



Rapid Ecological Assessment for the Florence County Wild Rivers and Barrens Planning Group

**A Rapid Ecological Assessment Focusing on Rare Plants, Selected Rare Animals, and
High-quality Natural Communities**

Properties included in this report are:

Haley Creek Swamp State Natural Area
Pine-Popple Wild Rivers
Spread Eagle Barrens State Natural Area

Wisconsin's Natural Heritage Inventory Program
Bureau of Endangered Resources
Department of Natural Resources
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The Florence County Wild Rivers and Barrens Planning Group At a Glance

Exceptional Characteristics of the Study Area

- **Rare Animals and Plants.** The diverse habitats of the Florence County Wild Rivers and Barrens Planning Group (PPSE) support numerous rare species. Forty-three rare animal species are known from the PPSE, including five State Threatened and 34 Special Concern species. Fifteen rare plant species are known from the PPSE, including one State Endangered, one State Threatened, and 13 Special Concern species.
- **Landscape-scale Management and Old-growth Forests.** The PPSE, in combination with surrounding lands is one of the most significant opportunities in the state to manage for old-growth forests within a landscape of older forests. Old-growth forests are present within the Haley Creek Swamp SNA with hemlock forests containing trees approaching 250 years old, northern white-cedar forests with trees approaching 300 years old, and forested wetlands with older tamarack and black spruce.
- **Breeding Bird Diversity.** There is a rich and diverse birdlife throughout the PPSE with 94 species of breeding birds noted from the Savage-Robago Lakes area alone. The PPSE provides habitat for rare and declining forest interior birds, forest raptors, grassland and shrub birds, and birds of conifer forests.
- **Bracken Grassland and Barrens.** This is the best place in the state to manage for Bracken Grassland, a natural community characterized by open areas of bracken fern with Pennsylvania sedge, grasses, and blueberries.
- **Rare Herptiles.** The PPSE provides nesting habitat for the State-Threatened Wood Turtle and additional opportunities to improve nesting habitat.

Site Specific Opportunities for Biodiversity Conservation

Two ecologically important sites were identified on the PPSE. These “Primary Sites” were delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan.

- **Goodman Wild Lakes and Pine River.** The boundaries of this site are defined based on known boundaries of high-quality natural communities with a focus on the area containing the Pine-Popple Wild Rivers. This site comprises WDNR fee title and easement property (including a WDNR-owned State Natural Area), private land, and Chequamegon-Nicolet National Forest land, (including a designated State Natural Area). This site provides significant opportunities to protect and enhance old-growth forests.
- **Spread Eagle Barrens SNA.** This site includes all of the Spread Eagle Barrens SNA, and provides significant opportunities to manage for Bracken Grassland. Bracken Grassland is a regionally unique type of Pine Barrens that is only known from the Northeast Sands Ecological Landscape. The largest stands of this type in Wisconsin occur at this site, making this site the best place in the state to manage for it and for the many rare or declining species of large open landscapes that live here.

Introduction

Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the Florence County Wild Rivers and Barrens Planning Group (PPSE; Figure 1). The regional ecological context for the PPSE is also provided to assist in developing the Regional and Property Analysis that is part of the master plan. Properties included in this assessment are:

- Haley Creek Swamp State Natural Area
- Pine-Popple Wild Rivers
- Spread Eagle Barrens State Natural Area

The primary objectives of this project were to collect biological inventory information relevant to the development of a master plan for the PPSE and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of documented or potential habitat for rare species and identifying natural community management opportunities.

Survey efforts for the PPSE were limited to a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning although inventory efforts were reduced compared to similar projects conducted on much larger properties such as state forests. There will undoubtedly be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work.

Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR’s Bureau of Endangered Resources and a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see www.NatureServe.org for more information), coordinates the network.

Natural heritage programs track certain elements of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The NHI Working List contains the elements tracked in Wisconsin. They include endangered, threatened, and special concern plants and animals, as well as the natural community types recognized by NHI. The NHI Working List is periodically updated to reflect new information about the rarity and distribution of the state’s plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR website (*Wisconsin Natural Heritage Working List*).

The Wisconsin NHI program uses standard methods for biotic inventory to support master planning (Appendix A). Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

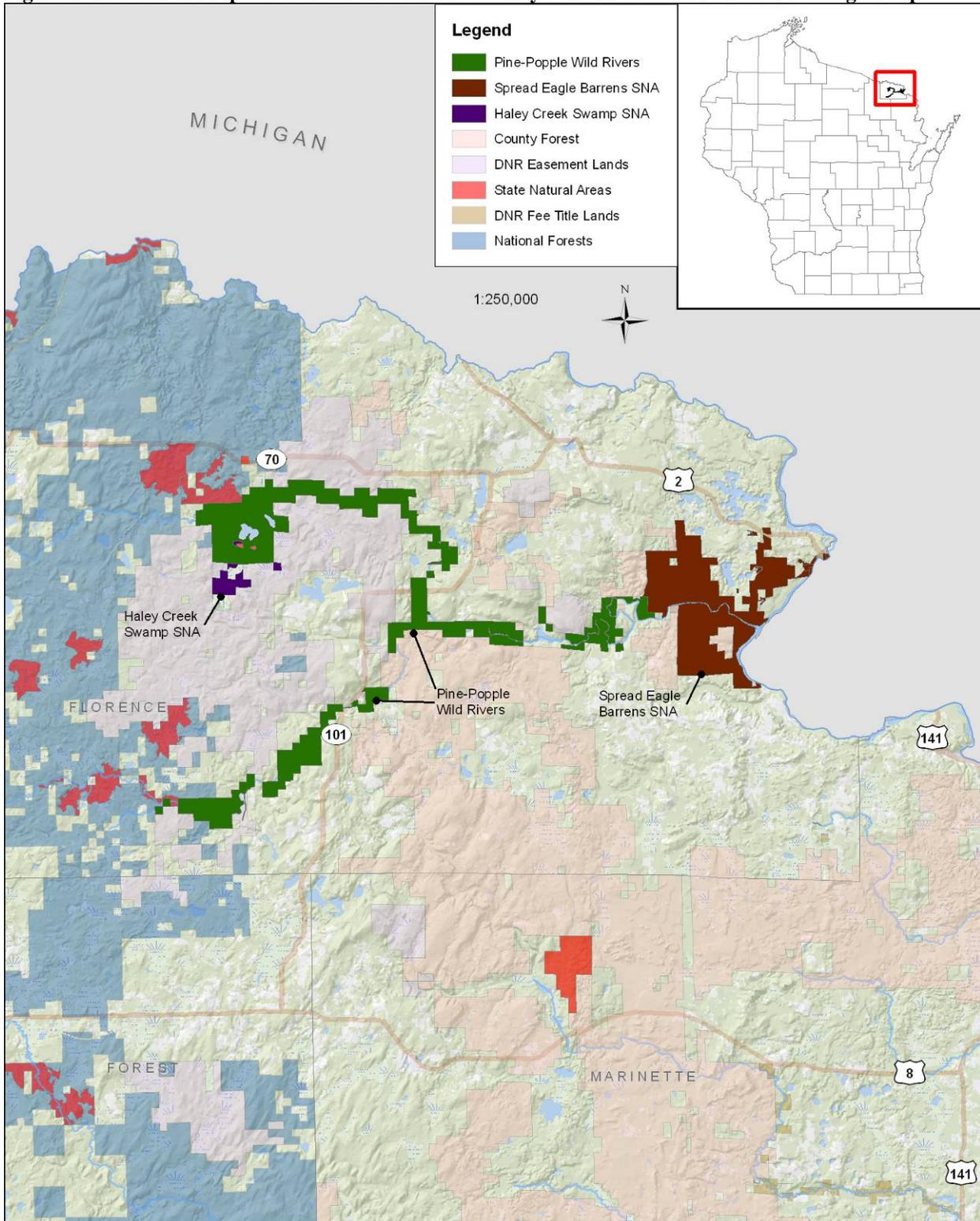
Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the PPSE were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureaus of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but include some surveys for rare plants and animals, 2) breeding bird surveys on State Natural Areas, 3) surveys conducted for the *Biodiversity in Selected Natural Communities Related to Global Climate Change* (Peatlands Project; Anderson et al. 2008), and 4) taxa specific surveys.

The most recent taxa-specific field surveys for the study area were conducted during 2010. Surveys were limited in scope and focused on documenting high quality natural communities, rare plants, breeding birds, herptiles, and forest raptors. The collective results from all of these surveys were used, along with other information, to identify ecologically important areas (Primary Sites) on the PPSE.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the PPSE, key inventory considerations included the identification of high quality barrens, forests, and wetland communities and the location of habitats that had the potential to support rare species. Private lands, including easements, surrounding the PPSE were not surveyed.

Scientific names for all species mentioned in the text are included in a list on page 44.

Figure 1. Location of Properties within the Florence County Wild Rivers and Barrens Planning Group



Background on Past Efforts

Various large-scale research and planning efforts have identified a number of locations within the PPSE as being ecologically significant. The following are examples of such projects and the significant features identified.

Land Legacy Report

The Land Legacy Report (WDNR 2006a) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. Pine-Popple Wild River and Spread Eagle Barrens State Natural Area (SNA) were recognized as having high conservation significance. Both sites were assigned a score of four points on their five-point scale, meaning they possess "excellent ecological qualities, are of adequate size to meet the needs of most of the critical components, and/or harbor natural communities or species of continental significance" (WDNR 2006a).

Important Bird Area

Important Bird Areas (IBA; WDNR 2007) are critical sites for the conservation and management of Wisconsin's birds.

- Spread Eagle Barrens SNA was recognized for its importance to birds associated with Pine Barrens including rare or declining species of large open landscapes.
- Lauterman Lake, which includes an extensive area of the Chequamegon-Nicolet National Forest and the Pine-Popple Wild Rivers property, is one of the state's most significant breeding areas for birds of northern hardwood forests.

Wisconsin Wildlife Action Plan: Conservation Opportunity Areas

The Wisconsin Wildlife Action Plan (WAP; WDNR 2006b) recognized two Conservation Opportunity Areas (COA) within the PPSE (see Appendix B). Conservation Opportunity Areas are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective.

- The Nicolet Hemlock Hardwoods COA, which includes the northwest part of the Pine-Popple Wild Rivers property, was recognized because of the large blocks of forest containing a preponderance of older forest in an area where climate change models indicate the climate should be ameliorated by the cooling effects of the Great Lakes.
- The Spread Eagle Barrens COA was recognized because of the Bracken Grassland, Northern Dry Forest, and Northern Wet Forest present.
- The Pine-Popple rivers were recognized as an aquatic COA.

The Nature Conservancy's Superior Mixed Forest Ecoregion Conservation Plan

The Nature Conservancy's (TNC) Superior Mixed Forest Ecoregion Conservation Plan (TNC 2002) covers 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 plan resulted in a set of terrestrial and aquatic "Conservation Areas" that represent viable natural community types, globally rare native species, and other selected features. Spread Eagle Barrens SNA and the Pine-Popple Wild Rivers property, as part of the Pine, Popple, and Peshtigo Headwaters site were both recognized as terrestrial Conservation Areas.

Wisconsin Wetlands Association Wetland Gems

The PPSE was recognized by the Wisconsin Wetlands Association (WWA) as having one "wetland gem" (WWA 2010). These habitats are critically important to Wisconsin's biodiversity, provide nearby communities with valuable functions and services, and serve as recreational and educational opportunities. The Savage-Robago Lakes wetland, in the northwest area of the Pine-Popple Wild Rivers

property, was recognized as a wetland gem because of the old-growth coniferous swamp, alder thicket, fen, and marsh habitats that are excellent wildlife habitat.

Special Management Designations

State Natural Areas are places on the landscape that protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. Designation confers a significant level of land protection through state statutes, administrative rules, and guidelines. State Natural Areas within the PPSE are:

- Spread Eagle Barrens SNA
- Haley Creek Swamp SNA

The Wisconsin **Wild Rivers** program was established by the 1965 Legislature with the enactment of s. 30.26, Wis. Stats. in order to afford the people of the state an opportunity to enjoy natural streams, to attract out-of-state visitors and assure the well-being of the tourist industry, and to preserve some rivers in a free flowing condition and protect them from development. Currently, four rivers, or portions of those rivers, are designated as Wild Rivers. These include the Pine-Popple River. Within DNR-owned lands of a designated Wild River, state statute specifies: no vegetative control within 150 feet from the bank on either side of the river, walk-in access only, no motorized vehicles, no stream alterations, no maintained trails, and few developed parking lots or canoe put-ins. These rules are intended to preserve the wild and scenic qualities of the river.

Forest Certification

All DNR-managed lands, including state parks, wildlife areas, and natural areas, are recognized by the Forest Stewardship Council and the Sustainable Forestry Initiative as being responsibly managed (WDNR 2009). This certification emphasizes the state's commitment to responsibly managing and conserving forestlands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

Public Lands

The PPSE is within an extensive area of public lands. These include the Chequamegon-Nicolet National Forest, county forests, and DNR-owned and easement lands associated with this planning group. Also of importance are State Natural Areas owned by the United States Forest Service.

