

Biotic Inventory and Analysis of the Flambeau River State Forest

A Baseline Inventory and Analysis of Natural Communities, Rare Plants, and Animals

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Natural Heritage Inventory Program
Bureau of Endangered Resources
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Primary Authors: Craig Anderson, Eric Epstein, Drew Feldkirchner, and William Smith

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- Joan Elias - birds
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Table of Contents

Executive Summary	3
Introduction	8
Project Purpose and Objectives	8
Overview of Methods	8
Background on Past Efforts	10
Description of the Study Area	11
Location	11
Ecoregions	11
Size	13
Special Management Designations	13
Public Lands	14
General Land Use	14
Physical Environment	15
Vegetation	16
Summary of Findings	21
Natural Communities of the Study Area	21
Rare Vascular Plants of the Study Area	21
Rare Animals of the Study Area	23
Threats to Natural Communities, Aquatic Systems, and Rare Species	27
Priority Opportunities for Biodiversity Conservation	30
Landscape Level Priorities	30
Community Level Priorities	31
Primary Sites: Significance and Summaries	33
Future Inventory, Monitoring and Research Needs	35
Glossary	41
Species List	36
References	42

Appendices

A. Natural Heritage Inventory Methods Overview.....	A-1
B. Primary Site Descriptions.....	B-1
C. Natural Communities of the Flambeau River State Forest.....	C-1
D. Species of Greatest Conservation Need for the North Central Forest.....	D-1
E. Working List Explanation.....	E-1
F. Summary of Breeding Bird Data from 2000-2001 Surveys.....	F-1

List of Tables

Table 1. Field Surveys Conducted During 2000 – 2001.....	9
Table 2. Natural Communities Documented from the Study Area.....	21
Table 3. Rare Plants Documented from the Study Area.....	21
Table 4. Rare Animals Documented from the Study Area.....	23
Table 5. Vertebrate Species of Greatest Conservation Need for the North Central Forest.....	26
Table D.1 Vertebrate Species of Greatest Conservation Need and Habitats for the North Central Forest.....	D-1
Table F.1. Numbers of Birds Observed During Point Counts, Flambeau River State Forest, June 2000.....	F-1

List of Figures

Figure 1. Flambeau River State Forest Study Area.....	11
Figure 2. Wisconsin’s Ecological Landscapes.....	11
Figure 3. Landtype Associations from the Flambeau River State Forest.....	12
Figure 4. Areas with Special Management Designations on the Flambeau River State Forest.....	13
Figure 5. Public Lands in the Area Surrounding the Flambeau River State Forest.....	14
Figure 6. Wisconsin Contiguous Deciduous Forested Blocks.....	15
Figure 7. Vegetation for the Flambeau River State Forest Prior to European Settlement.....	17
Figure 8. Pre-settlement General Land Office Tree Species for the Flambeau River State Forest.....	18
Figure 9. Landcover from Satellite Data for the Flambeau River State Forest and Surrounding Areas.....	19
Figure 10. Forest Cover Types for the Flambeau River State Forest.....	20
Figure 11. Wisconsin 2007 Timber Wolf Distribution.....	23
Figure 12 Flambeau River State Forest Primary Sites.....	34

Executive Summary

Project Purpose and Objectives

The Flambeau River State Forest Biotic Inventory was a multiple-year project to survey and analyze selected natural resources of the Flambeau River State Forest and select nearby areas. The Natural Heritage Inventory (NHI) Program, part of the Wisconsin Department of Natural Resources' Bureau of Endangered Resources, conducted the inventory in cooperation with the Division of Forestry. Project goals were to provide baseline information on rare species, high-quality natural communities, significant aquatic features, and the overall ecology of the Flambeau River State Forest (FRSF). This report will provide an ecological context for the property and its natural features and highlight opportunities to conserve biological diversity.

A biotic inventory is one of several assessments identified as critical for developing a state forest master plan. This report is intended to be used in combination with other documents, including the "Regional and Property Assessment," by department master planning teams when they develop a master plan for the forest. We also hope this report will be useful to property managers, administrators, conservation groups, private landowners, and others who have an interest in conserving the biological diversity of this portion of Wisconsin's landscape.

The objectives of this project were:

- identification and evaluation of natural communities;
- identification and evaluation of rare or otherwise significant plant and animal populations;
- identification and evaluation of selected aquatic features and their associated biota;
- identification of sites appropriate for the restoration of lost or declining communities or important habitats;
- identification of important protection, management, and restoration opportunities, involving both unique and representative natural features of the FRSF and surrounding landscape;
- interpretation and synthesis of the results for department master planning teams, property managers, administrators, and others involved in the implementation of land use decisions on the Flambeau River State Forest, as well as the surrounding landscape.

Description of the Study Area

Located in northwest Wisconsin, the FRSF occurs in Price, Sawyer, Rusk, Ashland, and Iron counties and surrounds portions of the north and south forks of the Flambeau River. The FRSF lies within the North Central Forest Ecological Landscape (Figure 2), an area characterized by extensive forests, wetlands, and some agriculture.

The North Central Forest contains a high percentage of public lands. Other public ownerships near the FRSF include four state wildlife areas, two units of the Chequamegon-Nicolet National Forest, and large acreages of three county forests. Large tracts of industrial forest also occur nearby.

According to data from the General Land Office surveys of the mid 1800s, the vegetation of what is now the FRSF was composed of hemlock-hardwood ("Northern Mesic") forests with large amounts of hemlock, sugar maple, and yellow birch, and smaller areas of red and white pine prior to European settlement. Hemlock is currently a minor component of this landscape which is now largely maple-dominated northern hardwoods. Currently, northern hardwoods comprise 44% of the forested acreage on the forest, followed in abundance by Aspen, swamp hardwoods,

and lowland brush, and fir-spruce cover types. All other forest cover types combined represent only 7% of the total area of the FRSF.

The FRSF contains abundant wetlands, including hardwood swamps, conifer swamps, open peatlands, wet meadows, Alder Thickets, and small amounts of Emergent Marsh. Several of the peatlands are large with mostly undisturbed hydrology. White cedar swamps are uncommon on the FRSF, and, as in almost all other areas in the state, white cedar regeneration appears to be lacking, most likely due to excessive deer browse. Ephemeral Ponds are dispersed throughout the upland forests of the FRSF and are common and characteristic landscape features.

Exceptional Characteristics of the Study Area

Although not known to support large numbers of rare species compared to other state-managed properties such as the Black River State Forest (Epstein et al. 2003), the FRSF does feature important ecological attributes. The characteristics described below are important considerations related to the FRSF for state property master planning and are not listed in order of importance.

- **Large Forested Acreage.** The FRSF contains a large acreage of Northern Mesic Forest, a characteristic northern Wisconsin plant community, within a matrix of state, county and federal land ownerships. This portion of the state contains a large block of unbroken forest that is regionally important and is less fragmented than many other areas in Wisconsin.
- **Extensive Public Lands.** The FRSF is Wisconsin's second largest state-managed property, encompassing over 90,000 acres. Public ownership in the area surrounding the FRSF is extensive and includes state and federally managed lands, along with three county forests. State, county forest, and national forest lands make up 30% of the total land area for the three counties (Price, Sawyer, and Rusk) comprising the majority of the FRSF. Ashland County, just to the north, contains another ca. 273,000 acres of public lands. There are many places where ecological connections could or already do occur among the public lands in these areas.
- **Large Peatlands.** The FRSF and nearby public lands contain large acid peatland complexes with good-quality examples of several wetland natural community types including Muskeg, Northern Wet Forest, Black Spruce Swamp, and Poor Fen. These peatlands have the potential to harbor rare species and are generally less impacted by the hydrological alterations and other disturbances that have often affected similar communities farther south.
- **Landscape-scale Management Opportunities.** Urban and agricultural uses are relatively localized within this portion of the state, and this area is much less fragmented by development than many portions of Wisconsin. The FRSF is large and situated within a matrix of public lands, so there are exceptional possibilities to manage lands at a landscape (rather than a local or stand) scale. In addition, housing density, human population density, and road density are low in the area surrounding the FRSF when compared with many other parts of the state. The combination of these factors provides management opportunities that occur at only a handful of state-managed lands to sustain certain plants, animals, and natural communities that are often restricted to larger unfragmented and undeveloped areas. For example, area-sensitive species, including rare forest interior birds, are present and could be maintained with appropriate management.
- **Old-growth Management Opportunities.** Stands of old forest are rare statewide (WDNR 2006b), and the WDNR Statewide Forest Plan (WDNR 2004) contains an objective to “conserve, protect, and manage old growth forests, and where feasible encourage their appropriate representation on the variety of ownerships.” The FRSF is large, located in a favorable ecological context, and provides numerous excellent opportunities to develop old-growth, old, and extended rotation forests (see WDNR 2006b for more information on these forest classes). The large land base of the FRSF could allow for a range of management opportunities including “managed old-growth,” experimental areas, and control or “benchmark” areas for long-term conservation and scientific study. In addition, although the FRSF's major cover types are not rare throughout the landscape, the FRSF contains examples of variants of the Northern Mesic Forest community that are not well represented on other state lands (i.e., with rich ground flora, a significant hemlock component, unique microhabitats such as forested seeps, and numerous Ephemeral Ponds).

- **Unique Microhabitats.** In addition to peatland communities, the FRSF contains specialized microhabitats that can harbor rare and unusual species. These habitats include Ephemeral Ponds, Forested Seeps, and springs.
- **Flambeau River and Associated Aquatic Habitats.** The FRSF was originally designated to protect portions of the Flambeau River, and the north and south forks of the Flambeau River have long been recognized for their biological importance. While both forks, and their tributaries, constitute significant aquatic resources, the South Fork is particularly important for aquatic invertebrate species diversity. These stream stretches support significant occurrences of natural communities, many rare species, and afford the opportunity to maintain connections with other ecologically important landscapes.
- **Undeveloped Lakes and Ponds within an extensive forest matrix.**

Summary of Biotic Inventory Results

Rare Vascular Plants

Seven rare plant species from the NHI Working List have been documented on the FRSF and immediate surrounding area (Table 3). These include the State Endangered mountain cranberry (*Vaccinium vitis-idaea* ssp. *minus*) and six Special Concern (see dnr.wi.gov/org/land/er/wlist/) plants: Assiniboine sedge (*Carex assiniboensis*), Sparse-flowered sedge (*Carex tenuiflora*), swamp bedstraw (*Galium brevipes*), swamp-pink (*Arethusa bulbosa*), Mingan's moonwort (*Botrychium minganense*), and blunt-lobe grape-fern (*Botrychium oneidense*). Collectively, these species are known to use a range of habitats including rich alluvial river terraces, acid conifer swamps, and Northern Mesic Forests.

Rare Animals

Eighteen animal species from the NHI Working List have been documented on the FRSF, including 10 bird, two dragonfly, four mussel, one snake, and one turtle species (Table 4). These include the State Endangered Extra-striped snaketail (*Ophiogomphus anomalus*), a dragonfly, and purple wartyback mussel (*Cyclonaias tuberculata*), as well as six State Threatened species: Red-shouldered Hawk, Cerulean Warbler, Osprey, pygmy snaketail (*Ophiogomphus howei*), salamander mussel (*Simpsonaias ambigua*), and wood turtle (*Clemmys insculpta*). Ten Special Concern (dnr.wi.gov/org/land/er/wlist/) animals are also known from the FRSF. Over half of the rare animals documented from the FRSF rely on wetland or aquatic habitats; several of these inhabit the Flambeau River or associated tributaries. Two of the species documented on the FRSF are globally rare (pygmy snaketail and salamander mussel).

Numerous Species of Greatest Conservation (SGCN) from the Wisconsin Wildlife Action Plan (WDNR 2006d) are known or predicted from the North Central Forest, including 10 mammal, 53 bird, seven herptile, and 10 fish species (Table 5). Some of these species have already been recorded on the FRSF; several others have the potential to occur there and are known to use natural communities representing *Ecological Priorities* in the landscape (WDNR 2006d).

Natural Communities

Fifty-two high-quality (Element Occurrence quality) examples of **15** natural community types have been documented on the FRSF (Table 2) including six wetland forest types, two upland forest types, two shrub community types, two wetland herbaceous types, and three lake types (see Appendix C for brief descriptions of the natural community types found on the FRSF). Most of these natural community types are characteristic of northern Wisconsin, with the notable exceptions of the locally uncommon Floodplain Forest and Emergent Marsh communities. The best examples of both rare and representative natural community types documented on the FRSF are included in the "Primary Sites" found in Appendix B.

Aquatic Features

The FRSF is well known for containing stretches of both the north and south forks of the Flambeau River. In addition to the rare animal species discussed elsewhere the warmwater Flambeau system supports a diverse fish and invertebrate community. Several of the tributaries to the Flambeau system flow entirely through forested watersheds. The Louisiana Waterthrush, a Special Concern species found here at the extreme northern edge of its breeding range,

has been found along high gradient stretches of some of these tributaries. Intact assemblages of aquatic invertebrates are also found on many of these tributary streams. The FRSF contains undeveloped lakes (e.g., Bass and Swamp lakes) embedded within large, undeveloped forested watersheds.

Threats to Natural Communities, Aquatic Systems, and Rare Species

Several threats to the biodiversity of the FRSF are discussed in the text; these are generally related to fragmentation, invasive species, and ecological simplification / habitat loss. Threats include negative impacts from invasive plants, non-native earthworms, excessive deer browse, and increased edge habitat. Limiting, avoiding, eliminating, or, in some cases, reversing these threats will play a key role in conserving and/or enhancing the biological diversity of the landscape.

Priority Opportunities for Biodiversity Conservation

We have identified several ecologically-important opportunities for biodiversity conservation on the FRSF. These opportunities were developed based on the assessment of inventory data collected during 2000-2001 and supplemented with more recent information collected through 2007. Several other sources were also used, including air photos and satellite imagery, as well as associated data such as WISCLAND (WDNR 1993), ecoregional data, various analyses of pre-European settlement vegetation data, and Forest Inventory and Analysis data (see <http://fia.fs.fed.us> for more information on these data).

The following lists provide an overview of the priority opportunities for biodiversity conservation at the landscape scale. Conservation opportunities are not equivalent throughout the study area, and significance of individual sites and opportunities for conservation at the site level are covered elsewhere (see “Primary Sites: Significance and Summaries”).

Protection, Restoration, and Management Opportunities and Needs

1. Maintain or develop large blocks of contiguous forest and wetland communities.
2. Maintain or develop connections between patches of habitat to avoid negative isolation effects.
3. Protect, manage, and maintain viable examples of native communities, aquatic systems including major river stretches, and geological features throughout the study area. Community priorities include rare and representative types, large patches, and missing or diminished successional stages (i.e., across the natural range of variation characteristic for a given community type). Communities are discussed on pp. 31-32 and Appendix C.
4. Manage at a landscape scale – consider stand level opportunities within the larger context of the landscape.
5. Protect and/or restore the hydrology of wetland and aquatic systems.
6. Protect, manage, maintain, and, where feasible, increase viable habitat for rare or otherwise sensitive plants and animals.
7. Increase management capacity to identify and control invasive species and prevent widespread infestations.
8. Identify means to increase cooperation and coordination across administrative boundaries since certain management issues cannot always be effectively addressed on an individual property basis (examples include wide-ranging species, area-sensitive species, riparian corridors, species that are distributed as “metapopulations,” invasive species management, and management of disturbance events that can occur at very large scales). Management interest and emphasis varies among federal, state, county, tribal, and private land ownerships.
9. Due to its size, context within a forested landscape and presence of a seed source, the FRSF may provide opportunities to attempt to restore hemlock, although browse pressure by deer and other factors may make this very difficult.

10. The WDNR has identified the need to conserve, protect, and manage old-growth forests (WDNR 2006b, WDNR 2004, WDNR 1995). Because of its size and large forested acreage, the FRSF offers some of the best opportunities to develop forests with old-growth characteristics and extended rotations on state managed lands. The FRSF is also the only state forest with high-quality northern hardwoods and hemlock hardwoods “Primary Sites.”

Primary Sites: Significance and Summaries

Since conservation opportunities vary throughout a given study area, we use inventory findings along with other sources of information to identify Primary Sites representing the best known examples of rare and representative native ecosystems, aquatic features, and sensitive species populations. Primary sites often include the largest and potentially most viable populations of rare plants and animals on the NHI Working List. For natural communities, sites were determined by identifying community occurrences that are 1) are least modified from a natural condition 2) occur in a context which is compatible with maintaining that community over time, and 3) are represented by relatively large stands. To conserve and manage for diversity efficiently, both rare and representative community types were evaluated. All of the sites contain ecologically important features, but the sites are not equivalent in terms of their potential for conserving biological diversity.

Twenty-one Primary Sites were identified for the FRSF, along with an additional site on the nearby Kimberly Clark Wildlife Area. The location of each site is illustrated on Figure 12, and site summaries are provided in Appendix B of this report. Each site summary contains a description of the site, element occurrence information, site significance, management considerations, and a site map.

Future Inventory, Monitoring & Research Needs

Future inventory and monitoring of the biotic resources of the FRSF should be ongoing and periodic, based on needs identified in the master plan and elsewhere, with adjustments made to accommodate new information using the principles of adaptive management. Major needs for future research and monitoring efforts are related to old-growth and invasive species, including non-native earthworms, as well as studying conifer and yellow birch regeneration, conducting targeted surveys for select species, and studying Ephemeral Ponds.

Introduction

Project Purpose and Objectives

The Flambeau River State Forest Biotic Inventory was a multiple-year project to survey and analyze selected natural resources of the Flambeau River State Forest. The Natural Heritage Inventory Program, part of the Wisconsin Department of Natural Resources' Bureau of Endangered Resources, conducted the inventory in cooperation with the Division of Forestry. Overall goals were to provide baseline information on rare species, high-quality natural communities, and the overall ecology of the Flambeau River State Forest (FRSF), in addition to highlighting opportunities to conserve biological diversity.

A biotic inventory is one of several assessments used when developing a state forest master plan. This report is intended to be used in combination with other sources, including the "Regional and Property Assessment" for developing overall recommendations for the forest. In addition to the department master planning teams, we hope this report will be useful to property managers, administrators, conservation groups, private landowners, and others who have an interest in conserving the biological diversity of this landscape.

The objectives of this project were:

- identification and evaluation of natural communities;
- identification and evaluation of rare or otherwise significant plant and animal populations;
- identification and evaluation of selected aquatic features and their associated biota;
- identification of sites appropriate for the restoration of lost or declining communities or important habitats;
- identification of especially important protection, management, and restoration opportunities, involving both unique and representative natural features of the FRSF and surrounding landscape;
- interpretation and synthesis of the results for department master planning teams, property managers, administrators, and others involved in the implementation of land use decisions on the Flambeau River State Forest, as well as the surrounding landscape.

Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program resides in the Wisconsin DNR's Bureau of Endangered Resources and is part of an international network of NHI programs. The defining and unifying characteristic of this network is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers is coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on natural communities, rare plant and animal species, and other natural features, referred to as *Elements* of biodiversity. Elements tracked by the Wisconsin NHI Program are listed on the Wisconsin NHI Working List, containing natural communities, as well as Endangered, Threatened and Special Concern plants and animals tracked by the Wisconsin DNR. This list changes over time as the populations of species change (both up and down) and as knowledge about species and natural community status and distribution increases. The most recent Working List for the State of Wisconsin is available online (www.dnr.state.wi.us/org/land/er/wlist/).

The Wisconsin NHI program uses a standard approach for biotic inventory work to support master planning (Appendix A). Generally, the approach involves data collection and development, data analysis, and report writing. Details of standardized NHI methodology can be found on the NatureServe Web site: www.natureserve.org.

Field surveys for the FRSF biotic inventory were conducted primarily during 2000 with a limited number of surveys conducted in 2001. Additional information was collected through 2007 to fill information gaps for high priority sites, taxa, and natural communities. Locations for surveys were identified or guided using recent aerial photos, USGS 7.5' topographic maps, various GIS sources, information from past survey efforts, discussions with FRSF staff, and the expertise of biologists familiar with the property or with similar habitats in the region. The collective results from these surveys and subsequent analyses were used to identify ecologically important areas on the FRSF.

Based on its location and ecological setting, key inventory considerations for the FRSF included the identification of large blocks of contiguous forest, patches of relatively intact older forest with diverse structure (or the potential for developing structural attributes associated with older forests), forests with rich and diverse understory composition, intact wetland and aquatic communities, and microsites such as Forested Seeps and Ephemeral Ponds, as these have been found to harbor rare or otherwise sensitive habitat specialists. Private lands surrounding the FRSF were not surveyed. Nearby county or state landholdings received only cursory treatment, with the exception of the Kimberly Clark Wildlife Area where efforts were made to characterize the large wetland comprising the southern end of the property. The Chequamegon-Nicolet National Forest was surveyed during previous efforts using similar methodologies during the 1980s and again in the 1990s.

Standard methods were used for surveying each taxa group. Tree species, game species, and other common animal species were not covered by this inventory. Table 1 summarizes the surveys conducted during the project along with the principal investigator(s) and the scope of each survey.

Many sources were consulted to aid in the identification and prioritization of survey sites within the FRSF. Our basic references included the Division of Forestry stand reconnaissance data, interpretations of local and regional land cover from recent aerial photographs and satellite imagery, information from the original land surveys for the area, the Ecological Landscapes of Wisconsin Handbook (WDNR 2005), habitat type information newly derived from available data on landforms, vegetation, and soils, and the NHI database.

Table 1: Field surveys conducted during 1997-1999.

Survey	Biologist(s)	Scope of Taxa Surveyed*
Aquatic Insects	Kurt Schmude and Richard Bautz	All species sampled were documented.
Birds	Eric Epstein, Joan Elias, and Linda Parker**	Bird counts documenting all species encountered and targeted surveys for select species on the Working List
Botany	Andy Clark, June Dobberpuhl, Eric Epstein, Rebecca Schroeder, Jim Meeker, Emmet Judziewicz, and Craig Anderson	Targeted surveys for Working List species. All species encountered during these surveys were documented.
Rare Forest Raptors	John Krause and Chris Cold	Targeted surveys for Working List species.
Herptiles	Erik Wild	Targeted surveys for Working List species. All species encountered during these surveys were documented.
Natural communities	Eric Epstein, Emmet Judziewicz, Elizabeth Spencer, John Krause, Christina Isenring, Ryan Magana, Craig Anderson, and Drew Feldkirchner	All plant species encountered during these surveys were documented as part of the community description.
Terrestrial Invertebrates	Kathryn Kirk	All species encountered during these surveys were documented

* For “targeted” surveys, sites were chosen based on likely habitat for rare species, although associated species were also noted.

** Linda Parker, US Forest Service Ecologist, also shared useful data from the Chequamegon-Nicolet National Forest

Background on Past Efforts

Previous survey work on the FRSF has been project-specific and more narrowly focused than the comprehensive biotic inventory that is needed to inform the master planning process. However, broad assessments have identified a number of locations within and around the FRSF as being ecologically significant. The following are examples of such projects and the significant features identified.

The Nature Conservancy: Ecoregional Planning

The Nature Conservancy (TNC) recently completed an ecoregional plan (TNC 2002) for their “Superior Mixed Forest” Ecoregion (an area that encompasses much of northern Wisconsin, northern Minnesota, a small portion of Michigan’s Upper Peninsula, and parts of southern Manitoba and southern Ontario). The resulting portfolio of terrestrial and aquatic “Conservation Areas” represents viable natural community types, globally rare native species, and other selected features.

The FRSF comprises a portion of a terrestrial TNC Conservation Area called the Flambeau River Conservation Area, a 420,000-acre site that includes the FRSF, nearby state and county lands and a portion of the Great Divide district of the Chequamegon-Nicolet National Forest. There are also two TNC Aquatic Conservation Areas on the FRSF: the “Flambeau and Upper Flambeau River” and the “Lower South Fork.”

Land Legacy Study

At the request of the Wisconsin Natural Resources Board, the WDNR conducted the “Land Legacy Study” (WDNR 2006a) to identify critical locations for meeting the state’s conservation and recreation needs through 2050. The criteria for identifying “Legacy Places” were broader than those used in this report, as they included recreational uses; however each site was assigned a score for “Conservation Significance.” The Flambeau River State Forest was identified as a Legacy Place, with a Conservation Significance score of four out of a possible five.

County Surveys

During the early 1980’s, the Scientific Areas section of the WDNR’s Bureau of Research (the predecessor to the current State Natural Areas Program) conducted inventories in Sawyer (1982), Rusk, and Price counties (1983) to locate and assess remnant natural areas. These surveys included the FRSF but were designed primarily to identify potential State Scientific Areas and were therefore much more limited in scope than the present effort.

Board of Commissioners of Public Lands Surveys

During 2001-2004 the Board of Commissioners of Public Lands conducted surveys on many of their landholdings and the surrounding areas (their land is in scattered parcels across 33 counties, mostly in the northern portion of the state). One of the areas surveyed and identified as ecologically significant is adjacent to FRSF land and part of the large peatland complex near Bass Lake (see Primary Site FR13, Bass Lake and Peatlands, Appendix B).

Description of the Study Area

Location

The Flambeau River State Forest (FRSF), located in north central Wisconsin, comprises portions of Sawyer, Rusk, Price, Ashland, and Iron counties (Figure 1). Originally designated to protect the Flambeau River, the FRSF surrounds portions of the river's north and south forks within a context of extensive forests and numerous public landholdings.

Ecoregions

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes; these were based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

The FRSF is located within the **North Central Forest** Ecological Landscape (Figure 2), an area covering 6.1 million acres of the northern one-third of the state and having the highest percentage of land area classified as timberland (77%) of any of Wisconsin's 16 Ecological Landscapes (WDNR 2005). Wetlands are abundant throughout the North Central Forest. Major soils in the landscape include sandy loams, sands, and silts, as well as peats in some of the acid wetlands.

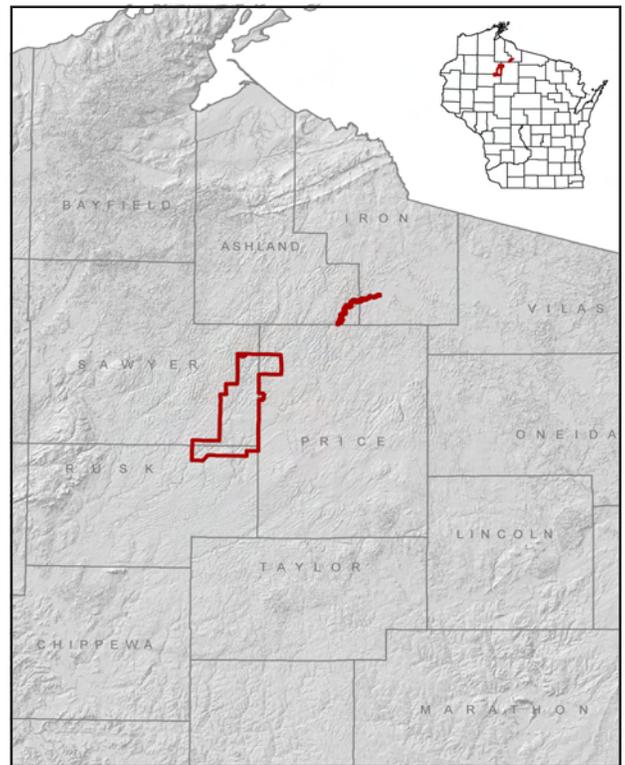


Figure 1
Location of the Flambeau River State Forest.

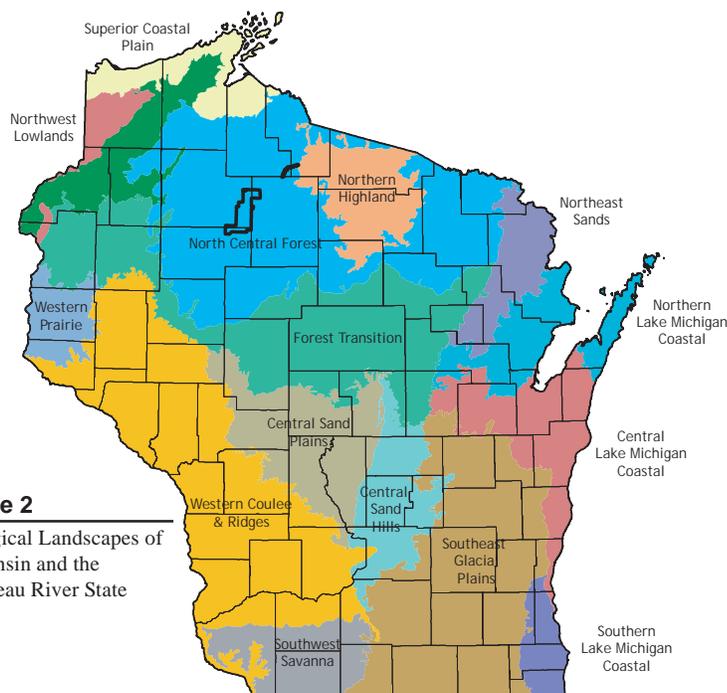
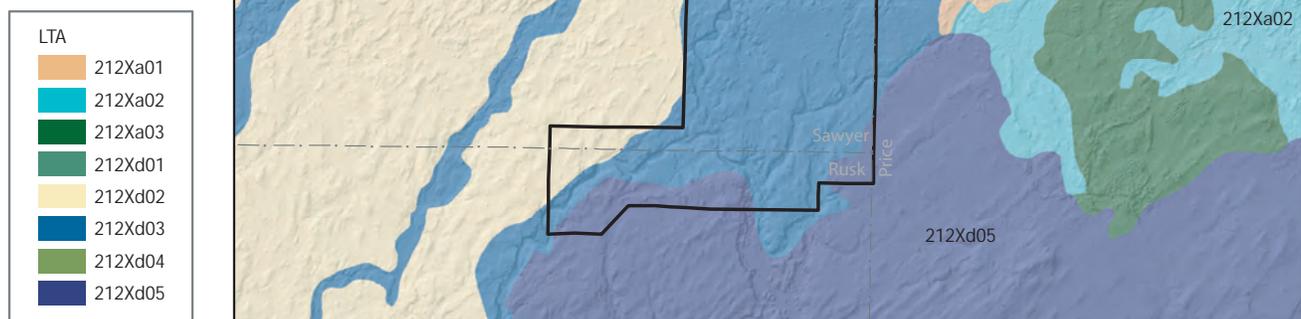


Figure 2
Ecological Landscapes of Wisconsin and the Flambeau River State Forest.

From the NHFEU, the units most relevant to this study are **Subsection 212Xd (Central/Northwest Wisconsin Loess Plains)** and three **Landtype Associations (LTAs)**, the finer scaled polygons that make up each subsection based on repeating patterns of characteristic landforms. Figure 3 shows the distribution of the following LTAs on the FRSF:

- **212Xd02 (Flambeau Silt-capped Drumlins).** The characteristic landform pattern is rolling drumlins with swamps common; this LTA has soils that are predominantly moderately well-drained silt loam over acid sandy loam till. Common habitat types (Kotar et al. 2002) are ArAbCo, Lowland, ATM, AOCa, and ACaI. This LTA comprises 16% of the FRSF in the north and east portions of the property.
- **212Xd03 (Exeland Plains).** The characteristic landform pattern is undulating outwash plain. Soils are predominantly well-drained silt loam over outwash. Common habitat types are AOCa/AH, Lowland, ACaI/AHI, ArAbCo, TMC, and ATM. This LTA comprises the majority (77%) of the FRSF.
- **212Xd05 (Jump River Ground Moraine).** The characteristic landform pattern is undulating moraine and stream terraces. Soils are predominantly somewhat poorly drained silt loam over dense, acid sandy loam till. Common habitat types are ArAbCo, Lowland, AHI/ACaI, AH/AOCa, and ATM. This LTA comprises only 7% of the FRSF in the southernmost portion of the forest and includes the richest mesic forest stands on the property, based on field observations of the ground flora during this project (e.g., see Primary Site FR19, Flambeau Forks Interior Forest, Appendix B).

Figure 3
Landtype Associations for the area comprising the Flambeau River State Forest. The Upper Flambeau Wilderness Zone (not shown) is located in 212Xa03.



Size

The FRSF, at just over 90,000 acres, is the second largest state-managed property in Wisconsin. Although some inholdings are present, public ownership here is mostly contiguous with 94% of the lands within the acquisition boundary currently in state ownership.

Special Management Designations

Two of the three state-designated **Wilderness Areas**¹ occur on the FRSF. The first, referred hereafter as the River Wilderness Area, was designed to protect water quality and includes all state owned lands within ¼-mile of the high water mark of the North and South Fork of the Flambeau River (Figure 4). Timber harvest within this zone is limited to existing conifer plantations. Some pre-existing roads, trails, and recreational developments occur within the zone and have remained open for public use. Many private developments along the river corridor have been removed and allowed to revert to a more natural condition since the state acquired the property. Several privately-owned inholdings are located with this zone.

The other Wilderness Area within the Forest includes most (1,354 of 1,600 total acres) of an area historically known as the “**Big Block.**” This tract was formerly occupied by a landmark stand of old growth hemlock-hardwood forest and represented the largest remaining state-owned old-growth remnant. In 1952, 370 acres of the Big Block, mostly in the River Wilderness Zone, were designated as the Flambeau River Hardwood Forest State Natural Area (SNA). The remainder of this old growth stand was actively managed for timber production, including a Northern Hardwood management “demonstration area” east of CTH M. On July 4, 1977 most of Big Block was blown down by a major windstorm event. Following this event, extensive timber salvage operations occurred here and elsewhere on the FRSF, including ca.100 acres of the SNA. No other management has occurred in the Big Block following the salvage operations per the existing master plan. Only small residual pockets of old growth remain in this area today. Most of the Big Block is currently dominated by a mix of hardwood saplings and poles, small patches of grassy openings, and upland brush.

Two designated “**Wild Areas,**” Butternut Creek (3,100 acres) and Bear Creek (2,072 acres), are located on the FRSF. Motorized vehicle access is restricted in these areas, but most forms of commercial timber harvest, road construction and reconstruction, and forest game habitat-improvement projects are permitted in these portions of the FRSF. All access roads into these areas are planned to be gated in the future.

Two **Wilderness Lake Zones** (Swamp Lake and Bass Lake) are located on the FRSF, as well as several **Wild Lake Zones**, including Hanson Lake, Champagne Lake, and the state-owned portion of Evergreen Lake. Wild Lake designations exclude motorized access, motorized watercraft, and recreational development, as well as limit timber harvest within 400 feet of shoreline areas. Wilderness Lakes also exclude camping, have no road access, and timber harvest does not occur within ¼ mile of the shoreline. See the current master plan (WDNR 1980) for more information.

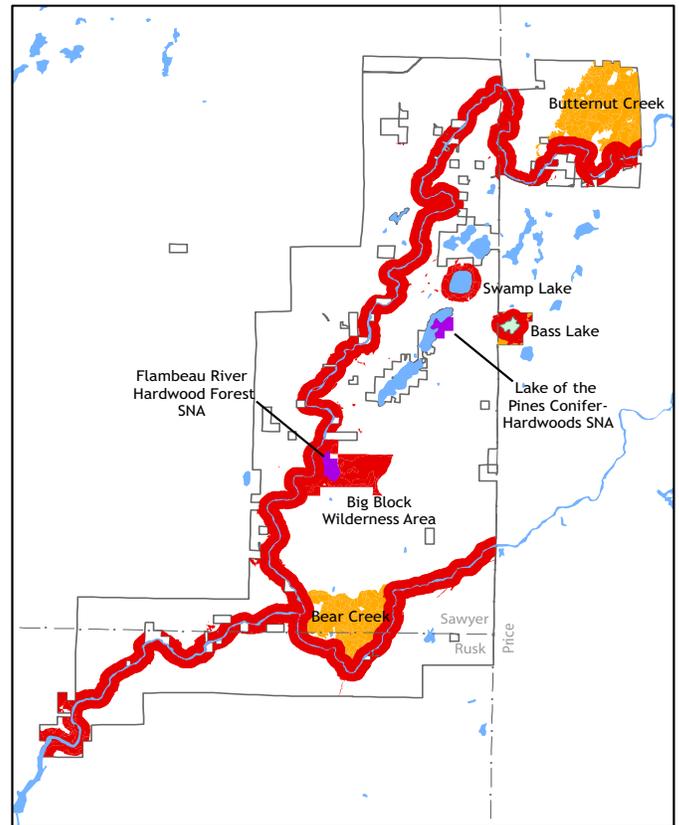


Figure 4

Flambeau River State Forest Wild Areas (orange), Wilderness Areas (red), and State Natural Areas (purple). The Upper Flambeau River Wilderness Area is not shown.

