

CHAPTER 5

Ecological Information

St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermilion Uplands Subsections

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How graphics are labeled:

Graphics referring to all four subsections combined (St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermilion Uplands) are indicated by a “North-4 Subsections” after the chart designation (e.g., Table 3.2 North-4 Subsections).

Graphics referring to the St. Louis Moraines subsection only are indicated by a “slm” after each chart designation (e.g., Chart 3.2 slm).

Graphics referring to the Tamarack Lowlands Subsection only are indicated by a “tl” after each chart designation (e.g., Map 3.2 tl).

Graphics referring to the Nashwauk Uplands Subsection only are indicated by a “nu” after each chart designation (e.g., Map 3.2 nu).

Graphics referring to the Littlefork-Vermilion Uplands only are indicated by a “lvu” after each chart designation (e.g., Map 3.2 lvu).

Notes relating to this chapter:

Color maps may be viewed as PDF files on the St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermilion Uplands Subsection Forest Resource Management Plan (SFRMP) Web site at:

http://www.dnr.state.mn.us/forestry/subsection/north_4subsections/assessment.html

Maps in this chapter depict information for an area within a “planning boundary.” This boundary is designed to closely approximate the subsection while capturing data summary and planning efficiencies by using survey or jurisdiction lines in some cases.

Printed documents will be available for review at the Minnesota DNR Grand Rapids Region Headquarters at 1201 E Hwy 2, Grand Rapids, Minnesota, and on compact disk by request to Lynn Sue Mizner at (218) 927-7511 or lynn.mizner@dnr.state.mn.us.

5.1 Summary Description of Each of the Four Subsections

St. Louis Moraines Subsection

Rolling to steep slopes characterize much of this subsection. End moraines are the dominant landform. The underlying topography was formed by the Rainy lobe. It was later overridden by the St. Louis sublobe of the last glaciation period. Northern hardwood forests were common in the southern portion of the region, south of Grand Rapids. North of Grand Rapids, white pine, sugar maple, basswood, and balsam fir were common tree species. Presently, forestry and tourism are the major land uses.



Landform

This subsection consists of distinct end moraines associated with the St. Louis and Koochiching Sublobes and a pitted outwash plain (Hobbs and Goebel 1982). These sublobes overrode Rainy Lobe moraines, which formed the framework of landform characteristics. The cap of calcareous gray sediment varies from 1 to 10-plus feet in depth. Coarse loamy Rainy Lobe sediments underlie the cap. Portions of this unit, both north and south of Grand Rapids, have very steep topography. These areas are ice disintegration features. Topography on the rest is gently rolling to rolling.

Bedrock geology

The glacial drift in this subsection ranges from 100 to 200 feet in depth (Olsen and Mossler 1982). Lower Precambrian undivided granites, metavolcanics, and metasedimentary rocks underlie the glacial drift (Sims et al. 1970c).

Soils

Loamy calcareous soils make up about 75% of the soils in this subsection (Dept. of Soil Science, Univ. of Minnesota 110-1971). Excessively well-drained outwash sands account for another 10 to 15% and poorly drained soils account for about 3%. The soils are classified as Boralfs (well drained soils developed under forest vegetation), Aqualfs (wet soils developed under forest vegetation), Hemists (moderately decomposed organic soils), and Psamments (sandy, poorly developed well-drained soils), with Boralfs most common (Cummins and Grigal 1981).

Climate

Total annual precipitation ranges from 24 inches in the northwest to 27 inches in the southeast, with about 40% occurring during the growing season. Only 12 to 16% of the annual precipitation falls during winter months (based on Midwest Climate Center 1992). Growing season length varies from 111 to 131 days.

Hydrology

The Mississippi River cuts this subsection virtually in half. The river flows northwest to southeast close to the north-south midpoint of the subsection. Several small, relatively short rivers are present. They include the Prairie, Willow, Hill, and Moose rivers. The drainage network is poorly developed due to landform characteristics. Lakes are numerous. In fact, there are over 66 lakes that have a surface area greater than 160 acres; lakes account for over 10% of the surface area.

Pre-settlement vegetation

White pine-red pine forest covered large portions of the steep moraines and portions of the pitted outwash along the eastern edge of the subsection. South of Grand Rapids was an area of moraine dominated by northern hardwoods. Aspen-birch forests also grew on the moraines, but were more common on the outwash, which had excessively well drained sandy soils. Mixed hardwood-pine forest was locally present on the moraines, generally near large lakes. Conifer swamp and bogs were scattered throughout the subsection, occupying both kettles and linear depressions in the pitted outwash and moraines (Albert 1993).

Present vegetation and land use

The most important land uses in this subsection are forestry and recreation. This area is heavily forested and timber harvesting is extensive. Quaking aspen is the primary species harvested. Recreation is primarily associated with the subsection's lakes and the areas around them. Fishing, hunting, snowmobiling, and skiing are popular.

Natural disturbance

Fire and windthrow were the most common natural disturbances. Fire was an important agent in maintaining fairly pure red and white pine stands.

Tamarack Lowlands Subsections



The boundaries of this subsection coincide with the boundaries of the Glacial Lake Upham Plain and the Aurora Till Plain. This is a unique area topographically and climatically. The till plain is included because it forms a relatively flat plain ecologically similar to the adjacent lacustrine plain.

