1180064	Aspen	Forestry	60	8	2017	1111
Houston	t10407w1210254	Oak	Forestry	125	21	2017	1111
Houston	t10205w1140042	White Pine	Forestry	28	3	2018	1810
Houston	t10306w1280126	White Pine	Forestry	47	5	2023	1810
Houston	t10206w1040026	Off site Oak	Forestry	137	4	2023	1111
Houston	t10104w1020134	White Spruce	Forestry	9	4	2022	1810
Houston	t10407w1340200	Lowland Hardwood	Forestry	103	4	2013	0
Houston	t10407w1270223	Oak	Forestry	126	48	2015	1111
Houston	t10204w1260225	White Pine	Forestry	44	12	2018	1810
Houston	t10306w1280069	Aspen	Forestry	65	2	2019	1810
Houston	t10204w1280220	Oak	Forestry	120	35	2019	1111
Houston	t10204w1150102	Oak	Forestry	134	5	2016	1111
Houston	t10105w1170049	Oak	Forestry	139	6	2019	1111
Houston	t10407w1200058	Central Hardwoods	Forestry	123	12	2017	1300
Houston	t10204w1150086	Norway Pine	Forestry	50	14	2021	1810
Houston	t10204w1220131	Aspen	Forestry	68	2	2019	1111
Houston	t10307w1130109	Northern Hardwood	Forestry	95	23	2019	1300
Houston	t10205w1150110	White Pine	Forestry	44	2	2021	1810
Houston	t10306w1270161	Northern Hardwood	Forestry	134	5	2020	1300
Houston	t10407w1150252	Red Cedar	Forestry	143	4	2022	9100
Houston	t10206w1040036	Birch	Forestry	92	4	2023	1111
Houston	t10405w1270122	Northern Hardwood	Wildlife	90	16	2017	1300
Houston	t10405w1270121	Northern Hardwood	Wildlife	83	60	2017	1300
Houston	t10204w1350336	Oak	Forestry	121	5	2013	1111

Houston	t10205w1140027	Northern Hardwood	Forestry	126	17	2018	1300
Houston	t10407w1150141	Oak	Forestry	118	66	2022	1111
Houston	t10307w1110163	White Pine	Forestry	9	8	2016	1810
Houston	t10204w1220111	Oak	Forestry	117	47	2023	1111
Houston	t10407w1150123	Oak	Forestry	123	0	2015	1111
Houston	t10407w1340203	Lowland Hardwood	Forestry	110	37	2020	1300
Houston	t10204w1220141	White Spruce	Forestry	50	8	2021	1810
Houston	t10307w1130025	Oak	Forestry	120	3	2019	1111
Houston	t10407w1270178	White Pine	Forestry	53	13	2024	1810
Houston	t10105w1240120	Northern Hardwood	Forestry	94	70	2021	1300
Houston	t10406w1160052	Birch	Forestry	87	4	2013	9110
Houston	t10204w1330285	Oak	Forestry	129	7	2024	1111
Houston	t10407w1340196	Lowland Hardwood	Forestry	93	27	2020	1300
Houston	t10204w1260176	Oak	Forestry	133	2	2019	1111
Houston	t10407w1310243	Oak	Wildlife	139	39	2024	1111
Houston	t10105w1170044	Norway Pine	Forestry	35	4	2019	1810
Houston	t10404w1320018	Northern Hardwood	Wildlife	80	12	2016	1300
Houston	t10204w1290247	Oak	Forestry	143	5	2019	1111
Houston	t10104w1290073	Off site Oak	Forestry	116	9	2017	1111
Houston	t10306w1280151	Oak	Forestry	143	8	2020	1111
Houston	t10306w1220194	Oak	Forestry	149	55	2017	1111
Houston	t10205w1230051	Off site Oak	Forestry	159	22	2018	0
Houston	t10205w1240071	Oak	Forestry	132	9	2024	1111
Houston	t10407w1320237	Oak	Wildlife	118	51	2022	1111
Houston	t10105w1170039	Oak	Forestry	117	26	2019	1111
Houston	t10204w1150097	Oak	Forestry	133	7	2021	1111
Houston	t10205w1260074	Northern Hardwood	Forestry	97	12	2016	1300
Houston	t10104w1270255	Northern Hardwood	Forestry	97	25	2015	1300
Houston	t10307w1250156	Norway Pine	Forestry	36	11	2016	1810
Houston	t10306w1280068	White Pine	Forestry	23	6	2019	1810
Houston	t10307w1110018	White Pine	Forestry	9	3	2016	1810
Houston	t10204w1280266	Off site Oak	Forestry	132	8	2019	1111
Houston	t10204w1270184	Aspen	Forestry	68	2	2021	1111

Houston	t10306w1220101	Oak	Forestry	131	20	2017	1111
Houston	t10307w1120094	Off site Oak	Forestry	143	3	2019	1111
Houston	t10205w1160095	Oak	Forestry	128	10	2021	1111
Houston	t10306w1270065	Norway Pine	Forestry	47	12	2023	1810
Houston	t10405w1270111	Lowland Hardwood	Wildlife	79	9	2017	1300
Houston	t10204w1260216	Off site Oak	Forestry	133	2	2019	1111
Houston	t10407w1270212	Oak	Forestry	137	47	2024	1111
Houston	t10407w1280226	Oak	Forestry	126	5	2020	1111
Houston	t10204w1330288	Off site Oak	Forestry	115	10	2024	1111
Houston	t10204w1230159	Off site Oak	Forestry	130	10	2019	1111
Houston	t10407w1330193	Lowland Hardwood	Forestry	87	8	2016	1300
Houston	t10204w1260222	white pine	Forestry	32	7	2018	1810
Houston	t10407w1280165	Oak	Forestry	124	22	2018	1111
Houston	t10407w1290245	Oak	Wildlife	156	30	2024	1111
Houston	t10407w1200255	Red Cedar	Forestry	25	4	2017	9100
Houston	t10306w1220114	Oak	Forestry	134	2	2017	1111
Houston	t10204w1320323	Oak	Forestry	128	3	2020	1111
Houston	t10307w1240143	Sctoch Pine	Forestry	43	10	2016	1810
Houston	t10407w1160125	Oak	Forestry	126	30	2018	1111
Houston	t10407w1180251	Northern Hardwood	Forestry	95	12	2019	1300
Houston	t10104w1340227	White Pine	Forestry	33	6	2023	1810
Houston	t10204w1350272	Off site Oak	Forestry	141	15	2019	1111
Houston	t10407w1210046	Oak	Forestry	130	21	2017	1111
Houston	t10105w1240123	Oak	Forestry	119	20	2018	1111
Houston	t10306w1270135	Oak	Forestry	126	32	2016	1111
Houston	t10205w1240126	Oak	Forestry	147	16	2024	1111
Houston	t10104w1350121	walnut	Forestry	108	8	2023	1300
Houston	t10307w1110164	White Pine	Forestry	9	12	2016	1810
Houston	t10204w1230169	Off site Oak	Forestry	123	4	2019	1111
Houston	t10407w1150027	Oak	Forestry	140	16	2022	1111
Houston	t10104w1340224	Oak	Forestry	123	2	2023	1111
Houston	t10307w1110161	White Pine	Forestry	11	6	2016	1810

Houston	t10205w1360133	Aspen	Forestry	63	3	2020	1111
Houston	t10205w1240120	Oak	Forestry	137	25	2018	1111
Houston	t10105w1240127	Red Cedar	Forestry	47	4	2018	9100
Houston	t10204w1150079	Oak	Forestry	127	47	2016	1111
Houston	t10305w1160036	Oak	Forestry	139	15	2020	1111
Houston	t10104w1190044	Northern Hardwood	Forestry	116	9	2021	1300
Houston	t10407w1180145	Off site Oak	Forestry	137	10	2019	1111
Houston	t10204w1150055	Oak	Forestry	116	16	2021	1111
Houston	t10307w1120008	White Pine	Forestry	11	26	2016	1810
Houston	t10204w1260241	White Pine	Forestry	51	6	2018	1810
Houston	t10207w1130016	Oak	Forestry	131	9	2020	1111
Houston	t10105w1130026	Off site Oak	Forestry	137	6	2015	1111
Houston	t10306w1220193	White Pine	Forestry	24	3	2017	1810
Houston	t10104w1260188	Northern Hardwood	Forestry	98	19	2023	1300
Houston	t10104w1340239	walnut	Forestry	100	7	2023	1300
Houston	t10306w1240037	Off site Oak	Forestry	153	17	2017	1111
Houston	t10105w1250081	white pine	Forestry	37	8	2023	1810
Houston	t10204w1330287	Oak	Forestry	129	70	2024	1111
Houston	t10407w1180132	Oak	Forestry	130	24	2019	1111
Houston	t10105w1130052	Norway Pine	Forestry	17	6	2015	1810
Houston	t10306w1310080	Oak	Forestry	135	11	2022	1111
Houston	t10204w1260249	white pine	Forestry	43	10	2018	1810
Houston	t10204w1110035	Northern Hardwood	Forestry	106	9	2021	1300
Houston	t10104w1260083	Northern Hardwood	Forestry	84	3	2023	1300
Houston	t10105w1130091	Northern Hardwood	Forestry	85	67	2015	1300
Houston	t10306w1270145	white pine	Forestry	29	1	2023	1810
Houston	t10407w1150126	Northern Hardwood	Forestry	126	44	2022	1300
Houston	t10104w1020141	Oak	Forestry	126	23	2022	1111
Houston	t10204w1070025	Off site Oak	Forestry	115	17	2017	1111
Houston	t10204w1180063	Off site Oak	Forestry	125	7	2017	1111

Houston	t10204w1280221	Oak	Forestry	125	26	2015	1111
Houston	t10105w1130046	Norway Pine	Forestry	20	7	2015	1810
Houston	t10205w1240123	Oak	Forestry	128	19	2024	1111
Houston	t10104w1270068	Oak	Forestry	117	1	2015	1111
Houston	t10307w1140115	white pine	Forestry	7	13	2016	1810
Houston	t10104w1290198	white pine	Forestry	22	14	2016	1810
Houston	t10407w1280166	Lowland Hardwood	Forestry	89	55	2016	1300
Houston	t10406w1160018	Oak	Forestry	117	39	2021	1111
Houston	t10204w1260173	white pine	Forestry	39	26	2018	1810
Houston	t10307w1240148	Norway Pine	Forestry	28	3	2016	1810
Houston	t10204w1260252	White Spruce	Forestry	43	9	2018	1810
Houston	t10205w1240143	Oak	Forestry	137	17	2018	1111
Houston	t10305w1190062	White Pine	Forestry	22	8	2020	1810
Houston	t10306w1270137	White Pine	Forestry	19	16	2023	1810
Houston	t10204w1140073	Aspen	Forestry	68	3	2021	1111
Houston	t10205w1240060	Oak	Forestry	135	18	2015	1111
Houston	t10404w1320020	Lowland Hardwood	Wildlife	75	3	2016	1300
Houston	t10204w1160081	White Pine	Forestry	17	11	2021	1810
Fillmore	t10308w1030005	Oak	Forestry	119	44	2013	0
Fillmore	t10408w1240066	Birch	Forestry	65	10	2015	1111
Fillmore	t10310w1200102	Norway Pine	Forestry	43	15	2018	1810
Fillmore	t10309w1160181	Oak	Forestry	127	19	2022	1111
Fillmore	t10309w1210146	Northern Hardwood	Forestry	85	15	2022	1300
Fillmore	t10208w1080038	Oak	Forestry	124	17	2015	1111
Fillmore	t10409w1360049	Northern Hardwood	Forestry	129	21	2021	1300
Fillmore	t10410w1070049	White Pine	Forestry	35	7	2018	1810
Fillmore	t10309w1120091	Off site Oak	Forestry	126	17	2020	1111
Fillmore	t10208w1290084	Northern Hardwood	Forestry	89	19	2017	1300
Fillmore	t10310w1200101	White Pine	Forestry	47	7	2018	1810
Fillmore	t10309w1160180	Red Cedar	Forestry	33	3	2024	9100

Fillmore	t10208w1080028	Northern Hardwood	Forestry	89	19	2015	1300
Fillmore	t10409w1250043	White Pine	Forestry	48	7	2015	1810
Fillmore	t10410w1350094	Northern Hardwood	Forestry	117	54	2017	1300
Fillmore	t10310w1200099	walnut	Forestry	120	13	2022	1300
Fillmore	t10408w1210067	Oak	Forestry	116	121	2023	1111
Fillmore	t10208w1080022	Off site Oak	Forestry	130	11	2020	1111
Fillmore	t10309w1220049	Oak	Forestry	128	20	2022	1111
Fillmore	t10410w1360042	Oak	Forestry	124	32	2015	1111
Fillmore	t10408w1210109	Off site Oak	Forestry	133	3	2023	1111
Fillmore	t10409w1360058	Oak	Forestry	124	27	2017	1111
Fillmore	t10410w1360087	Off site Oak	Forestry	125	36	2018	1111
Fillmore	t10309w1130125	Northern Hardwood	Forestry	86	5	2016	1300
Fillmore	t10310w1010042	Oak	Forestry	124	35	2018	1111
Fillmore	t10410w1350040	Norway Pine	Forestry	29	9	2019	1810
Fillmore	t10408w1290111	Northern Hardwood	Forestry	116	21	2020	1300
Fillmore	t10410w1260070	Oak	Forestry	140	79	2024	1111
Fillmore	t10309w1160175	Oak	Forestry	129	25.20000076	2024	1111
Fillmore	t10309w1150028	Off site Oak	Forestry	131	25	2021	1111
Fillmore	t10209w1260006	Northern Hardwood	Wildlife	103	23	2016	1300
Fillmore	t10410w1260072	Northern Hardwood	Forestry	102	15	2013	0
Fillmore	t10310w1200103	Norway Pine	Forestry	42	3	2018	1810
Fillmore	t10410w1360034	Northern Hardwood	Forestry	117	4	2019	1300
Fillmore	t10408w1190056	Oak	Forestry	140	26	2022	1111
Fillmore	t10208w1090034	Oak	Forestry	124	17	2015	1111
Fillmore	t10308w1050039	Off site Oak	Forestry	127	84	2016	1111
Fillmore	t10309w1140121	Northern Hardwood	Forestry	112	17	2016	1300
Fillmore	t10208w1060011	Off site Oak	Forestry	130	12	2018	1111
Fillmore	t10408w1280108	Northern Hardwood	Forestry	116	23	2023	1300
Fillmore	t10309w1340170	white pine	Forestry	19	3	2024	1810
Fillmore	t10309w1340187	White Pine	Forestry	19	2	2024	1810
Fillmore	t10213w1220008	Northern Hardwood	Wildlife	101	5	2015	1300
Fillmore	t10309w1160100	Northern Hardwood	Forestry	89	40	2019	1300

Fillmore	t10309w1140094	Off site Oak	Forestry	126	59	2022	1111
Fillmore	t10208w1190074	Northern Hardwood	Forestry	84	56	2019	1300
Fillmore	t10208w1300085	Northern Hardwood	Forestry	86	13	2017	1300
Fillmore	t10208w1300087	Northern Hardwood	Forestry	95	10	2017	1300
Fillmore	t10410w1350038	Northern Hardwood	Forestry	85	17	2019	1300
Fillmore	t10408w1180046	Oak	Forestry	143	58	2020	1111
Fillmore	t10309w1060069	Off site Oak	Forestry	128	12	2020	1111
Fillmore	t10310w1020046	Northern Hardwood	Forestry	99	11	2017	1300
Fillmore	t10408w1290079	Northern Hardwood	Forestry	116	18	2020	1300
Fillmore	t10410w1350036	Oak	Forestry	156	49	2019	1111
Fillmore	t10208w1190069	Northern Hardwood	Forestry	124	40	2019	1300
Fillmore	t10410w1360088	White Pine	Forestry	33	3	2018	1810
Fillmore	t10309w1160018	Northern Hardwood	Forestry	110	9	2019	1300
Fillmore	t10208w1080029	Northern Hardwood	Forestry	97	6	2020	1300
Fillmore	t10309w1160102	Off site Oak	Forestry	131	85	2023	1111
Fillmore	t10409w1360047	Oak	Forestry	124	44	2017	1111
Fillmore	t10309w1160104	Northern Hardwood	Forestry	110	7	2019	1300
Fillmore	t10208w1090042	Oak	Forestry	124	9	2015	1111
Fillmore	t10408w1240065	Norway Pine	Forestry	28	8	2015	1810
Fillmore	t10309w1130122	Oak	Forestry	114	46	2016	1111
Fillmore	t10309w1130115	Lowland Hardwood	Forestry	92	11	2024	1300
Fillmore	t10309w1140096	Northern Hardwood	Forestry	87	35	2016	1300
Fillmore	t10409w1360051	Oak	Forestry	116	4	2021	1111
Fillmore	t10309w1160183	Oak	Forestry	129	17	2024	1111
Fillmore	t10309w1110084	Off site Oak	Forestry	126	51	2015	1111
Fillmore	t10208w1090044	Oak	Forestry	124	4	2015	1111
Fillmore	t10309w1110081	Off site Oak	Forestry	133	7	2024	1111
Fillmore	t10208w1060013	Northern Hardwood	Forestry	118	61	2018	1300
Fillmore	t10411w1070011	Northern Hardwood	Wildlife	104	10	2016	1300
Fillmore	t10208w1190070	white pine	Forestry	41	18	2018	1810
Fillmore	t10310w1200100	white pine	Forestry	22	11	2016	1810
Fillmore	t10213w1230005	Northern Hardwood	Wildlife	104	7	2015	1300

