



Biotic Inventory and Analysis of the Chippewa County Forest

A Baseline Inventory and Analysis of Natural Communities, Rare Plants and Animals,
Aquatic Invertebrates, and Other Selected Features

October 2005

Natural Heritage Inventory Program
Bureau of Endangered Resources
Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

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Cover Photographs (clockwise from left): showy lady's slipper (*Cypripedium reginae*), Richard Bauer; Hay Meadow Flowage #1, Paul Garrison; female elfin skimmer (*Nannothemis bella*), Kathryn Kirk.

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Primary Authors: Eric Epstein, Craig Anderson, William Smith, and Drew Feldkirchner

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- Gary Casper – herpetology
- Andy Clark – botany, rare plants, community ecology
- Fred Clark – coarse filter, ecological overview
- Barbara Delaney – botany, rare plants
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Executive Summary

Project Purpose and Objectives

The Department of Natural Resources (DNR) and the Chippewa County Forest (CCF) developed a cooperative agreement to provide baseline information on the terrestrial and aquatic resources of the forest to assist with the preparation of a new forest master plan. Work was carried out by DNR staff in the West Central region, research scientists from DNR's Integrated Science Services Bureau, and specialists from the Natural Heritage Inventory (NHI) Program, part of the DNR's Endangered Resources Bureau.

The portion of the project included in this report was undertaken by NHI and presents the results of a three-year project to inventory and analyze selected biotic resources of the Chippewa County Forest and portions of the surrounding landscape, as well as to provide baseline ecological information about the area. This information can be used for property master planning in conjunction with other analyses to develop overall management recommendations for the forest such as where to conserve critical habitat for rare and endangered species.

The primary objectives of this project were:

- the identification and evaluation of natural biotic communities,
- the identification and evaluation of rare or otherwise significant plant and animal populations,
- the identification of sites appropriate for the restoration of lost or declining communities or important habitats,
- to emphasize important protection, management, and restoration opportunities, focusing on both unique and representative natural features of these properties, as well as the surrounding landscape,
- and the interpretation and transfer of the information gathered for use by the property master planning team, as well as managers, administrators, and others involved in the implementation of land use decisions on the Chippewa County Forest, as well as the surrounding landscape.

Description of the Study Area

The study area is located in northern Chippewa County, an area characterized by rolling hilly topography and an abundance of lakes. The study area includes the Chippewa County Forest, as well as portions of the Chippewa Moraine Ice Age State Recreation Area, part of the Ice Age National Reserve. The biological, topographical, and geological variation that occurs across a relatively small area in northern Chippewa County makes it one of the more interesting ecological regions in Wisconsin.

Exceptional Ecological Characteristics of the Study Area

The outstanding landscape feature is a rugged, mostly forested terminal moraine, pitted with hundreds of glacial kettle lakes and wetlands and occupying the southwestern margin of the study area in Block 2 (see Fig. 1). Though these lakes and wetlands are not large, they are abundant and mostly intact. The local watersheds are generally forested, and the vegetation is less fragmented by agricultural and residential uses than is the case in adjoining landscapes, especially to the south and west. Over the long-term, better representation of conifers (white and red pines on the appropriate dry-mesic sites in the south and west, eastern hemlock in the more mesic forests to the north and east) would further enhance the ecological values of the area to species that are not well represented there now. The absence of older forest also limits the suitability of the county-owned lands for those animals and plants that require or prefer stands composed of late successional species, or stands that represent older forest developmental stages. For some important forest communities within the study area (especially oak and mesic northern hardwoods) increasing the abundance of stands composed of large trees, with large spreading crowns, and that exhibit high crown closure, would benefit forest dwelling organisms that are presently rare or uncommon in the study area. The current absence of important structural features associated with older forests (e.g., snags, large coarse woody debris,

tip-ups, and pit and mound microtopography) is something that could be addressed at selected locations in the new county forest plan.

The wetlands associated with the terminal moraine are in generally good condition, and include examples of many native wetland communities. The concentration of undeveloped kettle lakes is noteworthy at state and regional scales, and this landscape also supports other aquatic features of high ecological value such as Ephemeral Ponds, Spring Seeps, and Headwaters Streams.

The gently rolling ground moraine to the north and east (Block 1) is occupied by a more fragmented upland forest - much of it dedicated to short rotation pulp production. This area also contains several very large, intact acid peatland complexes, consisting of Open Bog, Poor Fen, Muskeg, Alder Thicket and Black Spruce-Tamarack Swamp communities. The key functional characteristic of these wetlands, site hydrology, is largely unimpaired, though several small impoundments have been constructed and some of the local roads have altered drainage patterns. Runoff from agricultural lands may also be problematic for these wetlands.

Other valuable natural features occur at scattered locations throughout the study area. These include relatively isolated examples of natural communities, waterbodies, or populations of rare species.

Summary of Biotic Inventory Results

Rare Vascular Plants

Before this survey began, there were virtually no records of rare plants in the study area. Sixteen plant species on the Natural Heritage Inventory Working List were found within the study area in 2002 and 2003. One of the species, bog bluegrass (*Poa paludigena*), is listed as Threatened in Wisconsin.

The Chippewa County Forest and study area have a large number of lakes, reservoirs, streams, and wetlands. A parallel study that sampled aquatic plants was conducted during 2002 and 2003 (Konkel 2005), and the biologist found populations of the following Special Concern species.

- Prickly hornwort (*Ceratophyllum echinatum*)
- Robbins' spikerush (*Eleocharis robbinsii*)
- Farwell's water-milfoil (*Myriophyllum farwellii*)
- Water-thread pondweed (*Potamogeton diversifolius*)
- Vasey's pondweed (*Potamogeton vaseyi*)
- Torrey's bulrush (*Scirpus torreyi*)
- Hidden-fruited bladderwort (*Utricularia geminiscapa*)
- Purple bladderwort (*Utricularia purpurea*)

Concentrations that are of statewide significance for three species (purple bladderwort, hidden-fruited bladderwort, and Farwell's water-milfoil) are now known to occur on the County Forest.

The following Special Concern wetland species were also found during this inventory.

- Northern yellow lady's-slipper (*Cypripedium parviflorum* var. *makasin*)
- Showy lady's-slipper (*Cypripedium reginae*)
- White adder's-mouth (*Malaxis monophyllos* var. *brachypoda*)
- Brown beakrush (*Rhynchospora fusca*)

There is potential habitat for a number of rare plants that occur in upland habitats, but only the following Special Concern species were found during this inventory.

- Putty root (*Aplectrum hyemale*)
- Blunt-lobe grape-fern (*Botrychium oneidense*)
- Broad beech fern (*Phegopteris hexagonoptera*)

Putty root was only added to the NHI Working List in 2004, and additional populations undoubtedly exist in the study area. Blunt-lobed grape-fern had never been found in Chippewa County before, so the two new populations represent a range extension for Wisconsin. Broad beech fern is near the northern edge of its Wisconsin range in Chippewa County.

Populations and individuals of ginseng (*Panax quinquefolius*) and butternut (*Juglans cinerea*) were found in the study area. We have some concern about the status of these plants due to commercial harvest and disease, respectively. However, data collected for these species are not stored in the NHI database.

One Special Concern aquatic species (*Utricularia resupinata*) has been documented just outside of the study area. The appropriate habitat exists in the study area, but no populations were found during the lake sampling. Given the intensity of that survey, it is likely that northeastern bladderwort does not occur in the study area.

While several new populations of rare upland and wetland plant species were discovered during the biotic inventory, there remains potential habitat that has not been adequately surveyed. Some of the high priority species that could use additional inventory work include bog bluegrass, blunt-lobed grape-fern and other *Botrychium* species, as well as the various lady's-slipper and wetland orchids.

Four other Special Concern species have been documented in the vicinity of the study area. All are from specimens that were collected before 1970. There is potential habitat for all of these specimens on the County Forest and additional survey work could identify new populations.

- Swamp-pink (*Arethusa bulbosa*)
- Assiniboine sedge (*Carex assiniboinensis*)
- Tufted hairgrass (*Deschampsia cespitosa*)
- Small forget-me-not (*Myosotis laxa*)

Rare Animals

Forty-five NHI Working List animal species have been documented in and around the study area. Wisconsin DNR staff documented all but 18 of these species in surveys conducted in 2002 and 2003. Those taxa not found in recent surveys tended to be large river species found in the Study Area, but not on county forest property and were not systematically searched for as part of this project. Five of the rare species found on the county forest proper are listed as State or Federally Endangered or Threatened; these species include Red-shouldered Hawk, Cerulean Warbler, Bald Eagle, Osprey, and Blanding's Turtle.

Thirty-three Special Concern animals were found in the Study Area including many wetland or aquatic invertebrates. Of special note was the location of the globally rare (G1) Sylvan Hygrotus Diving Beetle, a species occupying open wetlands.

Fifteen additional species (all aquatic invertebrates) found in the Study Area have been identified as rare in WI and are being considered for inclusion into the NHI Working List, based on recommendations by Dr. Kurt Schmude, University of Wisconsin - Superior. Some of these species have not previously been documented in Wisconsin and many had not previously been documented in Chippewa County. Surveys of sites at the CCF have greatly aided understanding of structural and vegetational habitat characteristics for the Elfin skimmer (*Nannothemis bella*).

Most of the NHI Working List species that were found within the study area were associated with wetlands and aquatic habitats. However, there is potential to provide habitats for several upland - associated species (see the "Priority Opportunities" section).

Natural Communities

The uplands support extensive forests, and these in turn accommodate a diverse array of plant and animal life. Most of the upland forests are dry-mesic to mesic, with hardwoods better represented than native conifers. White and, to a lesser degree, red pines were historically common on the dry-mesic sites. The pines have been largely replaced by oaks and aspens, which are currently abundant in the present landscape. The mesic forests are also generally dominated by hardwoods, particularly sugar maple, basswood, and red oak. Hemlock is a relatively minor component of the present forests, primarily on the rolling lands north and east of the more rugged terminal moraine. Older forest developmental stages and large contiguous patches of relatively homogeneous habitat are currently in short supply. This is in part because of limitations of the rougher terrain and the complexity of the vegetation mosaic (e.g., on the terminal moraine), in part because of historical land use decisions, and in part because of current management direction. Young and medium-aged forests are well represented here, but older forests are absent. Representation of older forest is a legitimate opportunity on the County Forest and the adjoining Ice Age Reserve. With the possible exception of some of the acid conifer swamps, all of the forests within the study area are second growth.

The wetlands include ash-dominated hardwood swamps, at least three types of conifer swamp (Black Spruce Swamp, Tamarack Swamp, White Cedar Swamp), two types of shrub swamp (Alder Thicket and Shrub-carr), Poor Fen, Open Bog, Sedge Meadow, and marsh vegetation. Most wetlands are in good condition and provide important habitat for a diverse array of plants and animals, including rare species.

Aquatic features, encompassing lakes, impoundments, rivers, ephemeral ponds, spring runs, and spring seeps are treated separately, in the following section and a report from a companion project on the aquatic resources of the study area describes physical characteristics of many of the lakes in the study area.

For brief descriptions of the individual Natural Community types that are represented in the study area by relatively intact occurrences, see Appendix C. Among the communities included are:

Forest Communities:

- Northern Mesic Forest (hemlock-hardwoods forest and northern hardwoods forests)
- Northern Dry-mesic Forest (white pine-red pine forest and mixed pine-oak-red maple forest)
- Southern Dry-mesic Forest (red oak - white oak - red maple forest)
- Northern Hardwood Swamp (black ash swamp)
- Northern Wet-mesic Forest (white cedar swamp)
- Northern Wet Forest (Black Spruce Swamp, Tamarack Swamp)
- White Pine-Red Maple Swamp (white pine - red maple - tamarack - yellow birch forest)
- Floodplain Forest

Shrub Communities:

- Alder Thicket
- Shrub-carr (dogwood-willow)
- Muskeg (a sphagnum bog with stunted black spruce and tamarack common)

Herbaceous Communities:

- Open Bog
- Poor Fen
- Northern Sedge Meadow (wire-leaved sedges)
- Southern Sedge Meadow (tussock sedge - Canada bluejoint grass)

- Emergent Marsh (cattails, bulrushes, arrowheads, bur-reeds)
- Submergent Marsh (includes stands of floating leaved species, such as pond lilies)

Aquatic Features

- Seepage Lake – Seepage lakes occur in closed basins, lacking both an inlet and an outlet. Precipitation, groundwater inputs, and overland flow are the sources of water and nutrients for seepage lakes. In some landscapes, there can be dramatic year to year water level fluctuations.
- Drainage Lake – Drainage lakes have inlet streams and outlets, and receive water and nutrients from their inlet streams, as well as precipitation, groundwater, and overland flow. Water and nutrients are exported via the outlet stream.
- Meromictic Lake – These are distinctive lakes with unusual attributes. They are rare statewide.
- Spring Pond – Small bodies of standing water that have as their primary water source groundwater discharge. Spring Ponds have outlets.
- Ephemeral Pond – Ephemeral ponds are small, shallow, temporary waterbodies that hold water for relatively brief periods (up to several months) following spring snow melt and/or heavy rains. They lack predators such as fish, and provide critical habitat for frogs, salamanders, and many invertebrates.
- Seeps, Springs, and Spring Runs – Small aquatic features characterized by the discharge of groundwater.
- Small Stream – first order headwaters streams
- Medium-size Stream – second and third order streams

Threats to Natural Communities, Aquatic Systems, and Rare Species

This report outlines several broad threats to the many species and important habitats of the study area. For example, as of this writing, the study area evidently has not been significantly affected by many of the ecologically invasive plants that are serious concerns in other parts of the state. However, garlic mustard (*Alliaria petiolata*), a highly invasive exotic plant, was observed along a section of trail used by hikers, horse riders, logging equipment, and other vehicles in June 2003. This information was immediately relayed to CCF and Ice Age Reserve staff. It will be critical to continue monitoring for this and other invasive species to avoid future infestations. Identification and elimination of invasive species while still in small, controllable populations is the most cost-effective method for management. Other threats outlined in later in the report include damage caused by roads and motorized vehicles, as well as habitat loss for certain groups of species. Avoiding, eliminating, or, in some cases, reversing threats such as this will play a key role in conserving the biological diversity of the landscape.

Priority Opportunities for Biodiversity Conservation

More information about these priorities and how they were derived is available in the “Priority Opportunities for Biodiversity Conservation” section of this report. The priority opportunities are associated primarily with areas of: 1) extensive forest, within which there are embedded undisturbed lakes and wetlands; 2) large intact peatland complexes (in Block 1); 3) scattered sites, at more local scales, that harbor relatively isolated occurrences of a natural community, waterbody, or rare species population.

Protection and Management Opportunities

Inventory findings have been grouped into “Primary Sites” (see Appendix B). These vary in size from thousands of acres to very small acreages. The larger sites have the greatest potential value for conserving rare resources over the long-term, as they are capable of supporting the greatest number of species associated with the ecosystems, including area sensitive species, species that are adversely affected by fragmentation impacts and isolation effects, habitat specialists, and species that use different habitats at different points in their life cycles. We are not suggesting massive “set asides” for these large sites, but rather trying to underscore the importance of recognizing the special conservation opportunities these large sites represent.

Restoration & Management Opportunities and Needs

Focus areas for restoration activities might include planning for the development of older forests, particularly in 1) larger blocks of forest 2) at locations or in settings where there is good potential for providing the needs of species that prefer older forest, 3) where the forest types now present are appropriate for the consideration of establishing older forests, 4) where allowing for the development of such forests will have secondary benefits, such as protecting the watersheds of rare or representative lake types or wetlands of high conservation value, meeting aesthetic objectives for forest users, and creating interpretive educational opportunities for the county forest. This could be accomplished by incorporating extended rotations, creating reserves or benchmarks, and/or emphasizing the representation of tree species that play a significant role in older forests, especially (but not only) those species that are now reduced in abundance such as white pine, hemlock, and yellow birch.

In most cases, effective management for populations of rare species is an approach that considers the entire habitat / community (roughly equivalent to a stand) or an even larger area. An example might be a complex of adjacent habitats, each of which provides for a critical need for a species (group of species) at some stage in its (their) life cycle(s). Management considerations should include factors such as hydrology, water quality, the appropriate disturbance regime for both the species and the community, and scale issues. However, due to specific habitat requirements or other factors some species like the State Threatened bog bluegrass, or smaller community features such as ephemeral ponds or spring seeps, may warrant special consideration on an individual occurrence basis.

Primary Sites: Significance and Summaries

This report highlights 14 ecologically important sites. These “Primary Sites” were identified because they contain high-quality natural communities of both rare and representative types (including lakes and streams), provide important habitat for rare species, offer opportunities for restoration, may provide important ecological connections between sites or landscapes, or some combination of the above factors.

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

Using the language adopted from the Forest Certification process now being used by the Wisconsin DNR, and under consideration by some other land managers, several of these sites contain *High Conservation Value Forests* (although these lands are not all necessarily forested). This information can be used during the master planning process when evaluating the various alternatives for this property.

Future Needs

As noted in several places in this report, garlic mustard was documented in the study area in 2003. Monitoring for invasive species should be a high priority in this landscape to identify and quell new outbreaks and avoid difficulties being experienced by managers in many other locations throughout the state.

The study area has been shown to support numerous rare species populations. Management activities or siting of improvements on the county forest will need to take these species into account. WDNR managers use the NHI database when planning management activities to avoid impacts on listed species. In addition, locations of rare species populations that are found when doing routine management or those reported by users of the property should also be considered when planning management activities.

This report highlights several taxa that could benefit from future survey efforts. For example, some species, such as plants associated with fluctuating shoreline lakes, can only be surveyed under the appropriate environmental conditions, and some of the terrestrial invertebrate groups could not be as thoroughly surveyed as we had hoped due to weather conditions. Also, useful information for managing this landscape could be obtained through continued monitoring activities such as standardized breeding bird surveys.

Introduction

Project Purpose and Objectives

The Wisconsin Department of Natural Resources (WDNR) and the Chippewa County Forest (CCF) developed a cooperative agreement to provide baseline information on the terrestrial and aquatic resources of the forest to assist with the preparation of a new forest master plan. Work was carried out by WDNR staff in the West Central region, research scientists from WDNR Integrated Science Services Bureau, and specialists from the Natural Heritage Inventory (NHI) Program, part of the DNR Endangered Resources Bureau.

The portion of the project included in this report was undertaken by NHI and presents the results of a three-year project to inventory and analyze selected biotic resources of the Chippewa County Forest and portions of the surrounding landscape, as well as to provide baseline ecological information about the area. This information can be used for property master planning in conjunction with other analyses to develop overall management recommendations for the forest such as where to conserve critical habitat for rare and endangered species.

The primary objectives of this project were as follows:

- The identification and evaluation of natural communities.
- The identification and evaluation of rare or otherwise significant plant and animal populations.
- The identification and evaluation of selected aquatic features and their associated biotic communities.
- The identification of sites appropriate for the restoration of lost or declining communities or important habitats.
- The identification of especially important protection, management, and restoration opportunities, focusing on both unique and representative natural features of this property and the surrounding landscape.
- The interpretation and transfer of the information gathered for use by Chippewa County Forest managers, administrators, and others involved in the implementation of land use decisions on the county forest, as well as the surrounding landscape.

The companion project led by the Integrated Science Services Bureau focused on the aquatic resources within the study area, including the following components: characterization of trophic status of the forest lakes, characterization of littoral zone community and riparian habitat, identification of rare and endangered species, and discussion of management issues and identification of critical sites.

Overview of Methods

The Wisconsin NHI program is part of an international network of heritage programs. The defining characteristic of this network, and the feature that unites the individual programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers was established by The Nature Conservancy and is currently coordinated by NatureServe, an international non-profit organization (see www.natureserve.org for more information).

Natural Heritage Inventory programs focus on rare plant and animal species, natural communities, and other natural features. The Wisconsin NHI Working List is the official list of Endangered, Threatened, and Special Concern plants and animals for Wisconsin. (Special concern species are ones that are suspected to be rare but for which not enough information is known). The Working List also includes a list of natural communities known to occur in Wisconsin. The list changes over time as the populations of species change (both up and down) and as knowledge about species status and distribution increases. The most recent Working List for Wisconsin is available on the Internet through the WDNR Endangered Resources Program (dnr.wi.gov/org/land/er/).

The Wisconsin NHI database houses inventory results, in addition to data contributed by cooperating scientists and gleaned from museums, herbaria, and published reports. This database is the central repository for occurrences of rare species and high quality natural communities. Natural Heritage Inventory data are used for a variety of purposes including land management, state land master planning, community planning, conservation planning, and environmental review of public and private activities across the state. All actions that the WDNR conducts, funds or approves on public or private lands must be screened for potential impacts to rare species.

The Wisconsin NHI program utilizes a standard approach for biotic inventory work that supports master planning. Generally, the approach involves data collection and development, data analysis, and report writing. Many sources were consulted to aid in the identification and prioritization of survey sites within the CCF. Our basic references included the CCF stand/compartments reconnaissance data, interpretations of local and regional land cover from recent aerial photographs and satellite imagery, and GIS data on landforms, vegetation, and soils. We also drew upon the NHI database for previous records from this landscape.

Fieldwork for the Chippewa County Forest biotic inventory projects was conducted primarily between 2002-2003 and supplemented with information obtained by NHI staff prior to 2002. Staff employed a coarse filter – fine filter inventory approach (Appendix A). Coarse filter surveys conducted during the first year identified those natural communities, aquatic features, and rare priority taxa that warranted more detailed inventory. Fine filter inventory, initiated in Year 2, focused on more intensive surveys conducted by experts targeting high priority taxa. A limited number of additional surveys were conducted during Year 2 to fill information gaps for high priority sites and natural communities. Table 1 summarizes the individual surveys conducted along with the principal investigator(s) for each survey.