Regional Ecological Context

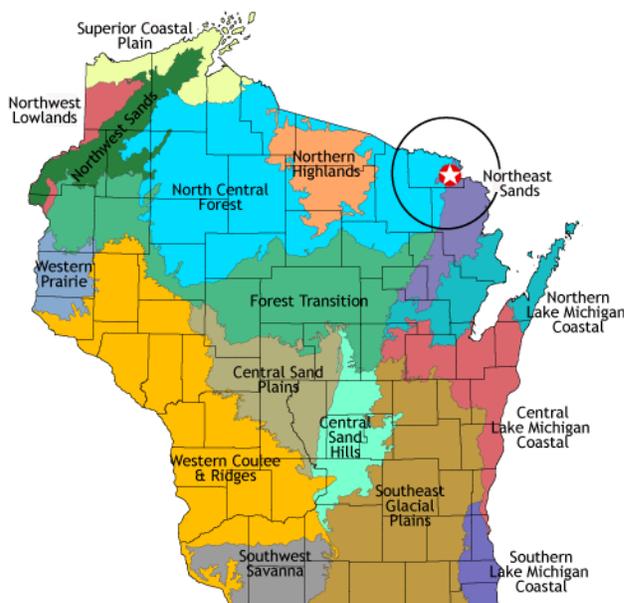
North Central Forest and Northeast Sands Ecological Landscapes

This section is largely reproduced from the Ecological Landscapes of Wisconsin Handbook (WDNR In Prep. a). The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are 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 PPSE is located in both the North Central Forest and Northeast Sands Ecological Landscapes (WDNR In Prep. a) (Figure 2). The **North Central Forest Ecological Landscape** occupies much of the northern third of Wisconsin. Its landforms are characterized by end and ground moraines with some pitted outwash and bedrock controlled areas. Kettle depressions and steep ridges are found in the northern portion.

The historical vegetation was primarily hemlock-hardwood forest dominated by hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghanensis*). There were some smaller areas of white and red pine (*Pinus strobus*, *P. resinosa* respectively) forest scattered throughout the Ecological Landscape, and individual white pine trees were a component of the hemlock-hardwood forest. Harvesting hemlock to support the tanneries was common at the turn of the century, and the species soon became a minor component of forests due to over-harvesting and lack of regeneration.

Figure 2. Ecological Landscapes of Wisconsin and the study area.



Currently, forests cover approximately 80% of this Ecological Landscape. The northern hardwood forest is dominant, made up of sugar maple, basswood (*Tilia americana*), and red maple (*Acer rubrum*), with

some scattered hemlock, yellow birch, red oak (*Quercus rubra*), white ash (*Fraxinus americana*), balsam fir (*Abies balsamea*), and white pine pockets within stands. The aspen-birch forest type group is also relatively abundant, followed by spruce-fir. In general, there has been a substantial decrease of hemlock, yellow birch, and white pine. A variety of forested and non-forested wetland community types are also present, and wet-mesic forests are more numerous here than elsewhere in the state.

Rivers, streams, and springs are common and found throughout this Ecological Landscape.

The **Northeast Sands Ecological Landscape** occupies a relatively narrow, vertical band of land in northeast Wisconsin. This Ecological Landscape formed in glacial outwash sand plains (some of them pitted), and has steep outcropping Precambrian bedrock knolls of basalt, rhyolite, and granite. Sandy ground moraines and end moraines are also interspersed in the Ecological Landscape.

Historically, extensive oak/jack pine (*Pinus banksiana*) barrens and jack pine forests were found in the outwash sand portions of this Ecological Landscape. Moraines supported forests of hardwoods, red pine, and white pine. Outwash plains often contained pitted depressions, resulting in numerous wetlands and kettle lakes. Most of this Ecological Landscape is still forested; aspen (*Populus* sp.) predominates, followed by northern hardwoods. Jack pine remains on the outwash plains along with northern pin oak (*Quercus ellipsoidalis*). There are several important occurrences of jack pine/oak barren communities. A small percentage of this Ecological Landscape contains spruce-fir-cedar forest and lowland hardwood forest. The Brazeau Swamp is one of the best representations of large northern white-cedar (*Thuja occidentalis*) swamp forests in northern Wisconsin. The Northeast Sands contains several important river systems as well as extensive wetlands.

Regional Biodiversity Needs and Opportunities

Opportunities for sustaining natural communities in the North Central Forest and Northeast Sands Ecological Landscapes were developed by the Ecosystem Management Planning Team (EMPT 2007) and later presented in the Wisconsin Wildlife Action Plan (WDNR 2006b). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the Ecological Landscape while maintaining important components of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within the North Central Forest and Northeast Sands Ecological Landscapes.

There are management opportunities for 25 natural communities in the North Central Forest Ecological Landscape. Of these, 19 are considered “major” opportunities (Table 1). A “major” opportunity indicates that the natural communities can be sustained in the Ecological Landscape, either because many significant occurrences of the natural community have been recorded in the landscape or major restoration activities are likely to be successful in maintaining the community's composition, structure, and ecological function over a longer period of time. An additional six natural communities are considered “important” in this landscape. An “important” opportunity indicates that although the natural community does not occur extensively or commonly in the Ecological Landscape, one to several occurrences are present and are important in sustaining the community in the state. In some cases, important opportunities may exist because the natural community may be restricted to just one or a few Ecological Landscapes within the state and there may be a lack of opportunities elsewhere.

Table 1. Major Natural Communities Management Opportunities in the North Central Forest Ecological Landscape (EMPT 2007 and WDNR 2006b)

Alder Thicket	Emergent Marsh	Northern Hardwood Swamp	Open Bog
Bedrock Glade	Ephemeral Pond	Northern Mesic Forest	Submergent Marsh
Coldwater streams	Impoundments/Reservoirs	Northern Sedge Meadow	Warmwater rivers
Coolwater streams	Inland lakes	Northern Wet Forest	Warmwater streams
Dry Cliff	Moist Cliff	Northern Wet-mesic Forest	

There are management opportunities for 21 natural communities in the Northeast Sands Ecological Landscape. Of these, eight are considered “major” opportunities (Table 2) and an additional 13 natural communities are considered “important” in this landscape.

Table 2. Major Natural Communities Management Opportunities in the Northeast Sands Ecological Landscape (EMPT 2007 and WDNR 2006b)

Bracken Grassland	Coolwater streams	Northern Dry-mesic Forest	Pine Barrens
Coldwater streams	Northern Dry Forest	Northern Wet-mesic Forest	Warmwater rivers

Rare Species of the North Central Forest and Northeast Sands Ecological Landscape

Numerous rare species are known from the North Central Forest and Northeast Sands Ecological Landscapes. “Rare” species include all of those species on the WDNR’s NHI Working List (*Wisconsin Natural Heritage Working List*) that are classified as “Endangered,” “Threatened,” or “Special Concern.” Table 3 lists the number of species known to occur in the North Central Forest and Table 4 lists the number of species known to occur in the Northeast Sands Ecological Landscape based on information stored in the NHI database as of 2009.

Table 3. Listing Status for rare species in the North Central Forest Ecological Landscape as of 2009. Source is the NHI database.

Listing Status	Birds	Fishes	Herptiles	Invertebrates	Mammals	Plants	Total Fauna	Total Flora	Total Rare
WI Endangered	2	0	0	6	1	15	9	15	24
WI Threatened	4	5	2	4	0	15	15	15	30
WI Special Concern	19	7	4	50	7	65	87	65	152
U.S. Endangered	0	0	0	0	1	0	1	0	1
U.S. Threatened	0	0	0	0	0	1	0	1	1
U.S. Candidate	0	0	0	1	0	0	1	0	1

Table 4. Listing Status for rare species in the Northeast Sands Ecological Landscape as of 2009. Source is the NHI database.

Listing Status	Birds	Fishes	Herptiles	Invertebrates	Mammals	Plants	Total Fauna	Total Flora	Total Rare
WI Endangered	1	0	0	4	0	3	5	3	8
WI Threatened	1	2	2	4	0	7	9	7	16
WI Special Concern	7	2	2	32	3	41	46	41	87
U.S. Endangered	0	0	0	1	1	0	2	0	2
U.S. Threatened	0	0	0	0	0	0	0	0	0
U.S. Candidate	0	0	0	0	0	0	0	0	0

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need (SGCN). Species of Greatest Conservation Need are animals that have low and/or declining populations that are in need of conservation action. They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g. dragonflies, butterflies, and freshwater mussels) that are:

- Already listed as threatened or endangered;
- At risk because of threats to their life history needs or their habitats;
- Stable in number in Wisconsin, but declining in adjacent states or nationally.
- Of unknown status in Wisconsin and suspected to be vulnerable.

SGCN status is independent of State Listing Status and the NHI Working List. Most but not all SGCNs are on the NHI Working List (published April 2009); in addition, the NHI Working List also includes rare species that are not designated as SGCN. There are 36 vertebrate SGCN significantly associated with the North Central Forest Ecological Landscape and 22 vertebrate SGCN significantly associated with the

Northeast Sands Ecological Landscape (See Appendix E). This means that these species are (and/or historically were) significantly associated with the Ecological Landscape, and that restoration of natural communities with which they are associated would significantly improve conditions for their survival.

Description of the Study Area

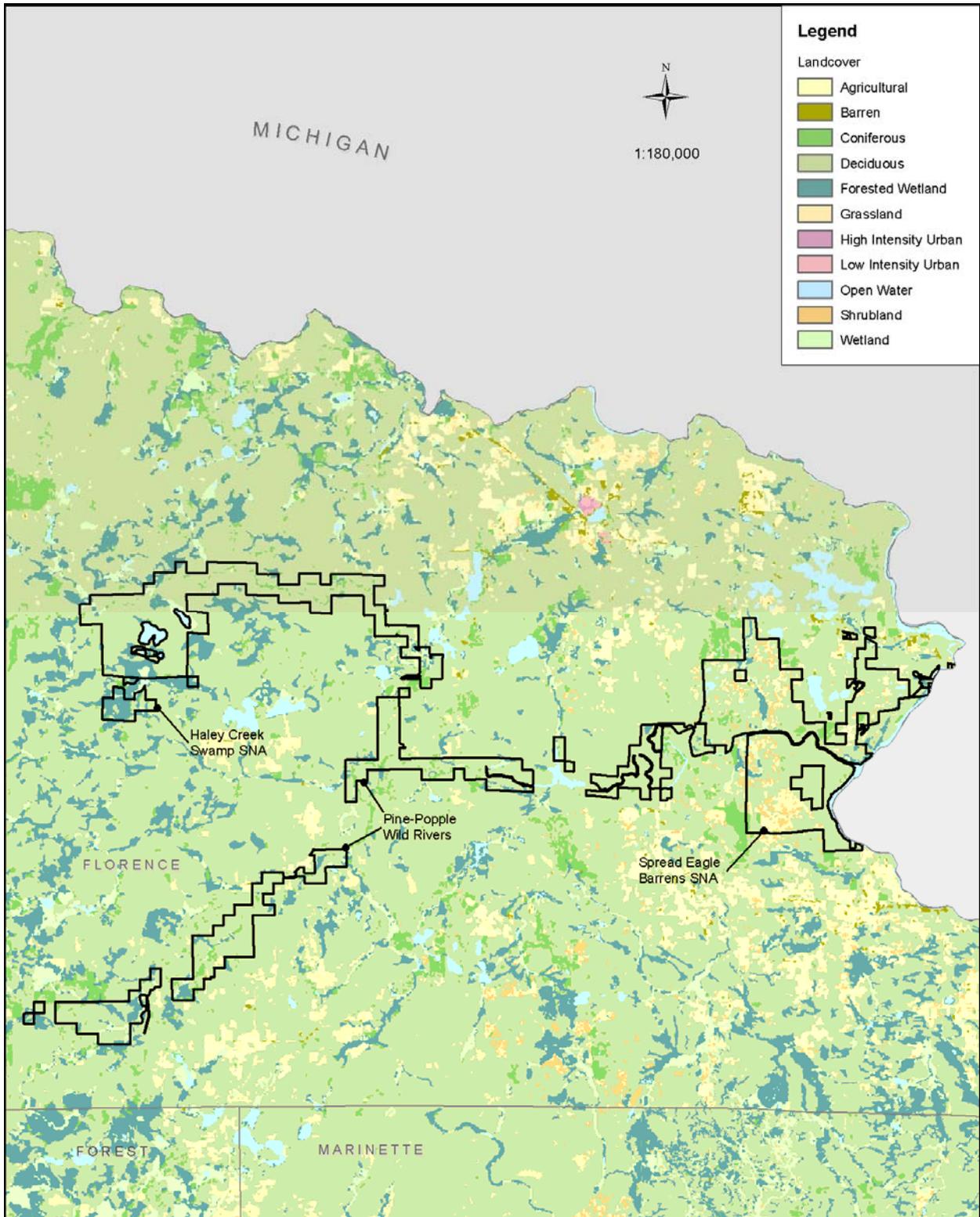
Location and Size

Comprising ca. 18,673 acres, the PPSE is located in Florence county along almost 27 miles of the Pine and Popple rivers, which converge in this study area and drain into the Menominee River along the Michigan border (Figure 1). The PPSE occurs within an extensive area of forests, forested wetlands, and conifer forests, along with open barrens of grasses, shrubs, and scattered trees. (Figure 3).

Properties included in the PPSE are:

- **Pine-Popple Wild Rivers** (11,382 acres), containing **Haley Creek Swamp State Natural Area**, is located in central Florence County about five miles south of the town of Florence.
- **Spread Eagle Barrens State Natural Area** (7,291 acres) is located in east-central Florence County about 2.5 miles northwest of the town of Iron Mountain, Michigan. The property is split in half by the Pine-Popple River and is bordered on the east by the Menominee River, the border with Michigan.