1. "Wilderness" and "Wild Area" designations are from a land classification system that has since been replaced in 2001 by a different set of land management classifications used for master planning (Wisconsin Administrative Code NR 44).

State Natural Areas on the FRSF include Lake of the Pines Conifer-Hardwoods (156 acres) and Flambeau River Hardwood Forest (370 acres). These SNAs were established to protect examples of relatively undisturbed old growth hemlock-hardwood forest. Both SNAs were significantly impacted by the 1977 windstorm and now serve as benchmarks for studying natural regeneration of old growth forest ecosystems following natural disturbance events - with and without salvage logging. Although the Natural Resources Board approved some salvage operations in both of the designated SNAs following the windstorm, roughly two-thirds of the SNA acreage were not harvested. Minor boundary modifications to the Flambeau River Hardwood Forest SNA were made following the salvage operations. The combined acreage of State Natural Areas on the FRSF is 526 acres, less than one percent of the property.

Public Lands

Public ownership in the North Central Forest is extensive, with 44% of the landscape under federal, state, or county management. The combination of public landholdings in and around the FRSF provides excellent opportunities for landscape-scale forest management not possible in many other parts of the state. In addition to large acreages of the Chequamegon-Nicolet National Forest, within 15 miles of the FRSF there are portions of Sawyer, Rusk, and Price county forests, three state fishery areas, four state wildlife areas, and the Chippewa Flowage Wild Rivers Area (Figure 5). Much of this acreage is managed for timber production, game habitat, and various forms of recreation. The Kimberly Clark Wildlife Area, an 8,300-acre property managed primarily for open, early successional habitats for game species, is the largest state-managed property in the immediate vicinity of the FRSF.

A small (ca. 1078 acres) disjunct portion of the FRSF is located in Ashland and Iron counties, comprised mostly of a 300-foot “buffer strip” on both banks of the upper North Fork of the Flambeau River between the Park Falls and Turtle-Flambeau Flowages. This 12-mile river segment is almost completely undeveloped (except for boat landings and user-developed campsites), has high water quality, no road crossings, a relatively intact and balanced fishery (with unusual species such as the lake sturgeon), is free-flowing, and supports a diversity of dragonflies and damselflies.

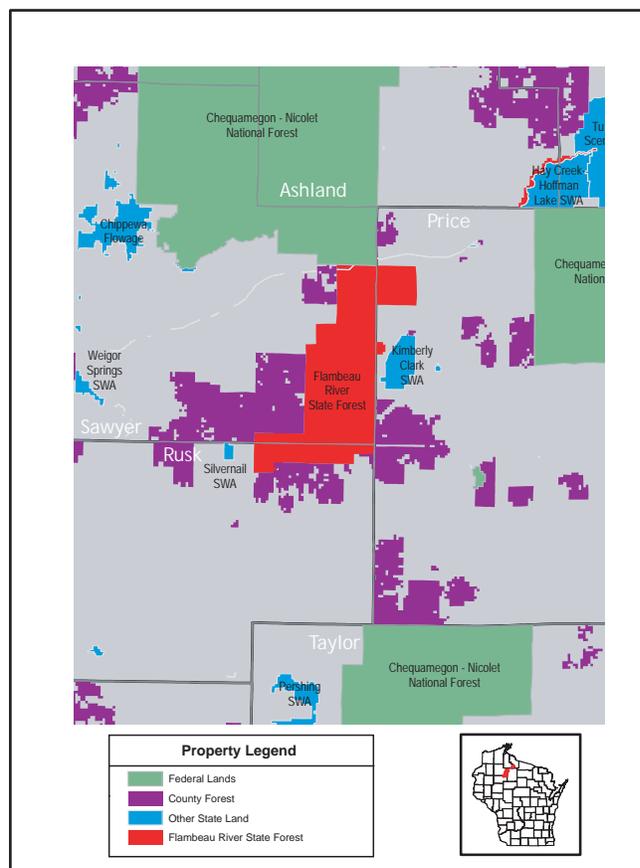
Other notable landholdings near the FRSF include large tracts of industrial forest and some other large and contiguous privately-owned tracts, including the Lac Courte Oreilles Ojibwa Reservation, not far to the west. The combination of large private tracts and abundant public lands leads to a mostly unfragmented landscape, relative to most other parts of the state.

General Land Use

The North Central Forest Ecological Landscape is approximately 80% forested (WDNR 2005). Production of wood products, both pulp and saw-timber, is a major land use in the FRSF and surrounding areas. Agriculture is a minor component here compared to many other Ecological Landscapes, although farming (row crop, hay and pasture) does occur in several areas. Urban areas are limited in density and extent, although the population is growing rapidly on a percentage basis (US Census Bureau 2001). Density of paved roads is relatively low and several roadless blocks are present in the area (The Nature Conservancy 2002). The FRSF and surrounding landscape are used for many recreational

Figure 5

Public lands in the area comprising the Flambeau River State Forest.



uses such as canoeing, camping, ATV and snowmobile riding, cross-country skiing, fishing, and hunting.

Many previously forested areas just south of the FRSF have been converted to other land uses, and the remaining forest cover in these areas is often highly fragmented. The FRSF is part of an extensive forested landscape with a high percentage of public lands that are likely to become increasingly important ecologically, socially, and economically in the future. Figure 6 illustrates contiguous forested blocks statewide.

Physical Environment

Geology & Geography

Precambrian bedrock is covered by 50 to 100 feet of glacial till in much of the area comprising the FRSF. Bedrock exposures are generally restricted to the major river corridors where post-glacial meltwater drainage caused erosion. On the FRSF, significant bedrock outcrops are associated with many of the larger rapids, especially along the South Fork of the Flambeau River.

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The Central / Northwest Wisconsin Loess Plains Subsection is characterized by silt-capped, undulating ground moraine (e.g., as found in the Jump River Ground Moraine LTA) with southwest trending drumlins prominent on rolling uplands in some areas (e.g., Flambeau Silt-capped Drumlins LTA). Swamps are common between the drumlin ridges. The FRSF lies within the terminal moraine of the Chippewa Lobe of the Wisconsin glaciation. Ground moraine of depositional materials predominates, with areas of pitted outwash. Within the FRSF there are also extensive areas of undulating outwash plain (Exeland Plains LTA) with smaller inclusions of pitted outwash with very hilly topography. The outwash deposits are somewhat narrow, and are associated with post-glacial, meltwater drainage channels. Minor landform features associated with these meltwater deposits include eskers, kames, outwash river terraces, narrow stream-cut ravines, and steep cutbanks. A wind blown silt cover (loess, up to 30" thick), derived from local glacial sources, accounts for a uniform silt loam surface texture often present on all of the above-mentioned landforms.

Soils

Surface soils in the Central / Northwest Wisconsin Loess Plains Subsection range from well-drained to somewhat poorly-drained and include silt loams, loams, and sandy loams over a compact sandy loam till (deposited underneath the weight of the glaciers). The dense till subsoil is tight, limiting downward movement of water and roots. The water table is often “perched” within this subsection. The compact till, firm, silty soils, and the gentle terrain also account for prolonged periods of seasonal wetness, numerous small wetlands, and an abundance of Ephemeral Ponds found in some areas. Windthrow can occur in some places due to shallow rooting on these soils.

Sandy soils are uncommon on the FRSF (USDA 2006). One notable area of sandy soils occurs on the northern portion of the State Forest near the town of Oxbow (see the “Oxbo Pines” Primary Site). Wetland soils on the FRSF include large areas of poorly drained mucks and organic peats.

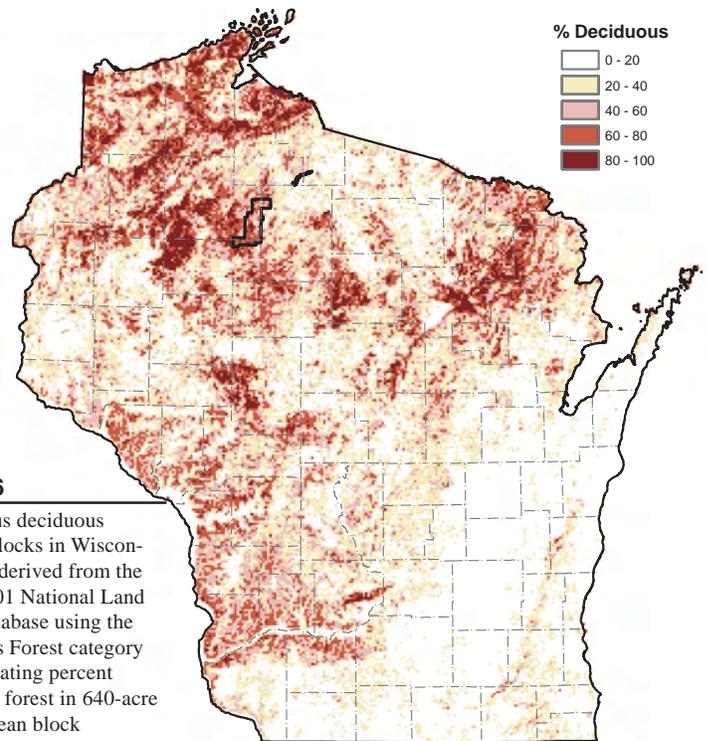


Figure 6

Contiguous deciduous forested blocks in Wisconsin. Map derived from the USGS 2001 National Land Cover Database using the Deciduous Forest category and calculating percent deciduous forest in 640-acre blocks (mean block statistics).

Hydrology: Lakes, Streams, and Wetlands

Approximately 60 miles of free-flowing stretches of the North and South Forks of the Flambeau River are located within the FRSF. These stretches of river are popular with canoeists because of the number of rapids, a relatively stable summer water flow, interesting rock formations, and their remote, forested context. These river stretches are warmwater or coolwater in terms of fisheries. Hydroelectric dams may have negative impacts of biota of these streams due to unnatural release regimes and water temperature alterations. The north Fork of the Flambeau, which passes through Park Falls before entering the FRSF, appears to have reduced biodiversity, possible due to past or current paper mill effluent.

Within this Subsection there are generally few large lakes, especially on the ground moraine; however the central portion of the FRSF contains a concentration of lakes (including five groups of large drainage lakes), mostly in an area of pitted outwash deposits. The lake types vary here and include deep, shallow, hard, and soft-water examples. Development on many of these lakes is minimal, and they are used by a wide range of water-dependent wildlife species including waterfowl, furbearers, loons, eagles, and ospreys. The nearby Flambeau River system provides additional early and late season open water habitat.

Wetlands are common in this subsection and are generally weakly to moderately minerotrophic due to the acidic, non-calcareous nature of the till parent material. Forested swamps including Northern Hardwood Swamps and mixed forest types, as well as wet meadows and Alder Thicket, are often found between the morainal ridges and along some stream borders. More acidic and sometimes large peatlands occur in other areas, including Open Bog, Muskeg, Black Spruce Swamp, Tamarack (poor) Swamp, Northern Wet Forest, and Poor Fen types. These wetlands are the headwaters for the many small creeks and rivers found in this subsection. Most, including the Flambeau and its major tributaries, follow a parallel or rectangular drainage pattern and flow in a southwesterly direction. Most streams are low gradient and meandering (thus providing some of the more important waterfowl habitat in the region). An exception are a number of small, high gradient, often rocky stream segments, which have cut narrow steep-sided ravines near the North and South Forks of the Flambeau River. Moist Forested Seeps, often rich in nutrients and with the potential to support rare plants, are common in these locations.

Vegetation

Historic Vegetation

Based on data from Finley (1976), relict primary forest stands, and historical accounts, the uplands comprising the FRSF were historically vegetated mostly with old growth and mature Northern Mesic Forest, dominated by hemlock and yellow birch, with white pine, sugar maple, and basswood as major associates (Figure 7). Yellow birch was thought to be especially predominant in the Central / Northwest Wisconsin Loess Plains Subsection when compared with most of the other subsections in the northern half of the state (Schulte et al. 2002) Figure 8 illustrates the tree species documented on the FRSF during the Public Land Surveys² conducted in this area in the 1860s.

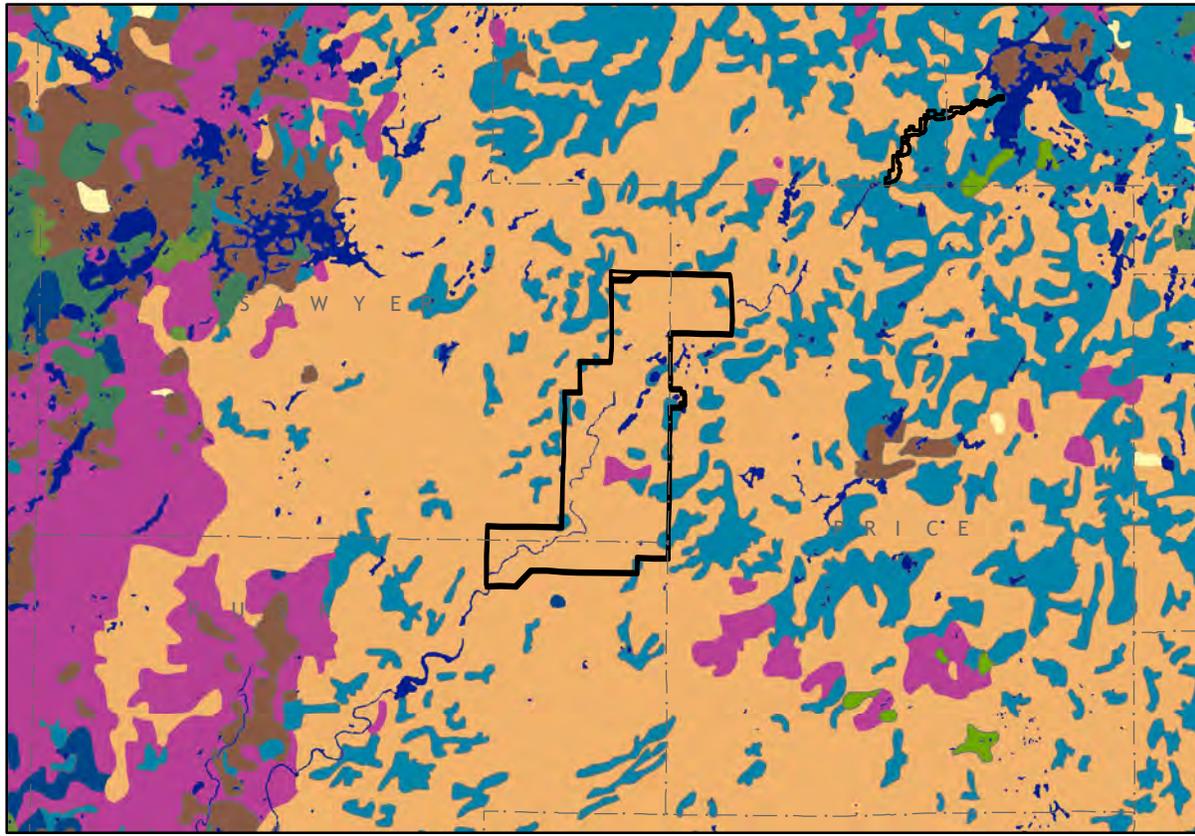
White ash is almost never mentioned in the Public Land Survey descriptions, although this species is common today in upland stands within this Subsection. Balsam fir and hemlock “brush” are frequently mentioned as understory species. It is possible the surveyors were referring to Canada yew or “ground hemlock,” a common understory shrub in the pre-settlement forest.

Although hemlock and yellow birch were probably once co-dominant in much of what is now the FRSF and the surrounding landscape, on better drained locations with deep silt loam soils, there may have been stands of richer, mesic northern hardwood forest (Hole and Germain 1994). These stands were likely to have been dominated by nutrient demanding hardwoods such as sugar maple, white ash, basswood, American elm, and possibly butternut. Based on GLO data, Finley delineated one such area just north of the current Hines Grade Road (T37N R3W) as

2. These surveys were conducted by the US General Land Office to establish the current township-range-section system of property description. Surveyors recorded the species and diameter of the nearest available trees at each section and quarter section corner, and the trees distance from the survey corners; these are referred to as “witness trees.” See Schulte and Mladenoff (2001) for more information on how these data are used for reconstructing pre-European settlement vegetation.

Figure 7

Pre-European Settlement Vegetation for the Flambeau River State Forest. Data are from Finley (1976).



1:800,000

- | | |
|--|--|
| Aspen, white birch, pine | Oak -- white oak, black oak, bur oak |
| Brush | Sugar maple, basswood, red oak, white oak, black oak |
| Hemlock, sugar maple, yellow birch, white pine, red pine | Sugar maple, yellow birch, white pine, red pine |
| Hydrographic area from the USGS 1:250,000-scale Land Use and Land Cover data layer | Swamp conifers -- white cedar, black spruce, tamarack, hemlock |
| Jack pine, scrub (Hill's), oak forest and barrens | White pine, red pine |
| Marsh and sedge meadow, wet prairie, lowland shrubs | White spruce, balsam fir, tamarack, white cedar, white birch, aspe |

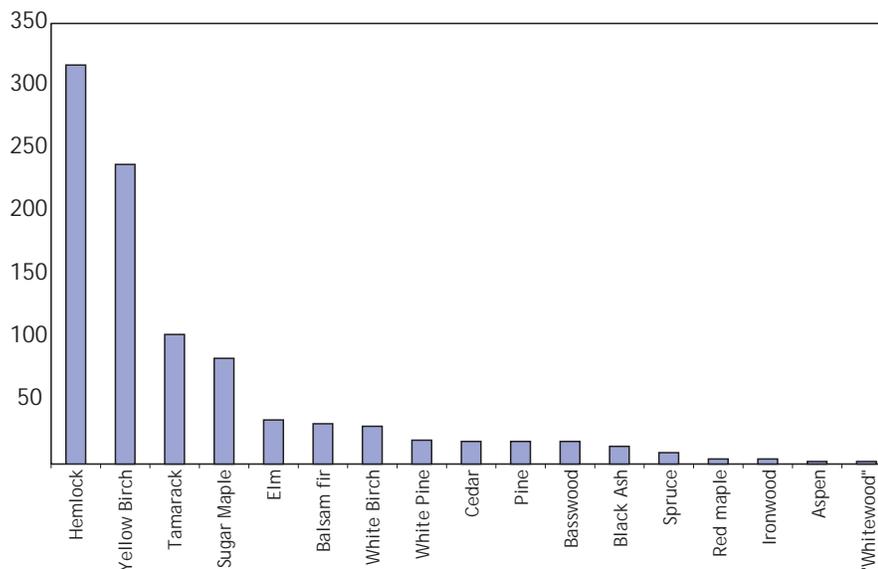
having “first rate soils” and forested only with deciduous hardwood species (the rest of the FRSF is described as having second or third rate soils). It would be useful to obtain more precise information regarding the historical extent and distribution of these “richer” pockets of mesic hardwood forest on the FRSF, if possible.

No early successional aspen-birch stands large enough to be mapped at the township scale were delineated by Finley in the study area, and aspen was the least reported tree species from the Public Land Survey data (Figure 8). No major blowdowns or burned areas were noted on Finley’s township scale maps on the FRSF (Price and Sawyer counties only), although they are reported to have been common in these counties in the literature. In contemporary times, large-scale blowdown events have occurred in 1941, 1949, 1950, 1951, and, most recently, in 1977. Damaging, but less widespread, tornadoes have also occurred near Hanson Lake in 2001 and 2002. Local residents frequently refer to the area in and around the FRSF as “tornado alley.” Historically, windthrow would have been the major natural disturbance over much of this landscape.

Historically dominant lowland species were mostly swamp conifers, including tamarack, black spruce, and white cedar. Hemlock, yellow birch, black ash, white pine, and balsam fir were also noted in the wetlands in some areas. Many cedar swamps were likely heavily cut for fence posts needed in agricultural areas just south of the forest (Mark Schmidt, personal communication).

Figure 8

Pre-European settlement tree species for the Flambeau River State Forest based on the original General Land Office Surveys (from the WDNR GIS coverage Pre-European Settlement Vegetation Database of Wisconsin: Differentiated Section and Quarter Section Corners prepared by the University of Wisconsin-Madison Forest Landscape Ecology Lab).



Current Vegetation

Several historical factors influenced the structure and composition of the FRSF and surrounding landscape, including unregulated logging during the state’s “cutover” period, along with subsequent land clearing and uncontrolled wildfires, as well as the more recent 1977 windstorm event (a “downburst”) that greatly affected approximately 1/3 of the total FRSF land area. Currently, this forested landscape is heavily dominated by sapling to pole-sized trees. Old growth developmental stages of all forest types are rare and larger blocks of older forest with mature forest structure are uncommon. Some forest types that were once characteristic of the region (e.g., hemlock-hardwoods) now exist mainly as small, isolated remnants (averaging tens of acres). Natural conifer cover is greatly reduced compared to its past extent, especially on mesic sites. Many of the dominant species associated with the pre-settlement forest types are currently experiencing region-wide regeneration failure, likely due to a combination of factors, including heavy deer browse. Deer browse pressure on the FRSF and surrounding areas is high, and evidence of heavy deer browse can be seen in many locations throughout the forest.

The area comprising the FRSF is still largely forested. Deciduous forests, covering roughly half of the land area of the three counties comprising the FRSF, are the most common land cover type, followed by Lowland Shrub, Forested Wetland, Agriculture, Grassland, Coniferous Forest, Mixed Deciduous / coniferous forest, Open Water, and Emergent / Wet Meadow types based on WISCLAND (WDNR 1993) data (Figure 9).

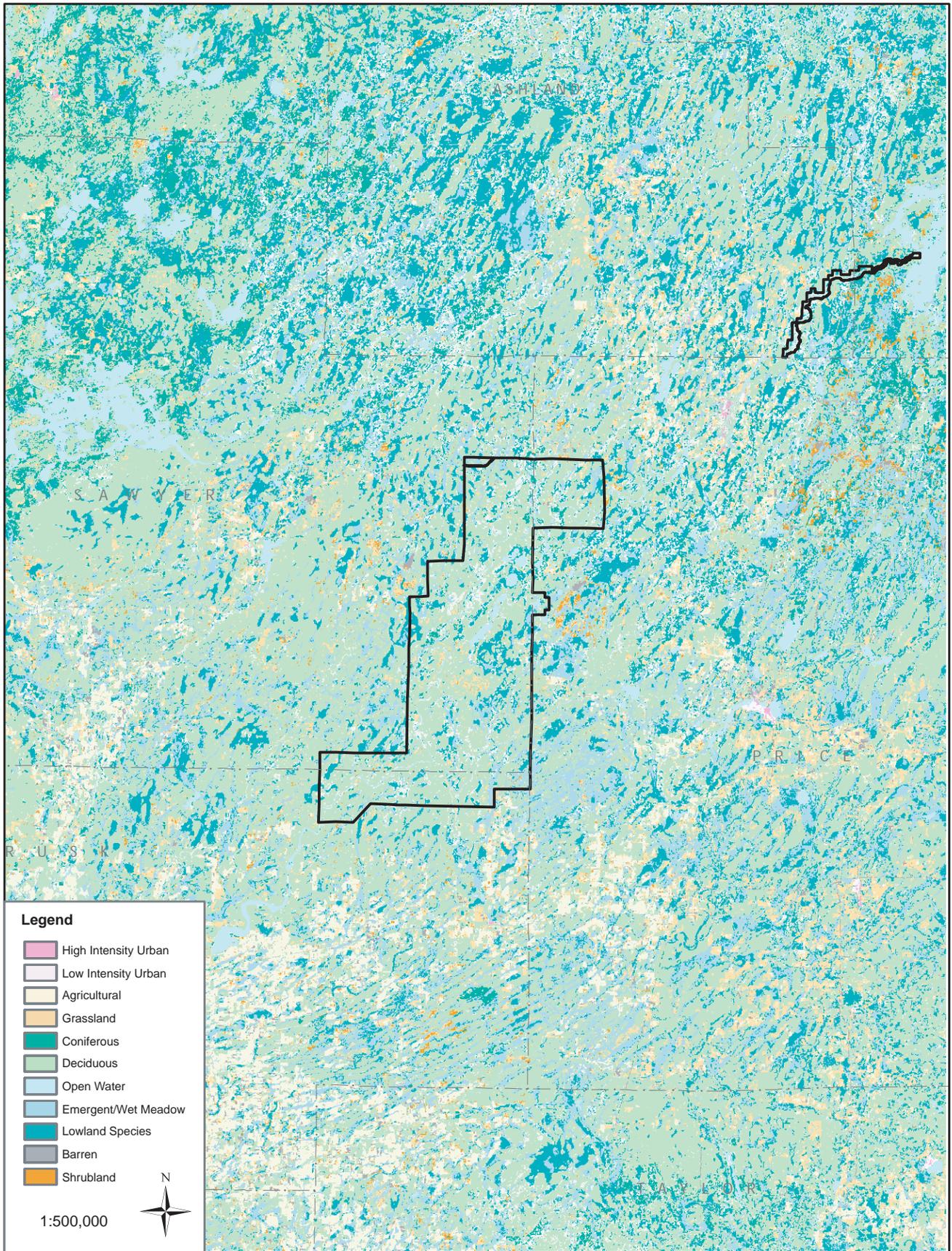
Forested cover types account for approximately 87 % of the FRSF based on WDNR Forest Reconnaissance data (Figure 10). Northern Hardwoods³ are the most common cover type, comprising 44% of the forested acreage on the forest, followed by Aspen, Swamp Hardwoods, and Lowland Brush, and Fir-Spruce. All other forest cover types combined only represent seven percent of the total area of the FRSF.

Although Northern Mesic Forest remains the most common natural community on the FRSF, the composition, structure, and patch sizes differ significantly from pre-settlement conditions. Hemlock and yellow birch reproduction is difficult here, as in many other parts of the state, and both of these species have declined in frequency in the forests of the FRSF and surrounding areas relative to presettlement conditions. Forest management on the FRSF has focused on improving the yield and timber quality of northern hardwood sawlogs through selective logging.

3. From most recent data as of this writing. Major acreages of the FRSF currently typed as “northern hardwoods” or “swamp hardwoods” need to be updated and correctly typed as red maple (J. Halvorson and H. Brunkow personal communication).

Figure 9

Landcover for the area comprising the Flambeau River State Forest from the Wisconsin DNR WISCLAND GIS coverage (WDNR 1993).

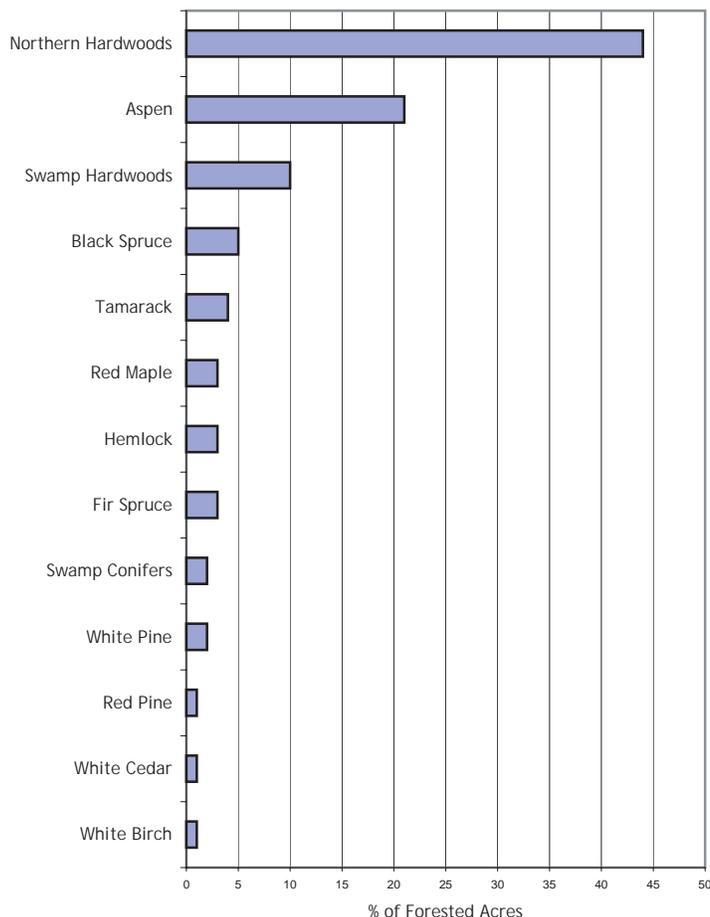


Now covering 21% of the forested acreage of the FRSF, the aspen cover type plays a greater role on the forest than it did historically (Figures 7-10). Attempts to maintain forest cover type diversity through aspen management have been a priority on the FRSF, and upland grass/brush openings and an extensive system of hunter walking trails have been created and maintained through both chemical and mechanical methods. Aspen management is also an important focus in much of the surrounding landscape, especially on county-owned lands and large industrial forests. The nearby Kimberly-Clark Wildlife Area (8,639 acres) maintains extensive areas of aspen and upland brush for game management and Sharp-tailed Grouse habitat. The aspen cover type accounts for nearly 1.7 million acres of the three counties that comprise the FRSF (Miles 2007).

The FRSF contains abundant wetlands, including hardwood swamps, conifer swamps, open peatlands, wet meadows, Alder Thickets, and small amounts of Emergent Marsh. Some of the FRSF lowland forested acreage, especially the Swamp Hardwoods cover type, is currently being actively managed for timber production. Several of the peatlands are large and undisturbed, with mostly undisturbed hydrology. White cedar swamps are currently uncommon on the FRSF, and white cedar regeneration appears to be lacking, as it is in many parts of the state, likely due to excessive deer browse. Ephemeral Ponds are common and characteristic features that are found dispersed throughout many of the forested areas of the FRSF.

Figure 10

Forested cover types for the Flambeau River State Forest. Data are from the Division of Forestry WISFIRS (Wisconsin Forest Inventory & Reporting System) "Property Cover Type Acreage" report, downloaded May 2, 2008. Data for each cover type are the percent of the property's total forested acreage of ca. 79,207 acres. Non-forested acres make up the remaining 12% of the property.



Summary of Findings

Natural Communities of the Study Area

Element occurrence quality stands of the following natural communities have been documented in and around the FRSF. Other community types are present, but these were represented by stands that were too small, too highly disturbed, or too altered to warrant inclusion in the NHI database. General descriptions of these natural community types are provided in Appendix C, and more detailed accounts of individual community occurrences can be found in the Site Descriptions section of this report (Appendix B). Additional information is archived by the Bureau of Endangered Resources (WDNR Madison office).

Table 2. NHI natural community types documented within the study area

Community	State Rank	Global Rank
Black Spruce Swamp	S3?	G5
Emergent Marsh	S4	G4
Floodplain Forest	S3	G3?
Forested Seep	S2	GNR
Lake--Deep, Very Soft, Seepage	S3	GNR
Lake--Shallow, Soft, Seepage	S4	GNR
Lake--Soft Bog	S4	GNR
Muskeg	S4	G4G5
Northern Dry-mesic Forest	S3	G4
Northern Mesic Forest	S4	G4
Northern Sedge Meadow	S3	G4
Northern Wet Forest	S4	G4
Northern Wet-mesic Forest	S3S4	G3?
Open Bog	S4	G5
Poor Fen	S3	G3G4
Tamarack (Poor) Swamp	S3	G4

Rare Vascular Plants of the Study Area

The Wisconsin Natural Heritage Database tracks **seven** rare plant species in the study area (Table 3). Mountain cranberry (*Vaccinium vitis-idaea* ssp. *minus*) is listed as State Endangered; the other five species are Special Concern. Heritage staff documented three of these rare species during recent field inventory, while the others have not been seen for decades.

Table 3. NHI Working List plants documented within the study area

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status
Swamp-pink	<i>Arethusa bulbosa</i>	2006	S3	G4	SC
Mingan's Moonwort *	<i>Botrychium minganense</i>	1979	S2	G4	SC
Blunt-lobe Grape-fern *	<i>Botrychium oneidense</i>	1979	S2	G4Q	SC
Assiniboine Sedge	<i>Carex assiniboinensis</i>	2000	S3	G4G5	SC
Sparse-flowered Sedge	<i>Carex tenuiflora</i>	2000	S3	G5	SC
Swamp Bedstraw	<i>Galium brevipes</i>	1963	S1S2	G4?	SC
Mountain Cranberry	<i>Vaccinium vitis-idaea</i> ssp. <i>minus</i>	2006	S1	G5T5	END

*These species were found just outside of the FRSF boundary.

Swamp-pink

Swamp-pink (*Arethusa bulbosa*) prefers neutral bog and fen mats with a mix of sedges, Ericads, and *Sphagnum*. Blooming occurs from mid-May through mid-July. Optimum identification period is from early June to mid-July.

Mingan's moonwort

Mingan's moonwort (*Botrychium minganense*) is most often found in cool, mixed conifer-hardwood forests near Lake Superior. The optimal identification period is from early June to late July.

Blunt-lobe grape-fern

Blunt-lobe grape-fern (*Botrychium oneidense*) prefers moist, often acid depressions in damp open forests. The optimal identification period is from mid-June to late-September.

Assiniboine sedge

Assiniboine sedge (*Carex assiniboinensis*) prefers rich alluvial terraces along rivers. Blooming occurs throughout the month of May, and the optimal identification period is from mid-May to late June.

Sparse-flowered Sedge

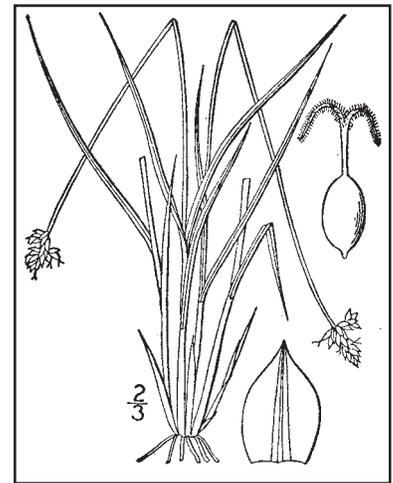
Sparse-flowered sedge (*Carex tenuiflora*) is found in open- to closed-canopy cold, wet, coniferous forests, usually on neutral to calcareous substrates. Flowering occurs from mid-May through mid-June. Optimal identification period is from mid-June to mid-July.

Swamp bedstraw

Swamp bedstraw (*Galium brevipes*) is found in calcareous swamps and wet shores.

Mountain cranberry

Mountain cranberry (*Vaccinium vitis-idaea* ssp. *minus*) is the only Endangered plant to be documented on the FRSF. In this portion of the state, it has been found in open conifer swamps, although there are few documented occurrences. Flowering occurs from early May through late June, but the species may be identified year-round. This plant is only known from five locations in Wisconsin, which is at the southern edge this species' range.



Carex tenuiflora. From: Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 2: 697. USDA, NRCS PLANTS Database (2008).



Vaccinium vitis-idaea ssp. *minus*.
Photo by Kitty Kohout.



Arethusa bulbosa growing on a bog mat.
Photo by Eric Epstein.

Rare Animals of the Study Area

The Wisconsin NHI database tracks **18** rare animal species documented in the FRSF (Table 4), including 10 bird species, two dragonfly species, one snake species, one turtle species, and four mussel species. Six of these species are State Threatened, two are State Endangered, and none are on the federal endangered and threatened species list. In addition to the species listed in Table 4, there are nine known timber wolf packs located within five miles of the FRSF (Figure 11).

Table 4. NHI Working List animals documented within the study area.

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status
Birds					
Northern Goshawk	<i>Accipiter gentilis</i>	2006	S2B,S2N	G5	SC/M
Red-shouldered Hawk	<i>Buteo lineatus</i>	1980	S3S4B,S1N	G5	THR
Swainson's Thrush	<i>Catharus ustulatus</i>	2000	S2B	G5	SC/M
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	2000	S3B	G5	SC/M
Cerulean Warbler	<i>Dendroica cerulea</i>	2001	S2S3B	G4	THR
Cape May Warbler	<i>Dendroica tigrina</i>	2000	S3B	G5	SC/M
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2007	S4B,S2N	G5	SC/P
Connecticut Warbler	<i>Oporornis agilis</i>	2000	S2S3B	G4	SC/M
Osprey	<i>Pandion haliaetus</i>	1992	S3S4B	G5	THR
Louisiana Waterthrush	<i>Seiurus motacilla</i>	2002	S3B	G5	SC/M
Dragonflies					
Extra-striped Snaketail	<i>Ophiogomphus anomalus</i>	1995	S1	G4	END
Pygmy Snaketail	<i>Ophiogomphus howei</i>	2002	S3	G3	THR
Reptiles and Amphibians					
Wood Turtle	<i>Clemmys insculpta</i>	2005	S2	G4	THR
Northern Ringneck Snake	<i>Diadophis punctatus edwardsii</i>	2000	S3?	G5T5	SC/H
Mussels					
Elktoe	<i>Alasmidonta marginata</i>	1990	S4	G4	SC/H
Purple Wartyback	<i>Cyclonaias tuberculata</i>	1992	S1S2	G5	END
Round Pigtoe	<i>Pleurobema sintoxia</i>	1990	S3	G4	SC/H
Salamander Mussel	<i>Simpsonaias ambigua</i>	1990	S2S3	G3	THR

Northern Goshawk

The Northern Goshawk is a large forest-dwelling hawk generally associated with mature deciduous, coniferous, or mixed forests in the northern half of the state. Small numbers may persist in central Wisconsin. The breeding season extends from mid-March through July.