Fillmore	t10409w1190034	Oak	Forestry	120	73	2021	1111
Fillmore	t10410w1250074	Red Cedar	Forestry	37	7	2023	9100
Fillmore	t10409w1260039	Off site Oak	Forestry	151	26	2016	1111
Fillmore	t10410w1220062	Red Cedar	Forestry	72	6	2015	9100
Fillmore	t10208w1300081	Lowland Hardwood	Forestry	82	5	2017	1300
Fillmore	t10309w1110087	white pine	Forestry	30	8	2018	1810
Fillmore	t10310w1030070	Off site Oak	Forestry	119	9	2022	1111
Fillmore	t10309w1060068	Oak	Forestry	141	16	2020	1111
Fillmore	t10209w1260002	Norway Pine	Wildlife	45	5	2018	1810
Fillmore	t10309w1210041	white pine	Forestry	43	10	2018	1810
Fillmore	t10310w1030058	white pine	Forestry	33	13	2018	1810
Fillmore	t10410w1250069	Oak	Forestry	140	5	2024	1111
Fillmore	t10208w1080023	Lowland Hardwood	Forestry	96	17	2020	1300
Fillmore	t10309w1210136	Northern Hardwood	Forestry	128	66	2022	1300
Fillmore	t10410w1250071	Oak	Forestry	124	86	2023	1111
Fillmore	t10208w1050014	Northern Hardwood	Forestry	83	10	2020	1300
Fillmore	t10408w1310099	Oak	Forestry	129	56	2017	1111
Fillmore	t10309w1110080	Off site Oak	Forestry	133	68	2024	1111
Fillmore	t10208w1050010	Northern Hardwood	Forestry	103	31	2021	1300
Fillmore	t10408w1180048	Oak	Forestry	140	24	2022	1111
Fillmore	t10410w1150056	Red Cedar	Forestry	72	3	2015	9100
Fillmore	t10209w1260007	Red Cedar	Wildlife	91	1	2016	9100
Fillmore	t10408w1320036	Oak	Forestry	140	4	2016	1111
Fillmore	t10208w1050015	Northern Hardwood	Forestry	124	5	2020	1300
Fillmore	t10208w1080024	Northern Hardwood	Forestry	83	5	2020	1300
Fillmore	t10310w1020060	Northern Hardwood	Forestry	85	6	2021	1300
Fillmore	t10208w1070031	Northern Hardwood	Forestry	91	19	2015	1300
Fillmore	t10308w1050008	White Pine	Forestry	32	5	2018	1810

Fillmore	t10310w1020078	Oak	Forestry	120	26	2022	1111
Fillmore	t10410w1360029	Central Hardwoods	Forestry	130	12	2019	1111
Fillmore	t10309w1240143	Oak	Forestry	136	26	2018	1111
Fillmore	t10310w1200110	Oak	Forestry	125	83	2018	1111
Fillmore	t10310w1020043	Oak	Forestry	124	48	2021	1111
Fillmore	t10309w1120089	Off site Oak	Forestry	133	4	2020	1111
Fillmore	t10309w1210138	Northern Hardwood	Forestry	101	23	2022	1300
Fillmore	t10309w1010065	Oak	Forestry	130	37	2020	1111
Fillmore	t10308w1030010	Oak	Forestry	121	40	2013	0
Fillmore	t10308w1050048	white pine	Forestry	32	2	2018	1810
Fillmore	t10409w1350059	Oak	Forestry	125	11	2017	1111
Fillmore	t10410w1350097	Northern Hardwood	Forestry	124	35	2024	1300
Fillmore	t10410w1360037	Northern Hardwood	Forestry	129	17	2015	1300
Fillmore	t10309w1130012	Off site Oak	Forestry	126	1	2020	1111
Fillmore	t10310w1200105	walnut	Forestry	123	2	2022	1300
Fillmore	t10309w1160126	Oak	Forestry	140	18	2022	1111
Fillmore	t10409w1250045	Northern Hardwood	Forestry	116	38	2021	1300
Fillmore	t10410w1350096	Northern Hardwood	Forestry	85	14	2024	1300
Fillmore	t10309w1170120	Oak	Forestry	116	34	2015	1111
Fillmore	t10213w1230012	Aspen	Wildlife	50	3	2015	1111
Fillmore	t10208w1170057	white pine	Forestry	18	20	2024	1810
Fillmore	t10410w1240022	Oak	Forestry	120	40	2021	0
Fillmore	t10208w1090033	Northern Hardwood	Forestry	105	11	2015	1111
Fillmore	t10408w1280110	Off site Oak	Forestry	133	23	2023	1111
Fillmore	t10408w1310098	Northern Hardwood	Forestry	102	13	2017	1300
Fillmore	t10208w1080027	Northern Hardwood	Forestry	96	19	2020	1300
Fillmore	t10309w1160178	Off site Oak	Forestry	131	27	2019	1111
Fillmore	t10309w1130133	Lowland Hardwood	Forestry	92	2	2016	1300
Fillmore	t10208w1050009	Northern Hardwood	Forestry	124	14	2021	1300
Fillmore	t10208w1090032	Oak	Forestry	124	40	2015	1111
Fillmore	t10309w1070079	Off site Oak	Forestry	135	8	2020	1111
Fillmore	t10408w1130019	Norway Pine	Forestry	69	18	2018	1810

Fillmore	t10309w1160021	Norway Pine	Forestry	35	3	2018	1810
Fillmore	t10209w1250016	Northern Hardwood	Wildlife	103	19	2013	0
Winona	t10610w1010009	Oak	Wildlife	153	18	2021	1111
Winona	t10809w1060487	Oak	Wildlife	133	15	2020	1111
Winona	t10710w1240365	Off site Oak	Wildlife	115	33	2015	1111
Winona	t10810w1230323	white pine	Wildlife	45	2	2015	1810
Winona	t10810w1080168	Off site Oak	Wildlife	113	18	2016	1111
Winona	t10810w1270444	Aspen	Wildlife	93	10	2020	1111
Winona	t10710w1100065	Off site Oak	Wildlife	115	12	2019	1111
Olmstead	t10513w1140039	Northern Hardwood	Forestry	79	10	2024	1300
Winona	t10608w1080043	Oak	Forestry	125	10	2019	1111
Winona	t10809w1020413	Norway Pine	Forestry	21	12	2020	1810
Winona	t10809w1050069	Oak	Wildlife	124	46	2017	1111
Winona	t10810w1340458	Lowland Hardwood	Wildlife	89	52	2016	1300
Winona	t10505w1100038	Aspen	Forestry	52	7	2023	1111
Winona	t10809w1170499	white pine	Forestry	12	4	2016	1810
Winona	t10809w1040385	white pine	Forestry	16	4	2019	1810
Winona	t10710w1190341	Oak	Wildlife	112	58	2018	1111
Winona	t10608w1260056	Northern Hardwood	Forestry	94	14	2019	1300
Olmstead	t10713w1330024	White Spruce	Wildlife	38	9	2015	1810
Winona	t10710w1020025	Off site Oak	Wildlife	114	72	2021	1111
Olmstead	t10711w1030008	Norway Pine	Wildlife	45	5	2018	1810
Olmstead	t10713w1320009	Lowland Hardwood	Wildlife	82	18	2017	1300
Winona	t10810w1280429	Off site Oak	Wildlife	111	25	2018	1111
Winona	t10506w1360041	white pine	Forestry	27	11	2018	1810
Winona	t10810w1130253	Oak	Wildlife	121	12	2016	1111
Winona	t10810w1220339	Lowland Hardwood	Wildlife	75	7	2023	1300
Olmstead	t10513w1140024	Lowland Hardwood	Forestry	107	48	2018	1300
Winona	t10809w1100359	white pine	Forestry	27	11	2016	1810

Winona	t10606w1120044	Oak	Forestry	116	9	2022	1111
Winona	t10710w1230312	white pine	Wildlife	58	6	2023	1810
Olmstead	t10513w1140036	Northern Hardwood	Forestry	86	8	2017	1300
Winona	t10810w1240608	white pine	Wildlife	38	2	2024	1810
Winona	t10809w1050090	Norway Pine	Forestry	27	24	2020	1810
Winona	t10610w1010003	Northern Hardwood	Wildlife	97	8	2022	1300
Winona	t10809w1010418	Central Hardwoods	Forestry	101	24	2017	1300
Winona	t10810w1170190	Off site Oak	Wildlife	131	21	2016	1111
Winona	t10709w1300047	White Spruce	Wildlife	47	7	2021	1111
Winona	t10610w1010046	Oak	Wildlife	124	11	2022	1111
Olmstead	t10713w1330023	Norway Pine	Wildlife	37	3	2015	1810
Winona	t10509w1350055	white pine	Forestry	30	7	2022	1810
Winona	t10710w1250380	Oak	Wildlife	117	37	2021	1111
Winona	t10509w1260040	Oak	Forestry	128	20	2015	1111
Winona	t10809w1040082	Norway Pine	Forestry	34	11	2020	1810
Winona	t10810w1200305	Northern Hardwood	Wildlife	94	92	2024	1300
Olmstead	t10711w1030018	Northern Hardwood	Wildlife	93	34	2016	1300
Winona	t10810w1290423	Off site Oak	Wildlife	136	41	2016	1111
Winona	t10710w1010058	Off site Oak	Wildlife	124	18	2017	1111
Winona	t10810w1330515	Off site Oak	Wildlife	157	8	2015	1111
Winona	t10505w1110030	Off site Oak	Forestry	154	6	2023	1111
Winona	t10606w1120048	Off site Oak	Forestry	145	19	2022	1111
Winona	t10810w1010092	Norway Pine	Wildlife	53	4	2022	1810
Winona	t10710w1010021	Norway Pine	Wildlife	56	7	2021	1810
Winona	t10809w1250304	Oak	Forestry	131	70	2024	1111
Winona	t10609w1060010	Oak	Wildlife	112	12	2024	1111
Winona	t10509w1260069	Northern Hardwood	Forestry	132	3	2015	1300
Winona	t10809w1090099	Norway Pine	Forestry	48	6	2019	1810
Winona	t10810w1160181	Off site Oak	Wildlife	126	8	2019	1111
Winona	t10809w1170365	Off site Oak	Forestry	120	31	2015	1111
Winona	t10809w1180247	Oak	Forestry	144	62	2017	1111

Winona	t10509w1330084	Northern Hardwood	Forestry	115	28	2021	1300
Winona	t10710w1360437	Northern Hardwood	Wildlife	92	56	2015	1300
Winona	t10509w1350096	Northern Hardwood	Forestry	115	11	2022	1300
Winona	t10708w1230075	white pine	Forestry	9	4	2015	1810
Winona	t10809w1070444	Off site Oak	Wildlife	131	35	2020	1111
Winona	t10505w1300060	Oak	Forestry	132	38	2019	1111
Winona	t10709w1010002	Oak	Forestry	129	78	2015	1111
Winona	t10810w1200312	Aspen	Wildlife	56	10	2024	1111
Winona	t10710w1120128	Oak	Wildlife	120	114	2023	1111
Winona	t10810w1290416	Off site Oak	Wildlife	143	25	2018	1111
Winona	t10810w1280421	Oak	Wildlife	120	29	2018	1111
Winona	t10809w1080187	white pine	Forestry	26	1	2024	1810
Winona	t10710w1020063	Off site Oak	Wildlife	115	12	2019	1111
Winona	t10809w1010432	Central Hardwoods	Forestry	101	21	2017	1300
Winona	t10809w1350335	Oak	Forestry	135	50	2020	1111
Winona	t10506w1360040	Scotch Pine	Forestry	41	5	2018	1810
Winona	t10810w1170593	Northern Hardwood	Wildlife	82	2	2016	1111
Winona	t10709w1310067	Oak	Wildlife	131	49	2021	1111
Winona	t10810w1260603	white pine	Wildlife	53	6	2016	1810
Winona	t10708w1230074	Birch	Forestry	72	15	2015	1111
Olmstead	t10711w1040094	white pine	Wildlife	88	16	2018	1810
Winona	t10509w1350044	Northern Hardwood	Forestry	91	7	2019	1300
Winona	t10810w1320459	Off site Oak	Wildlife	136	24	2016	1111
Winona	t10810w1270537	Northern Hardwood	Wildlife	103	105	2018	1300
Winona	t10710w1190338	Oak	Wildlife	126	101	2018	1111
Winona	t10509w1340049	Northern Hardwood	Forestry	122	12	2021	1300
Winona	t10710w1030043	Off site Oak	Wildlife	115	65	2019	1111
Winona	t10810w1280396	Northern Hardwood	Wildlife	97	36	2018	1300
Winona	t10810w1360481	Norway Pine	Wildlife	45	4	2016	1810
Olmstead	t10711w1030011	white	Wildlife	41	10	2018	1810

		pine					
Olmstead	t10713w1320005	Lowland Hardwood	Wildlife	79	46	2017	1300
Winona	t10709w1010014	Oak	Forestry	125	17	2015	1111
Olmstead	t10512w1180002	Off site Oak	Forestry	119	11	2018	1111
Olmstead	t10711w1030028	Lowland Hardwood	Wildlife	74	18	2016	1300
Winona	t10605w1190178	Northern Hardwood	Forestry	102	53	2024	1300
Winona	t10810w1260409	White Spruce	Wildlife	53	5	2016	1810
Winona	t10710w1120133	Off site Oak	Wildlife	126	57	2015	1111
Winona	t10509w1270037	white pine	Forestry	41	15	2023	1810
Winona	t10809w1040410	Aspen	Forestry	62	10	2019	1111
Winona	t10710w1110064	Off site Oak	Wildlife	115	54	2019	1111
Winona	t10810w1240285	Norway Pine	Wildlife	70	11	2024	1810
Olmstead	t10711w1020038	Norway Pine	Wildlife	48	2	2018	1810
Winona	t10810w1270378	Lowland Hardwood	Wildlife	93	86	2021	1300
Winona	t10709w1300048	Off site Oak	Wildlife	128	59	2021	1111
Winona	t10506w1360051	white pine	Forestry	18	25	2018	1810
Winona	t10808w1310044	Off site Oak	Forestry	131	22	2024	1111
Winona	t10509w1340046	Northern Hardwood	Forestry	99	7	2021	1300
Winona	t10608w1230046	Oak	Forestry	124	26	2024	9110
Olmstead	t10711w1010040	Northern Hardwood	Wildlife	94	94	2020	1300
Winona	t10809w1090134	Norway Pine	Forestry	48	5	2019	1810
Winona	t10810w1190311	Off site Oak	Wildlife	122	20	2021	1111
Olmstead	t10711w1010046	Northern Hardwood	Wildlife	84	147	2017	1300
Winona	t10509w1260041	Oak	Forestry	129	5	2015	1111
Winona	t10710w1100185	Oak	Wildlife	124	1	2024	1111
Winona	t10809w1090161	White Pine	Forestry	16	4	2019	1810
Winona	t10810w1280392	Off site Oak	Wildlife	125	9	2022	1111
Winona	t10505w1100079	Off site Oak	Forestry	129	43	2023	1111
Winona	t10809w1050390	white pine	Forestry	39	14	2024	1810
Winona	t10809w1090455	white pine	Forestry	16	11	2019	1810

