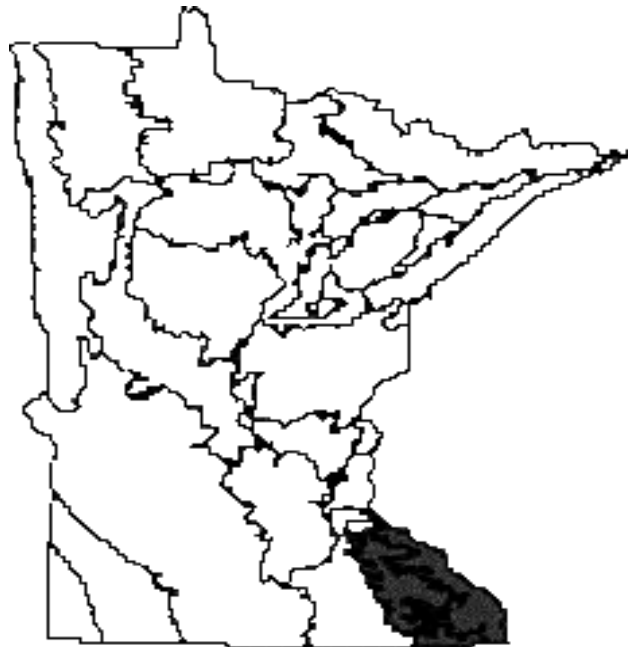


# Blufflands/Rochester Plateau

## *Subsection Forest Resource Management Plan*

### **Preliminary Issues and Assessment**



Minnesota Department of Natural Resources  
January 2013

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Prepared January 2013

Notes relating to this document:

This *Preliminary Issues and Assessment* document and color maps may be viewed as PDF files on the *Blufflands/Rochester Plateau Subsection Forest Resource Management Plan* website at:  
[www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html)

Information about the Division of Forestry Subsection Resource Management Plan (SFRMP) process can be found at:  
<http://www.dnr.state.mn.us/forestry/subsection/index.html>

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

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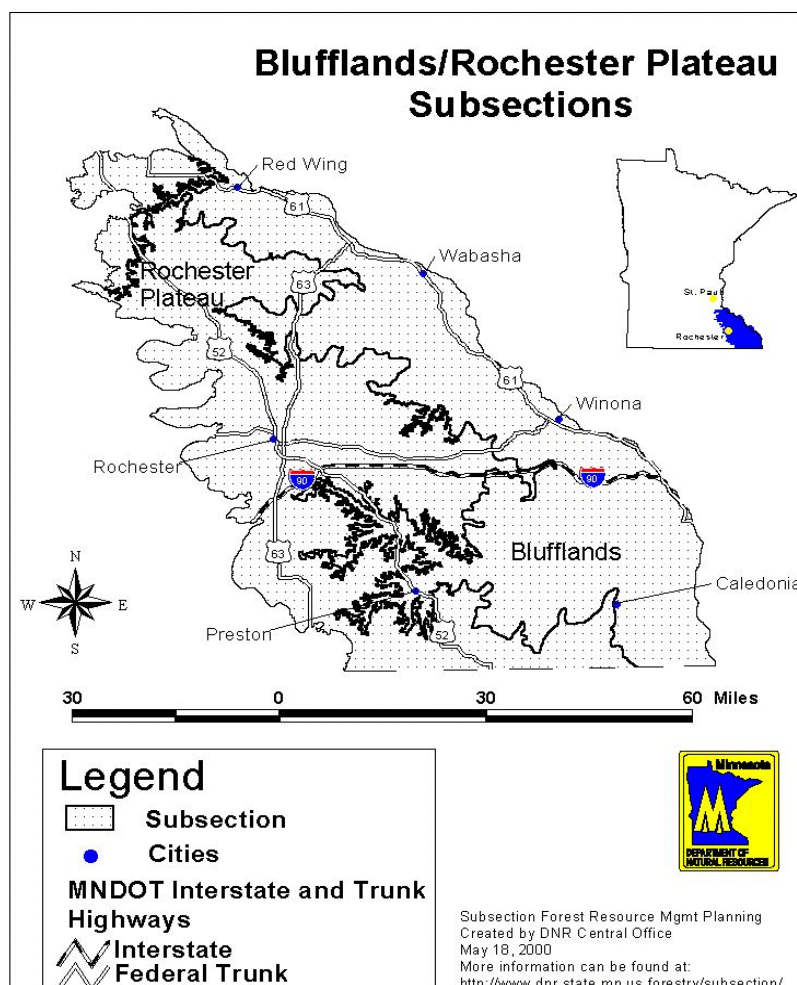
## CHAPTER 1

### Background and Preliminary Issues

#### 1.1 Background: Description of the Planning Area

The Blufflands/Rochester Plateau subsection consists of a total land area of approximately 2.6 million acres. The amount of timberland over all ownerships is approximately 500,000 acres. The majority of the land cover is identified as agricultural and grasslands. Unlike the northern regions of the state, the majority of the land is in private ownership. There is a little over 100,000 acres of land in state administered ownership in the subsection. Of these acres this planning process will identify approximately 5,000 acres (5%) of Forestry and Wildlife administered lands that will be assigned a treatment prescription over the next ten years (10-year stand exam list). The total amount of acres on the 10-year stand exam list will be determined by the cover type acres; age class distribution and management strategies identified in the *Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (BRP SFRMP)*.

**Map 1.1 Location of Blufflands/Rochester Plateau Subsections**



Color maps may be viewed as PDF files on the *Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP)* Web site at: [www.dnr.state.mn.us/forestry/subsection/index.html](http://www.dnr.state.mn.us/forestry/subsection/index.html).

## 1.2 Subsection Forest Resource Management Planning

### 1. Introduction

In the past, the Minnesota Department of Natural Resources (DNR) directed timber harvesting on lands it administered through 5-year to 10-year forest resource management plans developed for each of its administrative forestry areas. Opportunities for public involvement were limited in the development and review of these timber management plans.

In response to growing public interest in DNR timber management planning, the DNR Subsection Forest Resource Management Plan (SFRMP) process was developed to provide a more standardized, formal process and opportunities for increased public involvement. In addition, it is based at the subsection level of the DNR's ecological classification system (ECS) rather than DNR administrative areas as in the past (i.e., DNR area forestry boundaries). This BRP SFRMP is the second SFRMP to be prepared for DNR lands in southeast Minnesota. The original SFRMP was prepared in 2002 and together with several formal plan extensions, provided direction to vegetation management from 2002 through 2013.

The SFRMP process is divided into two phases. In Phase I, the subsection Team will prepare a *Preliminary Issues and Assessment document*. This document will identify important forest resource management *issues* that need to be addressed in the subsection plan and assess the current forest resource conditions in the subsection. In Phase II, the subsection Team will prepare a draft *subsection resource forest management plan* which includes Desired Future Forest Composition goals (DFFCs); recommended stand level management *Strategies* to support the DFFCs and stand-selection criteria leading to a ten year stand exam list. The DNR will seek stakeholder input on the *Preliminary Issues and Assessment document* and the *Draft Blufflands / Rochester Plateau Subsection Forest Resource Management Plan* (BRP SFRMP).

### 2. Goals for the Planning Effort

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

- **Identifying a desired future forest composition (DFFC)** for 50 years or more. Composition could include the amount of various cover types, age-class distribution of cover types, and their geographic distribution across the subsection. The desired future forest composition goals for state forest lands in the subsection will be guided by assessment information, key issues, general future direction in response to issues, and strategies to implement the general future direction.
- **Identifying forest stands to be treated over the next 10-year period.** SFRMPs will identify forest stands on DNR Forestry- and Wildlife- administered lands that are proposed for treatment (e.g., harvest, thinning, regeneration, and re-inventory) over the 10-year plan implementation period. Forest stands will be selected using criteria developed to begin moving DNR forest lands toward the long-term DFFC goals. Examples of possible criteria include stand age and location, soils, site productivity, and size, number, and species of trees. Many decisions and considerations go into developing these criteria and the list of stands proposed for treatment. Examples include: 1) identifying areas to be managed at normal rotation age; 2) identifying areas to be managed as high-biodiversity areas which could include representative sample areas and or high conservation value forests; 3) management of riparian areas and visually sensitive travel corridors; 4) management for the appropriate mix of age and cover-type distributions; and 5) regeneration, thinning, and prescribed burning needs. The DNR will select management activities (including “no action”) that best move the forest landscape toward the DFFC goals for state forest lands.

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



### 3. Process

The objectives of the DNR SFRMP process are to:

- effectively inform and involve the public and stakeholders.
- complete the process in each ecological classification system (ECS) subsection within a reasonable amount of time (the target is to complete a SFRMP plan in 12 months).
- conduct a process that is reasonable and feasible within current staffing levels and workloads; and,
- develop plans that are credible to stakeholders and enables sustainable forest management.

Gained experience, and the necessity to broaden the focus of SFRMPs to respond to new and evolving vegetation management issues in the future will demand a flexible and adaptable process. The SFRMPs will need to be flexible to reflect changing conditions. The SFRMP process will provide for annual reviews by DNR planning Teams for the purpose of monitoring implementation and determining whether plans need to be updated to respond to unforeseen substantial changes in forest conditions.

DNR subsection Teams will include staff from the DNR Divisions of Forestry and the Management Section of Wildlife, as well as the section of Ecological and Water Resources and other agency staff as needed. These subsection Teams will have primary responsibility for the work and decision-making involved in crafting subsection plans.

The subsection Team considers and coordinates with forest management plans of other agencies and levels of government that may affect management on state lands to be included in the BRP SFRMP. This information will help the DNR make better decisions on the forest lands it administers. In the Blufflands/Rochester Plateau subsection, the goals, strategies, and coordination efforts of the Minnesota Forest Resources Council (MFRC) Southeast Landscape Committee will be considered and incorporated into the BRP SFRMP.

One of the early tasks of the SFRMP process, the subsection Team will 1) identify important forest resource management *Issues* that will need to be addressed in the subsection plan and 2) develop an assessment of the current forest resource conditions in the subsection. The *Preliminary Issues and Assessment document* developed by the Team, will consider the following basic elements (i.e., chapters in this *document*):

- Land ownership and administration
- Land use and cover
- Forest composition and structure
- Silvicultural Practices
- Ecological information
- Wildlife Distributions
- Forest Insects and Disease

In the following tasks of the SFRMP process, the subsection Team will 1) finalize the list of *Issues* addressed in the SFRMP (stakeholder comments may lead to revisions of the *Issues* to be addressed), 2) identify *DFFC* goals, 3) develop *Strategies* to implement the DFFCs, and 4) develop the *stand-selection criteria* that will be used to identify the stands and acres to be treated over the next 10 years.

### 4. Relationship of SFRMP to Other Landscape-Level Planning Efforts.

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

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

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

- Gather and assess information on a region's current and future ecological, economic, and social characteristics;

- Use information about a region to identify that region's key forest resource issues;
- Plan ways to address key issues in order to promote sustainable forest management within the region; and,
- Coordinate various forest management activities and plans among a region's forest landowners and managers in order to promote sustainable forest management.

The MFRC Southeast Regional Landscape encompasses the Blufflands/Rochester Plateau subsection. Recommended Desired Future Conditions identified in the MFRC Southeast Landscape Plan were completed for the Southeast Landscape was completed in June of 2003. These recommendations will be considered and incorporated into the SFRMP process. This information will help the DNR make better decisions on DNR administered lands and assist in cooperating with management in the larger landscape.

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

## **2. Upper Mississippi River National Wildlife and Fish Refuge**

The U.S. Fish and Wildlife Service has prepared a *Comprehensive Conservation Plan* that guides the administration and management of the Upper Mississippi River National Wildlife and Fish Refuge starting in 2006 and out for a 15 year period. In addition the USFW Service has also prepared the *Upper Mississippi River Systemic Forestry Stewardship Plan*, dated Aug 2012. This *Plan* provides a guide for the sustainable management of Upper Mississippi River System (UMRS) forests, including opportunities for their restoration, and to ensure that the UMRS maintains its recognition as a nationally treasured ecological resource. The *Plan* accomplishes this by describing the current understanding of the state of the resource and its ecological stressors; providing guidance for forest restoration activities; establishing goals and objectives; identifying opportunities and data needs; establishing a monitoring strategy through an adaptive management framework; and developing additional recommendations that will ensure the long-term sustainability of this key component of the UMRS ecosystem. This plan can be viewed at: [www.ourmississippi.org](http://www.ourmississippi.org).

## **5. Relationship of SFRMP to Other DNR Planning Efforts**

While the SFRMP process focuses on developing vegetation management plans for state-administered forest lands within the subsection the SFRMP Teams consider other state, federal, and even local planning efforts affecting the subsection, particularly as they relate to management direction, decisions, and products that can assist in determining appropriate vegetation management direction on DNR lands. The following sections highlight a number of efforts that that SFRMP Teams consider in order to incorporate relevant information, management direction, and products in the SFRMP process.

### **1. Off-Highway Vehicle (OHV) Planning Process**

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

While the SFMRP process does not include OHV system planning, SFRMP Teams need to consider existing OHV trails and OHV system plans (where available), as well as other recreational trails and facilities, in making decisions on forest stand management next to these facilities and in determining new access needs. Likewise, OHV system plans should consider management direction and the results of stand selection (e.g., large patch areas, areas where temporary access is preferred, areas where new access is needed) developed through the SFRMP process.

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

## **2. Minnesota State Park Unit Planning Process**

The SFRMP process will not address the management of DNR forest lands within the boundaries of state parks. The management of state parks (i.e., facilities and natural resources) is established under a separate state park planning process. Park plans document existing natural and cultural resource conditions, and future management objectives. Existing recreational use and recreation trends are assessed, and a balance of sustainable recreational opportunities is recommended.

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

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

### **3. Incorporating Biodiversity Considerations in SFRMP**

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

The DNR SFRMP process provides an immediate opportunity to incorporate biodiversity considerations in planning for forest systems on DNR lands. Ecological and Water Resources staff provides ecological information pertinent to managing for biodiversity to each of the subsection forest management Teams (e.g. Minnesota County Biological Survey data, Natural Heritage information, Scientific and Natural Area biodiversity management techniques experience). SFRMP direction in addressing issues and developing strategies, desired future forest compositions, and ten-year lists of stands to be treated will reflect consideration of this information and the current, best understanding of how to manage for biodiversity.

In the original plan, special management sites were identified and named as High Biodiversity Sites. There are 13 such sites in the BRP subsections. Since the original SFRMP process, forest certification guidelines have resulted in the development of several other special management designations. These special management designations include High Conservation Value Forests (HCVFs), Representative Sample Areas (RSAs), Global 1 (G1) and Global 2 (G2). Special management designations will also include designated Old Growth (OG), along with the High Biodiversity Sites (HiBio). In many cases the previously identified HiBio sites will fall into the HCVF status. In these cases, the HiBio plan will serve as a guidance document for management of these sites. In situations where RSAs occur in previously identified HiBio plans, the RSA plan will take precedent since the RSA designation has more recent management guidelines. For sites with either an RSA or a HiBio plan providing management direction, site managers may proceed with habitat management without a joint site visit between DNR divisions. For HCVF sites without a HiBio or RSA plan, a multi-discipline coordination meeting will occur to determine agreed upon management direction.

The HiBio plans prepared to date will be appended to the *BRP SFRMP* as the more detailed vegetation management directions and will be consulted as stand decisions are made within these areas. The resource values of these areas will continue to be managed as or HCVF, RSAs or OG. The *BRP SFRMP* will identify specific *Strategies* that consider and manage the resource values of these areas. Those acres within HiBio Sites that do not become HCVF, RSAs, G1G2 or OG will continue to be reflected in the appended the high biodiversity area plans as a method to ensure areas adjacent to HCVF, RSAs, G1G2 or OG are taken into consideration. Following completion of designation of HCVF, RSAs and G1G2 these areas will be imported into the *BRP SFRMP* dataset. Identified below are the thirteen high biodiversity sites and a discussion of the unique values found

within these sites. As stated above, where appropriate, acres within these sites that are designated HCVF, RSAs, G1G2 or OG will be so identified and specifically managed consistent with department directives and the *Strategies* contained in the *BRP SFRMP*.

The thirteen *high biodiversity areas* are:

1. Money Creek Bluff
2. Peterson Prairie
3. Whitewater Sand Savannas
4. South Fork Whitewater River Area
5. Vermillion Bottoms and Lower Cannon River Area
6. Pine-Hemingway Creek Area
7. Upper Beaver Creek Valley
8. Upper West Indian Creek Valley
9. Partridge Creek Area
10. Rushford Bluffs
11. Shattuck Creek Valley
12. Upper Diamond Creek Valley
13. North Fork Whitewater River Valley

Designated HCVF, RSAs, G1G2 and HiBio sites will be referenced and discussed in the *BRP SFRMP document* with specific *Strategies* outlining recommended management.

#### **4. Wildlife Plans and Goals**

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

##### **a) Division of Fish and Wildlife Strategic Plan**

The Minnesota DNR's Division of Fish and Wildlife Strategic Plan has established population and or harvest objectives for many of the state's wildlife species that are hunted and trapped. These objectives have been determined by a variety of processes that involve some level of stakeholder involvement and public review. Population objectives consider both biological and social carrying capacities tempered by economic needs or constraints (e.g., crop depredation). Among other tools, the division establishes annual harvest levels to meet desired population goals. During SFRMP, wildlife managers work toward the development of a plan that facilitates achievement of the wildlife population and/or harvest goals for key wildlife species outlined in the division's strategic plan.

##### **b) Bird Plans**

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

##### **c) Comprehensive Wildlife Conservation Strategy**

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

This plan identifies challenges, threats, and opportunities that face the species; it develops 10-year objectives for species populations, habitats, and priority research and

information needs, and develops conservation actions that address the 10-year objectives. Wildlife managers use this information to form SFRMP recommendations and decisions.

**d) Wildlife Management Area Master Plans (Comprehensive Management Plans)**

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

**e) Management Guidance Documents – Individual Wildlife Management Areas**

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

**6. DNR Direction Documents and relationship to SFRMP**

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

**a. DNR Strategic Conservation Agenda 2009–2013 and DNR Directions 2000.**

The department's strategic planning documents, *DNR Strategic Conservation Agenda 2009– 2013* and *DNR Directions 2000*, provide broad goals, strategies, and performance indicators for forest resources in Minnesota (see DNR Directions 2000, Forest Resources Section in Appendix A and DNR Strategic Conservation Agenda, Forests Section at:

<http://www.dnr.state.mn.us/conservationagenda/index.html>.

This broad statewide direction will be used as a platform from which to develop additional complementary/supplemental goals and strategies specific to each subsection.

**b. Old-Growth Forest Guidelines**

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

[http://www.dnr.state.mn.us/forests\\_types/oldgrowth/index.html](http://www.dnr.state.mn.us/forests_types/oldgrowth/index.html).

Old-growth stand designation has been completed statewide and additional old-growth designation is not part of the SFRMP process. The primary significance of old growth in the SFRMP process is determining how DNR forest stands adjacent to and connecting adjacent old growth stands will be managed (e.g., as extended rotation forests, part of large patches, scheduling of harvest, conversion to other forest types, etc.).

**c. Extended Rotation Forest Guideline**

The MN Department of Natural Resources adopted extended rotation forest (ERF) management guidelines in 1994 to maintain a range of forest age classes on DNR managed lands. Since the adoption of this guideline a formal review to document the current status of ERF management and analyze the environmental, economic and social effects of the policy to date has been completed. The following recommendations guiding ERF designation have been adopted by the department:

1. Use an adaptive approach to manage older forests. The amount of older forest on the landscape and harvest levels will be monitored to determine the amount, if any, of ERF to designate on DNR-administered lands.

2. Prepare an old forest analysis as part of each SFRMP to determine the status of forests over normal rotation age. The analysis will be completed separately for DNR-managed timberlands and for all forest ownerships in the subsection.
  - a. if the amount of older forest 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 no ERF designation on state timberlands would be required on state managed lands.
  - b. if the current older forest for a given cover type on all ownerships is less than the desired age class distribution for that cover type on DNR managed timberlands, in the original SFRMP, ERF designation should be used to ensure older forest exists.

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

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

**e. DNR Forest-Wildlife Habitat Management Guidelines**

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

**f. DNR Interdisciplinary Forest Management Coordination Framework**

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

**g. High Conservation Value Forests**

The DNR, as a function of maintaining forest certification is required to develop an approach to identify and appropriately manage high conservation value forests (HCVFs) to ensure the maintenance or enhancement of the high conservation values (HCVs). The Department's *HCVF Framework* report identifies Minnesota County Biological Survey (MCBS) sites of *outstanding* and *high* biodiversity significance as candidates to manage as HCVFs. At this time, as an interim approach, the Department will:

- 1) Manage all MCBS *Outstanding* Sites as HCVFs;
- 2) Manage all MCBS *High* Sites as HCVFs until the Department identifies a subset of *high* sites to manage as HCVFs; and
- 3) Conduct an analysis to identify which *high* sites will be treated as HCVFs.

**h. Representative Sample Areas and G1G2**

Identification and appropriate management of Representative Sample Areas (RSAs) and globally imperiled native plant communities (G1G2) has been completed in the Blufflands/Rochester Plateau

subsections partially as a function of maintaining forest certification. A Memorandum of Understanding (MOU) has been prepared outlining the management directions for these identified areas. The MOU provides for agreement among the Divisions and outlines the overall management for these areas. The management of these areas will be recognized in the BRP SFRMP.

#### **i. White Pine Initiative**

In 1996 a White Pine Regeneration Strategies Work Group was formed to prepare recommendations for white pine management on state lands. The primary white pine harvest objectives recommended by that Work Group include: white pine harvesting will be restricted to thinnings, selective harvests, or shelterwood harvests; adequate seed producing white pine will be retained and treatments carried out to increase white pine natural regeneration; reserve the better white pine trees that occur as scattered individuals or in small groups for their seed producing, aesthetic, wildlife and ecological benefit; and, manage all white pine under extended rotation forest guidelines to increase the acreage and distribution of older white pine stands and trees on the landscape.