Figure 3. Landcover for the Florence County Wild Rivers and Barrens Planning Group from the Wisconsin DNR Wisland GIS coverage (WDNR 1993).



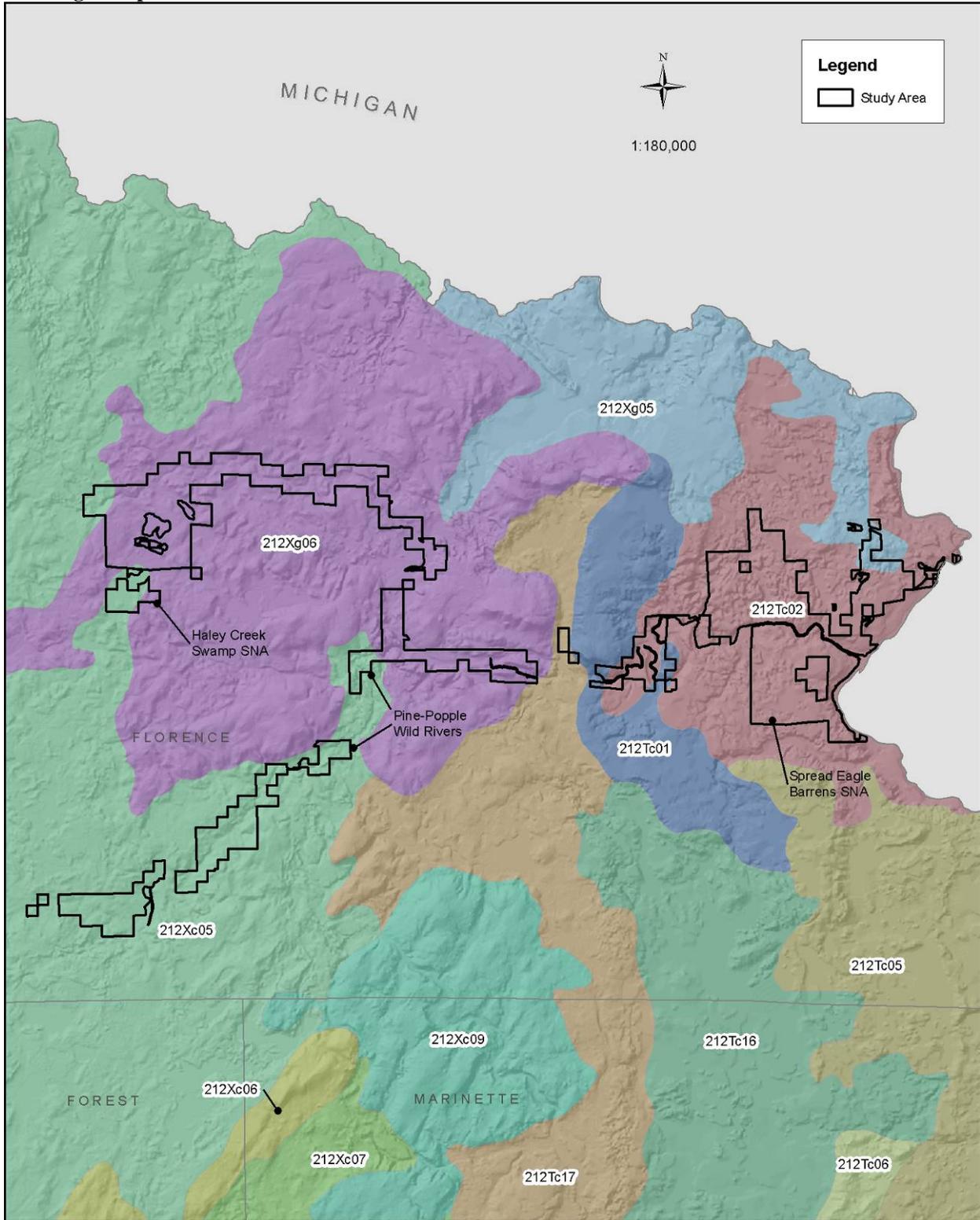
Ecoregion

Nested hierarchically within each Ecological Landscape are Subsections derived from the NHFEU and each Subsection is further divided into Landtype Associations (LTAs) (Cleland et al. 1997). The Subsections and LTAs within this study area are the Athelstane Sandy Outwash and Moraines, Crystal Falls Plains and Hills, and the Brule and Paint Rivers Drumlinized Ground Moraine Subsections are the most significant to this study area. Six Landtype Associations (LTA; Figure 4) are present within the study area. Landtype Associations represent an area of 10,000 – 300,000 acres and contain similarities of landform, soil, and vegetation.

The following Landtype Associations are within the study area:

- **Spread Eagle Barrens (212Tc02).** The characteristic landform pattern is rolling collapsed outwash plain. Soils are predominantly excessively drained loamy sand over outwash. The LTA comprises 42% of the study area.
- **Fern Moraines (212Xg06).** The characteristic landform pattern is rolling bedrock-controlled moraines and outwash plains. Soils are predominantly well drained silt loam over acid loamy sand till, igneous/metamorphic bedrock, or outwash. The LTA comprises 35% of the study area.
- **Popple River Knolls (212Xc05).** The characteristic landform pattern is rolling collapsed outwash plain with swamps and bogs common. Soils are predominantly well drained sandy loam over outwash. The LTA comprises 19% of the study area.
- **Florence Moraines (212Xg05).** Landform pattern is rolling collapsed moraines and outwash plains with bedrock knolls and ridges. Soils are predominantly well drained fine sandy loam over outwash, acid sandy loam till, or igneous/metamorphic bedrock. The LTA comprises 2% of the study area.
- **Homestead Moraines (212Tc01).** The characteristic landform pattern is undulating moraine. Soils are predominantly moderately well drained silty and sandy soils over calcareous loam till. The LTA comprises 1% of the study area.
- **Sand Lake Plains (212Tc17).** The characteristic landform pattern is undulating outwash plain and morainic knolls. Soils are predominantly excessively drained loamy sand over outwash. The LTA comprises <1% of the study area.

Figure 4. Landtype Associations for the area comprising the Florence County Wild Rivers and Barrens Planning Group.



Physical Environment

Geology and Geography

The PPSE lies within the southern portion of the Canadian Precambrian Shield which consists of granite and undifferentiated igneous and metamorphic rocks. These formations are estimated to be 5,000 to 15,000 feet thick (Carlson et al. 1971). The bedrock has been complexly folded and faulted and is drift-covered, with exposures on ridges and along streams. During the Wisconsin glaciation this area was covered by the Langelde lobe resulting in rolling collapsed outwash plains and moraines.

Soils

The soils of the PPSE are mostly the result of weathering of glacial deposits. A line runs roughly through the center of the PPSE that divides the planning group, as well as the county, between grayish loams and sandy loams in the west and sands in the east (Carlson et al. 1971). The grayish loams of the west were formed from glacial deposits which were derived from bedrock. The sands of the east were formed from sandy parent materials which were derived from the Cambrian and Lake Superior sandstone formations.

Hydrology

The Pine and Popple Rivers are the main hydrologic features of the PPSE. The Pine River, a tributary to the Menominee River, is a medium hard water river with slightly acid, light brown water (Carlson et al. 1971). One impoundment, the Pine River Flowage, is located on the river. Along the entire length of the Pine River are 44 tributary streams and 28 tributary lakes. The Popple River, a main tributary to the Pine River, is a hardwater stream with slightly acid, light brown water (Carlson et al. 1971). Along the entire length of the Popple River are 30 tributary streams and 10 lakes draining into the river.

Named tributaries to the Pine and Popple Rivers within the PPSE are: Hendricks Creek, Johnson Creek, Kieper Creek, Lamon Tanguie Creek, Lauterman Creek, Lepage Creek, Meyers Creek, Mud Creek, Rock Creek, Seidel Creek, Sevenmile Creek, Wakefield Creek, and Woods Creek.

The majority of the named lakes within the PPSE are concentrated in the northwest section of the planning group. Within this area are Dorothy, Haley, Mud, Robago, and Savage Lakes. Sand Lake, the only other named lake on the PPSE is located in Spread Eagle Barrens SNA.

Vegetation

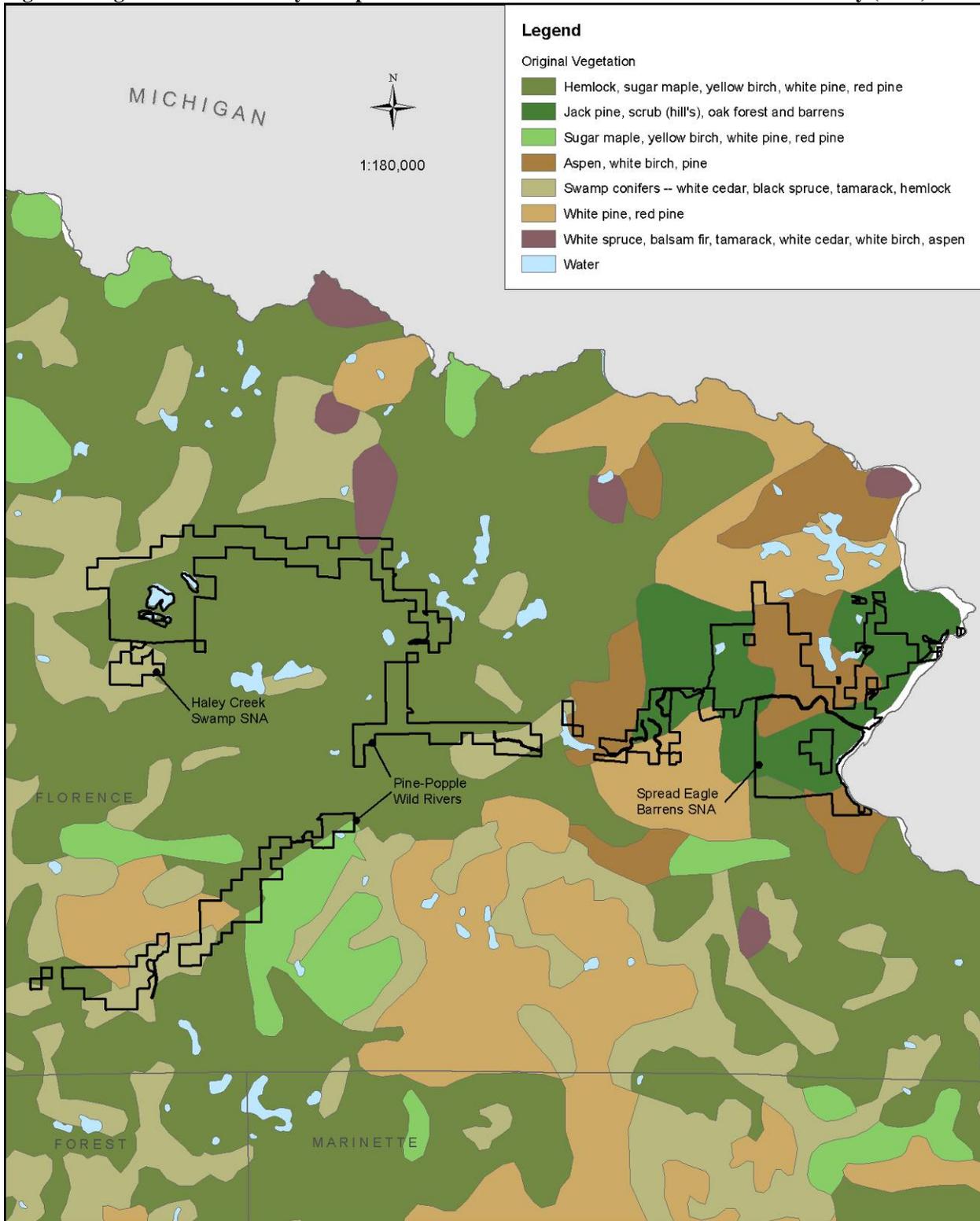
Historical Vegetation

Data from the original Public Land Surveys are often used to infer forest composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American settlement. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Although data are limited to a specific snapshot in time, they provide valuable insights into Wisconsin's ecological capabilities. Maintaining or restoring some lands to more closely resemble historical systems and including some structural or compositional components of the historical landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In Prep. a). Public Land Surveys for the area comprising the PPSE were conducted between 1856 and 1865.

Finley's (1976) Pre-settlement Vegetation map (Figure 5) identifies the historical vegetation of the PPSE as being split along the same line as the soils, with Northern Mesic Forests dominating the grayish loams

of the western half of the planning group and Northern Dry Forests and barrens dominating the sands of the eastern half. The Northern Mesic Forests consisted of hemlock, sugar maple, yellow birch, white pine, and red pine. Also in the western half of the PPSE were forests of swamp conifers (northern white-cedar, black spruce [*Picea mariana*], tamarack [*Larix laricina*], and hemlock), pines (white and red), and a Northern Mesic Forest variant that did not include hemlock. The Northern Dry Forest and barrens, found in the eastern half, were dominated by jack pine and northern pin oak. Also in the eastern half were forests of aspen, white birch (*Betula papyrifera*), and pine.

Figure 5. Vegetation for the study area prior to Euro-American settlement. Data are from Finley (1976).