Winona	t10509w1350056	Northern Hardwood	Forestry	119	13	2016	1300
Winona	t10810w1220338	Off site Oak	Wildlife	153	8	2022	1111
Winona	t10809w1170256	white pine	Forestry	39	9	2016	1810
Winona	t10810w1220602	Walnut	Wildlife	116	29	2019	1300
Winona	t10509w1350093	Off site Oak	Forestry	141	15	2016	1111
Winona	t10610w1010011	Oak	Wildlife	119	23	2021	1111
Winona	t10709w1010013	Lowland Hardwood	Forestry	114	7	2015	1300
Winona	t10810w1160630	Oak	Wildlife	130	25	2022	1111
Olmstead	t10513w1140033	Northern Hardwood	Forestry	90	119	2017	1300
Winona	t10809w1170274	white pine	Forestry	25	6	2016	1810
Winona	t10809w1050516	white pine	Forestry	30	6	2024	1810
Winona	t10708w1230066	white pine	Forestry	15	17	2024	1810
Olmstead	t10515w1010011	Oak	Wildlife	132	36	2016	1111
Winona	t10608w1260057	Northern Hardwood	Forestry	78	8	2019	1300
Winona	t10809w1100456	Lowland Hardwood	Forestry	89	20	2019	1300
Winona	t10708w1230061	white pine	Forestry	10	14	2015	1810
Winona	t10505w1100033	Northern Hardwood	Forestry	92	7	2023	1300
Winona	t10809w1090144	Off site Oak	Forestry	111	15	2023	1111
Winona	t10809w1030372	Off site Oak	Forestry	123	18	2020	1111
Olmstead	t10711w1040004	Norway Pine	Wildlife	50	9	2018	1810
Winona	t10809w1080141	Oak	Forestry	134	26	2024	1111
Winona	t10509w1260039	Northern Hardwood	Forestry	89	48	2023	1300
Winona	t10809w1090164	white pine	Forestry	16	13	2019	1810
Winona	t10810w1330462	Off site Oak	Wildlife	112	28	2018	1111
Winona	t10610w1010045	Oak	Wildlife	118	40	2016	1111
Winona	t10710w1230595	Oak	Wildlife	123	16	2015	1111
Olmstead	t10515w1070014	Lowland Hardwood	Wildlife	74	18	2015	1300
Winona	t10509w1350095	white pine	Forestry	29	8	2022	1810

Winona	t10810w1190279	Lowland Hardwood	Wildlife	72	5	2021	1300
Winona	t10708w1240047	White Pine	Forestry	17	9	2024	1810
Olmstead	t10513w1200010	Northern Hardwood	Forestry	83	5	2015	9110
Winona	t10509w1260065	Oak	Forestry	145	3	2015	1111
Winona	t10710w1060543	Oak	Wildlife	118	50	2022	1111
Winona	t10610w1010010	Northern Hardwood	Wildlife	115	12	2021	1300
Winona	t10809w1040051	Oak	Forestry	126	39	2022	1111
Winona	t10710w1130462	Off site Oak	Wildlife	123	27	2015	1111
Winona	t10710w1230309	Oak	Wildlife	121	16	2015	1111
Olmstead	t10713w1330022	Norway Pine	Wildlife	43	3	2015	1810
Winona	t10809w1170361	White Pine	Forestry	45	19	2016	1810
Winona	t10808w1210034	Lowland Hardwood	Wildlife	129	100	2023	1300
Olmstead	t10515w1040026	Off site Oak	Wildlife	131	8	2015	1111
Winona	t10809w1050002	Oak	Forestry	121	34	2022	1111
Winona	t10810w1250367	Norway Pine	Wildlife	46	8	2016	1810
Winona	t10505w1020025	Aspen	Forestry	48	11	2023	1111
Winona	t10810w1190267	Oak	Wildlife	130	6	2021	1111
Winona	t10710w1360435	Oak	Wildlife	120	94	2021	1111
Winona	t10809w1040387	Aspen	Forestry	49	21	2019	1111
Winona	t10810w1280433	Off site Oak	Wildlife	124	51	2020	1111
Winona	t10710w1140465	White Pine	Wildlife	63	17	2020	1810
Winona	t10810w1330523	White Spruce	Wildlife	47	8.5	2024	1810
Winona	t10708w1230067	white pine	Forestry	11	9	2015	1810
Winona	t10710w1250398	Oak	Wildlife	124	12	2015	1111
Winona	t10605w1070079	Aspen	Forestry	55	7	2022	1111
Winona	t10810w1260400	White Spruce	Wildlife	53	6	2016	1810
Winona	t10508w1310038	Oak	Forestry	121	32	2017	1111
Winona	t10810w1190328	Lowland Hardwood	Wildlife	87	4	2021	1300
Winona	t10810w1110108	Oak	Wildlife	127	44	2022	1111
Winona	t10605w1070084	Oak	Forestry	112	9	2022	1111
Winona	t10508w1310039	Off site Oak	Forestry	116	25	2017	1111
Winona	t10711w1010042	Oak	Wildlife	120	53	2020	1111

Winona	t10810w1270375	Off site Oak	Wildlife	125	14	2022	1111
Winona	t10710w1120120	Off site Oak	Wildlife	120	26	2017	1111
Winona	t10809w1060407	Sctoch Pine	Wildlife	14	53	2022	1810
Winona	t10809w1070148	Off site Oak	Wildlife	131	19	2020	1111
Winona	t10810w1350551	Off site Oak	Wildlife	131	42	2018	1111
Winona	t10809w1360464	Oak	Forestry	123	43	2024	1111
Winona	t10709w1310062	Off site Oak	Wildlife	128	11	2021	1111
Winona	t10610w1010032	white pine	Wildlife	100	5	2021	1810
Winona	t10809w1060014	white pine	Wildlife	47	4	2022	1810
Winona	t10810w1110169	Lowland Hardwood	Wildlife	76	7	2019	1300
Winona	t10809w1100512	Off site Oak	Forestry	138	47	2023	1111
Winona	t10808w1310045	Oak	Forestry	116	14	2015	1111
Olmstead	t10711w1020055	white pine	Wildlife	48	2	2018	1810
Winona	t10810w1260405	white pine	Wildlife	53	4	2016	1810
Winona	t10810w1280448	Off site Oak	Wildlife	111	8	2018	1111
Winona	t10509w1350043	Northern Hardwood	Forestry	123	14	2019	1300
Winona	t10809w1050089	Off site Oak	Forestry	164	18	2020	1111
Winona	t10809w1040075	white pine	Forestry	27	7	2020	1810
Winona	t10809w1360343	Oak	Forestry	123	19	2020	1111
Winona	t10810w1270402	Oak	Wildlife	145	14	2022	1111
Winona	t10810w1190286	Northern Hardwood	Wildlife	81	33	2015	9110
Winona	t10809w1070198	White Pine	Forestry	18	13	2024	1810
Winona	t10809w1050078	Norway Pine	Forestry	27	7	2020	1810
Winona	t10810w1100105	White Spruce	Wildlife	34	12	2019	1810
Winona	t10809w1160500	White Spruce	Forestry	18	5	2016	1810
Winona	t10710w1100158	Lowland Hardwood	Wildlife	73	8	2015	1300
Winona	t10708w1240054	White Spruce	Forestry	44	14	2024	1810
Winona	t10710w1110078	Off site Oak	Wildlife	124	31	2017	1111
Winona	t10509w1350018	Northern Hardwood	Forestry	102	40	2023	1300

Winona	t10809w1070204	Oak	Forestry	129	40	2022	1111
Winona	t10509w1350099	White Pine	Forestry	27	6	2022	1810
Olmstead	t10711w1020054	Aspen	Wildlife	65	13	2016	1111
Winona	t10809w1040031	White Pine	Forestry	26	13	2019	1810
Winona	t10605w1180013	Birch	Forestry	70	14	2024	1111
Winona	t10809w1020424	Off site Oak	Forestry	111	18	2020	1111
Winona	t10809w1080137	Oak	Wildlife	130	21	2017	1111
Winona	t10808w1310015	Aspen	Forestry	74	20	2024	1111
Winona	t10710w1120080	Off site Oak	Wildlife	124	47	2017	1111
Winona	t10809w1170495	Oak	Forestry	116	41	2019	1111
Winona	t10810w1220266	Off site Oak	Wildlife	132	22	2019	1111
Winona	t10810w1260443	Oak	Wildlife	123	29	2022	1111
Winona	t10608w1050035	Oak	Forestry	147	11	2019	1111
Winona	t10509w1270072	Off site Oak	Forestry	132	27	2023	1111
Winona	t10810w1160536	Oak	Wildlife	123	26	2019	1111
Winona	t10810w1010070	Northern Hardwood	Wildlife	84	70	2020	1300
Winona	t10710w1110215	Oak	Wildlife	134	13	2015	1111
Winona	t10710w1360420	Northern Hardwood	Wildlife	85	116	2022	1300
Winona	t10610w1010044	Northern Hardwood	Wildlife	92	9	2022	1300
Winona	t10605w1160145	Oak	Forestry	116	42	2021	1111
Winona	t10810w1230315	Norway Pine	Wildlife	40	5	2015	1810
Winona	t10810w1260410	Off site Oak	Wildlife	145	82	2022	1111
Winona	t10710w1250414	Off site Oak	Wildlife	127	17	2021	1111
Winona	t10509w1270016	Oak	Forestry	139	14	2023	1111
Winona	t10810w1230292	Lowland Hardwood	Wildlife	95	184	2023	1300
Winona	t10810w1160570	Oak	Wildlife	133	6	2016	1111
Olmstead	t10711w1010049	Northern Hardwood	Wildlife	81	77	2019	1300
Winona	t10710w1060544	Northern Hardwood	Wildlife	84	35	2020	1300
Winona	t10810w1200332	Northern Hardwood	Wildlife	81	14	2016	1300
Winona	t10606w1120045	Norway Pine	Forestry	23	30	2017	1810
Winona	t10810w1230330	Norway Pine	Wildlife	38	2	2015	1810
Winona	t10509w1350017	Oak	Forestry	129	6	2015	1111
Winona	t10810w1340463	Off site Oak	Wildlife	111	7	2020	1111

Winona	t10810w1190611	Northern Hardwood	Wildlife	81	6	2021	1300
Winona	t10810w1190358	Oak	Wildlife	118	11	2016	1111
Winona	t10810w1190329	Aspen	Wildlife	77	8	2024	1111
Winona	t10708w1240045	Birch	Forestry	90	19	2024	1111
Winona	t10509w1340050	Northern Hardwood	Forestry	102	6	2021	1300
Olmstead	t10713w1310037	Lowland Hardwood	Wildlife	79	3	2017	1300
Winona	t10810w1160569	Off site Oak	Wildlife	113	80	2016	1111
Winona	t10810w1360493	Oak	Wildlife	112	48	2016	1111
Winona	t10808w1310016	Off site Oak	Forestry	131	2	2024	1111
Winona	t10709w1300049	Oak	Wildlife	125	17	2021	1111
Winona	t10810w1280406	Oak	Wildlife	119	40	2016	1111
Winona	t10509w1350098	Off site Oak	Forestry	139	14	2022	1111
Winona	t10710w1150305	Northern Hardwood	Wildlife	110	5	2015	1300
Winona	t10710w1020035	Norway Pine	Wildlife	55	24	2021	1810
Winona	t10809w1170262	White Pine	Forestry	12	4	2016	1810
Winona	t10710w1110191	Off site Oak	Wildlife	128	30	2015	1111
Winona	t10810w1170225	Oak	Wildlife	123	8	2019	1111
Winona	t10810w1350624	Oak	Wildlife	118	56	2018	1111
Winona	t10810w1230325	Off site Oak	Wildlife	146	80	2024	1111
Winona	t10810w1160254	Oak	Wildlife	130	3	2022	1111
Winona	t10710w1250416	Northern Hardwood	Wildlife	121	20	2015	1300
Winona	t10710w1020046	Off site Oak	Wildlife	119	16	2021	1111
Winona	t10809w1250308	Oak	Forestry	120	24	2020	1111
Winona	t10708w1130036	White Pine	Forestry	30	21	2024	1810
Olmstead	t10513w1140027	Northern Hardwood	Forestry	104	4	2017	1300
Winona	t10810w1170257	Lowland Hardwood	Wildlife	75	14	2019	1300
Winona	t10710w1360429	Oak	Wildlife	133	23	2015	1111
Winona	t10708w1240058	Norway Pine	Forestry	17	11	2015	1810
Winona	t10509w1260078	Oak	Forestry	119	13	2019	1111
Wabasha	t10809w1040383	Norway Pine	Forestry	26	4	2019	1810
Goodhue	t11215w1240189	Aspen	Forestry	51	19	2022	1111
Wabasha	t10909w1300033	Lowland Hardwood	Wildlife	71	33	2015	1300
Goodhue	t11416w1360143	Lowland Hardwood	Forestry	78	70	2018	1300

Wabasha	t10910w1160202	Aspen	Forestry	90	7	2016	1810
Goodhue	t11315w1150044	Lowland Hardwood	Forestry	72	45	2018	1300
Wabasha	t10910w1030326	Red Cedar	Forestry	24	5	2021	9100
Dakota	t11416w1040034	Lowland Hardwood	Wildlife	78	33	2024	1300
Wabasha	t11011w1220140	Norway Pine	Forestry	31	29	2019	1810
Goodhue	t11215w1130096	White Pine	Forestry	38	3	2024	1810
Wabasha	t11010w1180029	White Pine	Forestry	51	14	2022	1810
Dakota	t11416w1040021	Lowland Hardwood	Wildlife	82	3	2024	1300
Wabasha	t11011w1210160	Oak	Forestry	121	19	2019	1111
Goodhue	t11416w1220118	Lowland Hardwood	Wildlife	87	65	2016	1300
Wabasha	t11011w1140049	Lowland Hardwood	Forestry	94	72	2023	1300
Wabasha	t10910w1150465	White Pine	Forestry	25	6	2016	1810
Goodhue	t11315w1160037	Off site Oak	Forestry	121	8	2019	1111
Goodhue	t11216w1160031	Lowland Hardwood	Forestry	75	4	2021	1300
Wabasha	t11010w1070011	Norway Pine	Forestry	41	2	2022	1810
Goodhue	t11315w1210075	Lowland Hardwood	Forestry	88	1	2017	1300
Wabasha	t11012w1260065	Lowland Hardwood	Forestry	70	24	2017	1300
Goodhue	t11416w1350137	Lowland Hardwood	Forestry	91	12	2018	1300
Wabasha	t11011w1130280	Lowland Hardwood	Forestry	73	12	2023	1300
Goodhue	t11215w1120052	Northern Hardwood	Forestry	95	9	2024	1300
Wabasha	t10909w1310039	Lowland Hardwood	Wildlife	87	13	2015	1300
Dakota	t11416w1160080	Lowland Hardwood	Wildlife	84	23	2020	1300
Wabasha	t10811w1340114	Central Hardwoods	Wildlife	124	40	2021	1111
Wabasha	t10911w1280029	Aspen	Forestry	91	8	2020	1111
Wabasha	t10910w1150175	Central Hardwoods	Forestry	119	6	2016	1111
Goodhue	t11315w1090019	Lowland Hardwood	Forestry	93	16	2019	1300
Wabasha	t10912w1150110	Northern Hardwood	Forestry	99	18	2020	1300
Wabasha	t10910w1220294	White Pine	Forestry	9	6	2016	1810
Dakota	t11416w1060003	Lowland Hardwood	Wildlife	94	7	2024	1300
Goodhue	t11215w1070183	Red Cedar	Wildlife	43	8	2017	9100
Goodhue	t11315w1160043	Lowland Hardwood	Forestry	72	4	2019	1300
Wabasha	t11010w1070069	Norway Pine	Forestry	38	7	2022	1810