#### **J. School Trust Fund**

The Minnesota Constitution established the School Fund to ensure a long-term source of funds for public education in the state. The goal of the permanent school fund is to secure the maximum long-term economic return from the school trust lands consistent with the fiduciary responsibilities imposed by the trust relationship established in the Minnesota Constitution, with sound natural resource conservation and management principles, and with other specific policy provided in state law. Further, clarification of this direction is included in Operational Order #121, effective February 23, 2012. This Operational Order will direct management of School Trust Fund lands.











#### **K. Grouping of DNR Direction Documents by 3-Level Hierarchy**















The DNR uses a variety of written vehicles (e.g., policies, guidelines, recommendations, memos, operational orders, agreements) to communicate direction to DNR staff on a wide range of forest management issues such as old-growth forests, inter-divisional coordination, site-level mitigation, rare habitats and species, and accelerated management. Interdisciplinary and external involvement has varied in the development of these direction documents, as have the expectations for their implementation (i.e., must follow, follow in most cases, follow when possible). Chart 1.2 places a number of DNR direction documents within a defined policy hierarchy that clarifies decision authority and expected actions. This can serve as a useful reference for the public in understanding the array of forest management guidance available to staff and serve as a starting place for DNR staff to help provide more consistent application across the state.

**Chart 1.1 Grouping of DNR Direction Documents by 3-level Hierarchy**

Nomenclature	Developed by	Level of Review	Expectations	Departure Authority
<b>Policies</b>				
Old Growth Forest Guideline	DNR			No departures allowed
ERF Guideline	DNR			No departures allowed
Forest/Wildlife Coordination Policy	DNR			No departures allowed
WMA Policy	Wildlife			Region - Interdisciplinary
SNA Est. & Admin. Op. Order	Eco Services			No departures allowed
MFRC Site-Level Guidelines	MFRC			Field appraiser w/ documentation
ID and Mgmt of EILC	CO/FRIT			Region - Interdisciplinary
<b>Guidelines</b>				
Rare Species Guides	Eco Services			Area ID Otherwise: field appraiser w/ doc.
Cover type Mgmt. Recommendations	SFRMP Teams			Field appraiser w/ documentation
NE Region Wood Turtle	NE Region (For, Wild, Trails)			Region - Interdisciplinary
Decorative Tree Harvest Guidelines	Forestry			Area - Interdisciplinary
Accelerated Management	Forestry			Area - Interdisciplinary
Gypsy Moth Mgmt. Guidelines	Forestry/ Dept. of Ag.			Field appraiser w/ documentation
For/Wild Habitat Guidelines	Wildlife/Forestry			Area - Interdisciplinary
Integrated Pest Management	Forestry			Field appraiser w/ documentation
Silvicultural Mgrs. Handbooks	NCES, Forestry			Field appraiser w/ documentation
NE R. Grouse Mgmt. Areas	Wildlife			Area - Interdisciplinary
Goshawk Considerations	Eco & Water Res			Known locations: Area - Interdisciplinary Otherwise, document use
MCBS H/O Biodiversity	Eco & Water Res			Consider if site conditions differ from FIM
ECS Field Guide Interps.	Eco & Water Res			Field appraiser w/ documentation
MCBS Rare NPC	Eco & Water Res			Known locations: Area - Interdisciplinary Otherwise, document use
Red-Shouldered Hawk	Eco & Water Res			Known locations: Area Interdisciplinary



				Otherwise, document use
Four-toed Salamander	Eco & Water Res			Known locations: Area - Interdisciplinary Otherwise, document use
Black-throated Blue warblers	Eco & Water Res			Document use
Seasonal ponds	Eco & Water Res			Document use
Boreal owl guidelines	Eco & Water Res			Known locations: Area - Interdisciplinary Otherwise, document use
Botrychium guidelines	Eco & Water Res			Known locations: Area - Interdisciplinary Otherwise, document use

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

## 7. Public Involvement

Public involvement in the SFRMP process occurs at two points:

1. The public review of the *Preliminary Issues and Assessment document*. The *Preliminary Issues and Assessment document* will be posted on the Department's public website and notice sent to stakeholders to review and forward comments; and,
2. A public review and comment period on the *Draft Blufflands/Rochester Plateau SFRMP* which includes the 10 –year Stand Exam List.

Hardcopies of all SFRMP plan documents will be available on request. Electronic copies can be viewed on the DNR website at:

<http://www.dnr.state.mn.us/forestry/subsection/blufflands/index>

## 8. SFRMP Process

The Blufflands/Rochester Plateau subsection Team is in the initial stages of the SFRMP process. The Team has developed the preliminary issues and assessment information and is now requesting public input, the first of two opportunities in the SFRMP process.

**Chart 1.2 Public Involvement and Process Timelines for the BRP SFRMP**

<b>SFRMP Task</b>	<b>Public Notification/Participation</b>	<b>Public Comment Period</b>	<b>Target completion</b>
<b>I. Preparation of the Planning Process</b> <ul style="list-style-type: none"> <li>Assemble initial assessment information and data sets.</li> </ul>	<ul style="list-style-type: none"> <li>DNR develops mailing list of public/ stakeholders.</li> <li>Establish web-site for subsection.</li> </ul>	n/a	at startup of the planning process
<b>II. Preliminary Issues and Assessment Document</b> <ul style="list-style-type: none"> <li>Background information</li> <li>Preliminary Issues</li> </ul>	<ul style="list-style-type: none"> <li>Inform the public of planning efforts, schedule, and how and when they can be involved.</li> <li>Provide the Preliminary Issue and Assessment document on DNR website</li> <li>Notice to Stakeholders</li> </ul>	30 days	Comment period ending March 29, 2013
<b>III. Prepare Draft Plan</b> <ul style="list-style-type: none"> <li>Desired Future Forest Conditions</li> <li>General Directions Strategies,</li> <li>10-Year Stand Examination List and New Access Needs</li> </ul>	<ul style="list-style-type: none"> <li>Mail summary to stakeholders</li> <li>Provide documents on request and post to DNR website</li> <li>Identify SFRMP contacts for questions.</li> <li>Solicit comments</li> </ul>	30 days	comment period ending Mid-July 2013
<b>IV. Prepare Final Plan</b> <ul style="list-style-type: none"> <li>Respond to public comments</li> <li>Present revised plan for approval</li> <li>Notice to stakeholders of approved SFRMP</li> </ul>	<ul style="list-style-type: none"> <li>Inform public of final plan via news release.</li> <li>Provide summary of public comments and how DNR responded.</li> <li>Provide final plans on website and in Area offices.</li> <li>Notice stakeholders of adopted final plan.</li> </ul>	n/a	Mid-September 2013

## 1.3 Preliminary Issue Identification

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

**What Is an SFRMP Issue?**

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

**What Is Not a SFRMP Issue?**

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

Each issue considers the following:

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

## 1.4 Preliminary Issues

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

The Blufflands/Rochester Plateau (BRP) Team has begun identifying important issues in these subsections that should guide forest planning. A preliminary issues list was developed to stimulate thought on issues that may impact forest planning in this subsection.

This plan will provide guidance for forest management on state lands for the next 10 years and establish goals for the next 50 to 100 years. The BRP Team is looking for additional issues that affect our forests that could be mitigated or avoided by forest planning and vegetation management.

For any of these issues there is no one correct answer, direction or response from the Department in terms of the “correct” method of vegetation management. How the BRP SFRMP ultimately addresses these issues will depend on many factors including: condition of the forest resources today; forest management goals for the future; the judgment and expertise of Department professionals; existing Department vegetation management directives and statutes; and recommendations from the public and stakeholders.

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

- **Why is this an issue?**

Representation of all age classes and growth stages, including old-forest types, provides a variety of wildlife habitats, timber products, and ecological values over time.

- **How might DNR vegetation management address this issue?**

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

- **What are possible consequences of not addressing this issue?**

A forest without representation of all age classes and growth stages exposes itself to increased insect and disease problems, loss of species with age-specific habitat requirements, and loss of forest-wide diversity. Such a forest would also provide a boom-and-bust scenario for forest industries that depend on an even supply of forest products.

- **Other considerations?**

What other factors ought to be considered with this issue?

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

- **Why is this an issue?**

This is an issue because different users and stakeholders have differing opinions concerning what are the highest values within a forest and highest priority uses and management. This issue is particularly pronounced in the Blufflands/Rochester Plateau due to the population distribution relative to the amount of state forest lands which exist in the subsection. The development patterns and associated stakeholder comments will influence how forestry management is implemented in the Blufflands/Rochester Plateau subsection.

- **How might DNR vegetation management address this issue?**

DNR can develop vegetation management strategies that produce effects similar to natural disturbances and can begin to restore certain species and conditions that were once more prevalent. Further the DNR can attempt to accommodate as many forest users as practical given the limited state land base in the subsection.

- **What are possible consequences of not addressing this issue?**

1) Loss of wildlife habitat and associated species; 2) increase in invasive exotics; 3) loss of biodiversity; 4) simplification of stand and landscape communities; 5) loss of ecologically intact landscapes; 6) loss of the ability to produce a diversity of forest products, e.g., saw timber, and other non-timber products, and tourism; 7) decrease resilience to climate change; and 8) continued and heightened user conflicts on the existing state lands within the subsection.

- **Other considerations?**

What other factors ought to be considered with this issue?

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

- **Why is this an issue?**

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

- **How might DNR vegetation management address this issue?**

The Minnesota Forest Resources Council (MFRC) site-level guidelines are the DNR's standard for vegetation management in riparian areas. At the site level, managers may want to exceed those guidelines. When planning vegetation management adjacent to aquatic and riparian areas, managers can consider specific conditions associated with each site such as soils, hydrology, desired vegetation, and considers enhancements to the MFRC guidelines.

- **What are possible consequences of not addressing this issue?**

Failure to consider vegetation management that affects riparian and aquatic areas could result in increased run-off and erosion; more conspicuous run-off events; less stable stream flows; and negative impacts to water quality, fisheries, and wildlife habitat.

- **Other considerations?**

What other factors ought to be considered with this issue?

### **D. How might we maintain or enhance biodiversity and native plant community composition on actively managed stands where historic disturbance patterns, such as the frequency and intensity of fire, have been interrupted?**

- **Why is this an issue?**

This is an issue because we have historically lost and continue to lose significant areas of native plant communities historically maintained by fire. Many of these native plant communities, such as pin oak-bur oak woodland, oak savanna, prairie, and sedge meadow, are increasingly rare. In addition, they support important populations of rare species and serve as reference areas to help us evaluate the effects of management on biodiversity. Further, there is increased fire danger due to the build-up of fuels in some areas.

- **How might DNR vegetation management address this issue?**

DNR will incorporate management techniques that maintain or enhance biological diversity and structural complexity into vegetation management plans, including increased use of prescribed burning.

- **What are possible consequences of not addressing this issue?**

1) Degradation of existing biodiversity and ecosystem function; 2) fewer opportunities for maintaining or restoring ecological relationships; 3) reduction of species associated with declining habitat; 4) economic losses due to loss of site capability to maintain or restore ecological relationships; 5) reduction of species associated with declining habitat; 6) economic losses due to loss of site capability to maintain desired species, and 7) social and economic losses resulting from a decline in recreational activity associated with wildlife viewing and hunting.

- **Other considerations?**

What other factors ought to be considered with this issue?

#### **E. How might we provide habitat for game and non-game wildlife and plant species as well as maintain opportunities for hunting, trapping, and nature observation?**

- **Why is this an issue?**

This is an issue because wildlife habitat is being lost. Forest wildlife species are important to Minnesotans. Many factors, ranging from timber harvest to land use development, influences wildlife species and populations.

- **How might DNR vegetation management address this issue?**

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

- **What are possible consequences of not addressing this issue?**

1) Reduction of some types of wildlife habitat; 2) reductions of species associated with declining habitats; and 3) economic and social losses resulting from a decline in recreational activity associated with wildlife viewing, hunting, and aesthetics.

- **Other considerations?**

What other factors ought to be considered with this issue?

#### **F. How might we address the impacts on forest ecosystems from forest insects and disease, invasive species, nuisance animals, herbivory, global climate change, and changes in natural disturbances such as fires and windthrow?**

- **Why is this an issue?**

This is an issue because insect and disease occurrences have significant impacts on vegetation in this subsection. Further, these invasive and/or exotic species may displace native species/communities. All of the above-mentioned processes can impact the amount of forest land harvested and regenerated during the 10-year planning period. They can also influence the long-term desired future forest composition (DFFC) goals of the subsection plans.

- **How might DNR vegetation management address this issue?**

DNR can design flexibility into the plan to deal with specific stands that are affected by these processes.

- **What are possible consequences of not addressing this issue?**

1) Reduced timber volume and recreational enjoyment of the forest;  
2) long-lasting change to native plant and animal communities; and  
3) Increased fire danger.

- **Other considerations?**

What other factors ought to be considered with this issue?

#### **G. What are sustainable levels of harvest for forest products?**

- **Why is this an issue?**

One primary goal of the SFRMP is to achieve a long-term sustainable harvest of forest products while considering and planning for all forest users and species that depend on the various forest growth stages. Determining the sustainable level of harvest requires consideration of the needs of all forest wildlife, plant, and recreational needs. Further, DNR managed forestlands have been certified by two third party certifiers: the Forest Stewardship Council and the Sustainable Forestry Initiative. Certification of the DNR's forest lands verifies that sustainable forest management is being practiced by the DNR.

- **How might DNR vegetation management address this issue?**

The DNR can develop a 10-year harvest plan for state lands in these subsections that promotes a balance of all age classes for all even-aged cover types, monitor non-timber species to ensure no over treatment while incorporating efforts in the process to protect and consider all wildlife and plant species and cultural resources.

- **What are possible consequences of not addressing this issue?**

- 1) Possible unsustainable harvests of these forest product resources;
- 2) Adverse impacts to wildlife habitat and native plant communities; and,
- 3) unintended impacts to rare species.

- **Other considerations?**

What other factors ought to be considered with this issue?

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

- **Why is this an issue?**

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

- **How might DNR vegetation management address this issue?**

Vegetation management planning can identify forest stands for treatments that will increase timber productivity (e.g., harvesting at desired rotation ages, thinning, control of competing vegetation, and reforestation to desired species and stocking levels).

- **What are possible consequences of not addressing this issue?**

Timber supplies would become less predictable and/or unsustainable over time, with potential negative impacts ranging from over supplies to scarcities of forest products, higher procurement costs for industry, increased chemical treatments, and waste. Increased management costs. Alternatively, wood and wood product imports might increase from countries that have fewer environmental controls, effectively exporting U.S. environmental issues.

- **Other considerations?**

What other factors ought to be considered with this issue?

## **I. How can we implement forest management activities and minimize impacts on visual quality?**

- **Why is this an issue?**

Scenic beauty is one primary reason people choose to live near or use their recreation and leisure time in or near forested areas. As population growth continues within the Blufflands/Rochester Plateau subsection, additional pressures will be placed on the area's remaining forested, woodlands, grasslands and open lands.

- **How might DNR vegetation management address this issue?**

DNR managers will continue to follow Best Management Practices (BMPs) for visual quality as forest lands are managed and identify areas that may need additional mitigation strategies.

- **What are possible consequences of not addressing this issue?**

Not addressing this issue may result in negative impacts to residents of the area and users of the forest, woodlands, and grasslands in the subsection.

- **Other considerations?**

What other factors ought to be considered with this issue?

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

- **Why is this an issue?**

There exist a wide range of legal mandates the Divisions within the DNR must follow to guide timber, wildlife, recreation and cultural management on state lands, many can be conflicting, while fulfilling both department and division missions. For example, State Trust Fund lands must generate income for various trust accounts under state law, with timber sales the primary tool to achieve this directive. Conversely, wildlife habitat management and preservation, not necessarily timber sales, is the mandate for acquired Wildlife Management Area (WMA) lands. Further, unless efforts are made to consider land management of other public land managers in the subsection, conflicting objectives on adjacent lands could result.

- **How might DNR vegetation management address this issue?**

Vegetation management will take administrative land status, relevant statutes and coordination with other land managers into consideration during the planning process.

- **What are possible consequences of not addressing this issue?**

Failure to follow these mandates and legislative intent may be a violation of federal or state law. Opportunities for cooperative efforts may be lost.

- **Other considerations?**

What other factors ought to be considered with this issue?

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

- **Why is this an issue?**

Cultural resource sites possess spiritual, traditional, scientific, and educational values. Some types of sites are protected by federal and state statutes.

- **How might DNR vegetation management address this issue?**

DNR managers will continue to have all vegetation management projects reviewed for known cultural resources. They will survey unidentified sites and if cultural resources are found, modify the project to protect the resource. If cultural resources are discovered in the course of the planning process, stand site visit or treatment, the project will be modified to protect the resource.

- **What are possible consequences of not addressing this issue?**

Loss or damage to cultural resources.

- **Other considerations?**

What other factors ought to be considered with this issue?



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

- **Why is this an issue?**

Protecting rare features (endangered, threatened, and special concern species and their habitats) is a key component of ensuring species, community, and forest-level biodiversity in this subsection.

- **How might DNR vegetation management address this issue?**

The Minnesota County Biological Survey (MCBS) has been completed in all counties in both the Blufflands and Rochester Plateau Subsections. DNR managers will check the Rare Features Database for the location of known rare features in this subsection. Identification and consideration of rare features will be addressed in two ways: identified in the management plan as part of stand selection criteria and considered as prescriptions are written prior to active management.

- **What are possible consequences of not addressing this issue?**

1) Loss of rare species at the local and state level; 2) rare species declines leading to status changes; 3) rare habitat loss or degradation; and 4) loss of biodiversity at the species, community, and/or landscape level.

- **Other considerations?**

What other factors ought to be considered with this issue?

## **M. How do we manage natural resources in the face of increased human population and urbanization?**

- **Why is this an issue?**

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. As populations increase, land parcelization often results adding to the difficulties of gaining access to state lands and increasing the number of adjacent private landowners potentially impacted by land management practices. Population increases directly result in increasing land acquisition costs for the Department when attempting to add parcels as a part of a comprehensive land acquisition program. 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 subsection.

- **How might DNR vegetation management address this issue?**

Seek 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.

- **What are possible consequences of not addressing this issue?**

Continued conflicting land uses adjacent to public lands, isolation of natural areas, and loss of connectivity between state-managed forested lands.

- **Other considerations?**

## **N. Can we accommodate the full range of management goals and stakeholder recommendations given the limited public land ownership in the Blufflands/Rochester Plateau SFRMP?**

- **Why is this an issue?**

This is an issue because state ownership is relatively limited in this subsection. 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. The development patterns and associated stakeholder comments will influence how forestry management is implemented in the Blufflands/Rochester Plateau subsection.

- **How might DNR vegetation management address this issue?**

The DNR will continue 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.

- **What are possible consequences of not addressing this issue?**

Further conflicts between users and the recommended management of state forested lands are 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.

- **Other considerations?**

#### **P. How should managers accommodate Topography Considerations in Determining Harvests**

- **Why is this an issue?**

The Blufflands/Rochester Plateau subsections are unique because of the significant aspect and slopes that exist. Aspect and slope are important considerations in determining the frequency and design of partial harvests.

- **How might DNR vegetation management address this issue?**

The frequency of partial harvests in a stand with a slope of 10% or less is not an issue. However, stands that have a slope of greater than 10% could be significantly damaged. The direction and equipment for harvesting trees on a slope can cause damage to the residual trees (standing timber on the downward side) if not carefully considered. Processors and hand felling can directionally fell trees on slopes thus enabling partial harvests. Stand conditions and subsection cover type management objectives also need to be considered in making decisions about partial harvests regardless of the cover type.

- **What are possible consequences of not addressing this issue?**

If partial harvest frequencies are not considered, then the impact of partial harvests given the topographical features of the subsections would be larger than necessary.

Vegetation management decisions on subsection cover type management objectives and stand selection will influence the partial harvest frequency for a particular cover type under varying slope and aspect conditions.

- **Other Considerations?**

#### **Q. How should Forest Stands Adjacent to DNR Administered Forest Lands be managed?**

(i.e. Should harvest levels be adjusted based on harvest levels (i.e., over harvesting or no harvesting) on adjacent forest lands?

- **Why is this an issue?**

The Blufflands/Rochester Plateau subsections contain a significant amount of private land. Much of the DNR administered forest lands are islands within private lands. Forest management on the private lands frequently differs from management on DNR administered lands. The desired management on DNR administered forest lands could be affected by the management of private forest lands.

- **How might DNR vegetation management address this issue?**

Vegetation management decisions should be made in consideration of the potential impact of adjacent stands on the desired management treatment.