Level to gently rolling topography are characteristic of this region. The largest landform is a lake plain. Around the edges of the old glacial lake is a till plain (Aurora Till Plain) formed in Superior lobe sediments. There is also a small piece of end moraine north of Sandy Lake that is related to the St. Louis moraines. Lowland

hardwoods and conifers were the most common forest communities. Northern hardwood and aspen-birch forests were common on the other portions of this region. Presently, much of the land is in public ownership. Forestry and tourism, along with some agriculture are the most common land uses.

Landform

Glacial lacustrine (lake deposited) sediments occupy much of the subsection. Beach ridges are not well defined. The lake was probably not present at one level long enough to form distinct beach ridges (as are found in the Glacial Lake Agassiz basin, to the west). There is a ground moraine along the northern and southern borders of the Glacial Lake Upham basin. Low drumlin ridges are present locally.

Bedrock geology

Glacial drift within the lake beds ranges from 100 to 300 feet thick, with some of the thickest sediments at the northern edge of the Glacial Lake Upham basin, where it meets the Mesabi Range (Olsen and Mosslet, 1982). The bedrock beneath Lake Upham is Middle Precambrian (Early Proterozoic) argillite, siltstone, quartzite, or graywacke, weakly metamorphosed (Morey 1976, Morey et al. 198~). There is also Cretaceous shale, sandstone, and clay near the southwest end of the basin and along the border with the Mesabi Range.

Soils

Soils include extensive areas of histosols (peats) over both fine-textured (silt and clay-rich) and sandy lacustrine deposits. Other soil orders present are entisols and alfisols. Soils are classified by Grigal and Anderson (1984) as primarily Ochrepts, Hemists, Aquents, and Boralfs. Alluvial soils are present along major rivers.

Climate

Total annual precipitation ranges from 24 inches in the northwest to 27 inches in the east, with about 40% occurring during the growing season. The growing season is short, from 92 to 115 days, as the low-lying subsection forms a frost pocket with late spring frosts and early fall frosts.

Hydrology

Several major rivers flow through this subsection. These include the Mississippi, St. Louis, Whiteface, East Swan, Savannah, and Willow rivers. Rivers and streams meander extensively across the subsection due to the predominately level landscape. There are few lakes present in the lake plain. The largest lake is Sandy Lake, which is a reservoir created by a dam on the Savannah River.

Pre-settlement vegetation

Vegetation in the lowlands was dominated by lowland conifers (black spruce, tamarack, and white cedar) and lowland hardwoods (black ash). Sedge meadows were also extensive. Uplands supported aspen-birch and upland conifer forest. White pine-red pine forests were located on the ground moraine at the edges of the lake plain, but were not extensive.

Present vegetation and land use

Forestry is the most important land use within the Tamarack Lowlands. There are some areas in the lake plain where agriculture is important, although most of the subsection is marginal for agriculture. Locally, tourism is important around Sandy Lake in Aitkin County.

Natural disturbance

Fire was probably important, both on the hardwood-conifer dominated uplands and in wetlands. Windthrow was probably important in the conifer swamps. In this type of flat, lacustrine setting, natural water-level fluctuations and flooding behind beaver dams often causes extensive tree mortality (Albert 1993).

Nashwauk Uplands Subsection



The southern boundary of this subsection is formed by Giant's Range, a prominent feature on the land. The western and part of the northern boundary is formed by the limit of the Nashwauk Moraine. The Nashwauk Uplands Subsection covers 810,000 acres (1,265 square miles) in northeast Minnesota.

Brown glacial sediments form the parent material for much of this subsection. Landforms include end moraines, outwash plains, and lake plains. Soils are varied and range from medium to coarse textures. One unique aspect of this region is the Giants Range, where the majority of iron mining in Minnesota takes place. It is a high narrow ridge trending northeast to southwest and caused by bedrock. This region consisted of forest communities dominated by white pine, red pine,

balsam fir, white spruce, and aspen-birch. Forestry and mining are the most important land uses presently.

Landform

The subsection includes rolling till plains and moraines and flat outwash plains formed by the Rainy Lobe glacier. Most striking is the Giants Range, a narrow bedrock ridge towering 200 to 400 feet above the surrounding area. It trends southwest to northeast. Bedrock is locally exposed in the end moraines. Small bogs and potholes are common.

Bedrock geology

Thickness of glacial drift is quite variable across the subsection. On moraines, till plains and outwash plains drift is commonly greater than 100 feet over Precambrian (Late Archean and Early Proterozoic) bedrock that includes gneiss, undifferentiated granite, and metamorphosed mafic to intermediate volcanic and sedimentary rocks. Giants Range has a thin blanket of drift over granite. Immediately to the south is the iron-formation of the Iron Range, which has been heavily mined, first for "soft" iron ore and later for taconite.

Soils

Soils are formed in sandy to fine-loamy glacial till and outwash sand. Soils on the Nashwauk Moraine have a loamy cap with dense basal till below at depths of 20 to 40 inches. They are classified as boralfs (cold, well-drained soils developed under forest vegetation). Other areas north of Giants Range have coarse-loamy to sandy soils classified as boralfs, orthents, and ochrepts.

Climate

Precipitation averages between 24 and 27 inches, with the lowest amount at the western edge of the subsection. About half of the precipitation arrives during the summer months. The growing season ranges from 106 to 121 days.