Wabasha	t11010w1080005	Oak	Forestry	112	20	2017	1111
Goodhue	t11215w1080186	Red Cedar	Wildlife	35	5	2017	9100
Goodhue	t11215w1120058	Lowland Hardwood	Forestry	76	11	2024	1300
Goodhue	t11214w1070030	Aspen	Forestry	64	22	2015	1111
Goodhue	t11315w1160039	Lowland Hardwood	Forestry	67	6	2019	1300
Goodhue	t11315w1210079	Lowland Hardwood	Forestry	86	30	2017	1300
Dakota	t11416w1040012	Lowland Hardwood	Wildlife	90	39	2024	1300
Wabasha	t11011w1140037	Lowland Hardwood	Forestry	72	38	2023	1300
Goodhue	t11214w1240077	White Spruce	Forestry	13	1	2017	1810
Goodhue	t11215w1120049	White Pine	Forestry	36	5	2024	1810
Goodhue	t11316w1020004	Northern Hardwood	Forestry	92	40	2018	1300
Goodhue	t11315w1080097	Northern Hardwood	Forestry	89	9	2019	1300
Wabasha	t11011w1290193	Lowland Hardwood	Forestry	72	21	2015	1300
Wabasha	t10911w1210017	Northern Hardwood	Forestry	139	6	2020	1300
Goodhue	t11214w1070010	Norway Pine	Forestry	36	4	2024	1810
Wabasha	t10910w1250247	White Pine	Forestry	17	5	2015	1810
Goodhue	t11215w1130086	Birch	Forestry	65	6	2022	1111
Goodhue	t11316w1360066	Aspen	Forestry	78	7	2021	1111
Wabasha	t11012w1360092	Lowland Hardwood	Forestry	70	6	2017	1300
Wabasha	t10910w1140448	White Spruce	Forestry	26	5	2016	1810
Wabasha	t10910w1110352	Red Cedar	Forestry	53	10	2021	9100
Goodhue	t11214w1070021	Norway Pine	Forestry	35	6	2015	1810
Wabasha	t10910w1140517	White Spruce	Forestry	19	4	2016	1810
Wabasha	t10911w1180001	Norway Pine	Forestry	45	15	2020	1810
Dakota	t11416w1160087	Lowland Hardwood	Wildlife	84	7	2020	1300
Goodhue	t11315w1160107	Lowland Hardwood	Forestry	72	3	2019	1300
Goodhue	t11217w1010046	Aspen	Forestry	46	7	2019	1111
Wabasha	t10910w1150297	White Pine	Forestry	17	3	2016	1810
Wabasha	t10910w1140388	White Pine	Forestry	16	3	2016	1810
Dakota	t11416w1040020	Lowland Hardwood	Wildlife	93	16	2024	1300
Wabasha	t10910w1150155	Birch	Forestry	98	13	2016	1111
Wabasha	t11011w1280235	Norway Pine	Forestry	70	4	2015	1810

Wabasha	t10910w1100037	White Pine	Forestry	54	6	2021	1810
Dakota	t11416w1050028	Lowland Hardwood	Wildlife	99	7	2024	1300
Wabasha	t10910w1100089	Norway Pine	Forestry	35	3	2021	1810
Wabasha	t10910w1150477	White Pine	Forestry	32	6	2016	1810
Wabasha	t10910w1170145	Lowland Hardwood	Forestry	111	8	2021	1300
Goodhue	t11215w1130079	White Pine	Forestry	36	3	2024	1810
Wabasha	t10910w1140473	Sctoch Pine	Forestry	28	3	2016	1810
Wabasha	t10910w1160165	White Pine	Forestry	13	8	2016	1810
Wabasha	t10910w1030324	White Pine	Forestry	12	4	2021	1810
Dakota	t11416w1090074	Lowland Hardwood	Wildlife	79	24	2020	1300
Wabasha	t11011w1210165	Lowland Hardwood	Forestry	74	21	2015	1300
Wabasha	t10911w1180005	Northern Hardwood	Forestry	93	21	2020	1300
Goodhue	t11215w1130069	White Pine	Forestry	17	4	2024	1810
Wabasha	t11012w1250081	Lowland Hardwood	Forestry	70	5	2017	1300
Goodhue	t11315w1060062	Lowland Hardwood	Forestry	72	3	2018	1300
Wabasha	t10911w1280022	Oak	Forestry	118	15	2020	1111
Goodhue	t11215w1070184	Red Cedar	Wildlife	41	8	2017	9100
Goodhue	t11215w1080185	Red Cedar	Wildlife	35	8	2017	9100
Goodhue	t11214w1240057	White Pine	Forestry	33	3	2017	1810
Wabasha	t11011w1120020	Lowland Hardwood	Forestry	85	20	2023	1300
Goodhue	t11118w1080002	White Pine	Wildlife	25	5	2019	1810
Wabasha	t10910w1220445	White Pine	Forestry	21	5	2016	1810
Goodhue	t11215w1120039	Lowland Hardwood	Forestry	71	22	2024	1300
Goodhue	t11315w1070084	Aspen	Forestry	48	12	2022	1111
Wabasha	t10910w1220209	White Pine	Forestry	33	4	2016	1810
Wabasha	t10910w1130392	Lowland Hardwood	Wildlife	74	5	2016	1300
Wabasha	t10910w1140386	White Pine	Forestry	26	4	2016	1810
Wabasha	t10910w1150483	White Pine	Forestry	33	1	2016	1810
Wabasha	t10910w1260423	Red Cedar	Forestry	45	5	2015	9100
Goodhue	t11216w1090025	Northern Hardwood	Forestry	123	20	2021	1300
Wabasha	t11010w1180043	White Pine	Forestry	42	4	2022	1810

Goodhue	t11215w1120054	White Pine	Forestry	37	12	2024	1810
Goodhue	t11215w1240146	Aspen	Forestry	55	6	2022	1111
Goodhue	t11215w1120045	Norway Pine	Forestry	37	4	2024	1810
Wabasha	t11012w1360094	Lowland Hardwood	Forestry	70	7	2017	1300
Wabasha	t10910w1350435	Jack Pine	Wildlife	68	2	2015	1810
Wabasha	t11012w1250071	Lowland Hardwood	Forestry	70	13	2017	1300
Goodhue	t11416w1220117	Lowland Hardwood	Wildlife	95	7	2016	1300
Goodhue	t11215w1080178	Northern Hardwood	Wildlife	87	10	2017	1300
Dakota	t11416w1090046	Lowland Hardwood	Wildlife	84	33	2024	1300
Goodhue	t11315w1150061	Lowland Hardwood	Forestry	72	10	2018	1300
Wabasha	t11012w1340137	Lowland Hardwood	Forestry	74	12	2017	1300
Goodhue	t11315w1160036	Lowland Hardwood	Forestry	66	32	2019	1300
Goodhue	t11216w1040054	Lowland Hardwood	Forestry	92	12	2021	1300
Goodhue	t11215w1230135	White Pine	Forestry	44	3	2022	1810
Goodhue	t11217w1010066	Oak	Forestry	124	13	2019	1111
Dakota	t11416w1050032	Lowland Hardwood	Wildlife	75	20	2024	1300
Wabasha	t10910w1260218	White Pine	Forestry	24	3	2015	1810
Goodhue	t11216w1060062	Norway Pine	Forestry	13	3	2019	1810
Goodhue	t11315w1080119	Northern Hardwood	Forestry	88	9	2019	1300
Goodhue	t11315w1150060	Lowland Hardwood	Forestry	72	23	2018	1300
Goodhue	t11215w1130073	White Pine	Forestry	35	11	2024	1810
Wabasha	t11010w1350095	Lowland Hardwood	Wildlife	91	8	2016	1300
Wabasha	t10910w1140184	Northern Hardwood	Forestry	113	6	2016	1300
Wabasha	t10910w1140369	White Pine	Forestry	29	13	2016	1810
Wabasha	t10910w1150410	Lowland Hardwood	Forestry	80	3	2016	1300
Goodhue	t11213w1080011	Oak	Forestry	139	4	2017	1111
Goodhue	t11315w1160028	Lowland Hardwood	Forestry	67	31	2019	1300
Goodhue	t11213w1080014	Off site Oak	Wildlife	119	6	2017	1111
Wabasha	t10912w1130027	Aspen	Forestry	57	3	2020	1111
Goodhue	t11215w1120046	White Pine	Forestry	35	20	2024	1810
Wabasha	t11011w1210123	Norway Pine	Forestry	28	21	2019	1810
Wabasha	t10912w1160112	Birch	Forestry	87	9	2020	1111
Wabasha	t10912w1160093	Lowland Hardwood	Forestry	86	7	2020	1300

Wabasha	t11011w1120028	Lowland Hardwood	Forestry	80	4	2017	1300
Wabasha	t11011w1280213	Lowland Hardwood	Forestry	80	34	2015	1300
Goodhue	t11315w1070115	White Spruce	Forestry	21	5	2022	1810
Goodhue	t11214w1130070	White Pine	Forestry	36	2	2017	1810
Goodhue	t11215w1140116	Oak	Forestry	118	16	2022	1111
Goodhue	t11216w1040035	White Pine	Forestry	40	3	2021	1810
Goodhue	t11216w1160056	Lowland Hardwood	Forestry	77	4	2021	1300
Goodhue	t11215w1120051	Aspen	Forestry	57	7	2024	1111
Wabasha	t11010w1180048	White Pine	Forestry	37	5	2022	1810
Wabasha	t10911w1280020	Northern Hardwood	Forestry	81	18	2020	1300
Dakota	t11416w1040025	Lowland Hardwood	Wildlife	67	40	2024	1300
Wabasha	t10910w1150408	White Pine	Forestry	26	1	2016	1810
Wabasha	t10910w1140373	Norway Pine	Forestry	35	2	2016	1810
Wabasha	t10910w1150158	White Pine	Forestry	30	4	2016	1810
Goodhue	t11215w1010015	norway Pine	Forestry	22	7	2024	1810
Dakota	t11416w1210115	Lowland Hardwood	Wildlife	72	11	2020	1300
Wabasha	t11011w1120015	Off site Oak	Forestry	118	7	2017	1111
Wabasha	t11011w1120031	White Pine	Forestry	45	5	2022	1810
Dakota	t11416w1060005	Lowland Hardwood	Wildlife	80	2	2024	1300
Dakota	t11416w1160101	Lowland Hardwood	Wildlife	84	7	2020	1300
Goodhue	t11315w1090031	Lowland Hardwood	Forestry	73	13	2019	1300
Dakota	t11416w1040014	Lowland Hardwood	Wildlife	90	22	2024	1300
Wabasha	t10910w1150143	White Pine	Forestry	33	7	2016	1810
Goodhue	t11215w1130071	Oak	Forestry	139	11	2022	1111
Goodhue	t11213w1290064	Aspen	Forestry	53	2	2017	1111
Goodhue	t11215w1130115	White Spruce	Forestry	41	2	2022	1810
Goodhue	t11215w1240138	Aspen	Forestry	51	7	2022	1111
Wabasha	t10910w1110494	White Pine	Forestry	24	3	2021	1810
Wabasha	t10909w1310090	Lowland Hardwood	Wildlife	72	32	2015	1300
Wabasha	t10910w1140156	White Pine	Forestry	18	5	2016	1810
Wabasha	t10910w1110355	Central Hardwoods	Forestry	115	55	2021	1111
Wabasha	t10910w1150194	Norway Pine	Forestry	35	7	2016	1810
Goodhue	t11315w1160035	Lowland Hardwood	Forestry	67	4	2019	1300

Wabasha	t10912w1130127	Norway Pine	Forestry	44	5	2020	1300
Wabasha	t11010w1070023	White Pine	Forestry	49	19	2022	1810
Wabasha	t11011w1210150	Oak	Forestry	121	18	2019	1111
Wabasha	t10912w1130128	White Pine	Forestry	24	8	2020	1300
Dakota	t11416w1090069	Lowland Hardwood	Wildlife	88	13	2020	1300
Wabasha	t10910w1150481	White Pine	Forestry	17	7	2016	1810
Goodhue	t11118w1080006	White Pine	Wildlife	15	14	2019	1810
Goodhue	t11316w1340061	Oak	Forestry	114	42	2021	1111
Wabasha	t10910w1160402	White Pine	Forestry	21	12	2016	1810
Goodhue	t11315w1210078	Lowland Hardwood	Forestry	88	8	2017	1300
Goodhue	t11217w1010067	Red Cedar	Forestry	36	9	2019	9100
Goodhue	t11416w1030026	Lowland Hardwood	Wildlife	88	108	2024	1300
Wabasha	t10910w1160098	Birch	Forestry	76	39	2021	1111
Goodhue	t11315w1070088	Northern Hardwood	Forestry	89	61	2022	1300
Goodhue	t11215w1020019	White Pine	Forestry	22	4	2024	1810
Wabasha	t11011w1220124	Oak	Forestry	121	52	2023	1111
Wabasha	t11012w1340143	Northern Hardwood	Forestry	103	3	2017	1300
Wabasha	t11010w1180038	White Pine	Forestry	34	2	2022	1810
Goodhue	t11315w1220067	Lowland Hardwood	Forestry	74	35	2018	1300
Wabasha	t11011w1210172	Lowland Hardwood	Forestry	74	2	2015	1300
Dakota	t11416w1160088	Lowland Hardwood	Wildlife	84	53	2020	1300
Goodhue	t11315w1090023	Lowland Hardwood	Forestry	94	8	2019	1300
Goodhue	t11315w1160058	Oak	Forestry	137	21	2019	1111
Wabasha	t10910w1020315	White Pine	Forestry	36	2	2021	1810
Wabasha	t11011w1120027	Lowland Hardwood	Forestry	75	5	2017	1300
Goodhue	t11315w1060009	Lowland Hardwood	Forestry	83	4	2018	1300
Wabasha	t11012w1270147	Lowland Hardwood	Forestry	73	17	2017	1300
Wabasha	t10910w1210510	White Pine	Forestry	37	7	2016	1810
Goodhue	t11416w1350141	Northern Hardwood	Forestry	81	9	2018	1300
Goodhue	t11315w1060064	Lowland Hardwood	Forestry	67	3	2018	1300
Goodhue	t11316w1010036	Lowland Hardwood	Forestry	71	17	2018	1300
Wabasha	t10910w1100350	Norway Pine	Forestry	32	1	2021	1810

Goodhue	t11216w1060058	Northern Hardwood	Forestry	92	1	2019	1300
Wabasha	t11010w1180044	Norway Pine	Forestry	42	4	2022	1810
Wabasha	t11010w1080007	Aspen	Forestry	56	4	2017	1111
Wabasha	t10910w1020312	Birch	Forestry	55	23	2021	1111
Wabasha	t11010w1170083	White Spruce	Forestry	33	3	2022	1810
Wabasha	t11011w1270241	Aspen	Forestry	57	3	2023	1111
Wabasha	t10910w1160116	White Pine	Forestry	71	10	2021	1810
Dakota	t11416w1050041	Lowland Hardwood	Wildlife	78	33	2024	1300
Goodhue	t11315w1160049	Northern Hardwood	Forestry	88	7	2019	1300
Dakota	t11416w1160094	Lowland Hardwood	Wildlife	84	19	2020	1300
Wabasha	t11011w1270231	Aspen	Forestry	57	1	2023	1111
Wabasha	t11011w1150048	Lowland Hardwood	Forestry	87	12	2023	1300
Wabasha	t10913w1230060	Aspen	Forestry	68	10	2020	1111
Goodhue	t11416w1100145	Lowland Hardwood	Wildlife	85	49	2016	1300
Goodhue	t11314w1190001	Lowland Hardwood	Wildlife	89	9	2019	1300
Dakota	t11416w1160096	Lowland Hardwood	Wildlife	84	14	2020	1300
Wabasha	t11011w1280194	Lowland Hardwood	Forestry	74	8	2015	1300
Wabasha	t11010w1180063	Aspen	Forestry	62	7	2022	1111
Wabasha	t11011w1140062	Norway Pine	Forestry	16	2	2023	1810
Wabasha	t10911w1210016	Northern Hardwood	Forestry	78	3	2020	1300
Goodhue	t11214w1070028	Aspen	Forestry	48	7	2015	1111
Wabasha	t10909w1320127	White Pine	Forestry	26	1	2015	1810
Goodhue	t11214w1070091	Lowland Hardwood	Forestry	92	3	2024	1300
Goodhue	t11214w1070025	Norway Pine	Forestry	34	5	2024	1810
Goodhue	t11214w1240060	Birch	Forestry	66	12	2017	1111
Goodhue	t11214w1070024	Oak	Forestry	122	12	2015	1111
Dakota	t11416w1050008	Lowland Hardwood	Wildlife	94	23	2024	1300
Wabasha	t10910w1020019	Aspen	Forestry	63	7	2021	1111
Goodhue	t11316w1010037	Northern Hardwood	Forestry	78	47	2018	1300
Wabasha	t11011w1140068	Lowland Hardwood	Forestry	85	2	2023	1300
Goodhue	t11214w1070027	Norway Pine	Forestry	35	4	2015	1810
Goodhue	t11315w1150051	Lowland Hardwood	Forestry	72	8	2018	1300
Goodhue	t11315w1090018	Lowland Hardwood	Forestry	67	5	2019	1300