## CHAPTER 2

### Land Ownership and Land Administration

#### 2.1 Land Ownership

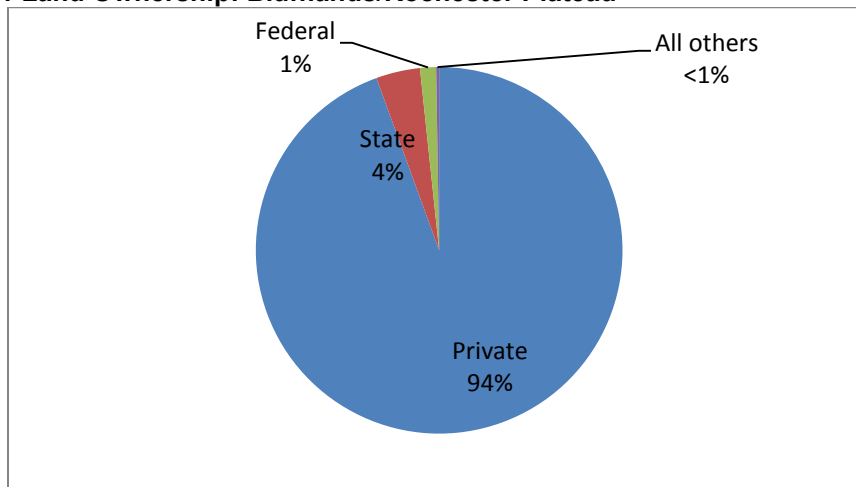
The subsection totals about 2.6 million total acres. Private lands account for the vast majority of ownership at approximately 94 percent, followed by State ownership at approximately 4 percent. Federal lands within the subsection account for less than 1 percent primarily located within the Mississippi River corridor. Of the total State ownership (102,634 acres, which includes state parks, scientific and natural areas and other miscellaneous state owned lands), the Blufflands/Rochester Plateau SFRMP addresses only Forestry and Wildlife lands totaling approximately 84,000 acres or 3 percent of the total land within the two subsections. Table 2.1 and Chart 2.1 displays the land ownership for the Blufflands/Rochester Plateau subsections.

**Table 2.1 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 DNR GAP Stewardship 2008 – All Ownership Types*

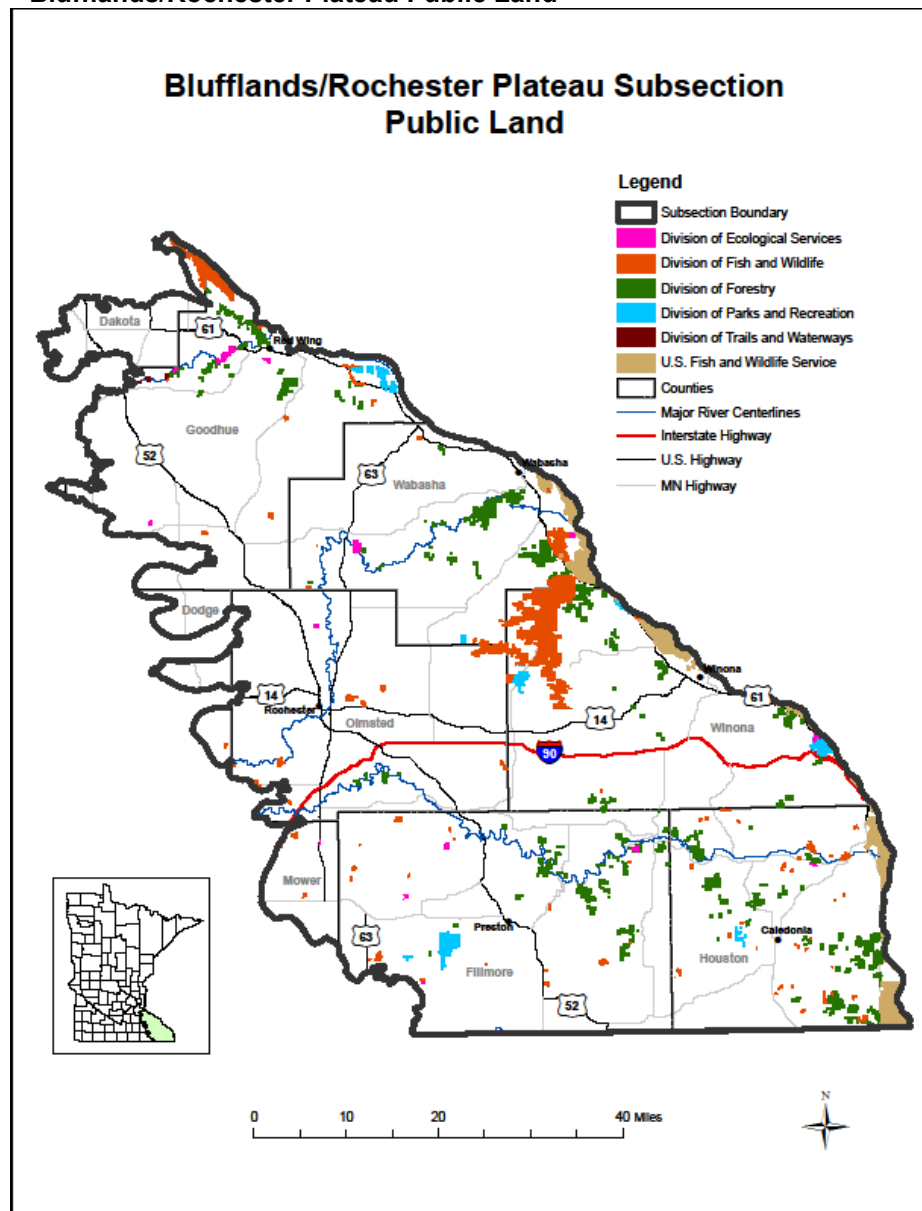
**Chart 2.1 Land Ownership: Blufflands/Rochester Plateau**



*Source: MN DNR GAP Stewardship 2008 – All Ownership Types*

Map 2.1 identifies the primary public land ownership within the Blufflands/Rochester Plateau subsection. The Blufflands/Rochester Plateau SFRMP plans for vegetative management on lands identified as State Forests and Wildlife Management Areas (administered by the Fish and Wildlife Division, Section of Wildlife).

**Map 2.1 Blufflands/Rochester Plateau Public Land**



Source: 2008 GAP Stewardship data

Color maps may be viewed as PDF files on the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

The administration and ownership patterns in the Blufflands/Rochester Plateau subsections are unique in comparison to the central and northern regions of the state. The Blufflands/Rochester Plateau subsections are characterized by state agency land ownerships without intermingled federal agency or county land ownerships. With the exception along the Mississippi River corridor there is little federal land ownership in the subsections.

Table 2.2 lists the acreage totals for state and federal administered lands within the Blufflands/Rochester Plateau subsections.

**Table 2.2 Public Administered Lands in Blufflands/Rochester Plateau Subsections**

Administrator	Acres	Percent
Forestry	46,115	33%
Fisheries & Wildlife	43,351	31%
Parks and Recreation	9,706	7%
Eco and Water Resources	2,668	2%
Trails and Waterways	273	<1%
USFWS	35,647	26%
<b>Total</b>	<b>137,760</b>	<b>100%</b>

Source: 2008 GAP Stewardship data

Chart 2.2 identifies the public land ownership within the Blufflands/Rochester Plateau subsections (state and federal ownership). Of the total public land ownership (state and federal), approximately 64% (Forestry lands at 33% and Fisheries and Wildlife lands at 31%) are subject to management through the *BRP SFRMP*.

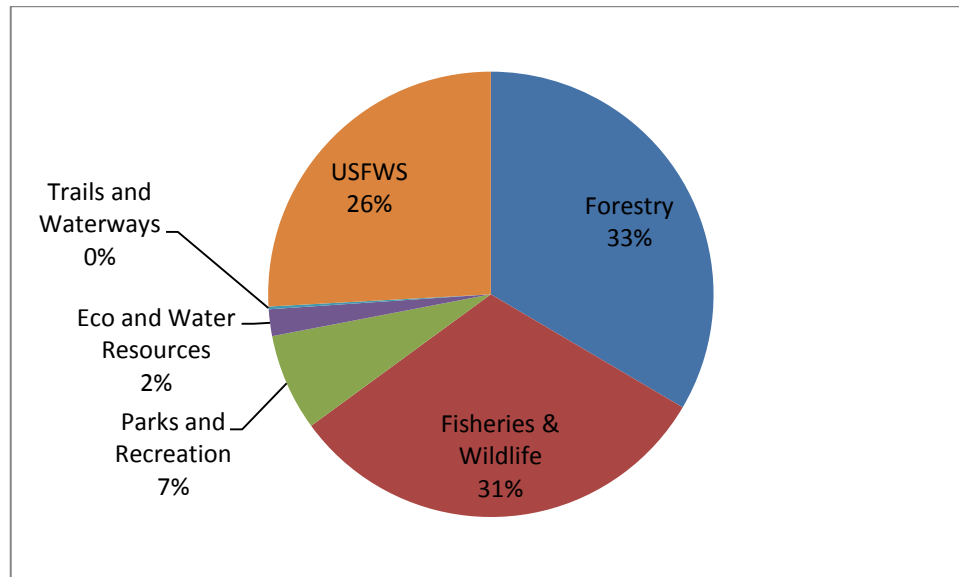
**Chart 2.2 Public Administered Lands in Blufflands/Rochester Plateau Subsections**

Table 2.3 shows that the counties within the BRP fall below the statewide average for public lands within Minnesota counties. This is significant in that the Department is somewhat limited in achieving “landscape” level goals with a comparatively limited land base in the BRP subsections.

**Table 2.3 Percent of Land in State Ownership (LMIC 1983)**

County	% State Ownership
Fillmore	2
Goodhue	3
Houston	8
Olmsted	1
Wabasha	7
Winona	10
State Avg.	23





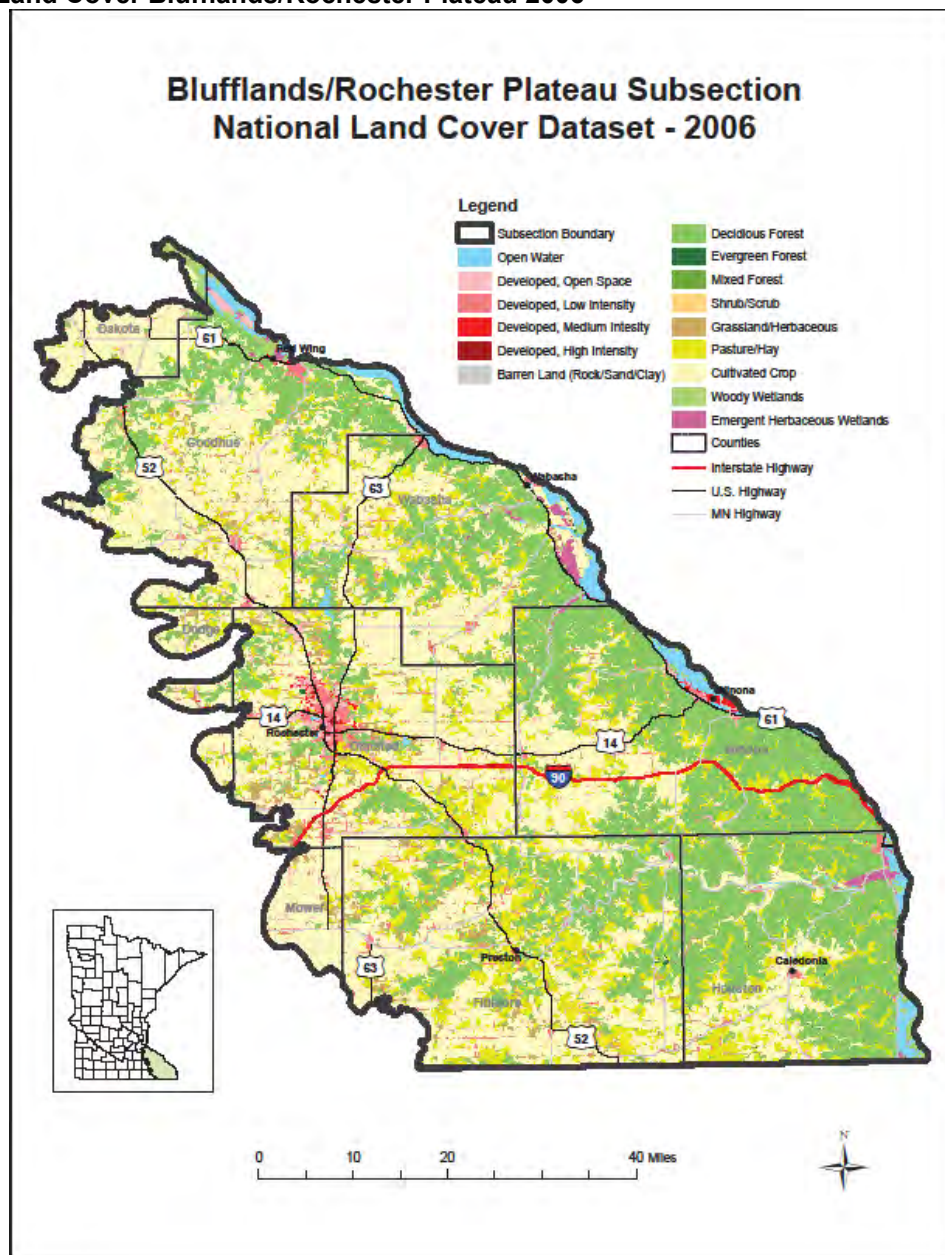
## CHAPTER 3

### Land Cover

#### 3.1 Land Cover

Map 3.1 identifies the land cover for the Blufflands/Rochester Plateau from the most recent land cover information available, 2006. It shows the most prominent land cover in the subsections is cultivated lands, pasture/hay lands and deciduous forest lands.

**Map 3.1 Land Cover Blufflands/Rochester Plateau 2006**



Color maps may be viewed as PDF files on the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

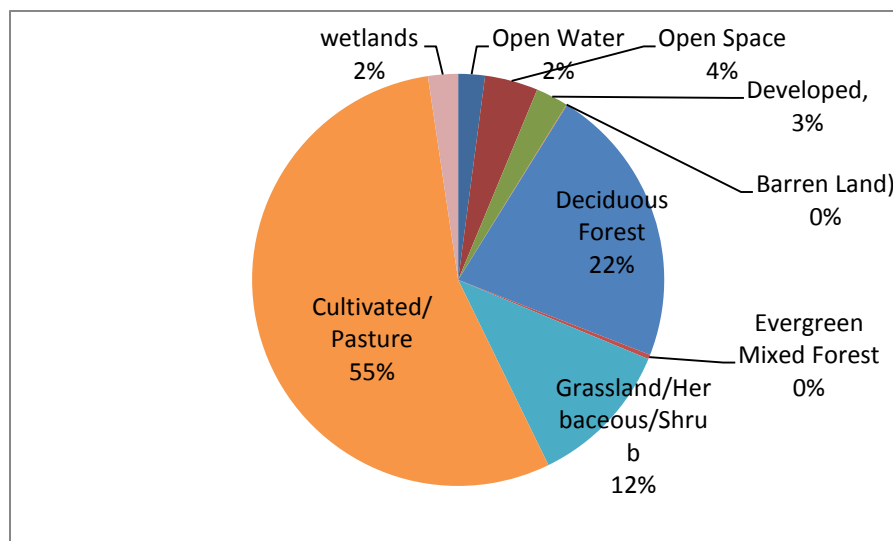
Table 3.1 identifies land cover by total acres across the Blufflands and Rochester Plateau subsections combined.

**Table 3.1 Land Cover Blufflands/Rochester Plateau 2006**

Land Class	Acres	Percent
Cultivated/Pasture	1,452,503	55%
Deciduous Forest	584,135	22%
Grassland/Herbaceous/Shrub	304,543	12%
Developed, Open Space	110,506	4%
Developed, Low/Medium/High	67,284	3%
Wetlands	62,311	2%
Open Water	55,416	2%
Evergreen Forest/Mixed Forest	9,314	<1%
Barren Land (Rock/Sand/Clay)	1,452	<1%
<b>Total</b>	<b>2,647,464</b>	<b>100%</b>

Chart 3.1 shows land uses and land cover for the Blufflands/Rochester Plateau subsections. The primary land use is Cultivate/Pasture making up 55 percent of the subsections, followed by Deciduous Forest at 22 percent and Grasslands/Shrub at 12 percent.

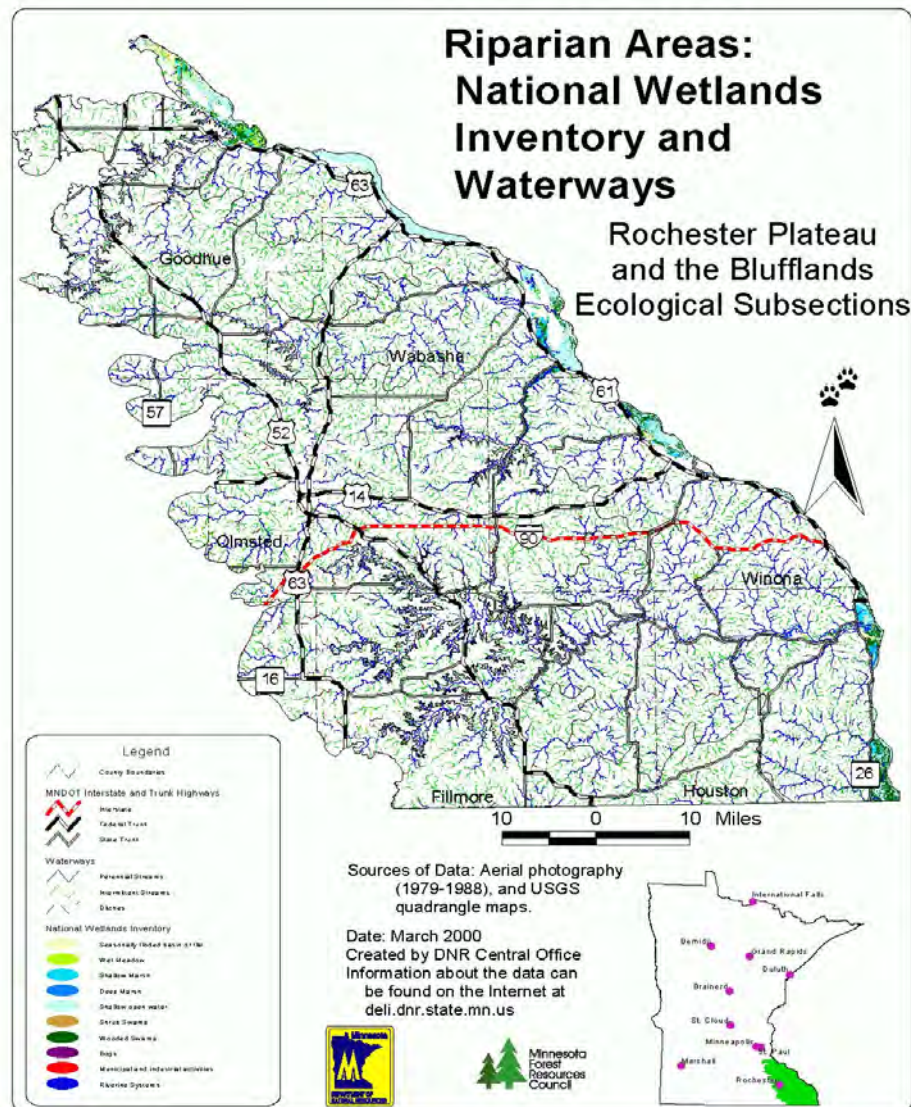
**Chart 3.1 Land Cover Blufflands/Rochester Plateau Subsections**



### 3.2 Riparian Areas

The following charts and graphics identify that the Blufflands/Rochester Plateau subsections are dominated by the uplands wetlands system. Uplands systems consist of 89% and 97% of the Blufflands/Rochester Plateau subsections respectively. These systems are characterized by a vegetative community where the depth to the water table is at least 1.5 feet and the soil moisture varies according to the depth to the water table. Uplands systems may also be characterized as terrestrial systems. There is a small percentage of shallow open water and the riverine system present in the Blufflands given the presence of the Mississippi River bordering on the east of the Blufflands subsection. Riverine systems are defined as all wetlands and deep-water habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean derived salts in excess of 0.5%. A channel is "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water" (Langbein and Iseri 1960:5).

### Map 3.2 National Wetlands Inventory (NWI) and Waterways.



Color maps may be viewed as PDF files on the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

**Table 3.2 Blufflands National Wetlands Inventory (NWI).**

<b>Wetland System Type</b>	<b>Acres</b>	<b>Percent</b>
98 Uplands, system	1,146,704	89%
5 Shallow open water	47,404	4%
90 Riverine system	30,749	2%
1 Seasonally flooded basin or flat	19,242	1%
7 Wooded swamps	19,234	1%
3 Shallow marsh	15,347	1%
2 Wet meadow	3,551	1%
6 Shrub swamp	2,848	0%
4 Deep marsh	2,183	0%
99 Area outside Minnesota, system	197	0%
80 Municipal and industrial activities, water regime	41	0%
8 Bogs	0	0%
Total	1,287,500	100%

**Table 3.3 Rochester Plateau National Wetlands Inventory (NWI).**

<b>Wetland System Type</b>	<b>Acres</b>	<b>Percent</b>
98 Uplands, system	1,322,407	97%
90 Riverine system	13,034	1%
3 Shallow marsh	11,482	1%
1 Seasonally flooded basin or flat	4,982	1%
2 Wet meadow	3,557	0%
5 Shallow open water	1,677	0%
6 Shrub swamp	884	0%
7 Wooded swamps	870	0%
4 Deep marsh	226	0%
80 Municipal and industrial activities	111	0%
8 Bogs	0	0%
99 Area outside Minnesota, system	0	0%
Total	1,359,230	100%

Tables 3.4 and 3.5 summarize the length in miles of three different types of streams; intermittent, perennial, and ditch for the two subsections. The definitions of these streams originated from the Cowardin wetland classification system. Intermittent streams consist of 58% and 77% of the Blufflands/Rochester Plateau subsections respectively. Perennial streams make up 40% and 20% of the Blufflands/Rochester Plateau subsections respectively. Few acres of ditch stream occur in these subsections.