Red-shouldered Hawk

Red-shouldered Hawk, a bird listed as Threatened in Wisconsin, prefers larger stands of medium-aged to mature lowland deciduous forests, and dry-mesic to mesic forest with small wetland pockets. Breeding occurs from mid-March through early August.

Black-throated Blue Warbler

Black-throated Blue Warbler is found in dense hardwood or coniferous undergrowth within extensive stands of mesic deciduous or mixed forests of mature sugar maple,

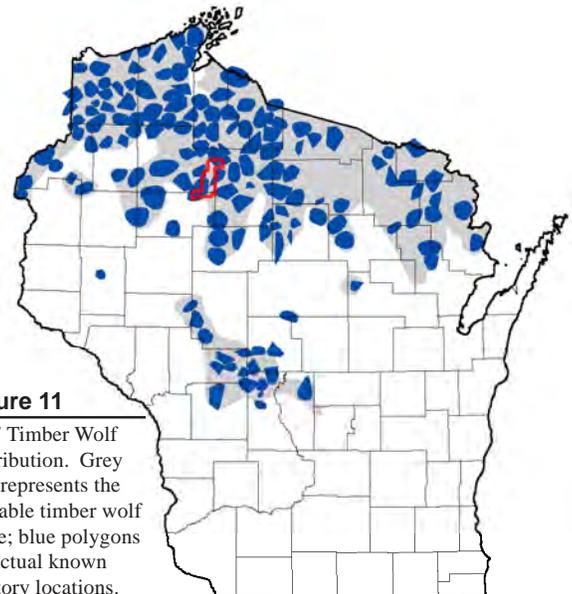


Figure 11

2007 Timber Wolf Distribution. Grey area represents the probable timber wolf range; blue polygons are actual known territory locations.

basswood, yellow birch and hemlock. The breeding season extends from June through August.

Cerulean Warbler

Cerulean Warbler is a State Threatened bird occurring most frequently in large stands of unfragmented, mature hardwood forest. At some locations its presence has been strongly associated with large canopy oaks, in both upland and lowland habitats. Although large oaks are preferred, they are not dependent on the presence of oaks. The breeding season extends from late May through July.

Cape May Warbler

Cape May Warbler breeds in northern Wisconsin, primarily in stands of mature boreal conifers such as spruce and fir. Both upland and lowland conifer forests may be used, and they occasionally occupy mature spruce plantations. Breeding begins in June and extends through July.

Bald Eagle

Bald Eagle, a bird listed as Special Concern in Wisconsin and Federally protected by the Bald & Golden Eagle Protection Act in addition to the Federal Migratory Bird Act, prefers large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. The breeding season extends from February through August. Favored wintering and roosting habitat includes wooded valleys near open water and major rivers from December through March.

Connecticut Warbler

Connecticut Warbler prefers mature, multi-layered pine stands, particularly jack pine, and occasionally tamarack-pine stands with a dense hardwood understory. They also breed in boggy stands of swamp conifers composed of black spruce and tamarack. The breeding season extends from late May through mid-July.

Osprey

Osprey, a fish-eating bird listed as Threatened in Wisconsin, prefers large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. The breeding season extends from late April through August.

Louisiana Waterthrush

Louisiana Waterthrush breeds along rocky, high-gradient streams within relatively large, intact deciduous or mixed forests, primarily in the southern 2/3 of the state. It is sometimes found in Floodplain Forest near streams. Breeding occurs from May through July.



Pygmy snaketails (*Ophiogomphus howei*) male (bottom) and female (top). Photo by William A. Smith.



Black-throated Blue warbler.

Photo by S. Maslowski, courtesy of US Fish & Wildlife Service

Extra-striped Snaketail

Extra-striped snaketail (*Ophiogomphus anomalus*), a dragonfly listed Endangered in Wisconsin, has been found locally in medium to large fast, clean, cool to warm streams. The flight period extends from late May through late June.

Pygmy Snaketail

Pygmy snaketail (*Ophiogomphus howei*), a Threatened dragonfly in Wisconsin has been found in small to large, clean, fast-flowing warm

streams with gravel- sand substrates. Adults apparently forage and perch on the stream-side forest canopy. The flight period extends from late May through late June.

Wood Turtle

Wood Turtle (*Clemmys insculpta*), a turtle listed as Threatened in Wisconsin, prefers deciduous forests, shrub swamps, and open meadows along moderate- to fast-moving streams and rivers. Egg-laying occurs in open, often sandy areas, during the month of June. Eggs hatch in late Summer.

Northern Ringneck Snake

Unlike most snakes, the northern ringneck (*Diadophis punctatus edwardsii*) occurs in moist deciduous forests and is fossorial (lives underground). Its diet consists of earthworms, beetles, salamanders, frogs, and other small snakes.

Elktoe

Elktoe (*Alasmidonta marginata*), a State Special Concern mussel, is found in various-sized streams with flowing water, sand, gravel or rock substrates that are stable. The known host fishes include five widespread species including redhorse and sucker species and rockbass.

Purple Wartyback

Purple wartyback (*Cyclonaias tuberculata*), a mussel listed as Endangered in Wisconsin, is now restricted to large streams in the northwestern part of the state. It prefers a stable substrate containing rock, gravel and sand in swift current. Known hosts include bullhead and catfish species.

Round Pigtoe

Round pigtoe (*Pleurobema sintoxia*) is a State Special Concern mussel. In Wisconsin, this species occurs only in clean water of small streams to large rivers on stable substrate. The known host fish include a number of cyprinid species.

Salamander Mussel

Salamander mussel (*Simpsonaias ambigua*) is a State Threatened species that occurs in both the Mississippi River drainage and the Lake Michigan drainage. In Wisconsin, this species prefers mud, silt or sand substrates directly beneath medium to large-sized rocks and undercut ledges, where its host, the mudpuppy frequents and is considered a microhabitat specialist. The overall number of sites of this globally rare species are limited, however large numbers of individuals can occasionally be found under one rock.

American Marten

The State Endangered American marten (*Martes americana*) is another species to consider during planning and management activities on the FRSF. American martens live in mature, dense conifer forests or mixed conifer-hardwood forests, preferring woods with a mixture of conifers and deciduous trees including hemlock, white pine, yellow birch, maple, fir and spruce. The presence of large limbs, snags, and coarse woody debris provide important prey, protection and den sites. Although they have not been documented on the FRSF to date, they are known to occur immediately to the north of the property on the Chequamegon-Nicolet National Forest. Forest management guidelines for this species are currently under development (J. Woodford, personal communication).

Species of Greatest Conservation Need

Numerous Species of Greatest Conservation (SGCN) from the Wisconsin Wildlife Action Plan (WDNR 2006d) are known from the North Central Forest, including 10 mammal, 53 bird, 7 herptile, and 10 fish species (Table 5). Several of these species have already been recorded on the FRSF, and several others have the potential to occur there. Appendix D combines North Central Forest SGCN with their habitats, highlighting habitats representing good management opportunities in the North Central Forest.

Table 5. Vertebrate Species of Greatest Conservation Need occurring in the North Central Forest Ecological Landscape. Species in bold are known to occur on the Flambeau River State Forest, and several others are potentially present. See the Wisconsin Wildlife Action Plan (WDNR 2006d) for more information on Species of Greatest Conservation Need and their habitats.

	Species with a high degree of probability of occurring in this Ecological Landscape	Species with a moderate degree of probability of occurring in this Ecological Landscape	Species with a low degree of probability of occurring in this Ecological Landscape
Mammals	Gray Wolf Northern Flying Squirrel Water Shrew Woodland Jumping Mouse Silver-haired Bat Hoary Bat American Marten	Moose Eastern Red Bat Northern Long-eared Bat	
Birds	American Bittern Trumpeter Swan Lesser Scaup Osprey Bald Eagle Northern Harrier Northern Goshawk Red-shouldered Hawk Spruce Grouse American Woodcock Black-billed Cuckoo Whip-poor-will Black-backed Woodpecker Olive-sided Flycatcher Least Flycatcher Boreal Chickadee Veery Wood Thrush Golden-winged Warbler Black-throated Blue Warbler Canada Warbler Red Crossbill	Canvasback Sharp-tailed Grouse Solitary Sandpiper Black Tern Brown Thrasher Cerulean Warbler Connecticut Warbler Bobolink Rusty Blackbird	Horned Grebe American Black Duck Blue-winged Teal American Golden Plover Upland Sandpiper Whimbrel Hudsonian Godwit Marbled Godwit Dunlin Short-billed Dowitcher Yellow-billed Cuckoo Red-headed Woodpecker Willow Flycatcher Loggerhead Shrike Louisiana Waterthrush Dickcissel Field Sparrow Vesper Sparrow Grasshopper Sparrow Henslow's Sparrow Eastern Meadowlark Western Meadowlark
Herptiles	Wood Turtle Boreal Chorus Frog Four-toed Salamander Mink Frog	Mudpuppy Pickerel Frog	Blanding's Turtle
Fishes	Lake Sturgeon Gilt Darter Longear Sunfish	Greater Redhorse	Least Darter Banded Killifish Pugnose Shiner Kiyi Shortjaw Cisco Redside Dace

Threats to Natural Communities, Aquatic Systems, and Rare Species

The FRSF and surrounding areas are part of an extensive forested landscape with low human population density and large acreages of publicly owned land. This landscape offers the potential for large-scale restoration and management projects, possibly across ownerships. However, several threats to the biodiversity of this area have been noted in recent years. Avoiding, eliminating, or, in some cases, reversing these threats will play a key role in conserving and/or enhancing the biological diversity of the landscape.

Fragmentation

Numerous studies have identified fragmentation as a major threat to northern forests in the Lake States (e.g., Hawbaker et al. 2006, Radeloff et al. 2005), in addition to the trend toward overall loss of forestland. As Wisconsin's second-largest state property located within a largely unfragmented landscape, the FRSF provides unique opportunities for management. As many forested areas in the state become parcelized and developed, the FRSF represents an important opportunity to maintain an intact forested landscape, serving critical functions on a statewide level. To maintain the ecological integrity of this important area, it will be critical for planning and management efforts to consider possible fragmentation effects when planning developments, building roads, creating forest and acquiring new parcels or inholdings. Planning and management efforts should consider the entire landscape and look for opportunities to cooperate with adjacent property managers when possible to best avoid or reduce the effects of fragmentation.

Although they may not lead to fragmentation on a large-scale, the impacts of maintaining artificial wildlife openings on the FRSF should be considered during the master planning process. While increased edge and upland grass habitats may benefit certain species, edges can also provide a corridor for entry by species such as Brown-headed Cowbirds, a brood parasite. Many studies have shown bird predation and parasitism rates to be higher near forest edges and in forest fragments (e.g., Flaspohler et al. 2001, Robinson et al. 1995, Donovan et al. 1997, and Paton 1994). In addition, bird surveys conducted on 13 wildlife openings on the FRSF during 2000-2001 showed few bird species using these areas, and birds present were limited to common, widespread habitat generalists such as American Robin and Red-winged Blackbird. Wildlife openings, such as those currently on the FRSF, are too small to benefit most "grassland" birds, and we are not aware of other rare species in this part of the state that would benefit from these openings. In contrast, white-tailed deer may benefit from wildlife openings on the FRSF. Since deer browse has been identified as a serious threat to forest ecosystems, activities that improve habitat for white-tailed deer in contiguous forests may be counter-productive. Given the high levels of deer browse on the FRSF, as well as the large acreage of edge habitat on the state forest and in the surrounding landscape, including the adjacent 8,300-acre Kimberly-Clark Wildlife Area, agricultural fields, and large acreages in young aspen, managing these areas to promote an intact forested landscape and provide for the associated species is an opportunity for consideration during master planning. The needs of common early-seral wildlife are likely already met within the landscape without maintaining dedicated permanent openings.

Invasive Species

As with the remainder of the state, invasive species threaten the FRSF and surrounding landscape. Fortunately, many invasive plants that appear nearly uncontrollable in many other areas have not become strongly established on the FRSF. Garlic mustard, known to spread rapidly through mesic forests such as those found on the FRSF, has been documented in some places on the property, but FRSF staff have worked to control these populations soon after they were discovered. Non-native honeysuckles have been found on the forest, are very common immediately to the south, and have the potential to become a problem; however, infestations, thus far, have been localized in extent.

Several other species have the potential to become a problem on the FRSF in the future, including glossy buckthorn and Eurasian swamp thistle in the conifer swamps, as well as common buckthorn in the mesic forests. Open wetlands, especially less acidic examples, are susceptible to reed canary grass and purple loosestrife infestation. Portions of the Flambeau River and the lakes of the FRSF may be subject to introduction of Eurasian milfoil and other aquatic invasive plants or animals, and aquatic invasives may already be established in some areas.

All of these invasive species, whether terrestrial or aquatic, have the potential to out-compete and displace native species in the FRSF and surrounding landscape, leading to ecological simplification and habitat loss. Management techniques will be needed to prevent the introduction of these species and control their spread whenever possible. Controlling outbreaks while they are small and localized, especially in ecologically important areas, will likely be the most effective strategy. It will be important for resource personnel to be able to identify invasive plants, and control measures will need to be implemented, wherever possible, to avoid major infestations such as those that now occur in many other parts of the state. There are a wide variety of materials available regarding identification and control of these species in Wisconsin (e.g. Czarapata 2005, Hoffman and Kearns 1997) in addition to information on the WDNR Web site (dnr.wi.gov/invasives).

Exotic earthworms are now understood to be invasive species in northern temperate forests that can dramatically alter ecosystem composition, structure and function (Holdsworth et al. 2007). Given the dominance of mesic forest types on the FRSF and the documented occurrence of invasive earthworms on the adjoining Chequamegon-Nicolet National Forest, many stands are likely to become infested, if they have not already. Recent research has shown worm-invaded forests in Minnesota to exhibit reduced forest floor thickness, increased soil bulk density, and significantly reduced plant species richness and abundance. Exotic earthworms were linked to the local extirpation of a threatened plant species (*Botrychium mormo*, a State Endangered plant in Wisconsin) in Minnesota (Gundale 2002). Although more research is needed regarding the patterns and extent of earthworm invasions, management will need to be adaptive. Since earthworm eradication does not appear to be an option, efforts will be needed to prevent new introductions to sensitive areas wherever possible. Holdsworth et al. (2007) suggest that non-infested areas could be maintained as refugia for sensitive plant species and targeted for educational efforts to prevent bait dumping. Stands surrounded by acidic wetlands may be less likely to be invaded by worms due to the worms' pH requirements (Edwards and Bohlen 1996); perhaps areas such as these could be identified on the FRSF as potential focus areas for preventing future outbreaks. Identifying 'worm-free' areas, if they exist, could be considered a priority action on the FRSF.

Ecological Simplification and Habitat Loss

Ecological simplification, or homogenization, of both overstory (Schulte et al. 2007) and understory (Rooney et al. 2004) species have been identified as major threats to northern forests in the Lake States. Forests throughout this region have exhibited reduced species diversity, structural diversity, and functional complexity and have simplified spatial patterns due to factors such as land uses, invasive species, lack of fire regime, and heavy browse pressure.

Herbivory by white-tailed deer has been identified as having major impacts on tree and herb species in northern forests of the Lake States (e.g., Schulte et al. 2007, WDNR 2006c, WDNR 2004, Rooney et al. 2004, Rooney and Waller 2003, Alverson et al. 1988). The Michigan Society of American Foresters (2006) recently released a position statement addressing the need to control the impacts caused by white-tailed deer. In addition, deer density has been shown to negatively impact species richness and abundance levels of songbirds that nest in the intermediate canopy layer (DeCalesta 1994, McShea and Rappole 2000). The evidence of deer browse can be seen throughout the FRSF and surrounding landscape. Excessive deer herbivory is known to inhibit reproduction of certain trees, especially those species that are preferred forage for herbivores, as well as species growing in areas where deer "yard" during portions of winter months. Cedar and hemlock are, perhaps, most notably impacted by heavy deer browse and regeneration of both species is now severely limited throughout the state and beyond. Many other tree species are impacted in varying degrees by deer browse on the FRSF, as well, including maple, birch, and pine species. Heavy herbivory can also subject several forest herbs and shrubs to pressures they cannot withstand, resulting in loss of

vigor or population size and reducing the number of species present. In addition to developing more effective methods to control deer densities, the mosaic of vegetation types and successional stages surrounding the cedar-dominated conifer swamps and remaining hemlock stands of the FRSF may need to be assessed to limit excessive deer browse. Strategies for ensuring adequate reproduction of several declining species may be needed if they are to be retained as part of the (local) landscape.

As in many forested areas throughout the state, there is a lack of older forest on the FRSF, especially in the large habitat patches associated with certain species and ecological processes. For example, few nest territories for the Northern Goshawk are known to occur on the FRSF, despite the property's large forested acreage. Larger tracts of older growth closed canopy forest, which are preferred by Northern Goshawks, Red-shouldered Hawks, and other rare and/or declining birds, are limited in number and extent on the FRSF. The "Primary Sites" presented in this report identify some of the best opportunities on the FRSF to develop stands with old-growth characteristics. Using a broader landscape-scale approach for planning long-term management activities would be beneficial on the FRSF to provide a favorable context for maintaining viable populations of these species.

Priority Opportunities for Biodiversity Conservation

These “priority opportunities for biodiversity conservation” result from our inventory and subsequent assessment of the natural features of the FRSF and surrounding landscape. Information derived from field-collected data was supplemented with several other ancillary data sources including aerial photos, satellite imagery, various GIS data layers, the NHFEU (Cleland et al. 1997), various analyses of pre-European settlement vegetation data, and Forest Inventory and Analysis (FIA) data summaries (Miles 2007).

As conservation opportunities are not equivalent throughout the FRSF, we have emphasized those areas with the best examples of rare and representative native ecosystems, aquatic features, and sensitive species populations. These sites include the largest and potentially most viable populations of plants and animals from the NHI Working List known to occur on the FRSF. Priority natural community examples are 1) the least modified from a natural condition 2) occurring in a context which is compatible with maintaining that community over time, and 3) represented by relatively large stands. Although few rare natural community types are known to occur on the FRSF, to effectively conserve and manage for biological diversity, both rare and representative community types were evaluated (e.g., Northern Mesic Forest as a type is abundant throughout northern Wisconsin, but old growth stands, stands dominated by conifers, and stands constituting large patches are now uncommon and may continue to decline). There are rare or otherwise sensitive species associated with all community types - not just rare types.

These opportunities are provided for consideration by the FRSF Master Planning Team when developing overall recommendations for the future management of the property. This section covers general themes for the property. The following section, entitled “Primary Sites: Significance and Summaries,” describes site-specific opportunities for conservation also presented in detail in Appendix B.

Landscape Level Priorities

The FRSF presents opportunities to maintain large blocks of contiguous forest with embedded, undeveloped lakes, streams, and wetlands that are representative of the natural community types (forest communities, wetland communities, and waterbodies) known from this region.

Older Forests / Old-growth Forests

The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 2004, WDNR 1995). Old-growth forests can support high densities of certain forest herbs, as well as certain unique assemblages of birds and other animals, fungi, and bacteria species that are scarce in the state. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2006b).

Older forests, for example those with trees older than 120 years, are rare in the state, especially upland forests with structural attributes such as the presence of trees with a range of diameter sizes including very large sizes, large-diameter coarse woody debris, abundant large dead snags and den trees, and pit-and-mound micro-topography. Although the FRSF is the second-largest state-owned property in Wisconsin and is located in one of the most heavily forested portions of the state, much of the forested lands surrounding the FRSF are represented by young and medium-aged stands; these stands are often dominated by early successional species such as aspen within a mosaic of relatively small patches providing ample habitat for species associated with such vegetation (this is almost the reverse of the historical condition). In contrast, older, less disturbed mesic forests, especially in larger patches used by certain bird assemblages and other animal species, are not well represented in this landscape. The FRSF offers excellent opportunities to manage specific areas for older forest within a context of outstanding aquatic features, intact and relatively undisturbed wetlands, and vast public landholdings. With its large, mostly contiguous forested

acreage, the FRSF could provide for a range of forest successional stages and patch sizes, as well as the ability to practice a wide spectrum of management strategies ranging from more intensive harvest activities designed to enhance timber production to establishing new benchmark areas for studying natural processes. There could be opportunities to practice non-traditional techniques such as “Managed Old-growth” including experimental manipulations to attempt to accelerate old-growth characteristics (two WDNR-supported studies are currently in progress on the FRSF for achieving this goal). The WDNR “Old-growth and Old Forests Handbook” (WDNR 2006b), provides definitions and guidance regarding old-growth management in Wisconsin. Several of the chapters covering common forest cover types have been completed and are available now, including the chapter on ‘Northern Hardwoods.’

Ecological Connections

The study area presents opportunities to maintain or re-establish ecological connectivity between ecologically significant inventory sites identified within this landscape. During the planning process, consideration should be given to forest patterns and processes, as well as the context of ecologically important areas and how stands function within the regional landscape. For example, the FRSF contains a rich mosaic of wetlands, streams, and lakes in a mostly remote, forested context, so forest and wetland / riparian connections will need to be recognized during planning efforts. Forest fragmentation should also be avoided wherever possible to preserve the ecological integrity of the forest.

Community Level Priorities

Northern Mesic Forest

The species composition of mesic forests in Wisconsin has changed dramatically since the time immediately prior to European settlement. In most cases, as with the FRSF, mixed coniferous-deciduous types have lost much of their coniferous component (Schulte et al. 2007, WDNR 1995). Reproduction of hemlock and white pine in mesic forests, as well as northern white cedar in wet-mesic forests, is lacking in most areas of the FRSF, despite several attempts at hemlock regeneration by FRSF staff. In addition, yellow birch has become a minor component of the forest here. Efforts could be made to restore these communities where a seed source still exists. Although additional deer control will be needed to successfully regenerate some of these species, these areas may benefit through consideration of their context within the landscape to avoid creating habitats such as high-contrast edges between stands that may encourage use by deer. Older mesic forests are uncommon in many parts of the state, and there are good opportunities on the FRSF to develop Northern Mesic Forests with old-growth characteristics.

Northern Dry-mesic Forest

More common in other parts of the state (other Ecological Landscapes), this is a rare type on the Forest. High-quality examples of Northern Dry-mesic Forests are limited to a few locations on the FRSF; these are included in the Primary Sites (Appendix B). These stands contain mature trees, conifer dominance, and areas of high crown closure. These sites offer opportunities to develop older forests of an uncommon type with ecological connections to the surrounding forest and the Flambeau River. They may also provide a seed source for the potential re-establishment of the now missing pine component in some of the adjoining mesic forests. Active management may be needed as a tool if the goal is to maintain some examples of these communities over time in the absence of fire.

Northern Wet-mesic Forest

The FRSF and surrounding areas contain some good examples of the Northern Wet-mesic Forest community; forested wetlands dominated by northern white cedar. This natural community type is known to harbor rare plant species and should be given special consideration during planning and management activities. Most of the stands documented on the FRSF have been heavily impacted by deer browse and have little cedar reproduction but otherwise retain good structure and representative species composition. The best examples of the type on the FRSF have been included in the Primary Sites; these may warrant special consideration in the master plan.

Forested Seeps

Several spring seeps were examined in the FRSF, mostly in the southernmost portion of the forest, and in places near the Flambeau River and Butternut Creek. These areas sometimes occur near the bases of steep slopes or bluffs. Seepage areas, with active discharges of groundwater, sometimes host uncommon or rare plant and animal species. They also contribute to high water quality of the streams they feed. These features are highly susceptible to damage, and land use practices that lead to soil or hydrological disturbance should be avoided. Recharge areas need to be identified and managed carefully if the springs and seeps are to remain functional.

Ephemeral Ponds

Ephemeral Ponds are abundant on the FRSF. Also known as vernal pools, Ephemeral Ponds are important refugia and breeding sites for a wide range of amphibian and aquatic invertebrate species within forested landscapes. These ponds can exhibit high macroinvertebrate richness and harbor invertebrates known only from these specialized habitats. Whenever possible, Ephemeral Ponds should remain embedded within forested habitats. To protect these habitats, the ponds should not be isolated by clearcutting around them, their canopy coverage should be maintained, and efforts should be made to minimize or prevent negative impacts to hydrology by limiting road, ditch, or dike construction. The timing of management activities around ephemeral ponds can be critical. Ephemeral Ponds can be difficult to identify in the winter when tree marking often occurs, so additional provisions may need to be made to protect these areas during harvest. Finally, places with known concentrations of Ephemeral Ponds may warrant special consideration during the master planning process to provide landscape-level protection to this resource within the larger forested context.

Forested and Non-forested Wetlands

Wetlands are abundant throughout the study area and include several forested and non-forested types. Many of them are in good condition, and they support a disproportionately high percentage of the rare species observed within the study area. The FRSF offers several opportunities to protect wetlands within a mosaic of forest and aquatic communities. Some of the best quality wetlands could be considered for special management and protection designation, particularly where sensitive (including rare) species have been documented.

Lakes

The undeveloped lakes within the FRSF warrant continued protection. The forest contains good examples of several lake types. Undeveloped examples of these lakes are becoming increasingly rare throughout the region, and they are important for several plant and animal species. Hanson Lake and its associated lakes and ponds have fluctuating shorelines that could harbor rare plants. Planners could use a landscape approach and consider further protection of undeveloped FRSF lakes by embedding them within special management areas of intact native communities, rather than applying a set distance buffer. Care will be needed to avoid introduction of aquatic invasive species to FRSF waterbodies.

Flambeau River

The free-flowing stretches of the river provide important habitat for many rare animal species, and management of lands adjacent to the river will have important effects on water quality. Many of the areas along the river slopes contain mature forests, as well as forested seeps that can harbor rare plant assemblages. A river “buffer” that accounts for steepness of slope, soil type, vegetative cover, and the habitat needs of sensitive species would be most effective for protecting species associated with the river.

Primary Sites: Significance and Summaries

Twenty-two ecologically important sites were identified as a result of the biotic inventory. These “Primary Sites” were identified because they contain relatively undisturbed, high-quality, natural communities, provide important habitat for rare species, offer opportunities for restoration, could provide important ecological connections, or some combination of the above factors. Figure 12 illustrates the locations of the Primary Sites. Rare species populations documented at several locations outside of the Primary Sites will be considered during the routine review process used by property managers when planning management activities. The present qualities and future viability of these sites is, in part, attributable to their context. It is important to consider them within the context of the prevalent management in the surrounding landscape.



Bass Lake & Peatlands (Primary Site FR13)
Photo by Eric Epstein, WDNR

Descriptions for each of the Primary Sites can be found in Appendix B. Information provided includes: location information, a site map showing occurrences of significant communities and species, a brief summary of the natural features present, the site’s ecological significance, and management considerations.

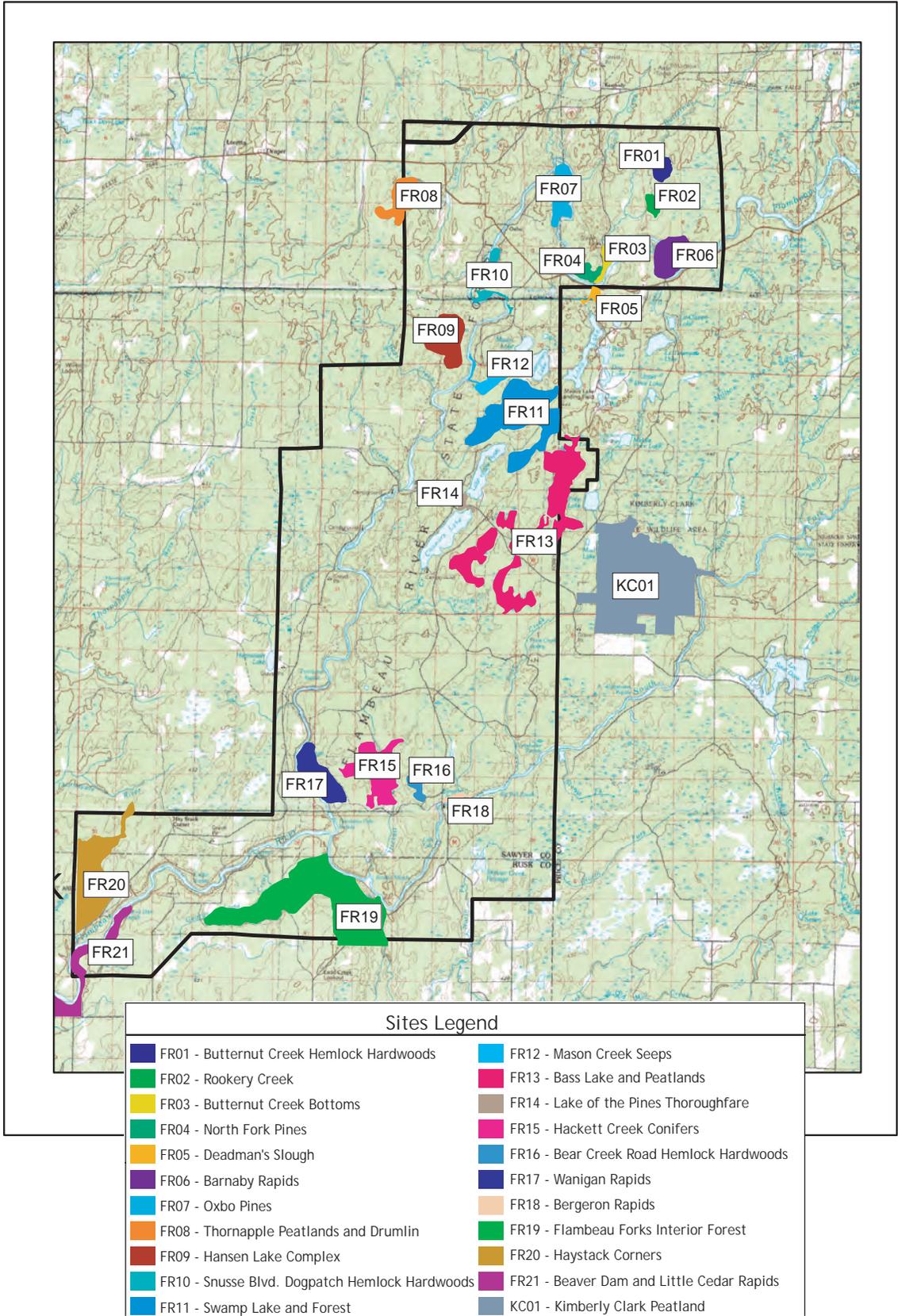
Flambeau River State Forest Primary Sites

- FR01. Butternut Creek Hemlock Hardwoods
- FR02. Rookery Creek
- FR03. Butternut Creek Bottoms
- FR04. North Fork Pines
- FR05. Deadman’s Slough *
- FR06. Barnaby Rapids
- FR07. Oxbo Pines
- FR08. Thornapple Peatlands and Drumlin
- FR09. Hanson Lake Complex
- FR10. Snusse Boulevard - Dogpatch Hemlock Hardwoods
- FR11. Swamp Lake and Forest
- FR12. Mason Creek Seeps
- FR13. Bass Lake and Peatlands
- FR14. Lake of the Pines Thoroughfare
- FR15. Hackett Creek Conifers
- FR16. Bear Creek Road Hemlock Hardwoods
- FR17. Wanigan Rapids
- FR18. Bergeron Rapids
- FR19. Flambeau Forks Interior Forest
- FR20. Haystack Corners
- FR21. Beaver Dam and Little Cedar Rapids
- KC01. Kimberly Clark Peatland *
- Barnaby Rapids Peatland (Recent Findings)

*Theses sites are located outside of the FRSF boundary.

Figure 12

Location of Flambeau River State Forest Study Area Primary Sites. Site descriptions are provided in Appendix B.



Future Inventory, Monitoring and Research Needs

The following are suggested or ongoing inventory, monitoring, and research efforts that could provide beneficial information for adaptive management of the FRSF.

- **Earthworms** – surveys and research could help to determine the extent of earthworm invasion on the FRSF, identify worm-free areas (if any exist), and explore the feasibility of establishing worm-free refugia on the forest. Some earthworm inventory is being conducted as part of the ongoing old-growth research on the FRSF.
- **Old-growth Research** – two projects are underway to study the potential for using alternative management techniques for developing old-growth characteristics in northern hardwood forests on the FRSF. It will be critical for this research to be followed in the long-term (at least several master planning cycles) to determine the effectiveness of these techniques.
- **Stream Monitoring** – this ongoing WDNR study will test the effectiveness of 100-foot Riparian Management Zones to determine if they provide adequate protection of aquatic communities and water quality (C. Wagner, personal communication). The project will involve stream sampling of fish and macroinvertebrates, as well as water quality parameters. Two of the study sites for this project are located on the FRSF, and a long-term monitoring station has been established for a related project on the FRSF.
- **Deer Herbivory** – a large deer enclosure was installed at the Big Block, over 20 years ago. Over time, the fence was broken in several areas and is in need of repair. There may be opportunities to repair the damage and continue this study.
- **Invasive Plants** – continued monitoring and control of invasive species will be critical on the FRSF
- **Mesic Forest Herbs** – in 2000 a set of permanent plots was established by Jim Meeker et al. of Northland College as part of a region-wide effort for monitoring changes to understory herbaceous plant diversity. These plots should be re-sampled in the future to identify changes and trends in these areas of the FRSF. These plots could supplement those utilized for the Continuous Forest Inventory effort.
- **Conifer and yellow birch regeneration** – the FRSF provides opportunities to study regeneration of declining species such as hemlock and yellow birch.
- **Selected SGCN/Habitat surveys** – additional targeted surveys and monitoring for certain groups (e.g., a recurring breeding bird survey) would be useful for informing management decisions.
- **Ephemeral Ponds** – additional information regarding this community type in northern Wisconsin would be useful, including the development of management recommendations.
- **The North Fork of the Flambeau River** – research to investigate the possible impacts of dams and point pollution discharge sources on the river biota.

Glossary

adaptive management – a formal, structured approach to dealing with uncertainty in natural resource management, using the experience of management as an ongoing and continually improving process.

aquatic macrophyte – vascular plants such as cattails, bulrushes, pond lilies, and pondweeds that have special adaptations that enable them to live in aquatic habitat.

bog – wetlands characterized by the accumulation of peat derived from *Sphagnum* moss, high acidity, low oxygen and nutrient availability, and a group of highly specialized vascular plants that includes ericaceous shrubs (e.g., leatherleaf, bog laurel, cranberries), sedges, and insectivorous species. By the strictest definition, a bog receives nutrients only from precipitation, and is isolated from mineral-enriched groundwater by thick beds of living *Sphagnum* mosses and partially decomposed moss peat. “Open” bogs are those lacking a dense overstory of coniferous trees. Forested, or treed, bogs support a relatively dense growth and correspondingly closed canopy of black spruce, sometimes mixed with tamarack. See “*muskeg*.”

Cambrian – the earliest geologic period of the Paleozoic Era, from 500 to 600 million years before the present. Most of the exposed or otherwise prominent bedrock in the study area is sandstone of Cambrian age.

complex – used here to reference an integrated mosaic of natural communities and/or aquatic features.

context- used in this report to aid in the assessment of the ecological effects that surrounding biological and physical features, land uses, ownership or other significant attributes of the environment may have on the potential to maintain an occurrence of a natural community or rare species population at a given location.

cover type – a broad vegetation classification method based on the single species or species group comprising a majority of plants found in an area. As used by professional WDNR Foresters, a cover type is a tract of forest land characterized by the predominance of one or more key species which make up 50% or more of the basal area of sawtimber and poletimber stands, or of the number of trees in seedling and sapling stands. Forest lands less than 10% stocked with commercial tree species are classified as upland brush, grass, or lowland brush. See WDNR (2006c) for cover type descriptions. A broader usage of “cover type” is sometimes used to describe areas with remotely-sensed data; these types may describe anthropogenic features such as cornfields, pastures, or urban areas.

diversity – used in this report as a shortened form for biological diversity, or biodiversity. A general definition (WDNR 1995) is “the spectrum of life forms and the ecological processes that support and sustain them.” Biological diversity is a complex of four interacting levels: genetic, species, community, and ecosystem.

downburst - an outburst of air on or near the ground originating from a parent cloud or thunderstorm that can cause “tornado-like” damage and sometimes called straight-line winds. (NOAA 2007)

drumlin – streamlined, teardrop shaped hills created by glacial action. The long axis parallels the direction of past glacial movement.