Wabasha	t11011w1290204	Lowland Hardwood	Forestry	74	28	2015	1300
Wabasha	t11011w1280247	Oak	Forestry	124	16	2015	0
Goodhue	t11315w1070085	Aspen	Forestry	48	3	2022	1111
Wabasha	t11011w1220126	Lowland Hardwood	Forestry	79	70	2023	1300
Goodhue	t11213w1200029	White Pine	Forestry	33	10	2017	1810
Wabasha	t11010w1070024	White Pine	Forestry	28	5	2022	1810
Goodhue	t11315w1070086	Northern Hardwood	Forestry	92	6	2022	1300
Goodhue	t11214w1070033	Norway Pine	Forestry	51	7	2015	1810
Wabasha	t10910w1260296	White Pine	Forestry	35	2	2015	1810
Goodhue	t11216w1060059	Northern Hardwood	Forestry	90	4	2019	1300
Wabasha	t10910w1150305	White Spruce	Forestry	17	9	2016	1810
Goodhue	t11214w1240078	White Spruce	Forestry	13	1	2017	1810
Wabasha	t11011w1270173	White Pine	Forestry	139	52	2023	1111
Goodhue	t11214w1070002	Aspen	Forestry	49	13	2024	1111
Wabasha	t11011w1270219	Off site Oak	Forestry	124	12	2023	1111
Goodhue	t11315w1220068	Lowland Hardwood	Forestry	76	64	2017	1300
Dakota	t11416w1050006	Lowland Hardwood	Wildlife	80	5	2024	1300
Dakota	t11416w1210109	Lowland Hardwood	Wildlife	84	6	2020	1300
Goodhue	t11214w1180040	Birch	Forestry	61	8	2022	1111
Wabasha	t10909w1330121	White Pine	Forestry	32	16	2015	1810
Wabasha	t11011w1280221	Norway Pine	Forestry	33	6	2015	1810
Wabasha	t11011w1280225	Jack Pine	Forestry	37	4	2015	1810
Goodhue	t11315w1160057	Norway Pine	Forestry	38	7	2019	1810
Wabasha	t10909w1300066	Lowland Hardwood	Wildlife	87	24	2015	1300
Goodhue	t11215w1130105	Birch	Forestry	79	4	2022	1111
Goodhue	t11215w1130088	Oak	Forestry	144	13	2022	1111
Goodhue	t11215w1130068	Oak	Forestry	121	1	2022	1111
Goodhue	t11215w1130093	Oak	Forestry	130	8	2022	1111
Goodhue	t11216w1060041	Aspen	Forestry	54	4	2019	1111
Wabasha	t11010w1180050	Norway Pine	Forestry	41	3	2022	1810
Goodhue	t11215w1120047	Aspen	Forestry	54	17	2024	1111
Wabasha	t10911w1210014	Northern Hardwood	Forestry	83	2	2020	1300
Dakota	t11416w1050010	Lowland Hardwood	Wildlife	78	72	2024	1300

Goodhue	t11316w1360074	Aspen	Forestry	67	5	2021	1111
Wabasha	t11012w1280129	Aspen	Forestry	78	9	2017	1111
Wabasha	t10910w1140515	White Pine	Forestry	24	3	2016	1810
Wabasha	t11012w1340140	Lowland Hardwood	Forestry	98	16	2017	1300
Goodhue	t11214w1180037	White Pine	Forestry	40	6	2022	1810
Wabasha	t10910w1140447	Norway Pine	Forestry	25	3	2016	1810
Goodhue	t11215w1130085	Oak	Forestry	116	20	2022	1111
Goodhue	t11315w1160053	Northern Hardwood	Forestry	98	13	2019	1300

Appendix F

Description of BLUFFLANDS/ROCHESTER PLATEAU

Subsection Forest Resource Management Plan (SFRMP) modeling

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Using the Preliminary Issues and Assessment background information, efforts are now underway to complete an updated Blufflands/Rochester Plateau (BRP) Subsection Forest Resource Management Plan (SFRMP). The Plan will establish directions and guide forest management activities for a 10-year period from 2015 through 2024. The plan will address some DNR-administered lands within boundaries of two large landscape units in southeastern Minnesota known as the BRP subsections. Subsections are a level of delineation within the DNR's ecological classification system (ECS) and are based on natural features and conditions. These two subsections extend southeastward from the Twin Cities to the Iowa border, and include parts of Dakota, Goodhue, Wabasha, Dodge, Olmsted, Winona, Mower, Fillmore, Rice, and Houston counties. Most DNR lands to be managed through this plan are located in Goodhue, Wabasha, Winona, and Houston counties. The largest blocks of DNR land within these subsections are the Whitewater Wildlife Management Area and Richard J. Dorer Memorial Hardwood State Forest. The BRP SFRMP guides vegetation management on nearly 60,000 acres of DNR forest lands. The plan revision process will be coordinated by a planning team composed of DNR staff with wide-ranging expertise and responsibilities in forest, wildlife, and ecological resource management.

As part of the SFRMP, landscape modeling was conducted. For this purpose, a software package called the Remsoft Spatial Planning System (RSPS) was used. Woodstock is a component of RSPS that allows users to examine how various land uses, management alternatives, and social policies will impact timber supply at a strategic-level, given the existing forest types and stand inventories. Strategic means at a large-scale, and ignores the spatial relationships between/among individual stands.

Within DNR's strategic-level plans the planning horizon is 75 years but only the initial 50 years are analyzed by planners. For this analysis the objective function in Woodstock is to maximize harvested volume. Since Woodstock uses linear programming to find an optimal solution when trying to maximize harvested volume, which is merely a mathematical operation, if no constraints are included most stands will be harvested at year 50 – hence harvested volume is maximized. Of course linear programming has no concept of the future beyond the 50 year planning period. Hence, the additional 25 years helps to provide a more realistic depiction of how stands will be managed near the end of the initial 50 year period. It is felt this is advantageous to placing binding constraints (or constraints that must be met) to avoid illogical behavior 45 and 50 years into the future. For the part of the planning horizon that is analyzed, 10 five-year planning periods were used. Even-flows also help to avoid catastrophic harvesting at the end of the 75 year planning period.

In general, individual stands are not grown throughout a planning horizon when using Woodstock. Rather, stands are grouped into categories and then acres within a category, where the acres are a conglomeration of many stands, receive treatments and are grown throughout the planning horizon. For example, all stands classified as a Central Hardwood cover type (within FIM/CSA coded as 40), could be grouped into site qualities using an interval of 5 feet (e.g. site

quality class 50 could encompass all Central Hardwood cover type stands with site qualities ranging from 50 to 54 feet) and then these Central Hardwood cover type stands grouped by site quality class would receive treatments within Woodstock and projected forward as a group. In this case, when treatments are assigned to a category, there is no way to tell what specific stands should be treated within a particular planning period.

As opposed to other optimization techniques, linear programming allows proportions of a landbase to receive treatments. For example, it could be that only 34% of Oak cover type, site index 65 stands receive a clearcut operation in a particular planning period. For other optimization techniques, such as integer programming, activities either occur or don't (either 1 or 0) in a particular planning period.

Forest planning and harvest scheduling does not optimize management objectives of the target forest. Rather, these plans are about developing an optimal activity schedule for the transition of the existing forest to the desired future forest. For many stands, individual stand management may be less than optimal so that subsection objectives as a whole can be met.

BLUFFLANDS/ROCHESTER PLATEAU GIS ARCMAP SHAPEFILE

To conduct a landscape level harvest scheduling analysis, the landbase must be quantified as to the amount of cover type acres by age and site productivity and potential management restrictions/actions that can occur on those acres. The most recent DNR FIM shapefile database (06/21/2013) was queried. Cover type is determined based on internal DNR algorithms, site index is calculated based on measurement of dominant trees within the field and appropriate equations, and age is based on field measurements.

There are 4,366 polygons totaling an acreage of 84,081 acres – includes old growth and other non-harvestable stands. Prior to conducting the analysis within Woodstock, this original dataset was manipulated. For instance, new cover types were created (e.g. red pine plantations are coded as 521 rather than 52 to allow for different management treatments relative to natural red pine stands which remain coded as 52).

Within Woodstock, after excluding old growth stands and other stands designated as not allowing timber harvest, there is a total of 4,320 polygons – the smallest stand acreage is 0.1 acres and the largest stand acreage is 613 acres. Number of acres by cover type are shown in Table 1. Table 2 shows modifications of the MN_CTYPE field for modeling purposes.

Table 1. MANAGEABLE (excludes old growth) cover type acreages within the Blufflands/Rochester Plateau SFRMP dataset.

MN_CTYP	Cover Type Name	Number of Stands	Acres
1	Ash	28	535
6	Willow	3	35
9	Lowland Hardwoods	372	7,860
12	Aspen	99	984
13	Birch	26	325
14	Balm of Gilead	1	4
15	Cottonwood	44	964
20	Northern Hardwoods	422	8,525
25	Black Walnut	205	2,208
30	Oak	1244	33,68
40	Central Hardwoods	177	2,505
51	White Pine	224	2,082
52	Red Pine Natural	4	32
53	Jack Pine	2	6
54	Scotch Pine	5	71
61	White Spruce	1	1
521	Red Pine Plantation	64	514
611	White Spruce Plantation	18	116
Non-merchantable Acreage			
55	Ponderosa Pine	1	5
64	Norway Spruce	5	30
70	Upland Larch	2	5
72	Tamarack	1	3
73	NWC	1	1
Low Productivity			
77	Stagnant Cedar	1	24
79	Offsite Oak	166	3,664
81	Red Cedar	36	314
82	Other	8	74
83	Other	78	1,423
84	Other	272	2,971
85	Other	60	1,523
86	Other	76	730
90	Other	29	179
91	Other	328	6,935
92	Other	19	97
93	Other	24	138
94	Other	23	223
95	Other	120	845
96	Other	96	1,742
97	Other	6	120
98	Other	45	2,584

Table 2. For the purposes of modeling, several cover types above have been split and in some cases new cover types have beencreated.

MN_CTYP	Cover Type Name	Creation	Reasoning
152	Once Thinned Red Pine Natural Stand	Created during	
252	Twice Thinned Red Pine Natural Stand	Created during	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
352	Three Thinned Red Pine Natural Stand	Created during	
452	Four Thinned Red Pine Natural Stand	Created during model	
512	Once Thinned White Pine Plantation	Created during	
513	Twice Thinned White Pine Plantation	Created during	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
514	Three Thinned White Pine Plantation	Created during	
515	Four Thinned White Pine Plantation	Created during model	
521	Red Pine Plantation	Existing, ORIGIN = 2	-
522	Once Thinned Red Pine Plantation	Created during	
523	Twice Thinned Red Pine Plantation	Created during	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
524	Three Thinned Red Pine Plantation	Created during	
525	Four Thinned Red Pine Plantation	Created during model	
532	Once Thinned Jack Pine Plantation	Created during	
533	Twice Thinned Jack Pine Plantation	Created during	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
534	Three Thinned Jack Pine Plantation	Created during	
535	Four Thinned Jack Pine Plantation	Created during model	
542	Once Thinned Scotch Pine Plantation	Created during	
543	Twice Thinned Scotch Pine Plantation	Created during	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
544	Three Thinned Scotch Pine Plantation	Created during	
545	Four Thinned Scotch Pine Plantation	Created during	

Table 2.	**(cont.)**		
612	Once Thinned Natural White Spruce	Created during model	
613	Twice Thinned Natural White Spruce	Created during model	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
614	Three Thinned Natural White Spruce	Created during model	
615	Four Thinned Natural White Spruce	Created during model	
611	White Spruce Plantation	Existing, ORIGIN = 2	-
6112	Once Thinned White Spruce Plantation	Created during model	
6113	Twice Thinned White Spruce Plantation	Created during model	To ensure stands can only be thinned **UP TO** 4 times prior to age 100
6114	Three Thinned White Spruce Plantation	Created during model	
6115	Four Thinned White Spruce Plantation	Created during model	
ECS	Ecological Classification System	Created during model	
			White Spruce and Redcedar converted stands are transitioned to this category. There is no management of

Description of Yield Tables

For this analysis, cover type volumes are initially estimated using cover type specific yield tables, then average cover type species compositions (calculated using FIA/FIM data) are used to determine the amount of individual species harvested volumes.

Basal area, mean stand diameter, and total cordwood volume were estimated for each planning period. All equations require cover type, site index, and age. Many clearcut even-aged systems were modeled using Walters and Ek (1993, Whole Stand Yield and Density Equations for Fourteen Forest Types in Minnesota, Northern Journal of Applied Forestry, 10:75-85) – these are values from across the state. To increase efficiency and reduce costs, and since most of these are minor acres, yield tables developed using data from across the state were utilized. These cover types are Ash (1), Willow (6), Lowland Hardwood (9), Aspen (12), Birch (13), Balm (14), Northern Hardwood (20), Oak (30), Central Hardwoods (40), Natural Red Pine (52), Jack Pine (53), and White Spruce (61/611 – both natural and plantations). For simplicity, the Ash, Lowland Hardwood, and Willow cover types all use the same yield tables.

After reviewing projections, new yield tables were developed for many cover types specifically for this subsection plan using data from the BRP SFRMP shapefile. These cover types were Cottonwood (15) (Forest Biometrics Report No. 15), Black Walnut (25) (Forest Biometrics Report No. 16), White Pine Plantation (51) (Forest Biometrics Report No. 20), and Red Pine Plantation (521) (Forest Biometrics Report No. 19).

Offsite Oak (79) used the same yield tables as Oak, and Scotch pine (54) used the same yield tables as Red Pine Plantations. For the Oak, White Pine Plantation, and Red Pine Plantation cover types, only stands within the BRP were utilized. However, for Cottonwood, Black Walnut, and Central Hardwoods cover types, observations from across the state were used but almost all are within southeastern Minnesota.

For simplicity, all thinnings were assumed to generate 10 cords per acre, regardless of cover type or age.

For uneven-aged types (partial cutting harvests) a reduced portion of the predicted yields were assumed to represent partial cuttings. For the Ash, Willow, Lowland Hardwood, Cottonwood, and Black Walnut cover types, it was assumed each partial cutting generates 20% of the predicted clearcut yields. For Northern Hardwoods, it is assumed a partial cutting generates 30% of the predicted clearcut yields.

For all clearcut harvests, only 95% of the expected volume (yield table estimate) was available at final harvest to reflect the current DNR practice of leaving 5% of the harvest area intact to address non-timber concerns. In practice, the 5% stand residual can be exceeded, e.g., leaving individual large-diameter oak beyond the threshold. Such instances were not addressed in this analysis.

DESIRED FUTURE FOREST CONDITIONS (DFFCs) AND CONSTRAINTS

The following constraints were utilized during this particular analysis (Tables 3 to 5).

Table 3. Normal rotation age (NRA) by cover type.

Cover Type	Site Inde	Age
Aspen/BG	All	50
Birch	All	60
Central Hardwood	All	85
Jack Pine	All	60
White Pine	All	130
Red Pine (natural and planted)	All	80
Scotch Pine	All	60
White Spruce (natural and	All	60
Oak	All	80
Offsite Oak	All	80

Table 4. Even-flow percentage by cover type. It should be made clear that even-flows are by cover types, not individual species volumes.