**Table 3.4 Blufflands Stream Data.**

<b>Stream Type</b>	<b>affected Acres</b>	<b>Percent</b>
Intermittent (29)	2,711	58%
Perennial (28)	1,863	40%
Ditch (30)	68	1%
Total:	4,642 acres	100%

**Table 3.5 Rochester Plateau Stream Data.**

<b>Stream Type</b>	<b>affected Acres</b>	<b>Percent</b>
Intermittent (29)	2,978	77%
Perennial (28)	742	20%
Ditch (30)	111	3%
Total:	3,831 acres	100%





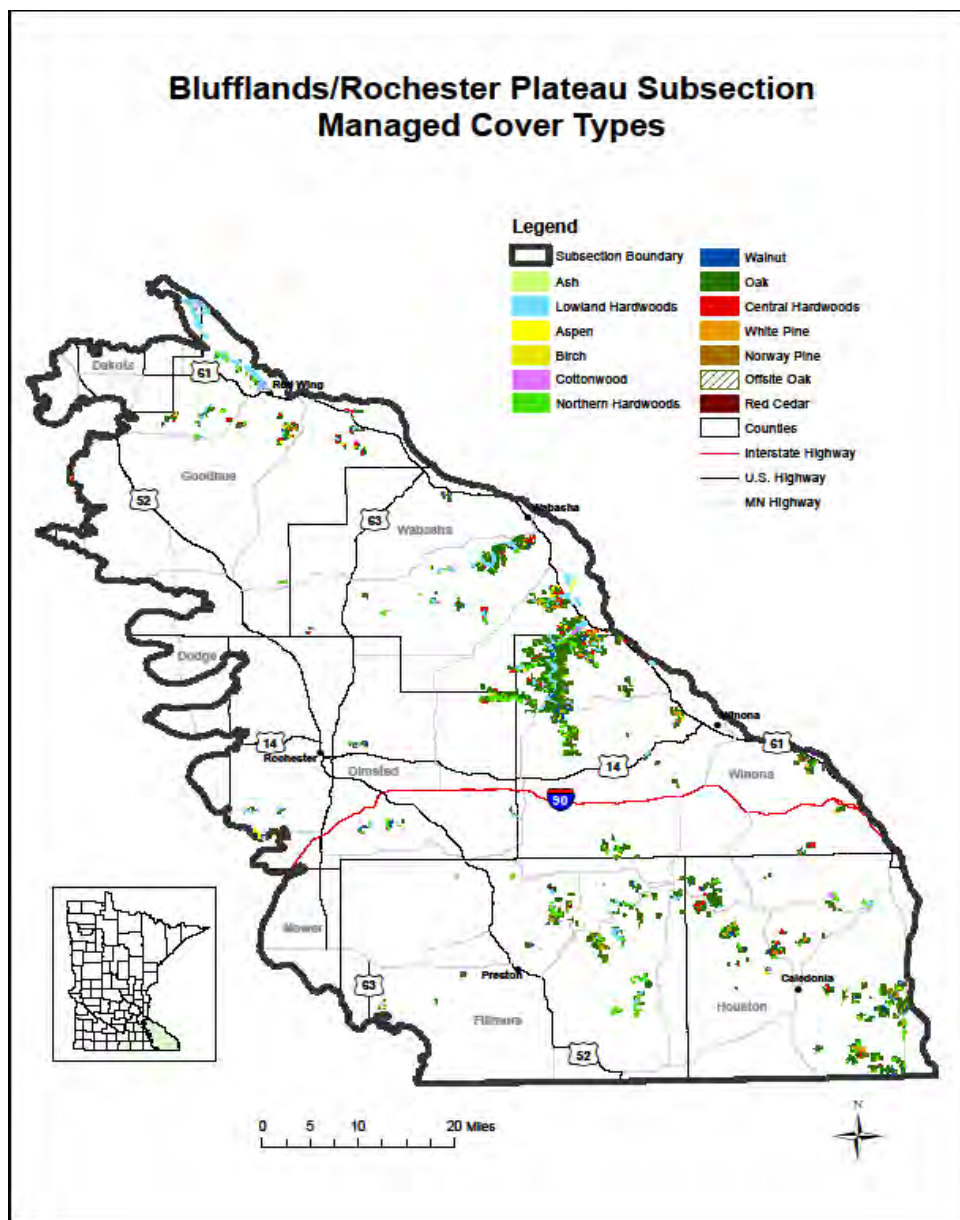
## CHAPTER 4

### Forest Composition and Structure

#### 4.1 State Lands by Cover Type

Map 4.1 identifies managed cover types on DNR administered lands being considered in the Blufflands/Rochester Plateau subsection forest resource management plan. The primary cover types are: ash, lowland hardwoods, central hardwoods, northern hardwoods, walnut, white pine, aspen, birch, cottonwood, oak, and red pine.

**Map 4.1 Managed Cover Types on DNR Lands for the Blufflands/Rochester Plateau Subsections**



Color maps may be viewed as PDF files on the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

approximately 5 million acres owned and administered across the state. FIM is a database and application through which field foresters can maintain an integrated and centralized inventory of the forests on publicly owned lands. Of the total cover types only a portion is considered timberlands. Not all forested cover types are considered as timberlands.

Table 4.1 illustrates the ownership of the approximately 621,000 acres of timberland in the Blufflands and Rochester Plateau subsections. Timberland is defined as 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.

Individuals own the largest amount of timberland at 532,000 acres. Individual is defined as privately owned land including the farmer class and miscellaneous private class. The significant individual ownership in comparison to state or federal lands impacts the ability of the department to implement “landscape level” forest vegetation management.

**Table 4.1 Timberlands<sup>1</sup>Land Ownership: Blufflands/Rochester Plateau (Acres)**

Owner	Acres	Percent
Private <sup>2</sup>	532,583	86
State – All <sup>3</sup>	65,388	11
Federal <sup>4</sup>	16,402	2
County/Municipal	6,785	1
<b>Total</b>	<b>621,159</b>	<b>100</b>

Source: FIA 2011

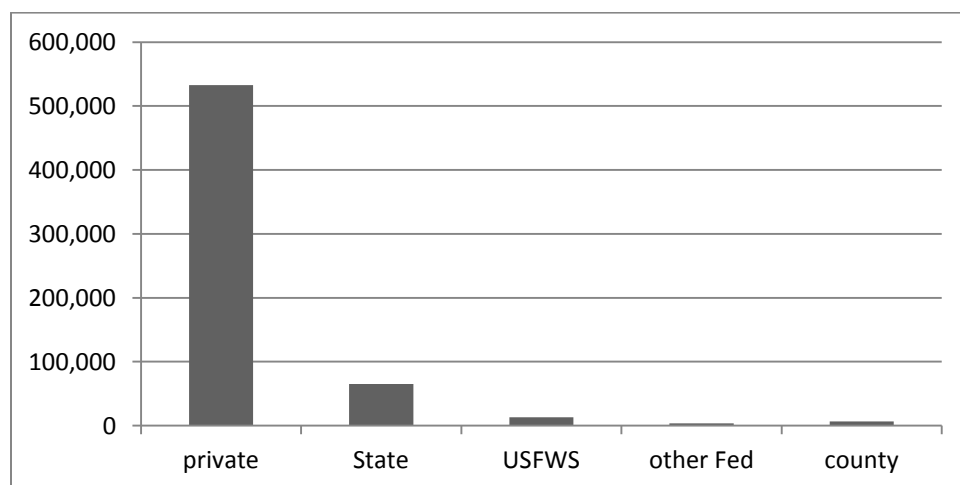
Footnotes:

<sup>1</sup> Timberland is defined as lands forestland capable of producing timber of a marketable size and volume at the normal harvest age for the cover-type.

<sup>2</sup> Includes all Private land categories

<sup>3</sup> Includes all lands administered by units of DNR including Forestry, Wildlife, Fisheries, Parks and Trails and Ecological and Water Resources. SFRMP only covers Forestry- and Wildlife-administered lands.

**Chart 4.1 Timberland Ownership 2011 FIA in Acres**



Source: FIA 2011



Table 4.2 identifies the primary cover types found in the Blufflands/Rochester Plateau subsections by age-class. This information is based on FIM updates completed in 2012 and shows only acres that are considered as timberlands. For purposes of preparing the *BRP SFRMP* Offsite Oak will be included as a timberland cover type. From these acres the *BRP SFRMP* will identify acres (individual forest stands) that will be selected and placed on the 10-year stand exam list. The 10-year stand exam list will reflect stands that meet the desired future forest conditions and stand selection criteria contained in the *BRP SFRMP*.

**Table 4.2 Blufflands/Rochester Plateau State<sup>1</sup> Timberland<sup>2</sup> 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
<b>Total</b>	<b>4,955</b>	<b>2,638</b>	<b>2,479</b>	<b>3,495</b>	<b>4,393</b>	<b>4,581</b>	<b>6,256</b>	<b>6,027</b>	<b>7,213</b>	<b>5,533</b>	<b>6,175</b>	<b>3,904</b>	<b>3,698</b>	<b>2,289</b>	<b>63,636</b>

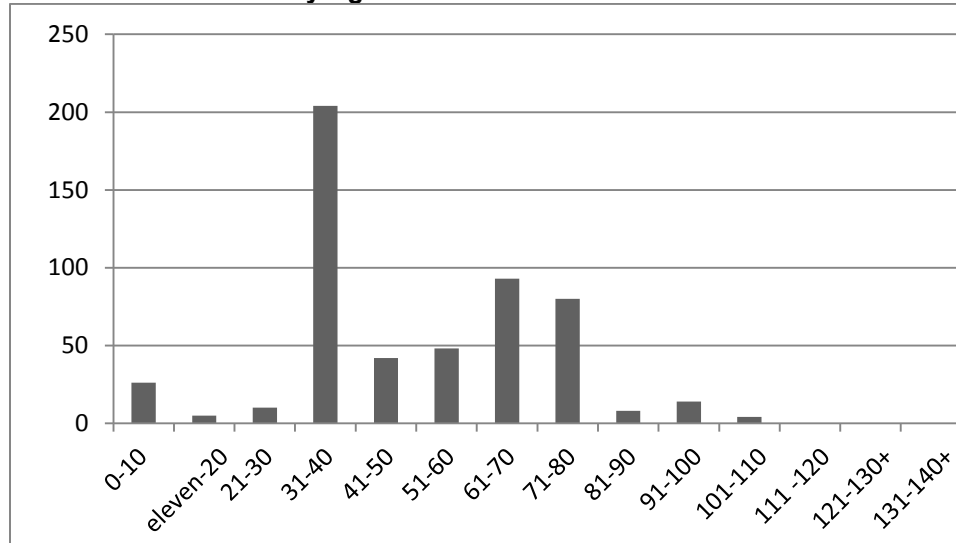
<sup>1</sup> Includes only Forestry- and Wildlife-administered lands within the Ecological Classification System (ECS) subsection boundary and based on Minnesota DNR FIM 2013.

<sup>2</sup> 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 (see Appendix A Glossary).

## 4.2 Cover type Age-Class Distributions

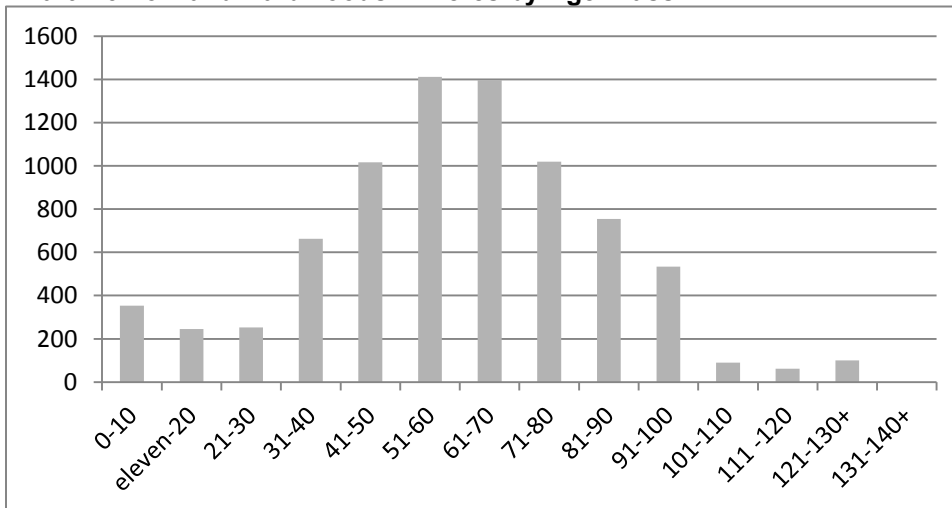
The following figures illustrate the age class distribution for the ash, lowland hardwoods, aspen, birch, cottonwood, northern hardwoods, central hardwoods, lowland hardwoods, northern hardwoods, walnut, oak, Norway pine and white pine cover types. This age class distribution was derived from FIM updates completed in 2013.