Table 1: Field surveys conducted during the biotic inventory.

Survey	Year	Biologist(s)
Aquatic insects	2002	Kurt Schmude
Birds	2003	Robert Howe
Botany	2002, 2003	Craig Anderson, Andy Clark, Barbara Delaney, and Eric Epstein
Forest raptors	2003	John Krause
Herptiles	2003	Gary Casper, Richard Sajdak
Natural communities	2002, 2003	Andy Clark, Eric Epstein, and Elizabeth Spencer
Terrestrial invertebrates	2002, 2003	Kathryn Kirk

Standard methods were used for surveying for each taxa group. For most of the surveys, data was collected for the entire suite of species present at a given survey site. Each investigator submitted a field report, and these are on file at the NHI program. Many common species, such as most tree species, were not covered by this inventory.

Following completion of fieldwork and data processing, NHI staff analyzed inventory data and refined site boundaries that include important assemblages of natural communities and rare species. Individual sites and their associated features are described in the “Primary Sites: Significance and Summaries” section of this report.

Description of the Study Area

Location

The study area (Fig. 1) is composed of four distinct blocks of primarily county-owned land in northern Chippewa County. Block 1 lies almost entirely within Ruby Township, along the Taylor County Line. Block 2, six miles to the west, makes up the bulk of the study area. It includes the 3,502-acre, WDNR-managed Chippewa Moraine State Recreation Area. This property is one of nine units in Wisconsin that make up the Ice Age National Scientific Reserve, a complex of parks and trails administered by the State of Wisconsin with assistance from the National Park Service. Block 3 is a narrow corridor along the Yellow River in Colburn Township, and Block 4 lies on the north shore of Otter Lake. There were no inventory sites identified for Block 4, so inventories were not conducted there.

Ecoregions

An *ecoregion* is a geographic area that has a relatively consistent pattern of topography, geology, soils, vegetation, natural processes, and climate. The most widely used ecoregion classification scheme is the U.S. Forest Services *National Hierarchical Framework of Ecological Units* (NHFEU) (Bailey, 1995; Keys, 1995). This system divides North America into four ecosystem *Domains*; each Domain is further divided into *Divisions*, *Provinces*, *Sections*, *Subsections*, and *Landtype Associations* (LTAs). Finer divisions have been developed for local use, sometimes at the individual property level (e.g., for the Chequamegon-Nicolet National Forest). To meet its own administrative and management needs, the WDNR has added another level of classification, called an *Ecological Landscape*, between the Section and Subsection levels. WDNR's Ecological Landscapes are aggregations of Subsections that are taken directly from the NHFEU.

WDNR Ecological Landscapes

The study area lies at the southwestern extreme of the North Central Forest, along the Forest Transition boundary (Fig. 2). Here the Forest Transition is just ten miles wide; the Western Coulees and Ridges lies to the southwest. In this area of the state, the transition from Northern Mixed Forest to Southern Broadleaf Forest ecosystems occurs across a very short distance. All but 430 acres of the study area lie within the North Central Forest Ecological Landscape. The following descriptions were adapted from the *Wisconsin Ecological Landscapes Handbook* (WDNR, 2004):

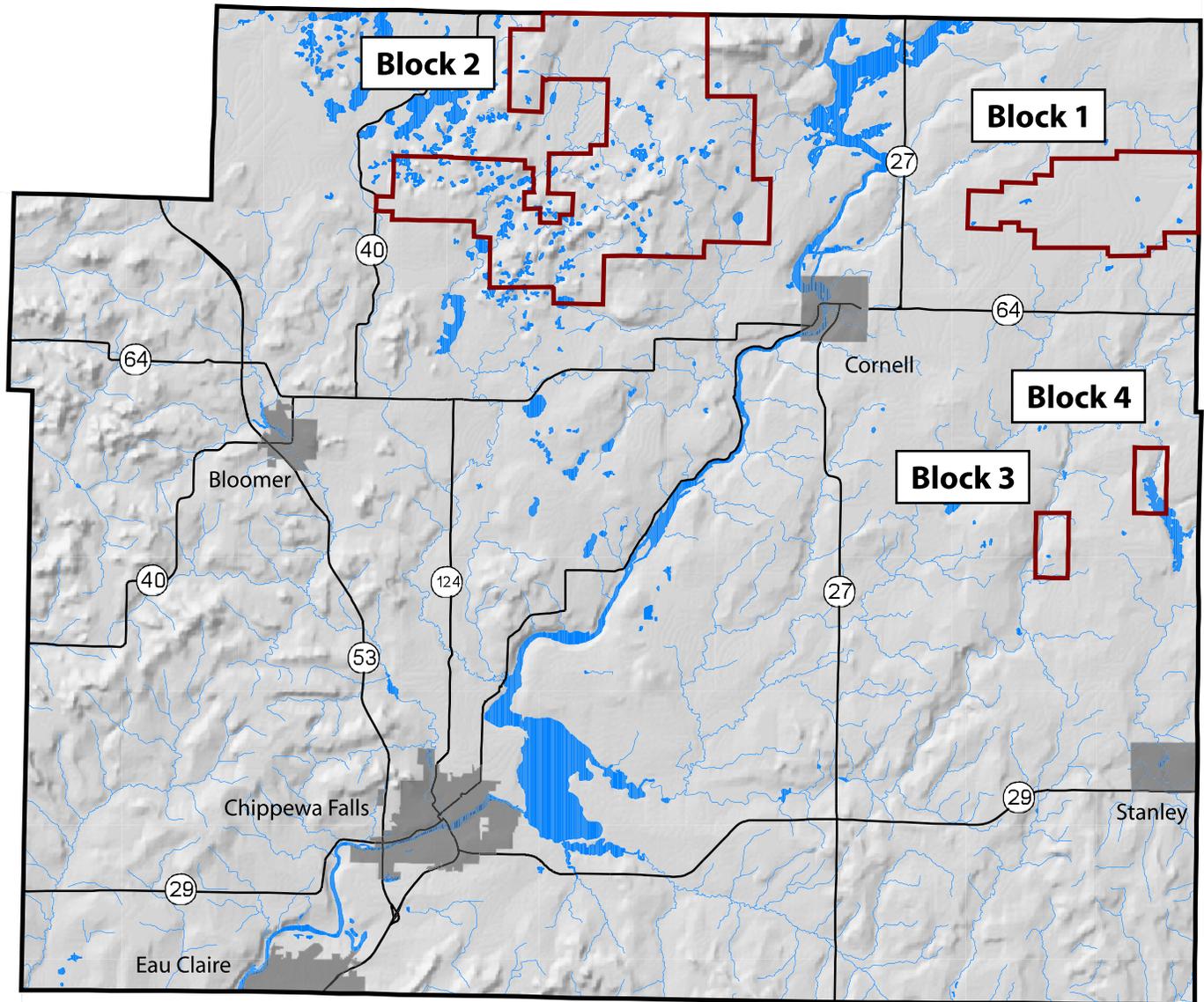
North Central Forest

This landscape is characterized by end and ground moraine with extensive northern hardwoods and large wetlands. There are almost no large lakes on the ground moraine. There are many small creeks, rivers, and kettle lakes. The moraines are also the headwaters of many major streams including the Chippewa and Flambeau rivers. Soils are primarily acid silt loams, podzolized, rocky, and often poorly drained, over underlying, acidic, reddish, sandy loam till. There are also areas of loam and loamy sand. Vegetation is primarily northern hardwood forest. Tamarack, white cedar, black ash, and black spruce are present in the conifer swamps. There are many large wetlands that are associated with kettles and streams. The major land use is timber for pulp production.

Forest Transition

This landscape is characterized by a mix of forest, agriculture, and swamp in the transition zone between the Northern Mixed Forest and the Southern Broadleaf Forest. Small kettle lakes are common on the moraines in the western lobe of this Ecological Landscape, but there are very few large lakes and few lakes at all in the remaining portion of the landscape. Soils are diverse and range from sandy loam to loam to shallow silt loam (both poorly drained and well drained). The moraines are the headwater to several streams. The numerous small creeks and rivers flowing across the plain form a dendritic drainage pattern. Vegetation is mainly northern hardwood forest, with areas of conifer swamps near the headwaters of streams.

Figure 1
Chippewa County Forest Biotic
Inventory Study Area.



1:325,000



Figure 2

Ecological Landscapes of Wisconsin and the Chippewa County Forest Study Area.

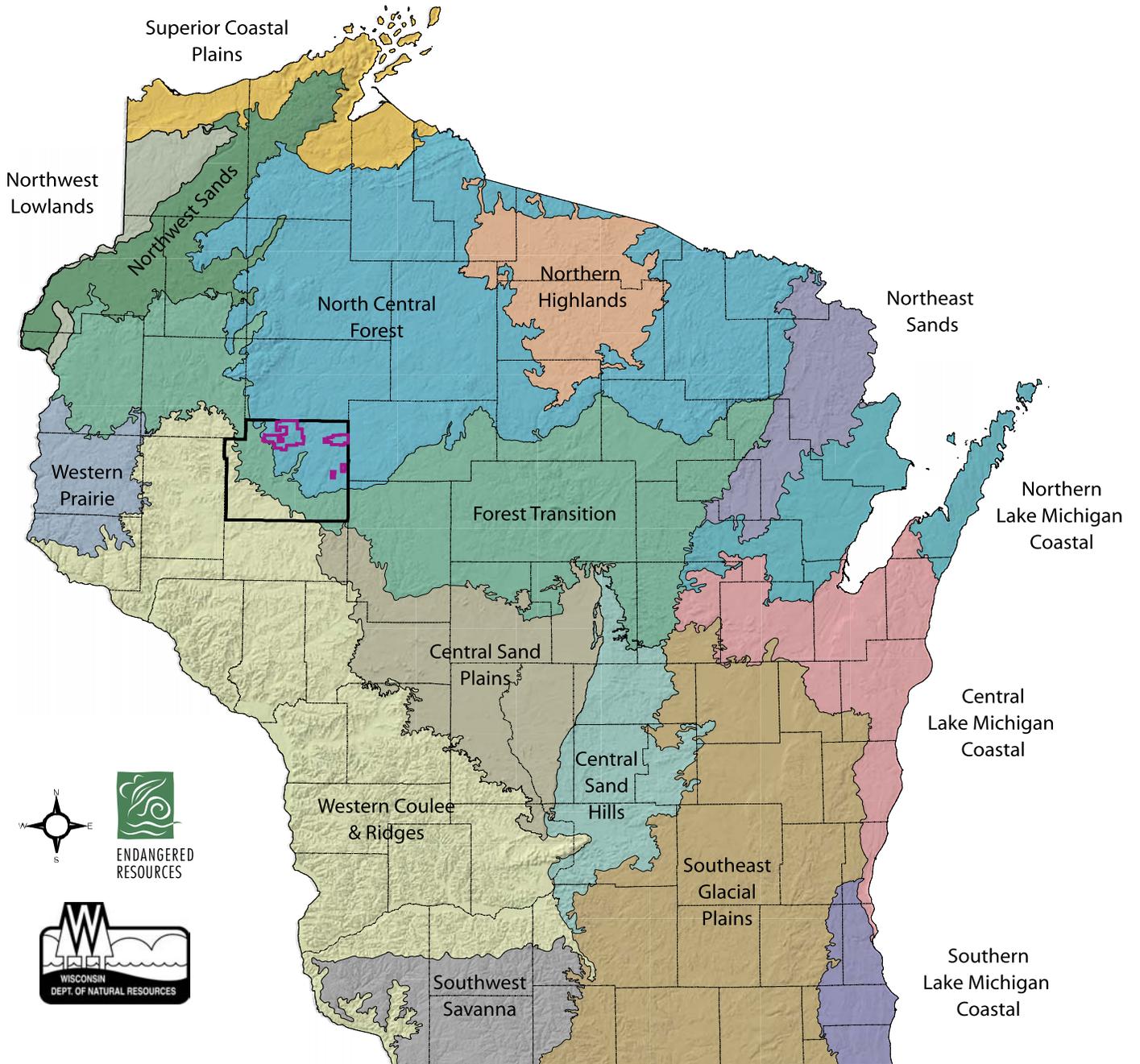
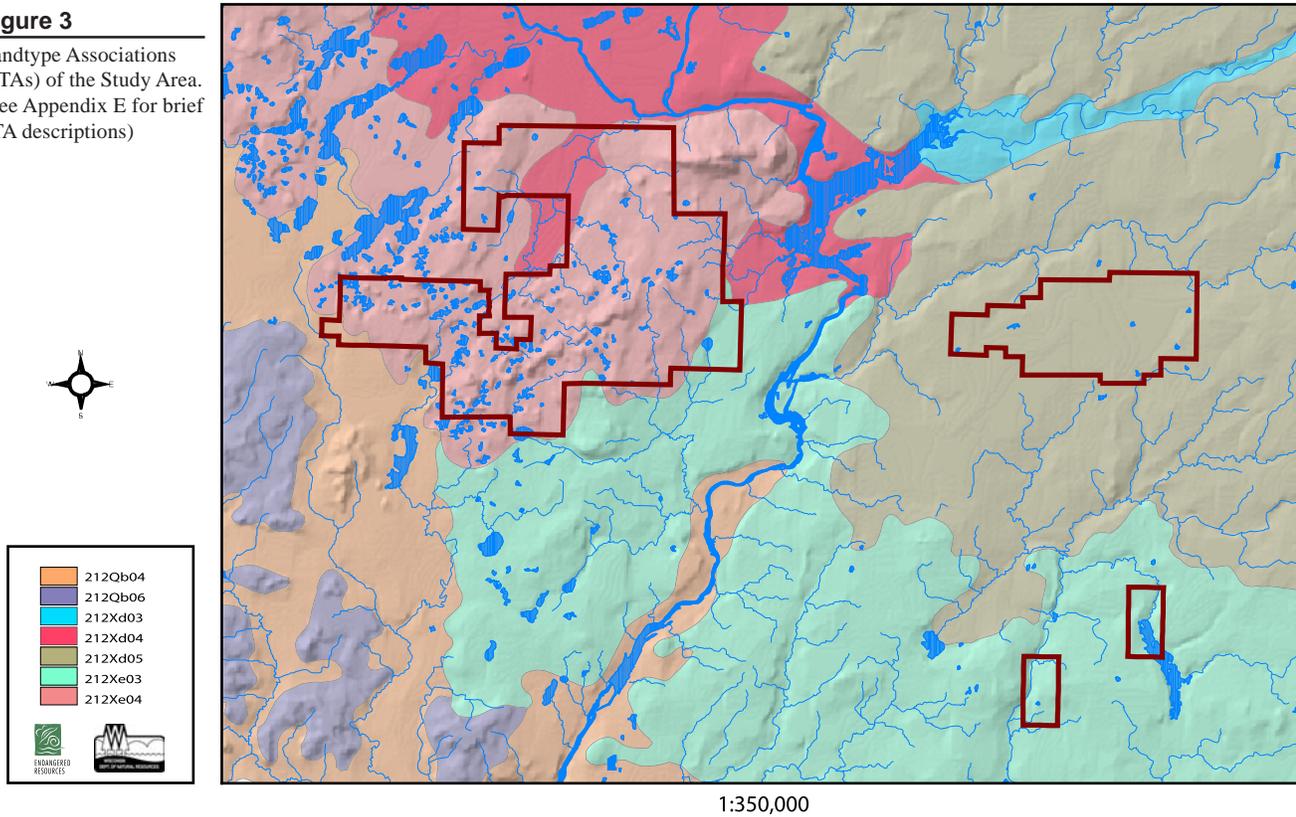


Figure 3

Landtype Associations (LTAs) of the Study Area. (See Appendix E for brief LTA descriptions)



The study area is comprised of portions of five Landtype Associations (LTAs), the finest level of the NHFEU hierarchy (Fig. 3). Brief descriptions of these LTAs are provided in Appendix E.

Size

The total acreage of the study area is 48,638 acres, which accounts for about seven percent of the area of Chippewa County. Twenty percent of the forested acreage in the county occurs within the study area, based on analysis of satellite imagery (Wisland, WDNR 1999) (Fig. 4).

General Land Use

The major land uses in the study area are commercial forestry and recreation. Important recreational activities include hunting, fishing, hiking, berry picking, and bird watching. Other uses include education and nature appreciation, which are coordinated at the Ice Age Reserve visitor center.

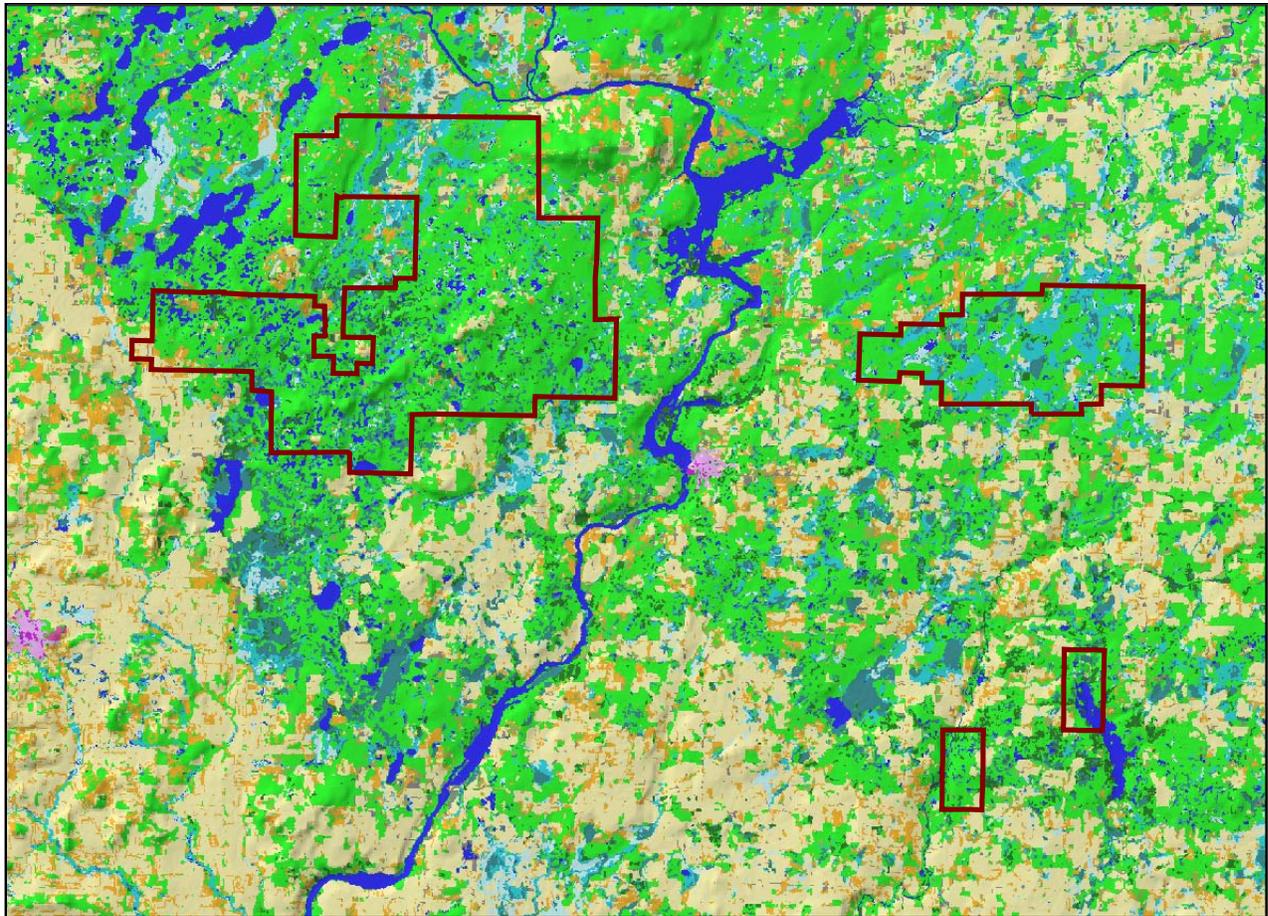
Physical Environment

Geography

Northern Chippewa County is characterized by rolling, hilly topography. Much of the area is located along a terminal moraine, and the landscape is composed of a diverse set of landforms, including outwash plains, kettles, kames, eskers, and ground moraines. Portions of the area contain abundant wetlands. Lakes are plentiful; there are over 300 lakes within the study area, many of them undeveloped.

Figure 4

Land cover of the Chippewa County Forest Study Area and surrounding landscape from the Wisconsin DNR Wiscland GIS coverage.



1:300,000

- URBAN / DEVELOPED
 - High Intensity
 - Low Intensity
 - Golf Course
- AGRICULTURE
 - General Agriculture
 - Cranberry Bog
- GRASSLAND
- FOREST
 - Coniferous
 - Broad-leaved Deciduous
 - Mixed Deciduous/Coniferous
- OPEN WATER
- WETLAND
 - Emergent / Wet Meadow
 - Lowland Shrub
 - Forested
- BARE SOIL/SAND/ROCK
- SHRUBLAND

The Wisconsin Land Cover data set is a raster representation of vegetation/land cover for the state. Source data were acquired from the Landsat Satellite Thematic Mapper (TM) sensor, primarily in the spring and fall of 1992. Image processing techniques followed and were published in the Upper Midwest GAP Image Processing Protocol (1997). The pixel size of the source TM data is 30 meters; however, the classified Land Cover data (excluding URBAN) are generalized or "smoothed" to an area no smaller than four contiguous pixels (equivalent to approximately one acre). Usage guidelines recommend that any feature five acres or larger may be resolved in the data i.e., a Minimum Mapping Unit (MMU) of five acres. The Land Cover data are considered reliable at nominal scales of from 1:40,000 to 1:500,000 for a wide variety of natural resource management and planning applications.