Cover Type	Percent
All cover types combined	20%
Central Hardwood, Oak, and Offsite Oak combined	20%
Northern Hardwood	10%

For the White Spruce and Redcedar cover types, acreages of 27 and 85, respectively, were converted during the first two planning periods (initial 10 years) to a general, undeclared, Ecological Classification System (ECS) cover type. After conversion, there are no potential management actions on these acres.

Table 5. Required cover type conversion operations by cover type.

Cover Type	Cover Type Code	Site Index (base age 50)	Ages	Amount of Acres
White Spruce	61/611	All site qualities	All ages	27
Red cedar	81	All site qualities	All ages	85

In addition, to obtain some harvest acres of the Lowland Hardwood (MN_Ctype = 9) and Central Hardwood (MN_Ctype = 40) cover types in the first two periods, a minimum harvest acreage was included. Within Woodstock, the actual target harvest acres, after accounting for failures (47% for CH and 75% for LH), are 38, 29 for CH, and 10, 641 for LH within Woodstock, during periods 1 and 2, respectively. See Table 6.

Table 6. Minimum harvest acre constraints by cover type during the first two periods (years 1 to 5 and 6 to 10).

Cover Type	Cover Type Code	Site Index (base	Ages	Minimum Amount of Acres Prior to Failures
Central Hardwood – Period 1	40	All site qualities	All harvestable ages	71
Central Hardwood – Period 2	40	All site qualities	All harvestable ages	55
Lowland Hardwood – Period	9	All site qualities	All harvestable ages	38
Lowland Hardwood – Period	9	All site qualities	All harvestable ages	2,562

UNDER DEVELOPMENT STANDS

At the time of the shapefile creation, many stands were scheduled to receive some type of treatment, or these stands were specified as "Under Development" within FIM. Unfortunately the exact treatment is not specified within FIM. Updated ages were provided to the modeler.

BRIEF DESCRIPTION OF MODELING DESIRED FUTURE FOREST CONDITIONS

Even-flows

Even-flows provide a target relative range of harvested volume over the next 75 years and represent the stability of harvested volumes. Quantifying the average amount of harvested volume and the likely variation about that average over the next 75 years provides industry some idea of the amount of fiber available for the production of primary wood products (e.g. sawlogs for lumber, pallet, and veneer production) and even the production of secondary wood products.

Factors such as rotation ages and yield tables (predicted volumes) all play an important part in estimating even-flows and their variation about the average harvested volume. A greater percent even-flow allows for more flexibility as to the timing of harvests across the landscape and will likely result in slightly greater average harvested volumes. However, the greater average harvested volumes across time may result in periods of excessive supply and demand that could negatively impact the forest industry.

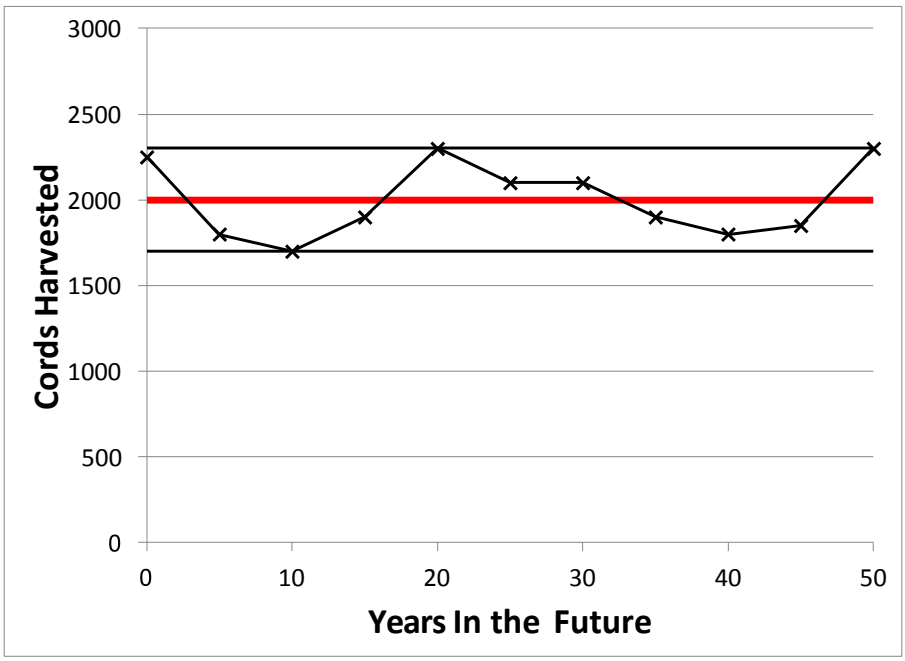

Figure 1. Depiction of an even-flow constraint on harvested volume. The average annual amount of cords harvested over the next 50 years is 2,000 cords. An even-flow constraint of 15% was utilized. Hence, in any one year, the amount of harvested volume could deviate +/- 15% from the average harvest of 2,000 cords.

Greater percent even-flows allow for more flexibility in choosing stands to harvest across time to meet desired future forest conditions (DFFCs), this will generally result in a greater average harvested volume. However, greater percent even-flows result in more variation in the amount of harvested volumes from year to year which could negatively impact the forest industry.

POTENTIAL MANAGEMENT ACTIONS

Given the current amount of acres by cover type, site quality, and age, and desired future forest conditions and management objectives, and potential management actions that can occur, Woodstock will find the optimal mathematical management scheme of all stands. For any acre, there are many potential management actions that could occur and the timing of those actions can vary. It is important that potential management actions within Woodstock reflect possible operational management options and the conditions that could impact choosing one alternative over another.

For instance, operationally, Oak stands are generally clearcut, and these clearcut operations do not occur until a stand reaches age 80. There are many options for a particular stand, for instance it could be harvested at age 80 or it could be harvested at age 95. The timing of a specific operation depends on the projected yields and the desired future forest conditions. It could be that for a particular Oak stand, based on its site index, volume is maximized at age 90. However, because of age-class distribution constraints at the landscape level, the optimal time to harvest this stand is at age 105. Thus, in order to optimize landscape level management objectives, some stand-level harvested volume would be sacrificed.

Table 7. Potential clearcut operations by cover type.

Cover Type	Cover Type Code	Site Index (base age 50)	Ages
Aspen/BG	12	All site qualities	> = 50
Birch	14	All site qualities	> = 60
Central Hardwood	40	All site qualities	> = 85
Jack Pine	53	All site qualities	> = 60
White Pine	51	All site qualities	> = 130
Red Pine (natural and planted)	52/521	All site qualities	> = 80
Scotch Pine	54	All site qualities	> = 60
White Spruce (natural and planted)	61/611	All site qualities	> = 60
Oak	30	All site qualities	> = 80
Offsite Oak	79	All site qualities	> = 80

For Jack Pine, White Pine, Red Pine, Scotch Pine, and White Spruce, at least 10 years must pass before another thinning can occur, respectively. For all cover types, up to 4 thinnings can occur beginning at age 15 and until age 100.

Table 8. Potential thinning operations by cover type.

Cover Type	Cover Type Code	Site Index (base age 50)	Ages
Jack Pine	53	All site qualities	>= 15 years and <= 100 years
White Pine	51	All site qualities	>= 15 years and <= 100 years
Red Pine (both natural and plantation)	52/521	All site qualities	>= 15 years and <= 100 years
Scotch Pine	54	All site qualities	>= 15 years and <= 100 years
White Spruce (both natural and	61/611	All site qualities	>= 15 years and <= 100 years

For any partial cutting, at least 20 years must pass before another cutting can occur.

Table 9. Potential uneven-aged (partial cutting) GROUP harvesting operations by cover type.

Cover Type	Cover Type Code	Site Index (base age 50)	Ages
Ash	1	>= 40	>= 60 years
Willow	6	>= 45	>= 50 years
Lowland Hardwoods	9	>= 40	>= 40 years
Cottonwood	15	>= 45	>= 60 years
Northern	20	>= 40	>= 60 years
Black Walnut	25	All site qualities	>=65 years

Because of ecological concerns, no harvesting of Northern White Cedar and Redcedar stands (although some Redcedar stands were converted) was conducted. Due to low acreages, there are no management actions in Ponderosa Pine, Norway Spruce, Upland Larch, and Tamarack cover type stands. Due to low productivity, Stagnant Cedar stands had no management actions.

AVERAGE PERCENT SPECIES COMPOSITIONS

To estimate individual species volumes, average percent species compositions were obtained by cover type. Only stands from the Blufflands/Rochester Plateau subsections containing merchantable volume were used to determine percent species compositions – stands with mn_spp_uom of Trees were deleted.

APPRAISED VOLUMES

To better reflect reality, the amount of estimated annually harvested wood was reduced by 47% for the Oak and Central Hardwoods cover types, by 20% for the Black Walnut cover type, by 80% for the Offsite Oak cover type, by 40% for the Northern Hardwood cover type, and 75% for all other cover types to represent the fact that, on average, for example, only around half of the Oak cover type and about 1/4th of most other cover types have offered timber sales that are actually sold/harvested. Although Black Walnut may have limited amount of acres harvested, these acres have a high probability of being harvested.

PERCENT SAWTIMBER

For most hardwood species, current markets in southeastern Minnesota dictate that basically only sawlogs are sold and harvested. However, because perhaps in the future biomass or pulpwood markets may exist, and currently some firewood may be harvested, models were developed to estimate total merchantable volume. After reviewing volume estimates from the Remsoft Spatial Planning System Software, the planning team felt volumes of hardwood cover types were overestimated and recommended only predicting sawlog volumes. Current yield tables were developed using standard statewide upper-stem merchantability limits and minimum DBH limits – however, basically merchantability limits of most trees will be lower in height on the stem than the 4 inches DOB (diameter outside bark) used previously during SFRMPs (for yield tables developed using FIA data) and upper stem limits of a 4 inch top in the current FIM dataset, and the minimum DBH will be greater than the 5 inches used by both FIA and FIM developed tables. In an effort to reduce time and costs, the average proportion of sawtimber (e.g. 8 inch top for hardwoods and 6 inch top for softwoods) from FIM inventories to total merchantable wood was calculated by cover type. This average ratio within a cover type was then used to reduce the predicted total merchantable yields obtained from yield tables across all merchantable site index classes and conditions. After discussion, it was decided that standard statewide FIA/FIM inventory merchantability specifications can be used for all softwood cover types – for example, much of the softwood fiber is shipped to pulp/paper mills in Wisconsin.

Data from FIM used during the modeling of the Blufflands/Rochester Plateau SFRMP was used to obtain average sawtimber to total merchantable (both pulpwood and sawtimber) ratio estimates by cover type. Minimum stand ages were used when estimating sawtimber ratios to better reflect stands indicative of the rotation ages selected by the planning team (Forest Biometrics Report No. 25).

All board feet per acre estimates (Total_MBF) were converted to cord per acre estimates by multiplying each MBF by 2. This value was then added to the current cord per acre estimate to obtain a total amount of merchantable cords per acre.

Ratios used during the BRP SFRMP modeling efforts are shown in Table 10. **Since in many instances the minimum DBH of sawtimber trees in appraisals is smaller than 15 inches (as utilized during FIM inventories), the ratios were artificially increased by 25% - Adj Ratio in Table 10.**

Table 10. Forest Inventory Module (FIM) code and cover type name, rotation age or minimum age thought feasible for a partial harvest as provided by the SFRMP planning team, minimum age of stands used to calculate ratios, number of stands used, and total merchantable and sawtimber cords and ratio by covertype. ONLY BLUFFLANDS/ROCHESTER PLATEAU SFRMP DATA USED.

Cover Type		SFRMP	Minimum	Number	Total Merch	Sawtimber		Adj
FIM	Name	Rotation Age	Age	of Stands	Cords	Cords	Ratio	Ratio
1	Ash	60	50	21	13.0	3.2	24.202	30.252%
6	Willow	50	40	2	6.0	2.5	33.150	41.438%
9	LH	40	40	290	15.9	6.3	33.670	42.088%
12/14	ABg	50	40	62	16.4	1.6	8.770%	10.963%
13	Birch	60	50	16	13.1	2.6	16.318	20.397%
15	Cottonwoo	60	50	25	13.6	6.2	56.529	70.662%
20	NH	60	50	282	17.4	5.7	31.029	38.787%
25	B Walnut	65	50	58	12.6	3.9	30.732	38.415%

For the Oak, Offsite Oak, and Central Hardwood cover types, rather than using the percent reduction approach above to estimate the amount of sawtimber volume harvested, volume ratio equations from Walters and Ek (1993) were used to estimate predicted volumes to a 10-inch top DOB.

CHECKS ON HARVESTED VOLUMES

Validation of predictions is important to help ensure that the model is producing reasonable outputs. It is important that the baseline predictions (e.g. prior to any changes in desired future conditions given scenario adaptations) provide outputs that are consistent with reality. The planning team provided three “checks.” One, after reviewing recent timber sale appraisals and harvest amounts, it is thought on average harvests should generate around 7.5 cords per acre.

After the appraisal reduction (for example, the reduction in harvested volumes of 47% for the Oak cover type and 75% for most other cover types), and the sawtimber reduction for hardwood cover types described above, preliminary runs predicted around 6.6 cords per acre, per harvest, on average annually during the initial 50 year planning period (or initial 10 5-year planning periods).

Two, on average, in the real world, over the recent past, around 597 acres have been harvested annually. Over the initial 50 year planning period, the model predicts an average of 655 acres annually.

Three, around 2,900 cords of the Oak, Offsite Oak, and Central Hardwood cover types are harvested annually – during the initial 50 years, or initial 10 5-year planning periods, on average around 2,794 cords are predicted to be harvested annually. Around 640 cords of softwood cover types are harvested annually (the model predicts on average 522 cords), and around 459 cords annually of the Northern Hardwood, Lowland Hardwood, Walnut, Ash, Cottonwood, and Willow cover types are harvested annually (the model predicts on average 1,012 cords). The majority of the 1,012 cords are from the Northern Hardwood cover type – an average annual amount of 712 cords.

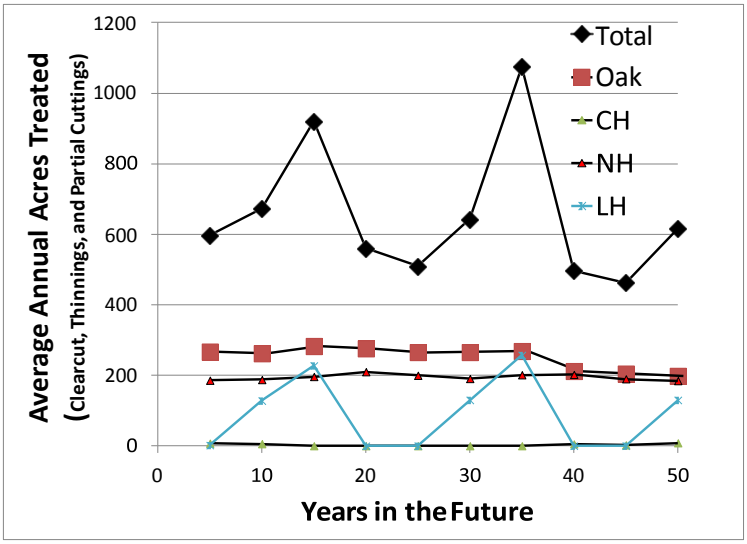

Figure 2. Estimated annual treatment acres by five-year planning period. Total is across all cover types and harvest types (e.g. clearcut, thinning, and partial cutting and across all conifers and hardwoods), the Oak (excludes Offsite Oak cover type), Central Hardwood, Lowland Hardwood, and Northern Hardwood cover types are also depicted.