Current Vegetation

Many of the factors that historically impacted current vegetation, such as timber management and fire suppression, continue to impact the study area today. Environmental factors including geology, soils, hydrology, and climate, along with emerging threats such as non-native invasive species and deer browse, also impact vegetation.

The Pine-Popple Wild Rivers is primarily forested, with 92% of the stands classified as forest according to the WDNR forest reconnaissance data. The majority of the forests are described by either the northern hardwoods or aspen cover types. Figure 6 illustrates the extent of the forest cover types from Forest Reconnaissance data for the Pine-Popple Wild Rivers.

Current vegetation for Spread Eagle Barrens SNA is split between forested and open cover types, with 56% of the stands classified as forest according to the WDNR forest reconnaissance data. The vast majority of the forests that are present are best described by the aspen cover type. Figure 7 illustrated the extent of the forest cover types from the Forest Reconnaissance data for Spread Eagle Barrens SNA.

The majority of the Pine-Popple Wild Rivers and Haley Creek Swamp SNA are within the North Central Forest Ecological Landscape. The composition, structure, and age classes of the forests are different than forests found in the mid-1800s. Much of the upland forests that are now dominated by northern hardwoods and aspen were once a mixed forest of hemlock, sugar maple, yellow birch, and white and red pine. This mixed forest is still present on a small percentage of the Pine-Popple Wild Rivers, representing a restoration and conservation opportunity.

Throughout the Pine-Popple Wild Rivers, Northern Mesic Forests and Northern Wet-mesic Forests types continue to persist, although the relative sizes of the forests are much smaller and some of the areas have had very recent timber management. Many of these forests occur on river-side terraces, a unique feature of large rivers that supports both wetland and upland species. Feeder streams to the Pine River support Northern Wet-mesic Forests and forested seeps with a canopy of hemlock, northern white-cedar, white spruce (*Picea glauca*), black ash, yellow birch, and sugar maple. Steep slopes along the river are dominated by hemlock. Bedrock outcrops along the river are variably forested, from scattered red pine to Northern Mesic Forests.

Northern Mesic Forest

The highest-quality and largest examples of natural communities on the Pine-Popple Wild Rivers are centered around the Savage-Robago Lakes area and Haley Creek Swamp SNA. The majority of this area is characterized as a Northern Mesic Forest that has been selectively logged, some having occurred in recent years. The resulting canopy cover varies from sparse to dense and is dominated by sugar maple (8-18 inch diameter at breast height [dbh], a few to 28 inch) with hemlock, basswood (*Tilia americana*), yellow birch, and northern white-cedar as associates. Hemlock groves are present with 12-24 inch dbh trees. The subcanopy cover is moderate to dense and dominated by sugar maple with hemlock, basswood, yellow birch and northern white-cedar as associates. The sapling cover is sparse to moderately dense and dominated by sugar maple with basswood, hemlock, yellow birch, American elm (*Ulmus americana*), ironwood (*Ostrya virginiana*), and white ash as associates. The shrub cover is sparse with red elderberry (*Sambucus racemosa*), red raspberry (*Rubus idaeus*), American fly honeysuckle (*Lonicera canadensis*), and mountain maple (*Acer spicatum*). The herb layer is diverse and varies from depauperate to moderately rich to very rich. Within the depauperate areas, Pennsylvania sedge (*Carex pennsylvanica*), wild sarsaparilla (*Aralia nudicaulis*), and large-leaved aster (*Aster macrophyllus*), are dominant. Characteristic herb species in the more diverse areas include numerous spring ephemerals such as spring-beauty (*Claytonia caroliniana*), Dutchman's-breeches (*Dicentra cucullaria*), squirrel-corn (*D. canadensis*), yellow trout-lily (*Erythronium americanum*), broad-leaved toothwort (*Dentaria diphylla*),

cut-leaved toothwort (*D. laciniata*), wild leek (*Allium tricoccum*), bloodroot (*Sanguinaria canadensis*), and large-flowered trillium (*Trillium grandiflorum*), along with longer-persisting bishop's-cap (*Mitella diphylla*), tall white violet (*Viola canadensis*), downy yellow violet (*V. pubescens*), blue cohosh (*Caulophyllum thalictroides*), lady fern (*Athyrium filix-femina*), hairy sweet cicely (*Osmorhiza claytonii*), maidenhair fern (*Adiantum pedatum*), long-stalk sedge (*Carex pedunculata*), Wood's stiff sedge (*C. woodii*), plantain-leaved sedge (*C. plantaginea*), northern beech fern (*Phegopteris connectilis*), wild sarsaparilla, rough-leaved rice grass (*Oryzopsis asperifolia*), horse-gentian (*Triosteum* sp.), mountain wood-sorrel (*Oxalis montana*), blue-bead-lily (*Clintonia borealis*), shining club-moss (*Huperzia lucidula*), Jack-in-the-pulpit (*Arisaema triphyllum*), large-flowered bellwort (*Uvularia grandiflora*), Canadian wood-nettle (*Laportea canadensis*), and white chervil (*Cryptotaenia canadensis*). Lungwort (*Lobaria pulmonaria*), a lichen often recognized as an indicator for ecosystem health and old-growth forests, is also present.

Northern Wet-mesic Forest

Haley Creek Swamp SNA is the only remnant of the former Goodman timber block that still retains old forest characteristics with mature stand structure. At the headwaters of Haley Creek, spring ponds are bordered by wetlands that are shrub-dominated with tamarack. These wetlands are embedded within a large old-growth Northern Wet-mesic Forest dominated by northern white-cedar with black ash (*Fraxinus nigra*) as a common associate, which are further surrounded by old-growth hemlock-hardwoods in the uplands. In the more wet areas, a black spruce-dominated forest with tamarack as a canopy associate is present. Northern white-cedar reproduction is limited to the seedling class; balsam fir reproduction is common. The shrub cover is of varying density, characterized by Labrador-tea (*Ledum groenlandicum*), velvet-leaf blueberry (*Vaccinium myrtilloides*), speckled alder (*Alnus incana*), mountain maple, and American fly honeysuckle. Common herbs include three-seeded sedge (*Carex trisperma*), three-leaved gold-thread (*Coptis trifolia*), and swamp false Solomon's-seal (*Maianthemum trifolium*), blue-bead-lily, bishop's-cap, bunchberry (*Cornus canadensis*), fowl manna grass (*Glyceria striata*), slender sedge (*Carex leptalea*), small enchanter's-nightshade (*Circaea alpina*), crested wood fern (*Dryopteris cristata*), spinulose wood fern (*D. carthusiana*), and nodding trillium (*Trillium cernuum*).

At the Pine River Flowage, the North Central Forest Ecological Landscape changes to the Northeast Sands Ecological Landscape. A section of the Pine-Popple Wild Rivers and all of Spread Eagle Barrens SNA are within the sandy soils of this area. A mosaic of Bracken Grassland, Pine Barrens, Northern Dry/Dry-mesic Forests, shallow seepage lakes and wetlands dominate this pitted outwash area.

Bracken Grassland

Bracken Grassland occurs on gently-rolling terrain that once supported Pine Barrens. The Bracken Grassland is characterized by: open areas of bracken fern (*Pteridium aquilinum*), Pennsylvania sedge, Kalm's brome (*Bromus kalmii*), sweet-fern (*Comptonia peregrina*), poverty grass (*Danthonia spicata*), northern heart-leaved aster (*Aster ciliolatus*), gray goldenrod (*Solidago nemoralis*), blueberries (*Vaccinium* spp.), wild strawberry (*Fragaria virginiana*), plus the non-native invasive Canada bluegrass (*Poa compressa*) and Kentucky bluegrass (*P. pratensis*); scattered thickets of beaked hazelnut (*Corylus cornuta*), prairie willow (*Salix humilis*), juneberry (*Amelanchier* spp.), and cherry (*Prunus* spp.); pockets of trembling aspen (*Populus tremuloides*), jack pine, and northern pin oak; and occasional large snags. Frost pockets (treeless depressions where frost may occur at any time of year) punctuate the landscape; they harbor Bracken Grassland-type vegetation of sedges, lichens, and other plant species that have adapted to their harsh microclimate.

Pine Barrens

Large areas of Pine Barrens are currently rare on this site. The largest example has scattered jack pine, red pine, black cherry (*Prunus serotina*), sand cherry (*Prunus pumila*), northern pin oak, juneberry, and beaked hazelnut. A low shrub layer consists of sweet-fern, early low blueberry (*Vaccinium angustifolium*), juneberry, and common blackberry (*Rubus alleghanensis*). Dominant ground layer species include Pennsylvania sedge, false melic grass (*Schizachne purpurascens*), poverty grass, Canada bluegrass, harebell (*Campanula rotundifolia*), bracken fern, and several non-native invasive species including orange hawkweed (*Hieracium aurantiacum*), tall hawkweed (*H. piloselloides*) and butter-and-eggs (*Linaria vulgaris*).

Northern Dry-mesic Forest

Stands of Northern Dry-mesic Forest on the site have an extensive logging history. While most stands were more heavily cut, one stand was noted as being of better quality, with good potential to mature into a red oak-dominated forest. This stand has 51-75% canopy cover from 10-16 inch dbh red oak with lesser amounts of red and white pine. A dense subcanopy is comprised mostly of red oak with some red maple. A sparse shrub layer is dominated by beaked hazelnut with lesser amounts of maple leaved-viburnum (*Viburnum acerifolium*) and witch hazel (*Hamamelis virginiana*). A sparse ground layer is typified by bracken fern, large-leaved aster, wood anemone (*Anemone quinquefolia*), and wild sarsaparilla.

On the northeast side of Frog Lake is another good-quality stand of Northern Dry-mesic Forest stand with large old growth pines (30 inch dbh, mostly white, some red) and a dense canopy. A dense subcanopy is comprised mostly of white pine with lesser amounts of red pine, red oak, white birch, and trembling aspen. Saplings of white and red pine, red oak and red maple create moderate cover. A sparse shrub layer is dominated by beaked hazelnut and blueberry. The ground layer is dominated by bracken fern, with lesser amounts of barren-strawberry (*Waldsteinia fragarioides*), Pennsylvania sedge, large-leaved aster, and rough-leaved rice grass.

Forested Wetlands

Scattered throughout the site are depressions in the pitted outwash that have developed into wetland communities, including Black Spruce Swamp and Northern Wet Forest, and shallow seepage lakes. Many of these contain very small acid peatlands with leatherleaf (*Chamaedaphne calyculata*) and Sphagnum moss. Some of these depressions have open water surrounded by a floating sedge mat that grades into a tamarack or black spruce dominated forest. Wetlands, some of significant size, are also found along small tributary streams, sometimes in conjunction with springs .

Aquatic Plant Communities

Smith's (1978) "Aquatic Macrophytes of the Pine and Popple River System, Florence and Forest Counties, Wisconsin" is the most recent information available on these aquatic plant communities. Most of the aquatic communities within this system consisted of one to five species. As is typical of aquatic plant communities, much of the changes in species abundance can be explained by environmental factors such as shading, substrate, and flow. The ten plants that contributed most to the total aquatic macrophyte vegetation are: bur-reed (*Sparganium* spp.), Richardson's pondweed (*Potamogeton richardsonii*), alpine pondweed (*P. alpines*), water-weed (*Elodea* spp.), common water-starwort (*Callitriche palustris*), buttercup (*Ranunculus* spp.), ribbon-leaf pondweed (*Potamogeton epihydrus*), common arrow-head (*Sagittaria latifolia*), flat-stem pondweed (*Potamogeton zosteriformis*), and alga (*Nitella* sp).

Figure 6. Percent of forested acres by cover type for Pine-Popple Wild Rivers. Data are from the Division of Forestry WISFIRS (accessed March 15, 2011).