Regional Geological Features

The study area sits on the southern edge of the Precambrian Shield (also called the Canadian Shield or the Laurentian Plateau), a vast region of extremely old, volcanic bedrock that covers most of northern Wisconsin, Minnesota, Michigan, and nearly all of central and eastern Canada. To the south and west, softer, Cambrian sedimentary bedrock dominates. Blocks 1, 3, and 4 are underlain by shield rock, while the majority of Block 2 is underlain by sandstone.

The edge of the furthest advance of the most recent continental glaciation also occurs in Chippewa County. As the glacier receded, interactions between melting ice and till left behind a complex assemblage of landforms including outwash plains, kettles, kames, eskers, ground moraines, and an extensive terminal moraine. As a result, northern Chippewa County today exhibits extremely variable physical geography, with a wide variety of slopes, aspects, soils, and hydrologic features.

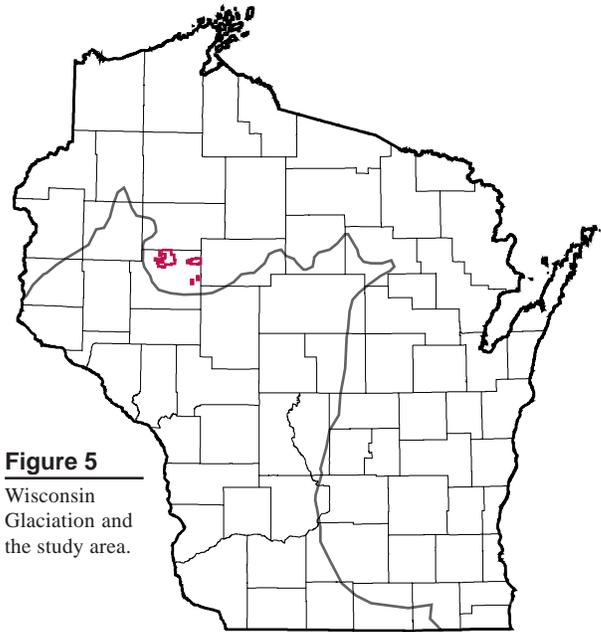


Figure 5
Wisconsin
Glaciation and
the study area.

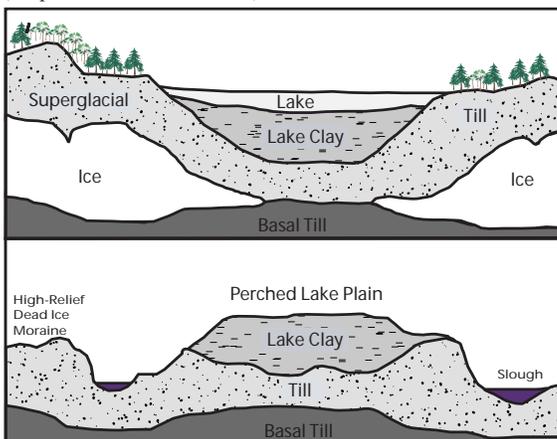
Northern Chippewa County is also at the margin of the furthest advance of the Wisconsin Glaciation (Fig 5), which occurred 10,000 to 15,000 years ago (National Park Service, 2001). The terminal moraine of the Chippewa Lobe runs from the northwest corner of the county southeast to Jim Falls, then east to the county line. Here, the glacier stopped its southwestern movement and began to recede. This process took place slowly, however, and left a type of terminal moraine called a *stagnation* or *dead ice moraine*. In this type of moraine, glacial debris actually collects on top of the slowly rotting ice, insulating it for hundreds, or even thousands, of years. When the underlying ice finally melts, the debris above collapses, creating uneven, hummocky topography with a variety of unique landforms (Bluemle, 1999).

Local Geological Features

Two types of glacial landforms, *ice-walled lake features* and *kettle lakes*, are of particular importance in the study area. Northern Chippewa county has some of the best examples of ice-walled lake features in the state. These clay or silt capped “miniature mesas” (Bluemle, 1999) formed when temporary glacial lakes collected sediment, then drained when the ice that enclosed them melted (see Fig. 6). Today these features contain some of the deeper, more productive soils in the area, and their flat tops are often used for agriculture.

Figure 6

Formation of an ice-walled lake feature
(adapted from Bluemle 1999)



The hundreds of kettle lakes found on the terminal moraine formed when large blocks of ice buried in the glacial debris melted, and filled the crater that they left behind with water.

In front of the receding ice, glacial melt water carried and deposited sand, forming relatively level to rolling outwash plains. These plains were often *pitted* by large blocks of ice carried by melt water streams, or *collapsed* when the sand was deposited over stagnant ice. Beneath the glacier, debris falling out of the melting ice formed rolling ground moraines of unsorted till. Most of the study area is covered with 50 to 100 feet of glacial till, but in some places on the terminal moraine the drift layer is in excess of 100 feet.

Soils

Soils of the study area reflect the wide variety of landforms and parent material left by the Wisconsin Glaciation. Block 1, on the ground moraine, is dominated by poorly drained soils. The most common soil series on the better-drained knolls of Block 1 is Freeon silt loam (901 acres).

Blocks 2, 3, and 4 are on the terminal moraine and are characterized by deep, well-drained soils on gently sloping to very steep terrain. Relatively fertile, well-drained soils dominate this area, covering over 20,000 acres. Lowland soils are the next most common (5,820 acres). They are very poorly drained and occupy the glacial depressions of Block 2. Sandy, excessively drained soils (about 600 acres) occur in areas dominated by glacial outwash. There are a variety of silt loams associated with ice-walled lake features (Jakel et al., 1989).

Hydrology

The entire study area sits within the Chippewa River drainage basin, which stretches 175 miles from the headwaters of the Flambeau River near the Michigan border to the Mississippi River. The Chippewa basin covers 18 percent of the total area of Wisconsin. The waters of the study area flow into the Chippewa River via four sub-basins: the Holcombe Flowage Basin, the McCann and Fisher Rivers Basin, the Upper Yellow River Basin, and the Lower Yellow River Basin.

Table 2. Hydrologic features of the Chippewa County Forest Study Area.

Block	Streams (mi.)	Open Water (ac.)	Wetlands (ac.)
1	2.6	89	4,484
2	70.5	2,342	7,425
3	4.9	348	98
4	1.7	234	170

The interactions between stagnant ice and glacial debris on the moraine resulted in a complex of lakes with wide variety of sizes, shapes, depths, and chemical characteristics (Sather, 1963). Table 2 provides a summary of the surface waters of the study area. In general, the surface waters of northern Chippewa County are relatively low in dissolved minerals (soft), acidic, and infertile. Some bogs and lakes, however, exhibit high alkalinity. The terminal moraine, with its hummocky topography and numerous kettle lakes and wetlands, has a poorly developed drainage network. Many streams that originate on the moraine flow out of lakes or wetlands and are intermittent. A more comprehensive treatment of lake chemistry will be available in a companion report (Garrison et al., in preparation).

Vegetation

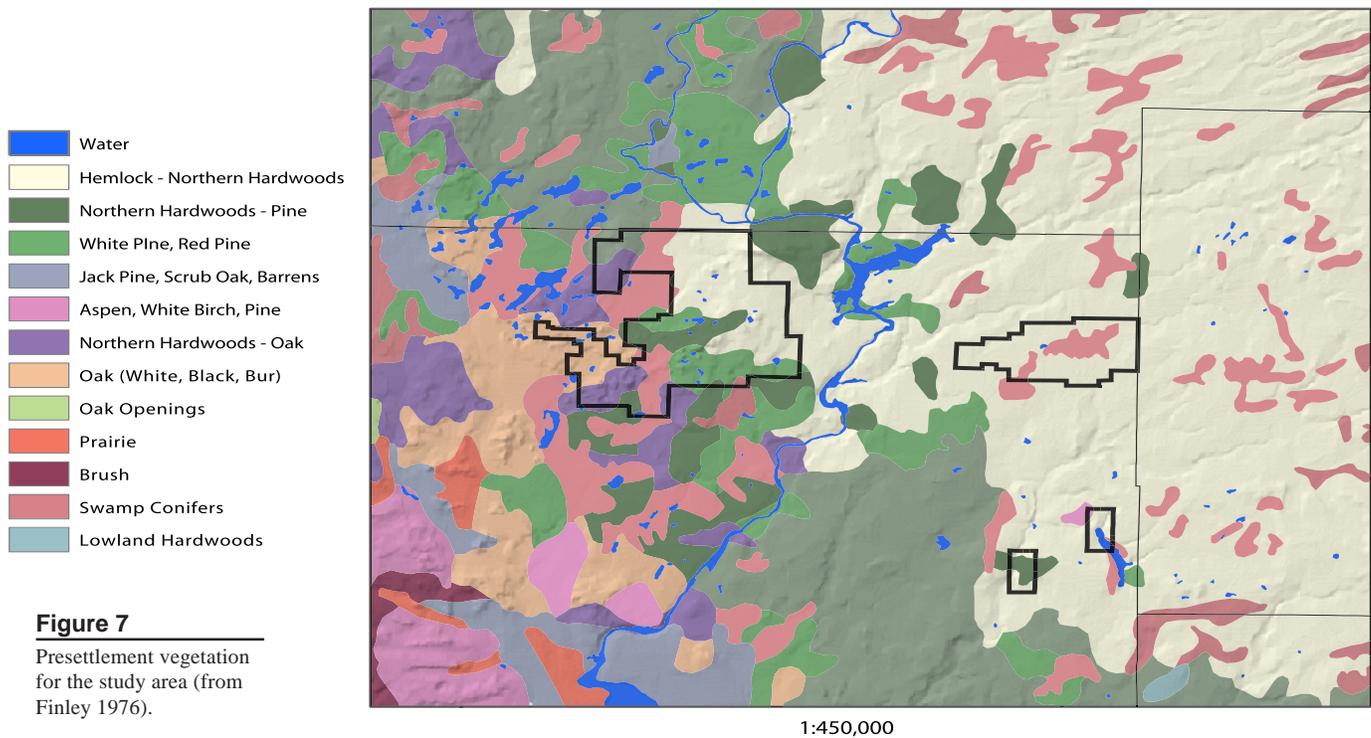
Historic Vegetation

In 1976, R.W. Finley used the General Land Office (GLO) survey records from the mid-1800s to produce a 1:500,000 scale map entitled *Original Vegetation Cover of Wisconsin*. As interpreted by Finley, the study area was dominated by mesic northern hardwood forest prior to settlement (Fig. 7). White pine and hemlock were often mixed with hardwoods, and in some areas pure stands of white and/or red pine dominated. Oak forests occurred on the western edge of the study area. Prairies and oak savannas occurred in areas to the south and west of the study area. Fig. 8 illustrates the major presettlement vegetation types in the study area from GLO records.

Current Vegetation

Forests are the dominant cover type in the study area. Over 90 percent of the area is covered by forests, wetlands, or open water, with nearly all of the remaining acreage in agriculture and old fields. Farming occurs on many of the ice-walled lake-plain features, which presented farmers with relatively level sites and relatively rich well-drained soils, once the forest had been cleared. The most dramatic change in land cover since settlement has been the conversion of mature hemlock-hardwood-pine forests to aspen and younger mixed hardwoods.

Forests A number of characteristics set the forests of northern Chippewa County apart from others in the state. The proximity of the tension zone provides for unique tree species assemblages: from west to east there is a remarkably fast transition from prairie, to oak woodland, to mixed oak, to northern hardwood, to more boreal forest types, with a number of conifers among the canopy dominants. Species composition on a given site is strongly influenced by

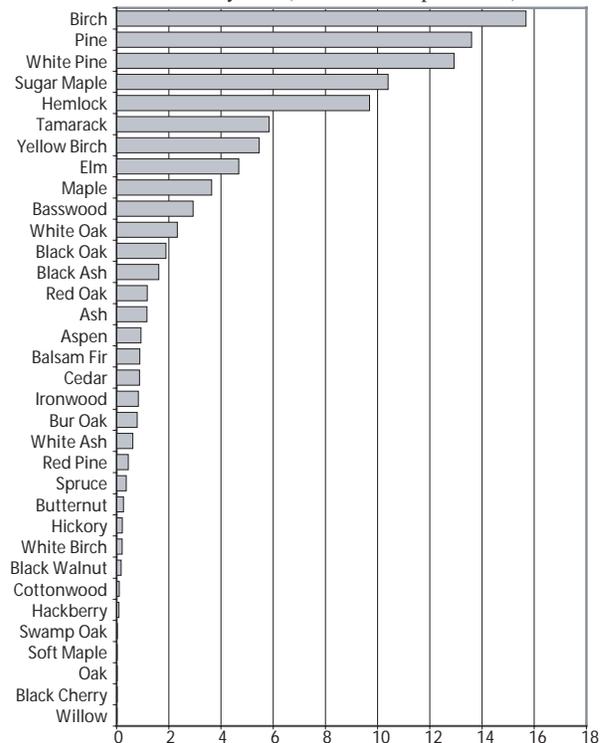


glacial landform (slope and aspect) and deposition (soils and drainage), and northern Chippewa County is unusually heterogeneous in both respects. Historically, fire also played an important role in determining forest composition.

Present tree species composition on the county-owned lands is dominated by aspen, which covers over a third of the forested acreage (Fig. 9). Northern hardwood and oak cover types account for the bulk of the remaining forests. In general, the forests of the study area are relatively young. Large trees are rare, and significant stands of large trees are virtually absent. Nearly 40 percent of the county owned forested area is covered by trees smaller than five inches in diameter at breast height, while only two percent is covered by stands with a primary component of trees with diameters greater than 15 inches (Fig. 10). The young aspen stands that dominate the Chippewa County forest are composed of a mixture of big-toothed and quaking aspen, often with a paper birch or oak component. Northern hardwoods cover about 15 percent of the forest, and 20 percent of the forested uplands. These forests are diverse mixtures dominated by sugar and red maple, white ash, basswood, paper birch, and red oak. Other species occasional in the type include black cherry, white oak, eastern hemlock, yellow birch, bitternut hickory, black ash, and, infrequently, swamp white oak. The southwestern part of the Chippewa County Forest supports drier and more oak-rich northern hardwood types than most other parts of the northern hardwoods landscapes. Due to these drier habitat types, sugar maple is not as dominant here as it is in forests to the east and north.

Figure 8.

Relative Importance Values (the average of Relative Dominance and Relative Density) for bearing tree species from General Land Office survey records for the northeast two-fifths of Chippewa County encompassing the CCF study area (numbers add up to 100%).



Forests dominated by oak are nearly as abundant as northern hardwoods; in the western half of Block 2 they cover close to half of the landscape (primarily on Ice Age Reserve lands). Typically these oak stands are 60 to 90 years old and are dominated by red oak. The proportion of white, northern pin, and bur oak increases as one moves west. Associates may include paper birch, trembling and bigtooth aspens, and white oak, and younger northern hardwoods, especially ash, basswood, and red and sugar maples. Historically, many of these forests contained a supercanopy of white and red pine.

Pine types are generally rare in this landscape, composing about three percent of the forested acreage, and with roughly half that acreage in plantations. Natural stands of mature red pine, often mixed with white pine, occur on steep slopes on the north and east sides of lakes and wetlands that served as natural firebreaks. Some wetland sites where tamarack or spruce-fir would be expected have an unusual white pine swamp type (White Pine-Red Maple Swamp).

Spruce-fir forest types cover about 600 acres, mainly near large wetland complexes in the north and east portions of the County Forest. Proximity to the tension zone makes for some interesting anomalies in the spruce-fir communities. Balsam fir is lacking or scarce in many moist forest understories, where one would normally find it in northern Wisconsin. Black spruce is often found with tamarack in small kettle wetlands near the tension zone, juxtaposed with upland Southern Broadleaf Forest types. White spruce generally occurs farther west than does balsam fir, but is rare in the study area.

Wetlands: Twenty two percent of the study area is covered by wetland vegetation. Northern Chippewa County wetlands have some attributes that make them unique on a statewide level. Many of them occur along the edge of the terminal moraine, where glacial till is deep and provides more variable soils and water chemistry than wetlands farther north and east. Many of these wetlands have remained intact because the uneven topography of the moraine makes them difficult to drain and convert to other uses.

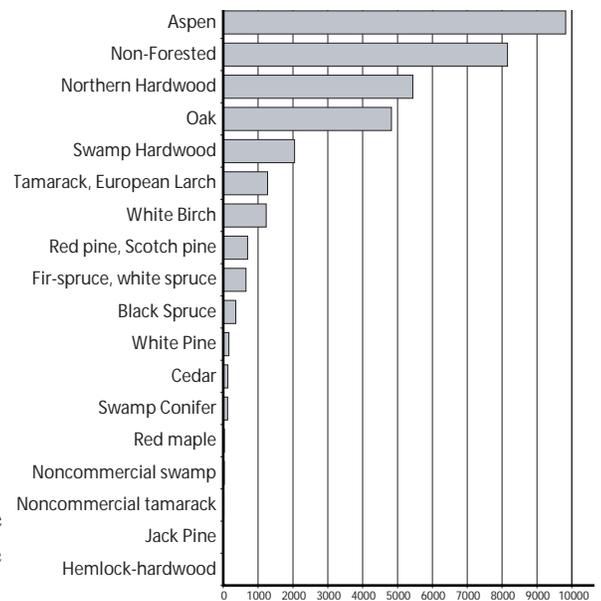
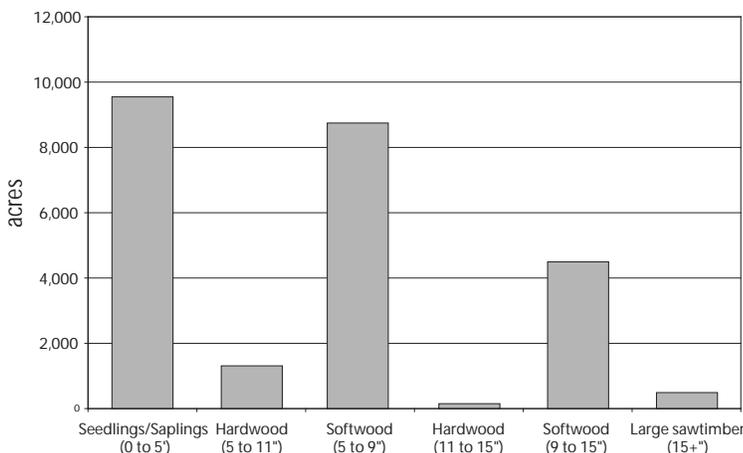


Figure 9
Primary cover types on the Chippewa County Forest from WDNR Forest Reconnaissance data (data are from 2003).

Figure 10
Tree size class distribution for Chippewa County Forest lands from WDNR Forest Reconnaissance.



Northern Chippewa County is also home to the southernmost extent of some northern-adapted wetland types. The overlapping of southern and northern vegetation communities creates a diverse mosaic of habitats, including some that support rare species. Perhaps most importantly, wetlands in the study area are generally less affected at this time by invasive plant species such as reed canary grass, purple loosestrife, and glossy buckthorn than those in other parts of the state, especially those near areas that receive heavy use for agricultural and residential purposes.

Summary of Findings

Natural Communities of the Study Area

Element occurrence quality stands of the following natural communities have been documented in and around the study area. Other community types are also present, but were represented by stands that were too small, or too isolated to warrant inclusion in the NHI database. Table 3 summarizes the natural community occurrences that resulted from this project.

Summaries of the community level information and vegetation are presented in other sections of the report, such as in the “Vegetation” portion of the “Description of the Study Area.” Descriptions of the natural communities that are found in this landscape are provided in Appendix C, and more detailed accounts of individual community occurrences can be found in the Site Descriptions. The following sections on rare plants and animals relate the occurrences of these species to the condition and abundance of the habitats and natural communities present.

Rare Vascular Plants of the Study Area

The Wisconsin Natural Heritage Database tracks **16** rare plant species in the study area, and the majority of these are either aquatic species or associated with wetlands. DNR staff documented almost all of these rare species during field inventories conducted in 2002 and 2003 (Table 4). Three other rare species have been noted in the vicinity but were not observed in the study area during this inventory. Biologists have confirmed one Wisconsin Threatened plant species in the study area: bog bluegrass (*Poa paludigena*). Figure 11 illustrates the distribution of the rare species documented in the study area.

Fourteen additional rare plant species found in the study area are designated of “Special Concern,” meaning that experts suspect the species are rare or declining in Wisconsin but have not yet gathered proof of threats to their survival in Wisconsin. As of this writing, the US Fish & Wildlife Service does not track any of the plant species documented in the study area.

Five other Special Concern plant species have previously been documented in the vicinity of the study area. There is some suitable habitat in the study area, but none of these species were located during the inventory.

The State Threatened bog bluegrass, a species that had not been found previously in Chippewa County, was documented at six sites on the County Forest. The populations vary in size, and all occur in wet forests under canopies of black ash, yellow birch, silver maple, other hardwoods, and sometimes white cedar. Microhabitat features of swamps that supported populations of bog bluegrass were fairly open beneath mature ash and yellow birch canopy, partial shade (not dense shade as typical of young stands of black ash), and the presence of mossy logs and tussocks of brome-like sedge (*Carex bromoides*) that provide suitable germination sites. Bog bluegrass did not occur in swamps (or portions of swamps) that had a vigorous growth of tall plants such as speckled alder, American black currant, joe-pye-weed, or lake sedge (such as in canopy gaps or in disturbed peat and muck). It did not occur in streams or flowages where “wash-out” events had cut into peat exposing sand or where sand and gravel had been deposited onto the peat. There is more suitable habitat for bog bluegrass that could be surveyed on the County Forest.