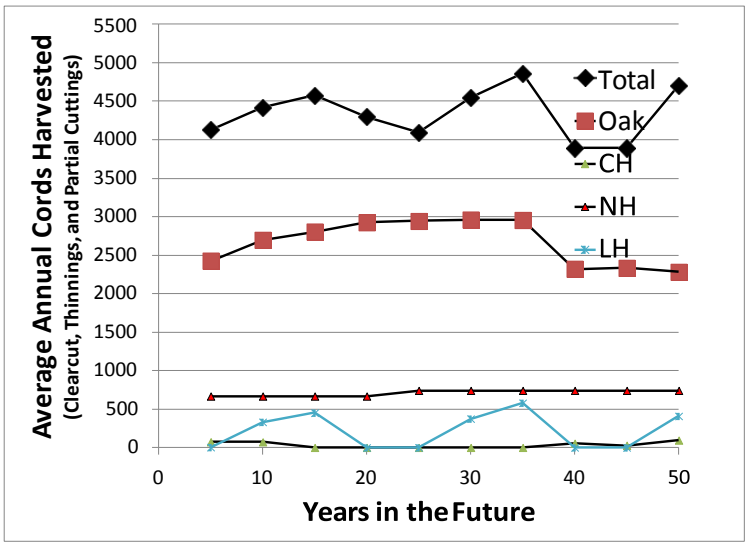

Figure 3. Estimated annual harvest amounts by five-year planning period. Total is across all cover types and harvest types (e.g. clearcut, thinning, and partial cutting and across all conifers and hardwoods), the Oak (excludes Offsite Oak cover type), Central Hardwood, Lowland Hardwood, and Northern Hardwood cover types are also depicted.

APPENDIX G

Glossary and Acronyms

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

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

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

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

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

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

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

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

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

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

Assessment: A compilation of information about the trends and conditions related to natural and socio-economic resources and factors. The initial round of Subsection Forest Resource Management Plans (SFRMP) will focus primarily on trends and conditions of forest resources. Standard core assessment information sources and products have been defined.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Extended rotation forests (ERF): Forest stands for which the harvest age is extended beyond the normal or economic harvest age. ERF provides larger trees, old forest wildlife habitat, and other nontimber values.

Additional details regarding management of ERF on DNR-administered lands is contained in the DNR Extended Rotation Forest Guidelines (1994). **Prescribed ERF** is the cover type acreage designated for management as ERF. Stands designated as ERF will be held beyond the recommended normal rotation (harvest) age out to the established ERF rotation age(s). A stand of any age can be prescribed as ERF.

Effective ERF is defined as the portion of the prescribed ERF acreage that is actually over the normal rotation age for the cover type at any one time.

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

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

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

Forest Inventory Module (FIM): The FIM provides a database and application through which field foresters can maintain an integrated and centralized inventory of the forests on publicly owned lands managed by the Division of Forestry and other divisions. In the field, foresters collect raw plot and tree data. Those data are summarized in stand level data that are linked to a spatial representation of stand boundaries. Part of the DNR's **FOR**estry **I**nformation **S**ys**T**em (FORIST).

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

Forest management: the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Note: forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.
From: The Dictionary of Forestry. 1998. The Society of American Foresters. J.A. Helms, ed.

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

> ***System roads*** - These roads are the major roads in the forest that provide forest management access, recreational access and may be connected to the state, county, or township public road systems. These roads are used at least on a weekly basis and often used on a daily basis. The roads should be graveled and maintained to allow travel by highway vehicles, and road bonding money can be used to fund construction and reconstruction of these types of roads. The level and frequency of maintenance will be at the discretion of the Area Forester and as budgets allow.
>
> ***Minimum maintenance roads*** - These roads are used for forest management access on an intermittent, as-need basis. Recreational users may use them, but the roads are not promoted or maintained for recreation. The roads will be open to all motorized vehicles but not maintained to the level where low clearance licensed highway vehicles can travel routinely on them. The roads will be graded and graveled as needed for forest management purposes. Major damage such as culvert washouts or other conditions that may pose a safety hazard to the public will be repaired as reported and budgets allow.
>
> ***Temporary access*** – If the access route does not fit into one of the first two options, the access route has to be abandoned and the site reclaimed so that evidence of a travel route is minimized. The level of effort to effectively abandon temporary accesses will vary from site to site depending on location of the access (e.g., swamp/winter vs. upland route), remoteness, and existing recreational use pressures.

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

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

Fragmentation: Breaking up of large and contiguous ecosystems into patches separated from each other by different ecosystem types. Breaking up a contiguous or homogeneous natural habitat through conversion to different vegetation types, age classes, or uses. *Forest fragmentation* occurs in landscapes with distinct contrasts between land uses, such as between woodlots and farms. *Habitat fragmentation* occurs where a contiguous or homogeneous forest area of a similar cover type and age is broken up into smaller dissimilar units. For example, a conifer-dominated forest (or portion of it) is fragmented by clearcutting if it is converted to another type, such as an aspen-dominated forest.

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

Globally Imperiled Communities (G1G2): Refers to areas identified by *NatureServe* as highest ranking globally imperiled native plant communities. Through forest certification, the Department is required to identify and appropriately manage these identified communities.

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

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

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

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

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

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

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

High Conservation Value Forests: HCVFs are defined as *areas of outstanding biological or cultural significance.* Through Certification the Department is required 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 requires certificate holders to identify High Conservation Value Forests (HCVFs) and manage such areas to "maintain or enhance" identified High Conservation Values (HCVs).

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

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

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

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

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

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

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

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

Landscape study area (LSA): A large geographic area identified by the MCBS as a core area for the MCBS survey process in northern Minnesota. The LSA is intended to represent some of the landscapes within an ecological subsection (a unit in Minnesota's ECS. A LSA 1) generally captures the range of environmental gradients and ecological conditions found in large landscapes, 2) generally encompasses the range of native plant community complexes that exhibit repeatable patterns at the landform or ecological land-type association (LTA) scale, 3) exhibits the potential for intact landscape level processes to occur, 4) contains representative native plant communities functioning under relatively undisturbed conditions, and 5) often contains habitat for rare species. An LSA area is typically thousands of acres and contains two to several MCBS sites. A LSA may encompass portions of one or more ecological LTAs and lie in more than one county. LSAs are identified prior to MCBS field surveys and boundaries are modified during the survey process. At the completion of the MCBS surveys, a LSA becomes a macro site, two or more sites, or a combination of macro sites and sites. In some cases a LSA is eliminated from further survey consideration during the MCBS survey process.

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

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

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

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

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

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

Marketable timber: Merchantable timber that is accessible now.

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

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

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

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

Mesic: Moderately moist.

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

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

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

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

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

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

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

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

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

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

Natural Area: An area of land, with significant native biodiversity, where a primary goal is to protect, enhance or restore ecological processes and Native Plant Community composition and structure. An MCBS *Site* of Outstanding or High biodiversity significance is often recommended for nomination as a natural area. For these Sites, an MCBS *Ecological Evaluation* is written to characterize the ecological significance of the Site as a whole and to serve as a guide for conservation action by the various landowners. Sites (or portions of Sites) that are recommended as natural areas may be identified by the landowner or land management agency for conservation activities such as designation as a (city, county, state, private) park, non-motorized recreation area, scientific and natural area, reserve, special vegetation management (e.g. natural disturbance based forest management for maintenance of mature growth stage), etc. (*Draft definition 3/24/2004*)

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

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

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

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

No forest land: Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses such as crops, improved pasture, residential areas, city parks, improved roads, and power line clearings.

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

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

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

Old-growth forests: Forests defined by age, structural characteristics, and relative lack of human disturbance. These forests are essentially free from catastrophic disturbances, contain old trees (generally over 120 years old), large snags, and downed trees. Additional details on the management of old-growth forests on DNR-administered lands are contained in Old-Growth Guidelines (1994).

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

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

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

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

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

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

Overstory: The canopy in a stand of trees.

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

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

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

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

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

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

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

Range of natural variation (RNV): Refers to the expected range of conditions (ecosystem structure and composition) to be found under naturally functioning ecosystem processes (natural climatic fluctuations

and disturbance cycles such as fire and windstorms). RNV provides a benchmark (range of reference conditions) to compare with current and potential future ecosystem conditions.

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

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

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

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

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

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

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

Relevés: Vegetation survey plot data.

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

Representative Sample Areas (RSAs): Ecologically viable representative samples designated to serve one or more of three purposes: 1) To establish and/or maintain an ecological reference condition; or 2) To create or maintain an under-represented ecological condition; or 3) To serve as a set of protected areas or refugia for species, communities and community types not captured in other Criteria of this Standard.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Silviculture and Roads Module (SRM): The SRM provides a database and application through which field foresters can record planned and actual forest development prescriptions (e.g., site preparation, tree planting projects, timber harvest, road maintenance, etc.) and follow-up surveys. SRM supports the geographic description of the extent of a development project separate from FIM stand boundaries. A variety of maps and other reports can be generated by the development system. SRM will also produce

maps and reports that roll up forestry area data to the regional or statewide level. Part of the DNR's **FOR**estry **I**nformation **S**ys**T**em (FORIST).

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

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

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

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

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

Snag: A standing dead tree.

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

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

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

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

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

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

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

Stand-selection criteria: Criteria used to help identify stands to be treated as determined by the subsection Team. Criteria will likely be based on include rotation ages, site index, basal area, cover-type composition, understory composition, location, etc. Factors considered in developing stand-selection criteria will include: 1) desired forest composition goals, 2) timber growth and harvesting, 3) old-growth

forests, 4) extended and normal rotation forests, 5) riparian areas, 6) wildlife habitat, 7) age and cover-type distributions, 8) regeneration, 9) thinning and 10) prescribed burning needs.

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

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

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

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

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

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

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

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

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

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

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

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

Tactical planning: See operational planning.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B
Acronyms

AFRMP	Area Forest Resource Management Plan
BT	Bearing Tree
CMAI	Culmination of Mean Annual Increment
CMT	Commissioner's Management Team
CSA	Cooperative Stand Assessment
CWCS	Comprehensive Wildlife Conservation Strategy
DBH	Diameter at Breast Height
DFC	Desired Future Condition
DFFC	Desired Future Forest Composition
DMT	Division Management Team
DNR	Department of Natural Resources
DOQ	Digital Orthophoto Quadrangle
DRG	Digital Raster Graphics
ECS	Ecological Classification System
EILC	Ecologically Important Lowland Conifers
ELCP	Ecological Land Classification Program
ERF	Extended Rotation Forestry
ETS	Endangered, Threatened, or Special Concern
FIA	Forest Inventory and Analysis
FIM	Forest Inventory Module
FORIST	Forest Information System
FRIT	Forest Resource Issues Team
FTC	Forest Tent Caterpillar
FY	Fiscal Year
G1 **G2**	Globally Critically Imperiled (G1) and Globally Imperiled (G2) Native Plant Communities
GAP	Gap Analysis Program
GEIS	Generic Environmental Impact Statement
GIS	Geographic Information System
GM	Gypsy Moth
HC	High Conservation Value Forest
HRLV	High Risk/Low Volume
HWDs	Hardwoods
LSA	Landscape Study Area
LSL	Laminated Strand Lumber
LTA	Land Type Association
MACLC	Minnesota Association of County Land Commissioners
MAI	Mean Annual Increment
MBF	Thousand Board Feet
MCBS	Minnesota County Biological Survey
MFRC	Minnesota Forest Resources Council
MFRP	Minnesota Forest Resources Plan
MnTAXA	Minnesota Taxonomy Database
MnWRAP	Minnesota Wildlife Resource Assessment Project
NAPP	National Aerial Photography Program
NAR	Natural Area Registry Agreement
NCFES	North Central Forest Experiment Station
NHIS	Natural Heritage Information System
NHNRP	Natural Heritage & Nongame Research Program
NPC	Native Plant Community

NRCS	Natural Resource Conservation Service
OFMC	Old Forest Management Complex
OHV	Off-Highway Vehicles
OSB	Oriented Strand Board
PM	Pine Moraines and Outwash Plains
RMT	Regional Management Team
RMZ	Riparian Management Zone
RNAs	Research Natural Areas
R **N**	Range of Natural Variability Representative
SFRMP	Subsection Forest Resource Management
SGCN	Species in Greatest Conservation Need
SI	Site Index
SMA	Special Management Area
SMZ	Special Management Zone
SNA	Scientific and Natural Area
SNN	Shipstead-Newton-Nolan Act
SONAR	Statement of Need and Reasonableness
SPP	Species
SRM	Silviculture and Roads Module
TMP	Timber Management Plan
TMPIS	Timber Management Plan Information System
TNC	The Nature Conservancy
WMA	Wildlife Management Area

High Conservation Value Forests (HCVFs) — FACT SHEET

What Are HCVFs?

As a Department, Minnesota DNR (DNR) is committed and required by statute *(MS 89 & 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 (FM) 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.

Note: The HCVF concept extends beyond forests and may include prairies, wetlands, or other areas on FSC-certified lands that contain significant and unique concentrations of HCVs.

Note: Thus far, DNR has emphasized the biological components of the HCVF Principle because FSC provides clearer guidance and there is more information available relative to the ecological components. DNR has existing policies and procedures that adequately maintain known cultural values.

What Does This Mean for Resource Managers?

All decisions regarding HCVFs should be based on the interpretation that most areas managed as HCVFs will remain working forests. This interpretation and expectation is based on a careful review of Principle 9 and the HCVF Assessment Framework in the FSC-US National Forest Management (FM) Standard (2010-2014). 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."*

Precautionary Principle

DNR and others have struggled to operationalize this Principle. FSC suggests the following approach: *"This principle establishes that a lack of information does not justify the absence of management measures. On the contrary, management measures should be established in order to maintain the conservation of the resources."* In 2010, DNR's HCVF Workgroup developed a document for resource managers to guide the application of this Principle. Essentially, management activities likely to affect the HCVs should only occur if they are likely to maintain or enhance the identified HCVs. Management activities unlikely to impact HCVs should proceed. *(See Precautionary Principle Guidance Document.)*

Background – DNR's Early Efforts

Addressing and operationalizing the HCVF Principle has been challenging for DNR, as highlighted by the multiple corrective action requests (CARs) DNR has received from FSC auditors related to HCVFs. Early CARs required DNR to operationally define the HCVF Principle, identify HCVFs, and implement appropriate management to maintain or enhance HCVs within HCVFs. As noted in DNR's Minor CAR 2006.10, *"Identifying, conserving, and monitoring HCVFs is an ongoing process, especially for managers of large public forests. Arguably, the most important aspect of this work is developing and implementing necessary guidelines to ensure proper management of High Conservation Values (HCVs) …"*

Note: According to FSC, old-growth forests are automatically HCVFs. Because DNR was proactive in addressing old growth years ago, DNR has and will continue to address old growth issues separate from its HCVF approach.

In 2006, DNR began a comprehensive approach to operationally define the HCVF Principle. The Department created a HCVF workgroup to develop a systematic approach to identify, conserve, and monitor HCVs within already established special management and protected areas. Wherever possible, the HCVF workgroup referenced existing policies, directives, stand designations, and interdisciplinary processes to address the above requirements. In 2007, the Department developed a document titled *"Framework for Identifying, Managing, and Monitoring High Conservation Value Forests on State Lands."* This working document identified several priority actions and provided the initial framework for resource managers to begin identifying, managing, and monitoring HCVFs. The vast majority of this report is now outdated and thus has been replaced with more recent, specific direction. Once DNR finalizes its HCVF designations and management approach, a new framework document will be developed.

By the 2008 annual surveillance audits, DNR was required (per Minor CAR 2006.10) to develop guidelines to ensure appropriate management of HCVs within HCVFs. Although DNR's 2007 Framework identified *high* and *outstanding* Minnesota Biological Survey (MBS) sites as possible areas to manage in accordance with the HCVF Principle, DNR had not identified or begun to manage specific sites as HCVFs by the 2008 audits. Therefore, the auditors concluded that there had been insufficient progress in specifying which *high* or *outstanding* MBS sites were to be managed under the HCVF Principle. As a result, the Department's minor CAR 2006.10 was replaced with Major CAR 2008.1.

For additional information on the MBS, please see DNR's website @ http://www.dnr.state.mn.us/mbs/index.html.