Ecological Landscape – landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin’s sixteen ecological landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units. The FRSF is located in the “North Central Forest” Ecological Landscape.

ecoregion – geographic units that are differentiated by climate, geology, geomorphology, physiography, hydrology, soils, and vegetation. These units have been defined and organized in different ways by various institutions but in this document we use the National Hierarchical Framework of Ecological Units (NHFEU). As described by Avers et al (1994), the NHFEU can provide a basis for assessing resource conditions at multiple scales. In this report we have most frequently referred to ecoregions of the “subsection” level, which are intermediate in scale within the NHFEU and typically cover

areas of hundreds to thousands of square miles. In recent years the NHI has found the ecoregions of the NHFEU to be useful tools for work planning, interpreting the collected data, and communicating across political and administrative boundaries.

Element –the basic building blocks of the Natural Heritage Inventory. They include natural communities, rare plants, rare animals, and other selected features such as colonial bird rookeries and mussel beds. In short, an element is any biological or ecological entity upon which we wish to gather information for conservation purposes.

element occurrence – an individual example of an element (a natural community, a rare plant population, a rare animal population, or other feature tracked by the Natural Heritage Inventory program) at a specific geographic location.

ericaceous – (also “ericad”) pertains to a family of plants, the Ericaceae, especially characteristic of highly acidic habitats such as bogs and muskeg. Members include familiar plants such as blueberries, cranberries, leatherleaf, Labrador tea, and bog rosemary.

esker – a ridge, commonly sinuous, composed of sand and gravel deposited by a stream that flowed in an ice-walled channel beneath a glacier (Dott Jr. and Attig 2004).

fen – wetland that receives nutrients via direct contact with mineral enriched groundwater and in which peat accumulates. A “poor” fen has relatively low concentrations of plant nutrients and a carpet of *Sphagnum* mosses, but is capable of supporting more nutrient demanding plants that are not characteristic of or abundant in the more acidic, true “bogs.” “Rich” fens have relatively high concentrations of nutrients, lack the continuous carpet of *Sphagnum* mosses, and support an assemblage of plants that often includes calcium-loving species absent from poor fens and bogs.

flowage – a body of standing water (an impoundment) created by constructing a dam or other water control structure across a stream or flowing ditch.

forb – a general term that usually refers to those native herbaceous plants of prairies and savannas that are not grasses, or grasslike. In broad terms, “wildflowers.”

fragmentation – the breaking up of large and continuous ecosystems, communities, and habitats into smaller discontinuous areas that are surrounded by altered or disturbed lands or aquatic features.

Global Rank - NatureServe global conservation status rank (G-Ranks). These ranks reflect an assessment of the condition of the species or ecological community across its entire range. Appendix E describes each of the G-Ranks currently used.

habitat – the natural environment that supports a given species or group of species, including both biotic and abiotic components.

habitat classification system – a site classification system based on the floristic composition of plant communities. See Kotar et al (2002) for more information.

habitat type – as used in the Forest Habitat Classification System (e.g., Kotar et al. 2002), all sites capable of producing similar climax plant communities. This system of vegetation classification uses the floristic composition of a plant community as an integrated indicator of those environmental factors that affect reproduction, growth, competition, and community development. These include soils, moisture, nutrient levels, and topography. Professional foresters in the upper Great Lakes region often use this system as a forest management tool.

inventory site – also “site” in text. The geographic location at which a biological survey has been conducted. These may be large or small, depending on the nature of the species or community surveyed. Boundaries may be finite and discrete (a property boundary, a single stand of a forest community), or rather arbitrary. When sites become very large (exceeding several thousand acres) and encompass complex landscapes, they are sometimes referred to as “macrosites.”

kame – Steep-sided hills or mounds of water-sorted sands and gravels that were built when streams of meltwater draining from stagnant glacial ice dropped their load of sediment as their velocity decreased (Schultz 1986).

landscape approach - used in this document to mean: considering an area (in this case during master planning)

within the broader context of its physical and biological surroundings, rather than focusing narrowly on the site (e.g., stand, property, or other unit of interest) itself. This approach would consider linkages among communities / habitats, protective buffers for unique features, and overall landscape pattern and context. By establishing a context for the lands and waters of interest, this approach enables an assessment of opportunities at multiple scales, identifies management issues and needs, and can help to prioritize the conservation values of the site.

Landtype Association (LTA) – a level in the National Hierarchical Framework of Ecological Units representing an area of thousands to hundreds of thousands of acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

macroinvertebrate – a term used in this report to refer to aquatic insects and mollusks.

matrix – used in this document to refer to the dominant land cover within which other features of the landscape are embedded.

mesic – used by ecologists to describe sites with moderate soil moisture (neither dry nor inundated with water)

metapopulation – in a broad sense, a group of spatially separated populations of the same species that interact on some level and may be connected by dispersal of individuals among them.

minerotrophic – wetlands that receive water enriched with mineral cations from surface runoff or water that has percolated through nearby mineral soils.

moraine – landforms composed of unsorted materials deposited by glaciers. They can cover broad geographic areas of millions of acres. Topography can vary from nearly level “till” plains to rough end moraine landscapes composed of steep dry ridges interspersed with deep kettle holes. These glacial “kettles” are frequent locations for lakes and wetlands.

muskeg – similar to “open bog.” Used to describe highly acidic peatlands characterized by a sparse growth of scattered, stunted black spruce and tamarack over ericaceous shrubs, sedges, and a deep carpet of *Sphagnum* mosses.

National Hierarchical Framework of Ecological Units (NHFEU) – a land unit classification system developed by the U.S. Forest Service and many collaborators. As described by Avers et al (1994): “The NHFEU can provide a basis for assessing resource conditions at multiple scales. Broadly defined ecological units can be used for general planning assessments of resource capability. Intermediate scale units can be used to identify areas with similar disturbance regimes. Narrowly defined land units can be used to assess specific site conditions including: distributions of terrestrial and aquatic biota; forest growth, succession, and health; and various physical conditions.”

natural community – an assemblage of (mostly native) plants and animals in a particular place at a particular time, interacting with one another and the abiotic environment around them, and subject to primarily natural disturbance regimes.

natural community occurrence – a place on the landscape that supports an example of a natural community that has been surveyed, evaluated, and documented by ecologists using standard NHI methodology that meets the minimum criteria for condition, context, and size. These places become “Element Occurrences” in the NHI database.

natural community type – a classified plant association used to describe assemblages that are repeated across a landscape. These types are generalizations since no two assemblages are exactly alike.

natural division – six major natural divisions have been delineated for the state of Wisconsin based on gross differences in vegetation, soils, and geomorphology. Recent collaborative work by the USDA Forest Service, The Nature Conservancy, the WDNR, and others has resulted in a somewhat similar but hierarchical classification system of “ecoregions.”

Natural Heritage Inventory – A system developed by the Science Division of The Nature Conservancy and currently coordinated by NatureServe for the collection, management, and use of biological, ecological, and related information. In Wisconsin, the Natural Heritage Inventory was established by an act of the state legislature in 1985, after which the program was installed within the WDNR’s Bureau of Endangered Resources.

northern hardwoods –generally applied to those forests of northern Wisconsin composed primarily of hardwoods such as sugar maple, basswood, white ash, yellow birch, and in some parts of the state, beech. As used by the WDNR, a stand of this type is comprised of 1) greater than 50% of the basal area in sawtimber and poletimber or 2) more than 50% of the stems in saplings and seedlings of the aforementioned species (WDNR 2006c). Several other species can be associates, including red maple, red oak, hemlock, white pine, balsam fir or, sometimes, aspen. The term is widely used in the Great Lakes states in areas that have vegetation similar to that of much of northern Wisconsin.

old forest - forests which are older than the typical managed forest (beyond traditional rotation age), but are not biologically old. They are beyond economic maturity, but are not senescent (WDNR 2006b).

old-growth forest - forests which are relatively old and relatively undisturbed by humans. The forest is biologically old, containing some trees which are nearing or beyond their average expected lifespan. The original even-aged overstory is becoming senescent, is senescing, or has senesced (WDNR 2006b). These forests are often associated with attributes such as large living trees, standing snags, coarse woody debris, pit and mound microtopography, and complex multi-layered canopies. Old-growth stages of many forest types were formerly common and/or widespread in Wisconsin but are now very rare (Frelich 1995).

outwash – composed of materials sorted and deposited by glacial meltwaters. The resulting topography can range from a level plain (“uncollapsed”) to very hilly (“collapsed” or “pitted”). Pitted outwash may contain numerous lakes, which originated when blocks of ice stranded by a receding glacier were buried within outwash deposits, but pitted outwash is absent from the Central Sands.

peat – organic deposits consisting of the partially decomposed remains of plants, which accumulate over time more rapidly than decomposition processes can break them down. Peat may be derived from the remains of mosses, sedges, or woody plants.

peatland –wetlands characterized by the gradual accumulation of peat, the partially decomposed remains of plants. Open bog, muskeg, black spruce swamp, tamarack swamp and poor fen are among the common peatland communities in the FRSF study area.

Pleistocene – in the geologists parlance, “the first epoch of the Quaternary Period.” In more common usage, the Ice Age.

Precambrian – the oldest major division in the geologic time scale, equivalent to ca. 90% of geologic time, covering the period up to approximately 600 million years ago.

rare– used in this report to refer to native species known or suspected to be uncommon and/or declining in the state. Specifically, these are the plants and animals on the NHI Working List. Included are species legally designated as “Endangered” or “Threatened” by either the WDNR or the US Fish and Wildlife Service, as well as species in the Department’s advisory “Special Concern” category and on the US Fish & Wildlife Service’s “Candidate” and “Species of Concern” lists. For animals, these species would also be considered “Species of Greatest Conservation Need” (WDNR 2006d).

“rare” natural community – in this context the modifier can refer to the relative scarcity of the community type itself on a state or global scale (see a discussion of Global and State Ranks), on a landscape scale, or rarity of a community within a given property or other boundary. In addition to rarity of a type of community, other considerations include the scarcity of a particular developmental stage or other specific attribute(s) of a particular community.

“relatively intact” (or “closed canopy”) – crown closure that approximates that achieved in the absence of major artificial or natural disturbance. This will vary somewhat by forest type.

refugium (or refugia) – a place where plant or animal species have survived despite widespread disturbance such as glaciation.

restoration – used in this report to refer to the re-establishment of a natural community, habitat, species population,

or other ecological attribute, that has been eliminated or greatly reduced on a given property or landscape. Many factors, sociological as well as ecological, must be weighed when making a decision to engage in a restoration project.

sawtimber – a forestry term referring to living trees of at least 9" d.b.h. for softwoods such as pine or of at least 11" d.b.h. for hardwoods such as sugar maple, yellow birch, or ash.

Section – a level in the National Hierarchical Framework of Ecological Units characterized by combinations of climate, geomorphic processes, topography, and stratigraphy. The study area is located primarily within Section 212x, the “Northern Highlands,” an area that encompasses much of the North Central Forest and Northern Highlands Ecological Landscapes

significant – has either documented or high potential for biodiversity conservation based on present condition, stand size, presence of rare species, or other factors

sink – a site that is attractive to breeding plants or animals but that acts as a drain on overall populations of such organisms.

site – see “inventory site.”

source – a site where sufficient offspring are produced that can disperse into the surrounding landscape.

State Natural Area – sites that are formally designated by the state of Wisconsin to protect outstanding examples of both representative and rare native plant communities, aquatic and geologic features, or archaeological sites. State Natural Areas are often among the last refuges in the state for rare and endangered species of plants and animals. State Natural Areas are devoted to scientific research, the teaching of conservation biology and, especially, to the preservation of natural values and genetic diversity for future generations. Management may be active or passive, depending on the natural features present. (For more information regarding Wisconsin’s State Natural Areas, visit the State Natural Areas Web pages, dnr.wi.gov/org/land/er/sna/).

State Rank - NatureServe state or subnational conservation status rank (S-Ranks). These ranks reflect an assessment of the condition of the species or ecological community within a given state or province. Subnational ranks are assigned and maintained by state or provincial natural heritage programs and conservation data centers. Appendix E describes each of the S-Ranks currently used.

Subsection – This is a level in the NHFEU that is intermediate in scale. Subsections are characterized by distinctive glacial landforms (e.g., outwash or moraine), soils, and broadly, by vegetation. The 16 Ecological Landscapes developed by the WDNR are largely based on NHFEU Subsections (see *Ecological Landscape*).

survey site – see “inventory site.”

timberland - forested land containing timber of commercial value

TNC – The Nature Conservancy, a private conservation organization responsible for developing the standardized methodology used by Natural Heritage programs.

wire-leaved sedges – grass-like plants in the sedge genus *Carex*, characterized by very narrow leaves and stems, that can be dominant in certain herbaceous wetland communities. Also referred to by the misnomer “wiregrass.” The most common wire-leaved sedges in the study area are *Carex oligosperma* and *Carex lasiocarpa*.

Species List

List of species referred to by common name in the report text.

Common Name	Scientific Name	Common Name	Scientific Name
arrow grass	<i>Scheuchzeria palustris</i>	small cranberry	<i>Vaccinium oxycoccos</i>
aspen	<i>Populus tremuloides</i>	starflower	<i>Trientalis borealis</i>
aster	<i>Aster</i> sp.	stinging nettle	<i>Urtica dioica</i>
balsam fir	<i>Abies balsamea</i>	sugar maple	<i>Acer saccharum</i>
basswood	<i>Tilia americana</i>	swamp false Solomon's-seal	<i>Smilacima trifolia</i>
beaked hazlenut	<i>Corylus cornuta</i>	three-seeded sedge	<i>Carex trisperma</i>
bitter dock	<i>Rumex obtusifolius</i>	white beak-rush	<i>Rhynchospora alba</i>
black ash	<i>Fraxinus nigra</i>	white birch	<i>Betula papyrifera</i>
bluejoint grass	<i>Calamagrostis canadensis</i>	white cedar	<i>Thuja occidentalis</i>
bog-laurel	<i>Kalmia polifolia</i>	white pine	<i>Pinus strobus</i>
bog-rosemary	<i>Andromeda glaucophylla</i>	white spruce	<i>Picea glauca</i>
bracken fern	<i>Pteridium aquilinum</i>	wild sarsaparilla	<i>Aralia nudicaulis</i>
bur oak	<i>Quercus macrocarpa</i>	willows	<i>Salix</i> sp.
Canada honeysuckle	<i>Lonicera canadensis</i>	wood anemone	<i>Anemone quinquefolia</i>
Canada mayflower	<i>Maianthemum canadense</i>	wood nettles	<i>Laportea canadensis</i>
Canada thistle	<i>Cirsium arvense</i>	yellow birch	<i>Betula alleghaniensis</i>
cedar	<i>Thuja occidentalis</i>		
common buckbean	<i>Menyanthes trifoliata</i>		
common forget-me-not	<i>Myosotis scorpioides</i>		
creeping-snowberry	<i>Gaultheria hispidula</i>		
drooping woodland sedge	<i>Carex arctata</i>		
European swamp thistle	<i>Cirsium palustre</i>		
false melic grass	<i>Schizachne purpurascens</i>		
few-flowered sedge	<i>Carex pauciflora</i>		
hawthorns	<i>Crataegus</i> sp.		
hemlock	<i>Tsuga canadensis</i>		
interrupted fern	<i>Osmunda claytoniana</i>		
labrador tea	<i>Ledum groenlandicum</i>		
lady fern	<i>Athyrium filix-femina</i>		
marsh fern	<i>Thelypteris palustris</i>		
mountain holly	<i>Ilex mucronata</i>		
muck sedge	<i>Carex limosa</i>		
muscle-wood	<i>Carpinus caroliniana</i>		
ostrich fern	<i>Matteuccia struthiopteris</i>		
Penn sedge	<i>Carex pennsylvanica</i>		
red maple	<i>Acer rubrum</i>		
red pine	<i>Pinus resinosa</i>		
reed canary grass	<i>Phalaris arundinacea</i>		
rough-leaved rice grass	<i>Oryzopsis asperifolia</i>		
royal fern	<i>Osmunda regalis</i>		
rusty cotton-grass	<i>Eriophorum virginicum</i>		
sedges	<i>Carex</i> sp.		
sensitive fern	<i>Matteuccia struthiopteris</i>		
sessile-leaved bellwort	<i>Uvularia sessilifolia</i>		
silver maple	<i>Acer saccharinum</i>		

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APPENDIX A

Natural Heritage Inventory Overview and General Methodology

The Flambeau River State Forest biotic inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program, which is part of an international network of NHI programs. The defining characteristic of this network, and the feature that unites the programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers is coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on rare species, natural communities, and other rare elements of nature. When NHI programs are established, one of the first tasks facing the staff is to consolidate existing information on the status and location of rare elements. Before proceeding, the NHI program must determine what elements warrant “tracking” and which are more common. Similar to most states, Wisconsin biologists had a general idea of which species in the better-studied taxonomic groups (e.g., mammals, birds, and vascular plants) were rare or declining. For less-studied groups such as macroinvertebrates, the process of assembling the list of species to track and gathering the data were quite dynamic. Initially, NHI staff cast a wide net, collecting data on many species from existing sources (e.g., scientific literature, field guides, books, maps, and museum collections) as well as from direct contact with experts throughout the state. As more data were gathered, it was clear that some species were more common than originally thought and the NHI program stopped collecting data on them. Thus, the list of which elements are tracked, the NHI Working List, changes over time as species’ populations change (both up and down) and as our knowledge about their status and distribution increases. This evolution continues today, with the NHI Working List typically going through several revisions a year. The most current Wisconsin Natural Heritage Working List for the State of Wisconsin is available through the NHI office and on the Endangered Resources Program Web pages (dnr.wi.gov/org/land/er/wlist/).

In general, there are two approaches to surveying biodiversity: (1) those focused on locating occurrences of particular elements, and (2) those focused on assessing the components of a particular area. The latter approach employs a “top down” analysis that begins with an assessment of the natural communities and aquatic features present, their relative quality and condition, the surrounding landscape pattern, and current land use and results in the identification of future species-oriented surveys. This approach, commonly referred to as “coarse filter-fine filter,” concentrates inventory efforts on those sites most likely to contain target species. It also allows sites to be placed in a larger, landscape context for more broad applications of ecosystem management principles.

For the Flambeau River State Forest, a top-down, coarse filter-fine filter approach was used. The initial analysis assessed the entire region and determined the important ecological attributes and the biological processes supporting them. Criteria to evaluate sites were established and then vegetative communities were identified and characterized. Based upon existing habitat characteristics and known habitat preferences of various rare species, sites where species-specific surveys were most appropriate were identified. ***No doubt, occurrences of rare species exist that were not located through these inventories.*** However, by concentrating inventory efforts on the highest quality or otherwise suitable sites, it is most likely that the populations with the highest conservation value were located.

The NHI methodology for organizing and storing data is actually a system of three inter-related data storage techniques: structured manual information files, topographic map files, and a computer database that integrates the various information. The computer component, known as Biotics, is a sophisticated relational database management application with both tabular and spatial components.

Methods of Inventory

The following is a description of standard NHI methods for conducting NHI inventories. Any step may be modified, dropped, or repeated as appropriate to the project.

File Compilation: Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the Biological & Conservation Data system, housed within DNR's Natural Heritage Inventory. Other databases with potentially useful information may also be queried, such as: forest stand/compartments reconnaissance, which is available for many public agency owned lands; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; museum/herbarium collections for various target taxa; soil surveys; and the fish distribution database (by watershed, WDNR-Research).

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources contain information on a variety of subjects relevant to the inventory of natural features and are frequently useful.

Literature Review: Field biologists involved with a given project consult basic references on the natural history and ecology of the region within which the study area is situated. This can both broaden and sharpen the focus of the investigator.

Target Elements: Lists of target elements including natural communities, rare plants and animals, and aquatic features are developed for the study area. Field inventory is then scheduled for the times when these elements are most identifiable or active. Inventory methods follow accepted scientific standards for each taxon.

Map Compilation: USGS 7.5 minute topographic quadrangles serve as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth.

Ecoregion maps are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. As these maps evolve, they should become increasingly useful, even for relatively small, localized projects.

Geographic Information Systems (GIS) are routinely used to allow for efficient and comprehensive planning of surveys, as well as analysis of the results.

Aerial photographs: These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. Both hard copy and digital versions of air photos are used for these projects.

Original Land Survey Records: The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. These notes also record general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns.

Interviews: Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield information not available in other formats.

Analysis of Compiled Information: The compiled information is analyzed to identify inventory priorities, determine needed expertise, and develop budgets.

Meetings: Planning and coordination meetings are held with all participants to provide an overview of the project, share information, identify special equipment needs, coordinate schedules, and assign landowner contact responsibilities.

Aerial Reconnaissance: Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most easily identified and differentiated. They are also useful for observing the general lay of the land, vegetation patterns and patch sizes, aquatic features, infrastructure, and disturbances within and around the site.

APPENDIX B

Primary Inventory Sites within the Flambeau River State Forest and Surrounding Landscape

The ecologically significant sites identified through the biotic inventory are depicted on Figure 12 and described in the following narratives. Each site contains documented, significant occurrences of rare and/or representative high quality natural features. Department master planning teams, land managers, and the general public can use these sites for identifying protection and management opportunities. Restoration potential for some native communities is discussed, as well as the presence of ecologically important resources on nearby lands outside of the FRSF boundary. Site boundaries are rough first approximations; further analysis may be needed to more precisely define these boundaries during master planning. Birds listed in site narratives were noted during the natural community surveys; more detailed bird data were collected using standard breeding bird surveys.

Table of Sites

FR01. Butternut Creek Hemlock Hardwoods	2
FR02. Rookery Creek	4
FR03. Butternut Creek Bottoms	6
FR04. North Fork Pines	9
FR05. Deadman's Slough *	11
FR06. Barnaby Rapids	13
FR07. Oxbo Pines	15
FR08. Thornapple Peatlands and Drumlin	17
FR09. Hanson Lake Complex	19
FR10. Snusse Blvd. - Dogpatch Hemlock Hardwoods	22
FR11. Swamp Lake and Forest	24
FR12. Mason Creek Seeps	27
FR13. Bass Lake and Peatlands	29
FR14. Lake of the Pines Thoroughfare	32
FR15. Hackett Creek Conifers	34
FR16. Bear Creek Rd. Hemlock Hardwoods	37
FR17. Wannigan Rapids	39
FR18. Bergeron Rapids	41
FR19. Flambeau Forks Interior Forest	44
FR20. Haystack Corners	47
FR21. Beaver Dam and Little Cedar Rapids	49
KC01. Kimberly Clark Peatland *	52

*These sites are located outside of the FRSF.

FR01. BUTTERNUT CREEK HEMLOCK HARDWOODS

Location

County: Price
 USGS 7.5' Quadrangle: Kennedy, Butternut Lake
 Landtype Association: 212Xd02. Flambeau silt capped Drumlins, 212Xd03. Exeland Plains
 Approximate Size (acres): 165

Description of Site

An extensive, mature, moderately rich hemlock-hardwood forest (Northern Mesic Forest) occurs here on a large drumlin with subdued topography. The canopy features hemlock, yellow birch and white cedar, along with super canopy white pine and white spruce. Trees range from 15" - 24" in diameter. Structural diversity of this forest is enhanced through numerous tip-up mounds, trees with broken tops, and trees regenerating in gaps. The soils vary from moderately well-drained to somewhat poorly-drained. Much of the stand grades from more mature hemlock-hardwood forest into pole-sized northern hardwoods with the exception of the southwest and northwest corners where it grades into conifer and hardwood swamp. Birds noted here during their breeding seasons at the time of the biotic inventory included Solitary Vireo, Broad-winged Hawk, Blackburnian Warbler, Great-crested Flycatcher, Northern Parula and Scarlet Tanager.

Significance of Site

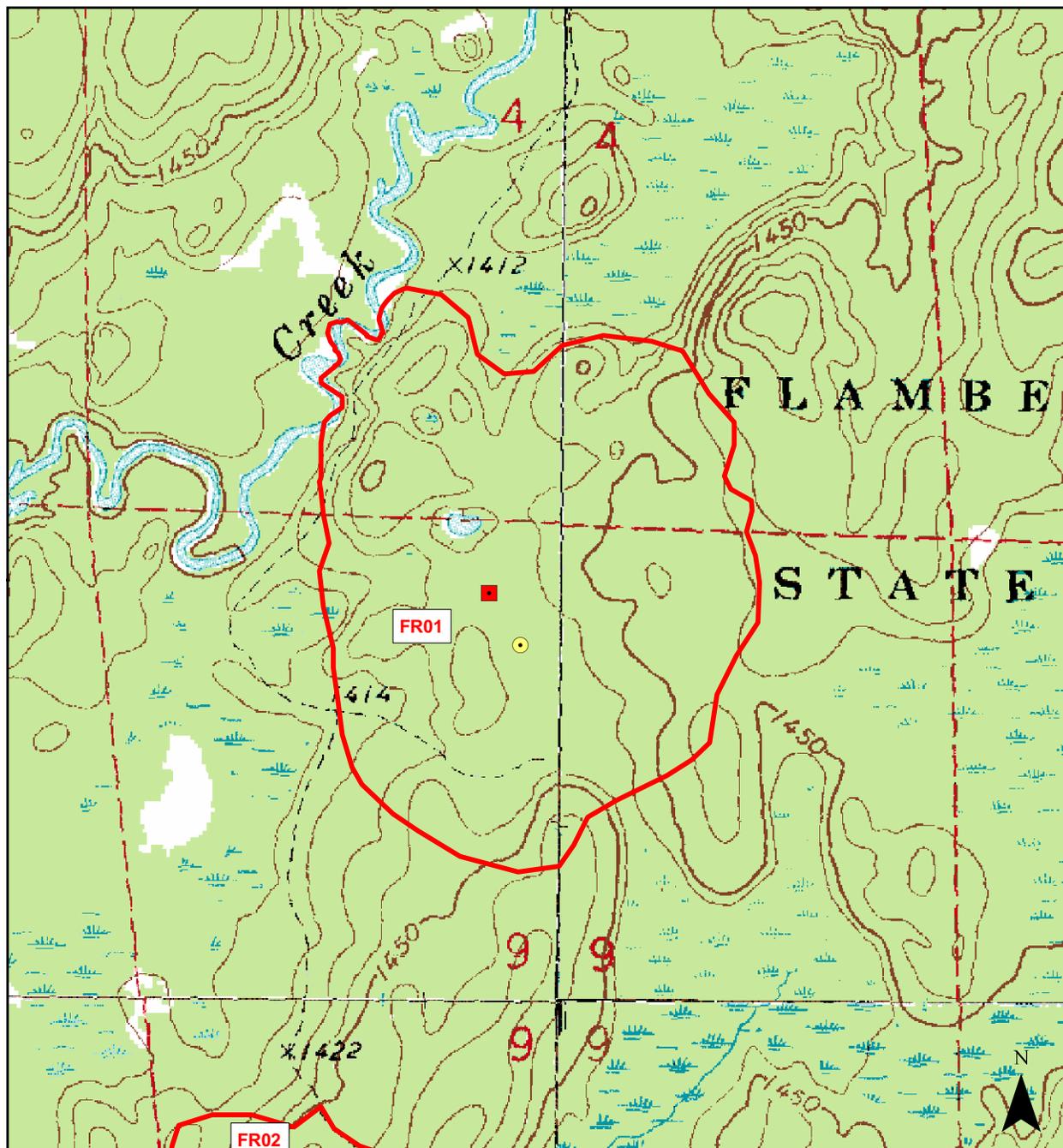
The primary natural feature of this site is a block of mature Northern Mesic Forest within a rolling drumlinized outwash landscape. Hemlock-hardwood forest with supercanopy white pine, once the most extensive and characteristic forest type of this part of Wisconsin, is now limited to small, isolated remnants (including on surrounding county, state, and national forest lands). Mesic sites that retain even small levels of residual hemlock, yellow birch, and white pine are uncommon on the FRSF, especially in the northern half of the State Forest. A Special Concern / SGCN raptor has been documented breeding at this site. This site contains good examples of Ephemeral Ponds within a forested context.

Management Considerations

Older stands of Northern Mesic Forest are currently rare throughout the region. This site offers opportunities for the continued development of a forest with old-growth characteristics such as large diameter trees, structural / tree size diversity, a mixed species composition, abundant coarse woody debris, and standing dead snags for use by wildlife, while protecting habitat for a rare forest raptor.

FR01 - Butternut Creek Hemlock Hardwoods Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Accipiter gentilis</i> (Northern Goshawk)	2006	S2B,S2N	G5	SC/M	
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
 FR01. Butternut Creek Hemlock Hardwoods



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

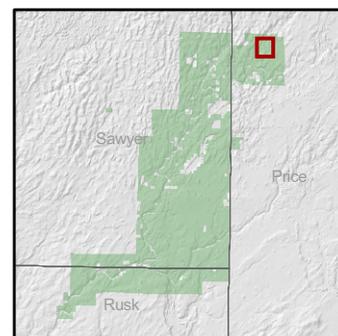
The survey site is approximate, and it should be used only generally, not literally, for management purposes.

Surveys were conducted between 2000-2001 for natural communities and priority taxa. The surveys were not comprehensive for all taxa potentially present.

Ownership shown is approximate and only meant to illustrate the site locations. Private lands include all lands 1) not under full ownership of or management by the Wisconsin Department of Natural Resources as of 2005, 2) not in the WDNR County Forests GIS coverage, and 3) not in the WDNR National Forests GIS coverage.

1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR02. ROOKERY CREEK

Location

County: Price
USGS 7.5' Quadrangle: Oxbo
Landtype Association: 212Xd02. Flambeau silt capped Drumlins
Approximate Size (acres): 107

Description of Site

A Hardwood Swamp composed of mature red maple, black ash, and yellow birch, including a small stand of 18" - 24" diameter trees, is the primary natural community at this site. The understory includes a carpet of wood nettle, stinging nettle, and sedges. A young aspen stand is located at the north end of the site. An ephemeral creek and wetland occur within the site, as does a beaver-flowage near the south end. Portions of the site were logged in 2001-2002.

Significance of Site

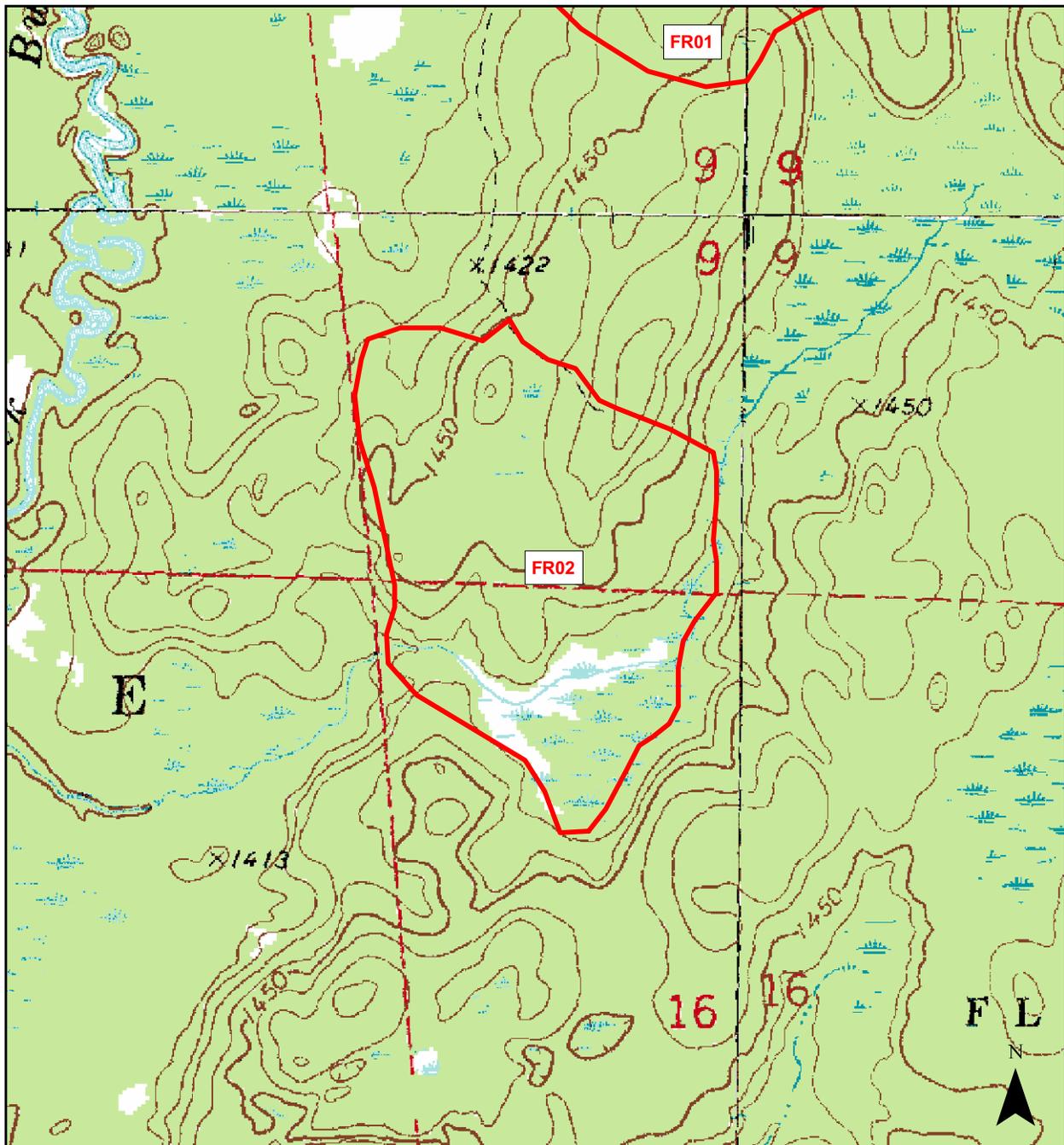
An heron rookery, once containing many active nests but probably no longer active, is the most important feature here. Although portions of the site were recently logged, the site includes a small but intact stand of Swamp Hardwoods.

Management Considerations

Although not large and probably not one of the best opportunities on the FRSF for native community management or the development of old-growth, there are some ecologically important characteristics present. Considerations include protection of the heron rookery and the site's hydrology, including providing adequate buffering from management activities. Heron rookeries on state managed lands warrant protection, and management guidelines are needed for this species.

FR02 - Rookery Creek Element Occurrences - none as of this writing

Flambeau River State Forest
FR02. Rookery Creek



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

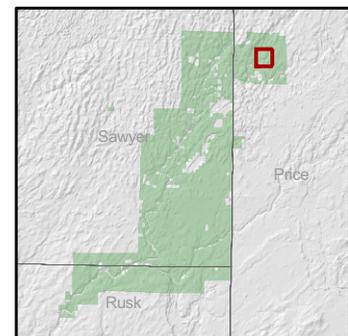
The survey site is approximate, and it should be used only generally, not literally, for management purposes.

Surveys were conducted between 2000-2001 for natural communities and priority taxa. The surveys were not comprehensive for all taxa potentially present.

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1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR03. BUTTERNUT CREEK BOTTOMS

Location

County: Price
USGS 7.5' Quadrangle: Oxbo
Landtype Association: 212Xd03. Exeland Plains
Approximate Size (acres): 102

Description of Site

A combination of Floodplain Forest and Hardwood Swamp in the lowlands, and Northern Mesic Forest in the uplands, this area is located along the North Fork of the Flambeau River and the lowest reaches of the Flambeau's tributary, Butternut Creek. The Floodplain Forest is dominated by 5"-15" diameter silver maple, bur oak, and red maple.

Small Hardwood Swamp inclusions dominated by black ash are scattered throughout the site, some with large (15" and larger) diameter trees. Some areas exhibit an open canopy with a dense shrublayer of beaked hazelnut, mountain holly, willows, hawthorns, and muscle-wood. Common herb layer species include bluejoint grass, ferns (including royal, marsh, ostrich, sensitive, and bracken), broad-leaved sedges, and asters. Small pockets of Tamarack (Poor) Swamp are found in some places.