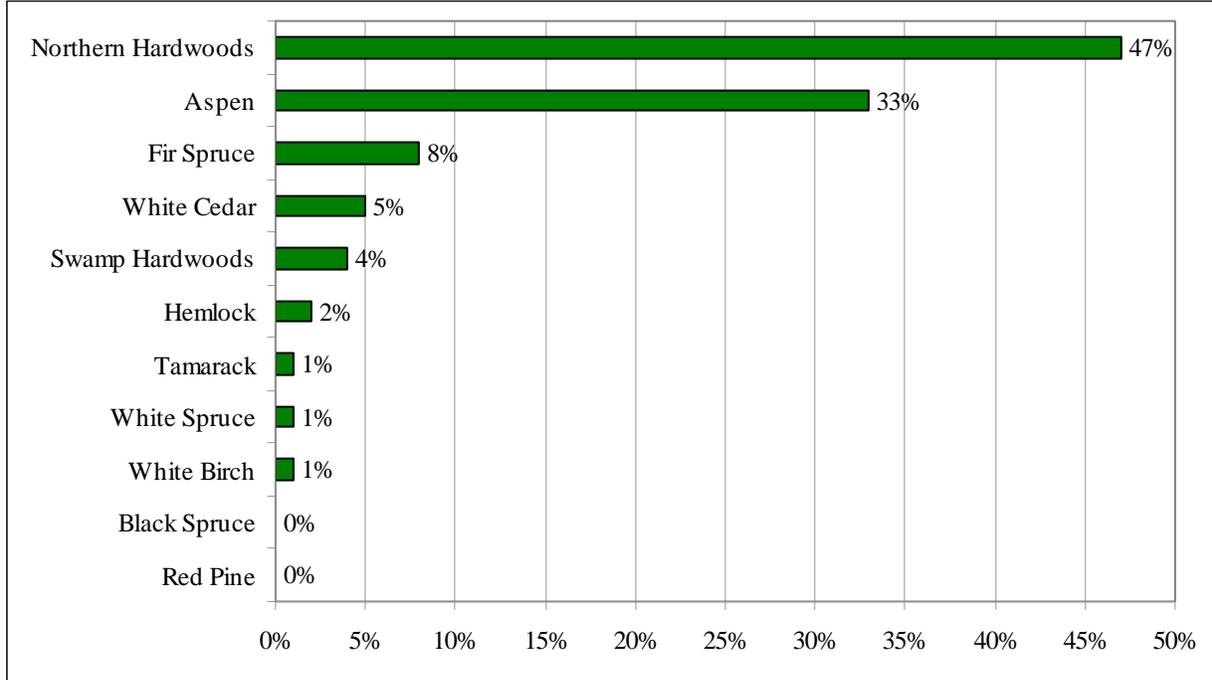
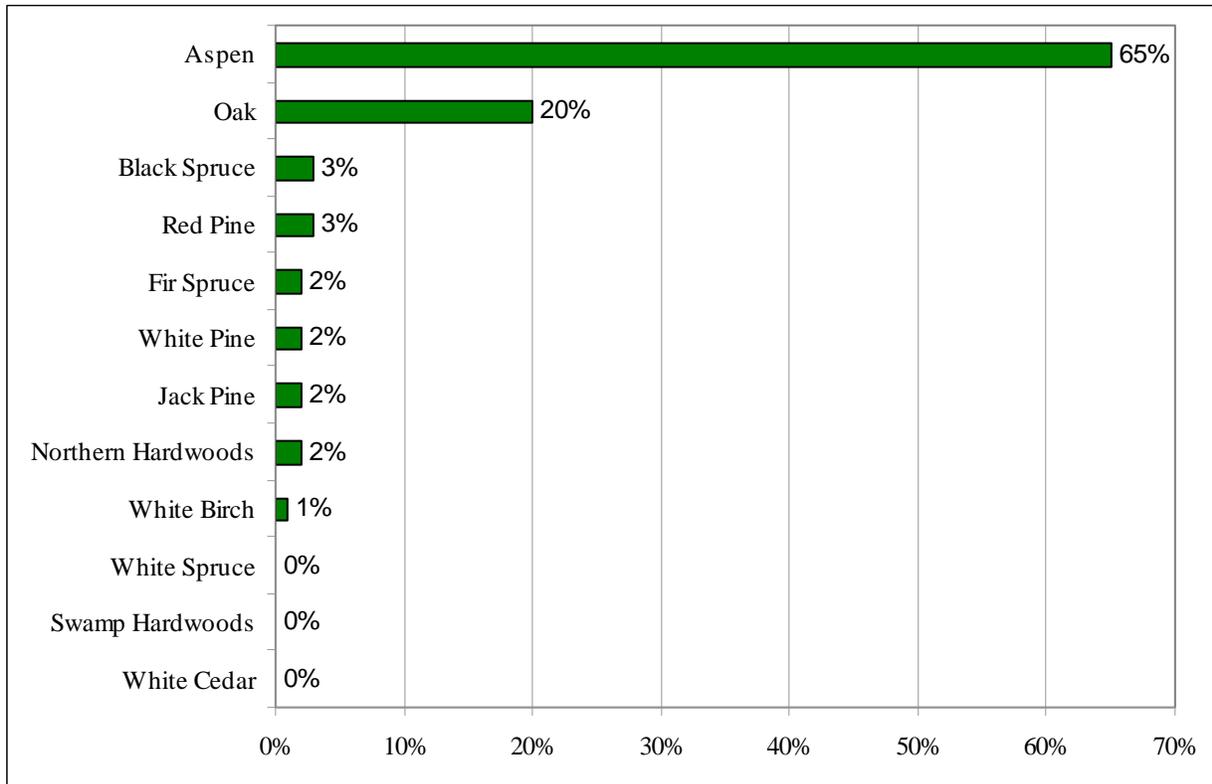


Figure 7. Percent of forested acres by cover type for Spread Eagle Barrens SNA. Data are from the Division of Forestry WISFIRS (accessed March 15, 2011).



Rare Species and High-Quality Natural Communities of the Florence County Wild Rivers and Barrens Planning Group

Numerous rare species and high-quality examples of native communities have been documented within the PPSE. Table 5 shows the rare species and high-quality natural communities currently known from the PPSE. Appendix C shows the rare species and high-quality natural communities currently known from the PPSE listed by property. See Appendix D for summary descriptions for the species and natural communities that occur on the PPSE.

Table 5. Documented rare species and high-quality natural communities for the Florence County Wild Rivers and Barrens Planning Group. For an explanation of state and global ranks, as well as state status, see Appendix A. Species with a “W” in the “Tracked by NHI” column are on the Watch List (see Appendix F) and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list. Listing status is based on the NHI Working List published April 2009.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	SGCN	Tracked by NHI
Animal							
A Perlodid Stonefly	<i>Isoperla marlynia</i>	1968*	S3	G5	SC/N	N	Y
A Perlodid Stonefly	<i>Isoperla richardsoni</i>	1968*	S4	G3	SC/N	N	Y
A water measurer	<i>Hydrometra martini</i>	1968	S4	G5	none	Y	N
American Bittern	<i>Botaurus lentiginosus</i>	2010	S3B	G4	SC/M	Y	Y
American Black Duck	<i>Anas rubripes</i>	2010*	S2B	G5	SC/M	Y	Y
American Woodcock	<i>Scolopax minor</i>	2010	S4B	G5	SC/M	Y	W
An Armored Mayfly	<i>Baetisca obesa</i>	1968	S3S4	G5	SC/N	Y	W
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2010	S4B,S4N	G5	SC/P	Y	Y
Black-backed Woodpecker	<i>Picoides arcticus</i>	2006*	S2B	G5	SC/M	Y	Y
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	2010	S4B	G5	SC/M	Y	W
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	2010*	S3B	G5	SC/M	Y	Y
Black Tern	<i>Chlidonias niger</i>	2010	S2B	G4	SC/M	Y	Y
Blue-winged Warbler	<i>Vermivora pinus</i>	2010	S4B	G5	SC/M	Y	W
Boreal Chickadee	<i>Poecile hudsonicus</i>	2010	S2S3B	G5	SC/M	Y	Y
Brown Thrasher	<i>Toxostoma rufum</i>	2010	S4B	G5	SC/M	Y	W
Canada Warbler	<i>Wilsonia canadensis</i>	2010*	S3B	G5	SC/M	Y	Y
Cape May Warbler	<i>Dendroica tigrina</i>	2010*	S3B	G5	SC/M	N	Y
Common Loon	<i>Gavia immer</i>	2006	S3S4B	G5	SC/M	N	W
Field Sparrow	<i>Spizella pusilla</i>	1986	S4B	G5	SC/M	Y	W
Golden-winged warbler	<i>Vermivora chrysoptera</i>	2010	S4B	G4	SC/M	Y	W
Hooded Warbler	<i>Wilsonia citrina</i>	2010	S2S3B	G5	THR	Y	Y
Least Flycatcher	<i>Empidonax minimus</i>	2010	S4B	G5	SC/M	Y	W
Merlin	<i>Falco columbarius</i>	2010	S3B,S2N	G5	SC/M	N	W
Moose	<i>Alces alces</i>	2010*	S1	G5	SC/P	Y	Y
Northern Goshawk	<i>Accipiter gentilis</i>	2011	S2B,S2N	G5	SC/M	Y	Y
Northern Harrier	<i>Circus cyaneus</i>	2010	S3B,S2N	G5	SC/M	Y	W
Olive-sided Flycatcher	<i>Contopus cooperi</i>	2009	S2B	G4	SC/M	Y	Y
Pickerel Frog	<i>Lithobates palustris</i>	2010	S3?	G5	SC/H	Y	Y
Pygmy Snaketail	<i>Ophiogomphus howei</i>	1992	S4	G3	THR	Y	Y
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	2010	S3B	G5	SC/M	Y	W
Red-shouldered Hawk	<i>Buteo lineatus</i>	2010	S3S4B,S1N	G5	THR	Y	Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	SGC N	Tracked by NHI
Ruby-crowned Kinglet	<i>Regulus calendula</i>	1999	S3B	G5	SC/M	N	W
<i>Sigara dolabra</i>	<i>Sigara dolabra</i>	1968	SNR	GNR	none	Y	N
Spruce Grouse	<i>Falcapennis canadensis</i>	2010	N	G5	THR	Y	Y
Swainson's Thrush	<i>Catharus ustulatus</i>	2010	S2B	G5	SC/M	N	Y
Upland Sandpiper	<i>Bartramia longicauda</i>	2008	S2B	G5	SC/M	Y	Y
Veery	<i>Catharus fuscescens</i>	2010	S4B	G5	SC/M	Y	W
Vesper Sparrow	<i>Poocetes gramineus</i>	1986	S4B	G5	SC/M	Y	W
Whip-Poor-Will	<i>Caprimulgus vociferus</i>	2010	S3B	G5	SC/M	Y	W
Wood Thrush	<i>Hylocichla mustelina</i>	2010	S4B	G5	SC/M	Y	W
Wood Turtle	<i>Glyptemys insculpta</i>	2010	S2	G4	THR	Y	Y
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	2006	S4B	G5	SC/M	N	W
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2010	S3B	G5	SC/M	Y	Y
Plant							
American Ginseng	<i>Panax quinquefolius</i>	2009	S4	G3G4	SC	NA	W
Assiniboine Sedge	<i>Carex assiniboinensis</i>	2010*	S3	G4G5	SC	NA	Y
Autumnal Water-starwort	<i>Callitriche hermaphroditica</i>	1967	S2	G5	SC	NA	Y
Canadian Yew	<i>Taxus canadensis</i>	2009	S4	G5	SC	NA	W
Heart-leaved Foam-flower	<i>Tiarella cordifolia</i>	2010	S1	G5	END	NA	Y
Marsh Willow-herb	<i>Epilobium palustre</i>	2010*	S3	G5	SC	NA	Y
Missouri Rock-cress	<i>Arabis missouriensis</i>	2010	S2	G5?Q	SC	NA	Y
Northern Black Currant	<i>Ribes hudsonianum</i>	2006	S4	G5	SC	NA	Y
Northern Bog Sedge	<i>Carex gynocrates</i>	2006	S4	G5	SC	NA	Y
Purple Clematis	<i>Clematis occidentalis</i>	2010*	S3	G5	SC	NA	Y
Ram's-head Lady's-slipper	<i>Cypripedium arietinum</i>	2006	S2	G3	THR	NA	Y
Sheathed Sedge	<i>Carex vaginata</i>	2010*	S3	G5	SC	NA	Y
Showy Lady's-slipper	<i>Cypripedium reginae</i>	2006	S4	G4	SC	NA	Y
Sparse-flowered Sedge	<i>Carex tenuiflora</i>	2010*	S3	G5	SC	NA	Y
Tufted Hairgrass	<i>Deschampsia cespitosa</i>	2010	S3	G5	SC	NA	Y
Natural Community							
Black Spruce Swamp		2010	S3?	G5	NA	NA	Y
Bracken Grassland		2010	S2	G3	NA	NA	Y
Lake--Deep, Hard, Seepage		1981	S2	GNR	NA	NA	Y
Lake--Deep, Soft, Seepage		2010	S3	GNR	NA	NA	Y
Lake--Shallow, Hard, Drainage		2006	SU	GNR	NA	NA	Y
Lake--Shallow, Hard, Seepage		2006	SU	GNR	NA	NA	Y
Northern Dry-mesic Forest		2010	S3	G4	NA	NA	Y
Northern Mesic Forest		2010	S4	G4	NA	NA	Y
Northern Sedge Meadow		2010	S3	G4	NA	NA	Y
Northern Wet Forest		2010	S4	G4	NA	NA	Y
Northern Wet-mesic Forest		2010	S3S4	G3?	NA	NA	Y
Pine Barrens		2010	S2	G2	NA	NA	Y

Rare species that are located within one mile of the PPSE and not found on the PPSE or are mapped at a low precision in the NHI Database (Table 6) are important to consider during planning efforts. These species may be located on adjacent easement, private, county, or U.S. Forest Service lands or State Natural Areas.

Table 6. Rare species that are either 1) found within one mile of the PPSE and not found on the PPSE or 2) mapped at a low precision. Listing status is based on the NHI Working List published April 2009.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
American Marten	<i>Martes americana</i>	2008	S2	G5	END		Y	Y
Gray Wolf	<i>Canis lupus</i>	2008	S4	G4	SC/FL	LE	Y	Y

Many invertebrate species are known from the Pine and Popple Rivers (Table 7).