**Chart 4.2 Ash in Acres by Age Class**



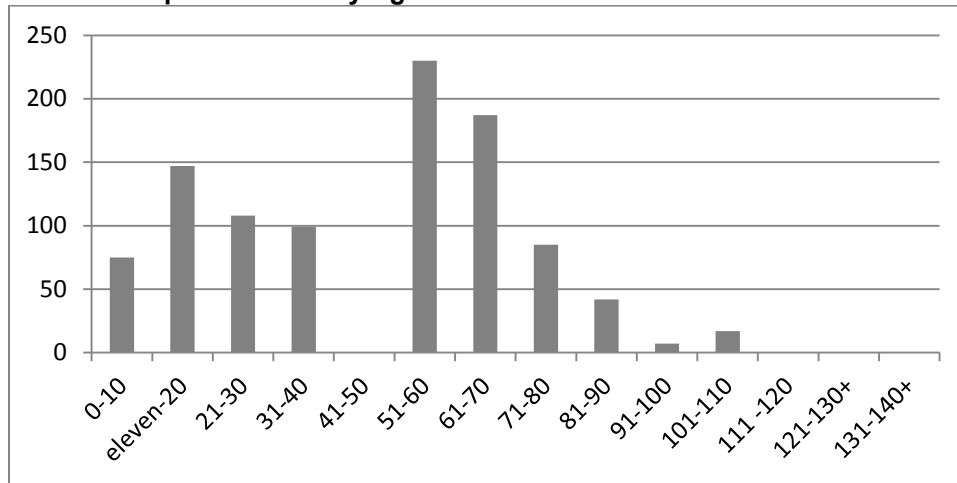
Source: FIM 2012

**Chart 4.3 Lowland Hardwoods in Acres by Age Class**



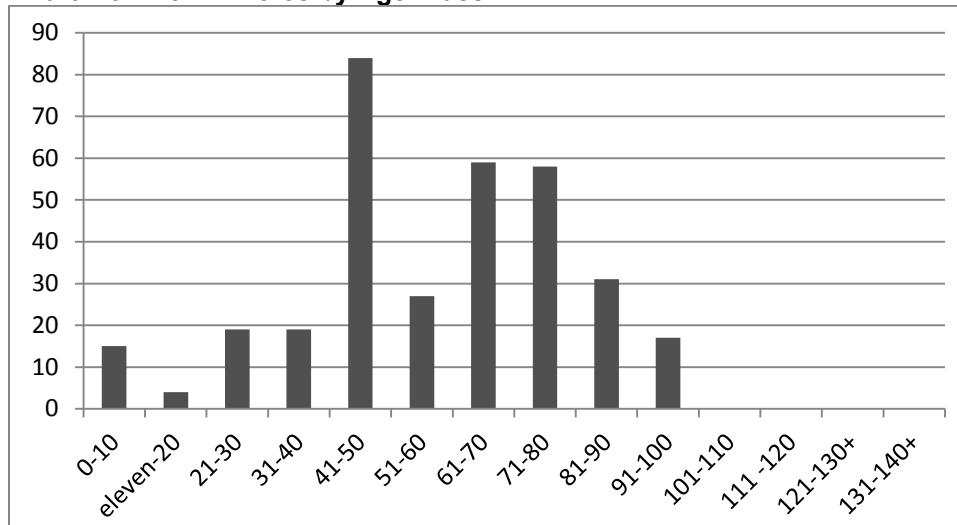
Source: FIM 2012

**Chart 4.4 Aspen in Acres by Age Class**



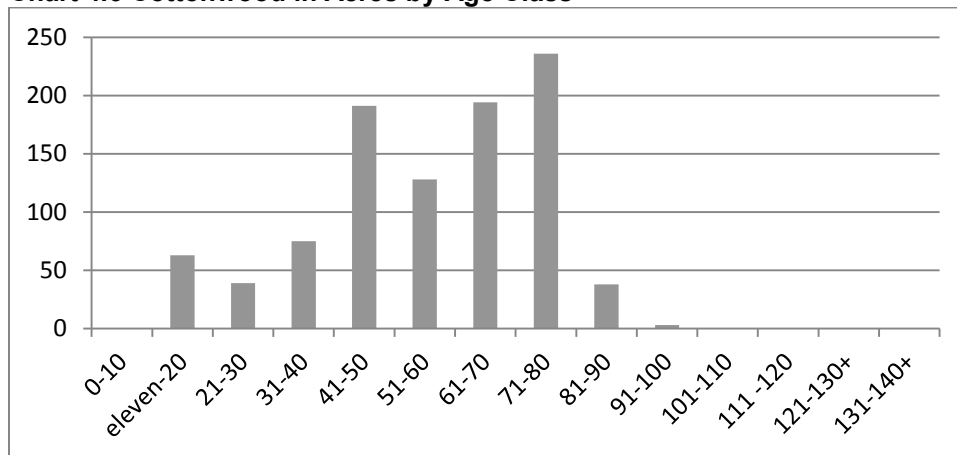
Source: FIM 2012

**Chart 4.5 Birch in Acres by Age Class**



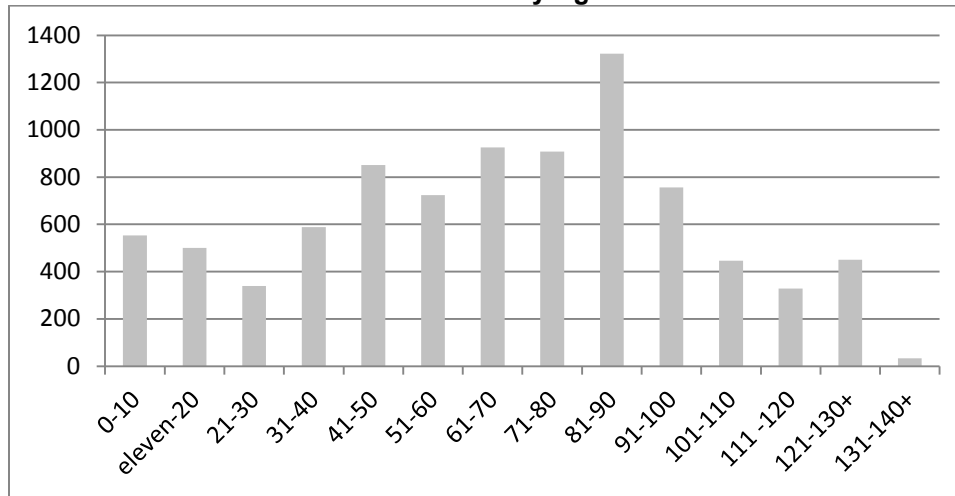
Source: FIM 2012

**Chart 4.6 Cottonwood in Acres by Age Class**



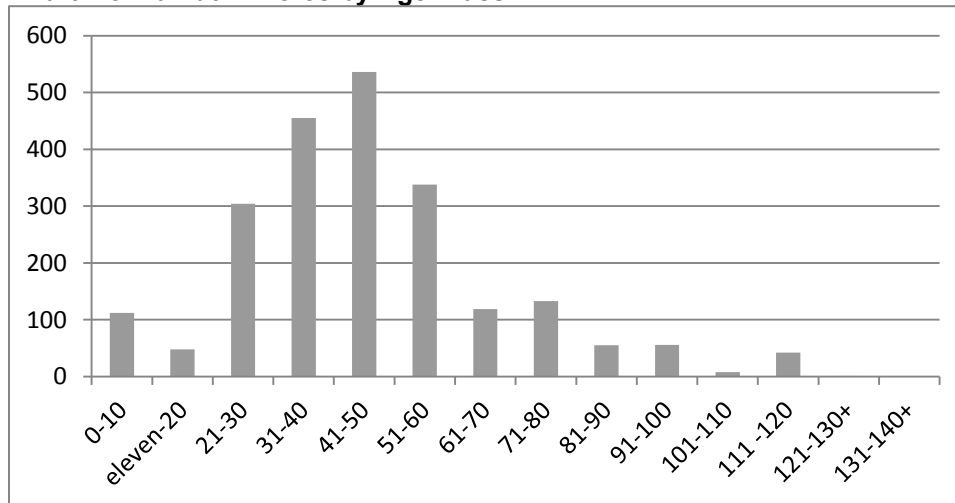
Source: FIM 2012

**Chart 4.7 Northern Hardwoods in Acres by Age Class**



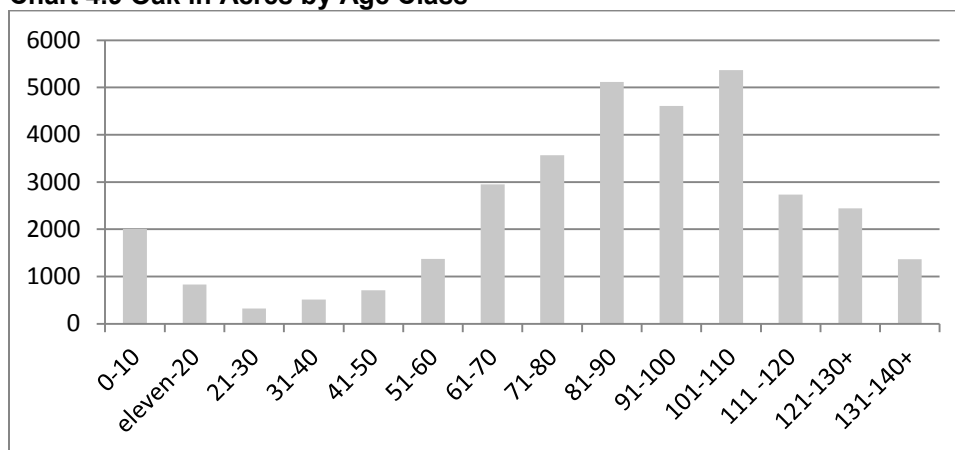
Source: FIM 2012

**Chart 4.8 Walnut in Acres by Age Class**



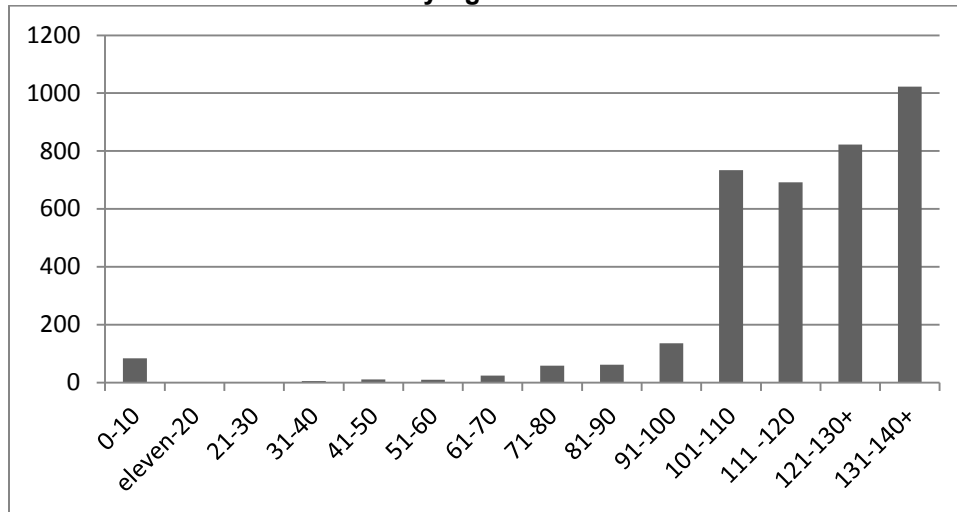
Source: FIM 2012

**Chart 4.9 Oak in Acres by Age Class**



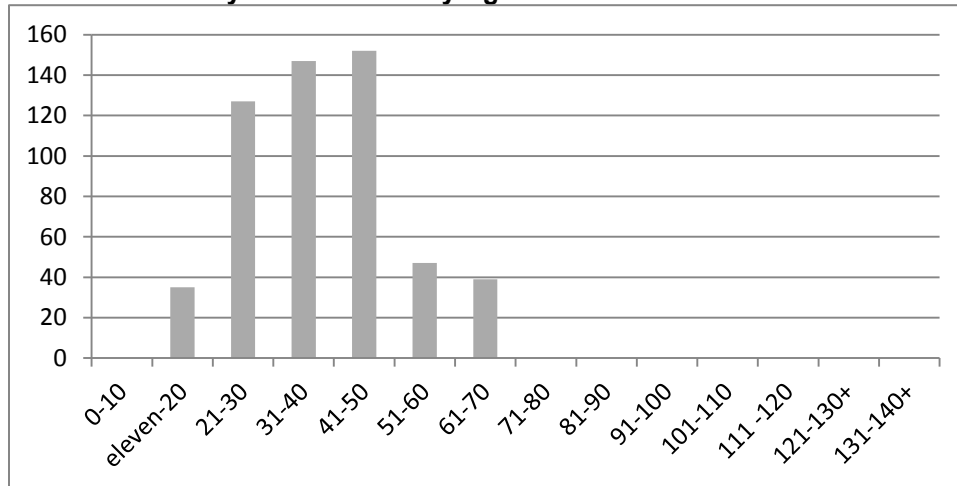
Source: FIM 2012

**Chart 4.10 Offsite Oak in Acres by Age Class**



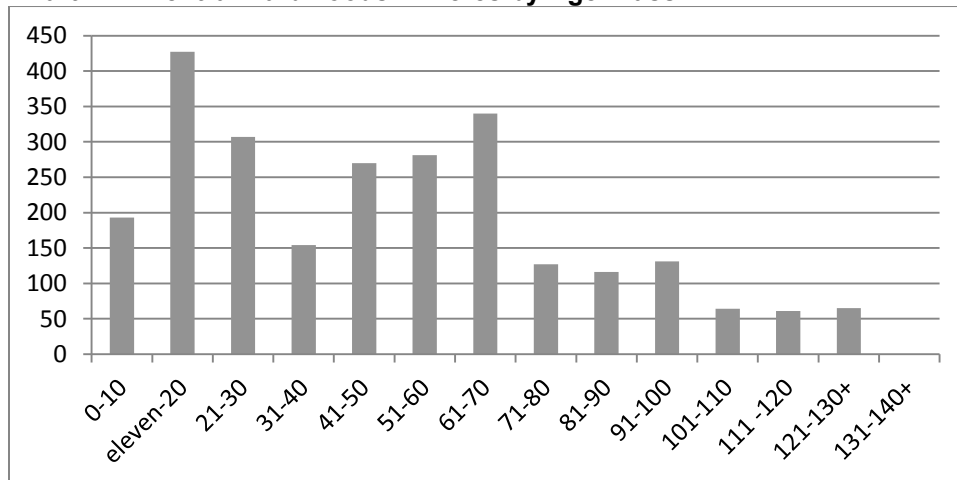
Source: FIM 2012

**Chart 4.11 Norway Pine in Acres by Age Class**



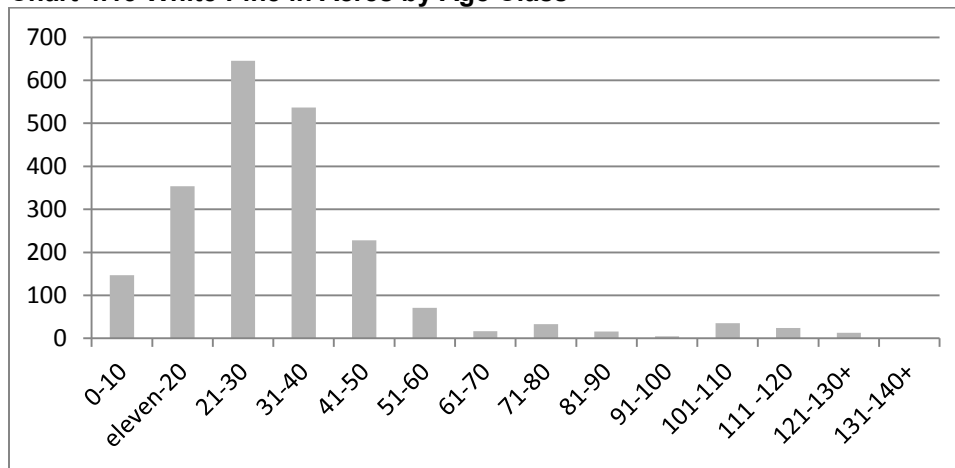
Source: FIM 2012

**Chart 4.12 Central Hardwoods in Acres by Age Class**



Source: FIM 2012

**Chart 4.13 White Pine in Acres by Age Class**



Source: FIM 2012

### 4.3 Old-Growth Forests

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

Old-growth forest represents the latter stages of succession in forested ecosystems. Remaining old-growth forests are important for their scientific and educational values, as well as their aesthetic and spiritual appeal. Old-growth forests provide special habitats for native plants, important habitat features for wildlife, and examples of the maximum limits of individual tree and stand production. Because old-growth ecosystems developed for a long time without large-scale disturbance, the study of plants, animals, soils, and ecosystem processes in old-growth stands provides important insights into the natural function of forest ecosystems. Such insights can be crucial for future forest management and for maintenance of biological diversity.

Old-growth designations are based on the 1994 DNR Old-Growth Guidelines. Designation of old-growth stands in the Blufflands/Rochester Plateau subsection was completed in 2011.

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

DNR old growth designated stands are delineated on Table 4.3. A total of 1,565 acres of old growth are designated in the Blufflands/Rochester Plateau subsections. See Table 4.3 for the total amount of designated old growth acres by forest type.

**Table 4.3 Designated old-growth acres in the Blufflands/Rochester Plateau Subsection**

Forest Type	Designated DNR Old Growth Acres
Lowland Hardwoods	40
Northern Hardwoods	406
Oak	1029
White Pine	58
Central Hardwoods	32
Total	1565

Source: FIM January 2013.

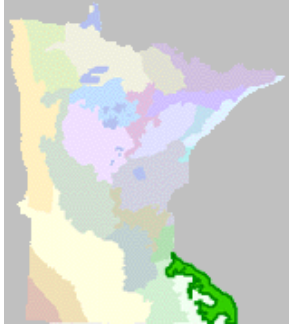
## CHAPTER 5

### Ecological Information

#### 5.1 Ecological Description of the Subsections

The Blufflands and Rochester Plateau subsections are described in the following pages as characterized by landform, bedrock geology, soils, climate, hydrology, presettlement vegetation, present vegetation and land use, natural disturbance, and conservation concerns.

##### Blufflands Subsection



The west boundary is complex, following major river valleys. Loess cover thins to the west). The northern boundary marks the northern extent of loess deposits. There is also small outwash plain that marks the northern boundary. This unit consists of an old plateau covered by loess (windblown silt) and then extensively eroded along rivers and streams. It is characterized by highly dissected landscapes associated with major rivers in southeastern Minnesota. Bluffs and deep stream valleys (500 to 600 feet deep) are common. River bottom forests grew along major streams and rivers.

##### *Landform*

The area is a loess-capped plateau, deeply dissected by river valleys. The greatest amount of relief occurs along the Mississippi River, where relief is up to 600 ft. In the east, loess lies directly on bedrock. In the southeast, loess overlies red clayey residuum that was formed directly from limestone and/or sandstone. Paleozoic sedimentary rocks crop out in valley walls, but are generally mantled with colluvium or loess. Topography is controlled by underlying glacial till along the western edge of the subsection, where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled (Dept. of Soil Science, Univ. of Minnesota 1973). Sinkholes are common in the southwestern portion of the subsection.

##### *Bedrock geology*

Depth of drift over bedrock varies from 0 to 50 feet. Bedrock is exposed in river and stream valleys. In general, sediment thickness varies by landscape position. Large exposures of bedrock occur in the steep ravines. These exposures are primarily Ordovician dolomite, limestone, and sandstone with Cambrian sandstone, shale, and dolomite. Devonian dolomite and limestone are more locally exposed along the western edge of the subsection.

##### *Soils*

Loess thickness is variable: loess deposits are as thick as 30 feet on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains of major rivers (Cummins and Grigal 1981). Cambrian siltstones, sandstones, and shales influence soil properties.

##### *Climate*

The subsection has a continental climate. Annual normal precipitation ranges from 29 inches in the western portion to 34 inches in the southeast (Midwest Climate Center 1992). Growing season precipitation ranges roughly from 11 to 16 inches and growing season length ranges from 136 to 156 days.

##### *Hydrology*

There are no lakes in this subsection. The drainage network is well developed and dendritic in nature. Major rivers include the Mississippi (which forms the eastern boundary), Root, Whitewater, Zumbro, and Canon. There are numerous coldwater trout streams throughout the subsection.

##### *Pre-settlement vegetation*

Tallgrass prairie and bur oak savanna were major vegetation types on ridge tops and dry upper slopes. Red oak-white oak-shagbark hickory-basswood grew on moister slopes, and red oak-basswood-black walnut forests in protected valleys. Prairie was restricted primarily to the broader ridge tops, where fires could carry, but also occurred on steep slopes with south or southwest aspect.

#### *Present vegetation and land use*

About 30 percent of this subsection is cropped, 20 percent is in pasture and 50 percent is in woodland (Dept. of Soil Science, Univ. of Minnesota 1973). In Minnesota, Wheeler et al. (1985) found species characteristic of oak openings and barrens to be abundant (based on herbarium collections). People are finding good recreational opportunities in this subsection.

#### *Natural disturbance*

Fire was important on the upland prairie and oak dominated ecosystems. Recent records of tornados and ice storms indicate that they locally impacted forest vegetation.

#### *Conservation Concerns*

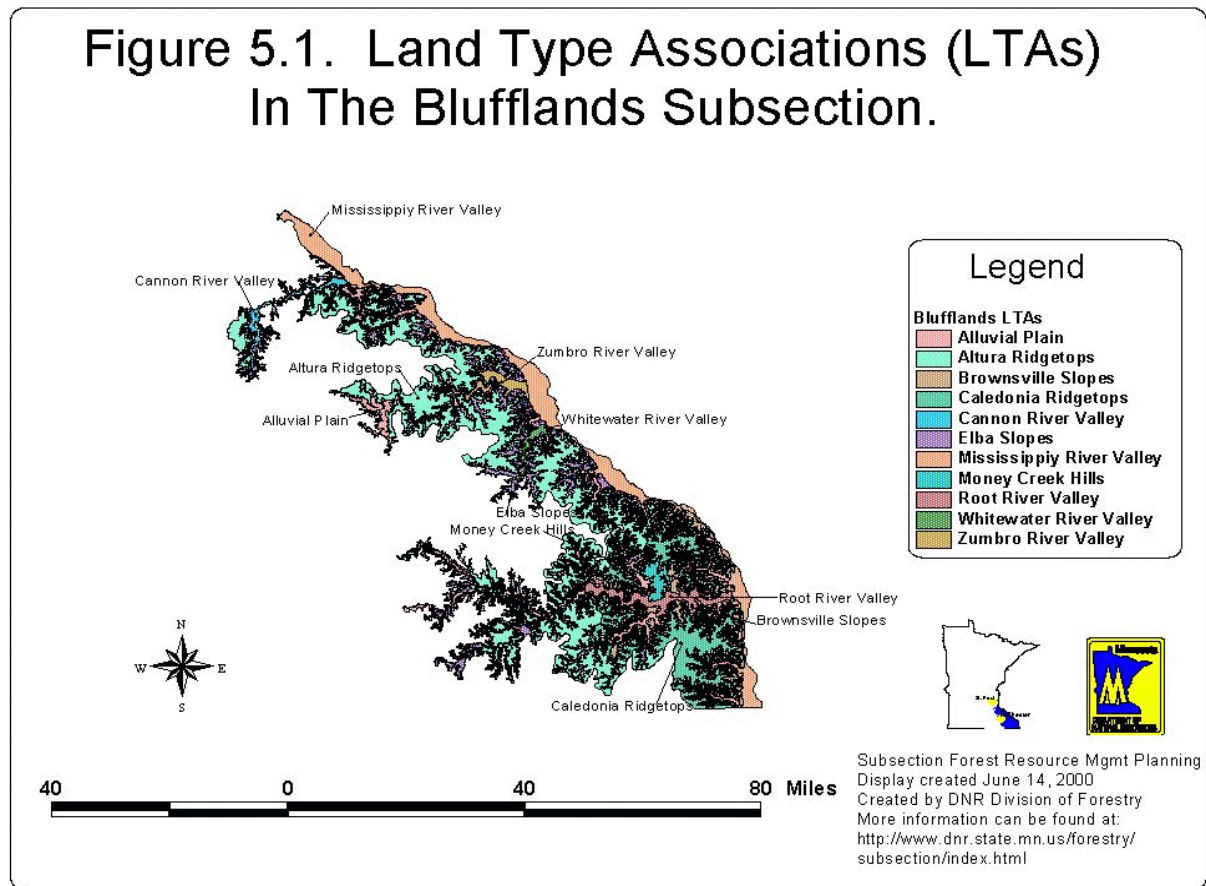
A major concern is groundwater quality. The groundwater has high amounts of nitrates and phosphates. These pollutants are mainly the result of agricultural activities. There are numerous high quality coldwater trout streams in the subsection. Many individuals are working to make sure that their quality is not degraded. Control of soil erosion is another conservation concern.

## **5.2 Land Type Associations (LTAs) of the Blufflands Subsection**

Below are maps and explanations of LTAs specific to the Blufflands/Rochester Plateau subsections. While the subsection level of the ECS provides the basic geographic units of delineation for the SFRMP process, the LTA level classification may be useful in differentiating management direction within a subsection where it makes sense for specific purposes.



**Figure 5.1 LTAs in the Blufflands Subsections**



Color maps may be viewed as PDF files on the *Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP)* Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

### **5.3 Land Type Association (LTA) Descriptions for the Blufflands Subsection 222Lc**

A landscape characterized by narrow ridges, steep slopes, and valleys. These are the remnants of a vast ancient ocean floor that began to form up to 600 million years ago. When the oceans receded the sediment was cemented and compressed into rock. About 435 million years ago the ocean bottom was uplifted leaving a broad nearly level plain that has been carved by millions of years of stream erosion. Stream erosion during the last ice age completely removed the upper layers of bedrock exposing older bedrock known as the Prairie du Chien surface throughout most of the subsection.

The boundary with the Rochester Plateau subsection is based on several characteristics. In Houston, Fillmore and Winona Counties the boundary is based on areas dominated by prairie communities (Rochester Plateau) versus forest communities (Blufflands) as delineated by Marschner. This boundary also roughly corresponds to a boundary between soils that formed under prairies communities versus soils formed under forested communities. In the remaining portions the boundary is defined using the lower edge or base of the first major escarpment which corresponds with the exposure of the St. Peter Sandstone bedrock. Where major rivers have eroded through this escarpment back into the plateau, the boundary follows the top of the valley.

The land type associations (LTAs) in the Blufflands subsection are relatively simple in concept; valleys, steep slopes, and ridge tops. This topographic model is also directly related to significant

differences in soil materials, historic and modern plant communities, and land use patterns. Though simple in concept, the map units are very complex because of the fine scale which the units are intertwined on the land.

There are two groups of LTAs that are separated based on differences in landscape characteristics related to the effects of the erosion. In the extreme southern part of the subsection (LTAs Lc02 and Lc03 - primarily in Houston county), the streams have cut much more deeply and extensively into the landscape. Main ridges are generally .7 to 2.0 miles wide and secondary ridges are .1 to .3 miles wide. Slopes are smooth with gradual transitions from ridge-top to sides to foot slopes. In contrast, LTAs Lc10, Lc11 that occur in northern portion of the subsection (Goodhue, Wabasha, Winona counties) stream erosion is not as deeply incised as in the south. Main ridges are 1.0 to 2.5 miles wide and secondary ridges are .2 to .6 miles wide. Changes in slope gradients are generally more abrupt, gently rolling on ridge-tops abruptly changing to steep side slopes to foot slopes. Bedrock outcrops are more common.

#### ***Lc01 Alluvial Plains***

A landscape dominated by flood plains and terraces of smaller streams and the narrow upper reaches of the larger rivers. The valleys are typically "v" shaped in cross section. This unit is mapped throughout the subsection.

The terrain is level to nearly level. Soils are typically wet silty to sandy material that often flood in the early spring. Common soil series include: Arenzville, Chaseburg, Colo, Comfrey, Genesee, Huntzville, Kegonsa, Kennebec, Lawson, Newalbin, Radford, and Rawles.

Terraces rise 25 to 80 feet in elevation above the flood plains. Side slopes are short and steep while tops are level. Terraces typically have silty soil material. Common soil series include: Bertrand, Billet, Festina, Littleton, Medary, Plainfield, Terraces, Timula, Walford, and Zwingle.

Presettlement vegetation was predominantly forest communities. Today, these areas are used primarily for row crops, forage crops, and pasture. Forest communities occasionally occur on steep side slopes of terraces.

#### ***Lc02 Brownsville Slopes***

A landscape characterized by steep hill sides and gullies carved through the Prairie du Chien bedrock surface and into the underlying bedrock strata by stream erosion. Slopes are 300 to 600 feet in length with slope gradients of 20% to 70%. The surface drainage network is more extensive and gullies are more deeply eroded than adjacent LTAs. A thin blanket of wind-blown silt covers clayey and loamy sediment containing very high amount of rocks. The slopes are underlain with bedrock rubble. Soil series mapped in this LTA include: Brodale, Dorerton, Dunbarton, Elbaville, Lacrescent, Lamoile, and Seaton.

Presettlement vegetation was predominantly forest communities on the mesic (north and east) aspects and prairie communities on the dry (south and west) aspects. These communities, though altered by human land use, continue to dominate the LTA. The extreme upper and lower slopes are commonly used for pasture.

#### ***Lc03 Caledonia Ridge Tops***

A landscape dominated by rolling ridge tops that are generally 1/8 to 1/2 miles wide. Slopes are long and smooth with gradients of 3% to 20%. Gullies and ravines are very common. These ridges occur on the surface of the Prairie du Chien bedrock formation. Soils are formed in thick blanket of wind-blown silt and underlying loamy and clayey erosional sediment. Soil series that occur in this LTA include: Blackhammer, NewGarlus, Nodine, Rollingstone, Seaton, and Southridge.

Presettlement vegetation varied from forest to savanna communities. Currently, the majority of the LTA is row crops, forage crops, and pasture.

#### ***Lc04 Root River Valley***

A landscape dominated by flood plains and terraces in the Root River valley from the confluence with the Mississippi River to near the town of Rushford. The valley is broad and "U" shaped in cross section. The flood plain and terraces are dissected by creeks into irregular shaped tracts.

Flood plains have level to nearly level terrain. They typically have wet silty to sandy soil material that occasionally flood in the spring. Common soil series include: Abscota, Becker, Chaseburg, Colo, Comfrey, Kennebec, Minneiska, Moundprairie, and Rawles.

Terraces rise 60 to 80 feet in elevation above the flood plains. Side slopes are short and steep and tops are level. Terraces typically have sandy soil material. Common soil series include: Bertrand, Billet, Festina, Lindstrom, Plainfield, Richwood, and Timula.