The uplands are mainly Northern Mesic Forest with sugar maple, yellow birch, and basswood dominant, and occasional white pine in the overstory. Bigtooth aspen (8"-14" diameter) is common in some areas. Large diameter (14") red oak trees are present but rare, and red oak seedlings are scattered in places. The site has been selectively logged in the past, based on the presence of partially rotted stumps. Some areas, especially in the north, contain higher proportions of aspen, red maple, and shrubs. Super-canopy white pine, white spruce, hemlock, and white cedar are found along Butternut Creek.

Birds noted during the inventory include Gray Catbird, American Redstart, Great-crested Flycatcher, and Baltimore Oriole. The majority of this site is located within the River Wilderness Zone.

Significance of Site

Although small, this Floodplain Forest / Hardwood Swamp complex represents a rare northern occurrence of the type and is the best example of this type on the FRSF. Both bur oak and silver maple are rare and somewhat disjunct here, north of the main portion of their ranges (e.g., Harlow et al. 1996, Burns, R.M. and B.H. Honkala 1990). Swamps such as these warrant protection and would benefit from further study. The forested uplands are in good condition, and should continue to provide a good buffer for the wetlands.

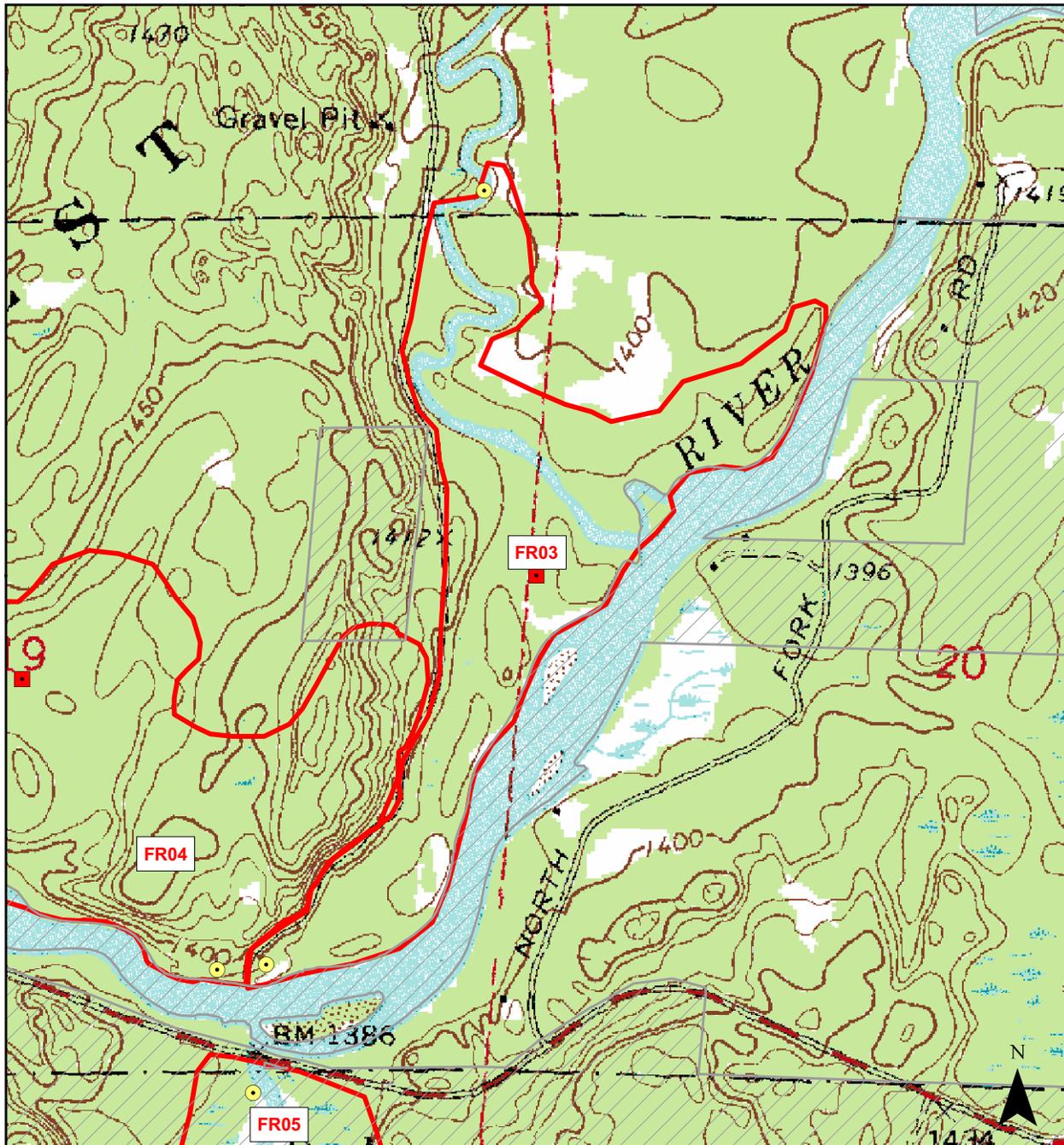
Management Considerations

This site represents an excellent opportunity to link with other significant natural features along the North Fork and the lower portion of Butternut Creek. In addition to protecting a regionally rare natural community feature, this site offers the potential to manage for a diverse mosaic of natural communities and develop old-growth characteristics, while maintaining hydrology and water quality.

FR03 - Butternut Creek Bottoms Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Clemmys insculpta</i> (Wood Turtle)	2005	S2	G4	THR	
Communities					
Floodplain Forest	2000	S3	G3?	NA	

Flambeau River State Forest
FR03. Butternut Creek Bottoms



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

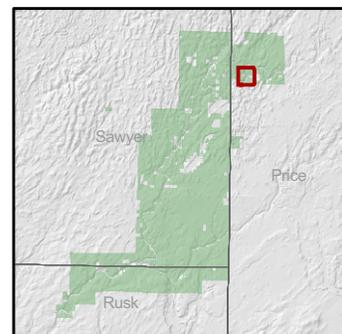
The survey site is approximate, and it should be used only generally, not literally, for management purposes.

Surveys were conducted between 2000-2001 for natural communities and priority taxa. The surveys were not comprehensive for all taxa potentially present.

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1:12,000

- Animal
- Community
- ◆ Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR04. NORTH FORK PINES

Location

County: Price
 USGS 7.5' Quadrangle: Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 159

Description of Site

North Fork Pines is consists of Northern Dry-mesic to Mesic Forest dominated by 15"-30" diameter white pine bordering the North Fork of the Flambeau River. The sub-canopy and sapling layers are dominated by hardwood species, such as red maple, white and yellow birch, ironwood, and red oak, along with white pine. The shrub layer is variable in density; dense near the river, more sparse to the north. The dominant shrubs are beaked hazelnut and Canada honeysuckle. Characteristic herbaceous species include wood anemone, wild sarsaparilla, lady fern, drooping woodland sedge, Penn sedge, Canada mayflower, rough-leaved rice grass, interrupted fern, bracken fern, false melic grass, starflower, and sessile-leaved bellwort. Old, well-rotted stumps are present but there was no evidence of recent disturbance. The site becomes richer and moister to the north and east where more mesic hardwoods become dominant. Birds noted here on 7/25/2006 included Bald Eagle (active nest along river), Hermit Thrush, Black-throated Green, Blackburnian and Pine Warblers.

Significance of Site

Mature conifer forests are rare in this landscape, and this site contains one of the two largest and best quality examples of white pine-dominated forest documented on the FRSF. This site has relatively high canopy closure and represents one of the two best existing opportunities on the FRSF to protect, manage, or restore large blocks of natural white pine forest. North Fork Pines is more mesic than Oxbo Pines, supports a different assemblage of understory species, and also has some important contextual differences.

Management Considerations

In addition to providing an opportunity to protect a locally rare variant of the Northern Mesic Forest community type, with white pine dominant, this site would be an excellent candidate for developing a forest with old-growth characteristics, providing habitat for uncommon wildlife associated with upland conifer forests, while maintaining hydrology and water quality. There are also opportunities to develop connections with other ecologically important areas immediately adjacent to the site, and to maintain a mosaic of contiguous native communities. Plot sampling would help to define this type and compare with other similar examples elsewhere.

FR04 - North Fork Pines Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Clemmys insculpta</i> (Wood Turtle)	2005	S2	G4	THR	
<i>Haliaeetus leucocephalus</i> (Bald Eagle)	1995	S4B,S2N	G5	SC/P	
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR04. North Fork Pines



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

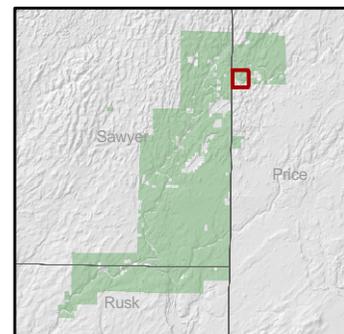
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1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR05. DEADMAN'S SLOUGH *

Location

County: Price
 USGS 7.5' Quadrangle: Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 67

Description of Site

This spring-fed area is located outside of the FRSF boundary on the south side of the North Fork of the Flambeau River and flows into the river. The site encompasses an Emergent Marsh and associated ponds and wetlands within a forested context. As this site is entirely in private ownership, fieldwork here was limited to canoe surveys during the biotic inventory.

Significance of Site

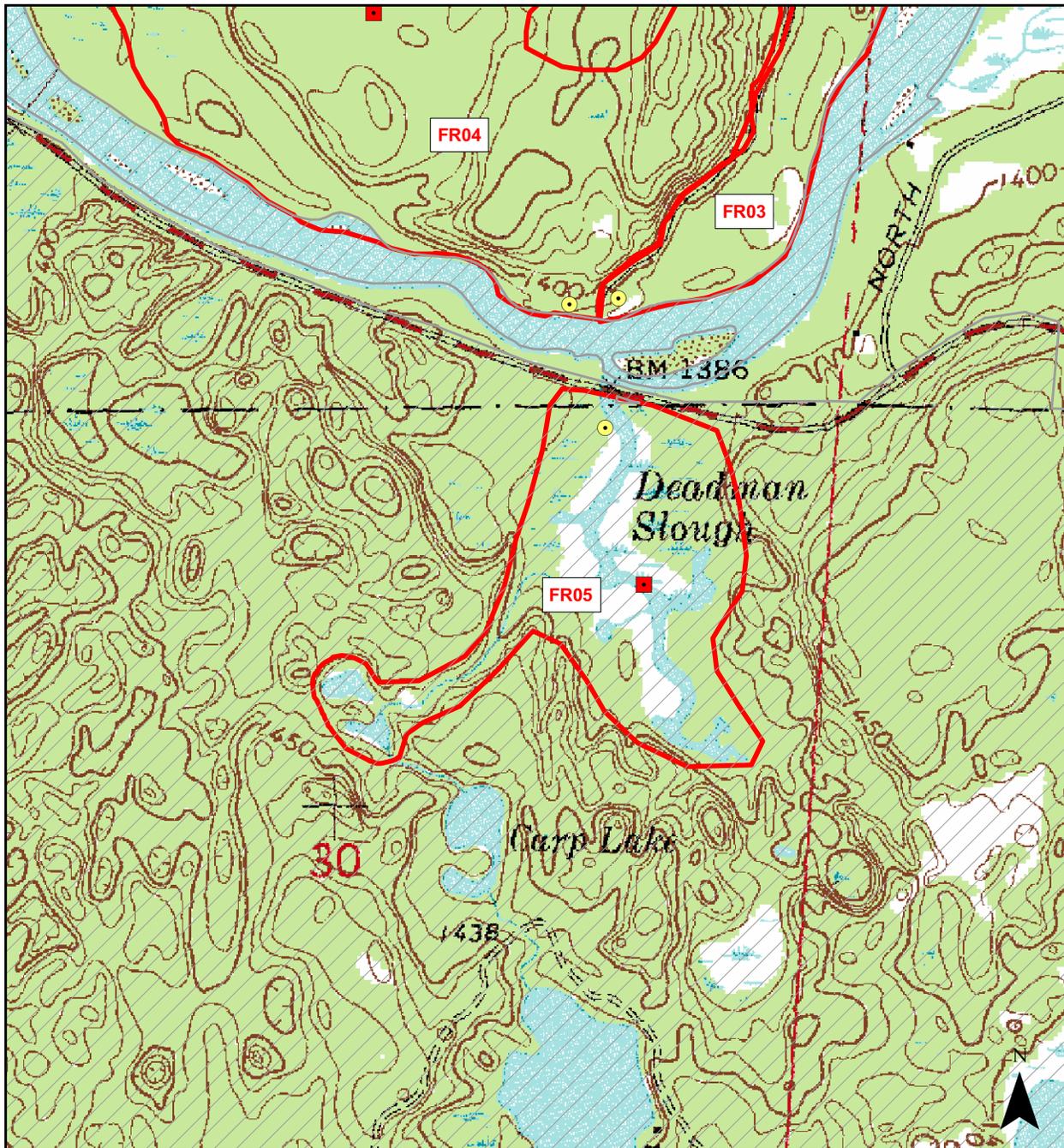
Marshes are relatively rare in this landscape; most wetlands here are acid peatlands (e.g., Open Bog, Poor Fen, Muskeg, Black Spruce Swamp), Alder Thicket, or Hardwood Swamp. Although not extensive, this area supports a diverse Emergent Marsh community and an important habitat for several bird species.

Management Considerations

This area is privately owned. Should the owners ever wish to sell, the site should be a protection priority for the Department, as it contains a good quality example of a locally rare community and adjoins the North Fork of the Flambeau River. A series of small interconnected ponds above the 'Slough' should be examined more thoroughly in the future.

FR05 - Deadman's Slough Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Clemmys insculpta</i> (Wood Turtle)	2005	S2	G4	THR	
Communities					
Emergent Marsh	2000	S4	G4	NA	

Flambeau River State Forest
FR05. Deadman's Slough



Legend Disclaimer:

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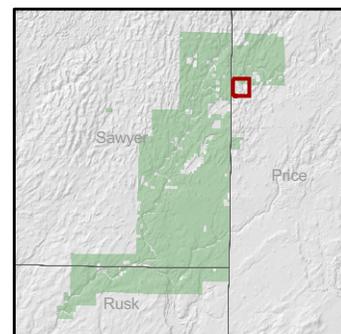
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1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR06. BARNABY RAPIDS

Location

County: Price
 USGS 7.5' Quadrangle: Butternut Lake, Kennedy
 Landtype Association: 212Xd02. Flambeau silt capped Drumlins, 212Xd03. Exeland Plains
 Approximate Size (acres): 467

Description of Site

Located mostly within a bend of the North Fork of the Flambeau River, this area is a mature Northern Mesic Forest with a conifer component. Topography varies from nearly level (on moderate to poorly drained outwash deposits) to areas of drumlinized ground moraine that sometimes exhibit steep slopes. Mature 11"-15" diameter sugar maple, basswood, and yellow birch are the dominant tree species. Larger trees (20" d.b.h. and up) are common west of the river. In the western portion of the site, just east of the river, large (24" d.b.h. and up) supercanopy white pine are common and hemlock is dominant. Old-growth hemlock hardwoods and areas with white cedar in the canopy are present on the steep slope just west of the river. An undisturbed Ephemeral Pond featuring 18"-20" d.b.h. black and green ash is located adjacent to the old growth hemlock hardwoods stand. The majority of this site is located within the River Wilderness Zone. Some tornado damage occurred here in 2001 (pers comm, 2006, Heidi Brunkow, FRSF Forester).

Significance of Site

The native communities here are in good condition. Several intact environmental gradients (soil moisture, gradient, aspect) are present, and the presence of native long-lived conifers on a mesic site is noteworthy since this is a rare condition elsewhere on the forest. The site's location near the river corridor further enhances its ecological importance. A rare forest raptor was documented breeding at this site.

Management Considerations

Good-quality natural communities and at least one rare animal are known from this area. This block of older forest contains several ecologically important characteristics. Protecting the integrity of the numerous wetland features and their hydrological connections to the river corridor are critical management considerations here and elsewhere on the FRSF to help maintain water quality and natural flow regimes.

FR06 - Barnaby Rapids Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Accipiter gentilis</i> (Northern Goshawk)	2004	S2B,S2N	G5	SC/M	
<i>Alasmidonta marginata</i> (Elktoe)	1990	S4	G4	SC/H	
<i>Clemmys insculpta</i> (Wood Turtle)	1980	S2	G4	THR	
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR06. Barnaby Rapids



Legend Disclaimer:

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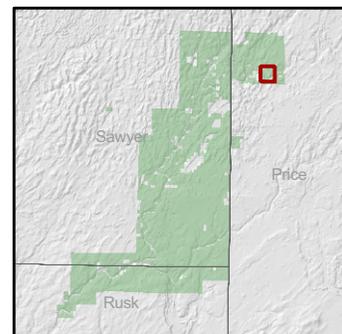
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1:10,570

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR07. OXBO PINES

Location

County: Price, Sawyer
 USGS 7.5' Quadrangle: Kennedy, Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 368

Description of Site

Oxbo Pines is located approximately 2 ½ miles up river from the town of Oxbo along the North Fork of the Flambeau River in an area of hilly, sometimes steeply-sloping, pitted outwash and esker deposits. Dominant vegetation is Northern Dry-Mesic Forest dominated by a mixture of white pine, red pine, and white spruce. Tree size and the forest condition varies significantly within the site. The most mature forested areas have 24"-30" diameter pines, with pines dominant and an imbedded boreal spruce/fir component. Aspen-birch stands feature scattered pines in the canopy, dense pole size white pine in the midstory, and a very dense hazel-dominated shrub layer.

Oxbow Lake, a small bog lake at the north end of the site, is surrounded by an acid Black Spruce Swamp (inclusions of Muskeg and Poor Fen are present) grading into hemlock/white pine forest (TMC type), and a narrow zone of Floodplain Forest and Swamp Hardwoods that extends along the river corridor. A less acidic conifer swamp, with tamarack, black spruce, and white cedar, grades into Alder Thicket and borders the river corridor in the southern portion of the site.

Roughly three-quarters of this site are located in the River Wilderness Zone.

Significance of Site

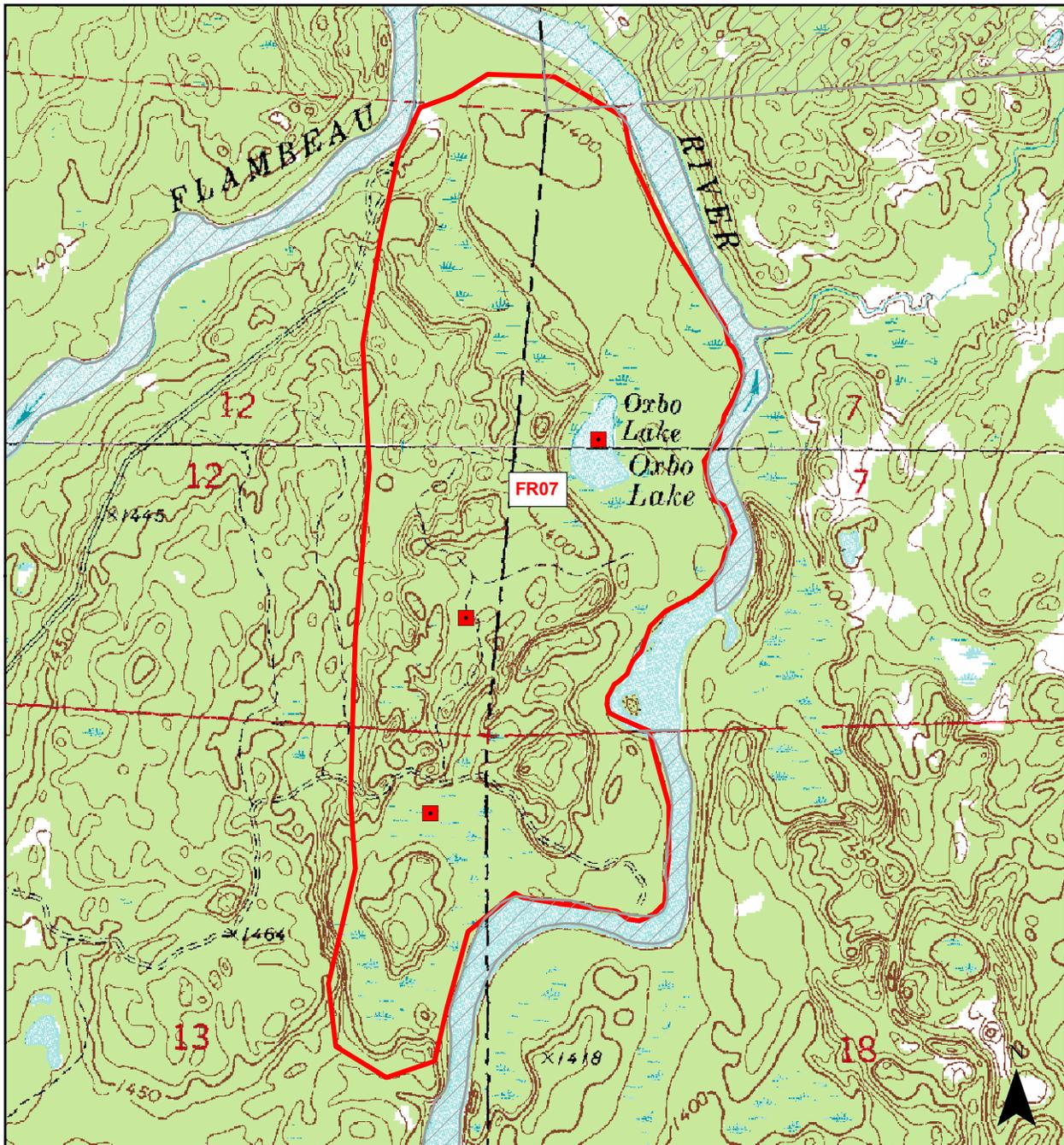
The largest stands of natural origin pine forest on the FRSF are found at this site, and this is the only area documented on the Forest featuring co-dominant red and white pines with dry-mesic site conditions. Northern Dry-mesic Forest is rare in this Landscape. A mosaic of upland and wetland native community types are found here, are mostly conifer-dominated, and are in generally good condition. Black-throated Blue Warblers have been documented just outside of the site.

Management Considerations

Historically associated with mesic hardwoods, white pine was once an important component in this portion of the FRSF. Opportunities to manage for older, closed canopy forest with good structural and high species diversity and with the species composition found on this site are rare on the FRSF. The WDNROld-growth Handbook (WDNR 2006) defines old-growth and will provide management strategies for pine-dominated types. (The Northern Hardwoods chapter has been completed.) A formal breeding bird survey using standard methods is recommended here, as this site may support good numbers of species that are scarce or absent elsewhere in this landscape. This site should be evaluated for State Natural Area potential.

FR07 - Oxbo Pines Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Black Spruce Swamp	2005	S3?	G5	NA	
Lake--Soft Bog	2005	S4	GNR	NA	
Northern Dry-mesic Forest	2005	S3	G4	NA	

Flambeau River State Forest
FR07. Oxbo Pines



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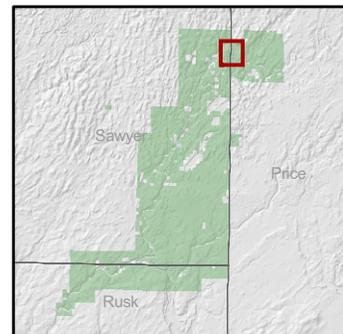
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1:16,000

- Animal
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FR08. THORNAPPLE PEATLANDS AND DRUMLIN

Location

County: Sawyer
 USGS 7.5' Quadrangle: Loretta, Babbs Island
 Landtype Association: 212Xd02. Flambeau silt capped Drumlins
 Approximate Size (acres): 433

Description of Site

Located along a northwest edge of the FRSF, this area contains Northern Mesic Forest and an extensive Muskeg. The Northern Mesic Forest occurs on a low drumlin and contains a large patch of mature (15" d.b.h. and up), moderately rich sugar maple, basswood, and white ash forest with a closed canopy and an open understory. Black ash is co-dominant on the more level north end of the site, where drainage is likely impeded. American elm snags are present, and elm seedlings are common.

The Muskeg is large, with moderately well-developed sphagnum hummocks in the center. Trees are stunted black spruce with occasional tamarack. Common understory species include few-flowered sedge, three-seeded sedge, small cranberry, and rusty cotton-grass. Occasional bog Ericads include labrador tea, bog-laurel, and bog-rosemary. Small "islands" of mature white pine occur on the west edge of site. Palm Warbler and Lincoln Sparrow were noted as residents in the Muskeg during the inventory.

Significance of Site

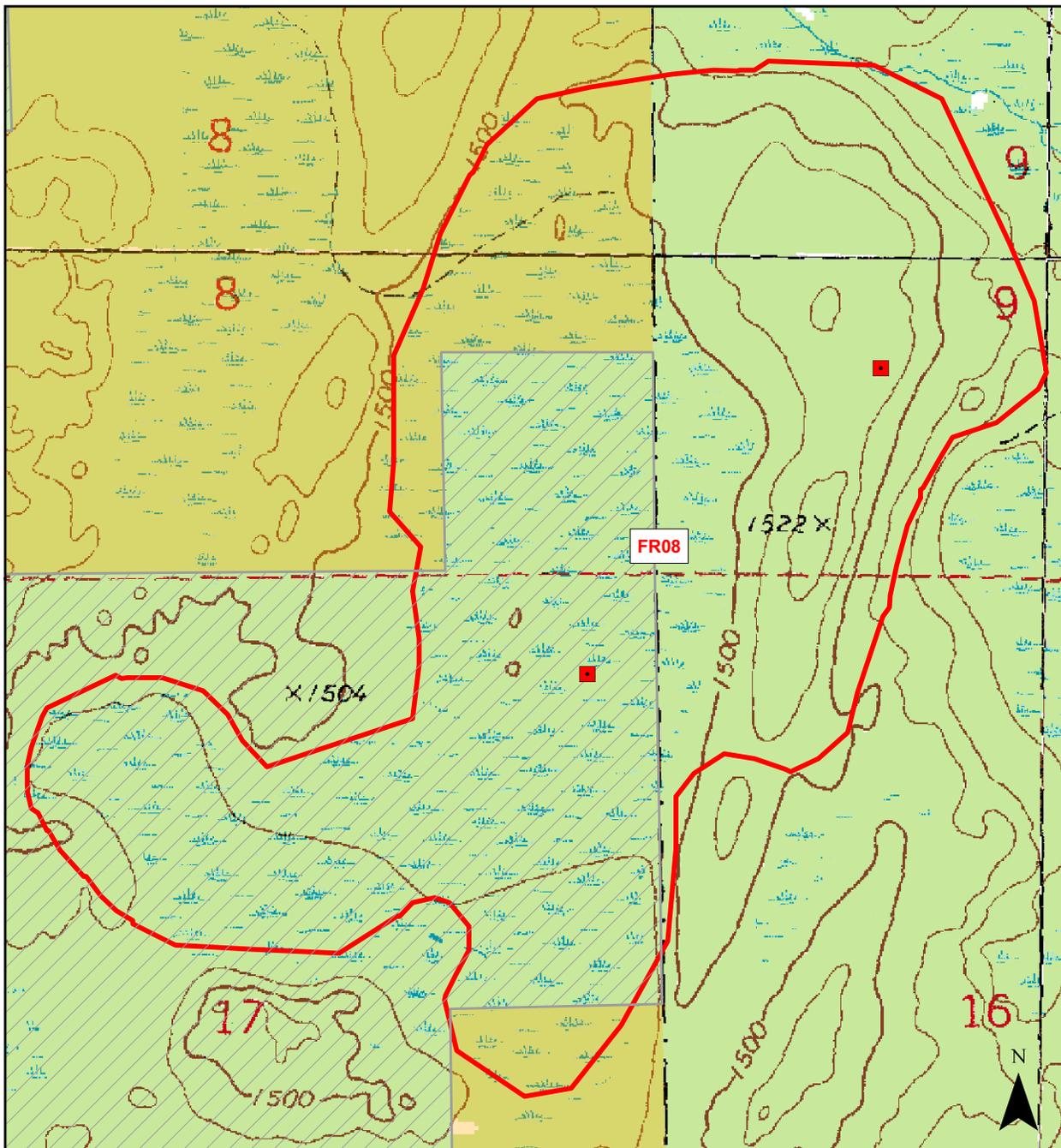
Some of the richer, least-disturbed sugar maple-basswood forest identified during the biotic inventory for this LTA was found on this site, along with a large, intact wetland feature. The wetland provides potentially suitable habitat for rare birds, butterflies, and moths. The timber sale history will need to be reviewed to determine the significance of the site's uplands.

Management Considerations

The Muskeg is almost entirely outside of the FRSF on Sawyer County Forest land. We recommend surveys for rare birds and select invertebrates in this wetland in the future. The state-managed portion of the site offers an excellent opportunity to manage for high-quality Northern Mesic Forest with old-growth characteristics within a mosaic of mostly intact natural communities.

FR08 - Thornapple Peatlands and Drumlin Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Muskeg	2000	S4	G4G5	NA	
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR08. Thornapple Peatlands and Drumlin



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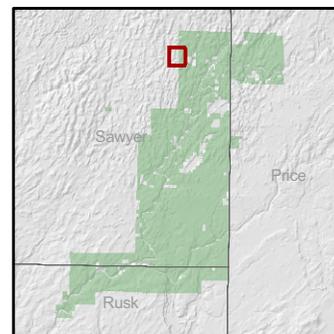
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1:12,000

- Animal
- Community
- Plant
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- National Forest Land



FR09. HANSON LAKE COMPLEX

Location

County:	Sawyer
USGS 7.5' Quadrangle:	Oxbo
Landtype Association:	212Xd03. Exeland Plains
Approximate Size (acres):	582

Description of Site

The Hanson Lake Complex, located in the northern one-third of the forest and west of the North Fork of the Flambeau River, occurs on hilly pitted outwash deposits and features a cluster of small, shallow, soft water seepage lakes and ponds with widely fluctuating shoreline habitats. Hanson Lake is designated a Wild Lake, so it is undeveloped and has no improved access. With the exception of the adjacent logging road, this area is a remote and undeveloped portion of the FRSF.

Hanson Lake, the largest of a group of lakes and ponds within the site, is a 13-ft deep, undeveloped, soft water, seepage lake with a muck bottom. Changes of several feet in lake levels maintain an interesting mix of zoned herbaceous vegetation including Inland Beach, Northern Sedge Meadow, and Emergent Aquatic habitats. The forests surrounding the lake are dominated by mesic hardwoods, with white pine and hemlock major associates in some places. Floating bog mats dominated by leatherleaf, some over one acre in size, occur within the shallow lake basin. Other kettle depressions in the vicinity support similar vegetation. A wetland approximately 0.25 miles southwest of Hanson Lake features leatherleaf-dominated Open Bog, as well as a Northern Sedge Meadow dominated by blue-joint grass and sedges (*Carex* species).

The southernmost portion of the site includes a small, unnamed bog lake surrounded by extensive, dense, closed canopy Black Spruce Swamp with a continuous carpet of Sphagnum mosses. A portion of the Black Spruce Swamp is more open with many downed trees, apparently from a significant windstorm event.

The uplands are a mosaic of forest cover types, much of which has been selectively logged in the past. Blowdown damage is evident in several locations. Northern Mesic Forest comprises much of the upland vegetative cover, with 9"-15" d.b.h. sugar maple, basswood, yellow birch, and white ash the dominant trees. White pine and hemlock are found in some areas, especially near Hanson Lake. Herbaceous species in the mesic hardwood forests are typical of moderately rich sites. Other portions of the uplands are dominated by early successional tree species such as white birch and bigtooth aspen, interspersed with red maple. Dead elm is abundant. Dense thickets of sugar maple saplings are locally common where canopy gaps occur. The terrain is hilly with numerous steep-sided ice-block depressions. Scattered trees of 24" d.b.h. and greater can be found in throughout the site.

Resident birds noted at this site included Black-throated Green Warbler, Red-Eyed Vireo, Least Flycatcher, Ovenbird, Veery, Northern Parula, Scarlet Tanager, Broad-Winged Hawk, Chimney Swift, and Gray Jay (in the Black Spruce Swamp).

Significance of Site

A diverse mosaic of representative wetland and upland native plant community types and aquatic features are contained within this site. Seepage lakes with fluctuating shorelines, such as those found here, are uncommon in this portion of the state, support a specialized flora, and provide important habitat for herptiles and aquatic insects. Rare plants, currently not well-represented on this property compared to other large state forest properties, are often associated with fluctuating lake shorelines. The uplands feature a large, contiguous area of relatively mature forest with good to excellent long-term potential for restoration to an intact forest with diverse structure.

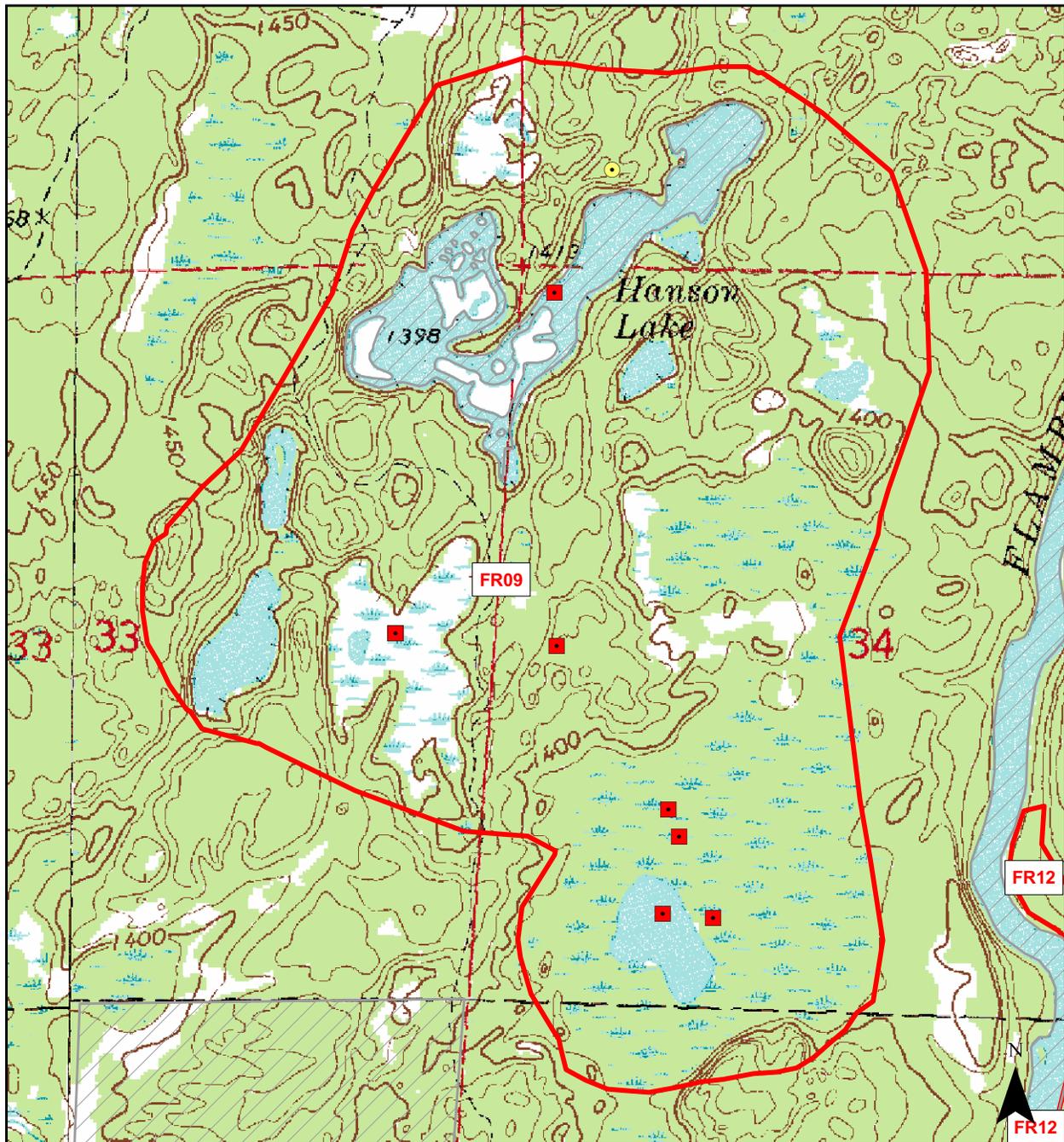
Management Considerations

Large patches of intact older forest are uncommon on the FRSF and in the surrounding region, and rich, floristically diverse, maple-basswood forests (one of the characteristic types on the property) are currently poorly represented in areas with special management designations. This extensive mosaic of good-quality plant communities in a remote setting with undisturbed wetlands, lakes, and ponds warrants consideration for special management designation and should be evaluated for State Natural Area potential. Additional survey work at Hanson Lake and the associated waterbodies and wetlands would help to determine the site's importance to invertebrates, herptiles, birds, and rare shoreline plants. The boundary should be evaluated for potential connection to the river corridor.