Table 3. NHI natural community types documented within the study area

Community	Last Year
Shrub Communities	
Alder thicket	2002
Muskeg	2002
Upland Forests	
Northern dry-mesic forest	2002
Northern mesic forest	2002
Southern dry-mesic forest	2003
Wetland Forests	
Floodplain forest ¹	2003
Hardwood swamp	2002
Northern wet forest	2002
Northern wet-mesic forest	2002
Tamarack (poor) swamp	2002
White pine-red maple swamp	2002
Wetland Herbaceous Communities	
Emergent marsh ¹	2002
Northern sedge meadow	2002
Poor fen	2002
Southern sedge meadow	2002

¹. These communities were not located within the Chippewa County Forest boundary

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

Scientific	Common Name	State	Global	State	Year
		Rank	Rank	Status	
<i>Aplectrum hyemale</i>	Putty Root	S2S3	G5	SC	2002
<i>Arethusa bulbosa</i> ¹	Swamp-pink	* S3	G4	SC	1959
<i>Botrychium oneidense</i>	Blunt-lobe Grape-fern	S2	G4Q	SC	2003
<i>Carex assiniboinensis</i> ¹	Assiniboine Sedge	* S3	G4G5	SC	1960
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	* S2	G4?	SC	2003
<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Northern Yellow Lady's-slipper	* S3	G5T4Q	SC	2002
<i>Cypripedium reginae</i>	Showy Lady's-slipper	* S3	G4	SC	2002
<i>Deschampsia cespitosa</i> ¹	Tufted Hairgrass	* S2	G5	SC	1935
<i>Eleocharis robbinsii</i>	Robbins' Spikerush	* S3	G4G5	SC	2003
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's-mouth	* S3	G4Q	SC	2002
<i>Myosotis laxa</i> ¹	Small Forget-me-not	* S2	G5	SC	1959
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	* S3	G5	SC	2003
<i>Phegopteris hexagonoptera</i>	Broad Beech Fern	S2	G5	SC	2002
<i>Poa paludigena</i>	Bog Bluegrass	* S3	G3	THR	2003
<i>Potamogeton diversifolius</i>	Water-thread Pondweed	* S2	G5	SC	2003
<i>Potamogeton vaseyi</i>	Vasey's Pondweed	* S2	G4	SC	2002
<i>Rhynchospora fusca</i> ¹	Brown Beakrush	* S2	G4G5	SC	2003
<i>Scirpus torreyi</i>	Torrey's Bulrush	* S2	G5?	SC	2002
<i>Scirpus torreyi</i>	Torrey's Bulrush	* S2	G5?	SC	1995
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	* S3	G4G5	SC	2003
<i>Utricularia purpurea</i>	Purple Bladderwort	* S3	G5	SC	2003
<i>Utricularia resupinata</i>	Northeastern Bladderwort ¹	* S3	G4	SC	1988

1. These species were not located within the County Forest boundary.

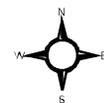
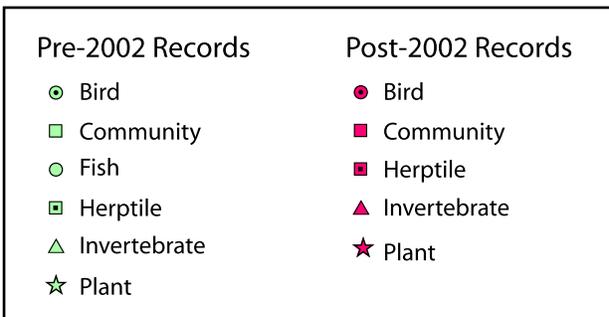
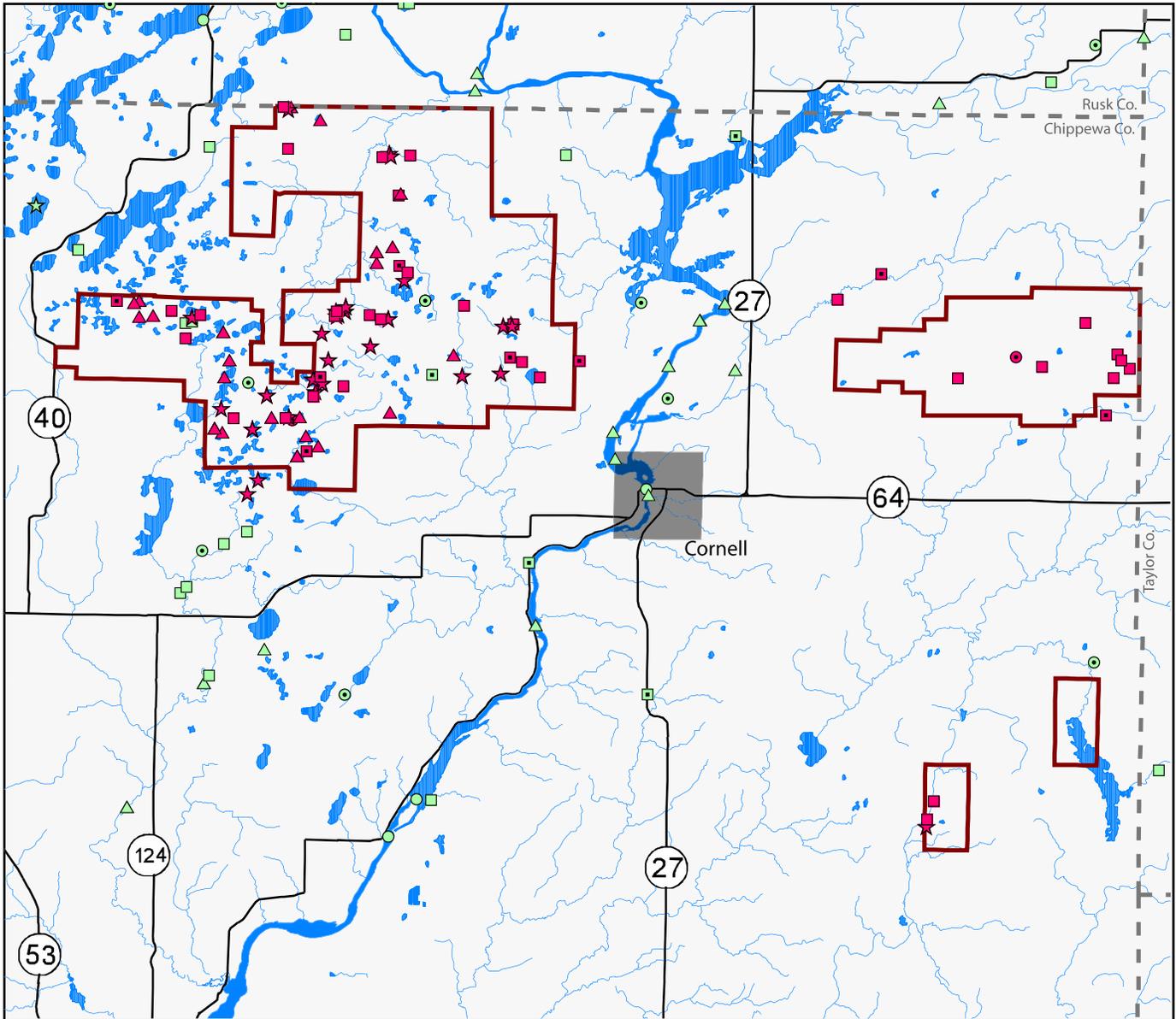
* Species associated with wetlands or aquatic features.

In Wisconsin, bog bluegrass most often is associated with seeps, springs, or cold water creeks and is often under some sort of canopy cover, commonly black ash or alder. Some records are from open habitats like sedge meadows. The species has been found at 38 sites in Wisconsin, of which six have been extirpated or were found before 1970. The majority of records are in northwestern (18) and central (11) Wisconsin.

The lakes, streams, and wetlands are important geological features on the Chippewa County Forest and are important features of biological diversity (Table 2). Sampling that was done in 2002 and 2003 (Konkel 2005) on the lakes and flowages documented many new records for rare aquatic plants including prickly hornwort (*Ceratophyllum echinatum*), several species of pondweed (*Potamogeton*), two bladderworts (*Utricularia* spp.), and Torrey's bulrush (*Scirpus torreyi*). The study area has important concentrations of at least three aquatic species: purple bladderwort (*Utricularia purpurea*), hidden-fruited bladderwort (*U. geminiscapa*), and Farwell's water-milfoil (*Myriophyllum farwellii*) (Fig. 12). Two other concentrations for these species in the state occur in the relatively sterile waters of the Northern Highland counties of Vilas and Oneida and in the Central Sands area of Jackson and adjacent counties. Chippewa County Forest is also important because, as a result of this study, the known populations of prickly hornwort known in Wisconsin have more than doubled. The other known populations are scattered, mainly across the northern central and northwestern parts of the state with a few in the Central Sands region. Robbins' spikerush (*Eleocharis robbinsii*) was documented at three locations in 2002 and 2003. Additional information about the sampling locations and techniques and the more common associated species can be found in Konkel 2005.

Figure 11

Study Area Rare Plant and Animal Occurrences
 from the Natural Heritage Inventory Database
 (data are from April 2005).



Several Special Concern wetland species were also documented during this study including plants of open wetlands like brown beakrush (*Rhynchospora fusca*), forested wetlands like white adder's-mouth (*Malaxis monophylla* var. *brachypoda*), and those that can occur in open or forested wetlands like northern yellow lady's-slipper (*Cypripedium parviflorum* var. *makasin*) and showy lady's-slipper (*Cypripedium reginae*). Two populations of brown beakrush were found just south of the Chippewa County Forest during 2003. The first one was large population on a floating poor fen mat, and the second consisted of a moderate-sized population in a fenny northern sedge meadow. The 20 known occurrences of brown beakrush are scattered throughout northern Wisconsin.

Each of the following species are most commonly found in wetlands that are neutral to slightly calcareous, and that type of habitat is more uncommon in central and north-central Wisconsin in general and the County Forest specifically. A moderate-sized population of white adder's-mouth was documented at one site in the study area. The range of this species is eastern and central Canada, as well as the northeast and north central United States. In Wisconsin, it is known primarily from the easternmost counties with a few localities in east central and northwest Wisconsin. White adder's-tongue inhabits neutral to calcareous swamps.

A tiny population of northern yellow lady's-slipper was documented at one site during this inventory. Several vegetative plants were found, but the biologist could not determine, with confidence, if the species was northern or large yellow lady's-slipper. *Cypripedium parviflorum* var. *makasin* inhabits calcareous open to forested wetlands throughout its range across the northern United States and most of Canada. About three quarters of the known sites in Wisconsin occur in eastern, especially southeastern, part of the state.

Showy lady's-slipper was documented at two sites, both neutral to slightly calcareous, in the study area. The first population is small, and the second population is moderate in size. It is in the central portion of its range in Wisconsin, and documented occurrences are scattered throughout Wisconsin. This species inhabits calcareous wetlands of many types throughout its range.

Three Special Concern upland forest species were found during the study: putty root orchid (*Aplectrum hyemale*), blunt-lobe grape-fern (*Botrychium oneidense*), and broad beech fern (*Phegopteris hexagonoptera*). Putty root is a relatively inconspicuous orchid that generally can be found in rich, moist deciduous forests but, in Wisconsin, has also been found in coniferous and mixed deciduous-coniferous woods. Putty root was noted at two locations in the County Forest. Because this species was added to the NHI Working List in 2004, putty root was not specifically looked for and it is likely that there may be additional populations in the study area. Putty root is distributed throughout the eastern United States and into Quebec and Ontario. Wisconsin is toward the northern edge of the range of the species.

Blunt-lobe grape-fern grows in moist, shady, acidic woods and swamps. This fern, previously not known to exist in Chippewa County, was found in two locations in the County Forest under red maple and basswood close to swamps. The new populations represent a range extension for the state. Blunt-lobe grape-fern ranges from Tennessee and

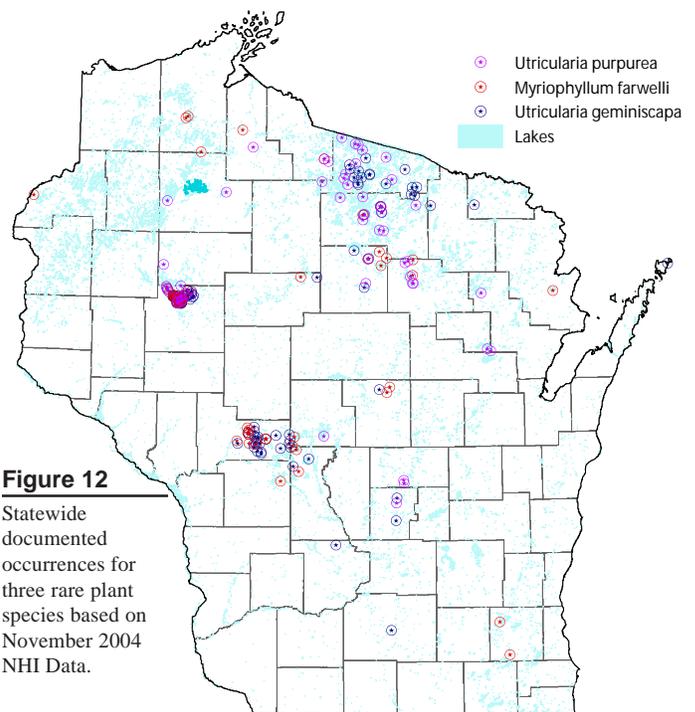


Figure 12
Statewide documented occurrences for three rare plant species based on November 2004 NHI Data.

North Carolina north, generally east of the Mississippi River, to Ontario and Quebec. It has also been found in Minnesota. All of the Wisconsin records are from the northern part of the state.

Broad beech fern was documented at two sites. It is at the northern edge of its range in Wisconsin, and ranges across the eastern United States and into Quebec and Ontario. Both colonies are healthy and of moderate size and were found in good quality northern mesic forests.

There are certain plants and animals for which we collect data that are not entered into the NHI database because the species are still fairly common. However, because we do have concerns about their status, we maintain records in manual files for these species. We found populations and individuals for two of these species: ginseng (*Panax quinquefolius*) and butternut (*Juglans cinerea*). Ginseng is an herb that falls under the auspices of by the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) treaty, and there is a system that tracks the wild ginseng roots that are harvested. Range wide, butternut populations have been drastically reduced by the fatal butternut canker. Healthy, mature trees that are resistant to the canker might be used as a seed source for any future restoration efforts. Unfortunately, most mature trees encountered on the County Forest were dead or dying. Only one apparently healthy and mature specimen was seen during this inventory. Saplings were seen but, like their parents, will likely be susceptible to canker as they grow.

One Special Concern aquatic species, northeastern bladderwort (*Utricularia resupinata*) was documented just outside the County Forest in 1988 but was not found during the extensive aquatic plant sampling in 2002 and 2003. It seems likely that if northeastern bladderwort did occur within the study area it would have been found during the study.

Future rare plant inventory

Bog bluegrass (WI Threatened) was found at six sites within the study area. Additional sites with suitable appearing habitat were surveyed without success during this study. However, several additional sites with suitable habitat conditions occur and should be surveyed for this rare grass.

The presence of blunt-lobe grape fern (Special Concern) and other more common species of *Botrychium* increases the possibility that there are additional populations of rare *Botrychium* species (such as Mingan's moonwort, *B. minganense*) to be found. A general guideline is to search in areas where other species of *Botrychium* occur because they may have similar microhabitat requirements for spore germination and plant development. Surveys of the appropriate habitat might also uncover additional populations of rare upland plants such as putty root and broad beech fern.

Several lady's-slipper orchids were found, but they were either vegetative, the flowers were withered, or the flowering stalk had been eaten and so their identity could not be determined. Inventory work at the appropriate time of the year could not only determine the identity of these plants, but additional populations of rare lady's-slippers could be found.

Four Special Concern plant species have been documented in the vicinity of the study area, and there is some potential habitat for each of these species in the study area. Swamp pink (*Arethusa bulbosa*) is an attractive orchid that is found in bogs and fens. There is one 1959 record for swamp pink along a boggy lakeshore in Chippewa County. There is potential habitat in the study area for this orchid around some of the lakes and near Ruby Swamp. Assiniboine sedge (*Carex assiniboinensis*) prefers rich alluvial terraces along rivers. There is a historic record of this sedge from the Cornell area. There is limited potential habitat for this species in the study area. In Wisconsin, most recent records of tufted hairgrass (*Deschampsia cespitosa*) have been found in Door County and the Apostle Islands. The majority of the occurrences have been in moist habitats, often in a coarse substrate like sand or cracks in dolomite pavement; there is one historical record from dry dunes along Lake Superior. Tufted hairgrass was collected in the 1930's along the Chippewa River near Holcombe, and there is some potential habitat for it in the study area. There are a few, scattered records for small forget-me-not (*Myosotis laxa*) in Wisconsin, and most of

those are older than 1970, including one from around Jim Falls. Habitat in general consists of moist soil and shallow water; the Chippewa County record is from the rocky flats and shores along the Chippewa River. There is abundant potential habitat within the study for small forget-me-not. The range of the species is intermittently circumboreal. It is found in eastern and western North America, north of Mexico, but appears to be largely absent from the central part of the continent.

Rare Animals of the Study Area

Forty-five NHI Working List animal species have been documented in and around the study area (Table 5). Wisconsin DNR staff documented all but 18 of these species in surveys conducted in 2002 and 2003. Those taxa not found in recent surveys tended to be large river species found in the Study Area, but not on county forest property and were not systematically searched for as part of this project.

State or Federally Endangered or Threatened species found on the county forest proper were limited to Red-shouldered Hawk, Cerulean Warbler, Bald Eagle, Osprey, and Blanding's Turtle. All other listed species mentioned above are large stream or river species and were not found on county forest property.

Table 5. NHI Working List Animals found in the study area.

Scientific	Common Name		State Rank	Global Rank	State Status	Federal Status	Last Year
Beetles							
<i>Agabetes acuductus</i>	A Water Scavenger Beetle	*	S2S3	GNR	SC/N		2002
<i>Copelatus glyphicus</i>	A Predaceous Diving Beetle	*	S3?	GNR	SC/N		2002
<i>Cymbiodyta minima</i>	A Water Scavenger Beetle	*	S3	GNR	SC/N		2002
<i>Haliphus leopardus</i>	A Crawling Water Beetle	*	S1S3	GNR	SC/N		2002
<i>Hydrobius melaenum</i>	A Water Scavenger Beetle	*	SU	GNR	SC/N		2002
<i>Hydroporus badiellus</i>	A Predaceous Diving Beetle	*	S3?	GNR	SC/N		2002
<i>Hygrotus sylvanus</i>	Sylvan Hygrotus Diving Beetle	*	S1	G1	SC/N		2002
<i>Ilybius discedens</i>	A Predaceous Diving Beetle	*	S3	GNR	SC/N		2002
<i>Liodessus flavicollis</i>	A Predaceous Diving Beetle	*	S3?	GNR	SC/N		2002
<i>Rhantus sinuatus</i>	A Predaceous Diving Beetle	*	S3	GNR	SC/N		2002
Birds							
<i>Buteo lineatus</i>	Red-shouldered Hawk	*	S3S4B	G5	THR		2003
<i>Dendroica cerulea</i>	Cerulean Warbler		S2S3B	G4	THR		2002
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	*	S4B	G5	SC/M		2002
<i>Haliaeetus leucocephalus</i>	Bald Eagle	*	S3B	G4	SC/FL	LT, PD	1992
<i>Pandion haliaetus</i>	Osprey	*	S3S4B	G5	THR		1990
Butterflies							
<i>Boloria eunomia</i>	Bog Fritillary	*	S3	G5	SC/N		2003
Caddisflies							
<i>Banksiola dossuaria</i>	A Giant Casemaker Caddisfly	*	SU	GNR	SC/N		2002
Crustaceans							
<i>Crangonyx richmondensis</i>	A Side-swimmer	*	SU	GNR	SC/N		2002
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp	*	S1S3	G5	SC/N		2002
Dragonflies and Damselflies							
<i>Gomphurus lineatifrons</i> ¹	Splendid Clubtail	*	S3	G4	SC/N		1998
<i>Gomphurus ventricosus</i> ¹	Skillet Clubtail	*	S3	G3	SC/N		1998
<i>Lestes eurinus</i>	Amber-winged Spreadwing	*	S3	G4	SC/N		2002
<i>Lestes inaequalis</i>	Elegant Spreadwing	*	S2S3	G5	SC/N		2002
<i>Nannothemis bella</i>	Elfin Skimmer	*	S3	G4	SC/N		2003
<i>Neurocordulia yamaskanensis</i> ¹	Stygian Shadowfly	*	S3	G5	SC/N		1998
<i>Ophiogomphus anomalus</i> ¹	Extra-striped Snaketail	*	S1	G3	END		1998
<i>Ophiogomphus carolus</i> ¹	Riffle Snaketail	*	S3	G5	SC/N		1971
<i>Ophiogomphus howei</i> ¹	Pygmy Snaketail	*	S3	G3	THR		1994
<i>Ophiogomphus smithi</i> ¹	Sand Snaketail	*	S2	G2	SC/N		1994

Scientific	Common Name		State Rank	Global Rank	State Status	Federal Status	Last Year
<i>Ophiogomphus susbehcha</i> ¹	Saint Croix Snaketail	*	S1	G1G2	END		1998
<i>Somatochlora franklini</i>	Delicate Emerald	*	S2S3	G5	SC/N		2003
<i>Stylogomphus albistylus</i> ¹	Least Clubtail	*	S3	G5	SC/N		1992
<i>Stylurus notatus</i> ¹	Elusive Clubtail	*	S2S3	G3	SC/N		1994
Fish							
<i>Acipenser fulvescens</i> ¹	Lake Sturgeon	*	S3	G3G4	SC/H		1991
Rare Leafhoppers and True Bugs							
<i>Hebrus burmeisteri</i>	A Velvet Water Bug	*	S2S3	GNR	SC/N		2002
<i>Hydrometra martini</i>	A Water Measurer	*	S3	G5	SC/N		2002
Rare Mussels and Clams							
<i>Alasmidonta marginata</i> ¹	Elktoe	*	S4	G4	SC/H		1997
<i>Cyclonaias tuberculata</i> ¹	Purple Wartyback	*	S1	G5	END		1997
<i>Plethobasus cyphus</i> ¹	Bullhead	*	S1	G3	END	C	1997
<i>Pleurobema sintoxia</i> ¹	Round Pigtoe	*	S3	G4	SC/H		1997
<i>Venustaconcha ellipsiformis</i> ¹	Ellipse	*	S2	G3G4	THR		1994
Rare Reptiles and Amphibians							
<i>Clemmys insculpta</i> ¹	Wood Turtle	*	S3	G4	THR		2004
<i>Emydoidea blandingii</i>	Blanding's Turtle	*	S3	G4	THR		2004
<i>Hemidactylium scutatum</i>	Four-toed Salamander	*	S3	G5	SC/H		2003
<i>Rana catesbeiana</i>	Bullfrog	*	S3	G5	SC/H		2003

1. These species were not located within the County Forest boundary.

* Species associated with wetlands or aquatic features.