Hydrology

There are over 63 lakes greater than 100 acres in size in this subsection. Many are found on the Nashwauk Moraine. The Continental Divide follows the summit of Giant's Range. Water flowing north eventually goes into Hudson Bay. On the west side, waters flow into the Mississippi River watershed. To the south, water flows into Lake Superior.

Presettlement Vegetation

Presettlement vegetation was a mixture of deciduous and coniferous trees. White pine-red pine forest and jack pine barrens were common on outwash plains. Aspen-birch forest and mixed hardwood-pine forest were present on moraines and till plains. Wetland vegetation included conifer bogs and swamps.

Present Vegetation and Land Use

Land ownership is roughly equal between public and private in St. Louis County and mostly public or forest industry in Itasca County. Quaking aspen is the dominant tree species presently. Forest management and recreation are the most important land use in this subsection. Mining is also an important land use.

Natural disturbance

Windthrow had the strongest impact on the moraines. Fire had a lesser impact overall but was more prominent on the outwash plains.

Littlefork – Vermilion Uplands Subsection



The western edge of the subsection lies just west of the Littlefork River. This river is a natural boundary between the extensive peatlands to the west and predominately clayey till and lake-laid mineral sediments to the east. The southern boundary is the southeastern corner of Glacial Lake Agassiz. To the east, the boundary is the Vermilion River up to the point where it turns east and enters Crane Lake. This boundary marks the division between bedrock-controlled uplands with shallow soils and glacial lake plain with bedrock knobs present but not dominant.

This is a level to gently rolling lake plain and transition zone to the Border Lakes region to the east. Soils are clayey to loamy and formed from lake-laid sediments and glacial till. Topographic relief is less than 50 feet on most of the lake plain, becoming greater to the east in the transition zone.

Landform

This subsection is transitional between extensive peatlands to the west and bedrock controlled landscape to the east. The major landform on the west side is lake plain. On the east side, the glacial lake had a very irregular shoreline. It squeezed between bedrock outcrops, depositing sediments like fillings in teeth. The elevation grades from 1100 feet in the northwest corner to 1500 feet in the southeastern corner around Lake Vermilion.

Bedrock geology

Glacial drift depth grades from shallow at the northern and eastern edges of the subsection to moderately thick in the western portion. Bedrock outcrops are common in the transition zone to the Border Lakes Subsection. Drift is up to 300 feet thick on the western side of the subsection. The underlying bedrock is Precambrian (Late Archean) in age, and includes gneiss, amphibolite, undifferentiated granite, and metamorphosed mafic to intermediate volcanic and sedimentary rocks. There are also iron formation, metasediments, and metamorphosed felsic volcanic rocks (Morey 1976).

Soils

Soils in this subsection are primarily moderately well to poorly drained mineral soils formed from clayey lake-laid sediments or loamy to clayey glacial till. Organic soils are common, but do not dominate the landscape (as they do to the west in the Agassiz Lowlands). Peat depths vary from shallow to deep (1 to 15 feet thick). Soils are classified primarily as Aqualfs (wet forested soils), Aqualfs (wet undeveloped soils), Boralfs (well to moderately

well drained forested soils), and Hemists (moderately decomposed peat) (Anderson and Grigal 1984).

Climate

The total annual precipitation ranges from 21 inches in the west to 25 inches in the east, with 40-50% occurring during the growing season. Average annual snowfall varies from 60 to 75 inches, with the greatest amounts occurring in the central portion of the subsection. The average daily maximum temperature during July is 80 degrees. The growing season is short, from 98 to 111 days, with the shortest growing season near the eastern edge of the subsection.

Hydrology

This subsection is framed by the Littlefork River on the west side and the Vermilion River on the east side. Topography is level to gently rolling throughout most of the subsection. The drainage network is undeveloped, with rivers and streams meandering extensively, especially in the western part. Major rivers flowing through include the Littlefork, Vermilion, Ash, Blackduck, Lost, Rat Root, and Rainy. Lakes are concentrated in the southeastern part. Larger ones include a portion of Vermilion Lake, Pelican Lake, and Net Lake. There are very few lakes in the western part of the subsection.

Presettlement vegetation

Marschner (1974) mapped much of the subsection as aspen-birch forest that would eventually become conifer dominated (white pine, white spruce, and balsam fir). The eastern portion was dominated by white pine, red pine, and jack pine forest. Lowlands were occupied by sedge fen, black spruce-sphagnum bog, and white cedar-black ash swamp. There were also low moraines and beach ridges dominated by jack pine forest or trembling aspen-paper birch forest.

Present vegetation and land use

Quaking aspen is the most common species of tree in this subsection. It is found in both pure and mixed stands. It is heavily harvested for pulp (Grigal, personal communication). Aspen is probably the best developed forest type on the uplands, and it probably was similarly common before settlement. Logging of conifer forests also occurs. In the past, attempts were made to farm portions of the peatlands. (Heinselmann 1963). Ditches were dug along section lines, but were not effective. The other important land use is recreation, particularly in the southeastern section where there are several prominent lakes and reservoirs.

Natural disturbance

Fire occurred in the peatlands. Insect infestations, such as spruce budworm probably lead to fires. Water level fluctuation, caused by short-term climatic changes and by beaver dams, contributed to tree mortality. Windthrow was common on poorly drained mineral soils (Albert 1993).