Prepared by: Rebecca Barnard, Forest Certification Coordinator

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High Conservation Value Forests (HCVFs) — FACT SHEET

Interim Approach: Major CAR 2008.1

DNR's HCVF Major CAR (2008.1) required the Department to develop an interim approach to identify and appropriately manage HCVFs to ensure the maintenance or enhancement of HCVs. Because DNR's 2007 HCVF Framework report identified MBS sites of *outstanding* and *high* biodiversity significance as possible HCVFs, the following interim HCVF approach was developed via interdisciplinary discussions and consultations with DNR's FSC accredited auditors:

1) Manage all MBS *Outstanding* Sites as interim HCVFs;
2) Manage all MBS *High* Sites as interim HCVFs until a subset of *high* sites are identified; and
3) Conduct an analysis to identify which *high* sites will be managed as HCVFs in the long-term *(thereby meeting step #2 above).*

In May of 2009, DNR began operating under interim guidance relative to the management of HCVFs. This interim period is expected to conclude by 2014 after DNR designates areas to be managed as HCVFs, completes a stakeholder review/comment process, and implements HCVF monitoring and adjacent landowner coordination processes.

Key Progress Made in 2009 & 2010

Since the 2008 audits, DNR has made significant progress by completing the following actions:

1) Directors Epperly, Schad and Hirsch sent a Memo (May 13, 2009) to Regional and Area staff, outlining a process for determining management of stands that occur within *high* or *outstanding* MBS sites being managed as HCVFs.
2) Updated and improved access to MBS information.
   a) MBS plant ecologists reviewed and updated information for all *outstanding* and *high* MBS sites that include DNR Forestry and Wildlife land.
   b) Based on this MBS information, Ecological & Water Resources (EWR) GIS Specialist generated Site summaries for all *high* and *outstanding* MBS sites. Site summaries include a list of the rare species, NPCs, and biodiversity values within each site.
   c) EWR staff developed a MBS Site Information Access Tool that allows DNR staff to access site summaries and generate information on each MBS site.
   d) Three Biodiversity/HCVF Workshops were held during the winter of 2009/2010.
3) Re-established the statewide interdisciplinary HCVF Workgroup. Accomplishments included:
   a) Defined and finalized HCVs – Categories 1-3. Replaces table 2 in DNR's 2007 Framework.
   b) Identified criteria necessary for selection as an HCVF.
   c) Developed a process to designate final HCVFs.

Key Progress Made Since 2010

Thanks to the hard work of members on DNR's Statewide HCVF Workgroup and interdisciplinary Regional Teams (established in 2010), the following tasks are complete:

1) Operationally defined the "Precautionary Principle."
2) Regional Teams sought field input when considering which interim HCVFs to propose as final HCVFs.
3) Obtained broad interdisciplinary agreement and senior leadership support for "Candidate HCVFs" in early 2013.
4) Added HCVF shapefile and metadata to Quick Layers.
5) Created HCVF Informational Reports, linked directly to the polygon in Quick Layers, for each Candidate HCVF.
6) Outlined monitoring and landowner coordination plans.
7) Devised a stakeholder review and comment process.

Process for Designating HCVFs

The most challenging and time consuming element was identifying which areas to designate as HCVFs. DNR's process, developed by the Statewide HCVF Workgroup, included the following key steps:

Step 1 – EWR's Recommendations for HCVFs (Done - 2011):

- Using information made available through MBS Site Summaries, along with GIS maps, imagery of MBS sites, and the revised definitions of HCVs, EWR staff reviewed all MBS sites of *outstanding* and *high* biodiversity significance in each ECS section and developed:
  - A list of MBS sites recommended for designation.
  - Comprehensive lists / summaries of HCVs present at each site. *(based on MBS data)*

Regional HCVF Teams led the efforts to accomplish steps 2 - 6. They were assisted by applicable Area staff, where necessary.

Step 2 – Identify Priority HCVs (Done - 2011):
Review HCVs present within each ECS Section to determine which HCVs are regionally significant and which are likely to be negatively impacted by "normal" management.

Step 3 – Identify a Subset of MBS Sites (Done - 2012):
Starting with EWR's recommendations, identify which MBS sites and other areas may warrant selection as HCVFs.

Step 4 & 5 – Field Input (Done - 2012):

- Distribute the draft list of sites recommended as candidate HCVFs to field staff for review and comment.
- Consider Area/field feedback and reach consensus with Regional HCVF Team on the candidate HCVFs.

Step 6 – Interdisciplinary Consensus of HCVFs (Done - 2013):
Present results to Region Managers for approval.

Rebecca Barnard and Kurt Rusterholz are the leads for steps 7-10. They will be assisted by the Regional HCVF Teams where needed.

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Step 7 – DNR Leadership Approval (Done - 2013):
Present region-approved candidate HCVFs to Division Directors and Commissioner's Office for approval.

Step 8 – Stakeholder Review & Comment (Planned - 2013):
Distribute candidate HCVFs and site summary information to external stakeholders for review and comment.

Step 9 – Finalize HCVF Designations (Planned - 2013):
Summarize and incorporate stakeholder comments into final designation proposal. Present results to DNR leadership for approval. Communicate decision to staff and stakeholders.

Step 10 – Future HCVF Designation/Delisting Process (2014):
Create an interdisciplinary process for designating, changing, or removing HCVFs in the future. Define the continued role of the Statewide HCVF Workgroup and Regional Teams.

DNR's Ongoing Efforts

Continue Providing Guidance to Field:

- The Statewide HCVF Workgroup continues to communicate progress and clarified direction via meetings with Division Directors and Regional Managers.
- Webinars were offered in the spring of 2011 (posted on Intranet) and more are being planned for 2013 and 2014.

Monitoring HCVs:
Certificate holders are also required to conduct periodic monitoring to ensure that management activities within HCVFs are maintaining or enhancing the HCVs. Following the 2010 Re-Assessment Audits, DNR received Major CAR 2010.2 related to this requirement. Shortly following the audits, the Statewide HCVF Workgroup developed a work plan to direct the development of monitoring approaches. This work plan served as DNR's CAR response. Initial monitoring is focused on Candidate HCVFs that are reasonably likely to be affected by planned management activities. Long-term monitoring procedures are being developed for similar functional groups of HCVs (i.e. rare species, key habitats, etc.). DNR received a follow-up minor CAR in 2011 for not implementing all components of the interim monitoring plan. *See CAR responses for details.*

Stakeholder Consultation:
Indicator 9.2.a of the FSC-US National FM Standard requires certificate holders to *"hold consultations with stakeholders and experts to confirm that proposed HCVF locations and their attributes have been accurately identified and that appropriate options for the maintenance of their HCVF attributes have been adopted."* According to FSC, *"experts"* may include DNR employees *"who possess the requisite expertise, but external stakeholders with experience pertinent to HCVF must always be consulted."* Indicator 9.2.b requires *"a transparent and accessible public review…"*

Based on this language and discussions with auditors, DNR intends to focus external stakeholder consultation on the identified HCVs and HCVF locations, proposed management guidance, and coordination of management activities to maintain HCVs that cross ownership boundaries. Initial stakeholder consultation has already been pursued through a variety of avenues, including MFRC Landscape Committee Meetings; Minnesota Forest Industry meetings; SFRMP public comment periods; emails and phone calls with adjacent landowners; and information accessible on DNR's website. A formal 60-day stakeholder review and comment period is being planned for fall 2013 and will be announced on DNR's website and through emails to key stakeholders.

Management & Documentation in HCVFs

Management activities within HCVFs and prescriptions to maintain and enhance HCVs will be determined through interdisciplinary discussions and consensus at the local field level. General management guidance and documentation direction will be provided by the Statewide HCVF Workgroup and Regional Teams via the HCVF Informational Reports.

Answers to Common Questions:

- HCVFs are not intended to be static, "set-asides," or "preservation / wilderness" areas.
- DNR is working to effectively address HCVFs by building on existing policies wherever possible.
- The HCVF concept offers a great opportunity for DNR to demonstrate how it integrates multiple purposes and objectives into resource management, including social, economic, and ecological considerations.
- Management objectives in HCVFs will be established through the existing planning and management processes. Specific management objectives may include a variety of multiple uses applicable to State Lands.
- Within HCVFs, management must maintain or enhance the HCVs. Prescriptions may need to be adjusted in order to meet this goal.

Additional Resources

- DNR's HCVF webpage @ MNDNR website explaining forest certification and HCVF
- Additional Internal Documents on DNR's Intranet @ http://intranet.dnr.state.mn.us/forestry/manuals/forest_certification/hcvf.html
  - CAR Responses & Audit Reports
  - Directors' Memo *(Signed May 13, 2009)*
  - DNR's Statewide HCVF Workgroup Project Definition
  - DNR's HCVs – Categories 1-3 *(Updated 8-12-11)*
  - Criteria for Selecting HCVFs *(Updated 8-12-11)*
  - Precautionary Principle – Definition & Guidance
- FSC-US Standard & Website @ FSC website

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APPENDIX I

Comments Received
And
Responses to Comments

Background
A 30-day public comment period for the *Blufflands/Rochester Plateau SFRMP* ended on February 3, 2014. Comments were accepted via letter, email, or fax. One comment was received within the posted comment period. Two comments were received after the comment period deadline. All comments are identified below as an excerpt from the complete submitted comment. The complete correspondence is available by contacting the Department. For each comment a response is provided. Where appropriate, actions resulting from the comment are identified.

Comments were received from the following:

- Joel Dunnette, Bryon, Minnesota by email received January 15, 2014.
- Richard Biske, Southeast Minnesota Conservation Coordinator, The Nature Conservancy Southeast Minnesota Office; rbiske@tnc.org by email dated February 5, 2014; and,

Comments and Responses

Comments from Joel Dunnette
"I appreciate the attention given in the Blufflands / Rochester Plateau forest plan (DNR website describing the BRP SFRMP and process) to diversity of tree species, age classes, and also other species. I especially liked seeing that some expansion of area of savanna was included.

I feel the plan has much merit and deserves approval."

Comments from Richard Biske
Comment 1
"The climate change adaptation strategy is good, I think this approach can be applied to landscape forest management in general throughout the SFRMP and help inform how to manage HCVF, RSAs Invasive Species, etc. It would be good to see this section expanded upon and applied to other sections of the plan."

Response:
The following General Direction Statements and Strategies apply to all lands subject to this SFRMP:

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.

GDS-8A Strategies

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.

This GDS and three Strategies apply to all sections of the plan.

Comment 2:
"Most of my comments below are addressed later on in the document, but not emphasized as much as they could be. Early references to recreational trails and use of forest areas and the subsequent strategies later in the document should emphasize the role trails play, particularly OHVs, in fragmenting plant communities and serve as vectors for invasive species as mentioned in I2 and L1. Pgs.5, 10 and 12. While OHV and recreation may be beyond the scope of the SFRMP, it occurs on state land assets, poses a threat to forest health and should be considered. The unintended use of forest roads for OHV use, authorized or not, should be considered when opening roads or consideration of ongoing use. Exceptions to management entry would be those RMZs where boxelder or other invasives have dominated the riparian area and provide little to no habitat or water quality benefit."

Response:
Few new roads will be necessary during the 10 year plan implementation period. As the Department establishes timber sales, foresters consider the trade-offs of value of timber compared to the cost and potential impacts of new road construction and also the implications of subsequent potential illegal use of new roads. These factors are considered as decisions are made as to whether or not to offer specific stands for sale.

This SFRMP does not alter the status of state administered lands that are subject to this SFRMP. State land status in relation to OHV use is managed through the State Forest classification and trail route designation process. Illegal OHV use is addressed as needed throughout the state forest system. As appropriate, the Department imposes enforcement actions. The Department has a comprehensive procedure to address illegal OHV operations. The Department's position is that appropriate forest management is the priority and should be implemented. Secondary effects of the adopted forest management such as the potential for illegal OHV impacts will be addressed as necessary.

Comment 3:
"G1and G2, RMZs, Southeast Minnesota riparian zones and lowland forests are particularly susceptible to invasive species infestation, especially reed canary grass and garlic mustard. Any activity within riparian zones other than light entry treatment for invasive species should be avoided."

Response*:*
The Department shares concern for management impacts in riparian zones. To address potential impacts the Department implements the Minnesota Forest Resource Council's Forest Management Guidelines for Water Quality. Further the Department implements Operational Order #113- Invasive Species. Because invasive species have the potential to adversely affect these natural resources, it is the DNR's policy to limit the introduction of invasive species onto DNR managed lands and waters, limit their rate of geographical spread, and reduce their impact on high value resources. The Department implements contract language with outside vendors that specifically regulates actions that may lead to invasive species management. Operational Order 113 sets forth DNR policy and procedures to prevent or limit the introduction, establishment and spread of invasive species, and to implement site-level management to limit the spread and impact of invasive species. Further, to carry out the Department's Operational Order, each DNR Division has developed Discipline Guidelines which explain how each Division will carry out Operational Order 113. **Comment 4:**
"Special management of riparian zones in proximity to public waterways is easily identified. However, similar management restrictions should be applied to intermittent streams and "dry runs" and gullies that serve as runoff conduits during what have become regularly occurring heavy runoff events. Likewise, within

these subsections, surface and groundwater features are closely related and special management consideration should be given to groundwater features including recharge zones, similar, but not as obvious as sinkholes. Forest management for infiltration and reduced runoff should be considered in areas prone to erosion. Examples include increasing herbaceous vegetation to reduce sheet and rill erosion where feasible."

Response:
The *MFRC's Forest Management Guidelines* identify best management practices related to forest management in proximity to waterways. Information or research which identifies and suggests that forestry management near "dry runs", gullies or "recharge zones" has negative effects or impacts should be shared with the Department. Lacking information or research, the Department must move forward implementing its mandated responsibility to manage forests which includes harvest. Slope, dry runs and gullies and their potential to impact waterways, wetlands or seasonal ponds are factors which field foresters take into consideration in marking and implementing timber sales. Special precautions are stated in sale agreements to address potential runoff as determined on site, by site conditions. The *Site Level Guidelines* are required to be implemented by the Department as timber sales are set up; loggers are required to implement these *Guidelines*. These *Guidelines* are reviewed and updated periodically.

The BRP SFRMP will adhere to the *MFRC's Site Level Guidelines*, which are mandatory on state land. The Department can exceed the *Guidelines* where viewed necessary and consistent with unique management requirements. The objectives of MFRC riparian guidelines are to protect water quality, forest productivity, and bank stability as vegetation management is implemented. Forest management to reduce runoff is implemented through the *Site Level Guidelines*. The *Guidelines* allow for flexibility in identifying the appropriate riparian management zone (RMZ) width for a particular site as determined by site-level conditions and management goals. Based on on-site conditions, the RMZ and subsequently the vegetation management within the RMZ can include all lands where vegetation management may have an impact on a water body. The *Guidelines* identify the characteristics of water bodies and the range of management practices to be implemented to protect water quality.

Comment 5
"*Fire as disturbance should be considered less as a threat to timber quality and more as an opportunity to control invasive species, maintain fire dependent plant communities and its potential role in oak regeneration as suggested later in the document. How about addressing this by permanently protecting more forest land and increasing state ownership of priority tracts.*

Response:
The BRP SFRMP does not mean to imply that fire is necessarily a threat to timber quality. Fire disturbance as referred to in the plan is used primarily in the context of fire disturbance to manage native plant communities. Generally across these subsections the best quality stands are not part of fire-dependent native plant communities.

The Department maintains an active land acquisition program to acquire priority acres. This program operates within budgetary and political constraints. Specific discussion on "priority" tracts that should be acquired is beyond the scope of the Department's SFRMP planning process.

Comment 6:

"These functional landscapes (fire dependent plant communities) are also important for germ plasm retention. Pg. 31 HCVF the various DNR Divisions are referenced as reaching out to other landowners. Shouldn't DNR increase the local understanding of HCVF, particularly with local forest management stakeholders including consulting foresters, loggers, SWCDs, NRCS and other local partners with the capacity and resources to influence private land management decisions and implementation. Forest management practices on state lands can also serve a larger role informing local stakeholders, landowners and forest managers?

Response:
The reference is to a Strategy that the Department personnel will communicate with landowners as to the values of High Conservation Value Forests (HCVF). Explanation of the Strategy will be clarified to include communication with other forest and land managers and not just landowners. These are not necessarily field forester responsibilities, although they can be. For clarity, the recommendation that the Divisions within the Department communicate these HCVF values applies to all staff in each Division and not just to field personnel.

Strategy 3D. l (p. 83) is revised to:
Divisions of Forestry, Fish and Wildlife, and Ecological and Water Resources personnel will communicate with other landowners and land managers, 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.