Presettlement vegetation was predominantly forest and prairie communities. Today, these areas are used primarily for row crops, forage crops, pasture, and residences. Forest communities occasionally occur on steep side slopes of terraces

#### **Lc05 White Water River Valley**

A landscape dominated by flood plains and terraces in the White Water River valley from the confluence with the Mississippi River to near the town of Elba. The valley is broad and "U" shaped in cross section. The flood plain and terraces are dissected by creeks into irregular shaped tracts.

Flood plains have level to nearly level terrain. They typically have wet silty to sandy soil material. Common soil series include: Abscota variant, Beavercreek, Becker, Chaseburg, Minneiska, Newalbin, Plainfield, and Shiloh.

Terraces rise 60 to 80 feet in elevation above the flood plains. Slopes are short and steep on the sides and level on the tops. Terraces typically have sandy soil material. Common soil series include: Billet, Festina, Plainfield, and Waukee.

Presettlement vegetation was predominantly bottomland or flood plain forest and prairie communities (terraces). Today, these areas are used primarily for row crops, forage crops, pasture, and residences. Forest communities occasionally occur on steep side slopes of terraces

#### **Lc06 Zumbro River Valley**

A landscape dominated by flood plains and terraces in the Zumbro River valley from the confluence with the Mississippi River to near the town of Theilman. The valley is broad and "U" shaped in cross section.

Flood plains have level to nearly level terrain. They typically have poorly drained to moderately well drained silty and sandy soil material. Flooding often occurs in the spring. Common soil series include: Alluvial, Arenzville, Colo, Genesee, Huntsville, Minneiska, Riverwash, and Zumbro.

Terraces rise 20 to 80 feet in elevation above the flood plains. Slopes are short and steep on the sides and level on the tops. Terraces typically have sandy soil material. Common soil series include: Bixby, Burkhardt, Plainfield, Sparta, Tell, Terrace, and Waukegan.

Presettlement vegetation was predominantly flood plain forest communities on the bottomlands and prairie communities on terraces. Today, drier areas are used primarily for row crops, forage crops, and pasture.

#### **Lc07 Cannon River Valley**

A landscape dominated by the flood plains and terraces in the Cannon River valley from the confluence with the Mississippi River to west of Aspelund. The valley is a broad "U" shape in cross section. The flood plain and terraces are dissected by creeks into irregular shaped tracts.

Flood plains have level to nearly level terrain. They typically have wet silty to sandy soil material that occasionally flood in the spring. Common soil series include: Ankeny, Bremer, Lawson, Marsch, Radford, and Zumbro.

Terraces rise 10 to 20 feet in elevation above the flood plains. Slopes are short and steep (6% to 12% gradients) on the sides and level on the tops. Terraces typically have sand and gravel soil material. Common soil series include: Billett, Burkhardt, Dickinson, Esterville, Fairhaven, and Plainfield.

Presettlement vegetation was predominantly flood plain forest and prairie communities. Today, these areas are used primarily for row crops, forage crops, pasture, and residences. Forest communities occasionally occur on steep side slopes of terraces

#### ***Lc08 Mississippi River Valley***

A landscape dominated by the flood plains, dunes, terraces, and benches in the Mississippi River valley from the confluence with the St. Croix River to the Iowa border. The flood plain has level to nearly level terrain. Wetlands are common. Flooding is common. Soil material is typically silty but commonly ranges from clayey to sandy. Common soil series include: Alluvial, Beaver Creek, Bremer, Comfrey, Genesee, Huntsville, McPaul, Minneiska, Minnewaska, Newalbin, Riverwash, Shiloh, and Zumbro.

Terraces or benches rise 10 to 50 feet in elevation above the flood plains. Slopes are short and steep (6% to 25% gradients) on the sides and level on the tops. Terraces typically have sandy and/or gravelly soil material. Common soil series include: Billett, Burkhardt, Festina, Kegonsa, Lamont, Lilah, Plainfield, Salida, Sparta, Tell, and Waukee.

Presettlement vegetation was predominantly bottomland or flood plain forest and prairie communities. Today, the terraces and drier portions of the flood plain are used primarily for row crops, forage crops, pasture, and residences. Forest communities occur in areas that flood regularly.

#### ***Lc09 Money Creek Hills***

A landscape characterized by very narrow ridges and steep slopes on Franconia sandstone bedrock. This LTA is more highly dissected by streams and has longer foot slopes than adjacent LTAs. Slope gradients are typically 12% to 45% but range to 70% in some areas. A thick blanket of wind-blown silt covers loamy sediment containing a very large amount of rocks. Soil series mapped in this LTA include: Boone, Brodale, Council, Elbaville, Lacrescent, Nodine, Norden, and Rollingstone.

Presettlement vegetation was predominantly forest communities on the mesic (north and east) aspects or oak savanna and prairie communities on the dry (south and west) aspects. These communities, though altered by human land use, are still common on the steep slopes. The narrow ridge tops and lower slopes are commonly used for pasture and forage crops.

#### ***Lc10 Altura Ridge Tops***

A landscape characterized by broad nearly level to rolling ridge tops that are dissected by ravines. Main ridges are 1.0 to 2.5 miles wide and secondary ridges are .2 to .6 miles wide. Slope gradients are 1% to 15%. The transition between the gently rolling on ridge-tops and the steep side slopes is generally more abrupt. Bedrock outcrops are more common. These ridges occur on the surface of the Oneota Dolomite bedrock formation. Scattered sinkholes are present.

Soils are formed in thick blanket of wind-blown silt and underlying clayey residuum or bedrock. The silt blanket is deeper in Goodhue County and thinnest in Winona County. Soil series that occur in this LTA include: Blackhammer, Byron, Dubuque, Fayette, Mt. Carroll, NewGarlus, Palsgrove, Port Racine, Seaton, and Timula.

Presettlement vegetation varied from prairie to oak savanna communities. Currently, the majority of the LTA is row crops, forage crops, and pasture.

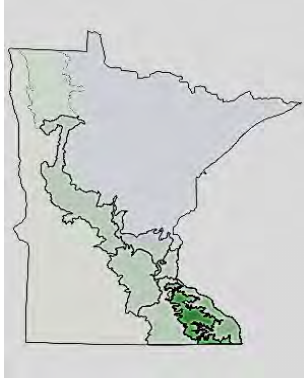
#### ***Lc11 Elba Slopes***

A landscape characterized by steep hill sides and gullies with slope gradients of 20% to 70%. The transition from ridge top to steep side slope is usually very abrupt. Bedrock outcrops more common than in Lc02.

A thin blanket of wind-blown silt covers clayey and loamy sediment that contains very high amount of rocks and bedrock. Soil series mapped in this LTA include: Brodale, Dorerton, Dubuque, Elbaville, Frontenac, Lacrescent, Lamoile, Marlean, Seaton, Sogn, Whalan, and Racine.

Presettlement vegetation was predominantly forest communities on the mesic (north and east) and prairie communities on the dry (south and west) facing ridges. These communities, though altered by human land use, continue to dominate the LTA. Foot slopes at the base of the steep valley walls are commonly used for pasture.

#### 5.4 Land Type Associations of the ROCHESTER PLATEAU



The west boundary consists of a series of Des Moines age end moraines (Bemis Moraine). The eastern boundary with The Blufflands is a transition between a level to rolling plateau and dissected landscapes. Another gradient is the depth of wind-blown silts (loess). It grades from thinner deposits in this subsection to much thicker deposits in The Blufflands. The northern boundary marks the northern extent of loess deposits. There is also small outwash plain that marks the northern boundary. This unit consists of an old plateau covered by loess (windblown silt) along the eastern border and pre-Wisconsin age glacial till in the central and western parts. The western portion is a gently rolling glacial till plain that is covered by loess in places.

##### *Landform*

This subsection consists of level to gently rolling older till plains. Topography is controlled by underlying glacial till along the western edge of the subsection, where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled (Dept. of Soil Science, Univ. of Minnesota 1973). Sinkholes are common in the southwestern portion of the subsection.

##### *Bedrock Geology*

Depth of drift over bedrock varies from 100 to 200 feet in the west to 10-100 feet in the east. Bedrock exposures are common. In general, sediment thickness varies by landscape position. Large exposures of bedrock occur in the steep ravines. These exposures are primarily Ordovician dolomite, limestone, and sandstone with Cambrian sandstone, shale, and dolomite exposed along the valley walls of the Mississippi River (Morey 1981, Sims et al. 1966). Devonian dolomite and limestone are more locally exposed along the western edge of the subsection.

##### *Soils*

Loess thickness is variable: loess deposits are as thick as 30 feet on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains of major rivers (Cummins and Grigal 1981). Cambrian siltstones, sandstones, and shales influence soil properties.

##### *Climate*

This subsection has a continental climate. Annual normal precipitation ranges from 29 inches in the western portion to 34 inches in the southeast (Midwest Climate Center 1992). Growing season precipitation ranges roughly from 11 to 16 inches and growing season length ranges from 136 to 156 days.

##### *Hydrology*

There are few lakes in this subsection. The drainage network is well developed and dendritic in nature. Major rivers include the headwaters of the Root, Whitewater, Zumbro, and Canon. There are some coldwater trout streams in the eastern part of this subsection.

### *Presettlement Vegetation*

Tallgrass prairie and bur oak savanna were major vegetation communities.

### *Present Vegetation and Land Use*

The majority of this unit is heavily farmed, with approximately 80% in crops, 10% in pasture, and 5-10% in woodland. (Dept. of Soil Science, Univ. of Minnesota 1973). In Minnesota, Wheeler et al. (1985) found species characteristic of oak openings and barrens to be abundant (based on herbarium collections)

### *Natural Disturbance*

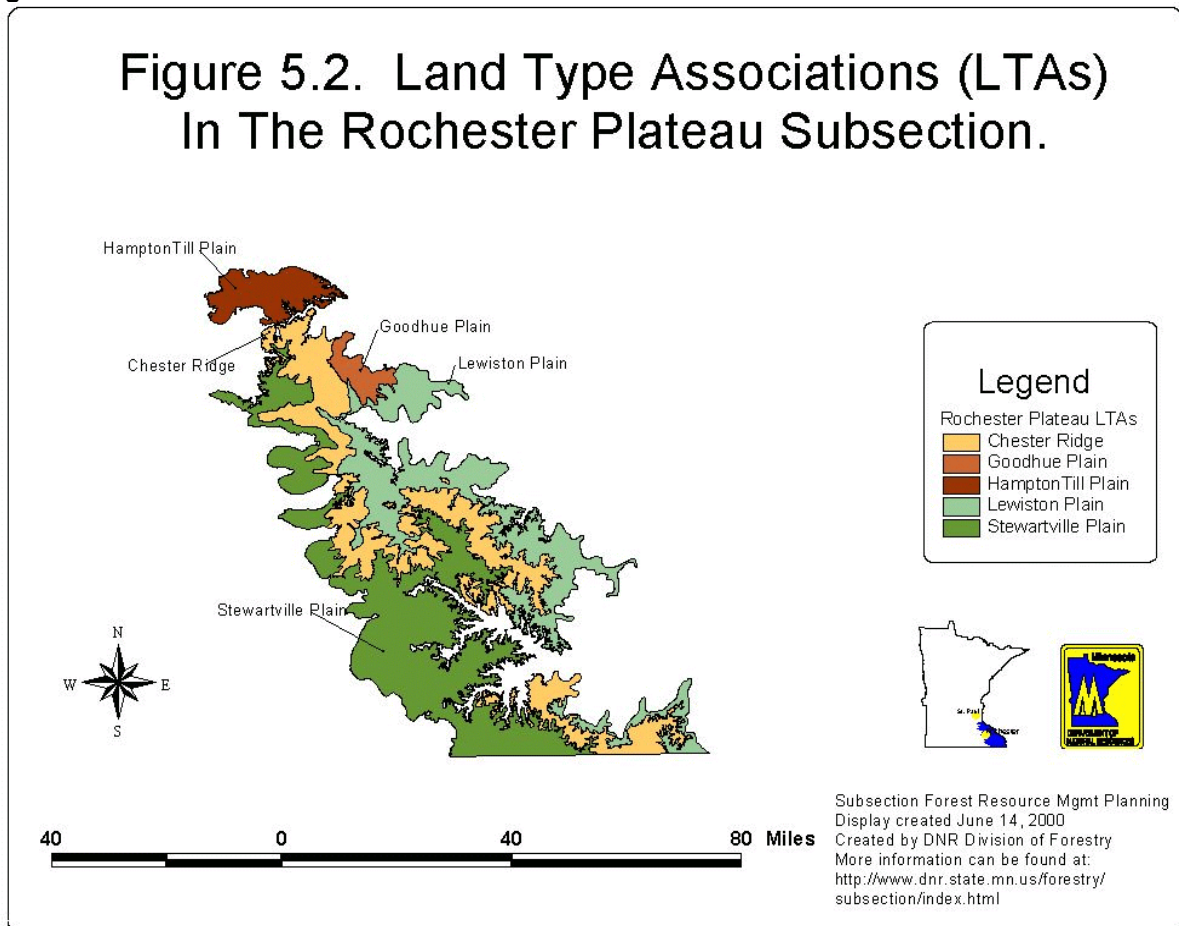
Fire was important on the upland prairie and oak savannah dominated ecosystems. Recent records of tornados and ice storms indicate that they locally impacted forest vegetation.

### *Conservation Concerns*

One major concern is groundwater quality. The groundwater has high amounts of nitrates and phosphates. These pollutants are mainly the result of agricultural activities. Another concern is the loss of red oak cover type through cutting and lack of reproduction.

Figure 5.2 identifies the Land Type Associations found in the Rochester Plateau subsection.

**Figure 5.2 LTAs in the Rochester Plateau Subsection**



Color maps may be viewed as PDF files on the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) Web site at: [www.dnr.state.mn.us/forestry/subsection/blufflands/index.html](http://www.dnr.state.mn.us/forestry/subsection/blufflands/index.html).

### ***Lf01 Chester Ridge***

A landscape characterized by rolling upland ridge features dominated by St. Peter sandstone, Decorah shale, and Galena limestone. Springs and algific talus slopes are common. The predominant historic vegetation was oak savanna. Loess soils are found shallow down to bedrock along the bluff edge, in the interior deeper soils are found underlain by shale (fingers or narrow ridges) and galena limestone.

### ***Lf02 Goodhue Plain***

A landscape characterized by level to gently rolling uplands with deep silts (mollisols and mollic intergrades) underlain by Prairie Du Chien bedrock type. This LTA is generally not dissected by streams. Scattered sink holes are common. Historic vegetation was predominantly prairie. This LTA is adjacent to Lf01 but is found at a lower elevation in the landscape.

### ***Lf03 Hampton Till Plain***

This landscape is described as an upland sinkhole plain underlain by Galena limestone bedrock. Sink holes are abundant (highest density of sinkholes per square mile of all LTAs). It is adjacent to the escarpment which is a highly visible feature of the plateau. Predominant historic vegetation was a complex of prairie and oak savanna. Soils are predominantly formed in loess.

### ***Lf04 Lewiston Plain***

This landscape is characterized as a gently rolling upland with five to ten feet of silty loam over Cretaceous shale. Typical original vegetation was made up of mollic intergrades (oak savannah or prairie vegetation). Clay found here was used to make Red Wing pottery.

### ***Lf05 Stewartville Plain Description***

This landscape is described as gently rolling to hilly, with some short steep bluffs and includes a thin loess over glacial till. The loess present is coarser than that found in the LTA to the south. Original Vegetation was oak savannah and prairie, possibly with some big woods cover types. This LTA is located at the northern end of the so-called driftless area. Some bedrock knobs are found, underlain by the Galena formation.

## **5.5 Native Plant Communities**

Native plant communities are defined as groups of native plants and animals that interact with each other and their abiotic environment in ways not greatly altered by modern human activity or by introduced organisms. They are classified by considering vegetation, topography, hydrology, landforms, substrates, soils, and natural disturbance regimes.

Two programs in the DNR's Division of Ecological Services are responsible for classifying and describing native plant communities in Minnesota. The Natural Heritage and Nongame Research Program (NHNRP) maintains the Natural Heritage Information System, an extensive database that includes, among other things, data on native plant communities and rare plant and animal species. The Minnesota County Biological Survey (MCBS) has completed a systematic county by county survey of native plant communities and rare species in the state. This is accomplished using existing inventories, air photos, satellite imagery, and field surveys. Native plant communities and rare species occurrences are grouped into MCBS sites, and information on these sites is entered into the Natural Heritage Information System. DNR staff use native plant communities and rare species information to make considerations for MCBS sites adjacent to and underlying forest stands proposed for treatment.

### **Native plant community nomenclature and hierarchy**

**Class** -- Classes are identifiable from aerial photographs and sometimes from satellite imagery. The features used to define native plant community classes are:

1. the water regime, including the source and chemistry of water and its seasonal availability to plants;
2. the physiognomy of the vegetation, particularly the distribution, height, and cover of woody plants;

3. the life form of the dominant cover species; and,
4. landforms and associated soils

Unlike individual rare and endangered species, no legal protections are in place to manage native plant communities.

Class names are not used in forming the names of the native plant communities (but they are used by MCBS ecologists as map-unit designators when identification to type is not possible.)

e.g. **Wet meadow/fen**

**Type** -- Native plant community types are designed to meet needs for conservation planning, quantitative vegetation analysis, and expressing patterns of vegetation at a local (county) scale. Many native plant community types can be identified from aerial photographs or a combination of aerial photographs, topographic maps, and soils maps. Others can be identified reliably only in the field. Native plant community types are defined primarily by their dominant cover-forming plant species.

Type names form the root of native plant community names.

e.g., **Wet Prairie**

**Subtype** -- Subtypes describe variability within a native plant community type that is evident from multivariate analyses of plot samples or that is obviously related to successional stage or to environmental features such as soil type or water chemistry.

Subtypes are appended to the native plant community type names.

e.g., **Wet Prairie Seepage Subtype**

**Table 5.1 Native Plant Communities in the Blufflands/Rochester Plateau**

Class	Type	Subtype	Total Acres in BRP subsections
Deciduous Forest	Oak Forest		4,740
		Dry	5,560
		Mesic	40,820
	Northern Hardwood Forest		2,470
	Maple-Basswood Forest		6,090
	Lowland Hardwood Forest		3,370
Coniferous Forest	Upland White Cedar Forest		30
Mixed Coniferous-Deciduous Forest	White Pine-Hardwood Forest		1,000
		Dry	130
		Mesic	280
	Northern Hardwood-Conifer Forest		30
Deciduous Woodland	Oak Woodland-Brushland		4,760
Deciduous Savanna	Mesic Oak Savanna		20
	Dry Oak Savanna		30



		Barrens	1,460
		Hill	
		Sand-Gravel	180
Coniferous Savanna	Jack Pine Barrens		100
Upland Prairie	Mesic Prairie		320
	Dry Prairie	Barrens	1,110
		Bedrock Bluff	4,850
		Hill	
		Sand-Gravel	100
Floodplain Forest	Floodplain Forest		6,320
		Silver Maple	6,540
		Swamp White Oak	2,140
Hardwood Swamp Forest	Black Ash Swamp		<10
		Seepage	29
	Mixed Hardwood Swamp	Seepage	60
Shrub Swamp	Shrub Swamp		340
		Seepage	80
	Willow Swamp		
Emergent Marsh	Cattail Marsh		20
	Emergent Marsh		
	Mixed Emergent Marsh		4,020
Wet Meadow/Fen	Wet Prairie		10
	Calcareous Seepage Fen		50
	Wet Meadow		320
	Seepage Meadow		710
Primary Community	Moist Cliff		500
		Moderate	80
	Dry Cliff		1,590
	Talus Slope		40
		Algific	125
	River Beach		130
Meadow-Marsh-Swamp Complex			1,450

## 5.5 Wildlife and Forestry Areas of Unique Resources and Values

In the original *BRP SFRMP*, special management sites were identified and named as High Biodiversity Sites. There are thirteen such sites in the BRP subsections. Since the original SFRMP process, forest certification guidelines have resulted in the development of several other special management designations. These special management designations include High Conservation Value Forests (HCVFs), Representative Sample Areas (RSAs), Global 1 (G1) and Global 2 (G2). Special management designations will also include designated Old Growth (OG). In many cases the previously identified HiBio sites will fall into the HCVF status. In these cases, the HiBio plan will serve as a guidance document for management of these sites. In situations where RSAs occur in previously identified HiBio plans, the RSA plan will take precedent since the RSA designation has more recent management guidelines. For sites with either an RSA or a HiBio plan providing management direction, site managers may proceed with habitat management without a joint site visit between DNR divisions. For HCVF sites without a HiBio or RSA plan, a multi-discipline coordination meeting will occur to determine agreed upon management direction.

The HiBio plans prepared to date will be appended to the *BRP SFRMP* as the more detailed vegetation management directions and will be consulted as stand decisions are made within these sites. The resource values of these sites will continue to be managed as or HCVF, RSAs, G1G2 or OG. The *BRP SFRMP* will identify specific *Strategies* that consider and manage the resource values of these sites. Those acres within HiBio Sites that do not become HCVF, RSAs, G1G2 or OG will continue to be reflected in the appended the high biodiversity area plans as a method to ensure areas adjacent to HCVF, RSAs, G1G2 or OG are taken into consideration. Following completion of designation of HCVF, RSAs and G1G2 these areas will be imported into the *BRP SFRMP* dataset. Identified below are the thirteen high biodiversity sites and a discussion of the unique values found within these sites. As stated above, where appropriate, acres within these sites that are designated HCVF, RSAs, G1G2 or OG will be so identified and specifically managed consistent with department directives and the *Strategies* contained in the *BRP SFRMP*.

Identified below are the high biodiversity areas as designated in the original *BRP SFRMP*:

### **MONEY CREEK BLUFF—**

Money Creek Bluff is an excellent example of the geologic and ecological features of the Bluffland Subsection of the Paleozoic Plateau. Money Creek Bluff 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 bluffs are surrounded on three sides by the floodplain of the Root River. The rich biological diversity 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 occur within Money Creek Bluff. These communities are continuous across the landscape and include various habitats important to Minnesota's native animals and plants.