References

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Following is a list of the wooded native plant community systems, classes, types and subtypes known to occur in the North 4 subsections. Both the codes and their associated names are provided. Much more detailed information about each plant community in the two subsections, including distribution maps, can be found in *Field Guide to the Native Plant Communities of Minnesota: the Laurentian Mixed Forest Province*. A copy of this publication will be available at sites where hard copies of this Issues and Assessment document are available for public viewing. In addition, the field guide is available through the Minnesota Bookstore at <http://www.comm.media.state.mn.us/bookstore>.

Wooded Native Plant Community Systems, Classes, Types, & Subtypes documented in the North-4 Subsections

FIRE-DEPENDENT FOREST/WOODLAND SYSTEM

FDn12 NORTHERN DRY – SAND PINE WOODLAND CLASS

FDn12a Jack Pine Woodland (Sand) Type

FDn12b Red Pine Woodland (Sand) Type

FDn22 NORTHERN DRY – BEDROCK PINE (OAK) WOODLAND CLASS

FDn22a Jack Pine Woodland (Bedrock) Type

FDn32 NORTHERN POOR DRY-MESIC MIXED WOODLAND CLASS

FDn32c Black Spruce – Jack Pine Woodland Type

FDn32c1 Jack Pine – Balsam Fir Subtype

FDn33 NORTHERN DRY- MESIC MIXED WOODLAND CLASS

FDn33a Red Pine-White Pine Woodland Type

FDn33a1 Balsam Fir Subtype

FDn33a2 Mountain Maple Subtype

FDn43 NORTHERN MESIC MIXED FOREST CLASS

FDn43a White Pine – Red Pine Forest Type

FDn43b Aspen – Birch Forest Type

FDn43b1 Balsam Fir Subtype

FDc24 CENTRAL RICH DRY PINE WOODLAND CLASS

FDc24a Jack Pine - (Bush Honeysuckle) Woodland Type

FDc24a1 Bracken Subtype

FDc25 CENTRAL DRY OAK-ASPEN (PINE) WOODLAND CLASS

FDc25b Oak – Aspen Woodland Type

FDc34 CENTRAL DRY-MESIC PINE-HARDWOOD FOREST CLASS

FDc34a Red Pine-White Pine Forest Type

MESIC HARDWOOD FOREST SYSTEM

MHn35 NORTHERN MESIC HARDWOOD FOREST CLASS

MHn35a Aspen-Birch-Basswood Forest Type

MHn35b Red Oak – Sugar Maple – Basswood – (Bluebead Lily) Forest Type

MHn44 NORTHERN WET-MESIC BOREAL HARDWOOD-CONIFER FOREST CLASS

MHn44a Aspen-Birch-Red Maple Forest MHn44c Aspen-Fir Forest Type

MHn44b White Pine – White Spruce – Paper Birch Forest Type

MHn44c Aspen – Fir Forest Type

MHn45 NORTHERN MESIC HARDWOOD (CEDAR) FOREST CLASS

- MHn46 NORTHERN WET-MESIC HARDWOOD FOREST CLASS
 - MHn46a Aspen-Ash Forest
 - MHn46b Black Ash-Basswood Forest Type
 - MHn46b Black Ash – Basswood Forest Type
- MHn47 NORTHERN RICH MESIC HARDWOOD FOREST CLASS
 - MHn47a Sugar Maple-Basswood-(Bluebead Lily) Forest Type
 - MHn47b Sugar Maple-Basswood-(Horsetail) Forest Type
- MHc26 CENTRAL DRY-MESIC OAK-ASPEN FOREST CLASS
 - MHc26a Oak-Aspen-Red Maple Forest Type
 - MHc26b Red Oak-Sugar Maple-Basswood (Large-Flowered Trillium) Forest Type
- MHc36 CENTRAL MESIC HARDWOOD FOREST (EASTERN) CLASS
 - MHc36a Red Oak-Basswood Forest (Noncalcareous Till) Type
 - MHc36b Red Oak-Basswood Forest (Calcareous Till) Type
- MHc47 CENTRAL WET-MESIC HARDWOOD FOREST CLASS
 - MHc47a Basswood – Black Ash Forest Type

FLOODPLAIN FOREST SYSTEM

- FFn57 NORTHERN TERRACE FOREST CLASS
 - FFn57a Black Ash-Silver Maple Terrace Forest Type
- FFn67 NORTHERN FLOODPLAIN FOREST CLASS
 - FFn67a Silver Maple-(Sensitive Fern) Floodplain Forest Type

WET FOREST SYSTEM

- WFn53 NORTHERN WET CEDAR FOREST CLASS
 - WFn53b Lowland White Cedar Forest (Northern) Type
- WFn55 NORTHERN WET ASH SWAMP CLASS
 - WFn55a Black Ash-Aspen-Balsam Poplar Swamp (Northeastern) Type
 - WFn55b Black Ash – Yellow Birch – Red Maple – Basswood Swamp (Eastcentral) Type
 - WFn55c Black Ash-Mountain Maple Swamp (Northern) Type
- WFn64 NORTHERN VERY WEST ASH SWAMP CLASS
 - WFn64a Black Ash-Conifer Swamp (Northeastern) Type
 - WFn64c Black Ash-Alder Swamp (Northern) Type
- WFn74 NORTHERN WET ALDER SWAMP CLASS