The State Threatened Cerulean Warbler uses large stands of older upland hardwoods and floodplain forest. This species is largely restricted to the southern two thirds of the state with occasional breeding season records in the northern third. Rangewide, Cerulean Warblers have undergone a 70% decline since 1966. This species was observed during its breeding season at several locations within the study area.

The habitat for the State Threatened Red-shouldered Hawk includes extensive woodlands with frequent ponds, wooded river bottoms, and timbered swamps. Red-shouldered hawks occur in limited numbers statewide but are often adversely affected by fragmentation of large forest blocks and stand thinning. This species was found in only two locations within the study area – one on county-owned land.

State Threatened Blanding's turtles appear to be fairly common in Blocks one and two. This species uses a variety of wetland types along with adjacent uplands for basking, nesting, and summer terrestrial feeding.

Wood turtles, also State Threatened, were not found during the biotic inventory and only one record has been reported to the Wisconsin Herp Atlas (REF) for this species in Chippewa County. There are numerous records from nearby Rusk County, and several areas with suitable habitat were identified on the county forest for this species including the Floodplain Forests along the Yellow River (Block 3), Alder Thickets along Christmas Creek (Block 1) and possibly Birch, Mud, and Tealey Creeks (Block 2) (Casper and Sadjak, 2003).

Thirty-three Special Concern Animal Species were found in the Study Area including many wetland or aquatic invertebrates, two birds, and two amphibians. Of special note was the location of the globally rare (G1, see Appendix D) Sylvan Hygrotus Diving Beetle (a species that occupies open wetlands).

Four-toed salamanders were found in woodland ponds in the Chippewa County Forest. This species is likely to be dispersed throughout Block 2 (Casper and Sadjak 2003). There is less suitable habitat for this species in the other blocks. This is one of the most sensitive of the pond-breeding amphibians, requiring fishless ponds and appropriate nesting sites. Four-toed salamanders are found in greatest abundance in old hardwood stands (Casper and Sadjak 2003).

Bullfrogs require permanent water habitats such as lakes, preferring habitats with tall, undisturbed shoreline vegetation and abundant submergent and floating aquatic vegetation (Christoffel et al., 2001). These frogs are listed as Special Concern on the NHI Working List species and appear to be fairly well distributed in this part of the state. They appear to be fairly common throughout the county forest in permanent water bodies.

As a result of this and other similar projects, the status of several NHI Working List animals have been changed to reflect discovery of several new populations. For example, results of this inventory found enough new viable populations of several species that they are currently no longer considered rare enough to track by NHI including: the Jutta arctic butterfly (*Oenis jutta*), a side swimmer (*Crangonyx richmondensis*), and the lily pad clubtail dragonfly (*Arigomphus furcifer*). Similarly, some 15 additional species found in the study area (all aquatic invertebrates) have been identified as rare in Wisconsin and are now being considered for inclusion on the NHI Working List, based on recommendations by Dr. Kurt Schmude, University of Wisconsin -Superior. Some of these species have not previously been documented in Wisconsin and many had not previously been documented in Chippewa County. These include:

- *Acilius mediatius*
- *Ceraclea misca*
- *Corisella tarsalis*
- *Cymatia americana*
- *Dasycorixa hybrida*
- *Gyrinus pectoralis*
- *Haliplus apostolicus*
- *Hydroporus columbianas*
- *Hygrotus compor*
- *Peltodytes duedecimpinctatus*
- *Phabdomastix sp.*
- *Phalacrorera tipulina*
- *Phalacrorera replicata*
- *Ranatra kirkaldy*
- *Sigara modesta*

Most of the rare species that were found within the study area were associated with wetlands and aquatic habitats. The habitat affinities for rare animals found in the county forest are summarized in Table 6. The predominance of aquatic and wetland species reflects both the kind of inventories conducted and the importance of these types on Chippewa County lands. Although most of the rare species were found in wetland or aquatic habitats, there is the potential to enhance habitats for several upland - associated species on this property (see Priority Opportunities section).

Table 6. Habitats associated with the rare species found in the study area.

Type	% of Working List Species
Sphagnum based wetlands	26
Lakes	24
Lakes and Streams	14
Woodland ponds	11
Small creeks	6
Marshy creek	5
Upland forest	5
Open pond	3
Swamp	3
Springs	3

Threats to Natural Communities, Aquatic Systems, and Rare Species

As discussed throughout this report, the study area has the potential to support many rare species. However, there are several broad threats to the many species and important habitats of the study area. Specific examples of these threats are described below; however, the threats are interrelated and may interact to amplify potentially negative effects. Avoiding, eliminating, or, in some cases, reversing these threats will play a key role in conserving the biological diversity of the landscape. The following types of threats are not all-inclusive but, instead, can help provide guidance for future management decisions.

Invasive Species

As of this writing, the study area evidently has not been significantly affected by many of the ecologically invasive plants that are serious concerns in other parts of the state. However, garlic mustard (*Alliaria petiolata*), a highly invasive exotic plant, was observed along a section of trail used by hikers, horse riders, logging equipment, and other vehicles in June 2003 (Fig 13). At that time the dense, but apparently localized, infestations appeared to be limited to areas along both edges of the road/trail, or where heavy logging equipment had disturbed the soil. Most of the plants seen were seedlings, with relatively few mature plants noted.

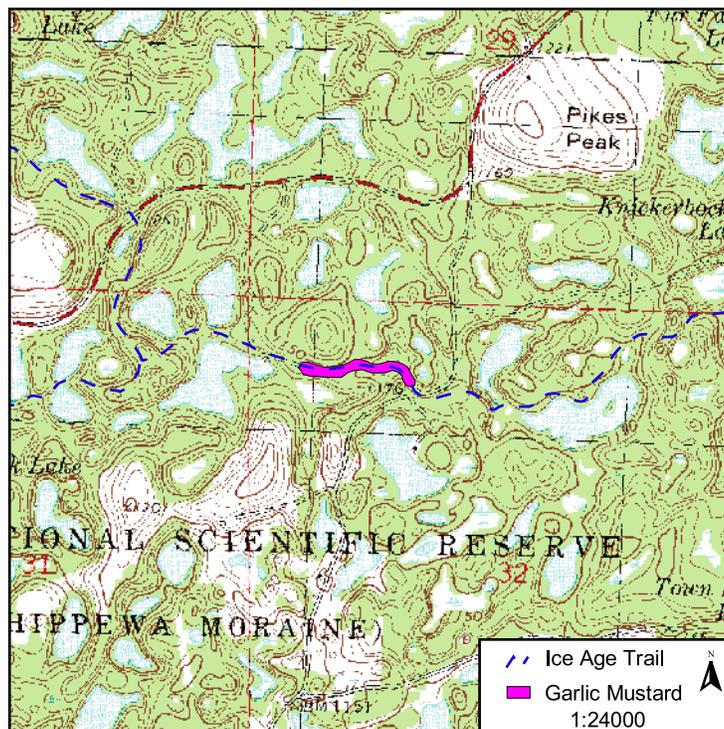


Figure 13

Location of the garlic mustard infestation found in the Chippewa County Forest (in the westernmost portion of Block 2), June 2003.

Most of the plants seen were seedlings, with relatively few mature plants noted.

Surveys for the garlic mustard were limited to the area near the original infestation, and it is possible that it was more widely distributed. However, garlic mustard had not been reported from the Chippewa County Forest or the Ice Age Reserve by DNR botanists in previous years and was not observed by NHI staff anywhere else in the Chippewa County Forest or surrounding areas during the biotic inventory. The potential for this plant to spread is very likely, given the foot, horse, and vehicular traffic occurring at the site. Therefore, it will be critical to monitor this location and any others that are identified in the future and use necessary control measures to avoid the plant's spread throughout the county forest and reserve.

Roads / Motor Vehicles

Construction and maintenance of roads that cut through wetlands and across streams, particularly where culverts are not present or are insufficient, disrupts hydrology and impacts water quality. These activities should be prevented to protect the high quality aquatic habitats present within the study area. In addition, damage to lake shorelines, often caused by inappropriate use of ATVs or other motorized vehicles, destroys vital shoreline vegetation and habitat that is required by many species and effects water quality. This landscape contains numerous high-quality lakes, and damage to lake shorelines should be avoided.



Photographs taken near the Yellow River (Block 3, Primary Site # 3) showing trails left by unauthorized ATV use on steep slopes adjacent to the river, as well in the river itself. The arrow in the right photo points to ATV tracks on a sandy point in the Yellow River. Photographs by Craig Anderson.

Habitat Loss

There is a lack of habitat on the county forest for species that prefer or require older, intact forests with relatively high canopy closure. Red-shouldered Hawk and Cerulean Warbler are both listed as Threatened by the state of Wisconsin and currently find very little suitable habitat within the study area. Surrounding landscapes are much more fragmented than the county forest and are even less likely to provide viable habitat for these and other forest interior species. Chippewa County forest has opportunities to provide for these and other species; Appendix B contains descriptions for “Primary Sites,” areas of high conservation value that could be considered for special management emphasis to benefit the biodiversity of this part of the state.

Populations of the State Threatened bog bluegrass at Chippewa County Forest are very small and are likely to be so even in the best years because the microhabitats that are suitable are small and narrow. Threats include loss of canopy cover, dense growth of woody plants (such as dense black ash reproduction), or changes in hydrology, especially an increase in surface water run-off. Increased surface water run-off into streams and creeklets at Chippewa County Forest tends to deposit and expose a considerable amount of sand and gravel. This is easily seen in streams and draws that are crossed by roads, trails, and clear cuts. Bog bluegrass was not found in any of these areas that had mineral sediments being deposited near trails or in “flashy”, incised creeks on steep terrain.

Priority Opportunities for Biodiversity Conservation

The priority opportunities for biodiversity conservation for the study area emerged primarily from our analysis of the data collected during the recent field inventory. The priority opportunities reflect inventory and assessment of the natural features within the study area. Opportunities are presented in the context of conserving and enhancing the biological diversity of this landscape.

Landscape Level Priorities

Maintain large blocks of contiguous forest, with embedded, undeveloped lakes and wetlands that are: 1) representative of the types (forest communities, wetland communities, and waterbodies) occurring in this region; 2) types that are rare locally, regionally, or statewide; 3) types that are outstanding because of their size, diversity, value to rare species, lack of, or recovery from, past disturbance.

Forest and lake connections need to be recognized in management plans. Look for opportunities to provide travel corridors by protecting shoreline vegetation along streams and clusters of lakes.

Community Level Priorities

Upland Forest Communities are well represented in terms of abundance within the study area. At appropriate locations, consider increasing the representation of older forest developmental stages that are now missing, especially on dry-mesic and mesic sites in Block 2. On sites that formerly supported a strong component of native conifers but where they are now scarce or absent, consider increasing their abundance over time, through methods that are most feasible and appropriate at a given location. Reduce high contrast edge between stands where there is an existing problem with excessive browse.

Wetlands are abundant throughout the study area and include both forested and non-forested types. Many of them are in good condition, and they support a disproportionately high percentage of the rare species observed within the study area. Protect the most intact sites, particularly where sensitive (including rare) species have been documented, and manage adjoining upland forests and waterbodies compatibly to maintain the condition and integrity of those wetlands. Consider offering additional levels of protection to sites that have especially high ecological values.

Ephemeral ponds are important refugia and breeding sites for amphibians and aquatic macroinvertebrates within forested landscapes, and protecting them would benefit a wide range of amphibian and invertebrate species. Some of the ponds on the county forest exhibited very high macroinvertebrate richness; one pond (in the northwestern portion of Primary Site #8) had 33 species of beetles alone, a remarkable finding. Other ponds surveyed in the study area exhibited lower macroinvertebrate richness but are important, as they harbor invertebrates that are highly adapted to temporary aquatic habitats and are only known from these temporary vernal pools. Whenever possible ephemeral ponds should remain embedded within forested habitats. To protect these habitats, the ponds should not be isolated by clearcutting around them, and efforts should be made to minimize or prevent negative impacts to hydrology by limiting road, ditch, or dike construction. Also, the timing of management activities around ephemeral ponds can be critical.

Lakes: As potential protection priorities, we would propose selecting lakes that: 1) represent types that are characteristic of the terminal moraine landform; 2) represent types that are rare (e.g., meromictic lakes, or spring lakes); 3) represent lake types that are under severe development pressure here and elsewhere in the state; 4) lakes that support rare species populations; 5) lakes that support especially high species diversity; 6) lakes that occur in

association with intact wetland communities and upland forests that are representative of those occurring in this landscape; and 7) lakes that combine as many of the attributes described in numbers 1-6 above.

Management Opportunities for Rare Species

Often the most effective method to manage populations of rare species is to use a habitat or natural community approach. A larger scale perspective is desirable because, in part, it can provide larger amounts of the appropriate habitat that species might require. This may be especially important for species such as annuals or disturbance-dependent species that opportunistically shift around the landscape using dispersed patches of suitable habitat. With an integrated approach, larger scale issues of aspects like hydrology, disturbance, and invasives can be addressed. While an integrated approach is important, some species may necessitate special management consideration. If a species, like the state Threatened bog bluegrass, has specific known microhabitat requirements or limited dispersal or movement capabilities, it might be more effective to address those on a small scale or individual occurrence basis.

Primary Sites: Significance and Summaries

Fourteen ecologically important sites were identified as a result of the biotic inventory. These “Primary Sites” were identified because they contain high-quality natural communities, provide important habitat for rare species, offer opportunities for restoration, may provide important ecological connections, or a combination of the above factors. Fig 14 illustrates the locations of the Primary Sites. Rare species were documented at several locations outside of the Primary Sites (see Fig 11).

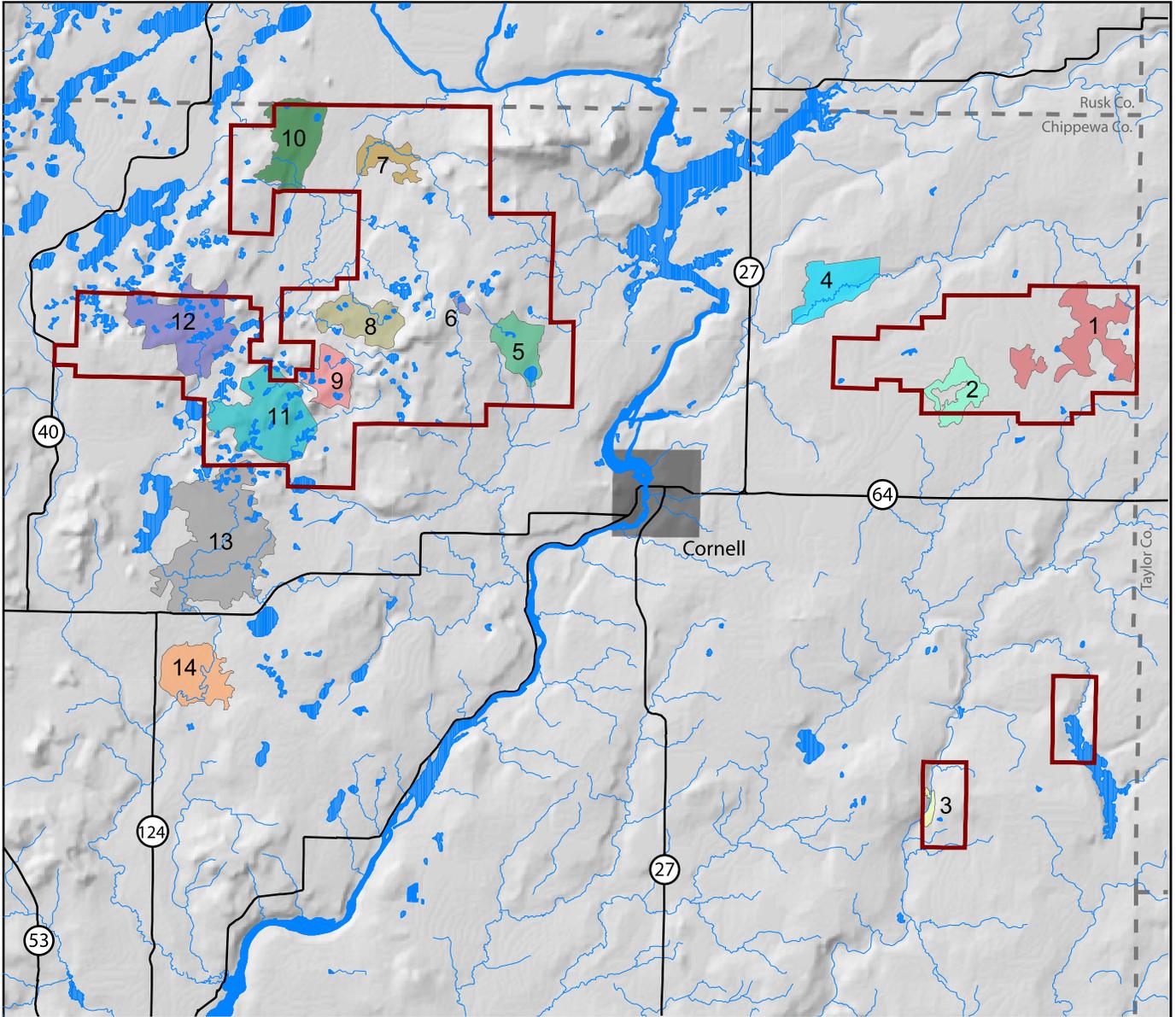
Using the language adopted from the Forest Certification process now being used by the Wisconsin DNR, and under consideration by some other land managers, these sites are of *High Conservation Value* (see glossary). This information can be used during the master planning process when evaluating the various alternatives for this property.

Descriptions of each of the 14 sites can be found in Appendix B. Information provided includes: location information, a site map showing occurrences of significant communities and species, a brief summary of the natural features present, the site’s ecological significance, and management considerations.

Each site map shows the site location against a background of a scanned USGS topographic quadrangle. The scale of the maps varies depending upon the size of each site and information presented (original USGS resolution is 1:24,000). Occurrences of rare or endangered species or natural communities are portrayed as dot symbols. Only those species or communities within the site or within 200 meters of the site boundary are portrayed in order to emphasize their location(s) relative to the boundary. Please note that: 1) there may be more than one occurrence of one or more species or communities represented by any single symbol, 2) these symbols may overlap, and 3) the significance of the site is not based only on the presence of rare species occurrences. In addition, the area of land a species or community occupies may be much larger than the dot representation. The coverage does not represent legal ownership boundaries and may encompass errors in presentation.

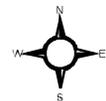
Figure 14

Location of Chippewa County Forest Study Area
Primary Sites.



Primary Site Legend

- | | |
|--|--|
|  1. Ruby Swamp East |  8. Dorothy Lakes Complex |
|  2. Buckhorn Trail Bog |  9. Bass Lakes Complex |
|  3. Yellow River Woods |  10. Spence Lake |
|  4. Fisher River Forest |  11. O'Neil Creek Hardwoods |
|  5. Firth lake |  12. Town Line Lake Complex |
|  6. M & E Woods |  13. Twin Lakes Complex |
|  7. Tealey Creek |  14. O'Neil Creek Complex - South |



Future Needs

Critical Management Needs

As noted earlier in this report, garlic mustard was documented in the study area in 2003. The deleterious effects of this and other invasive species have been well documented (e.g. see dnr.wi.gov/invasives/fact/garlic.htm). It will be critical to monitor this population and continue to use control measures to eradicate it so that it does not become pervasive throughout the County Forest, as it is in many other parts of the state. Information on invasive plants, along with control methods, can be found on the WDNR Web site at dnr.wi.gov/invasives/.

The study area has been shown to support numerous rare species populations. Management activities on the county forest will need to take these species into account. WDNR managers routinely use the NHI database when planning management activities to avoid impacts on listed species.

Additional locations of rare species populations that are found when doing routine management activities or those reported by users of the property should also be considered when planning management activities. For example, an active rare raptor nest in an older stand of forest would require special management considerations. Habitats supporting rare species should also be considered when siting of improvements such as trails, boat landings, etc.