Although deciduous forests cover much of the site, there is a complete array of native plant communities ranging from open prairies to closed-canopy forests. These plant communities exist on a variety of soil types and slope positions. 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 very few places where the river meanders in a natural setting. Ecologists identified twenty-four species of rare plants and animals found in several locations throughout Money Creek Bluff. For some species, the number of documented location within Money Creek Bluff represents a significant portion of the total number of known occurrences within the state and several species are found in no other Subsection.

### **PETERSON PRAIRIE—**

Peterson Prairie is a high-quality prairie on a steep, mostly south-facing bluff located in the northeast corner of Fillmore County near the confluence of a small tributary and the Root River. The landscape of Peterson Prairie is characteristic of the Blufflands ECS Subsection. It is a ridge-spur with very steep bluffs facing three directions and a relief of 350 feet. This area is significant due to its prairie openings on the upper and lower slopes where the soil is moist or mesic. Prairies at these slope positions are scarce throughout the Paleozoic Plateau due to their conversion to

agriculture or residences, or the absence of recurring fire that allowed woody plants to dominate the prairies.

Peterson Prairie provides prairie and woodland habitat for six state-listed species. Many of the native plants and animals inhabiting Peterson Prairie are thought to be part of a larger set of prairies within the Root River Watershed. The Peterson Prairies have a rich concentration of native species and are among the best bluff prairies remaining in the Paleozoic Plateau. These bluff prairies provide important microhabitats for plants of the mesic tall-grass prairie whose habitat is nearly gone in Southeast Minnesota.

#### **THE WHITEWATER SAND SAVANNAS—**

The large concentration of rare elements in Whitewater Sand Savannas makes it one of the most significant sites for native biological diversity in Southeast Minnesota. The area is defined by soils of Plainfield Sand on terraces along the Whitewater River, the bluffs above, and the floodplain of the adjacent Whitewater River. The sand was shaped over thousands of years into rolling low dunes and plains that are dissected by tributaries to the Whitewater River. The native plant communities occurring on the terraces include the largest expanse of barrens oak savanna in Southeast Minnesota, the largest jack pine barrens in Southeast Minnesota, two small white pine-hardwood forests, and dry oak forest where succession has led to a closed canopy. Other native plant communities located in this site include bedrock bluff prairie, mesic oak forest, oak woodland-brushland, mesic prairie, wet meadow, and floodplain forest.

Ecologists have documented 14 listed plant species and 17 listed animal species in this site; this includes multiple occurrences of many species. This site encompasses a continuum from upper bluffs to sandy terraces to river floodplain, providing habitat for an unusually large number of animal species that require this variety of habitat types for different portions of their life cycles.

#### **THE SOUTH FORK WHITEWATER RIVER AREA—**

The large concentration of rare natural features in South Fork Whitewater makes it one of the most significant sites for native biological diversity in Southeast Minnesota. This site contains one of the largest expanses of mature high-quality maple-basswood forest in the Paleozoic Plateau. Native plant communities identified on this site include an algific talus slope and three moderate cliffs. These are extremely rare Pleistocene (glacial) relic plant communities and are associated with cold-air fissures on north facing slopes found only in the Paleozoic Plateau.

Other native plant communities identified on this site 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 areas are of high quality and provide a large contiguous expanse of habitat for a variety of rare native species. Ecologists have documented 5 listed animal species and 14 listed plant species in this site; multiple occurrences of many of these species occur here.

#### **THE VERMILLION BOTTOMS AND LOWER CANNON RIVER AREA—**

The Vermillion River Bottoms area encompasses a large stretch of the Vermillion River between Hastings and Red Wing. Most of the site is floodplain along the Vermillion and Mississippi Rivers. The area also includes bluffs on the south side of the river and Prairie Island. The lower Cannon River area includes a long stretch of the Cannon River and the delta where the Cannon and Vermillion rivers meet and enter the Mississippi River. This area is primarily floodplain and includes the bluffs either side of the river. The Vermillion Bottoms and Lower Cannon River area make up one of the three most significant Mississippi River floodplain sites in Southeast Minnesota. This significance is a result of the areas high biological diversity and expanse of native plant communities.

The combination of communities found in this site constitute nearly the full range of Paleozoic Plateau habitats, including upper bluffs, outwash terraces, floodplain, and aquatic habitats. The hydrologic function of these floodplain communities more closely resembles the historical annual fluctuation than most other portions of the Mississippi River. The natural fluctuations result in high habitat and native species diversity. Aquatic communities include the Vermillion, Cannon and Mississippi Rivers, that provide important fish habitat and historically important mussel habitat. 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 savanna. The bluffs support bedrock bluff prairie, dry oak forest, mesic oak forest, maple-basswood forest, and oak woodland-brushland communities. This area is one of the top four sites in the state for rare forest birds. The site provides nesting, migratory, and roosting habitat for five state or federally listed bird species. Recent occurrences of thirteen other listed species have been recorded on this site.

#### **THE PINE-HEMINGWAY CREEK AREA–**

The large assemblage of rare features in Pine-Hemingway Creek makes it one of the most significant sites for native biological diversity in Southeast 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. Three forest stands have been designated old growth and, in addition, extensive areas of lowland hardwood forest and younger high-quality tracts of other forest types link the older stands and provide important rare species habitat.

There are two algific talus slopes and a moderate cliff that provide habitat for a rare, state-listed Pleistocene relic snail species. Five species of rare songbirds occupy portions of the site. Two caves in the site provide bat habitat and are an important winter hibernaculum for a state-listed bat species. There are multiple populations of fifteen state-listed plant species on the site. The site also consists of steep bluffs and floodplains along portion of three designated trout streams.

#### **THE UPPER BEAVER CREEK VALLEY–**

The Upper Beaver Creek Valley area encompasses valley bottom, steep bluffs, and forested ridge-tops along the upper most portion of Beaver Creek. The area is located within the Whitewater State Wildlife Management Area (Whitewater WMA). The Upper Beaver Creek area supports a high-quality and diverse array of native plant communities including maple-basswood forest, lowland hardwood forest, white pine-hardwood forest, oak forest, mesic oak forest, oak woodland-brushland, bedrock bluff prairie, mixed hardwood seepage swamp, seepage meadow, algific talus slope, and dry cliff. The area contains the headwaters of Beaver Creek and is fed by numerous cool groundwater springs and seeps along its upper reaches.

The area supports populations of fifteen state-listed plants and four state-listed animals. The Upper Beaver Creek 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. These areas of statewide significance occur in a large, intact natural landscape.

#### **THE UPPER WEST INDIAN CREEK VALLEY–**

The Upper West Indian Creek Valley area is one of the most biologically significant forested areas in Wabasha County and among similar valleys in Southeast Minnesota is of outstanding biological significance. The area is located along the upper reaches of West Indian Creek. The site supports a high quality and diverse array of forest communities including lowland hardwood forest, maple-basswood forest, mesic oak forest, white pine-hardwood forest, oak woodland, mixed hardwood seepage swamp, and algific talus slope. The area contains important geologic features including moist and dry cliffs and several caves. At least one of the caves present on the site was used by hibernating bats. Small bluff prairies occur atop several of the dry cliffs. The creek is a state-designated trout stream fed by springs and seeps that emerge in the area.

The area supports multiple populations of fifteen state-listed plants and two state-listed bird species. The Upper West Indian Creek valley is of statewide significance due to 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 animals, occurring in a large, intact natural landscape.

#### **THE PARTRIDGE CREEK AREA–**

The Partridge Creek area is one of the top four natural areas in Olmsted County and is an important natural area in Southeast Minnesota because of its large area of high quality forests and high diversity of rare species. The site consists of young to mature forest stands with intact canopies and high species diversity. These stands include areas of maple-basswood, lowland

hardwood, and white pine-hardwood, mesic oak and dry-mesic oak forest. There is one maple-basswood stand that is designated old growth.

The Partridge Creek area contains a high diversity of native plant species found in Southeast Minnesota forests. Several rare plant species and two rare bird species have been documented in the Partridge Creek area. Three of these rare species records are the only locations known in Olmsted County. The Partridge Creek area is significant because of its large continuous forest canopy that provides habitat for numerous bird species that require interior forest conditions in unfragmented forest stands and the high diversity of native plant species that occur in this area.

#### **THE RUSHFORD BLUFFS–**

The Rushford Bluffs area surround the city of Rushford in Fillmore County. This area is in the bottomlands of the Root River at the confluence with Rush Creek. The area supports high-quality occurrences of bedrock bluff prairies, barrens prairie/oak savanna, dry oak forest/woodland, mesic oak forest, and dry cliff. These features are part of one of the most important areas of native biodiversity in the Blufflands Subsection.

The Rushford Bluffs are of statewide significance due to the large, high-quality prairies, savannas, woodlands, and forests that support an important concentration of rare plants and animals. The diversity of Rushford's prairies rivals that of any area in the Blufflands. Ecologists have documented 2 state-listed animal species and 11 state-listed plant species in this site; multiple occurrences of many of these species occur here.

#### **THE SHATTUCK CREEK VALLEY**

The Shattuck Creek Valley area is located nine miles east-southeast of Lanesboro in Fillmore County and includes portions of Shattuck Creek and South Ford Root River which are both designated trout streams fed by springs and seeps. Shattuck Creek Valley supports a diverse array of high-quality native forest communities including white pine-hardwood forest, northern hardwood-conifer forest, algific talus slope, lowland hardwood forest, maple-basswood forest, mesic oak forest, and dry oak forest. This area also contains dry and moist cliffs.

The Shattuck Creek Valley area is of statewide significance due to the large, high-quality, scenic native plant communities, the presence of rare specialized habitats, and for the large concentration of rare plants and animals. The area is among the top areas of native biodiversity in all of southeastern Minnesota. The Shattuck Creek Valley area supports populations of 13 state-listed plant species and 4 state-listed animal species.

#### **THE UPPER DIAMOND CREEK VALLEY**

The Upper Diamond Creek Valley area is located five miles east of Lanesboro in Fillmore County along the upper reaches of Diamond Creek. The Upper Diamond Creek Valley supports a high-quality and diverse array of native forest communities including lowland hardwood forest, maple-basswood forest, mesic oak forest, dry oak forest, and oak woodland-brushland. Dry cliffs and outcrops are common on the bluffs of the area. Diamond Creek is a state designated trout stream fed by springs and seeps.

The Upper Diamond Creek Valley is of statewide significance due to the large, fairly contiguous acreage of native plant communities, the high-quality of these communities, the presence of rare microhabitats, and for the large concentration of rare plants and animals occurring in a large, mostly intact, natural landscape. The Upper Diamond Creek Valley supports populations of 13 state-listed plant species and 3 state-listed animal species; multiple occurrences of many of these species occur here.

#### **THE NORTH FORK WHITEWATER RIVER VALLEY–**

The North Fork Whitewater River area is located in the Whitewater Wildlife Management area and includes the largest and most significant natural area in Olmsted County and is an important natural area in Southeast Minnesota. The North Fork Whitewater River area contains a complete spectrum of native plant communities typical of dolomite-lined valleys. These communities include high quality examples of multiple moderate cliffs, algific talus slopes, and maple-basswood forest stands on the steep sheltered north-facing slopes. Floodplain forests occur on the bottomlands,

mesic and dry-mesic forests occur on the shallow slopes, dry cliffs, bedrock bluff prairies, and oak woodlands occur on steep south-facing exposures.

Twenty-one species of rare plants and animals have been recorded in the North Fork Whitewater River area. One of the rare plant species occurs in only six other known locations in the world. The North Fork Whitewater River area is significant because of its large tracts of mature deciduous forest, high quality native plant communities, and high diversity of rare plants and animals.

As stated above, specific designations of unique resources (OG, G1G2, HCVFs and RSAs) in most cases will fall within these currently designated high biodiversity areas. Specific *Strategies* will be included in the *BRP SFRMP* to guide management of these areas.

## CHAPTER 6

### Value of Forest Products

#### 6.1 Acres of Timber Sold on DNR Lands in the Blufflands/Rochester Plateau subsections

The annual harvest on DNR lands is allocated and tracked in acres and results from total acres examined. Not all acres examined result in a timber harvest. Table 5.1 shows the Total Acres Examined from years 2004 through 2013. This table shows relatively significant differences over the last ten years. Reasons for differences are primarily the result of the variation in timber markets and the resulting amount sold each fiscal year (i.e., July 1–June 30).

**Table 6.1 Acres of Timber Sold/Offered on DNR Lands**

Fiscal Year	Total Acres Examined
2004	2148
2005	1947
2006	1544
2007	1806
2008	2777
2009	3528
2010	2297
2011	2413
2012	1968
2013	1542

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

#### 6.2 Volume and Value of Timber Sold From DNR Lands in the BRP

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

**Table 6.2 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2007**

Species	Volume Cords	Value	Value per Cord
Aspen Birch	340	\$939	\$2.76
Basswood	180	\$16,398	\$91.10
Lowland Hardwoods <sup>1</sup>	290	\$6424	\$22.15
Northern Hardwoods <sup>2</sup>	151	\$4179	\$27.66
Central Hardwoods <sup>3</sup>	94	\$4187	\$27.71
Walnut	54	\$37,547	\$695.31
Butternut	11	\$1058	\$96.19
Oak all species	2941	\$478,978	\$162.85
White Pine	Insignificant	NA	NA
Norway Pine	105	\$368	\$3.50

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

**Table 6.3 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2008**

<b>Species</b>	<b>Volume Cords</b>	<b>Value</b>	<b>Value per Cord</b>
Aspen/ Birch	95	\$3085	\$32.63
Basswood	315	\$20,390	\$64.77
Lowland Hardwoods <sup>1</sup>	401	\$9633	\$24.04
Northern Hardwoods <sup>2</sup>	254	\$20,290	\$79.87
Central Hardwoods <sup>3</sup>	272	\$20,748	\$76.22
Walnut	276	\$323,514	\$860.40
Butternut	Insignificant		
Oak all species	5600	\$836,050	\$149.29
White Pine	103	\$206	\$2.00
Norway Pine	25	\$50	\$2.00
Misc. Softwoods	48	\$96	\$2.00

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

**Table 6.4 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2009**

<b>Species</b>	<b>Volume (cords)</b>	<b>Value</b>	<b>Value per Cord</b>
Aspen/ Birch	3	\$149	\$53.58
Basswood	67	\$2403	\$35.74
Lowland Hardwoods <sup>1</sup>	134	\$4856	\$36.14
Northern Hardwoods <sup>2</sup>	94	\$6887	\$73.26
Central Hardwoods <sup>3</sup>	207	\$2147	\$10.38
Walnut	69	\$41,831	\$606.24
Butternut	0	0	0
Oak species	1401	\$163,006	\$116.34
Norway pine	516	\$2609	\$5.05
White pine	68	\$321	\$4.75
Miscellaneous	20	\$40	\$2.00

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

**Table 6.5 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2010**

<b>Species</b>	<b>Volume (cords)</b>	<b>Value</b>	<b>Value per Cord</b>
Aspen/ Birch	128	\$1507	\$8.25
Basswood	176	\$8365	\$47.26
Lowland Hardwoods <sup>1</sup>	195	\$3115	\$15.76
Northern Hardwoods <sup>2</sup>	117	\$8846	\$75.6
Central Hardwoods <sup>3</sup>	55	\$2076	\$38.02
Walnut	245	\$281,099	\$1147.27
Butternut	0	0	0
Oak species	1031	\$457,090	\$443.34
Norway pine	824	\$3503	\$4.25
White pine	251	\$1705	\$7.07
Misc. Hardwoods	21	\$105	\$5.00

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



**Table 6.6 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2011**

<b>Species</b>	<b>Volume (cords)</b>	<b>Value</b>	<b>Value per Cord</b>
Aspen/ Birch	177	\$2709	\$15.32
Basswood	129	\$5862	\$45.47
Lowland Hardwoods <sup>1</sup>	162	\$4604	\$28.38
Northern Hardwoods <sup>2</sup>	49	\$5053	\$103.2
Central Hardwoods <sup>3</sup>	273	\$4582	\$16.79
Walnut	58	\$47,517	\$818.97
Butternut	0	0	0
Oak species	3903	\$625,170	\$160.19
Mixed Hardwoods	89	\$1301	\$14.67
Norway pine	690	\$7282	\$10.55
White pine	1235	\$9445	\$7.64
Misc. softwood	187	\$871	\$4.65

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

**Table 6.7 Annual Harvest on DNR Lands- Volume in acres and Value in dollars Fiscal Year 2012**

<b>Species</b>	<b>Volume (cords)</b>	<b>Value</b>	<b>Value per Cord</b>
Aspen/ Birch	19	\$163	\$14.72
Basswood	94	\$5278	\$56.14
Lowland Hardwoods <sup>1</sup>	57	\$8398	\$15.05
Northern Hardwoods <sup>2</sup>	79	\$10,141	\$128.69
Central Hardwoods <sup>3</sup>	22	\$776	\$35.58
Walnut	741	\$63,329	\$857.99
Butternut	0	0	0
Oak species	1906	\$269,123	\$141.21
Mixed Hardwoods	54	\$912	\$16.92
Pine species	18	\$105	\$5.95
Misc. Softwood	60	\$15	\$0.25

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

footnotes for all tables

<sup>1</sup> Lowland Hardwoods include; Cottonwood, Ash, Elm, Silver maple and willow

<sup>2</sup> Northern Hardwoods include; Boxelder, Hackberry, Butternut, Bitternut Hickory, Sugar Maple

<sup>3</sup> Central Hardwoods include; Shagbark hickory, Black cherry,



## Chapter 7

### Wildlife Distributions

#### 7.1 Wildlife Species

The following table summarizing wildlife species occurrences in the two subsections was produced from a database maintained by the Minnesota DNR Section of Wildlife. The databases identifies where species exist in the state based on ECS subsections. In addition, the state and federal status (i.e., endangered, threatened, or special concern) is provided.

**Table 7.1 Summary of Wildlife Species Present in Blufflands/Rochester Plateau Subsections**

Wildlife Group	Blufflands	Rochester Plateau	State: E/T/SC	BG/F/SG/MGB	Federal: T
Amphibians	13	7	1 / - /	-	-
Forest Birds	82	80	- / - / 4	- / - / 3 /	-
Openland Birds	50	47	1 / 2 /	- / - / 3 /	-
Water Birds	51	41	- / - / 1	-	-
Casual/Accidental Birds	N/A	N/A	N/A	N/A	N/A
Mammals	44	43	- / - / 5	1 / 12 / 4 /	-
Reptiles	27	17	1 / 2 / 6	-	-
Totals:	267	235	3 / 4 / 16	1 / 12 / 10 /	-

Notes to interpret Table 7.1:

1. State of Minnesota legal status contains seven categories. Minnesota wildlife species may be listed as:

1. big game (BG),
2. furbearer (F),
3. small game (SG),
4. and migratory game birds (MGB).

Three other categories exist that may be individually applied to wildlife species in Minnesota

5. endangered (E), if the species is threatened with extinction throughout all or a significant portion of its range within Minnesota.
  6. threatened (T), if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range within Minnesota.
  8. special concern (SC), if although the species is not endangered or threatened, is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations.
2. Federal legal status, contains the threatened and endangered categories. The only federally threatened species in the Blufflands/Rochester Plateau subsections is the bald eagle and no federally endangered species are present.

In addition to the wildlife database referenced above, the Division of Ecological and Water Resources has prepared an analysis of wildlife occurrences entitled *Tomorrow's Habitat for the Wild and Rare; An Action Plan for Minnesota Wildlife, Minnesota Comprehensive Wildlife Conservation Strategy*. This Plan identifies species of special concern by subsection and can be viewed at: [www.dnr.state.mn.us/cwcs](http://www.dnr.state.mn.us/cwcs)



## Chapter 8 Forest Insects and Disease and Invasive / Exotic Species

### Forest Insects and Disease Considerations

The following report details the forest health considerations in the Blufflands and Rochester Plateau subsections. Information about major forest insects and diseases, identifiable trends, future impacts, and possible future threats are provided. Dutch elm disease, oak wilt disease, butternut canker disease, basswood thrips, the gypsy moth, and white pine blister rust are examples of introduced diseases and insects found within these subsections. Introduced insects and diseases cause long-term impacts, and cost the greatest amount of program resources. Significant resources (i.e., people and dollars) will be needed in the future to address the gypsy moth through the region. Other insects and diseases mentioned below are native. Native insect and diseases have natural predators and parasites that moderate their population levels over the short and long term. Short term impacts mentioned below are for up to one growing season, long term impacts can be for several years.

#### Major Insects:

##### ***Hardwood Defoliators-***

Several hardwood defoliators (i.e., leaf eaters) exist and can impact the forest resource within these subsections in most years. Most are spring defoliators. Spring defoliators are active in late May and through mid-June. Examples include the spring cankerworm, oak leaf roller, eastern tent caterpillar, birch and elm leaf miners. Examples of mid-season to late season defoliators include the walnut caterpillars, and the fall webworm. These are examples of native insect defoliators that can be active in most years, resulting in scattered defoliation anywhere in these subsections. The locations of these defoliation events will vary greatly from year to year as does the intensity. All have short term impacts. Defoliated trees and stands of trees re-foliate (i.e., grow new leaves) a few weeks following the defoliation events. Hardwood trees store food reserves in their root systems for just this reason, and rebuild those reserves quickly during the subsequent growing season. It generally takes about 40% defoliation to trigger a re-foliation response in hardwood trees. Historically the region has been resistant to large scale outbreaks of native insect defoliators. This may be due to the diversity of cover types, land uses, and microclimate conditions.

A recent exception was the introduced basswood thrips. A potentially long term infestation took place during the 1980's and has since subsided. Serious losses seem to have been averted due to the timing of the early spring defoliation and to the resilience of this species. Secondary insects and diseases have not been observed to attack and kill weakened native basswood.