Table 7. Invertebrate species of the Pine and Popple River segments within the study area (Smith 1978). Listing status is based on the NHI Working List published April 2009.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	SGCN	Tracked by NHI
A Caddisfly	<i>Hydropsyche arinale</i>	1968	S3	G4G5	none	Y	N
A Caddisfly	<i>Psilotreta indecisa</i>	1968	S3	G5	none	Y	N
A Caddisfly	<i>Oxyethira serrata</i>	1968	SNR	G5	none	Y	N
A Caddisfly	<i>Limnephilus janus</i>	1968	SNR	G5	none	Y	N
A Caddisfly	<i>Limnephilus sericeus</i>	1968	SNR	G5	none	Y	N
A Caddisfly	<i>Hagenella canadensis</i>	1968	S2	G5	SC/N	Y	Y
A Caddisfly	<i>Agarodes distinctus</i>	1968	S4	G5	none	Y	N
A Caddisfly	<i>Hydroporus dichrous</i>	1968	SU	GNR	SC/N	Y	W
A Perlodid stonefly	<i>Isoperla richardsoni</i>	1968	S3	G4	SC/N	N	Y
A Perlodid stonefly	<i>Isoperla marlynia</i>	1968	S3	G5	SC/N	N	Y
A Riffle Beetle	<i>Stenelmis bicarinata</i>	1968	S3S4	GNR	SC/N	Y	N
A Small Minnow Mayfly	<i>Centroptilum album</i>	1968	SNR	G5	SC/N	Y	W
A Water Scavenger Beetle	<i>Hydrobius melaenum</i>	1968	S4	GNR	none	Y	N
An Armored Mayfly	<i>Baetisca obesa</i>	1968	S3S4	G5	SC/N	Y	W
Intrepid Forestfly	<i>Shipsa rotunda</i>	1968	none	none	none	Y	N
<i>Sigara dolabra</i>	<i>Sigara dolabra</i>	1968	SNR	GNR	none	Y	N

Management Considerations and Opportunities for Biodiversity Conservation

Landscape-scale Management and Old-growth Forests

The Pine-Popple Wild Rivers is part of a 64,000-acre area that includes fee title lands, a forest legacy easement, and a State Natural Area in Florence, Forest, and Marinette Counties. The large size of this area, including both the fee title and easement lands, provides opportunities to maintain, enhance, and/or restore under-represented successional stages that would have naturally occurred in this area, including the opportunity to enhance and/or restore old-growth characteristics. This property, combined with the neighboring Chequamegon-Nicolet National Forest, county forests, and State Natural Areas, make this one of the most significant opportunities in the state to manage for old-growth forests within a landscape of older forests.

Within the Pine-Popple Wild Rivers, the fee title land was acquired to protect pristine areas and public access for outdoor recreation. The forest legacy was developed to help maintain the exceptional ecological value of the hardwood/hemlock forest. Prior to acquisition by fee title and easement, this area was managed by the Goodman Lumber Company. This company managed the forests since before 1900 with long-term, sustained yield harvesting practices. Thus the forests were never clear-cut or burned as was the case in the majority of northern Wisconsin, and some of these forests possessed characteristics of Wisconsin's pre-settlement forests at the time they were sold.

Since the Goodman Lumber Company first sold these lands over twenty years ago, the lands have traded hands often. These changes in ownership have resulted in significant changes to the forests. However, despite numerous land transactions, they have remained intact and have not been subdivided.

The Goodman Wild Lakes Area in Florence County has been recognized in the DNR's Old Growth Handbook (WDNR In Prep. b) as having Old Forest in a "reserved" management class. Old Forests are defined as stands older than the typical managed forest, but not biologically old. The primary management goal in Old Forests with a reserved management class is the development and maintenance of old-growth compositional, structural, and functional attributes within a minimally manipulated environment. Future active management is very limited.

Older forests (greater than 100-120 years old) in Wisconsin are rare and declining, largely due to timber harvesting and conversion to other land uses (WDNR 2010b). The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 2004, WDNR 1995), and old-growth management is a required component of Forest Certification. The age and structure of an old-growth natural community varies with species and site, but, in general, old-growth characteristics do not significantly develop until a stand has remained undisturbed for at least 200 years. Old-growth stands are sometimes characterized by a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; significant amounts of coarse woody debris, and pit-and-mound microtopography (WDNR In Prep. a). Old-growth and older forests provide structural diversity that can support unique assemblages of plants, birds, and other animals. At the PPSE, one example is the usage of large hemlock snags by chimney swifts. This habitat structure has become rare throughout much of Wisconsin, and has resulted in most chimney swift colonies to relocate to human-made structures.

Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2010b). Although recent timber management practices have

occurred, the potential for old-growth and older forests exists, and examples are found on Haley Creek Swamp SNA. This forest is the only remnant of the former Goodman timber block that still retains old forest characteristics with mature stand structure. Within this area are hemlock forests with trees approaching 250 years old, northern white-cedar forests with trees approaching 300 years old, and forested wetlands with older tamarack and black spruce.

Breeding Bird Diversity

The Pine-Popple Wild Rivers property, as part of the Lauterman Lake IBA with the adjoining Chequamegon-Nicolet National Forest, is one of the state's most significant breeding grounds for birds of northern hardwood forests. There is a rich and diverse birdlife throughout the PPSE with 94 species of breeding birds noted from the Savage-Robago Lakes area alone.

An impressive assemblage of rare forest interior breeding birds (Table 8) is present on the PPSE. The area-sensitive species are utilizing the remaining minimally fragmented, contiguous, and older forests present on the PPSE and the surrounding landscape. Primary determinants of interior forest habitat quality include stand composition, age, size, structure, canopy closure, proximity to water or roads, slope and aspect, stand size and shape, and proximity to other stands on the landscape (Wilson 2008).

Limiting fragmentation associated with, but not limited to, clear-cutting, road building, or utility and pipeline development is important to the continued viability of these large blocks of forest and their associated bird species (WDNR 2006b). Fragmentation is also caused by maintaining artificial wildlife openings. These openings result in forest fragmentation that can increase forest edge and increase nest failure in ground and shrub-nesting forest birds, including neotropical migrants (Donovan et al. 1995; Knutson et al. 2004). The forest edge can be an "ecological trap" for ground and shrub-nesting forest bird species. Flaspohler et al. (1999) showed that the zone around a cleared area in a forest can extend up to 300 meters into the intact forest. Within this zone, ground-nesting bird nest density increases, but the nest success decreases. The decrease in nest success could be due to the increase in edge-adapted predators such as raccoons, skunks, and crows; nest-parasitizing cowbirds; and competition from edge-adapted species.

Maintaining vertical structural diversity within intact forest stands is important for conservative species like the black-throated blue warbler (*Dendroica caerulescens*), Canada warbler (*Wilsonia canadensis*), veery (*Catharus fuscescens*), and wood thrush (*Hylocichla mustelina*), all of which require a dense shrub layer for nesting (WDNR 2006b). Deer browse could pose a potential issue for these bird species if it results in the loss of a suitable shrub component (WDNR 2006b).

In addition, preserving the mature, closed canopy mixed forests with spring ponds, forested seeps, and other wetlands are very important to forest raptors like the northern goshawk (*Accipiter gentilis*), broad-winged hawk (*Buteo platypterus*), red-shouldered hawk (*Buteo lineatus*), and merlin (*Falco columbarius*). Maintaining this intact, closed canopy forest surrounding both active and alternate northern goshawk nests is vital to the survival of this species of Special Concern, which displays high nest fidelity and pair bonding for life.

Conifer forests, including both wet and upland forests, provide habitat for northern birds that are uncommon in Wisconsin. Spruce grouse (*Falcipennis canadensis*) are at the southern end of their range in Wisconsin. This species relies on conifer-dominated or mixed-conifer forests, with large clear-cuts posing a significant threat to this State-Threatened species. Boreal chickadee (*Poecile hudsonicus*) is also found here at the southern limit of its breeding range in Wisconsin. This species is dependent on black spruce and tamarack forests. Other northern birds that are associated with conifer forests are Swainson's thrush (*Catharus ustulatus*), Canada warbler, Cape May warbler (*Dendroica tigrina*), Blackburnian warbler

(*Dendroica fusca*), ruby-crowned kinglet (*Regulus calendula*), olive-sided flycatcher (*Contopus cooperi*), and black-backed woodpecker (*Picoides arcticus*).

The PPSE, in particular Spread Eagle Barrens SNA, also supports good populations of grassland and shrubland birds, both of which are declining. Numerous uncommon bird species utilize the more open sandy grassland areas of the PPSE such as upland sandpiper (*Bartramia longicauda*), northern harrier (*Circus cyaneus*), whip-poor-will (*Caprimulgus vociferous*), and common nighthawk (*Chordeiles minor*). Many of the shrubland birds are Species of Greatest Conservation Need and include brown thrasher (*Toxostoma rufum*), black-billed cuckoo (*Coccyzus erythrophthalmus*), veery, and field sparrow (*Spizella pusilla*).

Grassland bird habitat is most effectively maintained as large landscapes of continuous grassland, uninterrupted by hedgerows, with the cover of woody plants less than 5% (Sample and Mossman 1997). Hedgerows fragment grasslands and provide habitat for predators of grassland birds. Structural diversity within the grassland, including short and tall grass, a mix of grasses and forbs, and a management rotation of type, intensity, and frequency, is also important for grassland bird habitat. Many grassland bird species, however, require the structure present in other habitats within a grassland complex, including upland shrubs (Bielefeldt 2010) and trees, and therefore it is important to consider these and other variables from a landscape perspective.

Table 8. Forest interior birds known from the PPSE. Listing status is based on the NHI Working List published April 2009.

Common Name	Scientific Name	State Status
black-throated blue warbler	<i>Dendroica caerulescens</i>	SC/M
hooded warbler	<i>Wilsonia citrina</i>	THR
least flycatcher	<i>Empidonax minimus</i>	SC/M
Louisiana waterthrush	<i>Seiurus motacilla</i>	SC/M
ovenbird	<i>Seiurus aurocapilla</i>	none
red-shouldered hawk	<i>Buteo lineatus</i>	THR
scarlet tanager	<i>Piranga olivacea</i>	none
Swainson's thrush	<i>Catharus ustulatus</i>	SC/M
veery	<i>Catharus fuscescens</i>	SC/M
whip-poor-will	<i>Caprimulgus vociferous</i>	SC/M
wood thrush	<i>Hylocichla mustelina</i>	SC/M
yellow-billed cuckoo	<i>Coccyzus americanus</i>	SC/M
yellow-throated vireo	<i>Vireo flavifrons</i>	none

Table 9. Grassland and shrubland birds known from the PPSE. Listing status is based on the NHI Working List published April 2009.

Common Name	Scientific Name	State Status
black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	SC/M
brown thrasher	<i>Toxostoma rufum</i>	SC/M
common nighthawk	<i>Chordeiles minor</i>	none
field sparrow	<i>Spizella pusilla</i>	SC/M
northern harrier	<i>Circus cyaneus</i>	SC/M
upland sandpiper	<i>Bartramia longicauda</i>	SC/M
veery	<i>Catharus fuscescens</i>	SC/M
whip-poor-will	<i>Caprimulgus vociferous</i>	SC/M

Bracken Grassland and Barrens

Bracken Grassland is a regionally unique type of Pine Barrens that is only known from the Northeast Sands Ecological Landscape, and occurs on rolling uplands and depressions ("frost pockets") in pitted outwash topography. The largest stands of this type in Wisconsin occur at Spread Eagle Barrens SNA, making the PPSE the best place in the state to manage for it. The Bracken Grasslands within the PPSE are included within a mosaic of other natural communities, especially Pine Barrens and Northern Dry/Dry-mesic Forest.

Bracken Grasslands are typified by a relatively small suite of native plant species including graminoids, forbs and low shrubs, as well as a high number of non-native invasive species. This unusual floral composition originates from a variety of mostly anthropogenic influences (especially cutting and burning of northern forests and fire suppression), although topography, soil pH, soil organic matter, and perhaps even bracken fern-derived allelopathy (Nielsen and Haney 1998) certainly exert influence as well. Although Bracken Grassland is of limited value for promoting native botanical diversity, this community type provides important habitat for wildlife species that favor open grassland/barrens expanses, such as the sharp-tailed grouse, a state Special Concern species.

Opportunities to manage Bracken Grassland and barrens at a landscape level should be explored with adjoining property owners. Managing large tracts of land for barrens using a variety of methods can help to mimic diverse natural disturbance patterns that are important to many barrens dependent species (Radeloff et al. 2000). For example, Niemuth and Boyce (1998) concluded that there are differences in resulting vegetation structure on sites that have experienced clear-cutting, short-cycle prescribed burning, and crown fires. The resulting differences in vegetation structure can impact availability and quality of wildlife habitat, emphasizing the importance of landscape-level planning to promote the entire suite of barrens successional stages.

Rare Herptiles

A habitat assessment and herptile survey resulted in the location of the State Threatened wood turtle (*Glyptemys insculpta*) along with other more-common herptiles. The continuation of a multi-year drought, which was classified as severe during the spring of 2010, was most likely a factor that limited species detection. Five wood turtle nesting locations, other than bridge crossings, were identified along the Pine River, and two sites were identified on the Popple River. Within the PPSE there is a lack of the open sandy nesting habitat within 200 feet of a river that is typically favored by wood turtles, though several sites were identified as having nesting potential if improvements are made.

Maintaining and improving sites for wood turtles would involve protecting sand and gravel bars within the Pine and Popple rivers and maintaining a buffer of at least 500 feet of adjacent upland habitat for foraging (PARC 2002). Besides habitat loss/degradation, heavy bank erosion and water pollution, other threats to wood turtles include increases in small mammal populations (nest predators) and poaching.