Additional Inventory Needs

Below are opportunities for inventory for species that could not be thoroughly surveyed as part of this study. These surveys could be part of future monitoring efforts or part of other ongoing projects.

1. Wetland invertebrates

- Leafhoppers
- Grasshoppers (northern and wetland grasshoppers and katydids are not around until after June)
- Summer butterflies (e.g., Dorcas Copper, Bog Fritillary, Purple Lesser Fritillary, Bog Copper, Two-spotted Skipper, Broad-winged Skipper)
- Further inventory for insects using moats around the bogs.

2. Plants and Natural Communities

- Lakes with fluctuating water levels (water levels were too high during this study to survey these)
- Seepage springs
- Bog bluegrass in seeps/seepage swamps
- Rare ferns (i.e. *Botrychium* spp.) in mesic forests
- Orchids, especially *Cypripedium* species and “bog types”
- A list of nearby private lands that may present good potential for rare species and natural communities was prepared as part of this project and is available through the Endangered Resources program.
- Additional sites with ice-walled lake features

3. Aquatic Macroinvertebrates

- Species groups that were conspicuously absent or underrepresented by the 2002 survey (Schmude 2002)
- Several additional and more remote sites in the northern portion of Block 2 (main forest) and Block 1 (Ruby Swamp)
- A more thorough survey of the Yellow River
- Survey that includes different sampling dates to capture species with varying phenologies
- Sites that exhibited high abundance, diversity, and/or rare species (Schmude 2002)

4. Birds

- Set up transects or individual observation points that cover important sites and habitats. Use standardized point count methods

- Set up road transects using US Fish & Wildlife Service methods.
- Survey nocturnal birds (owls, goatsuckers, and perhaps certain wetland spp.)

5. Reptiles

- Additional surveys for wood turtles

Glossary

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

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

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

complex – used here to reference an integrated mosaic of natural communities and/or aquatic features. Many organisms use more than one community type during their life cycles, and the importance of the mosaic of vegetation in any given area should be considered along with stand level considerations.

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

cover type – a generalized method of broadly classifying vegetation based on the single species or species group comprising a majority of the living plants in the uppermost vegetative stratum (when used in a forestry context, these are usually commercially important trees). Cover types may also be applied to cultural features such as cornfields or pastures. In cases where a clear plurality of a single species is not apparent, terms have been invented to reference groups of commonly co-occurring species, such as “northern hardwoods” (see definition below), “swamp conifers”, and “bottomland hardwoods”.

diversity – used in this report as a shortened form for biological diversity, or biodiversity. A general definition (Matthiae et al., 1993) is “the spectrum of life forms and the ecological processes that support and sustain them. Biological diversity is a complex of four interacting levels: genetic, species, community, and ecosystem.”

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

Ecological Landscape – landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin’s sixteen ecological landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units that correspond with WDNR’s organizational structure. See <http://dnr.wi.gov/landscapes/> for more information.

ecoregion – geographic units that are differentiated by climate, subsurface geology, physiography, hydrology, soils, and vegetation. These units have been defined and organized in different ways by various institutions but in this document we use the National Hierarchical Framework of Ecological Units (NHFEU). As described by Avers et al (1994), the NHFEU can provide a basis for assessing resource conditions at multiple scales. In this report we have most frequently referred to ecoregions of the “subsection” level, which are intermediate in scale within the NHFEU and typically cover areas of hundreds to thousands of square miles. In recent years the NHI has found the ecoregions of the NHFEU to be useful tools for work planning, interpreting the collected data, and communicating across political and administrative boundaries.

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

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

ericaceous – pertaining to a family of plants, the Ericaceae, especially characteristic of highly acidic habitats such as bogs and muskeg. Members include familiar plants such as blueberries, cranberries, leatherleaf, Labrador tea, and bog rosemary.

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

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

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

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

habitat – references those environmental attributes necessary to provide a niche that supports the needs of a species or group of species.

habitat type – all sites capable of producing similar climax plant communities (Kotar 1996). This system of vegetation classification uses the floristic composition of a plant community as an integrated indicator of those environmental factors that affect reproduction, growth, competition, and community development. These include soils, moisture, nutrient levels, and topography. Some professional foresters in the upper Great Lakes region have recently begun using this system as a forest management tool, primarily for upland forest communities.

High Conservation Value Forest – (definition from the draft county forest master plan template, February 2005. The management implications associated with the designation are included in a separate chapter of the template). High Conservation Value Forest (HCVF) is a term that identifies those areas possessing unique qualities locally, regionally, or nationally. _____ County’s focus in managing these areas will be to maintain or enhance the qualities that make these areas special. In some instances this may involve altering management practices to mitigate impacts and in others it may entail no active management.

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

kettle lake – lakes formed from a depression caused by a block of buried glacier ice that gradually melted, causing the overlying land surface to collapse downward.

landtype association (LTA) – a level in the National Hierarchical Framework of Ecological Units that covers areas of tens to thousands of acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

lentic – pertaining to standing waters; lakes, ponds, and flowages.

lotic – pertaining to flowing waters; rivers and streams.

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

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

mesic – used by ecologists to describe site conditions that are well-drained but almost never excessively dry or inundated.

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

muskeg – similar to “open bog.” Used to describe highly acidic peatlands characterized by a sparse growth of scattered, stunted black spruce and tamarack over ericaceous shrubs, sedges, and a deep carpet of sphagnum mosses. Trees are extremely slow-growing, and their cover values, in aggregate, do not exceed 50% (usually they are much lower, in the 10-25 % range).

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

natural community – an assemblage of 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.

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

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

northern hardwoods – generally applied to those forests of northern Wisconsin composed primarily of hardwoods such as sugar maple, basswood, ash, and birch. It is also sometimes used to refer to forests with a significant component of red maple or red oak, or sometimes even aspen, but which lack strong representation by coniferous species. The term is widely used in the Great Lakes states in areas that have vegetation similar to that of northern Wisconsin.

old-growth – various definitions exist, but most include mature forests with attributes such as large living trees, standing snags, coarse woody debris, pit and mound microtopography, and complex multi-layered canopies. Old-growth stages of many forest types were formerly common and/or widespread in Wisconsin but are now very rare (Frelich, 1995).

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

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

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

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

Pleistocene – in the geologists parlance, “the first epoch of the Quaternary Period.” In more common usage, the Ice Age, which began ca. 1.8 million years ago and ended ca. 10,000 years ago.

poletimber – a forestry term referring to living trees of at least 5" d.b.h., but less than 9" d.b.h. for softwoods such as pine, or less than 11" d.b.h. for hardwoods such as sugar maple, yellow birch, or ash.

rare – used in this report to refer to native species and natural communities known or suspected to be rare and/or declining in the state (included on NHI’s “Working List”). Included are species legally designated as “Endangered” or “Threatened” by either the State of Wisconsin or the federal government, as well as species in the Department’s advisory “Special Concern” category and on the U.S. Fish & Wildlife Service’s “Candidate” and “Species of Concern” lists.

refugia – plural form of refugium, a place where plant or animal species have survived despite widespread natural or anthropogenic disturbance to its habitat such as glaciation.

restoration – used in this report to refer to the re-establishment of a natural community, habitat, species population, or other ecological attribute, that has been eliminated or greatly reduced on a given property or landscape. Many factors, sociological as well as ecological, must be weighed when making a decision to engage in a restoration project.

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

Section – a level in the National Hierarchical Framework of Ecological Units covering large geographic areas (Wisconsin Sections range from ca. 30-11,600 sq. miles).

site – see “inventory site.”

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

Subsection – This is a level in the NHFEU that is intermediate in scale (size of Wisconsin Subsections range from 30-4,300 sq. miles). Subsections are characterized by distinctive glacial landforms (e.g., outwash or moraine), soils, and broadly, by vegetation. The Ecological Landscapes developed by the WDNR are based on aggregations of subsections (see **Ecological Landscape**).

survey site – see “inventory site.”

xeric – characterized by excessive dryness. Plants and animals dwelling in xeric habitats must have adaptations that allow them to cope with periodic moisture deficits if they are to persist at such sites.

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

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APPENDIX A

Natural Heritage Inventory Overview and General Methodology

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

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

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

The Chippewa County Forest biotic inventory used the top-down, coarse filter-fine filter approach. The initial analysis assessed the entire region and determined the important ecological attributes and the biological processes supporting them. Criteria to evaluate sites were established and then vegetative communities were identified and characterized. Based upon existing habitat characteristics and known habitat preferences of various rare species, sites where species-specific surveys were most appropriate were identified. ***No doubt, occurrences of rare species exist that were not located through these inventories.*** However, by concentrating inventory efforts on the

highest quality or otherwise suitable sites, it is most likely that the populations with the highest conservation value were located.

The NHI methodology for organizing and storing data is actually a system of three inter-related data storage techniques: structured manual information files, topographic map files, and a computer database that integrates the various information. The computer component, known as the Biological & Conservation Data System (BCD), was developed by The Nature Conservancy for use by the Heritage Network. It is a sophisticated relational database management application built upon the Advanced Revelation application environment. Owing to the diversity and complexity of the information managed--from species taxonomy and ecosystem classification to real estate transactions--the system contains 36 database files and more than 2,000 information fields. The data in the Biological & Conservation Data System populate the NHI Geographic Information System.

Methods of Inventory

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

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

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

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

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

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

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

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

Geographic Information Systems (GIS) are increasing our ability to integrate spatial information on lands and waters of the state and are becoming a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

Aerial photographs: These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time.

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

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

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

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

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

APPENDIX B

Primary Inventory Sites within the Chippewa County Forest Study Area

The ecologically significant sites identified through the biotic inventory are depicted on Figure 14 and described in the following narratives. Each site contains documented, significant occurrences of rare and/or representative natural features of the landscape. All of the sites are within the *North Central Forest* Ecological Landscape, except sites 13 and 14 that are partially within the *Forest Transition* Ecological Landscape. The communities, aquatic features and rare species populations identified herein will give planners, managers, and the public the opportunity to make informed decisions on appropriate protection and management (land use classification and designation) in the County’s property master plan. Restoration potential for features that are now absent, substantially diminished, or isolated are discussed along with additional opportunities for management and protection of significant resources on lands adjoining the property.

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* Sites that are outside of the Chippewa County Forest

1. RUBY SWAMP

Location

USGS 7.5' Quadrangle: Ruby
Town-Range-Section: T31-R5W, sections 1, 2, and 3
T32-R5W, sections 23, 25, 26, and 34-36
Approximate Size: 1,613 ac.

Description of Site

This site is part of the larger Ruby Swamp area and consists of a series of shallow basins and uplands on a ground moraine. The basins are largely undisturbed wetlands that include Northern Wet Forest, Tamarack (poor) Swamp, Alder Thicket, Muskeg, and Northern Sedge Meadow. The surrounding uplands in the county forest portion of this area are under timber management of regeneration cuts, conifer plantations, and scattered patches of selectively cut mesic forest. The diversity of plants and animals within the wetlands is good. The wetlands on private lands near the site were not inventoried and need survey work. The nearby upland forests were not thoroughly surveyed either, and there may be some potential for rare plants and animals on the uplands. The only rare plant that was found at this site was ginseng in an upland forest.

Significance of Site

This site contains a large area of relatively undisturbed, good quality wetlands. There are small areas of disturbance centered on ditches that are dominated by reed canary grass and other areas that have been affected by beaver activity. The upland forests have been fairly intensively managed for timber but could be integrated into a landscape management approach for this site.

Management Considerations

Primary considerations include maintaining water quality and minimizing disturbances to the wetlands. A suitable buffer should be maintained when timber operations are conducted on the adjacent uplands. The site, especially in timber harvest areas, should be periodically monitored for the presence of invasive species, especially reed canary grass and garlic mustard.

1. Ruby Swamp Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	2002	S4B	G5	SC/M
Communities					
Alder thicket	Alder Thicket	2002	S4	G4	NA
Muskeg	Muskeg	2002	S4	G4G5	NA
Northern sedge meadow	Northern Sedge Meadow	2002	S3	G4	NA
Northern wet forest	Northern Wet Forest	2002	S4	G4	NA
Tamarack (poor) swamp	Tamarack (Poor) Swamp	2002	S3	G4	NA

2. BUCKHORN TRAIL BOG

Location

USGS 7.5' Quadrangle: Holcombe, Ruby
Town-Range-Section: T31-R5W, sections 4-6, and 8
T32-R5W, sections 32 and 33
Approximate Size: 659 ac.

Description of Site

Buckhorn Trail Bog is a large high quality wetland in a shallow depression on the Jump River Ground Moraine. The site is divided into northern and southern basins by a 100-acre island of logged hardwoods. The two basins are similar: each is composed of a central area of Muskeg with an outer border of Northern Sedge Meadow and Alder Thicket. There is also a Tamarack (poor) Swamp in the northern basin.

The surrounding landscape consists of large, low ridges interspersed with large shallow depressions. The forested upland portions are under silvicultural usage and are mostly heavily selectively logged or clear cut. The wetlands are generally relatively undisturbed with some disturbed areas where reed canary grass dominates, some ditches, and areas where beaver activity has had an impact. The uplands are under silvicultural management.

Significance of Site

This is a large undisturbed wetland complex, and all of the wetland communities are of good quality and size. The context of this site is good.

Management Considerations

Primary considerations include maintaining water quality and minimizing disturbances to the wetlands. A suitable buffer should be maintained when timber operations are conducted on the adjacent uplands. The site, especially in and adjacent to timber sales, should be periodically monitored for the presence of invasive species, especially reed canary grass and garlic mustard. Management of the upland could focus on longer rotation selective harvests.

Special management considerations should be given to populations of rare animals that are known to occur within the Buckhorn Trail Bog site. Buffer zones and practices that minimize potential impacts to breeding and wintering habitat should be established and followed.

2. Buckhorn Trail Bog Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Communities					
	Tamarack (Poor) Swamp	2002	S3	G4	NA

3. YELLOW RIVER WOODS

Location

USGS 7.5' Quadrangle: Colburn
Town-Range-Section: T30-R5W, sections 20, 29, and 30
Approximate Size: 101 ac.

Description of Site

The Yellow River Woods site lies a one-mile free flowing section of the Yellow River on deposits of the Maple Hill End Moraine. The Yellow River flows through a narrow, steep sided valley here. The site occupies the steep slopes and uneven uplands along the eastern side of this valley and a small wetland west of the river. It is mostly forested with good quality second growth Northern Mesic Forest and a small stand of Northern Dry-mesic Forest. There are depressions with Ephemeral Ponds, ponds, Hardwood Swamp, and Northern Sedge Meadow. Small streams draining these wetlands form deeply incised forested ravines through the steep slopes along the river.

The Northern Dry-mesic Forest is located on the steep slopes along the river. It features red oak, a few mature white pines, and some subcanopy and sapling hemlocks. Hemlock is uncommon in the county forest.

The northern mesic forest consists of sugar maple and red oak and has a good spring ephemeral population and the Special Concern broad beech fern (*Thelypteris hexagonoptera*) and sapling butternuts (*Juglans cinerea*).

There are also several Ephemeral Ponds within this forest. The wetland depressions support beaver ponds, moderate quality Northern Sedge Meadow, and black ash hardwood swamp.

There is a medium quality Northern Sedge Meadow and shrub-swamp on the west side of the river, clearly visible from the road on the west side of CTH S. This site was marked for logging in 2003.

Significance of Site

This site has good quality communities having good size and context and supports two Special Concern species plus hemlock, an uncommon species in the county forest. This is one of only two sites in the county forest with a major river passing through it.

Management Considerations

There is a casual use ATV path on the west side of the Yellow River that descends the very steep slope and continues along the floodplain. In 2003 it was also noted that the ATVs were traveling in the river. ATV access should be curtailed in this area due to the sensitivity of the soils and river.

A primary consideration should be protecting the water quality in this stretch of the Yellow River. In addition to ending illegal ATV access, Best Management Practices should be used when designing timber sales to ensure that there is a sufficient buffer between the steep slopes above the river and harvesting activities. Additional measures should be taken, when necessary, to avoid impacts to the small wetlands and ephemeral pools. The site in general, and timber sales in particular, should also be monitored for the introduction of invasive species such as garlic mustard.

3. Yellow River Woods Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Plants					
<i>Phegopteris hexagonoptera</i>	Broad Beech Fern	2002		G5	SC
Communities					
	Northern Dry-mesic Forest	2002	S3	G4	NA
	Northern Mesic Forest	2002	S4	G4	NA

4. FISHER RIVER FOREST *

Location

USGS 7.5' Quadrangle: Holcombe
Town-Range-Section: T32-R6W, sections 23-27
Approximate Size: 1,129

Description of Site

This is a privately owned, free flowing, two mile stretch of the Fisher River between Arnold Road and Rangeline Road on the gently rolling topography of the Jump River Ground Moraine. This stretch of the Fisher River is a slow, soft, warm and meandering stream with a sandy to gravelly bed, numerous oxbows, and a substantial area of silver maple floodplain forest on loam soils. The floodplain forest is of variable quality due to logging, various disturbances, and reed canary grass invasion. It borders mesic upland forest of red oak, sugar maple, basswood, and aspen.

Significance of Site

This area is one of the few large tracts of Floodplain Forest in the study area and contains a biologically interesting mosaic of terrestrial, palustrine, and aquatic communities. The State Threatened wood turtle and Special Concern sand snaketail dragonfly have been found at this site.

Management Considerations

This site is potentially important for a number of different bird and invertebrate species. Unfortunately, we were not able to conduct extensive surveys on the site. As a conservative measure, landowners should be encouraged to help protect the water quality of the Fisher River, allow for the development of old-growth features and high canopy closure throughout the forests, and ensure that the management of lands is compatible with retaining the features present.

4. Fisher River Forest Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Clemmys insculpta</i>	Wood Turtle	2004	S3	G4	THR
<i>Ophiogomphus</i> sp. 1 nr. <i>aspersus</i>	Sand Snaketail	1980	S2	G2	SC/N
Communities					
	Floodplain Forest	2003	S3	G3?	NA

5. FIRTH LAKE

Location

USGS 7.5' Quadrangle: Cornell
Town-Range-Section: T31-R7W, sections 2 and 3
T32-R7W, sections 27, 34, and 35
Approximate Size: 800 ac.

Description of Site

Firth Lake is a large, complex, and biologically important site. The namesake Firth Lake is in the southeast corner. The Ice Age trail passes along the southern edge of the site, and a boardwalk crosses the outlet stream. There is also a beaver dam at the south end of Firth Lake.

The eastern end of the site around Firth Lake is on the Maple Hill End Moraine in a landscape of gently rolling, fairly level topography with forests and the cleared areas are in agricultural usage, low density residential development, and recreational usage. Much of the site is on the Pikes Peak End Moraine and is a landscape that consists of very uneven, hilly topography that is mostly forested. There is very low-density residential and recreational development and a few scattered areas in agricultural production. Most of the roads on the Pikes Peak End Moraine are gravel, dirt, or unimproved.

The uplands are mostly wooded with mesic or dry-mesic forest communities. Most of the forested lands are managed for timber production, and many of the stands are relatively young. There are good to excellent quality areas of Northern Mesic Forest in the site, one just north of Firth Lake and the other in the north central part of Section 34. Canopy trees in each area are dominated by sugar maple and also basswood and red oak are also present. The herb layer in each area is diverse and includes several rich site indicator species. Forested seeps can be found on the slopes, and the site also encompasses Hardwood Swamp, sedge meadow, streams, and Ephemeral Ponds.

The eastern side of Firth Lake is dominated by a good quality Emergent Marsh. The marsh is dominated by various sedge species and cattails. The shrub coverage is variable and consists largely of alders with some willows.

The site includes a significant population of the State Threatened bog bluegrass as well as documented occurrences of putty-root orchid, four-toed salamanders, and Blanding's turtles.

Significance of Site

The site represents one of the largest tracts of good quality intact natural landscape remaining in the Chippewa County Forest. The area is significant because it contains several good quality natural communities, including extensive good quality mesic forest with an especially rich herb layer, a few stands of mature white and red pine, good quality hardwood swamp, sedge meadows and Emergent Marsh, Ephemeral Ponds, kettle wetlands, and numerous forested seeps and stream drainages which are at the headwaters Bob Creek.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as "benchmarks" for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Timber sales

on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Special management considerations should be given to populations of rare plants and animals that occur within the Firth Lake site. One example is bog bluegrass, a species that is sensitive to hydrologic and microclimatic changes. Buffer zones and practices that minimize potential impacts could be established around known populations, as well as critical breeding habitat like ephemeral pools.

5. Firth Lake Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Emydoidea blandingii</i>	Blanding's Turtle	2003	S3	G4	THR
<i>Hemidactylium scutatum</i>	Four-toed Salamander	2003	S3	G5	SC/H
Plants					
<i>Aplectrum hyemale</i>	Putty Root	2002	S2S3	G5	SC
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2002	S2	G4?	SC
<i>Phegopteris hexagonoptera</i>	Broad Beech Fern	2002	S2	G5	SC
<i>Poa paludigena</i>	Bog Bluegrass	2003	S3	G3	THR
<i>Potamogeton vaseyi</i>	Vasey's Pondweed	2002	S2	G4	SC
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	2002	S3	G4G5	SC
Communities					
Emergent marsh	Emergent Marsh	2002	S4	G4	NA
Northern mesic forest	Northern Mesic Forest	2002	S4	G4	NA

6. M & E WOODS

Location

USGS 7.5' Quadrangle: Cornell
Town-Range-Section: T32-R7W, section 28
Approximate Size: 66 ac.

Description of Site

M & E Woods is a forested portion of a larger ice walled lake plain on the Pikes Peak End Moraine. The surrounding landscape is mostly forested, very uneven end moraine topography with numerous depressions supporting lakes, ponds, wetlands, and streams. There are scattered clearings used for agriculture and low-density residential development. There are a few paved county roads but most of the roads are gravel, dirt, or unimproved.