FORESTED RICH PEATLAND SYSTEM

- FPn63 NORTHERN CEDAR SWAMP CLASS
 - FPn63b White Cedar Swamp (Northcentral) Type
- FPn71 NORTHERN RICH SPRUCE SWAMP (WATER TRACK) CLASS
- FPn73 NORTHERN ALDER SWAMP CLASS
 - FPn73a Alder Swamp Type
- FPn81 NORTHERN RICH TAMARACK SWAMP (WATER TRACK) CLASS
 - FPn81a Rich Tamarack (Sundew – Pitcher Plant) Swamp Type
- FPn82 NORTHERN RICH TAMARACK SWAMP (WESTERN BASIN) CLASS
 - FPn82a Rich Tamarack – (Alder) Swamp Type
 - FPn82b Extremely Rich Tamarack Swamp Type

ACID PEATLAND SYSTEM**APn80 NORTHERN SPRUCE BOG CLASS**

APn80a Black Spruce Bog Type

*APn80a1 Treed Subtype**APn80b2 Semi-Treed Subtype***APn81 NORTHERN POOR CONIFER SWAMP CLASS**

APn81a Poor Black Spruce Swamp Type

APn81b Poor Tamarack-Black Spruce Swamp Type

*APn81b1 Black Spruce Subtype**APn81b2 Tamarack Subtype***5.3 Minnesota's List of Endangered, Threatened, and Special Concern Species****Rare Features Information**

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

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

Purpose, Scope, and Relationships to Federal Laws

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

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

Note that the federal Endangered Species Act of 1973, as amended (16 USC 1531 _ 1544; see <http://www.fws.gov/endangered/policies/index.html>) requires the U.S. Department of the Interior to identify species as endangered or threatened according to a separate set of

definitions, and imposes a separate set of restrictions for those species. Three species on the federal list of endangered or threatened species occur in the North 4 subsections: gray wolf, bald eagle, and Canada lynx. See: <http://www.fws.gov/midwest/endangered/lists/minnesot-spp.html>

For more information on listed species, contact:
Natural Heritage and Nongame Research Program
Minnesota Department of Natural Resources
500 Lafayette Rd, Box 25
St. Paul, MN 55155
651-259-5090
1-888-646-6367 (toll free)

Minnesota Heritage Information System

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

Survey Methods

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

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

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

Minnesota Listed Species

Copyright (2007), State of Minnesota, Department of Natural Resources. Rare features data included here were provided by the Natural Heritage and Nongame Research Program of the Division of Ecological Resources, Minnesota Department of Natural Resources (DNR), and were current as of March 26, 2007. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present. In addition, there may be inaccuracies in the data, of which the DNR is not aware and shall not be held responsible for. Permission to use these data does not imply endorsement or approval by the DNR of any interpretations or products derived from the data.

The rare feature products prepared for the North-4 subsection plan include information on species of plants and animals listed as endangered, threatened, and special concern (ETS). *Minnesota's List of Endangered, Threatened, and Special Concern Species* was created in 1984 and was last revised in 1996. The list, created under Minnesota's Endangered and Threatened Species Statute, draws attention to species that are at greatest risk of extinction within the state and applies special regulations to species listed as endangered or threatened. By alerting resource managers and the public to species in jeopardy, activities can be reviewed and prioritized to help preserve the diversity and abundance of Minnesota's flora and fauna. Because the list influences resource use and management activities in Minnesota, it is critical that it reflect the most current information regarding the distribution, abundance, and security of species within the state. Consequently, Minnesota law requires periodic revisions to the list. The DNR submitted a set of proposed revisions to *Minnesota's List of Endangered, Threatened, and Special Concern Species* to the 2006-07 Minnesota Legislature that await legislative action at the time of this report. The proposed revisions are not reflected in the following tables.

Table 5.1 North-4 Subsections: Minnesota Listed Species – Animals

MINNESOTA LISTED SPECIES - ANIMALS							
St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork Vermilion Uplands Subsections							
		OCCURRENCE ¹					
SCIENTIFIC NAME	COMMON NAME	SM	TL	NU	LFV	MN RANK ²	NPC SYSTEM ³
<i>Acipenser fulvescens</i>	Lake Sturgeon		O		O	SPC	AR, AL
<i>Ammodramus henslowii</i>	Henslow's Sparrow		O			END	O
<i>Ammodramus nelsoni</i>	Nelson's Sharp-tailed Sparrow	O	O			SPC	AP, WM, OP
<i>Asio flammeus</i>	Short-eared Owl		O			SPC	MR, OP, AP, WM
<i>Buteo lineatus</i>	Red-shouldered Hawk	O				SPC	MH, FF, MR
<i>Cicindela denikei</i>	Laurentian Tiger Beetle				O	THR	
<i>Clemmys insculpta</i>	Wood Turtle		O			THR	RV, MH, FD
<i>Coturnicops noveboracensis</i>	Yellow Rail	O	O			SPC	MR, WM
<i>Cygnus buccinator</i>	Trumpeter Swan	O	O			THR	A
<i>Emydoidea blandingii</i>	Blanding's Turtle	O	O			THR	AR, FD
<i>Etheostoma microperca</i>	Least Darter	O				SPC	AR, AL
<i>Falco peregrinus</i>	Peregrine Falcon		O	O		THR	LK
<i>Haliaeetus leucocephalus</i>	Bald Eagle	O	O	O	O	SPC	U
<i>Hemidactylium scutatum</i>	Four-toed Salamander	O	O			SPC	MH, FP (shrub swamp)
<i>Ichthyomyzon fossor</i>	Northern Brook Lamprey			O	O	SPC	AR
<i>Lasmigona compressa</i>	Creek Heelsplitter	O	O	O	O	SPC	AR
<i>Lasmigona costata</i>	Fluted-shell	O				SPC	AR
<i>Ligumia recta</i>	Black Sandshell	O	O	O	O	SPC	AR
<i>Marpissa grata</i>	A Jumping Spider	O	O			SPC	O, WM, AP
<i>Notropis anogenus</i>	Pugnose Shiner	O	O			SPC	AR, AL
<i>Oxyethira itascae</i>	A Caddisfly				O	SPC	A
<i>Phalaropus tricolor</i>	Wilson's Phalarope		O			THR	A, WM, FD, MR
<i>Polycentropus milaca</i>	A Caddisfly	O				SPC	A