High Conservation Value Forests

The Wisconsin DNR manages 1.5 million acres that are certified by the Forest Stewardship Council (FSC) and the Sustainable Forest Initiative (SFI). Forest certification requires forests to be managed using specified criteria for ecological, social, and economic sustainability. Principle 9 of the *Draft 7 FSC-US Forest Management Standard* concerns the maintenance of High Conservation Value Forests (HCVF).

High Conservation Value Forests are defined as possessing one or more of the following:

- Contain globally, regionally, or nationally significant concentrations of biodiversity values, including rare, threatened, or endangered species and their habitats.
- Globally, regionally, or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
- Are in or contain rare, threatened, or endangered ecosystems.
- Provide basic services of nature in critical situations (e.g., watershed protection, erosion control).
- Are fundamental to meeting basic needs of local communities (e.g., subsistence, health).
- Are critical to local communities' traditional cultural identity (areas of cultural, ecological, economic, or religious significance identified in cooperation with such local communities).

Based on the current draft criteria for defining HCVFs (Forest Stewardship Council 2009) the best opportunities for HCVF on the PPSE are the Primary Sites, as well as high quality natural communities and rare species habitat areas that are outside of the Primary Sites.

Priority Conservation Actions

The Wildlife Action Plan developed Priority Conservation Actions that make effective use of limited resources and address multiple species with each action. Implementing these actions and avoiding actions that may preclude successful implementation of these actions in the future would greatly benefit the SGCN on the PPSE.

Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the Northeast Sands Ecological Landscape that apply to the PPSE include:

- Develop educational tools and demonstration/training areas that promote prescribed fire and other barrens/bracken grassland management practices.
- Manage the full range of barrens successional stages and diverse habitats in a landscape context. A comprehensive landscape plan will require identification and management of early succession cores. The barrens also need to have areas managed in a shifting mosaic of timber harvest with many clearcuts, some older than rotation-age stands, some thinning of stands for savanna structure and a few protected groves. Many small open patches are needed to conserve rare Lepidoptera. To enhance landscape attributes, red pine plantations can be applied to appropriate sites where the historical fire regime indicates that groves occurred.
- Restore oak/conifer barrens and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
- Develop conservation partnerships with county forests, private groups, and industrial forest landowners with the goal of planning landscape management.

- Integrate land-use planning efforts across federal, state, county, and local ownership boundaries.
- Eliminate off-trail operation of motor vehicles and off-road vehicles in barrens and bracken grassland restorations that leads to non-native invasive plant establishment, wind and storm erosion, or dominance of Pennsylvania sedge.
- Focus stream habitat and morphology restoration on areas where land use and wood turtle populations suggest the best success.
- Maintain lowland shrub communities like Alder Thicket and Shrub-carr, and manage the surrounding working forest to benefit golden-winged warblers (*Vermivora chrysoptera*) by leaving scattered off-site aspen, ash and tamarack in shrub-dominated areas and managing the adjacent upland forest in a shifting mosaic of patch sizes and age classes to provide continuous habitat.
- Protect and restore large river habitat for pygmy snaketail (*Ophiogomphus howei*) and other aquatic invertebrate SGCN.

Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the North Central Forest Ecological Landscape that apply to the PPSE include:

- Protect existing old-growth stands and defined high conservation value forests on public land, look for opportunities to identify additional areas that can develop into old-growth condition, and connect corridors to accommodate old-growth species movement in the light of climate change. The identified Conservation Opportunity Areas offer the best places to apply this priority.
- Work towards a balanced mosaic of age-classes; older age-classes are currently underrepresented.
- Encourage regeneration or reestablishment of hemlock, Canadian yew (*Taxus canadensis*), northern white-cedar, yellow birch, and other conifer, where appropriate through adaptive management techniques.
- Restore complexity to the entire forest landscape by retaining biological legacies such as large and cavity trees, snags, boles, large woody debris on the forest floor, herbaceous and understory plants, and forest floor organic matter.
- Inventory and map the locations of ephemeral ponds.
- Conduct additional survey work in northern wet forest for boreal birds, invertebrates and other taxa.

Wisconsin’s Statewide Forest Strategy

Wisconsin’s Statewide Forest Assessment (WDNR 2010b) was based on Wisconsin’s Forest Sustainability Framework (“Wisconsin Forest Sustainability Framework”) and was designed to assess the current state of Wisconsin’s public and private forests and analyze the sustainability of our forested ecosystems. Wisconsin’s Statewide Forest Strategy (WDNR 2010c) contains a collection of strategies and actions designed to address the management and landscape priorities identified in the Statewide Forest Assessment. The strategies are broad guides intended to focus the actions of the forestry community.

All three of these documents include topics related to biological diversity in Wisconsin’s forests, and provide information useful for department master planning and management activities. The following strategies, organized using their number in the Statewide Forest Strategy document, are particularly pertinent to the PPSE planning efforts in regard to opportunities to maintain or enhance biological diversity (WDNR 2010c). These strategies may not be applicable to areas of the PPSE.

Strategy Number	Strategy
1	Encourage planting to enhance, protect, and connect larger tracts of forested land in appropriate locations consistent with ecological landscapes.

5	Pursue the conservation and protection of large, unfragmented blocks of forest lands
6	Strengthen collaborative and large scale planning at the town, county, state and federal levels
7	Increase the functional size of forest blocks by encouraging coordination of management of clusters of forest ownerships
11	Encourage the management of under-represented forest communities
12	Improve all forested communities with a landscape management approach that considers the representation of all successional stages
13	Increase forest structure and diversity
14	Encourage the use of disturbance mechanisms to maintain diverse forest communities
15	Maintain the appropriate forest types for the ecological landscape while protecting forest health and function
22	Strive to prevent infestations of non-native invasive species before they arrive
23	Work to detect new (non-native invasive species) infestations early and respond rapidly to minimize impacts to forests
24	Control and management of existing (non-native invasive species) infestations.
25	Rehabilitate, restore, or adapt native forest habitats and ecosystems
29	Attempt to improve the defenses of the forest and increase the resilience of natural systems to future climate change impacts

Ecological Priorities for SGCN

The Wisconsin Wildlife Action Plan identifies ecological priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Appendix E highlights the Ecological Priorities for vertebrate SGCN on the PPSE. Note that these Ecological Priorities include all of the natural communities that we have determined to provide the best opportunities for management on the PPSE from an ecological/biodiversity perspective.

Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006b) identifies 25 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the North Central Forest Ecological Landscape. Nineteen of these natural communities are present on the PPSE:

Alder Thicket	Ephemeral Pond	Northern Mesic Forest	Shrub Carr
Bedrock Glade	Floodplain Forest	Northern Sedge Meadow	Submergent Marsh
Boreal Forest	Inland lakes	Northern Wet Forest	Warmwater rivers
Coldwater streams	Northern Dry-mesic Forest	Northern Wet-mesic Forest	Warmwater streams
Coolwater streams	Northern Hardwood Swamp	Open Bog	

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006b) identifies 21 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the Northeast Sands Ecological Landscape. Thirteen of these natural communities are present on the PPSE:

Alder Thicket	Inland lakes	Northern Wet Forest	Pine Barrens
Bracken Grassland	Northern Dry Forest	Northern Wet-mesic Forest	Submergent Marsh
Coldwater streams	Northern Dry-mesic Forest	Open Bog	Warmwater rivers
Coolwater streams			

Invasive Plants

Non-native invasive species thrive in newly disturbed areas, but also may invade and compromise high-quality natural areas. They establish quickly, tolerate a wide range of conditions, are easily dispersed, and are free of the diseases, predators, and competitors that kept their populations in check in their native range. Non-native invasive plants can out-compete and even kill native plants by monopolizing light, water, and nutrients, and by altering soil chemistry and mycorrhizal relationships. In situations where non-native invasive plants become dominant, they may even alter ecological processes by limiting one’s ability to use prescribed fire, by modifying hydrology, and by limiting tree regeneration and ultimately forest composition (WDNR In Prep. b). In addition to the threats on native communities and native species diversity, non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading fish and wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters).

Invasive species surveys were conducted in the northwest quarter of the PPSE during 2009 and invasives were noted throughout the PPSE during 2010 biotic inventory efforts. Through these efforts a list of known invasive species was developed for both disturbed areas (trails, roads, parking areas), forests, and wetlands of Pine-Popple Wild Rivers (Tables 9 and 10) and for Spread Eagle Barrens SNA (Table 11). Invasive plant species, although well-established in some areas of the PPSE, are generally restricted to trails, roadsides, rotavated fire-breaks, and low quality habitats. Many of the high-quality areas are not heavily infested. Campgrounds, trails, navigable waters, and other high-use areas are typical entry points for invasive species that are introduced by visitors’ footwear, clothing, vehicle tires, boats, and recreational equipment. Once established, these invasives may continue to spread along natural corridors (e.g. the Pine and Popple Rivers) and along recreational corridors (e.g. ATV trails). They even have the potential to invade remote high-quality natural areas via vectors such as wind, water, and wildlife. Invasive species may also be spread inadvertently through management activities such as timber operations and roadside mowing, especially if Best Management Practices (*Invasive Species Best Management Practices*) aren’t followed.

It’s important to note that a high number of non-native invasive species typically comprise a significant component of Bracken Grassland flora, including some that are considered to be invasive: orange hawkweed, tall hawkweed, Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), annual bluegrass (*P. annua*), smooth brome (*Bromus inermis*), bird’s-foot trefoil (*Lotus corniculata*), butter-and-eggs, and common mullein (*Verbascum thapsus*). While eliminating non-native invasive species in this community may not be a realistic goal, land managers may want to consider how to limit spread of these invasives to other sites, and to limit their negative impacts on achieving wildlife habitat goals.

When resources for complete control of widespread invasives are lacking, containment (i.e., limiting further spread) may be considered as an alternative action. Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010).

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR (<http://dnr.wi.gov/invasives>) and by the Invasive

Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups:

- Wild Rivers CWMA (Forest/Florence Co.) - contact: wildriverscwma@gmail.com . Or call: Robert Rouleau at 715-732-7642 or Anna Jahns at 715-450-4215 <http://www.wrisc.org/>

Also refer to invasive species Best Management Practices (BMPs) for forestry, recreation, urban forestry, and rights-of-way, which were developed by the Wisconsin Council on Forestry (*Invasive Species Best Management Practices*).

Emerald Ash Borer

The emerald ash borer (*Agrilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008, and is now found in six counties. The beetle attacks all species of ash (*Fraxinus* spp.) in Wisconsin, and the risk to forests is high: Models predict that a healthy forest could lose 98% of its ash trees in six years (<http://www.emeraldashborer.wi.gov>).

The lowland forests of the PPSE are vulnerable to the effects of emerald ash borer, as white, green, and black ash are important tree species within this ecosystem. Large-scale loss of ash in this area, whether through EAB-caused mortality or harvesting, could cause a cascade of negative impacts. Degradation of diverse, high-quality forests and loss of forest cover could further lead to diminishment of important habitat for rare plants and animals (especially forest interior birds), elevated water tables, and infestation of disturbance-loving invasives such as reed canary grass (WDNR 2010a). It is important to note that removal of all ash as a stopgap measure against EAB is not recommended; instead maintenance of a healthy forest and ash resource is suggested (WDNR 2010a).

Non-native Invasive Earthworms

The invasion of forests by European earthworms of the families *Acanthodrilidae*, *Lumbricidae*, and *Megascolecidae* is a concern throughout Wisconsin. While native earthworms were absent from this landscape after the last glaciation, non-native invasive earthworms have been introduced since Euro-American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Non-native invasive earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (Bohlen et al. 2004, Suarez et al. 2004), and fine-root biomass (Groffman et al. 2004). These physical changes in the forest floor reduce densities of tree seedlings and rare herbs (Gundale 2002) and can favor invasive plants (Kourtev et al. 1999). In a study of 51 Northern Wisconsin forest stands, Wiegmann (2006) found that shifts in understory plant community composition due to non-native invasive earthworms were more severe in stands with high white-tailed deer densities. Earthworms were present during 2009 surveys, although their densities are not suspected to be high. Limiting vehicle and foot traffic will deter further earthworm introduction.