This site is located on a 135-acre ice walled lake plain which has a large portion cleared for agriculture. This small area of intact forested ice walled lake plain consists of a 50 foot high, moderately sloped hill situated on the south end of a small seepage lake. The area to the northeast, north, and west is on farmland. The area to the south and southeast is logged forest. County Highway E passes within a quarter mile of the site.

This site contains good quality second growth forest of red oak and sugar maple with mesic and dry-mesic characteristics. Hemlock occurs in small numbers here. The shrub and herb layers are sparse. Old stumps and tip-up mounds are present. There is a good quality Ephemeral Pond on the southwest end of the site. Trees have been marked for logging and a new gravel logging road ends at the south end of the site.

Significance of Site

This site is covered in good quality second growth forest and contains hemlock, an uncommon tree in this area. There is a good quality Ephemeral Pond. The communities at this site are of good quality but are small in size and are in a marginal context.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as “benchmarks” for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

6. M & E Woods Element Occurrences

Common Name	Date	State Rank	Global Rank	State Status
Northern Mesic Forest	2002	S4	G4	NA

7. TEALEY CREEK

Location

USGS 7.5' Quadrangle: Fireside lakes
Town-Range-Section: T32-R7W, sections 5-8
T32-R8W, section 12
Approximate Size: 528 ac.

Description of Site

This site occupies a low terrace along the lower end of Tealey Creek, just above its confluence with Mud Creek where it drains off hilly end moraine and through gently rolling ground moraine - outwash deposits. The site includes a large, high quality cedar-black ash swamp varying from wet to wet-mesic. White cedar dominates the canopy. The dbh of canopy trees ranges from 6-10," but there are 13.5-18" diameter trees in the best areas and reproduction is occurring. Balsam fir and red maple are local associates. The swamp has a diverse structure including frequent blowdowns, tip-ups, fallen trees, snags and hummock-hollow microtopography. The herb layer is very diverse, and at least 2 rare plant species are present, w/ multiple colonies of each.

Further downstream, Tealey Creek flows through a good quality southern sedge meadow dominated by tussock sedge (*Carex stricta*) which has been impacted by beaver activity. This area is typical of the stream bottom sedge meadows in the area

The southernmost portion of the site contains three small lakes surrounded by open bog, a swamp with good quality black ash hardwood swamp, and high quality Northern Wet Mesic Forest of white cedar. Rare invertebrates were found in good numbers near this portion of the site.

Significance of Site

This site contains good to high quality natural communities with good size and context. White cedar is rare in this area and this white cedar swamp represents the largest and best quality example of this community in the county forest. The white cedar swamp is of special interest due to its scarcity in the area, and the presence rare plant species.

Management Considerations

Primary considerations include maintaining water quality and minimizing disturbances to the wetlands, including maintaining the hydrologic integrity of the site. A suitable buffer should be maintained when timber operations are conducted on the adjacent uplands.

Special management considerations should be given to populations of rare animals and plants that occur within the site. One example is showy lady's-slipper, a species that is sensitive to hydrologic and microclimatic changes. Buffer zones and practices that minimize potential impacts could be established around known populations.

7. Tealey Creek Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Boloria eunomia</i>	Bog Fritillary	2003	S3	G5	SC/N

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
<i>Nannothemis bella</i>	Elfin Skimmer	2003	S3	G4	SC/N
Plants					
<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Northern Yellow Lady's-slipper	2002	S3	G5T4Q	SC
<i>Cypripedium reginae</i>	Showy Lady's-slipper	2002	S3	G4	SC
Communities					
Northern wet-mesic forest	Northern Wet-mesic Forest	2002	S3S4	G3?	NA

8. DOROTHY LAKES COMPLEX

Location

USGS 7.5' Quadrangle: Bob Lake
Town-Range-Section: T32-R7W, sections 29-32
T32-R8W, sections 25 and 36
Approximate Size: 992

Description of Site

This site is bisected by Deer Fly Trail and several County Forest trails. This site is mostly forested, very uneven end moraine topography with number of ice-walled lake features and many small, narrow, steep sided, 50 to 80 foot high ridges interspersed with depressions. The topographic complexity of this site results in a diverse mosaic of natural communities including Northern Dry-mesic and Mesic Forests, Hardwood and Tamarack Swamps, Northern Sedge Meadows, Poor Fens, seepage springs, several streams, and a cluster of undeveloped lakes. The Dorothy Lake Complex has a number of named lakes including a Bass Lake and Dorothy Lake. A number of rare plants have been documented in the uplands, wetlands, and lakes of this site.

Significance of Site

The Dorothy Lake complex is a rich and diverse site. While parts of the complex have been logged to various extents, it contains many important elements, including one of the county forest's best example of Northern Dry-mesic Forest, a small, moderate quality Northern Mesic Forest, two good quality Hardwood Swamps, and a cluster of undeveloped lakes that include two hard water lakes. It also has several ice-walled lake features that have mostly second growth forest. The site also contains two populations of the state threatened bog bluegrass, two rare upland plant species, and four species of rare aquatic plants. Dorothy Lake is highly ecologically significant and contains diverse invertebrate habitats. Fifty-five taxa of macroinvertebrates were found here, including 19 new county records. Three rare plants were also found in Dorothy Lake.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Numerous sensitive and rare species would benefit from this management emphasis. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Management decisions should account for the rich invertebrate and plant species diversity found in Dorothy Lake. Suitable buffers should be established for timber sales in the surrounding uplands. Practices that protect the hydrology and water quality are also important considerations. Special attention should be paid so that invasive species like Eurasian water milfoil, purple loosestrife, and reed canary grass are not introduced to Dorothy Lake.

Special management considerations should be given to populations of rare plants that occur within the site. One example is bog bluegrass, a species that is sensitive to hydrologic and microclimatic changes. Buffer zones and practices that minimize potential impacts could be established around known populations.

8. Dorothy Lakes Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Haliaeetus leucocephalus</i>	Bald Eagle	1992	S3B	G4	SC/FL
<i>Pandion haliaetus</i>	Osprey	1979	S3S4B	G5	THR
<i>Pandion haliaetus</i>	Osprey	1990	S3S4B	G5	THR
Plants					
<i>Botrychium oneidense</i>	Blunt-lobe Grape-fern	2003	S2	G4Q	SC
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2003	S2	G4?	SC
<i>Cypripedium reginae</i>	Showy Lady's-slipper	2002	S3	G4	SC
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	White Adder's-mouth	2002	S3	G4Q	SC
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	2003	S3	G5	SC
<i>Poa paludigena</i>	Bog Bluegrass	2003	S3	G3	THR
<i>Potamogeton diversifolius</i>	Water-thread Pondweed	2002	S2	G5	SC
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	2003	S3	G4G5	SC
Communities					
Hardwood swamp	Hardwood Swamp	2002	S3	G4	NA
Northern dry-mesic forest	Northern Dry-mesic Forest	2002	S3	G4	NA
Northern mesic forest	Northern Mesic Forest	2002	S4	G4	NA

9. BASS LAKES COMPLEX

Location

USGS 7.5' Quadrangle: Bob Lake
Town-Range-Section: T31-R7W, section 6
T31-R8W, sections 1, 2, and 12
T32-R8W, section 36
Approximate Size: 706 ac.

Description of Site

The Bass Lakes Complex is bounded by the Ice Age Trail and is bisected by several County Forest trails. This site is mostly forested, very uneven end moraine topography with number of ice-walled lake features and many small, narrow, steep sided, 50 to 80 foot high ridges interspersed with depressions. The topographic complexity of this site results in a diverse mosaic of natural communities including Northern Dry-mesic and Mesic Forests, Hardwood and Tamarack Swamps, White Pine-red Maple Swamps, Northern Sedge Meadows, Poor Fens, seepage springs, several streams, and a cluster of undeveloped lakes. The Bass Lakes Complex has a number of named lakes including the Bass lakes, Deer Lake, Pickerel Lake, and several unnamed lakes. A number of rare plants have been documented in the uplands, wetlands, and lakes of this site.

The site includes a relatively small area located just north of Pickerel Lake of very good quality mature second growth forest dominated by red oak and sugar maple with a good spring ephemeral population. There is also a good quality white pine-red maple swamp, an uncommon community type in the study area, located within the site.

The only documented population of the Threatened shore sedge was found in the Bass Lakes Complex, and there also occurrences of blunt-lobe grape-fern and several rare aquatic plants like purple bladderwort and Farwell's water-milfoil. Biologists also noted populations or individuals of butternut and ginseng in the site.

Significance of Site

Bass Lakes Complex is a rich and diverse site with great topographic variation, a wide array of different types of natural communities, including good quality examples of Northern Mesic Forest and the unusual White Pine-red Maple Swamp, and seven rare plant species including the only known population of the state threatened shore sedge in the study area.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as "benchmarks" for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Numerous sensitive and rare species would benefit from this management emphasis. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Management decisions should account for the rich invertebrate and plant species diversity found in the Bass Lakes Complex. Suitable buffers should be established for timber sales in the surrounding uplands. Practices that protect the hydrology and water quality are also important considerations. Special attention

should be paid so that invasive species like Eurasian water milfoil, purple loosestrife, and reed canary grass are not introduced to this cluster of good quality lakes.

Special management considerations should be given to populations of rare plants that occur within the site but that are outside the boundaries of good quality natural community. Buffer zones and practices that minimize potential impacts could be established around known populations.

8. Bass Lakes Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animal					
<i>Rana catesbeiana</i>	Bullfrog	2003	S3	G5	SC/H
Plants					
<i>Carex lenticularis</i>	Shore Sedge	2002	S2	G5	THR
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2002	S2	G4?	SC
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	2002	S3	G5	SC
<i>Potamogeton vaseyi</i>	Vasey's Pondweed	2002	S2	G4	SC
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	2003	S3	G4G5	SC
<i>Utricularia purpurea</i>	Purple Bladderwort	2002	S3	G5	SC
Communities					
Northern mesic forest	Northern Mesic Forest	2002	S4	G4	NA

10. SPENCE LAKE COMPLEX

Location

USGS 7.5' Quadrangle: Fireside Lakes
Town-Range-Section: T32-R8W, sections 1-3, 10-12, and 14
T33-R8W, sections 35-36
Approximate Size: 1,373 ac.

Description of Site

The Spence Lake complex straddles the interface of the Pikes Peak End Moraine and the Chippewa - Flambeau Plains outwash plain and ground moraine. The end moraine landscape is mostly forested, very uneven topography with numerous depressions supporting lakes, ponds, wetlands, and streams. The western portion of the site is on a 110-foot high ridge known locally as Middle Ridge. This ridge is uneven on top with small depressions forming Ephemeral Ponds, small lakes, and hanging wetlands that drain into the lowland to the east in ravines incised in the steep sloped eastern edge of the ridge. Northern mesic forest covers most of this ridge.

Just to the east is gently rolling topography and is predominantly wetland with the exception of a low ridge of Northern Mesic Forest. Spence Lake is at the north end of this area and drains to the south through hardwood swamp and northern wet mesic forest into Foster Creek, a tributary of Mud Creek. Spence Lake is a small, acidic bog lake. The southern end of this area has been impacted by beaver activity. Spence Lake is situated near the head of a narrow drainage that supports tamarack, black spruce swamp and muskeg on its northern end around the lake, black ash and red maple swamp with some tamarack, black spruce, and white cedar along the central portion, and tussock sedge meadow on the southern end. The large wetlands east of the low ridge support red maple, black ash swamp, and sedge meadow in areas subject to flooding, and Alder Thicket, tamarack, Black Spruce Swamp, Open Bog and Muskeg in non-flooded areas.

Significance of Site

The Spence Lake complex contains a large tract of Northern Mesic Forest, extensive open and forested wetlands, including Poor Fen, Northern Sedge Meadow, Black Spruce Swamp, and Northern Wet-mesic Forest, a large stream, and two small acidic lakes.

The State Threatened Red-shouldered Hawk was found here, and Several Special Concern plants and animals were documented in this complex. The plants are either lake species or can be found in forested wetlands. The two rare butterflies occupy bog habitat.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as “benchmarks” for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Numerous sensitive species would benefit from this management emphasis. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Primary considerations include maintaining water quality and minimizing disturbances to the wetlands, including maintaining the hydrologic integrity of the site. A suitable buffer should be maintained when timber operations are conducted on the adjacent uplands.

Special management considerations should be given to populations of rare plants and animals that occur within the Spence Lake site. Buffer zones and practices that minimize potential impacts could be established around known populations, as well as critical breeding microhabitats.

The site should be monitored periodically for invasive species, especially garlic mustard on the uplands and reed canary grass in the wetlands. Small populations of invasive species should be eradicated as quickly as possible to minimize the risk of spreading.

10. Spence Lake Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Boloria eunomia</i>	Bog Fritillary	2003	S3	G5	SC/N
<i>Buteo lineatus</i>	Red-shouldered Hawk	2003	S3S4B	G5	THR
<i>Nannothemis bella</i>	Elfin Skimmer	2002	S3	G4	SC/N
Plants					
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2003	S2	G4?	SC
<i>Utricularia purpurea</i>	Purple Bladderwort	2002	S3	G5	SC
Communities					
Northern mesic forest	Northern Mesic Forest	2002	S4	G4	NA
Poor fen	Poor Fen	2002	S3	G3G4	NA

11. O'NEIL CREEK HARDWOODS

Location

USGS 7.5' Quadrangle: Bob Lake
Town-Range-Section: T31-R8W, sections 2-4, 9-12, and 14-15
Approximate Size: 2,148 ac.

Description of Site

The O'Neil Creek Hardwoods site lies on the Pikes Peak End Moraine. The end moraine consists of a 100-foot high hill with steep to gentle slopes, small depressions with wetlands and ponds, and a stream on the north edge. The site has a large ice-walled lake feature. Two gravel roads bisect O'Neil Creek Hardwoods. The site is mostly forested with numerous depressions supporting lakes, ponds, wetlands, and streams. The predominant community is selectively logged, moderate to good quality second growth Northern Mesic Forest. There is an area of mature second growth red oak and sugar maple in the central portion of the site that has a good spring ephemeral population. There is a pine plantation near the center of the site. Northern Sedge Meadow occurs in small depressions, in drainages, and around ponds. Much of the forested land is managed for timber production.

Significance of Site

This site contains a high quality example Northern Mesic Forest of good size and in a good context with a fairly rich herb layer and a population of the State Threatened bog bluegrass, as well as the State Threatened Cerulean Warbler. The wetlands are of good to moderate quality, are small in size, and are in a good to moderate context.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as "benchmarks" for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Numerous sensitive species would benefit from this management emphasis. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

The site should be monitored periodically for invasive species, especially garlic mustard on the uplands. Special attention should be paid to timber sale areas and ATV trails as seeds can easily and widely be spread by machinery. Small populations of invasive species should be eradicated as quickly as possible to minimize the risk of spreading.

Bog bluegrass is sensitive to changes in hydrology and light levels. Management in the vicinity of the population at this site calls for the use of appropriate buffer zones and best management practices to minimize disrupting canopy coverage and hydrology.

11. O'Neil Creek Hardwoods Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Agabetes acuductus</i>	A Water Scavenger Beetle	2002	S2S3	GNR	SC/N
<i>Boloria eunomia</i>	Bog Fritillary	2003	S3	G5	SC/N
<i>Crangonyx richmondensis</i>	A Side-swimmer	2002	SU	GNR	SC/N

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
<i>Dendroica cerulea</i>	Cerulean Warbler	2002	S2S3B	G4	THR
<i>Haliphus leopardus</i>	A Crawling Water Beetle	2002	S1S3	GNR	SC/N
<i>Hebrus burmeisteri</i>	A Velvet Water Bug	2002	S2S3	GNR	SC/N
<i>Hydrometra martini</i>	A Water Measurer	2002	S3	G5	SC/N
<i>Lestes eurinus</i>	Amber-winged Spreadwing	2002	S3	G4	SC/N
<i>Lestes inaequalis</i>	Elegant Spreadwing	2002	S2S3	G5	SC/N
<i>Liodessus flavicollis</i>	A Predaceous Diving Beetle	2002	S3?	GNR	SC/N
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp	2002	S1S3	G5	SC/N
<i>Nannothemis bella</i>	Elfin Skimmer	2003	S3	G4	SC/N
<i>Pandion haliaetus</i>	Osprey	1979	S3S4B	G5	THR
<i>Rana catesbeiana</i>	Bullfrog	2002	S3	G5	SC/H
<i>Rhantus sinuatus</i>	A Predaceous Diving Beetle	2002	S3	GNR	SC/N
Plants					
<i>Aplectrum hyemale</i>	Putty Root	2002	S2S3	G5	SC
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2003	S2	G4?	SC
<i>Eleocharis robbinsii</i>	Robbins' Spikerush	2003	S3	G4G5	SC
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	2003	S3	G5	SC
<i>Poa paludigena</i>	Bog Bluegrass	2003	S3	G3	THR
<i>Potamogeton diversifolius</i>	Water-thread Pondweed	2003	S2	G5	SC
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	2003	S3	G4G5	SC
<i>Utricularia purpurea</i>	Purple Bladderwort	2003	S3	G5	SC
Communities					
Northern mesic forest	Northern Mesic Forest	2002	S4	G4	NA

12. TOWN LINE LAKE COMPLEX

Location

USGS 7.5' Quadrangle: Bob Lake, Marsh-Miller Lake
Town-Range-Section: T31-R8W, sections 4-5
T32-R8W, sections 27-34
Approximate Size: 2,111 ac.

Description of Site

Much of the Town Line Lake Complex lies within the Ice Age National Scientific Reserve on the Pikes Peak end moraine; part is owned by Chippewa County Forest and part by the WDNR. The end moraine landscape is mostly forested, very uneven topography with numerous depressions supporting lakes, ponds, wetlands, and streams. The western part of the complex tends to be somewhat more gently rolling than the eastern part. Especially noticeable in the eastern part of the complex are numerous 30 to 60 foot high, steep sided ridges and hills supporting second growth southern dry-mesic forest of red oak, white oak, and red maple. In addition to mesic and dry-mesic forest, this complex supports good quality Northern Sedge Meadow, Open Bog, Tamarack Swamp, and Northern Wet Forest in small depressions and around several of the lakes in the area.

This inventory identified the State Threatened Red-shouldered Hawk populations of seven Special Concern invertebrate species and six Special Concern plant species.

Significance of Site

This is a topographically diverse complex and has important geologic as well biological features. The Southern Dry-mesic Forest on the Reserve varies in quality depending on the intensity of timber management, and there are good quality areas of dry-mesic forest, especially on property owned by the DNR. There is good quality Northern Sedge Meadow, Open Bog, Tamarack Swamp, and Northern Wet Forest in small depressions and around several of the lakes in the area. Many of the lakes in the complex have good water quality and support several rare plants and animals. Rare wetland animals have been documented in the Town Line Lake complex. This site supports the State Threatened Red-shouldered Hawk.

Management Considerations

Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as “benchmarks” for one or several of the forest communities present. This site could serve as a core area of lands that would feature older, intact, nearly connected forest. Numerous sensitive species would benefit from this management emphasis. Timber sales on this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Water quality is an important management consideration at this site in the many wetlands and lakes. As with all areas, if timber harvests are done in the Reserve, best management practices should be fully followed.

Special management considerations should be given to populations of rare plants and animals that occur within the Spence Lake site. Buffer zones and practices that minimize potential impacts could be established around known populations, as well as critical breeding microhabitats.

The site should be monitored periodically for invasive species, especially garlic mustard on the uplands and reed canary grass in the wetlands. Special attention should be paid to timber sale areas and ATV trails as seeds or other propagules can easily and widely be spread by machinery. Small populations of invasive species should be eradicated as quickly as possible to minimize the risk of spreading.

12. Town Line Lake Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status
Animals					
<i>Agabetes acuductus</i>	A Water Scavenger Beetle	2002	S2S3	GNR	SC/N
<i>Buteo lineatus</i>	Red-shouldered Hawk	2003	S3S4B	G5	THR
<i>Copelatus glyphicus</i>	A Predaceous Diving Beetle	2002	S3?	GNR	SC/N
<i>Crangonyx richmondensis</i>	A Side-swimmer	2002	SU	GNR	SC/N
<i>Lestes eurinus</i>	Amber-winged Spreadwing	2002	S3	G4	SC/N
<i>Lynceus brachyurus</i>	Holarctic Clam Shrimp	2002	S1S3	G5	SC/N
<i>Nannothemis bella</i>	Elfin Skimmer	2003	S3	G4	SC/N
<i>Rana catesbeiana</i>	Bullfrog	2003	S3	G5	SC/H
Plants					
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	2003	S2	G4?	SC
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	2003	S3	G5	SC
<i>Potamogeton diversifolius</i>	Water-thread Pondweed	2002	S2	G5	SC
<i>Scirpus torreyi</i>	Torrey's Bulrush	2002	S2	G5?	SC
<i>Utricularia geminiscapa</i>	Hidden-fruited Bladderwort	2003	S3	G4G5	SC
<i>Utricularia purpurea</i>	Purple Bladderwort	2002	S3	G5	SC
Communities					
Emergent marsh	Emergent Marsh	1976	S4	G4	NA
Northern sedge meadow	Northern Sedge Meadow	1976	S3	G4	NA
Southern dry-mesic forest	Southern Dry-mesic Forest	2003	S3	G4	NA

13. TWIN LAKES COMPLEX *

Location

USGS 7.5' Quadrangle: Bloomer, Bob Lake, Jim Falls, Marsh-Miller Lake
 Town-Range-Section: T30-R8W, sections 4 and 5
 T31-R8W, sections 15, 16, 20-23, 26-29, and 32-35
 Approximate Size: 3,841 ac.