Table 5.2 North-4 Subsections: Minnesota Listed Species – Plants

MINNESOTA LISTED SPECIES - PLANTS							
St. Louis Morianes, Tamarack Lowlands, Nashwauk Uplands, and Littlefork Vermilion Uplands Subsections							
SCIENTIFIC NAME	COMMON NAME	OCCURRENCE ¹				MN RANK ²	NPC SYSTEM ³
		SM	TL	NU	LV		
<i>Adoxa moschatellina</i>	Moschatel		O			SPC	MH
<i>Botrychium campestre</i>	Prairie Moonwort	O	N	O		SPC	O
<i>Botrychium lanceolatum</i>	Triangle Moonwort	O	O	O		THR	MH
<i>Botrychium minganense</i>	Mingan Moonwort	P		O		SPC	O, MH, RO
<i>Botrychium mormo</i>	Goblin Fern	O	O	O	O	SPC	MH
<i>Botrychium oneidense</i>	Blunt-lobed Grapefern	O	O	O		END	MH
<i>Botrychium pallidum</i>	Pale Moonwort	O	O	O		END	O
<i>Botrychium rugulosum</i>	St. Lawrence Grapefern	O	O	O		THR	O, MH
<i>Botrychium simplex</i>	Least Moonwort	O	O	O		SPC	O, WF, MH
<i>Caltha natans</i>	Floating Marsh-marigold	P	O	O	O	END	AR, RV, A,
<i>Carex exilis</i>	Coastal Sedge		O		O	SPC	RF
<i>Carex garberi</i>	Garber's Sedge		O			THR	RF
<i>Carex sterilis</i>	Sterile Sedge		N		O	THR	RF
<i>Cetraria aurescens</i>	Eastern candlewax lichen		O			SPC	FP,FD
<i>Cladium mariscoides</i>	Twig-rush				O	SPC	RF, LK
<i>Cypripedium arietinum</i>	Ram's-head Lady's-slipper	O		O	P	THR	FD, FP
<i>Drosera anglica</i>	English Sundew			O	O	SPC	RF
<i>Drosera linearis</i>	Linear-leaved Sundew				O	SPC	RF
<i>Eleocharis nitida</i>	Neat Spike-rush		O			THR	WM, O
<i>Eleocharis olivacea</i>	Olivaceous Spike-rush	O				THR	LK, AP, FP
<i>Eleocharis quinqueflora</i>	Few-flowered Spike-rush			O		SPC	RF, LK, O
<i>Eleocharis rostellata</i>	Beaked Spike-rush				O	THR	RF
<i>Fimbristylis autumnalis</i>	Autumn Fimbristylis	O				SPC	O, LK
<i>Juglans cinerea</i>	Butternut	O	N	N	N	SPC	MH
<i>Juncus stygius</i> var. <i>americanus</i>	Bog Rush	O	P		O	SPC	RF, AP
<i>Littorella uniflora</i>	American Shore-plantain	O		O		SPC	AL, LK
<i>Lobaria quercizans</i>	Smooth lungwort	O	O	O		SPC	WF, MH
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's-mouth	O	O		O	SPC	FP
<i>Najas gracillima</i>	Thread-like Naiad	O	O	O	O	SPC	AL

MINNESOTA LISTED SPECIES - PLANTS (cont)							
St. Louis Morianes, Tamarack Lowlands, Nashwauk Uplands, and Littlefork Vermilion Uplands Subsections							
		OCCURRENCE ¹					
SCIENTIFIC NAME	COMMON NAME	SM	TL	NU	LV	MN RANK ²	NPC SYSTEM ³
<i>Nymphaea leibergii</i>	Small White Water-lily	O				THR	AL, AR
<i>Panax quinquefolius</i>	American Ginseng	O	N	N	N	SPC	MH
<i>Phacelia franklinii</i>	Franklin's Phacelia	P	O			SPC	C, FD, O
<i>Platanthera clavellata</i>	Club-spur Orchid	O	O	O	P	SPC	FP, AP
<i>Platanthera flava</i> var. <i>herbiola</i>	Tuberclad Rein-orchid	O	N	O		END	WM
<i>Polemonium occidentale</i> ssp. <i>lacustre</i>	Western Jacob's Ladder		O		O	END	FP
<i>Potamogeton bicupulatus</i>	Snail-Keed Pondweed	O				END	AL
<i>Potamogeton vaginatus</i>	Sheathed Pondweed		O			SPC	AL
<i>Potamogeton vaseyi</i>	Vasey's Pondweed	O	O	O		SPC	AL
<i>Ranunculus lapponicus</i>	Lapland Buttercup	O	P	O	O	SPC	FP, WF
<i>Rhynchospora fusca</i>	Sooty-colored Beak-rush		O	O	O	SPC	RF, AP
<i>Salix maccalliana</i>	Mccall's Willow	N	N	N	O	SPC	WM
<i>Sparganium glomeratum</i>	Clustered Bur-reed	O	O	O	O	SPC	WM, AR, LK, WF, O
<i>Sticta fuliginosa</i>	Peppered moon lichen			O		SPC	WF, FP, MH
<i>Subularia aquatica</i>	Awlwort	O				THR	AL
<i>Torreyochloa pallida</i>	Torrey's Manna-grass	P	P	O	O	SPC	RV, LK, MR
<i>Tsuga canadensis</i>	Eastern Hemlock		O		O	SPC	MH
<i>Utricularia purpurea</i>	Purple-flowered Bladderwort	O				SPC	AL
<i>Utricularia resupinata</i>	Lavendar Bladderwort	O		O		SPC	AL
<i>Waldsteinia fragarioides</i>	Barren Strawberry		O	O		SPC	FD
<i>Xyris montana</i>	Montane Yellow-eyed Grass	O	O			SPC	RF, AP