FR09 - Hansen Lake Complex Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Diadophis punctatus edwardsii</i> (Northern Ringneck Snake)	2000	S3?	G5T5	SC/H	
Communities					
Lake--Shallow, Soft, Seepage	2000	S4	GNR	NA	
Lake--Soft Bog	1981	S4	GNR	NA	
Northern Mesic Forest	2000	S4	G4	NA	
Northern Wet Forest	2000	S4	G4	NA	
Open Bog	1981	S4	G5	NA	

Flambeau River State Forest
 FR09. Hansen Lake Complex



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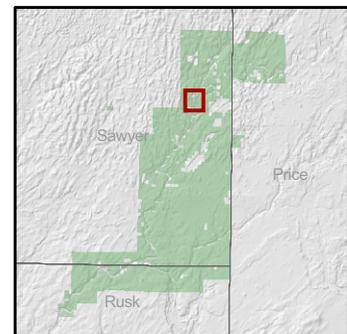
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1:13,390

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR10. SNUSSE BOULEVARD DOGPATCH HEMLOCK HARDWOODS

Location

County: Price
 USGS 7.5' Quadrangle: Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 163

Description of Site

Three discontinuous areas of Northern Mesic Forest dominated by hemlock, white pine, and hardwoods occur here, mostly on steep banks or outwash terraces along the east bank of the North Fork of the Flambeau River. Tree sizes vary from pole size to sawtimber size, with a few small inclusions of very large, old trees (20"-24" dbh). The shrub layer varies from dense to sparse, and spring ephemerals are locally common. Inclusions of Swamp Hardwoods (11"-15" dbh black ash, red maple, yellow birch) occur in small drainageways, on lower slopes, and in other transitional areas. Ephemeral Ponds and boggy/wet meadow wetlands in small kettle depressions are common within and near the site. Surrounding the site is a second growth, mature (11"-15" d.b.h. and greater), rich, Northern Mesic Forest of sugar maple-basswood-white ash on pitted outwash deposits. Birds noted in the area include Blackburnian, Pine, and Black-throated Green Warblers, and Red-breasted Nuthatch.

The site has been selectively-cut one or two times in the past, and rotted stumps are locally common. Surrounding land uses are forest production (on the site margins, outside of the River Wilderness Zone) and recreation (e.g., hunting, fishing, canoe camping). A state-maintained snowmobile/bike/hiking trail follows the east bank of the river. Seasonal houses can be found adjacent to the site. The southern half of the northernmost piece of the site was leveled by a tornado. The site is located entirely within the River Wilderness Zone.

Significance of Site

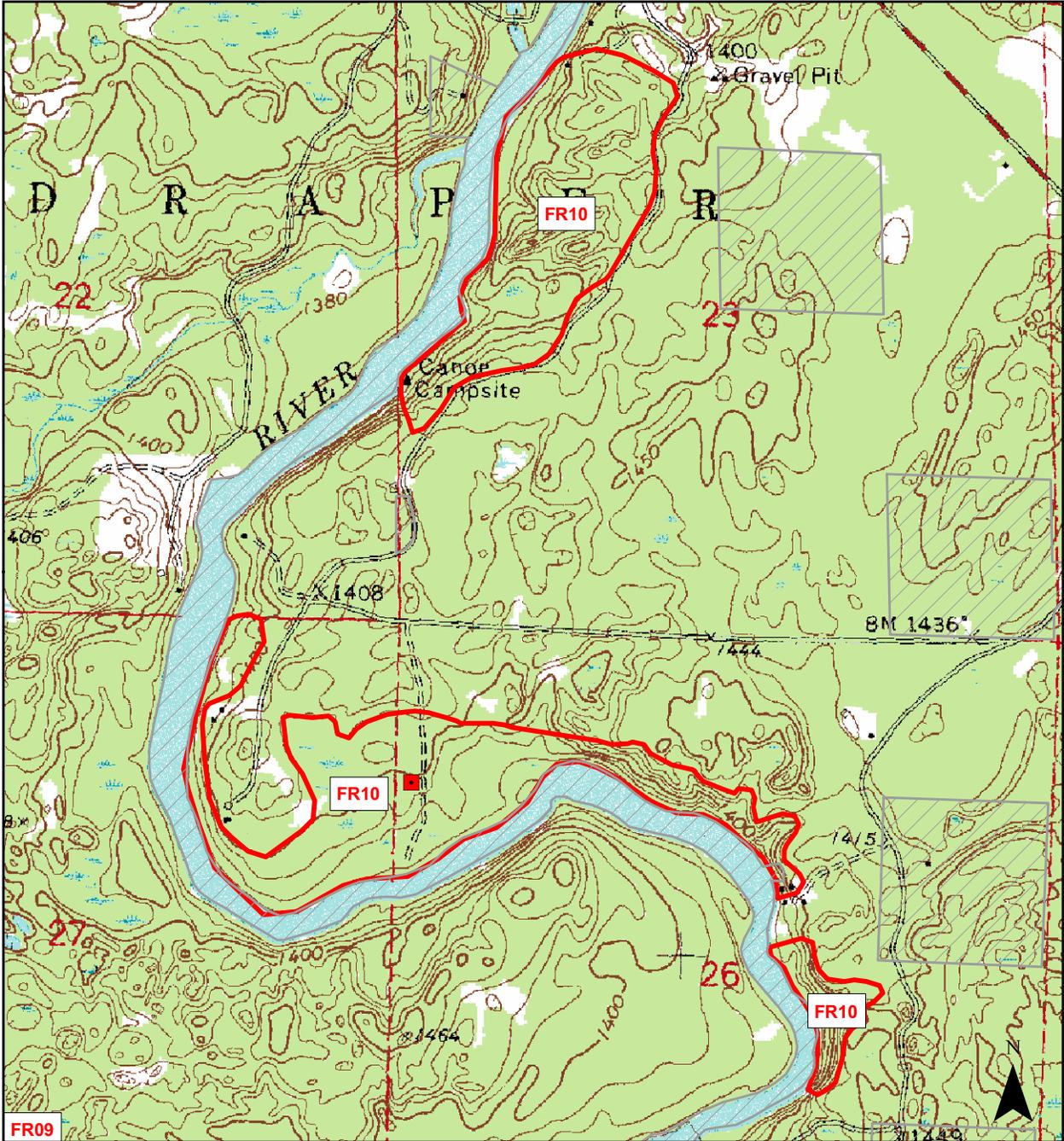
Areas containing blocks of mature hardwood stands with both high canopy closure and high basal area are uncommon outside of the river corridor, and natural conifer-dominated upland stands (in any age class) are uncommon in the area comprising the FRSF and surrounding landscape. In addition, floristically diverse, rich maple-basswood forests with the aforementioned characteristics were documented at only a few areas on the FRSF.

Management Considerations

Rather narrow and linear-shaped, this site is composed of three discontinuous pieces, reducing its potential for landscape-scale management. The three areas of primary interest contain unique attributes, however, and an expanded site management boundary could be developed to protect and enhance the core natural communities, while ensuring that water quality is maintained.

FR10 - Snusse Rd. - Dogpatch Hemlock Hardwoods Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
 FR10. Snusse Blvd. - Dogpatch Hemlock Hardwoods



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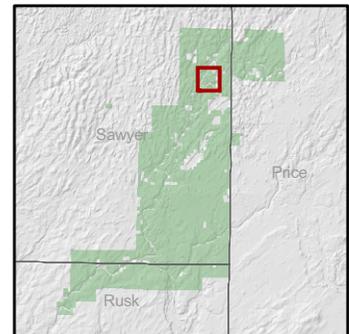
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1:16,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
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- National Forest Land



FR11. SWAMP LAKE AND FOREST

Location

County:	Price
USGS 7.5' Quadrangle:	Oxbo
Landtype Association:	212Xd03. Exeland Plains
Approximate Size (acres):	1511

Description of Site

This site features an undeveloped, 258 acre, soft water drainage lake with a maximum depth of nine feet, bordered by a 1/4-mile no-cut buffer zone. Swamp Lake is a designated Wilderness Lake in the current property master plan. Aquatic macrophytes generally appear sparse; a few small beds of bulrushes (*Schoenoplectus tabernaemonta*) occur in the shallows bordering the lake. Common Loon, Common Merganser, Belted Kingfisher, Great Blue Heron, and Osprey were noted during the site survey. Waterfowl use is reported to be significant during migration. Surrounding wetlands include Black Spruce Swamp and a large black ash swamp with small pockets of white cedar. A narrow outlet channel to Mason Lake drains Swamp Lake and the surrounding wetlands. East of the lake, pole-sized hardwoods grade into select-cut hemlock-hardwood forest with some old growth characteristics (trees with diameters of 20"- 30" and greater commonly occur here). To the south, a black spruce-tamarack swamp grades into an ash-dominated Northern Hardwood Swamp with scattered white pine. Size and disturbance history of stands to the south vary. There are small patches of old-growth and mature hemlock-hardwood forest, along with dense regenerating stands of mixed northern hardwoods.

Significance of Site

Swamp Lake is large, remote, and completely undeveloped with obvious aesthetic, wildlife, and ecological values. Large undeveloped lakes are now rare throughout northern Wisconsin and will only become more so over time. Proximity to other large, more productive lakes increases its value to a variety of water dependent species including Bald Eagle, Osprey, Common Loon, and various waterfowl. An historic heron rookery was also reported to have occurred in the vicinity. This site is adjacent to "Lake of the Pines Conifer-Hardwoods" State Natural Area, could be connected to it, and managed in a compatible fashion. This site historically (1980) supported a breeding pair of Red-shouldered Hawks and remains the only known occurrence of this species on the FRSF.

One of very few significant stands of older forest remaining on the FRSF following the severe 1977 blowdown event, this site includes the largest stand of hemlock-hardwood forest on the property and is one of the larger blocks of that type in the region. Other significant stands that occur nearby are on private lands. A rare plant from the NHI Working List has been documented at the site.

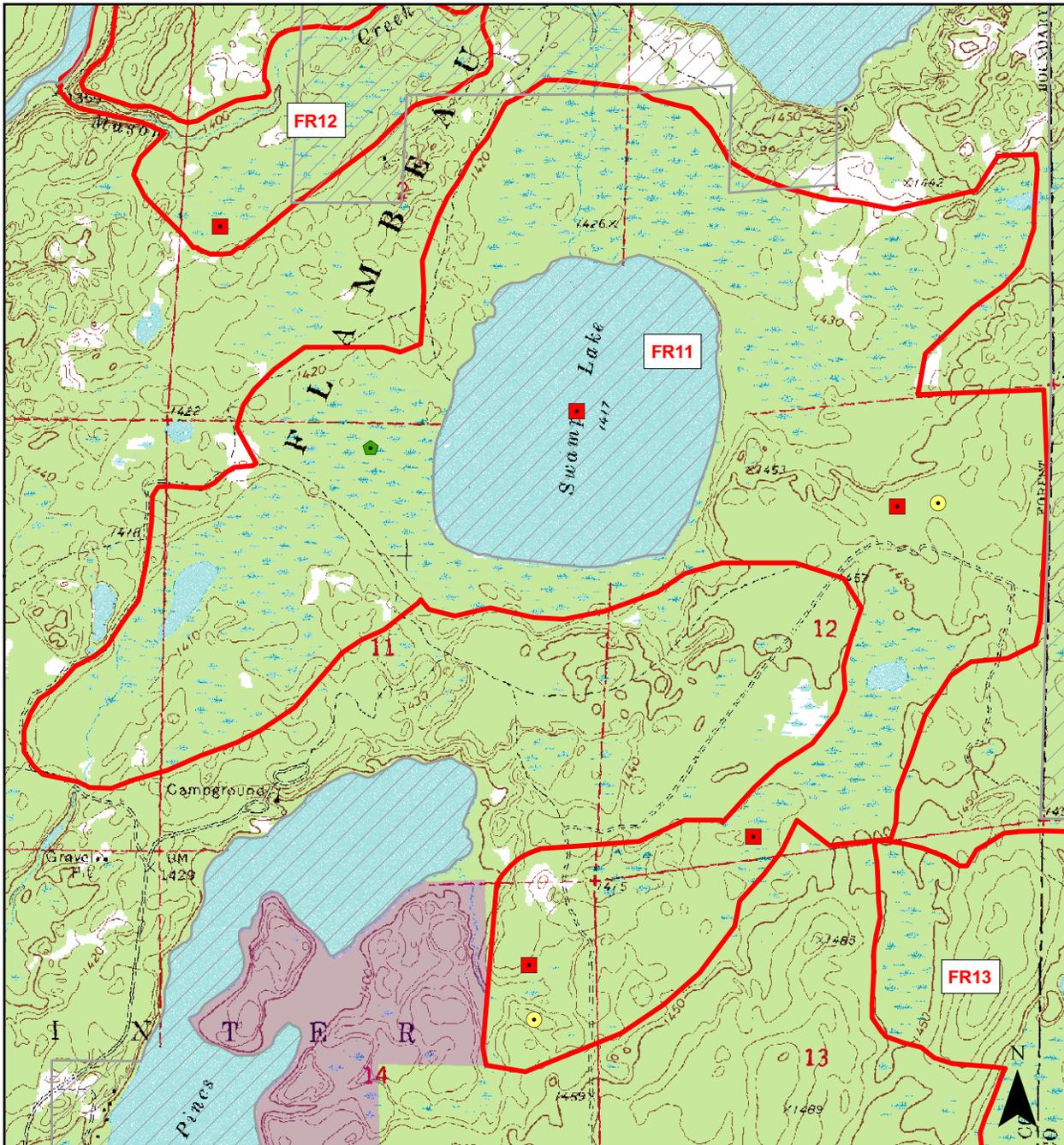
Management Considerations

This is one of the better opportunities on the FRSF to develop a forest with old-growth characteristics such as large diameter trees, multi-layered canopy, structural diversity, a mixed conifer-hardwood composition, abundant coarse woody debris, and standing dead snags for use by wildlife. Along with continued protection for a large undeveloped lake, this areas offers linkages to an existing State Natural Area and other nearby ecologically-important sites. This site should be evaluated for its potential as a State Natural Area.

FR11 - Swamp Lake and Forest Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Buteo lineatus</i> (Red-shouldered Hawk)	1980	S3S4B,S1N	G5	THR	
<i>Dendroica cerulea</i> (Cerulean Warbler)	2000	S2S3B	G4	THR	
Plants					
<i>Arethusa bulbosa</i> (Swamp-pink)	2007	S3	G4	SC	
Communities					
Lake--Shallow, Soft, Seepage	1980	S4	GNR	NA	
Northern Mesic Forest	2000	S4	G4	NA	
Open Bog	1979	S4	G5	NA	
Tamarack (Poor) Swamp	2000	S3	G4	NA	

Flambeau River State Forest
FR11. Swamp Lake and Forest



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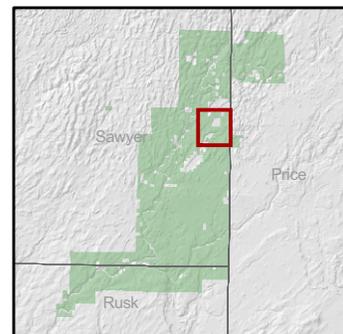
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1:24,000

- Animal
- Community
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FR12. MASON CREEK SEEPS

Location

County: Price
 USGS 7.5' Quadrangle: Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 177

Description of Site

Located just east of the North Fork of the Flambeau River near Mason Lake, this area includes a small Forested Seep, as well as a stretch of Mason Creek and surrounding areas. Located near a canoe camp site, the Forested Seep is a small cold, springy-mucky area on the east bank of the river that exhibits groundwater seepage. This seep, open near the water's edge and partly shaded by trees and tall shrubs (silver maple, white cedar, green ash, tag alder) further inland, is floristically rich and resembles a Calcareous Fen, with many fen indicator species present. Mats of common forget-me-not, a non-native plant are locally prevalent, especially in the more shaded areas, and other exotics (Canada thistle, bitter dock, and reed canary grass) are also present. This small portion of the site is entirely within the River Wilderness Zone.

Mason Creek drains Mason Lake into the Flambeau River; this creek and its associated wetlands, containing cedar with black ash as an associate, comprise the remainder of the site. A dense stand of alder is present, partly as a result of the openness of the forest canopy. Upland areas contain balsam fir, with hemlock and yellow birch. Other nearby areas include black ash and tamarack-black spruce swamps. A large portion of the site is outside of the FRSF boundary.

Significance of Site

Although it is small, contains several invasives, and is located near a campground, the Forested Seep was the most floristically rich patch of wetland noted in the FRSF during the biotic inventory. The creek was found to have moderate (representative for the type) aquatic macroinvertebrate species diversity.

Management Considerations

The seep is impacted by heavy recreational use and the presence of invasives. However, the stream has the potential to support Louisiana Waterthrush and warrants protection. The site boundary should be reviewed.

FR12 - Mason Creek Seeps Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Forested Seep	2000	S2	GNR	NA	
Northern Wet-mesic Forest	1981	S3S4	G3?	NA	

FR13. BASS LAKE AND PEATLANDS

Location

County:	Price, Sawyer
USGS 7.5' Quadrangle:	Oxbo, Kennan NW
Landtype Association:	212Xd03. Exeland Plains
Approximate Size (acres):	1,943

Description of Site

Bass Lake is located in the east-central portion of the FRSF. The primary features of this site are a 94-acre “Wilderness Lake” with a completely undeveloped upland shoreline, a block of older Northern Mesic Forest, and an extensive complex of native peatland community types.

Bass Lake is a deep, softwater seepage lake, featuring clear water and a mostly gravel littoral zone with areas of sand, rubble, and muck also present. Aquatic vegetation is generally sparse except for beds of mostly floating-leaved aquatics in shallow bays. Specialized plants from the “sterile rosette” group (such as *Eriocaulon aquaticum*) are also present. An intermittent outlet drains to Price Creek. Boggy wetlands and mature second growth hemlock-white pine forests surround the lake. Richer stands of Northern Mesic Forest dominated by sugar maple, basswood, and white ash are located further from shore. As with many areas on the FRSF, there is evidence of heavy deer browse, and in most places hemlock regeneration is limited to tiny seedlings. Water dependent wildlife noted using this lake during various visits included Common Loon, Bald Eagle, and Osprey.

The peatland complex is over three miles long, extending from Pot Lake south to CTH W and beyond. Major wetland communities include Black Spruce Swamp, Muskeg, Open Bog, and Poor Fen. Two large wetland blocks are located on the south side of CTH W. Although small portions of the site are privately-owned, state-owned lands comprise the majority of the peatlands (most are within the FRSF boundary, and there is a portion managed by the Board of Commissioners of Public Lands).

Significance of Site

Bass Lake is an excellent example of a lake type that is not common on the FRSF or in the surrounding region, and undeveloped lakes of this size are becoming increasingly rare anywhere in the state. Conservation value of this site is enhanced by the forested uplands, as they contain small, but good quality, stands of hemlock-dominated forest, some large white pine, and moderately rich sugar maple-basswood forest. The wetlands are large, mostly hydrologically intact, and support both rare and area sensitive species, including specialized peatland birds and rare plants. Use of the lake by water dependent wildlife is significant, especially given its proximity to other large lakes in the vicinity.

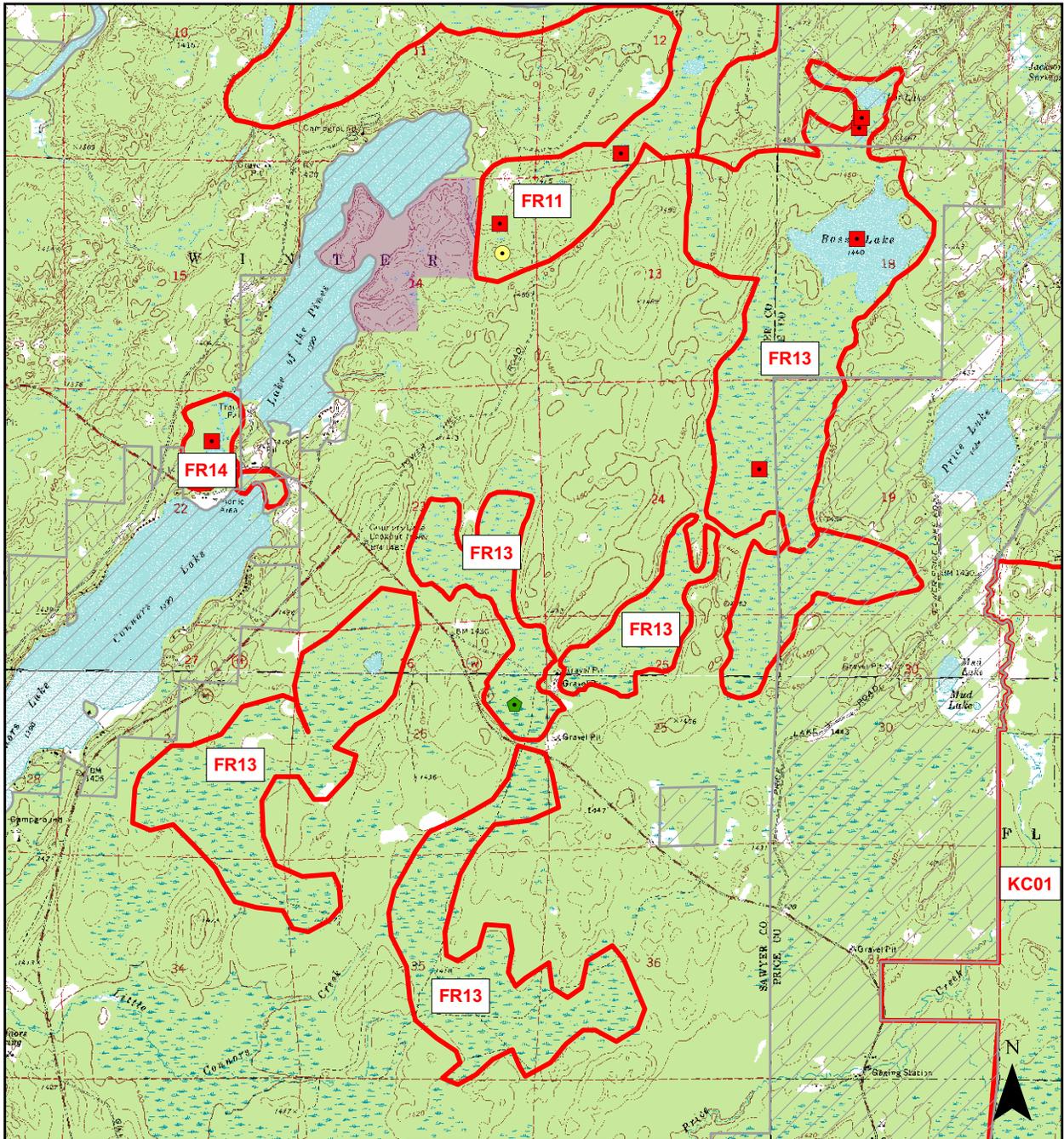
Management Considerations

Because of its size, quality, and condition, this site should be considered for a special management designation, possibly as a State Natural Area. Numerous ecologically important resources could be protected at this site, and there is good potential for developing and maintaining ecological linkages between this site and the Swamp Lake site to the northwest.

FR13 - Bass Lake and Peatlands Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Plants					
<i>Carex tenuiflora</i> (Sparse-flowered Sedge)	2000	S3	G5	SC	
Communities					
Lake--Deep, Very Soft, Seepage	2000	S3	GNR	NA	
Lake--Soft Bog	1980	S4	GNR	NA	
Muskeg	2005	S4	G4G5	NA	
Open Bog	1980	S4	G5	NA	

Flambeau River State Forest FR13. Bass Lake and Peatlands



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

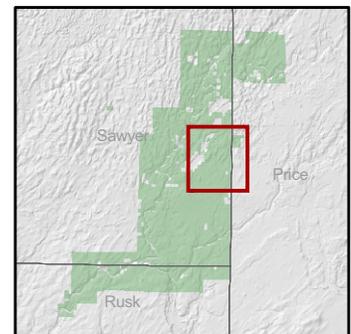
The survey site is approximate, and it should be used only generally, not literally, for management purposes.

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1:44,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR14. LAKE OF THE PINES THOROUGHFARE

Location

County: Sawyer
 USGS 7.5' Quadrangle: Oxbo
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 64

Description of Site

Located in the central portion of the FRSF, this site includes a tamarack-dominated swamp on both sides of a “thoroughfare,” draining Lake of the Pines into Connors Lake. There are also patches of swamp dominated by black ash, or mixed ash and tamarack. At the mid point, the thoroughfare widens into a five-acre pond with many submersed aquatic plants. The vegetation varies from maturing Tamarack Swamp with a sphagnum groundlayer and an alder understory, to very small “lawns” of Poor Fen along the banks of the pond. Alder Thicket occurs along the thoroughfare where it flows under the CTH W bridge, and an Emergent Marsh dominated by swamp loosestrife is located at the outlet on the north end of Connors Lake. The majority of this site is located in an area of the FRSF currently designated as an aesthetic zone.

Significance of Site

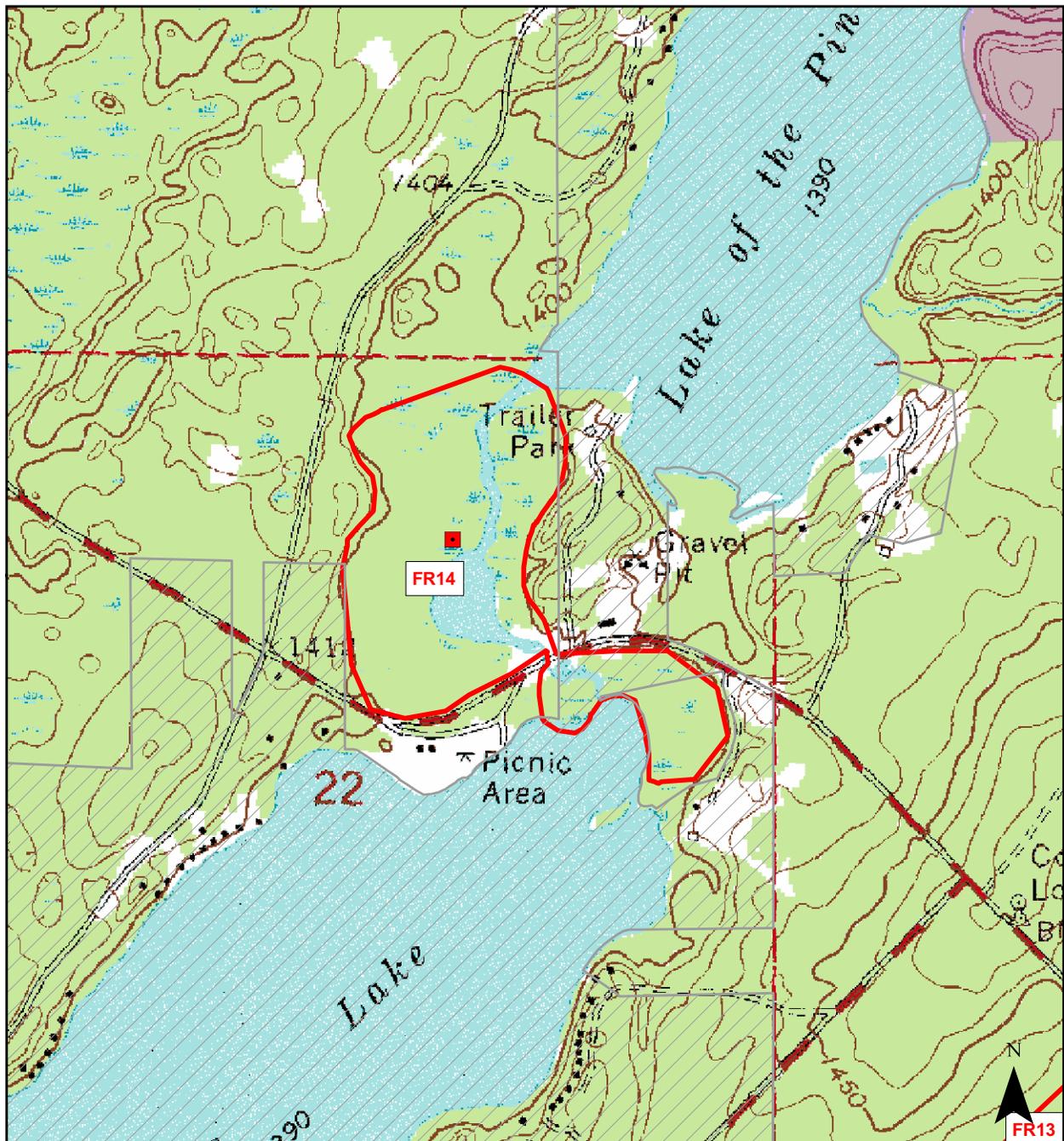
Although small and bisected by CTH W, this site includes a relatively undisturbed forested, open wetland communities, and an aquatic community providing habitat for several plant and animal species.

Management Considerations

This site has received passive management to protect the wetlands, as well as the aesthetic qualities of the area. Although probably not of State Natural Area quality, continuing the current management strategy here should protect the wetlands and maintain the ecological integrity of the site.

FR14 - Lake of the Pines Thoroughfare Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Tamarack (Poor) Swamp	2000	S3	G4	NA	

Flambeau River State Forest
FR14. Lake of the Pines Thoroughfare



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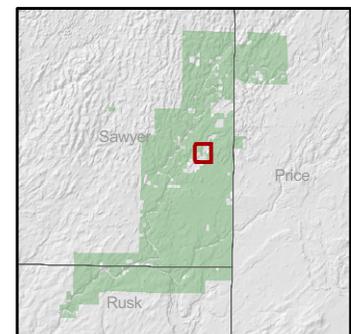
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1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR15. HACKETT CREEK CONIFERS

Location

County: Sawyer
USGS 7.5' Quadrangle: Ingram NE
Landtype Association: 212Xd03. Exeland Plains
Approximate Size (acres): 795

Description of Site

Located in the southern one-third of the FRSF, approximately 1.5 miles northeast of the confluence of the north and south forks of the Flambeau River, this site includes low, gravelly eskers and upland Northern Mesic Forest “islands” interspersed with extensive wetlands, including those surrounding Hackett Creek and its associated tributaries. Much of this area is remote, with no developed motorized access.

Northern Mesic Forest dominates the uplands with a variety of species and structural attributes present throughout the site. In some places, mature (up to 15" and greater diameter) sugar maple and basswood are dominant, along with scattered yellow birch and hemlock. Pockets of rich herbaceous species are scattered through the mesic stands, and large, rotted stumps are locally abundant in some areas. Other uplands support dense, pole-sized forests of hemlock, with yellow birch, paper birch, super-canopy white pine, white spruce, and, rarely, red pine. Mature trembling and bigtooth aspen are locally common overstory species in some areas, sometimes with balsam fir as a sapling and subcanopy associate.

Cedar swamps occur in several portions of the site; tree size, species and density vary among these stands, but understory composition is similar. In some places, especially in the southern 1/3 of the site, the cedar swamps have large (e.g., 18" diameter) trees and downed logs. Most of these areas have an intact ground layer of sphagnum. As with many areas around the state, cedar is not regenerating, likely due to heavy browse by white-tailed deer, and possibly, snowshoe hare.

Hackett Creek is surrounded by several wetland types, including bluejoint-dominated Northern Sedge Meadow, Tamarack (poor) Swamp, and Alder Thicket. These wetlands are extensive, appear to be of good quality, and provide an intact riparian buffer for the creek

Black Spruce Swamp and Northern Wet Forest comprise the remainder of the site. Notable examples of these types include a fairly extensive good-quality Northern Wet Forest in the northwest “arm” of the site and a Black Spruce Swamp surrounding a small bog lake at the south end of the site known to harbor a State Endangered plant. These conifer swamps are mostly intact.

Significance of Site

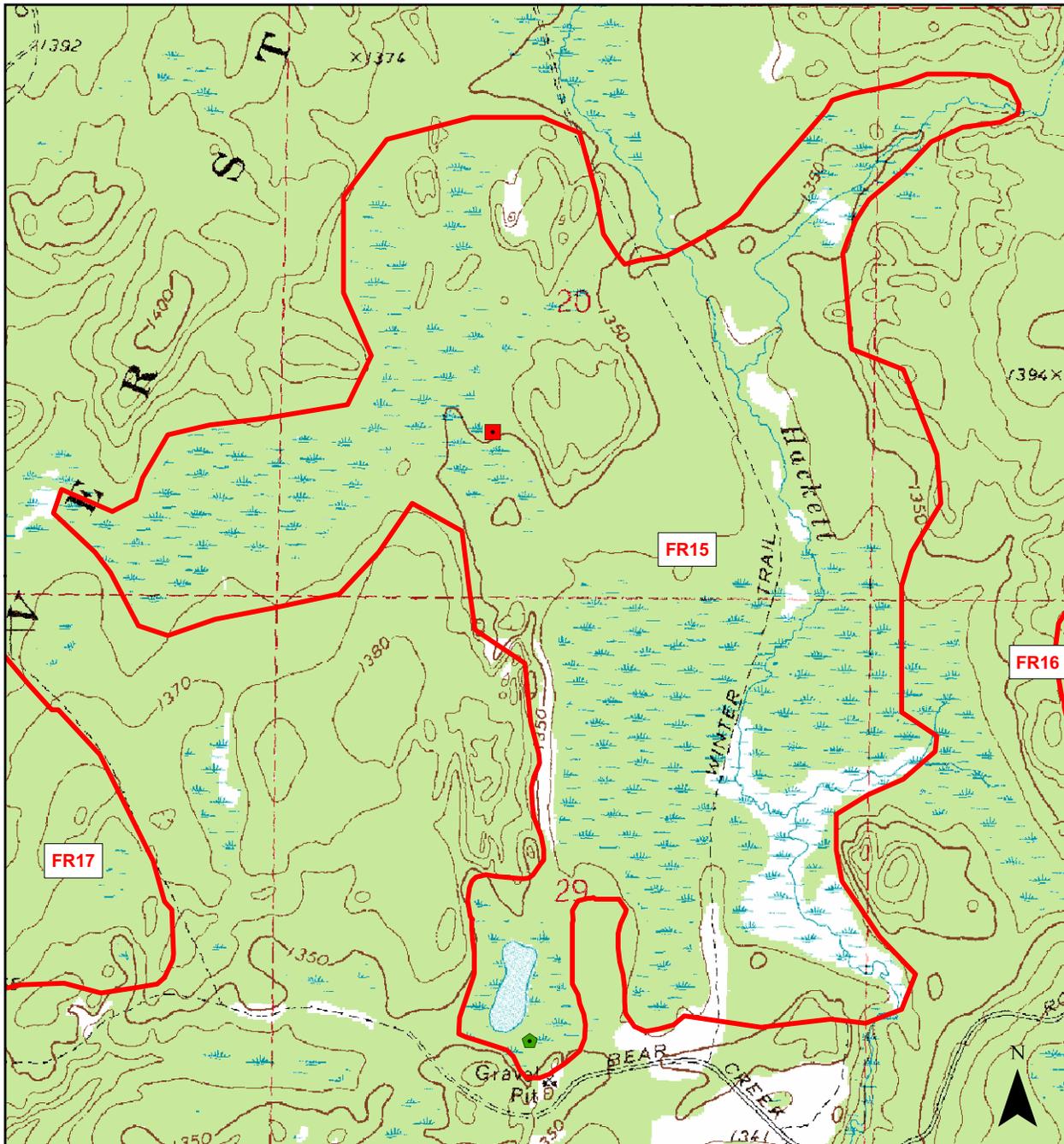
Located in a remote and mostly roadless portion of the FRSF, this site has many ecologically important qualities. First, this site encompasses a wide variety of native plant communities, including several wetland types, many of which are in good condition. Second, hemlock is present here in several size classes; this is notable as hemlock-dominated forest in the local landscape is rare in any seral stage, and existing hemlock trees are usually found only in larger size classes with little to no reproduction present. Third, this complex includes a variety of coniferous forest types, including good-quality mature cedar swamps, and provides valuable habitat for a wide variety of conifer-dependent wildlife species. Fourth, the creek is connected to intact wetlands and was found to have aquatic macroinvertebrate species diversity that is representative for the type. Finally, a State Endangered plant has been documented here, and a State Threatened animal has been found nearby.