Description of Site

This large site is largely roadless and mostly owned by Bloomer Plastics with smaller amounts owned by the Chippewa County Forest and other private landowners. Most of the Twin Lakes Complex is on the of uneven topography of the Pikes Peak Moraines, but the southern end is on the more gently rolling topography of the Maple Hill Moraines. This is a landscape of numerous low, sinuous forested ridges interspersed among low areas with open and forested wetlands, small lakes, and streams. The uplands are covered with red oak forest that has paper birch, aspen, and red maple. There are some areas with mesic sugar maple forest with a fairly rich herb layer. Open wetlands include Northern Sedge Meadow, Open Bog, Poor Fen, and Southern Sedge Meadow along streams. Forested wetlands include northern wet forest of tamarack and black spruce, and Hardwood Swamp of black ash, red maple, and yellow birch.

Significance of Site

Twin Lakes Complex has extensive tracts of Northern Wet Forest and Open Bog. There are also examples of Northern Sedge Meadow and Emergent Marsh. The wetlands are of good to high quality, and the site includes one the finest Poor Fens in the state on the northeast end of Little Buck Lake. The special concern plant brown beak-rush (*Rhynchospora fusca*) occurs in Poor Fen and Northern Sedge Meadow. This site requires additional inventory - especially the wetlands.

Management Considerations

Wetlands are the most significant natural communities at this site. Special consideration should be give to activities that could change hydrology or water quality.

The site should be monitored periodically for invasive species, especially garlic mustard on the uplands and reed canary grass in the wetlands. Special attention should be paid to timber sale areas and ATV trails as seeds or other propagules can easily and widely be spread by machinery. Small populations of invasive species should be eradicated as quickly as possible to minimize the risk of spreading.

13. Twin Lakes Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status	Federal Status
Animals						
<i>Boloria eunomia</i>	Bog Fritillary	1982	S3	G5	SC/N	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	1992	S3B	G4	SC/FL	LT, PD
<i>Ophiogomphus carolus</i>	Riffle Snaketail	1971	S3	G5	SC/N	
Plants						
<i>Rhynchospora fusca</i>	Brown Beakrush	2003	S2	G4G5	SC	
Communities						
Emergent marsh	Emergent Marsh	1999	S4	G4	NA	

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status	Federal Status
Northern sedge meadow	Northern Sedge Meadow	1999	S3	G4	NA	
Northern wet forest	Northern Wet Forest	1999	S4	G4	NA	
Open bog	Open Bog	1976	S4	G5	NA	

14. O'NEIL CREEK COMPLEX – SOUTH *

Location

USGS 7.5' Quadrangle: Bloomer, Jim Falls
 Town-Range-Section: T30-R8W, sections 4, 5, 8, 9, and 16
 Approximate Size: 1,173 ac.

Description of Site

O'Neil Creek Complex-South is a large mostly level basin bisected by O'Neil Creek and is wholly privately owned. There is a large gravel operation on the western edge of the site, and a small road traverses the southwest corner to uplands in the center. Much of the site consists of Northern Wet-mesic Forest that is dominated by conifers including northern white cedar. Other parts of the complex are in shrub-swamp and open wetlands including Northern Sedge Meadow.

Significance of Site

This site consists of a large, relatively remote wetland complex consisting of several different community types, as well as an over one-mile stretch of O'Neil Creek. The site was not surveyed during this study, and there might be other important elements of biodiversity. Two Special Concern dragonflies have been documented on O'Neil Creek.

Management Considerations

Wetlands are the most significant natural communities at this site. Special consideration should be given to activities that could change hydrology. The site should be monitored periodically for invasive species, especially garlic mustard on the uplands and reed canary grass in the wetlands. Special attention should be paid to timber sale areas and ATV trails as seeds or other propagules can easily and widely be spread by machinery. Small populations of invasive species should be eradicated as quickly as possible to minimize the risk of spreading.

14. O'Neil Creek Complex - South Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	State Status	
Animals						
<i>Ophiogomphus carolus</i>	Riffle Snaketail	1971	S3	G5	SC/N	
<i>Ophiogomphus smithi</i>	Sand Snaketail	1990	S2	G2	SC/N	
Communities						
Northern wet-mesic forest	Northern Wet-mesic Forest	1999	S3S4	G3?	NA	

APPENDIX C

Natural Communities of the Study Area

Forest Communities:

Northern Mesic Forest

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

Northern Dry-Mesic Forest

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

Southern Dry-Mesic Forest

Red oak (*Quercus rubra*) is a common dominant tree of this upland forest community type. White oak (*Q. alba*), basswood (*Tilia americana*), sugar and red maples (*Acer saccharum* and *A. rubrum*), and white ash (*Fraxinus americana*) are also important. The herbaceous understory flora is diverse and includes many species listed under Southern Dry Forest plus jack-in-the-pulpit (*Arisaema triphyllum*), enchanter's-nightshade (*Circaea lutetiana*), large-flowered bellwort (*Uvularia grandiflora*), interrupted fern (*Osmunda claytoniana*), Lady Fern (*Athyrium Filix-femina*), tick-trefoils (*Desmodium glutinosum* and *D. nudiflorum*), and hog peanut (*Amphicarpa bracteata*). To the detriment of the oaks, mesophytic tree species are becoming increasingly important under current management practices and fire suppression policies.

Hardwood Swamp (formerly called Northern Hardwood Swamp, this is a split from Curtis' Northern Wet-Mesic Forest),

These are northern deciduous forested wetlands that occur along lakes or streams, or in insular basins in poorly drained morainal landscapes. The dominant tree species is black ash (*Fraxinus nigra*), but in some stands red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*), and (formerly) American elm (*Ulmus americana*) are also important. The tall shrub speckled alder (*Alnus incana*) may be locally common. The herbaceous flora is often diverse and may include many of the same species found in Alder Thickets. Typical species are marsh-marigold (*Caltha palustris*), swamp raspberry (*Rubus pubescens*), skullcap (*Scutellaria galericulata*), orange jewelweed (*Impatiens capensis*), and many sedges (*Carex* spp.). Soils may be mucks or mucky sands.

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

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

White Pine - Red Maple Swamp

This swamp community is restricted to the margins of the bed of extinct glacial Lake Wisconsin in the central part of the state. It often occurs along headwaters streams and seepages in gently sloping areas. White pine (*Pinus strobus*) and red maple (*Acer rubrum*) are the dominant trees, with other species, including yellow birch (*Betula alleghiensis*), present in lesser amounts. Common understory shrubs are speckled alder (*Alnus incana*), winterberry holly (*Ilex verticillata*), and swamp dewberry (*Rubus pubescens*); characteristic herbs include skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmunda cinnamomea*), gold thread (*Coptis trifolia*), and two disjuncts from the eastern United States, bog fern (*Thelypteris simulata*) and long sedge (*Carex folliculata*). Sphagnum and other mosses are common.

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

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

Shrub Communities:

Alder Thicket

These wetlands are dominated by thick growths of tall shrubs, especially speckled alder (*Alnus incana*). Among the common herbaceous species are Canada bluejoint grass (*Calamagrostis canadensis*), orange jewelweed (*Impatiens capensis*), several asters (*Aster lanceolatus*, *A. puniceus*, and *A. umbellatus*), boneset (*Eupatorium perfoliatum*), rough bedstraw (*Galium asprellum*), marsh fern (*Thelypteris palustris*), arrow-leaved tearthumb (*Polygonum sagittatum*), and sensitive fern (*Onoclea sensibilis*). This type is common and widespread in northern and central Wisconsin, but also occurs in the southern part of the state.

Shrub-Carr

This wetland community is dominated by tall shrubs such as red-osier dogwood (*Cornus stolonifera*), meadow-sweet (*Spiraea alba*), and various willows (*Salix discolor*, *S. bebbiana*, and *S. gracilis*). Canada bluejoint grass (*Calamagrostis canadensis*) is often very common. Associates are similar to those found in Alder Thickets and tussock-type Sedge Meadows. This type is common and widespread in southern Wisconsin but also occurs in the north.

Herbaceous Communities:

Open Bog

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

Poor Fen

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

Northern Sedge Meadow

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

Southern Sedge Meadow

Widespread in southern Wisconsin, this open wetland community is most typically dominated by tussock sedge (*Carex stricta*) and Canada bluejoint grass (*Calamagrostis canadensis*). Common associates are water-horehound (*Lycopus uniflorus*), paniced aster (*Aster simplex*), blue flag (*Iris virginica*), Canada goldenrod (*Solidago canadensis*), spotted joe-pye-weed (*Eupatorium maculatum*), broad-leaved cat-tail (*Typha latifolia*), and swamp milkweed (*Asclepias incarnata*). Reed canary grass (*Phalaris arundinacea*) may be dominant in grazed and/or ditched stands. Ditched stands can succeed quickly to Shrub-carr.

Emergent Aquatic

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

Submergent Aquatic

This herbaceous community of aquatic macrophytes occurs in lakes, ponds, and rivers. Submergent macrophytes often occur in deeper water than emergents, but there is considerable overlap. Dominants include various species of pondweeds (*Potamogeton* spp.) along with waterweed (*Elodea canadensis*), slender naiad (*Najas flexilis*), eel-grass (*Vallisneria americana*), and species of water-milfoil (*Myriophyllum*) and bladderworts (*Utricularia* sp.).

Appendix D

Wisconsin Natural Heritage Working List Explanation

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

Key

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

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

Global Rank: Global element rank. Refer to the Rank Definition Sheet.

State Rank: State element rank. Refer to the Rank Definition Sheet.

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

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

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

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

Global & State Element Rank Definitions

Global Element Ranks:

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

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

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

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

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

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

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

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

G? = Not ranked.

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

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

State Element Ranks

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

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

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

S4 = Apparently secure in Wisconsin, with many occurrences.

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

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

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

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

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

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

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

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

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

SX = Apparently extirpated from the state.

State Ranking of Long-Distance Migrant Animals:

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

APPENDIX E

Landtype Associations of the Study Area

Ecoregions are geographic areas of similar physical, chemical, and biological characteristics organized within a hierarchical framework. Each level of the hierarchy shares important ecological attributes such as climate, geology, landform, hydrology, soils, and vegetation. Terminology for the ecoregions presented here follows that developed for the USDA Forest Service by Bailey (1995), the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et al., 1994), and others. Related information using somewhat different methods of classifying broad landscapes of Wisconsin and the western Great Lakes can be found in Albert (1995) and Hole and Germain (1994).

The NHFEU comprises the following eight different scales of mapping (from largest to smallest): Domain, Division, Province, Section, Subsection, Landtype Association, Landtype, and Landtype Phase. These scales range from millions of square miles to less than 100 acres.

The Chippewa County Forest is located within **Province** 212 – Laurentian Mixed Forest; **Section** 212X - Northern Highlands; and **Subsections** 212Xe - Perkinstown End Moraine, 212Xd - Central/Northwest Wisconsin Loess Plains, and 212Qb - Lincoln Formation Till Plain, Mixed Hardwoods.

The Chippewa County Forest study area contains five **Landtype Associations** (LTAs). Below are brief descriptions for the LTAs that occur within the study area.

LTA 212Xe04 - Pikes Peak Moraines

The characteristic landform pattern is hilly collapsed moraine. Soils are predominately well drained sandy loam over dense, acid sandy loam till. This LTA comprises 65 percent of the study area.

LTA 212Xd05 - Jump River Ground Moraine

The characteristic landform pattern is undulating moraine and stream terraces. Soils are predominately somewhat well drained silt loam over dense, acid sandy loam till. This LTA comprises 21 percent of the study area.

LTA 212Xe03 - Maple Hill Moraines

The characteristic landform pattern is undulating and rolling collapsed moraine complex. Soils are predominately moderately well drained silt loam over dense, acid sandy loam till. This LTA comprises eight percent of the study area.

LTA 212Xd04 - Chippewa-Flambeau Plains

The characteristic landform pattern is rolling collapsed outwash plain. Soils are predominately excessively drained loamy sand over outwash. This LTA comprises five percent of the study area.

LTA 212Qb04 - Chetek Plains

The characteristic landform pattern is nearly level outwash plain with terraces, fans, and sandstone hills common. Soils are predominately well-drained sandy loam over outwash. This LTA comprises one percent of the study area.

APPENDIX F

Sources of Additional Information for Rare Species and Natural Communities

Information for many of the rare plants, animals, and natural communities referred to in this report are available on the Wisconsin DNR Web site through the Bureau of Endangered Resources (<http://dnr.wi.gov/org/land/er/>). In addition to a list of threatened and endangered species (http://dnr.wi.gov/org/land/er/working_list/taxalists/TandE.asp) and the Natural Heritage Inventory Working List (http://dnr.wi.gov/org/land/er/working_list/taxalists/), there are factsheets for many rare species, forms for reporting rare species, and descriptions of Endangered Resources related projects. To view information related to Invasive plants and animals visit the Wisconsin DNR Invasive Species Web pages at <http://dnr.wi.gov/invasives/>.

General Species and Natural Community – Related Links

- Wisconsin's Biodiversity as a Management Issue Report, Wisconsin Department of Natural Resources, May 1995, http://dnr.wi.gov/org/es/science/publications/rs915_95.htm
- Wisconsin Ecological Landscapes Handbook, <http://dnr.wi.gov/landscapes/>
- NatureServe Web site, <http://www.natureserve.org/explorer/>
- Michigan Natural Features Inventory Abstracts: <http://web4.msue.msu.edu/mnfi/pub/abstracts.cfm>
- Endangered and Threatened Species in Forests of Wisconsin: <http://www.dnr.state.wi.us/org/land/forestry/publications/endangered/toc.htm>
- Checklist of Wisconsin Vertebrates: <http://dnr.wi.gov/org/es/science/publications/VertChklist/>
- Wisconsin's Comprehensive Wildlife Conservation Plan: http://dnr.wi.gov/org/land/er/cwcp/Strategy_cwcp/strategy.htm
- Missouri Natural History Division Abstracts: <http://www.conservation.state.mo.us/nathis/endangered/bmp.htm>
- U.S. Fish and Wildlife Services: Species information – Threatened and Endangered Animals and Plants <http://endangered.fws.gov/wildlife.html>
- USGS Northern Prairie Wildlife Research Center Web Site: www.npwrc.usgs.gov
- Landowner Management Guidebook (Michigan DNR) http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm
- Michigan Natural Features Inventory: <http://web4.msue.msu.edu/mnfi/pub/abstracts.cfm>
- Nature of New England- Mammals, Birds, and butterflies: <http://www.nenature.com/>
- Center for Biological Diversity: <http://www.sw-center.org/swcbd/>
- Illinois Field Museum – Research and Collections search (requires free registration): http://www.fmnh.org/research_collections/database.htm

- Cornell University Museum of Vertebrates- Ichthyology, Herpetology, Ornithology and Mammalogy Collections : <http://cumv.bio.cornell.edu/>

Species Specific Links

Amphibians and Reptiles

- Wisconsin's Reptiles and Amphibians: <http://dnr.wi.gov/org/land/er/herps/>
- Casper, G. Continuously updated. Wisconsin Herpetology homepage website: <http://www.mpm.edu/collect/vertzo/herp/atlas/welcome.html>

Aquatic Insects

- Wisconsin's Endangered and Threatened Dragonflies: <http://dnr.wi.gov/org/land/er/invertebrates/dragonflies/>
- Wisconsin Dragonflies and Damselflies: <http://www.atriweb.info/Inventory/Odonata/index.cfm>
- Checklist of Wisconsin Dragonflies – (Wisconsin Entomological Society publication) <http://www.entomology.wisc.edu/wes/pubs/dragonfly.htm>
- Dragonflies and Damselflies (Odonata Information Network): <http://www.afn.org/~iori/>
- Endangered and Threatened Invertebrates of Wisconsin: <http://dnr.wi.gov/org/land/er/publications/etinverts.htm>
- Wisconsin Butterflies (also has information on dragonflies and damselflies): <http://www.wisconsinbutterflies.org>
- University of Wisconsin – Stevens Point Aquatic Entomology Lab: <http://www.uwsp.edu/water/biomonitoring/index3.htm>

Beetles

- Wisconsin Butterflies (also has information on tiger beetles): <http://www.wisconsinbutterflies.org>
- The Tiger Beetles of Nebraska: http://entomology.unl.edu/nebraska_tigers/tigers_home.htm
- Imperial College Department of Biology – North American Tiger Beetle Distribution Maps <http://www.bio.ic.ac.uk/research/tigerb/rangepaper.htm>
- Endangered and Threatened Invertebrates of Wisconsin: <http://dnr.wi.gov/org/land/er/publications/etinverts.htm>

Birds

- Endangered and Threatened Birds of Wisconsin: <http://dnr.wi.gov/org/land/er/factsheets/birds.htm>
- Wisconsin Breeding Bird Atlas: <http://www.uwgb.edu/birds/wbba/>
- Avibase - a website offering an extensive database information system about all birds of the world including distribution information, taxonomy, synonyms and more. Go to: <http://www.bsc-eoc.org/avibase/avibase.jsp>
- Cornell Lab of Ornithology: <http://www.birds.cornell.edu/>
- ATRI Forest Raptor Information and Reporting Page: <http://atriweb.info/Inventory/Raptors/InfoPage.htm>
- U.S. Fish and Wildlife Services – Endangered Species: Cerulean Warbler Petition, habitat information: http://midwest.fws.gov/endangered/birds/cerw_find.html
- USGS Patuxent Wildlife Research Center – Tools for Learning About Birds: <http://www.mbrpwr.usgs.gov/bbs/ident.html>

Butterflies and Moths

- Wisconsin DNR Online Field Guide to Butterflies of Bogs and Barrens: http://dnr.wi.gov/org/land/er/invertebrates/butterflies_moths/intro.htm
- Wisconsin Butterflies: <http://www.wisconsinbutterflies.org>

- USGS- Moths of North America: <http://www.npwrc.usgs.gov/resource/distr/lepid/moths/mothsusa.htm#submit>
- USGS – Butterflies of North America: <http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/wi/toc.htm>
- Northern Prairie Research Center. Butterflies of Wisconsin website: <http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/wi/toc.htm#whitesands>

Fish and Crayfish

- Endangered and Threatened Fish of Wisconsin: <http://dnr.wi.gov/org/land/er/factsheets/fish.htm>
- Non-Game Fish Habitat information: <http://dnr.wi.gov/org/land/er/fish/habitat.htm>
- Fish Identification Database- UW Center for Limnology, WDNR, UW Sea Grant Institute: <http://www.wiscfish.org/fishid/>
- Fishes of Wisconsin- Great Lakes Grant: <http://www.seagrant.wisc.edu/greatlakesfish/becker.html>
- Crayfishes of Wisconsin- <http://www.mpm.edu/collect/invert/jass/default.asp>

Mammals

- Wisconsin's Rare and Non-game mammals: <http://dnr.wi.gov/org/land/er/mammals/>
- Bat Conservation of Wisconsin & Bat Conservation International Inc.: <http://www.batcow.org/>, <http://www.batcon.org/>

Mussels

- Wisconsin's Threatened and Endangered Mussels: <http://dnr.wi.gov/org/land/er/invertebrates/mussels/>
- Freshwater mussels of the Upper Mississippi River System (USGS) <http://midwest.fws.gov/mussel/>
- North Carolina Freshwater Mussels (North Carolina Mussel Atlas): http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a.htm
- Mussels of Illinois by County – Illinois Natural History Survey: <http://www.inhs.uiuc.edu/cbd/main/misc/mussel/mussel.html>
- Freshwater Mussels of the Mid-West: <http://www.msue.msu.edu/mnfi/abstracts.htm>

Plants

- Wisconsin Vascular Plants and Lichens :<http://www.botany.wisc.edu/wisflora/>
- Atlas of Wisconsin Prairie and Savanna Flora – Wisconsin State Herbarium: <http://www.botany.wisc.edu/wisflora/PSAtlas.asp>
- USDA- NRCS Plants Database: <http://plants.usda.gov>
- Wisconsin Vascular Plants – Wisconsin State Herbarium: <http://www.botany.wisc.edu/wisflora/>
- USGS: Midwestern Wetland Flora – field office guide to plant species: <http://www.npsc.nbs.gov/resource/othrdata/plntguid/plntguid.htm>
- Harvard University: Flora of North America: <http://hua.huh.harvard.edu/FNA/>
- Lichens of North America, <http://www.lichen.com/index.html>

Plant communities

- Wisconsin Natural Heritage Inventory Natural Community Descriptions: <http://dnr.wi.gov/org/land/er/communities/descriptions.htm>
- USGS – Wetland Plants and Plant Communities of Minnesota and Wisconsin: <http://www.npwrc.usgs.gov/resource/1998/mnplant/mnplant.htm>
- Plant Communities of the Midwest: <http://www.natureserve.org/publications/plantCommunitiesmidwest.jsp>

Terrestrial Molluscs

- Wisconsin's Threatened and Endangered Snails:
<http://dnr.wi.gov/org/land/er/invertebrates/snails/index.htm>
- Illinois Natural History Survey- Mollusk Collection: <http://www.inhs.uiuc.edu/cbd/collections/mollusk.html>
- Ohio State University – Division of Molluscs: <http://www.biosci.ohio-state.edu/~molluscs/OSUM2/>
- University of Michigan Museum of Zoology- Mollusk Division:
<http://www.ummz.lsa.umich.edu/mollusks/links.html>
- U.S. Fish & Wildlife Service - Region 3 threatened and Candidate Species: From A to Z
<http://midwest.fws.gov/News/publications/insert.pdf>