Additional Species Data

In addition to information on listed species, the North-4 subsections plan includes information on species labeled as “NONs.” “NONs” are defined as a plant or animal species with no legal status, but for which data are being compiled in the Natural Heritage Information System because the species falls into one of the following categories:

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

Table 5.3 North-4 Subsections: Minnesota “NONs” – Animals

MINNESOTA "NONs" - ANIMALS							
St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork Vermilion Uplands Subsections							
		OCCURRENCE ¹					
SCIENTIFIC NAME	COMMON NAME	SM	TL	NU	LFV	MN RANK ²	NPC SYSTEM ³
<i>Accipiter gentilis</i>	Northern Goshawk	O	O	O	O	NON	FD, MH
<i>Aegolius funereus</i>	Boreal Owl		O			NON	FD, MH, WF, AP
<i>Bartramia longicauda</i>	Upland Sandpiper		O			NON	O
<i>Botaurus lentiginosus</i>	American Bittern	O	O	O	O	NON	MR, WM
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	O	O	O	O	NON	A, MR, WF, FF, FD, LK
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler	O				NON	MH
<i>Grus canadensis</i>	Sandhill Crane	O	O			NON	MR, WM
<i>Lycaena epixanthe michiganensis</i>	Bog Copper	O	O			NON	AP
<i>Strix nebulosa</i>	Great Gray Owl		O			NON	FP, AP

Table 5.4 North-4 Subsections: Minnesota "NONs" – Plants

MINNESOTA "NONs" - PLANTS							
St. Louis Morianes, Tamarack Lowlands, Nashwauk Uplands, and Littlefork Vermilion Uplands Subsections							
SCIENTIFIC NAME	COMMON NAME	OCCURRENCE ¹				STATE RANK ²	NPC SYSTEM ³
		SM	TL	NU	LV		
<i>Actaea pachypoda</i>	White Baneberry			O	O	NON	MH
<i>Alisma gramineum</i>	Narrow-leaved Water Plantain	O				NON	A
<i>Arethusa bulbosa</i>	Dragon's-mouth	O	O	O	P	NON	RF, P
<i>Botrychium ascendens</i>	Upward-lobed Moonwort	O	N			NON	O
<i>Botrychium lineare</i>	Narrowleaf Grape Fern	O	N			NON	O
<i>Botrychium matricariifolium</i>	Matricary Grapefern	O	O	O	P	NON	MH, FD, O
<i>Botrychium michiganense</i>	Michigan Moonwort	O	O	O		NON	O, RO
<i>Botrychium spathulatum</i>	Spathulate Moonwort	O	N			NON	O
<i>Cardamine pratensis</i> var. <i>palustris</i>	Cuckoo Flower		O			NON	OP, FP, RV
<i>Carex ormostachya</i>	Necklace Spike Sedge	O	P	O		NON	MH
<i>Ceratophyllum echinatum</i>	Spiny Hornwort	O			O	NON	A
<i>Elatine triandra</i>	Three Stamened Waterwort	O				NON	A
<i>Eleocharis robbinsii</i>	Robbin's Spike-rush	O				NON	AL, LK
<i>Geocaulon lividum</i>	Northern Comandra	O	P	P	O	NON	FP, AP
<i>Liparis liliifolia</i>	Lilia-leaved Twayblade		N	O	N	NON	MH, FD
<i>Lycopus virginicus</i>	Virginia Water Horehound	O	N	N	N	NON	FF
<i>Myriophyllum tenellum</i>	Leafless Water Milfoil	O	O	O		NON	AL
<i>Poa sylvestris</i>	Woodland Bluegrass		O			NON	MH
<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb	O	O			NON	WM, WF
<i>Polygonum hydropiperoides</i>	Mild Water Pepper		O			NON	WM, O
<i>Potamogeton oakesianus</i>	Oakes' Pondweed		O			NON	AL
<i>Ranunculus gmelini</i>	Small Yellow Water Crowfoot	P	O	P	P	NON	LK, O, RV, WF
<i>Scirpus pedicellatus</i>	Woolgrass	P	P	O	P	NON	LK, WM, RV
<i>Spiranthes casei</i>	Case's Ladies'-tresses	O		O		NON	O
<i>Triglochin palustris</i>	Marsh Arrow-grass			O	O	NON	RF, AP, FP
<i>Utricularia gibba</i>	Humped Bladderwort	O	O	O	O	NON	AL

Key to Rare Features Codes

¹Occurrence

- O** – Documented occurrence in the subsection
- P** – Highly likely to occur in the subsection (plants only)
- N** – Not likely to occur in the subsection (plants only)

²MN Rank

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

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

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

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

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

³NPC (Native Plant Community) System

Most of the following codes were adapted from native plant community systems in *Field Guide to the Native Plant Communities of Minnesota: the Laurentian Mixed Forest Province*. Exceptions to this, created for the North-4 SFRMP and not part of the field guide, include the codes A, AL, AR, U, and O.