Management Considerations

One of the best opportunities on the FRSF exists here for managing a diverse mosaic of good quality natural communities at a landscape scale needed to ensure long-term viability. A special management designation may be warranted here. We recommend evaluating this site for its potential as a State Natural Area or for some other management emphasis designed to protect the rare species, high quality communities, and the other ecologically important attributes present.

FR15 - Hackett Creek Conifers Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Plants					
<i>Vaccinium vitis-idaea ssp. minus</i> (Mountain Cranberry)	2006	S1	G5T5	END	
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR15. Hackett Creek Conifers



Legend Disclaimer:

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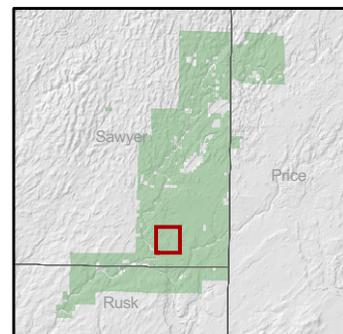
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1:17,559

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR16. BEAR CREEK RD. HEMLOCK HARDWOODS

Location

County: Sawyer
 USGS 7.5' Quadrangle: Ingram NE, Kennan NW
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 122

Description of Site

Located 1/2-mile west of the intersection of CTH M and Bear Creek Road, this site occurs on a nearly-level to undulating outwash plain with a thick blanket of loess deposits. Several mature stands of Northern Mesic Forest composed of hemlock, yellow birch, and white pine occur on small rises within an extensive matrix of mostly mature, mesic to wet-mesic, medium-rich mesic hardwoods and Swamp Hardwoods. Black ash swamps occur along intermittent drainages and in perched wet pockets with impeded drainage.

Significance of Site

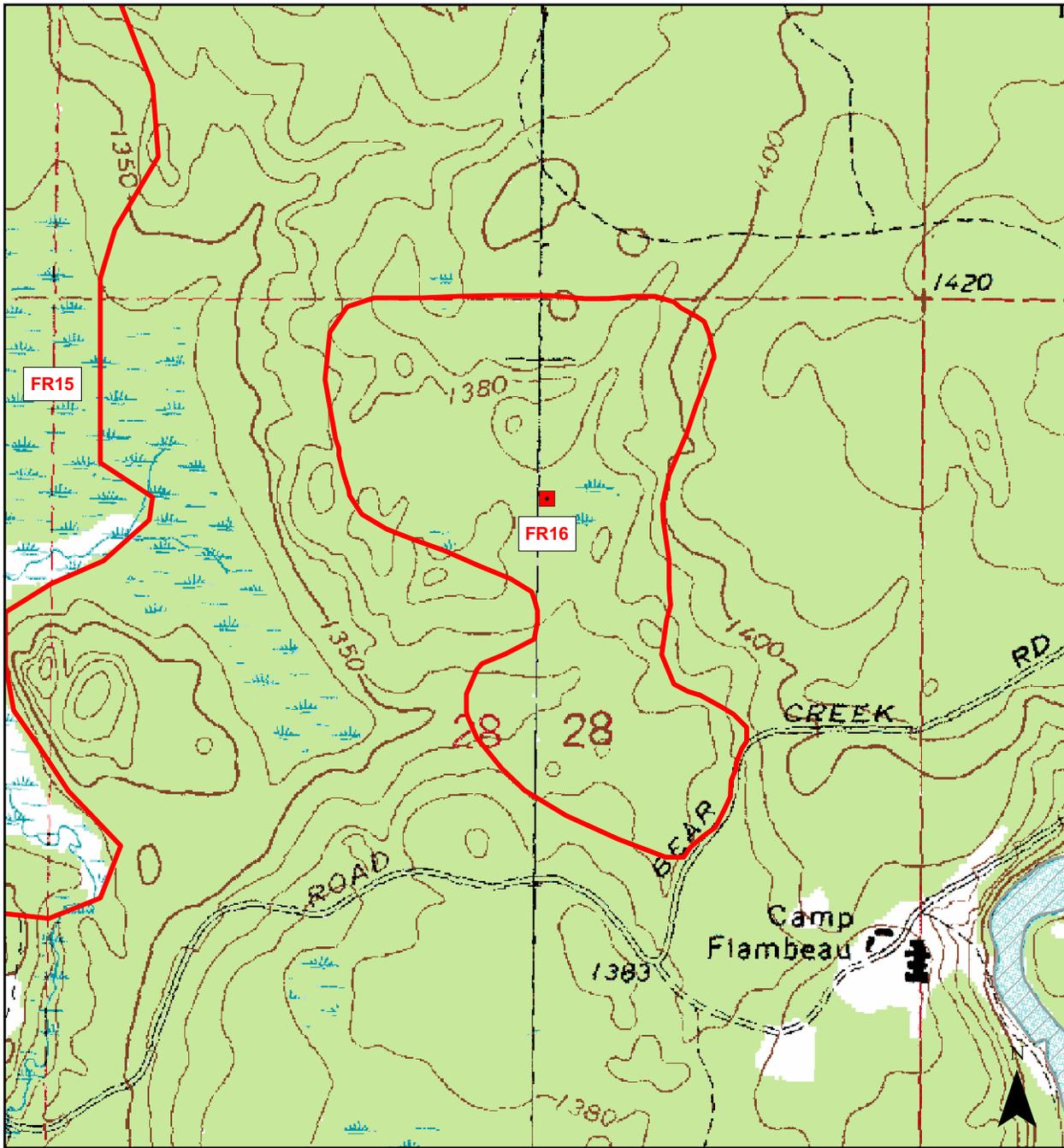
Hemlock-hardwood and hemlock-white pine stands are currently rare on the FRSF and in the surrounding landscape, and the stands at this site are located within a relatively mature forest matrix and are mostly undisturbed. The Hardwood Swamp represents a distinct community variant with the potential to support large diameter red maple, yellow birch, and black ash, among others, and develop old growth structural characteristics. Yellow birch is a consistent co-dominant here, and scattered hemlock constitute a potential seed-source, providing an opportunity for native community restoration in the near term.

Management Considerations

Offering an opportunity to maintain a unique variant of a rare forest type on the FRSF and surrounding landscape, this site merits consideration for special management designation in the new forest master plan. Maintaining the forest and allowing it to continue to develop old-growth characteristics would be appropriate and beneficial here, as this area is located within an extensive forested landscape. The aforementioned characteristics of the site, as well as the site's context within an extensive forested landscape, are favorable restoration factors which could include the possibility of hemlock regeneration.

FR16 - Bear Creek Rd. Hemlock Hardwoods Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
 FR16. Bear Creek Rd. Hemlock Hardwoods



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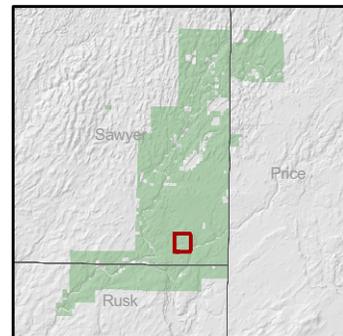
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1:12,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR17. WANNIGAN RAPIDS

Location

County: Sawyer
 USGS 7.5' Quadrangle: Ingram NE
 Landtype Association: 212Xd03. Exeland Plains
 Approximate Size (acres): 552

Description of Site

Located along the east bank of the Flambeau River near Wannigan Rapids on undulating to rolling, silt capped outwash plain, this site supports a large block of mostly mature, medium-rich, hardwood-dominated Northern Mesic Forest. Imbedded within this site are numerous, mature to old growth, hemlock-hardwood stands. Large super-canopy white pines are present in several of these areas. Swamp Hardwood stands composed of yellow birch, red maple, and black ash are commonly intermixed with the upland forest, most frequently occurring on lower slopes, in shallow depressions, and along drainage ways originating from perched wetlands in upslope locations.

Downslope and adjacent to the river corridor, a nearly level outwash terrace supports small but mature stands of mixed red and white pine forest, as well as pockets of more mesic to wet mesic hemlock, yellow birch, and white cedar-dominated forest. These stands grade into small patches of mixed swamp conifers which include black spruce, tamarack, and white cedar. Some areas are dominated by Alder Thicket. Several small drainages from the adjacent uplands flow into these wetlands.

Portions of Wannigan Rapids, the first of the big rapids on this section of the North Fork of the Flambeau River, occur near this site. Large rock outcrops and numerous boulders occur in and around these stretches of whitewater.

Significance of Site

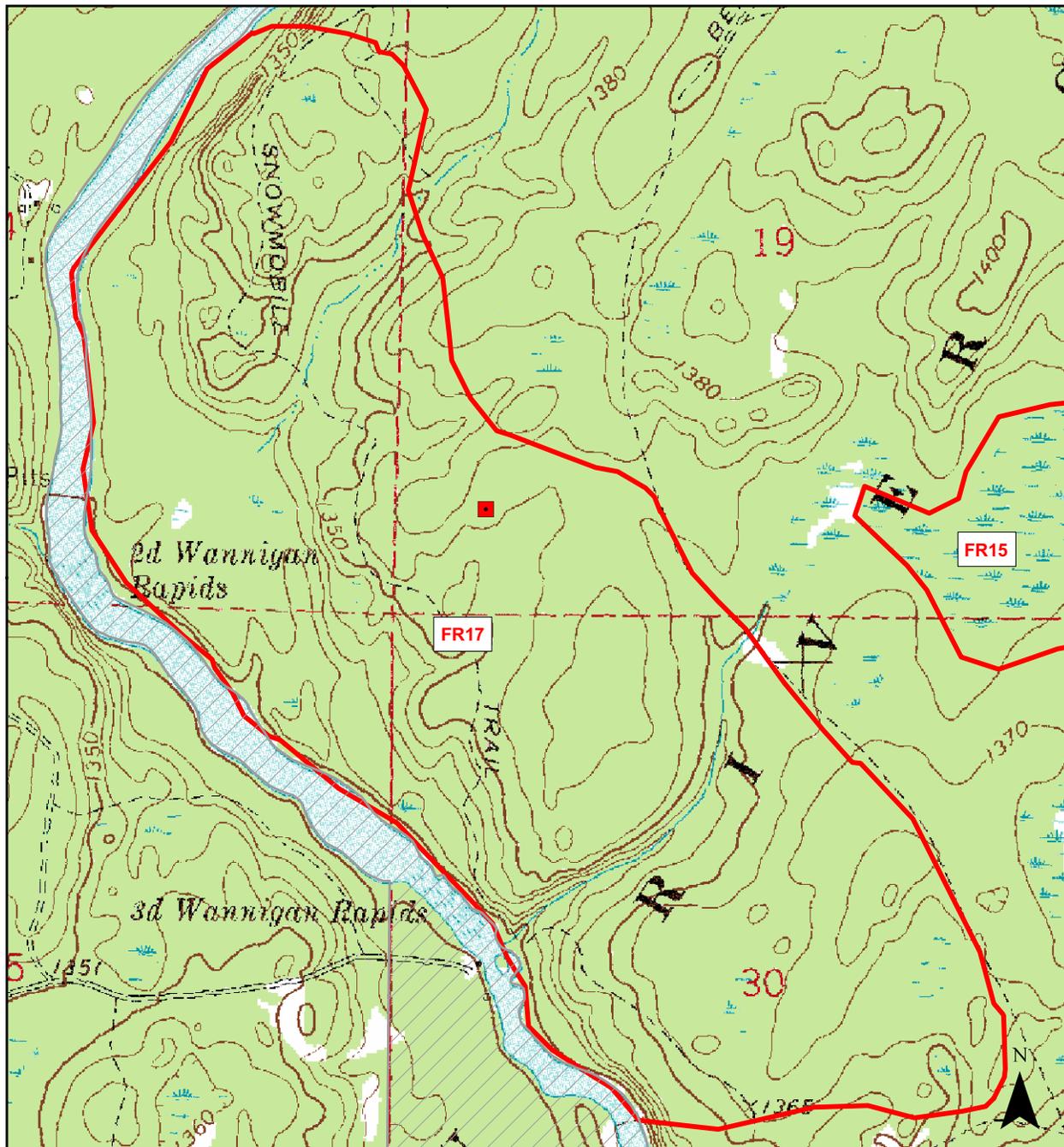
Hemlock-dominated mesic forest, a formerly characteristic forest type that is now uncommon on the FRSF (especially those in old growth successional stages with a high degree of canopy closure) occurs at this site. Similarly, the super-canopy pines found here in several locations were once found over much of the FRSF, especially on the river terraces where the soils have a sandy loam texture. Most of the outwash terraces surveyed during the biotic inventory were found to be highly disturbed, and this site includes one of the few terraces documented with mature stands of natural pine forest, including a red pine component.

Management Considerations

The site is traversed by an official ATV trail that was in very poor condition at the time of biotic inventory work. The trail was severely rutted in places and had deep, large potholes.

FR17 - Wannigan Rapids Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR17. Wannigan Rapids



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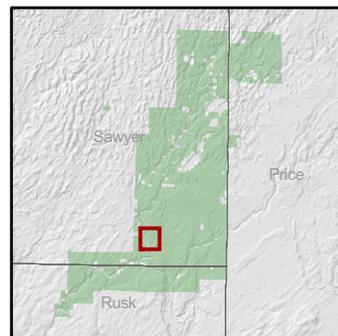
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1:14,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR18. BERGERON RAPIDS

Location

County:	Sawyer
USGS 7.5' Quadrangle:	Kennan NW
Landtype Association:	212Xd03. Exeland Plains
Approximate Size (acres):	57

Description of Site

Located on the north bank of the South Fork of the Flambeau River, just east of the Flambeau Correctional Center, this site occurs on nearly level to undulating ground moraine and narrow outwash terrace along a one-mile stretch of river. The site supports mature, mostly good quality stands of mesic to wet-mesic hemlock-white pine forest, mesic hardwood forest, Northern Hardwood Swamp, and Floodplain Forest communities. Bedrock exposures and small bedrock outcrops are common along this stretch of the river near the rapids, as well as further inland. A slow, hard, coldwater stream drains into the South Fork within this site. These lower stream segments generally have a mature forest cover and stable, hard bottoms. Open meadows with varying soil moisture regimes occur in a narrow zone along parts of the river corridor, apparently maintained by flooding and/or ice action. The site is located entirely within the River Wilderness Zone.

Significance of Site

Although small, this site contains areas of mature hemlock forest, a type that is both declining in the local landscape and is often limited to small isolated stands. The best-quality hemlock stands within this site are mature. Although lacking a conifer component, the mesic Northern Hardwoods here are mature, have a moderately-rich ground flora, have had no recent disturbance, and serve as an important mature forest linkage to the mixed Swamp Hardwood forest to the east (not currently part of this site).

Good-quality mature Swamp Hardwood / Floodplain Forest stands are localized in distribution on the FRSF, and most stands are dominated by pole size trees, have a poorly developed canopy, and often have a very brushy understory. This site contains representative examples of the type, as well as bur oak-dominated stands, a significant natural community variant in this part of the state. Both bur oak and silver maple are rare in this part of the state and represent local disjuncts north of the main portion of their ranges (e.g., Harlow et al. 1996, Burns, R.M. and B.H. Honkala 1990).

This site borders the South Fork of the Flambeau, providing ecological linkages with the river and adjacent natural communities, thereby enhancing its conservation importance. The geological features found along this stretch of river corridor are noteworthy at both the local and regional level. Vegetation on most of the outcrops has not been heavily damaged by recreational use unlike many other places on the FRSF.

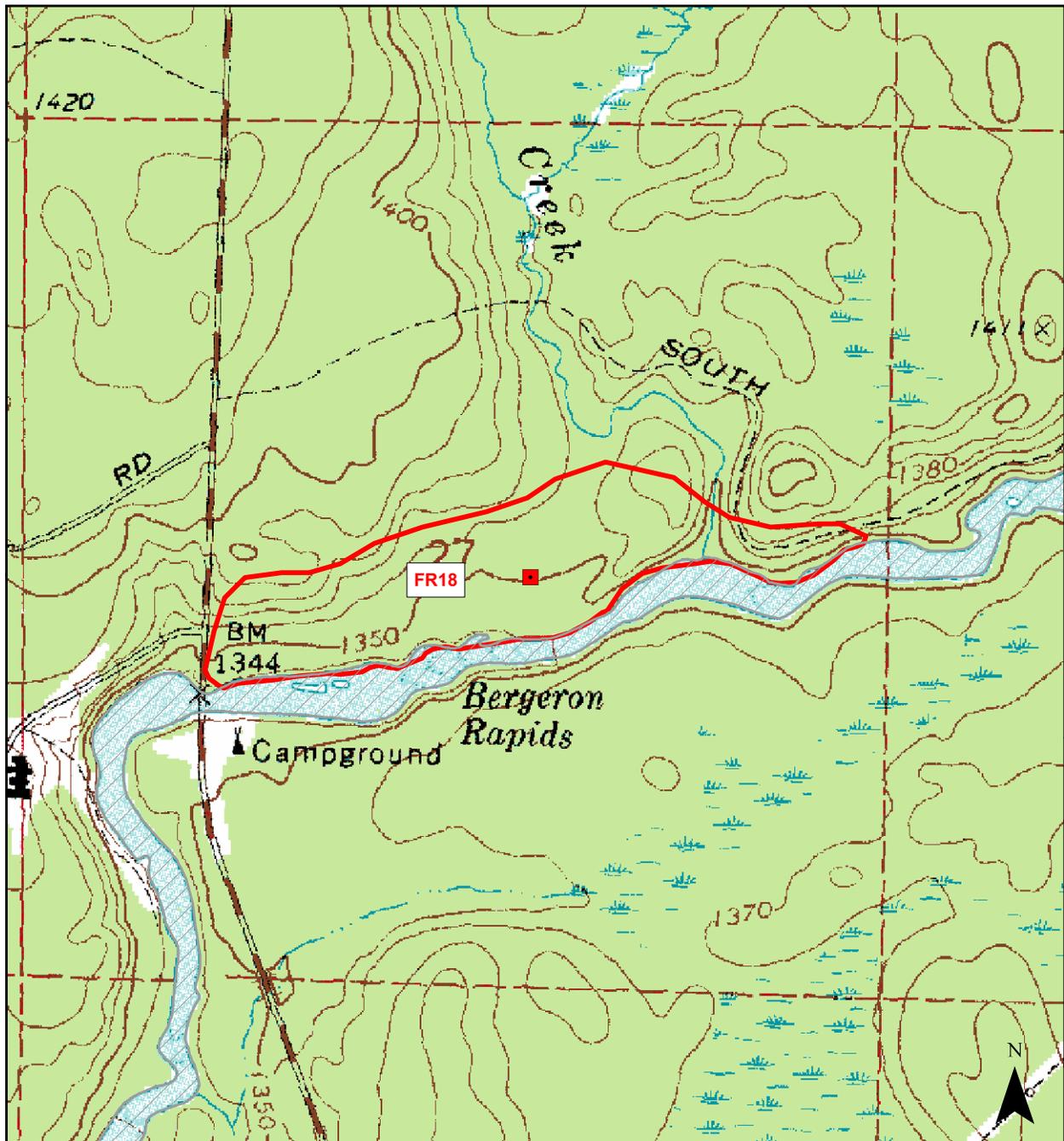
Management Considerations

Opportunities are present to develop a forest with old-growth characteristics such as large diameter trees, a multi-layered canopy, a mixed species composition which includes conifers, and structural diversity such as allowing for the development of coarse woody debris and large standing dead snags. Surrounding stands retain a native conifer component that could potentially serve as a seed source, and there is moderate potential for expanding this site into the surrounding landscape. Protecting site hydrology is a key factor in maintaining site integrity and water quality.

FR18 - Bergeron Rapids Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR18. Bergeron Rapids



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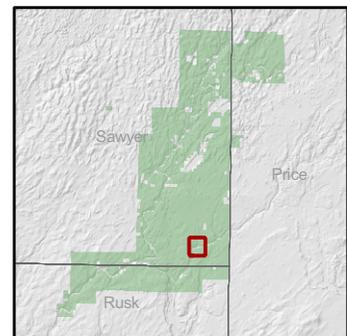
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1:12,000

- Animal
- Community
- ◆ Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR19. FLAMBEAU FORKS INTERIOR FOREST

Location

County:	Rusk
USGS 7.5' Quadrangle:	Ingram NE, Ingram
Landtype Association:	212Xd03. Exeland Plains, 212Xd05. Jump River Ground Moraine
Approximate Size (acres):	2,517

Description of Site

Located in the southernmost portion of the FRSF, this site contains a large block of forest with several unique characteristics for the property. Upland, wetland, and aquatic communities are present here.

The western half of the site is on undulating to rolling ground moraine and supports an extensive mesic to wet-mesic hemlock, yellow birch, and white pine dominated forest along a two mile stretch of George Ladd Creek. Most of these stands are found on lower slopes in areas transitional to upland forest. Upland white cedar, spruce, and large super-canopy white pine are important components of these areas. White pine is also co-dominant in somewhat poorly drained areas containing Swamp Hardwood species such as red maple and yellow birch. Small to medium-sized acid swamps, often with diverse canopy composition, are imbedded within the site. The wetlands along George Ladd Creek (a slow, warm water stream) feature extensive stands of sedge and Canada bluejoint grass -dominated Northern Sedge Meadow, bordered in turn by Alder Thicket. Numerous active beaver colonies have created large flowages with temporary marsh habitats along this stream system. Immediately to the east, the adjacent uplands are forested with rich to very rich stands of sugar maple-basswood-white ash forest and other mesic hardwoods, with highly diverse herbaceous layers. A prominent “kame-like” feature here rises at least 80 feet above the surrounding till plain and supports a number of uncommon plant species.

The northeast portion of the site occurs on undulating, silt capped, outwash plain and ground moraine with bluffs that slope steeply toward the South Fork of the Flambeau River. This area supports small to medium sized stands of mature to old growth, mesic to wet-mesic hemlock, hemlock-hardwood, and mesic hardwood forest. Richer, sugar maple-basswood-white ash dominated forest with black ash in seepy areas occurs on bluff tops and slopes along the Flambeau River. Further inland, perched wet pockets are common in shallow depressions on poorly drained silt loam soils and support swampy hemlock forest or mixed swamp hardwoods; the latter often have Ephemeral Ponds in the spring or following periods of heavy runoff. Small intermittent drainages (some quite rocky) originate from these wetland features, eventually draining into the South Fork or North Fork of the Flambeau River. A small, nearly level outwash terrace within the site supports an unusual Swamp Hardwood forest comprised of black ash, green ash, basswood, and bur oak. White pine is locally abundant in some areas. A small stand of Floodplain Forest dominated by silver maple occurs next to the river corridor. This stretch of the South Fork has a fast current, numerous small rapids and riffles, and numerous boulders.

The southeastern portion of the site near Skinner Creek contains mature, select-cut hardwood forest with a rich spring ephemeral display on rolling terrain near the confluence of Skinner Creek and the South Fork of the Flambeau River. Trees sizes range from 6"-20" dbh., and dominants are sugar maple, basswood, yellow birch, and ironwood. Rare trees include bitternut hickory, hemlock, and, reportedly, butternut in the southwest corner of the site. This portion of the site is bisected by a gravel road and a power line clearing, and there is a gravel pit located near the road. Seasonal cabins occur just to the northeast of the site. Northwest of the road, three intermittent to perennial small streams converge in a seeping basin. Two large-scale research projects were initiated in this portion of the forest to study the effects of various manipulations on accelerating the development of old-growth structure and composition in these forests.

Significance of Site

Natural conifer-dominated stands (especially those which feature white cedar and large super-canopy pines or hemlock-dominated stands) are uncommon on the FRSF, and larger blocks of forest incorporating these features are rare. Old growth successional stages of all of these types are also rare, especially located within a mostly contiguous, mature northern hardwoods-dominated landscape such as this one. Hemlock is present here within the site on a variety of habitat types and often in a mature successional stage.

Generally mature and with a few patches approaching old-growth, this site features rich, maple-basswood forests, sometimes occurring in areas with somewhat impeded drainage. These “wet phase” habitat types are a highly productive and ecologically-important community variant, supporting a mixture of swamp hardwood species in addition to some of the mesic hardwoods. The southern portion of the site near Skinner Creek exhibited the richest spring flora seen within the FRSF, with many species at or near their northern range limits, and is probably one of the richest sites in any of Wisconsin’s state forests. Butternut is reportedly present in the far southwest corner of this area. Ephemeral Ponds are located in several places.

Kames, a unique, localized glacial landform feature on the FRSF, are found on this site. In addition, Both Hackett and Skinner Creeks may have potential to support rare aquatic invertebrates. Louisiana Waterthrush, a rare forest interior songbird, occurs here at the extreme northern limits of its breeding range.

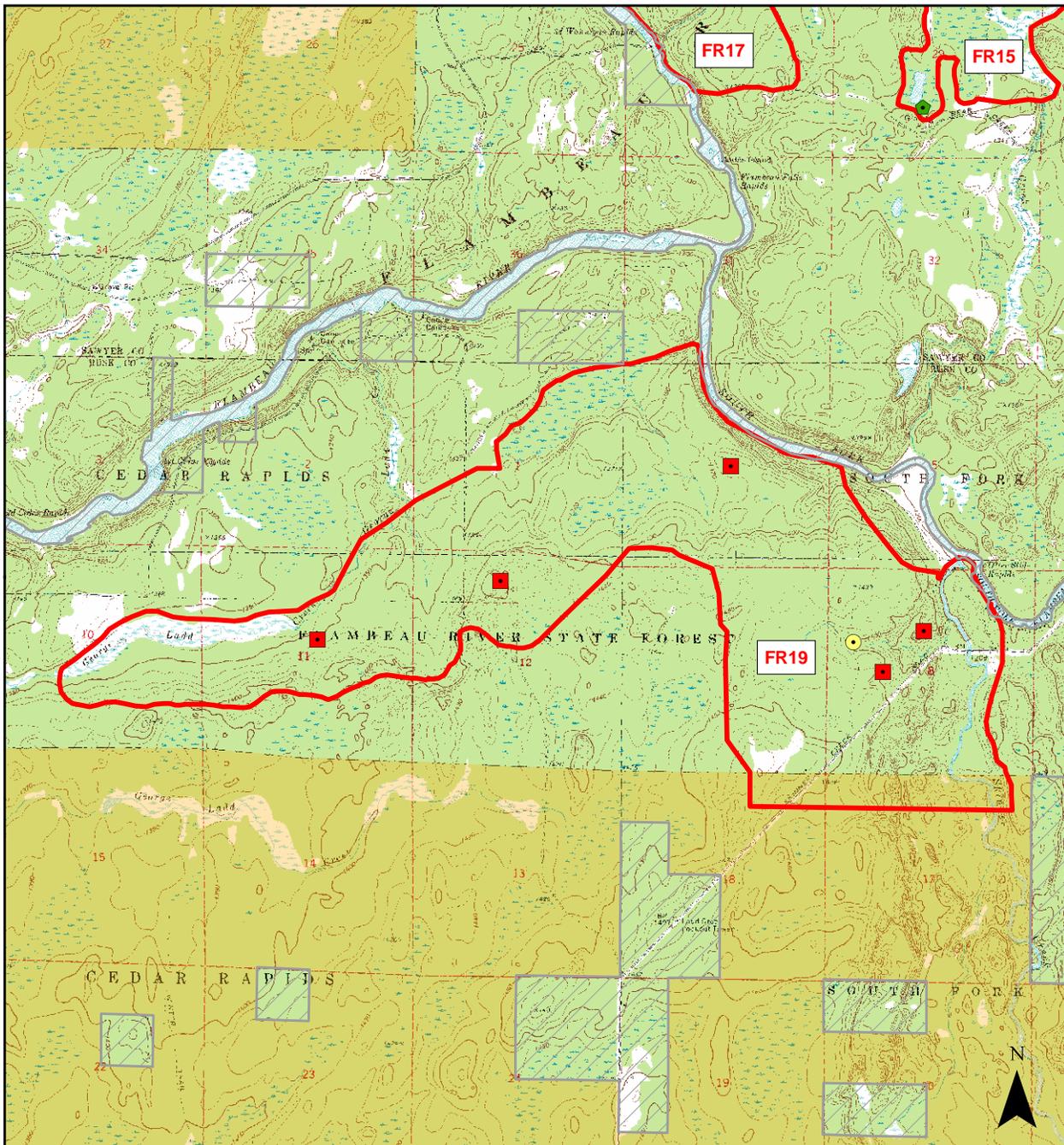
Management Considerations

This example of a contiguous mosaic of natural communities surrounding free-flowing stream corridors is more intact here than at other locations on the FRSF and in the surrounding region. Rich maple-basswood forests are currently very poorly represented in special management areas that provide a high level of protection for natural communities. This site warrants consideration for a special management designation that would include the ongoing old-growth research projects, along with other untreated areas as part of a core forested block. Portions of this site could be evaluated for State Natural Area potential.

FR19 - Flambeau Forks Interior Forest Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Seiurus motacilla</i> (Louisiana Waterthrush)	2002	S3B	G5	SC/M	
Communities					
Forested Seep	2000	S2	GNR	NA	
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
 FR19. Flambeau Forks Interior Forest



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

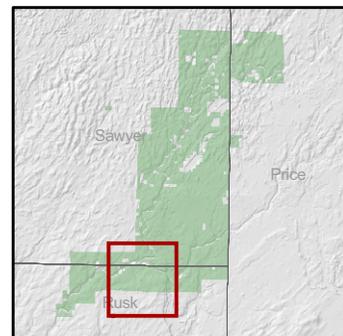
The survey site is approximate, and it should be used only generally, not literally, for management purposes.

Surveys were conducted between 2000-2001 for natural communities and priority taxa. The surveys were not comprehensive for all taxa potentially present.

Ownership shown is approximate and only meant to illustrate the site locations. Private lands include all lands 1) not under full ownership of or management by the Wisconsin Department of Natural Resources as of 2005, 2) not in the WDNR County Forests GIS coverage, and 3) not in the WDNR National Forests GIS coverage.

1:50,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR20. HAYSTACK CORNERS

Location

County: Rusk, Sawyer
 USGS 7.5' Quadrangle: Ingram NW, Big Falls Dam
 Landtype Association: 212Xd02. Flambeau silt capped Drumlins
 Approximate Size (acres): 1,143

Description of Site

Located north of the Flambeau River at the southwest end of the FRSF, this site occurs on nearly level outwash terraces and undulating to rolling ground moraine. The area supports a large tract of mostly mature (11"-15" and greater diameter) Northern Mesic Forest, with several small old growth inclusions. Black ash is a major component within several of the upland stands, especially in hemlock-hardwood stands west of West Lane. Several large conifer swamps are found within the site, varying from acidic black spruce-dominated stands to slightly more minerotrophic tamarack and hemlock-white pine swamps.

Significance of Site

Large patches of older maturing forest with an intact canopy and high basal area are uncommon on the FRSF and in the surrounding region, and hemlock hardwood forests now exist mostly as small isolated remnants. This site supports one of the largest natural conifer-dominated patches remaining on the FRSF and the surrounding region and has several small but relatively undisturbed, intact examples of forests with old-growth characteristics. It also features a concentration of mature (greater than 15" dbh) stands within a relatively contiguous block of interior forest, and a rare (Special Concern) bird has been documented breeding at this site. The recent timber sale history will need to be reviewed to help determine site significance.

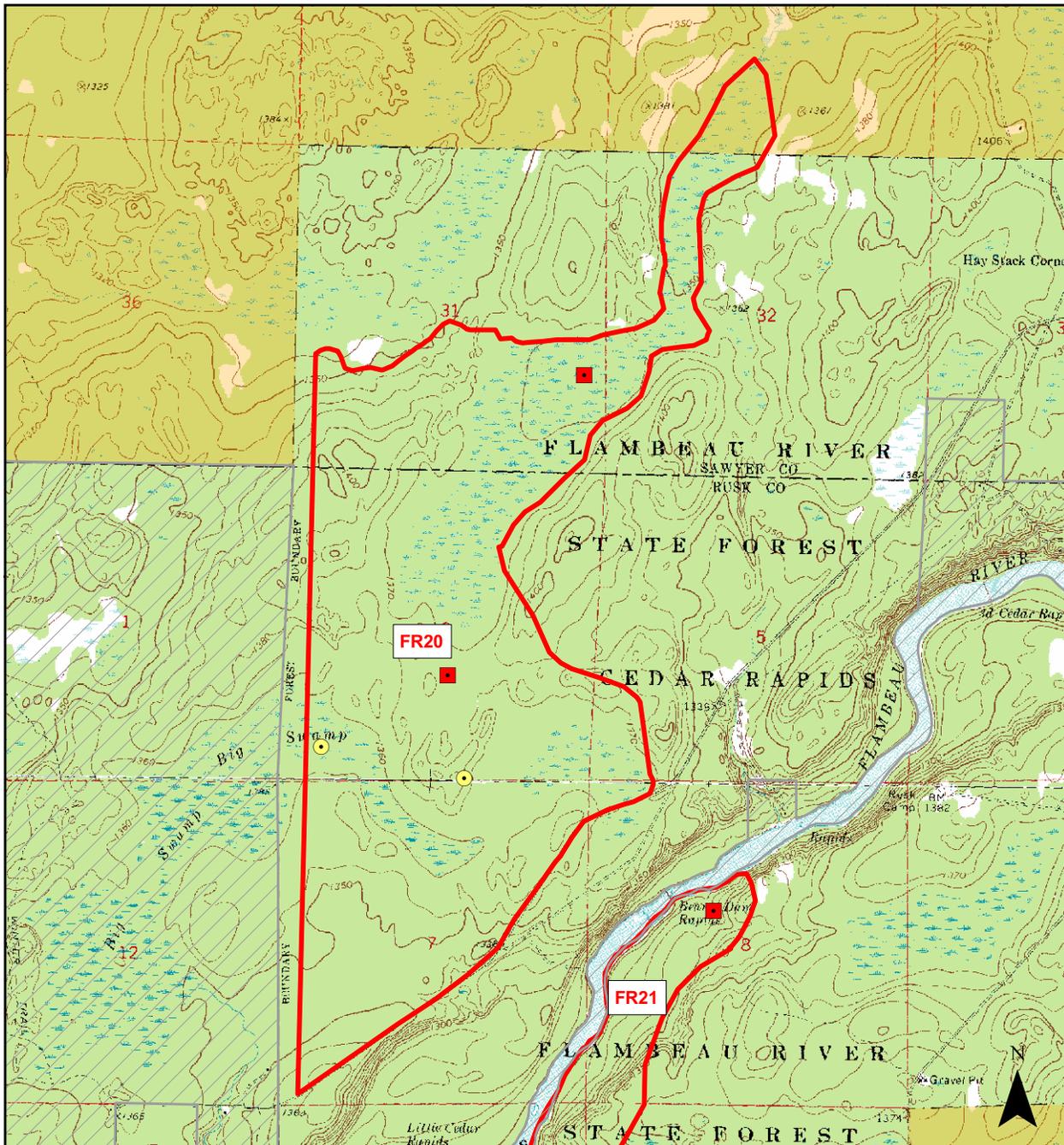
Management Considerations

Good opportunities exist here to develop a forest with old-growth characteristics such as large diameter trees, multi-layered canopy, a mixed species composition, increased coarse woody debris, and large standing snags for use by wildlife. This site provides an opportunity to protect and represent a relatively complete assemblage of characteristic landscape features (soils, landforms, species, communities, and aquatic features). Landscape-scale protection/restoration opportunities such as this one are limited on the FRSF and in the surrounding region, and this site warrants consideration for a special management designation in the new FRSF master plan.

FR20 - Haystack Corners Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Accipiter gentilis</i> (Northern Goshawk)	2001	S2B,S2N	G5	SC/M	
<i>Haliaeetus leucocephalus</i> (Bald Eagle)	1995	S4B,S2N	G5	SC/P	
Communities					
Black Spruce Swamp	2000	S3?	G5	NA	
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest
FR20. Haystack Corners



Legend Disclaimer:

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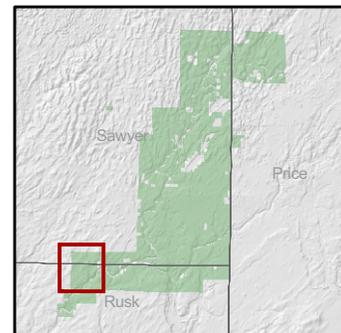
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Surveys were conducted between 2000-2001 for natural communities and priority taxa. The surveys were not comprehensive for all taxa potentially present.

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1:32,000

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



FR21. BEAVER DAM AND LITTLE CEDAR RAPIDS

Location

County: Rusk
USGS 7.5' Quadrangle: Big Falls Dam
Landtype Association: 212Xd03. Exeland Plains, 212Xd05. Jump River Ground Moraine
Approximate Size (acres): 699

Description of Site

Dominated by Northern Mesic Forest, with old growth characteristics in places, this site occurs south of the Flambeau River at the southernmost end of the FRSF. Topography varies from steep areas along the river bank to almost level terraces.