##### **Emerald Ash Borer (*Agrilus marcopoli*)**

The ash genus (*Fraxinus*) in Minnesota comprises some 900 million trees and is the second most common hardwood tree genus in the state. EAB was discovered in the United States in 2002 and is now present in 13 states and 2 Canadian Provinces. It was found in Minnesota in 2009; currently EAB's only known occurrence within Minnesota is within Houston County, Winona County, and the cities of St. Paul, Minneapolis, and Shoreview. EAB populations can spread rapidly in infested firewood, logs, and ash nursery stock. Therefore, it is assumed that EAB will soon infest Minnesota's forested areas and cause significant impact to the ash resource. Experience from other states has shown that EAB kills 99%+ of the ash in a stand once that stand becomes infested. This level of impact is greater than what occurred with American elm following the introduction of Dutch elm disease in Minnesota.

To date there has been no evidence of resistance to EAB within any North American ash species. Resistance does exist in some Asian ash species. Subtle differences in susceptibility to EAB between white, green, and black ash have been reported, but those differences are minor and should not influence management options. All three ash species in Minnesota will likely succumb to EAB attack.

The Blufflands/Rochester Plateau subsection does not have a large prevalence of ash cover types. Much of the ash resource is mixed with other lowland and bottomland species.

Management Guidelines for EAB have been developed and released in December 2010.

To find the complete document look for Op Order #119, which outlines the Department's guidance on invasive species see:

[http://files.intranet.dnr.state.mn.us/user\\_files/1920/oporder\\_119\\_ashmanagement.pdf](http://files.intranet.dnr.state.mn.us/user_files/1920/oporder_119_ashmanagement.pdf)

or on the main DNR website

<http://files.dnr.state.mn.us/forestry/ecssilviculture/policies/guidelinesManagingAshMinnesotaForestLands-100723.pdf>

The Minnesota Department of Agriculture is the lead agency for policy and procedure development for Emerald Ash Borer.

For further information see this general informational website,

<http://www.emeraldashborer.info/>

### **Hardwood Bark Beetles-**

Several hardwood bark beetles and wood borers are found on most species present in the subsections, but generally only on trees found to be under stress. Bark beetles kill trees by girdling the bark resulting in the death of a tree. When trees become weakened or stressed, often in drought conditions, bark beetles detect this stress and multiply. The best example is the 2-lined chestnut borer on oak. Other examples include the hickory bark beetle, hackberry engraver, and red oak borer, among others. Most have short term impacts and are triggered by stress. Drought conditions, local soil disturbance, poor site conditions, and overstocking are causes of stress. Oak mortality from Armillaria root rot and the Two-lined Chestnut borer can be severe during and in the year following periods of stress from drought. Generally, recharge of rainfall will reduce tree stress, ending the infestations. Impacts of borers on new wood products can be reduced by proper drying and storing in environmentally controlled areas.

### **Conifer Defoliators-**

Conifer defoliators are not common on the landscape scale in this region. Localized outbreaks of one or more species of conifer sawflies can affect a few trees in some areas. Insect defoliators of conifers should be monitored and suppressed if populations increase to noticeable levels. Conifers store the majority of their food reserves in their foliage, resulting in dieback following defoliation events. Conifer insects can be easily controlled with insecticides timed to life cycle considerations.

### **Conifer Bark beetles-**

Pine bark beetles cause the highest losses in conifer stands following periods of extended drought. However, losses during bark beetle outbreaks can be reduced with intensive management techniques. Such strategies as placement of artificial pheromone traps, fresh cut trap trees, or watering can all be effective techniques to reducing losses. Sanitation during thinning operations may reduce future bark beetle infestations, but this is largely dependent on future growing conditions. Trees that are not under stress, not at threshold for successful bark beetle attack, have not been observed to be attacked by any existing bark beetle populations in these subsections.

### **Gypsy Moth**

The gypsy moth is in the early stages of establishing itself in the region from both several years of introductions from eastern states, and from recent natural spread across Wisconsin.\* Gypsy Moth caterpillars defoliate a wide variety of species. It is the timing of gypsy moth defoliation that results in the larger impact. The defoliation occurs into mid-June time for refoliation but less time for defoliated trees to rebuild food reserves. Caterpillar defoliation does not kill trees. Trees weakened by defoliation can be killed by secondary insects and diseases. In oak stands, oaks weakened by defoliation are killed by the 2-lined chestnut borer and Armillaria root rot. Defoliation can be prevented in selected forest areas and broader urban areas by monitoring population levels (egg mass surveys) and by reducing those populations when necessary. The aerial application of Bt, (*Bacillus thuringiensis*), targeted to foliage when the 2<sup>nd</sup> star larvae are feeding is the best way to reduce populations. The timing in this region would be May 15<sup>th</sup>, + or - 5 days, or at 40% leaf development on basswood and bur oak.

**Table 8.1 Gypsy Moth; General Hosts**

<i>Preferred species</i>	<i>Non-Preferred</i>	<i>Avoided</i>
alder apple aspen basswood birch, white oaks willow hawthorn tamarack witch hazel	walnut maple, box elder butternut cherries cottonwood elms hickories pines spruces beech birch, yellow birch, black hemlock ironwood juniper chestnut	ash locusts cedar, red & white balsam fir dogwoods mountain maple pine, scotch

#### **Major Diseases:**

##### ***Hardwood Tree Diseases-***

**Dutch elm disease.** This disease is characterized by the active wilting of foliage during growing season. A vector (i.e., bark beetle) will infect the fungus in the tree resulting in the blocking of water conduction by the tree vessels. Root graft transmission of the fungus may occur, but is not as common. During the 1970's and 1980's Dutch elm disease was an epidemic in this region, due to the efficient movement of the fungus by the elm bark beetle populations. Dutch elm disease has had the largest impact of any insect or disease historically, and remains endemic to the subsections. Expect to see variability in losses over time depending on vector populations, (i.e., elm bark beetles ) and the amount of native elm (host) remaining.

##### ***Oak wilt disease.***

Oak wilt disease is endemic to the region, and has likely been active here for more than fifty years. It is found across the region in widely scattered small active infection centers. The incidence increases where northern pin oak exists, if found on sandy sites an associated with urban development. The incidence is low in stands of northern red oak found on the better quality sites. The spread of oak wilt disease is primarily through root grafts from tree to tree. Over land spread is very inefficient and caused by certain sap feeding beetles that visit previously wilted trees. If the beetles pick up the fungus spores and move onto another oak that has a wound, a new infection begins. This inefficient spread of the disease offers a great opportunity to reduce the severity of oak wilt. Oak wilt is a disease that can be stopped either by isolation of the active infection centers or by removal of the host. The techniques used for control of oak wilt include severing the root grafts between trees or harvesting and treating the stumps with approved silvicultural herbicides. It is possible to eradicate oak wilt disease in many areas, given the inefficient means of overland spread, and if local suppression efforts are vigorously pursued.

##### ***Butternut canker***

Another disease affecting the forest resource in the Blufflands and Rochester Plateau. Rainy conditions spread the butternut canker fungus. The fungus causes an elliptical canker in the cambium layer of the tree. Multiple cankers girdle the tree causing dead areas until the entire stem dies off. Great genetic variability exists in trees, and over the recent past resistance to butternut canker disease has been observed in the field. Future re-introductions of resistant trees may be possible. Since 1992 a moratorium on the harvest of butternut has been in effect on Division of Forestry administered lands. However, this does not prohibit the salvage or harvest of infected trees.

### ***Hardwood Leaf Diseases-***

A variety of native leaf diseases are common throughout the season on a number of species depending on climatic conditions and host susceptibility. All are of short term impact. Different species of anthracnose leaf disease fungi cause early season outbreaks on green ash in early June, on bur oak in early August and throughout the season on other susceptible species. Hardwood trees may refoliate following outbreaks or continue through the season with the blighted foliage.

### ***Conifer diseases-***

White pine blister rust. White pine blister rust is an introduced disease that is endemic to the region. The disease requires an alternate host, Ribes. Airborne fungus spores from the alternate host spread blister rust. Similar to butternut cankers are blister rust cankers that girdle the stem killing the tree. However, unlike the butternut canker the blister rust canker begins through the white pine needle, continues through the branch, and then attacks the stem. The incidence of blister rust is generally low throughout these subsections. However, the level of infection can increase in areas with white pine found on the lower areas of north facing slopes. Losses can be reduced by selective pruning of the lower branches as management options allow.

### ***Conifer Leaf Diseases-***

Outbreaks of conifer leaf diseases on the landscape scale are not common. Rhizosphaera needle cast is endemic on Colorado blue spruce and sometimes white spruce in urban areas and windbreaks. In some instances use of an approved fungicide may protect unaffected trees. Diversity in spruce species is recommended.

### ***Winter Injury-***

Due to temperature variability and extremes, winter injury (e.g., winterburn, winter drying on conifers, and freeze injury to a number of hardwood and conifer species) is common in most years. During mild winter conifer species are unable to get moisture from the frozen ground around the tree roots and the tree respirates decreasing the moisture content further. Freeze injury to black walnut plantations has been well documented in low lying landscape areas over the recent years. Site selection is a critical factor for success. Depending on the severity of winter injury a tree can recover from the condition.

### ***Wood Decay: Heart Rot in Residual Stands-***

Heart rot is particularly prevalent in timber which is currently of harvestable age. The prevalence of heart rot is traceable to the widespread use of fire for clearing and the introduction of livestock into forest areas of southeastern Minnesota near the turn of the century. Currently 17% of the inventoried forest stands on state land, or 40,000 of 240,000 acres have heart rot present, affecting existing timber. Wounds start the process that leads to wood discoloration and decay. When harvesting it is important to minimize wounds to the residual stand to maintain the health and quality of the remaining trees. This will be important in uneven aged management systems, particularly on steep slopes.

### ***Future impacts:***

#### ***Gypsy moth-***

Gypsy moth has not spread as originally anticipated. The gypsy moth will have a long term impact on southeastern Minnesota for several years. The gypsy moth will impact both the forest and urban areas. Oak forests will sustain the largest losses. Over time the oak component will be reduced in terms of the number of stems per acre, but the volume per acre may remain similar depending on level of harvest.

The residual volume in oak will be concentrated on fewer but larger diameter stems per acre. In northern hardwood forests background levels of gypsy moth will persist for long periods of time with little impact. Practices that promote stand vigor and increased species diversity will reduce losses due to inevitable landscape scale gypsy moth defoliation events. Intermediate cuts that remove poor quality oaks and increase species diversity will reduce losses following defoliation events.

### ***Possible future threats:***



Asian Long-horned beetle (ALB). The risk of introduction is low. The losses and costs of any infestations will be high.

**Table 8.2. Environmental Factors, Degradation agents, Native, Non-Native Insects and Diseases Affecting Trees in the Blufflands/Rochester Plateau Subsections.**

Environmental Factors	
Stress from drought	
Secondary Degradation Agents	
two-lined chestnut borer	
heart rot	
armillaria root rot	
Native Insects	Native Diseases
spring cankerworms	vascular wilt of hardwoods
oak leaf rollers	anthracnose leaf
eastern tent caterpillars	
fall webworm	
birch and elm leaf miners	
skeletonizers	
bark beetles	
hickory engraver	
hickory borer	
Non-Native Insects	Non-Native Diseases
asian long-horned beetle (ALB)	oak wilt
Emerald ash borer	butternut canker add
Gypsy moth	

### **Invasive / Exotic Species**

A number of invasive and exotic species impact the Blufflands/Rochester Plateau subsections. Identified below are the more prominent invasives and exotic species. Further information on these and other invasive and exotic species can be found at: <http://www.dnr.state.mn.us/invasives/eco/index.html>

### **Buckthorn**

As with insect and disease issues, often times managing non-native invasive species issues centers around managing the vector that spreads the non-native invasives. The Department attempts to manage the vector to prevent the spread of a problem into new areas or if populations are low, to keep them from becoming well established. These methods include: enforcing local ordinances and state statutes, education of public, and regulations (timber sales). Once a non-native invasive is established in an area it is often there to stay and the goals shifts to managing

its impact. The hope is that, over time, natural controls evolve to help control the non-native invasive. As with insect and disease problems prevention strategies are then used to help prevent it from spreading into new areas

The main vector of buckthorn is birds eating the seeds and depositing them in previously uninfested areas. There is almost no opportunity to control this vector. Buckthorn is fairly shade tolerant so it easily dwells in the understory of stand. Once established, buckthorn is almost impossible, or at least very expensive, to control.

### ***Japanese Barberry***

Japanese barberry was introduced to North America as ornamental as a living fence and for wildlife and erosion control. It invades oak woodlands and oak savanna and prefers well-drained soils. Once established its prolific spreading shades out native plants.

### ***Garlic Mustard***

Garlic mustard spreads into high quality woodlands, upland and floodplain forests, not just into disturbed areas. Invaded sites undergo a decline on native herbaceous cover within 10 years.

Garlic mustard alters habitat suitability for native insects and thereby birds and mammals.

This European exotic occurs in 27 mid-western and northeastern states and in Canada.

Garlic mustard is a MDA [Prohibited noxious weed \(Controlled List\)](#) in Minnesota.

### ***Reed Canary Grass***

This Eurasian species has been planted throughout the U.S. since the 1800s for forage and erosion control. Reed canary is a major threat to natural wetlands. It out competes most native species. It presents a major challenge in wetland mitigation efforts. It forms large, single-species stands, with which other species cannot compete. If cut during the growing season a second growth spurt occurs in the fall. Invasion is associated with disturbances, such as ditch building, stream channeling sedimentation and intentional planting. While many Minnesota state agencies have removed it from their planting lists, it is still being planted in the state

### ***Oriental bittersweet***

Highly invasive in forests in the eastern United States. Vines girdle trees as they climb to dominate the canopy and shade the understory, reducing and preventing the growth of other plant species. At this time Oriental bittersweet still has a limited distribution in Minnesota. By detecting Oriental bittersweet populations early and rapidly treating infestations in Minnesota, reduces the impact of this species. At times, the weight of Oriental bittersweet vines in the canopy can break trees, especially with the additional weight of snow and ice.

Oriental bittersweet outcompetes and displaces American bittersweet (which is native to Minnesota) to the point that Connecticut now lists the formerly common American bittersweet as a species of concern. Additionally, by hybridizing with American bittersweet, Oriental bittersweet causes further loss of American bittersweet populations.

Oriental bittersweet is a MDA [Prohibited Noxious Weed \(Eradicate List\)](#) in Minnesota meaning that above and below ground parts of the plant must be destroyed. Additionally no transportation, propagation, or sale of Oriental bittersweet and its cultivars (including 'Diana', 'Hercules', 'Indian Mix', 'Indian Brave', and 'Indian Maiden') is allowed.

## **APPENDICES**

- A. Glossary
- B. Acronyms
- C. Metadata - General Information of Data



## APPENDIX A

### Glossary

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

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

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

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

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

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

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

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

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

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

**Assessment:** A compilation of information about the trends and conditions related to natural and 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 Information **Sys**Tem (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:  $25 \div 50 \text{ years} = 0.5 \text{ cords per year}$ ).

**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.

**Relevé9s:** 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 Information **Sys**Tem (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 capable 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**

<b>AFRMP</b>	Area Forest Resource Management Plan
<b>BT</b>	Bearing Tree
<b>CMAI</b>	Culmination of Mean Annual Increment
<b>CMT</b>	Commissioner's Management Team
<b>CSA</b>	Cooperative Stand Assessment
<b>CWCS</b>	Comprehensive Wildlife Conservation Strategy
<b>DBH</b>	Diameter at Breast Height
<b>DFC</b>	Desired Future Condition
<b>DFFC</b>	Desired Future Forest Composition
<b>DMT</b>	Division Management Team
<b>DNR</b>	Department of Natural Resources
<b>DOQ</b>	Digital Orthophoto Quadrangle
<b>DRG</b>	Digital Raster Graphics
<b>ECS</b>	Ecological Classification System
<b>EILC</b>	Ecologically Important Lowland Conifers
<b>ELCP</b>	Ecological Land Classification Program
<b>ERF</b>	Extended Rotation Forestry
<b>ETS</b>	Endangered, Threatened, or Special Concern
<b>FIA</b>	Forest Inventory and Analysis
<b>FIM</b>	Forest Inventory Module
<b>FORIST</b>	Forest Information System
<b>FRIT</b>	Forest Resource Issues Team
<b>FTC</b>	Forest Tent Caterpillar
<b>FY</b>	Fiscal Year
<b>G1G2</b>	Globally Critically Imperiled (G1) and Globally Imperiled (G2) Native Plant Communities
<b>GAP</b>	Gap Analysis Program
<b>GEIS</b>	Generic Environmental Impact Statement
<b>GIS</b>	Geographic Information System
<b>GM</b>	Gypsy Moth
<b>HCVF</b>	High Conservation Value Forest
<b>HRLV</b>	High Risk/Low Volume
<b>HWDs</b>	Hardwoods
<b>LSA</b>	Landscape Study Area
<b>LSL</b>	Laminated Strand Lumber
<b>LTA</b>	Land Type Association
<b>MACLC</b>	Minnesota Association of County Land Commissioners
<b>MAI</b>	Mean Annual Increment
<b>MBF</b>	Thousand Board Feet
<b>MCBS</b>	Minnesota County Biological Survey
<b>MFRC</b>	Minnesota Forest Resources Council
<b>MFRP</b>	Minnesota Forest Resources Plan
<b>MnTAXA</b>	Minnesota Taxonomy Database
<b>MnWRAP</b>	Minnesota Wildlife Resource Assessment Project
<b>NAPP</b>	National Aerial Photography Program
<b>NAR</b>	Natural Area Registry Agreement
<b>NCFES</b>	North Central Forest Experiment Station
<b>NHIS</b>	Natural Heritage Information System
<b>NHNRP</b>	Natural Heritage & Nongame Research Program
<b>NPC</b>	Native Plant Community
<b>NRCS</b>	Natural Resource Conservation Service
<b>OFMC</b>	Old Forest Management Complex
<b>OHV</b>	Off-Highway Vehicles
<b>OSB</b>	Oriented Strand Board
<b>PM</b>	Pine Moraines and Outwash Plains

<b>RMT</b>	Regional Management Team
<b>RMZ</b>	Riparian Management Zone
<b>RNAs</b>	Research Natural Areas
<b>RNV</b>	Range of Natural Variability
<b>RSA</b>	Representative Sample Area
<b>SFRMP</b>	Subsection Forest Resource Management Plan
<b>SGCN</b>	Species in Greatest Conservation Need
<b>SI</b>	Site Index
<b>SMA</b>	Special Management Area
<b>SMZ</b>	Special Management Zone
<b>SNA</b>	Scientific and Natural Area
<b>SNN</b>	Shipstead-Newton-Nolan Act
<b>SONAR</b>	Statement of Need and Reasonableness
<b>SPP</b>	Species
<b>SRM</b>	Silviculture and Roads Module
<b>TMP</b>	Timber Management Plan
<b>TMPIS</b>	Timber Management Plan Information System
<b>TNC</b>	The Nature Conservancy
<b>WMA</b>	Wildlife Management Area

## APPENDIX C: METADATA - GENERAL INFORMATION OF DATA

<b>Data</b>	<b>Date(s)</b>	<b>Source</b>	<b>Size of Data Area</b>	<b>Spatial Resolution</b>	<b>Summary</b>	<b>Pros (+) / Cons (-)</b>
<b>Forest Inventory Module FIM</b>	January 2013	Aerial photos and ground surveys	Minnesota Stand Level, Public Forest Lands	1 to 3 acres	Updated version of CSA.	+ Detailed forest stand information - Only land managed by public agencies
<b>Cooperative Stand Assessment CSA</b>	1998	Aerial photos and ground surveys	Minnesota, Stand Level, Public Forest Lands	1 to 3 acres	Public agencies responsible for forest management use this data as their main inventory source.	+ Detailed forest stand information - Only land managed by public agencies
<b>Forest Inventory and Analysis FIA</b>	1977 1990	Aerial photos and ground surveys	Minnesota, Plot Level	1225 acres represented per plot	A federally funded inventory of the state's forest resources: their type, extent, growth, mortality, and removals.	+ Detailed forest stand information + Represents public and private lands - Poor spatial resolution
<b>GAP Stewardship</b>	2008	PLS Sections and ownership data	Minnesota	40 acres	Database containing land ownership information. Attribute fields describe ownership, administrator, and conservation management code	+ Best data available to get quickly get an idea of land ownership. - Inaccurate below 40 acre level.
<b>National Land Cover Dataset (NLCD)</b>	2006	Aerial photos and satellite images	Conterminous United States	30 meters	Shows land use broken down by 16 different land cover classifications.	+ Recognize and evaluate types of land use changes
<b>Minnesota Wildlife Resource Assessment Project MNWRAP</b>	2000	MNDNR Section of Wildlife	Minnesota State Level		Lists wildlife species present in Minnesota and state status (e.g., endangered, threatened, or special concern)	+ Statewide - Needs to be field checked - Further development
<b>National Wetlands Inventory NWI</b>	1994	Aerial photos	Minnesota		Linear wetland features (including selected streams, ditches, and narrow wetland bodies)	+ High spatial resolution
<b>Natural Heritage Information System</b>	2000	MNDNR Section of Ecological Services, Nongame Program	Varies according to completion of CBS in state.		Displays inventory of native plant communities, rare species, and biodiversity.	+ Extensive habitat classification - Not complete statewide - Different standards statewide
<b>Silvicultural Practices</b>	2013 prepared		Minnesota	none	harvesting practices in the Blufflands/Rochester Plateau subsections.	+ Shows volume and value trends for 2007 - 2012 - No spatial breakdown - Does not account for practices on non-industrial private forest (NIPF)