- A** – Aquatic general
- AL** – Aquatic (lake)
- AR** – Aquatic (river)
- FD** – Fire dependent forest
- FF** – Floodplain forest
- LK** – Lakeshore
- MR** – Marsh
- MH** – Mesic hardwood forest
- FP** – Forested/treed peatland (includes both rich and acid forested/treed)

peatlands)

OP – Open rich peatland (includes rich fens)

AP – Acid peatland (includes open bogs)

RV – River shore

WF – Wet forest

WM – Wet meadow/carr (patchy graminoid and deciduous shrub on permanently wet, organic soil.)

U – Wide-ranging and/or associated with a wide variety of habitats

O – Openings (natural and anthropogenic)

Listed Species Status Sheets

A supplemental document, *Statement of Need and Reasonableness (SONAR) and Species Status Sheets*, is available by contacting the DNR. This document addresses listed species in Minnesota for which a change in status was proposed during the 1996 list revision. The *Species Status Sheets* provide some information on the species and describe the rationale for the 1996 proposed change in Minnesota status.

Natural Heritage and Nongame Research Program Rare Species Fact Sheets

The Natural Heritage and Nongame Research Program is in the process of preparing and publishing rare species fact sheets. This effort will not be completed for this round of subsection planning although it will be completed and the fact sheets will become available for use in vegetation management during the implementation phase of the North-4 SFRMP.

The goal of the rare species fact sheet project is to update and publish information on Minnesota's rare species. It is both an informational and technological update to the 1988 publication, *Minnesota's Endangered Flora and Fauna*, by Coffin and Pfanmuller. Species information will be web-based and will use an interactive database approach that allows users to search on selected fields and create customized reports. Users will also be able to perform alphabetical searches and generate standard printouts of rare species accounts.

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

Information Resources

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

Sources for Additional Rare Species Information

1. The Nature Conservancy. *Element Occurrence Abstracts*
2. NatureServe. A network connecting science with conservation that includes an online encyclopedia of rare plants and animals. <http://www.natureserve.org/>
3. U.S. Department of Agriculture – Forest Service Region 9. Regional Forester *Sensitive Species Conservation Assessment Documents* (also on the Web at: <http://www.fs.fed.us/r9/wildlife/tes/ca-overview/index.htm>)

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5.4 Minnesota County Biological Survey

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

Minnesota County Biological Survey (MCBS) fieldwork has been completed in some counties and is in progress in other counties and regions within the North-4 subsections (http://www.dnr.state.mn.us/ecological_services/mcbs/index.html). See *Table 5.5 North-4 Subsections* below for the status of the MCBS in the North-4 subsections and, where available, the location of associated data. The SFRMP team will include in its assessment package MCBS survey information available in the DNR rare features database, the DNR data deli, and from other sources. Where MCBS survey work is in progress, the SFRMP team will incorporate information into the planning process as it becomes available.

MCBS Site Delineation Process

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

MCBS Procedures – site and native plant community surveys

1. Review existing information

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

Among the sources consulted are:

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

2. Site selection

Sites that appear to contain important areas of native vegetation are digitized in a Geographic Information System (GIS) or delineated on topographic maps using aerial photography, satellite imagery, and other related resource maps and data. These sources

of information are used to determine boundaries and provide a preliminary determination of the types of native plant communities that are present within each site.

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

3. Field surveys of selected sites

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

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

4. Information management

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

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

5. Final Steps

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

MCBS Procedures – Rare Species Surveys

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

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

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

Status of MCBS in the North-4 Subsections

Table 5.5 North-4 Subsections: MCBS Status

County	Field Data Collection Scheduled	Notes on Sites and NPCs
Aitkin	Completed	Draft sites are digital, NPC mapping in-progress
Beltrami	No	None
Carlton	Completed	Draft sites are digital, NPC mapping in-progress
Cass	Completed	Draft sites are digital, need revisions
Crow Wing	Completed	Draft final sites are digital, need revisions
Itasca	In progress	Preliminary survey sites digitized, prioritized for survey
Koochiching	No	None
St. Louis	NSH: complete TU: complete LU: complete TL: no NU: no BL: no	NSH: complete, available on the DNR Data Deli; TU: in progress; LU: in progress; TL: no NU: no BL: no

Contact: Carmen Converse carmen.converse@dnr.state.mn.us (651) 296-9782

NSH – North Shore Highlands Subsection

TU – Toimi Uplands Subsection

LU – Laurentian Uplands Subsection

TL – Tamarack Lowlands Subsection

NU – Nashwauk Uplands Subsection

BL – Border Lakes Subsection

DNR Data Deli – Department of Natural Resources Data Deli (<http://deli.dnr.state.mn.us/>)