The central portion of the site contains mature hemlock-hardwood forest on a north-facing bank of the Flambeau River. The best development of hemlock is located on the steep, narrow riverbank, where trees up to 24" in diameter are frequent. Farther south on the rim of the bluff the forest is dominated by 12"-24" diameter sugar maple, basswood, yellow birch, and white ash. This part of the stand was probably selectively cut in the distant past. The sapling-shrub layer is moderately dense, with sugar maple saplings and hazelnut among the prominent species. The herbaceous varies from moderately rich to very rich, especially along the four small areas of seeps and spring runs that flowing out of ravines and into the Flambeau River.

South and east of the Flambeau River, the site is situated on an upland terrace, supporting a rich mesic hardwood forest of medium-sized (9"-15" diameter) sugar maple, white (and/or green) ash, and basswood. All of the dominant canopy species were reproducing at the time of the survey. Associates include red oak, yellow birch, bitternut hickory, and butternut. White pine and hemlock are present, but very rare, in this area. The herb layer is quite rich. To the west, and on the steep slopes above the river, the site becomes less rich. Patches of Swamp Hardwoods are found nearby, and several rocky, dry ravines cut the slope.

A portion of this site is located outside of the FRSF boundary and is privately owned. The portion of the site within the FRSF boundary is encompassed by the River Wilderness Zone.

Significance of Site

Outwash river terraces, a common landform along the Flambeau River, were impacted by historic land uses such as attempted farming, and most of these terraces are now dominated by early successional forest types. This site represents one of the few examples on the FRSF with good-quality stands of hemlock, hemlock-hardwood, and swamp hardwood forest with short-term restoration potential. The glacial landforms are especially well-developed on this site, with at least three distinct outwash terraces present.

Forested seeps found in some of the ravines within the site support large populations of a number of fairly uncommon sedges, ferns, and spring ephemeral herbs. Perched wetlands on the surrounding till plain drain into these ravines and eventually into the Flambeau River system.

Management Considerations

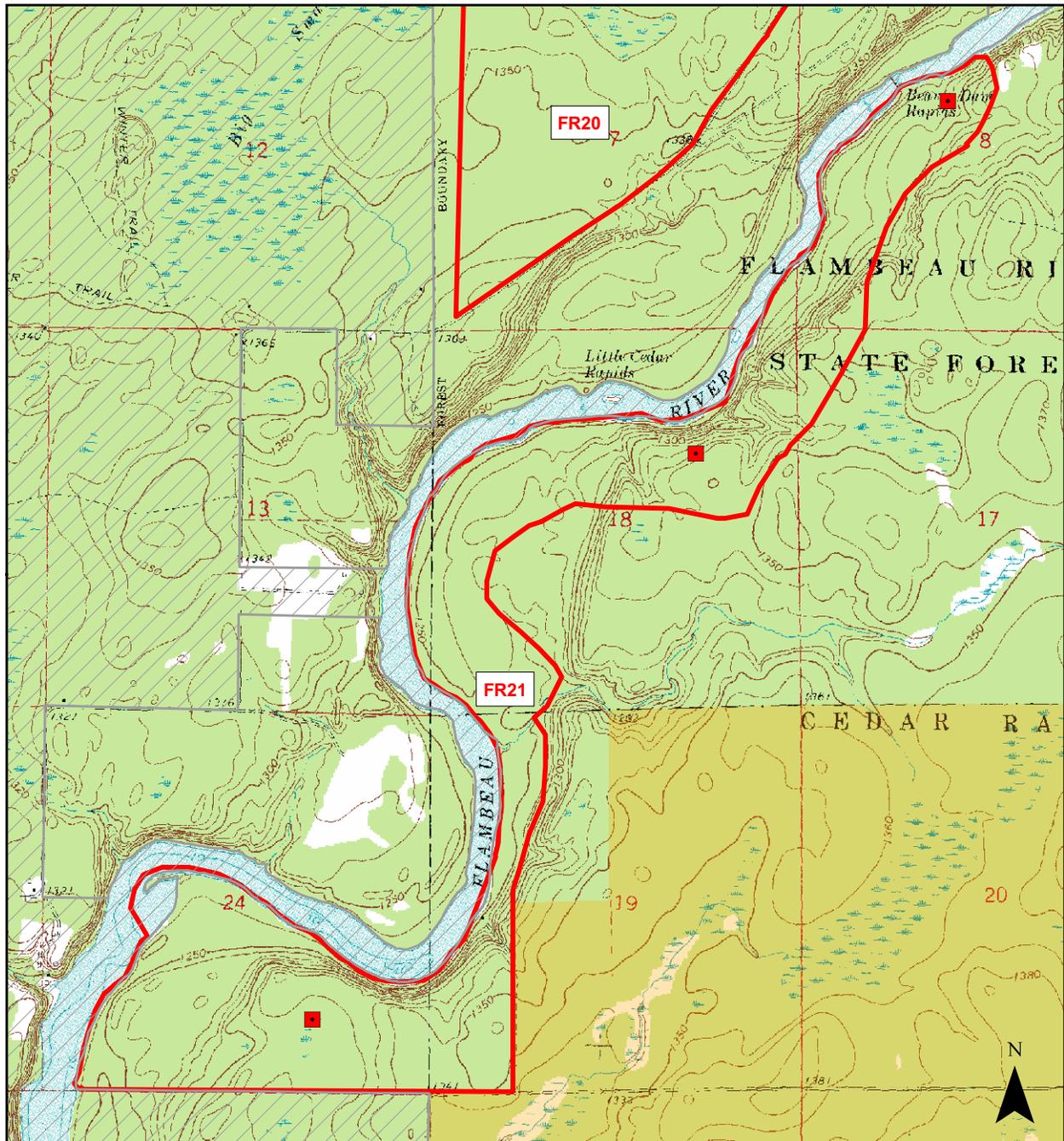
A unique opportunity exists here to protect a fairly complete assemblage of characteristic landscape features (soils, landforms, species, communities, and aquatic features) at a landscape scale. This forest could be allowed to develop old-growth characteristics such as large diameter trees, a multi-layered canopy, mixed species composition, increased coarse woody debris, and large standing dead snags for use by wildlife.

FR21 - Beaver Dam and Little Cedar Rapids Element Occurrences

Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Communities					
Northern Mesic Forest	2000	S4	G4	NA	

Flambeau River State Forest

FR21. Beaver Dam and Little Cedar Rapids



Legend Disclaimer:

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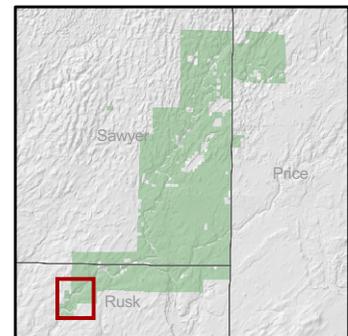
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1:26,929

- Animal
- Community
- Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



KC01. KIMBERLY CLARK PEATLAND *

Location

County: Price
 USGS 7.5' Quadrangle: Kennan NW, Lac Sault Dore, Lugerville, and Oxbo
 Landtype Association: 212Xd03. Exeland Plains, 212Xa01. Glidden Drumlins
 Approximate Size (acres): 3595

Description of Site

Located in poorly drained ground moraine in the southern half of the Kimberly Clark Wildlife Area, just east of the FRSF, the main feature here is an extensive acid peatland vegetated mostly with Muskeg and Black Spruce Swamp. The Muskeg is extensive, relatively open, and has scattered, stunted black spruce with a lesser component of tamarack over a carpet of *Sphagnum* mosses. Other characteristic species include leatherleaf, bog-rosemary, few-flowered sedge, swamp false Solomon's-seal, small cranberry, and rusty cotton-grass. The Black Spruce Swamp has a closed canopy of 5" diameter black spruce, with tamarack, over hummocky sphagnum. Other characteristic plant species include Labrador tea, leatherleaf, swamp false Solomon's-seal, creeping-snowberry, rusty cotton-grass, and three-seeded sedge. Forested "islands" within the peatland are dominated by second growth trembling aspen, white birch, balsam fir, and sugar maple. Small wet depressions on the islands support black ash. Minerotrophic conditions occur along the margins of the islands with alder, mountain holly, blue flag iris, and bog birch in some places. An extensive snowmobile trail traverses the site, altering hydrology somewhat and creating Poor Fen-like conditions that favor white beak rush, common buckbean, arrow grass, and muck sedge. The snowmobile trail impedes drainage slightly in the southern half of the site, allowing the trees to grow slightly taller downslope from the trail, but characteristic Muskeg plants are still abundant. Gray Jays and Palm Warblers were observed at the site.

Significance of Site

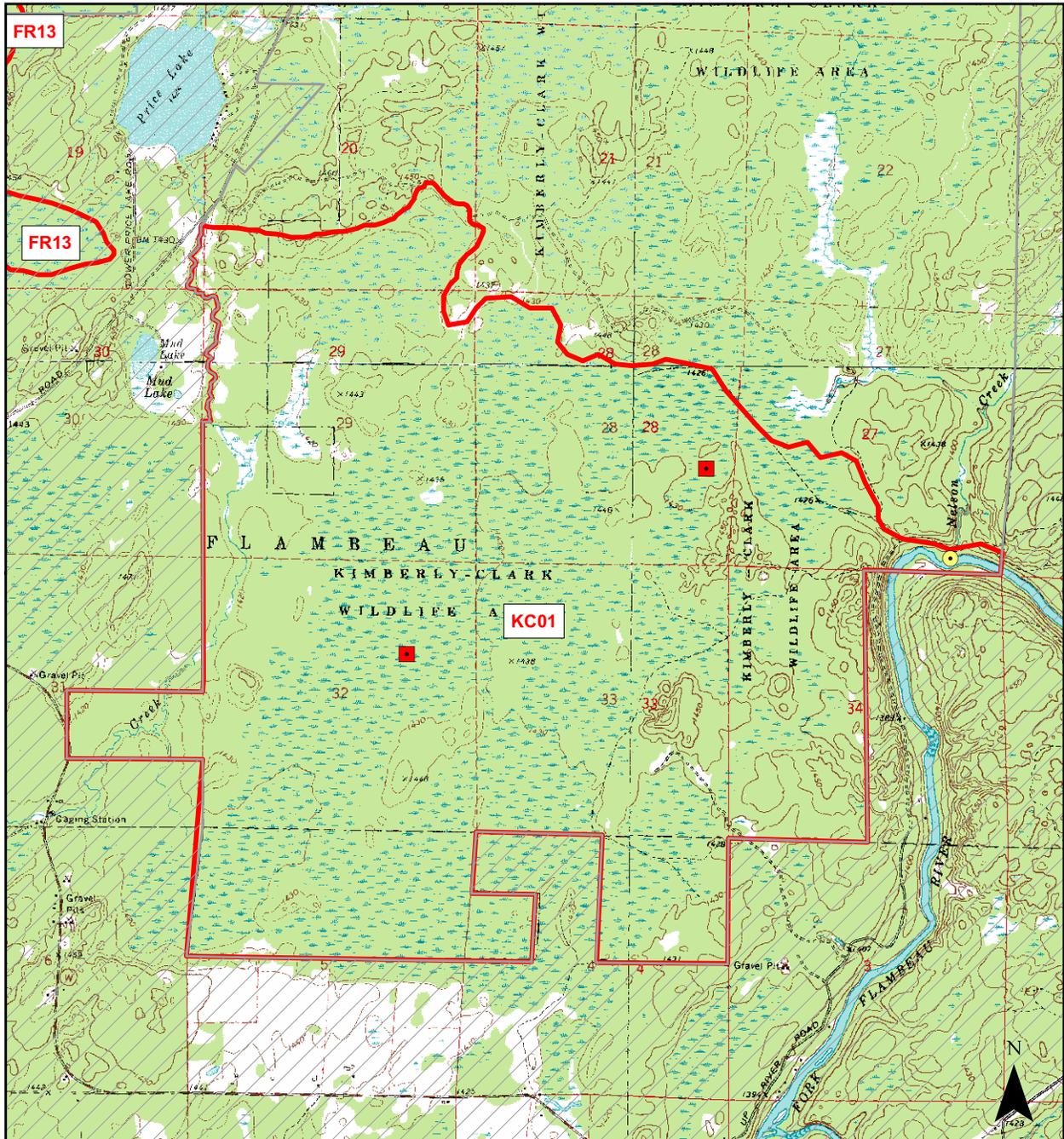
A large good-quality peatland complex occurs here, providing habitat for a unique suite of plants and some specialized animals.

Management Considerations

This area would benefit from management that would better protect wetland hydrology. The upland "islands" could also be allowed to recover from past disturbance, adding to the site's diversity. This area may be worthy of consideration for special management designation to protect its ecologically-important attributes and wildlife habitats for the long term.

KC01 - Kimberly Clark Peatland Element Occurrences					
Scientific Name (Common Name)	Observation Date	State Rank	Global Rank	State Status	Federal Status
Animals					
<i>Clemmys insculpta</i> (Wood Turtle)	2001	S2	G4	THR	
Communities					
Black Spruce Swamp	2007	S3?	G5	NA	
Muskeg	2007	S4	G4G5	NA	

Kimberly Clark Wildlife Area KC01. Kimberly Clark Peatland



Legend Disclaimer:

Element Occurrence (EO) locations were generated using May 08, 2008 NHI data records. Each symbol may represent more than one EO, and symbols may overlap each other. The absence of evidence does not indicate evidence of absence.

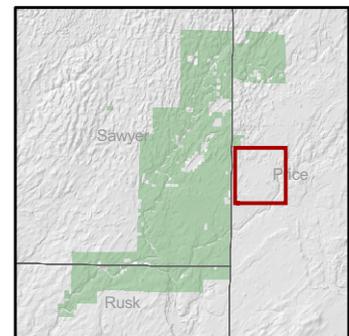
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1:38,000

- Animal
- Community
- ◆ Plant
- Private Lands
- Primary Sites
- State Natural Areas
- County Land
- National Forest Land



APPENDIX C

Natural Communities of the Flambeau River State Forest

These descriptions are from the September 2002 Revision of the NHI Natural Community Descriptions prepared by Eric Epstein, Emmet Judziewicz and Elizabeth Spencer. See dnr.wi.gov/org/land/er/communities/ for additional information.

Black Spruce Swamp (A split from Curtis' Northern Wet Forest)

An acidic conifer swamp forest characterized by a relatively closed canopy of black spruce (*Picea mariana*) and an open understory in which Labrador-tea (*Ledum groenlandicum*) and sphagnum mosses (*Sphagnum* spp.) are often prominent, along with three-leaved false Solomon's-seal (*Smilacina trifolia*), creeping snowberry (*Gaultheria hispida*), and three-seeded sedge (*Carex trisperma*). The herbaceous understory is otherwise relatively depauperate. This community is closely related to Open Bogs and Muskegs, and sometimes referred to as Forested Bogs outside of Wisconsin.

Emergent Marsh

These open, marsh, lake, riverine and estuarine communities with permanent standing water are dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include cattails (*Typha* spp.), bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds (*Sparganium* spp.), giant reed (*Phragmites australis*), pickerel-weed (*Pontederia cordata*), water-plantains (*Alisma* spp.), arrowheads (*Sagittaria* spp.), and the larger species of spikerush such as (*Eleocharis smallii*).

Ephemeral Pond

These ponds are depressions with impeded drainage (usually in forest landscapes), that hold water for a period of time following snowmelt but typically dry out by mid-summer. Common aquatic plants of these habitats include yellow water crowfoot (*Ranunculus flabellaris*), mermaid weed (*Proserpinaca palustris*), Canada bluejoint grass (*Calamagrostis canadensis*), floating manna grass (*Glyceria septentrionalis*), spotted cowbane (*Cicuta maculata*), smartweeds (*Polygonum* spp.), orange jewelweed (*Impatiens capensis*), and sedges. Ephemeral ponds provide critical breeding habitat for certain invertebrates, as well as for many amphibians such as frogs and salamanders.

Floodplain Forest (replaces in part the Southern Wet and Southern Wet-Mesic Forests of Curtis)

This is a lowland hardwood forest community that occurs along large rivers, usually stream order 3 or higher, that flood periodically. The best-development occurs along large rivers in southern Wisconsin, but this community is also found in the north. Canopy dominants may include silver maple (*Acer saccharinum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis occidentalis*), swamp white oak (*Quercus bicolor*), and cottonwood (*Populus deltoides*). Northern stands are often species poor, but balsampoplar (*Populus balsamifera*), bur oak (*Quercus macrocarpa*), and box elder (*Acer negundo*) may replace some of the missing "southern" trees. Buttonbush (*Cephalanthus occidentalis*) is a locally dominant shrub and may form dense thickets on the margins of oxbow lakes, sloughs and ponds within the forest. Nettles (*Laportea canadensis* and *Urtica dioica*), sedges, ostrich fern (*Matteuccia struthiopteris*) and gray-headed coneflower (*Rudbeckia laciniata*) are important understory herbs, and lianas such as Virginia creepers (*Parthenocissus* spp.), grapes (*Vitis* spp.), Canada moonseed (*Menispermum canadense*), and poison-ivy (*Toxicodendron radicans*) are often common. Among the striking and characteristic herbs of this community are cardinal flower (*Lobelia cardinalis*) and green dragon (*Arisaema dracontium*).

Forested Seep

These are shaded seepage areas with active spring discharges in (*usually*) hardwood forests that may host a number of uncommon to rare species. The overstory dominant is frequently black ash (*Fraxinus nigra*), but yellow birch (*Betula allegheniensis*), American elm (*Ulmus americana*) and many other tree species may be present including conifers such as hemlock (*Tsuga canadensis*) or white pine (*Pinus strobus*). Understory species include skunk cabbage (*Symplocarpus foetidus*), water-pennywort (*Hydrocotyle americana*), marsh blue violet (*Viola cucullata*), swamp saxifrage (*Saxifraga pennsylvanica*), golden saxifrage (*Chrysosplenium americanum*), golden ragwort (*Senecio aureus*), silvery spleenwort (*Athyrium thelypteroides*) and the rare sedges (*Carex scabrata* and *C. prasina*). Most documented occurrences are in the Driftless Area, or locally along major rivers flanked by steep bluffs.

Muskeg

Muskegs are cold, acidic, sparsely wooded northern peatlands with composition similar to the Open Bogs (*Sphagnum* spp. mosses, *Carex* spp., and ericaceous shrubs), but with scattered stunted trees of black spruce (*Picea mariana*) and tamarack (*Larix laricina*). Plant diversity is typically low, but the community is important for a number of boreal bird and butterfly species, some of which are quite specialized and not found in other communities.

Northern Dry-Mesic Forest

In this forest community, mature stands are dominated by white and red pines (*Pinus strobus* and *P. resinosa*), sometimes mixed with red oak (*Quercus rubra*) and red maple (*Acer rubrum*). Common understory shrubs are hazelnuts (*Corylus* spp.), blueberries (*Vaccinium angustifolium* and *V. myrtilloides*), wintergreen (*Gaultheria procumbens*), partridge-berry (*Mitchella repens*); among the dominant herbs are wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), and cow-wheat (*Melampyrum lineare*). Stands usually occur on sandy loams, sands or sometimes rocky soils.

Northern Mesic Forest

This forest complex covered the largest acreage of any Wisconsin vegetation type prior to European settlement. Sugar maple (*Acer saccharum*) is dominant or co-dominant in most stands, while hemlock (*Tsuga canadensis*) was the second most important species, sometimes occurring in nearly pure stands with white pine (*Pinus strobus*). Beech (*Fagus grandifolia*) can be a co-dominant with sugar maple in the counties near Lake Michigan. Other important tree species were yellow birch (*Betula allegheniensis*), basswood (*Tilia americana*), and white ash (*Fraxinus americana*). The groundlayer varies from sparse and species poor (*especially in hemlock stands*) with woodferns (*especially Dryopteris intermedia*), bluebead lily (*Clintonia borealis*), clubmosses (*Lycopodium* spp.), and Canada mayflower (*Maianthemum canadense*) prevalent, to lush and species-rich with fine spring ephemeral displays. After old-growth stands were cut, trees such as quaking and bigtoothed aspens (*Populus tremuloides* and *P. grandidentata*), white birch (*Betula papyrifera*), and red maple (*Acer rubrum*) became and still are important in many second-growth Northern Mesic Forests. Several distinct associations within this complex warrant recognition as communities, and draft abstracts of these are currently undergoing review.

Northern Sedge Meadow

This open wetland community is dominated by sedges and grasses. There are several common subtypes: Tussock meadows, dominated by tussock sedge (*Carex stricta*) and Canada bluejoint grass (*Calamagrostis canadensis*); Broad-leaved sedge meadows, dominated by the robust sedges (*Carex lacustris* and/or *C. utriculata*); and Wire-leaved sedge meadows, dominated by such species as woolly sedge (*Carex lasiocarpa*) and few-seeded sedge (*C. oligosperma*). Frequent associates include marsh bluegrass (*Poa palustris*), manna grasses (*Glyceria* spp.), paniced aster (*Aster lanceolatus*), joy-pye-weed (*Eupatorium maculatum*), and the bulrushes (*Scirpus atrovirens* and *S. cyperinus*).

Northern Wet Forest (revised from Curtis, with Black Spruce and Tamarack Swamps split out)

These weakly minerotrophic conifer swamps, located in the North, are dominated by black spruce (*Picea mariana*) and tamarack (*Larix laricina*). Jack pine (*Pinus banksiana*) may be a significant canopy component in certain parts of the range of this community complex. Understories are composed mostly of sphagnum (*Sphagnum* spp.) mosses and ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), Labrador-tea (*Ledum groenlandicum*), and small cranberry (*Vaccinium oxycoccos*) and sedges such as (*Carex trisperma* and *C. paupercula*). The Natural Heritage Inventory has split out two entities, identified (*but not strictly defined*) by the two dominant species (see Black Spruce Swamp and Tamarack Swamp).

Northern Wet-Mesic Forest (revised from Curtis, with Northern Hardwood Swamp split out)

This forested minerotrophic wetland is dominated by white cedar (*Thuja occidentalis*), and occurs on rich, neutral to alkaline substrates. Balsam fir (*Abies balsamea*), black ash (*Fraxinus nigra*), and spruces (*Picea glauca* and *P. mariana*) are among the many potential canopy associates. The understory is rich in sedges (*such as Carex disperma* and *C. trisperma*), orchids (*e.g., Platanthera obtusata* and *Listera cordata*), and wildflowers such as goldthread (*Coptis trifolia*), fringed polygala (*Polygala pauciflora*), and naked miterwort (*Mitella nuda*), and trailing sub-shrubs such as twinflower (*Linnaea borealis*) and creeping snowberry (*Gaultheria hispida*). A number of rare plants occur more frequently in the cedar swamps than in any other habitat.

Open Bog

These non-forested bogs are acidic, low nutrient, northern Wisconsin peatlands dominated by *Sphagnum* spp. mosses that occur in deep layers, often with pronounced hummocks and hollows. Also present are a few narrow-leaved sedge species such as (*Carex oligosperma* and *C. pauciflora*), cotton-grasses (*Eriophorum* spp.), and ericaceous shrubs, especially bog laurel (*Kalmia polifolia*), leatherleaf (*Chamaedaphne calyculata*), and small cranberry (*Vaccinium oxycoccus*). Plant diversity is very low but includes characteristic and distinctive specialists. Trees are absent or achieve very low cover values as this community is closely related to and intergrades with Muskeg. When this community occurs in southern Wisconsin, it is often referred to as a **Bog Relict**.

Poor Fen

This acidic, weakly minerotrophic peatland type is similar to the Open Bog, but can be differentiated by higher pH, nutrient availability, and floristics. *Sphagnum* (*Sphagnum* spp.) mosses are common but don't typically occur in deep layers with pronounced hummocks. Floristic diversity is higher than in the Open Bog and may include white beak-rush (*Rhynchospora alba*), pitcher-plant (*Sarracenia purpurea*), sundews (*Drosera* spp.), pod grass (*Scheuchzeria palustris*), and the pink-flowered orchids (*Calopogon tuberosus*, *Pogonia ophioglossoides* and *Arethusa bulbosa*). Common sedges are (*Carex oligosperma*, *C. limosa*, *C. lasiocarpa*, *C. chordorrhiza*), and cotton-grasses (*Eriophorum* spp.).

Tamarack (poor) Swamp (formerly called Tamarack Swamp, this is a split from Curtis' Northern Wet Forest)

These weakly to moderately minerotrophic conifer swamps are dominated by a broken to closed canopy of tamarack (*Larix laricina*) and a frequently dense understory of speckled alder (*Alnus incana*). The understory is more diverse than in Black Spruce Swamps and may include more nutrient-demanding species such as winterberry holly (*Ilex verticillata*) and black ash (*Fraxinus nigra*). The bryophytes include many genera other than *Sphagnum*. Stands with spring seepage sometimes have marsh-marigold (*Caltha palustris*) and skunk-cabbage (*Symplocarpus foetidus*) as common understory inhabitants. These seepage stands have been separated out as a distinct type or subtype in some nearby states and provinces.

APPENDIX D

Flambeau River State Forest Species of Greatest Conservation Need

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on the Flambeau River State Forest in the North Central Forest Ecological Landscape. Only SGCN with a high or moderate probability of occurring in the North Central Forest Ecological Landscape are shown. Communities shown here are limited to those identified as “Major” or “Important” management opportunities in the Wisconsin Wildlife Action Plan (WDNR 2006d). Letters indicate the degree to which each species is associated with a particular habitat type (S=significant association, M=moderate association, and L=low association). Animal-community combinations shown here that are assigned as either “S” or “M” are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan (see dnr.wi.gov/org/land/er/WWAP/ for more information about these data). Shaded species have been documented at the Flambeau River State Forest.

Table D.1 Vertebrate Species of Greatest Conservation Need and Habitats for the North Central Forest.

	Major															Important			
	Alder Thicket	Coldwater streams	Coolwater streams	Emergent Marsh	Ephemeral Pond	Impoundments/Reservoirs	Inland lakes	Northern Hardwood Swamp	Northern Mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Open Bog	Submergent Marsh	Warmwater rivers	Warmwater streams	Floodplain Forest	Northern Dry-mesic Forest	Shrub Carr
Species that are Significantly Associated with the North Central Forest Landscape																			
American Bittern	L			S					S			S							L
American Marten							L	S		L	L						L	S	
American Woodcock	S				L		M	M	L	L	L	L					L	L	S
Bald Eagle						S	S						M	S			L		
Black-backed Woodpecker								L		S	L	L						L	
Black-billed Cuckoo	S						L	M	L	L							M	L	S
Black-throated Blue Warbler								S										M	
Boreal Chickadee										S	L								
Boreal Chorus Frog				S	S	S	S			S			S						
Canada Warbler	M						S	M		M	S							M	L
Four-toed Salamander	S	M	M	S	S		M	S	M	M	S	S					S		S
Gilt Darter														S	S				
Golden-winged Warbler	S						M	M		M	L	M						M	S
Gray Wolf	S						M	S	L	S	S	M					M	S	M
Hoary Bat	M	S	S	M	S	L	M	M	M	M	M	M	M	M	M	M	M	M	M
Lake Sturgeon						S	S							S					
Least Flycatcher							M	S			L						M	M	L
Lesser Scaup				L		M	M						S	M					
Longear Sunfish							M							M	M				
Mink Frog	M	M	S	S	M	S	S	L	L	S	L	L	S	S	S	S			M
Northern Flying Squirrel							M	S		S	S						M	S	
Northern Goshawk							L	S			L							M	
Northern Harrier	L			L					S			M							L
Olive-sided Flycatcher	L									S	M	M						L	L
Osprey						S	S						L	S					
Red Crossbill								L			L								S
Red-shouldered Hawk					S		L	M			L						S	M	
Silver-haired Bat	M	S	S	M	S	L	M	M	M	M	M	M	M	M	M	M	M	M	M
Spruce Grouse										S		M							

	Major														Important				
	Alder Thicket	Coldwater streams	Coolwater streams	Emergent Marsh	Ephemeral Pond	Impoundments/Reservoirs	Inland lakes	Northern Hardwood Swamp	Northern Mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Open Bog	Submergent Marsh	Warmwater rivers	Warmwater streams	Floodplain Forest	Northern Dry-mesic Forest	Shrub Carr
Species that are Significantly Associated with the North Central Forest Landscape...																			
Spruce Grouse												S		M					
Trumpeter Swan				S		M	M			L				L	S	L			
Veery	S							S	M		M	L					M	M	S
Water Shrew	M	S	S			L	M	S	M	L	S	S	L		L	M	M		L
Whip-poor-will										L								L	M
Wood Thrush								L	M		L	L					M	L	
Wood Turtle	S	S	S		M			M	S	M	M	M		S	S	S	S		S
Woodland Jumping Mouse	L				M			M	S	L	M	M	L				M	L	L
Species that are Moderately Associated with the North Central Forest Landscape																			
Black Tern				S		M	M			M					M				
Bobolink										S				M					
Brown Thrasher																			
Canvasback				L		M	M								S	S			
Cerulean Warbler										L								S	
Connecticut Warbler											M		M					L	
Eastern Red Bat	M	S	S	M	S	L	M	M	M	M	M	M	M	M	M	M	M	M	M
Greater Redhorse						M	M								M	S			
Moose	S	L	L	S		M	S	S	M	M	M	S	M	S	M	M	M	L	S
Mudpuppy		M	L			S	S								S				
Northern Long-eared Bat	M	S	S	M	S	L	M	M	M	M	L	L	M	M	M	M	M	M	M
Pickrel Frog	M	S	S	S	S	S	M		M	S	M	M	M	S	S	S	M		M
Rusty Blackbird	M			M	M								M				S		M
Sharp-tailed Grouse										M			L						L
Solitary Sandpiper	L	M	M	S	S					L			M			M	S		L

APPENDIX E

Wisconsin Natural Heritage Working List Explanation

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as “Endangered” or “Threatened” as well as species in the advisory “Special Concern” category. Most of the species and natural communities on the list are actively tracked and we encourage data submissions on these species. This list is meant to be dynamic - it is updated as often as new information regarding the biological status of species becomes available. See the Endangered Resources Program web site for the most recent Natural Heritage Inventory Working List (<http://dnr.wi.gov/org/land/er/wlist/>).

Working List Key

Scientific Name: Scientific name used by the Wisconsin Natural Heritage Inventory Program.

Common Name: Standard, contrived, or agreed upon common names.

Global Rank: Global element rank. See the rank definitions below.

State Rank: State element rank. See the rank definitions below.

US Status: Federal protection status in Wisconsin, designated by the Office of Endangered Species, U.S. Fish and Wildlife Service through the U.S. Endangered Species Act. LE = listed endangered; LT = listed threatened; XN = non-essential experimental population(s); LT,PD = listed threatened, proposed for delisting; C = candidate for future listing.

WI Status: Protection category designated by the Wisconsin DNR. END = endangered; THR = threatened; SC = Special Concern.

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are SC/P = fully protected; SC/N = no laws regulating use, possession, or harvesting; SC/H = take regulated by establishment of open closed seasons; SC/FL = federally protected as endangered or threatened, but not so designated by WDNR; SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

Global & State Element Rank Definitions

Global Element Ranks:

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU = Possibly in peril range-wide, but their status is uncertain. More information is needed.

GX = Believed to be extinct throughout its range (e.g. Passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? = Not ranked.

Species with a questionable taxonomic assignment are given a “Q” after the global rank.

Subspecies and varieties are given subranks composed of the letter “T” plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

State Element Ranks

S1 = Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in Wisconsin because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in Wisconsin (21 to 100 occurrences).

S4 = Apparently secure in Wisconsin, with many occurrences.

S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly although not every year); a few of these species (typically long-distance migrants such as some birds and butterflies) may have even bred on one or more of the occasions when they were recorded.

SE = An exotic established in the state; may be native elsewhere in North America.

SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SN = Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in Wisconsin. This category includes migratory birds and bats that pass through twice a year or, may remain in the winter (or, in a few cases, the summer) along with certain lepidoptera which regularly migrate to Wisconsin where they reproduce, but then completely die out every year with no return migration. Species in this category are so widely and unreliably distributed during migration or in winter that no small set of sites could be set aside with the hope of significantly furthering their conservation.

SZ = Not of significant conservation concern in Wisconsin, invariably because there are no definable occurrences in the state, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long-distance migrants whose occurrence during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. Typically, the SZ rank applies to a non-breeding population.

SR = Reported from Wisconsin, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports that are hard to dismiss because the habitat is now destroyed.

SRF = Reported falsely (in error) from Wisconsin but this error is persisting in the literature.

SU = Possibly in peril in the state, but their status is uncertain. More information is needed.

SX = Apparently extirpated from the state.

State Ranking of Long-Distance Migrant Animals:

Ranking long distance aerial migrant animals presents special problems relating to the fact that their non-breeding status (rank) may be quite different from their breeding status, if any, in Wisconsin. In other words, the conservation needs of these taxa may vary between seasons. In order to present a less ambiguous picture of a migrant's status, it is necessary to specify whether the rank refers to the breeding (B) or non-breeding (N) status of the taxon in question. (e.g. S2B,S5N).

APPENDIX F

Summary of Breeding Bird Data from 2000-2001 Surveys

Breeding Bird Surveys were conducted in 2000-2001 by Joan Elias using the point count method. Selected records from a federal BBS that crosses the FRSF (provided by Linda Parker, Chequamegon-Nicolet National Forest Ecologist) were included. Observation points were chosen to cover an array of important bird habitats. The table below is an overall list of species found on the property; additional data were collected during the surveys that allow the observations to be broken down by habitat. Not all bird survey information collected during, after, or prior to the biotic inventory of the FRSF is included here (e.g., forest raptor surveys, incidental breeding season observations from other observers, waterfowl and game bird surveys, nocturnal bird surveys, migratory bird counts, and Christmas Bird Counts. Additional surveys are needed for select areas (see Appendix B for more information), and future inventory / monitoring may be recommended in some areas in the future.

Table F.1. Numbers of birds observed during point counts, Flambeau River State Forest, June 2000. Total number of birds = 1560.

Ovenbird	309	Golden-winged Warbler	8	Eastern Phoebe	1
Red-eyed Vireo	239	Wood Thrush	8	Mallard	1
Black-throated Green Warbler	95	Northern Parula	7	Swainson's Thrush	1
Chestnut-sided Warbler	71	Pine Warbler	7	Whip-poor-will	1
Least Flycatcher	50	Brown-headed Cowbird	6	Yellow Warbler	1
Rose-breasted Grosbeak	50	Golden-crowned Kinglet	5		
Hermit Thrush	45	Yellow-throated Vireo	5		
Blackburnian Warbler	40	Red-breasted Nuthatch	4		
Nashville Warbler	37	Ruby-throated Hummingbird	4		
American Robin	36	Savannah Sparrow	4		
White-throated Sparrow	32	Chipping Sparrow	3		
American Redstart	31	Magnolia Warbler	3		
Common Yellowthroat	31	Blue-headed Vireo	3		
Blue Jay	30	American Crow	2		
Mourning Warbler	30	American Goldfinch	2		
Black-and-white Warbler	29	Black-billed Cuckoo	2		
Yellow-bellied Sapsucker	28	Chimney Swift	2		
Scarlet Tanager	17	Cedar Waxwing	2		
Song Sparrow	17	Downy Woodpecker	2		
Yellow-bellied Flycatcher	17	Eastern Kingbird	2		
Eastern Wood Pewee	16	Gray Catbird	2		
Indigo Bunting	16	Louisiana Waterthrush	2		
Sedge Wren	16	Northern Flicker	2		
Yellow-rumped Warbler	16	Northern Waterthrush	2		
Black-capped Chickadee	15	Ruffed Grouse	2		
Red-winged Blackbird	14	Tree Swallow	2		
Canada Warbler	13	American Bittern	1		
Great-crested Flycatcher	13	Baltimore Oriole	1		
Winter Wren	13	Black-throated Blue Warbler	1		
White-breasted Nuthatch	12	Bobolink	1		
Purple Finch	10	Broad-winged Hawk	1		
Alder Flycatcher	9	Brown Thrasher	1		
Hairy Woodpecker	9	Cape May Warbler	1		
Lincoln's Sparrow	9	Cerulean Warbler	1		
Swamp Sparrow	9	Common Raven	1		
Veery	9	Connecticut Warbler	1		
Palm Warbler	9	Dark-eyed Junco	1		
Brown Creeper	8	Eastern Bluebird	1		