Table 10. Invasive plants known from disturbed areas (trails, roads, and parking areas) of the Pine-Popple Wild Rivers

Common Name	Scientific Name
bull thistle	<i>Cirsium vulgare</i>
butter and eggs	<i>Linaria vulgaris</i>
Canada thistle	<i>Cirsium arvense</i>
common burdock	<i>Arctium minus</i>
common mullien	<i>Verbascum thaspus</i>
common tansy	<i>Tanacetum vulgare</i>
creeping Charlie	<i>Glechoma hederacea</i>
European swamp thistle	<i>Cirsium palustre</i>
Morrow's honeysuckle	<i>Lonicera morrowii</i>
ox-eye daisy	<i>Leucanthemum vulgare</i>
Queen Anne's lace	<i>Daucus carota</i>
reed canary grass	<i>Phalaris arundinacea</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
St. John's wort	<i>Hypericum perforatum</i>

Table 11. Invasive plants known from forests and wetlands of the Pine-Popple Wild Rivers

Common Name	Scientific Name
bittersweet nightshade	<i>Solanum dulcamara</i>
brittle stem hemp nettle	<i>Galeopsis tetrahit</i>
Canada thistle	<i>Cirsium arvense</i>
common burdock	<i>Arctium minus</i>
common mullein	<i>Verbascum thapsus</i>
European swamp thistle	<i>Cirsium palustre</i>
forget-me-not	<i>Myosotis scorpioides</i>
Japanese barberry	<i>Berberis vulgaris</i>
Morrow's honeysuckle	<i>Lonicera morrowii</i>
reed canary grass	<i>Phalaris arundinacea</i>
watercress	<i>Nasturtium officinale</i>

Table 12. Invasive plants known from Spread Eagle Barrens SNA

Common Name	Scientific Name
alsike clover	<i>Trifolium hybridum</i>
annual bluegrass	<i>Poa annua</i>
Bell's honeysuckle	<i>Lonicera X bella</i>
bird's-foot trefoil	<i>Lotus corniculatus</i>
butter and eggs	<i>Linaria vulgaris</i>
common St. John's wort	<i>Hypericum perforatum</i>
Kentucky bluegrass	<i>Poa pratensis</i>
orange hawkweed	<i>Hieracium aurantiacum</i>
quackgrass	<i>Elytrigia repens</i>
red clover	<i>Trifolium pratense</i>
smooth brome	<i>Bromus inermis</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
tall hawkweed	<i>Hieracium piloselloides</i>
white clover	<i>Trifolium repens</i>
white sweet clover	<i>Melilotus alba</i>

Primary Sites: Site-specific Opportunities for Biodiversity Conservation

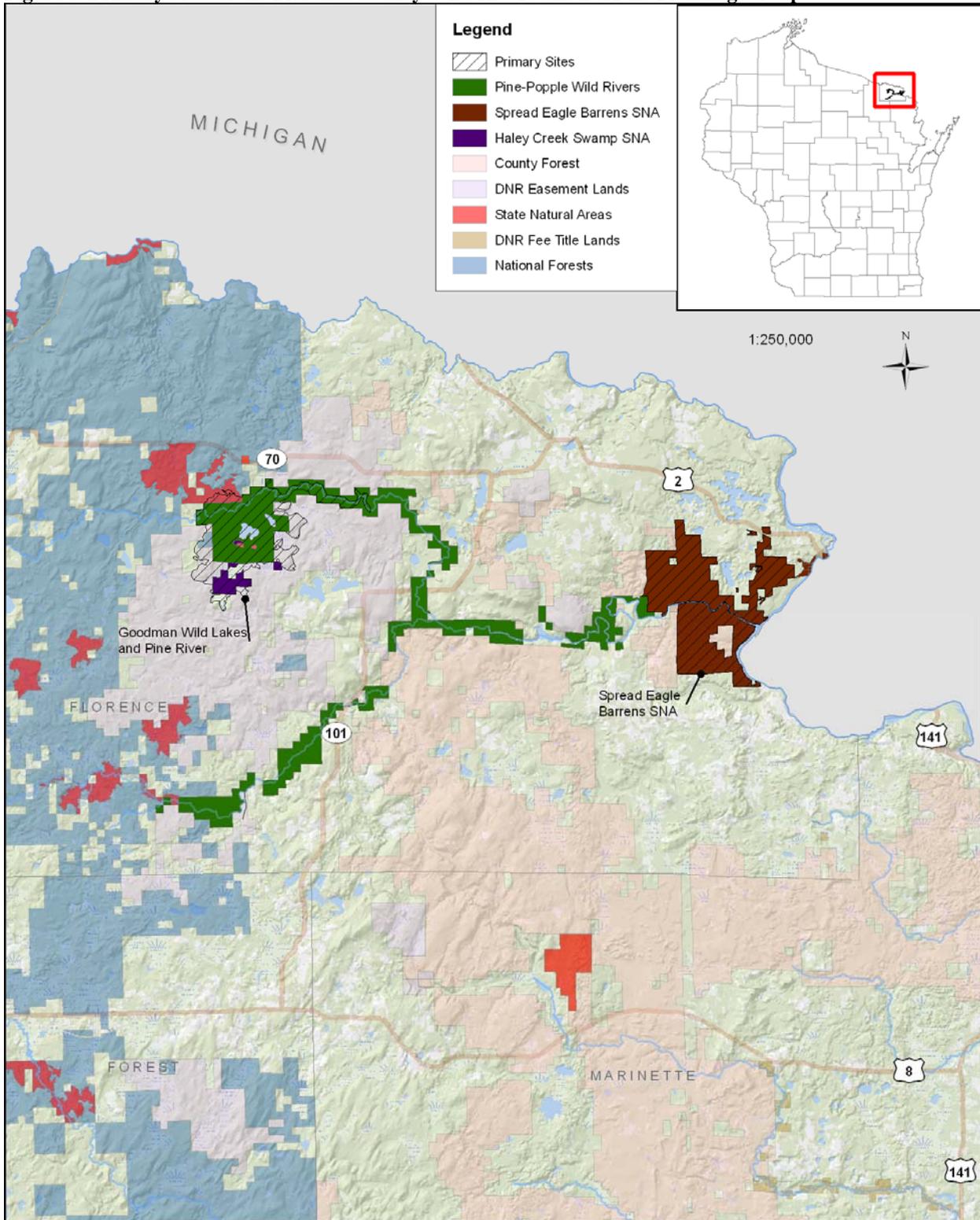
Two ecologically important sites were identified on the PPSE (Figure 8). These “Primary Sites” were delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

Descriptions for each of the Primary Sites can be found in Appendix G. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations. Appendix H lists the rare species and high-quality natural communities currently known from the PPSE by Primary Site.

Florence County Wild Rivers and Barrens Planning Group Primary Sites

- PPSE01. Goodman Wild Lakes and Pine River
- PPSE02. Spread Eagle Barrens State Natural Area

Figure 8. Primary Sites of the Florence County Wild Rivers and Barrens Planning Group



Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for the PPSE. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species contained in the PPSE.

- Continued invasive species monitoring and control is needed. Public lands throughout Wisconsin are facing major management problems because of serious infestations of highly invasive species. Some of these species are easily dispersed by humans and vehicles; others are spread by birds, mammals, insects, water, or wind. In order to protect the important biodiversity values of the PPSE, a comprehensive invasive species monitoring and control plan will be needed for detecting and rapidly responding to current and new invasive threats.
- Locations and likely habitats should be identified for conducting additional rare plant and animal surveys during appropriate seasons. This should include additional vertebrate and invertebrate animal taxon groups.

Glossary

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.

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, bat hibernacula, 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 Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., a single nest territory or long distance dispersers) or a group of nearby populations (e.g., metapopulation). For communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

Landtype Association (LTA) - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

natural community – an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.

old-growth forest – Old-growth forests are relatively old and relatively undisturbed by humans. Old-growth stands are biologically old, containing some trees which are nearing or beyond their average expected lifespan. The original even-aged overstory, established following a catastrophic disturbance, is becoming senescent, is senescing, or has senesced. Typically, the development of old-growth conditions begins near the end of the stem exclusion stage; the most characteristic stages of stand development are demographic transition and multi-aged. Specific historical human disturbance events are relatively unimportant, as long as age and developmental criteria are met. The actual qualifying stand age will vary depending on dominant species (forest type) and site capability. Old-growth forests are dominated by native vegetation (WDNR In Prep. b).

old forest – Old forest stands are older than the typical managed forest, but are not biologically old. They are beyond economic maturity, but are not senescent. These stands are older than their traditional rotation age [usually near the age where mean annual increment (MAI) is at a maximum]. Typically, old forest stands are still in the stem exclusion stage of stand development, but, depending on forest type and disturbance history, they can be in the transition or multi-aged stages. Historical human disturbance is unimportant, as long as age and developmental criteria are met. The actual qualifying stand age will vary depending on dominant species (forest type) and site capability. Old forests are dominated by native vegetation (WDNR In Prep. b).

representative - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

SGCN (or “Species of Greatest Conservation Need”) – native wildlife species with low or declining populations that are most at risk of no longer being a viable part of Wisconsin’s fauna (from the “Wisconsin Wildlife Action Plan,” WDNR 2006b).

Species List

The following is a list of species referred to by common name in the report text.

Common Name	Scientific Name
Animals	
Canada warbler	<i>Wilsonia canadensis</i>
veery	<i>Catharus fuscescens</i>
wood turtle	<i>Glyptemys insculpta</i>
Plants	
American fly honeysuckle	<i>Lonicera canadensis</i>
balsam fir	<i>Abies balsamea</i>
basswood	<i>Tilia americana</i>
beaked hazelnut	<i>Corylus cornuta</i>
bishop's-cap	<i>Mitella diphylla</i>
black spruce	<i>Picea mariana</i>
blue cohosh	<i>Caulophyllum thalictroides</i>
blue-bead-lily	<i>Clintonia borealis</i>
bracken fern	<i>Pteridium aquilinum</i>
Canada bluegrass	<i>Poa compressa</i>
early low blueberry	<i>Vaccinium angustifolium</i>
hemlock	<i>Tsuga canadensis</i>
jack pine	<i>Pinus banksiana</i>
juneberry	<i>Amelanchier</i> sp.
large-leaved aster	<i>Aster macrophyllus</i>
mountain maple	<i>Acer spicatum</i>
northern pin oak	<i>Quercus ellipsoidalis</i>
northern white-cedar	<i>Thuja occidentalis</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
poverty grass	<i>Danthonia spicata</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red pine	<i>Pinus resinosa</i>
rough-leaved rice grass	<i>Oryzopsis asperifolia</i>
sugar maple	<i>Acer saccharum</i>
sweet-fern	<i>Comptonia peregrine</i>
tamarack	<i>Larix laricina</i>
trembling aspen	<i>Populus tremuloides</i>
white ash	<i>Fraxinus americana</i>
white birch	<i>Betula papyrifera</i>
white pine	<i>Pinus strobus</i>
wild sarsaparilla	<i>Aralia nudicaulis</i>
yellow birch	<i>Betula alleghanensis</i>

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Additional Resources

Numerous online resources are available for learning more about the rare species, natural communities, and ecological concepts contained within this report. These are just a few of the resources that we recommend.

1. Bureau of Endangered Resources' Animals, Plants, and Communities Web Pages

Information for plants, animals, and natural communities on the Wisconsin Working List, as well as Species of Greatest Conservation Need from the Wisconsin Wildlife Action Plan. For reptiles and amphibians, information for more common species is also provided here. At this time, the level of detail available varies among species; some have detailed factsheets while others have only a short paragraph or a map. These pages will continue to evolve as more information becomes available and are the Bureau of Endangered Resources' main source of information for species and communities. dnr.wi.gov/org/land/er/biodiversity/

2. Wisconsin Natural Heritage Inventory Working List

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. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. dnr.wi.gov/org/land/er/wlist/

3. Ecological Landscapes of Wisconsin Handbook

Wisconsin's 16 Ecological Landscapes have unique combinations of physical and biological characteristics such as climate, geology, soils, water, or vegetation. This handbook will contain a chapter for each of these landscapes with detailed information about their ecology, socioeconomics, and ecological management opportunities. An additional introductory chapter will compare the 16 landscapes in numerous ways, discuss Wisconsin's ecology on the statewide scale, and introduce important concepts related to ecosystem management in the state. The full handbook is in development as of this writing, and chapters will be made available online as they are published. Currently, a set of Web pages provide brief Ecological Landscape descriptions, numerous maps, and other useful information, including management opportunities for natural communities and Species of Greatest Conservation Need. dnr.wi.gov/landscapes/

4. The Wisconsin Wildlife Action Plan

This plan is the result of a statewide effort to identify native Wisconsin animal species of greatest conservation need. The plan also presents priority conservation actions to protect the species and their habitats. The plan itself is available online, and there are several online tools to explore the data within the plan. The Web pages are closely integrated with the pages provided in items #1 and #3 above. The Wildlife Action Plan Web pages are quite numerous, so we recommend the following links as good starting points for accessing the information.

- the plan itself: dnr.wi.gov/org/land/er/wwap/
- explore Wildlife Action Plan data: dnr.wi.gov/org/land/er/wwap/explore/
- Wildlife Action Plan Implementation: dnr.wi.gov/org/land/er/wwap/implementation/

5. Wisconsin's Biodiversity as a Management Issue - A Report to Department of Natural Resources Managers

This now out-of-print report presents a department strategy for conserving biological diversity. It provides department employees with an overview of the issues associated with biodiversity and

provides a common point of reference for incorporating the conservation of biodiversity into our management framework. The concepts presented in the report are closely related to the material provided in this report, as well as the other resources listed in this section.

dnr.wi.gov/org/es/science/publications/rs915_95.htm

6. Wisconsin's Statewide Forest Strategy

Wisconsin's Statewide Forest Strategy is a collection of many strategies and actions designed to address major issues and priority topics over the next five to ten years. It provides a long-term, comprehensive, coordinated approach for investing resources to address the management and landscape priorities identified in the Statewide Forest Assessment. Several of the strategies contain issues related to biodiversity and ecosystem management.

dnr.wi.gov/forestry/assessment/strategy/overview.htm

7. 2010 Wisconsin's Statewide Forest Assessment

The goal of this project was to assess the "state of affairs" of Wisconsin's public and private forests and analyze the sustainability of our forested ecosystems. The Statewide Forest Assessment helps to explain trends, identify issues, and present an updated view of the status of forests in Wisconsin. The first chapter deals with biological diversity in Wisconsin's forests, and the major conclusions from this assessment were used to develop the strategies in # 6 above.

dnr.wi.gov/forestry/assessment/strategy/assess.htm